AERCO
A WATTS Brand

Operation & Maintenance Manual

AM Series

Natural Gas and Propane Gas Modulating Condensing Boilers and Water Heaters

Other documents for this product include:

TAG-0072 GF-146-E Electrical Power Guide
TAG-0073 GF-146-G Gas Supply Guide
TAG-0074 GF-146-P Piping Application Guide
TAG-0075 GF-146-V Venting Guide

Applies to serial numbers:

From 18170091 and up.

Disclaimer

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FOREWORD

The Advanced Modular (AM) Series represents the latest in high efficiency, condensing boiler and water heater technology. The AM Series has a unique modular design that provides exceptional reliability, serviceability, and fuel savings from 399 to 1000 MBTU. Each unit is comprised of between two and four independent thermal modules firing up to 250 MBTU each at 5:1 individual turndown. This allows for superior temperature control and low-cycling operation. This unique design provides the multiple boiler redundancy required in a boiler plant, but in a single unit installation with one set of water connections, one gas connection, and one vent connection. When needed, multiple units are easily co-located to provide a boiler plant with the highest efficiency, turndown, and redundancy in the smallest footprint. Multiple units are sequenced through the AERCO AM Cascade Manager. Each unit is equipped for Modbus communication to a BAS. High efficiencies and low vent temperatures mean the unit can be vented in PVC, CPVC, Polypropylene, and AL29-4C vent materials. The front-access design also means the unit is very simple to maintain and service.

Features:

- High Efficiency Condensing Boiler/Water Heater
- Natural Gas or Propane
- Superior Turndown 8:1 to 20:1 (depending on unit)
- Low NOx Emission <20ppm
- Direct or Conventional Vent with PVC, CPVC, Polypropylene, or AL29-4C materials
- Concentric Vent Capability
- Common Vent Capability
- Side wall common venting with no additional check valve
- Small, Doorway-Size Footprint
- Superior Reliability
- Minimal Maintenance
- Easy Front Access for Serviceability
- Zero Side Clearance
- Supports Integration to BAS System
- Modbus Communication Standard
- Integrated isolation valves, flow meters, and condensate neutralizer

SECTION 1: GENERAL INFORMATION

1.1 Warnings & Cautions

In addition to all the requirements included in this AERCO Instruction Manual, the installation of units MUST conform with local building codes, or, in the absence of local codes, ANSI Z223.1 (National Fuel Gas Code Publication No. NFPA-54) for gas-fired boilers and ANSI/NFPASB for LP gas-fired boilers. Where applicable, the equipment shall be installed in accordance with the current Installation Code for Gas Burning Appliances and Equipment, CSA B149.1, and applicable Provincial regulations for the class; which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

IMPORTANT!

This Instruction Manual is an integral part of the product and must be maintained in legible condition. It must be given to the user by the installer and kept in a safe place for future reference.

WARNING!

Failure to comply with provisions, warnings, and cautions provided in this manual can lead to extensive property damage and/or personal injury or death.

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

WARNING!

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

User: The installation and maintenance sections of this manual are for use only by a qualified heating installer. Refer to Chapter 9: Operation for user information.

Installation and Alterations: Only a Qualified installer must carry out the installation and calibration of the boiler. Never modify the boiler or its components in any way.

Overheating: 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.

Water Contamination: 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.

Ensure the boiler and its controls are protected from dripping or spraying water during normal operation or service.

Spare Parts: Only use the boiler with the accessories and spares listed in this manual. Failure to do so can cause equipment damage or dangerous conditions.

NOTE:

When calling or writing about the boiler, have the unit model and serial number as seen on the unit rating plate.

CAUTION!

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

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

- Incorrect installation or failure to comply with this or any other instruction provided by the manufacturer;
- Failure to comply with the applicable local and/or national regulations in force.
- Incorrect use of this appliance.
- Inadequate or incorrect service
- Inadequate or incorrect maintenance.

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.

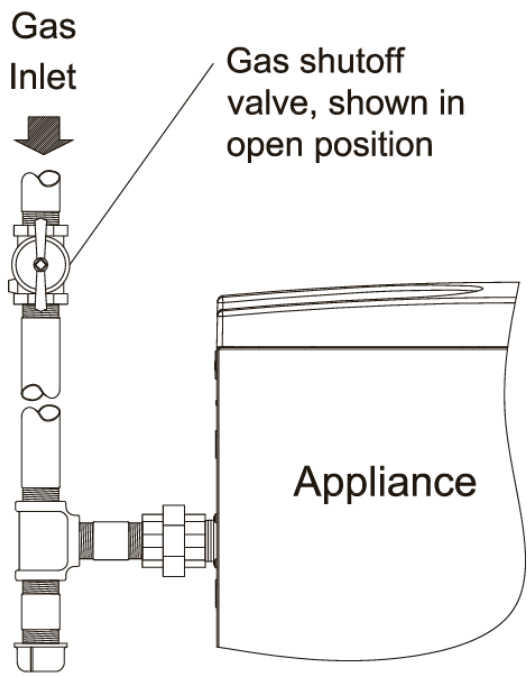
B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

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 **OFF**.
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 **OFF**.
3. Close the manual gas shutoff valve turning the knob clockwise. Do not force.

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1.2 Emergency Shutdown

If overheating occurs or the gas supply fails to shut off, close the manual gas shutoff valve (Figure 1-1) located external to the unit.

NOTE:

The Installer must identify and indicate the location of the emergency shutdown manual gas valve to operating personnel.

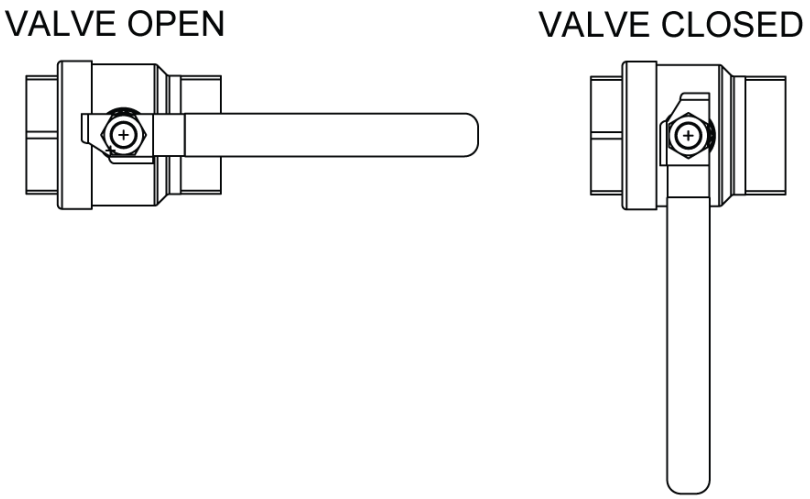


Figure 1-1: Manual Gas Shutoff Valve

IMPORTANT: FOR MASSACHUSETTS INSTALLATIONS:

Boiler Installations within the Commonwealth of Massachusetts must conform to the following requirements:

- Boiler must be installed by a plumber or a gas fitter who is licensed within the Commonwealth of Massachusetts.
- Prior to unit operation, the complete gas train and all connections must be leak tested using a non-corrosive soap.
- The vent termination must be located a minimum of 4 feet above grade level. If side-wall venting is used, the installation must conform to the requirements **in 248 CMR 5.08 (2).**
- Must be installed according to all local codes.

SECTION 2: FUNCTIONAL OVERVIEW

2.1 INTRODUCTION

2.1.1 AM Water Heaters and Boilers

Figure 2-1 shows the exterior appearance of the AM Series of boilers and water heaters. The AM Series comes in four functionally sized models; the 399, 500, 750, and 1000. Boilers are appended with a B (i.e. AM 1000B), and water heaters with a W (i.e. AM 1000W).

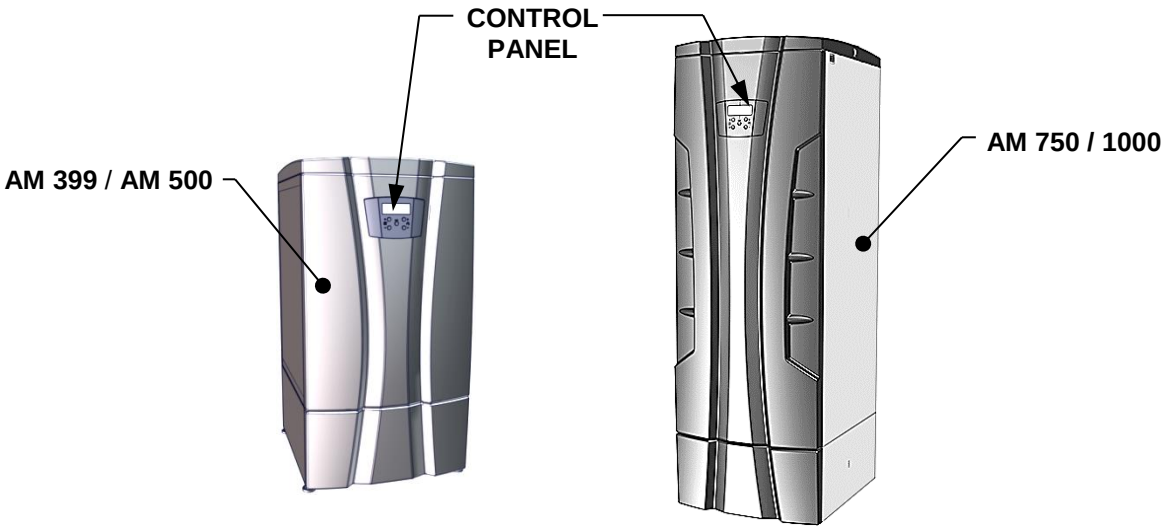


Figure 2-1: AM Boiler or Water Heater (AM 399/500 Left, AM 750/ AM 1000 Right)

2.1.2 AM Rapid Recovery (AMR) Skid Option

Figure 2-2 shows the AMR option, comprised of an AM water heater, thermal buffer tank, low water cutoff (LWCO), recirculation loop piping, and recirculation loop pump.

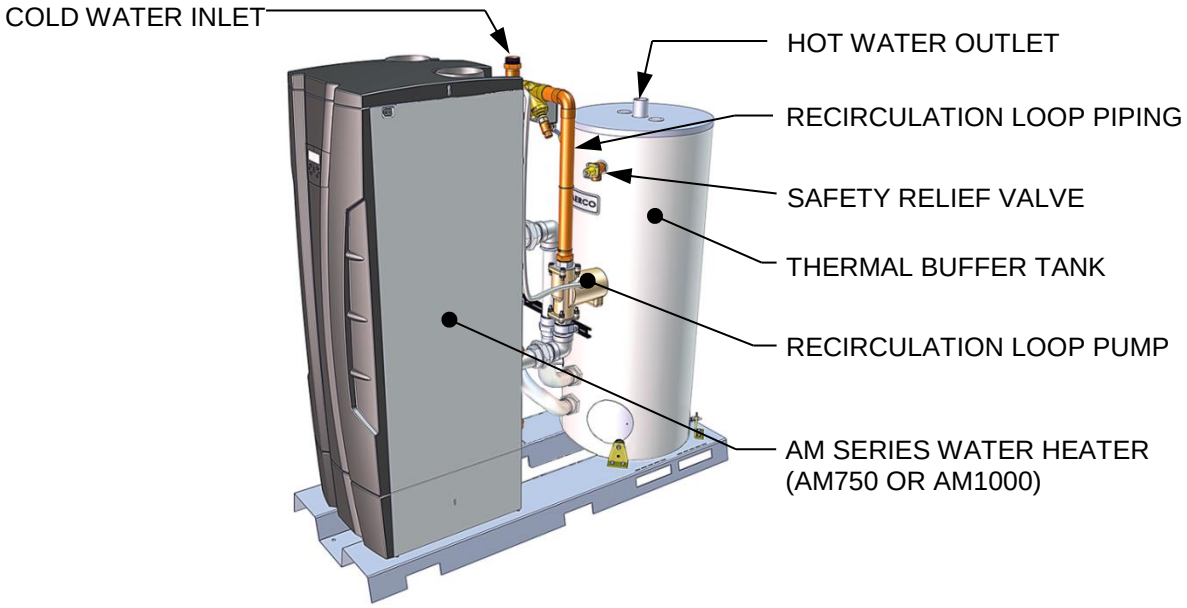


Figure 2-2: AM Water Heater with Rapid Recovery Option (AM 1000RS Shown)

2.2 Intended Use – Boilers

The gas-fired condensing AM Series boilers are designed to be used in central heating systems. Any other use is prohibited.

Heat is always guaranteed for the production of domestic hot water since it is given priority over space heating demands. Follow the specific procedure in Section 9.7 for boiler adjustment for domestic hot water temperature. This boiler can be connected to an indirect storage tank for the production of domestic hot water (Section 4.10).

This unit can be installed with a direct venting system or with a one pipe vent system and draw combustion air from the room.

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

A heating system can be configured to function at a temperature range of between 68°F *(20°C)* and 180°F *(82°C)*.

The AM Series boiler can be connected to a room On/Off control (Section 5.2.1).

An outdoor air temperature sensor must also be connected to the boiler for an outdoor reset supply temperature control for maximum fuel efficiency and comfort. For further information on the outdoor-air reset, refer to Section 9.10.

2.3 Intended Use – Water Heaters

The gas fired condensing AM Series water heaters are designed to be used for domestic hot water production. Any other use is prohibited.

The water heaters must be connected to a storage tank for the production of domestic hot water. When connecting the water heater to the storage water heater, the installer must consider the head loss of the water heater (see figure 4-4), the head loss of the piping system and the head loss of the storage water heater to size adequate pumps.

This unit can be installed with a direct venting system or with a one pipe vent system and draw combustion air from the room.

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

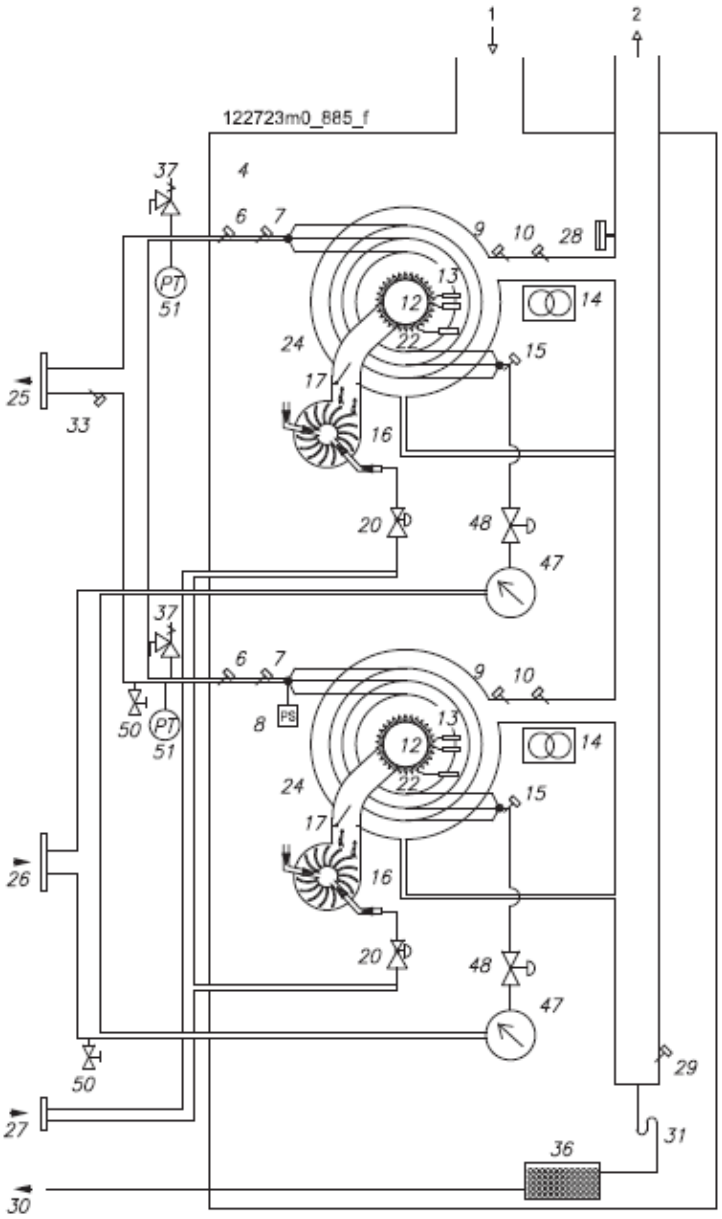
2.4 Intended Use – Water Heaters and Boilers with AMR Option

This option is available for AERCO AM Series water heaters and boilers. All functional descriptions that apply to AM water heaters and boilers apply to the AMR option, except where specifically noted.

The AMR option reduces thermal loss by using a pump to efficiently recirculate a mix of building recirculated water (if used on site), fresh potable water, and water in the lower portion of the tank for heating in the heat exchanger. A functional diagram may be found at the end of this chapter.

2.5 AM Series Functional Schematics

2.5.1 AM 399 / 500 Functional Schematic

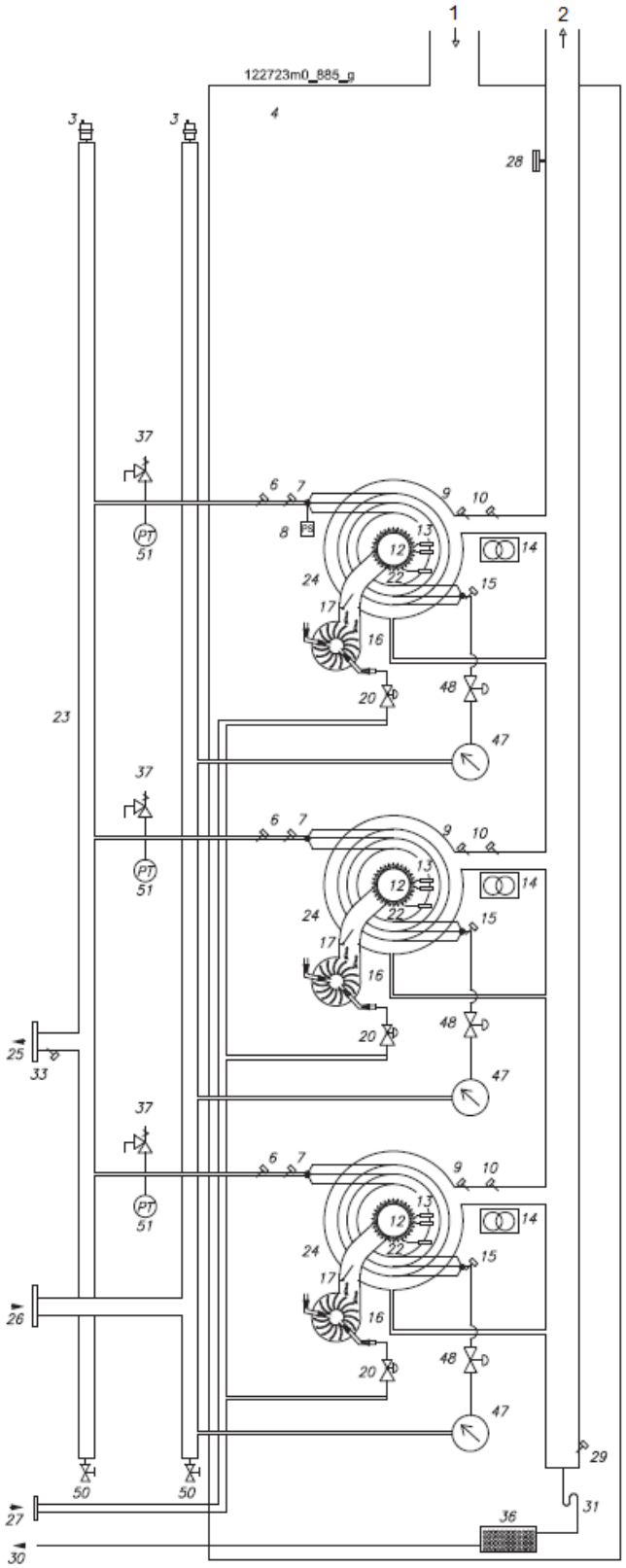


LEGEND

1 - Air inlet
2 - Flue exhaust
3 - Automatic air vent
4 - Sealing chamber
6 - High limit supply temperature switch
7 - Supply temperature sensor
8 - Water pressure sensor
9 - Flue gas temperature sensor
10 - High limit flue gas temperature fuse
12 - Premix burner
13 - Ignition electrodes
14 - ignitor
15 - Return temperature sensor
16 - Modulating PWM fan
17 - Back flue preventer
20 - Gas valve
22 - Detection electrode
23 - Supply and return manifolds
24 - CRV Stainless steel heat exchanger
25 - Water supply
26 - Water return
27 - Gas inlet
28 - Blocked flue pressure switch
29 - Condensing blocked drain switch
30 - Condensing drain
31 - Condensate Siphon
33 - Header temperature sensor
36 - Condensate neutralizer box
37 - ASME Safety relief valve (Boiler)
P-T relief valve (Water Heater)
47 - Water Flow meter
48 - Motorized valve (optional)
50 - Drain valve
51 - Pressure/temperature gauge

Figure 2-3: 399 / 500 (Boiler & Water Heater) Functional Schematic

2.5.2 AM 750 Functional Schematic



LEGEND

1 - Air inlet
2 - Flue exhaust
3 - Automatic air vent
4 - Sealing chamber
6 - High limit supply temperature switch
7 - Supply temperature sensor
8 - Water pressure sensor
9 - Flue gas temperature sensor
10 - High limit flue gas temperature fuse
12 - Premix burner
13 - Ignition electrodes
14 - ignitor
15 - Return temperature sensor
16 - Modulating PWM fan
17 - Back flue preventer
20 - Gas valve
22 - Detection electrode
23 - Supply and return headers
24 - CRV Stainless steel heat exchanger
25 - Water supply
26 - Water return
27 - Gas inlet
28 - Blocked flue pressure switch
29 - Condensing blocked drain switch
30 - Condensing drain
31 - Condensate Siphon
33 - Header temperature sensor
36 - Condensate neutralizer box
37 - ASME Safety relief valve (Boiler)
P-T relief valve (Water Heater)
47 - Flow meter
48 - Motorized valve (optional)
50 - Drain valve
51 - Pressure/temperature gauge

Figure 2-4: 750 (Boiler & Water Heater) Functional Schematic

2.5.3 AM 1000 Functional Schematic

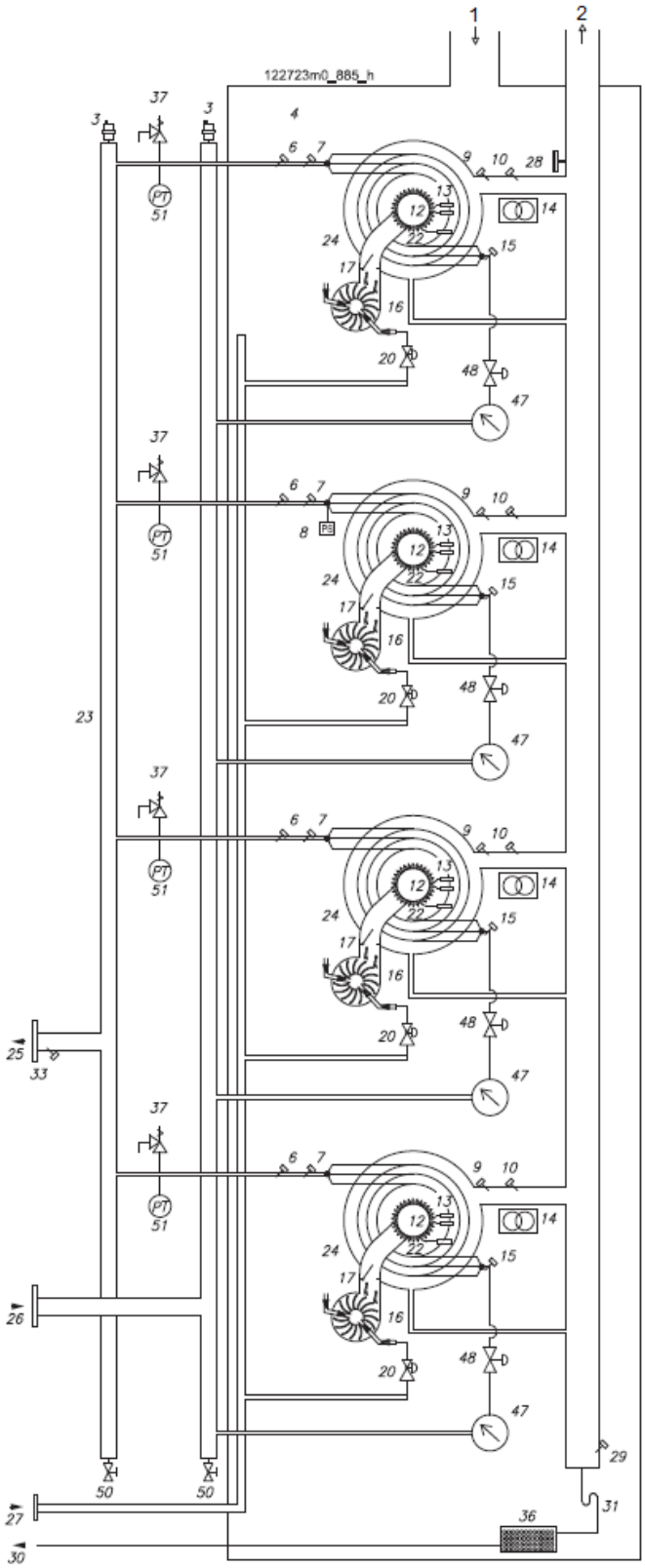


Figure 2-5: AM 1000 (Boiler & Water Heater) Functional Schematic

2.5.4 AMR Functional Schematic

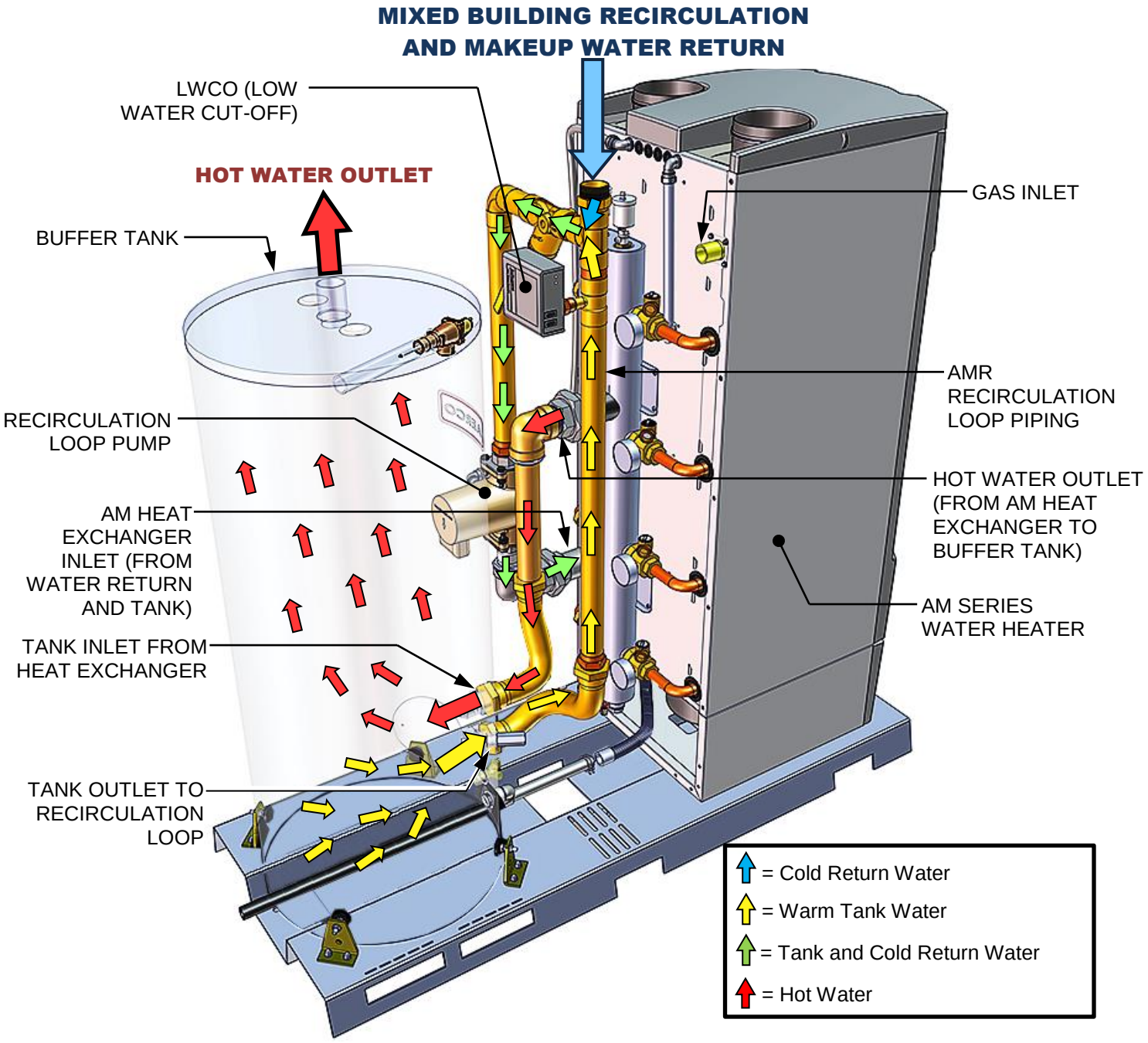
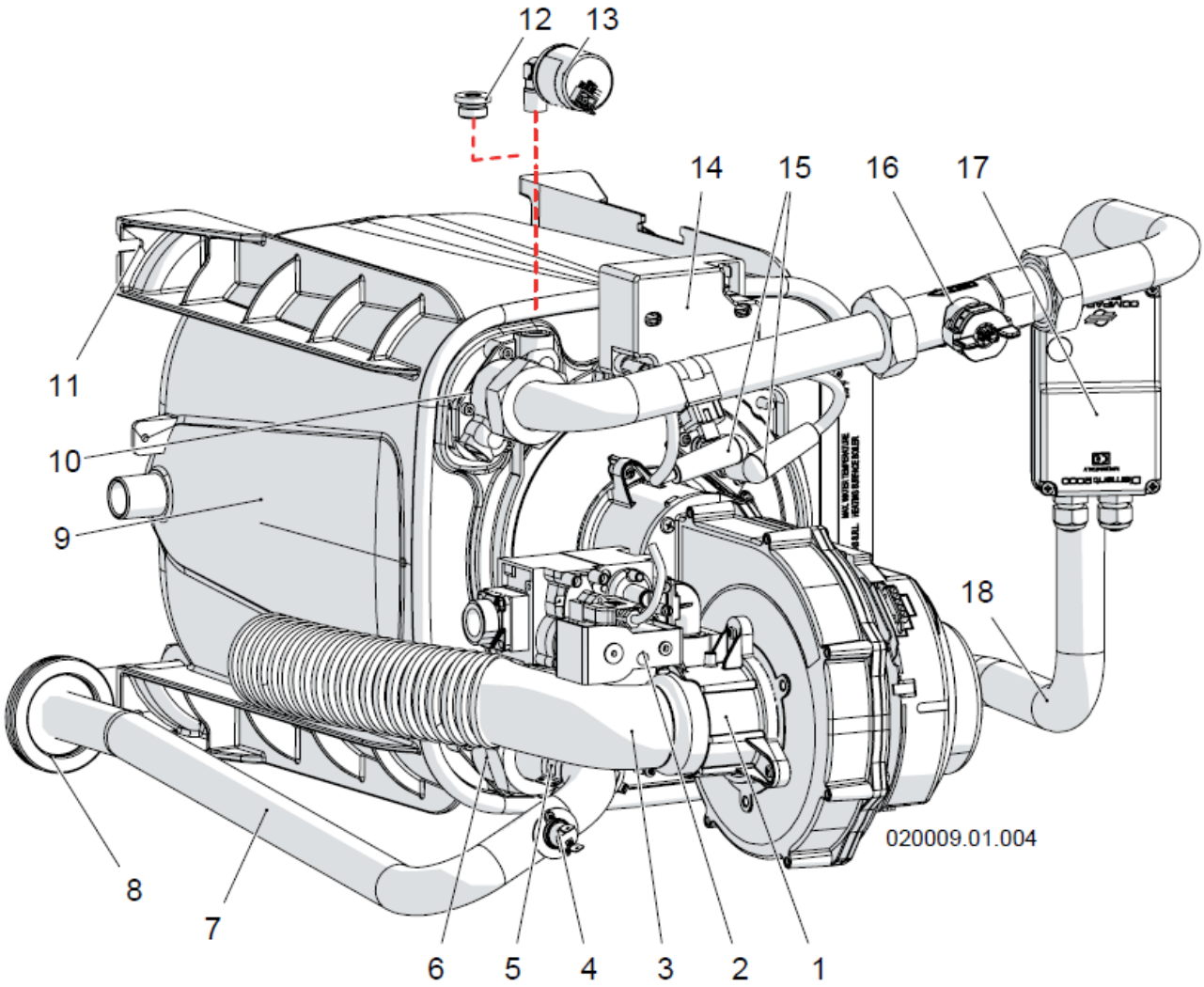


Figure 2-6: AMR Function Diagram (Buffer Tank Transparent for Clarity

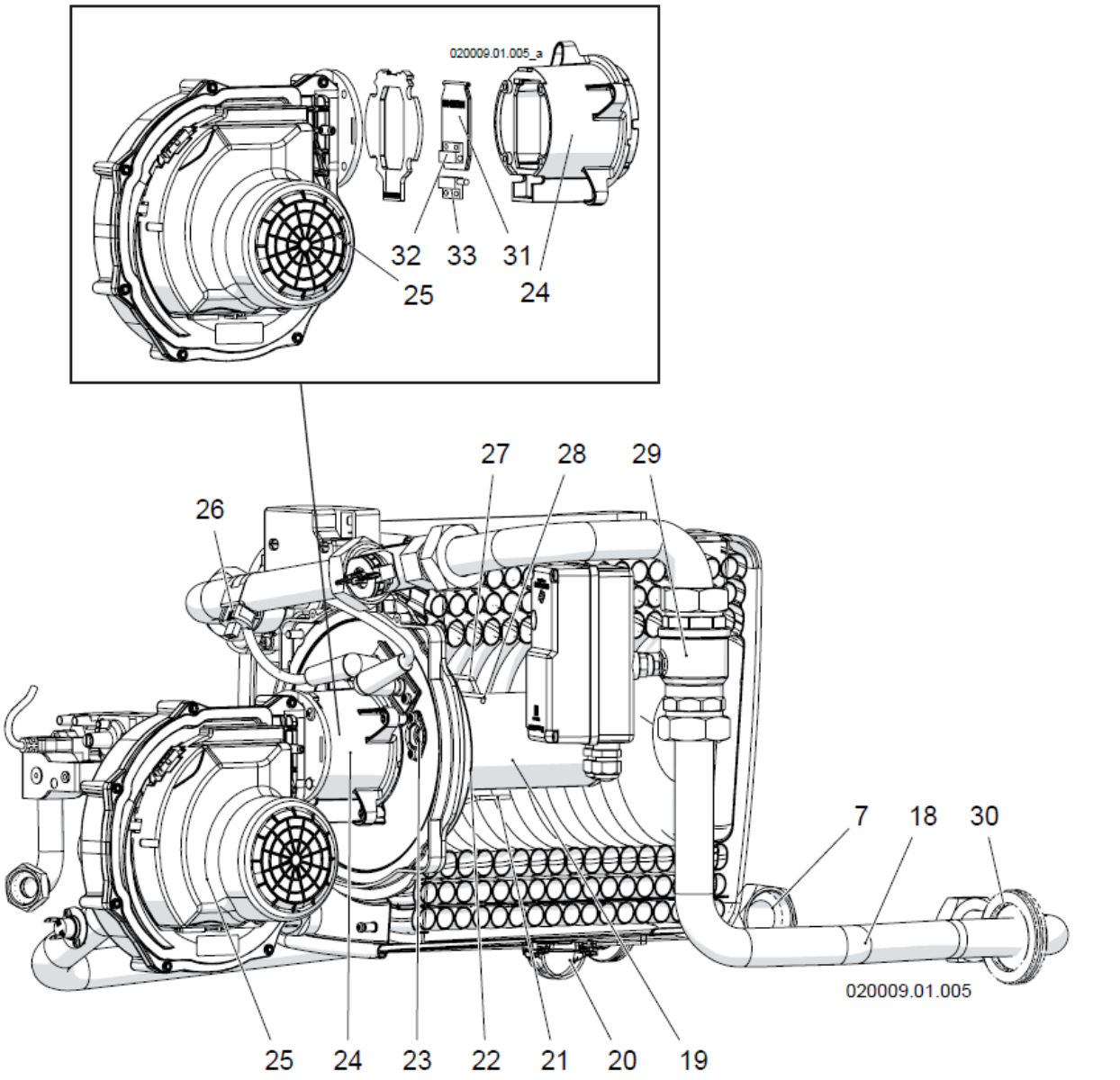
2.6 Main Components

2.6.1 Burner



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
12 - Plug (present on BURNER 2, 3 and 4 if any)
13 - Water pressure sensor (present on Burner 1 only)
14 - Spark generator
15 - Ignitors covers
16 - Water flow sensor (par. 1062)
17 - Motorized valve (optional)
18 - Return pipe

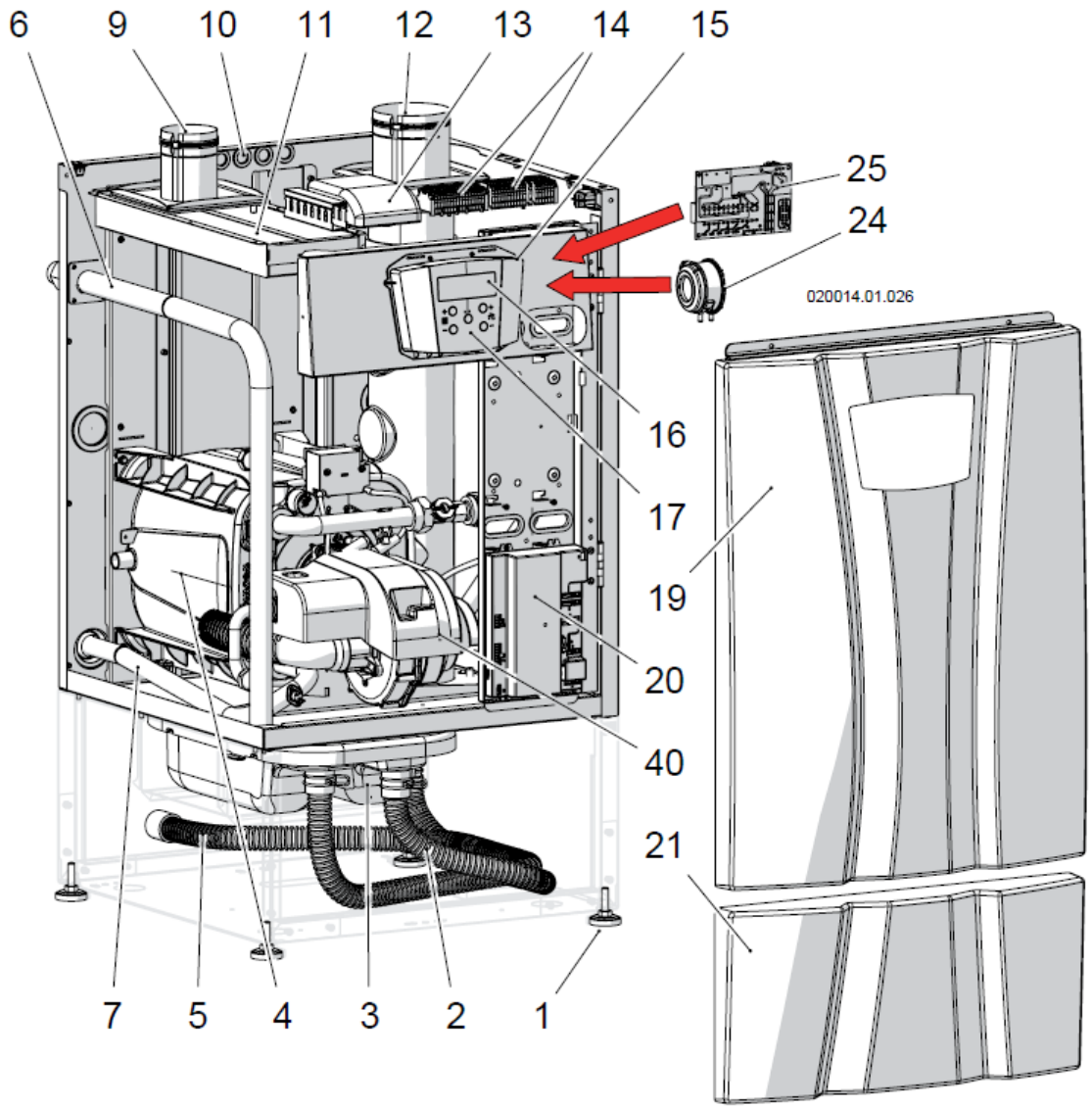
Figure 2-7: Burner Main Components



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
29 - Motorized valve body (optional)
30 - Gasket
31 - Flapper valve
32 - Flapper magnet
33 - Flapper sensor

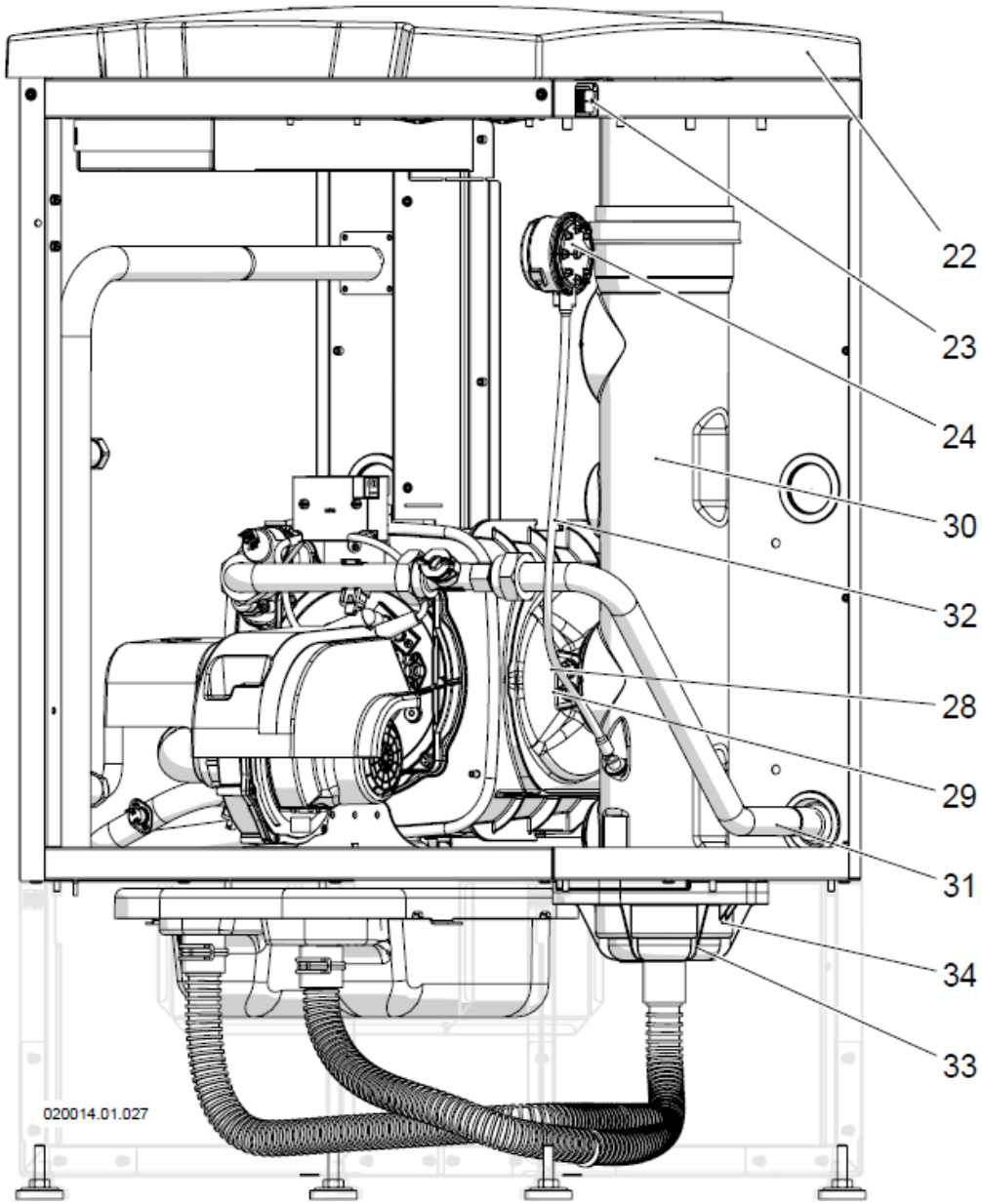
Figure 2-8: Burner Main Components

2.6.2 AM Series 199 and 250 Main Components



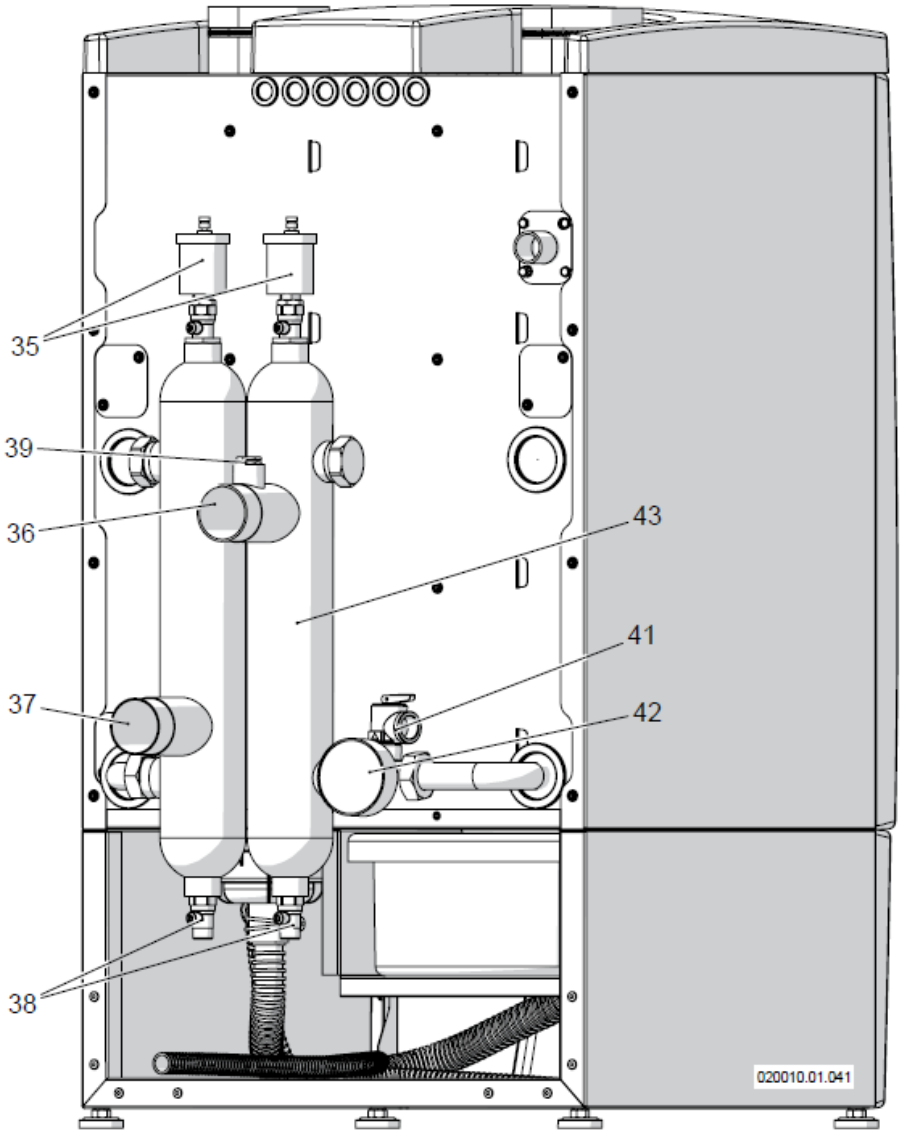
1 - Leveling feet
2 - Condensate hose that coming from heater's flue exhaust
3 - Condensate neutralizer box
4 - Heat exchanger
5 - Condensate discharge hose
6 - Gas inlet pipe
7 - Supply pipe
9 - Air inlet connection
10 - Electrical cable passages
11 - Air filter
12 - Flue exhaust connection
13 - 885IF board (Optional)
14 - Electrical terminals (Junction box)
15 - Control panel cover
16 - Display
17 - Control keys
19 - Front cover
20 - Control board
21 - Bottom front cover

Figure 2-9: AM Series 199 and 250 Main Components



22 - Top cover
23 - Main electrical switch
24 - Flue blocked pressure switch
25 - Electrical board
28 - Flue gas temperature sensor (Blue color connector) (1006)
29 - High limit flue gas temperature fuse (Red color connector)
30 - Flue gas exhaust manifold
31 - Water Return connection
32 - Flue blocked pressure switch pipe connection
33 - Condensate blocked drain magnetic switch

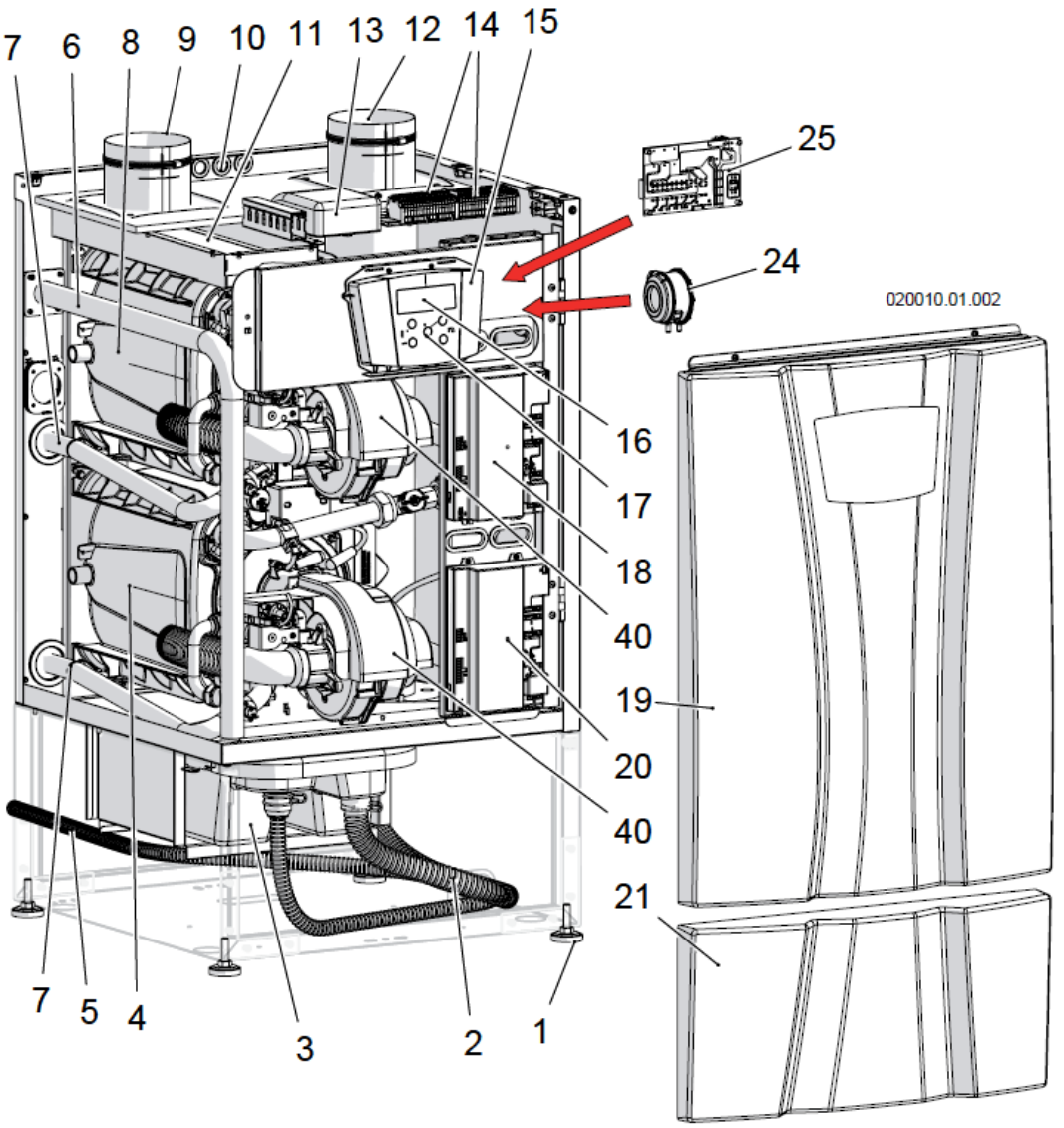
Figure 2-10: AM Series 199 and 250 Main Components



34 - Flue gas manifold cap
35 - Automatic air vent
36 - Water Supply connection
37 - Water Return connection
38 - Draining valves
39 - Header temperature sensor (1102)
40 - Fan cover
41 - Safety relief valve (P-T safety relief valve on AM - W water heater)
42 - Pressure and temperature gauge
43 - Supply and return Headers

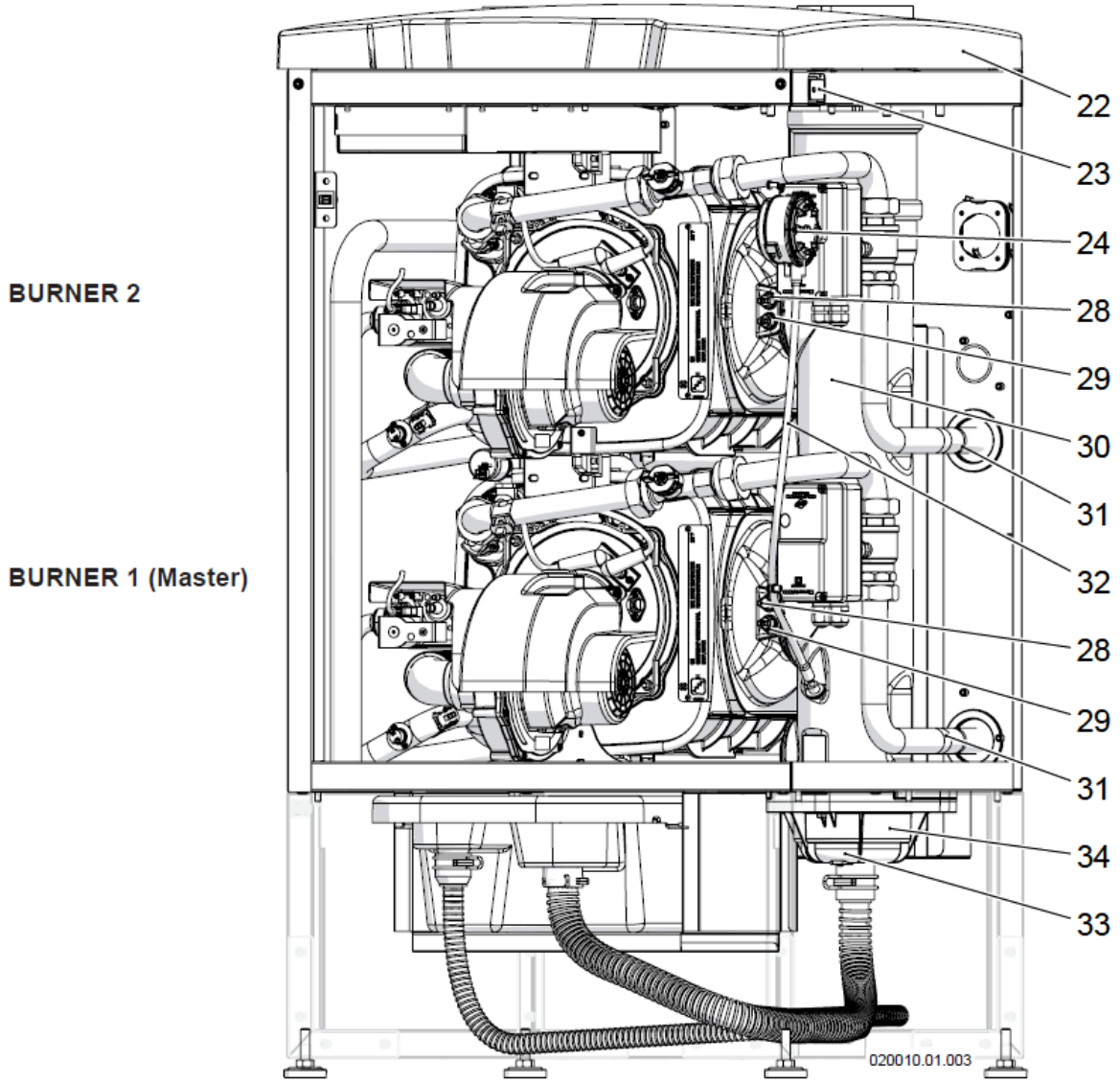
Figure 2-11: AM Series 199 and 250 Main Components

2.6.3 AM Series 399 and 500 Main Components



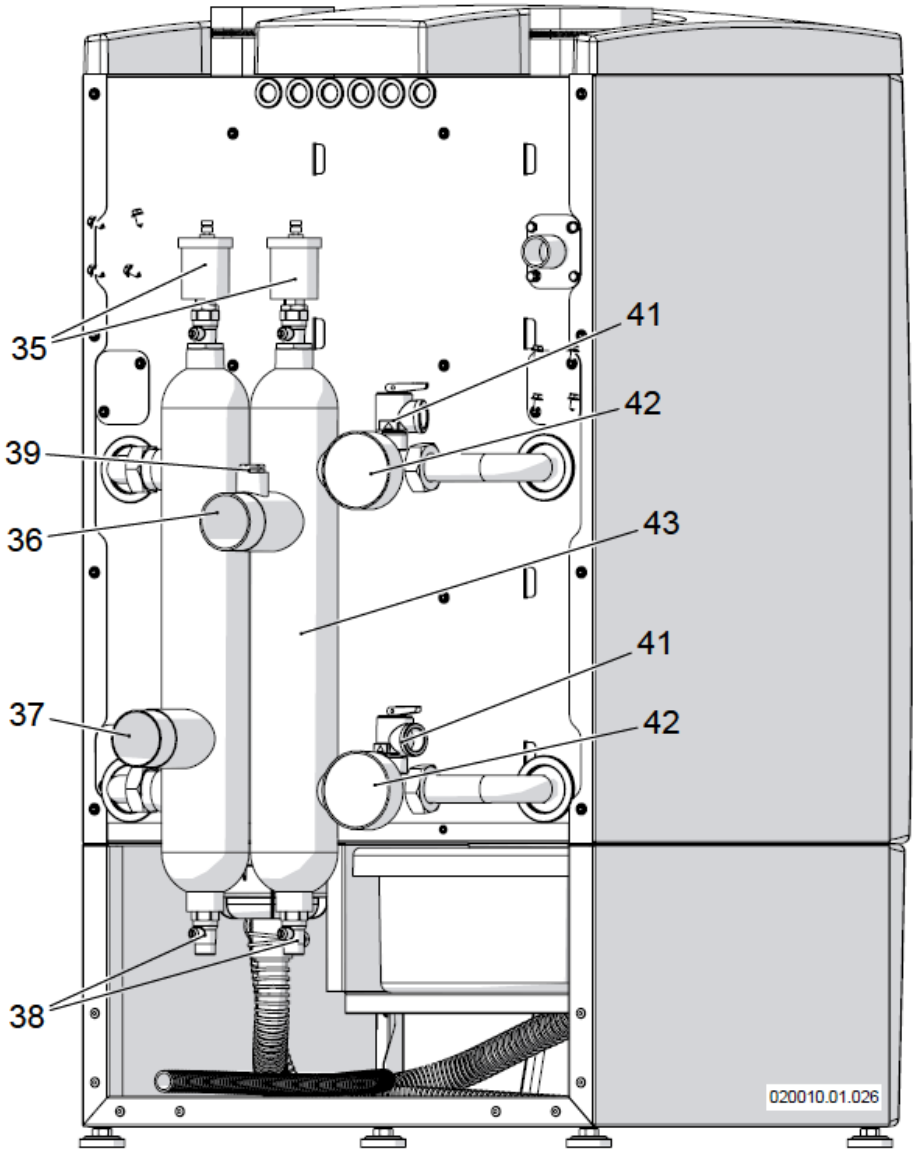
1 - Leveling feet
2 - Condensate hose coming from heater's flue exhaust
3 - Condensate neutralizer box
4 - Heat exchanger
5 - Condensate discharge hose
6 - Gas inlet pipe
7 - Water Supply pipe
8 - Heat exchanger
9 - Air inlet connection
10 - Electrical cable passages
11 - Air filter
12 - Flue exhaust connection
13 - 885IF board (Optional on model 399)
14 - Electrical terminals
15 - Control panel cover
16 - Display
17 - Control keys
18 - "Burner 2" power control board
19 - Front cover
20 - "Burner 1" (Master) power control board
21 - Bottom front cover

Figure 2-12: AM Series 399 and 500 Main Components



22 - Top cover
23 - Main electrical switch
24 - Flue blocked pressure switch
25 - Electrical Board
28 - Flue gas temperature sensor (Blue color connector) (1006)
29 - High limit flue gas temperature fuse (Red color connector)
30 - Flue gas exhaust manifold
31 - Water Return pipe
32 - Flue blocked pressure switch pipe
33 - Condensate blocked drain magnetic switch
34 - Flue gas manifold cap

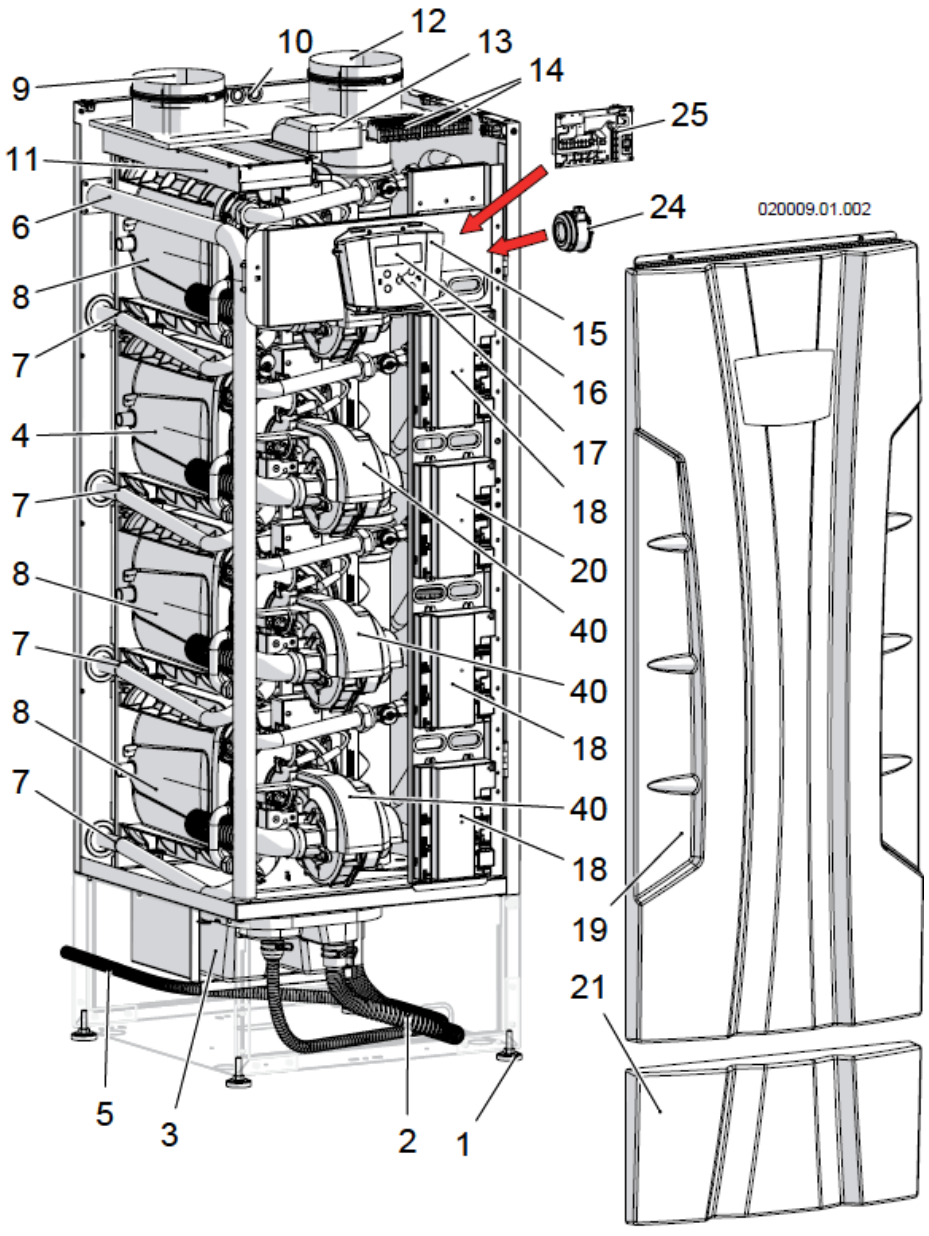
Figure 2-13: AM Series 399 and 500 Main Components



35 - Automatic air vent
36 - Water Supply connection
37 - Water Return connection
38 - Draining valves
39 - Header temperature sensor (1102)
41 - Safety relief valve (P-T safety relief valve on AM - W water heater)
42 - Pressure and temperature gauge
43 - Supply and return headers

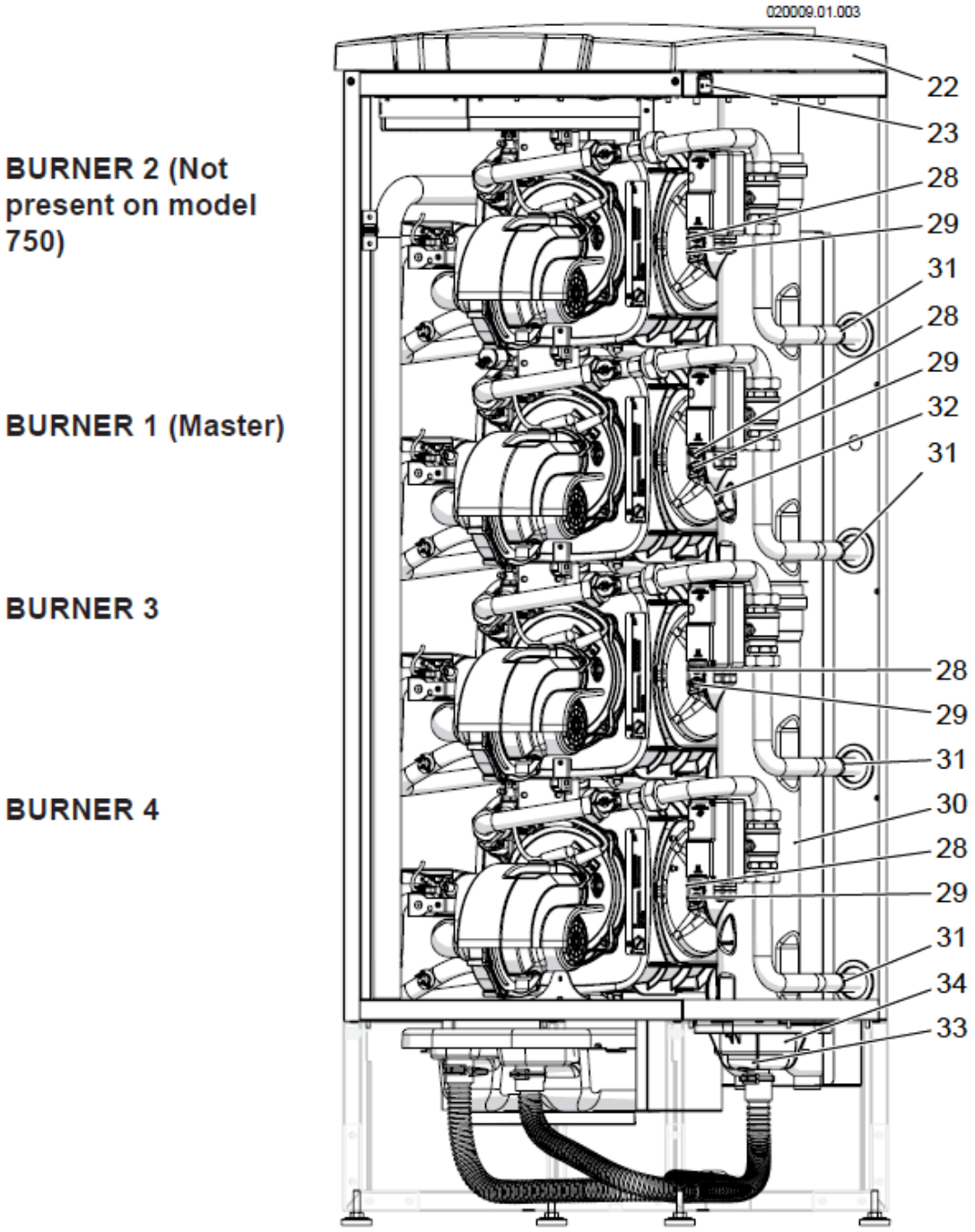
Figure 2-14: AM Series 399 and 500 Main Components

2.6.4 AM Series 750 and 1000 Main Components



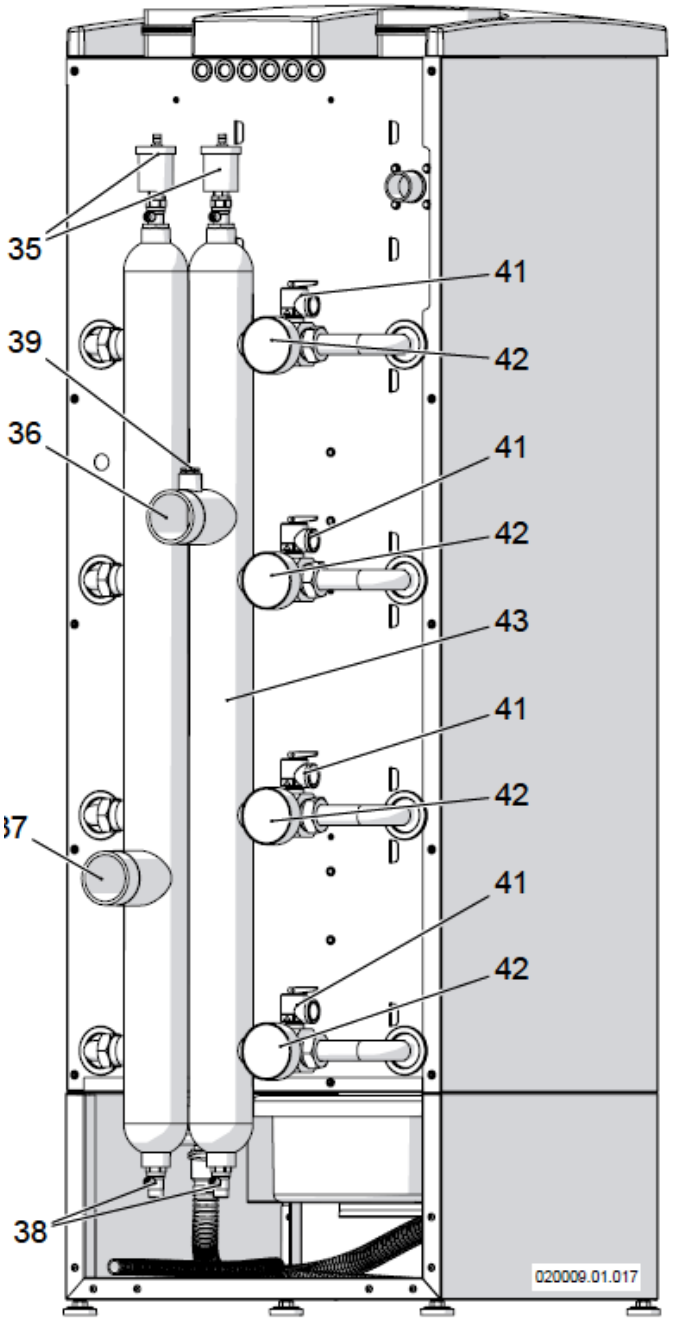
1 - Leveling feet
2 - Condensate hose coming from heater's flue exhaust
3 - Condensate neutralizer box
4 - Heat exchanger of the "Burner 1" (Master)
5 - Condensate discharge hose
6 - Gas inlet pipe
7 - Water Supply pipes
8 - Heat exchangers (the highest heat exchanger is not present on model 750)
9 - Air inlet connection
10 - Electrical cable passages
11 - Air filter
12 - Flue exhaust connection
13 - 885IF board
14 - Electrical terminals
15 - Control panel cover
16 - Display
17 - Control keys
18 - Power control boards (the highest power control board is not present on model 750)
19 - Front cover
20 - "Burner 1" (Master) power control board
21 - Bottom front cover
24 - Flue blocked pressure switch
25 - Electrical control board
40 - Fan cover

Figure 2-15: AM Series 750 and 1000 Main Components



22 - Top cover
23 - Main electrical switch
28 - Flue gas temperature sensor (Blue color connector) (1006)
29 - High limit flue gas temperature fuse (Red color connector)
30 - Flue gas exhaust manifold
31 - Water Return connection
32 - Flue blocked pressure switch pipe connection
33 - Condensate blocked drain magnetic switch
34 - Flue gas manifold cap

Figure 2-16: AM Series 750 and 1000 Main Components



35 - Automatic air vent
36 - Water supply connection
37 - Water return connection
38 - Drain valves
39 - Header temperature sensor (1102)
41 - Safety Relief valve (P-T relief valve on AM - W water heater)
42 - Pressure and temperature gauge
43 - Supply and return headers

Figure 2-17: AM Series 750 and 1000 Main Components

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SECTION 3: INSTALLATION – SITE

3.1 Choosing the Installation Location

This section describes the general installation considerations for the AM Series units.

WARNING!

Provisions for combustion air and ventilation of the boiler room are always required, regardless whether the combustion air is taken from the outside (Direct Vent, sealed combustion) or inside (room air for combustion). Insufficient ventilation of the boiler room can lead to high air temperatures. Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of openings takes place. If these are not provided, do not operate the boiler.

WARNING!

LIQUEFIED PETROLEUM (L.P.) PROPANE GAS-FIRED BOILER LOCATION REQUIRES SPECIAL ATTENTION: 1994 UNIFORM MECHANICAL CODE, section 304.6: "LPG Appliances. Liquefied petroleum gas-burning appliances shall not be installed in a pit, basement or similar location where heavier-than-air-gas might collect. Appliances so fueled shall not be installed in an above grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas."

This appliance 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 appliance in a location that would subject it to temperatures at or near freezing or excessively high temperature. Failure to properly locate this unit can result in premature failure.

The boiler must NOT be installed on carpeting.

This appliance must be installed in a location so that any water leaking from the unit or piping connections or relief valve openings will not cause damage to the area surrounding the unit or any lower floors in the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.

When installed in a room with thin flooring, resonating noises may occur. Install noise reducing parts if required.

Do not allow excessive dust to collect on the appliance.

WARNING!

Do not store or use gasoline or other flammable vapors or 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 the building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot contact your gas supplier, call the fire department.

3.2 Boiler and Water Heater Installation Location Factors

When locating the boiler or water heater, the following factors must be considered:

- location of vent/air intakes;
- connection to the gas supply;
- connection to the water supply;
- connection to the heating system;
- connection to the electrical supply;
- disposal of the condensation produced by the boiler;
- connection to the room thermostat, building automation system, or equivalent device;
- piping of the safety relief valve discharge;
- connection of the outdoor temperature sensor;
- possible connection of an indirect water heater;
- If flooding is possible, elevate the boiler sufficiently to prevent water from reaching the unit;
- The location of vent/air intakes;
- connection to the gas supply;
- connection to the water supply;
- connection to the electrical supply;
- disposal of the condensation produced by the boiler;
- piping of the safety relief valve discharge;
- connection of a storage tank;
- If flooding is possible, elevate the boiler sufficiently to prevent water from reaching the unit;

3.3 Safety Concerns

WARNING!
Do not store any flammable materials or liquids in the immediate vicinity of the boiler.

3.4 Closet and Alcove Installation

AM boilers or water heaters are not approved for installation in a closet or in an alcove site.

3.5 Clearances for Installation and Servicing

Figures 3-1, 3-2 and 3-3 show the minimum clearances required for installation and servicing.

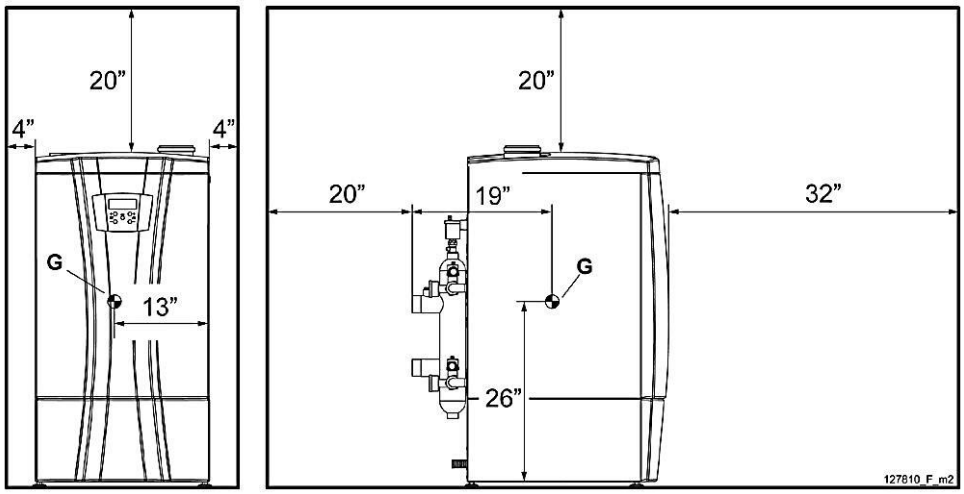


Figure 3-1: Recommended Minimum Clearance Distance, AM 199 – AM 500

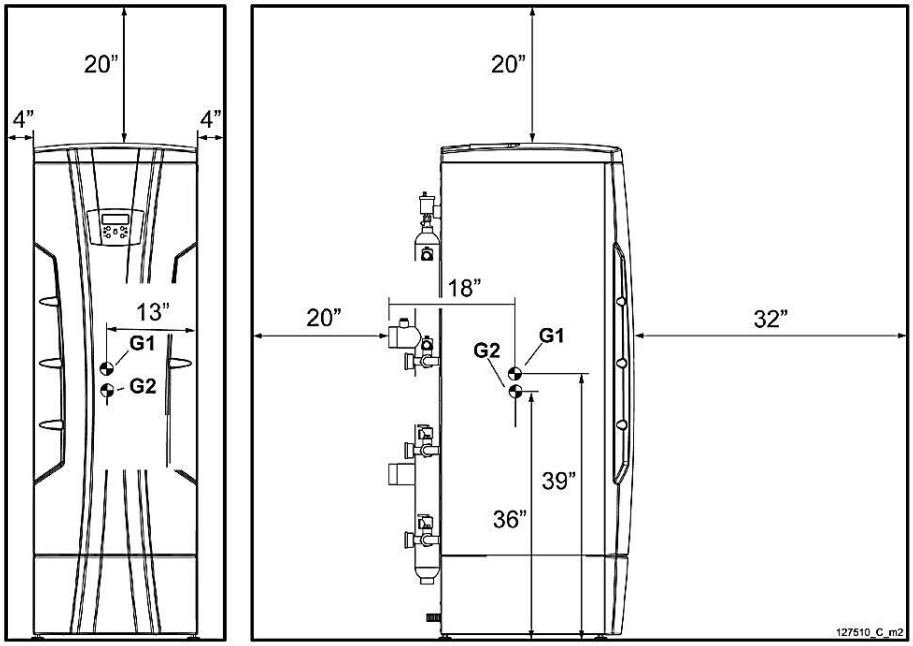


Figure 3-2: Recommended Minimum Clearance Distance, AM 750 & AM 1000

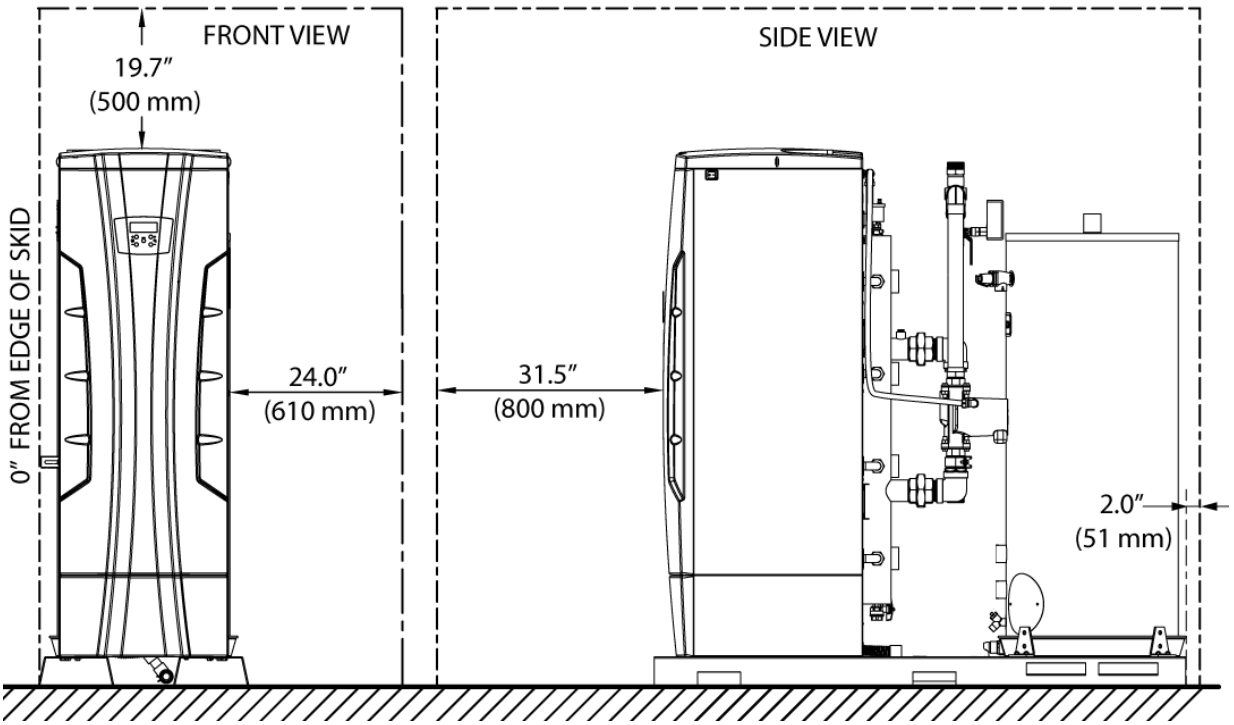


Figure 3-3: AMR Option - Recommended Minimum Service Clearances

NOTE:
Service clearances are minimum required clearances for ease of access, but larger service clearances are always preferred.

3.6 Clearances to Combustible Material

This unit may be installed directly onto a floor of combustible material with the following clearances:

Table 3-1: Unit Installation Clearance Dimensions

COMPONENT	CLEARANCE DISTANCE
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)
Concentric vent	0 inches (0 mm)
Split vent (two pipes) first 3 feet from the boiler	1 inch (25 mm)
Split vent (two pipes) after 3 feet from the boiler	0 inches (0 mm)
Boiler piping	¼ inch (7 mm)

3.7 Vent and Combustion Air Piping

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

The boiler is to be configured for either direct vent installation or for installation using room combustion air. When room combustion air is considered, see Chapter 6.

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 Chapter 6.

Be sure to locate the unit 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 Chapter 6.

3.8 Prevention of Combustion Air Contamination

Install air inlet piping for the appliance as described in Chapter 6. Do not terminate vent/air in locations that can allow contamination of combustion air.

WARNING!

Ensure that the combustion air will not contain any contaminants. Contaminated combustion air will damage the unit, resulting in possible personal injury, death or substantial property damage.

3.9 Transporting the Unit

- Only transport the unit using the right transportation equipment, such as a hand truck with a fastening belt or special equipment for maneuvering steps.
- During transportation, the unit must be secured on the transportation equipment to prevent it from falling off.
- Protect all parts against impacts during transport.
- Observe the transportation markings on the packaging.
- Leave the protective covers on the connections until ready to install.
- During transportation, cover the flue gas and air intake connections at the top of the unit with plastic or other material to avoid contamination.

3.10 Unpacking and Transporting

After removing the shipping carton from the unit, it may be moved according to its configuration as ether a standard AM unit, as described in section 3.10.1, or an AM water Heater configured with the Rapid Recovery option, as described in section 3.10.2.

CAUTION!

AM water heaters configured with the AERCO Rapid Recovery option must be moved ONLY with a forklift through the supporting skid. See section 3.10.2 for instructions.

3.10.1 Transporting a Standard AM Unit

Transport a *standard* AM boiler or water heater to its installation location as follows.

Transporting a *Standard* AM Water Heater or Boiler

1. Remove the lower cover “A” at front of the AM unit by pulling it off.
2. Remove the screw & washer “B” (Figure 3-4), which fastens the pallet to the unit front.

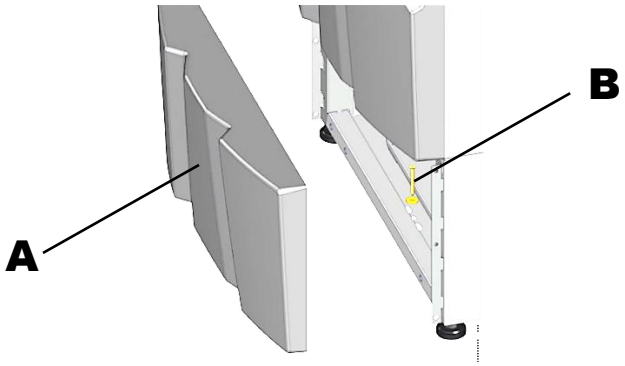


Figure 3-4: Removing the Unit Front from Wood Pallet

3. Remove the screw and washer “C” (Figure 3-5), which fastens the pallet to the unit rear.

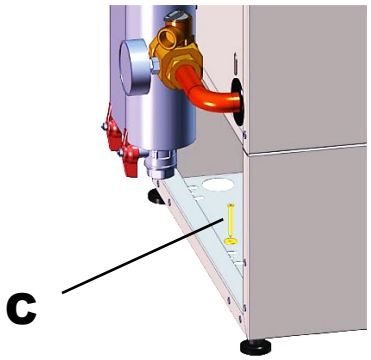


Figure 3-5: Removing the Unit rear from Wood Pallet

4. Install the two factory supplied eyebolts “D” on the upper side of the unit and attach chains or straps to lifting ring/hook “E” as shown in Figure 3-6.

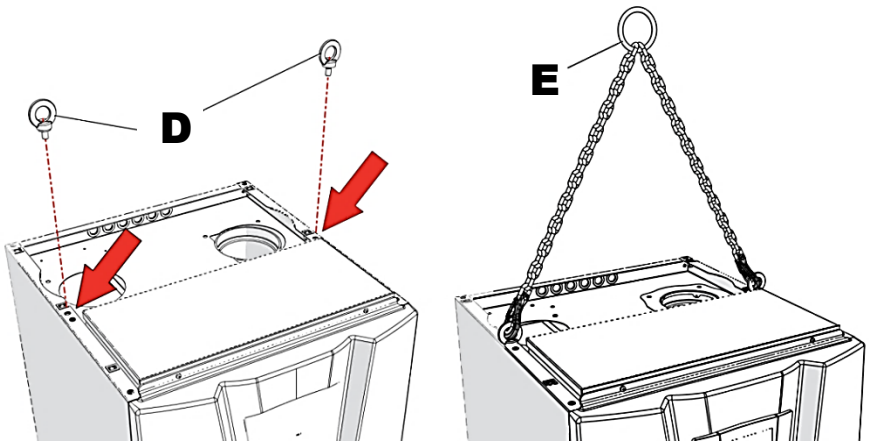


Figure 3-6: Removing the Unit from Wood Pallet (Lifting)

Transporting a *Standard* AM Water Heater or Boiler – Continued

5. Using the appropriate lifting equipment, hoist the unit from the wood pallet. The weight of each models are as follows:

Model	Weight (lbs.)
AM399	300
AM500	325
AM750	500
AM1000	550

WARNING!

The floor onto which the unit is installed must be capable of supporting the weight of the unit or the unit and/or building may be damaged.

6. While unit is suspended, install the leveling feet "F" (Figure 3-7), to allow leveling the unit after installation.

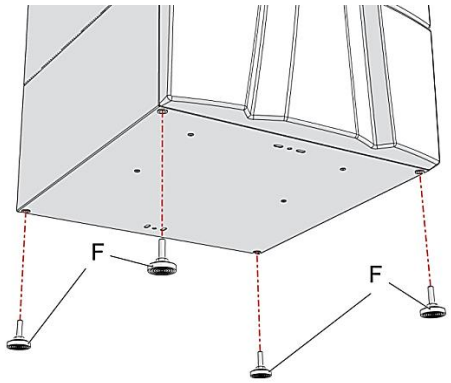


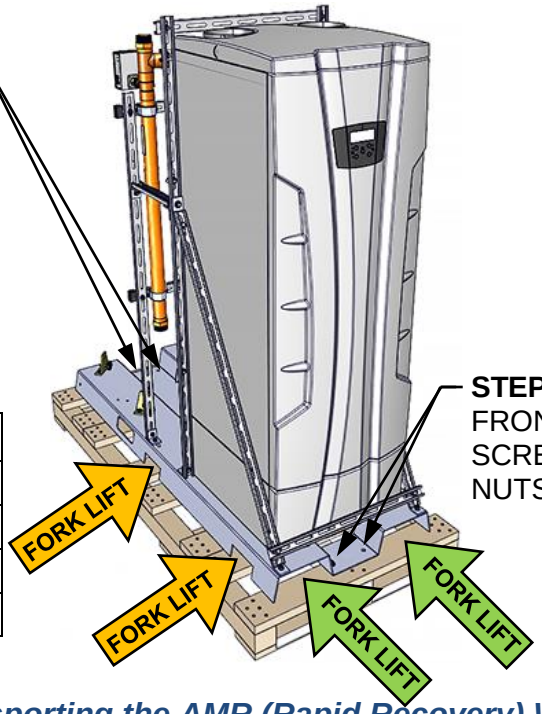
Figure 3-7: Installing the Leveling Feet

3.10.2 Transporting an AMR Water Heater

For an AM water heater with the rapid recovery option, the buffer tank is shipped separately from the main unit and must be assembled after main unit installation. The buffer tank should only be assembled to the unit ***after*** the water heater has been transported, located, positioned and installed in its ***final operating position***. Transport the main unit (without buffer tank installed) as described below:

Transporting an AMR Water Heater

1. Remove the two (2) 3/8-16 hex cap screws, washers, and nuts attaching the front of the assembly skid to the pallet (Figure 3-8).
2. Remove the two (2) 3/8-16 hex cap screws, washers, and nuts attaching the rear of the assembly skid to the pallet (Figure 3-8.
3. Once the assembly is disconnected from the pallet, the unit may be transported using a fork lift inserted into the skid, front or rear, or at the sides, as indicated in Figure 3-8.



Model	Weight (lbs.)
AM 399 RS	600
AM 500RS	625
AM 750RS	800
AM 1000RS	850

Figure 3-8: Transporting the AMR (Rapid Recovery) Water Heater

CAUTION!

DO NOT use the lifting lugs on the AM unit to lift the entire AMR assembly. They are to be used ONLY in the maintenance or replacement of the AM Series unit.

WARNING!

- Do not transport the AMR unit while the buffer tank is installed, or damage to equipment or property, or injury to persons might occur.
- The floor onto which the unit is installed must be capable of supporting the weight of the unit or the unit and/or building may be damaged.

3.11 AMR Buffer Tank Installation

3.11.1 AMR Buffer Tank Installation Kits

If you are installing an AMR series unit (with rapid recovery option), the buffer tank is shipped as a separate item and installed only after the main water heater unit is in its final installation location and position. A kit is included with the necessary parts and components needed to install the buffer tank appropriate for your AMR model and tank size. Below are tables showing the part numbers for each model, and the parts included in the kits.

See Figure 3-9 for illustrations of the parts in the list.

AMR Buffer Tank Installation Kit P/Ns

AMR MODEL	TANK SIZE	
	80 GAL. TANK	119 GAL. TANK
AMR 399/500	P/N 24484	P/N 24485
AMR 750/1000		P/N 24486

P/N 24484 Kit Part – 80 Gallon Tank for All AMR Models

QTY	PART NO.	DESCRIPTION
1	97084-18	FLEX HOSE, 18”
1	97084-24	FLEX HOSE, 24”

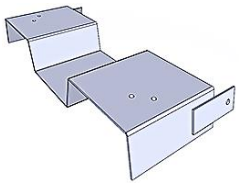
P/N 24485 Kit Parts – 119 Gallon Tank for AMR 399/500

QTY	PART NO.	DESCRIPTION
1	97084-18	FLEX HOSE, 18"
1	97084-24	FLEX HOSE, 24"
1	39209	EXTENSION ASSEMBLY, AMR BASE
2	56034	3/8-16 UNC-2B HEX LOCKNUT
2	121699	BOLT HEX 3/8-16
4	53050	FLAT WASHER, 3/8
2	90046-3	NIPPLE, 2" NPT x 3" LG
2	93499	REDUCING COUPLING, 2 1/2" FNPT x 2" FNPT

P/N 24486 Kit Parts – 119 Gallon Tank for AMR 750/1000

QTY	PART NO.	DESCRIPTION
2	97084-24	FLEX HOSE, 24"
1	39209	EXTENSION ASSEMBLY, AMR BASE
2	56034	3/8-16 UNC-2B HEX LOCKNUT
2	121699	BOLT HEX 3/8-16
4	53050	FLAT WASHER, 3/8
2	90046-3	NIPPLE, 2" NPT x 3" LG
2	93499	REDUCING COUPLING, 2 1/2" FNPT x 2" FNPT

97084 - FLEX HOSE



39209 – BASE EXTENSION

56034 - 3/8-16 LOCKNUT

121699 - BOLT 3/8-16

53050 - FLAT WASHER, 3/8

90046-3 - NIPPLE, 2x3L

93499 - REDUCING COUPLING, 2-1/2 x 2

Figure 3-9: Buffer Tank Installation Parts Illustration

3.12 AMR Buffer Tank Components

The following components are provided and must be installed on the buffer tank during installation of the buffer tank to the main unit (see Figure 3-10):

- **P/N 92129** - T & P Valve
- **P/N 62005** - Cord Grip
- **P/N 49263** - Thermowell
- **P/N 122848** - Conductive Compound (not shown)

P/N 92129 - T & P Valve

P/N 62005 - Cord Grip

P/N 49263 - Thermowell

Figure 3-10: Buffer Tank Components

3.13 Buffer Tank Installation Overview

80-Gallon Tank: Place tank, connect flex hoses, install tank components.

119-Gallon Tank: Attach base extender, place tank, install reducer couplings and 3" nipples to tank openings, connect flex hoses between tank and AMR unit, install tank components.

3.14 Removing the AMR Bracing Plate

The AMR bracing plate ***MUST*** be removed prior to tank installation while the remaining struts, required for shipping, may be left in place or removed.

After AMR unit is placed, remove the screws affixing the bracing plate covering the lower rear section of the AMR water heater, as shown in Figure 3-11. Remove all the screws, and then slide plate from the side of the unit.

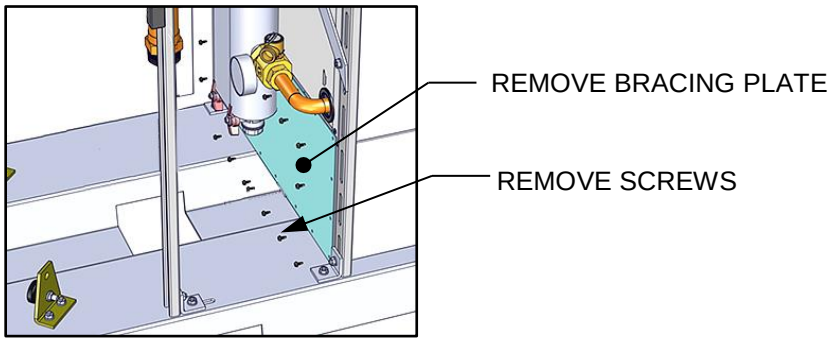


Figure 3-11: Removing the AMR Bracing Plate

WARNING!

The buffer tank should only be installed to the main AMR unit AFTER the water heater has been transported and positioned in place. **DO NOT** attempt to move the entire unit after the buffer tank is installed.

3.15 AMR 80-Gallon Buffer Tank Installation

To install the 80 gallon buffer tank to all AMR units, follow the procedures below:

Installing the AMR 80-Gallon Buffer Tank

1. Retract threaded tank clamps to allow maximum clearance for the tank (Figure 3-12).

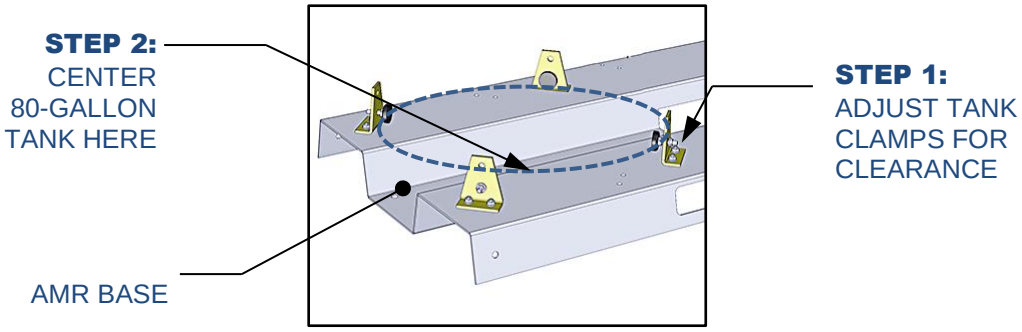


Figure 3-12: 80 Gallon Tank Location and Tank Clamps on AMR Base

NOTE:

One or more of the tank clamps may be temporarily removed, to allow sliding the tank in from the side. Ensure any clamps removed are reinstalled after tank placement.

2. Center tank as indicated in Figure 3-12. Ensure that water connections are facing the rear of the AMR water heater as indicated in Figure 3-13.
3. When tank is in correct position, tighten tank clamps against tank (Figure 3-13).

Installing the 80-Gallon Tank for All AMR Models - Continued

4. Install the thermowell (P/N 49263) into the lower port on tank (see Figure 3-13) with pipe dope, then put heat conducting compound (P/N 122848) inside the thermowell.
5. Put the temperature sensor probe through the cord grip (P/N 62005) and then insert the sensor fully into the thermowell (see Figure 3-13). Screw the cord grip into the thermowell and then tighten cord grip to secure the temperature sensor probe in the thermowell.
6. Install pressure relief valve (P/N 92129) into upper port of tank using appropriate pipe dope, (such as Loctite 567). Valve outlet should point downwards (Figure 3-13).

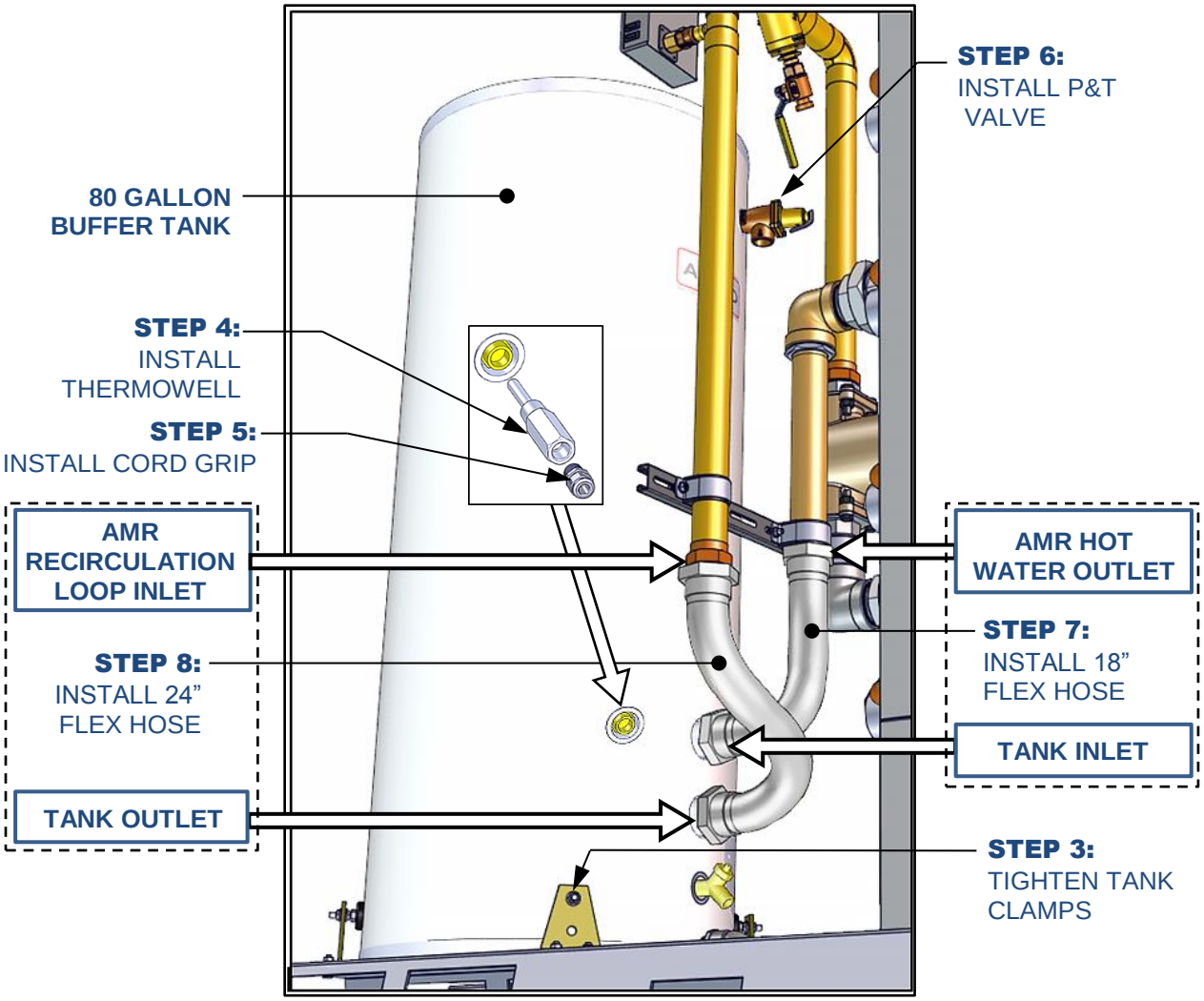


Figure 3-13: AMR 80-Gallon Tank Installation and Components

7. Install the 18" Flex Hose (P/N 97084-18) between the AMR hot water OUTLET and the tank INLET. See Figure 3-13.
8. Install the 24" Flex Hose (P/N 97084-24) between the tank OUTLET and the AMR circulation loop INLET. See Figure 3-13.
9. Double-check that all water connections on the rear of the unit are tight and have not loosened during shipping.

3.16 AMR 119-Gallon Buffer Tank Installation

Installing the AMR 119-Gallon Buffer Tank

WARNING!
Affixing the base extension to the base is required for 119-gallon tank installation.

1. Remove the two tank clamps from REAR of main base and relocate them to base extension (P/N 39209) using the existing hardware (Figure 3-14).
2. Remove the two tank clamps that are closer to the main unit and relocate both to next set of holes toward the rear using existing hardware (Figure 3-14).

NOTE:
One or more of the tank clamps may be temporarily removed, to allow sliding the tank in from the side. Ensure any clamps removed are reinstalled after tank placement as shown.

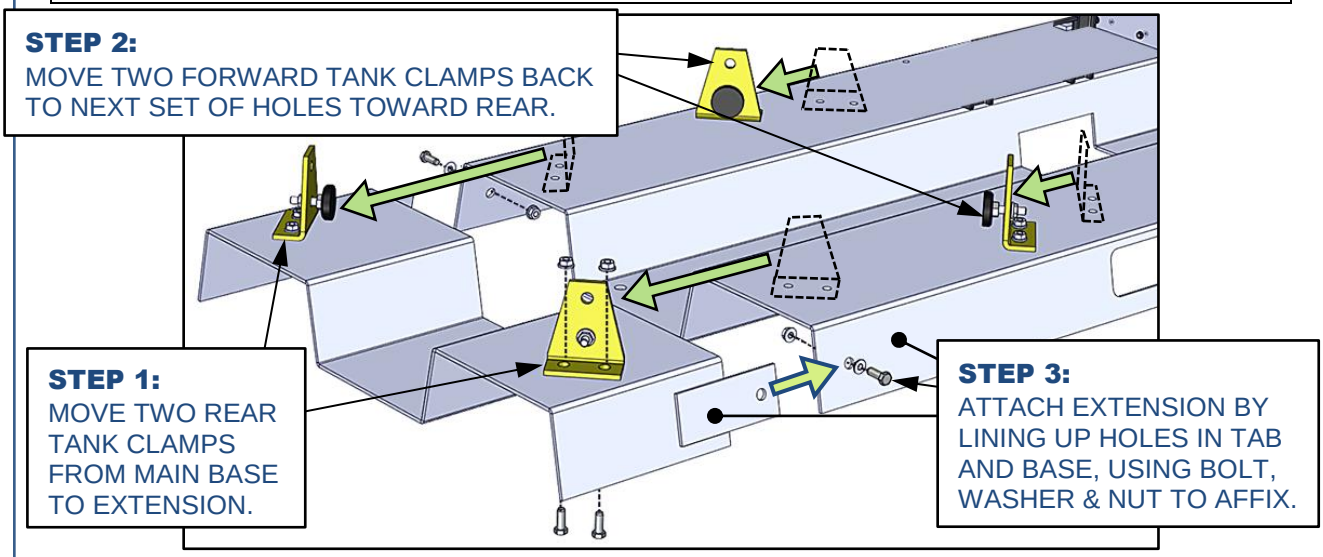


Figure 3-14: Adding the Extension to AMR Base for 119-Gallon Tank Installation

3. Affix extension (P/N 39209) to rear of AMR base by aligning tab holes of extension with holes on base sides (Figure 3-14). Use lock nuts (P/N 56034), hex bolts (P/N 1216990), and washers (P/N 53050) to secure both sides, with bolt/washer on outside, and nut on inside.
4. Adjust threaded tank clamps (Figure 3-14) to allow maximum clearance for tank.
5. Center the tank as shown in Figure 3-15. Ensure that the water connections are facing the rear of the AMR water heater as indicated in Figure 3-16.
6. Tighten all four tank clamps against the tank (Figure 3-16).

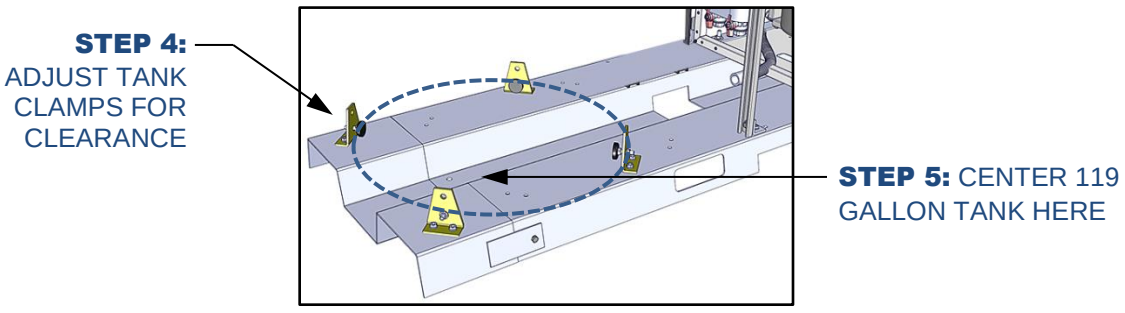


Figure 3-15: 119 Gallon Tank Location and Tank Clamps on AMR Base w/Extender

Installing the 119-Gallon Tank - Continued

7. Install the thermowell (P/N 49263) into the lower port on tank (see Figure 3-16) with pipe dope, then put heat conducting compound (P/N 122848) inside the thermowell.
8. Put the temperature sensor probe through the cord grip (P/N 62005) and then insert the sensor fully into the thermowell (see Figure 3-16). Screw the cord grip into the thermowell and then tighten cord grip to secure the temperature sensor probe in the thermowell.
9. Install pressure relief valve (P/N 92129) into upper port of tank using appropriate pipe dope (such as Loctite 567). Valve outlet should point downwards (Figure 3-16).

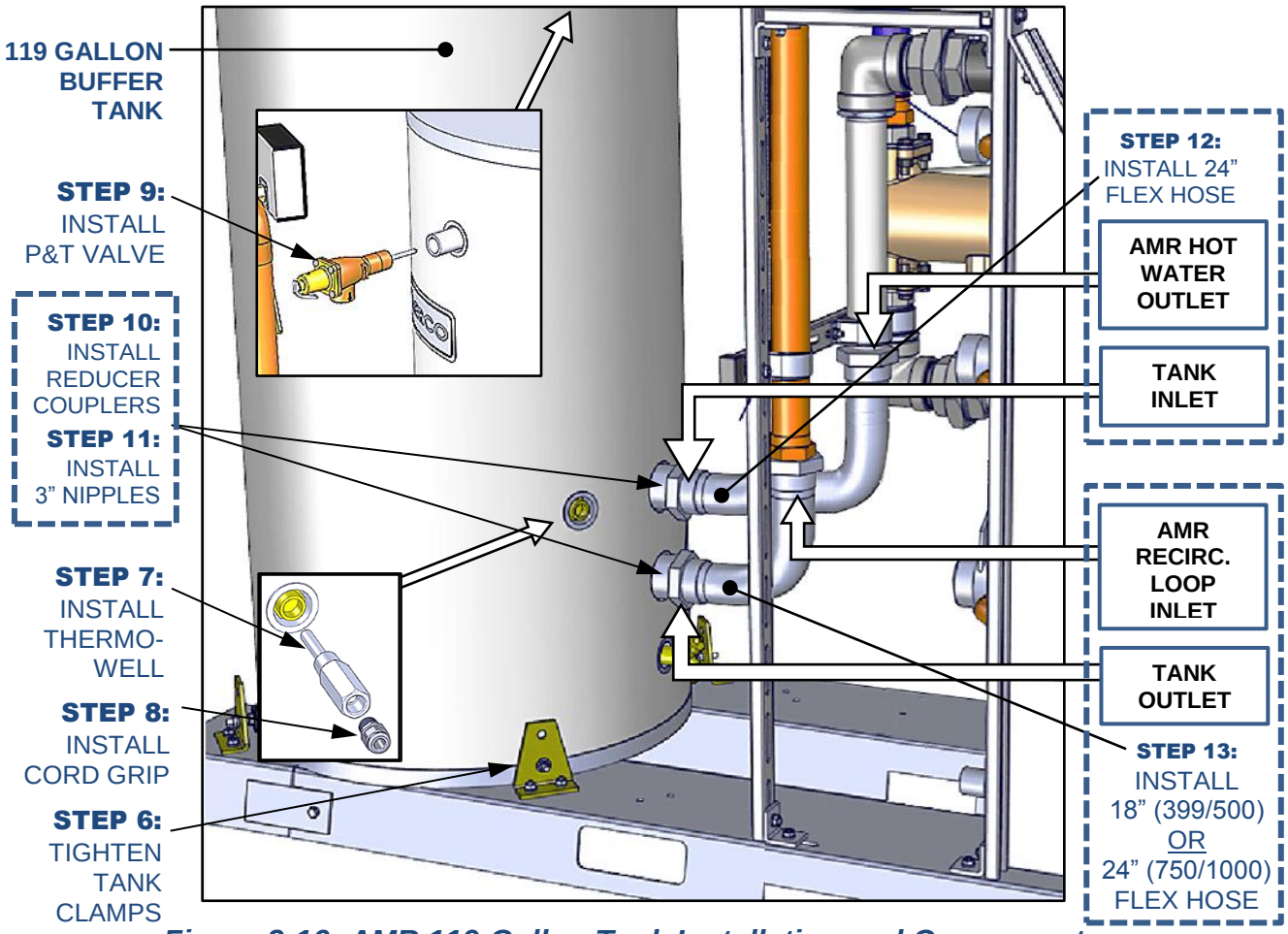


Figure 3-16: AMR 119-Gallon Tank Installation and Components

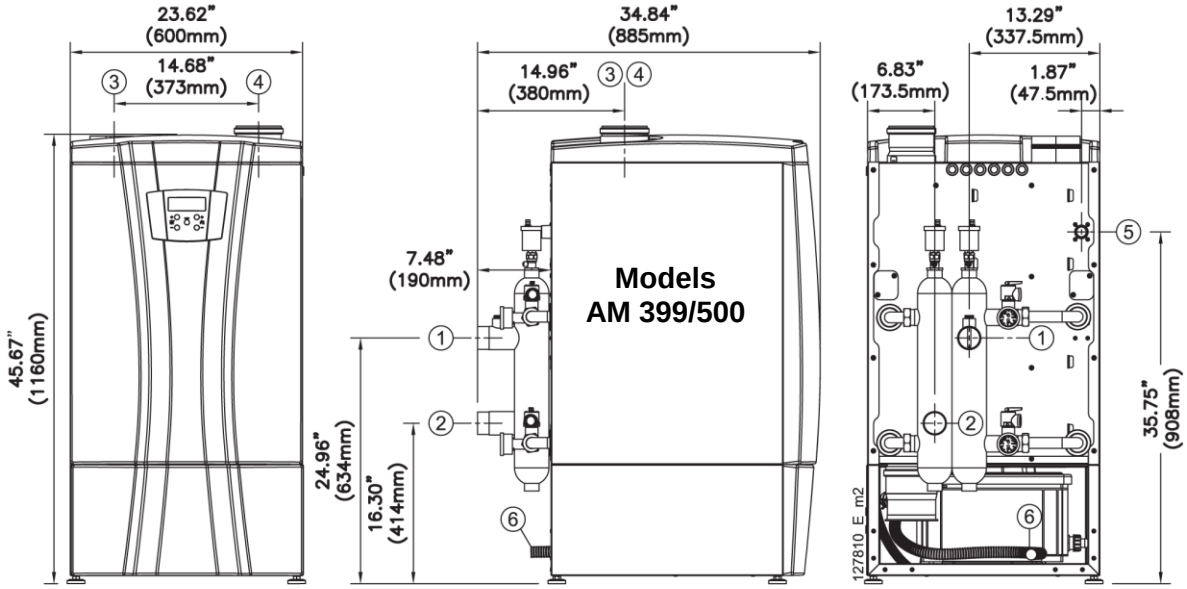
10. Install a reducing coupler (P/N 93499) into both the tank INLET and OUTLET to reduce both connections from 2-1/2" to 2".
11. Install a 3" nipple (P/N 90046-3) into the reducing couplers installed in the tank's INLET and OUTLET in Step 10.
12. Connect 24" flex hose (P/N 97084-24) between nipple in the tank INLET and AMR OUTLET.
13. Connect 18" or 24" (see NOTE) flex hose between nipple in the tank OUTLET and AMR recirculation loop INLET (Figure 3-16).
14. Double-check that all water connections on the rear of the unit are tight and have not loosened during shipping.

NOTE:
Use 18" hose (P/N 97084-18) for 399/500 units & 24" hose (P/N 97084-24) for 750/1000 units.

3.17 AM Series Supply and Return Piping Dimensions

3.17.1 Standard AM Supply and Return Piping Dimensions

Standard connections and dimensions for all AM Series units are shown in Figure 3-17.



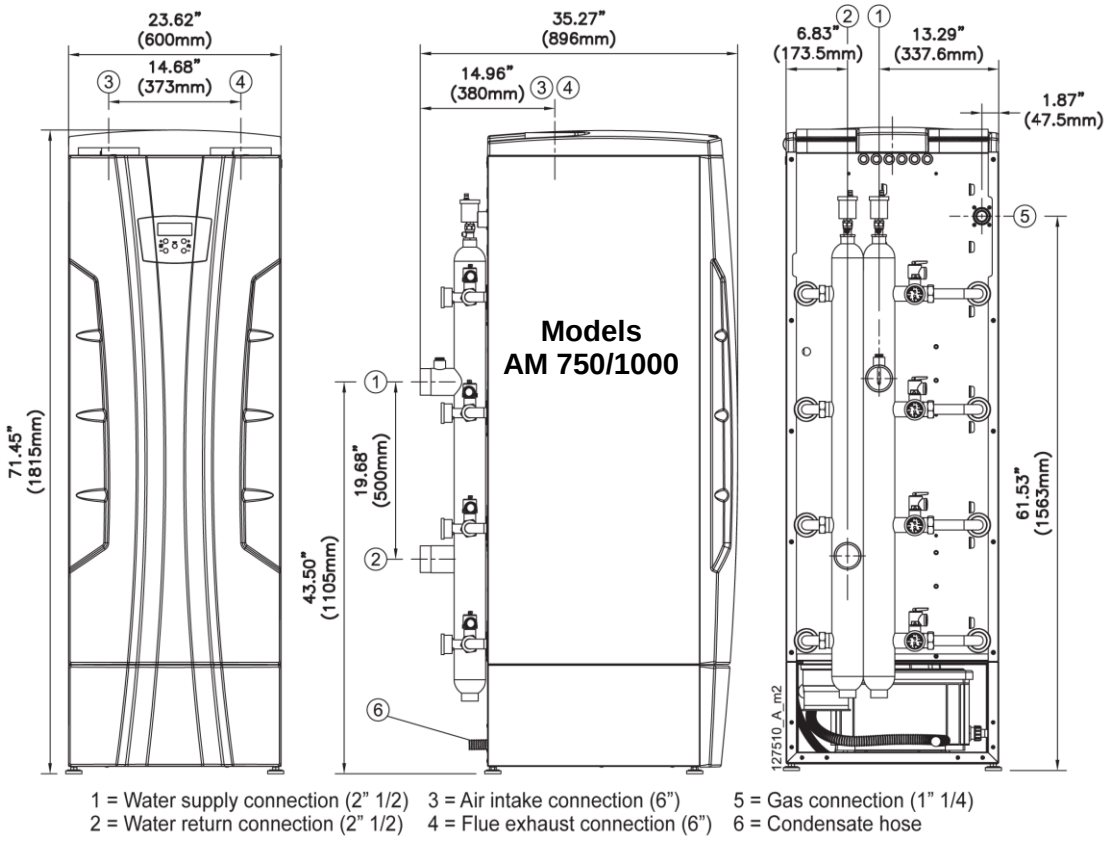


Figure 3-17: AM 399/500 & 750/1000 Installation Connection Dimensions

3.17.2 AMR Supply and Return Piping Dimensions

Connections and dimensions for AM Series water heaters with the Rapid Recovery option are shown in Figure 3-18.

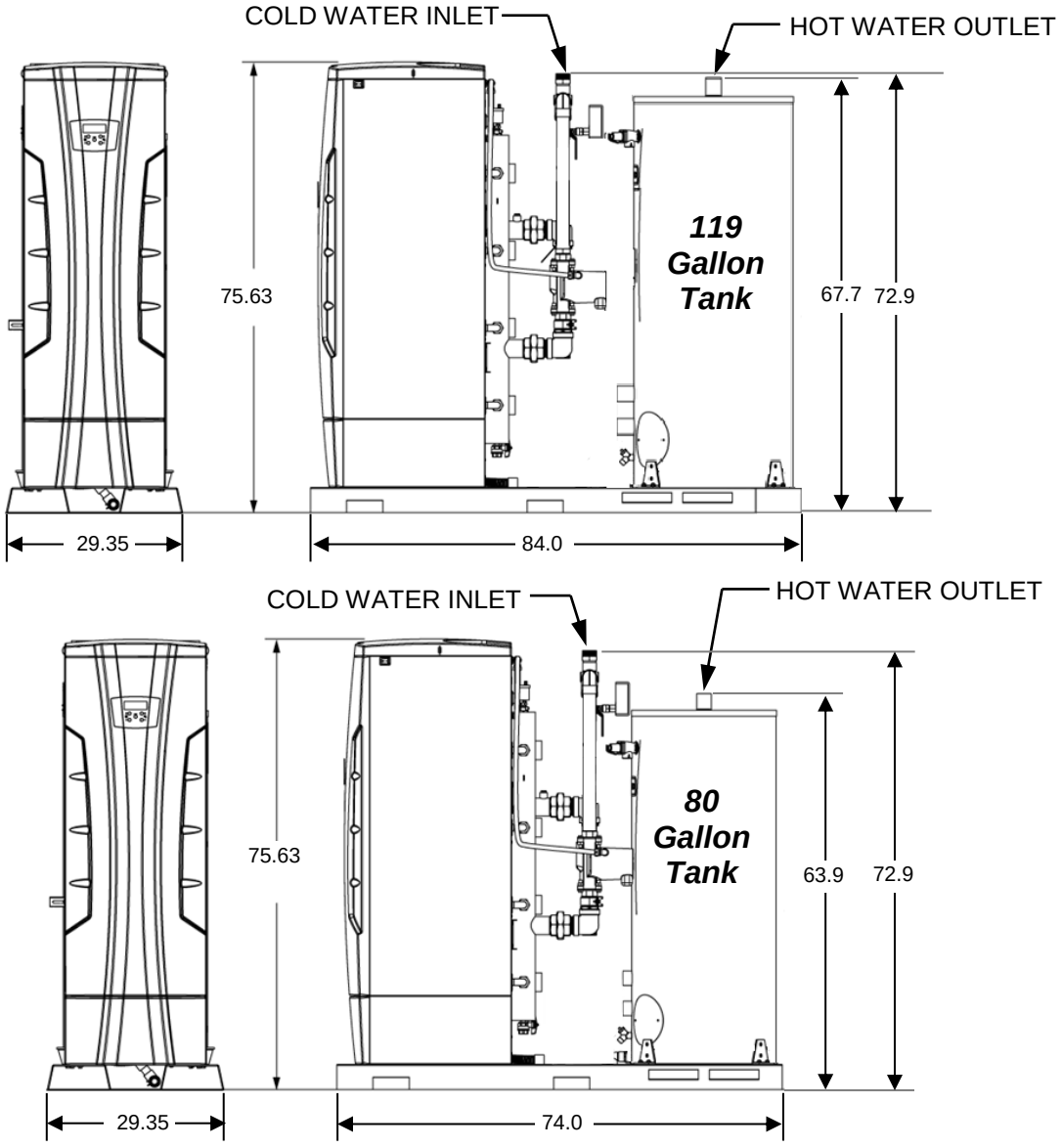


Figure 3-18: AMR Installation Connection Dimensions

NOTE:

Installation considerations for AM units with the AMR option are identical as for standard AM water heaters, except where specifically noted.

SECTION 4: INSTALLATION – PIPING

4.1 Water Inlet and Outlet Piping

When connecting the hot water outlet and cold water inlet to building piping, first make sure the threads are thoroughly clean. AERCO recommends using Loctite ® 7649 to prime the threads and then Loctite 567 as pipe dope. **Do *NOT* use Teflon tape.**

4.2 Water Quality

- Before connecting the boiler to the heating system, the heating system must be thoroughly flushed to remove sediment, flux, filings and other foreign matter. The heat exchanger can be damaged by build-up of corrosion due to sediment.
- An approved inhibitor should be added to the heating system water to prevent limestone and magnetite deposits from forming and to protect the boiler from galvanic corrosion.
- The manufacturer cannot be held responsible for any damage caused by incorrect use of additives in the heating system.
- Continual fresh make-up water will reduce boiler life. Mineral buildup in the heat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen carried in by makeup water can cause internal corrosion in system components. Leaks in boiler or piping must be repaired at once to prevent makeup water entering the boiler.
- Do not use the boiler to directly heat swimming pools or spa water.
- **Hardness** –Hardness substantially contributes to the formation of scaling, which is highly undesirable. The total hardness must be less than 200 ppm total dissolved solids (TDS).
- **Artificial Softness** – Do NOT use artificially softened water. Artificial softening agents generally use salt, which creates a chloride water chemistry, a major contributor to the corrosion of the types of metals used in hydronic systems. Elevated salt levels also contribute to higher conductivity levels, another undesirable characteristic in hydronic systems.
- **Chloride** – Chlorides are salts resulting from the combination of the gas chlorine with a metal and are instrumental in accelerating corrosion in the types of metals used in hydronic systems. Chlorides may be naturally occurring in the water. Concentrations of chlorides in system water should be less than 150 ppm.
- **Conductivity** – Dissolved metals and minerals increase the conductivity of water and indicate not only the presence of undesired corrosive agents, but also contribute to the transfer and migration of ions and charged particles in the water that contribute to fouling of sensors, valves, and other devices used in the system. Additionally, high conductivity contributes to galvanic corrosion, in which one metal will preferentially corrode when in when both are in contact with an electrolyte. conductivity should be less than 3000 µS.
- **pH** – The pH must always be between **6.5** and **8.5**. Values out of this range are corrosive, causing damage to the heat exchanger and/or heating piping.

4.3 System Piping Methods - Boilers

This boiler is designed to function in a closed loop pressurized system not less than 15 psi (1 bar). A pressure gauge is included to monitor system pressure. Each boiler installation must have an air elimination device, which will remove air from the system. Install the boiler so the

gas ignition system components are protected from water (dripping, spraying, etc.), during appliance operation for basic service of circulator replacement, valves, and others.

4.3.1 Low water cutoff device

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

The low water cutoff terminals are present within the line voltage junction box.

4.4 Freeze Protection

Freeze protection for new or existing systems must use glycol that is specially formulated for this purpose. This includes inhibitors, which prevent the glycol from attacking the metallic system components. Make certain to check that the system fluid is correct for the glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the producer of the glycol solution. Allowance should be made for the expansion of the glycol solution in the system piping. Use only inhibited propylene glycol solutions. Ethylene glycol is toxic and can corrode gaskets and seals.

WARNING!

Never use non-approved additives or toxic boiler treatment chemicals in the heating system. Any additives introduced into the heating system must be recognized as safe. Use only inhibited propylene glycol solutions, which are specifically formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.

4.5 Floor Radiant Heating Systems - Boilers

The setting of parameter 3015 in the Factory Menu (see Appendix B) determines the maximum supply temperature the boiler will maintain. No change to settings made from the control panel will cause the supply water temperature to exceed the maximum stated in this parameter.

- If glycol is used, it must be used in accordance with the instructions supplied with the product.
- Any additives added to the heating system must not be added directly inside the boiler but through the heating system piping to prevent damage to the boiler.
- This boiler is capable of servicing multiple temperature loop systems. It is the responsibility of the installer to protect the loops with lower temperature requirements from higher temperatures that may be required by other loops.
- To protect the radiant floor panel against over-heating you must install a safety device that shuts-off the boiler before it reaches the floor panel's limit temperature.
- There is a risk of system damage due to unsuitable heating system water. If oxygen-permeable pipes are used, e.g. for under floor heating systems, the systems must be separated from one another by plate heat exchangers. Unsuitable heating system water promotes sludge and corrosion formation. This can result in boiler damage and malfunction.

4.6 Piping Components - Boilers

- **Boiler system piping:** boiler system piping MUST be properly sized. Reducing the pipe size can restrict the flow rate through the boiler, causing inadvertent high limit shutdowns and poor system performance.
- **Boiler system pump:** Field supplied. The system pump MUST be sized to meet the specified flow requirements.

- **Indirect water heater circulating pump:** Field supplied. The pump MUST be sized to meet the specified flow requirements. Consult the indirect water heater operating guide to determine flow characteristics for the selected product used.
- **Isolation valves:** Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the boiler.
- **Anti-scald mixing valve:** Field supplied. If the boiler is connected to an indirect water heater for domestic hot water, this device MUST be installed.
- **Unions:** Field supplied. Recommended for unit serviceability.
- **Safety relief valve**. See Section 4.8.
- **LWCO (Low Water Cut-Off):** A LWCO comes with every unit and must be field installed. For more information, see Section 4.9.
- **Indirect water heaters:** Field supplied. This boiler may be piped to an indirect water heater to heat domestic hot water with the space heat transfer medium. The indirect water heater is connected to the system supply piping. A pump controlled by the boiler's control will provide the flow of water through the indirect water heater. The indirect water heater's temperature will be regulated by the boiler's control. The boiler is pre-configured to control the operation of the DHW pump with Domestic Hot Water Prioritization programming.
- **Temperature Sensor:** For a single unit installation, the temperature sensor must be relocated to the system piping. For multiple unit installations using the AM Cascade Sequencer, the cascade header temperature sensor (included) must be installed in the system piping.

CAUTION!

It is ***up to the installer to*** ensure the minimum system flow is not at any time less than the values in the **Minimum Water Flow** row in Section 11: *Technical Data*. If the flow is lower, the unit automatically stops the burner.

WARNING!

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

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

4.7 Piping Components – Water Heaters

The separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with the Standard for Relief Valves for Hot Water Supply Systems, ANSI Z21.22 • CSA 4.4.

Water heater system piping MUST be sized considering the pressure drops of the water heater (see figure 4-4), piping and storage tank.

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 4-6 and 4-8, which will guide you through the installation of the water heater piping.

- Connect the cold water supply to the inlet side of the water heater.
- Connect the hot water supply to the outlet side of the water heater.
- Install a backflow preventer (field supplied) on the cold feed make-up water line
- Install a field supplied pump as shown in Figures 4-6 and 4-8.
- 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.
- Install a drain valve at the lowest point of the system.
- The temperature and pressure relief valve is sized to ASME specifications. Storage tanks may require additional valves depending on local codes.
- **Water heater isolation valves:** Field supplied. Install isolation valves as show on Figures 4-6 and 4-8. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the water heater.
- **Anti-scald mixing valve:** Field supplied. Install an anti-scald mixing valve as shown on Figures 4-6 and 4-8. An Anti-scald mixing valve is recommended when storing domestic hot water above 115°F. An anti-scald mixing valve MUST always be installed on an AMR system.
- **Unions:** Field supplied. Install Unions as shown on Figures 4-5 and 4-7, recommended for unit serviceability.
- **Tank sensor:** Factory supplied on water heater. The tank sensor MUST be installed in the lower 1/3 of the storage tank to achieve proper operation.
- **Pump:** Recirculation pump should be sized according to AERCO's Primary Loop Design Guide, C400.3.
- **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.
- **LWCO (Low Water Cut-Off):** Factory Supplied. See Section 4.9.

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

4.8 Safety Relief Valve

AM units come equipped with a safety relief valve on each factory installed module. Boilers are supplied with 50 PSI pressure relief valves. Water heaters are supplied with 125 PSI T&P relief valves. If a higher or lower rated PRV is required it must be field supplied and installed.

If an AM Series H-Stamped unit is being used directly in a domestic water heating application the relief valves must be replaced with appropriate temperature & pressure relief valves. These valves are supplied with the unit when configured in buy.aerco.com.

Pipe the discharge of the safety relief valve(s) (Figure 4-1) to a suitable drain to prevent injury in the event of pressure relief. Each relief valve must have its own discharge piping, be piped to within 18" of the ground, and not be combined with any other piping all the way to the point of discharge into a drain. Provide piping that is the same size as the safety relief valve outlet.

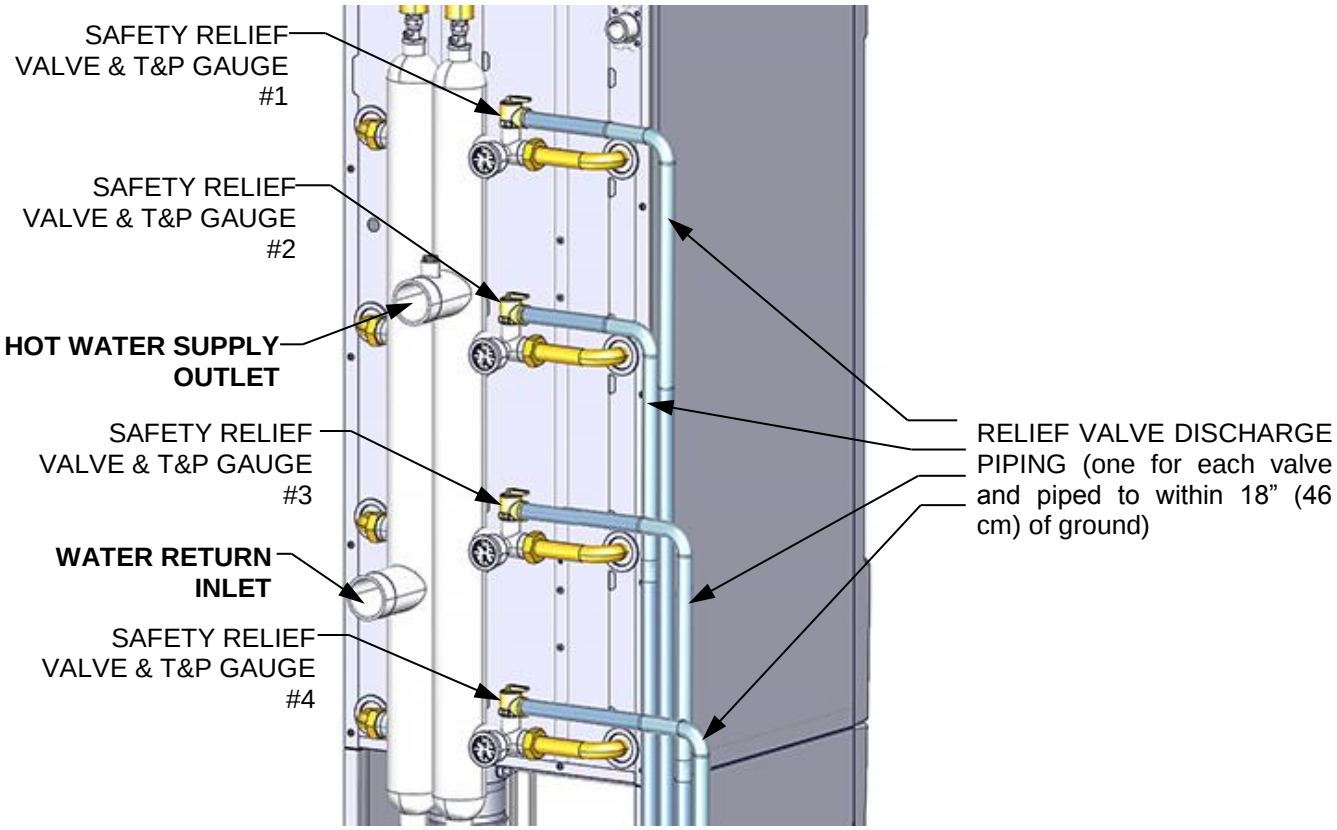


Figure 4-1: Piping the Relief Valve Discharge

4.9 Low Water Cutoff (LWCO)

A low water cutoff (LWCO) (Figure 4-2) must be installed on the outlet piping of the boiler, and before any intervening valves (Figure 4-3). When installing such a device, you must consult and abide by all local codes and regulations in force.

Figure 4-2: Low Water Cutoff (LWCO)

NOTE:

In AM water heater systems configured with the AM Rapid Recovery Skid option, the LWCO is factory installed as shown in Figure 2-6 of Section 2.5.4.

NOTE:

Use Teflon tape or a suitable pipe joint compound for component and piping connections.

4.10 Expansion Tank and Makeup Water

Install an expansion tank. Ensure the expansion tank is properly sized for the boiler volume and the system volume, temperature and pressure.

CAUTION!

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

Refer to the expansion tank manufacturer instructions for additional installation details.

Connect the expansion tank to an air separator only if the air separator is located on the suction side (inlet) of the system circulator.

Always locate and install the system fill connection at the same location as the expansion tank connection to the system

4.11 Circulator Heating Pump

AM Series boilers and water heaters must be fitted with a circulator pump. The water resistance to size the circulator pump to supply flow through the heating system at the unit's connections is shown in graph form in Figure 4-3.

It is up to the installer to ensure the minimum system flow is not at any time less than the values in in the **Minimum Water Flow** in Section 11: *Technical Data*. If the flow is lower, the unit automatically stops the burner.

To connect a central heating pump on the secondary loop, see Figure 4-7, and to electrically connect the pump to the boiler, see Figure 5-3.

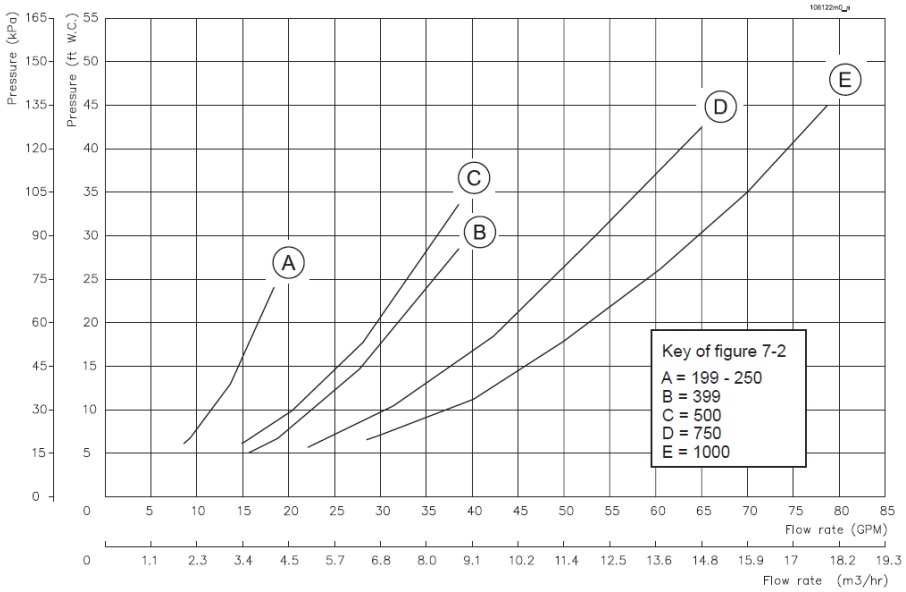


Figure 4-3: AM Series Water Side Head Pressure Loss Graph

The water heater pressure losses (see Figure 4-4) are based on potable water with a hardness of 5 to 25 grains per gallon and a total dissolved solids not exceeding 200 ppm. Consult the manufacturer when heating potable water exceeding these specifications.

Heating of high hardness and/or high total dissolved solids water increases the pressure drops

and may require a larger circulating pump, and a revised temperature rise specification based on the water chemistry of the water to be heated.

Size your water system according to the following hardness guidelines to prevent scaling of the heat exchanger. See Figure 4-4 for corresponding water flow.

- If the water is 5 to 8 grain per gallon, this is SOFT water and you have to size the system for a 4 ft/sec minimum water velocity.
- If the water is 8 to 18 grain per gallon, this is NORMAL water and you have to size the system for a 4 to 8 ft/sec minimum water velocity.
- If the water is 18 to 23 grain per gallon, this is HARD water and you have to size the system for a 8 ft/sec minimum water velocity.

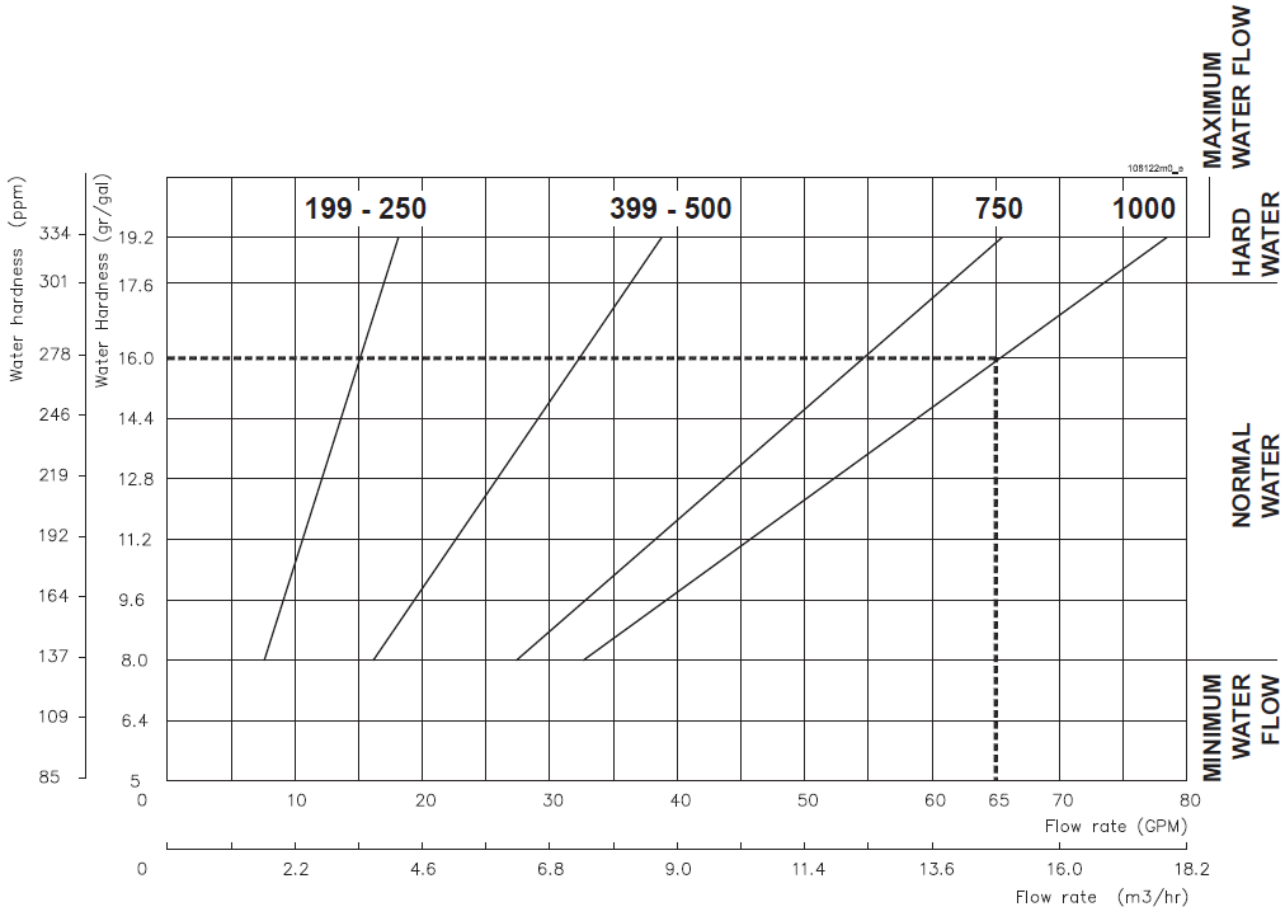


Figure 4-4: AM Series Water Velocity and Flow Graph

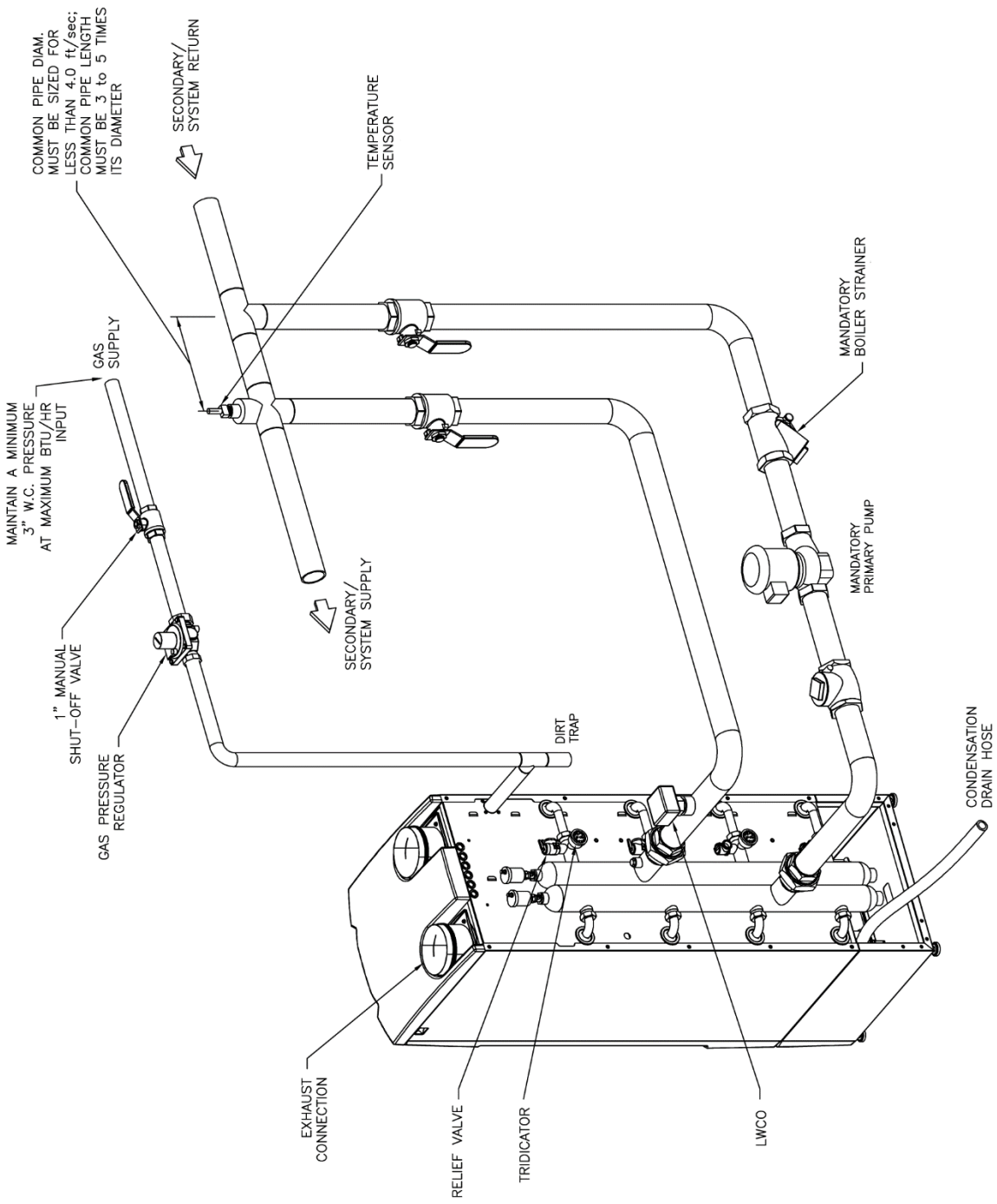


Figure 4-5: AM Boiler Piping Example (Models AM750/1000 Shown)

4.12 Domestic Hot Water System Piping with Direct Water Heater: Water Heaters

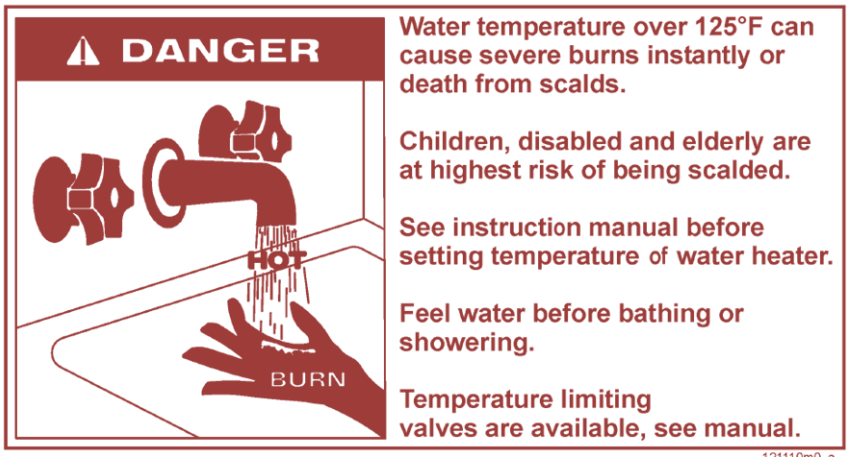
See Figure 4-5, for recommended piping for the AM Series water heater. Refer to Figure 5-3 to wire the water heater pump.

An anti-scald mixing valve is field supplied and is mandatory on the domestic hot water outlet of the water heater.

4.13 Scalding – Water Heaters

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 automatic clothes washers 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.

Figure 4-6 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.



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 4-6: Approximate Time / Temperature Relationships for Scalding

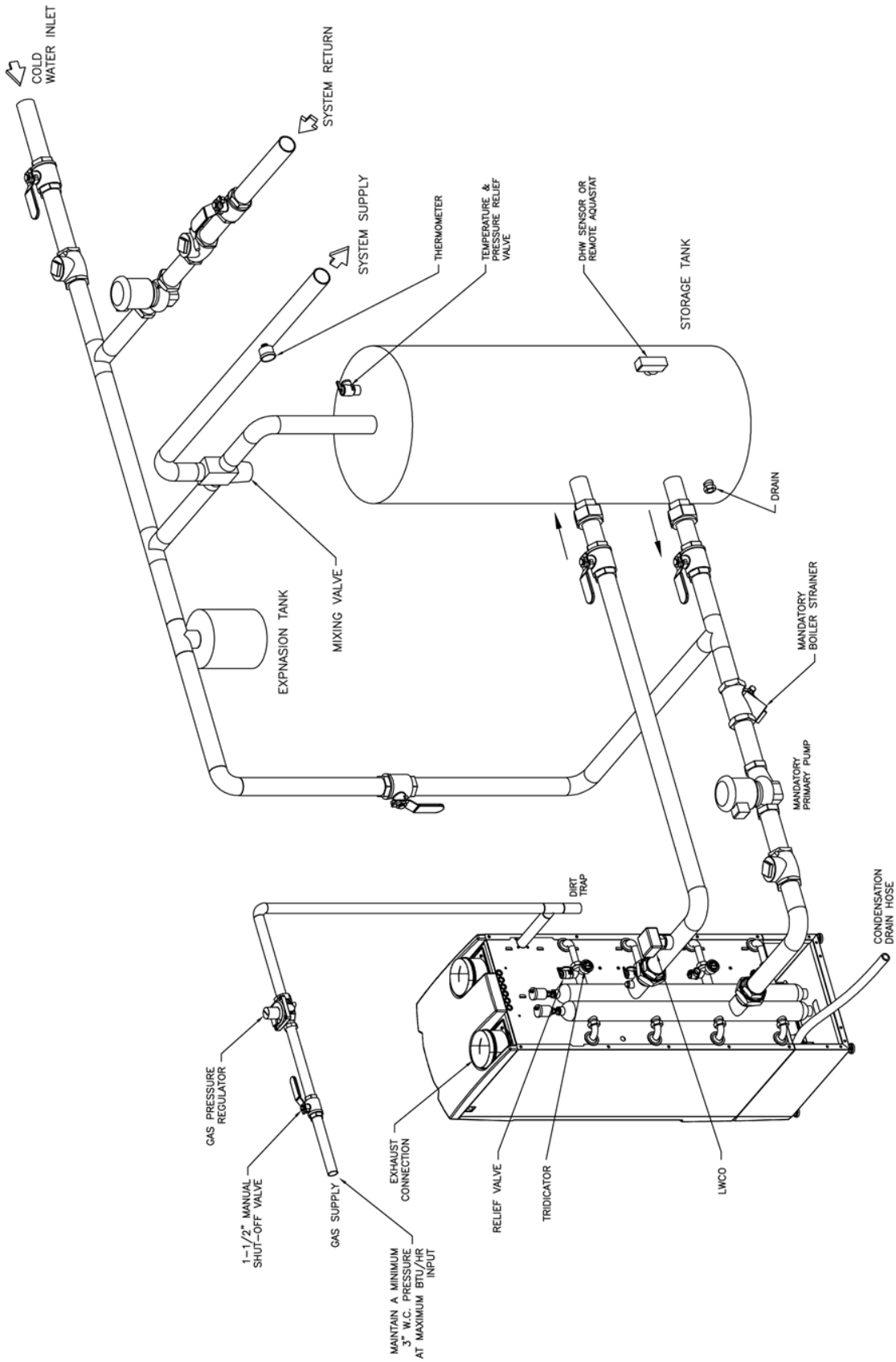


Figure 4-7: AM Water Heater Piping Example (Models AM 750W/1000W Shown)

4.14 Condensate Disposal

WARNING!

The condensate trap (Fig. 4-8, item "B") MUST be filled with water or combustion gases will enter the room. The condensate neutralizer tank must be installed into the unit exactly as shown in Figure 4-8. Do NOT remove the condensate neutralizer tank from its position while the unit is in operation, as this will result in dangerous carbon monoxide escaping and creating a very dangerous situation.

The unit is equipped with a condensate neutralizer tank for the evacuation of condensate and to prevent the leakage of combustion products. The condensate drains from the flue exhaust outlet "A" through pipe to condensate neutralizer tank, drains through pipe "C" (Figure 4-8) and "E" (Figure 4-9, and empties into the floor drain or drain pan, "F" (Fig. 4-9).

NOTE:

In newer units, hose "A" (Fig. 4-8) attaches to a port at the bottom of flue, rather than the side.

The condensation disposal system must:

- slope the condensate tubing down and away from the boiler into a drain or drain pan (See Figure 4-9). Condensate from the boiler will be slightly acidic (around pH 4). The neutralizing tank (see Figure 4-8, item "B") is built into the boiler and will neutralize the condensate products;
- be carried out with a pipe with an internal diameter equal to or greater than 3/4 inches (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;

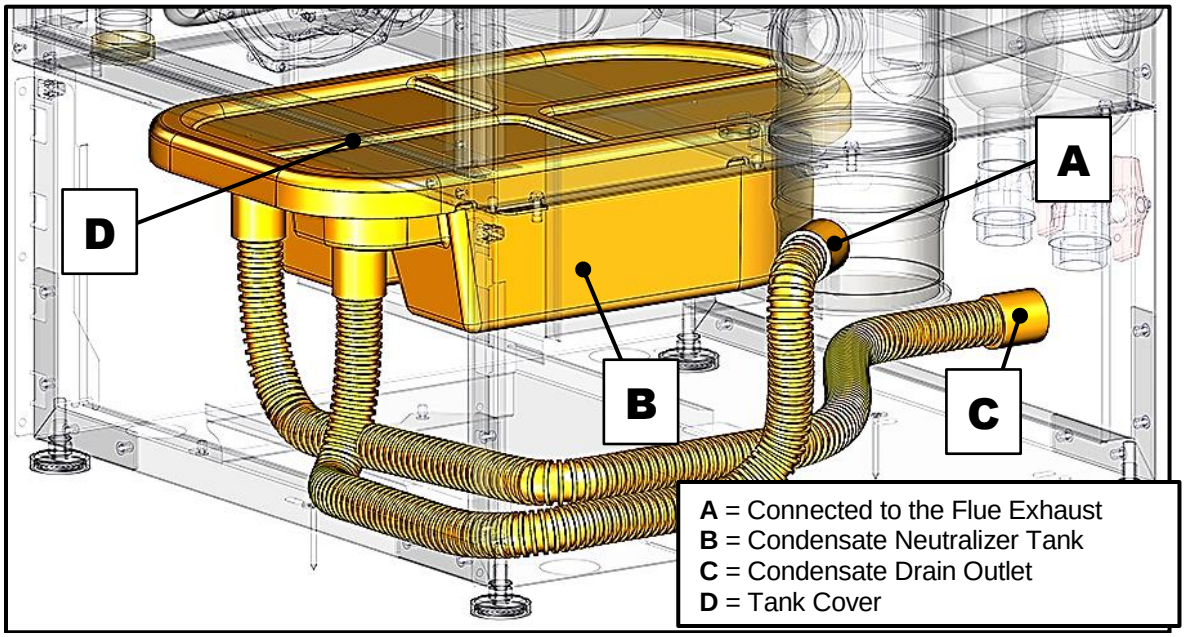


Figure 4-8: Condensate Neutralizer Tank (Unit Transparent for Clarity)

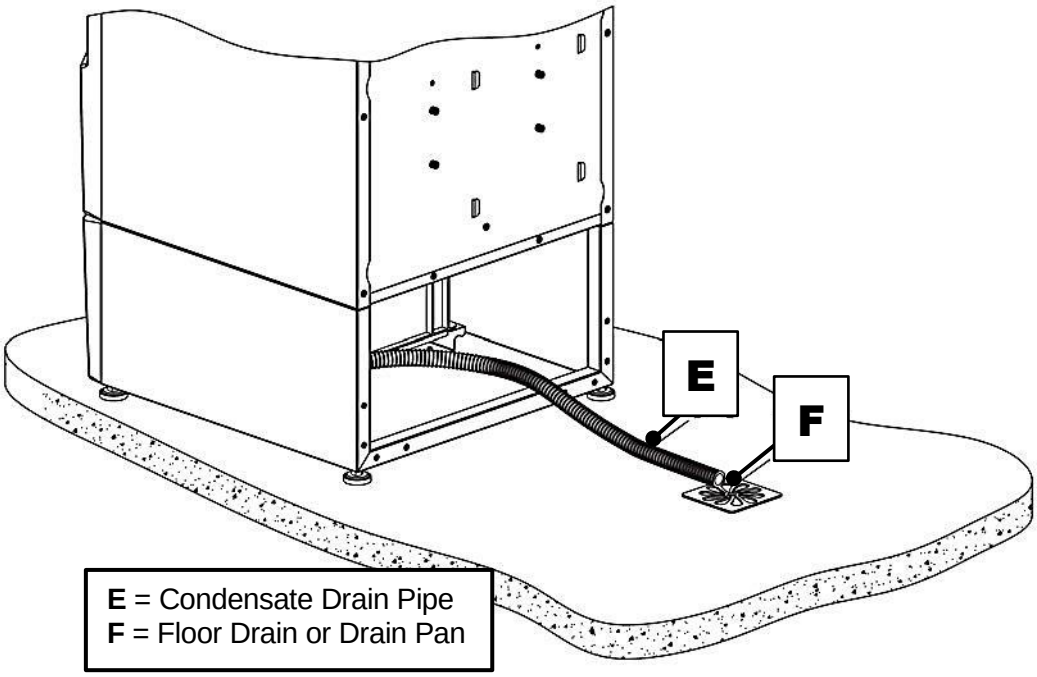


Figure 4-9: Condensate Tank Draining

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

SECTION 5: INSTALLATION – ELECTRICAL

5.1 Electrical Connections – Boilers and Water Heaters

5.1.1 Power Supply Cable Connection - Boilers and Water Heaters

Provide and install a fused disconnect or service switch (15 amp recommended) as required by prevailing codes. To connect the electrical line voltage power supply cable, refer to Figure 5-1.

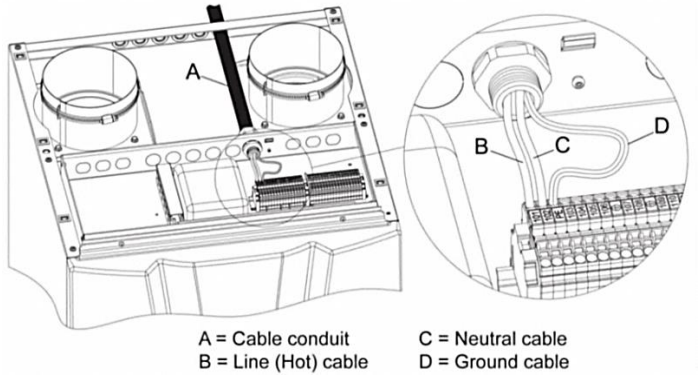


Figure 5-1: Line Voltage Connection

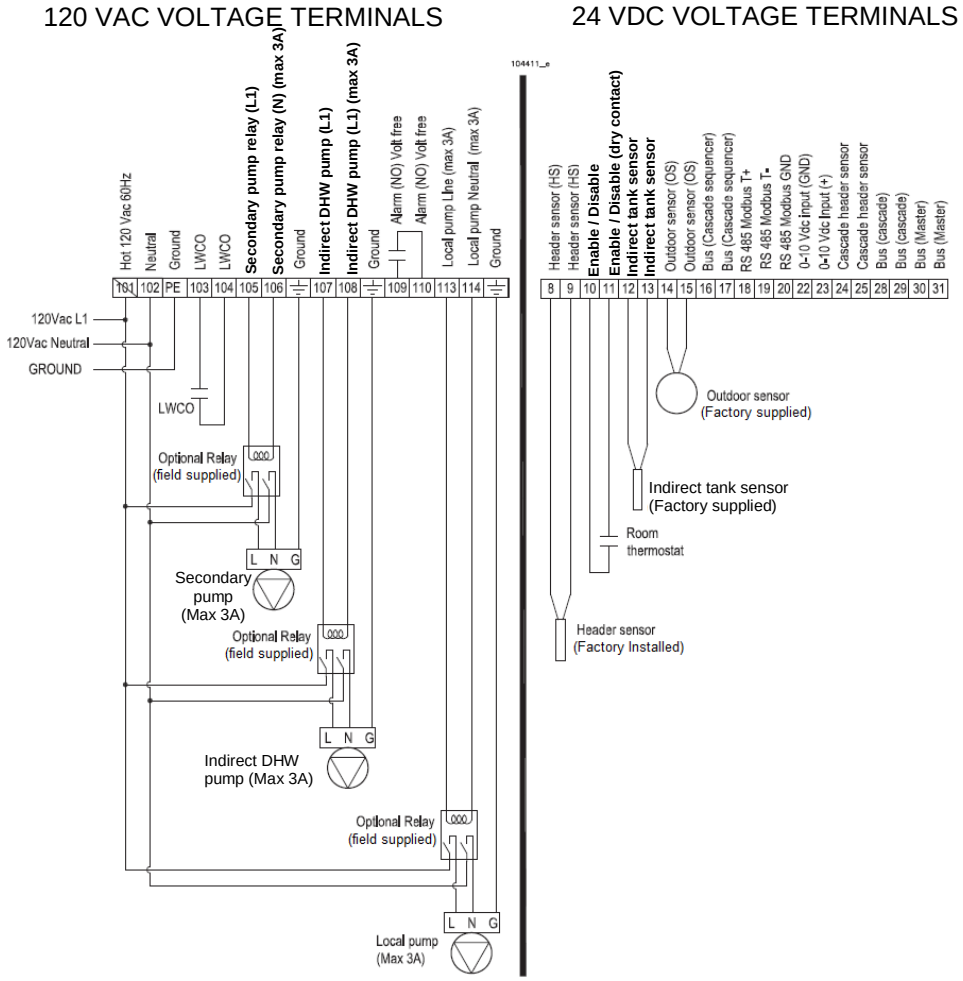


Figure 5-2: Boiler Electrical Junction Box Connections (W/ Optional DHW through an Indirect Tank)

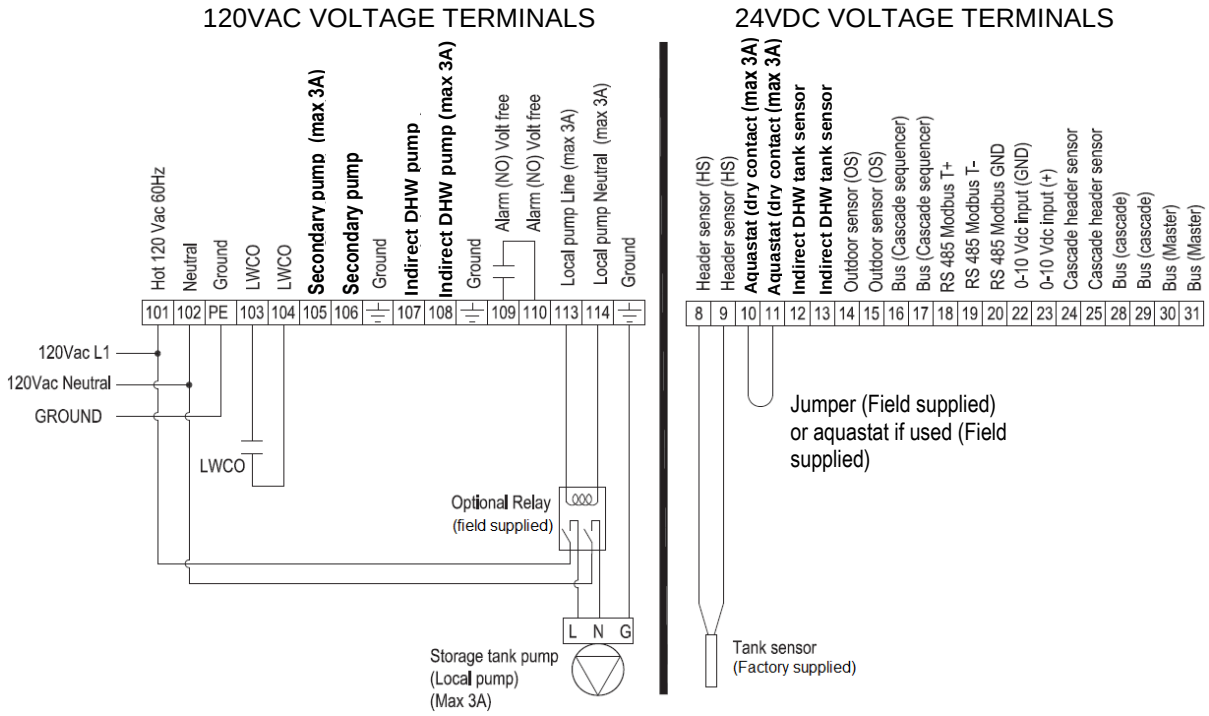


Figure 5-3: Water Heater Electrical Junction Box Connections (with Direct Storage Tank)

5.1.2 Connecting Units in Cascade - Boilers and Water Heaters

Boilers or water heaters may be combined in a cascading system using the optional Cascade Sequencer (P/N 62110095). A maximum of eight heaters can be connected in a cascade. Refer to the AERCO Cascade Sequencer user manual (GF-146-CS) for information on how to set up and use a cascade system using AM water heaters or boilers.

5.1.3 0-10 VDC Input Connections - Boilers and Water Heaters

The AM Series models 500, 750 and 1000 are factory supplied with a Communications Module (the 399 model can be equipped with one as an option). This allows driving the appliance via a 0-10 VDC analog input. To do this, you must connect the 0-10 VDC supply between terminals 22 and 23 (see Figure 5-3) in the electrical junction box, and the CH mode (parameter 2003 in the Installer Menu per Section 9.16) must be set to 4 (four). When configured this way, the heater supply temperature is controlled by the analog input 0-10 VDC as shown in Figure 5-4 where:

- If the input voltage stays below 1.5V, the heater stays OFF.
- If the input voltage increases to between 1.5V and 2.0V, the heater start to operate and the supply temperature stays at the value set for the Minimum CH setpoint (parameter 3018 in the Factory menu per Appendix B).
- As the input voltage changes between 2V and 10V, the supply temperature will change proportionally between the Minimum CH setpoint (parameter 3018 in the Factory menu per Appendix B) and the Maximum CH setpoint (parameter 3017, in the Factory menu per Appendix B).

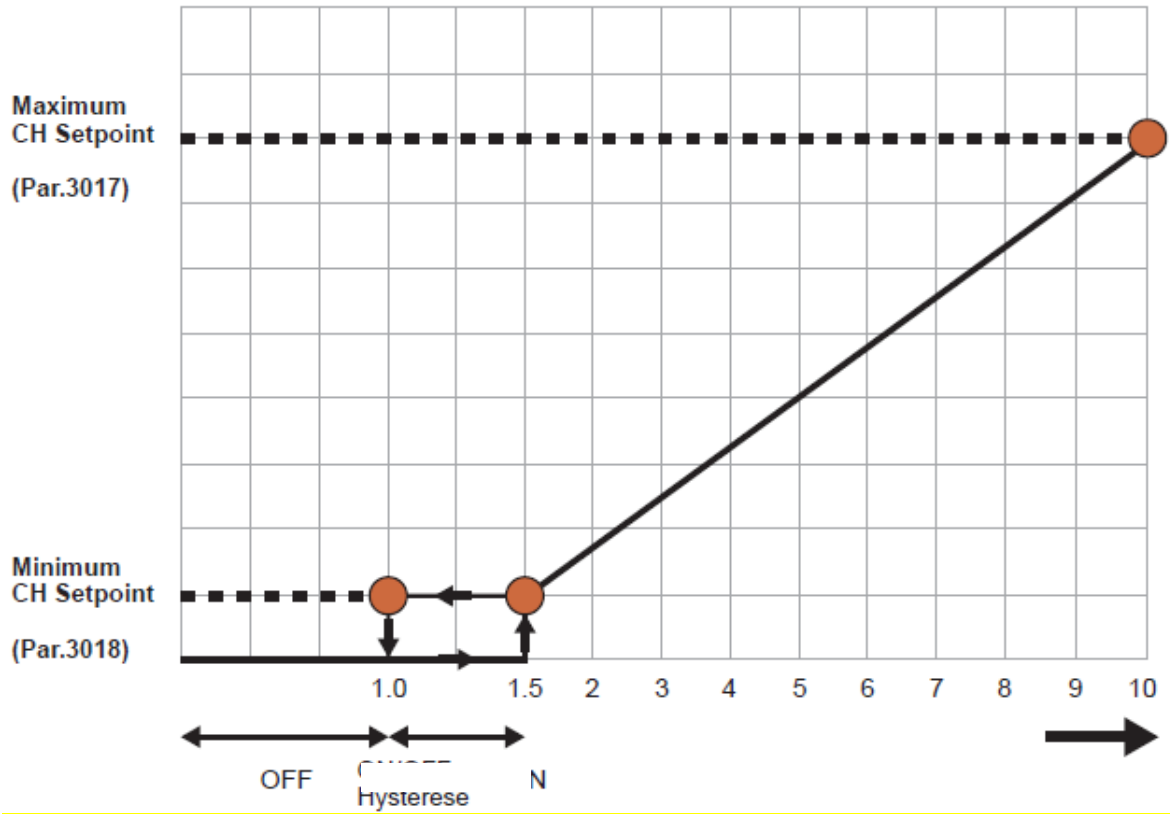


Figure 5-4: 0-10 VDC Analog Input Algorithm

5.1.4 MODBUS Interface Connections – Boilers and Water Heaters

The AM Series models 500, 750 and 1000 are factory supplied with a Communications Module (the 399 model can be equipped with one as an option). This MODBUS interface can be connected to drive the unit from a building management device. Refer to the AM Series MODBUS User Manual (GF-146-MB), which is available from AERCO technical support and the AERCO website (www.aerco.com).

5.1.5 Connection to a LWCO Device

Use only LWCO sensor device. To use water flow switch, ask the manufacturer for an engineering wiring diagram.

Install LWCO device as per engineering method. Connect LWCO to heater terminals terminals 103 and 104.

WARNING!
Heater terminals 103 and 104 containing line voltage; an electrical shock hazard will exist.

5.1.6 Alarm contact

Alarm contact works only in presence of the 885 IF board (see Figures 2-9, 2-12 and 2-15, item 13).

Alarm contact does not react in case a dependent module (burner 2, 3 or 4) is in error.

5.2 Electrical Connections – Boilers Only

5.2.1 Enable/Disable - Boilers

For remote enabling/disabling of a boiler, follow the instructions below.

Wiring an ON/OFF Control to the Boiler

1. Remove the boiler front cover according to the instructions in Section 10.14.
2. Connect the leads of a two conductor cable (with a minimum cross section of #18 AWG) to your enable/disable controller and run the cable to the boiler electrical junction box.
3. Open the boiler electrical junction box cover and connect the leads of the cable to the "10" and "11" terminals as shown in Figure 5-5, below.
4. Enter the Installer Menu (Section 9.16) and ensure that parameter 2003 is set to 0 (zero).

NOTE:

The maximum cable length permitted is 32 feet (10 meters). For longer lengths, up to 300 feet (100 meters), a shielded cable with the shield connected to the ground must be used.

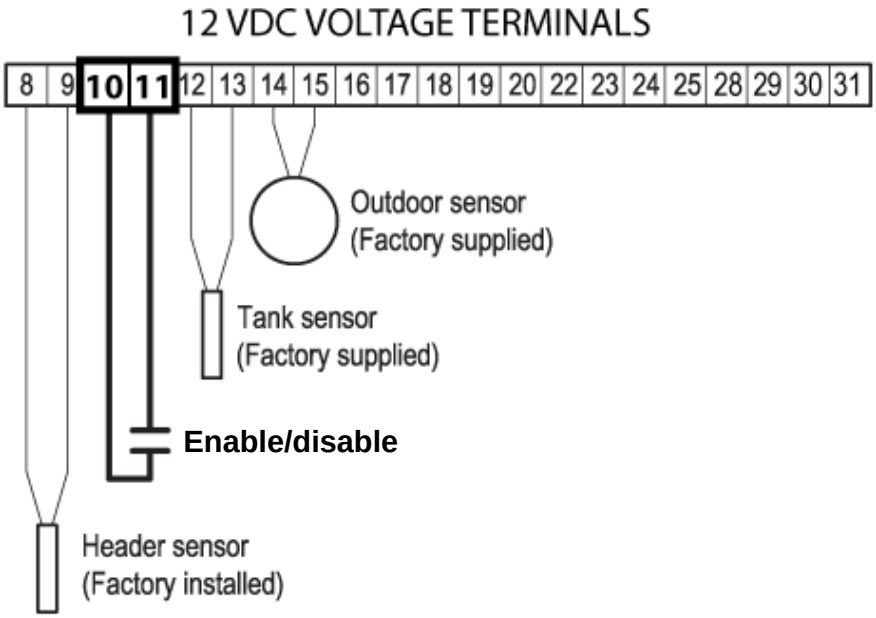


Figure 5-5: Enable/Disable Electrical Connection to Boiler (Terminals 10 and 11)

5.2.2 Installing the Outdoor Temperature Sensor - Boilers

The outdoor temperature sensor is supplied with the boiler. Install the outdoor temperature sensor on an exterior wall of the building facing NORTH or NORTH-EAST, at a height of between 4 feet and 6 feet from the ground level. On multi-story buildings, install the sensor near the upper half of the second floor. Do not install the sensor above doors, windows or ventilation outlets nor directly under balconies or gutter pipes. Do not shield the outdoor temperature sensor. Do not install the sensor on walls without overhangs, or that are not protected from rain. Connect the outdoor temperature sensor to the boiler to terminals "14" and "15" (see Figure 5-5, above).

To connect an outdoor sensor to the boiler, perform the following:

Connecting the Outdoor Temperature Sensor to the Boiler

1. Remove the boiler front cover according to the instructions in Section 10.14.
2. Connect the leads of a two conductor cable (with a minimum cross section of #18 AWG) to the outdoor temperature sensor and run the cable to the boiler electrical junction box.
3. Open the boiler electrical junction box cover and connect the leads of the cable to the "14" and "15" terminals as shown in Figure 5-5, above.
4. Enter the Installer Menu (Section 9.16) and ensure that parameter 2003 is set to 1 (one).

NOTE:

The maximum outdoor temperature sensor cable length permitted is 32 feet (10 meters). For longer lengths, up to 300 feet (100 meters) a shielded cable, with the shield connected to the ground must be used.

WARNING!

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

5.2.3 Indirect Water Heater Connection - Boilers

To connect an indirect water heater to the boiler, perform the following steps:

Connecting the Boiler to an Indirect Water Heater

1. Ensure that water connections are first made per examples in Figures 4-6 or 4-8.
2. Open the boiler electrical junction box cover and connect the leads from the indirect water **heater pump** to terminals "107" and "108" (See Figure 5-3). The pump must not be higher than 2 amps current absorption.
3. Connect the indirect water heater temperature **sensor** to terminals "12" and "13" (See Figure 5-3). The sensor must be placed into the indirect water heater in a way that can detect its water temperature (follow the indirect water heater instructions).
4. Access the Factory Menu (Appendix B) and set parameter 3012 to 1 (one) to set the boiler to detect the indirect water heater sensor. Refer to Section 9.7 to set the desired indirect water heater temperature.

WARNING!

Since the indirect water heater temperature sensor wires conduct 24 VAC, they must never be run through conduits containing 120 VAC power wires or an electrical shock hazard will exist.

5.2.4 Indirect Water Heater Priority Selection - Boilers

The boiler is factory set for DHW priority. This means that the boiler will stay in DHW mode until the capacity of the indirect water heater reaches temperature. Once the indirect water heater is satisfied the boiler will automatically return to central heating.

Priority selection is a functionality that toggles between heating and DHW demand when they are both active at the same time. The priority selection is set with the 2067 (DHW Priority) parameter in the Installer Menu (see Section 9.16).

- If parameter 2067 is set to "**0**", the boiler will load the indirect water heater for the time set in parameter 2063 and, after that, heating will take place for the same amount of time.
- If parameter 2067 is set to "**1**", the boiler is prioritized for heating functionality.
- If parameter 2067 is set to "**2**", the boiler is prioritized for indirect water heating.

5.3 Electrical Connections – Water Heaters Only

5.3.1 Storage Tank Connection - Water Heaters

This unit must be connected to a storage tank as follows:

Connecting the Water Heater to a Storage Tank

1. Connect the storage tank to the water heater as shown in Figure 4-7.
2. Remove the water heater front cover according to the instructions in Section 10.14.
3. If using an aquastat, connect the leads of a two conductor cable (with a minimum cross section of #18 AWG) to the aquastat and run the cable to the water heater electrical junction box.
4. Connect the aquastat cable leads to the "10" and "11" terminals as shown in Figure 5-5.
5. Access the Installer Menu (Section 9.16) and ensure that parameter 2003 is set to 0 (zero).
6. The storage tank pump must be connected to terminals "113" and "114" of the electrical junction box (See Figure 5-3) (a field supplied pump relay must be installed if the pump current draw is greater than 3 amps).
7. Remove the header sensor connections from terminals "8" and "9" (Figure 5-5).
8. Connect the leads of a two conductor cable (with a minimum cross section of #18 AWG) to the storage tank temperature sensor and run the cable to the water heater electrical junction box.
9. The storage tank temperature sensor must be connected to terminals "8" and "9" (See Figure 5-5). The sensor must be placed into the storage tank in a way that can detect the water temperature (Follow the storage tank manufacturer's instructions).
10. Refer to Section 9.14 for how to set the desired storage tank temperature.

NOTE:

The maximum cable length permitted is 32 feet (10 meters). For longer lengths, up to 300 feet (100 meters), a shielded cable with the shield connected to the ground must be used.

5.4 AMR Rapid Recovery Option Wiring

If installing an AM water heater with the AM Rapid Recovery (AMR) option, the following electrical connections should be confirmed in addition to all connections previously described. Refer to Section 2.4 for a description of the AMR option. The recirculation pump, pump relay, and LWCO are prewired into the AM water heater wiring terminals, as shown in Figure 5-6.

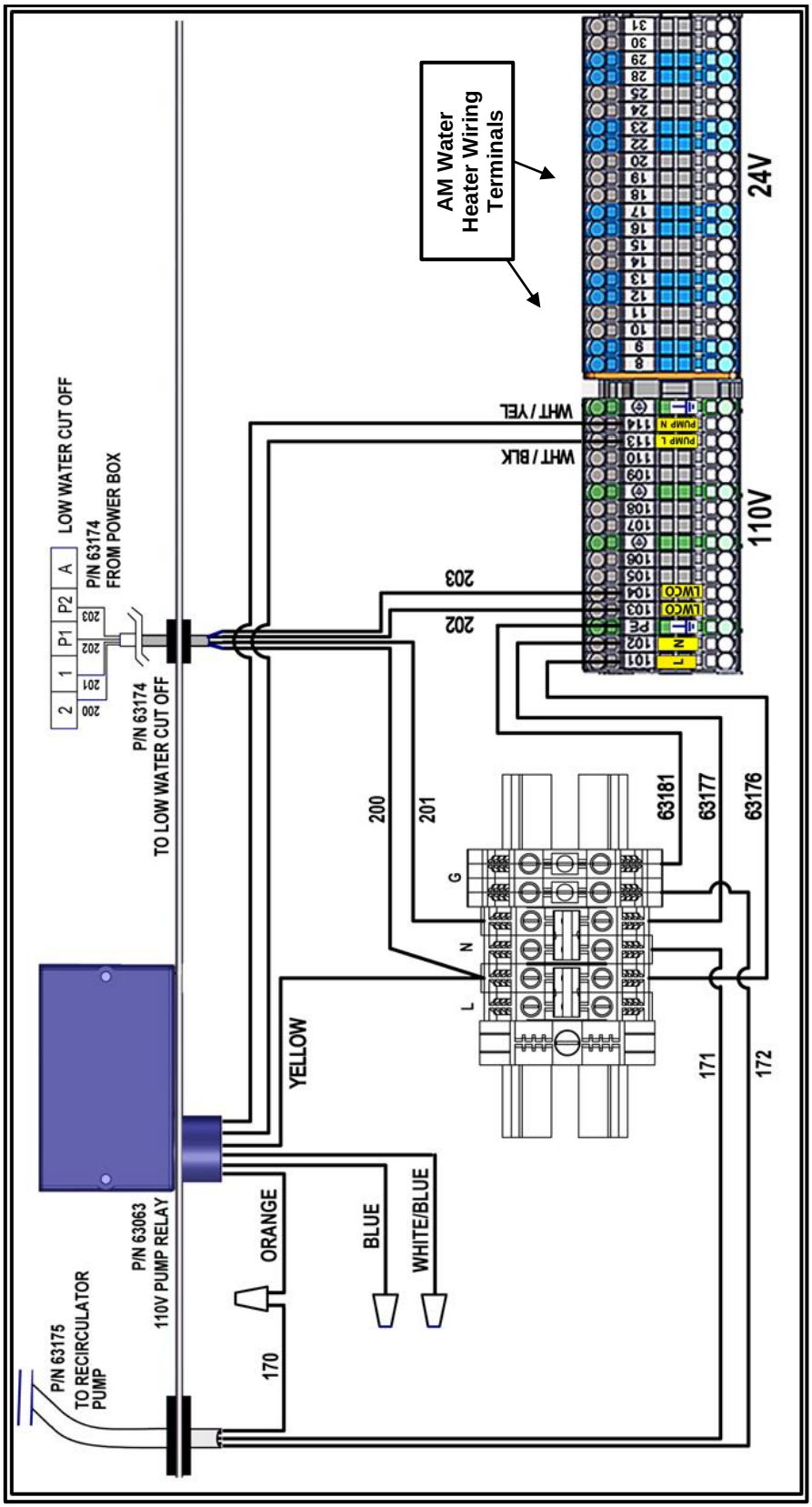


Figure 5-6: AMR Recirculation Pump, Pump Relay, and LWCO Wiring (Other Wiring Not Shown for Clarity)

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SECTION 6: INSTALLATION – VENTING AND COMBUSTION AIR PIPING

WARNING!

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

6.1 Combustion Air Contamination Prevention

Install air inlet piping only as described in all of Chapter 6. Do not terminate vent/air in locations that can allow contamination of combustion air.

WARNING!

Contaminated combustion air will damage the unit possibly causing a dangerous condition.

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

- Permanent wave solutions;
- Chlorinated waxes/cleaners;
- Chlorine-based swimming pool chemicals;
- Calcium chloride used for thawing;
- Sodium chloride used for water softening;
- Refrigerant leaks;
- Paint or varnish removers;
- Hydrochloric acid/muriatic acid;
- Cements and glues;
- Antistatic fabric softeners used in clothes dryers;
- Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms;
- Adhesives used to fasten building products and other similar products.

Do not pipe combustion air near sources of products that may contaminate the air combustion, such as:

- 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.

6.2 General Venting and Air Piping Systems

The AM Series of boilers and water heaters requires a special vent system, designed for pressurized venting.

The unit is to be used for either direct vent installation or for installation using room combustion air. When room air is considered, see example #6 in Figure 6-1 for an example of such a venting configuration.

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 6-1.

Be sure to locate the unit 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 Chapter 6.

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.

All vent pipes must be mechanically fixed.

The exhaust vent and the air inlet lines must be supported to prevent sagging. To do this, use a suitable pipe clamp to support the lines. Pipe clamps shall support the line every 3 feet (1 meter). Provide a support at each elbow. Pipe clamp shall be fixed with use of a wall stud.

DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Use only approved materials listed on Tables 3-3 and 3-4.

Use of cellular core PVC and CPVC, or Radel, for venting system is **NOT** allowed.

Improper venting due to failure to comply with the warnings above can result in excessive levels of carbon monoxide!

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

The vent system shall be installed so as to prevent the accumulation of condensate.

Due to the high efficiency of the unit 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.

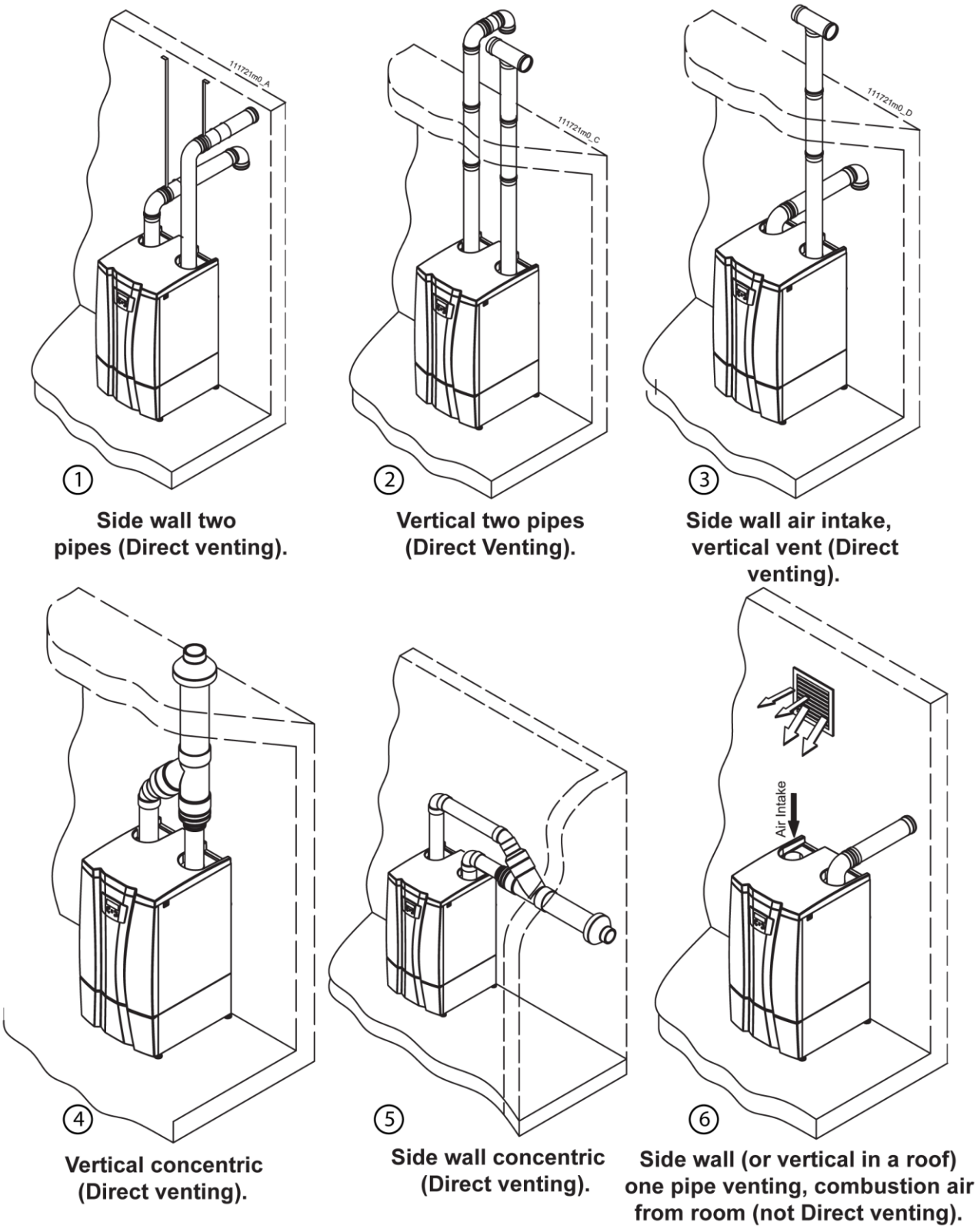


Figure 6-1: Acceptable Vent/Air Piping Methods for AM Series Units

6.3 Min/Max Allowable Combustion Air and Vent Piping Lengths

- The **maximum** length of the two pipes vent system is 120 equivalent feet (air intake plus flue exhaust). However, each single pipe can't be longer than 60 feet.
- Each 45° elbow inserted in the venting system has a loss of pressure equivalent to 3 feet of linear pipe.
- Each 90° elbow inserted in the venting system has a loss of pressure equivalent to 6 feet of linear pipe.
- The **minimum** length of the venting system is 1 foot (357 mm).

6.4 General Venting and Combustion Air Piping Installation

The unit 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. 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.

WARNING!

Failure to provide a properly installed vent and air system will cause severe personal injury or death.

Using vent materials other than those listed in Table 6-1, 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 injury, death or property damage.

Table 6-1: Approved Venting Materials

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

NOTE: Use of cellular core PVC, CPVC, and Radel for venting system is not allowed.

6.5 Specific Vent Installations

Choose acceptable combustion air inlet pipe materials from the following list:

- PVC, CPVC or ABS
- Polypropylene material to be sealed to specification of its manufacturer.
- AL29-4C, stainless steel material to be sealed to specification of its manufacturer. If using stainless steel, refer to section 6.5.1.

Polypropylene and stainless steel pipe may require an adaptor (not provided) to transition between the air inlet connection on the appliance and the air inlet pipe. Contact the vent manufacturer for a suitable adaptor.

6.5.1 Installations Requiring High Temperature Venting

The AM Series burners are factory set for plastic venting applications, and will the firing rate when flue gas temperatures reach 203°F. For installations with a delta T <35°F and return water temperatures higher than 145°F, a high temperature vent kit (69254-TAB) is required, and PVC venting is not allowable. These kits are automatically configured in buy.aerco.

Factory Menu Settings and Fuse Replacement for SST Venting

1. Refer to Appendix B for how to access, navigate, and choose settings in the Factory Menu.
2. Navigate to 3100 parameter and change to "**SST**" for stainless, "**CPVC**" for cPVC, and "**PP**" for polypropylene venting, which changes vent temperature threshold from 203°F to 215°F.
3. Refer to section 10.14 for instructions on opening the front panels to access the burners.
4. Locate the red Molex bayonet style fuse located to the right of each burner module, at the exhaust flue connection, as shown in 6-1a.
5. Remove each existing fuse rated for 203°F (P/N 62110042) and replace with the new one rated for 215°F (62110046).
6. Replace the front covers and proceed with venting installation procedures.

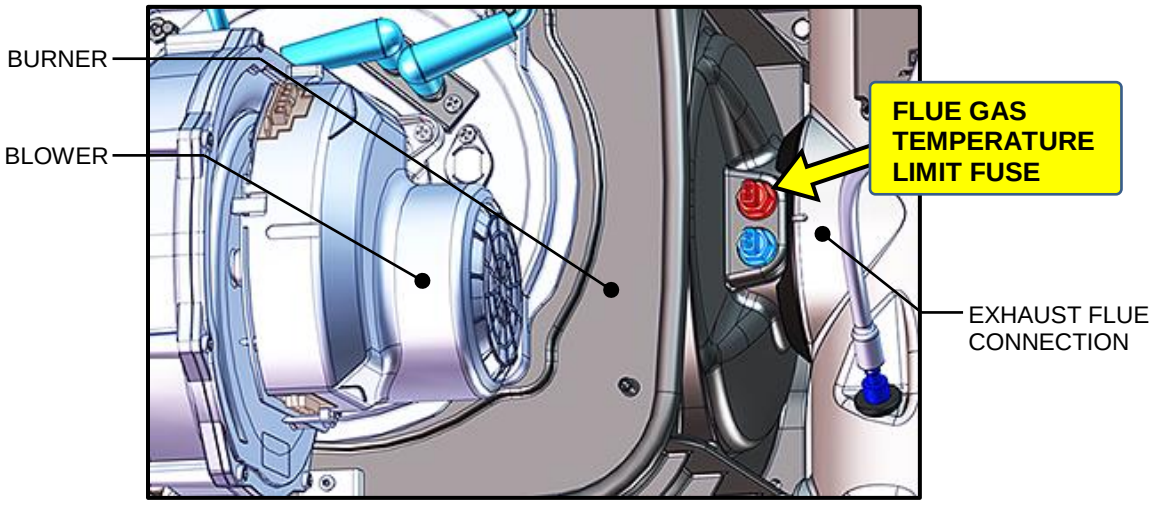


Figure 6-1a: Location of Flue Gas Temperature Limit Fuse

6.5.2 Sealing of PVC or CPVC

The PVC or CPVC should be cleaned and sealed with the pipe manufacturer's recommended solvents and standard commercial pipe cement for the material used. The PVC or CPVC should use a silicone sealant to ensure a proper seal at the appliance connection and the air inlet cap connection. 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.

6.5.3 PVC/CPVC Vent Piping Materials

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.

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

WARNING!

Do not insulate PVC/CPVC exhaust pipes nor install into an enclosure, closet, alcove or any other obstruction thereby preventing the cooling of the exhaust pipe.

WARNING!

PVC venting is only approved for installations with a difference of >35 degrees between supply and return temperature, and a return temperature less than 145°F. For lower ΔT systems, cPVC, polypropylene, or stainless steel venting is required. A high temperature kit will also be required. Contact your manufacturer's representative for further information.

6.5.4 Air Intake and Vent Starter Pieces

Venting must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.

Figure 6-2 shows how the air intake and vent outlet adapters are assembled. To connect a vent pipe to the air intake and vent outlets, proceed as follows while referring to Figures 6-2 and 6-3:

Installing the Air Intake and Vent Connections

1. Apply a suitable sealant (Viton RTV or equivalent) to the inside diameter of both the air inlet adapter and vent outlet adaptor (see Figure 6-2) to create an airtight seal with the piping.
2. Install air inlet piping and exhaust vent piping 3" deep into the adapters.
3. Tighten each adaptor hose clamp (Fig. 6-2) to secure each adaptor to its respective piping.
4. Drill a 1/4" hole into the exhaust outlet piping in approximately the position as shown in Figure 6-2. This port will be used as a combustion analysis port during the combustion calibration procedure described in Section 8.2. Procure a suitable cap to plug this port when it is not being used for calibration.

WARNING!

You must ensure that a suitable cap is used to seal the calibration analysis port during normal operation to prevent the escape of dangerous exhaust gases.

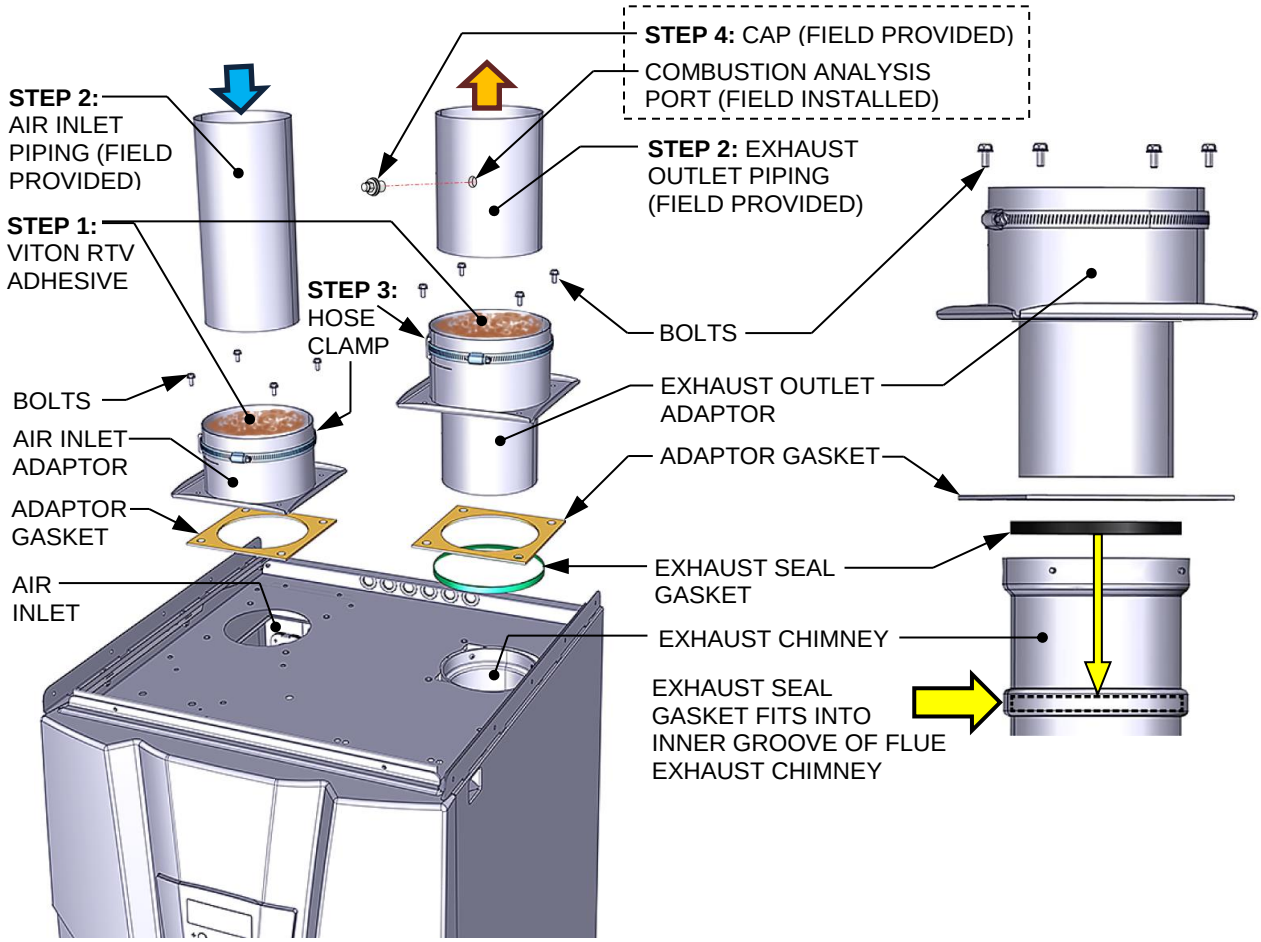


Figure 6-2: Air Intake and Vent Connection Installation

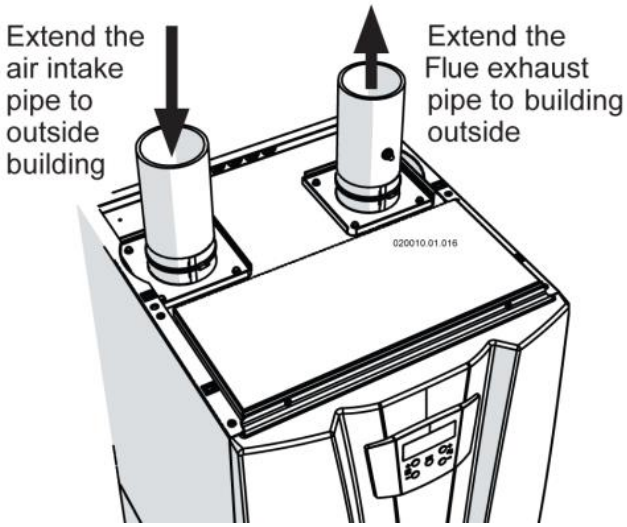


Figure 6-3: Air Intake and Vent Connection Correctly Installed

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

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

The installer must use a specific vent starter adaptor at the flue collar connection, supplied by the vent manufacturer to adapt to its vent system.

WARNING!

Do not insulate polypropylene exhaust pipes nor install into an enclosure, closet, alcove or any other obstruction thereby preventing the cooling of the exhaust pipe.

Do not use water-based lubricants on joints. Never use hydrocarbons-based lubricants because they would destroy gaskets.

6.5.5 Single Pipe Venting (Room Air Combustion)

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:

Utilizing the single pipe method, provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes. For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 6-1).

There will be an increase in the noise level during normal operation from the inlet air opening.

Vent system and terminations must comply with all venting instructions found in Chapter 6.

All vent pipes connections must be secured following manufacturer instruction, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the boiler (to allow drainage of condensate). Vent pipe system shall be installed in a way to prevent accumulation of condensate;

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

6.5.6 Determining Vent Termination Location

Locate the vent termination using the following guidelines:

1. The total length of piping for vent must not exceed the limits given in Section 6.3.
2. You must consider surrounding factors when terminating the vent, such as:
   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 6-5, 6-6, or 6-7.

CAUTION!

Do not exceed the maximum lengths of the outside vent piping shown in Figure 3-31. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential heater shutdown.

4. Maintain clearances as shown in Figure 6-5. Vent must terminate as follows:
   - 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.
   - 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. Requirement unique to CANADA: vent system shall terminate at least 6 feet 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.

NOTE
Minimum clearances to grade may be higher depending on snow line.

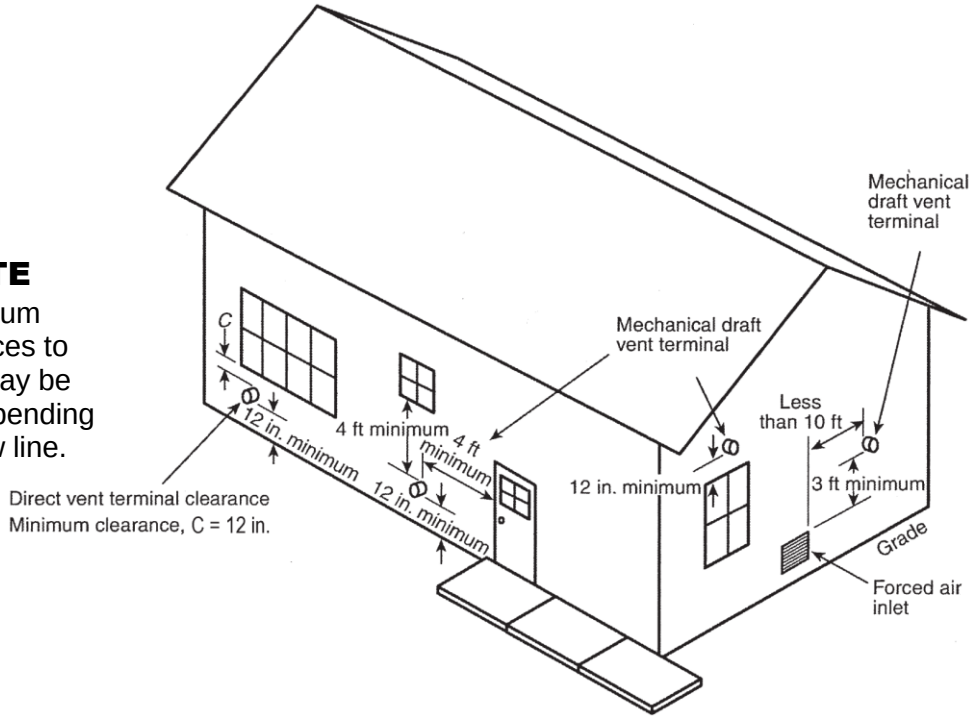


Figure 6-4: Vent Locations and Clearances for Direct Venting

6.5.7 Sidewall Termination - Two pipes

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.

CAUTION!
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.

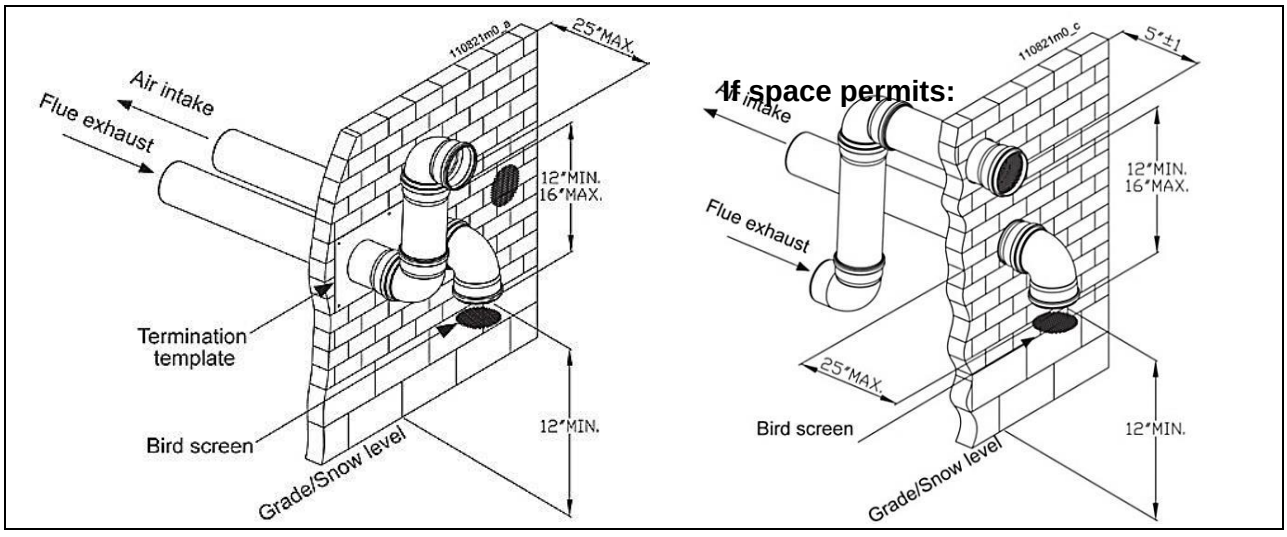


Figure 6-5: Sidewall Termination of Air and Vent Pipes

6.5.8 Combustion Air and Ventilation Openings

Outdoor combustion air shall be provided through opening(s) to the outdoors.

WARNING!

Make sure that combustion air and ventilation openings are sufficiently sized and no reduction or closure of openings takes place.

6.5.9 Two Permanent Openings Method

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

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

6.5.10 One Permanent Opening Method

One permanent opening, commencing within 12 inches (300 mm) of the top of the room, shall be provided. The appliances shall have clearances of at least 1 inch (25 mm) from the sides and back and 6 inches (150 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors and shall have a minimum free area of 1 in 2 each 3000 Btu/hr (700 mm2/kW) of the total input rating of all appliances located in the room.

6.5.11 Installing Vent and Air Piping into Sidewall

Install vent and air piping through sidewalls as follows:

Installing Vent and Air Piping into Sidewall

1. Install air pipe through wall: Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Install vent pipe through wall:
   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 6-6.
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.

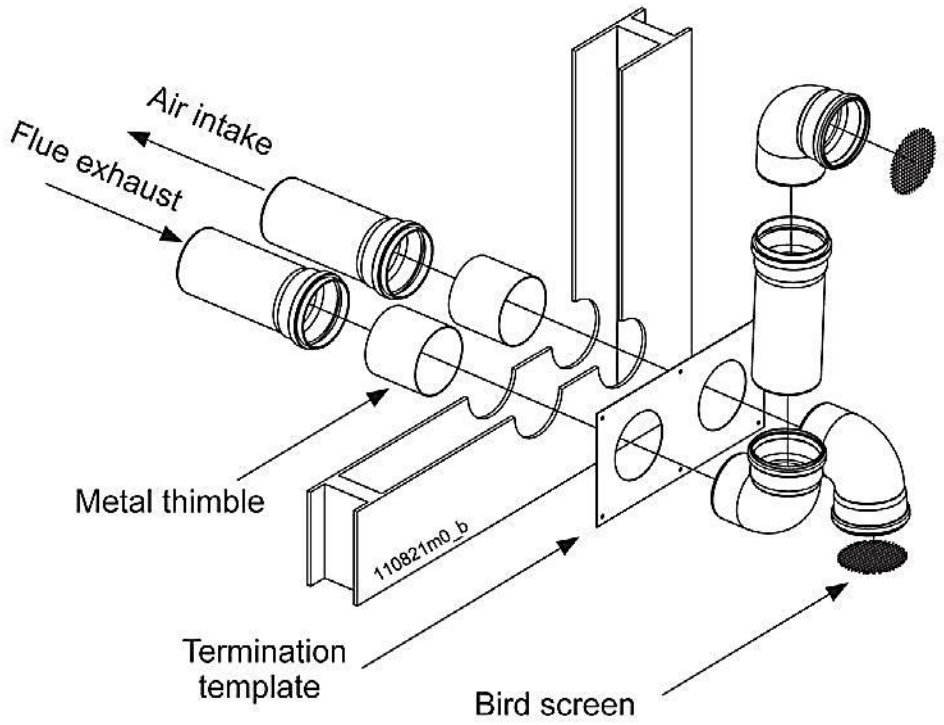


Figure 6-6: Separate Air Intake and Vent Pipes Sidewall Termination

6.5.12 Sidewall Termination and Fittings

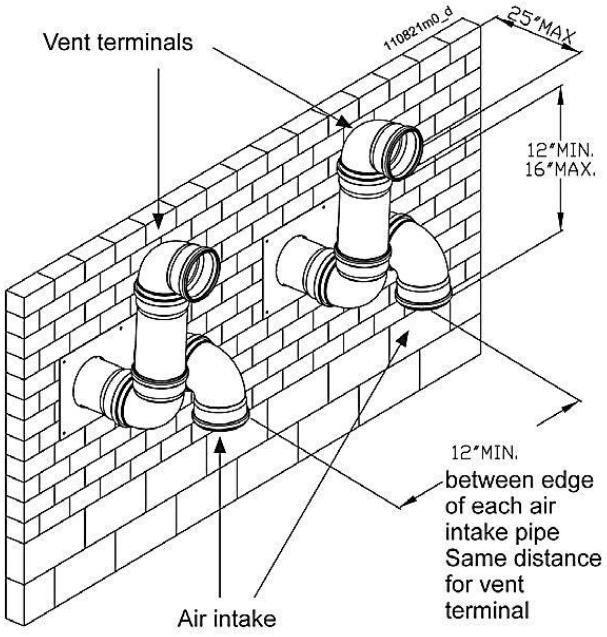
Ensure the following when installing through sidewalls:

- The air termination coupling must be oriented at least 12 inches above grade or snow line as shown in Figure 6-5.
- Maintain the required dimensions of the finished termination piping shown in Figure 6-5.
- Do not extend exposed vent pipe outside of the building more than what is shown in Figure 6-5. Condensate could freeze and block vent pipe.

6.5.13 Multiple Vent and Air Terminations

When installing multiple air and vent terminations, ensure the following:

- Terminate each vent/air connection as shown in Figure 6-7.
- All vent pipes and air inlets must terminate at the same height.
- Place wall penetrations to obtain minimum clearance of 12 inches between edge of air inlet and adjacent vent outlet, as shown in Figure 6-7 for U.S. installations. For Canadian installations, provide clearances required by CSA B149.1 Installation Code.
- The air inlet is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent appliance vents.



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

Figure 6-7: Two-Pipe Multi-Unit Air and Vent Sidewall Termination

6.5.14 Sidewall Termination – Concentric Vent

A concentric vent termination must terminate outside the structure and must be installed as shown in Figure 6-8. The termination opening must be protected from rain, as shown in Figure 6-9.

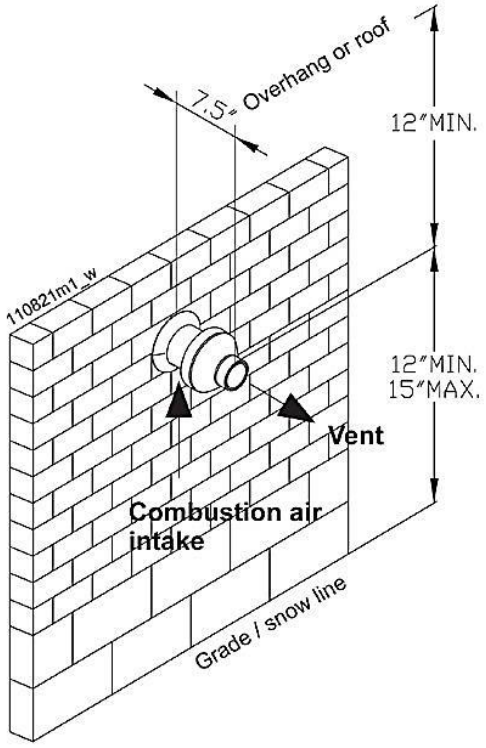


Figure 6-8: Concentric Sidewall Termination Clearances

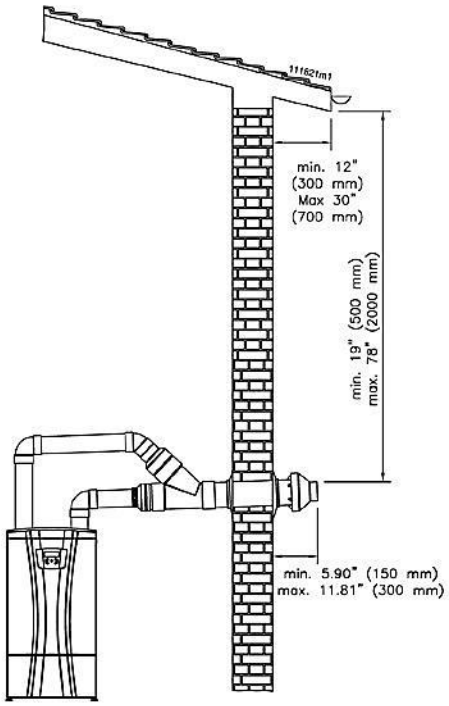


Figure 6-9: Concentric Sidewall Termination Clearances (Side View)

6.5.15 Sidewall Termination Installation

Install a concentric vent termination into a sidewall as follows:

Installing Concentric Vent Termination into Sidewall

1. Determine the best location for the termination (see Figures 6-8 and 6-9).
2. The total length of piping for vent or air must not exceed the limits given in Section 6.3.
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 inches diameter into the structure to install the termination.
5. Install the concentric vent following the concentric kit manufacturer's instruction. Ensure termination location clearance dimensions are as shown in Figures 6-8 and 6-9.
6. Operate the appliance one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

6.5.16 Multi-venting 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 6-10. It is important that vent terminations be made as shown to avoid recirculation of flue gas.

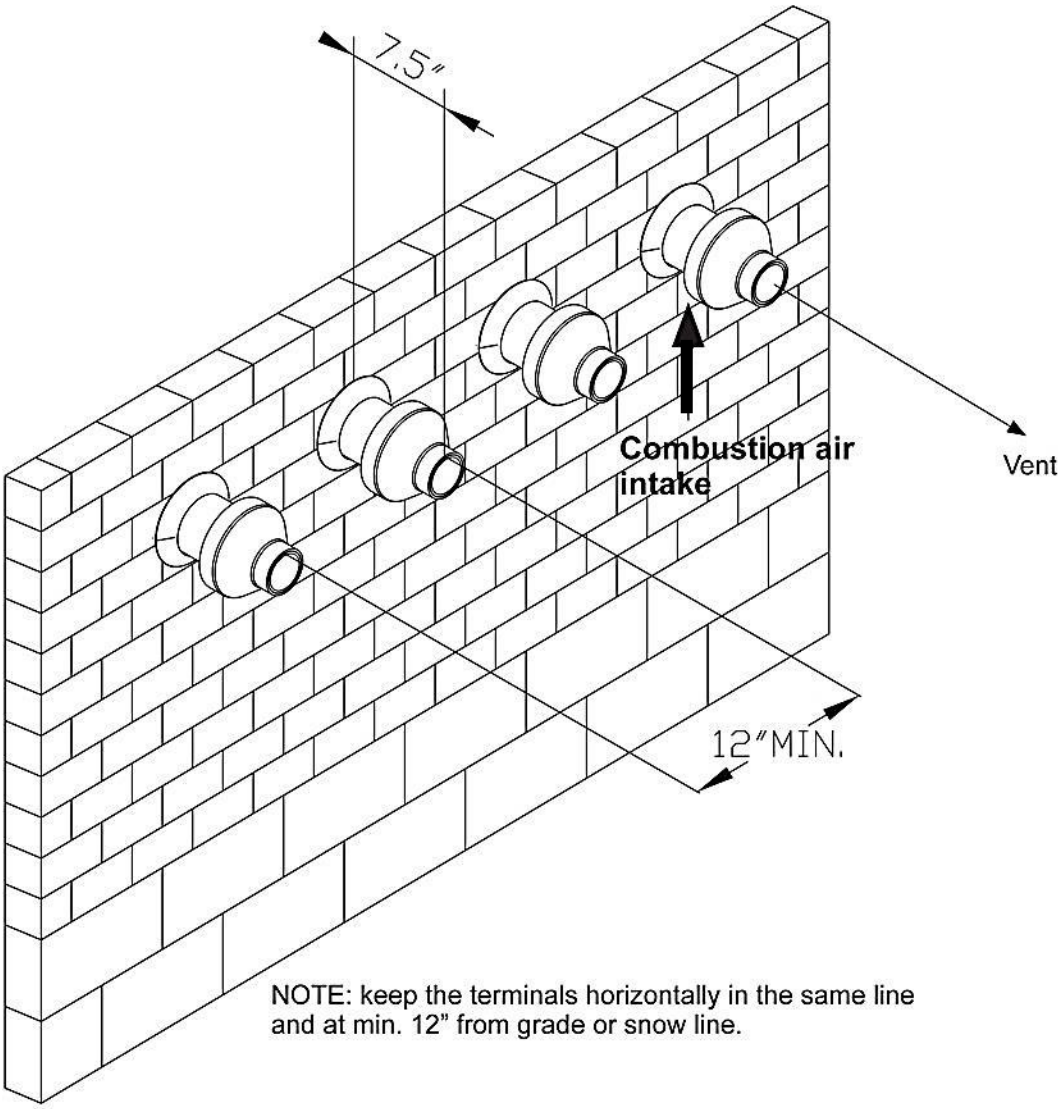


Figure 6-10: Concentric Sidewall Multiple-Unit Termination Clearances

6.5.17 Determining Location of Vertical Termination

Locate the vertical 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 6.3.
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 vent must terminate in a tee or acceptable rain-cap.
4. The air piping must terminate in a down-turned 180° return pipe no further than 2 feet from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream
5. The vent piping must terminate at least 1 foot above the air intake. The air inlet pipe and vent pipe can be located in any desired position on the roof, but must always be no further than 2 feet apart and with the vent termination at least 1 foot above the air intake.
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.

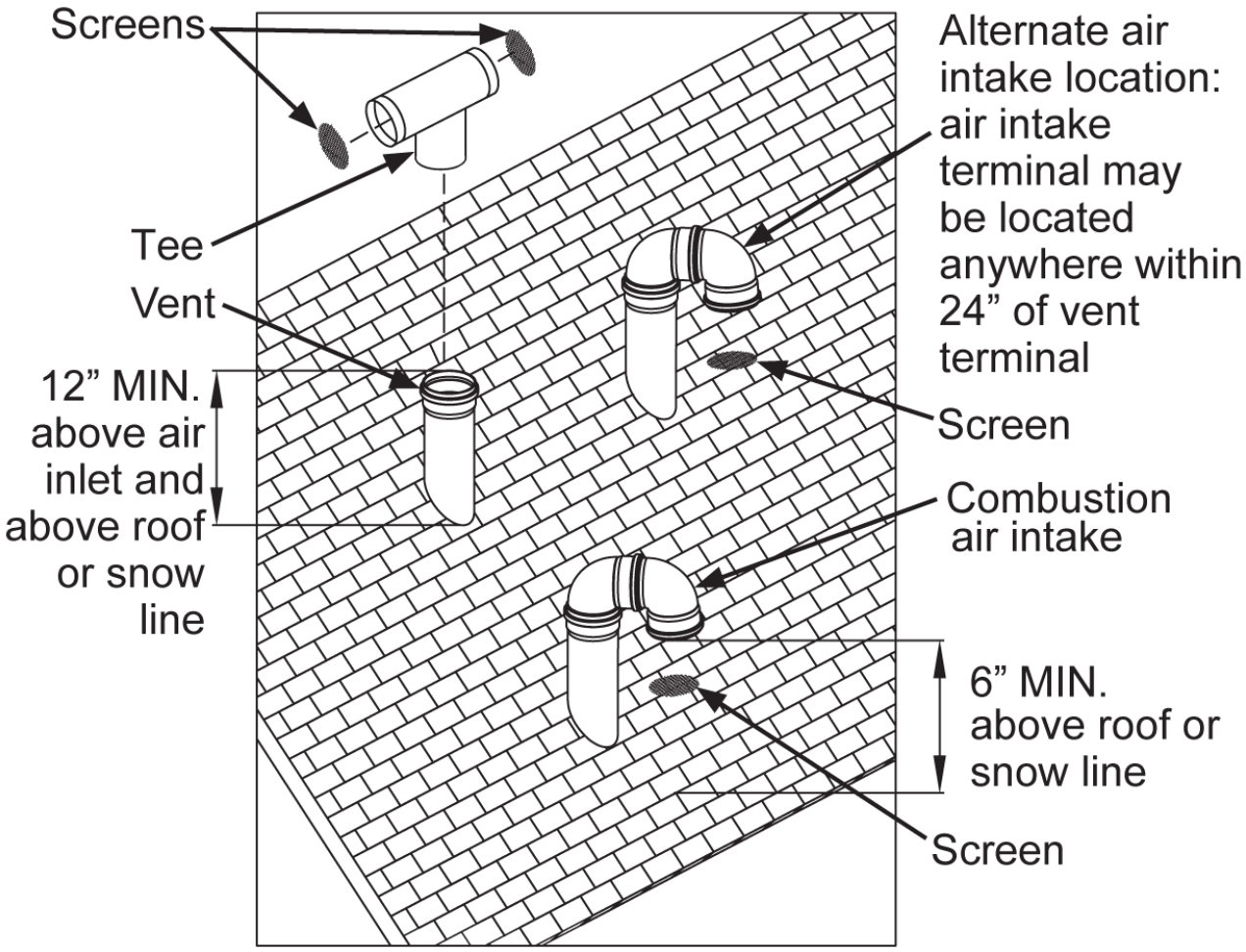


Figure 6-11: Vertical Vent Termination

6.5.18 Vertical Vent and Air Roof Termination Preparation

Prepare for installation of vent and air termination into a roof as follows:

Vertical Vent and Air Roof Termination Preparation

1. Air pipe penetration: cut a hole for the air pipe, sizing the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
3. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter;
4. Insert a galvanized metal thimble in the vent pipe hole.
5. Space the air and vent holes to provide the minimum spacing shown in Figure 6-11 and listed in Section 6.5.16.
6. Follow all local codes for isolation of vent pipe when passing through floors, ceilings, and roofs.
7. Provide flashing and sealing boots sized for the vent pipe and air pipe.

6.5.19 Installing Vertical Vent and Air Roof Terminations

Install vent and air terminations into a roof as follows:

Installing Vertical Vent and Air Roof Terminations

1. Prepare the vent termination and the air termination elbow (Figure 6-11) by inserting bird screens.
2. The air piping must terminate in a down-turned 180° return bend as shown in Figure 6-11. Locate the air inlet pipe no further than 2 feet from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream.
3. Maintain the required dimensions of the finished termination piping as shown in Figure 6-11.
4. Do not extend exposed vent pipe outside of building more than shown in Figure 6-11. Condensate could freeze and block vent pipe.

6.5.20 Installing Multiple Vent and Air Vertical Terminations

Install multiple vent and air terminations in a roof as follows:

Installing Vertical Multiple Vent and Air Roof Terminations

1. When terminating multiple units, terminate each vent/air connection as shown in Figure 6-12.
2. Place roof penetrations to obtain minimum clearance of 12 inches between edge of air intake elbow and adjacent vent pipe of another appliance for U.S. installations
3. The air inlet is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent appliance vents.

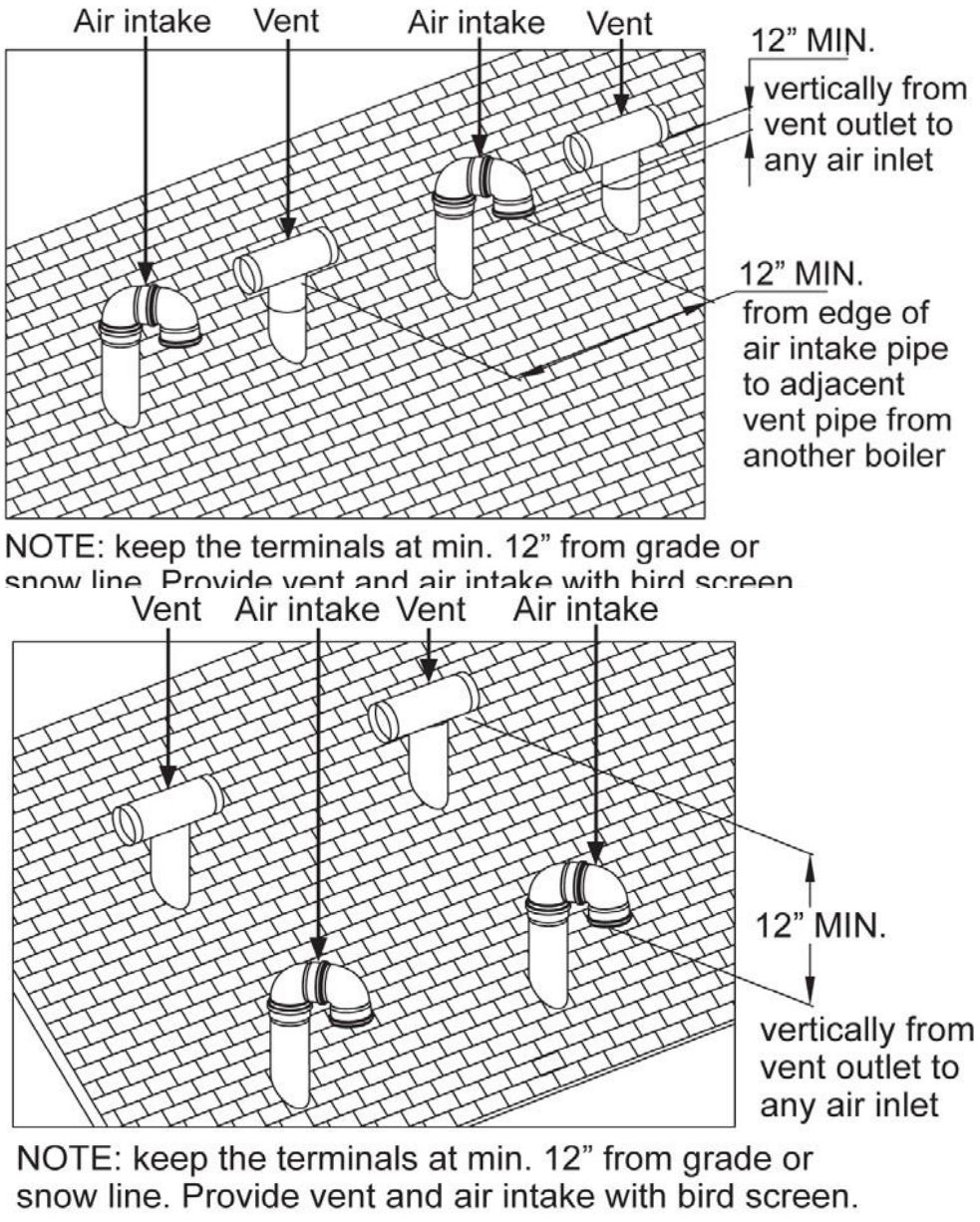


Figure 6-12: Installing Multiple Vent and Air Vertical Terminations – Two Alternatives

6.5.21 Vertical Termination – Concentric Vent

Both combustion air and vent pipes must attach to the termination. The termination must terminate outside the structure and must be installed as shown in Figure 6-13.

6.5.22 Determining Location of Vertical Concentric Vent Termination

Locate the vertical concentric 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 6.3.
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.

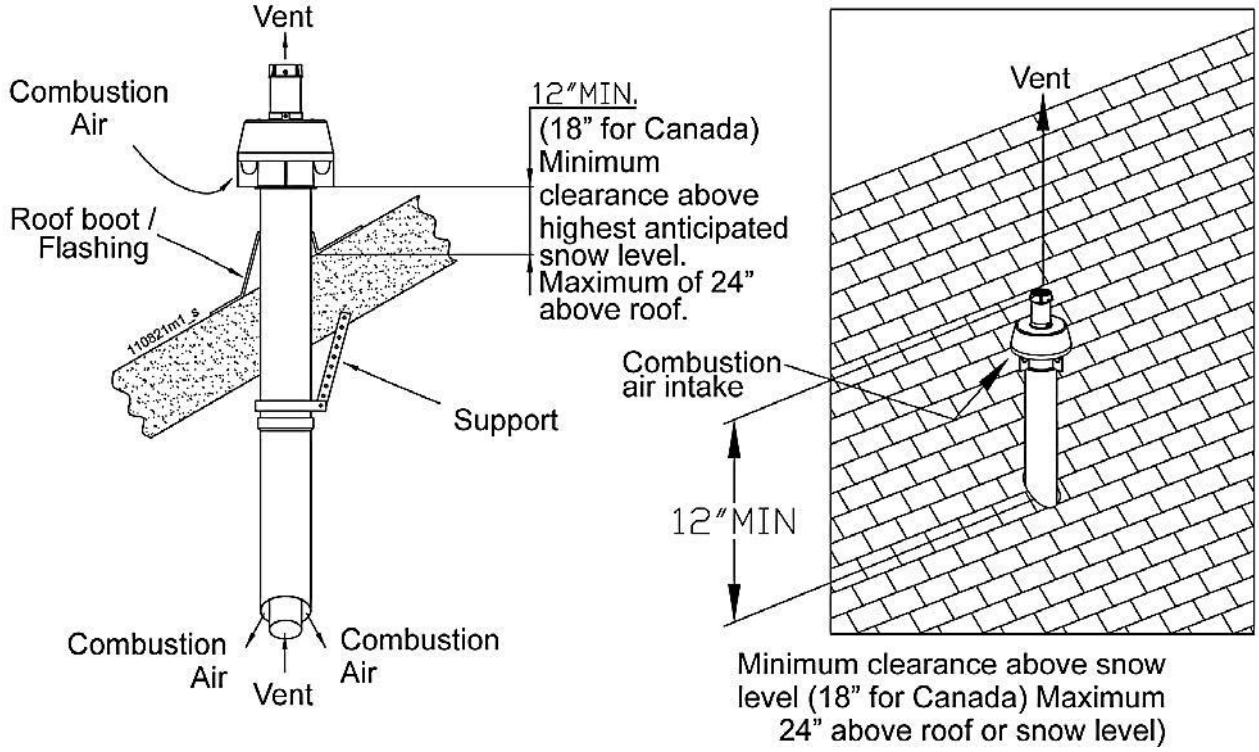


Figure 6-13: Concentric Vertical Terminations

6.5.23 Multi-Venting Vertical Terminations

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

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SECTION 7: INSTALLATION – NATURAL GAS

7.1 Gas Supply Piping

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.

A lockup style regulator is required on each unit any time the gas supply pressure may exceed 13" W.C. If gas supply pressure is between 3" and 13" individual regulators are recommended on every unit but not required.

NOTE:

For installation in Massachusetts an individual gas regulator is required on every unit regardless of incoming gas pressure.

7.2 Connection of Gas Supply Piping

Connect the gas supply to the unit as follows:

Connecting the Gas Supply to the Unit

1. Refer to Figure 7-1 for connections necessary to pipe gas to the unit.
   a) Install ground joint union for servicing, when required.
   b) Install a manual shutoff valve in the gas supply piping.
   c) Manual main shutoff valves must be identified as such by the installer.
2. Install a sediment trap / drip leg. (see Figure 7-1).
3. Support piping with hangers, and not from the unit or its accessories.

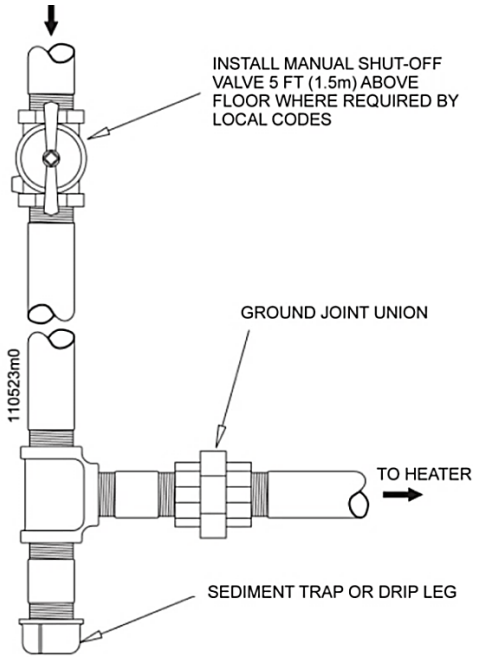


Figure 7-1: Gas Supply Piping Connections

Connecting the Gas Supply to the Unit - Continued

4. Purge all air from the gas supply piping.
5. Before placing the appliance in operation, check the appliance 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.
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!

- Do not attempt to support the weight of the piping with the water heater or its accessories.
- Never use an open flame to test for gas leaks. Always use an approved leak detection method.
- Failure to apply pipe sealing compound can result in severe personal injury, death, or substantial property damage.

The unit is shipped ready to fire on natural gas. Check appliance rating plate to determine which fuel the appliance is set for. If set to natural gas, it may be converted to propane gas following instructions in Section 7.9.

7.3 Natural Gas Pipe Sizing

Refer to the table below for pipe lengths and diameters. For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 for Canadian installations).

TABLE 7-1: Gas Pipe Capacity for Natural Gas

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

NOTE:

Maximum pipe capacity is based on a 0.60 specific gravity gas at a pressure of 0.5 PSIG and a 0.3" W.C. pressure drop.

7.4 Natural Gas Supply Pressure Requirements

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

7.5 Propane Gas Pipe Sizing

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

7.6 Propane Gas Supply Pressure Requirements

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

NOTE:
Ensure that the high gas pressure regulator is at least 6 to 10 feet upstream of the appliance.

7.7 Checking and Adjusting the Unit Inlet Gas Supply Pressure

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.

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 servicing.

Refer to Section 8.6 and check the gas supply pressure.

7.8 High Altitude Operation

Calibration at high altitudes follows the normal combustion calibration procedure and is subject to a de-rating according to C302.7. See aerco.com for further information.

For installations at higher altitudes in the United States, follow local codes or, in the absence of local codes, follow ANSI Z223.1/NFPA No. 54, The National Fuel Gas Code, and check and adjust the CO_2 level following Section 8.7.

7.9 Conversion from Natural gas to Propane Gas

The gas conversion must be performed on each burner present inside the unit.

The gas conversion shall be performed by a qualified service agency in accordance with these 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 danger. The qualified service agency is responsible for the proper conversion of the appliance. The installation is not proper and complete until the operation of the converted appliance is checked as specified in these instructions.

Conversion shall be carried out in accordance with the requirements of the provincial authorities having jurisdiction and in accordance with the requirements of the CAN-B149.1 and CAN1-B149.2 installation code.

7.9.1 Gas Conversion Kit

The conversion kit (supplied with the unit) is composed of the following parts, which are necessary for the gas change:

- A label stating the new gas rating and settings.
- Instructions for the change.
- An orifice for each burner present in the unit.

7.9.2 Gas Conversion Instructions

To change the gas type used by the unit, follow the instructions starting on the next page:

Gas Rating Conversion of Master Burner 1

You must convert **Burner 1 (Master)** *first*, and then convert each additional burner in the unit afterward. Refer to Figure 7-6 to locate **Burner 1 (Master)** and then perform the following steps:

1. Turn **OFF** power to the unit.
2. Gain access to the Factory Menu as follows: press and hold, at the same time, both the **RESET** and  buttons while turning **ON** unit power. Display will enter the Factory Menu (parameters 3000).
3. Using push buttons  and  select parameter 3002.
4. Press **RESET** button once to select displayed parameter. Parameter 3002 will begin to blink in the display. Now the value can be changed using the  and  buttons.
5. Using Table 3-5, select the right parameter value for the unit you are converting to propane gas or to natural gas.

Table 7-2: Natural Gas and Propane Gas Settings

Appliance model	Gas Type	3002 par value setting	Orifice	CO2 content at high fire	CO2 content at low fire	O2 content at high fire	O2 content at low fire	CO content at high and low fire
	/	/	Stamping	%	%	%	%	ppm
399	Natural gas	0	No orifice	8.4 to 8.7	8.4 to 8.7	5.9 to 5.4	5.9 to 5.4	less than 150
399	LP gas	1	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
500	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
500	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
750	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
750	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
1000	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
1000	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250

6. Press **RESET** button once to save the new value.
7. Turn the power **OFF** to the unit.
8. Close the manual gas shut off valve.
9. Remove the covers from the unit.
10. Unscrew nut “H” as per Figure 7-2.
11. Using a screwdriver, remove spring clip “A” (Figure 7-2);
12. Remove the gas valve from its site “C” as per Figure 7-3 (note O-ring “L”).
13. Replace orifice “G” per Figure 7-4, for the correct one for type of gas used. Verify that the stamping on the orifice matches Table 7-2.
14. Reinstall the gas valve, taking care to properly position O-ring “L” per Figure 7-3 and to place the gasket between the gas valve and nut “H” in Figure 7-2.
15. Open the manual gas shut off valve.

Gas Rating Conversion of Master Burner 1 - Continued

16. Check for any gas leaks on nut "H" as per Figure 7-2.
17. Turn the power ON to the unit.
18. Turn completely counter-clockwise screw "E" in Figure 7-5.
19. Check the gas supply pressure per Section 8.6. The minimum gas supply pressure must not be less than 3" W.C. (7.6 mbar) and the maximum gas supply pressure must not be higher than 13" W.C. (33 mbar).
20. Verify the CO_2 rate and its adjustment per Section 8.7.

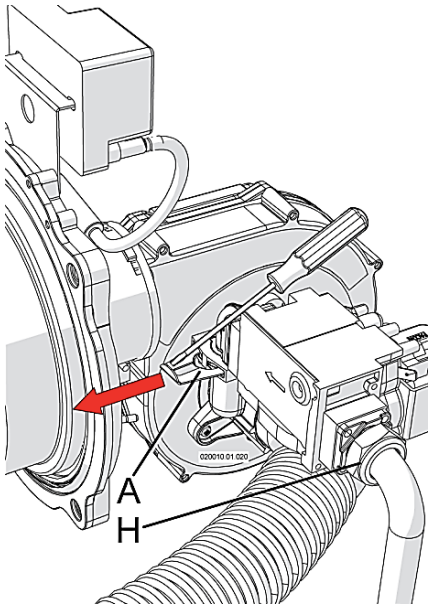


Figure 7-2: Dismantling the Gas Valve

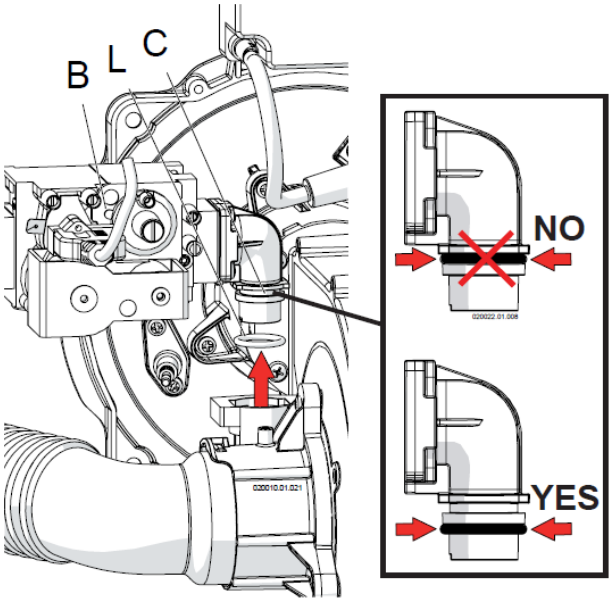


Figure 7-3: Lifting up the Gas Valve

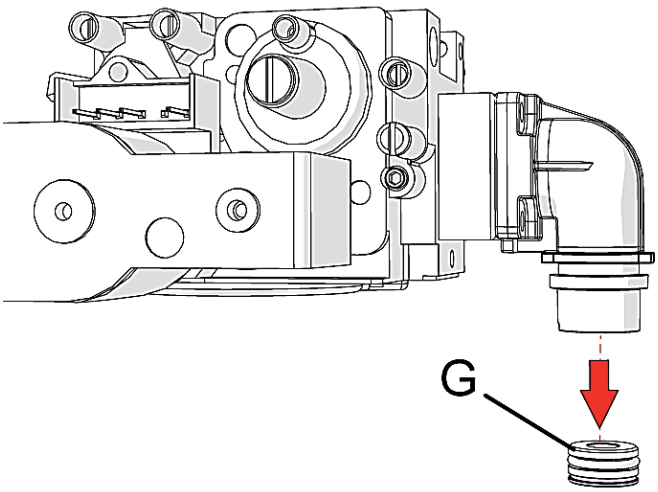


Figure 7-4: Gas Valve Orifice

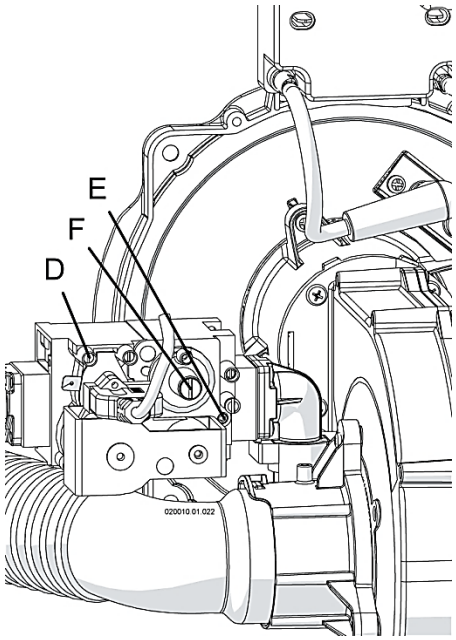


Figure 7-5: Gas Valve Adjustments

Gas Rating Conversion of Burners 2, 3, and 4

After converting **Burner 1 (Master)**, you must convert **Burner 2**, **Burner 3** (if present), and **Burner 4** (if present). Refer to Figure 7-6 and perform the following steps:

1. Turn the power OFF to the unit.

Burner 2:

2. Disconnect plug "B" from connector "A".
3. Connect plug "B" to connector "C".
4. Repeat Step 1 through Step 20 of the previous instructions "**Gas Rating Conversion of Master Burner".**
5. Ensure power is still OFF to the unit.

Burner 3 (if present):

6. Disconnect plug "B" from connector "C".
7. Connect plug "B" to connector "D".
8. Repeat Step 1 through Step 20 of the previous instructions "**Gas Rating Conversion of Master Burner".**
9. Ensure power is still OFF to the unit.

Burner 4 (if present):

10. Disconnect plug "B" from connector "D".
11. Connect plug "B" to connector "E".
12. Repeat Step 1 through Step 20 of the previous instructions "**Gas Rating Conversion of Master Burner".**

After converting all burners:

13. Connect plug "B" to plug "A".
14. Check the inlet gas pressure of the unit, per Section 8.6.
15. 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 7-7 if the heater has been converted to PROPANE GAS.
    b) Apply the label in Figure 7-8 if the heater has been converted to NATURAL GAS.

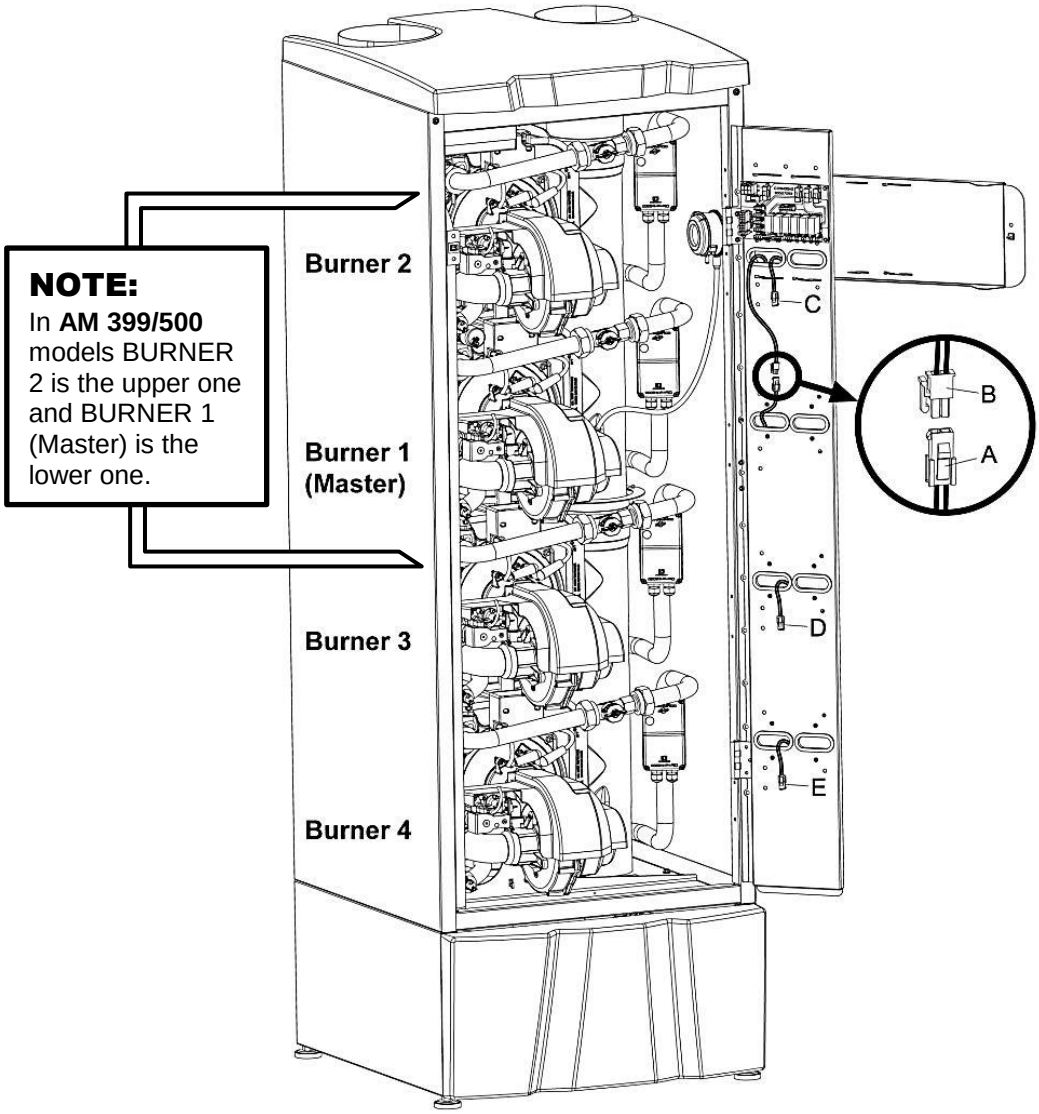


Figure 7-6: Changing the Display Connections (AM 750/1000 Shown)

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).

Figure 7-7: PROPANE (LP) GAS Label

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).

Figure 7-8: NATURAL GAS label

SECTION 8: UNIT START-UP

8.1 INITIAL START-UP REQUIREMENTS

Before starting the heater, 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 and controls.

8.1.1 Filling the Condensate Neutralizer

The condensate neutralizer tank is positioned inside the heater as shown in Figure 4-8. It must be filled with water to prevent the leakage of flue gases from the condensate drainpipe, item “C” in Figure 4-8 and Item “E” in Figure 4-9. To fill and inspect the condensate neutralizer, refer to Section 10.12.

WARNING!

If the unit is turned 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.

8.1.2 Filling the Heating System

To fill the heating system, proceed as follows:

CAUTION!

The water's pH must fall within the following limit: 7.5<pH<9.5 and if the system contains aluminum parts, it must be less than 8.5. This pH value must be measured after steady condition and after air purging operations has been done. Water out of the above pH values can result in premature heat exchanger damage.

Filling the Boiler Heating System

1. Open any automatic air vents in the heating system.
2. Open the fill valve and proceed to fill the heating system and boiler until the pressure gauge, item "M" in Figure 8-1, reads the pressure for which the heating system is sized. To temporarily decrease the minimum water pressure, set parameter 3022 to the desired value (See Appendix B).
3. Check that there is no water leaking from the fittings. If there is, the leaks must be repaired.
4. Check the pressure gauge during the purging process. If the pressure has dropped, re-open the fill valve to bring the pressure back to the desired value. If it was changed, be sure ro set parameter 3022 back to its original value.

8.2 General Warnings Concerning the Gas Supply

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

- That the unit is supplied with the type of fuel that it is configured to use (see Section 7.1).
- 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 and free from any blockages.
- That the condensate drain tube is properly connected (see Section 4.14).

WARNING!

Do not store or use gasoline or other flammable vapors or 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 the building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot contact your gas supplier, call the fire department.

8.2.1 Confirming the Unit's Gas Type

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

The AM Series boilers and water heaters can operate using one of the following two gases:

NATURAL GAS

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

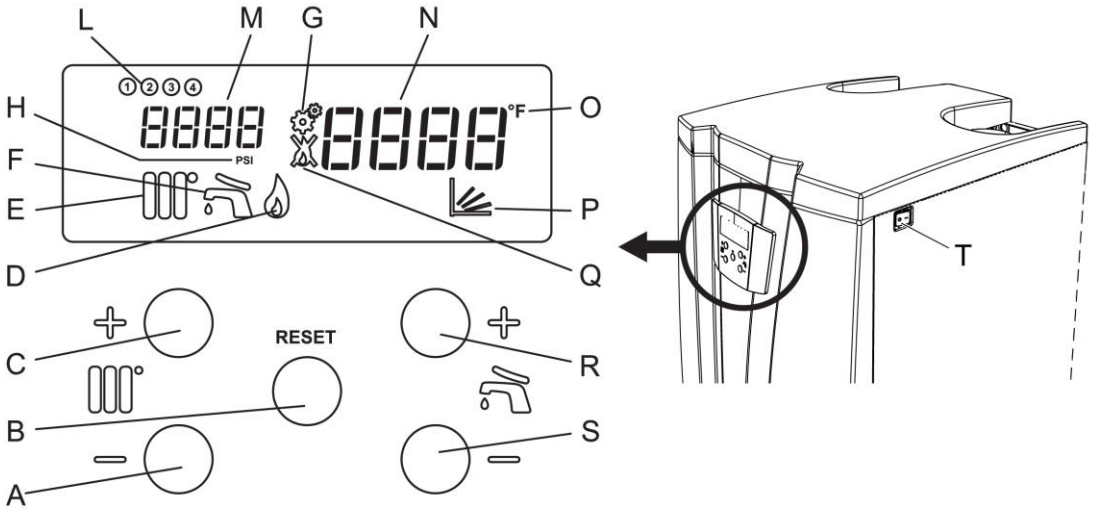
PROPANE (LP) GAS

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

8.2.2 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. The gas conversion procedure may be found in Section 7.9. Conversion must be carried out by a qualified technician.

8.3 Identification of Controls



A - Setpoint Button -: lowers the heating setpoint.
B - Multifunction button: resets any lockouts; accesses user and installer menus.
C - Setpoint Button +: raises the heating setpoint.
D - Flame icon: indicates that a flame is present.
E - Radiator icon. indicates that a heating service is enabled. Blinks when heating service is active.
H - Unit of measure of the pressure (M).
F - Faucet icon: Indicates that the domestic hot water service is enabled. Blinks when domestic hot water service is active.
L - Burner unit indicators: Lights up when burner is burning; blinks when burner is in lockout or has a blocking error.
1 = Burner 1 (master) 3 = Burner 3
2 = Burner 2 4 = Burner 4

M - Pressure gauge and parameter display.
G - Gear icon: indicates access to the installer menu.
N - Supply or indirect water heater temperature gauge and display of parameter values.
O - Unit of measure of the temperature (N).
P - Sensor icon: indicates that the outdoor sensor is active.
R - Multifunction button +: raises the domestic hot water temperature; scrolls the parameters; increases the parameter values.
S - Multifunctional button -: lowers the domestic hot water temperature; scrolls the parameters; decreases the parameter values.
T - On-Off power switch.

Figure 8-1: AM Series Control Panel Functions and Indicators

8.4 Boiler Startup Procedure

This section applies only to AM Series boilers. Refer to the next section for starting an AM Series water heater. To start the boiler, do the following:

Boiler Startup Procedure

NOTE:

Before operation it may be necessary to check the 2000 and 3000 level parameters on each control board. See Section 9.16 and Appendix B for further information.

1. Open the manual gas shut off valve (Figure 7-1),
2. Turn the unit power switch to ON (item “T” in Figure 8-1).
3. The boiler will fire only when there is a call for heat and the heating temperature setting is higher than the actual supply temperature. Hold buttons or to select the desired heating temperature. If the external temperature sensor is connected (see Section 5.2.2), check that the calculated temperature (See User Menu, Section 9.15, parameter 1012 or parameter 1107) is higher than the actual boiler temperature and that the outdoor temperature (See User Menu, Section 9.15, parameter 1004) is lower than “warm weather shut down temperature” (See Section 9.16, parameter 2020 in Installer Menu).
4. If the boiler is connected to an indirect water heater, press buttons and to select the desired domestic hot water temperature.

8.5 Water Heater Startup Procedure

This section applies only to AM Series water heaters, as well as all water heaters configured with the AM Rapid Recovery (AMR) option. Refer to the previous section for starting an AM Series boiler. Refer to section 2.4 for a description of the AMR option for AM water heaters. To start the water heater, do the following:

Water Heater Startup Procedure

NOTE:

Before operation it may be necessary to check the 2000 and 3000 level parameters on each control board. See section 8.16 and Appendix B for further information.

1. Open the manual gas shut off valve (Figure 7-1).
2. Turn the unit power switch to ON (Figure 8-1).

NOTE:

The temperature setpoint is adjusted to its lowest temperature position when shipped from the factory.

3. The unit will fire only when the domestic hot water setting is higher than the storage tank temperature (parameter 1002). Press buttons or to select the desired storage tank temperature.
4. If the display gives a Low Water Pressure error (Err 59, Section 9.19), repeat the air purging operations.

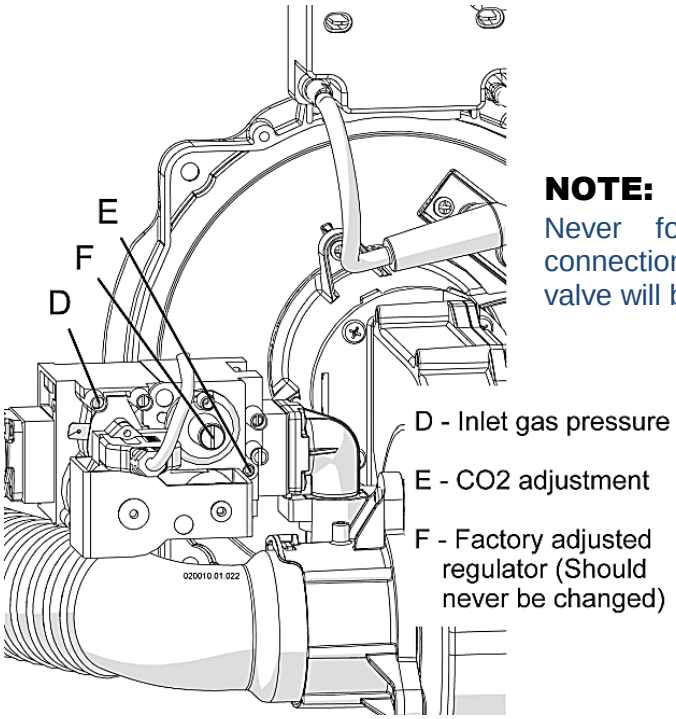
8.6 Gas Supply Pressure Test

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.

Check the gas supply pressure by following the steps below:

Gas Supply Pressure Test

1. Close the manual gas shut-off valve (Figure 7-1).
2. Remove the front cover (Figure 10-1).
3. Turn the screw in pressure port “D” shown in Figure 8-2 three turns counterclockwise.



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

Figure 8-2: Gas Valve

4. Connect a manometer with graduations of at least 0.1” W.C. (0.25 mbar) to the inlet gas port “D” shown in Figure 8-2 (on unit model 399 to 1000, choose the pressure port “D” from any gas valve present).
5. Open the manual gas shut off valve (Figure 7-1).
6. Check that the gas supply pressure does not exceed 13” W.C. If the gas supply pressure is higher than 13” W.C., adjust the upstream gas pressure regulator to bring the gas supply pressure between 12” W.C. and 13” W.C.
7. Turn the power switch to ON.

Gas Supply Pressure Test - Continued

8. Generate a heat demand as follows, for appropriate type (boiler or water heater):
   - **BOILER or WATER HEATER:** by pressing button  to its maximum setting.
   - **INDIRECT WATER HEATER:** by pressing button  to its maximum setting.
9. Gain access to the installer menu (See Section 9.16) and set parameter 2200 to HIGH. Now the unit will run for 20 minutes at maximum input.
10. Check the manometer to make sure the gas supply pressure does not drop below 3" W.C. (7.6 mbar). If the gas supply pressure is lower than 3" W.C. it means that your inlet gas line or your gas pressure regulator is not correctly sized.

CAUTION!

DO NOT adjust the screw "F" (Figure 8-2). This screw is factory-set for the correct gas flow and outlet pressure. Attempting to alter the gas valve setting could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

11. After verifying the correct gas pressures:
    a) Return to parameter 2200 and set to OFF.
    b) Close the manual gas shut-off valve (Figure 7-1).
    c) Disconnect the manometer.
    d) Turn the screw in pressure connection "D" in Figure 8-2, clockwise until snug.
    e) Check pressure port "D" (Figure 8-2) for any gas leaks.

8.7 Combustion Calibration

Table 8-1 lists the correct CO_2 and O_2 ranges for a unit running at normal operating conditions. CO_2 values outside of the ranges given in Table 8-1 may lead to malfunctioning of the unit and cause it to prematurely fail. To check the CO_2 values, carry out a combustion analysis as described below:

WARNING!

During this procedure, compare CO (carbon monoxide) readings with the value given in Table 8-1. If this is higher, STOP the boiler and call the Factory service department (see phone number on the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

Combustion Calibration

1. If it is not already present, create a combustion analysis probe site 8" after the flue gas exhaust connection (see Figure 6-2). To do so, follow the vent pipe manufacturers' instruction.
2. Keep the boiler or water heater in stand-by by pushing either button  (for water heaters) or  (for boilers) until the word OFF is seen in the display.
3. Gain access to the Installer menu and set parameter 2201 to HIGH (see Section 9.16) so the "Burner 1 (Master) will run for 20 minutes at high fire input, then generate a demand for heat by pressing the  button.
4. Increase the setpoint to any valve above "OFF", such as 90°F.
5. Wait 2 to 3 minutes for the CO_2 to stabilize;
6. Insert the probe of a calibrated combustion analyzer into the combustion analysis opening, as shown in Figure 6-2, and take a flue gas sample.
7. Compare the CO_2 reading with the high fire range given in Table 8-1, making sure to use the range for the gas type in use. If the CO_2 reading is outside the specified range, it must be adjusted using the "E" screw in Figure 8-2 of the gas valve *closest* to the burner unit in fire. Use a 2.5 mm Allen Wrench to turn the screw (clockwise to reduce the CO_2 level, counter-clockwise to increase the CO_2 level) in small increments and wait for the CO_2 to stabilize to prevent overshooting the desired value.

Table 8-1: Combustion Calibration Values

Appliance model	Gas Type	3002 par value setting	Orifice	CO2 content at high fire	CO2 content at low fire	O2 content at high fire	O2 content at low fire	CO content at high and low fire
	/	/	Stamping	%	%	%	%	ppm
399	Natural gas	0	No orifice	8.4 to 8.7	8.4 to 8.7	5.9 to 5.4	5.9 to 5.4	less than 150
399	LP gas	1	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
500	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
500	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
750	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
750	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250
1000	Natural gas	2	930	8.8 to 9.1	8.8 to 9.1	5.2 to 4.7	5.2 to 4.7	less than 150
1000	LP gas	3	700	9.5 to 10	10.5 to 11.5	6.4 to 5.6	4.8 to 3.4	less than 250

Combustion Calibration - Continued

8. Set value of parameter **2201** to LOW. The Burner 1 (Master) will now run for 20 minutes at low fire input.
9. Wait 2 to 3 minutes for the CO_2 to stabilize.
10. Compare the CO_2 reading with the low fire range given in Table 8-1, making sure to use the range for the gas type in use. The CO_2 reading must be inside the specified range; if not, STOP the unit and call the Factory service department (see phone number on the last cover page).
11. Set Parameter 2201 in the Installer Menu (Section 9.16) to OFF.
12. Repeat this process for burners 2, 3, and 4 as applicable, using parameters 2202-2204 to calibrate each burner in turn.
13. Close the combustion analysis probe "H" in Figure 6-2 with a suitable cap in accordance with the vent pipe manufacturers' instructions.

WARNING!
Once the analyzer probe cap in Figure 6-2 is correctly installed with the unit at high fire, check that there are no leaks and that the cap is mechanically secure.

8.8 Lost Ignition Procedure

If the burner will not stay lit long enough to perform combustion calibration, perform the following steps:

Lost Ignition Procedure

1. Ensure the gas pressure to the unit is between 3"-13" W.C., ensure that parameter 3002 is set correctly on each burner, and that the gas valve has the appropriate gas orifice for either natural gas or propane.
2. Turn the setpoint to **OFF**.
3. For burner 1, turn parameter 2201 to **IGN**, for burner 2 use parameter 2202, etc.
4. Change the setpoint to 90°F.
5. Allow the unit to fire. Monitor parameter 1008 (flame strength). The minimum flame strength is 3.0. If the burner does not light, back the adjustment screw "E" fully out counterclockwise.
6. Repeat ignition trial. If the burner fails to stay lit, turn the adjustment screw one turn clockwise.
7. This procedure may be repeated for LOW and HIGH fire if necessary.

8.9 Minimum Water Flow

This unit is self-protected against low water flow. A flow meter (Item 16 in Figure 2-7) continuously monitors the water flow to each burner. If the water flow decreases below the **Minimum Water Flow** in Section 11: *Technical Data*, the burner automatically shuts off.

This value is adjustable via parameter 3035.

8.10 Heating System Pressure Test

If the pressure inside the heating circuit falls below the minimum pressure for the system, the appliance switches off and the display shows Err 59 to indicate that it is necessary to restore the correct pressure. Open the filling valve and check the pressure on the pressure gauge “M” of Figure 8-1. Err 59 will disappear when the pressure is back at the right value. To prevent accidental relief valve openings, fill the heating circuit slowly.

This value is adjustable via parameter 3022.

CAUTION!

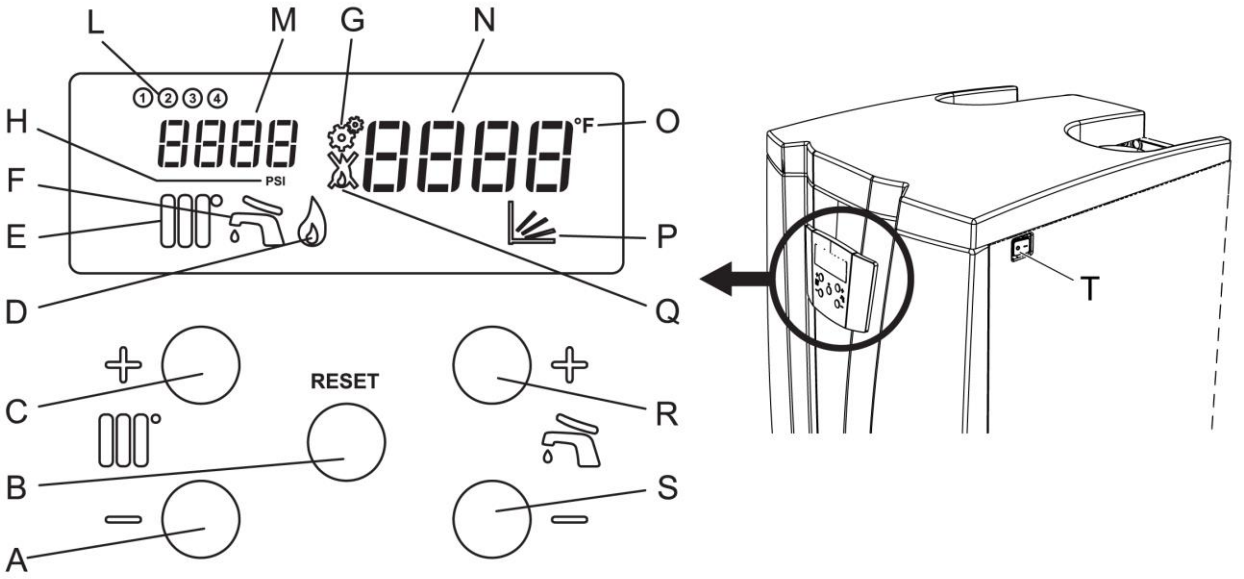
Continual fresh make-up water will reduce boiler life. Mineral buildup in the heat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen carried in by makeup water can cause internal corrosion in system components. Leaks in boiler or piping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

SECTION 9: OPERATION

9.1 General Operation

The unit is pre-set with standard parameters. However, it is possible to make a number of changes to the parameters by means of using the "User Menu" (see Section 9.15) and the "Installer Menu" (see Section 9.16).

During use, the part of the display labeled "N" (in Figure 9-1 shows the supply temperature (if the boiler is supplying heat) or the indirect water heater temperature (if boiler is supplying a tank load). The part of the display labeled "M" shows the pressure of the heating system. The other icons in the display show the status of the various operating parameters per Figure 9-1.



A - Setpoint Button -: lowers the heating setpoint.
B - Multifunction button: resets any lockouts; accesses user and installer menus.
C - Setpoint Button +: raises the heating setpoint.
D - Flame icon: indicates that a flame is present.
E - Radiator icon. indicates that a heating service is enabled. Blinks when heating service is active.
H - Unit of measure of the pressure (M).
F - Faucet icon: Indicates that the domestic hot water service is enabled. Blinks when domestic hot water service is active.
L - Burner unit indicators: Lights up when burner is burning; blinks when burner is in lockout or has a blocking error.
1 = Burner 1 (master) 3 = Burner 3
2 = Burner 2 4 = Burner 4

M - Pressure gauge and parameter display.
G - Gear icon: indicates access to the installer menu.
N - Supply or indirect water heater temperature gauge and display of parameter values.
O - Unit of measure of the temperature (N).
P - Sensor icon: indicates that the outdoor sensor is active.
R - Multifunction button +: raises the domestic hot water temperature; scrolls the parameters; increases the parameter values.
S - Multifunctional button -: lowers the domestic hot water temperature; scrolls the parameters; decreases the parameter values.
T - On-Off power switch.

Figure 9-1: Boiler Control Panel Functions and Indicators

9.2 Freeze Protection

For the freeze protection function to operate, the unit must remain connected to the electrical and gas supplies with DHW and central heating service switched to OFF

The freeze protection function is designed to protect the appliance only, not the heating system.

Because the water heater freeze protection function depends upon the electrical and gas supply, it is mandatory to install a safety device that alarms the user in case the unit room will reach a temperature near 35°F (2°C).

Once the boiler has reached a temperature of 50 °F (10 °C), the heating pump will automatically turn on. If the temperature falls below 41 °F (5 °C), the burner will light to prevent the boiler from freezing. If the boiler will not be used for long time it should be drained per Section 10.23.

9.3 Display Energy Saving Mode

The display, in Figure 9-1 is switched off each time no key is touched for at least 30 minutes, with the exception of when it displays errors or settings.

9.4 Control Panel Display

During normal operation, the display remains off, except if the unit goes into Lockout, or has a Blocking error. Pressing any button will activate the display, which will stay on for 30 minutes from the time of the last button press.

9.5 Startup Procedure - Boilers

This section applies only to AM Series boilers. For Water Heaters, refer to Section 9.13.

Boiler Startup Procedure

1. Open the manual gas shutoff valve.
2. Switch ON electric power to the boiler.
3. If the display shows code Err 65, it means that the polarity has not been observed between phase and neutral (Call service department to restore the situation, do not attempt to repair it).
4. Press button  or  to setup the heating temperature desired, then press RESET key to save the change.
5. Press button  and  to setup the domestic hot water temperature desired, then press RESET key to save the change.

If the burner fails to ignite within 60 seconds, the boiler 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 01 together with icon  .

If the boiler goes into any lockout or blocking error, the display will show icon  and the corresponding burner icon () will blink.

To restore the normal operating condition, press RESET key one time and the display will show the type of lockout. Press the RESET key again. To return to normal display mode, press and hold the RESET button for at least 5 seconds.

The boiler will automatically attempt another start-up.

Now the boiler will continue to operate in relation to the service requested and will show:

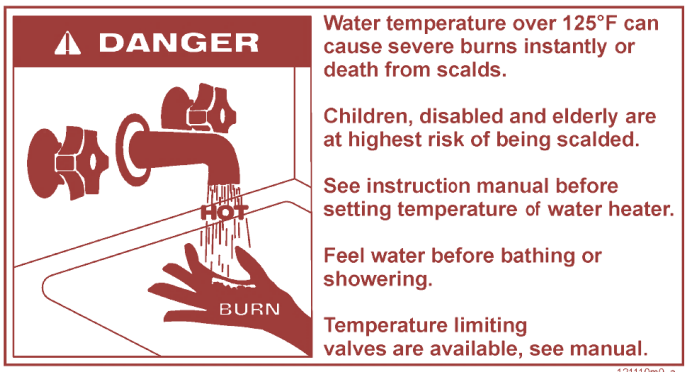
- The icon  if the heating service is enabled.
- Blinking  if heating service is active (boiler is warming the heating plant).
- The icon  if a domestic hot water service is enabled;
- Blinking  if a domestic hot water service is active (and boiler is loading an indirect water heater);

9.6 Boiler Summer Mode

To disable the heating functions for a prolonged period, leaving only the domestic hot water function, press the  key until the word OFF is displayed. Then press RESET button to save the change. Now the heating service is disabled, and is indicated by the  icon disappearing from the display.

9.7 Adjusting the Domestic Hot Water Temperature - Boilers

The domestic hot water temperature for an indirect tank is adjusted by pressing buttons  and  . When the buttons are pressed, the display, item "N" in Figure 9-1, shows the domestic hot water setpoint being selected. The range within which the domestic hot water can be set is 104°F (40°C) to 140°F (60°C).



9.8 Heating System Temperature Adjustment - Boilers

The boiler provides hot water to the heating system at the temperature set by adjusting buttons  or  as shown in Figure 9-1. To maximize the boilers' performance, the heating temperature, should be set at a value that is just sufficient to maintain the desired temperature of the rooms.

9.9 Heating System Type Selection - Boilers

The boiler is factory set for constant setpoint control.

The heating system type can be changed by accessing the Installer Menu per Section 9.16 and changing the 2003 parameter. One of the following heating modes can be selected:

- 2003 = 00 "Constant setpoint with remote enable" (see Section 9.16)
- 2003 = 01 "Outdoor reset with remote enable" (see Section 9.16). An outdoor temperature sensor is required for this setting.
- 2003 = 02 "Outdoor reset"
- 2003 = 03 "Constant setpoint"
- 2003 = 04 "0-10V control (remote setpoint)" (See Section 9.16). Settings 01 & 02 will wait for a closed circuit between terminals 10 and 11 before firing.

9.10 Outdoor Reset Adjustment - Boilers

While in the "Installers' Menu", set the 2003 parameter to 01. In this mode the heating supply temperature, calculated temperature in Figure 9-2, will be adjusted automatically based on the input from the outdoor temperature sensor. The relationship between the outdoor temperature and the supply water temperature, corresponds with the graphs shown in Figure 9-2. In order to change the relationship between the supply water temperature and the outdoor temperature, all the parameters listed in the sections below must be set.

9.10.1 Outdoor Reset: Setting Parameters

The following are the parameter settings for Outdoor Reset (See Section 9.16):

- 2020 = “Warm weather shutdown temperature”. When the outdoor temperature drops this value the heating system is forced to shut-down. Suggested starting value is 72°F (22°C).
- 2021 = “Winter outdoor temperature”. Is the design winter temperature used for the basic heat load calculation.
- 2022 = “Winter supply temperature”. Is the supply temperature correspondent to the “Winter outdoor temperature” (parameter 2021). Suggested values are 104°F (40°C) for floor radiant panels or 158°F (70°C) for radiator heating systems.
- 2023 = “Spring outdoor temperature”. Is the typical spring outdoor temperature you want the heating service to the minimum capacity. Suggested value is 64°F (18°C).
- 2024 = “Spring supply temperature”. Is the supply temperature correspondent to the “Spring outdoor temperature” (parameter 2023). Suggested values are 86°F (30°C) for floor radiant panels or 108°F (42°C) for radiators heating systems.

9.10.2 Outdoor Reset Activation

Once selected, reset adjustment is completely automatic and will switch off at the end of the heating season and switch back on at the beginning of the heating season. When the outdoor temperature is higher than parameter 2020, (“Warm weather shutdown temperature”) the heating service switches off. When the outdoor temperature lowers below parameter 2020, (“Warm weather shutdown temperature”), the heating service switches back on. If, for some reason, the heating service doesn’t match the load, adjust parameters 2022 (during cold winter) and 2024 (during spring season) to raise or lower the calculated temperature and match the desired room temperature.

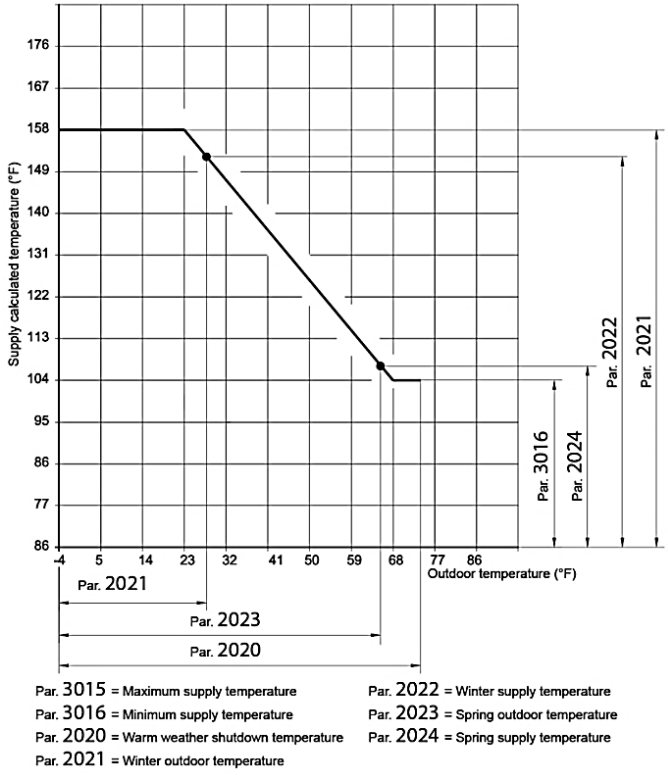


Figure 9-2: Outdoor Reset Settings Adjustment Graph

9.11 Boiler Delays, Alarms and Protective Actions

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

a) Pump delay: each time the room setpoint is satisfied, the circulator pump continues to run for 4 minutes;

b) DHW delay: each time the domestic hot water demand is satisfied, a 4 minute delay must 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 boiler restarts again.

9.12 Boiler Circulator Pump Protection

During the summer months, the circulators pumps are run once a day for around 15 seconds to prevent it from seizing.

9.13 Startup Procedure - Water Heaters

This section applies only to the AM Series water heaters. For boilers, refer to the previous section.

Water Heater Startup Procedure

1. Open the manual gas shutoff valve.
2. Switch ON electric power to the boiler.
3. If the display shows code Err 65, it means that the polarity has not been observed between phase and neutral (Call service department to restore, do NOT attempt to repair it).
4. Press key and to setup the storage tank water temperature desired, then press RESET key to save the change.
5. The flame control will start up the burner.
   a) If the burner fails to ignite within 60 seconds, the water 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 01** together with icon .
   b) If the boiler goes into any lockout or blocking error, the display will show icon and the corresponding burner icon (1 2 3 or 4) will blink.
6. Press the RESET key in order to re-set normal operating conditions.
7. To restore the normal operating condition, press RESET key one time, display will show you the type of lockout, than press RESET button again (to return to normal display mode, press and hold the RESET button for at least 5 seconds.
8. The heater will automatically attempt another start-up.
9. Now the heater will continue to operate in relation to the service requested and will indicate the following on display:
   a) The icon if a domestic hot water service is enabled;
   b) Blinking if a domestic hot water service is active (heater is loading a storage tank).

9.14 Adjusting the Storage Tank Temperature (Water Heaters)

The storage tank temperature is adjusted by pressing keys  and  . When the keys are pressed, the display shows the domestic hot water setpoint being selected. The range within which the domestic hot water can be set is from 104°F (40°C) to 140°F (60°C).

The right temperature to keep storage and save energy, is the lowest possible temperature compatible with the amount of water you need. Start with a temperature of 120°F and check if this is sufficient. If not, gradually increase the temperature setpoint, checking each time if it is ok or not.

There is a hot water scald potential if the setpoint is set too high.

9.15 User Menu

Press and hold the RESET button for 5 seconds to invoke the User Menu. When entering the User Menu, the 1000 series of parameters, shown in the chart below, are available for display, but cannot be edited.

Parameters for "Burner 1" are applicable for that burner only. If you want to see the same parameters for the other burners you must connect the display to the burner you want to see per the illustration in Figure 8-3. Parameters labeled "MULTIBURNER" apply to the entire unit. To navigate the Installer Menu, perform the following:

User Menu Navigation

Press the buttons  and  to scroll through each of the parameters. All parameters in the User Menu may be displayed, *but cannot be edited*.

User Menu			
PAR#	**PARAMETER'S DESCRIPTION**		**UNITS**
1001	Burner 1 supply temperature		°F
1002	Indirect water heater temperature		°F
1004	Outdoor sensor temperature (Boilers Only)		°F
1006	Burner 1 Flue gas temperature		°F
1007	Burner 1 Return temperature		°F
1008	Burner 1 Ionisation current		µA
1009	State of the General pump (and of the Burner 1 check valve)		ON/OFF
1010	State of the CH pump (Boilers Only)		ON/OFF
1011	State of the DHW pump		ON/OFF
1012	Calculated CH setpoint (when outdoor sensor s activated) (only for 199 and 250 mode)		°F
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		#
1055	Burner 1 Number of failed ignitions		#
1056	Burner 1 Total hours of operation tor boiler		Hr x 10
1057	Burner 1 Total hours of operation for DHW		Hr x 10
1059	*Burner 1 Interval between Lockouts. May be: 1MIN; 2:HRS; 3:0AY; 4:WK	For parameters 1059 and 1060, the first digit displays the unit used, and the second digit displays the number of those units. For example 1:34 would mean 34 minutes. A display of 4:3 would indicate 3 weeks.	
1060	*Burner 1 Interval between Blocking errors. May be: 1:MIN; 2:HRS; 3:DAY; 4:WK		
1062	Burner 1 Heating Water flow		GPM
1101	MULTIBURNER: Number of burners ON		n
1102	MULTIBURNER: System temperature·		°F
1103	MULTIBURNER: My Burner Into Lockout		/
1104	MULTIBURNER: Any Sumer into Stocking Error		/
1106	MULTIBURNER: System is in emergency mode		/
1107	MULTIBURNER: Current multi-burner setpoint		°F
1120	MULTIBURNER: Burner 1 fire rate		%
1121	MULTIBURNER: Burner 2 fire rate		%
1122	MULTIBURNER: Burner 3 fire rate		%
1123	MULTIBURNER: Burner 4 fire rate		%

*Examples of displayed timer values and equivalent time lengths:
1:29 = 29 minutes 3:15 = 15 days
2:12 = 12 hours 4:26 = 26 weeks

9.16 Installer Menu

This menu of parameters is available to qualified technicians for the purpose of analyzing the function of, and making adjustments to, the unit.

Parameters for "Burner 1" are applicable for that burner only. If you want to see the same parameters for the other burners you must connect the display to the burner you want to see per the illustration in Figure 8-3.

To enter and make changes in the Installer Menu, perform the following steps:

Installer Menu Navigation and Adjustment

1. To enter the Installer Menu, press and simultaneously hold down both the **RESET** and  buttons or 5 seconds until the  icon is displayed., then release the buttons. After entering the Installer Menu, the 2000 series of parameters, as shown in the menu table below, are available for display and editing.
2. To scroll through the list of parameters, press buttons  and  .
3. Once the desired parameter is displayed, it can be selected for editing by pressing the **RESET** button once (the displayed value will start blinking) and then using the  and  buttons to change the value, up or down.
4. To confirm the new value, press and release the **RESET** button before moving to the next parameter.
5. To exit the Installer Menu, press and hold RESET button for more than 5 seconds until the  icon is no longer shown in the display.

Installer Menu						
PAR#	**DESCRIPTION**	**UM**	**RANGE**	**BOILER FAC.SET**	**W.H. FAC.SET**	USER
2001	Burner 1 minimum Power	%	1 to 50	1	1	
2002	Burner 1 maximum Power	%	1 to 100	100	100	
2003	CH mode	nn	0: CH with thermostat; 1: CH with outdoor reset; RT opening will stops heating; 2: CH with outdoor reset; RT closure will reduce setpoint of par 2027; 3: CH with permanent heat demand; RT closure will reduce setpoint of par 2027 4: CH with 0-10Vcc input; 5: N/A	0	0	
2004	Burner 1 Wait time after max differential	sec	10 to 30	30	30	
2005	Local post pump time (and of the Burner 1 Motorized valve)	sec	10 to 900	240	240	
2010	System test: Burner 1 (Master)	\	Off, Low, Ign, High (Set parameter to OFF to exit from this state)	OFF	OFF	

Installer Menu						
PAR#	DESCRIPTION	UM	RANGE	BOILER FAC.SET	W.H. FAC.SET	USER
2011	System test: Local pump (and of the Burner 1 Motorized valve)	\	On or OFF	OFF	OFF	
2012	System test: CH pump	\	On or OFF	OFF	OFF	
2013	System test: DHW pump	\	On or OFF	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	69	N/A	
2021	Reset curve design: winter outdoor	°F	-4 to 41	24	N/A	
2022	Reset curve design: winter supply	°F	32 to 176	176	N/A	
2023	Reset curve design: spring outdoor	°F	32 to 86	69	N/A	
2024	Reset curve design: spring supply temperature	°F	32 to 104	104	N/A	
2027	Night setback temperature	°F	2 to 90	18	N/A	
2040	N/A	N/A	N/A	N/A	N/A	
2041	N/A	N/A	N/A	N/A	N/A	
2042	Burner 1 anti-cycling: time	sec	10 to 900	180	180	
2043	Burner 1 anti-cycling: differential temperature	°F	0 to 36	28	28	
2062	DHW post pump time	sec	10 to 255	240	N/A	
2063	DHW max priority time	min	1 to 60	30	N/A	
2067	DHW priority		**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	N/A	
2100	Display: delay to shut off	min	0 to 30	5	5	
2101	MULTIBURNER Emergency mode (If sensor 1102 fail)	\	no or yes	Yes	Yes	
2102	MULTIBURNER Emergency setpoint	°F	68 to 149	113	113	
2103	MULTIBURNER start delay time	sec	1 to 900	180	15	
2104	MULTIBURNER stop delay time	sec	1 to 900	180	15	
2105	MULTIBURNER start burner diff.	°F	0 to 36	9	9	
2106	MULTIBURNER stop burner diff.	°F	0 to 36	9	9	
2107	MULTIBURNER calculated setpoint. Max	°F	1 to 36	18	7	
2108	MULTIBURNER calculated setpoint. Max offset down.	°F	1 to 36	36	7	
2109	MULTIBURNER next burner start rate	%	1 to 100	70	70	
2110	MULTIBURNER next burner stop rate	%	1 to 100	10	10	
2111	MULTIBURNER rotation interval	Days	0 to 9	6	6	
2113	MULTIBURNER start modulation delay factor	min	0 to 60	5	0	
2114	MULTIBURNER post local pump time	sec	0 to 255	240	240	
2200	System test: all burners together.	\	Off, Low, Ign, High	OFF	OFF	
2201	System test: Burner 1 (Master).	\	Off, Low, Ign, High	OFF	OFF	
2202	System test: Burner 2.	\	Off, Low, Ign, High	OFF	OFF	

Installer Menu						
PAR#	DESCRIPTION	UM	RANGE	BOILER FAC.SET	W.H. FAC.SET	USER
2203	System test: Burner 3.	\	Off, Low, Ign, High	OFF	OFF	
2204	System test: Burner 4.	\	Off, Low, Ign, High	OFF	OFF	

9.17 Factory Menu

Inappropriate changes to parameters in the Factory Menu could result in a unit or system malfunction. For this reason, only a qualified technician who has in-depth knowledge of the unit should make any changes to the parameters in this menu. The parameters available allow the unit to be configured and set for proper operation.

The Factory Menu for boilers and water heaters are different from one another, so there are separate columns showing the settings for each in the chart below.

To enter the Factory Menu, perform the following steps:

Factory Menu Navigation and Adjustment

1. Turn the electrical power switch to **OFF**.
2. Simultaneously press and hold the **RESET** and  buttons.
3. While the **RESET** and  buttons are both depressed, turn the power switch to ON.
4. Wait until the word “init” is displayed in the control panel display, or until the control panel display begins to show the 3000 parameters, then release the RESET button and then the  button.
5. Press the  and  buttons to scroll up or down through the parameters.
6. To change a displayed parameter, press the **RESET** button. The parameter value will blink.
7. Press the  and  buttons to cycle up or down through the parameter values.
8. To set a parameter value, press the **RESET** button while the desired value is displayed.
9. Wait at least 10 seconds after the last parameter change before exiting menu.
10. Exit the menu by turning the unit power switch to **OFF**.
11. The power switch may now be turned **ON**, and the Factory Menu will no longer be displayed.

Factory Menu							
				BOILER PARAMETERS		WATER HEATER PARAMETERS	
PARA#	PARAMETER DESCRIPTION	RANGE	FACTORY SETTINGS	BURNER 1	BURNER 2 TO 4	BURNER 1	BURNER 2 TO 4
3001	Burner logic address **NOTE**: This is **NOT** the Modbus address	0 = No cascade 1 = Burner 1 (Master) 2 to 4 = Burner 2 to 4 (slave burners)	2	1	2 to 4	1	2 to 4

Factory Menu							
				BOILER PARAMETERS		WATER HEATER PARAMETERS	
PARA#	PARAMETER DESCRIPTION	RANGE	FACTORY SETTINGS	BURNER 1	BURNER 2 TO 4	BURNER 1	BURNER 2 TO 4
3002	Fan speed range	0 to 4	0	Refer to Table 8-1 in Chapter 8			
3003	Display units	C = °C and bar units F = °F and PSI units	F	F	F	F	F
3004	Water pressure sensor	0 = Disabled 1 = Enabled 2 = N/A 3 = N/A	1	1	0	1	0
3005	Burner flapper valve	0 = Disabled 4 = Enabled 8 = N/A 12 = N/A	4	4	4	4	4
3006	Water flow sensor	0 = Disabled 16 = N/A 32 = N/A 48 = N/A	48	48	48	48	48
3007	Condensate blocked drain detector	EnAb = Enabled dISA = Disabled	Enab	Enab	dISA	Enab	dISA
3008	Flue gas detector	SEnS = Sensor StCH = Switch	SEnS	SEnS	SEnS	SEnS	SEnS
3009	Outdoor thermistor type	10 = 10kohms 12 = 12kohms	10	10	10	10	10
3010	Other thermistor type	10 = 10kohms 12 = 12kohms	10	10	10	10	10
3011	Pump MODE	0 = Local pump 1 = N/A 2 = N/A 3 = N/A	0	0	0	0	0
3012	DHW mode	0 = no DHW 1 = DHW store with sensor 2 = DHW store with aquastat 3 = N/A 4 = N/A 5 = N/A	0	1 (if indirect W.H. is present)	0	0	0
3013	Reset Err 115	EnAb = Enabled dISA = Disabled	Enab	Enab	Enab	Enab	Enab

Factory Menu							
				BOILER PARAMETERS		WATER HEATER PARAMETERS	
PARA#	PARAMETER DESCRIPTION	RANGE	FACTORY SETTINGS	BURNER 1	BURNER 2 TO 4	BURNER 1	BURNER 2 TO 4
3015	Reset curve design: Maximum heating supply temperature (This parameter is overruled by 3017 parameter)	68°F to 194°F	179°F	179°F	179°F	N/A	N/A
3016	Reset curve design: Minimum heating supply temperature	68°F to 194°F	68°F	68°F	68°F	N/A	N/A
3017	Maximum supply temperature (This parameter overrules 3015 parameter)	68°F to 194°F	179°F	179°F	179°F	179°F	179°F
3018	Minimum supply	68°F to 194°F	89°F	89°F	89°F	89°F	89°F
3020	Type of water flow sensor	0 = N/A 1 = DN8 2 = DN 10 3 = DN 15 4 = DN 20 5 = DN 25	3	4	4	4	4
3022	Minimum water pressure	0 to 74 PSI	14	14	14	14	14
3035	Minimum water flow	0 to 26.4 GPM	3.9	3.9	3.9	3.9	3.9
3050	Number of slave burners	0 to 3	3	399 = 1 500 = 1 750 = 2 1000 = 3	3	399 = 1 500 = 1 750 = 2 1000 = 3	3
3085	Modbus Address	0 - 126	0	0	0	0	0
3086	Number of Modbus Stop Bits	1 or 2	2	2	2	2	2
3100	Venting Type	PVC, CPVC, PP, or SST	PVC	PVC	PVC	PVC	PVC
3101	N/A	N/A	N/A	N/A		N/A	
Switch "S4"	Position of Switch "S4"	On or Off	On	On	Off	On	Off

9.18 Diagnostics – Display Messages

During normal operation, the following diagnostic information may be shown in the display:

Diagnostics Messages		
DISPLAY	DISPLAY DESCRIPTION	DISPLAY REFERENCE
AFro	Heater is performing antifreeze protection operation.	Supply temperature (°F)
	Light Steady On = Indirect water heater enabled Light Blinking = indirect water heater loading	Supply temperature (°F)
	Light Steady On = Hot water supply enabled Light Blinking = Hot water supply active	Supply temperature (°F)
Loc	Heater is in Lockout. Press RESET button to unlock the burner. If lockout happens frequently, have a qualified service technician investigate.	Lock out code (see Section 9.18)
Err	Heater is in blocking error. It is possible to restore the normal operating conditions only by resolving the problem. If unable to resolve the error, have a qualified service technician investigate the problem.	Blocking error code (see Section 9.19)

9.19 Diagnostics – Lockout (Loc) Errors

Lockout errors will stop the unit from functioning until the error is resolved and the unit is reset. Refer to the chart below for Lock Errors, with solutions. To reset, perform the following:

Resetting the Unit after a Lockout Error

1. When the boiler goes into lockout, the  icon will show in the control panel display and the burner icon(s) (①, ②, ③, or ④) associated with the lockout will blink.
2. Press the **RESET** button once and the lockout error number will show in the display.
3. To attempt to reset the unit, press and hold down the **RESET** button for at least 5 seconds, which should return the display to its normal function.
4. If the unit cannot be reset in this way, consult the table of Lockout error messages below and attempt to diagnose and resolve the problem before attempting to reset the unit again.

Lockout Error Messages			
LOC#	DESCRIPTION	CHECKS	SOLUTIONS
Loc 1	Flame loss during ignition. No flame detected after five ignition attempts.	a) Correct gas supply pressure. b) Ignition spark (see section 10.19). c) Correct amount of gas (see sections 8.6 and 8.7). d) 120VAC at the gas valve. e) Resistance of the two gas valve coils should be 0.18 k ohm and 1.1 k ohm. f) If the burner lights, but goes out at the end of the ignition attempt, check: that the ionization current is set at a value greater than 3uA (follow procedure in section 10.8).	a) If the gas supply pressure is incorrect, it must be adjusted to the correct pressure. b) If spark is not present, check for correct ignition electrode position and gap as per section 10.19; If position is correct, check for 120VAC at the supply of the spark generator. c) Inspect the vent system and eliminate any obstructions. d) If the voltage to the gas valve is not 120VAC the power control board must be replaced. e) If the resistance of the gas valve coils is not 0.18k ohm and/or 1.10k ohm, the gas valve must be replaced. f) If the ionization current is not greater than 3uA, confirm that the CO2 content is adjusted properly (see section 8.7). Check the flame detection electrode (section 10.19) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.

Lockout Error Messages			
LOC#	**DESCRIPTION**	**CHECKS**	**SOLUTIONS**
Loc 2	Gas valve not supplied before ignition attempt (When this error happens to burner 1 (MASTER), it stops all other burners)	a) - Check High limit temperature switch b) - Check High limit flue temperature fuse	**WARNING!** If the high temperature fuse is blown, before it is replaced it is mandatory to inform the manufacturer to prevent serious damage and a possible dangerous condition. Failure to comply with this requirement can result in excessive levels of carbon monoxide, which can result in severe personal injury or death!
Loc 3	Gas valve lost cable connection during fire	a) Check the integrity of the wires connections between gas valve and control board.	a) If wires are interrupted, replace the wires. b) If wires are ok try to replace the gas valve or the power control board.
Loc 4	Gas valve relay not closing	a) Check the integrity of the wires connections between gas valve and control board.	a) If wires are interrupted, replace the wires. b) 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), it stops all other burners)	a) Check High limit temperature switch b) Check High limit flue temperature fuse	**WARNING!** If the high temperature fuse is blown, before it is replaced it is mandatory to inform the manufacturer to prevent serious damage and a possible dangerous condition. Failure to comply with this requirement can result in excessive levels of carbon monoxide, which can result in severe personal injury or death!
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	a) Check for 120VAC power connection of the fan b) Check PWM connection of the fan	a) If no 120Vac is present replace the power control board b) If no PWM signal, replace power control board c) Try to replace the fan
Loc 13 to 24	Internal software error		Replace the power control board
Loc 25	Gas valve circuit (When this error happens to burner 1 (MASTER), it stops all other burners)	a) Check High limit temperature switch. b) Check High limit flue temperature fuse.	**WARNING!** If the high temperature fuse is blown before it is replaced, it is mandatory to inform the manufacturer to prevent serious damage and a possible dangerous condition. Failure to comply with this requirement can result in excessive levels of carbon monoxide, which can result in severe personal injury or death!
Loc 26	Internal software error		Replace the power control board
Loc 27 to 28	Flame present with closed gas valve		Replace the gas valve
Loc 29	Interlock input (When this error happens to burner 1 (MASTER) stops all other burners)	a - Check LWCO connection b - Check flue blocked pressure switch	a - If LWCO intervenes, try to reset it b - Check if flue gas line is free from any blockage

Lockout Error Messages			
LOC#	**DESCRIPTION**	**CHECKS**	**SOLUTIONS**
Loc 30	Internal software error		Replace the power control board
Loc 31	Five times flame lost during one demand	a)Check detection electrode. b)Check for any obstruction on air inlet / flue exhaust system. c)Check for any air inlet contamination from combustion gas (e.g. flue exhaust terminal too much near air inlet terminal).	a)Try to replace detection electrode. b)Remove any obstruction. c)Remove the cause of the air inlet contamination.
Loc 32 to 37	Internal software error		Replace the power control board
Loc 38	Flue sensor does not increase temperature when burner on	a) Check if flue temperature sensor match section 10.24 b) Check if flue gas sensor reading (parameter 1006) increases its temperature when burner is on.	a) If temperature sensor does not match section 10.24, it must be replaced. b) If temperature does not increase replace the flue gas sensor or the control board.

9.20 Diagnostics – Blocking (Err) Errors

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.

To reset a lockout error, do the following:

Resetting the Unit after a Blocking (Err) Error

1. When the boiler goes into lockout, the icon will show in the control panel display and the burner icon(s) (1 , 2 , 3 , or 4) associated with the lockout will blink.
2. Press the **RESET** button once and the lockout error number will show in the display.
3. To resolve the error, consult the table of Error (Err) messages in the chart below and attempt to diagnose and resolve the problem.
4. To return the display to normal function, press and hold down the **RESET** button for at least 5 seconds.

Blocking Error Messages			
ERR#	**DESCRIPTION**	**CHECKS**	**SOLUTIONS**
Err 0	Self Checking	Not needed	a) During startup, display shows "Err 0" temporarily, because it's doing its own self checking.
Err 45 to 53	Internal software error		Replace the power control board.
Err 54	Flame detected, but not observed.	-	Replace the power control board.
Err 55 to 58	Low water pressure error	Check pressure sensor.	Replace the pressure sensor.

Blocking Error Messages			
ERR#	**DESCRIPTION**	**CHECKS**	**SOLUTIONS**
Err 59	Low water pressure error (This error will stop all modules)	Check the pressure entering the water system and gradually increase it.	a) If water system pressure is over what is set in parameter 3022, replace the water pressure sensor. b) If filling the system for the first time, turn parameter 2011 to **ON** to open the internal valve and allow air to purge.
Err 60	High flue gas temperature error	a) Check the combustion efficiency of the burner in fail. Combustion Efficiency must be higher than 92%. b) Check the flue gas temperature sensor for the graph in indicated in Section 10.24.\	a) If return temperature is higher than 145°F (62°C) downrate the capacity or reduce the water flow; b) If combustion efficiency is lower than **88%**, try to clean the flue gas side and the water side of the heat exchanger; c) If flue temperature sensor does not match Section 10.24, replace it.
Err 61	Return temperature is higher than 176 °F (80°C)	a) Check the return temperature sensor for values indicated in graph in Section 10.24. b) Check if supply and return pipe are reversed	If return temperature sensor does not match Section 10.24, replace it.
Err 62	Blocked drain switch is active (This error will stop all modules)	a) Check if the condensate drain is blocked b) Check if the condensate tank is blocked.	a) Remove any obstruction from the condensate drain. b) Check the condensate tank; if medium is exhausted, it must be replaced.
Err 64	No correct Frequency signal, or no correct ground connection, or no communication with the WD.	a) Check frequency signal is between 55 and 65Hz. b) Check the ground connection (between ground and neutral it must be 0 volts).	a) If out of range, consult your electrical supplier. b) If the ground connection is not correct, ask your electrical supplier to investigate. Alternately, replace the power control board.
Err 65	Hot neutral reversed	Check supply voltage polarity.	Reverse supply voltage polarity if needed.
Err 66	Net freq. error detected in the main	Check the frequency signal. It must be between 55 and 65Hz.	If out of range, consult your electrical supplier. Alternately, replace the power control board.
Err 67	Faulty earth connection	Check the earth connection to the appliance.	Reconnect the earth connection.
Err 68	Watchdog communication error	Check the connections to the appliance.	Reconnect the power control board.
Err 72	Supply sensor open	Check the connections to the appliance.	If temperature sensor does not comply with section 10.24, replace.
Err 73	Return sensor open		
Err 76	DHW sensor open		
Err 80	Supply sensor shorted		
Err 81	Return sensor shorted		
Err 84	DHW sensor shorted		
Err 86	Flue sensor shorted		

Blocking Error Messages			
ERR#	**DESCRIPTION**	**CHECKS**	**SOLUTIONS**
Err 87	Reset button error	Too many reset button pushes within 60 sec. period.	
Err 93	Appliance selection error	Check the list of 3000 parameters (Appendix B).	
Err 107	Internal software error	-	Replace the power control board.
Err 108			
Err 109	Error happening to burners 2, 3 or 4	When burner 1 (MASTER) goes in a general error, it stops burners 2, 3 and 4 generating an "Err 109"	Resolve the error to burner 1 (MASTER)
Err 110	Flapper valve not open error	a)Check for any obstruction into the exhaust system. b)Check if the fan is running. c)Check the flapper valve and its control sensor.	a)Remove the obstruction from flue exhaust. b)Replace the fan or the power control board. c)Replace the flapper valve or its control sensor.
Err 111	Flapper valve not closed error	Check the flapper valve and its control sensor.	Replace the flapper valve or its control sensor.
Err 112	Internal software error	-	Replace the power control board.
Err 113			
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 obstructions in the water system inlets.
Err 115	Multiple burner master failure	-	Reset via 3013 parameter.
Err 116	Multiple burner communication failure. (This error will stop all modules.)	a) Bus communication interrupted. b) Burner is not working.	a) Check for bus communication. b) Restore the burner that has its light off.
NO CONN	Microprocessor in lockout	a) Check if water pressure sensor wires are in short circuit. b) Check if water flow meter wires are in short circuit. c) Check display wires are connected to burner 1 (MASTER).	a) If not in short circuit try to replace the water pressure sensor (or disconnect it via 3000 menu). b) If not in short circuit try to replace the water flow meter (or disconnect it via 3000 menu). c) If not any of the above try to replace the power control board or the display.

9.21 Blocked Flue Pressure Switch

The AM Series units are equipped with a blocked flue pressure switch safety that shuts down the unit when the flue exhaust vent pipe is blocked. If this pressure switch shuts off the unit (Loc 25), do not attempt to place the boiler in operation but rather, contact a qualified service agency or technician able to reset the unit after checking for any potential dangerous situations.

WARNING!

If the high temperature fuse is blown before it is replaced, it is mandatory to inform the manufacturer to prevent serious damage and a possible dangerous condition. A blocked vent could cause high levels of CO to enter the mechanical room. Ensure vent is intact and free of any obstructions or restrictions.

9.22 Unit Shut-Down

To shut the unit down, perform the following:

Shutting Down the Unit

1. Turn the unit power switch to the OFF position.
2. Turn off all electrical power to the unit.
3. Close the manual shut-off valve (Figure 9-3) by turning the valve handle clock-wise. Do not force.

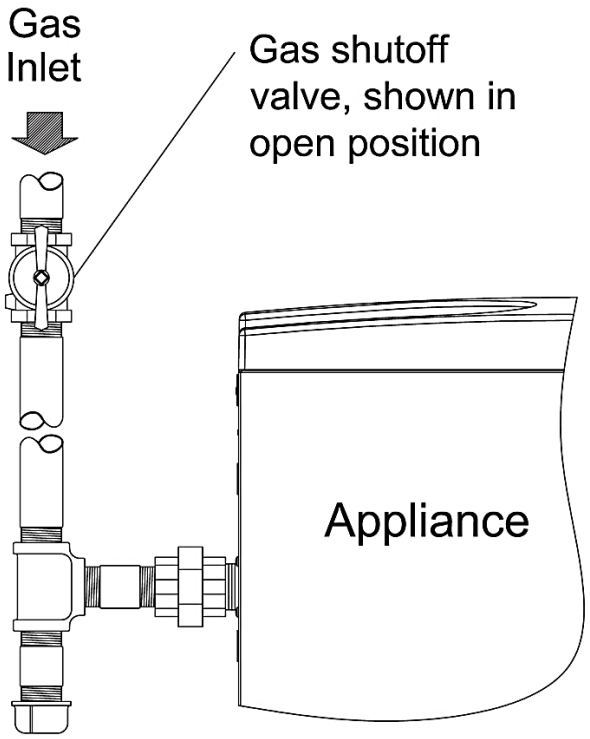


Figure 9-3: Gas Safety Shut-Off Valve

- Do not drain the system, unless exposure to freezing temperatures will occur.
- Do not drain the system, if it is filled with an antifreeze solution.

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SECTION 10: MAINTENANCE

This section must be brought to the attention of the user by the installer so that the user can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of the boiler. Refer to Table 10-1 for a schedule of necessary maintenance procedures.

Lack of proper care and maintenance of this boiler and any fuel burning equipment may result in a hazardous condition.

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

CAUTION!

Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment could damage the boiler and result in equipment damage or a dangerous condition!

Table 10-1: AM Series Maintenance Schedule

SERVICE TECHNICIAN	USER MAINTENANCE
Annual Startup and Maintenance: • Address reported problems • Check all piping for gas leaks • Verify flue and air lines in good condition and sealed tight • Check system water pressure/system piping/expansion tank • Check control settings • Check ignition and flame sense electrodes • Check wiring and connections • Perform start up checkout and performance verification • Flame inspection • Check flame signal • Inspect combustion chamber. Clean and vacuum if necessary. • Clean the heat exchanger if the flue temperature is 63°F (35°C) above return water temperature • Clean condensate reservoir and fill with fresh water • Clean air filter • Check the capacity input • Check relief valve • Check thermal Insulation inside every module	**Daily Check:** • Check boiler area • Check pressure gauge **Monthly Check:** • Check vent piping and vent termination screen • Check air piping and air termination screen • Check relief valve • Check condensate drain system • Check any air vents on the system that no leaks are present **Periodic Check:** • Test low water cut-off (if used) • Reset low water cut-off button (if used) **Six Month Check:** • Check boiler piping (gas and water) for leaks • Check and clean anodes in buffer tank (if installed) **End of Season Months Check:** • Shut boiler down (unless boiler used for domestic hot water)

10.1 Checking for Gas Leaks

- Inspect all gas piping and verify to be leak free.
- 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.

10.2 Flue and Air inlet Piping Inspection

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

10.3 System Piping, Pressure, and Expansion Tank Inspection

- Check water piping and accessories for leaks. All leaks should be corrected.
- Check that the system is filled with water and the reading on the pressure gauge remains stable.

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

10.4 Ignition and Flame Sensor Inspection

To inspect and maintain the ignition and flame sensor, perform the following:

Ignition and Flame Sensor Inspection

1. Remove the fan-burner assembly unit per Section 10.15.
2. Remove any deposits accumulated on the ignition/flame sensor electrode using sand paper.
3. Check the positioning of the electrodes per Section 10.19.
4. Reinstall the fan-burner assembly back into the unit.

10.5 Wiring and Connections Inspection

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

10.6 Performance Verification Inspection

- Start the unit and perform a combustion calibration test as per Section 8.7.
- Verify cold fill pressure is correct and that operating pressure does not go too high (if so, check for problems with the expansion tank).

10.7 Flame Inspection

- Inspect flame through the observation window on the burner.
- If the flame is unsatisfactory at either high fire or low fire, clean the burner per Section 10.15.

10.8 Flame Signal Inspection

- Start the unit and perform the combustion calibration procedure per section 8.7.
- At high fire and low fire the flame signal (parameter 1008) should be within values given in Appendix A, under header "ionization current". A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve the problem, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sensor electrode.

10.9 Relief Valve Inspection

- 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.
- 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. 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, and a dangerous condition.

10.10 Unit Vicinity Inspection

The following are NOT allowed to be in the vicinity of the unit or the flue exhaust system:

- **Combustible/flammable materials**: Do not store combustible materials, gasoline or any other flammable vapors or liquids near the unit or exhaust system. Remove immediately if found.
- **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. 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.

All materials discussed above should be immediately removed from the heater vicinity and the vicinity of the heater combustion air inlet.

If these materials have been present 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.

10.11 Pressure Gauge Inspection

Make sure the pressure reading on the heater pressure gauge (item "M" in Figures 5-1 or 5-3) does not exceed the maximum working pressure. Higher pressures may indicate a problem with the expansion tank.

Contact a qualified service technician if problem persists.

10.12 Condensate Drain System Inspection

- Inspect the condensate drain line, condensate fittings, and condensate trap for signs of weeping or leakage.
- If you detect signs of leakage, immediately contact your qualified service technician to inspect the boiler and system.
- Ensure there is sufficient neutralizer media. It is recommended to replace this media annually.

WARNING!
Have leaks fixed at once by a qualified service technician.

10.13 Low Water Cutoff Test

If an LWCO is installed, it should be tested. Testing the low water cutoff shuts the unit off. Press the **RESET** button on the low water cutoff to turn the unit back on.

10.14 Removing the Unit Covers

In order to remove the unit covers, refer to Figure 10-1 and follow the steps below:

Removing the Unit Covers

1. Lift up, by hand, the Top Cover “A”.
2. Remove two Front Cover screws “B”.
3. Pull back the upper part of Front Cover “C” for 2 inches, then pull it up for one inch and remove it from the unit.
4. Pull back upper part of Bottom Cover “D” for 2 inches, then pull it up for one inch and remove it from the unit.
5. To gain access to the junction box:
   a) Remove the Junction Box Cover screw “E” at rear of cover.
   b) Remove Junction Box cover “F”.

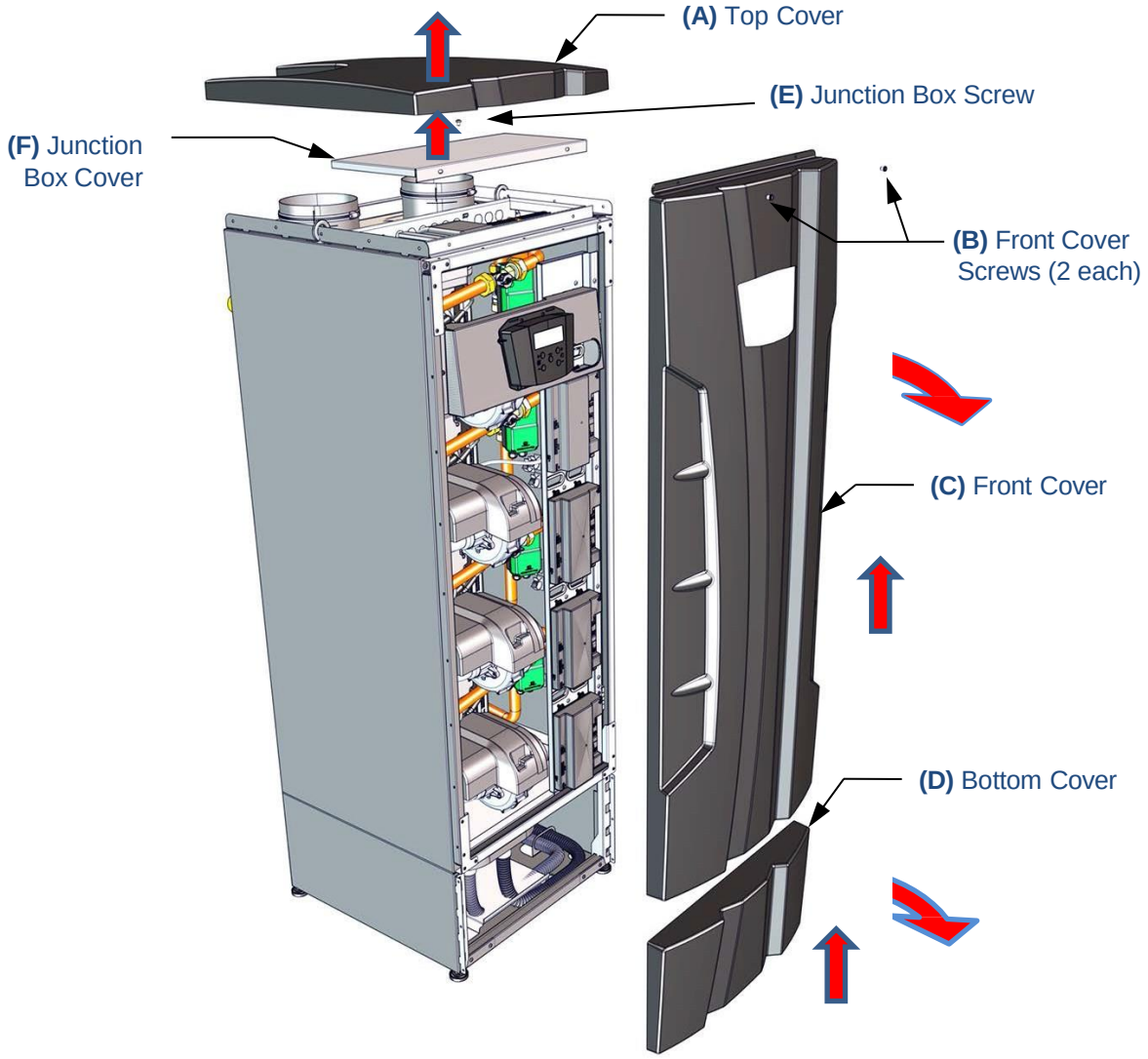


Figure 10-1: Removing the Top and Front Covers

10.15 Cleaning the Burner and Primary Heat Exchanger (Flue/Gas Side)

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

Cleaning the Burner and Primary Heat Exchanger

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.

1. Follow the steps in Section 10.14 to gain access to the internal components.
2. Prepare a suitable cover for the burner so that no dirt, water, or other foreign objects can fall into the burner unit from above.
3. Disconnect the two wires “D” (Figure 6-2) from the ignition electrodes and the wire “E” (Figure 10-3) from the flame detection electrode.
4. Loosen screws “F” (Figure 10-2) and move up the spark generator “A”.

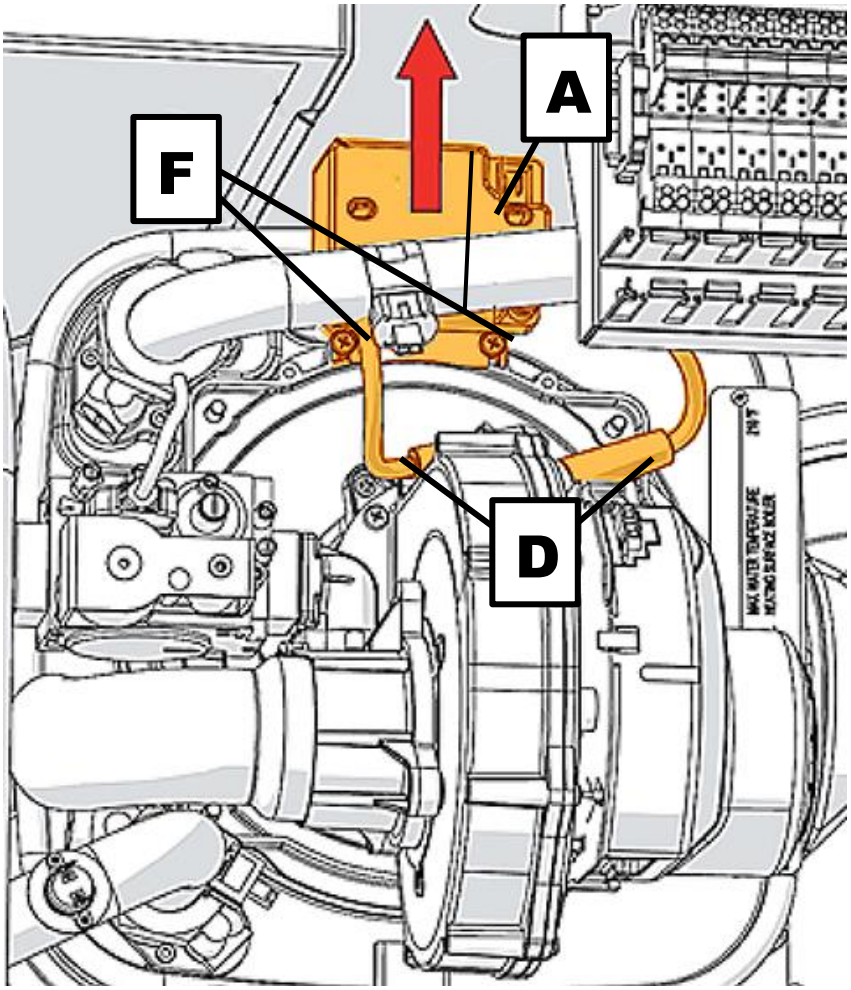


Figure 10-2: Removing the Spark Generator

Cleaning the Burner and Primary Heat Exchanger - Continued

5. Rotate the air inlet elbow connector “B” (Figure 10-3) in the up direction.
6. Pull in the left direction “C” the air inlet silencer and remove it from the fan.

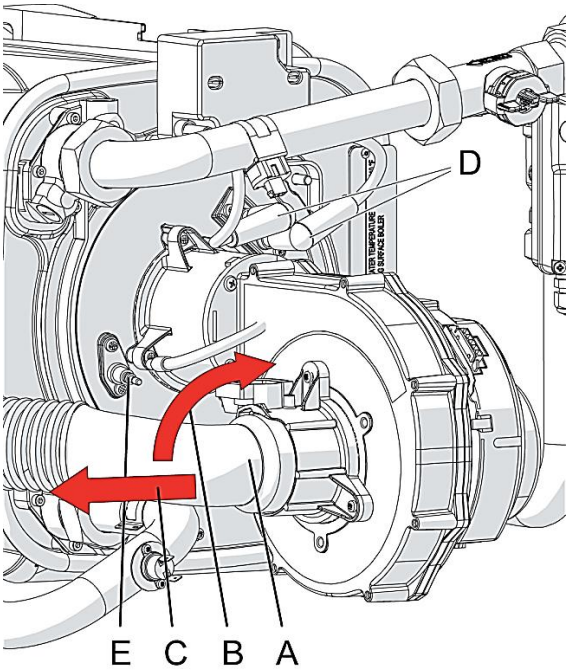


Figure 10-3: Removing the Air Inlet Silencer

7. Unscrew nut “H” (Figure 10-4). Take note of the gasket between nut “H” and the gas valve and remove the electrical plug from the gas valve.

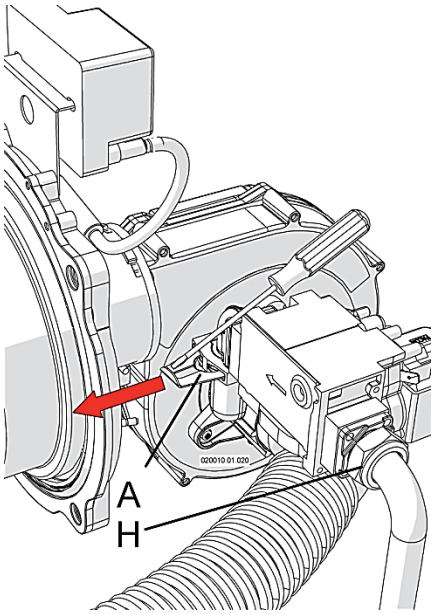


Figure 10-4: Removing the Nut & Spring from the Gas Valve

8. Remove spring “A”, as indicated in Figure 10-4, using a screwdriver.

Cleaning the Burner and Primary Heat Exchanger - Continued

9. Remove the gas valve from its position (see Figure 10-5). Note the O-ring “L” per Figure 6-5.

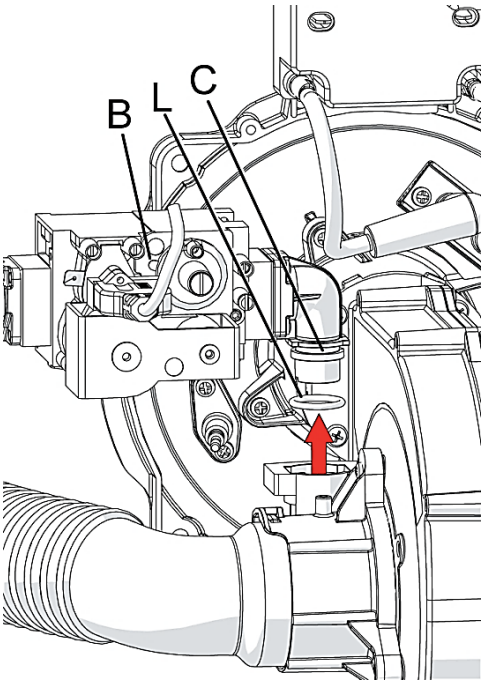


Figure 10-5: Removing the Gas Valve

10. Unscrew the four nuts “B” in Figure 10-6;
11. Remove the entire fan and burner assembly, detail “C”, as shown in Figure 10-6

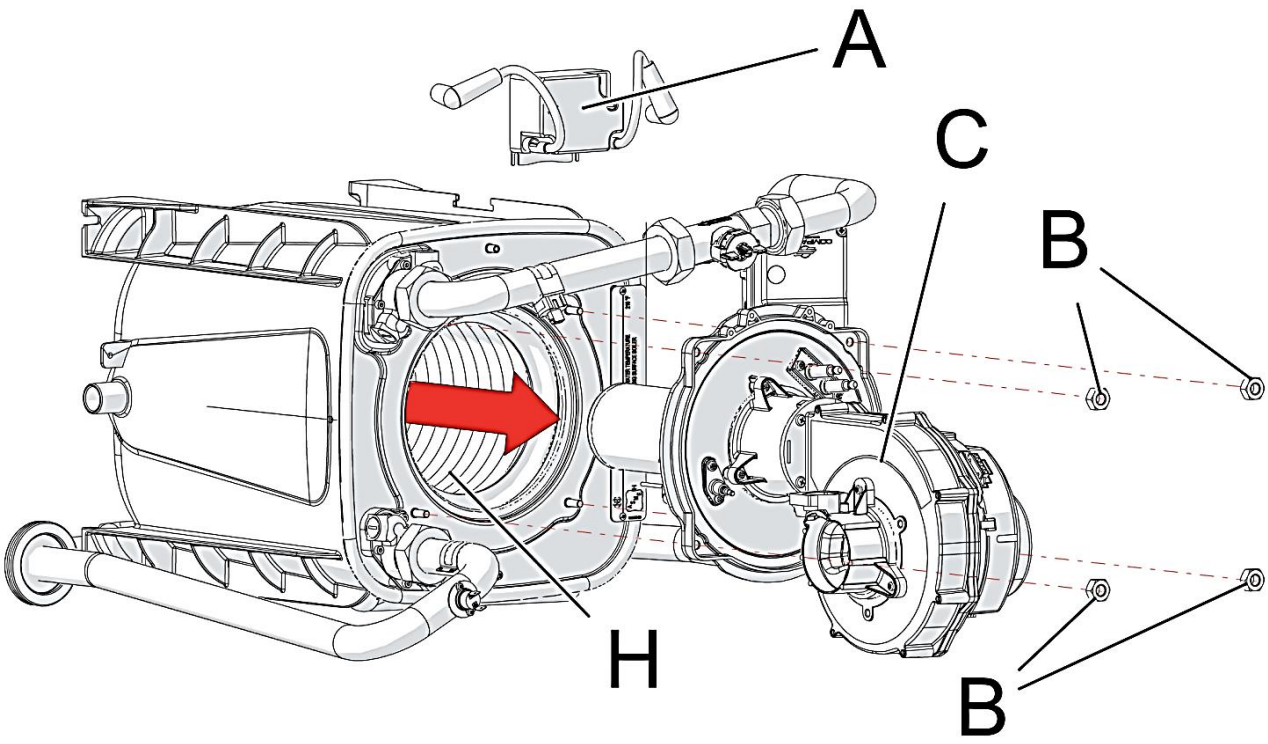


Figure 10-6: Removing the Fan and Burner Assembly

Cleaning the Burner and Primary Heat Exchanger - Continued

12. Use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, item “H” per Figure 10-6

13. Use a vacuum cleaner to remove any unburned residue from the combustion chamber.
14. Clean the surfaces of the burner and around the electrodes using the vacuum cleaner.

WARNING!

While performing the next step, carefully wash only the inside of the combustion chamber and do not get water on the outside of the combustion chamber opening. Failure to comply with this warning can cause extensive property damage or a dangerous condition.

15. Using only water, wash the inside of the combustion chamber. The water will drain into the condensate drain.
16. Reassemble the components by performing the disassembly steps in reverse order, taking care to reinstall the gasket at nut “H” of Figure 10-4 and the O-ring “L” as per Figure 10-5. These must be replaced with a new gasket and/or O-ring if not in good condition.
17. Open the manual gas shutoff valve.
18. Check that there are no gas leaks.
19. Restore electrical power to the unit.

10.16 Inspecting and Replacing the Heat Exchanger Thermal Insulation

The thermal insulation in each heat exchanger module must be inspected every year for any damage, including cracks, chips, or other abnormalities. If any damage is found, the insulation must be replaced using the instructions below. The replacement procedure must be repeated on each heat exchanger module in the unit.

Replacing the HEAT EXCHANGER Thermal Insulation

1. Follow Steps 1 through 11 of the instructions in section 10.15 in order to remove the fan and burner assembly from the heat exchanger.
2. Unscrew nut from the thermal insulation (see Figure A).
3. Use a screwdriver to remove the thermal insulation.
4. Prepare the screw and the washer to fix the new thermal insulation (see Figure B).

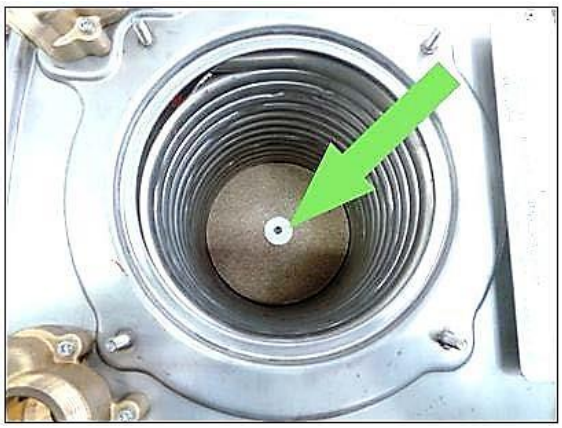


Figure A: Screw & Thermal Insulation

Figure B: Screw & Washer

5. Align the bolt holes in the heat exchanger (detail **B** in Figure 8) with the corresponding hole in the thermal insulation (detail **A** in Figure C).
6. Install the thermal insulation in the heat exchanger, holding it in place with the screw and washer included with the kit (see Figure D).). It is recommended that you use a high temperature anti-seize compound when installing the screw to facilitate removal during subsequent maintenance.

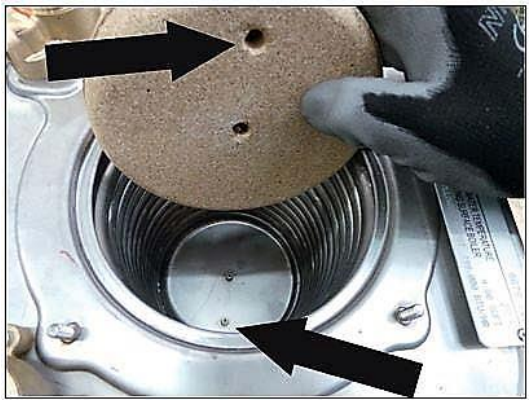


Figure C: Replacing Thermal Insulation

Figure D: Installing Thermal Insulation

10.17 Inspecting and Replacing the Burner Thermal Insulation

The thermal insulation in each burner must be inspected every year for any damage, including cracks, chips, or other abnormalities. If any damage is found, the insulation must be replaced using the instructions below. The replacement procedure must be repeated on each burner module in the unit.

Replacing the BURNER Thermal Insulation

1. Follow Steps 1 through 11 of the instructions in section 6.1.16 in order to remove the fan and burner assembly from the heat exchanger.
2. Unscrew the screws holding the electrodes in place (see Figure E).
3. Remove both the ignition and flame detection electrodes (see Figure F).

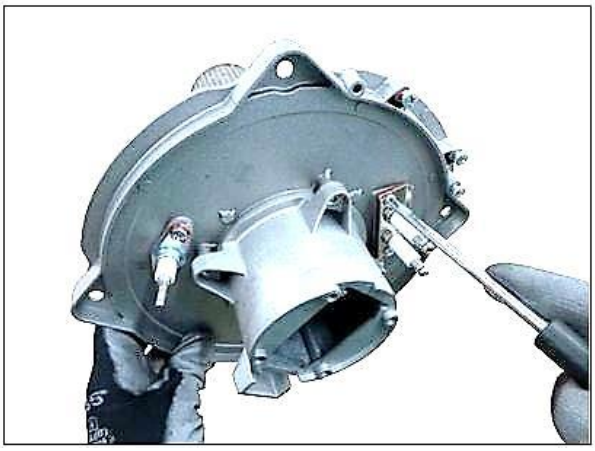


Figure E: Removing Electrode's Screws

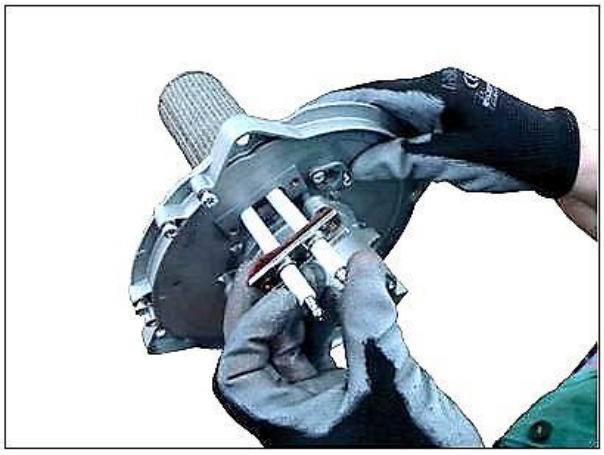


Figure F: Removing the Electrodes

4. Remove the burner's thermal insulation (see Figure G).
5. Replace the O-Ring (see arrow in Figure H) with the new one included in the kit.

Figure G: Remove Thermal Insulation

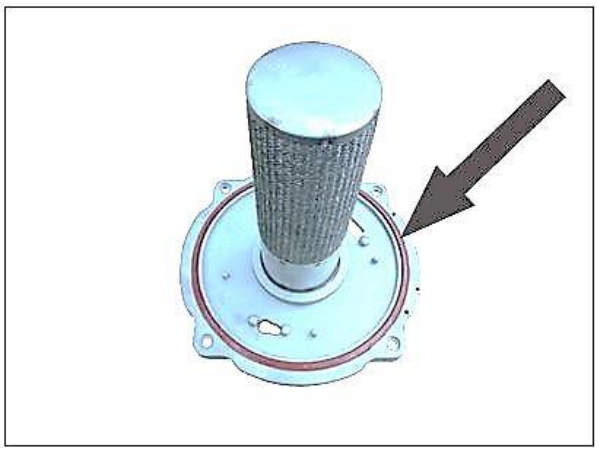


Figure H: Replace the O-Ring

Replacing the BURNER Thermal Insulation - Continued

6. Install the wool gasket in the back of the new burner thermal insulation (see Figure I).
7. Install the new burner thermal insulation on the burner (see Figure J).

Figure I: Wool Gasket w/ Thermal Insulation

Figure J: Install Thermal Insulation

8. Assembly the ignition and detection electrodes, paying attention to the correct position of the red gasket (shown with arrows in Figure K).
9. Screw the electrodes in place (see Figure L).

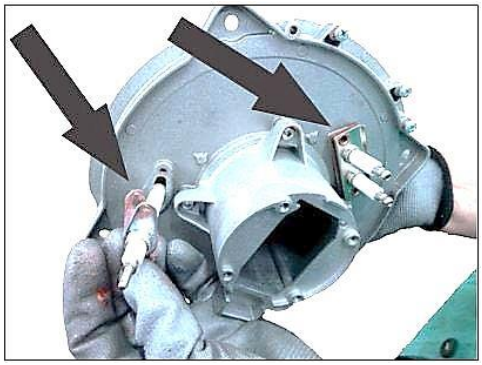


Figure K: Reassemble the Electrodes

Figure L: Tighten the Electrodes

10. Before reinstalling the burner, clean the surface on which the gasket will sit (shown with arrows in Figure M) to ensure a good seal.
11. Install the reassembled fan burner assembly (see Figure N) in the heat exchanger by performing the steps in section 10.15 – *Removing the Burner* in reverse order.

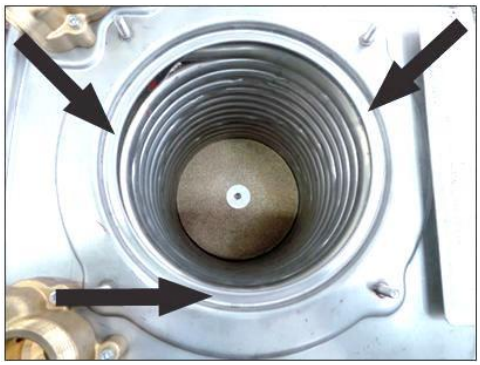


Figure M: Clean Gasket Surface

Figure N: Burner Reassembly

12. Repeat the instructions above on the remaining burners in the unit.

10.18 Checking for Gas Leaks after Reassembly

Once the unit is reassembled and the electrical connection restored, open the manual gas shut off valve and check the unit for gas leaks.

Checking for Gas Leaks After Reassembly

1. Use an approved leak detention method to check all junctions shown with arrows **A** through **E** in Figure O.

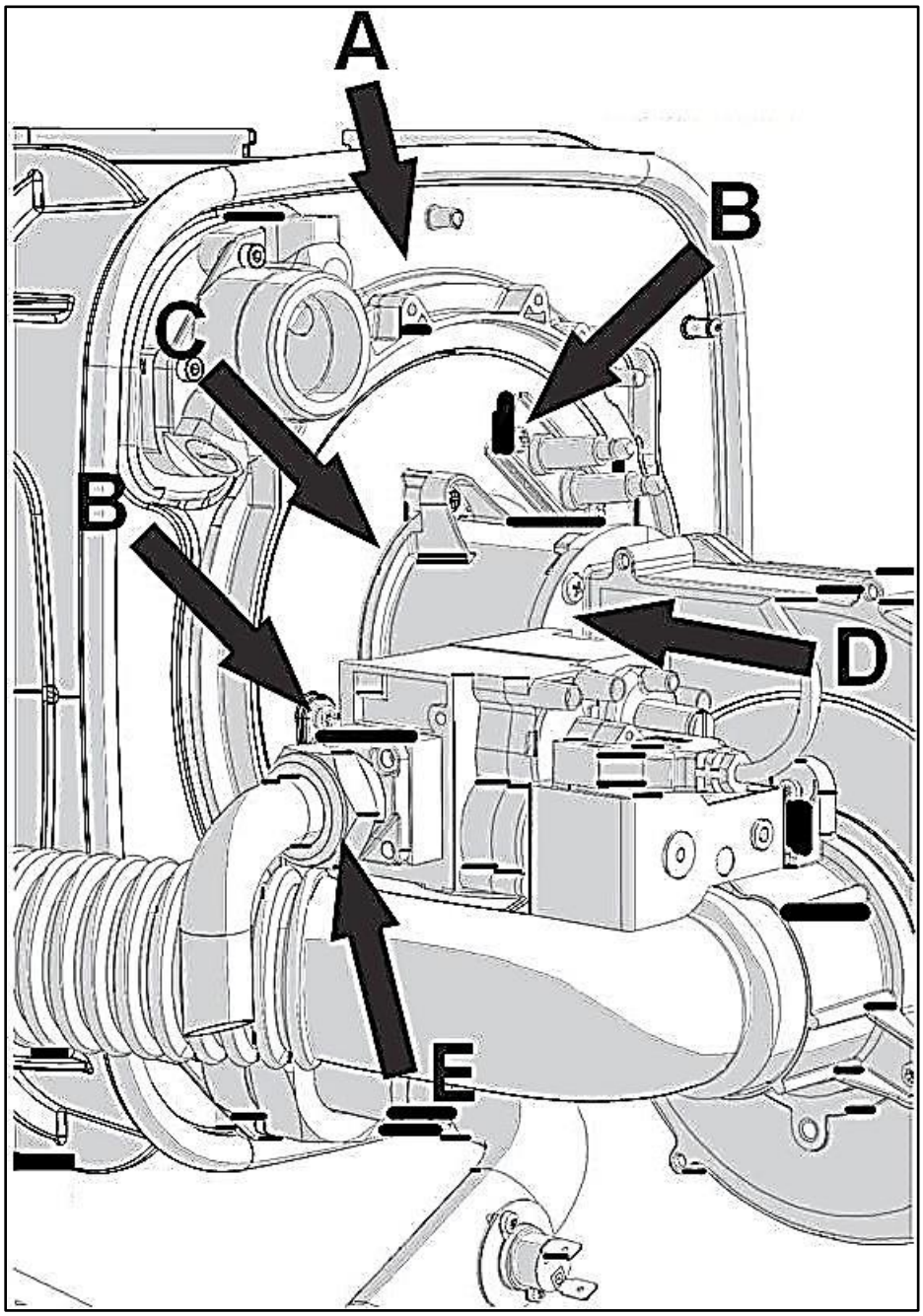


Figure O: Leak Check Locations

10.19 Ignition and Flame Detection Sensor Electrode Positioning

For the heater to work properly the electrodes must be positioned as listed below and shown in Figure 10-7:

Ignition and Flame Detection Electrode Positioning

2. To insure correct functioning of the burner, the distances listed below should be carefully verified by hand using calipers.
   - The distance between the ignition electrodes “A” and “B”, must be between 0.08 in (2 mm), and 0.10 in (2.5 mm);
   - The distance of the ignition electrodes to the burner surface must be between 0.20 in (5.0 mm), and 0.22 in (5.5 mm);
   - The distance of the flame detection electrode to the burner surface must be between 0.23 in (6.0 mm), and 0.27 in (7.0 mm).

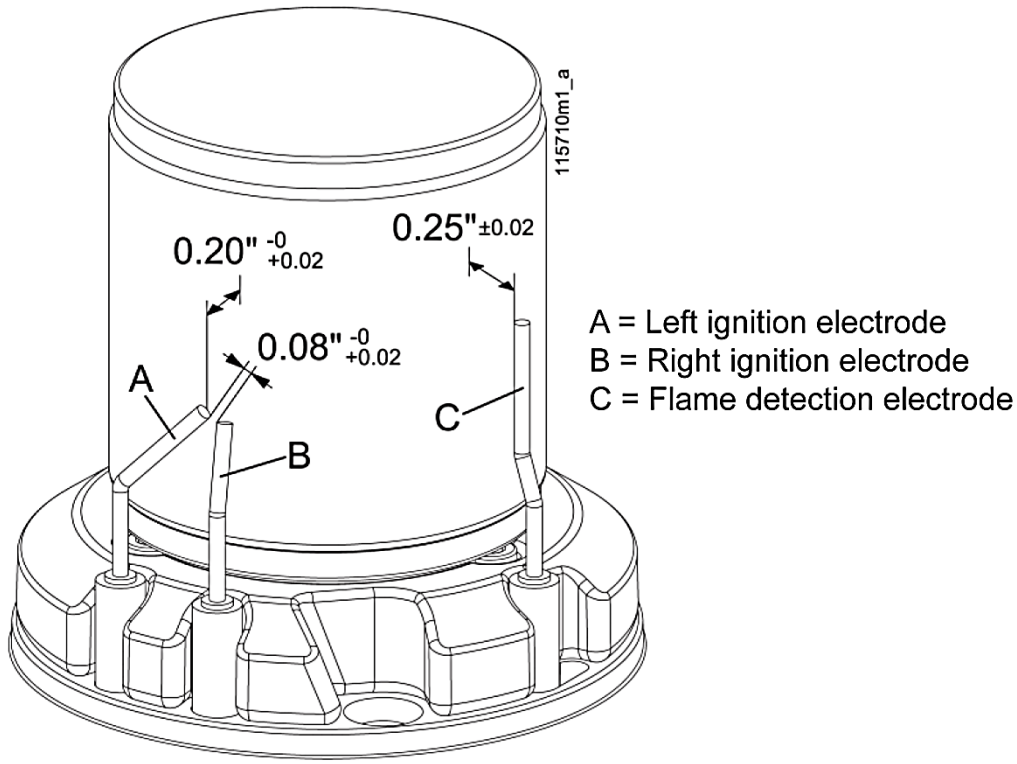


Figure 10-7: Positioning the Ignition & Flame Detection Sensor Electrodes

10.20 Air Filter Cleaning

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. To clean the air filter, perform the following:

Cleaning the Air Filter

1. Follow the steps in Section 10.14 to gain access to the internal components.
2. Pull down with a rotating motion the air filter “B” as per Figure 10-8.
3. Pull out the air filter and remove it from the unit.
4. Clean the surface of the air filter using compressed air.
5. Reassemble the air filter, noting the orientation arrow on the front of the filter.

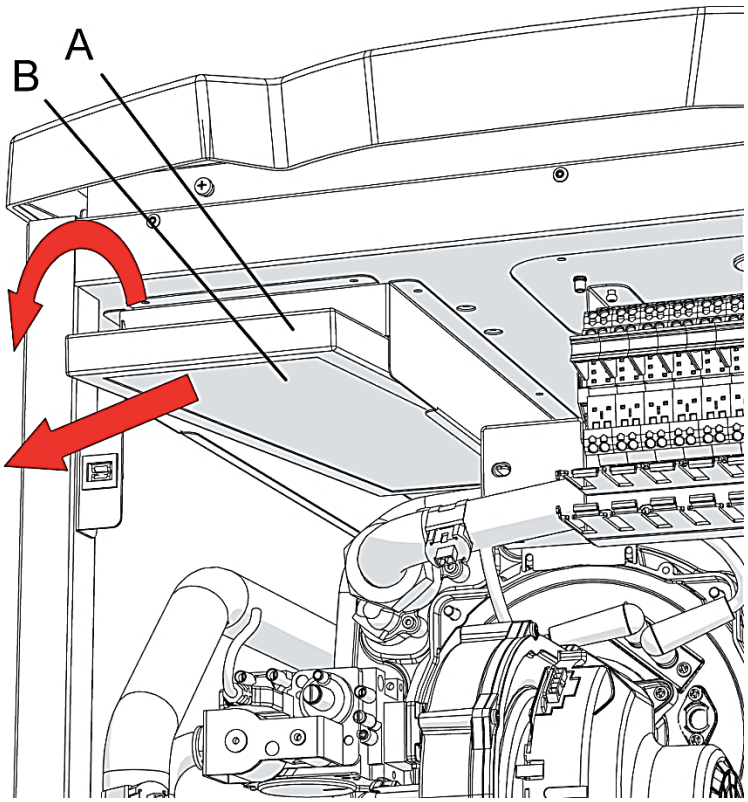


Figure 10-8: Removing the Air Filter for Cleaning

10.21 Condensate Trap and Neutralizing Reservoir Maintenance

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

Monitor the level of the neutralization media in the reservoir periodically. The pH can be checked after the condensate has exited from pipe “A” of Figure 4-8. 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 pH level inspection 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 AERCO.

To inspect and maintain the condensate system, perform the following:

Condensate System Inspection and Maintenance

1. Turn off electrical power to the unit.
2. Close the manual gas shut-off valve (Figure 7-1).
3. Follow the steps in Section 10.14 to remove the lower front cover.
4. Pull out the condensate collection tank assembly “A” (Figure 10-9).

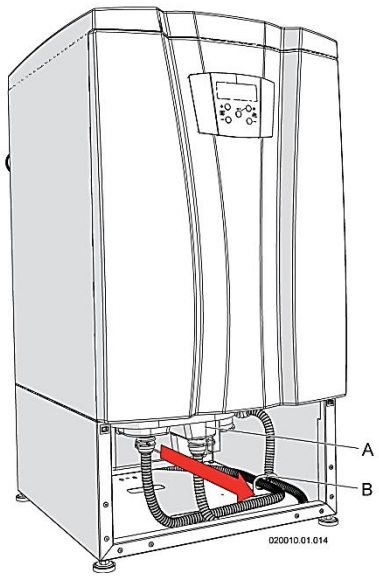


Figure 10-9: Pull Out Tank

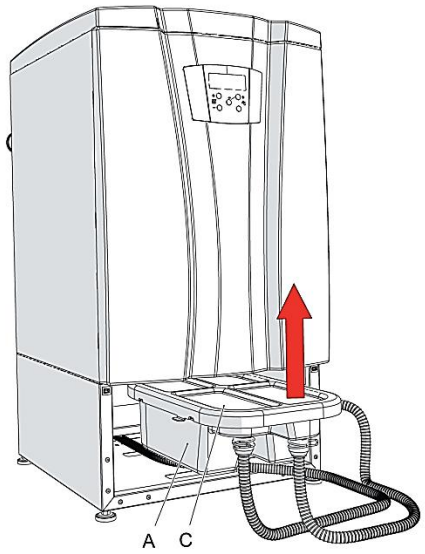


Figure 10-10: Open Cover

5. Open the neutralizer tank cover “C” per Figure 10-10, and inspect the collection tank for wear or damage.
6. Examine the neutralizing media and replenish with fresh media if needed.
7. Fill the condensate collection tank with fresh water until the water begins to flow from the condensate drain piping.

Condensate System Inspection and Maintenance - Continued

8. Replace the condensate cover and reinsert the condensate collection tank assembly back into the unit.

WARNING!

The condensate collection tank must be filled with water to prevent flue gas emissions from escaping during unit operation. Failure to comply with this requirement can result in dangerous levels of carbon monoxide.

9. Open the manual gas shutoff valve.
10. Restore electrical power to the unit and return to service.

WARNING!

The condensate neutralizer tank MUST be installed correctly into the unit, as shown in Figure 4-8. If you do not install the condensate collection tank into its correct position, it will result in combustion gases will entering the room and creating a dangerous condition.

10.22 Control Board Replacement

The AM Series multi-burner units are configured to be driven by one control board (named Burner 1 (Master)). On this board are connected all external devices such as: enable/disable, outdoor sensor, pump commands, LWCO, and some internal safety devices such as blocked drain magnetic switch, flue blocked pressure switch, etc. If the Burner 1 control board fails, the complete unit stops functioning. If installer does not have a spare replacement part, the burner control board from one of the other burners may be used to replace the Burner 1 (master) control board in order to resume the function of the unit. To do so, perform the following:

Replacing the Burner 1 (Master) Control Board

1. Turn off all electrical power to the unit.
2. Follow the steps in Section 10.14 to remove the front cover.
3. Refer to Figure 10-11 and disconnect plug “B” (plug coming from display) from plug “A” (plug coming from “Burner 1 (Master).
4. Disconnect all other plugs from the Burner 1 (Master) control board.
5. Loosen the four (4) screws “C” and remove the Burner 1 (Master) control board from the unit.

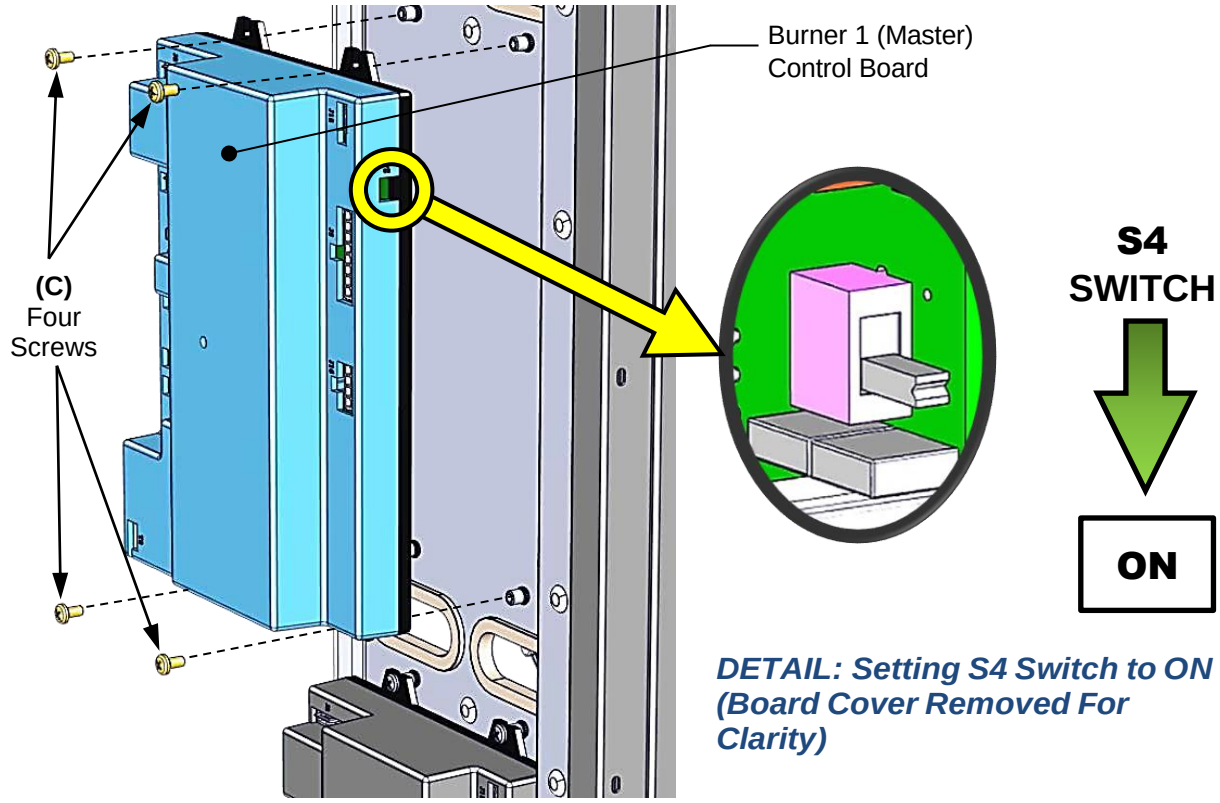


Figure 10-11: Replacing the Burner 1 (Master) Control Board

6. Repeat step 5 above to remove another control board from its location.
7. Install this control board to the location where the Burner 1 (Master) control board was installed, and reconnect all plugs to this board.
8. Locate S4 Switch per figure 10-11, and move from OFF (UP) to ON (DOWN) position.

Replacing the Burner 1 (Master) Control Board - Continued

9. Ensure that all connections that are now disconnected from the replacement board are secure from shorts or damage by electrically insulating each of the plugs.
10. Replace all covers.
11. Turn on electrical power to the unit.
12. Gain access to the Factory menu, per Appendix B, and set all parameters as shown in the column “Burner 1 (Master)”. Take special note of parameter 3050, as the unit has lost the function of a control board, and the 3050 value must be reduced by one unit to reflect this.
13. Shut off electrical power to the unit;
14. Turn on the power to the unit. Now the new Burner 1 control board should drive the unit correctly.

10.23 Draining the Water from the Unit

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

Draining the Water from the Unit

1. Cool down the unit by setting the control temperature to the maximum (see Section 9.2 for boilers and Section 9.14 for water heaters) and wait the temperature gauge shows less than 104°F (40°C).
2. Turn OFF all electrical power off to the heater.
3. Close the manual gas shutoff valve, Figure 7-1.
4. Close the heater isolation valves in the heating system. If isolation valves haven’t been installed, the entire heating system will have to be drained.
5. Check that the heating system fill valve is closed.
6. Connect a hose to the drain valves and place the other end of the hose in a sink or some other suitable drain.
7. Open the drain valves and wait for all water drain.
8. If unit isolation valves have not been installed in the heating system open any bleed valves at the highest point of the system.
9. After draining out all the water, close the bleed valves and the unit drain valves.

10.24 Water and Flue Temperature Sensor

The boiler has a number of sensors that measure temperature. For proper function, the electrical resistance between the sensor wires must correspond with the values shown in Figure 10-12 for both boilers and water heaters.

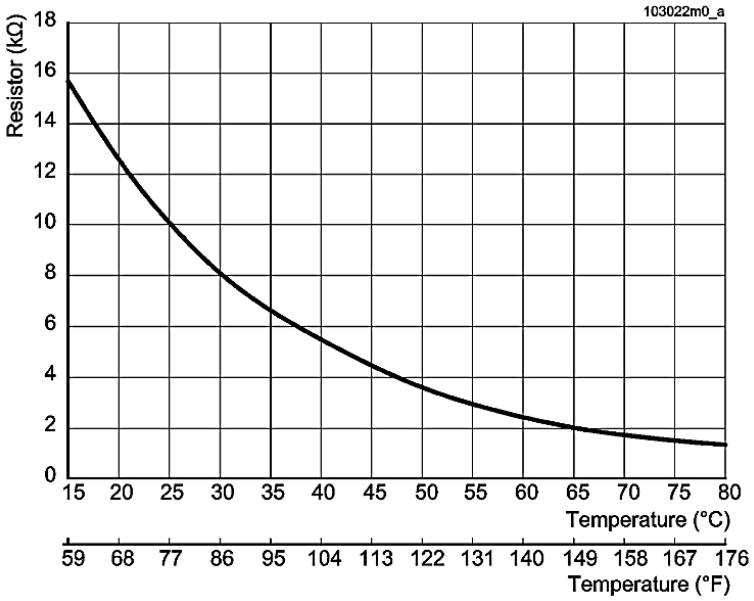


Figure 10-12: Water and Flue Temperature Sensor Curve

10.25 Outdoor Temperature Sensor (Boilers Only)

An outdoor temperature sensor can be connected to the boiler (see Section 5.2.2). The electrical resistance existing between the sensor wires must correspond with the values shown in Figure 10-13.

Figure 10-13: Outdoor Temperature Sensor Curve (Boilers Only)

10.26 AM Rapid Recovery (AMR) Option Maintenance

Refer to Chapter 10 for all general maintenance procedures applicable to the AM Series of water heaters used in the AMR option.

10.26.1 Components and Piping

The external circulator pump, piping, parts, and low water cut-off specific to the AMR option are designed to provide years of trouble-free service. However, periodic inspection and routine maintenance are recommended for all hydronic systems and mechanical equipment. If any evidence of leakage or damage is present, take preventive measures and shut down the system immediately, then contact AERCO technical support for information about repair or replacement of any parts or components. See Chapter 12 for a diagram and parts list of all AMR option spare parts.

10.26.2 Buffer Tank Anode Rods

Anodes should be checked and cleaned every six months.

The AMR buffer tank supplies 25 grams of anode per square foot of tank area. Original anode rod diameter is 3/4" (0.75"), and should be replaced if diameter is reduced by 20% to 3/5" (0.60") diameter or less. Figure 10-14 shows a comparison of an old anode needing replacement, and a new anode.

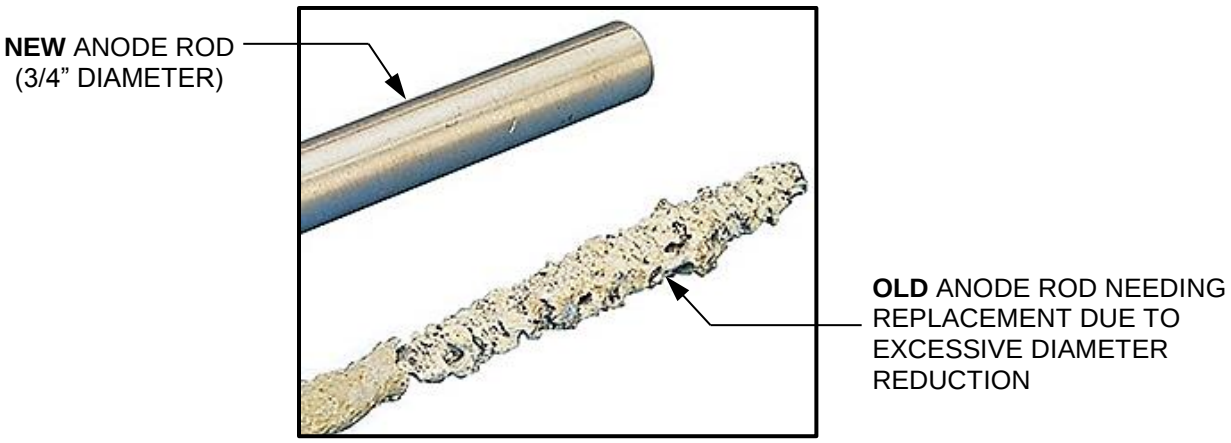


Figure 10-14: Buffer Tank New and Old Anode Comparison

Replacement anode rods (PN **93135-4**) are available from AERCO Technical Support.

10.27 Maintenance Kits Part Lists

The annual and 24-month maintenance kits for the various models of AM units are shown in the table below. The basic kit part number is **58109**, with the suffix of **-01** through **-06** appended to it to indicate the specific kit required.

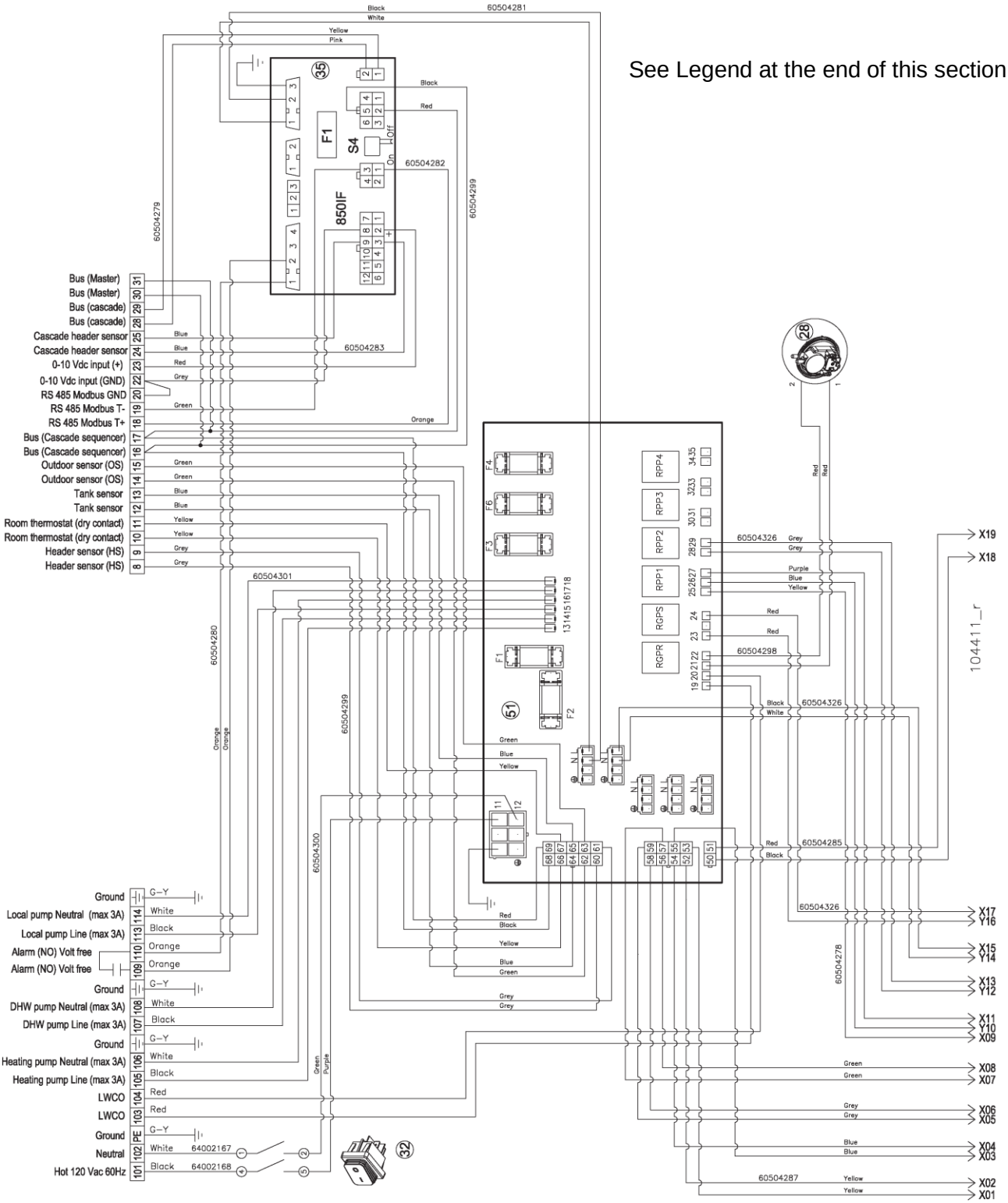
AM Series Maintenance Kit (P/N 58109) P/N Suffix and Part List

P/N SUFFIX	DESCRIPTION	COMPONENTS		
		P/N	DESCRIPTION	Q'TY
-01	**AM399/500** ANNUAL MAINTENANCE KIT	60505029	DETECTION ELECTRODE	2
		60701023	GASKET KERASIL 325R SQ 38X17X2	2
		60505028	IGNITION ELECTRODE	2
		60701022	GASKET KERASIL 325R SQ 56X22X2	2
-02	**AM750** ANNUAL MAINTENANCE KIT	60505029	DETECTION ELECTRODE	3
		60701023	GASKET KERASIL 325R SQ 38X17X2	3
		60505028	IGNITION ELECTRODE	3
		60701022	GASKET KERASIL 325R SQ 56X22X2	3
-03	**AM1000** ANNUAL MAINTENANCE KIT	60505029	DETECTION ELECTRODE	4
		60701023	GASKET KERASIL 325R SQ 38X17X2	4
		60505028	IGNITION ELECTRODE	4
		60701022	GASKET KERASIL 325R SQ 56X22X2	4
-04	**AM399/500** 24 MONTH FIRESIDE INSPECTION KIT	60505029	DETECTION ELECTRODE	2
		60701023	GASKET KERASIL 325R SQ 38X17X2	2
		60505028	IGNITION ELECTRODE	2
		60701022	GASKET KERASIL 325R SQ 56X22X2	2
		60703047	SIL. GASKET D.200 F.188 H.7,2	2
		62801021	SYNTHETIC PLATE FILTER	2
-05	**AM750** 24 MONTH FIRESIDE INSPECTION KIT	60505029	DETECTION ELECTRODE	3
		60701023	GASKET KERASIL 325R SQ 38X17X2	3
		60505028	IGNITION ELECTRODE	3
		60701022	GASKET KERASIL 325R SQ 56X22X2	3
		60703047	SIL. GASKET D.200 F.188 H.7,2	3
		62801021	SYNTHETIC PLATE FILTER	3
-06	**AM1000** 24 MONTH FIRESIDE INSPECTION KIT	60505029	DETECTION ELECTRODE	4
		60701023	GASKET KERASIL 325R SQ 38X17X2	4
		60505028	IGNITION ELECTRODE	4
		60701022	GASKET KERASIL 325R SQ 56X22X2	4
		60703047	SIL. GASKET D.200 F.188 H.7,2	4
		62801021	SYNTHETIC PLATE FILTER	4

10.27.1 AM Series 399 – 1000 Model Wiring Diagram

WARNING

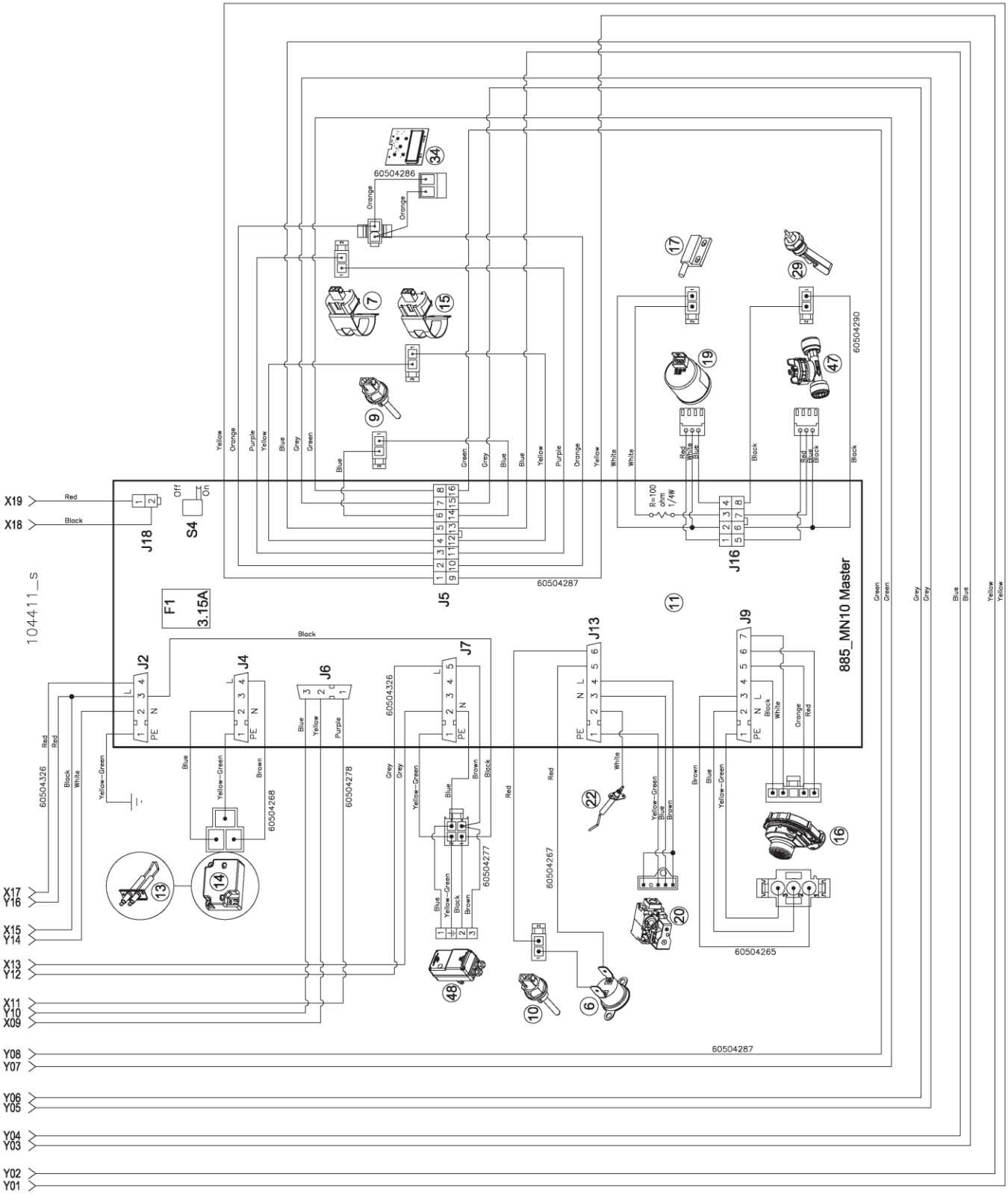
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!



See Legend at the end of this section.

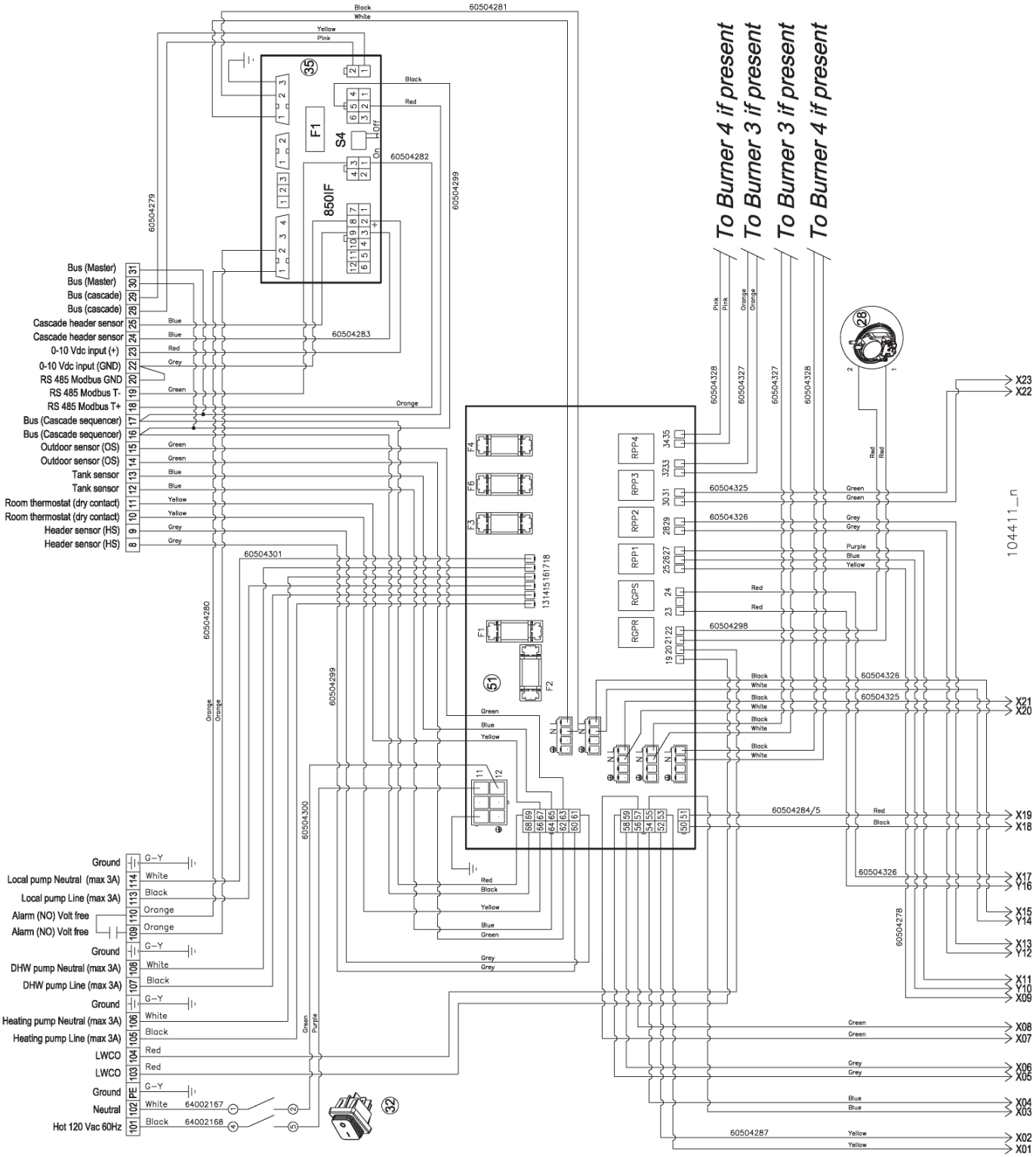
WARNING

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!



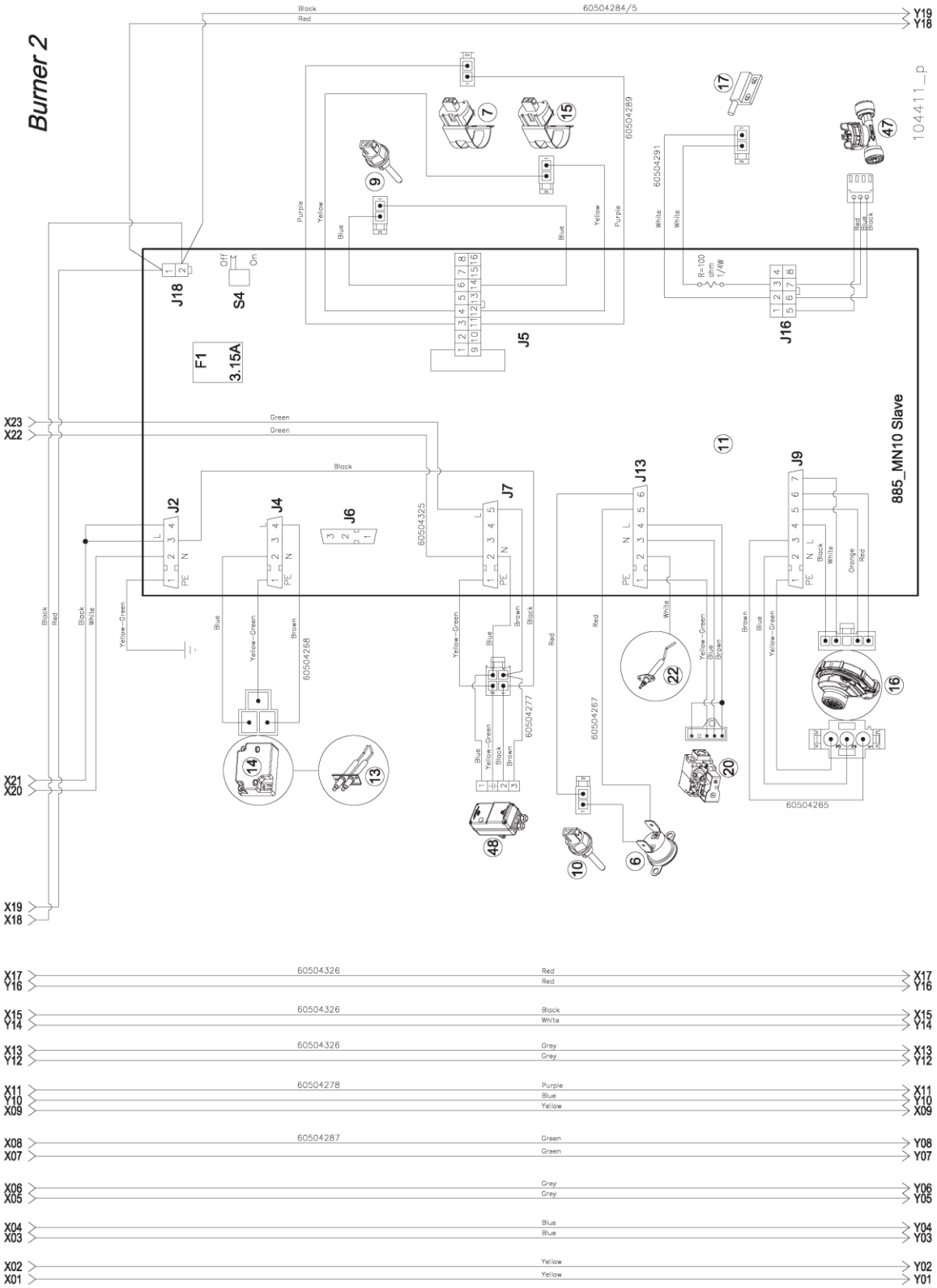
WARNING

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!



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!



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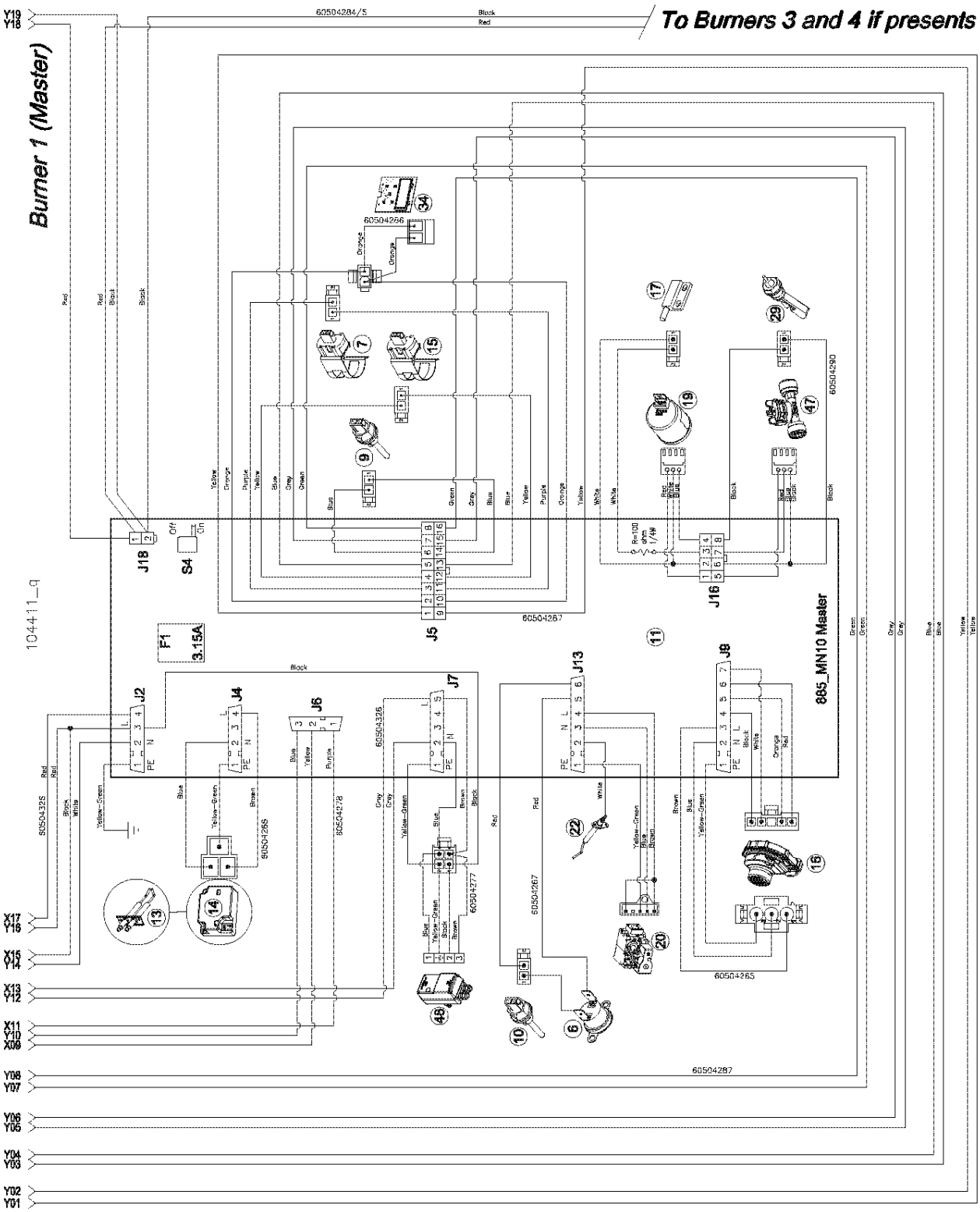
WARNING

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



Legend for Electrical Scheme

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 on 199 & 250) Fuse– F1 5x20 3A
47 – Water flow meter
48 – Motorized valve (optional)
51 – Connection board
Fuse – F1 5X20 10A
Fuse – F2 5X20 10A
Fuse – F3 5X20 3A
Fuse – F4 5X20 3A
Fuse – F6 5X20 3A
RGPR – CH pump relay
RGPS – DHW pump relay
RPP1 – Local pump relayfor Burner 1 (MASTER)
RPP2 – Local pump relayfor Burner 2
RPP3 – Local pump relayfor Burner 3
RPP4 – Local pump relayfor Burner 4

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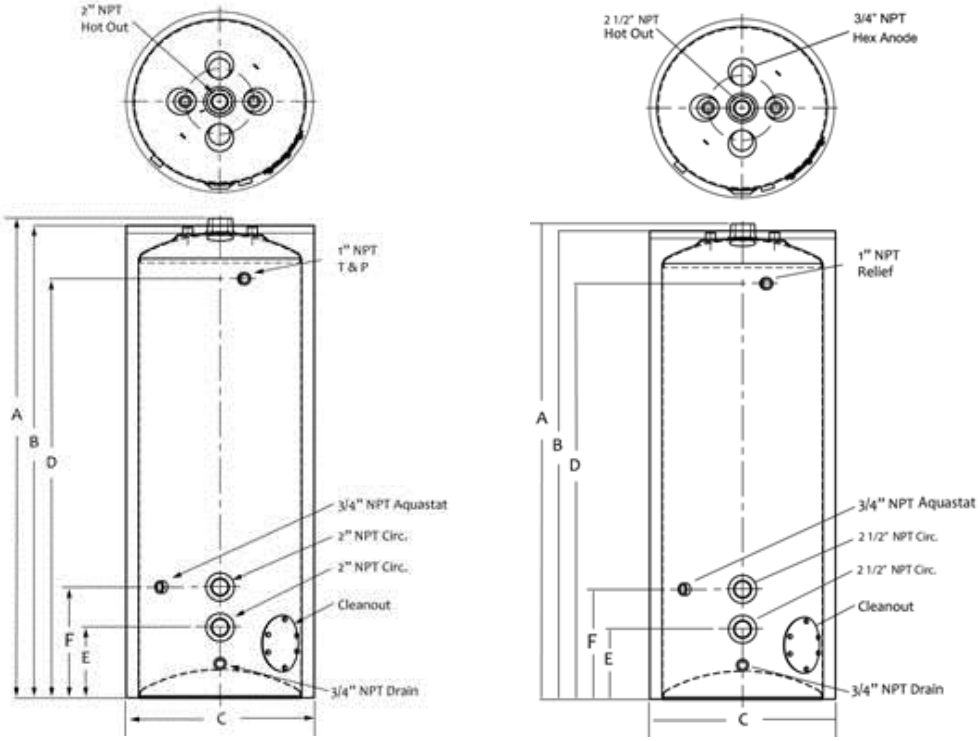
SECTION 11: TECHNICAL DATA

AM Series Boiler and Water Heater Technical Data

Description		Model			
		399	500	750	1000
Category of discharge chimney		II & IV	II & IV	II & IV	II & IV
Maximum Heat input	Btu/hr.	399,000	500,000	750,000	999,000
Minimum heat input	Btu/hr.	50,000	50,000	50,000	50,000
Turndown ratio		8:1	10:1	15:1	20:1
Number of burners		2	2	3	4
Gas flow rate (Natural gas)	ft^3/hr.	399	500	750	999
Gas flow rate (LP gas)	ft^3/hr.	160	200	300	400
Min / Max gas pressure (Nat. and LP)	In. W.C.	3 / 13	3 / 13	3 / 13	3 / 13
Min / Max water temperature	°F	68 / 190	68 / 190	68 / 190	68 / 190
Min / Max water pressure	PSI	8 / 160	8 / 160	8 / 160	8 / 160
Minimum Water Flow at Minimum Fire	GPM	11	12	12	12
Minimum Water Flow at Maximum Fire	GPM	22	24	36	48
Content of water	Gal.	3.4	4	7	9
Supply voltage / Frequency		120Vac 60Hz	120Vac 60Hz	120Vac 60Hz	120Vac 60Hz
Absorbed electric power	W	220	300	430	591
Air intake / Flue gas pipes diameter	inch	4	4	6	6
Max. length venting system	Ft.	120	120	120	120
CO (Carbon monoxide) with natural gas	ppm	<150	<150	<150	<150
CO (Carbon monoxide) with LP gas	ppm	<250	<250	<250	<250
NOx	ppm	<20	<20	<20	<20
CO2 (Carbon dioxide) for Natural gas at high	%	8.4 to 8.7	8.8 to 9.1	8.8 to 9.1	8.8 to 9.1
CO2 (Carbon dioxide) for Natural gas at low	%	8.4 to 8.7	8.8 to 9.1	8.8 to 9.1	8.8 to 9.1
CO2 (Carbon dioxide) for LP gas at high fire	%	9.5 to 10	9.5 to 10	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	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	5.2 to 4.7	5.2 to 4.7
O2 (Oxygen) for Natural gas at low fire	%	5.9 to 5.4	5.2 to 4.7	5.2 to 4.7	5.2 to 4.7
O2 (Oxygen) for LP gas at high fire	%	6.4 to 5.6	6.4 to 5.6	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	4.8 to 3.4	4.8 to 3.4
Ionization current	uA (Micro Amps)	4 to 7	4 to 7	4 to 7	4 to 7
Maximum flue gas temperature	°F	203	203	203	203
Maximum water condensate flow	GPM	0.064	0.077	0.116	0.154
Average acidity of condensation	PH	4	4	4	4
Heater weight (empty of water)	Lbs.	312	323	464	548
Recovery Rating (100°F rise) (water heater only)	Gal/hr.	455	570	855	1138
DHW delivery (75°F rise) (water heater) only)	GPM	10.1	12.7	19	25.4

AM Rapid Recovery Buffer Tank Technical Data		
Specifications	80 Gal. Tank	**119 Gal. Tank**
Code	ASME Sec IV HLW	ASME Sec IV HLW
Design Pressure	150 psi	150 psi
Test Pressure	150 psi	150 psi
Heads	10 Gauge	10 Gauge
Shell	10 Gauge	10 Gauge
Interior	Ultonium Glass Lining	Porcelain Enamel
Exterior	Baked Enamel Steel Jacket	Baked Enamel Steel Jacket
Insulation	2” R-12.5 Open Cell Foam	2” R-12.5 Open Cell Foam
Supports	Sits on Shell	Sits on Shell
Capacity	80 Gal.	119 Gal.
Weight	192 Lbs.	225 Lbs.
Material Specifications		
Shell	Carbon Steel	Carbon Steel
Heads	Carbon Steel	Carbon Steel
Couplings	Carbon Steel	Carbon Steel
Jacket	24 Gauge Steel	24 Gauge Steel
AMR Storage Tank Dimensions		
Mark	**80 Gal. Tank**	**119 Gal. Tank**
A – Overall height	59.75”	63.50”
B – Top of Jacket	58.75”	62.50”
C – Diameter	28”	28”
D – T&P to Floor	52.5”	55.75”
E – Circulation	9.25”	9.25”
F – Circulation	14.25”	14.25”



SECTION 12: SPARE PARTS DRAWINGS & LISTS

12.1 AM 399/500 Spare Parts Drawings

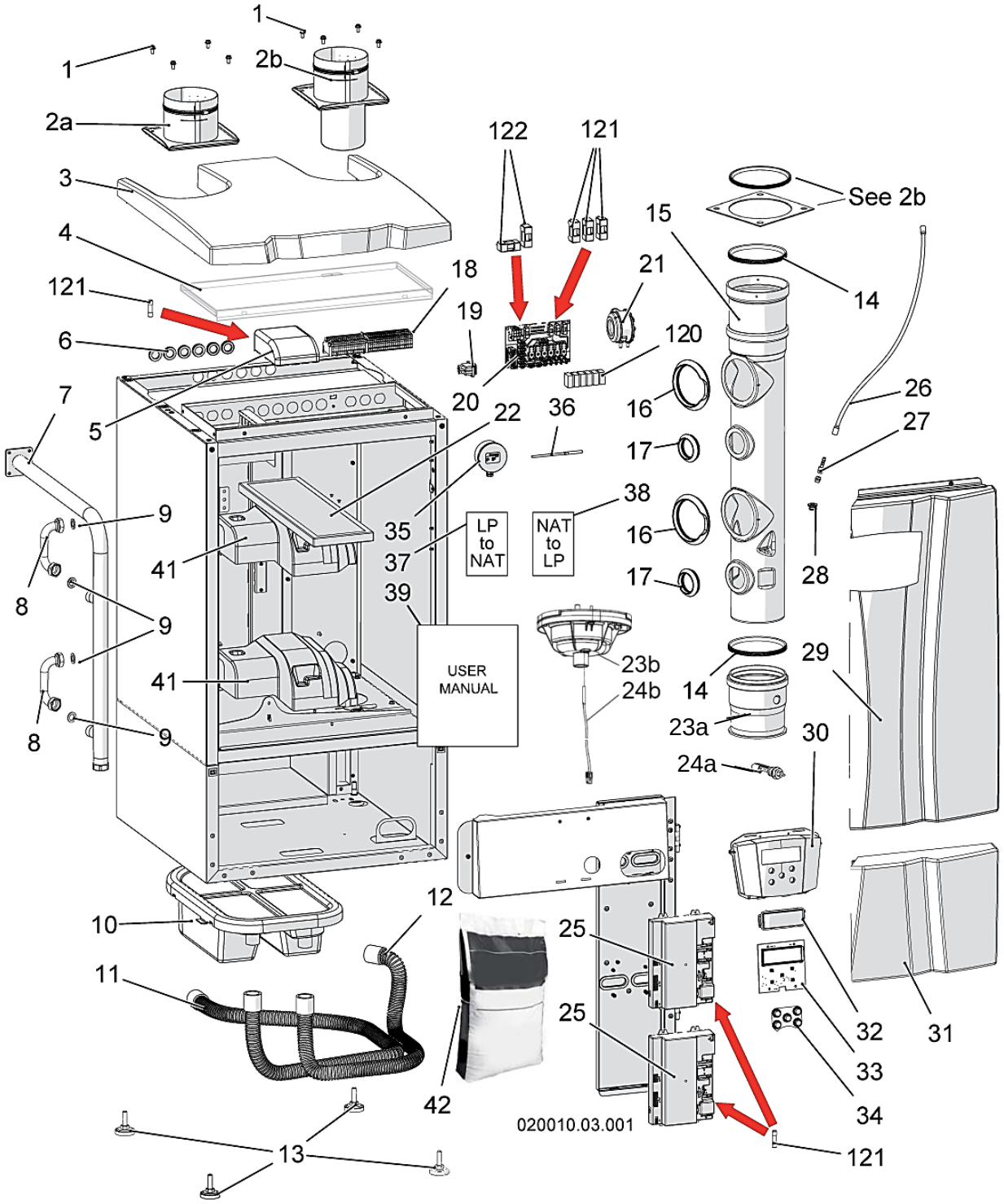


Figure 12-1: AM 399/500 General Assembly Parts Drawing (1 of 2)

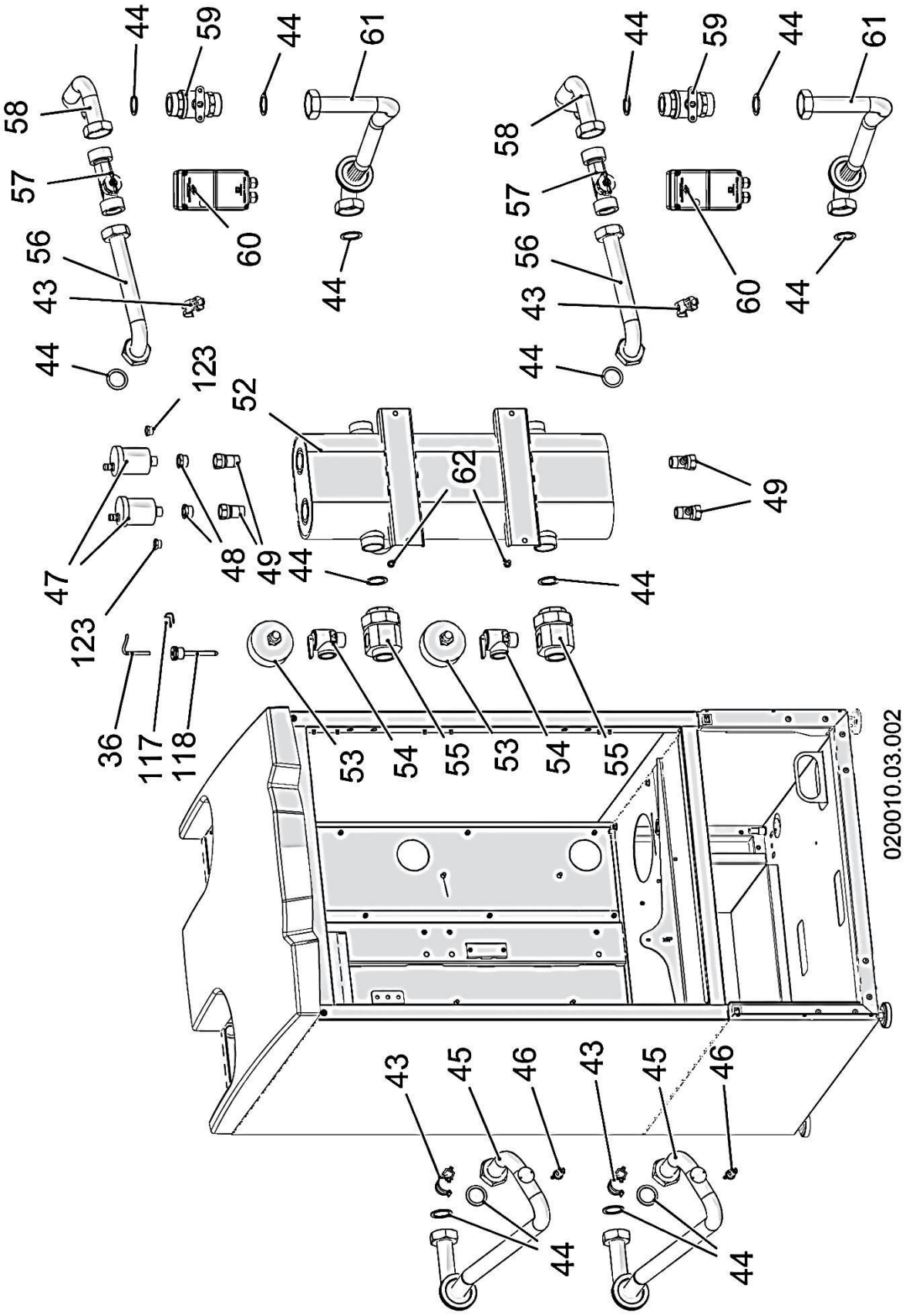


Figure 12-2: AM 399/500 General Assembly Parts drawing (2 of 2)

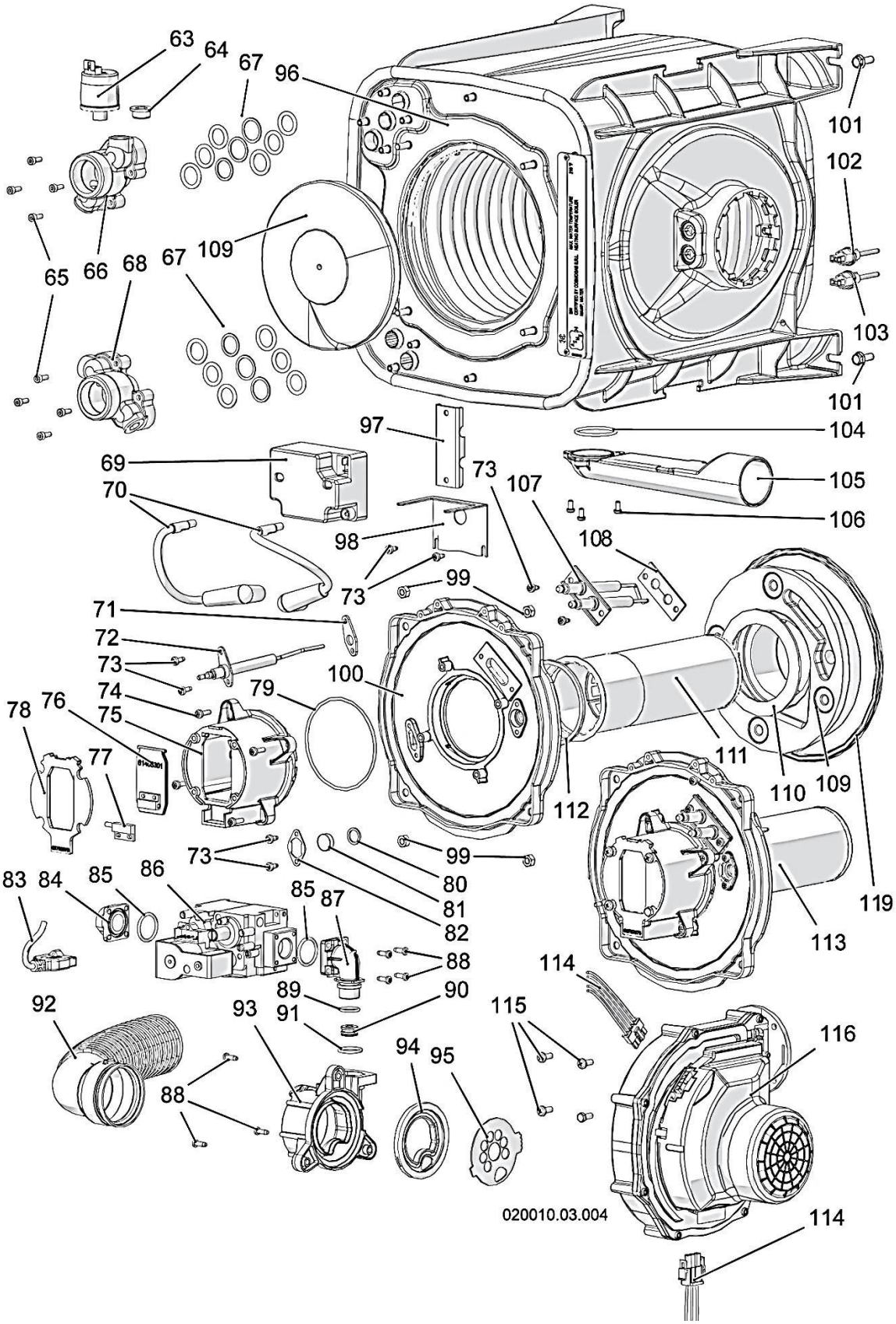


Figure 12-3: AM 399/500 Burner/Fan Assembly Parts Drawing

12.2 AM 399/500 Spare Parts List

AM 399/500 Spare Parts List		
Item#	**Part#**	**Description**
1	60801066	6X12 SCREW WITH WASHER
2a	62617327	4" CONNECTION – AIR INTAKE ADAPTER w/ GASKET (See Section 6.5.4)
2b	62617353	4" CONNECTION – VENT OUTLET ADAPTER w/ GASKETS (See Section 6.5.4)
3	62610091	BLACK UPPER COVER
3	62610098	GREY UPPER COVER
4	60404391	BENT BOX COVER
5	62118027	885IF BOARD INTERFACE
6	61103015	PVC CLAMPER INTERNAL DIAM. 22
7	60338034	GAS COLLECTOR 1P 1/4 NPT H=593
8	62626003	STAINLESS STEEL TUBE D.18 3/4P F-F INT.90
9	60701006	GASKET 3/4P 24X15X2 KLINSIL
10	62801023	CONDENSE ACIDITY NEUTRALIZER UNTIL 280 KW BOX
11	60322021	CORRUGATED TUBE DIAM 28 L 1250
12	60322020	CORRUGATED TUBE DIAM 28 L 800
13	60805006	ADJUSTABLE FOOT
14	60703034	GASKET EPDM D.125
15	61405316	D.125 H.809 COLLECTOR-2 EXCHANGERS
16	60702097	GASKET D.119 H.16 I.94
17	60702096	GASKET D.66 H.16 I.45
18	60502085	SINGLE GREY BOARD CLAMP
18	60502086	ON FLOOR YELLOW-GREEN BOARD CLAMP
18	60502101	SINGLE BLUE BOARD CLAMP
19	60506031	BLACK 2 POLES SWITCH
20	60507059	CONNECTION BOARD 160X100
21	62113046	PRESSURE SWITCH ON 3.2 IN W.C.
22	62801021	SYNTHETIC PLATE FILTER
23a	61405326	CAP WITH LATERAL DISCHARGE
24a	62111040	TILTING LEVEL SENSOR
23b	62651066	CAP WITH BOTTOM DISCHARGE
24b	62111051	TILTING LEVEL SENSOR
25	62110088	CONTROL BOARD 885MN10 110 V
26	60320001	SILICONE PIPE D.4X8
27	61405339	RIGHT REDUCED TAP 1/4'-3/8'
28	60702059	EPDM CLAMPER
29	62610094	COMPLETE BLACK FRONT COVER H80
29	62610097	COMPLETE GREY FRONT COVER H80
30	61405320	NO LOGO FRONT COVER
31	62610100	ABS 287X600 BASE BLACK
31	62610099	ABS 287X600 BASE GREY
32	61405264	DISPLAY GLASS
33	62110089	DISPLAY TYPE 885LB01
34	61405254	6 BUTTONS SWITCH
35	62110067	OUTDOOR SENSOR
36	62110071	SENSOR 10K D6X45 L=2500 T
37	62630185	LP TO NAT CONVERSION KIT (399 Models Only)
37	62630192	LP TO NAT CONVERSION KIT (500 Models Only)
38	62630212	NAT TO LP CONVERSION KIT

NOTE: Items 23a & 24a are used in AM 399/500 units ***before*** serial number 16060000.

NOTE: Items 23b & 24b are used in AM 399/500 units ***after*** serial number 16060000.

AM 399/500 Spare Parts List		
Item#	**Part#**	**Description**
39	OMM-0100_0C	AM SERIES USER MANUAL REV-C
40	N/A	N/A
41	61405347	WATER PROTECTION COVER FAN GROUP
42	62801022	NEUTRALISING LIMESTONE 10 KG
43	62111026	CLIP SENSOR NTC 10 KOHM D. 28
44	60701007	1"1/4 GASKET
45	62621151	COPPER TUBE D28 F/F 1'1/4 H=550
46	62101079	AUTOMATIC SAFETY THERMOSTAT 95°C
47	61206002	AIR VENT VALVE
48	60101072	BRASS REDUCTION 3/8 INCH
49	61204005	SCREWDRIVER 1/2" CHARGE FAUCET
52	60338033	STAINLESS STEEL 2 IN COLLECTOR 2" NPT
52	60338036	CARBON STEEL 2 IN COLLECTOR 2" NPT (Boilers Only)
53	62115004	THERMOMANOM. D.80 0-75 PSI 60-320°F (Boilers Only)
53	62115005	THERMOMANOM. D.80 0-200 PSI 60-320°F (Water Heaters Only)
54	61205023	SAFETY VALVE 3/4P M ASME NPT 50 PSI (Boilers Only)
54	61205024	SAFETY VALVE 3/4P M ASME NPT 125 PSI (Water Heaters Only)
55	60113009	BRASS CONNECTION 1P1/4 - 1P1/4
56	62621154	COPPER TUBE D28 F/F 1'1/4 1'1/4
57	61212014	VORTEX FLOW SENSOR
58	62621153	COPPER TUBE D28 F/F 1'1/4 1'1/4 RIT 2 (Models **WITH** Motorized Valve)
58	62621186	COPPER TUBE D28 F/F 1'1/4 1'1/4 (Models **WITHOUT** Motorized Valve)
59	61202043	SPHERE 2 WAY VALVE (Models **WITH** Motorized Valve)
60	61203024	2 WAY VALVE MOTOR (Models **WITH** Motorized Valve)
61	62621152	COPPER TUBE D28 F/F 1'1/4 1'1/4 RIT (Models **WITH** Motorized Valve)
62	60801065	6X12MM TC CR SCREW
63	62113045	PRESSURE GAUGE BAR
64	60107005	PLUG BRASS 1/4P M WITH O-RING
65	60801151	SCREW 4X10 GALVANIZED
66	61408014	BRASS CONNECTION 1' 1/4' IN EXIT
67	62616111	KIT FOR 6 OR AND 3 WASHERS
68	61408013	BRASS CONNECTION 1' 1/4' IN ENTRANCE
69	60510022	SPARK GENERATOR NO CABLE UL
70	60504206	CABLE UL IGNITOR CONN 90° L155
71	60701023	GASKET KERASIL 325R SQ 38X17X2
72	60505029	DETECTION ELECTRODE
73	60801081	SELFTAPPING SCREW 4X8 TC S-TT UNI-8112
74	60801108	SELFTAPPING SCREW 4X14 TCC-NP UNI-8112
75	61404123	AXIAL FAN COLLECTOR H.69
76	62651043	MAGNET CLAP GROUP
77	62111044	REED MAGNETIC POSITION SENSOR
78	60702078	GASKET SHAPED FOR FAN
79	60702077	OR RING 3325 SIL 2,62 X 82,22
80	60701013	GASKET FRIZITE D15,5 F11,5 SP1,5
81	60815013	PIREX GLASS D15,5 SP5
82	60404253	FLANGE L21,2 H34 SP1
83	60504266	MASTER GAS CABLE UL 885
83	60504267	SLAVE GAS CABLE UL 885
84	60101224	FLANGE GAS 32X32 3/4P

AM 399/500 Spare Parts List		
Item#	**Part#**	**Description**
85	60702029	O-RING 130 2,62 X 22,22
86	61201040	GAS VALVE SIGMA848 120V
87	61404121	90° INTERNAL ELBOW
88	60801136	SCREW SELFTAPPING 4X12 TC S-TT UNI-8112
89	60702052	O-RING 2050 EPDM 1,78 X 12,42
90	60114093	GAS DIAPHRAGM D.15,5 H8 HOLE D.7
91	60702065	O-RING 2,62 X 17,86
92	62651054	HIGH POWER SILENCER GROUP
93	61404120	COSMOMIX GAS MIXER
94	60702064	SHAPED GASKET DIAM. 71,2 H. 9,2
95	60406142	AIR MIXER DIAPHRAGM 7 D.10-1 D.17
96	62649090	CONDENSING HEAT EXCHANGER 58KW 12T ASME H (399 Models Only)
96	62649088	CONDENSING HEAT EXCHANGER 58KW 12T ASME HLW (399 W.H. Only)
96	62649086	CONDENSING HEAT EXCHANGER 70KW 15T ASME H (500 Models Only)
96	62649089	CONDENSING HEAT EXCHANGER 70KW 15T ASME HLW (500 W.H. Only)
97	60434036	EXCHANGERS BRACKET
98	60406137	SHAPED BRACKET 67X54X36
99	60802005	NUT ZINC COATED 6MA
100	61404122	FAN COLLECTOR BASE
101	60801093	SCREW 6X16 8.8 WITH WASHER UNI 6921
102	62111041	BAYONETTE SENSOR NTC 10K 2P MOLEX
103	62111042	BAYONETTE FUSE 203°F 2P MOLEX (NON-SST VENTING) SEE SECTION 6.5.1
	62111046	BAYONETTE FUSE 215°F 2P MOLEX (SST VENTING) SEE SECTION 6.5.1
104	60702083	OR RING 3137 EPDM 2,62 X 34,60
105	61405300	CONDENSATION DISCHARGE PIPE D.46.7
106	60801138	SCREW 4X8 ZINC TC-CR DIN4042
107	60505028	IGNITION ELECTRODE
108	60701022	GASKET KERASIL 325R SQ 56X22X2
109	62632006	KIT THERMAL INSULATIONS
110	60701021	GASKET S.WOLL PLUS D.100 SP.2
111	62629045	FIBER BURNER D.70 H200
112	60701019	KERASIL GASKET 325R SQ Ø 80.5 MM
113	62651052	AXIAL BURNER GROUP 58-70KW
114	60504265	FAN CABLE UL 885
115	60801021	BOLT 5X12 CROSS HEAD
116	61901036	BOILER FAN 135 KW 115V
117	60807002	SPRING FOR 3/4" RING NUT
118	60108006	SENSOR TRAP
119	60703047	SIL. GASKET D.200 F.188 H.7,2
120	60503064	RELAY 115V 16A EXCHANGE
121	60503026	FUSE 3A DELAYED GLASS
122	60503065	FUSE 10A DELAYED GLASS
123	60101119	3/8G MALE TO 1/8NPT FEMALE BUSHING

12.3 AM 750/1000 Spare Parts Drawings

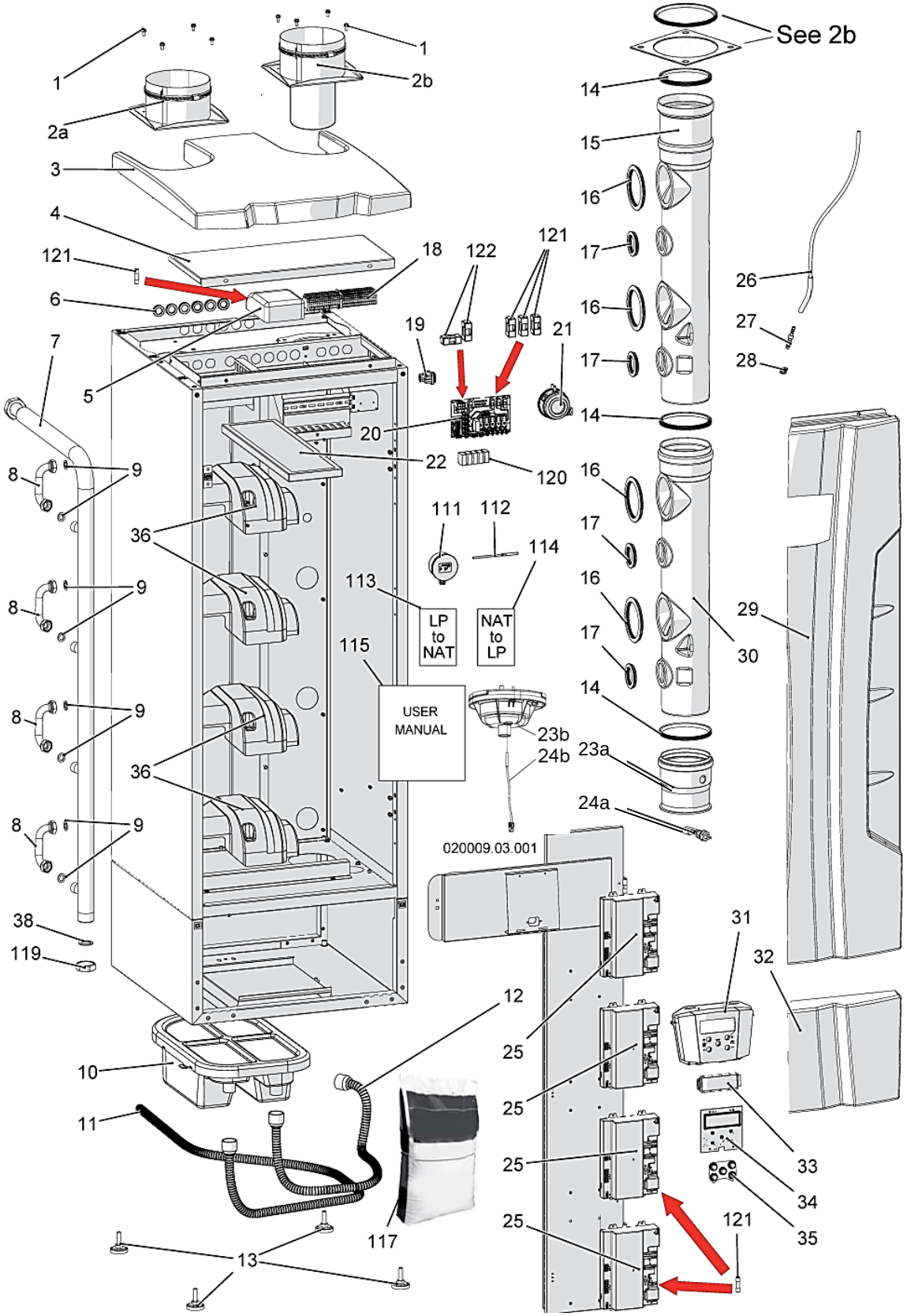


Figure 12-4: AM 750/1000 General Assembly Parts Drawing (1 of 2)

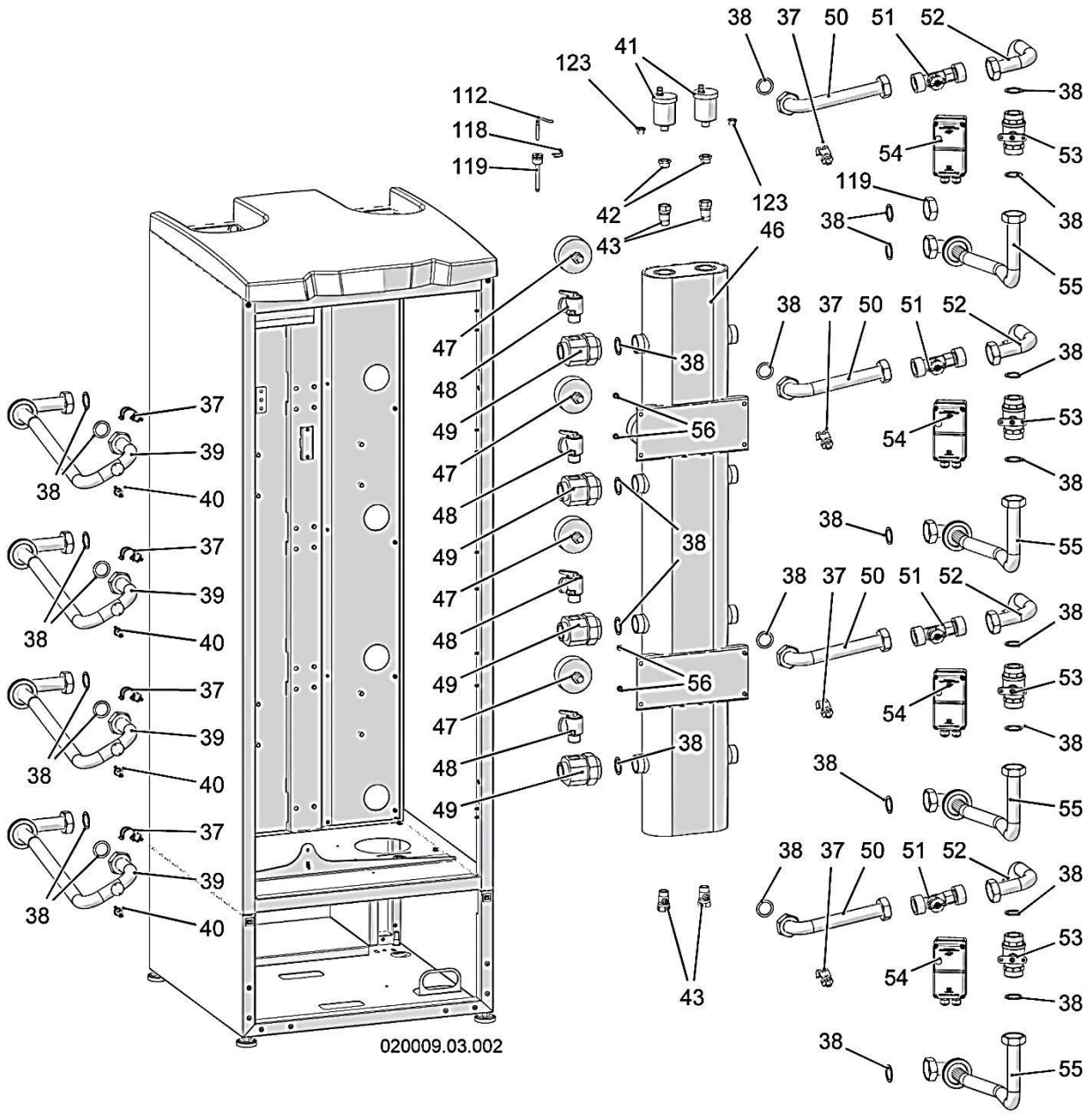


Figure 12-5: AM 750/1000 General Assembly Parts Drawing (2 of 2)

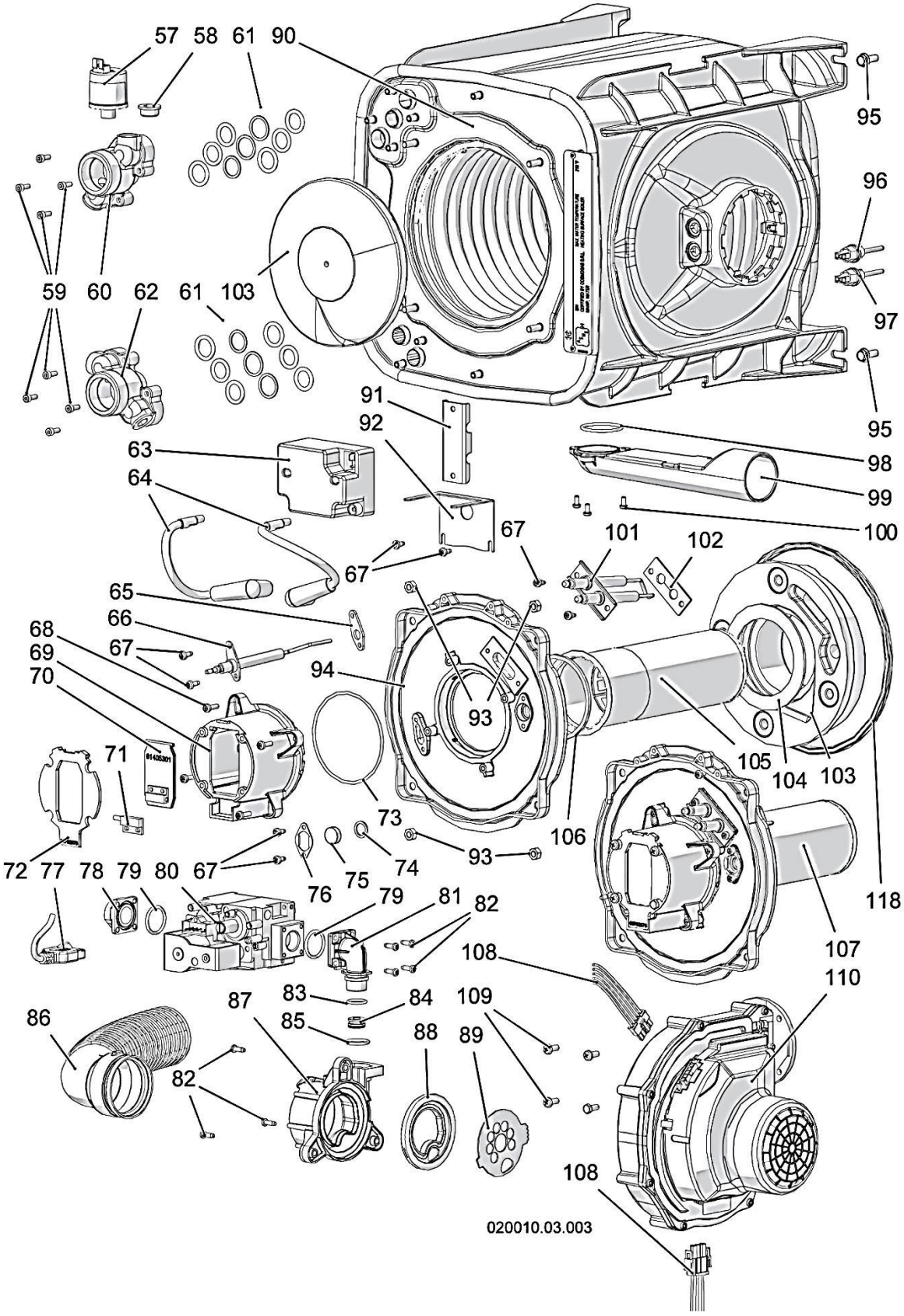


Figure 12-6: AM 750/1000 Burner/Fan Assembly Parts Drawing

12.4 AM 750/1000 Spare Parts List

AM 750/1000 Spare Parts List		
Item#	**Part#**	**Description**
1	60801066	6X12 SCREW WITH WASHER
2a	62617326	6" CONNECTION – AIR INTAKE ADAPTER w/ GASKET (See Section 6.5.4)
2b	62617351	6" CONNECTION – VENT OUTLET ADAPTER w/GASKETS (See Section 6.5.4)
3	62610091	BLACK UPPER COVER
3	62610098	GREY UPPER COVER
4	60404391	BENT BOX COVER
5	62118027	885IF BOARD INTERFACE
6	61103015	PVC CLAMPER INTERNAL DIAM. 22
7	60338032	COLLECTOR PIPE 1P 1/4 M NPT H=1245
8	62626003	STAINLESS STEEL TUBE D.18 3/4P F-F INT.90
9	60701006	GASKET 3/4P 24X15X2 KLINSIL
10	62801023	CONDENSE ACIDITY NEUTRALIZER UNTIL 280 KW BOX
11	60322021	CORRUGATED TUBE DIAM 28 L 1250
12	60322020	CORRUGATED TUBE DIAM 28 L 800
13	60805006	ADJUSTABLE FOOT
14	60703034	GASKET EPDM D.125
15	61405317	D.125 H.809 COLLECTOR-1 EXCHANGER (750 Models Only)
.	+	D.125 H.809 COLLECTOR-2 EXCHANGERS (1000 Models Only)
16	60702097	GASKET D.119 H.16 I.94
17	60702096	GASKET D.66 H.16 I.45
18	60502085	SINGLE GREY BOARD CLAMP
18	60502086	ON FLOOR YELLOW-GREEN BOARD CLAMP
18	60502101	SINGLE BLUE BOARD CLAMP
19	60506031	BLACK 2 POLES SWITCH
20	60507059	CONNECTION BOARD 160X100
21	62113046	PRESSURE SWITCH ON 3.2 IN W.C.
22	62801021	SYNTHETIC PLATE FILTER
23a	62651066	CAP WITH LATERAL DISCHARGE
24a	62111051	TILTING LEVEL SENSOR
23b	62651066	CAP WITH BOTTOM DISCHARGE
24b	62111051	TILTING LEVEL SENSOR
25	62110088	CONTROL BOARD 885MN10 110 V
26	60320001	SILICONE PIPE D.4X8
27	61405339	RIGHT REDUCED TAP 1/4'-3/8'
28	60702059	EPDM CLAMPER
29	62610093	COMPLETE PLASTIC FRONT COVER BLACK
29	62610096	COMPLETE PLASTIC FRONT COVER GREY
30	61405305	COLLECTOR D.125 H.718 - 2 EXCHANGERS
31	61405320	NO LOGO FRONT COVER
32	62610100	ABS 287X600 BASE BLACK
32	62610099	ABS 287X600 BASE GREY
33	61405264	DISPLAY GLASS
34	62110089	DISPLAY TYPE 885LB01
35	61405254	6 BUTTONS SWITCH
36	61405347	WATER PROTECTION COVER FAN GROUP
37	62111026	CLIP SENSOR NTC 10 KOHM D. 28
38	60701007	1"1/4 GASKET

NOTE: Items 23a & 24a are used in all AM 750/1000 units ***before*** serial number 16060000.

NOTE: Items 23b & 24b are used in AM 1000 units (only) ***after*** serial number 16060000.

AM 750/1000 Spare Parts List		
Item#	**Part#**	**Description**
39	62621151	COPPER TUBE D28 F/F 1'1/4 H=550
40	62101079	AUTOMATIC SAFETY THERMOSTAT 95°C
41	61206002	AIR VENT VALVE
42	60101072	BRASS REDUCTION 3/8 INCH
43	61204005	SCREWDRIVER 1/2" CHARGE FAUCET
46	60338028	STAINLESS STEEL 4 IN COLLECTOR 2"1/2 NPT
46	60338024	CARBON STEEL 4 IN COLLECTOR 2"1/2 NPT (Boilers Only)
47	62115004	THERMOMANOM. D.80 0-75 PSI 60-320°F (Boilers Only)
47	62115005	THERMOMANOM. D.80 0-200 PSI 60-320°F (Water Heaters Only)
48	61205023	SAFETY VALVE 3/4P M ASME NPT 50 PSI (Boilers Only)
48	61205024	SAFETY VALVE 3/4P M ASME NPT 125 PSI (Water Heaters Only)
49	60113009	BRASS CONNECTION 1P1/4 - 1P1/4
50	62621154	COPPER TUBE D28 F/F 1'1/4 1'1/4
51	61212014	VORTEX FLOW SENSOR
52	62621153	COPPER TUBE D28 F/F 1'1/4 1'1/4 RIT 2 (Models **WITH** Motorized Valve)
52	62621186	COPPER TUBE D28 F/F 1'1/4 1'1/4 NO (Models **WITHOUT** Motorized Valve)
53	61202043	SPHERE 2 WAY VALVE (Models **WITH** Motorized Valve)
54	61203024	2 WAY VALVE MOTOR (Models **WITH** Motorized Valve)
55	62621152	COPPER TUBE D28 F/F 1'1/4 1'1/4 RIT (Models **WITH** Motorized Valve)
56	60801065	6X12MM TC CR SCREW
57	62113045	PRESSURE GAUGE BAR
58	60107005	PLUG BRASS 1/4P M WITH O-RING
59	60801151	SCREW 4X10 GALVANIZED
60	61408014	BRASS CONNECTION 1' 1/4' IN EXIT
61	62616111	KIT FOR 6 OR AND 3 WASHERS
62	61408013	BRASS CONNECTION 1' 1/4' IN ENTRANCE
63	60510022	SPARK GENERATOR NO CABLE UL
64	60504206	CABLE UL IGNITOR CONN 90° L155
65	60701023	GASKET KERASIL 325R SQ 38X17X2
66	60505029	DETECTION ELECTRODE
67	60801081	SELFTAPPING SCREW 4X8 TC S-TT UNI-8112
68	60801108	SELFTAPPING SCREW 4X14 TCC-NP UNI-8112
69	61404123	AXIAL FAN COLLECTOR H.69
70	62651043	MAGNET CLAP GROUP
71	62111044	REED MAGNETIC POSITION SENSOR
72	60702078	GASKET SHAPED FOR FAN
73	60702077	OR RING 3325 SIL 2,62 X 82,22
74	60701013	GASKET FRIZITE D15,5 F11,5 SP1,5
75	60815013	PIREX GLASS D15,5 SP5
76	60404253	FLANGE L21,2 H34 SP1
77	60504266	MASTER GAS CABLE UL 885
77	60504267	SLAVE GAS CABLE UL 885
78	60101224	FLANGE GAS 32X32 3/4P
79	60702029	O-RING 130 2,62 X 22,22
80	61201040	GAS VALVE SIGMA848 120V
81	61404121	90° INTERNAL ELBOW
82	60801136	SCREW SELFTAPPING 4X12 TC S-TT UNI-8112
83	60702052	O-RING 2050 EPDM 1,78 X 12,42
84	60114093	GAS DIAPHRAGM D.15,5 H8 HOLE D.7

AM 750/1000 Spare Parts List		
Item#	**Part#**	**Description**
85	60702065	O-RING 2,62 X 17,86
86	62651054	HIGH POWER SILENCER GROUP
87	61404120	COSMOMIX GAS MIXER
88	60702064	SHAPED GASKET DIAM. 71,2 H. 9,2
89	60406142	AIR MIXER DIAPHRAGM 7 D.10-1 D.17
90	62649086	CONDENSING HEAT EXCHANGER 70KW 15T ASME H
90	62649089	CONDENSING HEAT EXCHANGER 70KW 15T ASME HLW (Water Heaters Only)
91	60434036	EXCHANGERS BRACKET
92	60406137	SHAPED BRACKET 67X54X36
93	60802005	NUT ZINC COATED 6MA
94	61404122	FAN COLLECTOR BASE
95	60801093	SCREW 6X16 8.8 WITH WASHER UNI 6921
96	62111041	BAYONETTE SENSOR NTC 10K 2P MOLEX
97	62111042	BAYONETTE FUSE 102°C 2P MOLEX
	62111046	High temperature bayonet fuse NOTE: FOR UNITS WITH HIGH TEMPERATURE VENT KIT 69254 ONLY!
98	60702083	OR RING 3137 EPDM 2,62 X 34,60
99	61405300	CONDENSATION DISCHARGE PIPE D.46.7
100	60801138	SCREW 4X8 ZINC TC-CR DIN4042
101	60505028	IGNITION ELECTRODE
102	60701022	GASKET KERASIL 325R SQ 56X22X2
103	62632006	KIT THERMAL INSULATIONS
104	60701021	GASKET S.WOLL PLUS D.100 SP.2
105	62629045	FIBER BURNER D.70 H200
106	60701019	KERASIL GASKET 325R SQ Ø 80.5 MM
107	62651052	AXIAL BURNER GROUP 58-70KW
108	60504265	FAN CABLE UL 885
109	60801021	BOLT 5X12 CROSS HEAD
110	61901036	BOILER FAN 135 KW 115V
111	62110067	OUTDOOR SENSOR
112	62110071	SENSOR 10K D6X45 L=2500 T
113	62630192	LP TO NAT CONVERSION KIT
114	62630184	NAT TO LP CONVERSION KIT
115	OMM-0100_0C	AM SERIES USER MANUAL REV-C
116	N/A	N/A
117	62801022	NEUTRALISING LIMESTONE 10 KG
118	60703047	SIL. GASKET D.200 F.188 H.7,2
119	60107020	1”1/4G F BRASS PLUG (750 Models Only)
120	60503064	RELAY 115V 16A EXCHANGE
121	60503026	FUSE 3A DELAYED GLASS
122	60503065	FUSE 10A DELAYED GLASS
123	60101119	3/8G MALE TO 1/8NPT FEMALE BUSHING

12.5 AMR Option Spare Parts Drawing

The AMR spare parts and part numbers are shown below. Refer to the previous sections for water heater part drawings and part lists.

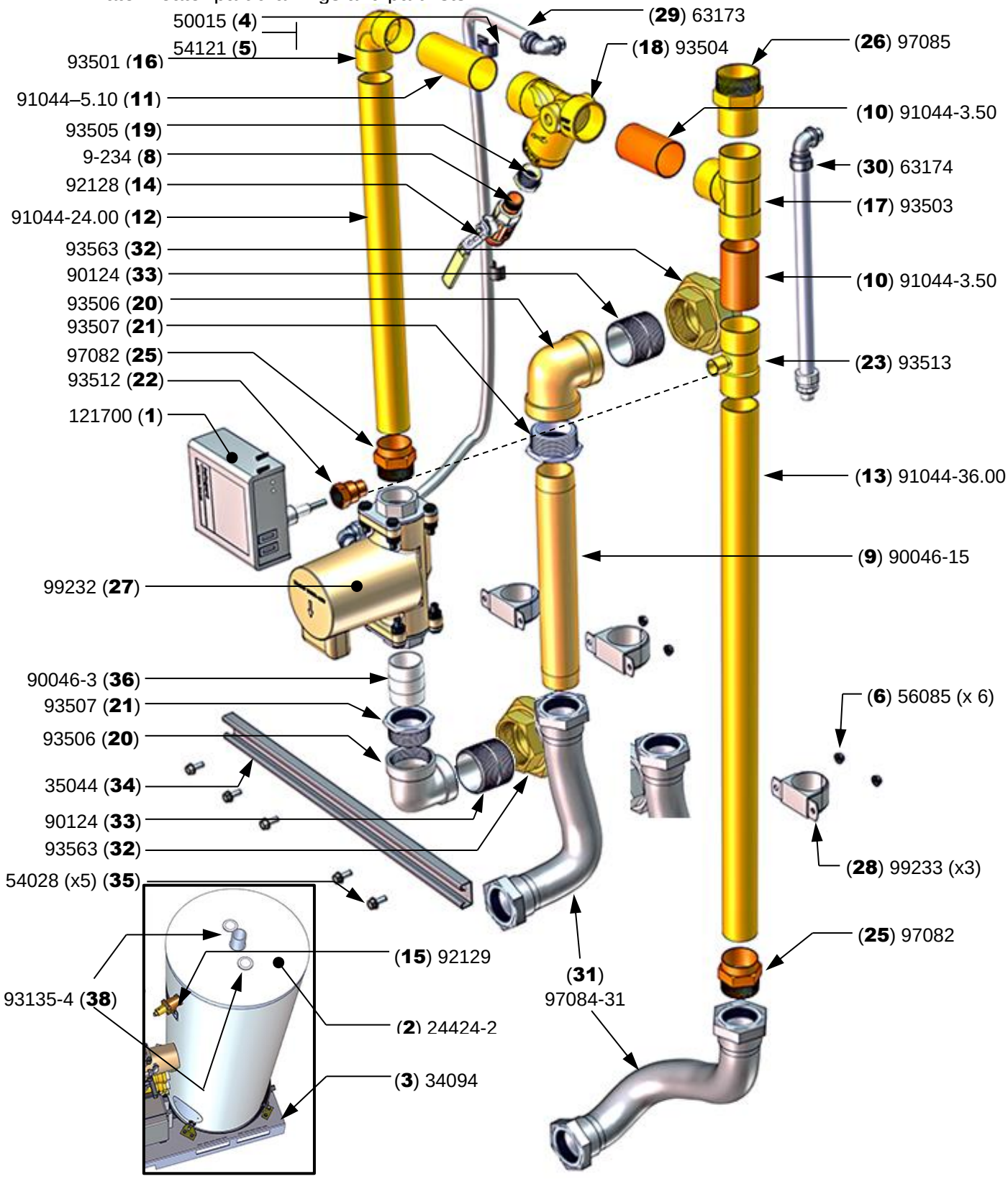


Figure 12-7: AMR Piping and Parts Identification (Partially Exploded)

12.6 AM Rapid Recovery (AMR) Option Spare Parts List

The AM Rapid Release units contain the following parts in addition to the parts for the particular model of AM water heater used. Refer to Figure 12-7:

AM Rapid Recovery (AMR) Option Spare Parts List			
ITEM#	QTY.	PART #	DESCRIPTION
1	1	121700	LOW WATER CUT-OFF
2	1	24424-2	BUFFER TANK, 80 GAL
3	1	34094	BASE
4	2	50015	STEEL CLAMP W/MOUNTING HOLE
5	2	54121	DRILLING SCREW, #10-24 x 1/2 LG
6	6	56085	SERRATED FLANGE LOCKNUT, 5/16-18
7	-	-	-
8	1	9-234	CLOSE NIPPLE, 3/4" NPT SCH. 40 RED BRASS
9	1	90046-15	NIPPLE, 2" NPT 304 SS SCH 40, 15" LG
10	2	91044-3.50	COPPER TUBE, 2" x 3.50" LG
11	1	91044-5.10	COPPER TUBE, 2" x 5.10" LG
12	1	91044-24.00	COPPER TUBE, 2" x 24.00" LG
13	1	91044-36.00	COPPER TUBE, 2" x 36.00" LG
14	1	92128	FULL PORT BALL VALVE, 3/4" NPT
15	1	92129	T&P RELIEF VALVE, 1" MNPT x 1" FNPT
16	1	93501	ELBOW 90 DEG., SOCKET TO SOCKET, 2" TUBE
17	1	93503	TEE, SOCKET TO SOCKET, 2" TUBE
18	1	93504	WYE STAINER, 2" TUBE
19	1	93505	HEX REDUCING BUSHING, 1" MNPT x 3/4" FNPT
20	2	93506	ELBOW 90 DEG., 2 1/2" FNPT
21	2	93507	HEX REDUCING BUSHING, 2 1/2" MNPT x 2" FNPT
22	1	93512	ADAPTOR, 3/4" TUBE x 3/4" FNPT
23	1	93513	REDUCING INLINE TEE, 2" TUBE x 3/4" TUBE
24	2	97082	ADAPTOR, SOCKET END, 2" TUBE x 2" MNPT
25	2	97082	ADAPTOR, SOCKET END, 2" TUBE x 2" MNPT
26	1	97085	ADAPTOR, 2" MALE TUBE END x 2" MNPT
27	1	99232	CIRCULATOR PUMP
28	3	99233	CLAMP, 2" PIPE
29	1	63173	POWER WIRE ASSEMBLY, CIRCULATOR PUMP
30	1	63174	WIRE ASSEMBLY, PUMP RELAY
31	2	97084-24	CORRUGATED HOSE, 2" FIP x 2" FIP x 24" LG
32	2	93545	UNION, BRASS, 2 1/2" FNPT x 2 1/2" FNPT
33	1	90124	CLOSE NIPPLE, 2 1/2" NPT
34	1	35044	STRUT CHANNEL
35	5	54028	SCREW, HEX HD SERRATED 5/16-18
36	1	90046-3	NIPPLE, 2" NPT 304 SS SCH 40, 3" LG
37	1	AM 750W or AM 1000W	ADVANCED MODULAR (AM) WATER HEATER
38	2	93135-4	ANODE ROD, BUFFER TANK

APPENDIX A: CONTROL PANEL OPERATION CHART

Key to Figure

Symbol	Description
RESET 0	Push RESET button
RESET 2	Push and hold for at least 2 seconds the reset button
RESET 5	Push and hold for at least 5 seconds the reset button
RESET 5	Push and hold together for a time in seconds explained by the number the RESET button and button
	Push button
	Push button

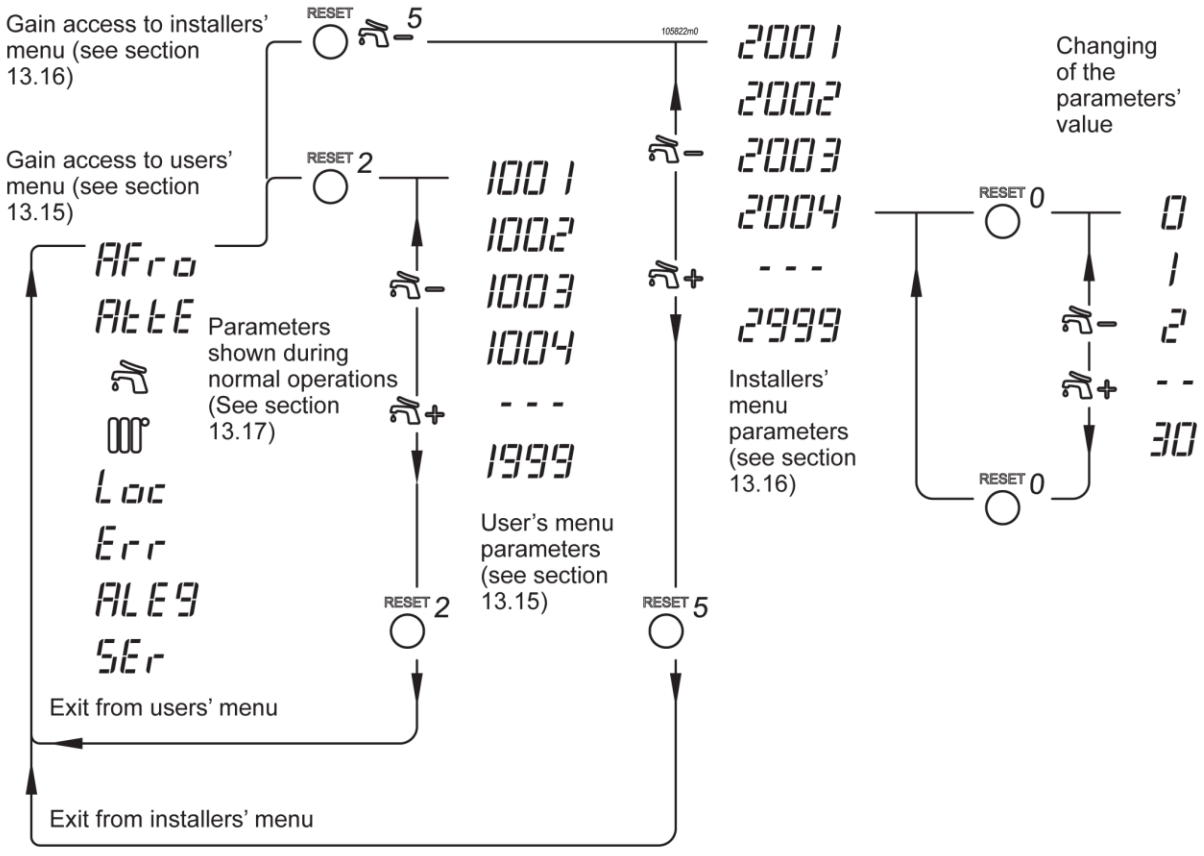


Figure A-1: Flow Chart of Control Panel Operation

Change Log:

Date	Description	Changed By
03/28/2016	**Rev D**: Added SST venting down rate menu/fuse change instructions, changed number/function of electrical terminals in drawings, changed venting adapter configuration/BOM/part drawing/instructions, added Class II compliance, changed or added menu items 2200-2204, 3085, 3086, & 3101, misc. changes and improvements, fixed all tables. Added buffer tank installation instructions (section s 3.11 – 3.16), corrected AMR electrical diag., added new AMR images, removed drain pan from images/parts list, replaced item 32 coupling with brass version, P/N 93563. Added new section 4.1 Water Inlet and Outlet Piping.	Curtis Harvey
5/10/2019	**Rev E**: **PIR 1290**: Removed De-Scaler option, replaced union 93563 with 93545. **DIR 364**: Modified model list on front cover **DIR 376**: Changed range of temperatures that can be set to 68°F (20°C) to 176°F (80°C) in section 9.7 and 9.14. **DIR 407**: Section 9.6 Installer Menu, changed parameter 2005 to "10 to 260" seconds (from 10 to 900).	
11/15/2019	**Rev F:** **DIR 19-70:** Updated Parts Number	Linley Thobourne

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