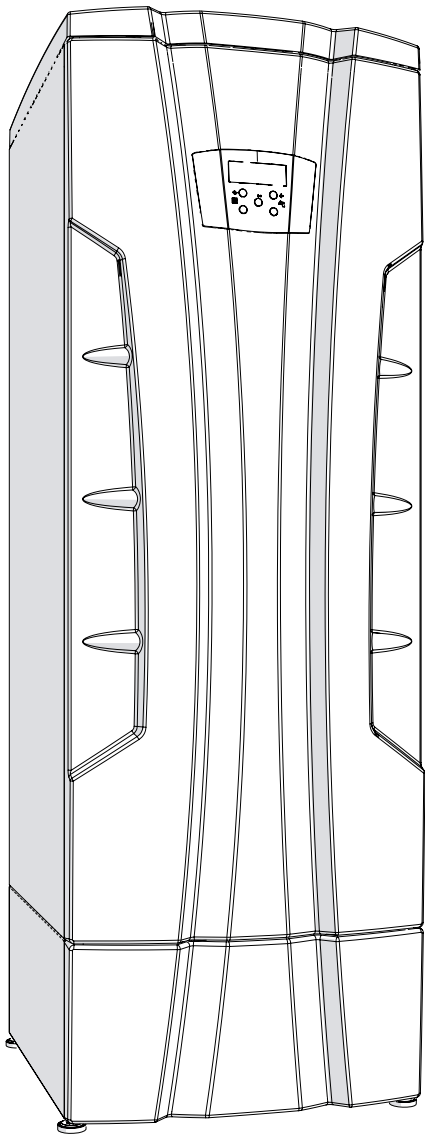
AERCO®

Instruction No. 62403631 R05

AERCO INTERNATIONAL, Inc., 100 Oritani Dr., Blauvelt, NY 10913 USA

Installation and maintenance instructions gas-fired condensing water heater series

AM - R



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

Save this manual for future reference.

C US LLC

ASME

DESIGN CERTIFIED®

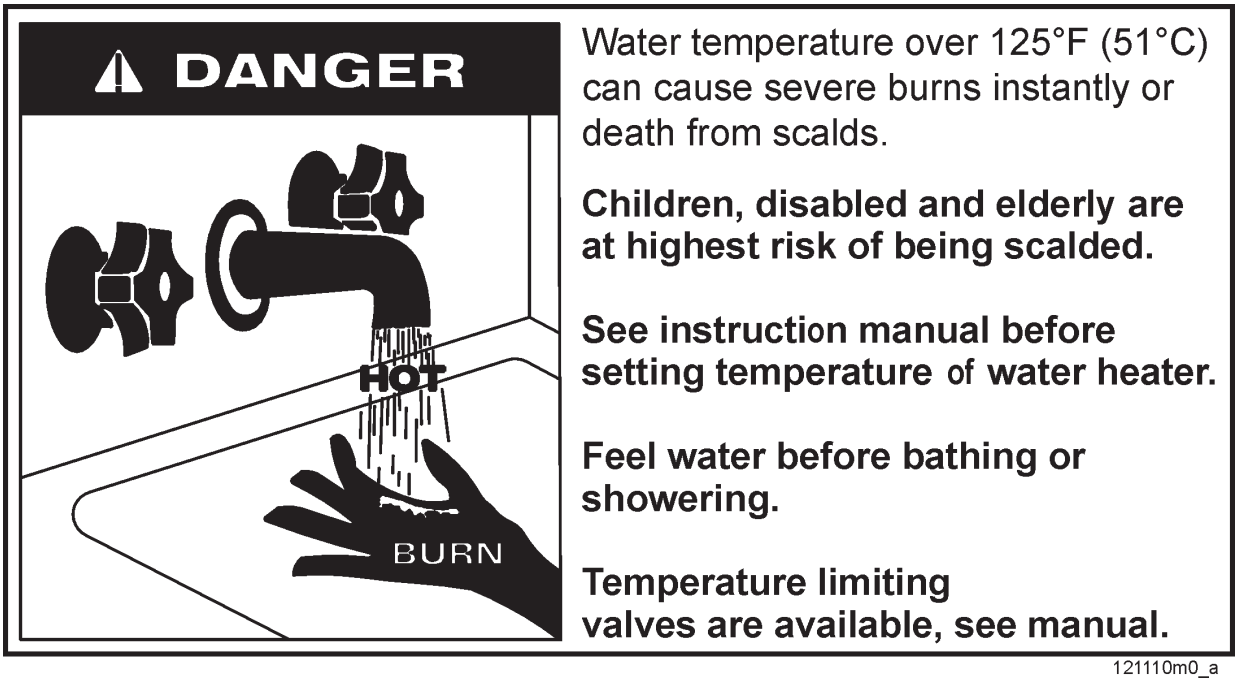
CERTIFIED®

INSTALLER, THESE INSTRUCTIONS TO BE AFFIXED ADJACENT TO THE HEATER

62403631 R05 Feb. 01, 2023

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.**



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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.

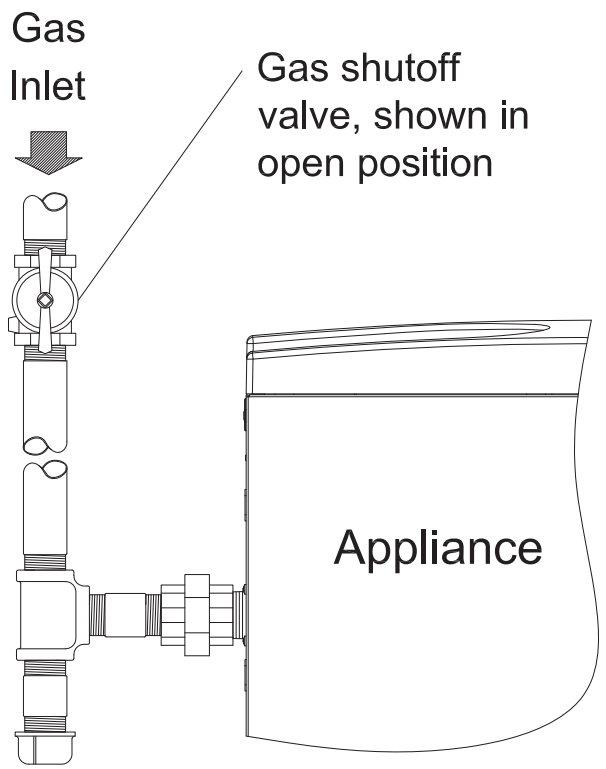
B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

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



1. STOP! Read the safety information above (to the left) on this label.
2. Turn off all electric power to the appliance.
3. Set the main switch to zero.
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 turning the knob 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 (to the left) on this label. If you don't smell gas, go to the next step.
7. Open the manual gas shutoff valve turning the knob counterclockwise.
8. Turn on all electric power to the appliance, and set the main switch to the on position.
9. Set an heating request following the installation manual.
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 to zero.
3. Close the manual gas shutoff valve turning the knob clockwise. Do not force.

62408200

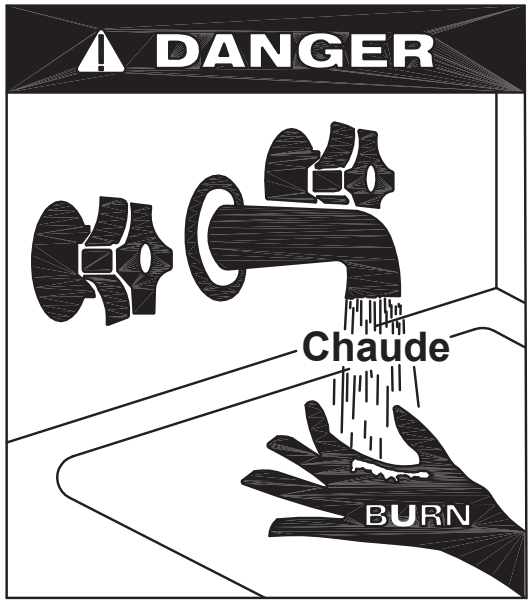
AVERTISSMENT: Assurez vous de bien suivre les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort

- **Ne pas entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables à proximité de cette appareil ou de tout autre appareil.**

- **QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:**

  - **Ne pas tenter d'allumer l'appareil.**
  - **Ne touchez à aucun interrupteur, ne pas vous servir des téléphones se trouvant dans le bâtiment**
  - **Appelez immédiatement votre fournisseur de gas de puis un voisin. Suivez les instructions du fournisseur.**
  - **Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies**

- **L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.**



Un temperature de l'eau au dessus de 125°F (52°C), peut causer de graves brulures instantanément, ou la mort par échaudure.

Les enfants, les personnes handicapées ou âgées sont plus à risque d'être échaudées

Voir le manuel d'instruction avant de régler la température de l'eau sanitaire

Sentir la temperature de l'eau sanitaire avant un bain ou une douche

Limiteurs de temperature sont disponible voir le manuel

121110m0_d

POUR VOTRE SÉCURITÉ LISEZ AVANT D'ALLUMER

AVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans le présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.

A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.

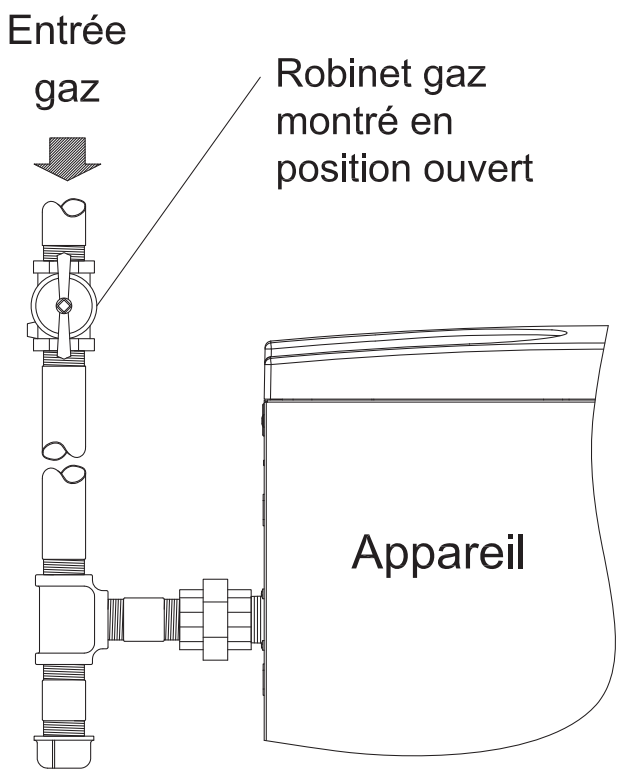
B. AVANT DE FAIRE FONCTIONNER, reniflez tout autour de l'appareil pour déceler une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:
- Ne pas tenter d'allumer d'appareil.
- Ne touchez à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.

C. Ne poussez ou tournez la manette d'admission du gaz qu'à la main; ne jamais utiliser d'outil. Si la manette reste coincée, ne pas tenter de la réparer; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.

D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, méme 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.

INSTRUCTIONS DE MISE EN MARCHE



1. ARRÊTEZ! Lisez les instructions de sécurité sur la portion supérieure (à gauche) de cette étiquette.
2. Coupez l'alimentation électrique de l'appareil.
3. Positionner l'interrupteur sur zero.
4. Cet appareil est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
5. Fermer le robinet de l'admission du gaz tournant la manette dans le sens horaire .
6. Attendre cinq (5) minutes pour laisser échapper tout le gaz. Renifléz tout autour de l'appareil, y compris près du plancher, pour déceler une odeur de gaz. Si vous sentez une odeur de gaz, ARRÊTEZ! Passez à l'étape B des instructions de sécurité sur la portion supérieure (à gauche) de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
7. Ouvrir le robinet de l'admission du gaz tournant la manette dans le sens antihoraire .
8. Positionner l'interrupteur sur un (I).
9. Tourner un demande de eau chauffe suivante le manuel d'installation.
10. Si l'appareil ne se pas en marche, suivez les instructions intitulées "Comment couper l'admission de gaz de l'appareil" et appelez un technicien qualifiè ou le fournisseur de gaz.

COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
2. Positionner l'interrupteur sur zero (0).
3. Fermer le robinet de l'admission du gaz tournant la manette dans le sens horaire .

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SAFETY INSTRUCTIONS

⚠ WARNING!!!

Installer: Read all instructions, including this manual, before installing. Perform steps in the order given.

User: This manual is for use only by a qualified heating installer. Refer to the User's Information Manual for your reference.

Maintenance: at least once a year the user must call a Qualified installer for routine maintenance.

Failure to comply with these provisions can cause a fire or explosion causing property damage, personal injury, or death.

⚠ WARNING!!! **If the information in this manual is not followed exactly, can result in a fire or explosion causing property damage, personal injury, or death.**

⚠ WARNING!!! **Qualified installer: qualified installer is an individual with specific, technical training in space heating systems, domestic hot water systems, fuel gas systems and electrical systems. This individual must have the legally required qualifications. Failure to comply with these provisions can cause a fire or explosion causing property damage, personal injury, or death.**

⚠ WARNING!!! **Installation and Alterations: Only a Qualified installer must carry out the installation and calibration of the heater. Never modify the heater or its flue gas carrying components in any way.**
This heater must be properly vented. Failure to follow these instructions could result in personal injury or death!

⚠ WARNING!!! **Flue gas/air intake: You are only permitted to operate this appliance with the combustion air/flue gas system that has been specifically designed and approved. Failure to follow these instructions could result in excessive levels of carbon monoxide which can cause severe personal injury or death!**

⚠ WARNING!!! **Flue gas/air intake: 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!**

⚠ WARNING!!! **Flue gas/air intake: If heater installation is provided as replacement heater, DO NOT connect new heater venting to an existing vent system, if it is shared with other appliances. Failure to follow these instructions could result in excessive levels of carbon monoxide which can cause severe personal injury or death!**

⚠ WARNING!!! **Flue gas/air intake terminals: Do not restrict or seal any air intake or outlet openings (terminals). Failure to follow these instructions could result in excessive levels of carbon monoxide which can cause severe personal injury or death!**

⚠ WARNING!!! **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 heater! Feel water before bathing or showering.**

NOTICE! Local approval of the flue system and the condensate connection to the public sewer system may be required.

NOTICE! The local building regulations stipulating the installation rules at the time of installation.

CAUTION!!! **Installation location: The heater must be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the heater or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the heater. The pan must not restrict combustion air flow.**

CAUTION!!! **Installation location: The heater must not be installed on carpeting.**

⚠ WARNING!!! **Defects: If you find any defects, you must inform the owner of the system of the defect and the associated hazard in writing. Failure to follow these instructions could result in excessive levels of carbon monoxide a fire or explosion which can cause severe personal injury or death!**

CAUTION!!! **In the event of a breakdown and/or malfunction of the heater, turn off the unit and do not make any attempt to repair it. The heater must be serviced exclusively by a Qualified installer using original spare parts. Failure to comply with this requirement may compromise the safety of the unit.**

⚠ WARNING!!! **When servicing heater, to avoid electric shock, disconnect electrical supply before performing maintenance. Failure to do so can cause severe personal injury or death.**

SAFETY INSTRUCTIONS

⚠ WARNING!!! **When servicing heater, to avoid severe burns, allow heater to cool before performing maintenance. Failure to do so can cause severe personal injury or death.**

⚠ WARNING!!! **Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing. Failure to follow these instructions can cause cause a fire or explosion causing property damage, 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'entretirn terminé.***

⚠ WARNING!!! **Correct Use: This heater must only be used for the purpose for which it has been expressly designed: heating of domestic water (potable) for civil uses. Failure to follow these instructions could result in severe personal injury or death!**

⚠ WARNING!!! **Should overheating occur or the gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, turn off the manual gas shut-off valve external to the appliance. Failure to follow these instructions could result in fire or explosion which can cause severe personal injury or death!**

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

⚠ WARNING!!! **Do not use this appliance if any part has been under water. Immediately call a licensed authorized technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water. Failure to do so can cause severe personal injury or death.**

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

⚠ WARNING!!! **Ensure the heater and its controls are protected from dripping or spraying water during normal operation or service. Failure to do so can cause severe personal injury or death.**

NOTICE! When calling or writing about the heater – Please have the heater model and serial number from the heater rating plate.

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

⚠ WARNING!!! **Only use the heater in the combinations and with the accessories and spares listed in this manual. Failure to do so can cause severe personal injury or death.**

⚠ WARNING!!! **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 or death!**

CAUTION!!! **Do not use "homemade cures" or "heater patent medicines". Serious damage to the heater, personnel, and/or property may result.**

CAUTION!!! **Do not use petroleum-based cleaning or sealing compounds in the heater system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.**

NOTICE! The manufacturer declines all liability, contractual or otherwise (warranty included), for any damage to people, animals property or this same appliance, caused by:

a) - incorrect installation;
b) - failure to comply with this or any other instruction provided by the manufacturer;
c) - failure to comply with the applicable local and/or national regulations in force;
d) - incorrect use of this appliance
e) - inadequate or incorrect service
f) - inadequate or incorrect maintenance.

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1 - CODE REQUIREMENTS

1.1 - Regulations and guidelines

- The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to:

- the latest edition of the ***National Fuel Gas Code, ANSI Z223.1/NFPA 54*** and or ***CAN/CSA B149.1, Natural Gas and Propane Installation Code***.

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

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

NOTICE!
Install CO detectors per local regulations.

NOTICE!
This Water heater meets the safety and other performance requirements as specified in ANSI Z21.10.3 standard.

1.2- Commonwealth of Massachusetts Installation Requirements

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

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

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

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equip-ment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, **"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".**
4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.

(b) Exemptions

The following equipment is exempt from the installation of carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5:

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

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT - VENTING SYSTEM PROVIDED.

When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

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

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT - VENTING SYSTEM NOT PROVIDED.

When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

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

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

2 - GENERAL INFORMATION

2.1 - Key to symbols used

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

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

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

☞ Important indication symbol

2.2 - Manufactured by

AERCO INTERNATIONAL., INC,
100 Oritani Drive, Blauvelt,
NY 10913, USA
Tel (845) 580-8000
FAX (845) 580-8090

2.3 - Description of models:

XXXXXX XXXX

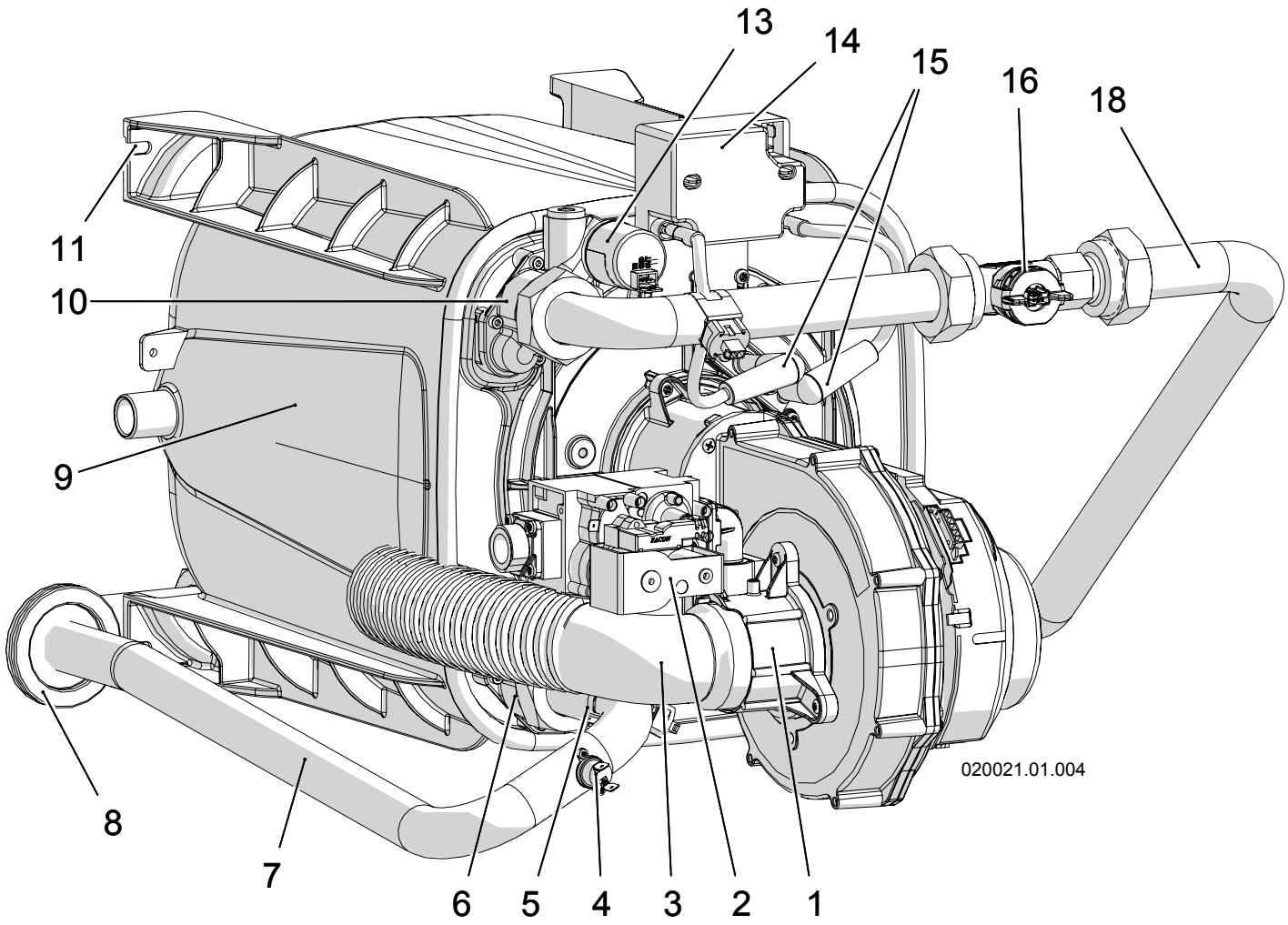
199 = maximum power input 199,000 Btu/hr (57,5 kW) and minimum 50,000 Btu/hr (14,7 kW).
250 = maximum power input 250,000 Btu/hr (70 kW) and minimum 50,000 Btu/hr (14,7 kW).
399 = maximum power input 399,000 Btu/hr (117 kW) and minimum 50,000 Btu/hr (14,7 kW).
500 = maximum power input 500,000 Btu/hr (146,5 kW) and minimum 50,000 Btu/hr (14,7 kW).

AM - R = Fully modulating, gas-fired, condensing potable water heater

2.4 - Accessories included

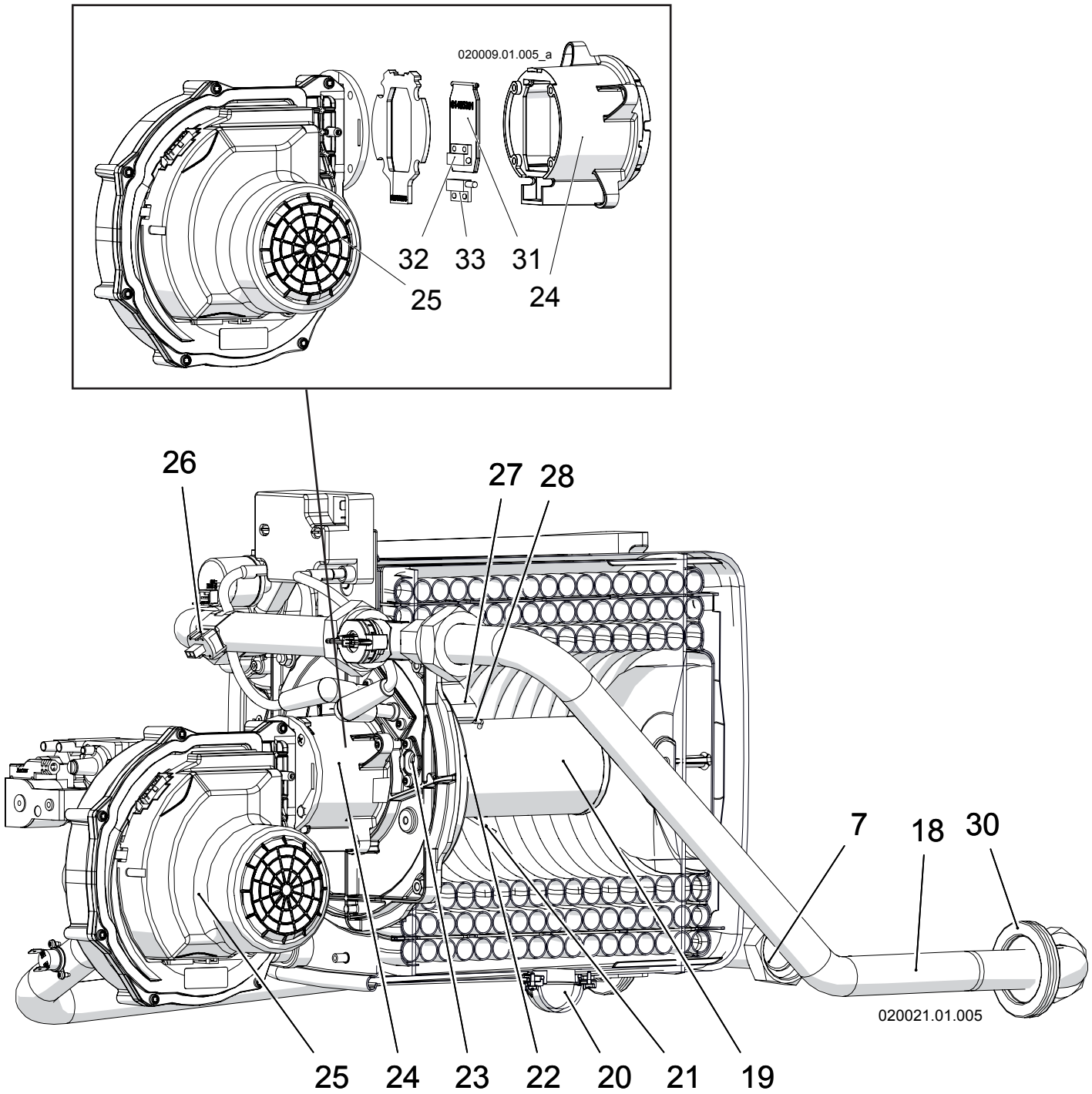
The appliance is equipped with the following accessories:

Quantity No.	Description	Figure
No. 1	NAT TO LP GAS CONVERSION KIT 199 TO 1000	
No. 4	ADJUSTABLE FOOT	
No. 2	PIPE	
No. 2	NUT	
No. 3	GASKET	
No. 1	PIPE FOR LARGER PUMP	
No. 1	NEUTRALIZING LIMESTONE 10KG	
No. 2	EPDM GASKET 2P D56X43X2	
No. 2	SEAL ADAPTER 8 - 1-2	



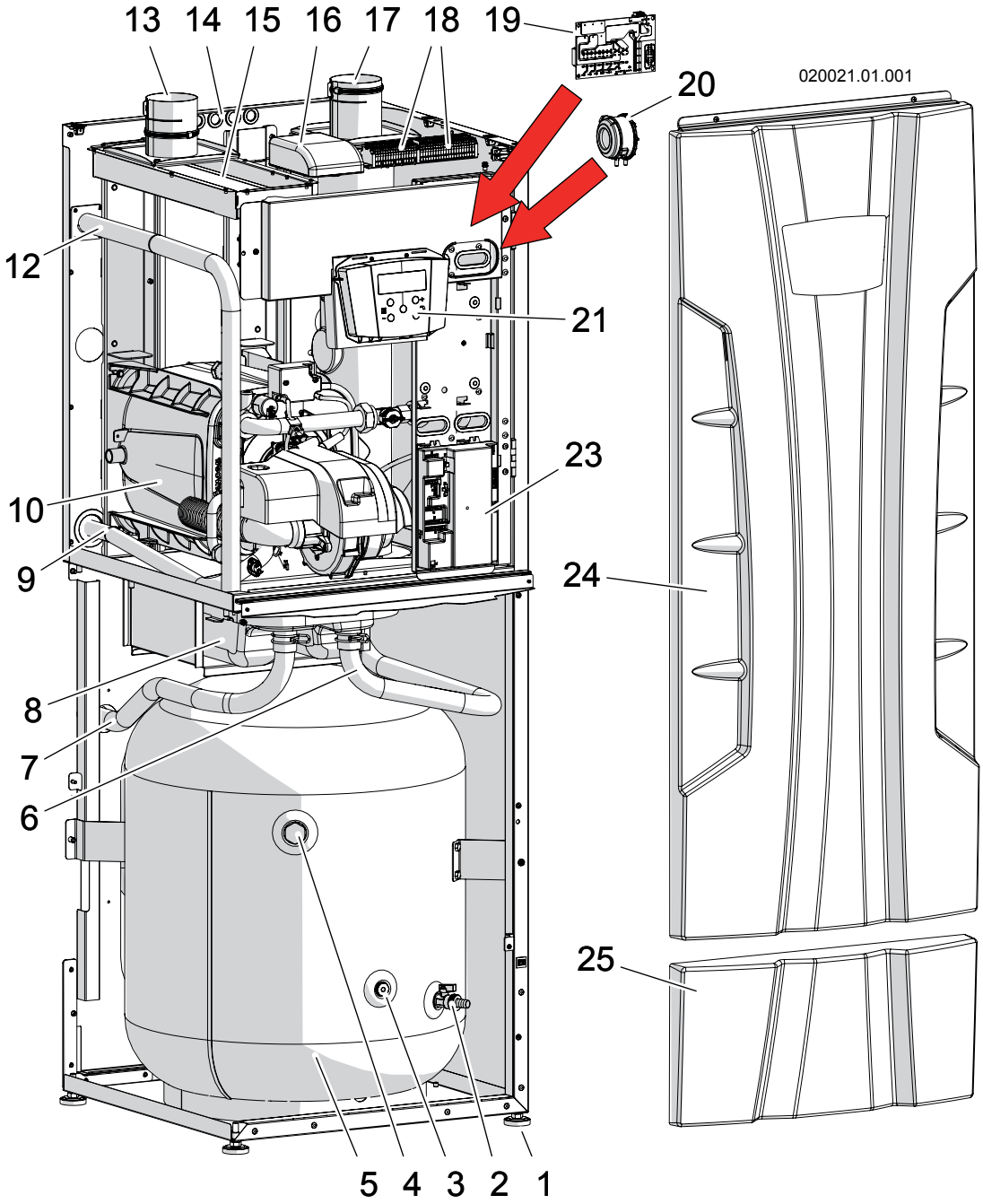
1 - Air / gas mixing device
2 - Gas valve
3 - Air intake silencer
4 - High limit temperature safety switch (UL 353 listed)
5 - Burner unit supply temperature sensor (par. 1001)
6 - Burner unit supply connection
7 - Burner unit supply pipe
8 - Gasket
9 - Unit heat exchanger
10 - Burner unit return connection
11 - Support arrangement
13 - Water pressure sensor (present on Burner 1 only)
14 - Spark generator
15 - Ignitors covers
16 - Water flow sensor (par. 1062)
18 - Return pipe

Figure 3-1 Burner unit main components



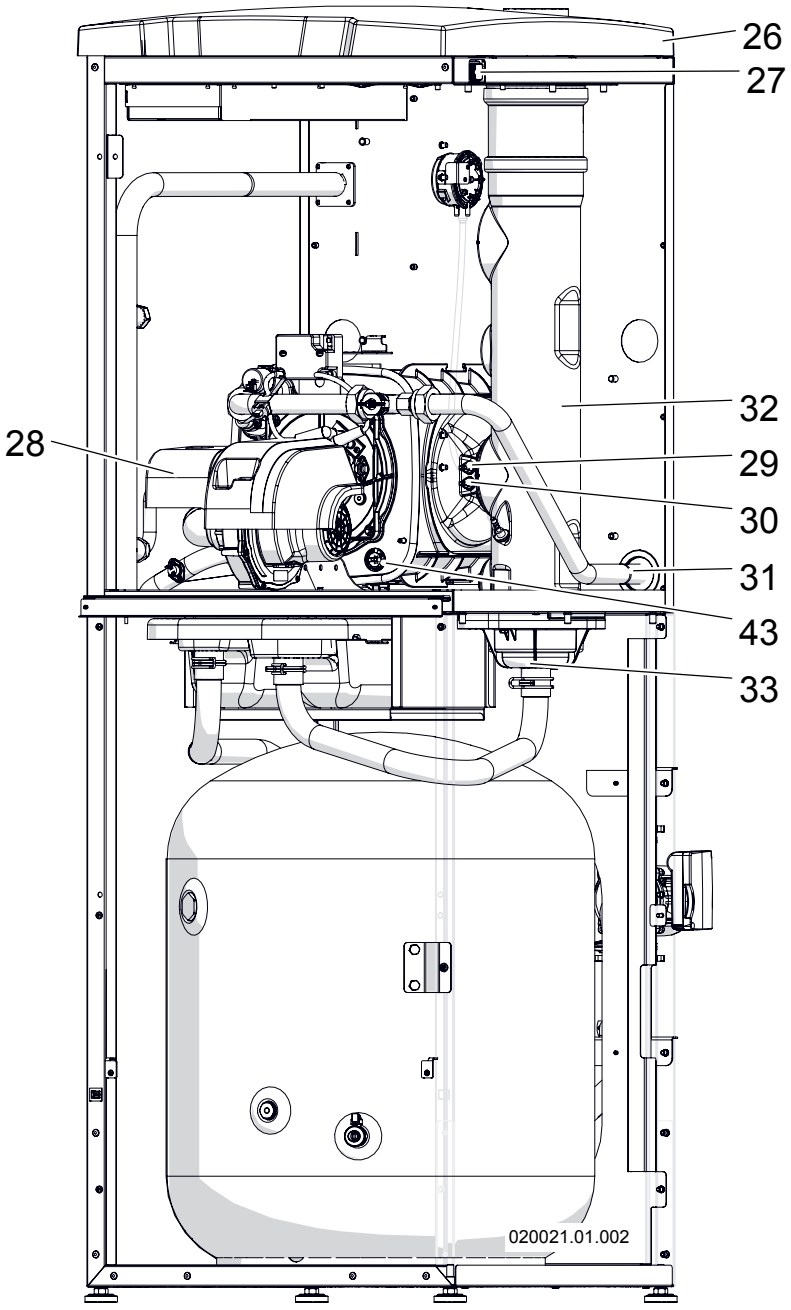
19 - Burner surface
20 - Burner unit condesate discharge
21 - Detection electrode
22 - Thermal insulation
23 - Sight glass
24 - Raccord fan-burner
25 - Modulating Fan
26 - Return temperature sensor (par. 1007)
27 - Left ignition electrode
28 - Right ignition electrode
30 - Gasket
31 - Flapper valve
32 - Flapper magnet
33 - Flapper sensor

Figure 3-2 Burner unit main components



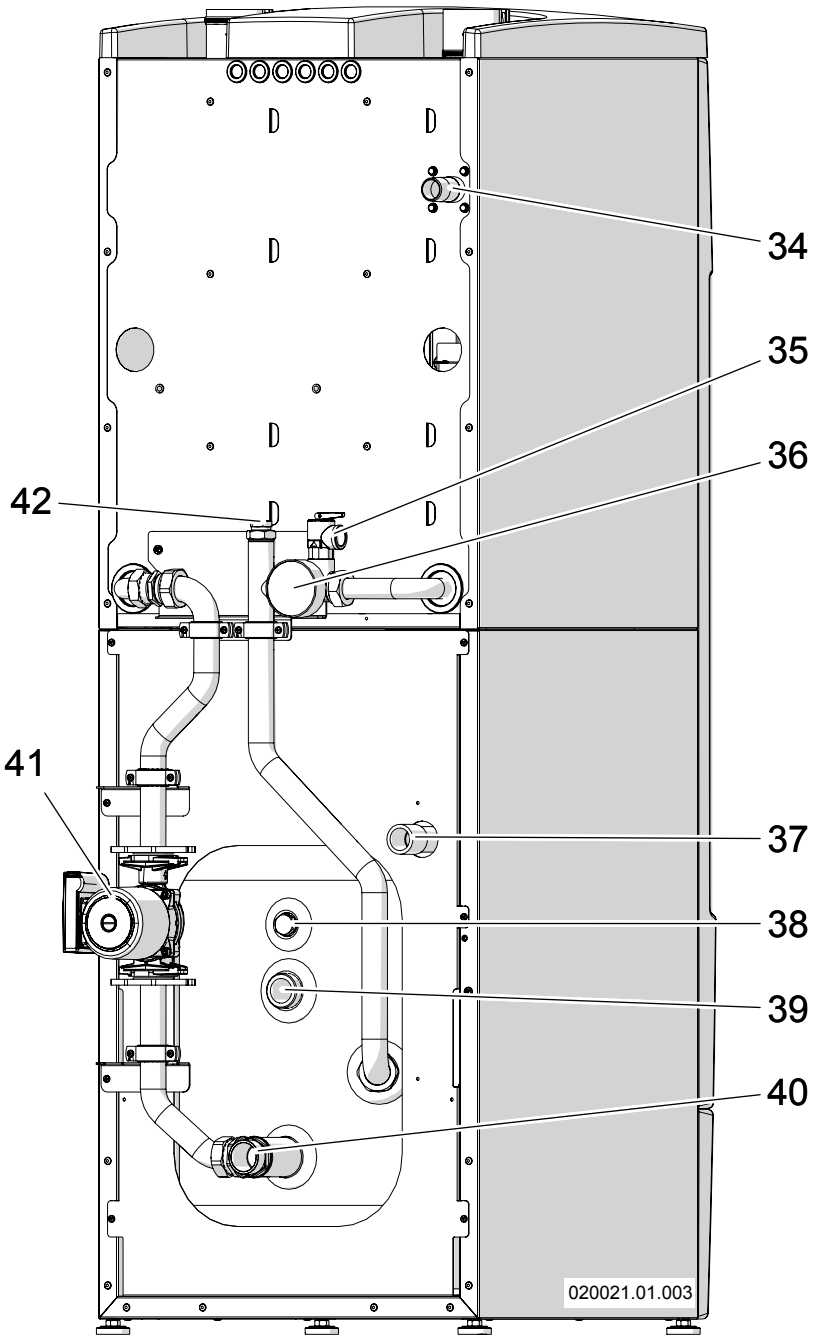
1 - Leveling feet
2 - Drain valve
3 - Tank sensor well
4 - Electronic anode
5 - 32 gal storage tank with 2" thick thermal insulation "R"= 0,0383 W/mK
6 - Condensate hose coming from heater's flue exhaust
7 - Condensate discharge hose
8 - Condensate neutralizer box
9 - Water supply pipe
10 - Heat exchanger
12 - Gas inlet pipe
13 - Air inlet connection
14 - Electrical cable passages
15 - Air filter
16 - 885IF board (optional)
17 - Flue exhaust connection
18 - Electrical terminals
19 - Electrical control board
20 - Flue blocked pressure switch
21 - Control panel
23 - Power control boards
24 - Front cover
25 - Bottom front cover

Figure 3-3 Main components for models 199 and 250



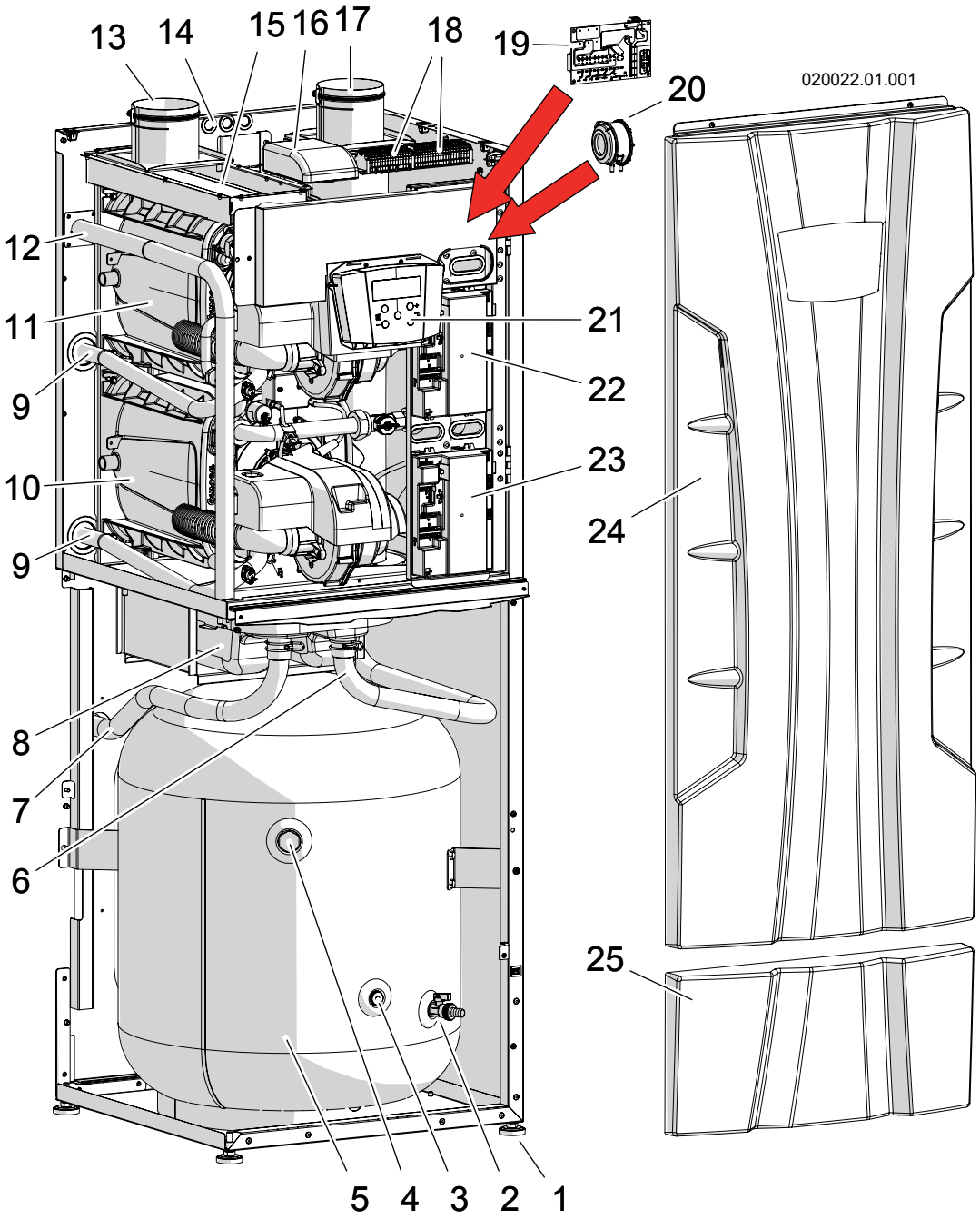
26 - Top cover
27 - Main electrical switch
28 - Fan protection cover
29 - High limit flue gas temperature fuse (Red color connector)
30 - Flue gas temperature sensor (Blue color connector) (1006)
31 - Water return connection
32 - Flue gas exhaust manifold
33 - Condensate blocked drain switch
43 - Primary heat exchanger temperature fuse

Figure 3-4 Main components for models 199 and 250



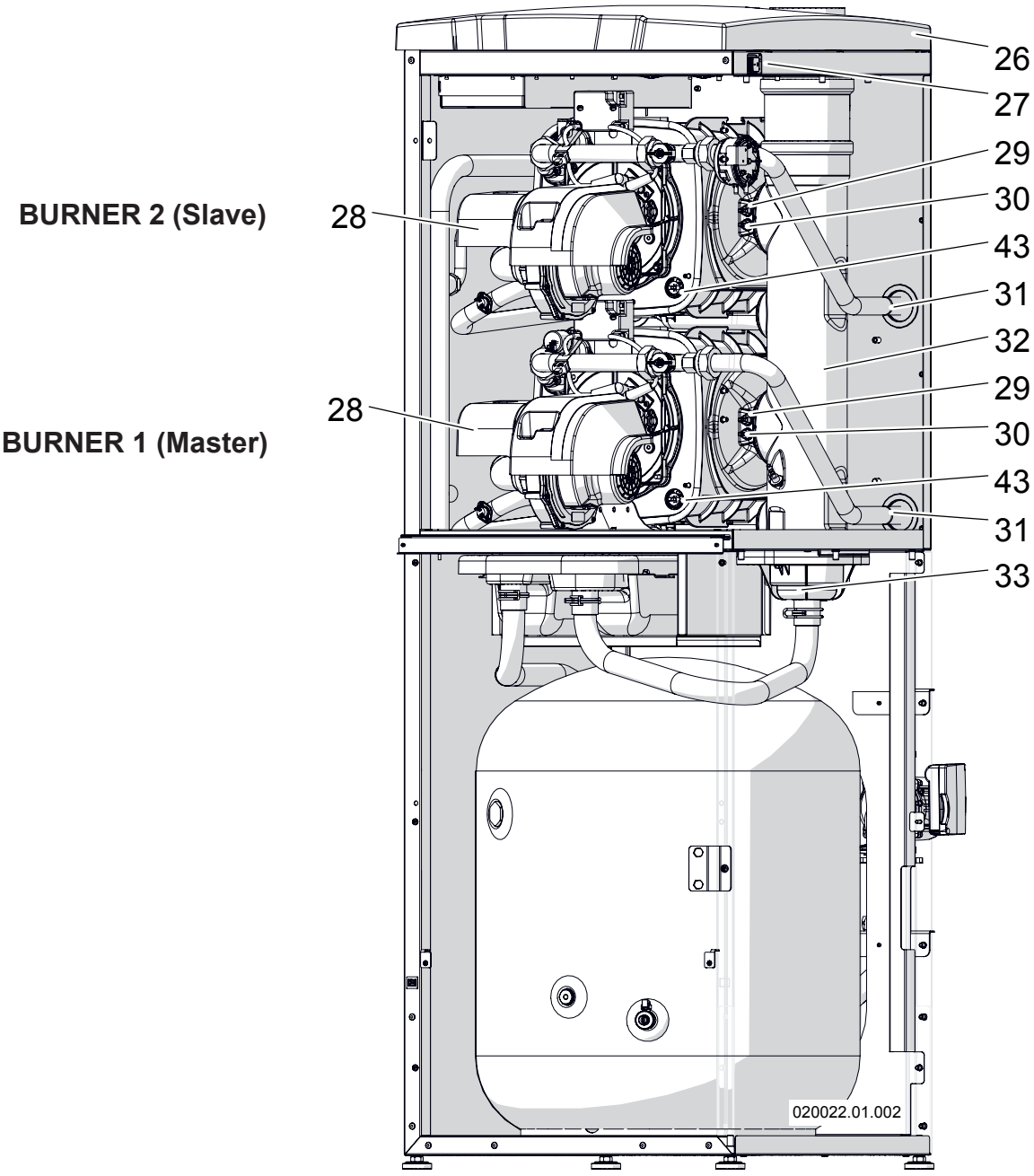
34 - Gas connection
35 - P-T safety relief valve
36 - P-T gauge
37 - Condensate drain
38 - Plug (connection for field supplied safety relief valve)
39 - Hot water outlet connection
40 - Cold water inlet connection
41 - DHW Circulator pump
42 - 3/4” female thread for low water cut off application

Figure 3-5 Main components for models 199 and 250



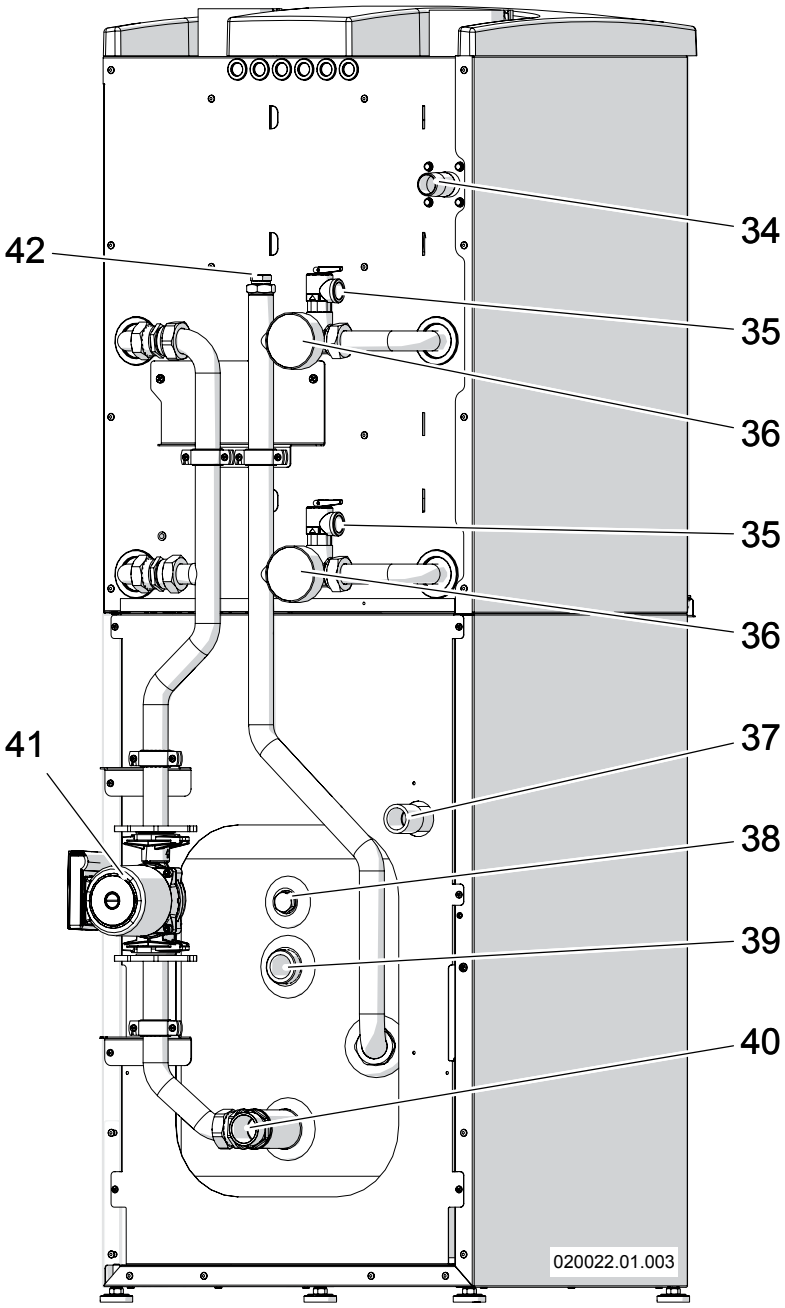
1 - Leveling feet
2 - Drain valve
3 - Tank sensor well
4 - Electronic anode
5 - 32 gal storage tank with 2" thick thermal insulation "R"= 0,0383 W/mK
6 - Condensate hose coming from heater's flue exhaust
7 - Condensate discharge hose
8 - Condensate neutralizer box
9 - Water supply pipe
10 - Heat exchanger ("Burner 1" Master)
11 - Heat exchanger ("Burner 2" Member)
12 - Gas inlet pipe
13 - Air inlet connection
14 - Electrical cable passages
15 - Air filter
16 - 885IF board (optional)
17 - Flue exhaust connection
18 - Electrical terminals
19 - Electrical control board
20 - Flue blocked pressure switch
21 - Control panel
22 - "Burner 2" power control board
23 - "Burner 1" (Master) power control boards
24 - Front cover
25 - Bottom front cover

Figure 3-6 Main components for models 399 and 500



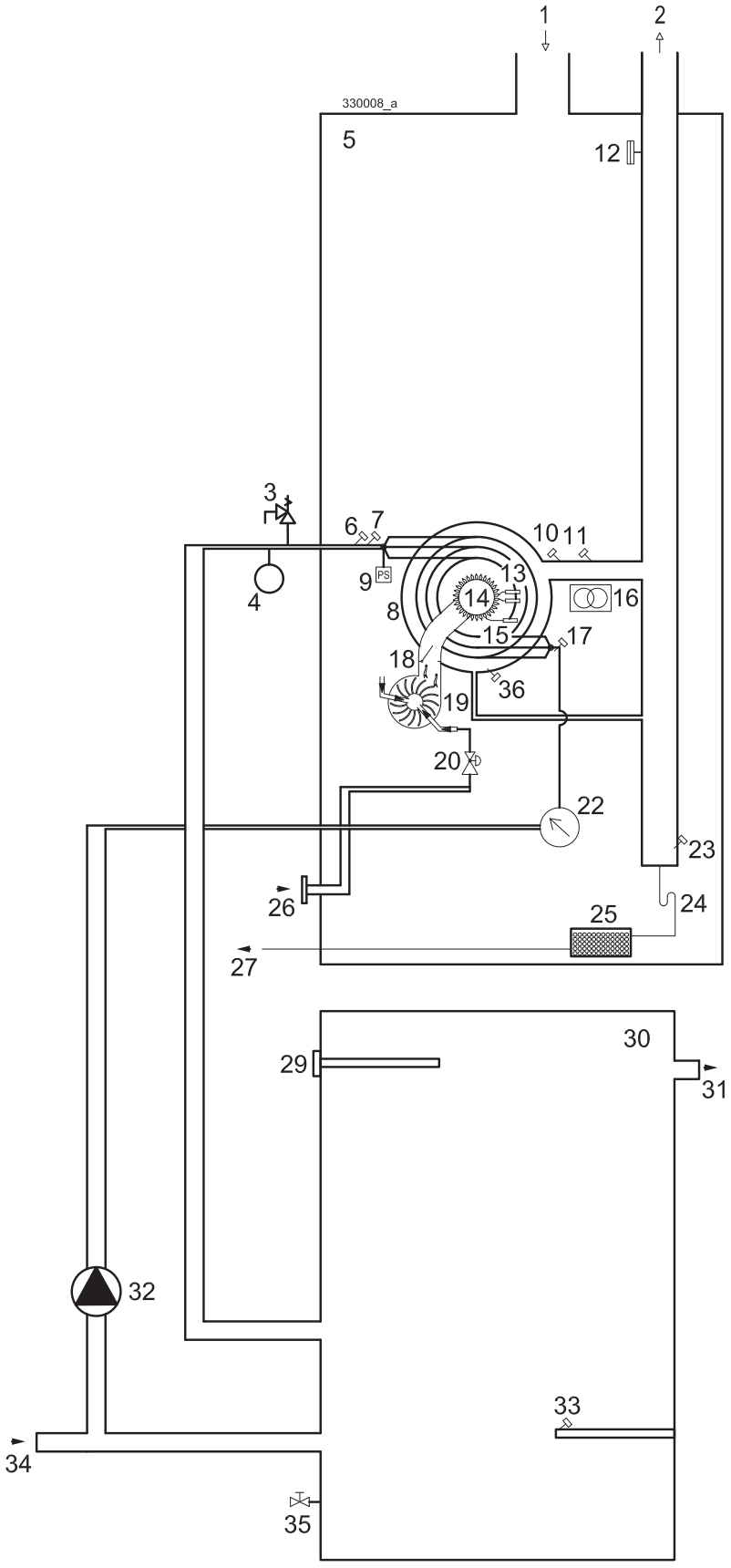
26 - Top cover
27 - Main electrical switch
28 - Fan protection cover
29 - High limit flue gas temperature fuse (Red color connector)
30 - Flue gas temperature sensor (Blue color connector) (1006)
31 - Water Return connection
32 - Flue gas exhaust manifold
33 - Condensate blocked drain switch
43 - Primary heat exchanger temperature fuse

Figure 3-7 Main components for models 399 and 500



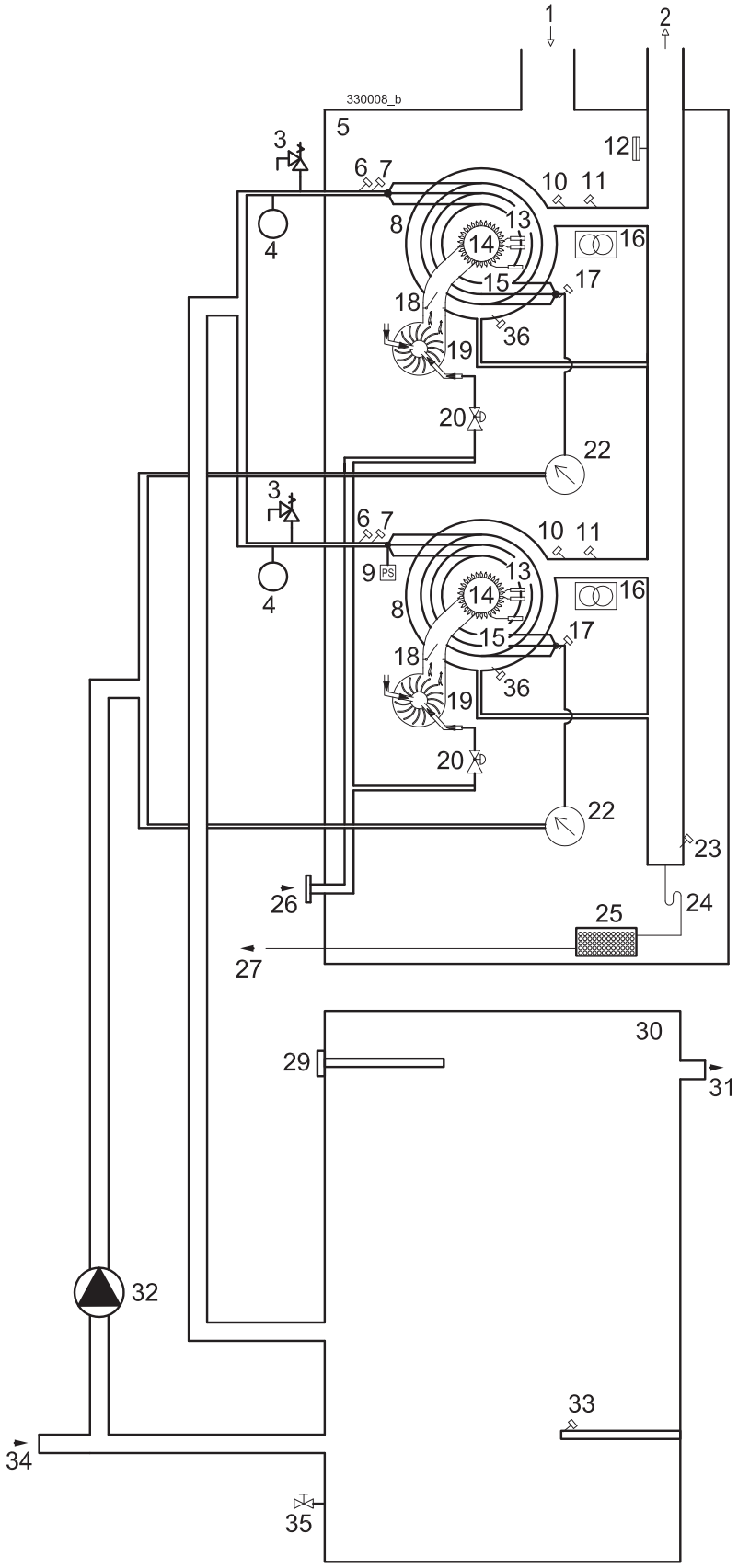
34 - Gas connection
35 - P-T safety relief valve
36 - P-T gauge
37 - Condensate drain
38 - Plug (connection for field supplied safety relief valve)
39 - Hot water outlet connection
40 - Cold water inlet connection
41 - DHW Circulator pump
42 - 3/4” female thread for low water cut off application

Figure 3-8 Main components for models 399 and 500



Key to figures 4-1
1 - Air inlet
2 - Flue exhaust
3 - P-T Safety relief valve
4 - P-T gauge
5 - Sealing chamber
6 - High limit supply temperature switch
7 - Supply temperature sensor
8 - CRV Stainless steel heat exchanger
9 - Water pressure sensor
10 - Flue gas temperature sensor
11 - High limit flue gas temperature fuse
12 - Blocked flue pressure switch
13 - Ignition electrodes
14 - Premix burner
15 - Detection electrode
16 - ignitor
17 - Return temperature sensor
18 - Back flue preventer
19 - Modulating PWM fan
20 - Gas valve
22 - Water flow meter
23 - Condensing blocked drain switch
24 - Condensate Siphon
25 - Condensate neutralizer box
26 - Gas inlet
27 - Condensate drain
29 - Electronic anode
30 - Stainless steel storage tank
31 - Hot water outlet
32 - DHW Circulator pump
33 - Tank sensor
34 - Cold water inlet
35 - Drain valve
36 - Primary heat exchanger temperature fuse

Figure 4-1 - Hydronic functional schematic for models 199 and 250



Key to figures 4-2
1 - Air inlet
2 - Flue exhaust
3 - P-T Safety relief valve
4 - P-T gauge
5 - Sealing chamber
6 - High limit supply temperature switch
7 - Supply temperature sensor
8 - CRV Stainless steel heat exchanger
9 - Water pressure sensor
10 - Flue gas temperature sensor
11 - High limit flue gas temperature fuse
12 - Blocked flue pressure switch
13 - Ignition electrodes
14 - Premix burner
15 - Detection electrode
16 - ignitor
17 - Return temperature sensor
18 - Back flue preventer
19 - Modulating PWM fan
20 - Gas valve
22 - Water flow meter
23 - Condensing blocked drain switch
24 - Condensate Siphon
25 - Condensate neutralizer box
26 - Gas inlet
27 - Condensate drain
29 - Electronic anode
30 - Stainless steel storage tank
31 - Hot water outlet
32 - DHW Circulator pump
33 - Tank sensor
34 - Cold water inlet
35 - Drain valve
36 - Primary heat exchanger temperature fuse

Figure 4-2 - Hydronic functional schematic for models 399 and 500

4.1 - Intended use and functions

4.1.1 Intended use and functions

The water heater version, is designed to warm domestic water (potable) for civil uses. Any other use is prohibited.
The water heater can be installed with a Direct Venting system or with a one pipe vent system and getting combustion air from room.
The quality of the system water is very important. Poor water quality can damage the water heater due to scale formation and corrosion.
The heater must be connected to a domestic hot water supply with compatible specifications, performance and power rating.

5.1 - Choosing the installation location

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

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

WARNING!!! Provisions for combustion air and ventilation of the heater room are always required, regardless whether the combustion air is taken from the outside (Direct Vent, sealed combustion) or inside (room air for combustion). Failure to comply with this provision could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

WARNING!!! Insufficient ventilation of the heater room can lead to high air temperatures. Failure to comply with this provision could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

WARNING!!! Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of openings takes place. When the problem is not resolved, do not operate the heater. Please note these restrictions and its dangers to the operator of the heater. Failure to comply with this provisions could result in severe personal injury, death, or substantial property damage.

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

CAUTION!!! This heater is not designed for direct outdoor installation. If installed outside of the structure, it must be sheltered so it is protected from rain, wind, sun and frost. NEVER place this heater in a location that would subject it to temperatures at or near freezing or temperature that exceed 100°F (38°C). Failure to properly locate this heater can result in premature failure.

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

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

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

Maintain minimum specified clearances for adequate operation. All installations must allow sufficient space for servicing the vent connections, water pipe connections, piping and other auxiliary equipment, as well as the appliance. The clearance labels on each appliance note the same service and combustible clearance requirements as shown on section 5.4 and 5.5.

Multiple appliances may be installed in a modular heater installation.

Consult the venting section of this manual for specific installation instructions for the appropriate type of venting system that you will be using. Direct vent and vent/air venting systems require installation with **Category IV** flue pipe, sealed air inlet pipe, and air inlet caps, which must meet the manufacturer's specifications.

Combustion and ventilation air requirements for appliances drawing air from the equipment room.

Provisions for combustion and ventilation air must be in accordance with air for combustion and ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances end Equipment, or applicable provisions of the local building codes.

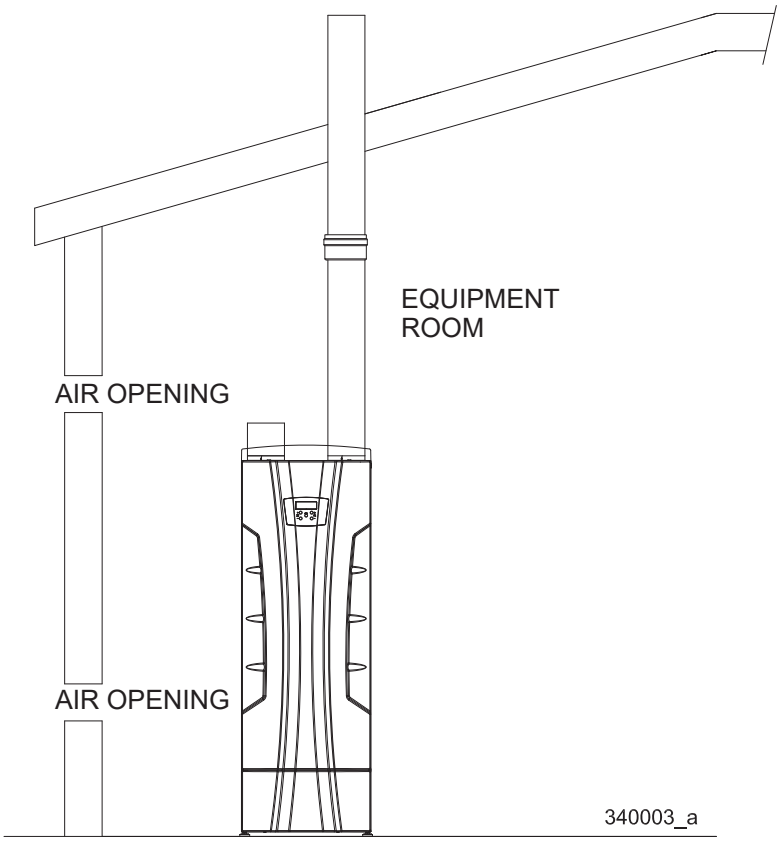


Figure 5-1 Combustion Air direct from outside

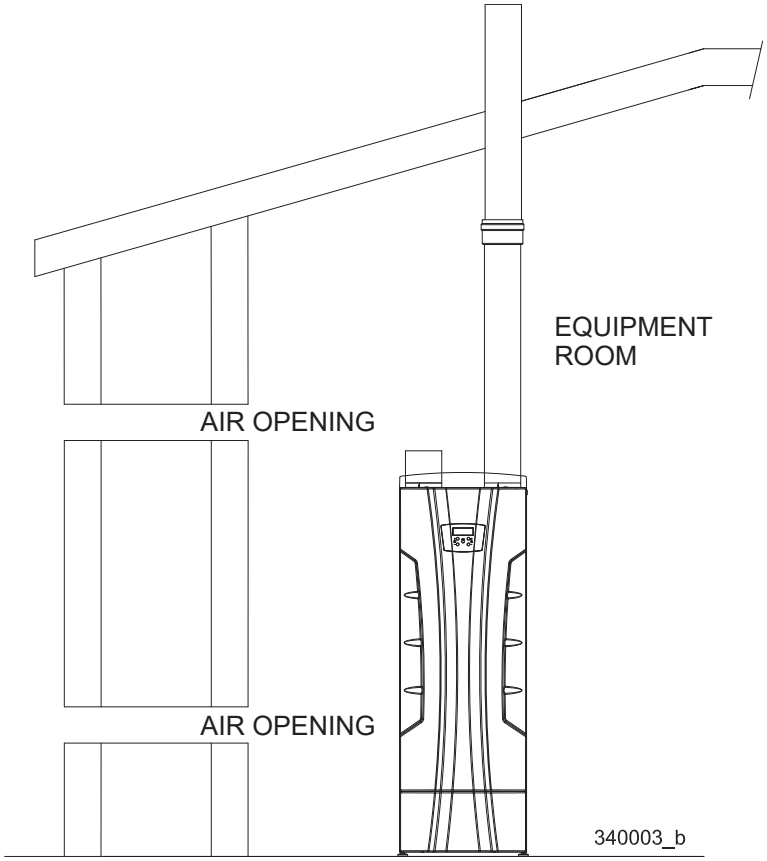


Figure 5-2 Combustion Air through Ducts

The equipment room MUST be provided with properly sized openings to assure adequate combustion air and proper ventilation.

1. If air is taken directly from outside the building with no duct, provide two permanent openings to the equipment room (see Fig. 5-1)

   (a) Combustion air opening, with a minimum free area of one square inch per 4000 Btu/hr input (5.5 cm^2 per kW). This opening must be located within 12” (30 cm) of the bottom of the enclosure.

   (b) Ventilation air opening, with a minimum free area of one square inch per 4000 Btu/hr input (5.5 cm^2 per kW). This opening must be located within 12” (30 cm) of the top of the enclosure.

2. If combustion and ventilation air is taken from the outdoors using a duct to deliver the air to the equipment room, each of the two openings should be sized based on a minimum free area of one square inch per 2000 Btu/hr (11 cm^2 per kW) of input (see Fig. 5-2).

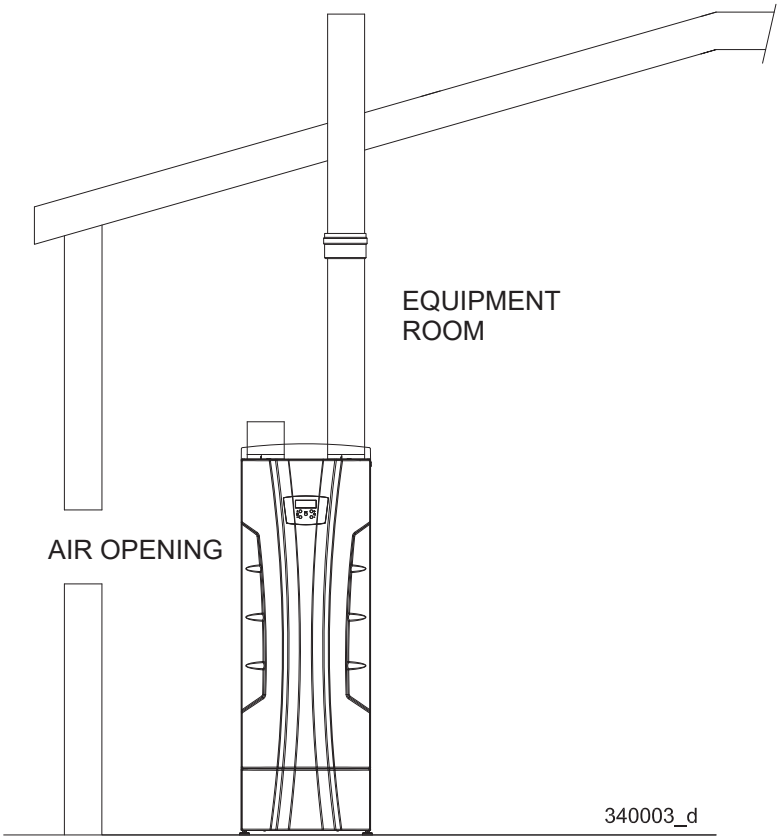


Figure 5-3 Combustion Air from outside - single opening

3. If a single combustion air opening is provided to bring combustion air in directly from the outdoors, the opening must be sized based on a minimum free area of one square inch per 3000 Btu/hr (7 cm^2 per kW). This opening must be located within 12” (30cm) of the top of the enclosure (see Fig.5-3).

MINIMUM RECOMMENDED COMBUSTION AIR SUPPLY TO EQUIPMENT ROOM					
Model Number	* Outside Air from 2 openings Directly from Outdoor		* Outside Air from 1 Opening Directly from Outdoors, in^2	Inside Air from 2 Ducts Delivered from Outdoors	
	Top Opening, in^2	Bottom Opening, in^2		Top Opening, in^2	Bottom Opening, in^2
199	50 (323 cm^2)	50 (323 cm^2)	67 (433 cm^2)	100 (646 cm^2)	100 (646 cm^2)
250	63 (407 cm^2)	63 (407 cm^2)	84 (542 cm^2)	125 (807 cm^2)	125 (807 cm^2)
399	100 (646 cm^2)	100 (646 cm^2)	134 (865 cm^2)	200 (1201 cm^2)	200 (1201 cm^2)
500	125 (807 cm^2)	125 (807 cm^2)	167 (1078 cm^2)	250 (1613 cm^2)	250 (1613 cm^2)

* Outside air openings shall directly communicate with the outdoors. When combustion air is drawn from the outside through a duct, the net free area of each of the two openings must have twice (2 times) the free area required for Outside Air/2 Openings. The above requirements are for the heater only; additional gas fired appliances in the equipment room will require an increase in the net free area to supply adequate combustion air for all appliances.

Figure 5-4 Minimum recommended combustion air supply to equipment room

Combustion air requirements are based on the latest edition of the National Fuel Gas, ANSI Z223.1; in Canada refer to the latest edition of CGA Standard CAN B142.2. Check all local code requirements for combustion air.

All dimensions based on net free area in square inches. Metal louvers or screens reduce the free area of a combustion air opening a minimum of approximately 25%. Check with louver manufacturers for exact net free area of louvers. Where two openings are provided, one must be within 12” (30 cm) of the ceiling and one must be within 12” (30 cm) of the floor of the equipment room. Each opening must have net free area as specified in the chart on Figure 5-4. Single openings shall commence within 12” (30 cm) of the ceiling.

⚠ WARNING!!! **Under no circumstances should the equipment room ever be under negative pressure. Particular care should be taken where exhaust fans, attic fans, clothes dryers, compressors, air handling units, etc., may take away air from the unit.**
Failure to follow this warning could result in excessive levels of carbon monoxide, wich can cause severe personal injury or death.

⚠ WARNING!!! **EXHAUST FANS: Any fan or equipment which exhaust air from the equipment room may deplete the combustion air supply and/or cause a downdraft in the venting system. spillage of flue products from the venting system into an occupied living space can cause a very hazardous condition that must be immediately corrected.**
Failure to follow this warning could result in excessive levels of carbon monoxide, wich can cause severe personal injury or death.

⚠ WARNING!!! **The combustion air supply must be completely free of any flammable vapors that may ignite or chemical fumes wich must be avoided are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichlorethylene, perchlorethylene, chlorine, etc. These chemicals, when burned, form acids which quickly attack the heat exchanger tubes, headers, flue collectors, and the vent system.**

The result is improper combustion and premature appliance failure.

5.1.1 - Prevent combustion air contamination

Do not terminate vent/air in locations that can allow contamination of combustion air.

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

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

Products that may contaminate the air combustion:
- Any products with a high ammonia content or other chemical products (eg. Beauty Salons);
- Chlorinated waxes/cleaners;
- Chlorine-based swimming pool chemicals;
- Calcium chloride used for thawing;
- Sodium chloride used for water softening;
- Refrigerant leaks;
- Paint or varnish removers;
- Hydrochloric acid/muriatic acid;
- Cements and glues;
- Antistatic fabric softeners used in clothes dryers;
- Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms;
- Adhesives used to fasten building products and other similar products;

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

5.1.2 - Location of water heater

When locating the water heater the following factors must be considered:

☞ location of the openings for the ventilation of the boiler room regardless whether the combustion air is taken from the outside (Direct Vent, sealed combustion) or inside (room air for combustion).;

☞ the location of vent/air intake terminals;

☞ connection to the gas supply;

☞ connection to the cold water inlet;

☞ connection to the water outlet;

☞ connection to the electrical supply;

☞ disposal of the condensation produced by the heater;

☞ piping of the safety P-T relief valve discharge;

☞ If flooding is possible, elevate the appliance sufficiently to prevent water from reaching the unit.

5.2 - Residential garage installation

Take the following precautions when installing the heater in a residential garage. If the heater is located in a residential garage, it should be installed in compliance with the latest edition of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code.

- ☞ Appliances located in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling shall be installed not less than 18 inches (46 cm) above the floor.
- ☞ The appliance shall be located or protected so that it is not subject to physical damage by a moving vehicle.

5.3 - Closet and alcove installations

This heater is approved for the installation in an alcove or in a closet, for which you have to respect all next rules about clearances, ventings, ventilation openings as per this manual and the National Fuel Gas Code, ANSI Z223.1 /NFPA 54 and/or CAN/CSA B149.1, Natural Gas and Propane Installation Code.

⚠ WARNING!!! Do not use PVC/CPVC/Polypropylene exhaust pipe material into a closet or alcove. Into closet or alcove, the only exhaust pipe material accepted is stainless steel. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can cause severe personal injury or death!

5.4 - Clearances for installation and servicing

Figure 5-6 shows the minimum clearances required for installation and servicing.

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

5.5 - Clearances from combustible material

This heater may be installed directly onto a floor of combustible material. See also Figure 5-5 for other clearances from combustible materials.

5.6 - Vent and combustion air piping

This heater requires a special vent system, designed for pressurized venting.
The heater is to be used for either direct vent installation or for installation using room combustion air. When room air is considered, see Sections 5.1 and 12.9.
Vent and air may be vented vertically through the roof or out a side wall, unless otherwise specified. You may use any of the vent/air piping methods covered in Sections 12 and 13.

⚠ WARNING!!! Do not attempt to install the heater using any other venting / air intake methods than as explained on Sections 12 and 13. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

Be sure to locate the heater such that the vent and air piping can be routed through the building and properly terminated.
The vent/air piping lengths, routing and termination method must all comply with the methods and limits given in Sections 12 and 13.

5.7 - Prevent combustion air contamination

Install air inlet piping for the heater as described in Sections 12 and 13. Do not terminate vent/air in locations that can allow contamination of combustion air. Refer to Section 5.1.1, for products and areas which may cause contaminated combustion air.

⚠ WARNING!!! Ensure that the combustion air will not contain any of the contaminants listed in Section 5.1.1. Contaminated combustion air will damage the heater, resulting in possible severe personal injury, death or substantial property damage.

CLEARANCES FROM COMBUSTIBLE MATERIALS	
Ceiling	2 inches (51 mm)
Front	2 inches (51 mm)
Rear	2 inches (51 mm)
Sides	2 inches (51 mm)
Floor	0 inches (0 mm)
Concentrinc vent	0 inches (0 mm)
Split vent (two pipes), first 3 ft from the appliance	1 inch (25 mm)
Split vent (two pipes), after 3 ft from the appliance	1/4 inch (7 mm)
Supply and return piping	1/4 inch (7 mm)

Figure 5-5; Clearances from combustible material

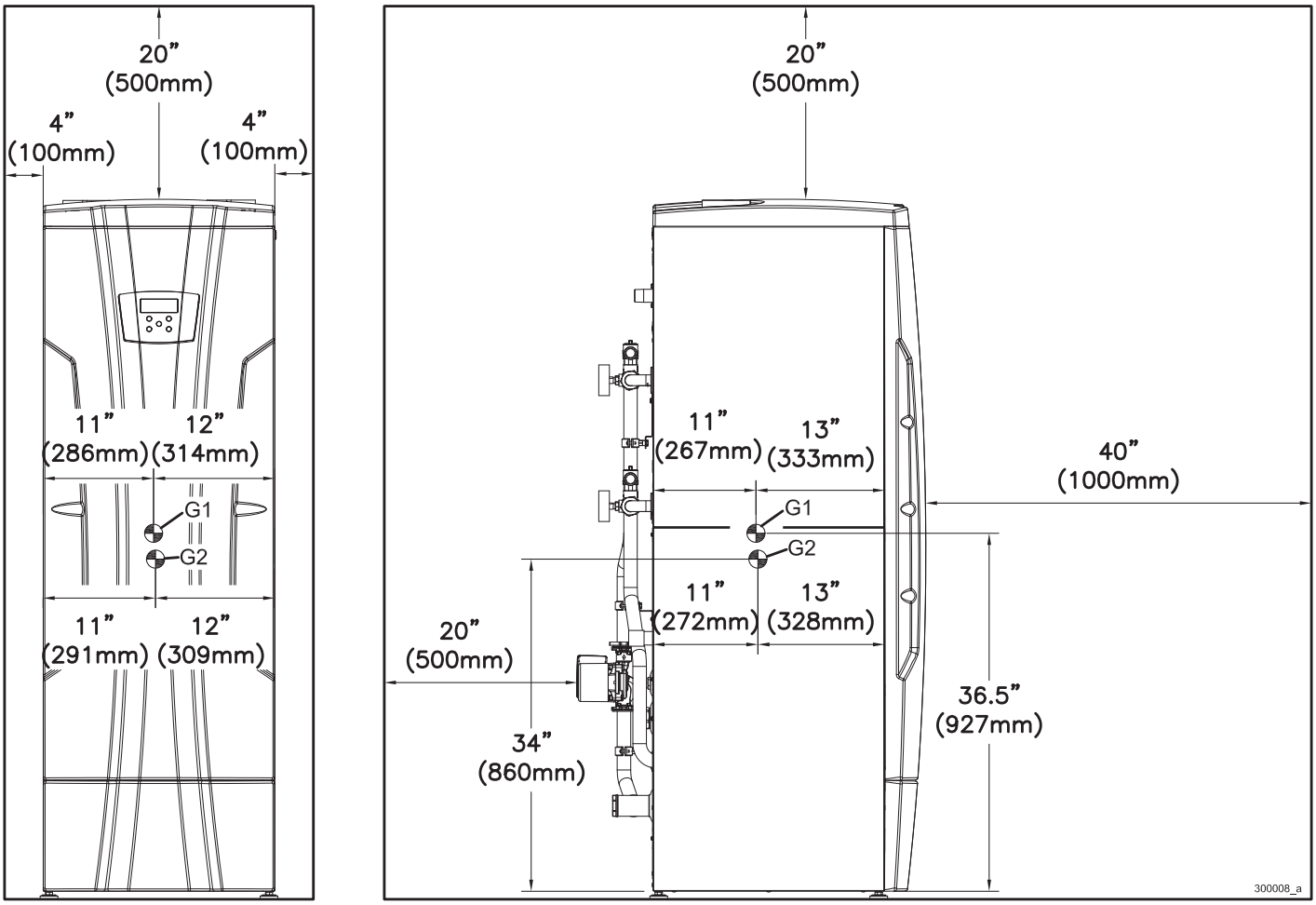


Figure 5-6 Recommended minimum clearance distances for proper installation and servicing for models 199 to 500 (G1 = Center of gravity for 199 and 250 model G2 = Center of gravity for 399 and 500 model)

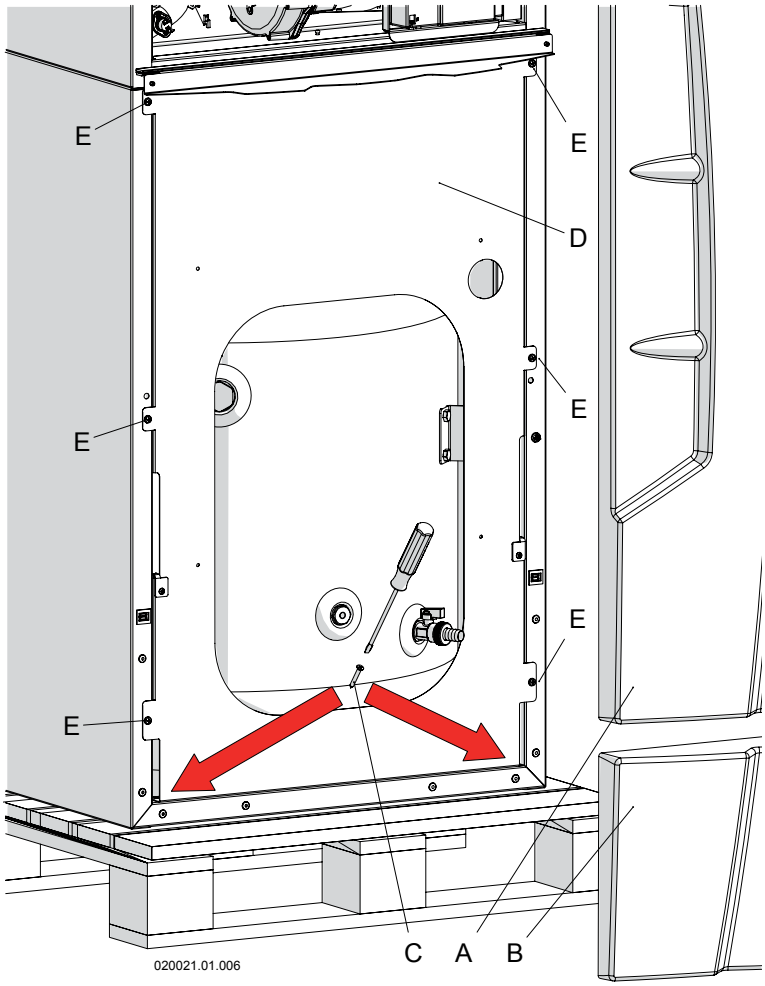


Figure 6-1 Remove heater from wood pallet (front)

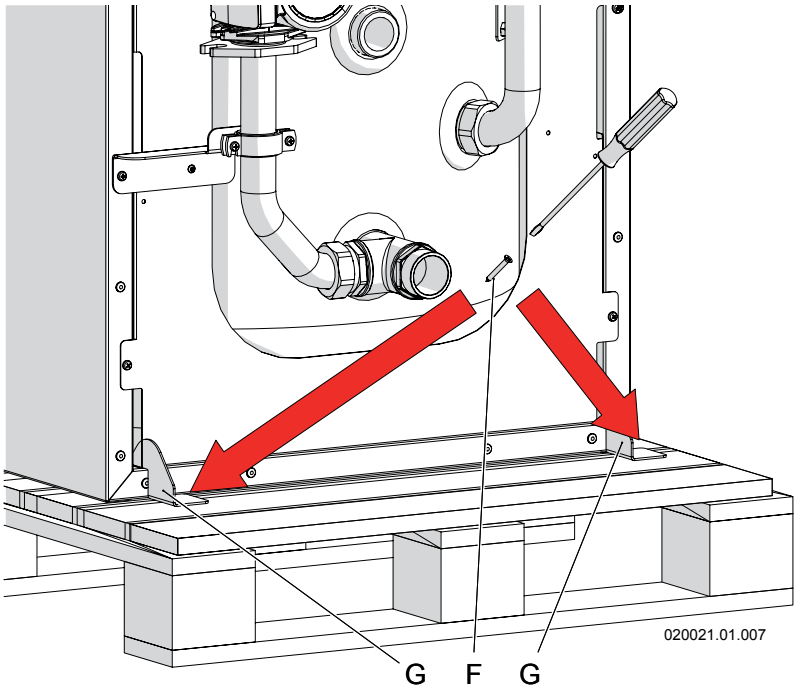
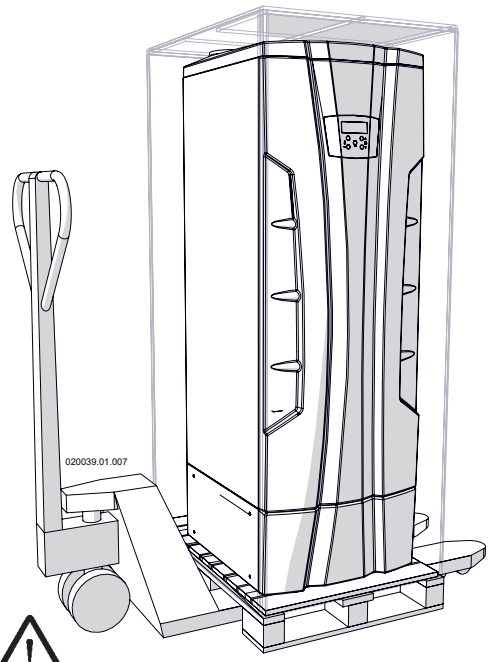


Figure 6-2 Remove heater from wood pallet (back)



WARNING!
Do not remove pallet until final location.

6.1 - Transporting the heater

WARNING!!! Always lift and carry the heater with a hand truck or special equipment. Failure to comply with this provision could result in severe personal injury, death or substantial property damage.

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

CAUTION!!! The unpacked heater may be damaged when not protected against contamination.

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

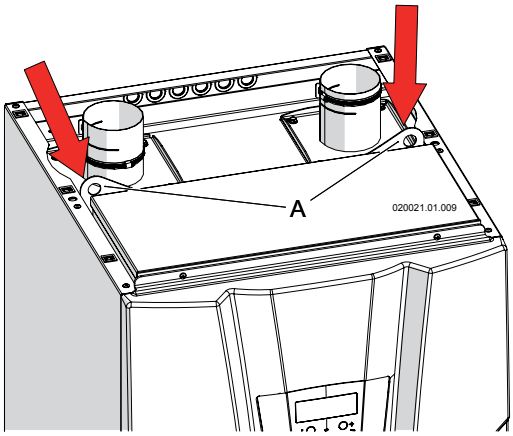


Figure 6-3 Install eyebolt to lift the appliance

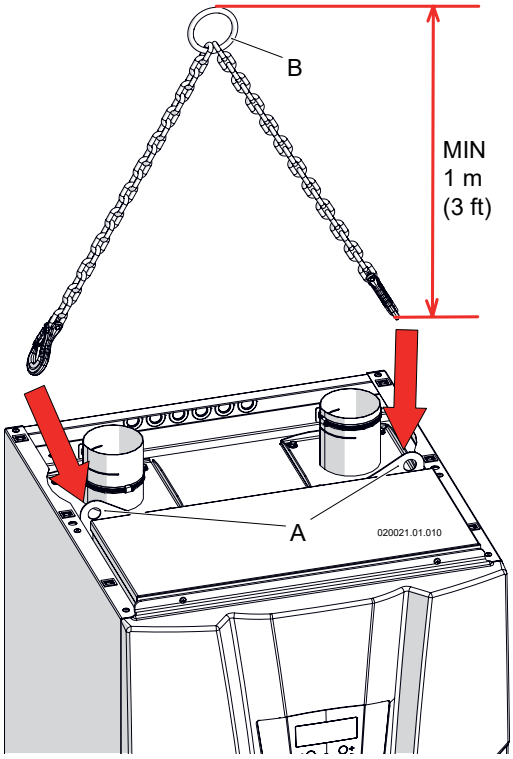
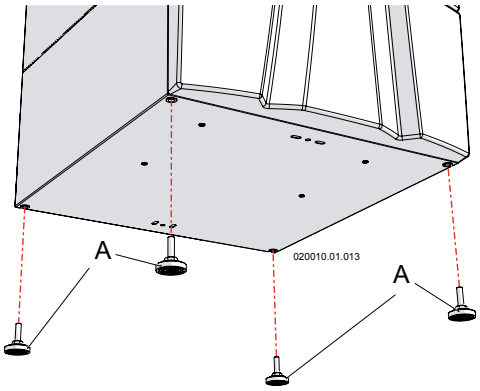
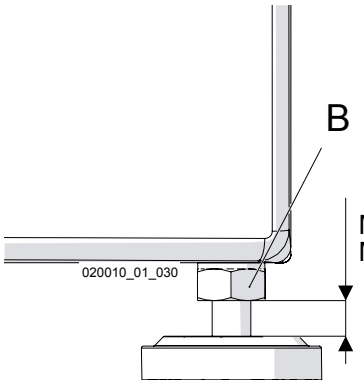


Figure 6-4 Correct way to lift the appliance





B = blocking nut

Figure 6-5 Install leveling feet

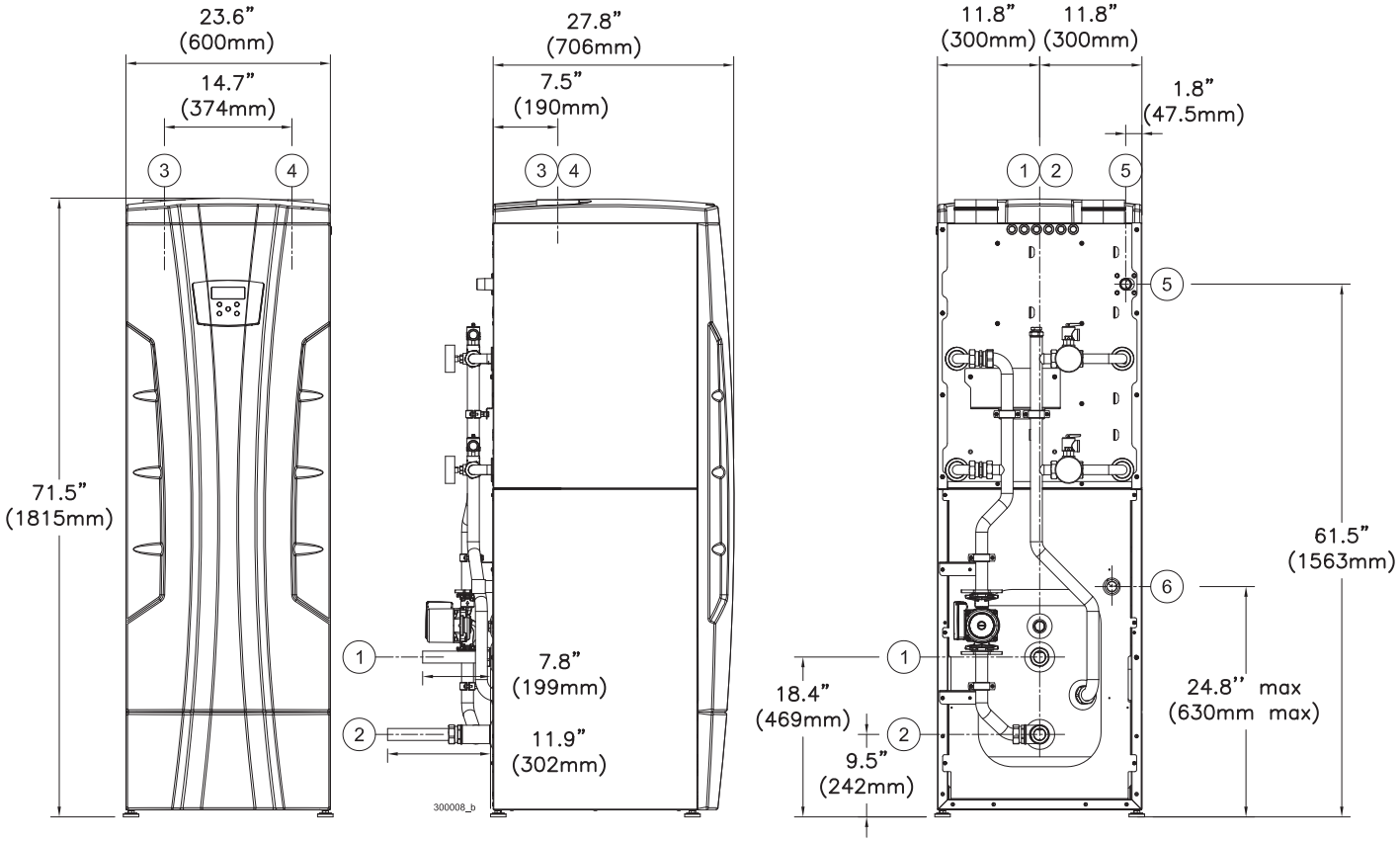
6.2 - Mounting the heater

1. Remove the outer shipping carton from the heater.
2. Remove the front door (see Section 17.2) and the panel “D” by the screws “E” to access the screws “C” (Figure 6-1) in front of the unit.
3. Remove the locking bracket “G” by the screws “D” in the rear of the unit (Figure 6-2).
4. Access to the uplift brackett “A” (Figure 6-3) on the upper side of the heater (see Figure 6-3);
5. Using a proper equipment (check the weight of the unit in Section 18), and lift the unit from the wood pallet and move it to the installation location;
6. Install the leveling feet and plumb the unit accordingly (see Figure 6-5).

⚠ WARNING!!! The floor must be capable of supporting the weight (see Section 18) of the unit or the same unit and building may be damaged causing severe personal injury, death, or substantial property damage.

6.3 - Dimensions

Figure 6-6 list all dimensions of each heater model.



MODEL	① WATER OUTLET COONECTION	② WATER INLET CONNECTION	③ AIR INTAKE CONNECTION	④ FLUE EXHAUST CONNECTION	⑤ GAS CONNECTION	⑥ CONDENSATE DRAIN
199	1"1/4	1"1/4	3"	3"	1"	1"1/4
250	1"1/4	1"1/4	3"	3"	1"	1"1/4
399	1"1/4	1"1/4	4"	4"	1"	1"1/4
500	1"1/4	1"1/4	4"	4"	1"	1"1/4

Figure 6-6 Dimensions for models 199, 250, 399 and 500

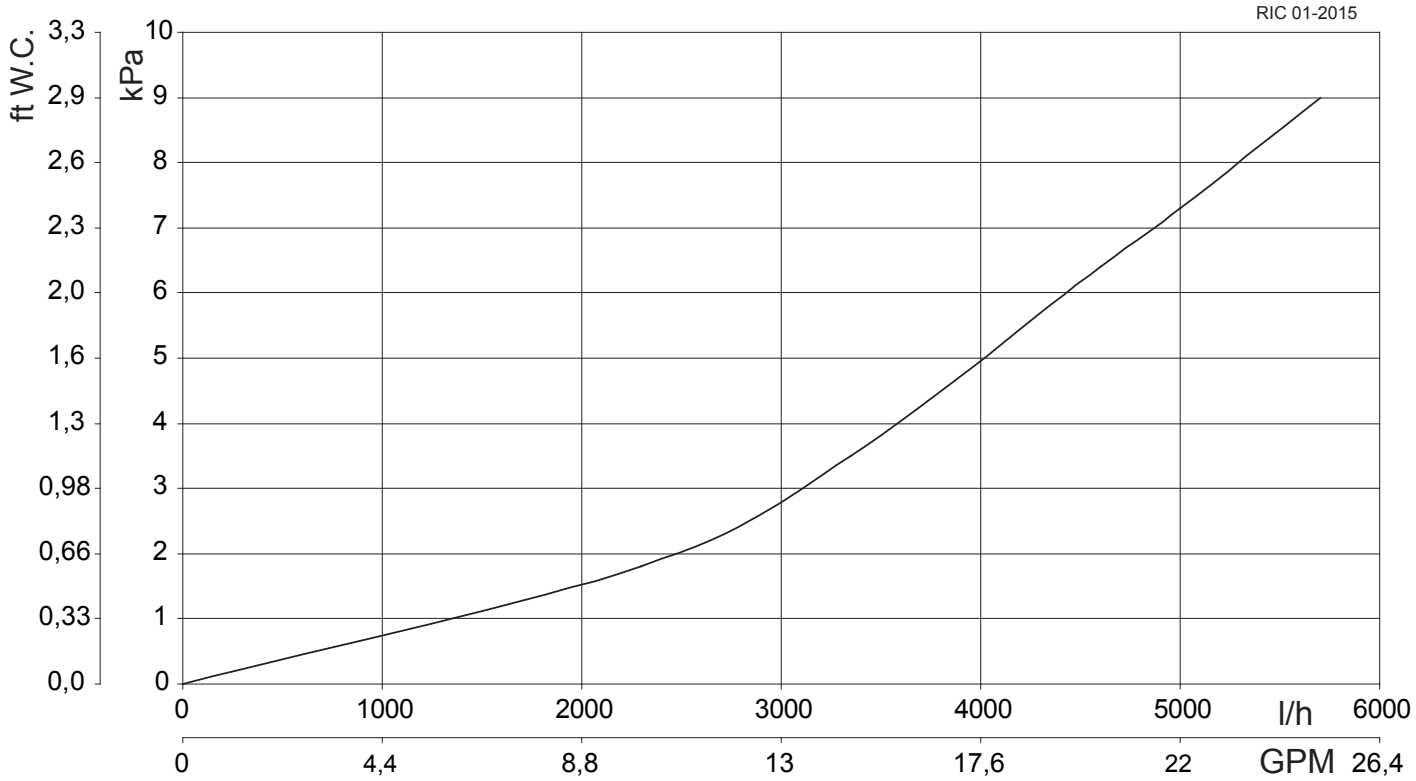


Figure 7-1 Water side head loss between water inlet and outlet ("1" e "2" Figure 6-6). Do not use to size the circutator pump "41" Figure 3-8.

8.1 - Water heaters water connections

The water heater comes with the connections shown in Figures 6-6.

8.2 - Hot and Cold water piping

The water heater is equipped with ASME safety P-T relief valves set at 125 PSI *(8,6 bar)* 210°F *(99°C)*. However, this water heater can be equipped with P-T relief valves set at maximum 160 PSI *(11.2 bar)* 210°F *(99°C)* that is the maximum working pressure - temperature.

CAUTION!!! **All water system piping must be installed in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV. All applicable local codes and ordinances must also be followed.**

CAUTION!!! **Before connecting the water heater to the system this last must be thoroughly flushed to remove sediment, flux, filings and other foreign matter. The heat exchanger can be damaged by build-up or corrosion due to sediment.**

CAUTION!!! **This water heater can supply water at a temperature up to 203°F (95°C) (setup of the safety high limit thermostat) and pressure of 160 PSI (11,2 bar) (maximum setup of the relief valve). If the hot water system is built with materials not able to resist to this temperature and pressure, contractor must supply and install a device that will shut-off the appliance before the system material's maximum operating temperature and pressure are met.**

CAUTION!!! **Do not use this heater to directly heat swimming pool or spa water.**

Low water cutoff device

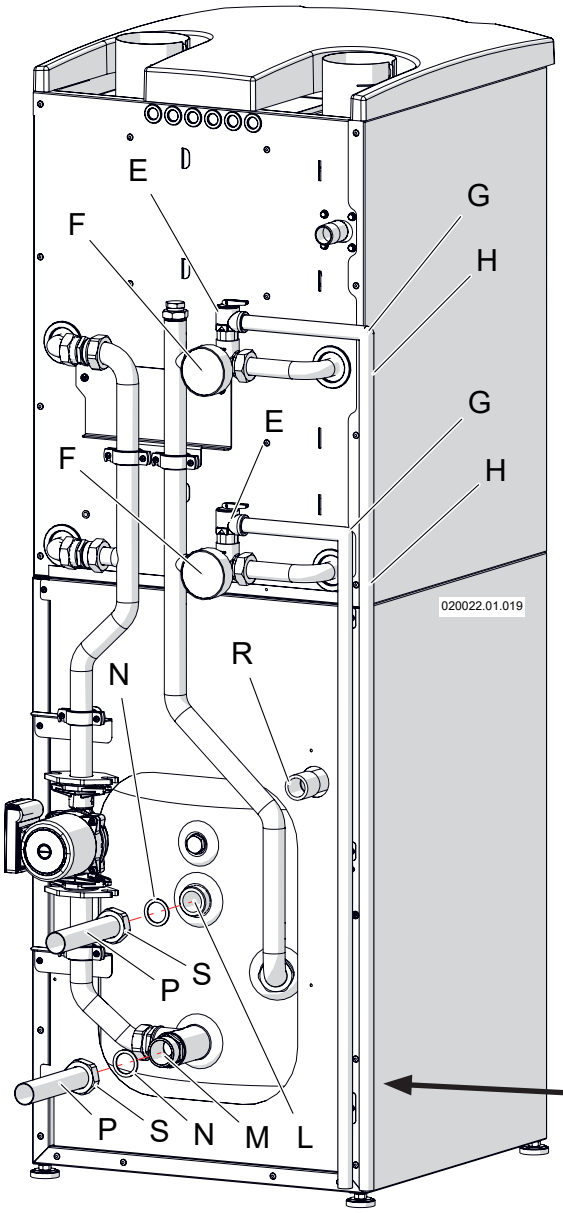
On a water heater installed above radiation level, some states and local codes require a low water cutoff device at the time of installation.
The low water cutoff terminals are present within the line voltage junction box.
The Low water cutoff can be installed on the 3/4" connection as per figures 3-5 and 3-8, item "42".

8.2.1 - Near water heater piping components

Water heater system piping MUST be sized considering the pressure drops of the water heater (see Figure 7-1) and pipings.
Reducing the pipe size can restrict the flow rate through the water heater, causing poor system performance.
Basic steps are listed below along with illustrations on Figures 8-1 and 8-5, which will guide you through the installation of the water heater.

1. Connect the cold water supply to the inlet side of the water heater using the factory supplied items "P" and "S" of Figure 8-1.
2. Connect the hot water supply to the outlet side of the water heater using the factory supplied items "P" and "S" of Figure 8-1.
3. Install a backflow preventer (field supplied) on the cold feed make-up water line.
4. Install a field supplied expansion tank on the cold water inlet. Consult the tank manufacturer's instruction for specific information relating to tank installation. Size the expansion tank for the required system volume and capacity.
5. Install a drain valve at the lowest point of the system.
6. Pipe the discharge outlet of any Pressure and temperature relief valve following Section 8.2.2. The temperature and pressure relief valve is sized to ASME specifications.
7. Water heater ball valves: Field supplied. Install ball valves as shown on figure 8-5. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the water heater.
8. Anti-scald mixing valve: Field supplied. Install an anti-scald mixing valve as shown on figure 8-5. An Anti scald mixing valve is recommended when storing domestic hot water above 115°F.
9. Unions: Field supplied. Install Unios as shown on Figure 8-5, recommended for unit serviceability.
10. Filter: Field supplied. Install a filter or equivalent multipurpose strainer at the cold water inlet connection of the water heater to remove system particles from older hydronic systems and protect newer systems. **NOTICE!** Filter will be able to stops particles with an equivalent volume of a spheres with diameter of 0.04" (1mm).

Install the heater so the gas ignition system components are protected from water (dripping, spraying, etc.), during appliance operation for basic service or circulator, valves and other parts replacement.



8.2.2 - Temperature and pressure Relief valve

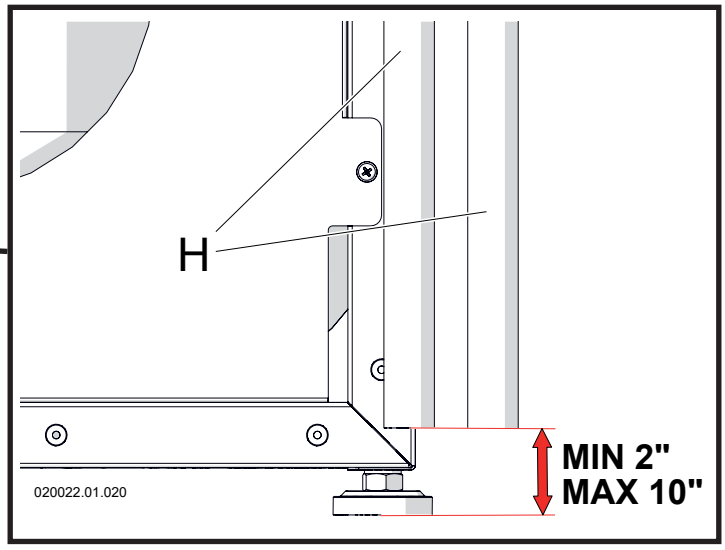
This water heater is supplied with a Safety Temperature and Pressure Relief valve which discharge connection must be piped in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV, to prevent scalding in the event of a discharge. Pipe the discharge of the safety relief valve like on Figure 8-1. to a suitable drain to prevent injury in the event of pressure relief. Pipe the discharge to a drain.
Provide piping that is the same size as the safety relief valve outlet.

⚠ WARNING!!! Failure to properly pipe the relief valve discharge can result in scalding of individuals and animals.

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

⚠ WARNING!!! Never install any type of valve between the water heater and the relief valve or an explosion causing extensive property damage, severe personal injury or death may occur!

NOTICE! If the relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the relief valve.



Key to Figure 8-1
E = ASME Safety Temperature and Pressure relief valve
F = Temperature and pressure gauge
G = Elbow (Field supplied)
H = Relief valve discharge piping (Field supplied)
L = Hot water outlet
M = Water intlet
N = Gasket (Factory supplied)
P = Pipe (Factory supplied)
R = Condensing drain
S = Nut (Factory supplied)

Figure 8-1 Piping of the P-T relief valve discharge and piping the water connections

8.2.3 - Expansion Tank

If a water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water inlet line, means shall be provided to control thermal expansion. Contact the water supplier or local plumbing inspector on how to control this situation.
Install an expansion tank. Ensure the expansion tank is properly sized for the water volume (See Section 18, header “Content of water”) and the system volume, temperature and pressure.

CAUTION!!! Undersized expansion tanks will cause system water to be lost through the relief valve

The expansion tank must be located as shown in Figure 8-5 or as per recognized design methods. Refer to the expansion tank manufacturer instructions for additional installation details.

8.2.4 - Circulator pump

This water heater must be fitted with a circulator pump for domestic potable hot water. To size and install the pump follow section 8.4.

8.2.5 - Sizing water system

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

8.2.6 - Anti-legionella

This water heater is not protected against the proliferation of the Legionella bacteria. If you don’t install any Anti-legionella external system, you have to keep the water temperature, at least at 140°F (60°C). This temperature will prevent the proliferation of the legionella bacteria.

⚠ WARNING!!! Your domestic hot water system must be protected against legionella bacteria. Failure to comply with this provision can result in severe personal injury or death.

8.3 - Scalding

This water heater can deliver scalding temperature water at any faucet in the system.
Be careful whenever using hot water to avoid scalding injury.
Certain appliances such as dishwashers and washing machines may require increased temperature water.
By setting the water temperature control on this water heater to obtain the increased temperature water required by these appliances, you may create the potential for scald injury.
To protect against injury, you should install a mixing valve in the water system.
This valve will reduce point of discharge temperature by mixing cold and hot water in branch supply lines. Such valves are available from the local plumbing supplier.

Figure 8-2 details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

8.4 - How to install the circulator pump

This domestic potable water heater must be fitted with a circulator pump to provide the required minimum water flow through the heat exchanger. Select the pump from figure 8-3 in function of the model and in function of the water hardness.

CAUTION!!! Undersize the circulator pump could damage the water heater due to scale formation and corrosion.

To electrically connect the pump (Local pump) follow Figure 10-3.
A field supplied pump relay must be installed if the pump current draw is greater than 3 amps.
If the pump have an interax of 6” 1/2, you can install it between flanges “C” and “D” of Figure 8-4. If the pump have an interax of 8” 1/2, replace pipe “D” with the factory supplied pipe “F” and apply seal adapter “G” with gasket “H” (both factory supplied) as shown in figure 8-4.
For the electrical connection, proceed as follows (refer to Figure 10-3):

1. remove the heater casing following the instructions given in section 17.2 and open the junction box cover;
2. use a three conductor cable with a minimum cross section of #18 AWG between the water heater and the pump;
3. connect the cable leads to the “113”, “114” and “Ground” terminals as shown in Figure 10-3.
4. connect the other side of the cable to the pump as shown in the instruction supplied with the pump.

CAUTION!!! Since the pump wires conduct 120 Vac, they must never run through conduits containing 24 Vac power wires or an electrical shock hazard will exist.

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F (49°C)	More than 5 minutes
125°F (51°C)	1,5 to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (65°C)	About 1,5 seconds
155°F (68°C)	About 1 second

Figure 8-2 Time / temperature scalds

8.5 - Water Quality Guideline

To keep your water heater operating efficiently over a long lifetime, it is critical to make sure the chemical composition of incoming water is not harmful to the heater. To prevent corrosion, fouling, and other harmful effects on the heater, the following water quality guideline should be adhered to:

Water Quality Guideline	
pH	6.5 to 8.5
Total Dissolved Solids:	500 ppm
Hardness ($CaCO_3$):	See Calcium Hardness paragraph below and Waterside Cleaning Schedule in Section 17.5
Chlorides:	250 ppm
Free Chlorine:	0.5 ppm

pH Level – pH is a measure of the acidic, neutrality, and alkalinity of the water, must always be between 6.5 and 8.5. Values out of this range are corrosive, causing damage to the heat exchanger and/or appliance piping. Naturally soft water generally has low pH. Consult with your water quality operator to properly address so it falls within the required range.

Total Dissolved Solids (TDS) – Total dissolved solids measure the overall risk of water corrosivity/hardness/salinity/color in domestic water applications. The EPA recommends keeping a level below 500 ppm.

Calcium Hardness – See Section 17.5 for Waterside Cleaning Schedule. The allowable calcium hardness depends on temperature set point as well as concentration. For units installed at sites with hard water (>10.5 grains/gal, >180 mg/L), AERCO strongly recommends use of AERCO AquaSolve anti-scaling system (note, this system does not protect against orthophosphates, which can also cause scale deposits). It provides an economical, chemical free treatment of hard water, allowing the water heater to perform at its peak heat transfer efficiency, thereby reducing heating cost.

If the appliance is connected to a softener that may work intermittently (cleaning filters, etc.), during the period in which water softening is interrupted, the burners must be forced to shut down. For this purpose, it is possible to use the input on the terminal block at terminals “10” and “11” (Figure 10-3).

Orthophosphate – Many water systems also carry orthophosphate chemicals for corrosion protection. These chemicals form orthophosphate scale. Conventional water softening techniques that treat calcium scale may not treat orthophosphate scale. If the system contains orthophosphates, the unit must be inspected every 6 months and cleaned as needed. Systems may also contain polyphosphates that sequester and mitigate water hardness. Over time, these chemicals break down in the system to form orthophosphates. Therefore, any water entering the water heater that contains polyphosphates warrants that the heat exchanger be inspected every 6 months and cleaned as needed. The waterside of the unit must be cleaned in accordance with Section 17.5.

Chloride – Chloride limits are set to prevent corrosion of the heat exchanger. The EPA recommends keeping a level below 250 ppm.

Free Chlorine – Free chlorine is added to systems to protect from harmful microbes. Most public water supplies have been treated to a safe level, but care must be taken when building owners perform supplemental treatment. Batch feeding or poorly controlled methods will cause free chlorine spikes that will damage any equipment in the system. When added in excess, free chlorine is a powerful oxidant that can cause corrosion. Inlet water fed to the heater should always be below 0.5 ppm free chlorine, regardless of where in the system the chemical feed pump is positioned.

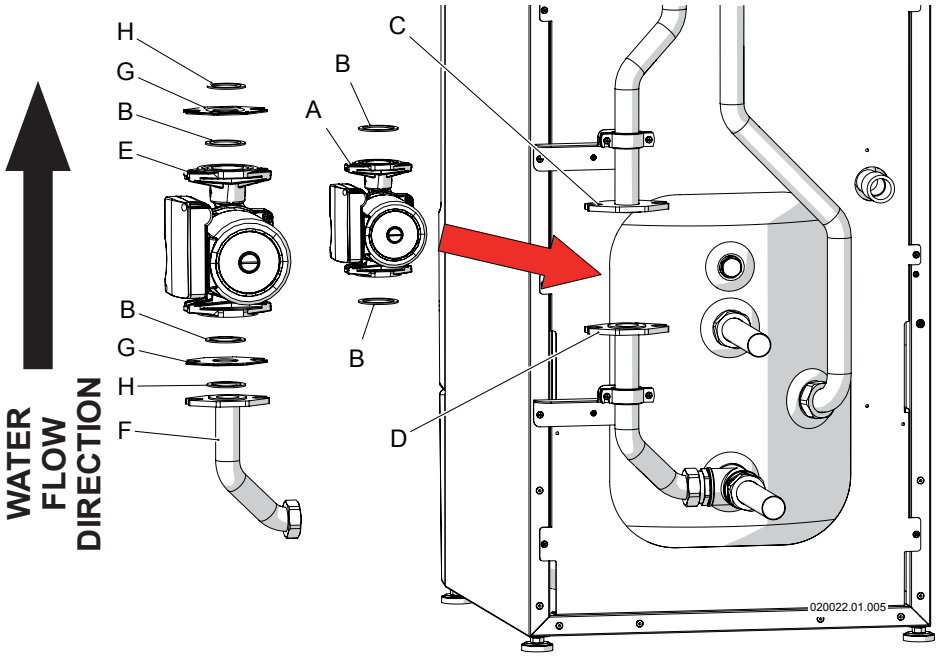
NOTE: Install a filter or equivalent multipurpose strainer at the cold water inlet connection. Filter shall be able to stop particles with an equivalent volume of a sphere with diameter of 0.04” (1mm).

USEFUL PUMPS						
HEATER MODEL	Up to 10.5 grains/gal (180 mg/L)			> 10.5 up to 19 grains/gal (> 180 up to 325 mg/L)		
	GRUNDFOS	TACO	WILO	GRUNDFOS	TACO	WILO
199	UP26-96BF	0011-SF4	Star 21 BFX	UP26-99BF	0013-SF3	Star S 33ZF
250	UP26-96BF	0011-SF4	Star 21 BFX	UP26-99BF	0013-SF3	Star S 33ZF
399	UP26-99BF	0013-SF3	Star S 33ZF	/	/	(2) Stratos Z 1,25x3-35
500	/	0013-SF3	Star S 33ZF	/	/	(2) Stratos Z 1,25x3-35

(1) With hard water settings the maximum water temperature is 140°F (60°C). If you need higher water temperature, contact the manufacturer

(2) This pump need 230 Vac Fase and Neutral

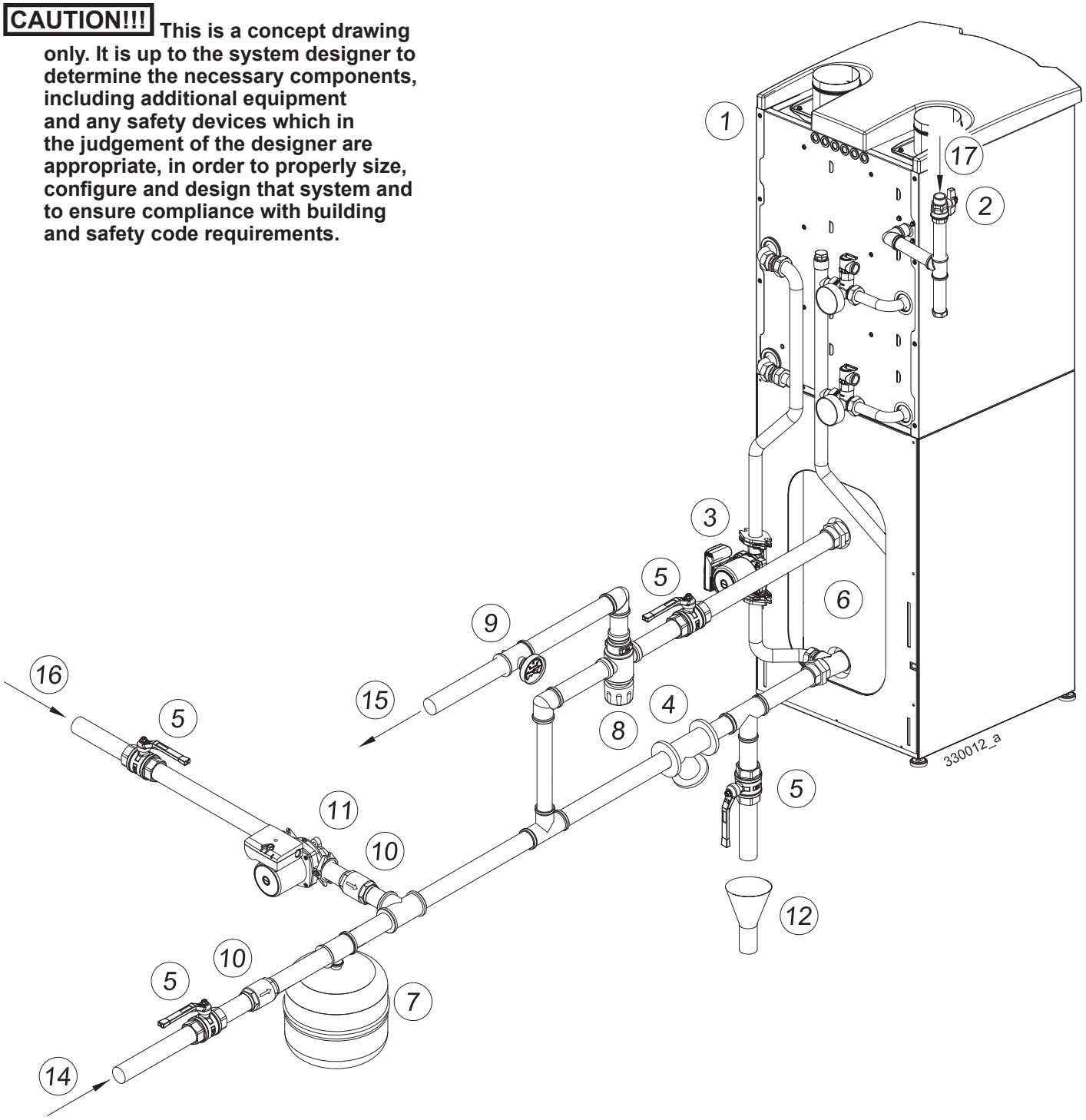
Figure 8-3 Useful pumps



Key to Figure 8-4
A = Field supplied 6” 1/2 interax pump
B = Field supplied Gaskets
C = Flange
D = Flange
E = Field supplied 8” 1/2 interax pump
F = Factory supplied useful pipe for 8” 1/2 circulator pump
G = Factory supplied Seal adapter
H = Factory supplied Gasket

Figure 8-4 Circulator pump installation

CAUTION!!! **This is a concept drawing only. It is up to the system designer to determine the necessary components, including additional equipment and any safety devices which in the judgement of the designer are appropriate, in order to properly size, configure and design that system and to ensure compliance with building and safety code requirements.**



1 = Water heater
2 = Manual gas shut-off valve (Install manual gas shut-off valve 5 ft (1.5m) above floor)
3 = Water heater Pump (Local pump)
4 = Filter
5 = Ball valve
6 = Built in storage tank
7 = Expansion tank
8 = Mixing valve
9 = Temperature gauge
10 = Check valve
11 = Recycling pump (If needed)
12 = Drain
14 = Cold Water Inlet
15 = Hot Water Outlet
16 = Recycling Loop
17 = Gas Inlet

Figure 8-5 Piping the water heater

9.1 - Condensate disposal

⚠ WARNING!!! The condensate trap is the same condensate neutralizer box (see Figure 9-1, item "B"). Condensate neutralizer box MUST be filled of water or combustion gases will enter the room. This can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

⚠ WARNING!!! The condensate neutralizer box (see Figure 9-1, item "B") must be kept within the unit, as shown in Figures 3-3 through 3-6. Removing the condensate neutralizer box from its position may result in combustion gases entering the room. This can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

This heater produces water as a byproduct of combustion. The heater is equipped with a condensate neutralizer box, Figure 9-1, item "B", for the evacuation of condensate and to prevent the leakage of combustion products. The condensate drains through pipe shown in Figure 9-1 item "C" and Figure 9-2 item "A". Slope condensate tubing down and away from the heater into a drain or drain pan (See Figure 9-2). Condensate from the heater will be slightly acidic (around pH 4). The neutralizing box (see figure 9-1, item "B") will neutralize the condensate products.

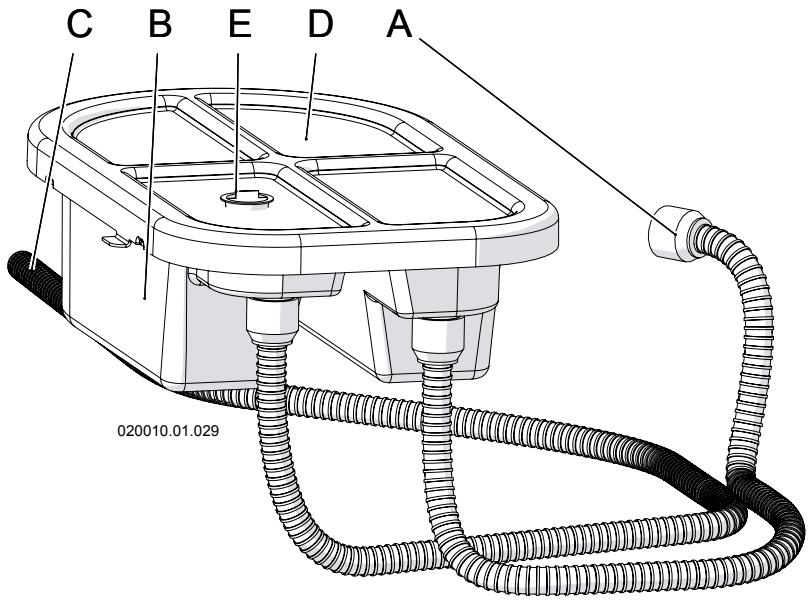
CAUTION!!! The condensate discharge line must be of materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785 or D2845. Cement and primer must comply with ASME D2564 or F493. For Canada use CSA or ULC certified PVC or CPVC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

- ☞ be carried out with a pipe with an internal diameter equal to or greater than **3/4 in** (*19 mm)*;
- ☞ be installed in such a way so as to avoid the freezing of the liquid;
- ☞ never discharge into gutters or rain collectors;
- ☞ be properly pitched towards the point of discharge avoiding high points, which could place the condensate system under pressure.

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

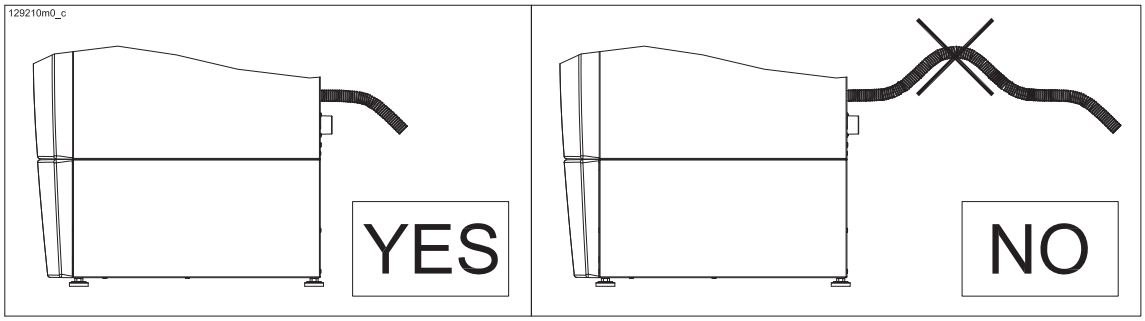
A condensate removal pump is required if the heater is below the drain. When installing a condensate pump, select one approved for use with condensing heaters and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage.

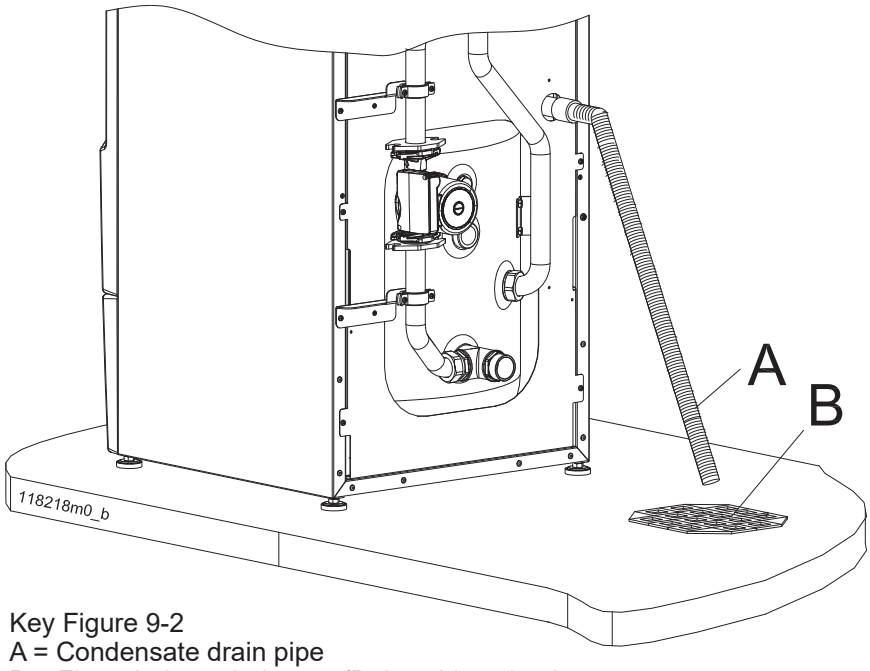
COMMONWEALTH OF MASSACHUSETTS SPECIAL REQUIREMENT
This heater meet the special requirement of the Commonwealth of Massachusetts, because the neutralization unit is already installed within the heater.



Key Figure 9-1
A = Pipe connected to the heaters' flue exhaust system
B = Condensate neutralizer box
C = Condensate drain pipe
D = Cover of the box
E = PH test port

Figure 9-1 Condensate neutralizer box (see also Figures 3-3 through 3-6, Item "8")





Key Figure 9-2
A = Condensate drain pipe
B = Floor drain or drain pan (Below this point there must be a trap capable of preventing the return of sewer gas)

Figure 9-2 Condensate pipe and drain

10.1 - Electrical connections: overview

WARNING!!! ELECTRICAL SHOCK HAZARD Turn off electrical power supply before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation, severe personal injury or death. Be sure of a correct functioning after the 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.

WARNING!!! The heater must be electrically wired to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code, ANSI/NFPA 70* and/or the *Canadian Electrical Code Part I, CSA C22.1, Electrical Code*.

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

Installation must comply with:

1. National Electrical Code and any other national, state,provincial, or local codes, or regulations.
2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.

☞ Check that the electrical system is adequate for the power consumption indicated on the rating plate or in Section 18.

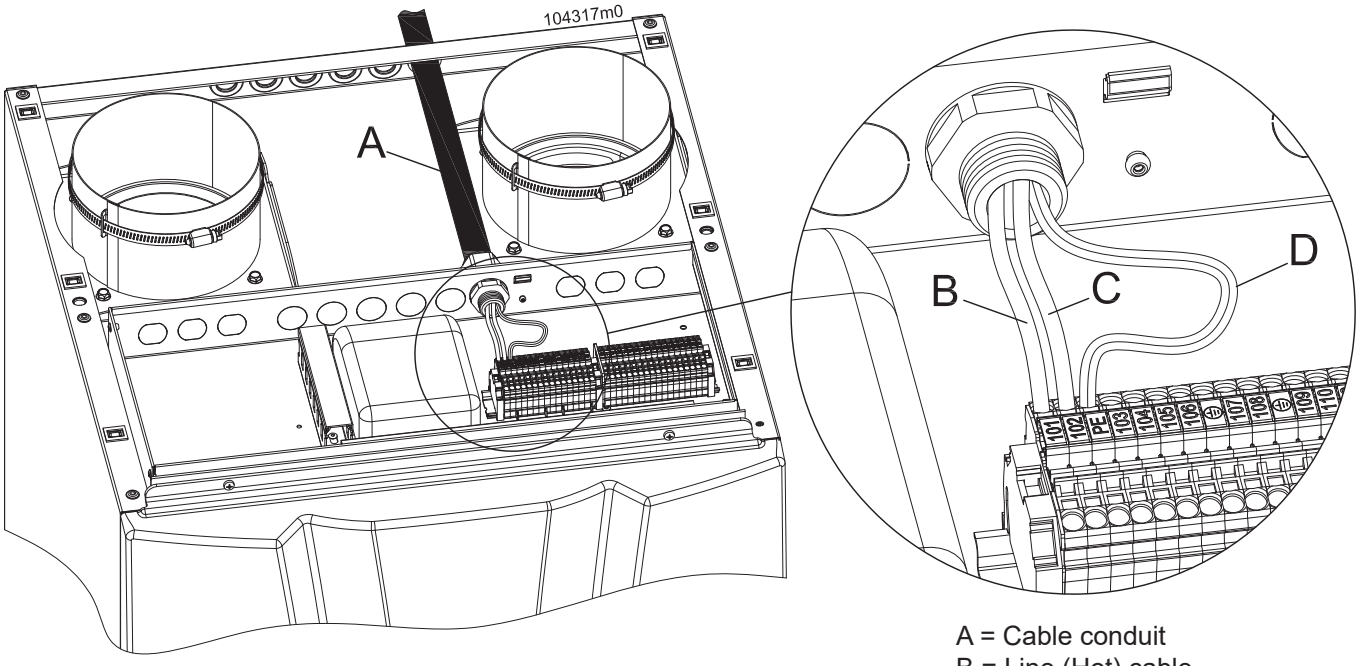
☞ Line voltage field wiring of any controls or other devices must conform to the temperature limitation of type T wire at 95 °F (*35 °C)*, above room temperature. Use copper conductors with a minimum size of #14 AWG. Low voltage wiring must not be less than #18 AWG with a neoprene, thermoplastic or other equivalent insulation having a minimum insulation thickness of 0.012 in, *(0.3 mm)*.

☞ A properly rated shut-off switch shall be located nearest to the heater for any maintenance use.

☞ Ensure that the polarity between live and neutral wires is maintained when connecting the heater.

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 heater, piping and radiators.

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



A = Cable conduit
B = Line (Hot) cable
C = Neutral cable
D = Ground cable

Figure 10-1 Junction box

10.1.1 - Connecting the power supply cable

Provide and install a fused disconnect or service switch (15 amp recommended) as required by the code.
To connect the electrical power supply cable, follow the steps below while referring to Figure 10-3:

1. remove the heater casing following the instructions given in Section 17.2 and open the junction box cover;
2. install the power supply wires, “B” and “C” to terminals “101” and “102”. connect the ground wire to the ground terminal;
3. connect the 120 volt hot wire to terminal “101”;
4. connect the 120 volt neutral wire to terminal “102”.

NOTICE! If the 120 volt power wires are inverted, the heater will block, displaying error code Err 65.

10.1.2 - Connection to an analog Vcc input

On appliances model 399, 500, 750 and 1000 it is factory supplied the 885IF board that permit installer to drive the unit via a Vcc input. To do this, you have to connect the Vcc supply between terminals “22” and “23” (see Figures 10-3). Also, the CH mode (parameter 2003 as per Section 16.11) must be set to 4 value.
Now the appliance can start to receive the analog input Vcc and it will control the supply temperature under the rules as explained in Figure 10-2 where:

- If the input voltage is growing up to 1.5V, the appliance stay OFF;
- If the input voltage move between 1.5V and 2.0V the appliance start to work and the supply temperature stay at the value set on parameter 3018 (Minimum CH setpoint, see Section 22);
- If the inpult voltage move between 2V and 10V, the supply temperature will change proportionally between the Minimum CH setpoint (parameter 3018, see Section 22) and the Maximum CH setpoint (parameter 3017, see Section 22).

10.1.3 - Connection to a MODBUS protocol

On appliances model 399, 500, 750 and 1000 it is factory supplied the 885IF board that has an integrated MODBUS protocol.
This 885IF board with the MODBUS protocol can be connected to drive the unit from a building management device. Instructions on how to connect the MODBUS protocol are supplied on demand.

10.1.4 - Connection to a LWCO device

CAUTION!!! **Use only LWCO sensor device. To use water flow switch ask engineering wiring diagram to the manufacturer.**

Install LWCO device as per engeneering method. Connect LWCO terminals to “103” and “104” heater terminals.

WARNING!!! **Heater terminals “103” and “104” containing line voltage and electrical shock hazard will exist.**

10.1.5 - Alarm contact

Alarm contact works only in presence of the 885 IF board (see figures 3-3, 3-6 item “16”). Alarm contact does not react in case a dependent module (burner 2) is in error.

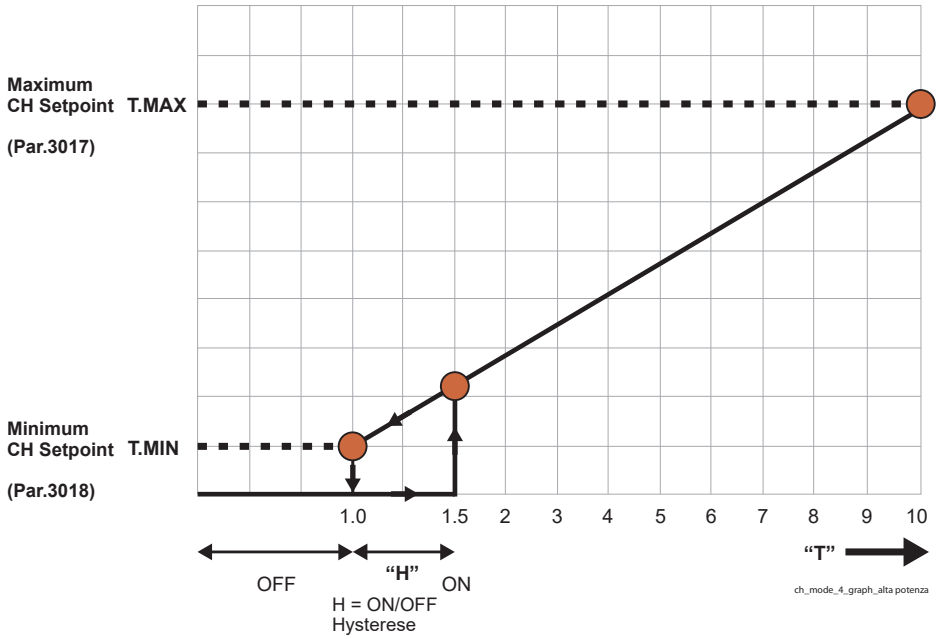


Figure 10-2 Vcc analog input algorithm

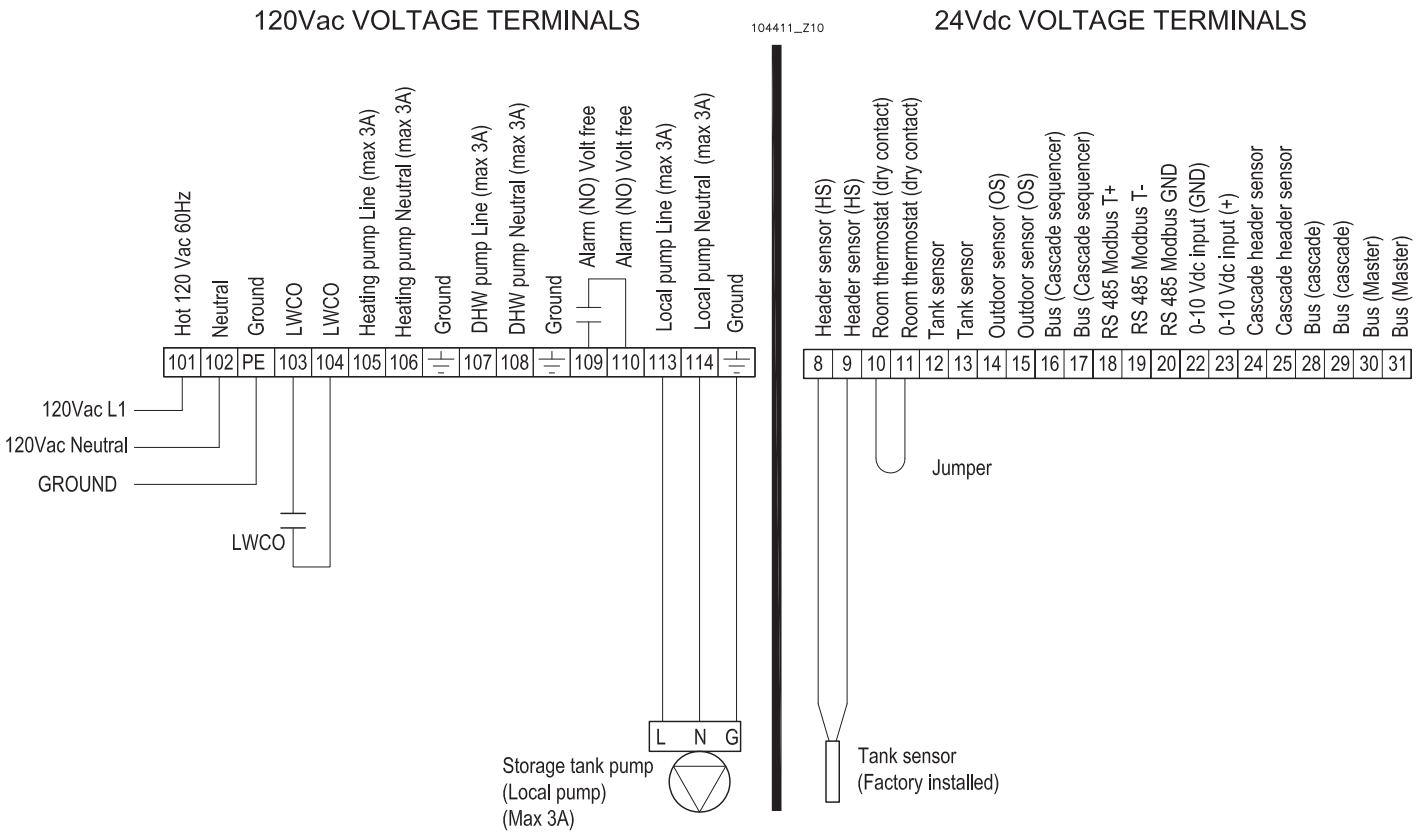


Figure 10-3 Electrical customer connection

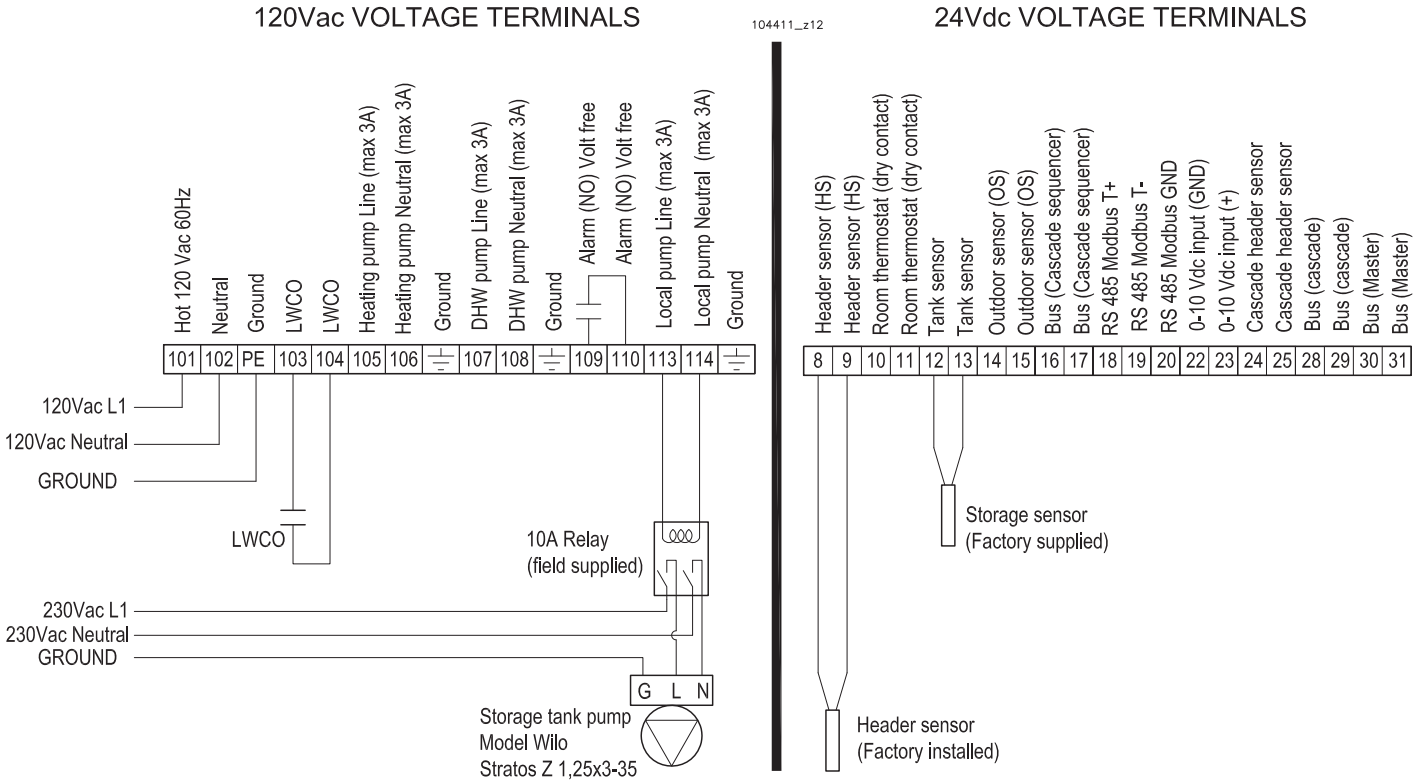


Figure 10-4 Electrical customer connection for pump brand Wilo model Stratos Z1,25X3-35

CAUTION!!! **For this appliance the following terminals are "NOT APPLICABE" (See Figures 10-3 and 10-4):**

Terminal "12" - Tank Sensor - (NOT APPLICABLE)
Terminal "13" - Tank Sensor - (NOT APPLICABLE)
Terminal "14" - Outdoor Sensor (OS) - (NOT APPLICABLE)
Terminal "15" - Outdoor Sensor (OS) - (NOT APPLICABLE)
Terminal "24" - Cascade header Sensor - (NOT APPLICABLE)
Terminal "25" - Cascade header Sensor - (NOT APPLICABLE)
Terminal "28" - Bus (cascade) - (NOT APPLICABLE)
Terminal "29" - Bus (cascade) - (NOT APPLICABLE)
Terminal "30" - Bus (Master) - (NOT APPLICABLE)
Terminal "31" - Bus (Master) - (NOT APPLICABLE)

Terminal "105" - Heating pump Line (max 3A) - (NOT APPLICABLE)
Terminal "106" - Heating pump Neutral (max 3A) - (NOT APPLICABLE)
Terminal "Ground" (between "106" and "107") - (NOT APPLICABLE)
Terminal "107" - DHW pump Line (max 3A) - (NOT APPLICABLE)
Terminal "108" - DHW pump Neutral (max 3A) - (NOT APPLICABLE)
Terminal "Ground" (between "108" and "109") - (NOT APPLICABLE)

10.2 - Connecting the heater in cascade

Heaters can be installed in cascade with a configuration like in Figure 10-5. Many other configurations can be done (ask to the heater manufacturer for conceptual drawings).

For water, gas, flue exhaust and air intake connections, ask for conceptual drawings to the manufacturer.

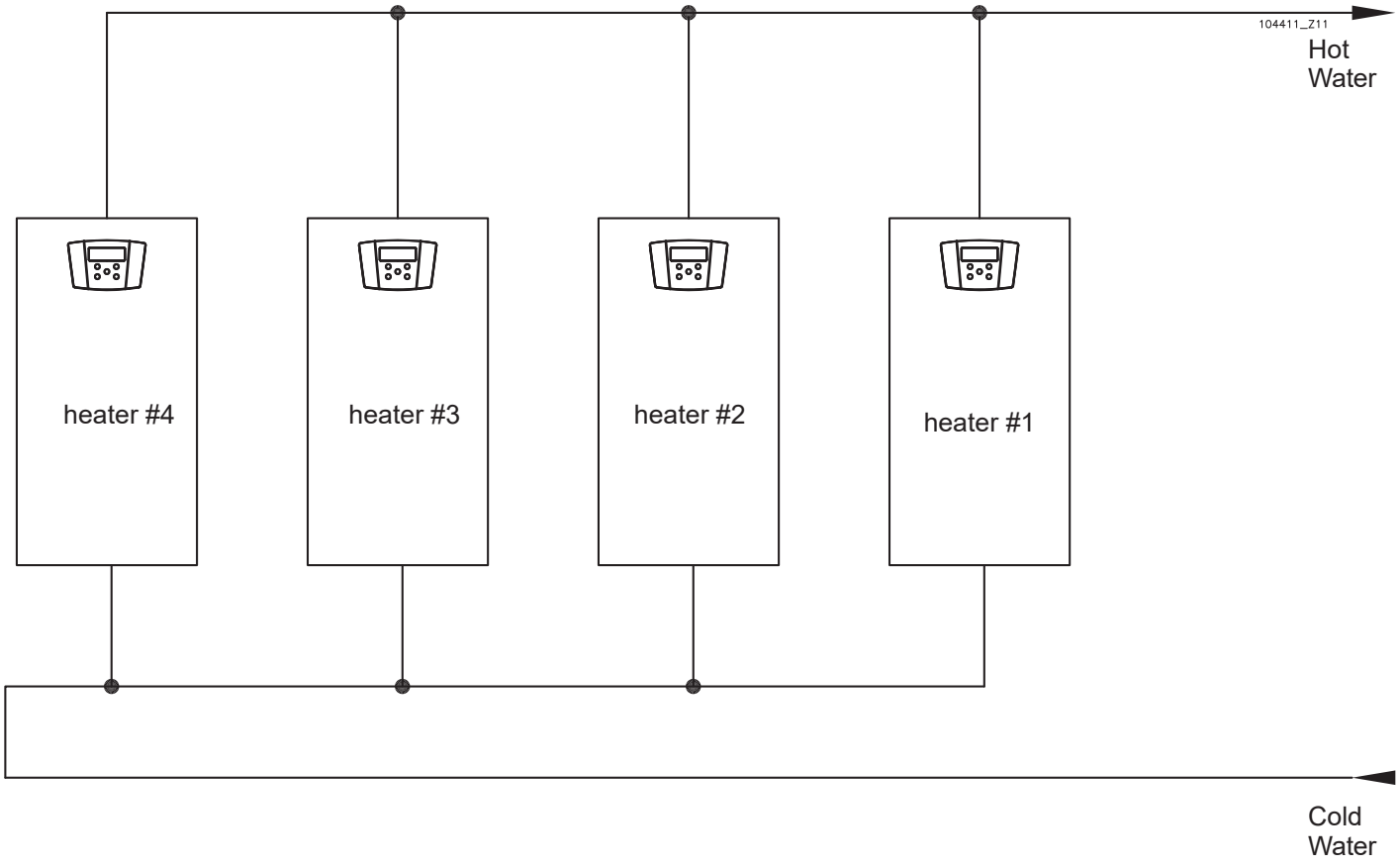


Figure 10-5 Multiple water heaters conceptual scheme

11.1 - Removing of an heater from a common venting system

⚠ WARNING!!! DO NOT connect this heater 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 heater 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 heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

12.1 - CATEGORY IV: Positive pressure condensing

An appliance that operates with a positive vent static pressure with a vent gas temperature that may cause condensate production in the vent.

12.2 - CATEGORY IV: Venting and air piping systems

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

⚠ WARNING!!! All vent pipes must be mechanically fixed. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

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

NOTICE! The exhaust pipe must be pitched a minimum of a 1/4 inch per foot back to the heater (to allow drainage of condensate).

NOTICE! The venting system shall be installed with a means for condensate disposal in order to prevent its accumulation.

NOTICE! Due to the high efficiency of the heater 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.

This heater requires a special vent system, designed for pressurized venting.
You must install air piping from outside to the heater air intake. The resultant installation is Direct Vent (sealed combustion).
The heater is to be used for either Direct Vent installation or for installation using room combustion air. When room air is considered, see Section 12.9.
Vent and air must terminate near one another and may be vented vertically through the roof or out a side wall, unless otherwise specified. You may use any of the vent/air piping methods from Figure 12-1 to Figure 12-5. Do not attempt to install this heater using any other means.

⚠ WARNING!!! DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Use only approved materials listed on Figures 12-6 and 12-7. Improper materials or mixing materials can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

⚠ WARNING!!! Use of cellular core PVC and CPVC or Radel for venting system is not allowed. Use of improper materials can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

Be sure to locate the heater such that the vent and air piping can be routed through the building and properly terminated.
The vent/air piping lengths, routing and termination method must all comply with the methods and limits given in Section 12.3.

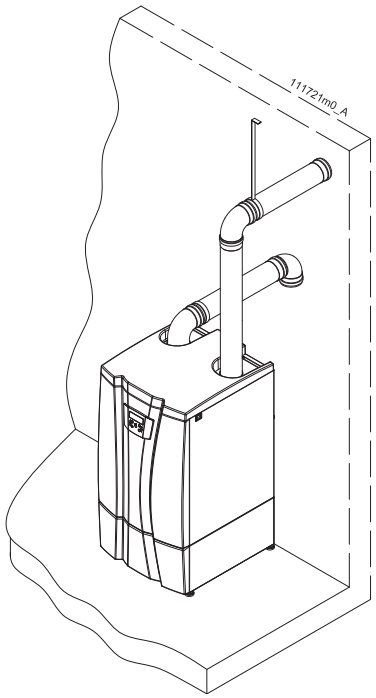


Figure 12-1 Side wall two pipes (Direct venting).

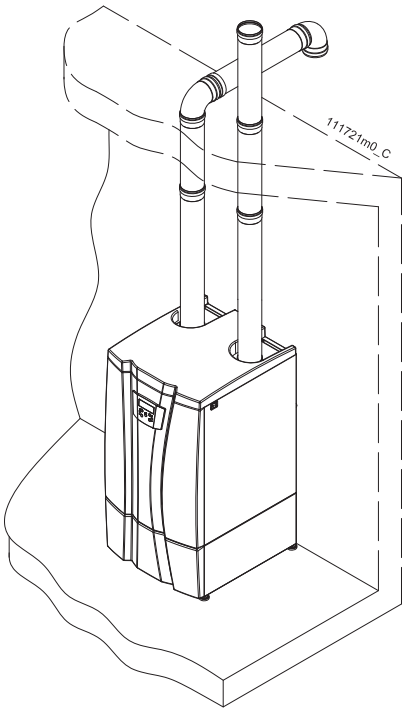


Figure 12-2 Vertical two pipes (Direct Venting).

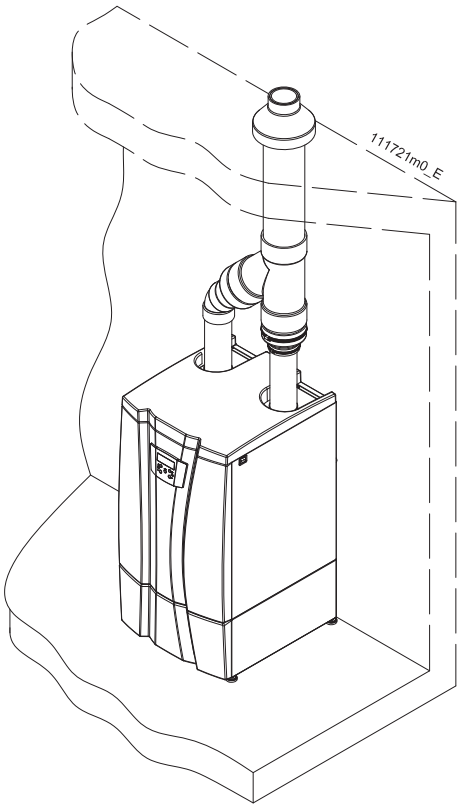


Figure 12-3 Vertical concentric (Direct venting).

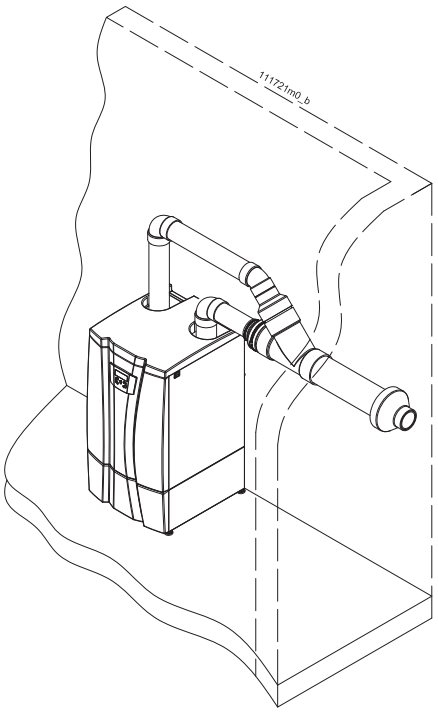


Figure 12-4 Side wall concentric (Direct venting).

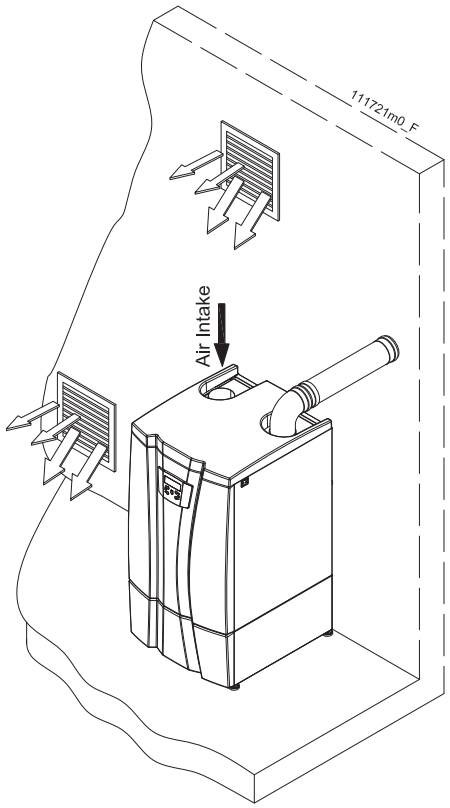


Figure 12-5 Side wall (or vertical in a roof) one pipe venting, combustion air from room (not Direct venting).

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

The maximum length of the two pipes vent system is 120 equivalent ft (Air intake plus flue exhaust). However, each single pipe can't be longer than 60 ft.

Each 45° elbow inserted in the venting system, has a loss of pressure equivalent to 5 ft of linear pipe.

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

Each sharp 90° elbow insterted in the venting system, has a loss of pressure equivalent to 10 ft of linear pipe.

12.4 - Install vent and combustion air piping

⚠ WARNING!!! This heater must be vented and supplied with combustion and ventilation air as described in this section. Ensure the vent and air piping and the combustion air supply comply with these instructions regarding vent system, air system, and combustion air quality and also with the venting system manufacturer's instructions. See also Section 5.1.1 of this manual. Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of all applicable codes. Failure to provide a properly installed vent and air system will cause severe personal injury or death.

⚠ WARNING!!! Using vent materials other than those listed in Figure 12-6 and Figure 12-7, failure to properly seal all seams and joints, mixing of venting materials or failure to follow vent pipe and fittings manufacturer's instructions can result in personal injury, death or property damage.

⚠ WARNING!!! Use of cellular core PVC and CPVC or Radel for venting system is not allowed. Use of improper materials can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

⚠ WARNING!!! Use only the materials listed in Figure 12-6 and Figure 12-7 for vent pipe, and fittings. Failure to comply could result in severe personal injury, death, or substantial property damage.

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

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Figure 12-6).

Vent pipe materials and fittings must comply with the following standards			
Item	**Material**	**Standard for installation in USA**	**Standard for installation in CANADA**
Vent pipe	PVC schedule 40/80	ANSI/ASTM D2665	ULC-S636
	CPVC schedule 40/80	ANSI/ASTM F441	
	Polypropylene	ULC-S636	
	Stainless steel AL29-4C	UL 1738	
Vent fittings	PVC schedule 40	ANSI/ASTM D2466	
	PVC schedule 80	ANSI/ASTM D2467	
	CPVC schedule 80	ANSI/ASTM F439	
	Polypropylene	ULC-S636	
	Stainless steel AL29-4C	UL 1738	
Pipe cement/primer	PVC	ANSI/ASTM D2564	
	CPVC	ANSI/ASTM F493	

WARNING!!! Use of cellular core PVC, CPVC, and Radel for venting system is not allowed

Figure 12-6 Approved vent materials

Approved vent manufacturers and items				
Item	**Family of the Material**	**Manufacturer/ supplier**	**Applicable to models**	**Manufactur. Part Number**
3” Concentric roof or wall terminal	PVC	IPEX (System 636)	199, 250	196006
4” Concentric roof or wall terminal	PVC	IPEX (System 636)	399, 500	196021
3” Concentric roof or wall terminal	CPVC	IPEX (System 636)	199, 250	197009
4” Concentric roof or wall terminal	CPVC	IPEX (System 636)	399, 500	197021
3” Two (and single) pipes roof or wall terminal (90° elb.)	PVC	IPEX (System 636)	199, 250	196025
4” Two (and single) pipes roof or wall terminal (90° elb.)	PVC	IPEX (System 636)	399, 500	196124
3” Two (and single) pipes roof or wall terminal (90° elb.)	CPVC	IPEX (System 636)	199, 250	197201
4” Two (and single) pipes roof or wall terminal (90° elb.)	CPVC	IPEX (System 636)	399, 500	197202
3” Wall termination kit	PVC	IPEX (System 636)	199, 250	081219
3” Low profile wall termination kit	PVC	IPEX (System 636)	199, 250	196985
4” Low profile wall termination kit	PVC	IPEX (System 636)	399, 500	196986
3” Bird screen	PVC/CPVC	IPEX (System 636)	199, 250	196051
4” Bird screen	PVC/CPVC	IPEX (System 636)	399, 500	196052
3” (80mm) Two (and single) pipes roof or wall terminal (90° elb.)	Polypropylene	Centrotherm (Innoflue System)	199, 250	ISELL0387UV
4” (110mm) Two (and single) pipes roof or wall terminal (90° elb.)	Polypropylene	Centrotherm (Innoflue System)	399, 500	ISELL0487UV
3” (80mm) Heater adapter	Polypropylene	Cosmogas	199, 250	62617361
4” (110 mm) Heater adapter	Polypropylene	Cosmogas	399, 500	62617359
3” (80mm) Bird screen	Polypropylene	Centrotherm (Innoflue System)	199, 250	IASPP03
4” (110mm) Bird screen	Polypropylene	Centrotherm (Innoflue System)	399, 500	IASPP04
3” (80mm) Two (and single) pipes roof or wall terminal (90°elb.)	Polypropylene	Z-Flex U.S. Inc.	199, 250	2ZDE387UV
4” (110mm) Two (and single) pipes roof or wall terminal (90°elb.)	Polypropylene	Z-Flex U.S. Inc.	399, 500	2ZDE487UV
3” (80mm) Heater adapter	Polypropylene	Z-Flex U.S. Inc.	199, 500	2ZDCPVCG3
4” (110mm) Heater adapter	Polypropylene	Z-Flex U.S. Inc.	399, 500	2ZDCPVCG4
3” (80mm) Bird screen	Polypropylene	Z-Flex U.S. Inc.	199, 500	2ZDES3
4” (110mm) Bird screen	Polypropylene	Z-Flex U.S. Inc.	399, 500	2ZDES4
3” Two (and single) pipes roof or wall terminal (90° elb.)	Stainless steel	Duravent (FasNSeal)	199, 250	FSELB9003
4” Two (and single) pipes roof or wall terminal (90° elb.)	Stainless steel	Duravent (FasNSeal)	399, 500	FSELB9004
3” Heater adapter	Stainless steel	Duravent (FasNSeal)	199, 250	FSA-3PVCS-3FNSF
4” Heater adapter	Stainless steel	Duravent (FasNSeal)	399, 500	FSA-4PVCS-4FNSF
3” Bird screen	Stainless steel	Duravent (FasNSeal)	199, 250	FSBS3
4” Bird screen	Stainless steel	Duravent (FasNSeal)	399, 500	FSBS4
3” (80mm) Two (and single) pipes roof or wall terminal (90°elb.)	Stainless steel	Z-Flex U.S. Inc.	199, 500	2SVSTEX0390
4” (110mm) Two (and single) pipes roof or wall terminal (90°elb.)	Stainless steel	Z-Flex U.S. Inc.	399, 500	2SVSTEX0490
3” (80mm) Heater adapter	Stainless steel	Z-Flex U.S. Inc.	199, 500	2SVSPVC03
4” (110mm) Heater adapter	Stainless steel	Z-Flex U.S. Inc.	399, 500	2SVSPVC04
3” (80mm) Bird screen	Stainless steel	Z-Flex U.S. Inc.	199, 500	Included in elbow
4” (110mm) Bird screen	Stainless steel	Z-Flex U.S. Inc.	399, 500	Included in elbow

Figure 12-7 Approved vent manufacturers and items

12.5 - Air inlet pipe materials:

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

Choose acceptable combustion air inlet pipe materials from the following list:
- PVC, CPVC or ABS
- AL29-4C, stainless steel material to be sealed to specification of its manufacturer.
- Polypropylene material to be sealed to specification of its manufacturer.

⚠ WARNING!!! Using air intake materials other than those specified, mixing the specified materials, failure to properly seal all seams and joints or failure to follow the manufacturer's instructions can result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing severe personal injury or death.

NOTICE! Polypropylene and stainless steel pipe may require an adapter (not provided) to transition between the air inlet connection on the appliance and the air inlet pipe.

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

NOTICE! Combustion air piping must be supported per guidelines listed in the "National Mechanical code", section 305, table 305.4 or local codes dictate.

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

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

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

⚠ WARNING!!! All air intake pipes must be glued, properly supported and pitched a minimum of a 1/4 inch per foot out to the heater (to allow drainage of water into the appliance). Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

12.6 - PVC/CPVC vent piping materials

⚠ WARNING!!! Use only the materials listed in Figures 12-6 and 12-7 for vent pipe, and fittings. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! This appliance requires a special venting system. The vent pipe must be connected to the heater following Section 12.6.1. Use only the vent materials, primer, and cement specified in this manual to make the vent connections. Failure to follow this warning could result in fire, personal injury, or death.

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

⚠ WARNING!!! Improper installation of PVC or CPVC systems may result in excessive levels of carbon monoxide or a fire, which can cause severe personal injury or death!

⚠ WARNING!!! All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the heater (to allow drainage of condensate). Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

NOTICE! Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.
For installation in Canada, vent pipe system must be certified to ULC-S636 (see Figures 12-6).

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

12.6.1 - Installing PVC/CPVC vent and air piping

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

1. Work from the heater to vent or air termination. Do not exceed the lengths given in Section 12.3.
2. Cut pipe to the required lengths and deburr the inside and outside of the pipe ends.
3. Bevel outside of each pipe end to ensure even cement distribution when joining.
4. Clean all pipe ends and fittings using a clean dry rag (Moisture will retard curing and dirt or grease will prevent adhesion).

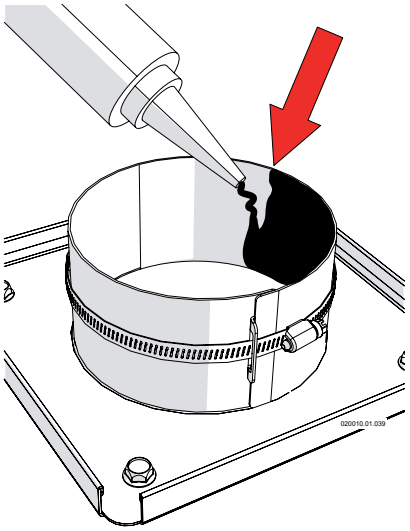
Connection of the the vent or air piping to the heater adapters

5. Dry fit vent or air piping to ensure proper fit up before assembling pipes to the heater adapters. The pipe should go completely into the adapter to ensure proper sealing after sealant is applied.
   a. Handle adapters and pipes carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the the pipe end approximately 1/2" beyond the socket depth.
   c. While the VITON-BASED RTV high temperature silicone is still wet, insert the pipe into the heater adapter. **NOTICE!** If voids are present, sufficient VITON-BASED RTV was not applied and joint could be defective.
   d. Tight the clamp to mechanically secure the joint

Connection between pipes and /or elbows and/or terminals of the the vent or air piping

6. Dry fit vent or air piping to ensure proper fit up before assembling any joint. The pipe should go a third to two-thirds into the fitting to ensure proper sealing after cement is applied.
7. Priming and Cementing:
   a. Handle fittings and pipes carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of primer to the fitting socket.
   c. Apply a liberal even coat of primer to the pipe end to approximately 1/2" beyond the socket depth.
   d. Apply a second primer coat to the fitting socket.
   e. While primer is still wet, apply an even coat of approved cement to the pipe equal to the depth of the fitting socket.
   f. While primer is still wet, apply an even coat of approved cement to the fitting socket.
   g. Apply a second coat of cement to the pipe.
   h. While the cement is still wet, insert the pipe into the fitting, if possible twist the pipe a 1/4 turn as you insert it. **NOTICE!** If voids are present, sufficient cement was not applied and joint could be defective.
   i. Wipe excess cement from the joint removing ring or beads as it will needlessly soften the pipe.

CAUTION!!! **Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the internal side of the heater adapter (item "B" and "P" fig.12-8)**



12.6.2 - PVC/CPVC air intake connection

Combustion Air Intake connection (see Figure 12-8 Item "P"). This connection is used to provide combustion air directly to the heater from outdoors. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.
To connect a PVC/CPVC pipe to the air intake connection proceed as follow while referring to Figure 12-8:

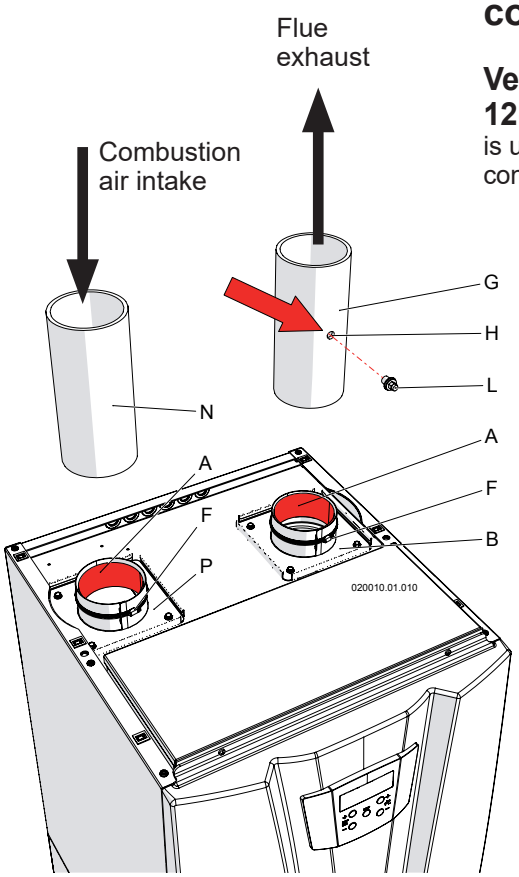
1. Prepare the connection between adapter "P" and pipe "N" like described on Section 12.6.1;
2. Insert the air inlet PVC/CPVC pipe, for 3" into the adapter "P";
3. Tighten the clamp "F" to mechanically secure the adapter "P" to the pipe.

12.6.3 - PVC/CPVC vent connection

Vent connection (see Figure 12-8 Item "B"). This connection is used to provide a passageway for conveying combustion gas to the outside. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.
To connect a PVC/CPVC pipe to the vent connection proceed as follow while referring to Figure 12-8:

1. Prepare the connection between adapter "B" and pipe "G" like described on Section 12.6.1;
2. Insert the flue exhaust PVC/CPVC pipe, for 3" into the adapter "B";
3. Tighten the clamp "F" to mechanically secure the adapter "B" to the pipe.

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



Key Figure 12-8
A = Pipe connection
B = Flue exhaust adapter for polypropylene pipe (Field supplied)
F = Mechanically secure clamp
G = Polypropylene exhaust pipe (Field provided)
H = Combustion analization probe (Field installed)
L = Cap (Field provided)
M = Air intake connection
N = Polypropylene air inlet pipe (Field provided)
P = Air intake adapter for polypropylene pipe (Field supplied)

Figure 12-8 PVC/CPVC air intake/ vent connection

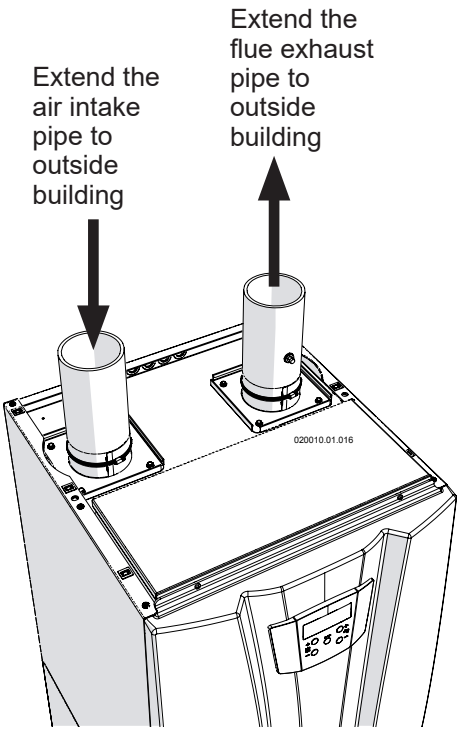


Figure 12-9 PVC/CPVC air intake/Vent connection correctly in place

12.7 - Stainless steel vent piping materials

⚠ WARNING!!! Use only the materials, vent systems, and terminations listed in Figures 12-6 and 12-7. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! This appliance requires a special venting system. The field provided vent heater adapter (Figure 12-10, item "R") must be connected to the heater following Section 12.7.2. Failure to follow this warning could result in fire, personal injury, or death.

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

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

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

NOTICE! For installation in Canada, vent pipe system must be certified to ULC-S636 (see Figure 12-6).

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

NOTICE! Installation of a stainless steel vent system should adhere to the stainless steel vent manufacturer's installation instructions supplied with the vent system.

NOTICE! The installer must use a specific vent starter adapter at the flue collar connection, supplied by the vent manufacturer to adapt to its vent system. See Figure 12-7 for approved vent adapters.

12.7.1 - Stainless steel air intake connection

Combustion Air Intake connection (see Figure 12-10 Item "P").

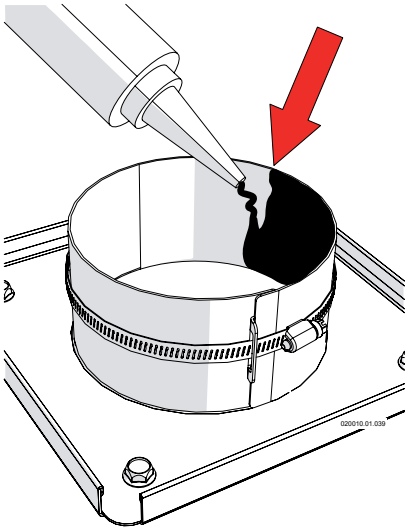
This connection is used to provide combustion air directly to the heater from outdoors. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.

To connect a stainless steel pipe to the air intake connection proceed as follows while referring to Figure 12-10:

1. Dry fit adapter "R" and heater connection "P" to ensure proper fit up before assembling the adapter to the heater. The adapter "R" should go completely into the heater connection to ensure proper sealing after sealant is applied.
   a. Handle adapters "R" and heater adapter "P" carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the adapter "R" approximately 2" beyond the socket depth.
   c. While the VITON-BASED RTV high temperature silicone is still wet, insert the adapter "R" into the heaterconnection "P". **NOTICE!** If voids are present, sufficient VITON-BASED RTV was not applied and joint could be defective.
   d. Tight the clamp to mechanically secure the joint

2. Insert air intake pipe "N", into adapter "R", following instruction of stainless steel pipe manufacturer.

CAUTION!!! **Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the internal side of the heater adapter (item "B" and "P" fig.12-10)**

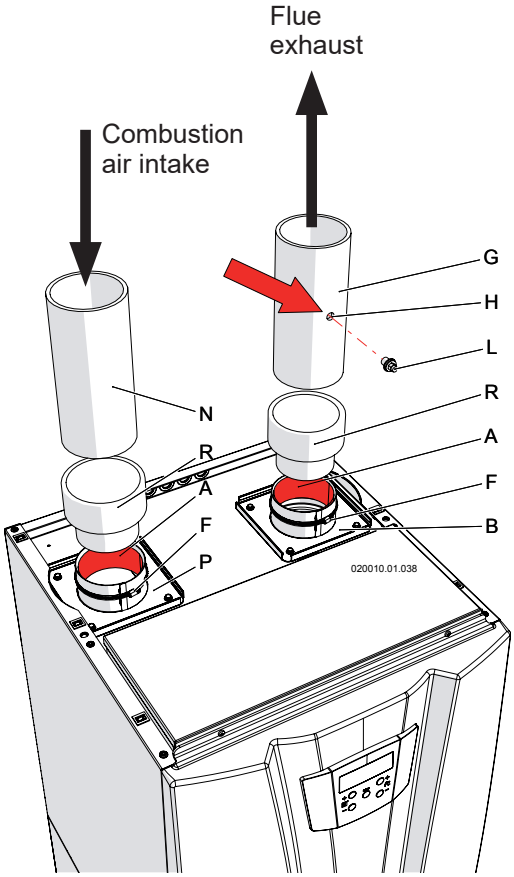


12.7.2 - Stainless steel vent connection

Vent connection (Figure 12-10 item "B") is used to provide a passageway for conveying combustion gases to the outside. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.

To connect a stainless steel pipe to the vent connection proceed as follows while referring to Figure 12-10:

1. Dry fit adapter "R" to ensure proper fit up before assembling adapter to the heater connection "B". The adapter "R" should go completely into the heater adapter to ensure proper sealing after sealant is applied.
   a. Handle adapters "R" and heater connection "B" carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the adapter "R" approximately 2" beyond the socket depth.
   c. While the VITON-BASED RTV high temperature silicone is still wet, insert the adapter "R" into the heater connection "B". **NOTICE!** If voids are present, sufficient VITON-BASED RTV was not applied and joint could be defective.
   d. Tight the clamp to mechanically secure the joint
2. Insert vent pipe "G", into adapter "R", following instruction of stainless steel pipe manufacturer.



Key Figure 12-10
A = VITON-BASED RTV high temperature silicone (or equivalent) (Field provided)
B = Flue exhaust connection
F = Mechanically secure clamp
G = Stainless steel exhaust pipe (Field provided)
H = Combustion analization probe (Field installed)
L = Cap (Field provided)
N = Stainless steel air inlet pipe (Field provided)
P = Air intake connection
R = Stainless steel adapter (Field provided)

Figure 12-10 Stainless steel air intake/vent connection

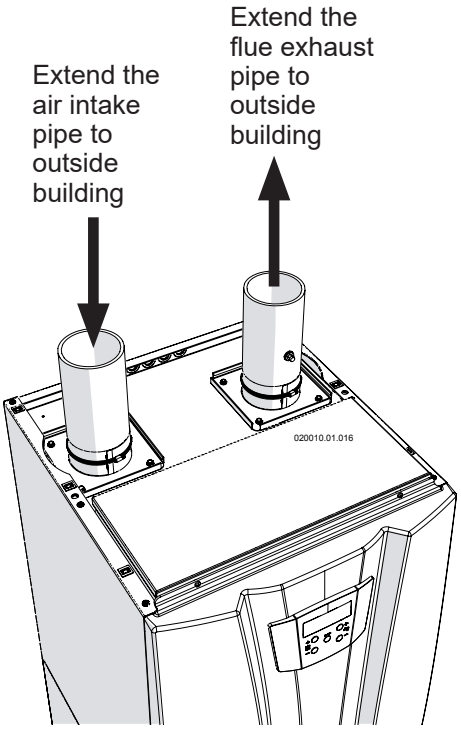


Figure 12-11 Stainless steel air intake/vent connection correctly in place

12.8 - Polypropylene vent piping materials

⚠ WARNING!!! Use only the materials listed in Figures 12-6 and 12-7 for vent pipe, and fittings. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! This appliance requires a special venting system. The field provided vent fittings must be connected to the heater following Section 12.8.2. Failure to follow this warning could result in fire, personal injury, or death.

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

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

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

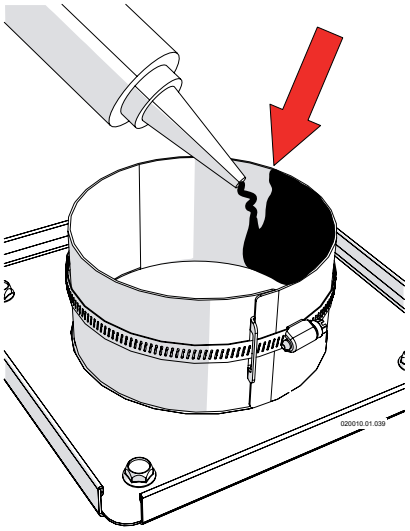
NOTICE! Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Figure 12-6).

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

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

CAUTION!!! **Apply a liberal even coat of VITON-BASED RTV high temperature silicone (or equivalent) to the internal side of the heater adapter (item "B" and "P" fig.12-12)**



12.8.1 - Polypropylene air intake connection

Combustion Air Intake connection (see Figure 12-12 Item "M") is used to provide combustion air directly to the heater from outdoors. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.

To connect a polypropylene pipe to the air intake connection proceed as follows while referring to Figure 12-12:

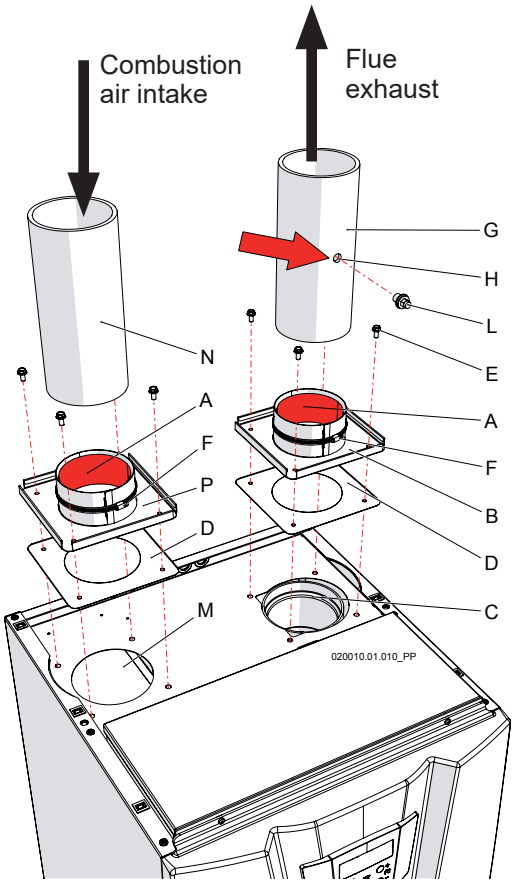
1. install heater adapter "P" (Field provided) above exit "M" using gasket "D" and bolts "E".
2. Insert vent pipe "N", into adapter "P", following instruction of polypropylene pipe manufacturer.

12.8.2 - Polypropylene vent connection

Vent connection (Figure 12-12 item "C") is used to provide a passageway for conveying combustion gases to the outside. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.
To connect a polypropylene pipe to the vent connection proceed as follows while referring to Figure 12-12:

1. install heater adapter "B" (Field provided) above exit "C" using gasket "D" and bolts "E".
2. Insert vent pipe "G", into adapter "B", following instruction of polypropylene pipe manufacturer.

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



Key Figure 12-12
A = VITON-BASED RTV high temperature silicone (or equivalent) (Field provided)
B = Flue exhaust adapter for PVC/CPVC pipe
C = Flue exhaust connection
D = Gasket
E = Fixing screws
F = Mechanically secure clamp
G = PVC/CPVC exhaust pipe (Field provided)
H = Combustion analization probe (Field installed)
L = Cap (Field provided)
N = PVC/CPVC air inlet pipe (Field provided)
P = Air intake adapter for PVC/CPVC pipe

Figure 12-12 Polypropylene air intake/vent connection

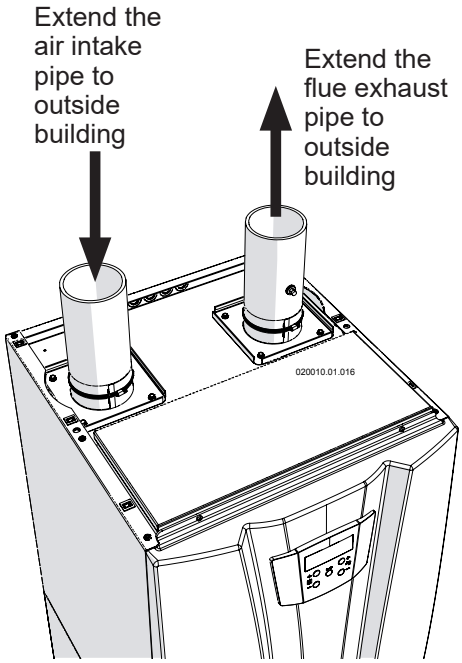


Figure 12-13 Polypropylene air intake/vent connection correctly in place

12.9 - Single pipe vent (not sealed combustion)

For heaters for connection to gas vents or chimneys, vent installations shall be in accordance with “Venting of Equipment,” of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or “Venting Systems and Air Supply for Appliances,” of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

⚠ WARNING!!! When utilizing the single pipe vent method, provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes (see section 5.1).

Failure to follow this warning could result in excessive levels of carbon monoxide, wich can cause sever personal injury or death!

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

NOTICE! There will be a noticeable increase in the noise level during normal operation from the inlet air opening.

NOTICE! Vent system and terminations must comply with the venting instructions set forth in Sections 12.6, 12.7 and 12.8.

⚠ WARNING!!! Use only the materials, vent systems, and terminations listed in Figures 12-6 and 12-7. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

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

⚠ WARNING!!! Heater must be clear and free from combustible materials, gasoline and other flammable vapors and liquids, and corrosive liquids and vapors. Never use chlorine and hydrocarbon containing chemicals (such as spray chemicals, solution and cleaning agents, paints, glues etc.) in the vicinity of the heater. Do not store and use these chemicals in the heater room. Avoid excessive dust formation and build-up. Failure to comply could result in fire, severe personal injury, death, or substantial property damage.

⚠ WARNING!!! Where exhaust fans, clothes dryers, and kitchen ventilation systems interfere with the operation of appliances, makeup air shall be provided. Failure to follow this warning could result in excessive levels of carbon monoxide, which can cause severe personal injury or death!

NOTICE! For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table in Figure 12-6).

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

NOTICE! The venting pipe shall be installed with a means for condensate disposal in order to prevent its accumulation.

12.9.1 - Determine location

Locate the vent termination using the following guidelines:

1. The total length of piping for vent must not exceed the limits given in the Section 12.3.
2. You must consider the surroundings when terminating the vent:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals.
   e. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
   f. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   g. Locate or guard vent to prevent condensate damage to exterior finishes.
3. The vent piping must terminate in an elbow pointed outward as shown in Figures 12-14 or 12-15 or in a roof as shown in Figure 12-21.

⚠ WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 12-14, 12-15 or 12-21. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential heater shutdown.

4. Maintain clearances as expected by “Venting of Equipment,” of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or “Venting Systems and Air Supply for Appliances” of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes. Also maintain the following:
   a. Vent must terminate:
      • At least 6 feet from adjacent walls.
      • No closer than 12 inches below roof overhang.
      • At least 7 feet above any public walkway.
      • At least 3 feet above any forced air intake within 10 feet.
      • No closer than 4 feet below or horizontally from any door or window or any other gravity air inlet.

      Item unique to U.S.: vent for this appliance shall not terminate:
      i) over public walkways; or
      ii) near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
      iii) where condensate vaper could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
   b. Do not terminate closer than 4 feet horizontally from any electric meter, gas meter, regulator, relief valve, or other equipment. Never terminate above or below any of these within 4 feet horizontally.**Item unique to CANADA: vent system shall terminate at least 6 ft from electrical and gas meters.**
5. Locate termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

12.10 - Sidewall termination - Two pipes

12.10.1 - Vent/air termination

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

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

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

12.10.2 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in the Section 12.3.
2. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals.
   e. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
   f. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   g. Locate or guard vent to prevent condensate damage to exterior finishes.

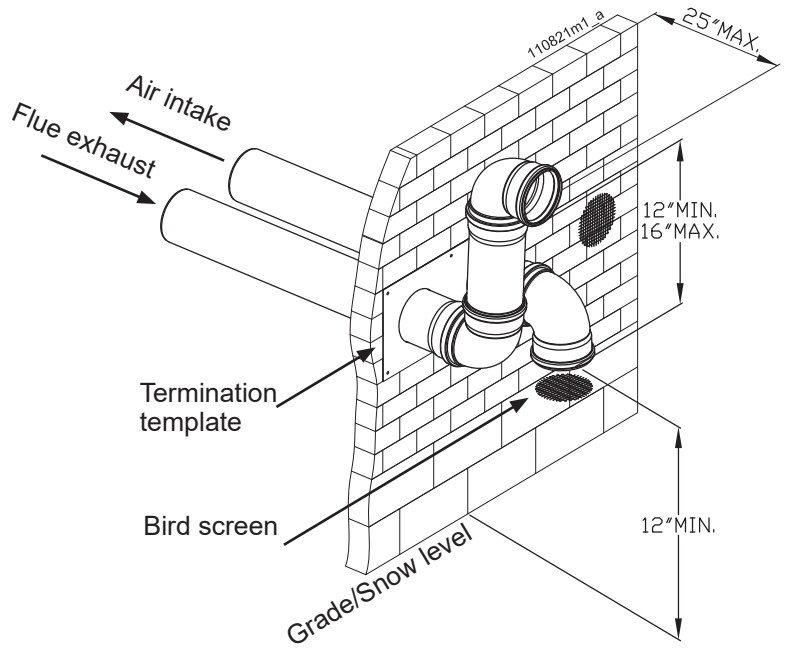


Figure 12-14 Two pipes sidewall termination of air and vent

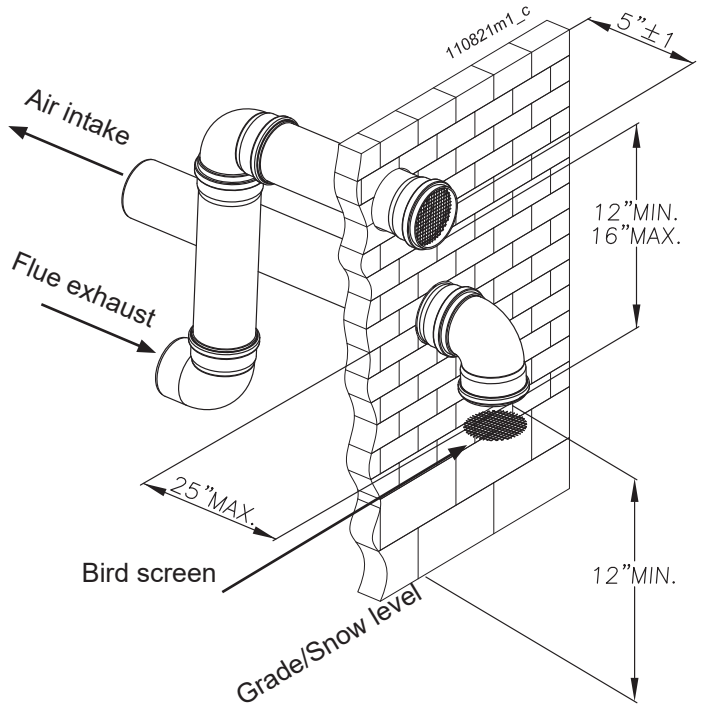


Figure 12-15 Two pipes sidewall termination of air and vent (if space permits)

3. The air piping must terminate in a down-turned elbow as shown in Figures 12-14 and 12-15. This arrangement avoids recirculation of flue products into the combustion air stream.
4. The vent piping must terminate in an elbow pointed outward or away from the air inlet, as shown in Figures 12-14 and 12-15.

⚠ WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 12-14 and 12-15. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential heater shutdown.

5. Maintain clearances as shown in Figures 12-14 and 12-15. Also maintain the following:
   a. Vent must terminate:
      - At least 6 feet from adjacent walls.
      - No closer than 12 inches below roof overhang.
      - At least 7 feet above any public walkway.
      - At least 3 feet above any forced air intake within 10 feet.
      - No closer than 12 inches below or horizontally from any door or window or any other gravity air inlet.

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

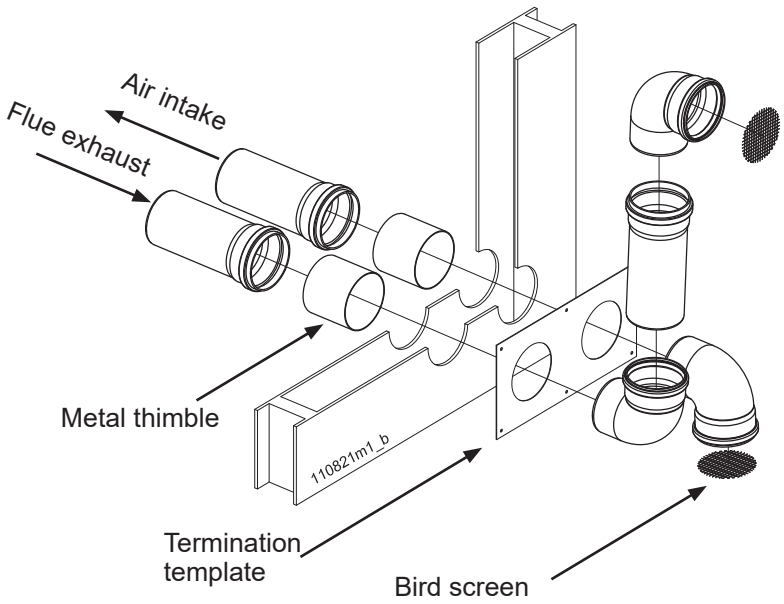
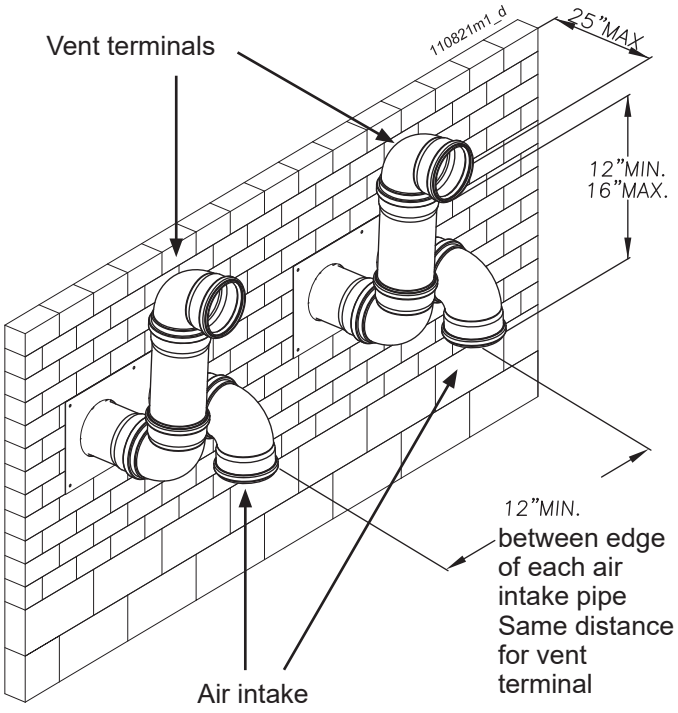


Figure 12-16 Two pipes sidewall termination assembly



NOTICE! Keep the air intake at min. 12" from grade or snow line. Provide vent and air intake with bird screen

Figure 12-17 Two pipes multiple heaters vent terminations

12.10.3 - Prepare wall penetrations

1. Air pipe penetration:
   a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter;
   b. Insert a galvanized metal thimble in the vent pipe hole as shown in Figure 12-16.
3. Use a sidewall termination plate as a template for correct location of hole centers.
4. Follow all local codes for isolation of vent pipe when passing through floors or walls.
5. Seal exterior openings thoroughly with exterior caulk.

12.10.4 - Termination and fittings

1. The air termination coupling must be oriented at least 12 inches above grade or snow line as shown in Figures 12-14 and 12-15.
2. Maintain the required dimensions of the finished termination piping as shown in Figures 12-14 and 12-15.
3. Do not extend exposed vent pipe outside of the building more than what is shown in Figures 12-14 and 12-15. Condensate could freeze and block vent pipe.

12.10.5 - Multiple vent/air terminations

1. When terminating multiple heaters terminate each vent/air connection as shown in Figure 12-17.

⚠ WARNING!!! All vent pipes and air inlets must terminate at the same height to avoid possibility of air inlet flue contamination that could result in excessive levels of carbon monoxide which can cause severe personal injury or death!

2. Place wall penetrations to obtain minimum clearance of 12 inches between edge of air inlet and adjacent vent outlet, as shown in Figure 12-17 for U.S. installations. For Canadian installations, provide clearances required by CSA B149.1 Installation Code.

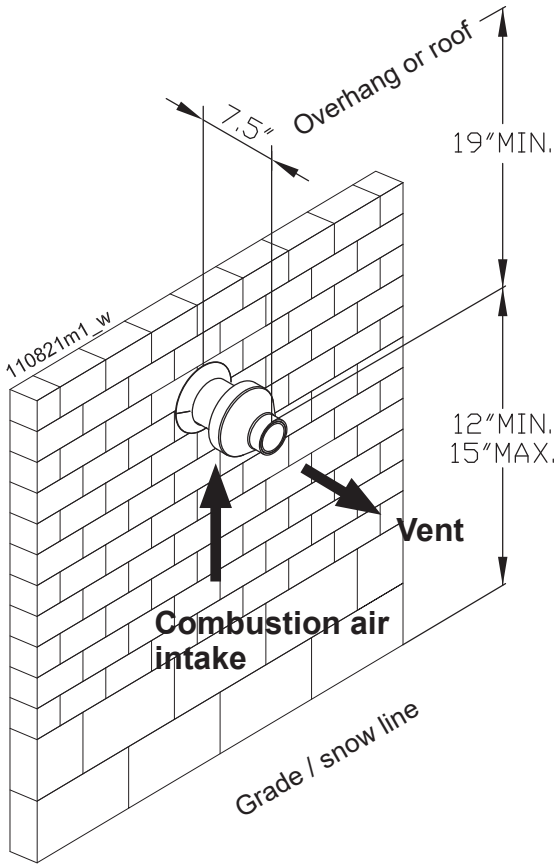


Figure 12-18 Concentric sidewall termination clearances

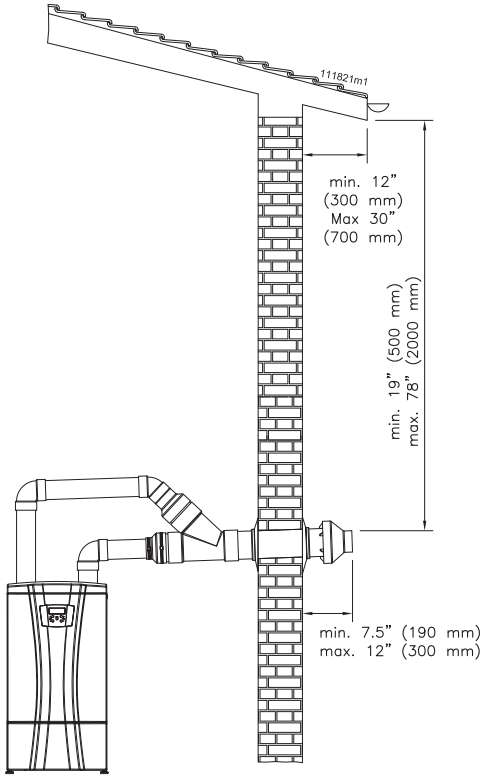


Figure 12-19 Concentric sidewall termination clearances

12.11 - Sidewall termination – Concentric vent

12.11.1 - Description and usage

The termination kit must terminate outside the structure and must be installed as shown in Figure 12-18.
The required concentric termination kit as well as combustion air and vent pipe materials are listed in Figures 12-6 and 12-7.
The termination ending must be protected from rain, see Figure 12-19.

12.11.2 - Sidewall termination installation

1. Determine the best location for the termination kit (see Figures 12-18 and 12-19).
2. The total length of piping for vent or air must not exceed the limits given in Section 12.3.
3. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals
   e. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   f. Locate or guard vent to prevent condensate damage to exterior finishes.
4. Cut one (1) hole 5 inch diameter into the structure to install the termination kit.
5. Install the Concentric vent kit following the concentric kit manufacturer's instruction.

NOTICE! Ensure termination location clearance dimensions are as shown in Figures 12-18 and 12-19.

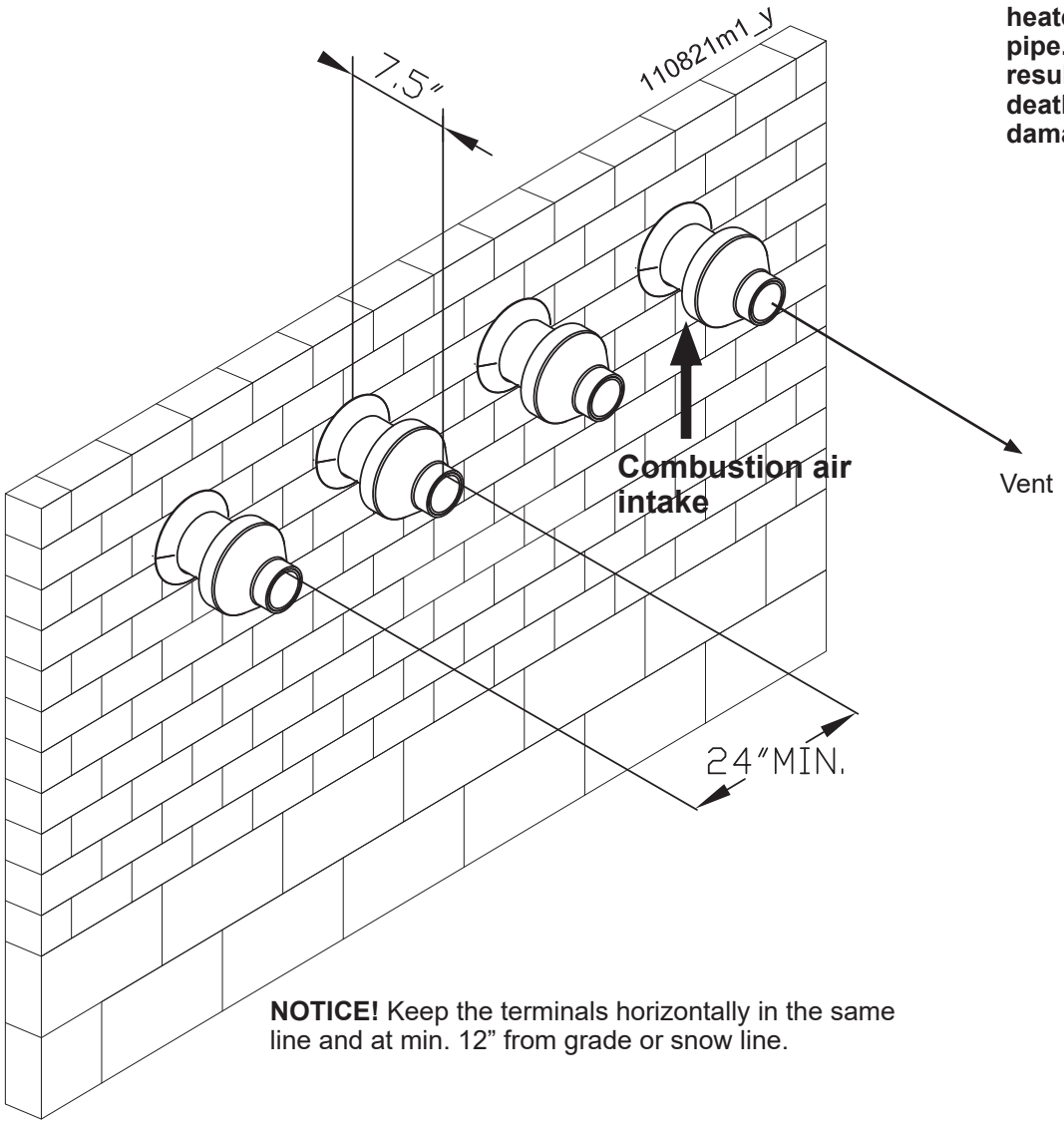
CAUTION!!! **DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.**

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

12.11.3 - Multiventing sidewall terminations

When two or more direct vent appliances are vented near each other, each appliance must be individually vented and vent terminations may be installed as shown in Figure 12-20. It is important that vent terminations be made as shown to avoid recirculation of flue gas.

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



NOTICE! Keep the terminals horizontally in the same line and at min. 12" from grade or snow line.

Figure 12-20 Concentric sidewall multiple heaters terminations

12.12 - Vertical termination - Two pipes

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

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

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

12.12.1 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in the Section 12.3.
2. The vent must terminate at least 3 feet above the highest place in which the vent penetrates the roof and at least 2 feet above any part of a building within 10 horizontal feet.
3. The air piping must terminate in a down-turned 180° return pipe 3 feet minimum below any vent terminal within 10 feet. This placement avoids recirculation of flue products into the combustion air stream.
4. The vent piping must terminate at least 3 feet above any forced air intake within 10 feet.
5. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

12.12.2 - Prepare roof penetrations

1. Air pipe penetration: cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter;
   b. Insert a galvanized metal thimble in the vent pipe hole.
3. Space the air and vent holes to provide the minimum spacing shown in Figure 12-21 and listed in Section 12.12.1.
4. Follow all local codes for isolation of vent pipe when passing through floors, ceilings, and roofs.
5. Provide flashing and sealing boots sized for the vent pipe and air pipe.

12.12.3 - Termination and fittings

1. Prepare the vent termination and the air termination elbow (Figure 12-21) by inserting bird screens.
2. The air piping must terminate in a down-turned 180° return bend as shown in Figure 12-21. Locate the vent pipe at least 3 feet above any forced air intake within 10 feet. This placement avoids recirculation of flue products into the combustion air stream.
3. Maintain the required dimensions of the finished termination piping as shown in Figure 12-21.
4. Do not extend exposed vent pipe outside of building more than shown in Figure 12-21. Condensate could freeze and block vent pipe.

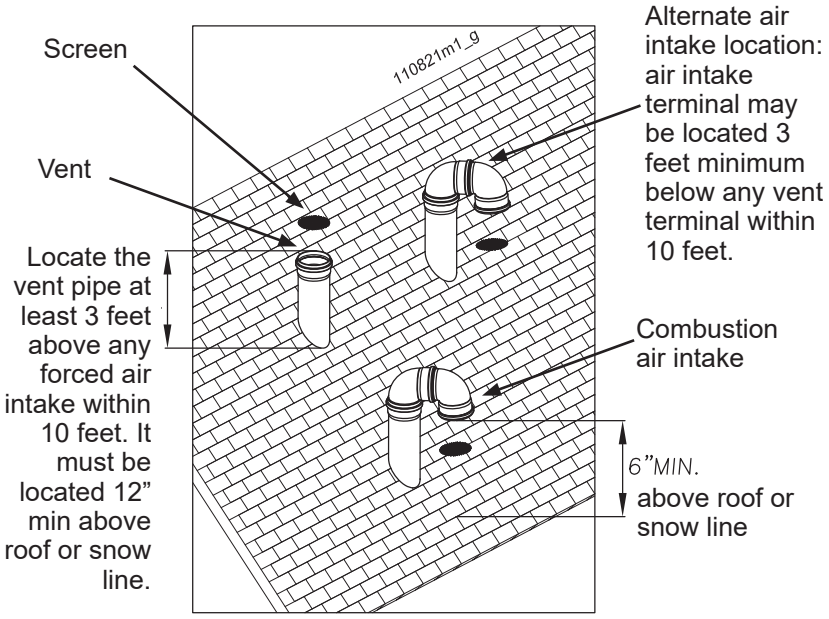
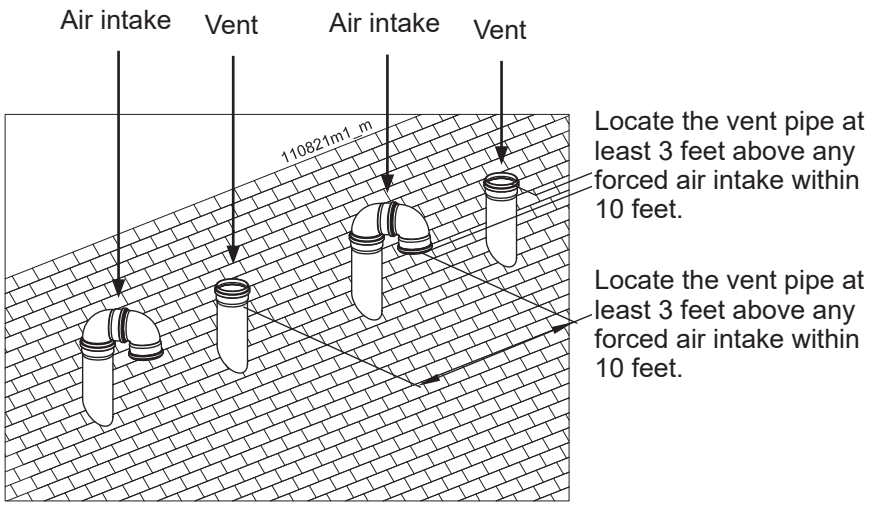
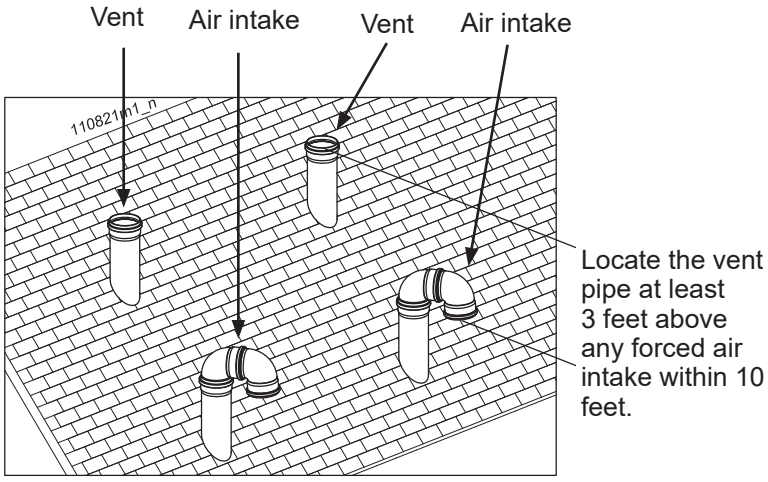


Figure 12-21 Two pipes vertical terminations of air and vent



NOTICE! Keep the terminals at min. 12” from grade or snow line. Provide vent and air intake with bird screen.

Figure 12-22 Two pipes Multiple heaters vertical terminations



NOTICE! Keep the terminals at min. 12” from grade or snow line. Provide vent and air intake with bird screen.

Figure 12-23 Alternate vertical terminations with multiple heaters

12.12.4 - Multiple vent/air terminations

1. When terminating multiple heaters, terminate each vent/air connection as shown in Figures 12-22 and 12-23.

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

2. Place roof penetrations to locate the vent pipe at least 3 feet above any forced air intake within 10 feet (see Figure 12-22). For Canadian installations, provide clearances required by CSA B149.1 Installation Code.

12.13 - Vertical termination – Concentric vent

12.13.1 - Description and usage

Both combustion air and vent pipes must attach to the termination kit. The termination kit must terminate outside the structure and must be installed as shown in Figure 12-24.

12.13.2 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in Section 12.3.
2. The concentric terminal must terminate at least 3 feet above the highest place in which the vent penetrates the roof and at least 2 feet above any part of a building within 10 horizontal feet.
3. Locate termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

12.13.3 - Vertical termination installation

1. Determine the best location for the termination kit (see Figure 12-25).
2. The total length of piping for vent or air must not exceed the limits given in Section 12.3.
3. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals
   e. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   f. Locate or guard vent to prevent condensate damage to exterior finishes.
4. Cut one (1) hole into the structure to install the termination kit.
5. Install the Concentric vent kit following the concentric kit manufacturer's instruction.

NOTICE! Ensure termination location clearance dimensions are as shown in Figures 12-24 and 12-25.

NOTICE! Ensure termination height is above the roof surface or anticipated snow level (12 inches in U.S.A. or 18 inches in Canada) as shown in Figure 12-24.

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

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

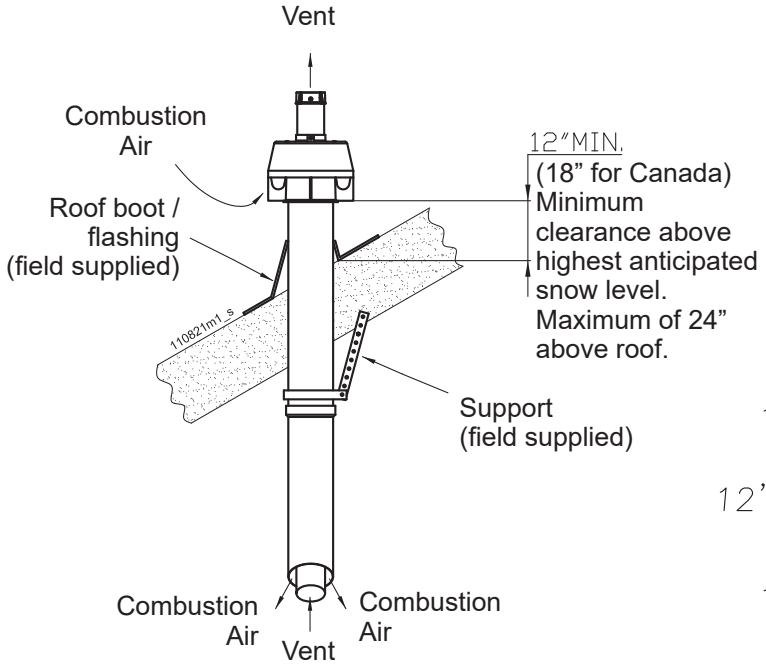
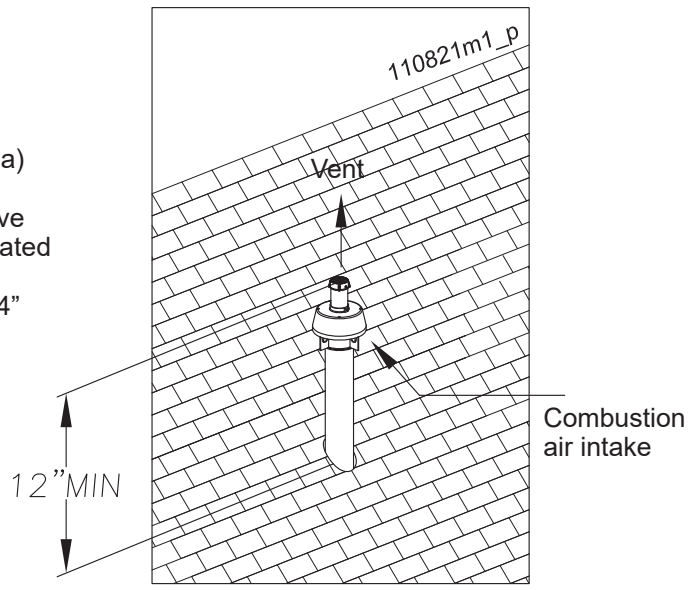


Figure 12-24 Concentric vertical terminations



Minimum clearance above snow level (18" for Canada) Maximum 24" above roof or snow level)

Figure 12-25 Concentric vertical terminations

12.13.4 - Multiventing vertical terminations

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see Figure 12-26).

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

When two or more direct vent appliances are vented near each other, two vent terminations may be installed as shown in Figure 12-26. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

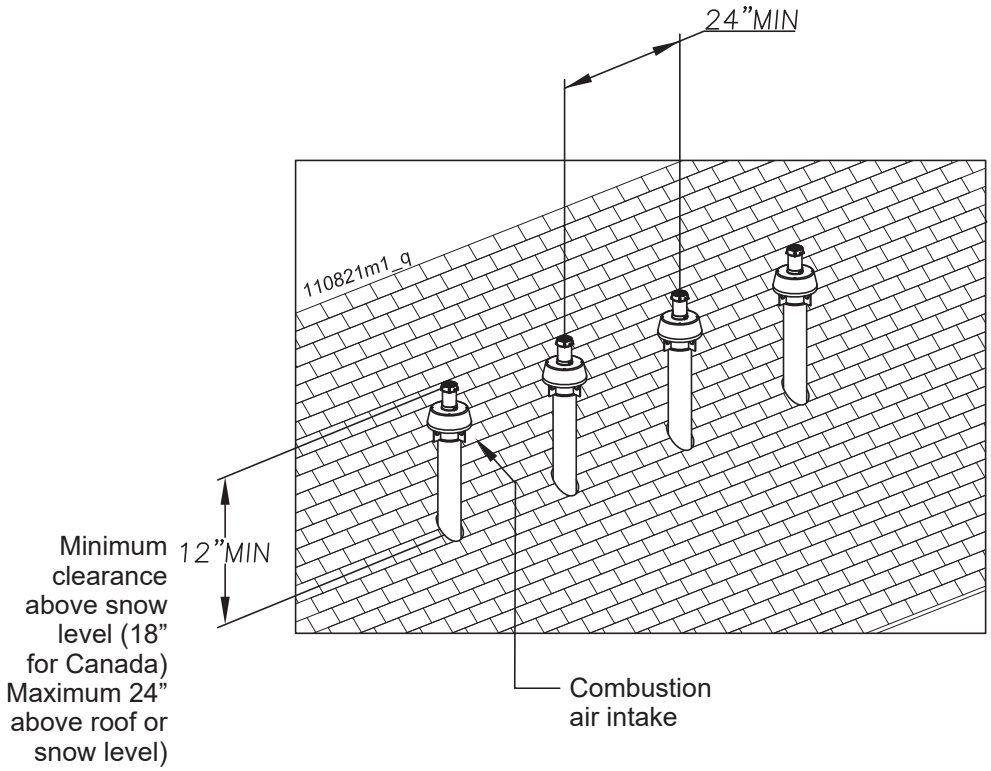
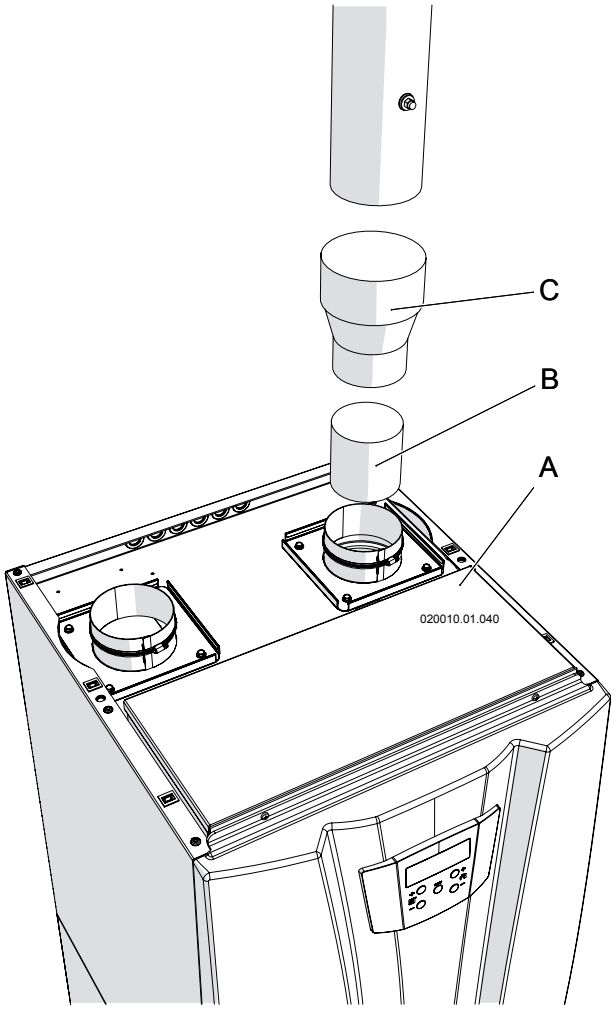


Figure 12-26 Concentric multiple heaters vertical terminations

13.1 - CATEGORY II: Negative pressure condensing

An appliance that operates with a non-positive vent static pressure with a vent gas temperature that may cause excessive condensate production in the vent.

13.2 - CATEGORY II: Adapter and increaser



A = HEATER
B = ADAPTER
C = INCREASER

Figure 13-1 Adapter and increaser

MODEL	FLUE SIZE	FAMILY OF MATERIAL	MANUFACTURER	ADAPTER	INCREASER	AIR INLET	VENT ROOF TERMINAL
199	3” to 6”	Stainless steel	DURAVENT	810005378	810003136 + 810005375	FSBS6 + FSELB9006	FSVL 3606
399 500	4” to 8”	Stainless steel	DURAVENT	810005545	810005375 + 810005385	FSBS8 + FSELB9008	FSVL 3608

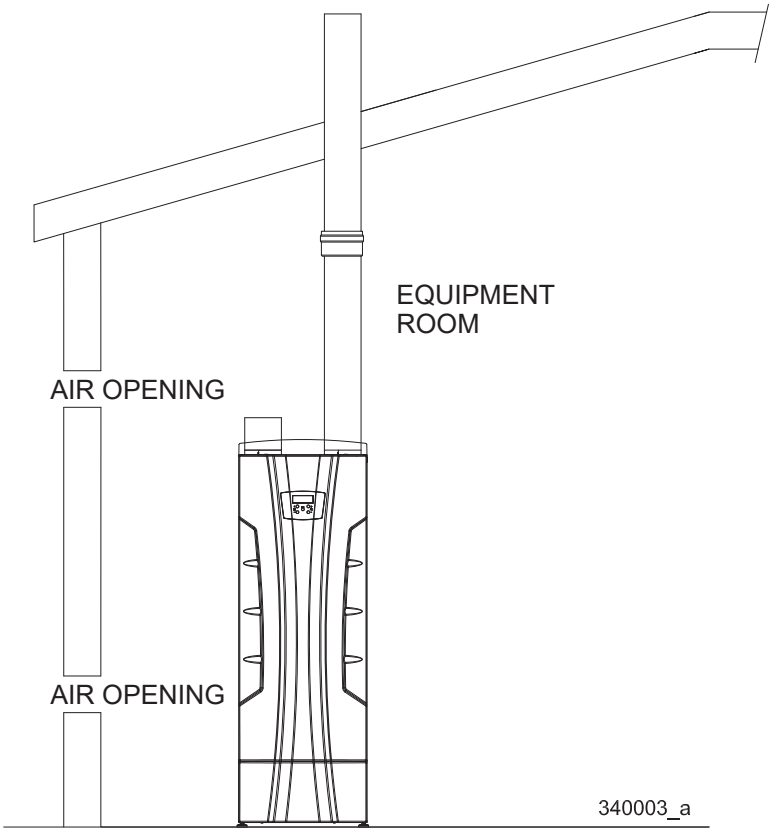


Figure 13-2 Vertical vent with combustion air from equipment room

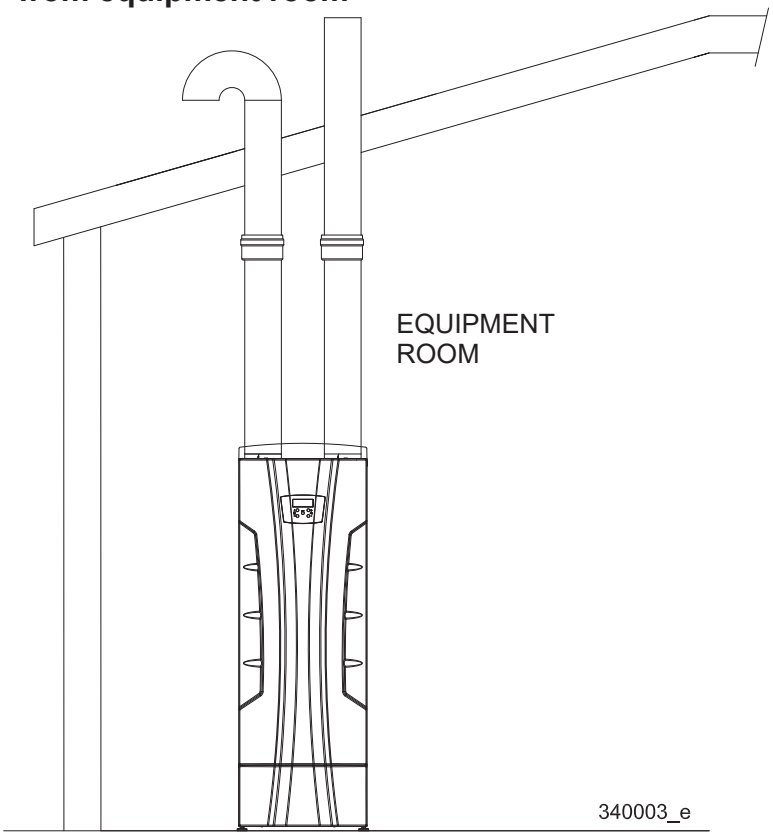


Figure 13-3 Vertical direct vent installation with rooftop combustion air inlet

13.3 - Condensing vent option: CATEGORY II:

Vertical vent with combustion air from equipment room

The flue outlet terminates on the rooftop.

The termination point for the flue products must follow the vertical vent termination clearance requirements on section 12.12. These units can be identified by the CATEGORY II as noted on the unit's rating plate.

The flue from this category II appliance must have all vent joints and seams sealed gastight. A category II vent system has specific vent material and installation requirements.

The flue products in the vent system may be cooled below their dew point and form condensate in the flue. The materials used for a category II vent must be resistant to any corrosive damage from flue gas condensate.

Follow all requirements in section 5.1, 12.2 and 12.9. Follow all requirements for venting flue products to the outdoors with a vertical termination as per section 12.12.

Vertical direct vent installation with rooftop combustion air inlet

The vertical direct vent system is installed with a Category II flue and a separate combustion air pipe to the outdoors. The flue outlet and combustion air intake must both terminate on the rooftop.

The termination point for the flue products must follow the vertical vent termination clearance requirements on section 12.12. These units can be identified by the Category II as noted on the unit's rating plate.

Follow all requirements in sections 5.1, 12.2 and 12.9. Follow all requirements for venting flue products to the outdoors with a vertical termination as per section 12.12.

The vertical direct vent system requires the installation of an additional pipe to supply combustion air from outdoors directly to the appliance. Follow all requirements under the combustion air inlet section 12.5.

Vent/Air vertical installation with sidewall combustion air inlet

The vent/air vertical with a sidewall combustion air vent system terminates the flue at the rooftop and air inlet at the sidewall. The flue outlet and combustion air intake terminate in different pressure zones.

The termination point for the flue products must follow the vertical vent termination clearance requirements on section 12.12. These units can be identified by the Category II as noted on the unit's rating plate.

Follow all requirements in sections 5.1, 12.2 and 12.9. Follow all requirements for venting flue products to the outdoors with a vertical termination as per section 12.12.

The vent/air vertical system requires the installation of an additional pipe to supply combustion air from outdoors directly to the appliance. Follow all requirements under the combustion air inlet section 12.5.

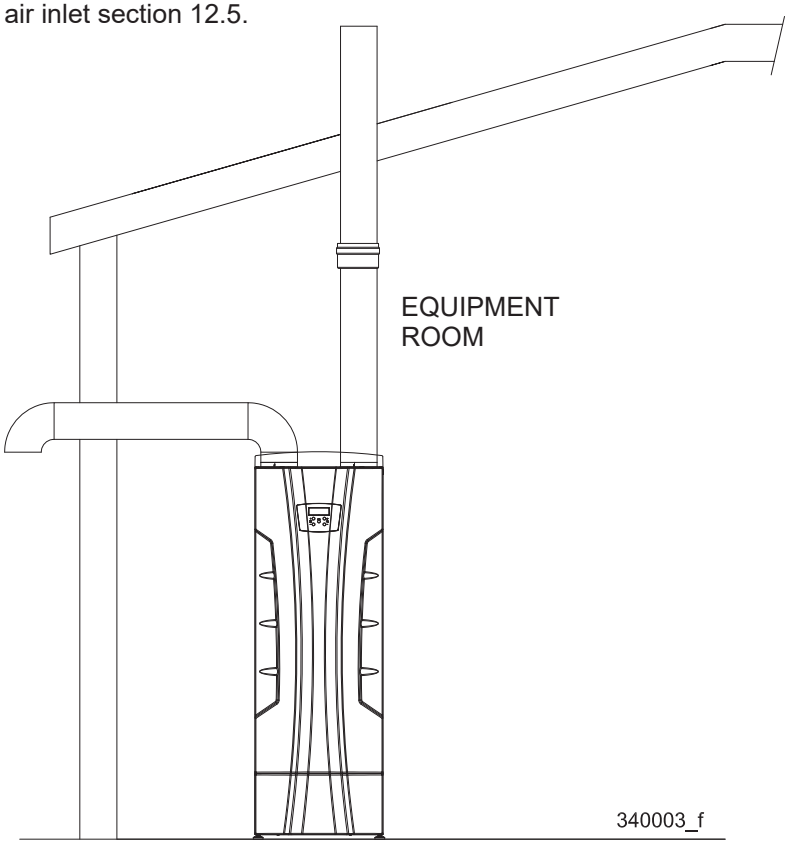


Figure 13-4 Vertical vent/air installation with sidewall combustion air inlet

Common venting CATEGORY II:

Flues of multiple water heaters may be combined by incorporating a vent increaser to change the category IV appliance to a category II vent system which can be common vented using an engineered vent system. The increaser kit must be provided by the manufacturer and the combined engineered vent system must be designed to ensure that flue products will be properly exhausted from the building at all times.

⚠ WARNING!!! Failure to use the correct vent increaser or a properly sized vent system may result in excessive levels of carbon monoxide which can cause severe personal injury or death!

Consult a vent designer to determine the diameter of the common vent pipe required for combined vent installation. It is recommended that all vent joints and seams are sealed gasthigt. This vent system has specific vent material and installation requirements. The negative draft in a conventional vent installation must be within the range of 0.02 to 0.08 inches w.c. to ensure proper operation. Make all draft readings while the unit is in stable operation (approximately 10 minutes).

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

1. INSTALL A CARBON MONOXIDE DETECTOR. At the time of installation of the common vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

14.1 - Gas supply piping

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

Connecting gas supply piping:

1. Refer to Figure 14-1 to pipe gas to the heater.
   a. Install ground joint union for servicing, when required.
   b. Install a manual shutoff valve in the gas supply piping, outside heater jacket
   c. Manual main shutoff valves, must be identified by the installer.
2. Install sediment trap / drip leg. (see Figure 14-1).
3. Support piping with hangers, not by the heater or its accessories.

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

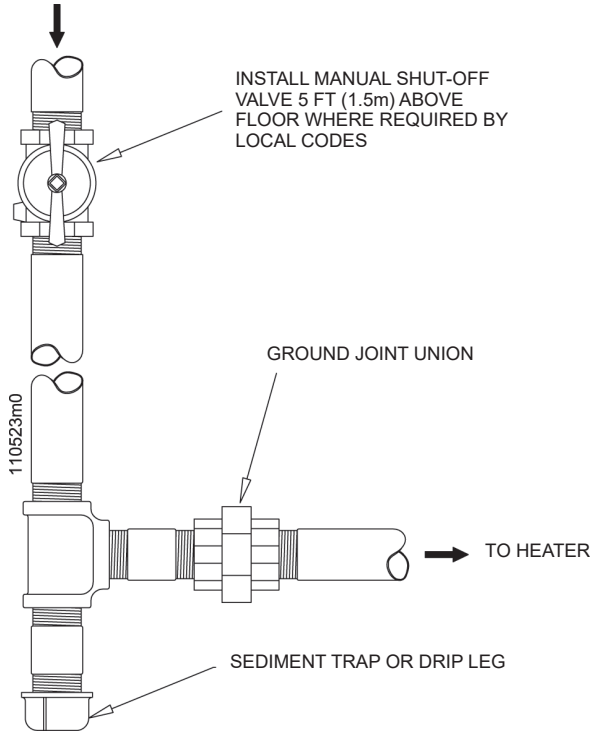
4. Purge all air from the gas supply piping.
5. Before placing the heater in operation, check the heater and its gas connection for leaks.
   a. The appliance must be disconnected from the gas supply piping system during any pressure testing of that system at a test pressure in excess of 1/2 PSIG (3.5 kPa).
   b. The appliance must be isolated from the gas supply piping system by closing a manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.5 kPa).
   c. The appliance and its gas connection must be leak tested before placing it in operation.

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

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

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

WARNING!!! This heater is typically shipped ready to fire on natural gas. Check heater rating plate to determine which fuel the heater is set for. If set to natural gas, it may be converted to LP following instruction on Section 14.6 or 14.7. Failure to comply could result in severe personal injury, death, or substantial property damage.



WARNING!!! Manual main shutoff valve, must be identified by the installer. Failure to comply could result in fire or explosion that can cause severe personal injury, death, or substantial property damage.

Figure 14-1 Gas supply piping

14.2 - Pipe sizing for natural gas

Refer to Figure 14-2 for pipe length and diameter. For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 for Canadian installations).

Natural gas supply pressure requirements

1. Pressure required at the gas valve inlet pressure port:
   - Maximum 13”W.C. with no flow (lockup) or with heater off.
   - Minimum 3”W.C. with gas flowing (verify during high fire).
2. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 13”W.C. at any time. Adjust lockup regulator for 13”W.C. maximum.

14.3 - Propane Gas

WARNING!!! These heaters are typically shipped ready to fire on natural gas. Check heater rating plate to determine which fuel the heater is set for. If set to natural gas, it may be converted to LP by following instruction on Section 14.6 or 14.7. Failure to comply could result in severe personal injury, death, or substantial property damage.

Pipe sizing for propane gas

Contact gas supplier to size pipes, tanks, and 100% lockup gas pressure regulator.

Propane supply pressure requirements:

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

WARNING!!! Ensure that the high gas pressure regulator is at least 6 - 10 ft upstream of the appliance. Failure to comply could result in severe personal injury, death, or substantial property damage.

	Iron Pipe size (in)							
Nominal:	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Actual ID:	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
Length (ft)	Capacity in Cubic Feet of Gas per Hour							
10	273	514	1060	1580	3050	4860	8580	17500
20	188	353	726	1090	2090	3340	5900	12000
30	151	284	583	873	1680	2680	4740	9660
40	N/A	243	499	747	1440	2290	4050	8270
50	N/A	215	442	662	1280	2030	3590	7330
60	N/A	195	400	600	1160	1840	3260	6640
70	N/A	179	368	552	1060	1690	3000	6110
80	N/A	167	343	514	989	1580	2790	5680
90	N/A	157	322	482	928	1480	2610	5330
100	N/A	148	304	455	877	1400	2470	5040
125	N/A	131	269	403	777	1240	2190	4460
150	N/A	119	244	366	704	1120	1980	4050
175	N/A	N/A	224	336	648	1030	1820	3720
200	N/A	N/A	209	313	602	960	1700	3460
250	N/A	N/A	185	277	534	851	1500	3070

NOTICE! Maximum pipe capacity is based on a 0.60 specific gravity gas at a pressure of 0.5 PSIG and a 0.3”WC pressure drop

Figure 14-2 Gas pipe capacity for natural gas

14.4 - Check inlet gas supply pressure

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

NOTICE! The maximum inlet gas pressure must not exceed the value specified by the manufacturer and that the minimum value listed is for the purposes of input adjustment.

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

1. Follow Section 15.7 to check the inlet gas supply pressure.
2. If gas supply pressure is within normal range and no adjustments are needed, proceed on to step 4.
3. If the gas pressure is out of range, contact the gas utility, gas supplier, qualified installer or service agency to determine the necessary steps to provide proper gas pressure to the heater.
4. Turn the power switch to the “OFF” position.
5. Shut off the manual gas shut off valve.
6. After verifying the correct gas pressures disconnect the manometer, turn the screw in pressure connection “D” in Figure 14-6, clockwise until snug and check for any gas leaks.

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

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

14.5 - Operating at high altitudes

For installation in the United States and in Canada:

Due to the reduced density of air at higher altitudes, the output of the AM must be de-rated at elevations above 5000 feet for AM 199/399 and above 2000 feet for AM 250/500. Please contact your local AERCO Sales Representative for details. Check and adjust the CO2 level following Section 15.8.

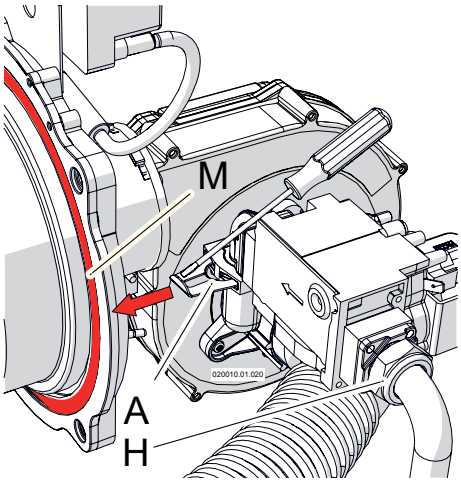


Figure 14-3 Dismantle the gas valve

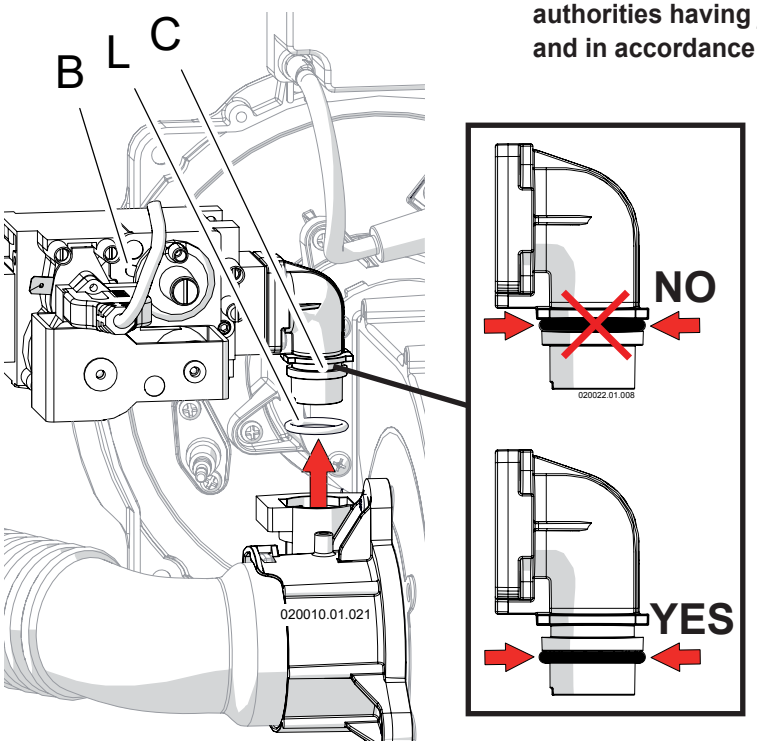


Figure 14-4 Lift the gas valve

14.6 - Convert a heater model 199 or 250 from Natural Gas to Propane gas or viceversa

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

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

Contents:
The conversion kit (supplied with the heater) is composed of the following elements, which are necessary for the gas change:
- a label rating stating the new gas setting;
- an instruction sheet;
- an orifice per each burner present on the unit;

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

1 - turn off the power to the heater;
2 - close the manual gas shut off valve;
3 - dismantle the jacket of the heater, follow Section 17.2;
4 - unscrew nut “H” as per Figure 14-3;
5 - with the help of a screwdriver, remove spring “A” (see figure 14-3);
6 - remove the gas valve from its site “C” as per Figure 14-4 (take care attention to o-ring “L” of Figure 14-4);
7 - replace orifice “G” of Figure 14-5, for the correct one for type of gas used. Verify that the stamping on the orifice matches the Figure 14-7;
8 - reinstall the gas valve, paying close attention to the o-ring “L” of Figure 14-4 (see also Figure 17.7) and to the gasket between gas valve and nut “H” of Figure 14-3;
9 - Insert again the spring “A” of Figure 14-3;
10 - tight nut “H” of Figure 14-3;
11 - open the manual gas shut off valve;
12 - check for any gas leaks on nut “H” of Figure 14-3;

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

13 - turn the power on to the heater;
14 - turn completely counter clockwise the screw “E” of Figure 14-6;

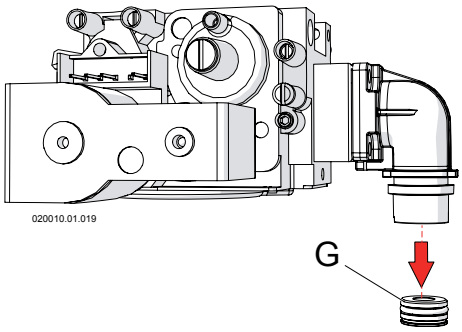


Figure 14-5 Gas orifice

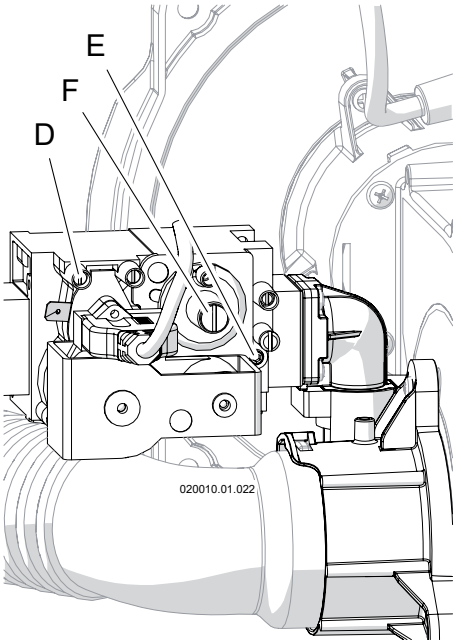


Figure 14-6 Gas valve

15 - Checking gas supply pressure following Section 15.7. The minimum gas supply pressure must not be less than 3”WC (7.6 mbar) and the maximum gas supply pressure must not be higher than 13”WC (33 mbar).

16 - Verifying the CO2 rate and its eventual adjustment following Section 15.8: The heater has a CO2 exhaust rate as shown in Figure 14-7. If not within range of value shown, malfunctions will occur.

WARNING!!! The CO (carbon monoxide) level should not exceed values given in Figure 14-7, when combustion is correct. Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

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

WARNING!!! If the combustion levels are not within the range given in Figure 14-7 for the firing rate, shut the heater down and contact your distributor or the heater manufacturer (see reference in the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

17 - check the capacity of the heater following Section 15.9;

18 - Attach to the front of the heater the appropriate conversion label, found in the conversion kit (see Figure 14-8 or Figure 14-9), stating the new type of gas adjustment of the heater.

a - Apply the label in Figure 14-8 if the heater has been converted to **LP GAS**;

b - Apply the label in Figure 14-9 if the heater has been converted to **NATURAL GAS**.

	U.M	199	250	399	500
Orifice stamping for Natural gas	mm/100	No orifice	930	No orifice	930
Orifice stamping for LP gas	mm/100	700	700	700	700
CO2 (Carbon dioxide) for Natural gas at high fire	%	8.4 to 8.7	8.8 to 9.1	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for Natural gas at low fire	%	8.4 to 8.7	8.8 to 9.1	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for LP gas at high fire	%	9.5 to 10			
CO2 (Carbon dioxide) for LP gas at low fire	%	10.5 to 11.5			
O2 (Oxygen) for Natural gas at high fire	%	5.4 to 5.6	4.7 to 5.2	5.4 to 5.6	4.7 to 5.2
O2 (Oxygen) for Natural gas at low fire	%	5.4 to 5.6	4.7 to 5.2	5.4 to 5.6	4.7 to 5.2
O2 (Oxygen) for LP gas at high fire	%	5.7 to 6.4			
O2 (Oxygen) for LP gas at low fire	%	3.4 to 4.9			
CO (Carbon monoxide) for Natural gas at high and low fire	ppm	Less than 150			
CO (Carbon monoxide) for LP gas at high and low fire	ppm	Less than 250			

Figure 14-7 Settings of the heater for NATURAL GAS and LP GAS

ATTENTION!!!
This heater has been converted for use with
LP GAS
- Maximum inlet gas pressure: 13 In.W.C.
- Minimum inlet gas pressure: 3 In.W.C.
-Manifold pressure: (see rating plate)
-Input rating: (see rating plate)
This water heater was converted on (day-month-year)
_____to _____ gas
with kit n°_____
by_____
_____
(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).
62408139-01

Figure 14-8 Label for LP gas heater

ATTENTION!!!
This heater has been converted for use with
NATURAL GAS
- Maximum inlet gas pressure: 13 In.W.C.
- Minimum inlet gas pressure: 3 In.W.C.
-Manifold pressure: (see rating plate)
-Input rating: (see rating plate)
This water heater was converted on (day-month-year)
_____to _____ gas
with kit n°_____
by_____
_____
(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).
62408125-01

Figure 14-9 Label for Natural gas heater

14.7 - Convert a heater model 399 or 500 from Natural Gas to Propane gas or viceversa

Appliances model 399 or 500 are multiburner appliances. This means that the gas conversion must be performed on each burner present inside the unit.

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

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

Contents:
The conversion kit (supplied with the heater) is composed of the following elements, which are necessary for the gas change:
- a label rating stating the new gas setting;
- an instruction sheet;
- an orifice per each burner present on the unit;

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

1. operate to convert the “Burner 1 (Master)”. See Figure 3-7 to identify “Burner 1 (Master)”;
2. operating on “Burner 1 (Master)” following exactly Section 14.6 from point 1. to 16.;

After converting “Burner 1 (Master)” you have to operate on “Burner 2” (See Figure 3-7) and:

3. follow exactly Section 14.6 from point 1. to 16.;

After converting all burners:

6. check the inlet gas pressure of the unit, following Section 15.7;
7. check the capacity input of the unit following Section 15.9;
8 - Attach to the front of the heater the appropriate conversion label, found in the conversion kit stating the new type of gas adjustment of the heater as follow:
   a - Apply the label in Figure 14-8 if the heater has been converted to **LP GAS**;
   b - Apply the label in Figure 14-9 if the heater has been converted to **NATURAL GAS**.

15.1 - Operating

Before starting the heater, the following must be done.

15.1.1 - User instructions

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

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

15.1.2 - Filling the condensate neutralizer media

The condensate neutraliser box must be filled of neutralizer media (see section 2.4) like showed in Figure 15-1. make attention to placing the box on two axes to keep it level horizontally. Ensure the amount of media is between MIN and MAX. For access, maintenance and cleaning see section 17.7.

15.1.3 - Filling water in the condensate outlet siphon

The condensate and neutralizing box is positioned inside the heater as shown in Figures 3-3 through 3-6, item “8”. It must be filled with water to prevent the leakage of flue gases from the condensate drainpipe, item “7” in Figures 3-3 through 3-6.

To fill and inspect the condensate box proceed as follow:

1.- Once the neutralizer media is placed fill the box with water until the max level indicated in Figure 15-2, make attention to placing the box on two axes to keep it level horizontally;
2.- Reassemble everything in reverse order.

For access, maintenance and cleaning see section 17.7.

⚠ WARNING!!! If heater stays off for more than 3 months, repeat the above operation to again fill the condensate trap. Failure to follow this warning could result in excessive levels of carbon monoxide, which can result in severe personal injury or death!

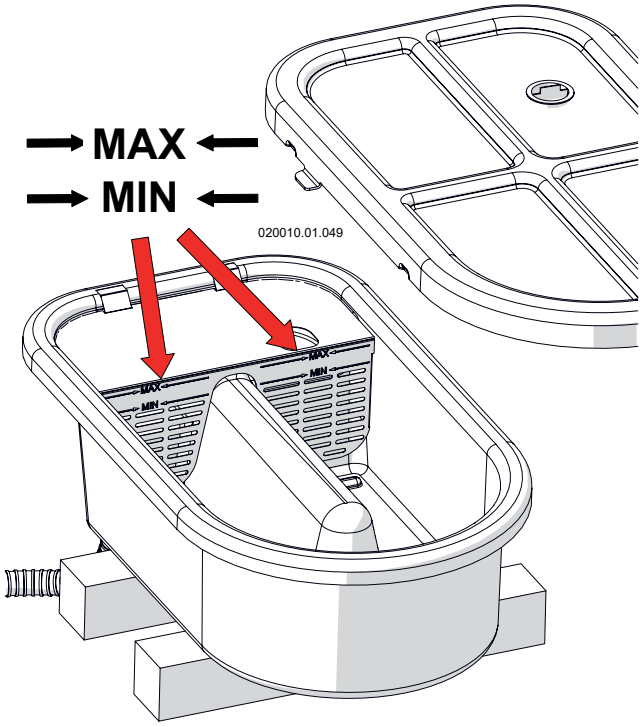


Figure 15-1 - Filling the condensate neutralizer media

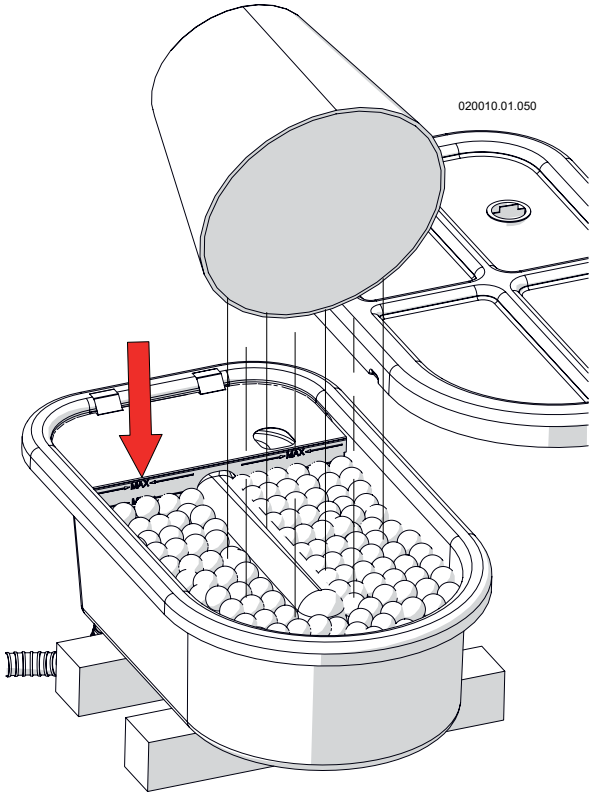


Figure 15-2 - Filling water in the condensate outlet siphon

15.2 - General warnings concerning gas supply

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

☞That the heater is supplied with the type of fuel that it is configured to use. Read Section 14.

☞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 properly connected (see Sections 12 and 13) and free from any blockages.

☞That the condensate drain tube is properly connected (see Section 9).

CAUTION!!! To avoid corrosion inside heat exchanger, gas used should have sulphur rates inside maximum annual peak over a short period of time of 150 mg/m3 and an annual average of 30 mg/m3.

⚠ 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!

15.3 - Confirming the heater's gas type

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

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

NATURAL GAS

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

or

LP Gas

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

15.4 - Gas type conversion

If the gas available at the installation site is not the type the heater is configured to use, the heater must be converted. Special conversion kits are available for this purpose inside the heater. Follow instruction on Sections 14.6 and 14.7.

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

15.5 - Start-up

1. Open the manual gas shut off valve (Figure 14-1).
2. Switch the on/off power switch, item "T" in Figure 16-1, to "on".
3. The heater will fire only when the supply temperature settings is higher than the actual supply temperature. Press buttons ✚ or ▬ to select the desired supply temperature.
4. If the display gives a Low water flow error (see Section 16.14), repeat the air purging operations.

15.6 - Ignition control testing

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

1. turn the power switch (item "T" in Figure 16-1) to on;
2. follow Section 15.5 to create a call for heat;
3. wait a few minutes for the burner to light-up as indicated by icon. On units model 399 and 500, wait until icons ① and ② are present on the display.
4. close the manual gas shutoff valve, see Figure 14-1;
5. after 3 minutes, the display must show Loc 01 and or, on models 399 and 500 all burners icons will blinking and the icon is displayed;
6. open the manual gas shutoff valve, see Figure 14-1;
7. 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 de-energized. Do not operate the heater until the problem is resolved or a fire or explosion causing property damage, personal injury or loss of life may occur!

15.7 - Gas supply pressure checking

⚠ WARNING!!! DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the gas valve, causing excessive levels of carbon monoxide, which can cause severe personal injury or death!

Check the gas supply pressure by following the steps below:

1. close the manual gas shut-off valve, Figure 14-1;
2. follow the steps in Section 17.2 to remove the front cover;
3. turn the screw in pressure port “D” shown in Figure 15-3 three turns counterclockwise;
4. connect a manometer with graduations of at least 0.1 in.W.C. *(0.25 mbar)* to the inlet gas port “D” shown in Figure 15-3 (on unit model 399 and 500, choose the pressure port “D” from any gas valve present).
5. open the manual gas shut off valve, Figure 14-1;
6. check that the gas supply pressure does not exceed 13 in.W.C. If the gas supply pressure is higher than 13 in.W.C. adjust the upstream gas pressure regulator to bring the gas supply pressure between 12”WC and 13”WC;
7. turn the power switch to on and generate a heat demand by pressing button ✣ to its maximum setting. Also ensure that the room thermostat is calling for heat and operate downstream the unit to verifiy the system is able to dissipate all heat generated.
8. set parameter 2200 to “H 19H” (see section 16.11) (for boiler model 199 use parameter 20 10). All burners will now start to run at high fire.
9. check the manometer to make sure the gas supply pressure does not drop below 3 in.W.C. (7.6 mbar). If the gas supply pressure is lower than 3 in.W.C. means that your inlet gas line or your gas pressure regulator are not correctly sized;

CAUTION!!! Do not attempt to adjust your upstream gas pressure regulator. This was already adjusted for the maximum inlet gas pressure.

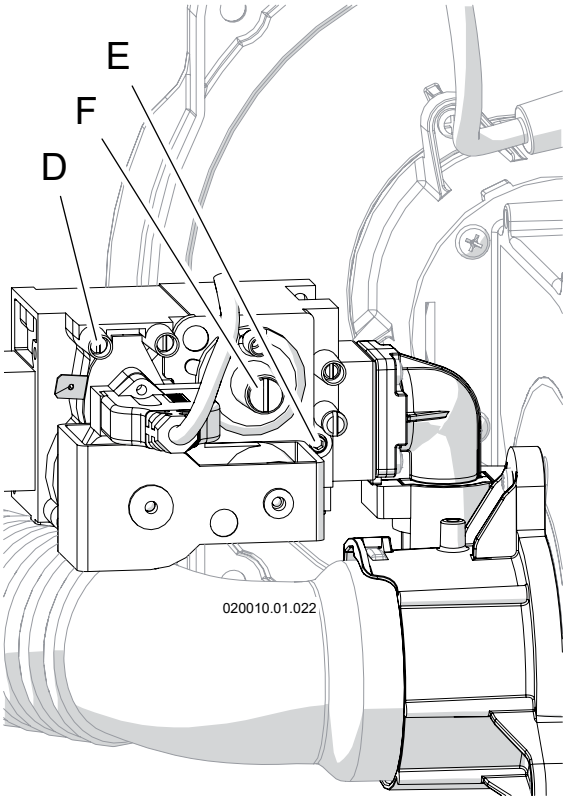
After verifying the correct gas pressures:

1. back to set parameter 2200 to “OFF” (on models 199 back to set parameter 20 10 to “OFF”). Now heater will back to work in normal condition;
2. disconnect the manometer;
3. turn the screw in pressure connection “D” in Figure 15-3, clockwise until snug;
4. check pressure port “D” (Figure 15-3) 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!

5. close the manual gas shut-off valve, Figure 14-1.



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

Figure 15-3 Gas valve

15.8 - Checking and adjusting CO2 levels

Figure 14-7 lists the correct CO2 ranges. CO2 values outside of the ranges given in Figure 14-7 may lead to malfunctioning of the heater and cause it to prematurely fail. To check the CO2 value, carry out a combustion analysis follow Section 15.8.1 or 15.8.2.

15.8.1 - Checking CO2 level on units model 199 and 250

⚠ WARNING!!! During this procedure compare also CO (carbon monoxide) reading, with the value given in Figure 14-7. If this is higher, STOP the heater and call the Factory service department (see phone number on the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

1. If it is not already present, create a combustion analysis probe site at 8" after the flue gas exhaust connection (see Figures 12-8, 12-10 or 12-12, item "H"). To do so, follow the vent pipe manufacturers' instruction.
2. generate a call for heat and wait until the heater is firing;
3. gain access to the "Installers' menu" and set parameter 20 10 to H 19H (see Section 16.11). The heater will now run for 20 minutes at high fire input;
4. wait 2 to 3 minutes for the CO2 to stabilize;
5. insert the probe of a calibrated combustion analyzer into the combustion analysis probe "H" of Figures 12-8, 12-10 or 12-12 and take a flue gas sample;
6. compare the CO2 reading with the high fire range given in Figure 14-7, making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted operating on the "E" screw of Figure 15-3. Use a 2.5mm Allen Wrench to turn the screw (clockwise to reduce the CO2 level, counter-clockwise to increase the CO2 level) in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value;
7. when CO2 level match the value of Figure 14-7, seal screw "E" with red paint or nail polish to discourage tampering.
8. set value of parameter 20 10 to LOW. The heater will now run for 20 minutes at low fire input;
9. wait 2 to 3 minutes for the CO2 to stabilize;
10. compare the CO2 reading with the low fire range given in Figure 14-7, making sure to use the range for the gas type in use. The CO2 reading must be inside the specified range; If not, STOP the heater and call the Factory service department (see phone number on the last cover page).
11. set parameter 20 10 to OFF to return the heater to its normal operating mode.
12. close the combustion analysis probe "H" of Figures 12-8, 12-10 or 12-12 with a suitable cap in accordance with the vent pipe manufacturers' instruction.

⚠ WARNING!!! Once the cap "L" of Figures 12-8, 12-10 or 12-12 is right in place, with the heater at high fire, check that it is absent from leakage and is mechanically fixed. Improper cap fixing can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

15.8.2 - Checking CO2 level on units model 399 and 500

⚠ WARNING!!! During this procedure compare also CO (carbon monoxide) reading, with the value given in Figure 14-7. If this is higher, STOP the heater and call the Factory service department (see phone number on the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

1. If it is not already present, create a combustion analysis probe site at 8" after the flue gas exhaust connection (see Figures 12-8, 12-10 or 12-12 item "H"). To do so, follow the vent pipe manufacturers' instruction.
2. Set parameter 2200 to "H 19H" (see section 16.11). Now all burners will run at high fire for 20 minutes;
3. wait 2 to 3 minutes the CO2 to stabilize.
4. Insert the probe of a calibrated combustion analyzer into the combustion probe "H" of figures 12-8 or 12-10 or 12-12, and take a flue gas sample.
5. compare the CO2 reading with the high fire range given in Figure 14-7, making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted operating on each burner. Set parameter 2200 to OFF and follow the sequent procedure:
   a. keep the heater in stand-by by removing any call for heat (remove the jumper or any wires from terminals "10" and "11" inside the junction box or set the heating service to off by pushing on the ▭ button up to see the OFF word);
   b. gain access to the Installer menu and set parameter 2201 to H 19H (see Section 16.11). Now the "Burner 1 (Master) will run for 20 minutes at high fire input;

c. wait 2 to 3 minutes for the CO2 to stabilize;
d. insert the probe of a calibrated combustion analyzer into the combustion analysis probe “H” of Figures 12-8, 12-10 or 12-12 and take a flue gas sample;
e. compare the CO2 reading with the high fire range given in Figure 14-7, making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted operating on the “E” screw of Figure 15-3 of the gas valve closer to the burner unit in fire. Use a 2.5mm Allen Wrench to turn the screw (clockwise to reduce the CO2 level, counter-clockwise to increase the CO2 level) in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value;
f. when CO2 level match the value of Figure 14-7, seal screw “E” (Figure 15-3) with red paint or nail polish to discourage tampering.
g. set value of parameter 2201 to LOW. The Burner 1 (Master) will now run for 20 minutes at low fire input;
h. wait 2 to 3 minutes for the CO2 to stabilize;
i. compare the CO2 reading with the low fire range given in Figure 14-7, making sure to use the range for the gas type in use. The CO2 reading must be inside the specified range; If not, STOP the heater and call the Factory service department (see phone number on the last cover page).

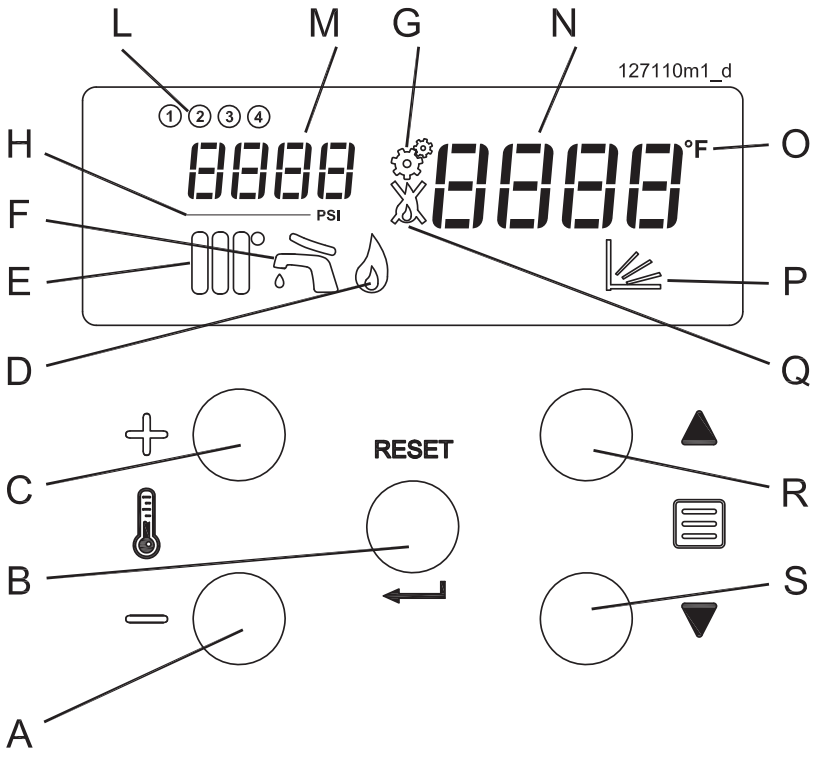
CAUTION!!! The CO2 reading, at low fire, could be affected by the natural draught of the chimney (negative pressure inside the chimney). If this is the case, take the CO2 reading removing the correspondent flue gas sensor (item “30” of figures 3-4 or 3-7)

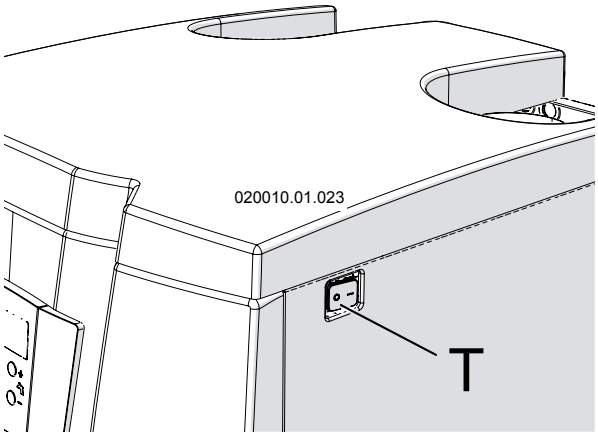
l. set parameter 2201 to “OFF”, to return the Burner 1 (MASTER) to its normal running mode.
6. check the CO2 value on the other burner follow steps as described in sections (a through l) taking in consideration that for the Burner 2 you have to use parameter 2202;
7. turn off the main power to the appliance;
8. close the combustion analisys probe “H” of Figures 12-8, 12-10 or 12-12 with a suitable cap in accordance with the vent pipe manufacturers’ instruction.

⚠ WARNING!!! Once the cap “L” of Figures 12-8, 12-10 or 12-12 is right in place, with the heater at high fire, check that it is absent from leakage and is mechanically fixed. Improper cap fixing can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

15.9 - Check the capacity input

The heater has a factory-set air/gas ratio. The pressure of the gas at the burner is indirectly controlled by the blower. The only way to check the heater capacity input is operating directly on the gas meter. To do so proceed as follow:
1. turn the power switch (item “T” in Figure 16-1) to on and perform a call for heat by pressing button ✛ to its highest settings and operate downstream the unit to verifiy the system is able to dissipate all heat generated.
2. On unit model 199 and 250, gain access to the installer menu (See Section 16.11) and set parameter 2010 to H 199H. For models 399 and 500, set parameter 2200 to “H 199H”. Now boiler will run at high fire for 20 minutes. Be sure the heating system is able to dissipate all energy.
3. measure the capacity input to the gas meter. This should match with the value given in Section 18 header “Maximum heat input” with a tolerance of +/- 10%. (For the calculation of the btu/hr, for Natural gas, multiply the measured flow in ft3/hr by 1075. For LP gas multiply the measured flow in ft3/hr by 2500).
4. if the capacity input is too low, check:
   a) that there are no obstructions in the combustion air and/or vent systems;
   b) check that the flue and air intake length match with the rules of Section 12.3;
   c) check that the inlet air filter (see Figure 17-5 item “B”) is clean;
5. if the capacity input is within tolerance, bring parameter 2010 to OFF to return the heater to its normal running mode. On models 399 and 500 set parameter 2200 to “OFF” to return the heater to its normal running mode;
6. if the capacity input is higher than the expected value, repeat the procedure as per Section 15.8.





A - Key to reduce the supply water temperature;
B - Multifunctional key: reset any lockouts; access to user and installer menu.
C - Key to increase the supply water temperature;
D - Flame icon, is present when the flame is present;
E - Radiator icon. Present when heater is enabled to work. Blinking when heater working;
F - Faucet icon. Present when an indirect water heater (coil water heater) is enabled. Blinking when an indirect water heater (coil water heater) is loading;
H - Unit of measure of the water system pressure
L - Burner unit indicators: Light when burner is burning; blinking when burner is in lockout or in blocking error

① = Burner 1 (master)

② = Burner 2

M - Water pressure gauge and indicator of the parameters
G - Icon indicating access to the installer menu
N - Supply water temperature gauge and indicator of the parameters value
O - Unit of measure of the temperature
P - Icon displayed when the outdoor sensor is active
Q - Flame crossed icon: is present when the appliance is in lockout or blocking error condition
R - Multifunctional key: increase the indirect water heater (coil water heater) temperature; scroll the parameters; increase the parameters' value;
S - Multifunctional key: decrease the indirect water heater (coil water heater) temperature; scroll the parameters; decrease the parameters' value;
T - On-Off Main power switch

Figure 16-1 Instrument panel and main power switch

16.1 - Check water pressure

If the pressure inside the water circuit falls below the minimum pressure for the system, the appliance switches off and the display “N” as per Figure 16-1, shows Err 59 to indicate that it is necessary to restore the correct pressure. Because water heater is installed in an open loop system, you have to check for the net water pressure or for any pressure reducer upstream of the water supply circuit. When the pressure is restored the Err 59 will disappear.

16.2 - Overview

The heater is pre-set with standard parameters. However, it is possible to make a number of changes or consult the parameters by means of using the “Users’ Menu” (see Section 16.10) and the “Installers’ Menu” (see Section 16.11).
During functioning display “N” of Figure 16-1, displays the supply temperature, and display “M” (see Figure 16-1) shows the pressure of the water. The various operating statuses are shown with other icons as per Figure 16-1.

16.3 - Displays

During normal operations, the display will remain permanently off, except when the appliance goes into Lockout, or in Blocking error.
In any case, pressing any key, display will light on and will stay light on for 5 minutes from the last pressing key.

16.4 - Start-up procedure

1. Open the manual gas shutoff valve;
2. switch on electric power to the heater;
3. If the display shows code Err 65, it means that the polarity has not been observed (Call service department to restore the situation, do not attempt to repair it);
4. press key + or − to setup the supply temperature desired, then press RESET key to save the change.
5. press key ▼ and ▲ to setup the indirect water heater desired temperature, then press RESET key to save the change.

The flame control appliance will start-up the burner.
If the burner fails to ignite within 60 seconds, the heater will automatically attempt ignition another four times, after which if it fails to start-up, it will shut down and the display will show Loc 1 together icon .

When multi-burner unit models 399 or 500 go into any Lockout or Blocking error the display will show the icon and the corresponding burner icon in fail (① or ②) that blink.

Press the RESET key in order to re-set normal operating conditions.
On units model 399 or 500, to restore the normal operating condition, press RESET key one time, diplay will show the type of lockout, than press RESET key again (to back in normal display mode, press and hold for at least 5 seconds RESET key).
The heater will automatically attempt another start-up.

CAUTION!!! **If the appliance frequently shuts down, contact a qualified technician to restore normal running conditions. Do not attempt to repair it.**

16.5 - Supply water temperature adjustment

The water heater provides hot water at the temperature set by adjusting keys + or − as shown in Figure 16-1.
When the keys are pressed, the display, item “N” in Figure 16-1, shows the supply water setpoint being selected. The range within which the water can be set is 68°F (20°C) to 176°F (80°C).

⚠ WARNING!!! **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. Feel water before bathing or showering.**

16.6 - 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 - DHW delay: each time the domestic hot water demand is satisfied, a 4 minute delay pass before the end of the service;

c - Time delay in restarting the burner: in its normal functioning state, every time the burner stops, there is a delay time of 3 minutes before the burner starts again.

16.7 - Circulator pump protection

During stand by state, circulator pumps run once a day for around 15 seconds to prevent them from seizing.

16.8 - Heater's Freeze protection

CAUTION!!! For the freeze protection function to work, the heater must remain connected to the electrical and gas supplies with DHW service switched to OFF

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

Once the heater has reached a temperature of 50 °F *(10 °C)*, the local pump will automatically comes on. If the temperature falls below 41 °F *(5 °C)*, the burner will light to prevent the heater from freezing.
If the heater will not be used for long time it should be drained per Section 17.10.

16.9 - Display in energy saver mode

The display, in Figure 16-1, is switched off each time no key is touched for at least 5 minutes, with the exception of when it displays errors or settings. If you want to leave the display continuously ON, set parameter  to 0 (zero) (see Section 16.11.

16.10 - “Users’ menu”

Pressing RESET key for 2 seconds, you will enter the “Users’ menu”. When entering the “Users’ menu”, the display, item “M” in Figure 16-1, will start showing parameters from 1000. Press keys ▼ and ▲ to scroll all parameters inside this menu. All parameters into this “Users’ menu” are reading only.
For unit models 399 and 500, parameters addressed to “Burner 1 (Master)” are applicable for that burner only. If you want to see the same parameters for other burners you have to connect the display to the burner you want to see. To do this follow procedure in Section 17.8.

Parameter	Parameter’s description	Units
1001	Burner 1 supply temperature	°F
1002	External storage temperature (N/A)	N/A
1004	Outdoor Temperature Sensor (N/A)	N/A
1006	Burner 1 Flue gas temperature	°F
1007	Burner 1 Return temperature	°F
1008	Burner 1 Ionisation current	µA (micro ampere)
1009	State of the Local pump	ON/OFF
1010	State of the CH pump (N/A)	N/A
1011	State of the DHW pump (N/A)	N/A
1012	Calculated setpoint	N/A
1040	Burner 1 Actual Fan speed	rpm/min
1041	Burner 1 Ignition fan speed	rpm/min
1042	Burner 1 Low power fan speed	rpm/min
1043	Burner 1 High power fan speed	rpm/min
1051	Burner 1 Last lockout number	\
1052	Burner 1 Last Blocking error	\
1053	Burner 1 Number of flame failures	no
1055	Burner 1 Number of failed ignitions	no
1056	Burner 1 Total hours of operation	Hr x 10
1057	Burner 1 Total hours of operation of the indirect water heater	Hr x 10
1059	**Burner 1 Interval between Lockouts. May be: 1:MIN; 2:HRS; 3:DAY; 4:WK	
1060	**Burner 1 Interval between Blocking errors. May be: 1:MIN; 2:HRS; 3:DAY; 4:WK	
1062	Burner 1 Water flow	GPM
1101	MULTIBURNER: number of burners ON	n
1102	MULTIBURNER: water heater supply temperature	°F
1103	MULTIBURNER: any Burner into Lockout	/
1104	MULTIBURNER: any Burner into Blocking Error	/
1106	MULTIBURNER: system is in emergency mode	/
1107	MULTIBURNER: current setpoint	°F
1120	MULTIBURNER: burner 1 modulating level	%
1121	MULTIBURNER: burner 2 modulating level	%
1122	MULTIBURNER: burner 3 modulating level (N/A)	N/A
1123	MULTIBURNER: burner 4 modulating level (N/A)	N/A

** How to read the timer values:
Eg: If it shows 1:29, it means 29 minutes;
Eg: If it shows 2:12, it means 12 hours;
Eg: If it shows 3:15, it means 15 days;
Eg: If it shows 4:26, it means 26 weeks;
(N/A): NOT APPLICABLE

16.11 - “Installer’s menu”

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

The heater’s micro-processor makes this menu of parameters available to the qualified technician for diagnostic and adjustment of the appliance to the system.
When entering the “Installers’ Menu”, the display in Figure 16-1, will start to show the icon and parameters over 2000 indicating that a change of mode has taken place.
To access the “Installers’ Menu” (see also Section 20 to better understand the several menus) proceed as follows:

1. press and hold together buttons RESET and ▼ for 5 seconds until the icon is displayed;
2. release the two precedent buttons;
3. press and release the ▼ and ▲ buttons to scroll through the list of the parameters;
4. once the parameter has been displayed, it can be changed pressing the RESET button (value start to blinking) and using the ▼ and ▲ keys you can change the value;
5. press and release the RESET button to confirm the amended data before moving to the next parameter.
6. To exit the “installers’ Menu”, press and hold RESET button for more than 5 seconds until the icon stops to be displayed.

NOTICE! 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.
For heaters models 399 and 500 parameters addressed to “Burner 1” are applicable for that burner only. If you want to see the same parameters for the other burners you have to connect the display to the burner you want to see. To do this follow procedure in Section 17.8.
The next table lists each parameter, what it affects and its adjustment range.
Custom value column is at your convenience to record changed values in the event you need to change the control board.

Parameter	Parameter’s description	M.U.	Range	W.Heat. factory settings	Custom. value
2001	Burner 1 minimum Power	%	1 to 50	1	
2002	Burner 1 maximum Power	%	1 to 100	100	
2003	CH mode (N/A)	nn	0: CH with thermostat; 1: CH with RT and outdoor reset; 2: CH with full outdoor reset; 3: CH with permanent heat demand; 4: CH with 0-10 Vcc input 5: N/A	Must be at 0	
2004	Burner 1 Wait time after max differential	sec	10 to 30	30	
2005	Post CH pump time (N/A)	sec	10 to 260	60	
2010	System test: For models 199 and 250	\	Off, Low, Ign, High (Set back parameter to OFF to exit from this state)	OFF	
2011	System test: Local pump	\	On or OFF	OFF	
2012	System test: CH pump (N/A)	\	On or OFF	OFF	
2013	System test: DHW pump (N/A)	\	On or OFF	OFF	
2014	Display test (when RESET button is pushed all display icons will light-on. Next RESET buttons back in settings menu)	\	\	\	
2020	Warm weather shutdown temperature	°F	32 to 95	N/A	
2021	Reset curve design: winter outdoor temperature	°F	-4 to 41	N/A	
2022	Reset curve design: winter supply temperature	°F	32 to 176	N/A	
2023	Reset curve design: spring outdoor temperature	°F	32 to 86	N/A	
2024	Reset curve design: spring supply temperature	°F	32 to 104	N/A	

Continue

Parameter	Parameter's description	M.U.	Range	W.Heat. factory settings	Custom. value
2027	Night setback temperature	°F	2 to 90	N/A	
2040	N/A				
2041	N/A				
2042	Burner 1 anti cycling: time	sec	10 to 900	60	
2043	Burner 1 anti cycling: differential temperature	°F	0 to 36	28	
2062	DHW post pump time (N/A)	sec	10 to 255	60	
2063	DHW max priority time (N/A)	min	1 to 60	30	
2067	DHW priority (N/A)		0 = (TIME), DHW has priority to CH during DHW max priority time (2063) 1 = (OFF), CH always has priority to DHW. 2 = (ON), DHW always has priority to CH	2	
2100	Display: delay to shut off	min	0 to 30	5	
2101	MULTIBURNER Emergency mode (If sensor 1102 fail)	\	no or yES	Yes	
2102	MULTIBURNER Emergency setpoint	°F	68 to 149	113	
2103	MULTIBURNER start delay time	sec	1 to 900	15	
2104	MULTIBURNER stop delay time	sec	1 to 900	15	
2105	MULTIBURNER start burner diff.	°F	0 to 36	9	
2106	MULTIBURNER stop burner diff.	°F	0 to 36	9	
2107	MULTIBURNER calculated setpoint. Max offset up.	°F	1 to 36	18	
2108	MULTIBURNER calculated setpoint. Max offset down.	°F	1 to 36	36	
2109	MULTIBURNER next burner start rate	%	1 to 100	70	
2110	MULTIBURNER next burner stop rate	%	1 to 100	10	
2111	MULTIBURNER rotation interval	days	0 to 9	6	
2113	MULTIBURNER start modulation delay factor	min	0 to 60	0	
2114	Burner 1 post local pump time	sec	0 to 255	60	
2200	System test: all burners together.	\	Off, Low, Ign, High	OFF	
2201	System test: Burner 1 (Master).	\	Off, Low, Ign, High	OFF	
2202	System test: Burner 2.	\	Off, Low, Ign, High	OFF	
2203	System test: Burner 3.	\	Off, Low, Ign, High	OFF	
2204	System test: Burner 4.	\	Off, Low, Ign, High	OFF	

(N/A): NOT APPLICABLE

16.12 - Diagnostic

During normal operation display can show the information below:

Parameter	Parameter description	Visualization on display "N" (see Figure 16-1)
AFrO	Heater is doing antifreezing protection	Supply temperature (°F)
	Light fixed = Hot water supply enabled Blinking = Hot water supply active	Supply temperature (°F)

16.13 - Diagnostic: Lockouts “Loc”

To RESET a lockout on units model 199 and 250, simply press RESET key.
On multi-burner unit models 399 and 500, when the heater goes into lockout state you’ll see  icon and the corresponding burner icon (① or ②) if failing, will blink. To reset the lockout press the RESET key, the display will show the Lockout number, you can try to reset the lockout by pushing the RESET key again. Press and hold the RESET key for 5 seconds to go back into normal display condition.

Loc	Description	Checks	Solutions
Loc 1	No flame detected after five ignition attempts.	Correct gas supply pressure (see section 15.7);	If the gas supply pressure is incorrect, it must be adjusted to the correct pressure;
		Ignition spark (see section 17.4);	If spark is not present, check for correct ignition electrode position and gap as per section 17.4; If position is correct, check for 120Vac at the supply of the spark generator.
		Correct amount of gas (see sections 15.7 and 15.8);	Inspect the vent system and eliminate any obstructions;
		120Vac at the gas valve;	If the voltage to the gas valve is not 120Vac the power control board must be replaced;
		Resistance of the two gas valve coils should be 0.18 kohm and 1.1 kohm;	If the resitance of the gas valve coils is not 0.18 kohm and/or 1.10 kohm, the gas valve must be replaced.
		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 4uA (follow procedure in section 17.1.10)	If the ionization current is not greater than 4uA, confirm that the CO2 content is adjusted properly (see section 15.8). Check the flame detection electrode (section 17.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.
Loc 2	Gas valve not supplied before try to ignition (when this error happens to burner 1 (Master), stops other burner)	Check High limit temperature switch	**⚠ WARNING!!! If the high limit temperature fuse melt, before any replacement, it is mandatory to contact the appliance manufacturer to prevent any permanent damages to the heat exchanger. Failure to comply with this requirement can result in excessive levels of carbon monoxide which can result in severe personal injury or death!**
		Check High limit flue temperature fuse	
Loc 3	Gas valve lost cable connection during fire	Check the integrity of the wires connections between gas valve and control board	If wires are interrupted, replace the wires
			If wires are ok try to replace the gas valve or the power control board
Loc 4	Gas valve relay not closing	Check the integrity of the wires connections between gas valve and control board	If wires are interrupted, replace the wires
			If wires are ok try to replace the gas valve or the power control board
Loc 5	Gas valve circuit (when this error happens to burner 1 (Master), stops other burner)	Check High limit temperature switch	**⚠ WARNING!!! If the high limit temperature fuse melt, before any replacement, it is mandatory to contact the appliance manufacturer to prevent any permanent damages to the heat exchanger. Failure to comply with this requirement can result in excessive levels of carbon monoxide which can result in severe personal injury or death!**
		Check High limit flue temperature fuse	
Loc 6	Safety relay open error		Replace the power control board
Loc 7	Safety relay closed error		Replace the power control board
Loc 11	Blocking error over 20 hr	Press RESET button to see the Blocking error reference and proceed follow it	
Loc 12	Fan error	Check for 120Vac power connection of the fan	If no 120Vac is present replace the power control board
		Check PWM connection of the fan	If no PWM signal, replace power control board
			Try to replace the fan
Loc 13	Internal software error		Replace the power control board

Continue

Loc	Description	Checks	Solutions
Loc 14	Internal software error		Replace the power control board
Loc 15	Internal software error		Replace the power control board
Loc 16	Internal software error		Replace the power control board
Loc 17	Internal software error		Replace the power control board
Loc 18	Internal software error		Replace the power control board
Loc 19	Internal software error		Replace the power control board
Loc 20	Flame lost three times	Control: that the ionisation current is at a value over 60 (see parameter 1008)	If the ionisation current is not over 60, the CO2 must be checked (see section 15.8) and restore the correct value. Check the ionisation electrode and replace it if necessary. Check the integrity of the ionisation current electric circuit cables.
		Control: that the fumes exhaust must be protected with a wind-proof grid	If the fumes exhaust is placed in a vertical wall it must be protected with a wind-proof grid. If the fumes exhaust is positioned on the roof, make sure that it is not in an area of reflux and that any windproof chimney pot is really efficient.
Loc 21	Internal software error		Replace the power control board
Loc 22	Internal software error		Replace the power control board
Loc 23	Internal software error		Replace the power control board
Loc 24	Internal software error		Replace the power control board
Loc 25	Gas valve circuit (when this error happens to burner 1 (Master), stops other burner)	Check High limit temperature switch	**⚠ WARNING!!! If the high limit temperature fuse melt, before any replacement, it is mandatory to contact the appliance manufacturer to prevent any permanent damages to the heat exchanger. Failure to comply with this requirement can result in excessive levels of carbon monoxide which can result in severe personal injury or death!**
		Check High limit flue temperature fuse	
Loc 26	Internal software error		Replace the power control board
Loc 27	Flame present with closed gas valve		Replace the gas valve
Loc 28	Flame present with closed gas valve		Replace the gas valve
Loc 29	Interlock input (when this error happens to burner 1 (Master), stops other burner)	Check LWCO connection	If LWCO intervenes, try to reset it
		Check flue blocked pressure switch	Check if flue gas line is free from any blockage
Loc 30	Internal software error		Replace the power control board
Loc 31	Five times flame lost during one demand	Check for low gas supply pressure	Restore gas pressure and flow
		Check for any obstruction on air inlet / flue exhaust sytem	Remove any obstruction
		Check for any air inlet contamination from combustion gas (Ex. flue exhaust terminal too much near air inlet terminal)	Remove the cause of the air inlet contamination
		Check detection electrode;	Try to replace detection electrode
Loc 32	Internal software error		Replace the power control board
Loc 33	Internal software error		Replace the power control board
Loc 34	Internal software error		Replace the power control board
Loc 35	Internal software error		Replace the power control board
Loc 36	Internal software error		Replace the power control board
Loc 37	Internal software error		Replace the power control board
Loc 38	Flue gas sensor does not increase	Check flue gas sensor match section 17.11	If does not match it, it must be replaced
		Check if flue gas sensor (parameter 1006) increases its temperature when burner is on	If temperature does not increase, replace the flue gas sensor or the control board

16.14 - Diagnostic: Blocking errors “Err”

Blocking errors are generated by a permanent fault. There is no way to unlock the unit other than to resolve the cause of the fault.

On multi-burner unit models 399 and 500, when the burner goes into a blocking error state, you’ll see  icon and the corresponding burner icon (① or ②) if failing will blink. To see the blocking error code, press the RESET key and display will show the blocking error code. Press and hold the RESET key to go back into normal display condition.

Err	Description	Checks	Solutions
Err 0	Main board error	Check the control board fuse (“B” of Figure 16-2)	Replace the control board fuse
		Check that all the temperature sensors are in a plausible field of measurement	Replace the sensor that is not in the correct temperature field or replace the control board
Err 45	Internal software error		Replace the power control board
Err 46	Internal software error		Replace the power control board
Err 47	Internal software error		Replace the power control board
Err 48	Internal software error		Replace the power control board
Err 49	Internal software error		Replace the power control board
Err 50	Internal hardware error		Replace the power control board
Err 51	Internal hardware error		Replace the power control board
Err 52	Internal hardware error		Replace the power control board
Err 53	Internal hardware error		Replace the power control board
Err 54	Flame is detected in a state in which no flame is allowed to be seen.		Replace the power control board
Err 55	Low water pressure error	Check pressure sensor	Replace the pressure sensor
Err 56	Low water pressure error	Check pressure sensor	Replace the pressure sensor
Err 57	Low water pressure error	Check pressure sensor	Replace the pressure sensor
Err 58	Low water pressure error	Check pressure sensor	Replace the pressure sensor
Err 59	Low water pressure error (this error will stops all modules)	Check the pressure into the water system and eventually increase it	If water system pressure is over parameter 3022, replace the water pressure sensor
Err 60	High flue gas temperature error	Check if return temperature is higher than 145°F (62°C) at high fire;	If return temperature is higher than 145°F (62°C) downrate the capacity or reduce the water flow;
		Check the combustion efficiency of the burner in fail. Combustion Efficiency must be higher than 88%;	If combustion efficiency is lower than 88%, try to clean the flue gas side and the water side of the heat exchanger;
		Check the flue gas temperature sensor match section 17.11.	If flue temperature sensor do not match section 17.11, it must be replaced.
Err 61	Return temperature is higher than 176°F (80°C)	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
		Check if supply and return pipe are reversed	
Err 62	Block drain switch is active (this error will stops all modules)	Check if the condensate drain is blocked	Remove any obstruction from the condensate drain
		Check if the condensate box is blocked	Check the condensate box, if medium is exhaust it must be replaced
Err 64	No correct Frequency signal or no correct ground connection or no communication with the WD	Check the frequency signal. It must be between 58 and 62 Hz	If out of range, ask your electrical supplier.
		Check the ground connection (between ground and neutral it must be 0 volt)	If the ground connection is not right ask to your electrical supplier
			Diversely try to replace the power contro board
Err 65	Hot neutral reversed	Check supply voltage polarity	Reverse supply voltage polarity, if it’s the case
Err 66	Net freq. error detected in the main	Check the frequency signal. It must be between 58 and 62Hz	If out from range, ask your electrical supplier. Diversely try to replace the power contro board
Err 67	Faulty earth connection	Check the earth connection to the appliance	Repristinate the earth connection
Err 68	Watchdog communication error		Replace the power control board
Err 72	Supply sensor open	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
	Exchanger malfunction	Check that the primary heat exchanger temperature fuse has not intervened.	If the primary heat exchanger temperature fuse has intervened (the contact is open), the exchanger must be replaced
Err 73	Return sensor open	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
Err 76	DHW sensor open	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.

Err	Description	Checks	Solutions
Err 80	Supply sensor shorted	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
Err 81	Return sensor shorted	Check if temperature sensor match section 17.11	If temperature sensor do not match section 17.11, it must be replaced.
Err 84	DHW sensor shorted	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
Err 86	Flue sensor shorted	Check if temperature sensor match section 17.11	If sensor do not match section 17.11, it must be replaced.
Err 87	Reset button error	Too many reset button pushing in 60 sec	
Err 93	Appliance selection error	Check the list of 3000 parameters (Section 22)	
Err 107	Internal software error		Replace the power control board
Err 108	Internal software error		Replace the power control board
Err 109	Error happening to burner 2	When burner 1 (master) goes in a general error, will stops burner 2 generating an “Err 109”	Resolve the error to burner 1(Master)
Err 110	Flapper valve not open error	Check for any obstruction into the exhaust system	Remove the obstruction from flue exhaust
		Check if the fan is running	Replace the fan or the power control board
		Check the flapper valve and its control sensor (See Figure 3-2 items 32 and 33)	Replace the flapper valve or its control sensor (See Figure 3-2 items 32 and 33)
Err 111	Flapper valve not closed error	Check the flapper valve and its control sensor (See Figure 3-2 items 32 and 33)	Replace the flapper valve or its control sensor (See Figure 3-2 items 32 and 33)
Err 112	Internal software error		Replace the power control board
Err 113	Internal software error		Replace the power control board
Err 114	Too low water flow	Check water flow into the system (parameter 1062), it must be higher than parameter 3035.	Increase the water flow into the system
			Check for any obstruction into the water system
Err 115	Multiple burner master failure		Reset via 3013 parameter
Err 116	Multiple burner communication failure (this error will stops all modules)	Bus communication interrupted	Check for the bus communication
		Burner is not working	Repristinate the burner that is light off.
No Conn	Microprocessor in lockout	Check wires of the water pressure sensor are not in short circuit	If wires are not in short circuit, replace the pressure sensor
		Check wires of the water flow sensor are not in short circuit	If wires are not in short circuit, replace water flow sensor
		Check display wires are connected to the burner 1 (MASTER)	If display wires are connected to burner 2 and the relative board is off, display shows “No Conn”

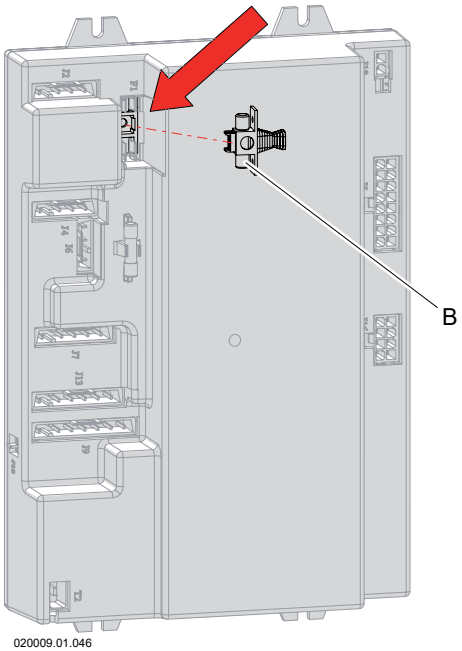


Figure 16-2 - Control board fuse

16.15 - Flue blocked pressure switch

This appliance is equipped with a safety flue blocked pressure switch (see Figures 3-3 through 3-6, item “20”) that shut-off the unit when the flue exhaust vent pipe is blocked. If this pressure switch shuts off the unit (Loc 2, Loc 5 or Loc 25), do not attempt to place the heater in operation but contact a qualified service agency that will reset the unit after checking for any potential dangerous situation.

⚠ WARNING!!! If the safety flue blocked pressure switch shuts off the system do not attempt to reset or repair the unit. It is mandatory to contact a Qualified service agency. Failure to comply with this requirement can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

16.16 - Shutting Down for An Extended Period of Time

If the unit is to be taken out of service, complete the following instructions.

Extended Period Shut-Down Instructions

1. Follow “To Turn Off Gas to Appliance” on page 3 of this manual.
2. Follow “Section 17.10 Draining the water from the heater” of this manual. It is important to drain the system completely in the event the storage location get below freezing.

16.17 - How to clean the appliance jacket

To clean the appliance jacket, use only a soft cloth dampened with water. Do not use aggressive or abrasive agents.

17.1 - Care and maintenance

This section must be brought to the attention of the user by the installer so that the user can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of the heater. User must check its heater follow Figure 17-1 column “User maintenance”.
The installer must also inform the user that the lack of proper care and maintenance of this heater and any fuel burning equipment may result in an hazardous condition.

Installer should discuss contents of Section 16 (User’s section) with the user.
A trained and qualified service technician should perform the inspection listed in these instructions before each heating season and at regular intervals.

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

Service and maintenance schedules

Service Technician

Annual Startup:

- Address reported problems (Follow Section 17.1.1);
- Check all piping for gas leaks (Follow Section 17.1.2)
- Verify flue and air lines in good condition and sealed tight (Follow Section 17.1.3);
- Check system water pressure/system piping/expansion tank (Follow Section 17.1.4);
- Check control settings (Follow Section 17.1.5);
- Check ignition and flame sense electrodes (Follow Section 17.1.6);
- Check wiring and connections (Follow Section 17.1.7);
- Perform start up checkout and performance verification (Follow Section 17.1.8);
- Flame inspection (Follow Section 17.1.9);
- Check flame signal (Follow Section 17.1.10);
- Inspect combustion chamber. Clean and vacuum if ther’is presence of debris and/or products of the combustion (Follow Section 17.3).
- Inspect thermal insulations inside the combustion chamber and replace them if they are cracked or damaged (Follow Section 17.3.1)
- Clean condensate box and fill with fresh water (Follow Section 17.7).
- Clean air filter (Follow Section 17.6)
- Check the capacity input (Follow Section 15.9).
- Check relief valve (Follow Section 17.1.11);
- Check electronic anode (Follow Section 17.1.21);

User maintenance

Daily:

- Check heater area (Follow Section 17.1.12);
- Check pressure gauge (Follow Section 17.1.13);

Monthly:

- Check vent piping and vent termination screen (Follow Section 17.1.14);
- Check air piping and air termination screen (Follow Section 17.1.15);
- Check condensate drain system (Follow Section 17.1.16);
- Check any air vents on the system that no leaks are present;

Periodically:

- Test low water cut-off (if used) (Follow Section 17.1.19);
- Reset low water cut-off button (if used) (Follow Section 17.1.20)

Every six month:

- Check heater piping (gas and water) for leaks (Follow Section 17.1.17);

End of season months:

- Shut heater down (unless heater used for domestic hot water) (Follow Section 17.1.18);

Figure 17-1 - Service and Maintenance Schedules

⚠ WARNING!!! Never store combustible materials, gasoline or any product containing flammable vapors and liquids in the vicinity of the heater. 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 heater can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

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

⚠ WARNING!!! Before performing any maintenance operations, shut the heater off, close the manual gas shut-off valve (Figure 14-1) and shut electrical power off to the heater. Follow the Operating Instructions outlined in the section "SAFETY INSTRUCTIONS" (Page 3 of this manual).

17.1.1 - Address reported problems

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

17.1.2 - Check all piping for gas leaks

1. Inspect all gas piping and verify to be leak free.
2. Check for gas leaks: using soap solution, check for gas leaks from meter to appliance including all pipes and fittings and heater connection. Use liquid soap solution for all gas testing.

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

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

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

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

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

17.1.5 - Check control settings

1. Set heaters setpoint low enough to end call for heat (see Section 16.5). Gas valve should close and burner should stop firing. Fan will go into a post purge, then shuts off.
2. Control Safety Shutdown test: with the burner firing, close the manual gas shut off valve (Figure 14-1). Gas valve should close and burner should stop firing. The boiler will try for ignition five times, then should lock out with a "Loc 1" error shown on the display. Open the manual gas shut-off valve, and 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!

3. Press the "Reset" key to return to normal operation.

17.1.6 - Check ignition and flame sense electrodes

1. Remove the fan-burner assembly unit (see Section 17.3);
2. Remove any deposits accumulated on the ignition/flame sense electrode using sand paper;
3. Check electrodes positioning meet Section 17.4.

17.1.7 - Check wiring and connections

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

17.1.8 - Perform performance verification.

1. Run the unit at maximum input following Section 15.9. When in steady state, check the efficiency using recognized methods. Efficiency shall be not less than 88%.
2. Verify cold water pressure is correct and that operating pressure does not go too high (could be a problem on the expansion tank).

17.1.9 - Flame inspection

1. Inspect flame through sigh glass.
2. If the flame is unsatisfactory at either high fire or low fire, clean the burner following Section 17.3.

17.1.10 - Check flame signal

1. Start unit and perform the procedure of Section 15.8 to check the flame signal.
2. At high fire and low fire the flame signal (parameter 1008) should be within values given in Section 18, header “ionisation current”. A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sense electrode.

17.1.11 - Check relief valve

Inspect the relief valve and lift the lever to verify flow. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read Section 8.2.2 before proceeding further. Relief valve should be re-inspected at least once every three years, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency – not by the user.

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

17.1.12 - Check heater area

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

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

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

1. Combustible/flammable materials -- Do not store combustible materials, gasoline or any other flammable vapors or liquids near the heater. Remove immediately if found.
2. Air contaminants -- Products containing chlorine or fluorine, if allowed to contaminate the heater intake air, will cause acidic condensate in the heater. This will cause significant damage to the heater if allowed to continue. Read the list of potential materials listed in Section 5.1.1. If any of these products are in the room from which the heater takes its combustion air, they must be removed immediately or the heater combustion air (and vent termination) must be relocated to another area.

17.1.13 - Check pressure gauge

1. Make sure the pressure reading on the heater pressure gauge (item “M” of Figure 16-1) does not exceed the maximum working pressure. Higher pressure may indicate a problem with the expansion tank.
2. Contact a qualified service technician if problem persists.

17.1.14 - Check vent piping

1. Visually inspect the vent outlet termination to be sure it is unobstructed. Visually inspect the entire length of the flue gas vent piping for any signs of blockage, leakage, or deterioration of the piping. Notify your qualified service technician at once if you find any problems.

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

17.1.15 - Check air piping

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

17.1.16 - Check condensate drain system

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

17.1.17 - Check heater piping (gas and water)

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

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

17.1.18 - Shut heater down

1. Follow “To Turn Off Gas to Appliance” on page 3 of this manual.
2. Do not drain the system unless exposure to freezing temperatures will occur.

17.1.19 - Test low water cutoff (if installed)

If the system is equipped with a low water cutoff, test the low water cutoff periodically, following the low water cutoff manufacturer’s instructions.

17.1.20 - Reset button (low water cutoff)

Testing the low water cut-off shuts the unit off. Press the RESET button on the low water cutoff to turn the unit back on.

17.1.21 - Check electronic anode

The electronic anode protects the storage tank from corrosion and is to be checked at least once a year.

CAUTION!!! **Do not remove the anode rod from the tank, except for inspection and/or replacement, as operation with the anode rod removed will shorten the life of the tank.**

The check consists in verifying that in the control board part. “N” in figure 17-2 the green light is ON (to access the board, see section 17.2).
Possible verifiable cases:
1.- **Led green on** = electronic anode in operation;
2.- **Led red on** = electronic anode failure;
3.- **Both leds off** = electronic anode off;
If the red led is ON or both leds are OFF, this means that the anode is not working, after checking the correct connection of the same, proceed as follows to replace the anode:

1. Shut the electrical power off and close the manual gas valve;
2. draw the water until cool down and ther’are no risk of scalding;
3. follow the steps in section 17.2 to remove the casing;
4. close the water isolation valves to isolate the water heater from the net pressure;
5. drain the water from the heater using the valve item “2”, Figure 3-6;
6. unscrew the anode rode item “4”, Figure 3-6;
7. remake the gasket on the anode rode thread;
9. install the new anode;
10. close the valve item “2”, Figure 3-6;
11. open the water isolation valves to restore net pressure inside the heater;
12. wait 5 minutes and check for any water leakage from the anode rode thread;
13. reinstall the heater cover;
14. open the manual gas valve and restore the electrical power.

17.2 - Removing the casing

In order to remove the casing, follow the steps below while refering to Figure 17-2:

1. Lift up by hands cover “A”;
2. remove screws “B”;
3. pull back for 2 inches the upper side of cover “C”;
4. pull up for one inch cover “C” and remove it from appliance;
5. pull back for 2 inches the upper side of cover “E”;
6. pull up for one inch cover “E” and remove it from appliance;
7. pull back from left side the door “D”
8. pull up the fan cover “H”;

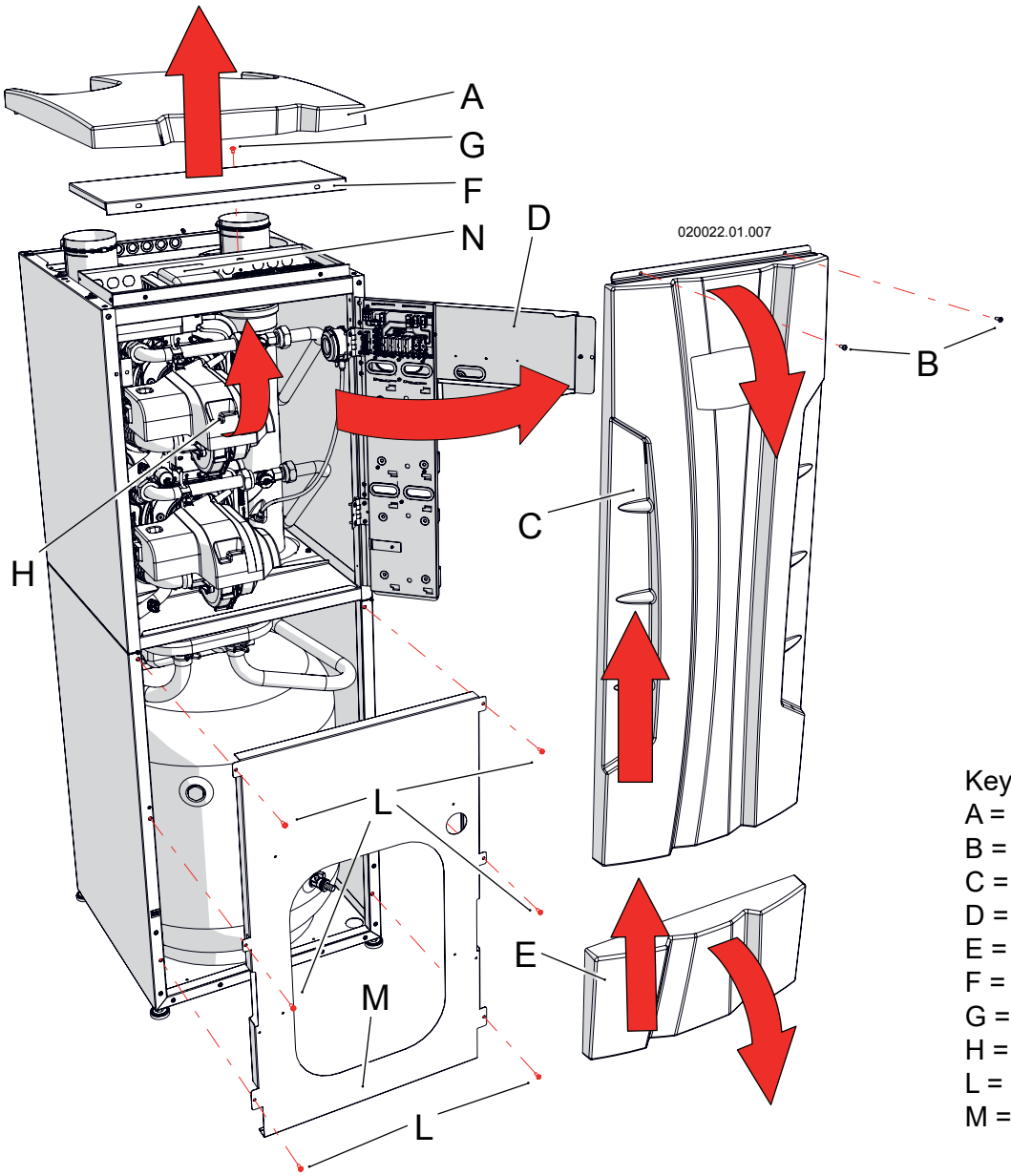
Now you can gain access to all components inside heater.

To gain access to the junction box:

9. Remove screw “G”;
10. Take away cover “F”.

To gain access to the condensing neutralizer:

11. Remove screws “L”;
12. Take away cover “M”.



Key Figure 17-2
A = upper cover
B = screws
C = front cover
D = electrical panel door
E = bottom cover
F = junction box cover
G = fixing screw
H = fan cover
L = screws
M = panel

Figure 17-2 Removing the casing

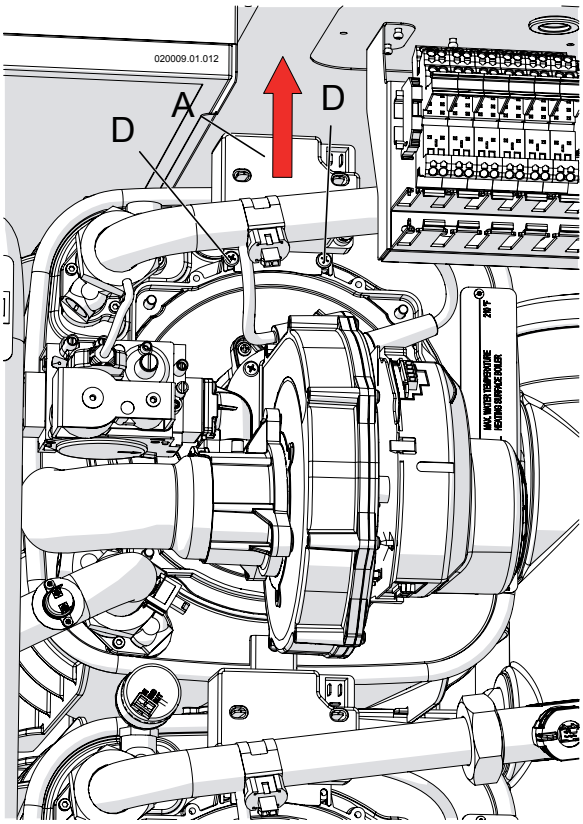


Figure 17-3 Remove the spark generator

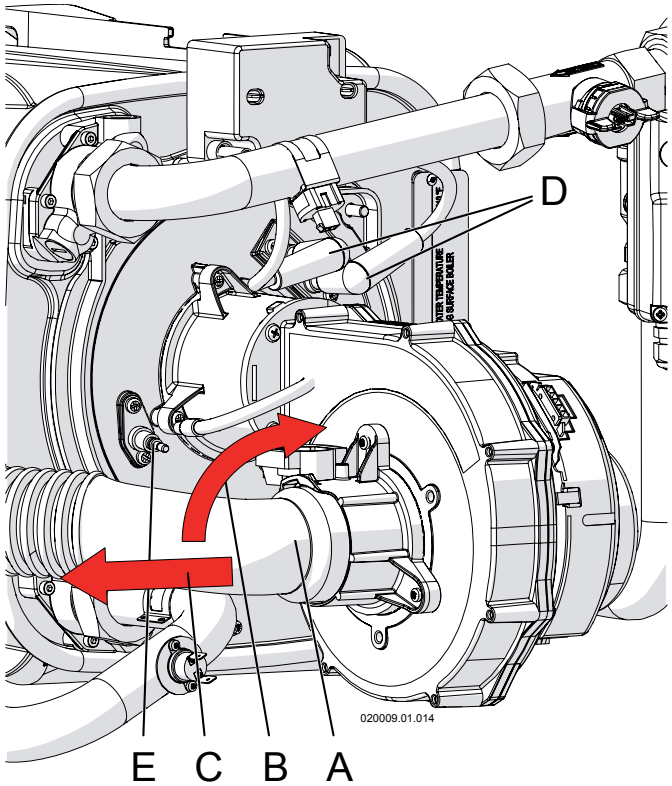


Figure 17-4 Remove the air inlet silencer

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

Burner and primary heat exchanger must be checked every year and cleaned if ther'is presence of debris or products of the combustion. To correctly clean the burner and the flue gas side of the heat exchanger follow the steps below:

⚠ WARNING!!! Before proceeding to the next step, verify that the electrical supply to the heater, and any other electrical supply near the heater, is off. Verify that the manual gas shut off valve is closed. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

1. follow the steps in Section 17.2 to gain access to the internal components;
2. for units 399 and 500, prepare a suitable cover for the burner units below your actual site (if any) so that no dirt, water, or other foreign objects can fall into the burner unit below;
3. loosen screws "D" (Figure 17-3) and move up the spark generator "A" (Figure 17-3);
4. disconnect the two wires "D" (Figure 17-4) from the ignition electrodes and the wire "E" (Figure 17-4) from the flame detection electrode;
5. rotate the air inlet silencer "B" (Figure 17-4) in the up direction;
6. pull in the left direction "C" (Figure 17-4) the air inlet silencer and remove it from the fan;
7. unscrew nut "H" (Figure 17-5). Pay attention to the gasket between nut "H" (Figure 17-5) and the gas valve.
8. take away the spring "A" as per Figure 17-5. Help yourself with a screwdriver;
9. remove the electrical plug from the gas valve;
10. Remove the gas valve from its position (see Figure 17-6). Take care attention to the o-ring "L" of Figure 17-6;

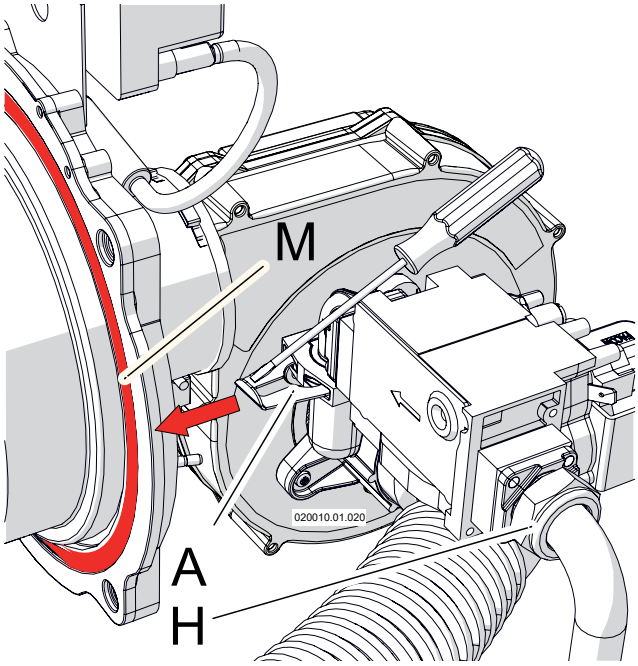


Figure 17-5 Nut and spring that fixes the gas valve

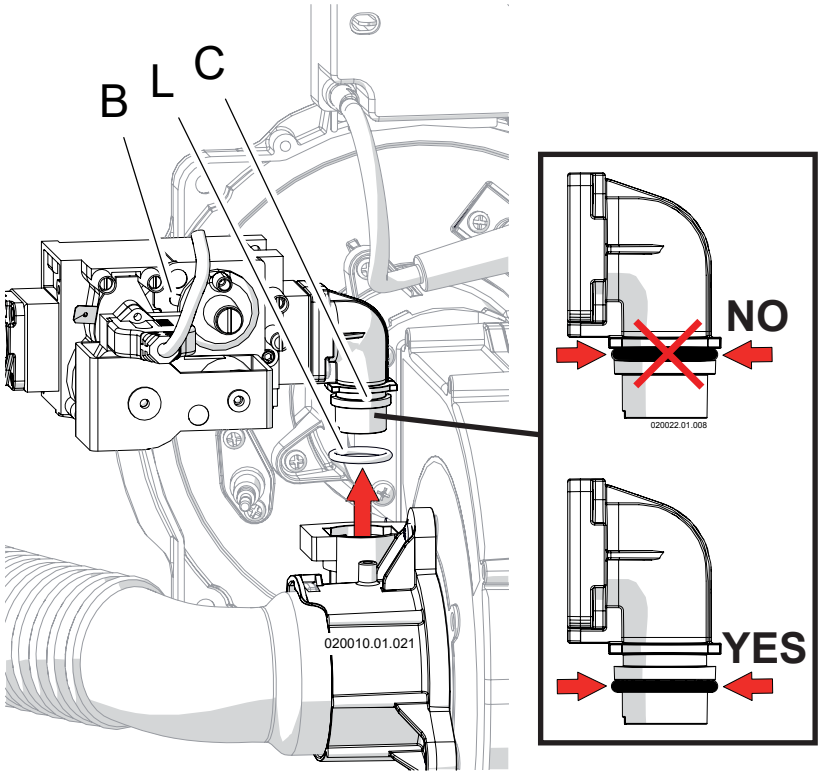


Figure 17-6 Remove the gas valve

11. unscrew the four nuts “B” in Figure 17-7;
12. remove the entire fan - burner assembly, detail “C” in Figure 17-7;
13. use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, detail “H” in Figure 17-7;
14. use a vacuum cleaner to remove any unburned residue from the combustion chamber “H” in Figure 17-7;
15. using the same vacuum cleaner, clean the surfaces of the burner and around the electrodes;

⚠ WARNING!!! While performing the next step, carefully wash only the inside of the combustion chamber “H” of Figure 17-7, 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!

16. using only water, wash the inside of the combustion chamber, detail “H” in Figure 17-7. The water, will drain into the condensate drain;
17. replace gasket “M” as per Figure 17-5 (Part number for this gasket is in Section 19). Take care that the gasket and its site are clean.

⚠ WARNING!!! Pay attention to the gasket “M” (Figure 17-5) during reassemble. When finished, perform a leakage test with the burner firing. Always use an approved leak detection method. Failure to comply with this warning can cause fire, extensive property damage, severe personal injury or death!

18. reassemble the components by proceeding in reverse order. Pay attention in the reinstalling of gasket between nut “H” of Figure 17-5 and of the o-ring “L” of Figure 17-6. These must be in good condition. If not they must be replaced;
19. open the manual gas shutoff valve;
20. 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 fire, extensive property damage, severe personal injury or death!

21. restore electrical power to the heater.

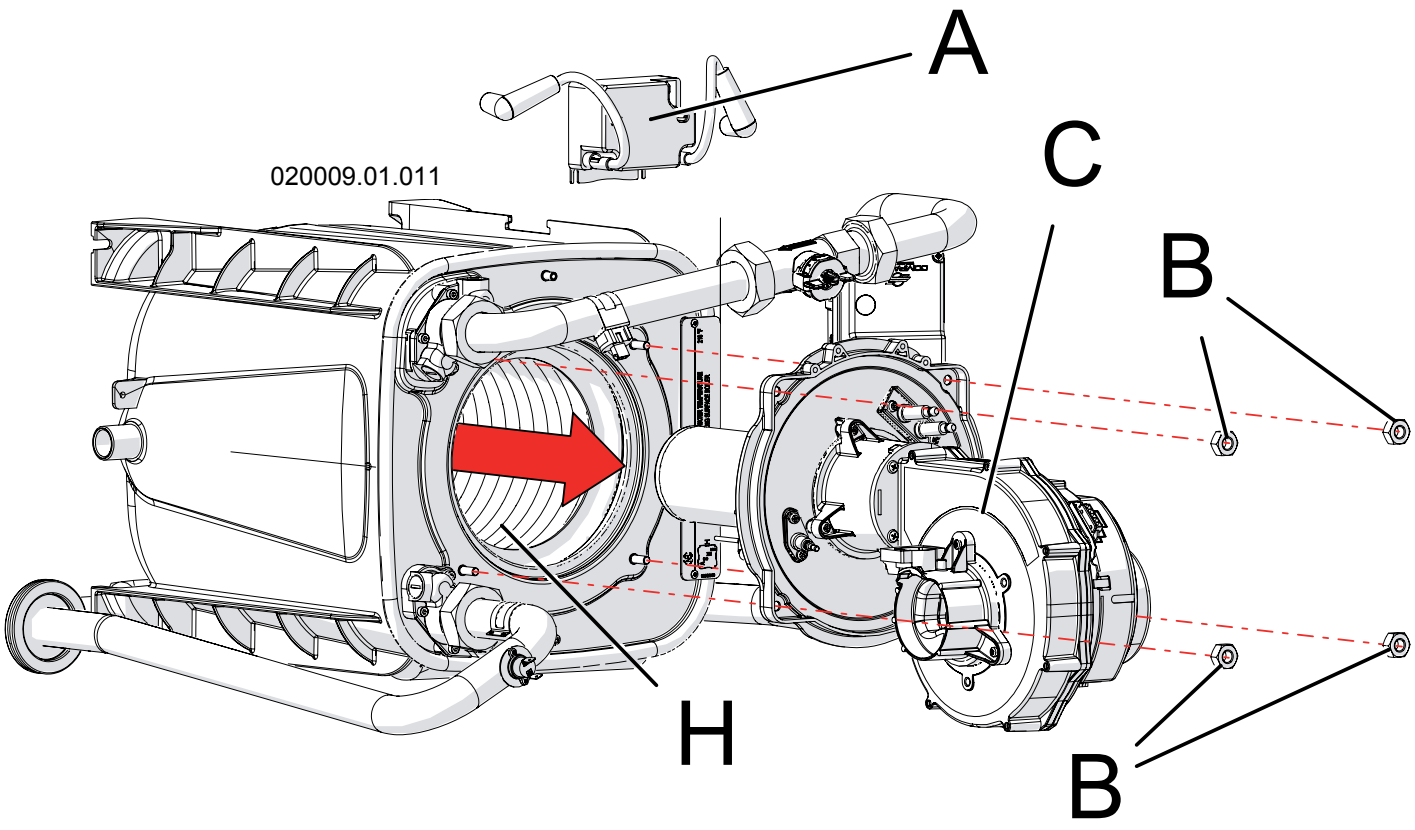
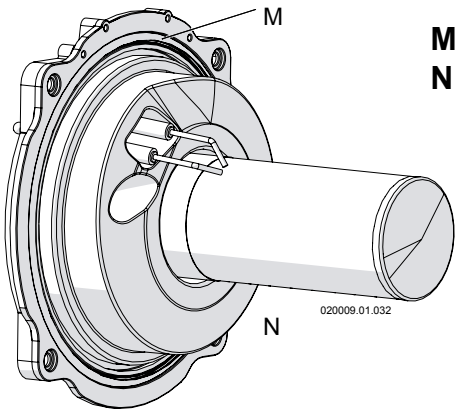


Figure 17-7 Remove the fan burner assembly



M = GASKET
N = HEAT EXCHANGER DOOR

CAUTION!!! **If gasket is damaged DO NOT reuse, the heat exchanger door must be replaced.**

NOTICE ! Gasket is intended for sealing combustion. If damaged DO NOT reuse, the heat exchanger door must be replaced. Consult factory for replacement heat exchanger door.

17.3.1 - Thermal insulations

Thermal insulations must be checked every year and replaced if they are cracked or damaged. See Figures 17-8 where the thermal insulations (items “C” and “E”) are showned already disassembled from heat exchanger and burner.
For replacement information see the spare parts section.

Key Figure 17-8
A = Fixing screw
B = Washer
C = Thermal Insulation
D = Stainless steel tube
E = Thermal Insulation
F = White thermal insulation
G = Burner
H = Gasket
L = Ignition electrodes
M = Screws
N = Detection Electrode
Q = White thermal insulation
R = Gasket
S = Gasket

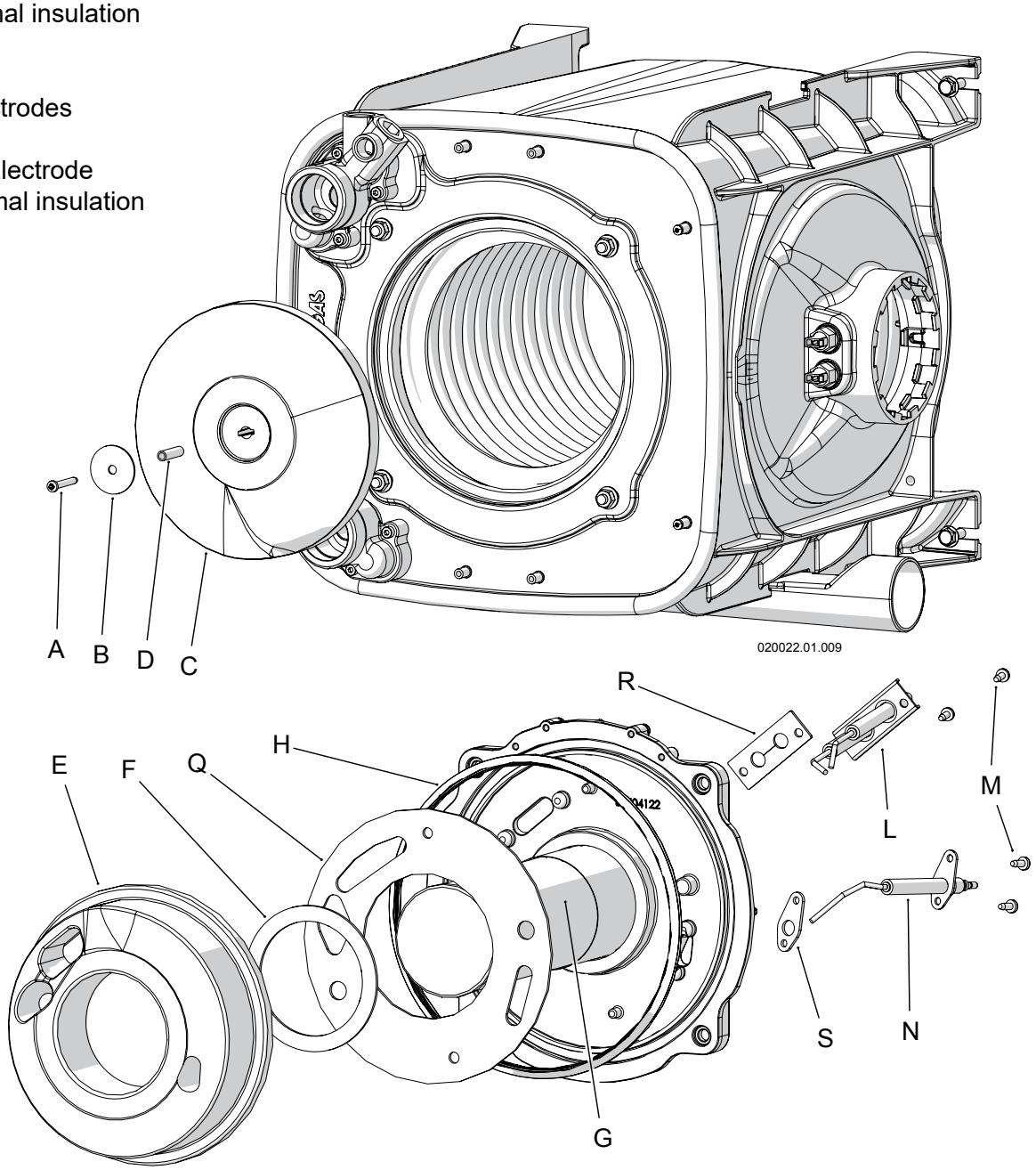
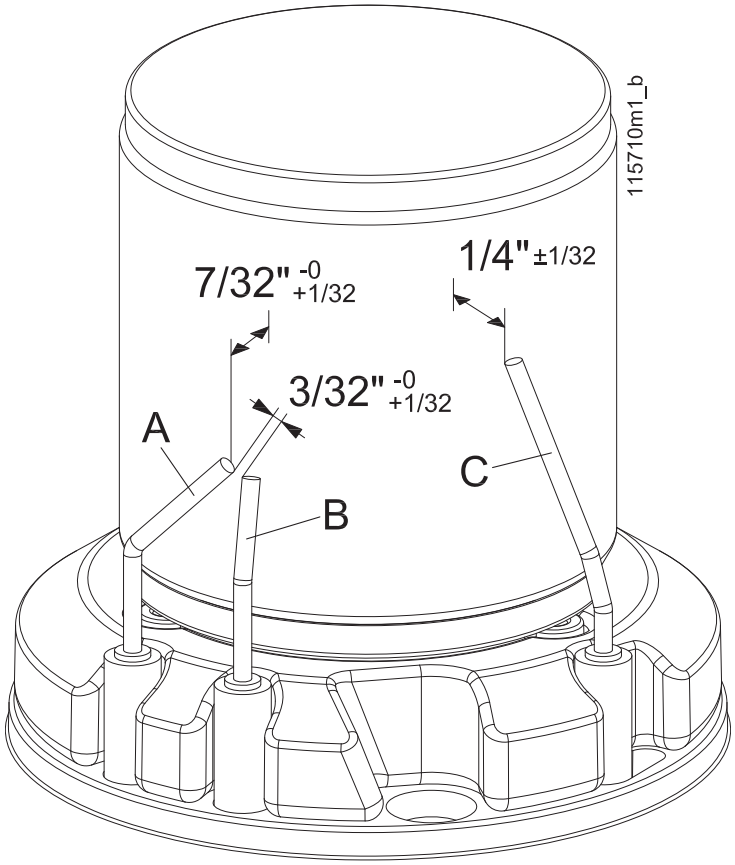


Figure 17-8 Thermal insulations

17.4 - Correct positioning of the ignition and flame detection electrodes

For the heater to work properly the electrodes must be positioned as shown in Figure 17-9.

NOTICE! To insure correct functioning of heater the distances listed above shall be verified very carefully also using a hand caliper.



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

Figure 17-9 Positioning electrodes on burner (Use a hand caliper to verify the distances)

17.5 - Waterside Cleaning Schedule and Instructions

For units installed at sites with hard water (>10.5 grains/gal, >180 mg/L), AERCO strongly recommends use of AERCO AquaSolve anti-scaling system (note, this system does not protect against orthophosphates, which can also cause scale deposits). It provides an economical, chemical free treatment of hard water, allowing the water heater to perform at its peak heat transfer efficiency, thereby reducing heating cost.

AERCO requires that the individual heat exchangers be cleaned per the schedule in Figure 17-10, below.

The frequency of cleaning can be determined at each site based on performance of the unit, and/or experience with similar equipment. The cleaning frequency may be affected by the quality of the inlet water (see Section 8.5: Water Quality Guideline), but it generally follows the schedule shown below.

Operating Conditions	Cleaning Frequency			
	24-months	12-months	6-months	Monthly
Domestic Water Setpoint	<130ºF (54.4 ºC)	140 - 160ºF (60 - 71ºC)	160 - 180ºF (71 - 82ºC)	>15 grains/gal (>257 mg/L*)
Calcium Hardness Level at water inlet	<7 grains/gal (<120 mg/L*)	3.5 – 9.9 grains/gal (60 - 170 mg/L*)	3.5 – 15 grains/gal (60 - 257 mg/L*)	

* 1 mg/L = 1 ppm

Figure 17-10 - Required Waterside Cleaning Schedule

In Figure 17-10, if calcium hardness level, and domestic water setpoint fall under different cleaning intervals, the heat exchanger must be cleaned at the most frequent interval. During the next few cleaning intervals observe how much scale is removed to determine if less frequent intervals can be followed.

For example, if:
Domestic water setpoint = 125ºF (51.7ºC) and
Calcium Hardness level = 9.5 grains/gal (163 mg/L)

Start with a 12-month cleaning frequency (125ºF setpoint falls under “24-months” and calcium hardness falls under “12-months”). Observe the next few cleanings to determine how much scale is removed to decide if 18-month cleaning frequency is more appropriate.

To clean each heat exchanger, AERCO recommends using a cleaning solution of Rydlyme Chemical Descaler (or equivalent) and clean water. This product, available from Apex Engineering Products Corp., is designed to dissolve water scale, lime scale, calcium and rust. To obtain this product, or for specifications and instructions for its use contact Apex Engineering Products.

A pumping set-up similar to Figure 17-11 is required to **clean one heat exchanger at a time**. The heat exchanger is cleaned by pumping the cleaning solution between a circulating bucket and the heat exchanger. Cleaning connections kit, part number 62632058 (as shown in Figure 17-11), is available from AERCO and includes step by step instructions on how to create a setup similar to Figure 17-11 (the chemical descaler, circulating bucket, pump and hoses shall be sourced from others).

Use a cleaning solution of Rydlyme Chemical Descaler and clean water according to manufacturer’s instructions. The amount of the solution should be approximately the volume of water that the heat exchanger holds: 2.5 gallons (9.5 L). Follow the step by step instructions included with connections kit 62632058.

Notes for cleaning:

- Periodically check for leaks and maintain the liquid level in the bucket. A lowering volume level is an indication that there is an open drain in the system. Return discharge foaming indicates an active cleaning solution and the presence of mineral deposits in the heat exchanger.
- Refer to descaler manufacturer's instructions for the circulation period and estimate based on the time in service and water hardness. When the foaming action stops, cleaning solution strength is depleted (two pounds of deposits removed per gallon used) or the equipment is free from calcium and other water-formed mineral deposits.
- Periodically test the solution for effectiveness to determine if more cleaning solution is needed. Refer to "Testing Cleaning Effectiveness" in the next section for details. If the cleaning solution is expended before circulation time is up, additional cleaning solution will be needed and circulation time may be extended to complete the cleaning.
- Upon completion of the cleaning process, begin flushing the solution by adding clean water to the circulation bucket. Continue water flushing the equipment for a minimum of 10 minutes or until discharge runs clear.
- Rydlyme Chemical Descaler is biodegradable, and in most instances may be purged down sewers. Check with local authorities before disposing of any complex compositions.

Testing Cleaning Effectiveness

There are two methods of testing the effectiveness of the cleaning solution during cleaning: the calcium carbonate spot test of the circulating solution and the charting of a trend in the pH of the cleaning solution.

Calcium Carbonate Spot Test

A calcium carbonate spot test is performed by exposing a form of calcium carbonate to the cleaning solution. Samples of the deposit, a Tums or Rolaids tablet, or bare concrete can be used. Observe the reaction of the cleaning solution on the calcium carbonate. Foaming and bubbling indicates the solution is still active. Little or no reaction indicates that the solution is expended. This test should be performed near the end of the circulating time. If the solution has been expended, more cleaning solution will be required to complete the job. If the solution is still active at the end of the time, all the scale has been dissolved.

pH Trend Charting

The initial pH of the cleaning solution will measure between 1-3 (See pH sheet on Rydlyme Chemical Descaler packaging). To test the effectiveness of the circulating solution as a function of pH, take readings at regular intervals and chart as a trend. Note that the deposits can cause a premature jump in the pH. After circulating for approximately 75% of the cycle time, begin testing the pH at 10-15 minute intervals. Once the solution's pH reads 6.0-7.0 on three or more consecutive readings, the solution is expended. If the pH reads below 6.0 after the circulating time, the application is clean.

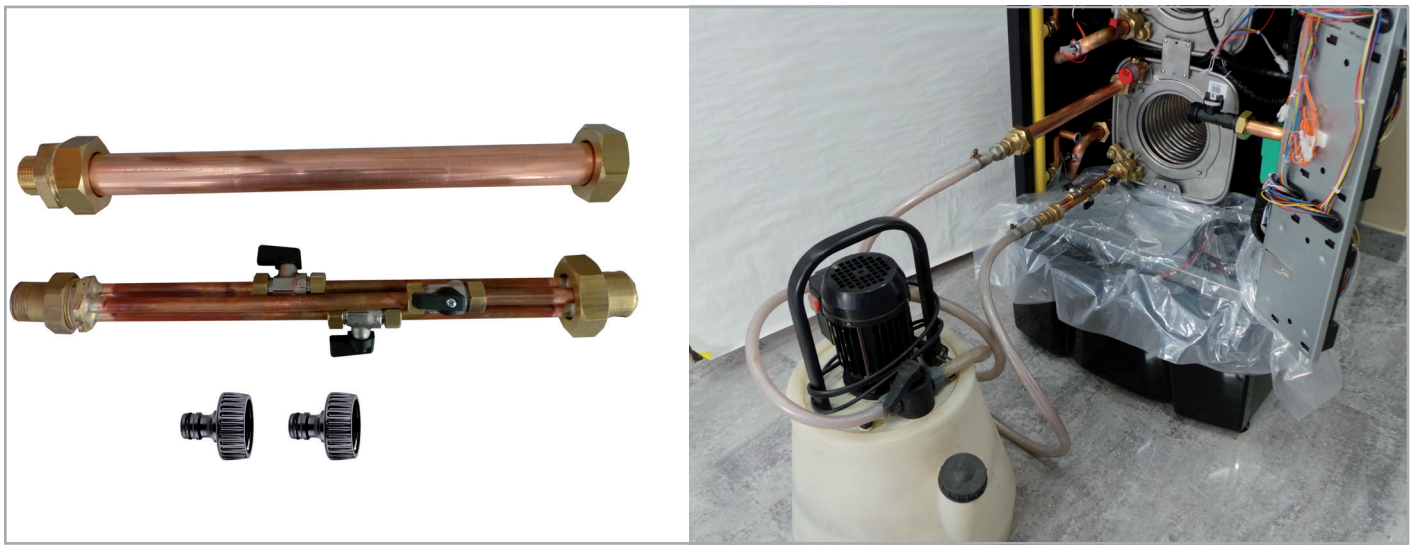


Figure 17-11 - Cleaning connections kit

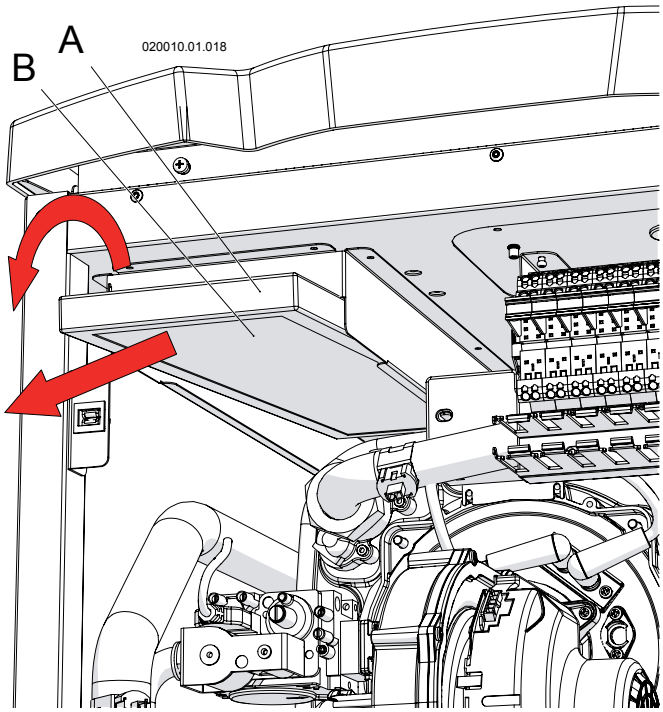


Figure 17-12 Remove the air filter “B”

17.6 - Clean the air filter

For the heater to work properly, the air filter must be clean. A dirty air filter can cause a power input reduction of the unit, resulting in system malfunctions. Operate as follows in order to clean the air filter:

1. follow the steps in Section 17.2 to gain access to the internal components;
2. pull down with a rotation the air filter “B” as per Figure 17-12;
3. pull back the air filter and remove it from the unit;
4. with compressed air, clean the surface of the air filter;
5. reassemble the air filter.

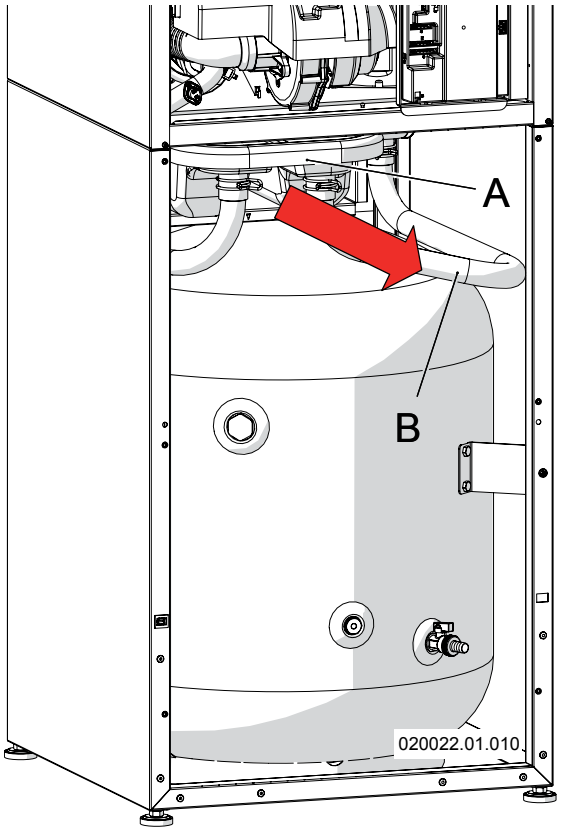


Figure 17-13 Condensate trap “B” and neutralizing box “A”

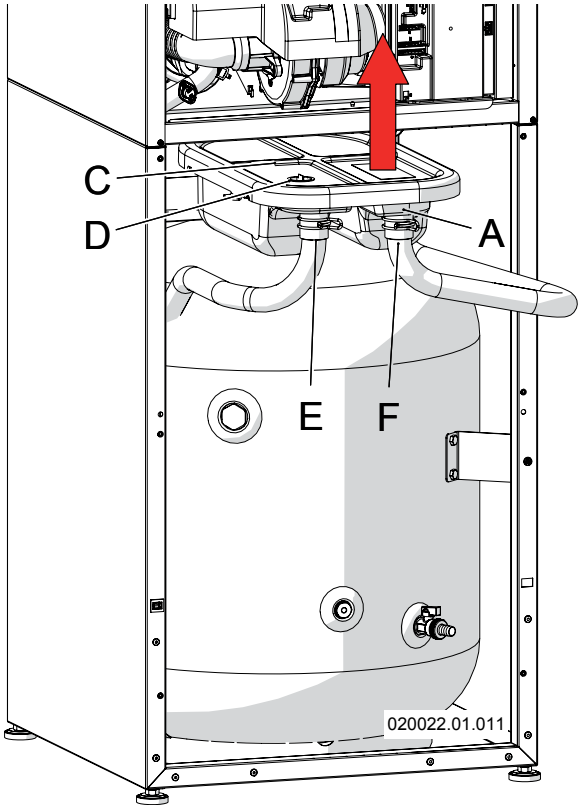


Figure 17-14 Condensate trap and neutralizing box removing

17.7 - Condensate trap and neutralizing box maintenance and cleaning

The condensate trap and neutralizing box must be checked every year and cleaned if required. Follow the steps below to properly inspect, recharge or substitute condensate neutralizing box and media:

Monitor the level of the neutralization media in the box periodically. The pH can be checked from the test port “D” (Figure 17-14). Check the pH level every three months for the first year. Use a suitable pH test strip paper or an electronic pH meter for precise measurement. The frequency of checking the pH level can be reduced to every six months or every year depending on the readings obtained compared to local water authority requirements. The neutralizing media should be replaced when the pH level drops below the minimum level of the local water authority. For replacement media contact your local sales representative. How to operate:

1. follow the steps in Section 17.2 to gain access to the condensate box;
2. pull out for 2 inches the condensate box “A” (Figure 17-13);
3. place a bucket (Min. 2 gallons) below connection “E” and “F” (Figure 17-14);
4. Disconnect connections “E” and “F” (Figure 17-14);

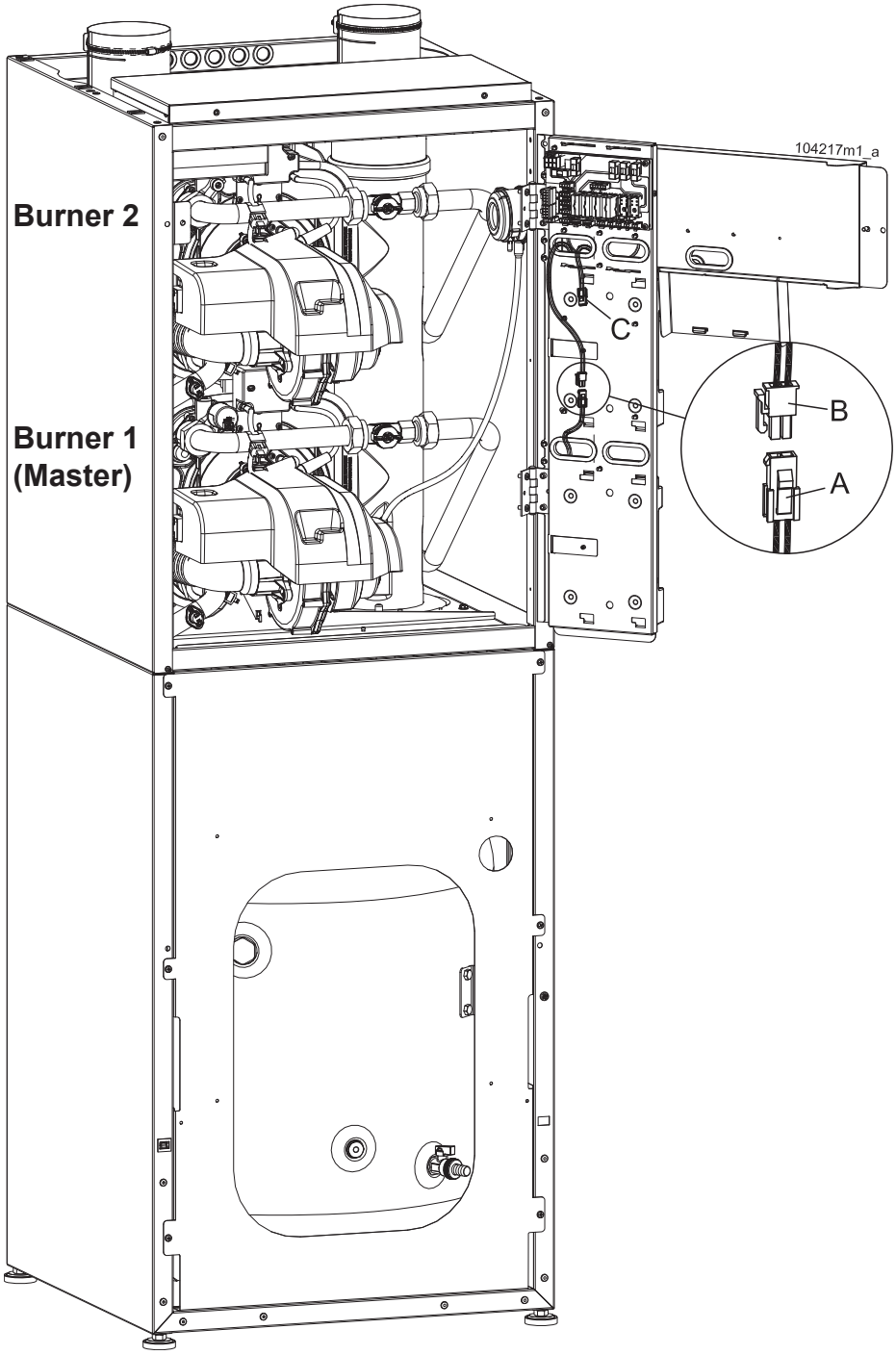
CAUTION!!! Disconnecting connection “E” and “F” (Figure 17-14) condensate water will immediately exit and must be collected into the presaid bucket. Leaking condensate water may cause severe property damage.

5. pull completely out the condensate box “A” from heater;
6. open cover “C” (Figure 17-14) in the upper direction;
7. inspect the condensate box making sure the collection box is intact;
8. examine neutralizer media and refill as necessary with fresh media;
9. fill with fresh water until the water begins to flow out of drains “E” and “F” (Figure 17-14) ;
10. re-install the condensate box;

⚠ WARNING!!! The condensate collection box must be filled with water to prevent flue gas emissions from escaping during unit operation. Failure to comply with this requirement can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

11. open the manual gas shutoff valve;
12. restore electrical power to the heater.

⚠ WARNING!!! The condensate neutralizer box must be kept correctly installed into the unit, like shown in Figures 3-3 through 3-6 item “8”. Correctly reinstall the condensate collection into its position. Incorrectly reinstall the condensate collection box into position will result in combustion gases entering the room. This can result in excessive levels of carbon monoxide which can cause severe personal injury or death!



A = Connector coming from Burner 1 (Master)
B = Connector coming from display
C = Connector coming from Burner 2

17.8 - Connection of the display to other burners

On multi-burner units models 399 and 500, display of Figure 16-1, is always connected directly to “Burner 1 (Master)”. All parameters readed in the display (see Sections 16.10, 16.11 and 22), addressed to “Burner 1 (Master)” are related exclusively to this burner. If you want to see/change, the same parameters for other burners, you have to move the display connection from “Burner 1 (Master)” to Burner 2. To do so, operate as follows (make reference to Figure 17-15):

1. turn off the electrical power;
2. follow the steps in Section 17.2 to remove the cover and gain access to the internal components;
3. disconnect plug “B” (plug coming from display) from plug “A” (plug coming from “Burner 1 (Master)”);
4. connect plug “B” to the plug “C”;
5. once you moved the display plug, turn on power to the appliance;
6. now display will show all information related to the Burner 2. To make any change follow Sections 16.10, 16.11 and 22;
7. once you terminate the query, connect again the plug “B” on the original plug “A”.

Figure 17-15 Connection of the display in other burner units

17.9 - How to move a control board

Multi-burner unit models 399 and 500 are configured to be drived by one control board (named Burner 1 (Master)). On this board all external devices are connected, such as: pumps commands, LWCO, and some internal safety devices such as: blocked drain switch, flue blocked pressure switch, etc.
If Burner 1 control board fails, the complete unit stops working. If the installer doesn't have a replacement part, it can replace Burner 1 control board for another installed on the unit and reactivate it.
To do so, operate as follows:

1. turn off the electrical power;
2. follow the steps in Section 17.2 to remove the cover and gain access to the internal components;
3. disconnect plug "B" (plug coming from display) from plug "A" (plug coming from "Burner 1 (Master)");
4. disconnect all other plugs from Burner 1 (Master) control board;
5. remove the Burner 1 (Master) control board from the appliance;
6. follow step 3 to 5 above to remove the board of "Burner 2";
7. install this last control board in the site where there where the Burner 1 (Master) control board;
8. reconnect all plugs to this board;
9. move "Switch S4" as per Figure 17-16, from OFF position to ON position;
10. pay attention that all connections of the board removed are not in short circuit or in a dangerous position;
11. electrically insulate each one of these plugs;
12. close the external jacket of the unit;
13. turn the electrical power on to the unit;
14. gain access to the Factory menu, by following Section 22 and set all parameters by following column "Burner 1 (Master)" (pay attention to parameter 3050. Because you are moving a board to the master, the 3050 value must be set to "0" zero);
15. shut off electrical power to the unit;
16. turn on the power to the unit. Now the new Burner 1 control board should drive the unit correctly.

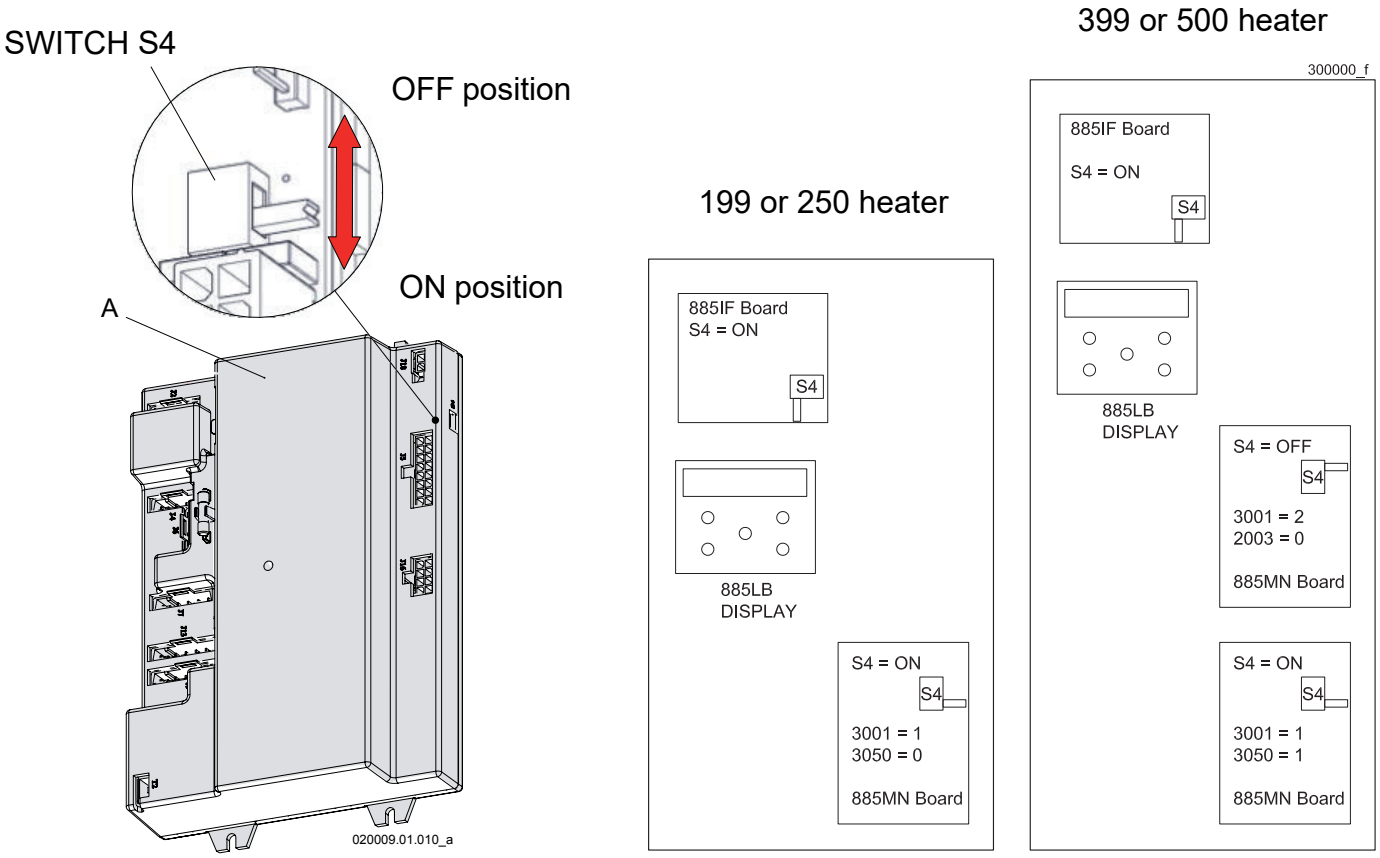


Figure 17-16 Control board "A" and complete situation of addresses and switches S4

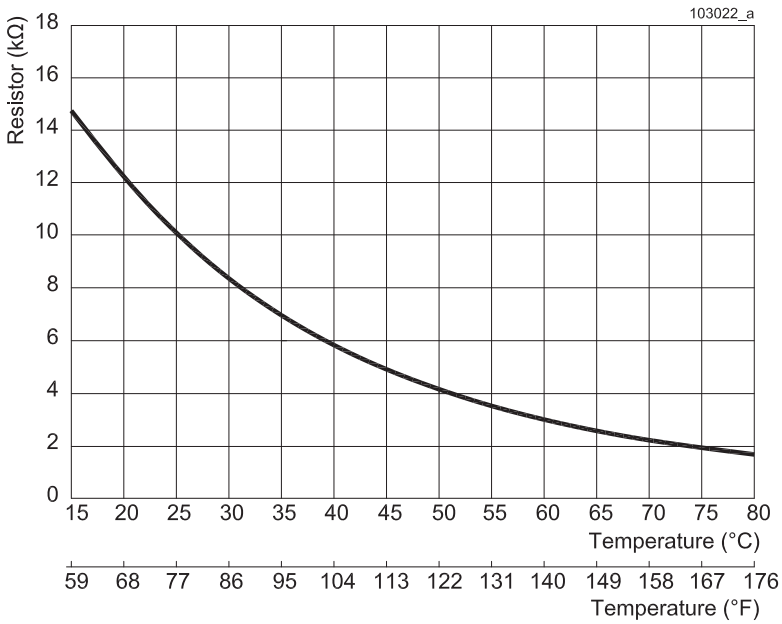


Figure 17-17 Water and flue temperature sensors' curve

17.10 - Draining the water from the heater

To drain the water from the unit, follow the steps below:

1. turn the power off to the heater;
2. close the manual gas shutoff valve, Figure 14-1;
3. wait until the water temperature decreas below 104°F (40°C);
4. close the heater isolation valves. If isolation valves haven't been installed, the entire system will have to be drained;
5. connect a hose to the drain valve item "2" of Figures 3-3 and 3-6 or item "5" directed on the item "12" of Figure 8-5 and place the other end of the hoses in a sink or some other suitable drain;
6. open the drain valves and wait for all water to drain;
7. if unit isolation valves have not been installed, open any bleed valves at the highest point of the system;
8. after draining out all the water, close the bleed valves and the unit drain valves.

NOTICE! The heater cannot be drained completely of water without purging the unit with an air pressure of 60 psi.

Proceed as follow:
1.- completely drain the water as per steps above;
2.- remove circulator pump "A" or "E" (Figure 8-4);
3.- spray 50 PSI compressed air in connection "C" (Figure 8-4) to drain the water from inner heat exchanger.

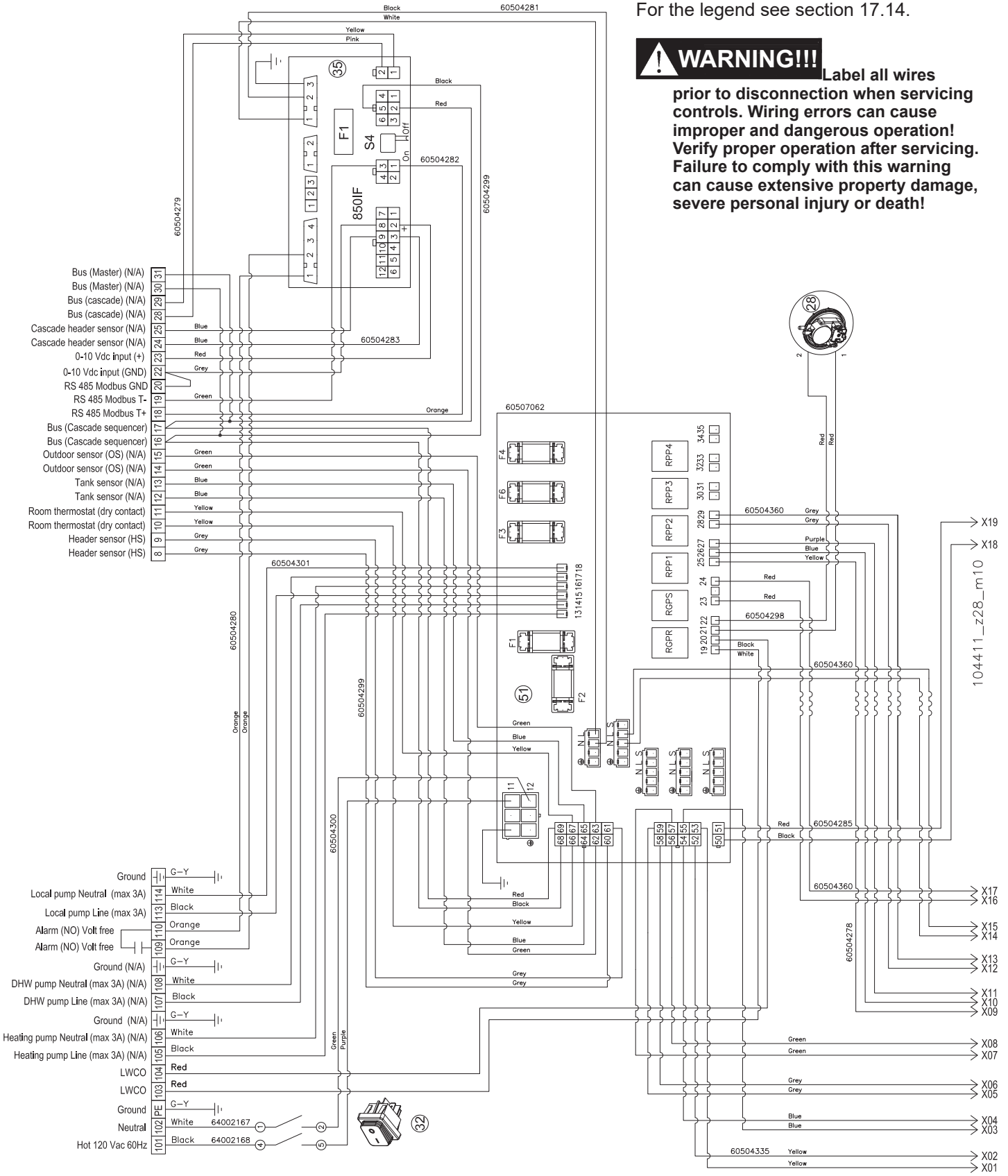
17.11 - Water and flue temperature sensor

The heater has a number of sensors that measure temperature. The electrical resistance between the sensor wires must correspond with the values shown in Figure 17-17.

17.12 - 199 models wiring diagram

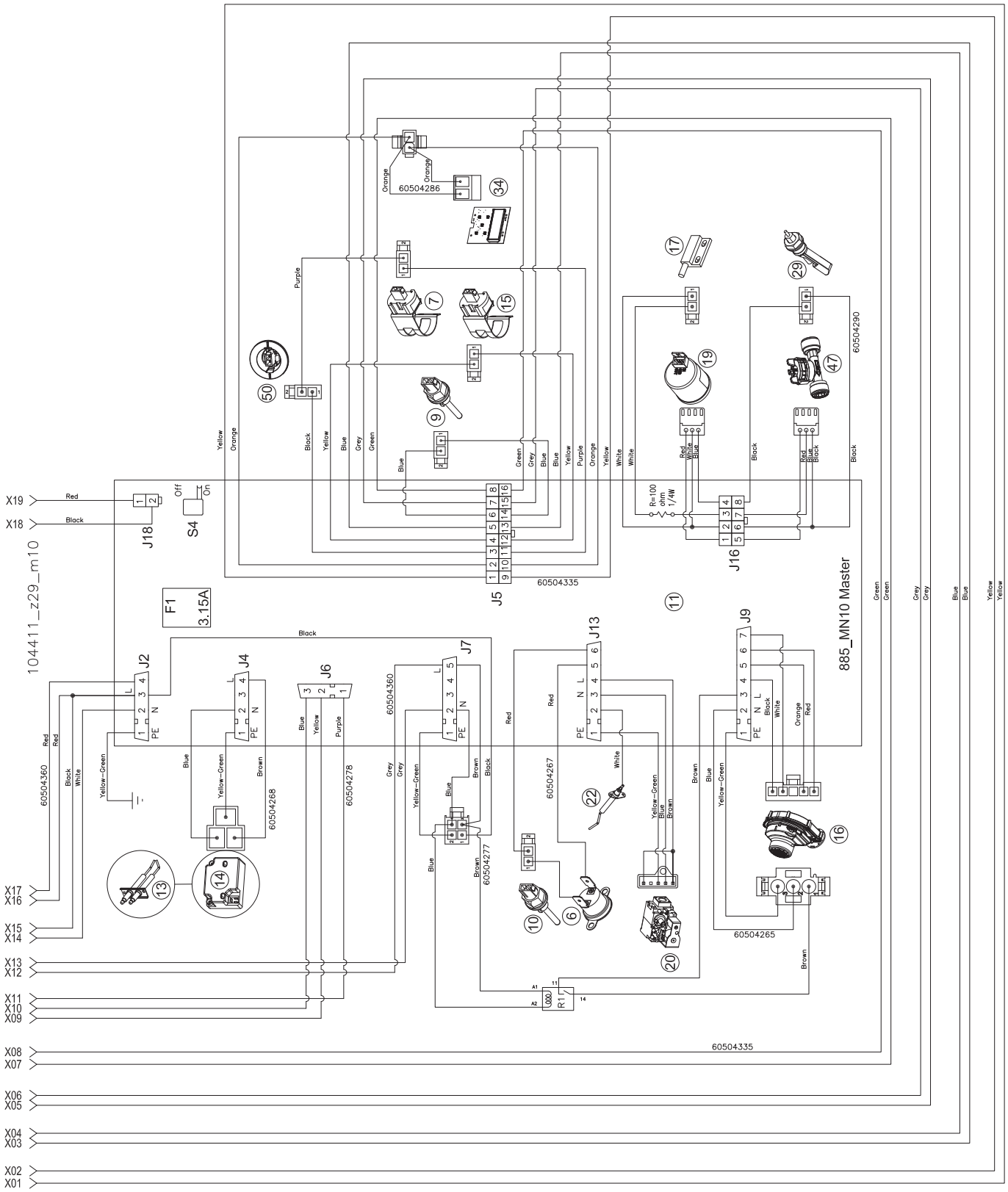
For the legend see section 17.14.

⚠ 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!



17 - MAINTENANCE

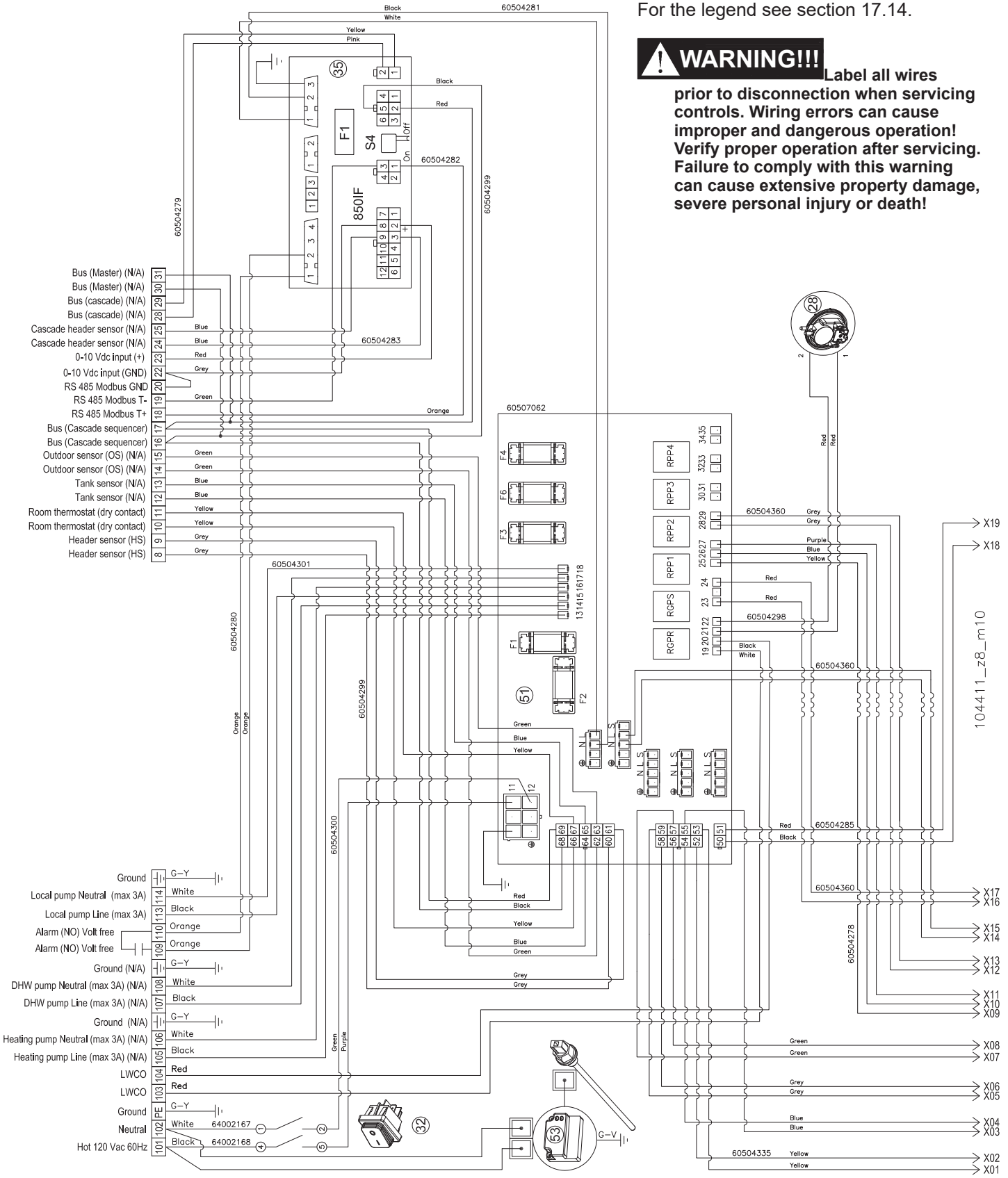
ATTENTION!!! ***Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.***



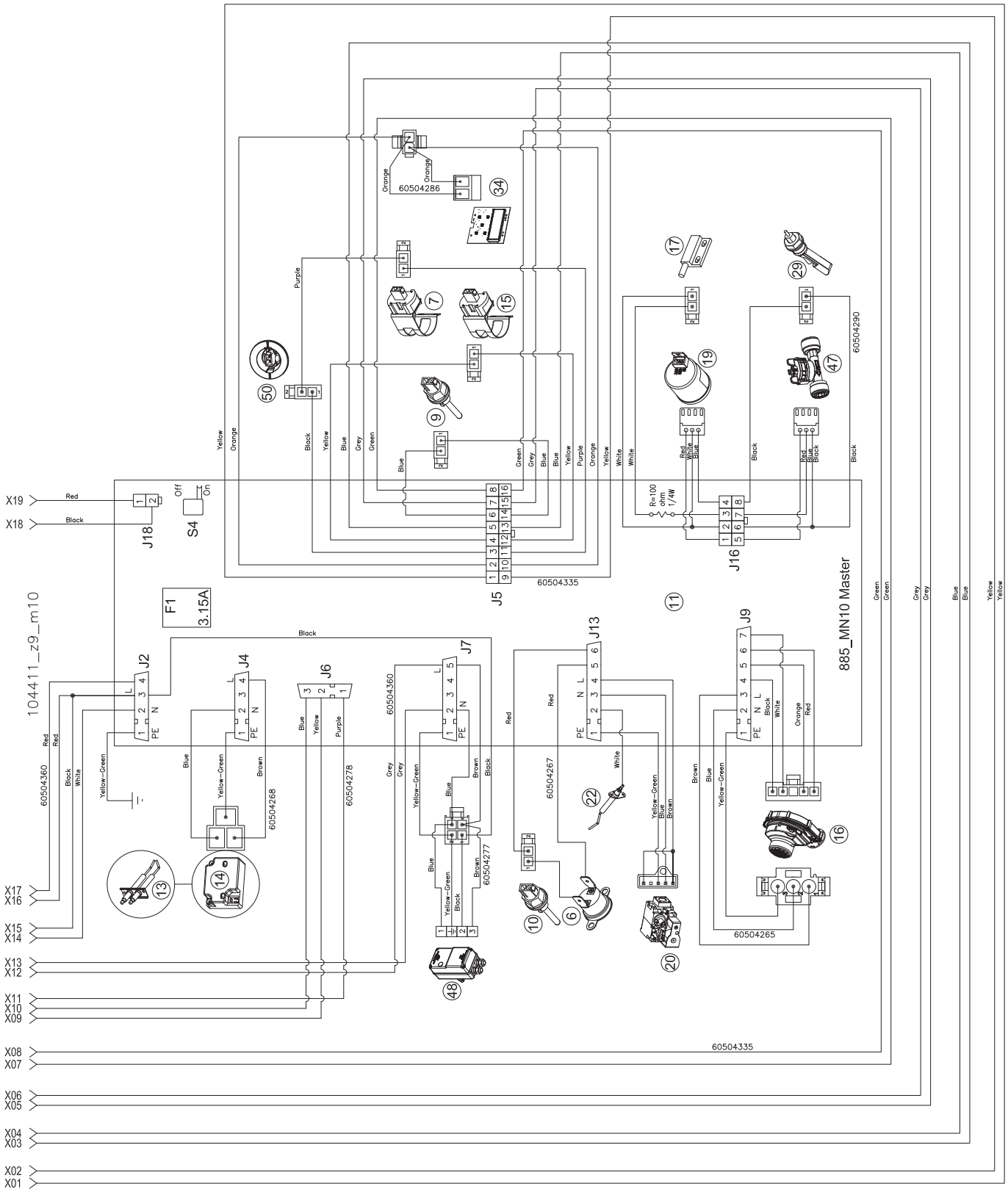
17.13 - 250 models wiring diagram

For the legend see section 17.14.

⚠ 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!

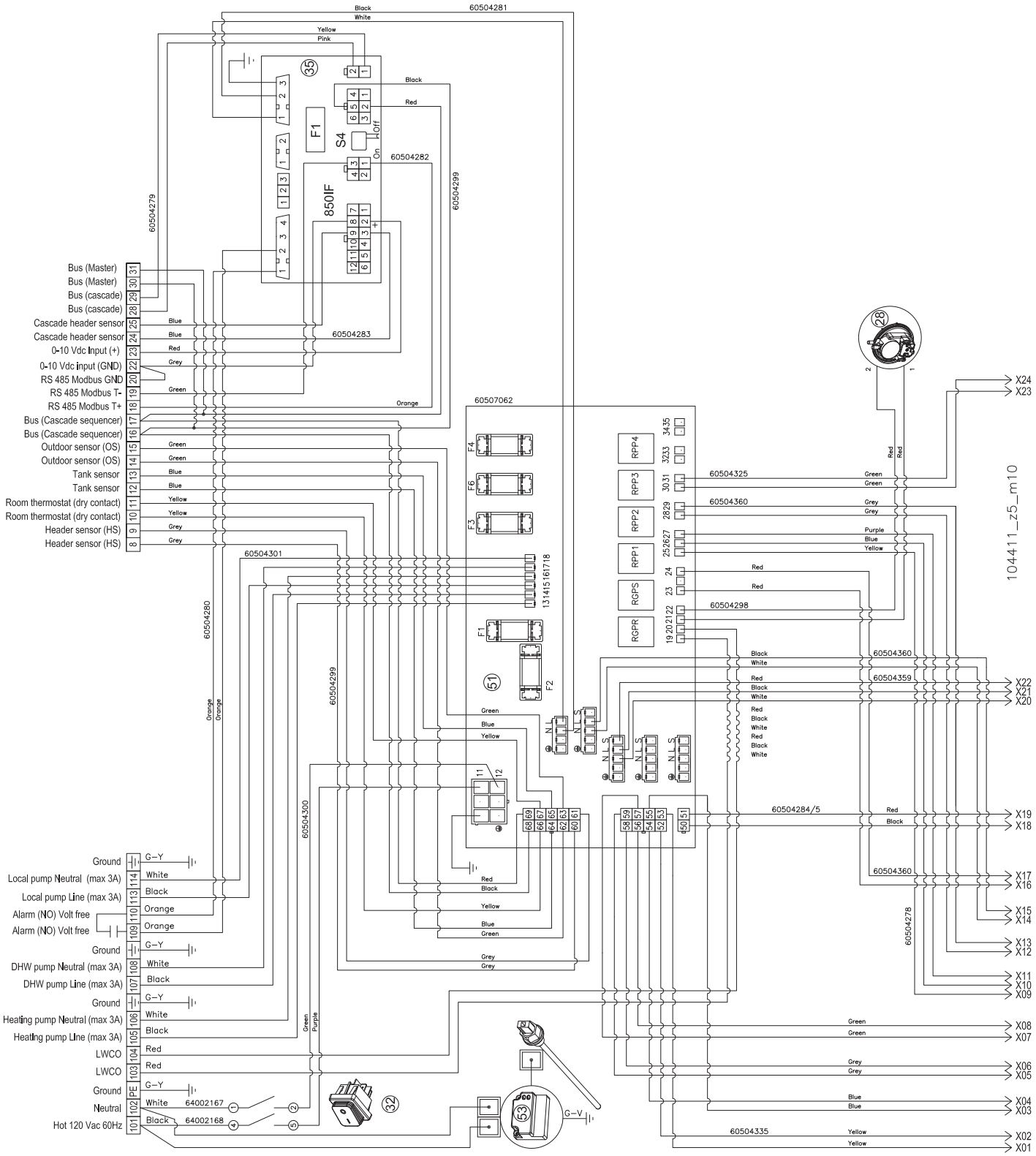


ATTENTION!!! ***Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.***

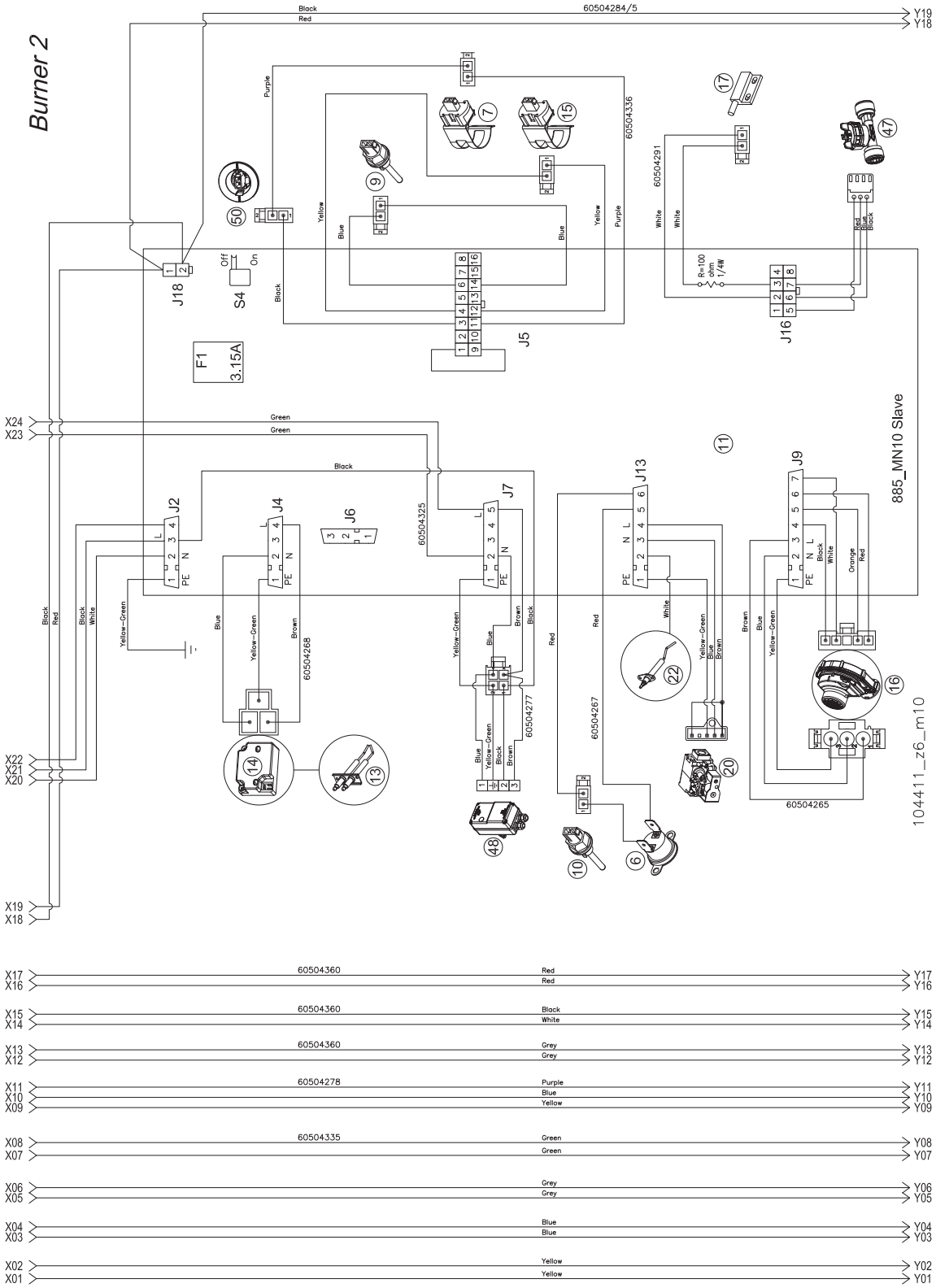


17.14 - 399 and 500 models wiring diagram

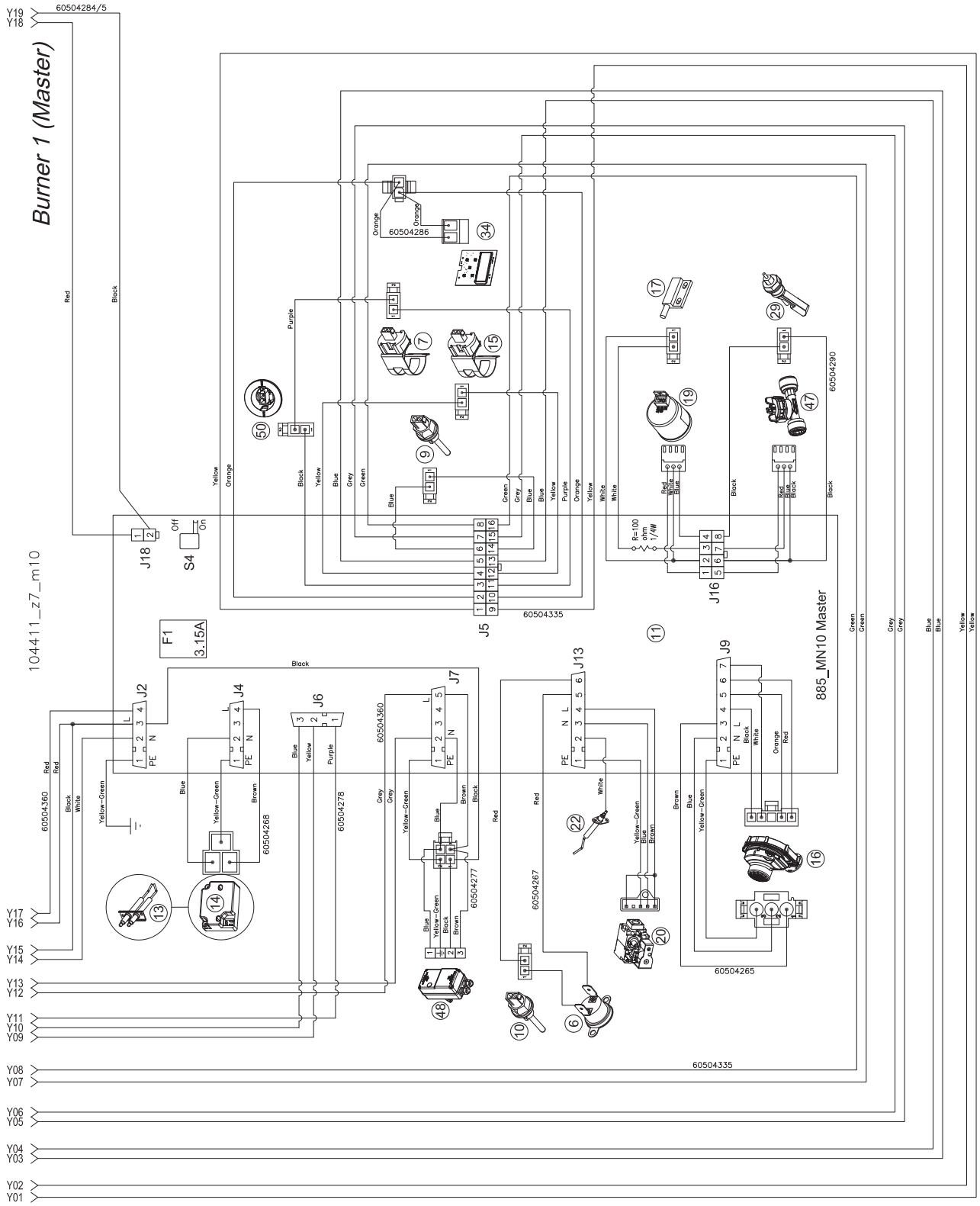
WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing Failure to comply with this warning can cause extensive property damage, severe personal injury or death!



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



Continue


Burner 1 (Master)
104411_z7_m10
885_MN10 Master
60504284/5
60504335
60504286
60504290
60504360
60504268
60504278
60504277
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60504265
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S4
J5
J16
J2
J4
J6
J7
J13
J9
F1
3.15A
Off
On
Red
Black
Yellow
Orange
Blue
Grey
Green
Purple
White
Brown
Yellow-Green

Legend to electrical schemes:

6 - High limit supply temperature switch
7 - Supply temperature sensor
9 - Flue gas temperature sensor
10 - High limit flue gas temperature fuse
11 - Control board
  Fuse - F1 5x20 3A
13 - Ignition electrodes
14 - Spark generator
15 - Return temperature sensor
16 - Modulating PWM fan
17 - Back flue preventer switch (Flapper valve switch)
19 - Water pressure sensor
20 - Gas valve
22 - Detection electrode
28 - Blocked flue pressure switch
29 - Condensate blocked drain switch
32 - Main electrical switch
34 - Display
35 - IF 885 board (Optional)
  Fuse - F1 5x20 3A
41 - CH pump relay
42 - DHW pump relay
47 - Water Flow meter
48 - Motorized valve (N/A)
49 - Local pump relay
50 - Primary heat exchanger temperature fuse
51 - Connection board
  Fuse - F1 5x20 10A
  Fuse - F2 5x20 10A
  Fuse - F3 5x20 3A
  Fuse - F4 5x20 3A
  Fuse - F6 5x20 3A
53 - Electronic anode
RGPR - CH pump relay (N/A)
RGPS - DHW pump relay (N/A)
RPP1 - Local pump relay of Burner 1 (Master)
RPP2 - Local pump relay of Burner 2
RPP3 - Local pump relay of Burner 3 (N/A)
RPP4 - Local pump relay of Burner 4 (N/A)
R1 - Fan stand-by relay

N/A = Not Applicable

18 - TECHNICAL DATA

Heater MODEL		199	250
Category of discharge chimney		II and IV	II and IV
Maximum heat input	Btu/hr	199,500	250,000
Minimum heat input	Btu/hr	50,000	50,000
Turndown ratio		4:1	5:1
Number of burners		1	1
Gas flow rate (Natural gas)	ft3/hr	199.5	250
Gas flow rate (LP gas)	ft3/hr	80	100
Min / Max gas pressure (Nat. and LP)	In.W.C.	3 / 13	3 / 13
Min / Max water temperature	°F	68 / 180	68 / 180
Min / Max water pressure	PSI	8 / 160	8 / 160
Content of water	gal	33.7	34
Supply voltage / Frequence		120Vac 60Hz	120Vac 60Hz
Absorbed electric power (pump excluded)	W	110	150
Air intake / Flue gas pipes diameter	inch	3	3
Max. length venting system	ft	120	120
CO (Carbon monoxide) with natural gas	ppm	<150	<150
CO (Carbon monoxide) with LP gas	ppm	<250	<250
NOx (0% O2 with natural gas)	ppm	<30	<30
CO2 (Carbon dioxide) for Natural gas at high fire	%	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for Natural gas at low fire	%	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for LP gas at high fire	%	9.5 to 10	9.5 to 10
CO2 (Carbon dioxide) for LP gas at low fire	%	10.5 to 11.5	10.5 to 11.5
O2 (Oxygen) for Natural gas at high fire	%	5.9 to 5.4	5.2 to 4.7
O2 (Oxygen) for Natural gas at low fire	%	5.9 to 5.4	5.2 to 4.7
O2 (Oxygen) for LP gas at high fire	%	6.4 to 5.6	6.4 to 5.6
O2 (Oxygen) for LP gas at low fire	%	4.8 to 3.4	4.8 to 3.4
Ionisation current	uA (Micro Amps)	4 to 7	4 to 7
Maximum flue gas temperature	°F	203	203
Maximum water condensate flow	GPM	0.032	0.039
Maximum permissible depression in flue gas system / intake	Pa	50	50
Average acidity of condensation	PH	4	4
Heater weight - Empty of water / Full of water	lb	211 / 411	216 / 428
Recovery Rating (100°F rise)	Gal/hr	227	285
DHW delivery (75°F rise)	GPM	5	6.3

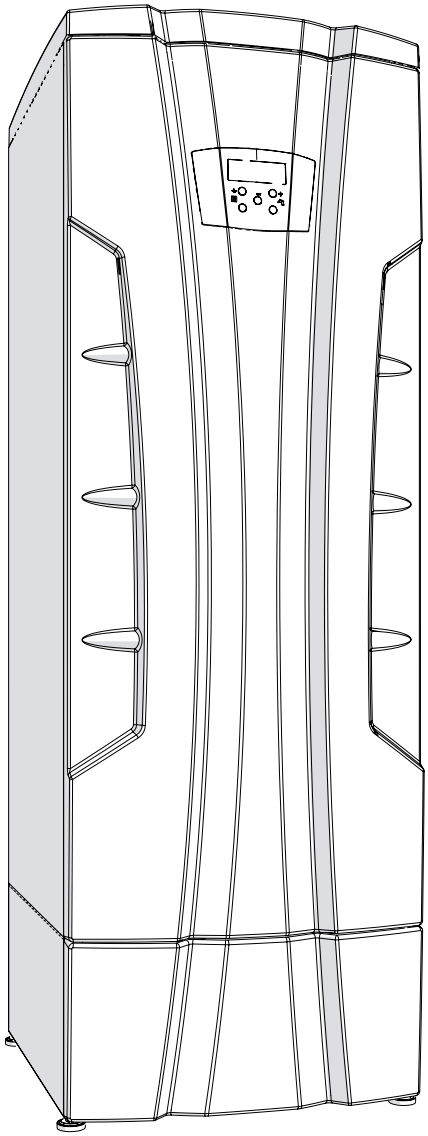
18 - TECHNICAL DATA

Heater MODEL		399	500
Category of discharge chimney		II and IV	II and IV
Maximum heat input	Btu/hr	399,000	500,000
Minimum heat input	Btu/hr	50,000	50,000
Turndown ratio		8:1	10:1
Number of burners		2	2
Gas flow rate (Natural gas)	ft3/hr	399	500
Gas flow rate (LP gas)	ft3/hr	160	200
Min / Max gas pressure (Nat. and LP)	In.W.C.	3 / 13	3 / 13
Min / Max water temperature	°F	68 / 180	68 / 180
Min / Max water pressure	PSI	8 / 160	8 / 160
Content of water	gal	35.4	36
Supply voltage / Frequence		120Vac 60Hz	120Vac 60Hz
Absorbed electric power (pump excluded)	W	220	300
Air intake / Flue gas pipes diameter	inch	4	4
Max. length venting system	ft	120	120
CO (Carbon monoxide) with natural gas	ppm	<150	<150
CO (Carbon monoxide) with LP gas	ppm	<250	<250
NOx (0% O2 with natural gas)	ppm	<30	<30
CO2 (Carbon dioxide) for Natural gas at high fire	%	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for Natural gas at low fire	%	8.4 to 8.7	8.8 to 9.1
CO2 (Carbon dioxide) for LP gas at high fire	%	9.5 to 10	9.5 to 10
CO2 (Carbon dioxide) for LP gas at low fire	%	10.5 to 11.5	10.5 to 11.5
O2 (Oxygen) for Natural gas at high fire	%	5.9 to 5.4	5.2 to 4.7
O2 (Oxygen) for Natural gas at low fire	%	5.9 to 5.4	5.2 to 4.7
O2 (Oxygen) for LP gas at high fire	%	6.4 to 5.6	6.4 to 5.6
O2 (Oxygen) for LP gas at low fire	%	4.8 to 3.4	4.8 to 3.4
Ionisation current	uA (Micro Amps)	4 to 7	4 to 7
Maximum flue gas temperature	°F	203	203
Maximum water condensate flow	GPM	0.064	0.077
Maximum permissible depression in flue gas system / intake	Pa	50	50
Average acidity of condensation	PH	4	4
Heater weight - Empty of water / Full of water	lb	312 / 607	323 / 623
Recovery Rating (100°F rise)	Gal/hr	455	570
DHW delivery (75°F rise)	GPM	10.1	12.7

Spare parts

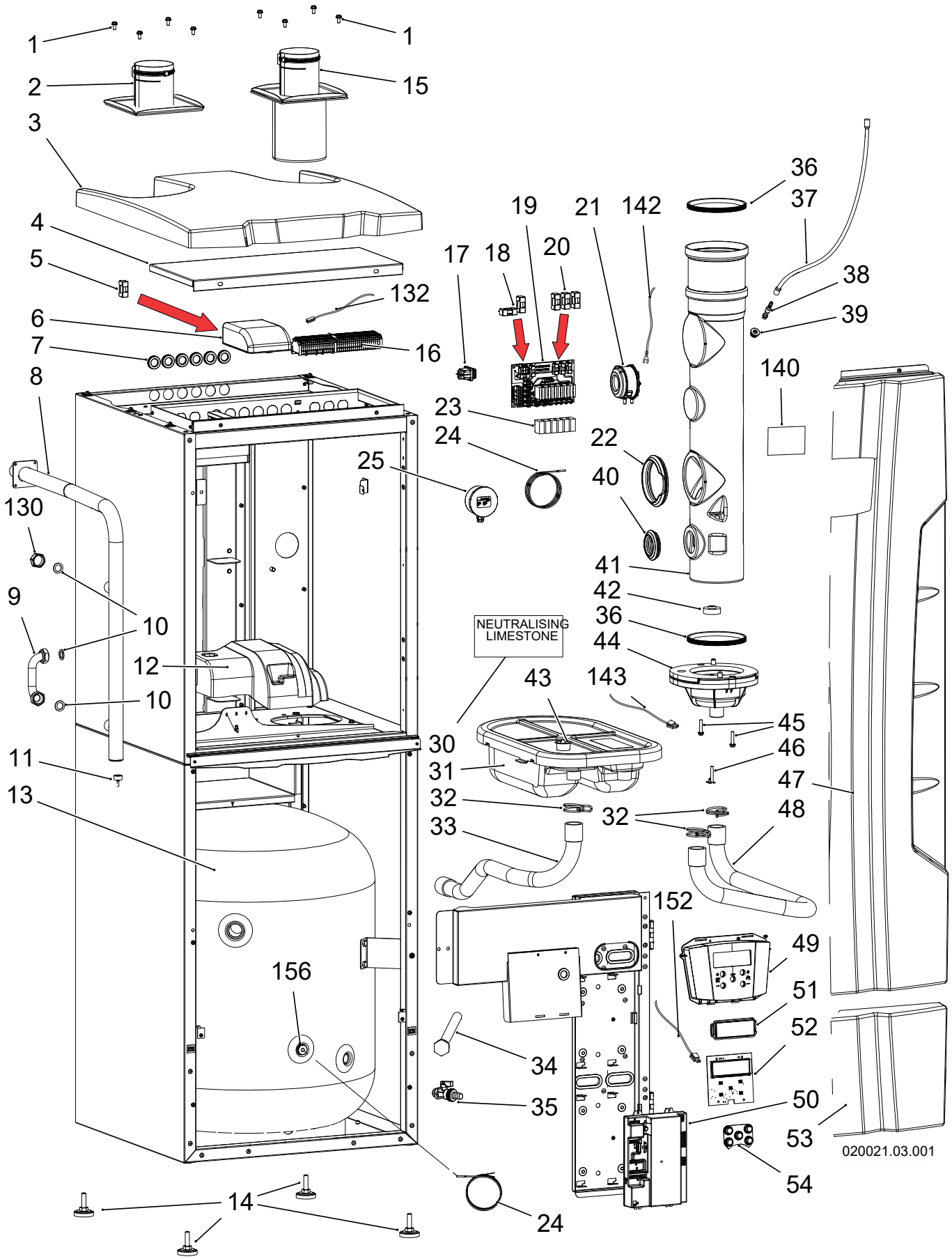
Spare parts for models:

199
250



DESCRIPTION	MOD
AM 199R	**A**
AM 250R	**B**

WARNING!!! Only use the heater in combinations and with the spare parts listed in this manual. Failure to do so can cause severe personal injury or death.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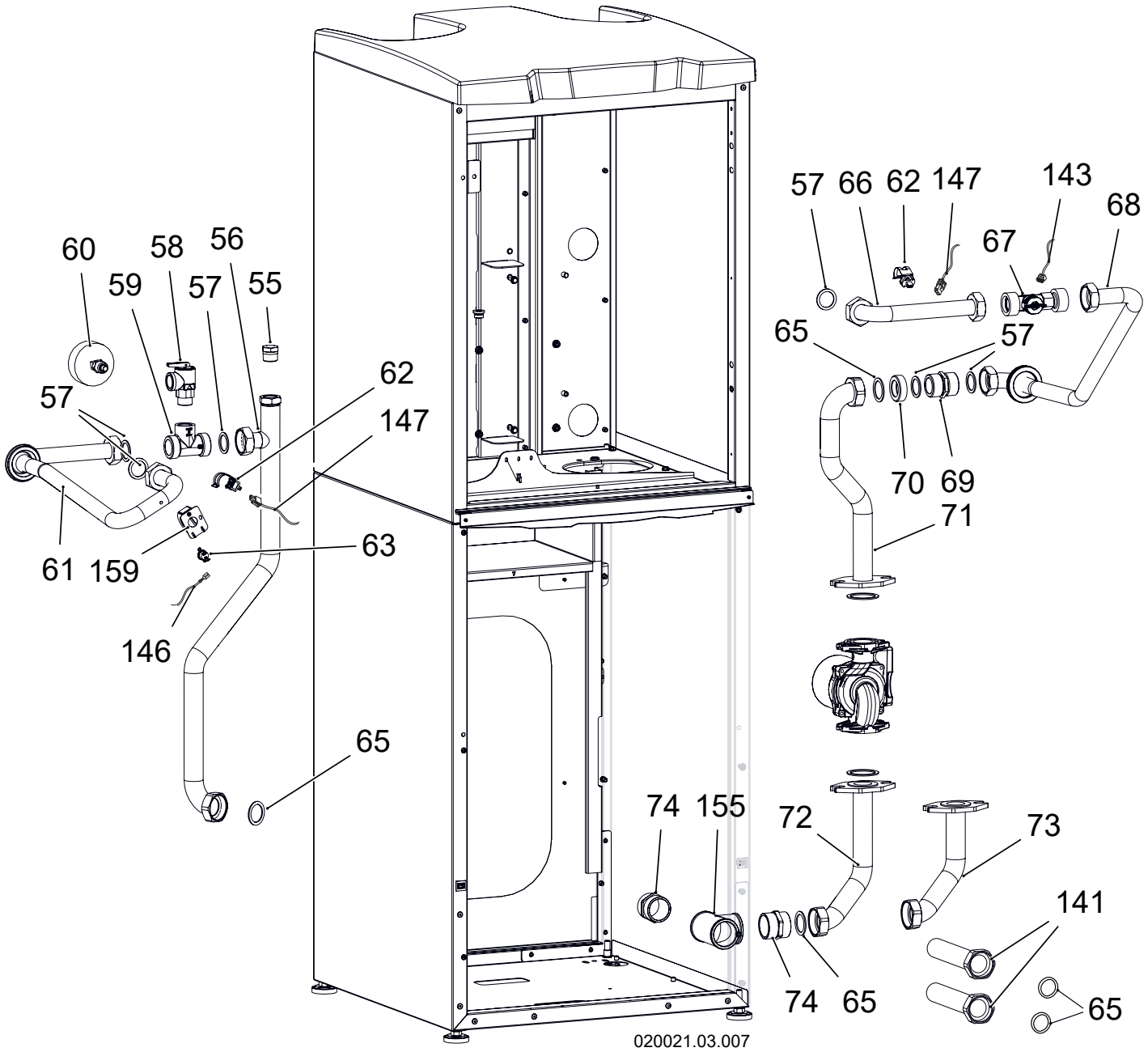
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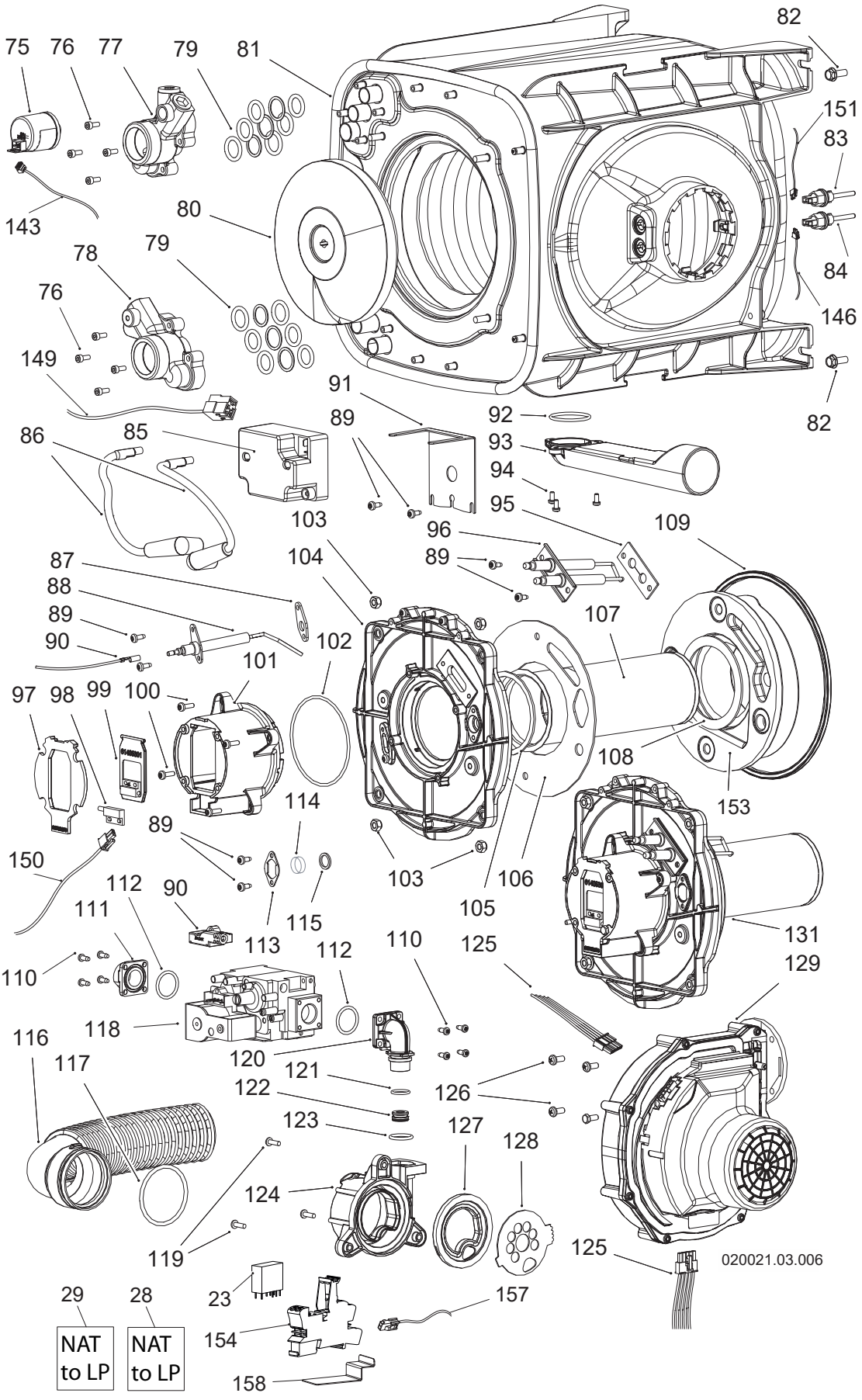
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DESCRIPTION	MOD.
AM 199R	A
AM 250R	B

N	CODE	DESCRIPTION	MOD
1	63505097	10 SCREW KIT 6X12 WITH WASHER - REPLACEMENT	AB
2	63504015	3" COMPLETE AIR INLET CONNECTION - REPLACEMENT	AB
3	63505053	BLACK UPPER COVER	AB
4	60404391	BENT BOX COVER	AB
5	63501058	10 FUSE KIT 3A DELAYED GLASS KIT – REPLACEMENT	AB
6	62118037	0-10V INTERFACE 885 120V 2D	AB
7	63505054	PVC CLAMPER INTERNAL DIAM. 22 - REPLACEMENT	AB
8	60338042	GAS COLLECTOR 1P NPT 4 HOLE FLANGE	AB
9	62626008	GAS VALVE PIPE	AB
10	63505004	10 GASKET KIT 3/4P D24 X16 SP.2	AB
11	63505089	SILICONE FIXING FOR FAN KIT - REPLACEMENT	AB
12	63505055	WATER PROTECTION COVER FAN GROUP - REPLACEMENT	AB
13	63502008	ASME STORAGE TANK	AB
14	63505057	4 ADJUSTABLE FOOTS - REPLACEMENT	AB
15	63504013	4" COMPLETE AIR INLET CONNECTION - REPLACEMENT	AB
16	63501037	SINGLE GREY BOARD CLAMP - REPLACEMENT	AB
16	63501039	ON FLOOR YELLOW-GREEN BOARD CLAMP - REPLACEMENT	AB
16	63501040	SINGLE BLUE BOARD CLAMP - REPLACEMENT	AB
17	63501041	BLACK 2 POLES SWITCH - REPLACEMENT	AB
18	63501059	10 FUSE KIT 10 A DELAYED GLASS - REPLACEMENT	AB
19	63501122	CONNECTIONS BOARD 160X100 - SPARE PART	AB
20	63501058	10 FUSE KIT 3A DELAYED GLASS KIT – REPLACEMENT	AB
21	63501043	PRESSURE SWITCH ON 3,2 INWC - REPLACEMENT	AB
22	63505051	GASKET D.119 H.18 I.94 - REPLACEMENT	AB
23	63501057	RELAY 115V 16A EXCHANGE - REPLACEMENT	A
24	63501038	SENSOR 10K D6X45 L=2500 T - REPLACEMENT	AB
25	63501044	OUTDOOR SENSOR - REPLACEMENT	AB
28	62630212	NAT-LP CONV KIT 199-1000 AERCO	AB
29	62630213	LP-NAT CONV KIT 199 AND 399 AERCO	A
29	62630214	LP-NAT CONV KIT 2505007501000 AERCO	B
30	63505048	NEUTRALISING LIMESTONE 10 KG - REPLACEMENT	AB
31	62801024	NEUTRALIZER KIT UP TO 280KW	AB
32	63505090	FIXING SPRING - REPLACEMENT	AB
33	63505047	CORRUGATED TUBE DIAM 28 L 800 - REPLACEMENT	AB
34	63505091	MAGNESIUM ANODE ROD FOR B70 - REPLACEMENT	AB
35	63502029	DISCHARGE VALVE - REPLACEMENT	AB
36	63505058	GASKET EPDM D.125 - REPLACEMENT	AB
37	63505059	SILICONE PIPE D.4X8 - REPLACEMENT	AB
38	63505156	REDUCED TAP 1/4”- 3/8” - REPLACEMENT	AB
39	63501036	EPDM CLAMPER - REPLACEMENT	AB
40	63505052	GASKET D120.2 H20.5 I92 - REPLACEMENT	AB
41	63504006	D.125 H.703 COLLECTOR-1 EXCHANGER - REPL	AB
42	63505076	FLOAT D40X16X8,6 - REPLACEMENT	AB
43	63505075	CONICAL PLUG TAB D.29.2-32,7 - REPLACEMENT	AB

N	CODE	DESCRIPTION	MOD
44	63504005	CONDENSATE BLOCKED DRAIN SWITCH - REPLACEMENT	AB
45	63505014	10 SCREW KIT 6X25 GALVANIZED	AB
46	63501045	MAGNETIC SENSOR D5,8X38	AB
47	63505084	COMPLETE PLASTIC FRONT COVER BLACK - REPLACEMENT	AB
48	63505046	CORRUGATED TUBE DIAM 28 L 1250 - REPLACEMENT	AB
49	63505088	FRONT COVER - REPLACEMENT	AB
50	62612786	REPLACEMENT KIT 885MN10 110 V	AB
51	63505064	DISPLAY GLASS - REPLACEMENT	AB
52	63501046	DISPLAY TYPE 885LB01 - REPLACEMENT	AB
53	63505049	ABS 287X600 BASE BLACK - REPLACEMENT	AB
54	63505063	6 BUTTONS SWITCH - REPLACEMENT	AB
55	63502024	PLUG BRASS 3/4P NPT MALE - REPLACEMENT	AB
56	62621200	SUPPLY PIPE STORAGETANK	AB
57	63505020	“5 GASKET KIT 1””1/4 39X29,5X2”	AB
58	63502009	SAFETY VALVE 3/4P M ASME NPT 125 PSI - REPLACEMENT	AB
59	63502025	BRASS FITTING 1P1/4 MM 3/4P F 1/2P F - REPLACEMENT	AB
60	63502010	THERMOMANOM. D.80 0-200 PSI 60-320°F - REPLACEMENT	AB
61	63502102	STAINLESS STEEL TUBE 304 D28 F/F 1P1/4 H	AB
62	63501048	CLIP SENSOR NTC 10 KOHM D. 28 - REPLACEMENT	AB
63	63501047	AUTOMATIC SAFETY THERMOSTAT 95°C - REPLACEMENT	AB
65	63505094	10 GASKET KIT 1”1/2 - REPLACEMENT	AB
66	63502099	ASS.INOX 304 PIPE D.28 - SPARE PART	AB
67	62660038	FLOW SENSOR DN 20 1P1/4 SPARE PART	AB
68	63502100	STAINLESS STEEL PIPE 304L D28 RET NO 2V	AB
69	63502026	BRASS NIPPLE 1"1/4 F.29 H=52 - REPLACEMENT	AB
70	63502027	REDUCTION 1"1/4 - 1"1/2 F.31 - REPLACEMENT	AB
71	62621204	RETURN PIPE BOILER PUMP	AB
72	62621205	RETURN PIPE TANK-PUMP 6 1-2	AB
73	62621206	RETURN PIPE TANK-PUMP 8 1-2	AB
74	63502028	BRASS NIPPLE DOUBLE 1" 1/2 - REPLACEMENT	AB
75	63502023	P. SENS. 0-10B. RAST 2.5 G1/4P WRAS - REPLACEMENT	AB
76	63505003	10 SC REW KIT 4X10 GALVANIZED	AB
77	63502012	BRASS CONNECTION 1"1/4 RETURN - REPLACEMENT	AB
78	63502011	BRASS CONNECTION 1"1/4 SUPPLY - REPLACEMENT	AB
79	62616111	KIT FOR 6 OR AND 3 WASHERS	AB
80	62632087	SPARE PART KIT INSULATION HE	AB
81	62649088	CONDENSING HE 58KW 12T ASME HLW	A
81	62649089	CONDENSING HE 70KW 15T ASME HLW	B
82	63505021	10 SC REW KIT 6X16 8.8 WITH WASHER	AB
83	63501055	BAYONETTE FUSE 102°C 2P MOLEX - REPLACEMENT	AB
84	63501054	BAYONETTE SENSOR NTC 10K 2P MOLEX - REPLACEMENT	AB
85	63501050	SPARK GENERATOR - REPLACEMENT	AB
86	63501051	CABLE UL IGNITOR CONN 90° L155 - REPLACEMENT	AB
87	63505029	10 GASKET KIT 38X17 SP.2	AB
88	62632007	GRP DETECTION ELECTRODE	AB
89	63505012	10 SELFTAPPING SC REW KIT 4X10 TC S-TT	AB
90	63501053	MASTER GAS CABLE UL 885 - REPLACEMENT	AB
91	63505195	SHAPED BRACKET 67X54X36 -L - SPARE PART	AB

N	CODE	DESCRIPTION	MOD
92	63505081	OR RING 3137 EPDM 2,62 X 34,60 - REPLACEMENT	AB
93	63505082	CONDENSATION DISCHARGE PIPE D.46.7 - REPLACEMENT	AB
94	63505022	10 SC REW KIT 4X8 ZINC TC -C R DIN4042	AB
95	63505028	10 GASKET KIT 56X21 SP.2	AB
96	62632008	GRP IGNITION ELECTRODE	AB
97	63505067	GASKET SHAPED FOR FAN - REPLACEMENT	AB
98	63501052	REED MAGNETIC POSITION SENSOR - REPLACEMENT	AB
99	63505066	MAGNET CLAP GROUP - REPLACEMENT	AB
100	63505015	10 SELFTAPPING SC REW KIT 4X14 TC C -NP	AB
101	63503005	COLLECTOR AXIAL FAN H.69 - REPLACEMENT	AB
102	63505068	5 OR RING 3325 KIT SIL 2,62 X 82,22 - REPLACEMENT	AB
103	63505019	10 NUT KIT ZINC C OATED 6MA	AB
104	63503006	BASE FOR FAN C OLLEC TOR - REPLACEMENT	AB
105	63505073	5 GASKET KIT Ø71 - 80.5 MM SP.2 - REPLACEMENT	AB
106	63505095	5 GASKET KIT D.170 F90 SP.2 - REPLACEM.	AB
107	62629045	FIBER BURNER D.70 H200	AB
108	63505072	GASKET S.WOLL PLUS D.100 SP.2	AB
109	63505074	SIL. GASKET D.200 F.188 H.7,2 - REPLACEMENT	AB
110	63505009	10 SC REW KIT 4X10 ZINC TC -C R	AB
111	63503001	FLANGE GAS 32X32 3/4P - REPLACEMENT	AB
112	63505070	O-RING 130 2,62 X 22,22 - REPLACEMENT	AB
113	63505193	KIT 5 FLANGE L21.2 H34 - SPARE PART	AB
114	63505069	PIREX GLASS D15,5 SP5 - REPLACEMENT	AB
115	63505005	10 GASKETS KIT D15,5 F11,5 SP1,5	AB
116	63504009	HIGH POWER SILENCER GROUP - REPLACEMENT	AB
117	63505096	10 O-RING KIT 156 NBR 3,53 X 52,39 - REPLACEMENT	AB
118	62632024	GRP SPARE GAS VALVE USA	AB
119	63505093	10 SCREW KIT 4X14 GALVANIZED - REPLACEMENT	AB
120	63503002	90° INTERNAL ELBOW - REPLACEMENT	AB
121	63505006	10 O-RING KIT EPDM 1,78 X 12,42	AB
122	60114093	GAS DIAPHRAGM D.15,5 H8 HOLE D.7	AB
122	60114100	GAS DIAPHRAGM D.15,5 H8 HOLE D.9,3	B
123	63505007	10 O-RING KIT 2,62 X 17,86	AB
124	63504010	COSMOMIX GAS MIXER - REPLACEMENT	AB
125	63501010	FAN CABLE UL 885	AB
126	63505011	10 BOLT KIT 5X12 C ROSS HEAD	AB
127	63505071	SHAPED GASKET DIAM. 71,2 H. 9,2 - REPLACEMENT	AB
128	60406142	AIR MIXER DIAPHRAGM 7 D.10-1 D.17	AB
129	63501056	BOILER FAN 135 KW 115V - REPLACEMENT	AB
130	60701014	2 GASKETS KIT DN65	AB
131	63503007	GRP GAS AND BURNER 12/15 LAPS - REPLACEMENT	AB
132	63501015	0-10V UL 885 CASCADE CABLE	AB
140	63505087	“””AERC O AM”” SERIES LABEL” - REPLACEMENT	AB
141	60304012	PIPE 35X185	AB
142	63501003	PRESSURE CABLE MASTER UL 885	AB
143	63501008	SENSOR CABLE MASTER UL 885	AB
146	63501009	GAS CABLE UL 885 - REPLACEMENT	AB
147	63501011	SENSOR CABLE MASTER 2 UL 885	AB

N	CODE	DESCRIPTION	MOD
149	63501007	IGNITION CABLE UL 885	AB
150	63501008	SENSOR CABLE MASTER UL 885	AB
152	63501002	DISPLAY CABLE UL 885	AB
153	62632088	SPARE PARTS KIT INSULATION BURNER	AB
154	63501074	SOCKET FOR RELAYS - REPLACEMENT	A
155	63502068	TEE BRASS FFF 1P 1-2	AB
156	60108004	TANK SENSOR WELL	AB
157	63501005	CONNECTION CABLE VALV. UL 885 - REPLACEMENT	A
158	63505179	RELAY BRACKET	A
159	63501107	CLICSON SIC. BASE REPLACEMENT	AB

Spare parts for models:

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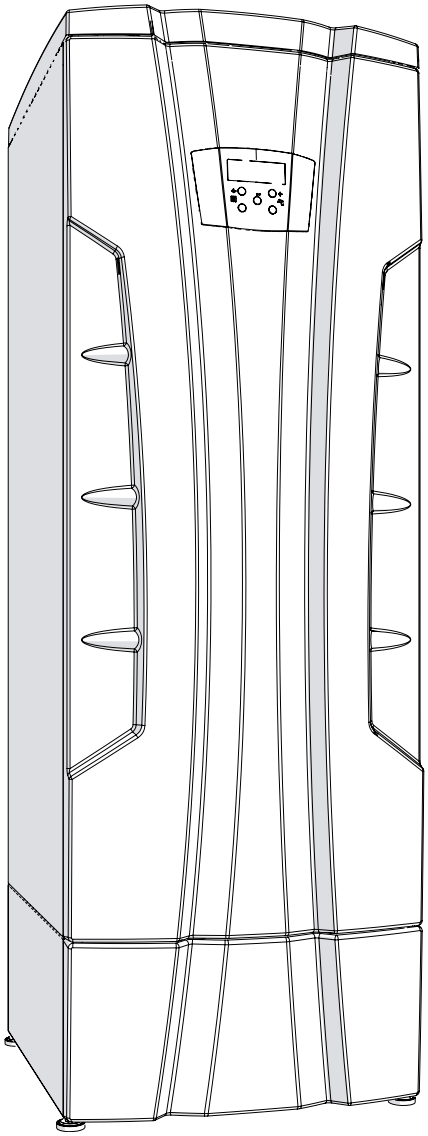
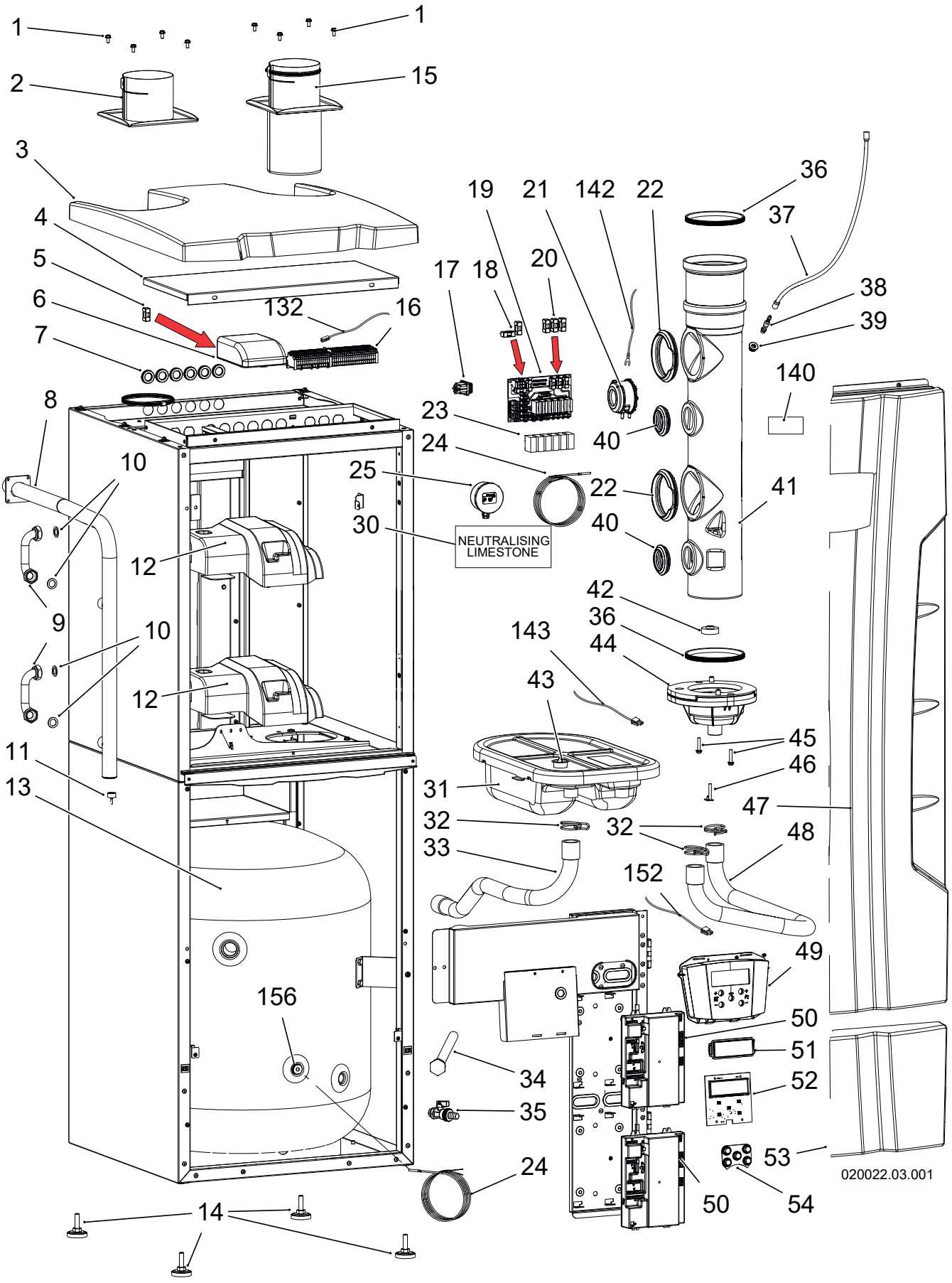
500



DESCRIPTION	MOD
AM 399R	C
AM 500R	D

WARNING!!! Only use the heater in combinations and with the spare parts listed in this manual. Failure to do so can cause severe personal injury or death.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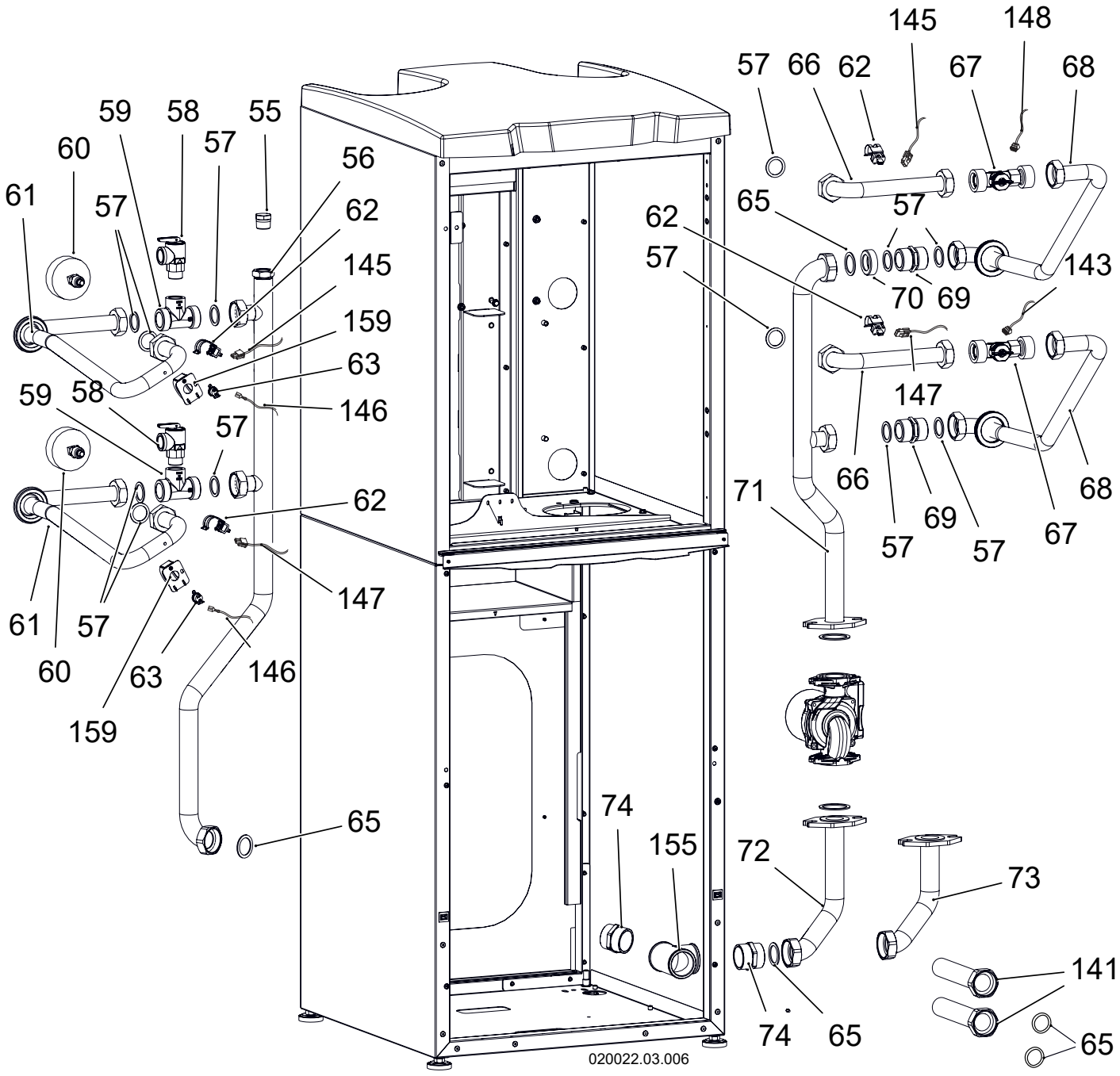
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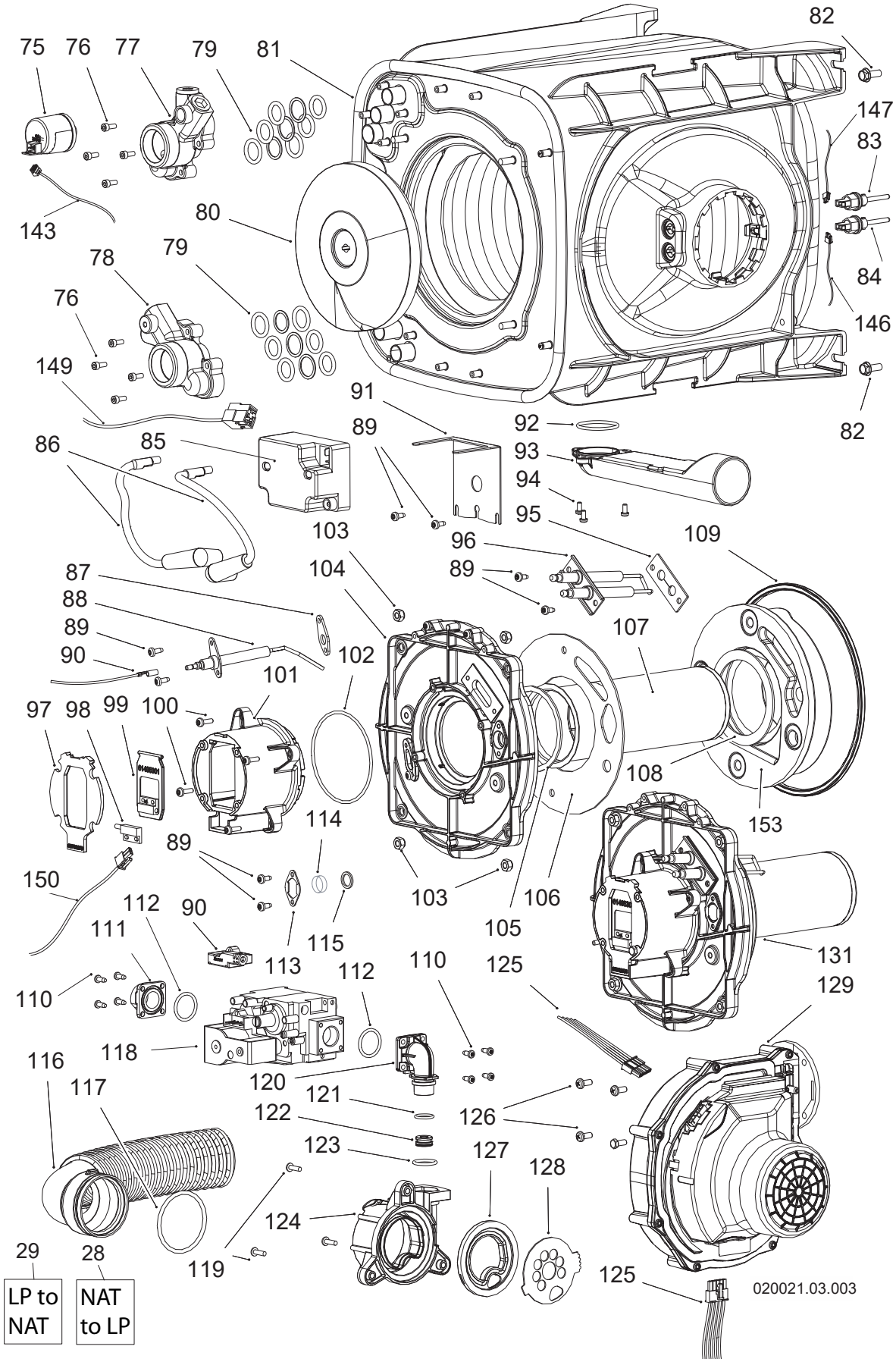
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LP to NAT
NAT to LP
020021.03.003

DESCRIPTION	MOD.
AM 399R	C
AM 500R	D

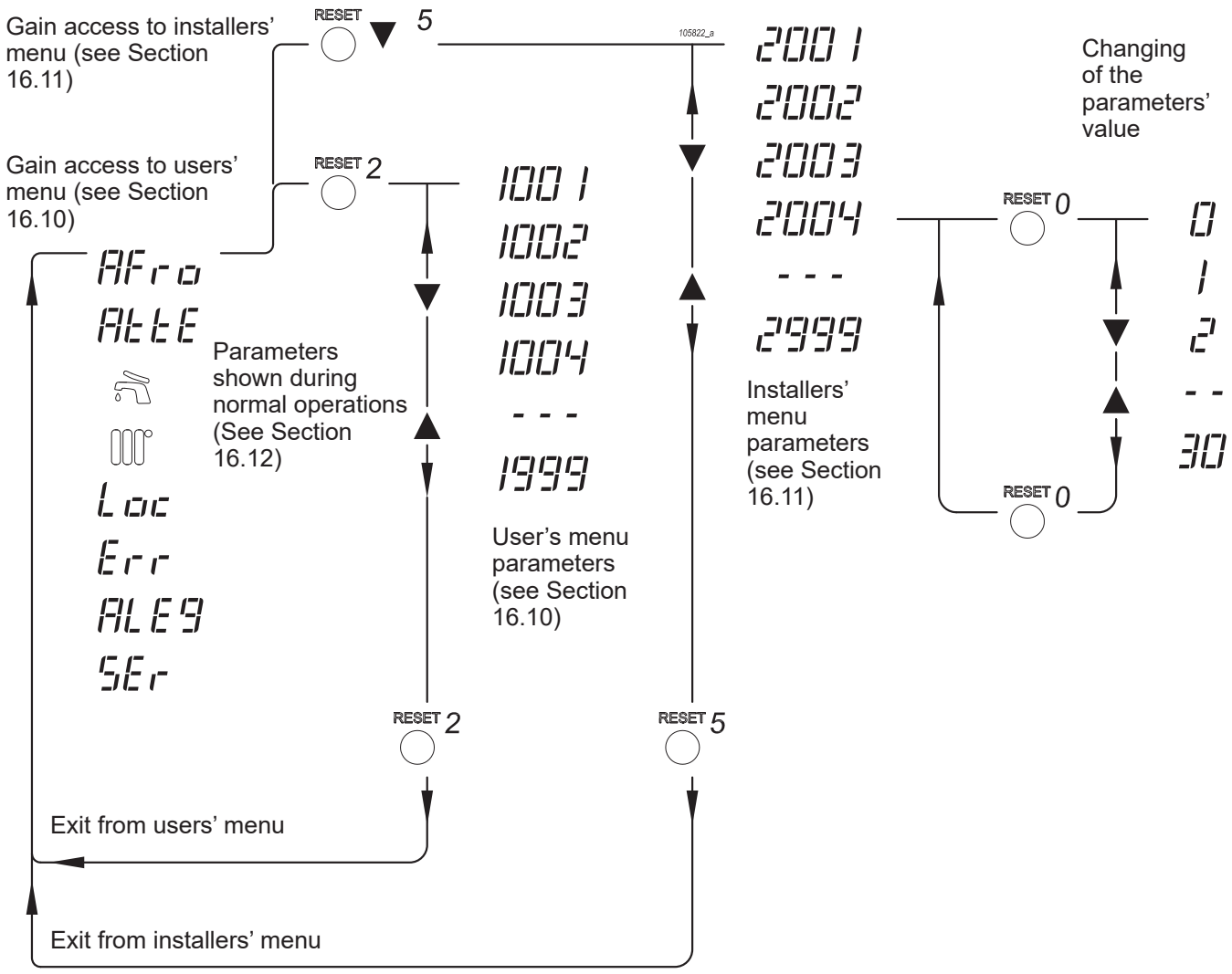
N	CODE	DESCRIPTION	MOD
1	63505097	10 SCREW KIT 6X12 WITH WASHER - REPLAC.	CD
2	63504015	3" COMPLETE AIR INLET CONNECTION - REPLA	CD
3	63505053	BLACK UPPER COVER - REPLACEMENT	CD
4	60404391	BENT BOX COVER	CD
5	63501058	10 FUSE KIT 3A DELAYED GLASS KIT - REPLA	CD
6	62118037	0-10V INTERFACE 885 120V 2D	CD
7	63505054	PVC CLAMPER INTERNAL DIAM. 22 - REPLACEMENT	CD
8	60338042	GAS COLLECTOR 1P NPT 4 HOLE FLANGE	CD
9	62626008	GAS VALVE PIPE	CD
10	63505004	10 GASKET KIT 3/4P D24 X16 SP.2	CD
11	63505089	SILICONE FIXING FOR FAN KIT - REPLACEME.	CD
12	63505055	WATER PROTECTION COVER FAN GROUP - REPL.	CD
13	63502008	ASME STORAGE TANK	CD
14	63505057	4 ADJUSTABLE FOOTS KIT - REPLACEMENT	CD
15	63504013	4" COMPLETE AIR INLET CONNECTION - REPL.	CD
16	63501037	SINGLE GREY BOARD CLAMP - REPLACEMENT	CD
16	63501039	ON FLOOR YELLOW-GREEN BOARD CLAMP - REPL	CD
16	63501040	SINGLE BLUE BOARD CLAMP - REPLACEMENT	CD
17	63501041	BLACK 2 POLES SWITCH - REPLACEMENT	CD
18	63501059	10 FUSE KIT 10 A DELAYED GLASS - REPLAC.	CD
19	63501122	CONNECTIONS BOARD 160X100 - SPARE PART	CD
20	63501058	10 FUSE KIT 3A DELAYED GLASS KIT - REPLA	CD
21	63501043	PRESSURE SWITCH ON 3,2 INWC - REPLACEME.	CD
22	63505051	GASKET D.119 H.18 I.94 - REPLACEMENT	CD
23	63501057	RELAY 115V 16A EXCHANGE - REPLACEMENT	CD
24	63501038	SENSOR 10K D6X45 L=2500 T - REPLACEMENT	CD
25	63501044	OUTDOOR SENSOR - REPLACEMENT	CD
28	62630212	NAT-LP CONV KIT 199-1000 AERCO	CD
29	62630213	LP-NAT CONV KIT 199 AND 399 AERCO	C
29	62630214	LP-NAT CONV KIT 2505007501000 AERCO	D
30	63505048	NEUTRALISING LIMESTONE 10 KG - REPLACEM-	CD
31	62801024	NEUTRALISER KIT UP TO 280KW	CD
32	63505090	FIXING SPRING - REPLACEMENT -	CD
33	63505047	CORRUGATED TUBE DIAM 28 L 800 - REPLACEM	CD
34	63505091	MAGNESIUM ANODE ROD FOR B70 - REPLACEM.	CD
35	63502029	DISCHARGE VALVE - REPLACEMENT	CD
36	63505058	GASKET EPDM D.125 - REPLACEMENT	CD
37	63505059	SILICONE PIPE D.4X8 - REPLACEMENT	CD
38	63505156	REDUCED TAP 1/4"- 3/8" - REPLACEMENT	CD
39	63501036	EPDM CLAMPER - REPLACEMENT	CD
40	63505052	JOINT D120.2 H20.5 I92 - REMPLACEMENT	CD
41	63504018	D.125 H.703 COLLECTOR-2 EXCHANGERS - RE.	CD
42	63505076	FLOAT D40X16X8,6 - REPLACEMENT	CD
43	63505075	CONICAL PLUG TAB D.29.2-32,7 - REPLACEM	CD

N	CODE	DESCRIPTION	MOD
44	63504005	CONDENSATE BLOCKED DRAIN SWITCH REPLAC.	CD
45	63505014	10 SCREW KIT 6X25 GALVANIZED	CD
46	63501045	MAGNETIC SENSOR D5,8X38 - REPLACEMENT	CD
47	63505084	COMPLETE PLASTIC FRONT COVER BLACK - RE	CD
48	63505046	CORRUGATED TUBE DIAM 28 L 1250 - REPLACE	CD
49	63505088	FRONT COVER - REPLACEMENT	CD
50	62612786	REPLACEMENT KIT 885MN10 110 V	CD
51	63505064	DISPLAY GLASS - REPLACEMENT	CD
52	63501046	DISPLAY TYPE 885LB01 - REPLACEMENT	CD
53	63505049	ABS 287X600 BASE BLACK - REPLACEMENT	CD
54	63505063	6 BUTTONS SWITCH - REPLACEMENT	CD
55	63502024	PLUG BRASS 3/4P NPT MALE - REPLACEMENT	CD
56	62621199	SUPPLY PIPE STORAGETANK	CD
57	63505020	5 GASKET KIT 1"1/4 39X29,5X2	CD
58	63502009	SAFETY VALVE 3/4P M ASME NPT 125 PSI - R	CD
59	63502025	BRASS FITTING 1P1/4 MM 3/4P F 1/2P F - R	CD
60	63502010	THERMOMANOM. D.80 0-200 PSI 60-320°F - R	CD
61	63502102	STAINLESS STEEL TUBE 304 D28 F/F 1P1/4 H	CD
62	63501048	CLIP SENSOR NTC 10 KOHM D. 28 - REPLACEM	CD
63	63501047	AUTOMATIC SAFETY THERMOSTAT 95°C REPLAC.	CD
65	63505094	10 GASKET KIT 1"1/2 - REPLACEMENT	CD
66	63502099	ASS.INOX 304 PIPE D.28 - SPARE PART	CD
67	62660038	FLOW SENSOR DN 20 1P1/4 SPARE PART	CD
68	63502100	STAINLESS STEEL PIPE 304L D28 RET NO 2V	CD
69	63502026	BRASS NIPPLE 1"1/4 F.29 H=52 - REPLACEM.	CD
70	63502027	REDUCTION 1"1/4 - 1"1/2 F.31 - REPLACEM.	CD
71	62621203	RETURN PIPE HEATER-PUMP	CD
72	62621205	RETURN PIPE TANK-PUMP 6 1-2	CD
73	62621206	RETURN PIPE TANK-PUMP 8 1-2	CD
74	63502028	BRASS NIPPLE DOUBLE 1" 1/2 - REPLACEMENT	CD
75	63502023	P. SENS. 0-10B. RAST 2.5 G1/4P WRAS - RE	CD
76	63505003	10 SCREW KIT 4X10 GALVANIZED	CD
77	63502012	BRASS CONNECTION 1"1/4 RETURN - REPLACEM	CD
78	63502011	BRASS CONNECTION 1"1/4 SUPPLY - REPLAC.	CD
79	62616111	KIT FOR 6 OR AND 3 WASHERS	CD
80	62632087	SPARE PART KIT INSULATION HE	CD
81	62649088	CONDENSING HE 58KW 12T ASME HLW	C
81	62649089	CONDENSING HE 70KW 15T ASME HLW	D
82	63505021	10 SCREW KIT 6X16 8.8 WITH WASHER	CD
83	63501055	BAYONETTE FUSE 102°C 2P MOLEX	CD
84	63501054	BAYONETTE SENSOR NTC 10K 2P MOLEX - REPL	CD
85	63501050	SPARK GENERATOR - REPLACEMENT	CD
86	63501051	CABLE UL IGNITOR CONN 90° L155 - REPLACE	CD
87	63505029	10 GASKET KIT 38X17 SP.2	CD
88	62632007	GRP DETECTION ELECTRODE	CD
89	63505012	10 SELFTAPPING SCREW KIT 4X10 TC S-TT	CD
90	63501053	MASTER GAS CABLE UL 885 - REPLACEMENT	CD
91	63505195	SHAPED BRACKET 67X54X36 -L - SPARE PART	CD

N	CODE	DESCRIPTION	MOD
92	63505081	10 OR RING 3137 KIT 2,62 X 34,60 - REPLA	CD
93	63505082	CONDENSATION DISCHARGE PIPE D.46.7 - RE	CD
94	63505022	10 SCREW KIT 4X8 ZINC TC-CR DIN4042	CD
95	63505028	10 GASKET KIT 56X21 SP.2	CD
96	62632008	GRP IGNITION ELECTRODE	CD
97	63505067	GASKET SHAPED FOR FAN - REPLACEMENT	CD
98	63501052	REED MAGNETIC POSITION SENSOR - REPLACEM	CD
99	63505066	MAGNET CLAP GROUP - REPLACEMENT	CD
100	63505015	10 SELFTAPPING SCREW KIT 4X14 TCC-NP	CD
101	63503005	COLLECTOR AXIAL FAN H.69 - REPLACEMENT	CD
102	63505068	OR RING 3325 KIT SIL 2,62 X 82,22 - RE.	CD
103	63505019	10 NUT KIT ZINC COATED 6MA	CD
104	63503006	BASE FOR FAN COLLECTOR - REPLACEMENT	CD
105	63505073	5 GASKET KIT Ø71 - 80.5 MM SP.2 - REPLA	CD
106	63505095	5 GASKET KIT D.170 F90 SP.2 - REPLACEM.	CD
107	62629045	FIBER BURNER D.70 H200	CD
108	63505072	5 GASKET KIT S.WOLL PLUS D.100 SP.2 - R.	CD
109	63505074	SIL. GASKET D.200 F.188 H.7,2 - REPLAC.	CD
110	63505009	10 SCREW KIT 4X10 ZINC TC-CR	CD
111	63503001	FLANGE GAS 32X32 3/4P - REPLACEMENT	CD
112	63505070	N.10 O-RING KIT 130 2,62 X 22,22	CD
113	63505193	KIT 5 FLANGE L21.2 H34 - SPARE PART	CD
114	63505069	PIREX GLASS D15,5 SP5 - REPLACEMENT	CD
115	63505005	10 GASKETS KIT D15,5 F11,5 SP1,5	CD
116	63504009	HIGH POWER SILENCER GROUP - REPLACEMENT	CD
117	63505096	10 O-RING KIT 156 NBR 3,53 X 52,39 - REP	CD
118	62632024	GRP SPARE GAS VALVE USA	CD
119	63505093	10 SCREW KIT 4X14 GALVANIZED - REPLACEM.	CD
120	63503002	90° INTERNAL ELBOW - REPLACEMENT	CD
121	63505006	10 O-RING KIT EPDM 1,78 X 12,42	CD
122	60114093	GAS DIAPHRAGM D.15,5 H8 HOLE D.7	CD
122	60114100	GAS DIAPHRAGM D.15,5 H8 HOLE D.9,3	D
123	63505007	10 O-RING KIT 2,62 X 17,86	CD
124	63504010	COSMOMIX GAS MIXER - REPLACEMENT	CD
125	63501010	FAN CABLE UL 885	CD
126	63505011	10 BOLT KIT 5X12 CROSS HEAD	CD
127	63505071	SHAPED GASKET DIAM. 71,2 H. 9,2 - REPACL	CD
128	60406142	AIR MIXER DIAPHRAGM 7 D.10-1 D.17	CD
129	63501056	BOILER FAN 135 KW 115V - REPLACEMENT	CD
131	63503007	GRP GAS AND BURNER 12/15 LAPS - REPLACE.	CD
132	63501015	0-10V UL 885 CASCADE CABLE	CD
140	63505087	"AERCO AM" SERIES LABEL - REPLACEMENT	CD
141	60304012	PIPE 35X185	CD
142	63501003	PRESSURE CABLE MASTER UL 885	CD
143	63501008	SENSOR CABLE MASTER UL 885	CD
145	63501012	SENSOR CABLE SLAVE 2 UL 885	CD
146	63501009	GAS CABLE UL 885	CD

N	CODE	DESCRIPTION	MOD
147	63501011	SENSOR CABLE MASTER 2 UL 885	CD
147	63501012	SENSOR CABLE SLAVE 2 UL 885	CD
148	63501006	SENSOR CABLE SLAVE UL 885	CD
149	63501007	IGNITION CABLE UL 885	CD
150	63501006	SENSOR CABLE SLAVE UL 885	CD
150	63501008	SENSOR CABLE MASTER UL 885	CD
152	63501002	DISPLAY CABLE UL 885	CD
153	62632088	SPARE PARTS KIT INSULATION BURNER	CD
155	63502068	TEE BRASS FFF 1P 1-2	CD
156	60108004	TANK SENSOR WELL	CD
159	63501107	CLICSON SIC. BASE REPLACEMENT	CD

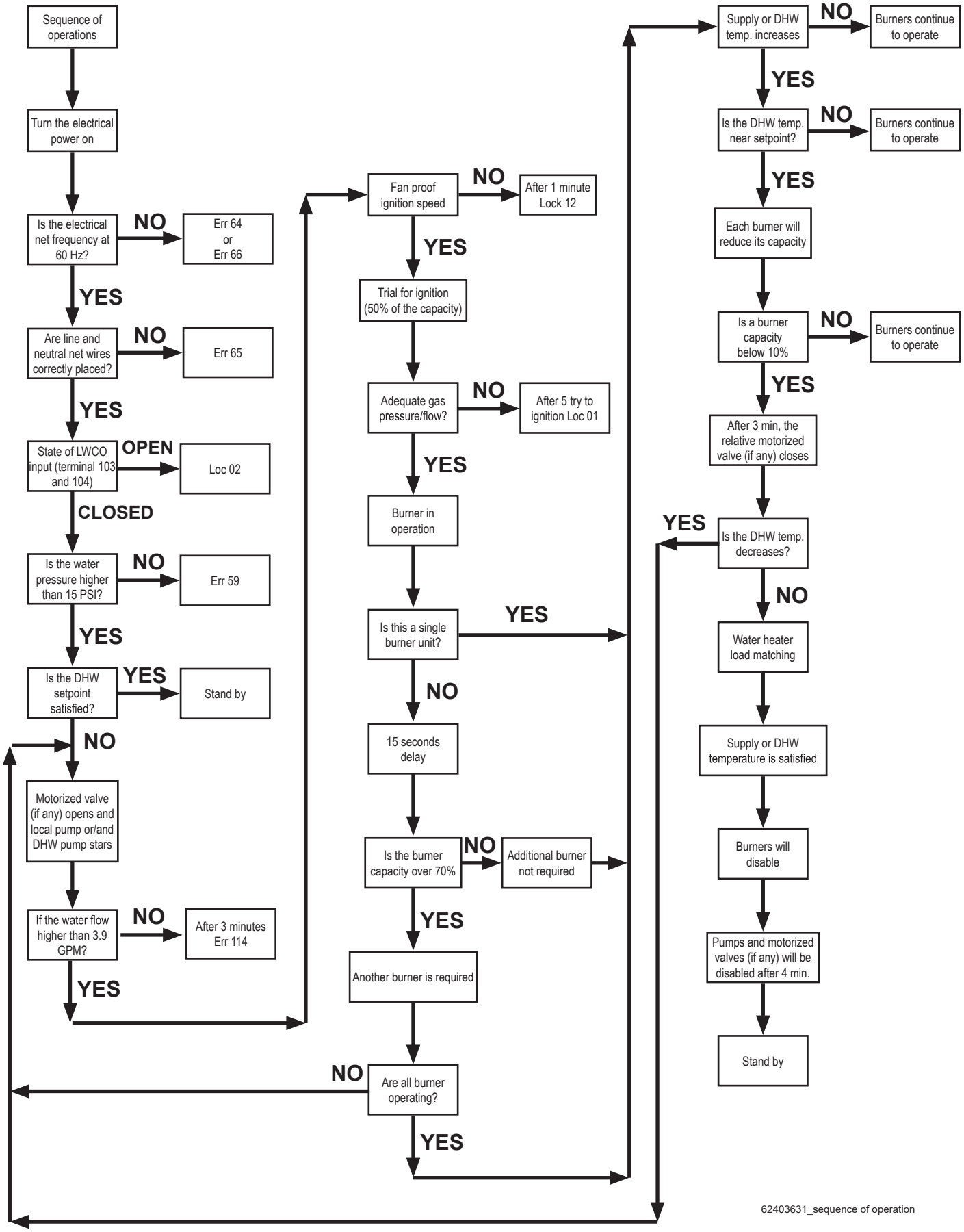
20 - READ OUT FLOW CHART



Where:

Simbol	Description
RESET 0	Push RESET button
RESET 2	Push and hold the RESET button for at least 2 seconds
RESET 5	Push and hold the RESET button for at least 5 seconds
RESET ▼ 5	Push and hold together the RESET button and ▼ button for the time in seconds displayed
▼	Push ▼ button
▲	Push ▲ button

21 - SEQUENCE OF OPERATION



22 - FACTORY MENU

⚠ WARNING!!! Changing these parameters could cause the heater and the system to malfunction. For this reason, only a qualified technician who has in-depth knowledge of the heater should change them. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

⚠ WARNING!!! Pay attention when entering the Factory Menu, changes may cause the unit to start. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

CAUTION!!! On multiburner units (399 and 500) display is always connected to the Burner 1 (Master). To change parameters to the other burners you have to move the display connection as per Section 17.8.

Ref.	Parameter's description	Range
3001	Burner logic address	0 = No cascade, 1 = Burner 1 (Master), 2 to 4 = Burner 2 to 4 (slave burners)
3002	Fan speed range	0 to 4
3003	Display units	C = °C and bar units; F = °F and PSI units;
3004	Water pressure sensor	0 = Disabled; 1 = Enabled; 2 = N/A; 3 = N/A
3005	Burner flapper valve	0 = Disabled; 4 = Enabled; 8 = N/A; 12 = N/A;
3006	Water flow sensor	0 = Disabled; 16 = N/A; 32 = N/A; 48 = Enabled
3007	Condensate blocked drain detector	EnAb = Enabled; dISA = Disabled
3008	Flue gas detector	SEnS = Sensor; StCH = Switch
3009	Outdoor thermistor type	10 = 10kohms; 12 = 12kohms;
3010	Other thermistor type	10 = 10kohms; 12 = 12kohms;
3011	Pump MODE	0 = Local pump; 1 = N/A; 2 = N/A; 3 = N/A;
3012	DHW mode	0 = no DHW; 1 = DHW store with sensor; 2 = DHW store with thermostat; 3 = N/A; 4 = N/A; 5 = N/A
3013	Reset Err 115	EnAb = Enabled; dISA = Disabled
3015	Reset curve design: Maximum heating supply temperature (This parameter is overruled by 3017 parameter)	68°F to 194°F
3016	Reset curve design: Minimum heating supply temperature	68°F to 194°F
3017	Maximum supply temperature (This parameter overrule 3015 parameter)	68°F to 194°F
3018	Minimum supply temperature	68°F to 194°F
3020	Type of water flow sensor	0 = N/A; 1 = DN8; 2 = DN 10; 3 = DN 15; 4 = DN 20; 5 = DN 25
3022	Minimum water pressure	0 to 74 PSI
3035	Minimum heat exchanger water flow	0 to 26.4 GPM
3050	Number of slave burners	0 to 3
3085	Modbus address	0 to 126
3086	Number of Stopbits	1 or 2
3100	Material selection	ABS; CPVC; PVC; SST; PP.
3101	Country selection	US = United States; CA = Canada;
Switch "S4"	Position of Switch "S4" (see Figure 17-16)	On or Off

N/A = Not Applicable

22 - FACTORY MENU

	AM - R water heaters' parameters			
Factory settings	Single burner (mod. 199 and 250)	Burner 1 (Master) (mod. 399 and 500)	Burner 2 (mod. 399 and 500)	Custom. values
2	1	1	2	
0	199 = 0 250 = 2.	399 = 0 500 = 2.	399 = 0 500 = 2.	
F	F	F	F	
1	1	1	0	
4	0	4	4	
48	48	48	48	
Enab	Enab	Enab	dISA	
SEnS	SEnS	SEnS	SEnS	
10	10	10	10	
10	10	10	10	
0	0	0	0	
0	0	0	0	
Enab	Enab	Enab	Enab	
179°F	N/A	N/A	N/A	
68°F	N/A	N/A	N/A	
140°F	140°F	140°F	140°F	
89°F	89°F	89°F	89°F	
3	4	4	4	
14	14	14	14	
See individual burner setting.	199=11 250=12	399=11 500=12	399=11 500=12	
3	0	1	0	
1	1	1	1	
1	1	1	1	
PVC	PVC	PVC	PVC	
US	US	US	US	
On	On	On	Off	

The heater's micro-processor makes this menu of parameters available to the qualified technician for the setting of the appliance.
To enter this menu operate as follow:

1. turn the main electrical supply Off;
2. press and hold, in the same time, RESET key and ▼ key;
3. keeping the before mentioned button pressed, turn the power on;
4. wait until the word "init" is displayed or until display start to show the 3000 parameters;
5. leave before the RESET button and after the ▼ key;
6. parameters 3000 start to be displayed;
7. press and release ▼ and ▲ buttons to scroll through the list of the parameters;
8. once the parameter has been selected, it can be changed pressing the RESET button (value start to blinking) and using the ▼ and ▲ keys you can change the value;
9. press RESET key to save the change;
10. wait 10 seconds;
11. turn the main electrical supply Off;
12. turn the main electrical supply On to leave the Factory menu.

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