

CROWN Boiler Co.

D E S I G N E D T O L E A D

MWC Series

Mid Efficiency Gas-Fired Hot Water
Direct Vent Condensing Boilers

INSTALLATION INSTRUCTIONS

These instructions must be affixed on or adjacent to the boiler.



Models:

- MWC116ENT
- MWC116ELT
- MWC116ENL
- MWC116ELL

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury, or loss of life. For assistance or additional information, consult a qualified installer, service agency or the gas supplier. This boiler requires a special venting system. Read these instructions carefully before installing.

CROWN Boiler Co.

Manufacturer of Hydronic Heating Products

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I Product Description

The MWC Series are gas fired condensing boilers designed for use in forced hot water heating systems requiring supply water temperatures of 176F or less and return water temperatures greater than 86F. The primary heat exchanger is a copper water tube design. Additional heat is extracted from the flue gas in a stainless steel secondary heat exchanger located down stream of the inducer. These boilers include a built in circulator, expansion tank, and automatic air vent. In addition, “combi” models include a plate exchanger for domestic hot water (DHW) generation. All MWC Series boilers are designed for installation on a wall and may be vented vertically or horizontally with combustion air supplied from outdoors.

Key	Component
1	Primary Heat Exchanger
2	Secondary Heat Exchanger
3	Inducer
4	Burner
5	Electrodes and Flame Rod
6	Circulator
7	Automatic Air Vent
8	Condensate Trap
9	Control Box
10	Differential Boiler Water Pressure Switch
11	Ignition module/Gas Valve
12	Air Pressure Switch
13	Flue Gas Temperature Limit
14	Supply Temperature Limit
*	Expansion Tank
*	Plate Heat Exchanger (Combi Only)
*	3-Way Diverting Valve (Combi Only)
*	Supply Temperature Sensor
*	DHW Temperature Sensor (Combi Only)
*	DHW Flow Switch (Combi Only)

* Not visible

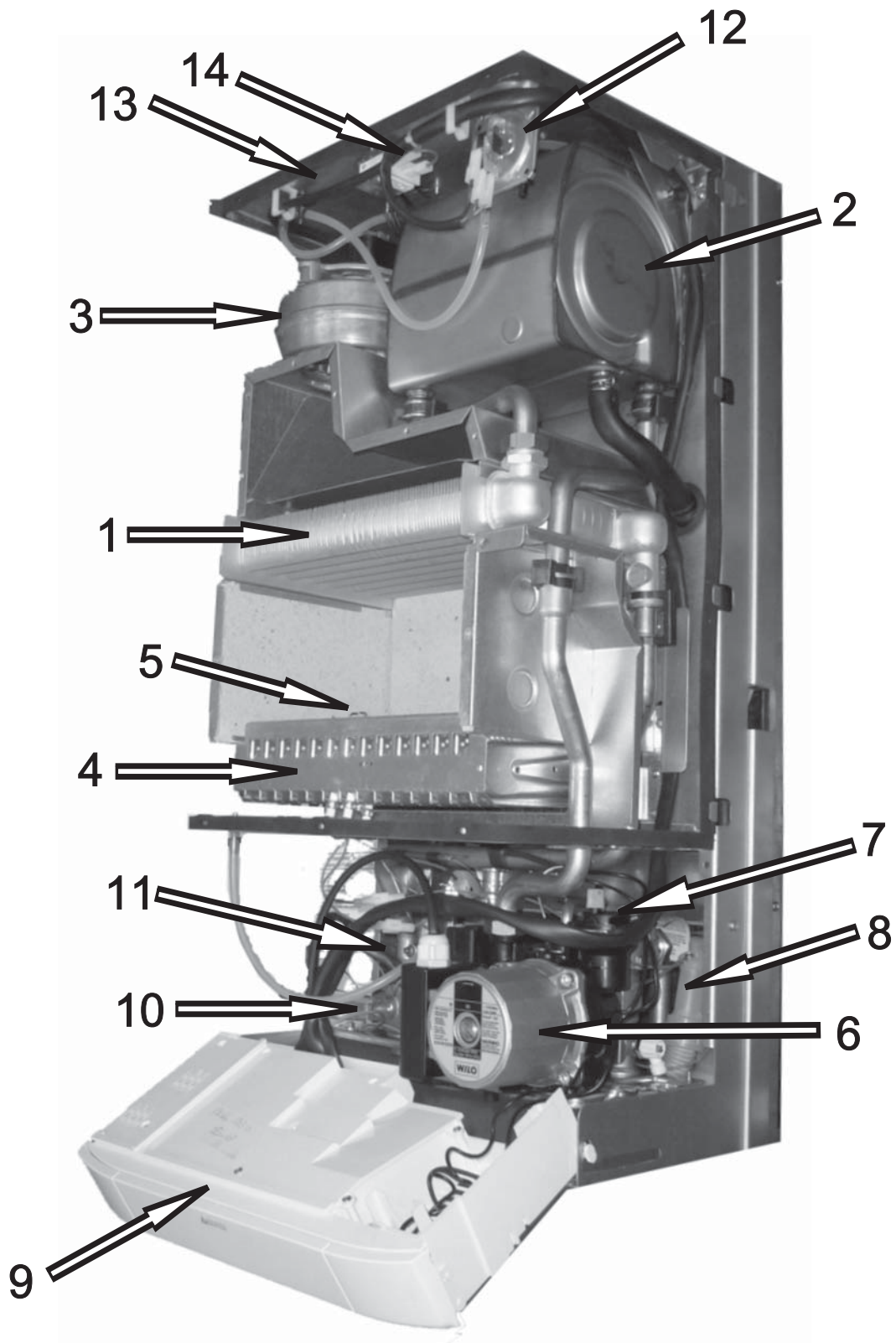


Figure 1.1: MWC Boiler Principle Components

II Specifications

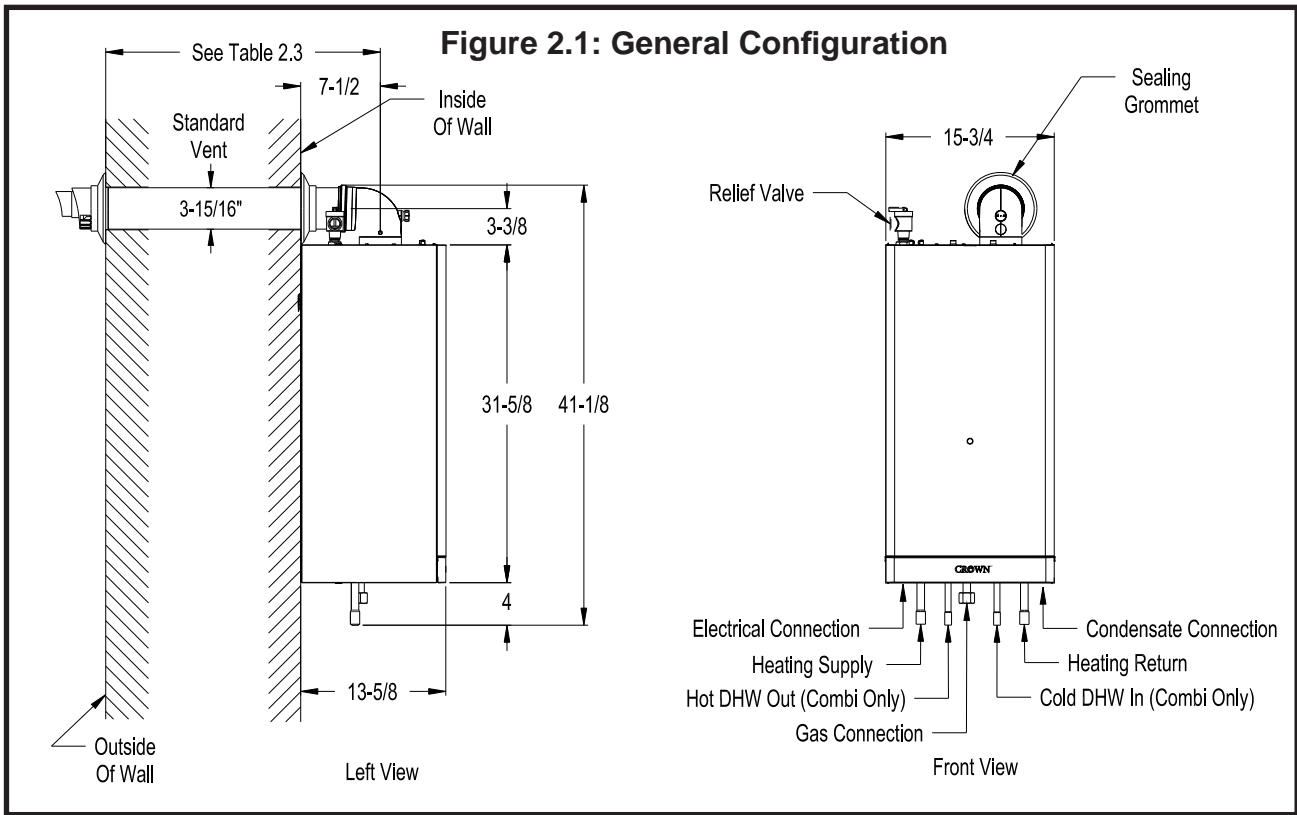


Table 2.2: Ratings

MODEL *	APPLICATION	MAX. INPUT (BTU/hr)	MINIMUM INPUT (BTU/hr)		D.O.E. HEATING CAPY. (BTU/hr)	IBR NET RATING (BTU/hr)	AFUE (%)	DHW Output (GPM)	
			HEATING	DHW				77F Rise	90F Rise
MWC116E*T	Combi	116,000	75,000	49,500	102,000	89,000	85.0	2.67	2.25
MWC116E*L	Heat Only	116,000	75,000	N/A	102,000	89,000	85.0	N/A	N/A

* Insert suffix "N" for natural gas and "L" for propane. Ratings are the same for both fuels (Example: MWC116ENT denotes Natural Gas, Combi).

Table 2.3: Maximum Vent Lengths

Using 60/100mm Concentric Vent System Supplied with the Boiler	25 in.
Using Optional 60/100mm Concentric Vent Components	8ft -10in
Using Optional 80/125mm Concentric Vent Components	27 ft

See Vent Section for additional venting options and requirements

Table 2.4: Other Specifications

Maximum Supply Temperature.....	176 F
Minimum Continuous Return Temperature.....	86F
Maximum Allowable Working Pressure	30 psi
Minimum System Pressure (at boiler)	4.4 psi
Maximum Achievable Flow Through Boiler	5.5 GPM
Minimum Temperature Rise Across Boiler at High Fire.....	37 F
Maximum Gas Inlet pressure	10.5" Nat / 13.0" LP
Minimum Gas Inlet Pressure	5.3" Nat / 10.5" LP
Electrical Ratings.....	120VAC/60Hz/1.8A
Thermostat Voltage	120VAC

III Before Installing

- 1) Safe, reliable operation of this boiler depends upon installation by a professional heating contractor in strict accordance with this manual and the authority having jurisdiction.
 - In the absence of an authority having jurisdiction, installation must be in accordance with this manual and the National Fuel Gas Code, ANSI Z223.1./NFPA 54 and/or CAN/CSA B 149.1 Natural Gas and Propane Installation Code.
 - Where required by the authority having jurisdiction, this installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers* (ANSI/ASME CSD-1).
- 2) Read Section VII to verify that the maximum combustion air and exhaust pipe lengths will not be exceeded in the planned installation. Also verify that the vent terminal can be located in accordance with Section VII.
- 3) Make sure that the boiler is correctly sized:
 - a) For heating systems employing convection radiation (baseboard or radiators), use an industry accepted sizing method such as the I=B=R Heat Loss Calculation Guide (Pub. #H21 or #H22) published by the Hydronics Institute in Berkeley Heights, NJ.
 - b) In sizing the boiler take into consideration the following boiler water flow/temperature limitations:
 - Maximum regulated supply temperature is 176F
 - Maximum flow through the boiler is approximately 5.5GPM.
 - Minimum boiler temperature rise is approximately 37F at high fire.
 - c) For new radiant heating systems, refer to the radiant tubing manufacturer's boiler sizing guidelines.
 - d) For combi boilers make sure that the domestic hot water flow rate shown in Table 2.2, will be adequate to meet the peak demand for domestic hot water.
- 5) Make sure that the boiler received is configured for the correct gas (natural or LP).
- 6) Make sure that the boiler is configured for use at the altitude at which it is to be installed.

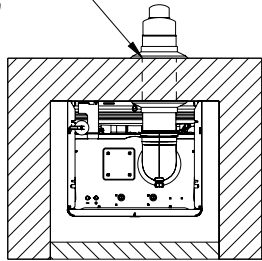
NOTICE

This product must be installed by a licensed plumber or gas fitter when installed within the Commonwealth of Massachusetts. See Appendix A for additional important information about installing this product within the Commonwealth of Massachusetts.

IV Locating the Boiler

- 1) Observe the minimum clearances shown in Figure 4.1. These clearances apply to both combustible and non-combustible materials.
- 2) Note the recommended service clearances in Figure 4.1. These service clearances are recommended, but may be reduced to the combustible clearances provided:
 - Access to the front of the boiler is provided through a door
 - Access is provided to the condensate trap located underneath the boiler.
- 3) The relief valve must be installed in the factory specified location.
- 4) The boiler should be located so as to minimize the length of the vent system.
- 5) The boiler must not be installed on carpeting.
- 6) The combustion air piping must terminate where outdoor air is available for combustion and away from areas that will contaminate combustion air. Avoid areas near chemical products containing chlorine, chloride based salts, chloro/fluorocarbons, paint removers, cleaning solvents and detergents.

Clearance From
Coaxial Vent Pipe To
Combustibles = 0"



Removable Front
Access Panel

Top View

CLEARANCES TO COMBUSTIBLE & NON-COMBUSTIBLE CONSTRUCTION:

THIS BOILER IS APPROVED FOR CLOSET INSTALLATION WITH THE FOLLOWING MINIMUM CLEARANCES:

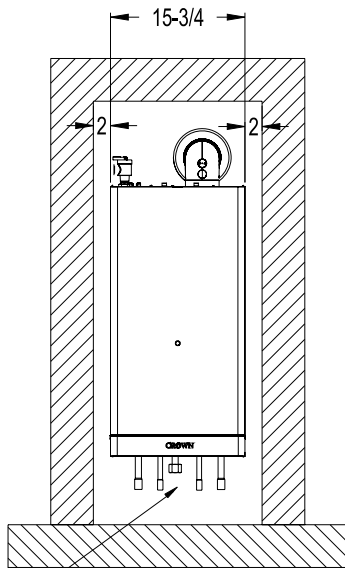
TOP = 10"
FRONT = 3"
SIDES = 2",
BOTTOM = 8"

RECOMMENDED SERVICE CLEARANCES:

TOP = 10"
FRONT = 24"
SIDES = 6"
BOTTOM = 24"

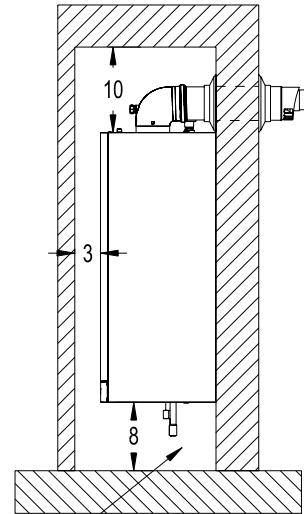
THESE SERVICE CLEARANCES ARE RECOMMENDED, BUT MAY BE REDUCED TO THE MINIMUM CLEARANCES PROVIDED:

1. ACCESS TO THE FRONT OF THE BOILER IS PROVIDED THROUGH A DOOR.
2. ACCESS IS PROVIDED TO THE CONDENSATE TRAP AND UNIONS LOCATED UNDERNEATH THE BOILER.



Clearance From
Hot Water Pipes To
Combustibles = 1"

Front View



Provide Access To This Area
For Inspection Of Condensate
Trap & Unions

Right View

Figure 4.1: Clearances To Combustible Or Non-combustible Material

V Mounting The Boiler

CAUTION

This boiler weighs approximately 110 pounds:

- **Two people are required to safely lift this boiler onto the wall mounting hook.**
- **Make sure that wall mounting hook is anchored to a structure capable of supporting the weight of the boiler and attached piping when filled with water.**

Jurisdictions in areas subject to earthquakes may have special requirements for supporting this boiler. These local requirements take precedence over the requirements shown below.

Mounting Steps:

- 1) If the boiler is installed on a framed wall, minimum acceptable framing are 2 x 4 studs. The boiler mounting holes are on 11-5/8" centers. Usually the wall studs will be on 16" centers. In such cases, both boiler bracket mounting holes must be anchored to 3/4" Plywood, horizontal 2 x 4s anchored to the studs, or some other framing system capable of supporting the boiler. Attachment of either bracket hole to wallboard alone is unacceptable.
- 2) When mounting this boiler directly onto studs covered with 1/2" wall board, 5/16 x 2" lag screws are recommended. When the boiler is attached to other types of construction, such as masonry, use fasteners capable of supporting the weight of the boiler and attached piping in accordance with good construction practice and applicable local codes.
- 3) Make sure that the surface to which the boiler is mounted is plumb.
- 4) Before mounting the boiler, make sure that wall selected does not have any framing or other construction that will interfere with the vent pipe penetration.
- 5) Tape the paper template to the wall in the chosen location. Be sure to level the template.
- 6) Pre-drill two holes in the center of the "oval" slots on the mounting bracket sized for the hardware being used.
- 7) Mount the bracket to the wall. Be sure to level the bracket by adjusting the screw in the vertical slot.
- 8) Pre-drill the remaining hole in the mounting bracket and secure the final screw.
- 9) Cut the opening in the wall for the vent system. The recommended hole diameter for the standard 60/100mm venting is 4-3/8".
- 10) Hang the boiler on the wall bracket as shown in Figure 5.2.
- 11) Verify that the front and sides of the boiler are plumb.
- 12) See Section VII ("Venting) for instructions on attaching the vent system to the boiler.
- 13) A hot water boiler installed above radiation level or as the Authority having jurisdiction, must be provided with a low water cutoff device either as a part of the boiler or at the time of installation.

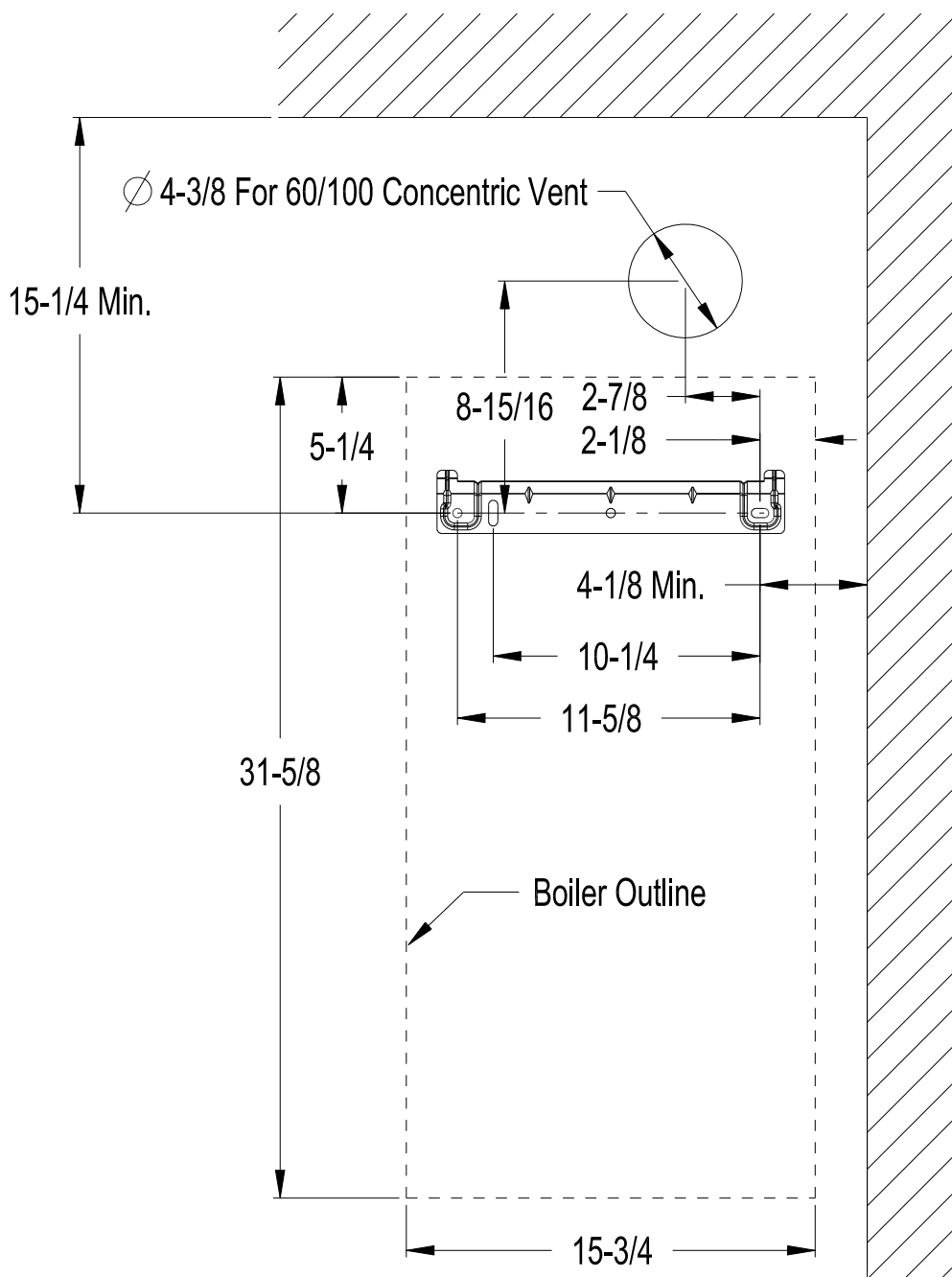
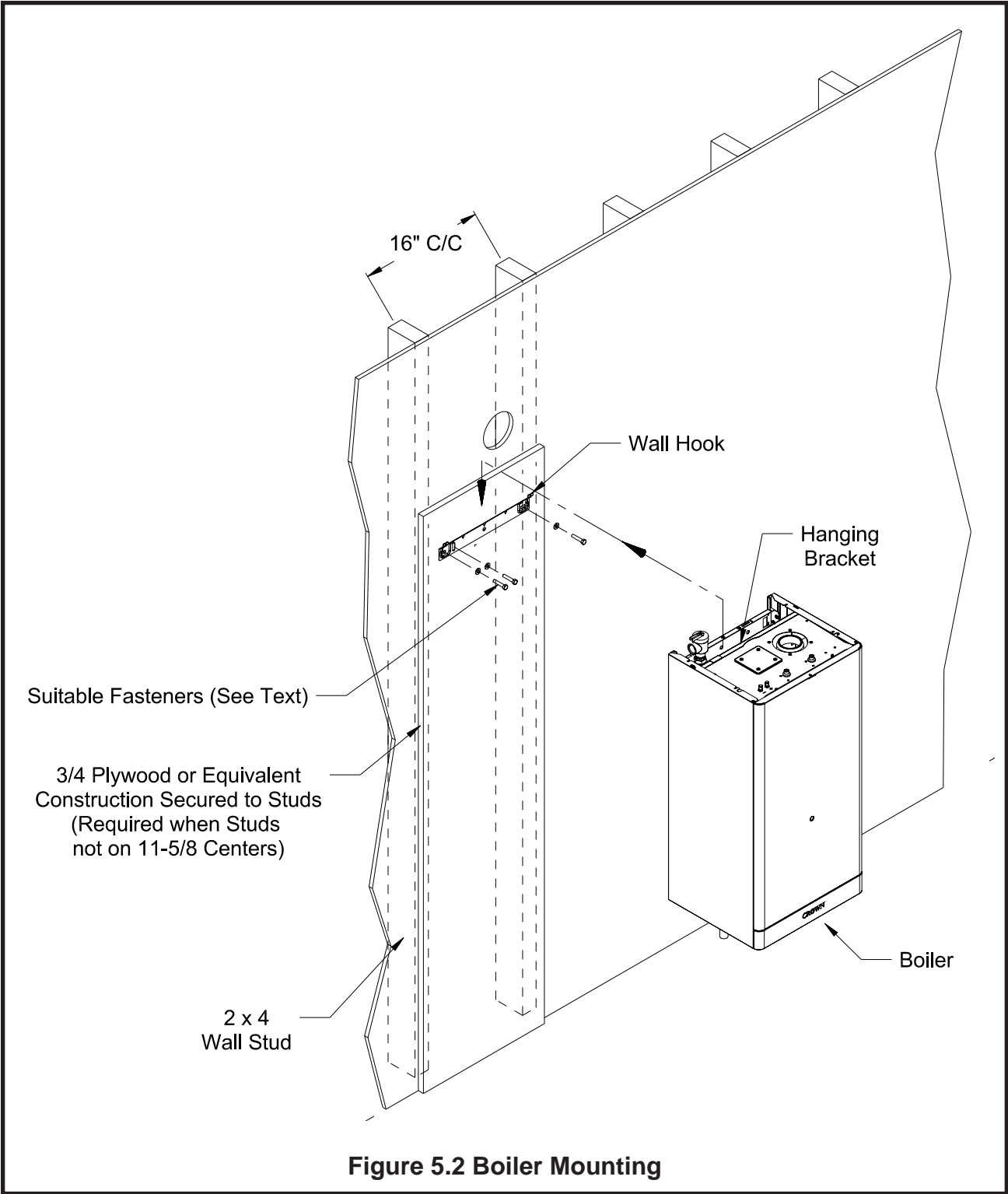


Figure 5.1 Wall Mounting Hole Locations



VI Air for Ventilation

WARNING

Outdoor combustion air must be piped to the air intake. Never pipe combustion air from areas containing contaminants such as areas where swimming pool chemicals are stored. Contaminated combustion air will damage the boiler and may cause property damage, personal injury or loss of life.

Air for combustion and ventilation, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 CAN/CSA B 149.1 Natural Gas and Propane Installation Code, or applicable provisions of the local building codes.

Air for combustion must always be obtained directly from outdoors, however sufficient air for ventilation must still be provided in the boiler room. Air for ventilation is required to keep various boiler components from overheating and is always obtained from outdoors. To ensure an adequate ventilation air supply, perform the following steps:

Step 1: Determine whether the boiler is to be installed in a confined space - A confined space is defined by the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CAN/CSA B 149.1 Natural Gas and Propane Installation Code, as having a volume less than 50 cubic feet per 1000 BTU/hr input of all appliances installed in that space. To determine whether the boiler room is a confined space:

- A. Total the input of all appliances in the boiler room in thousands of BTU/hr. Round the result to the next highest 1000 BTU/hr.
- B. Find the volume of the room in cubic feet. The volume of the room in cubic feet is:

Length (ft) x width (ft) x ceiling height (ft)

In calculating the volume of the boiler room, consider the volume of adjoining spaces only if no doors are installed between them. If doors are installed between the boiler room and an adjoining space, do not consider the volume of the adjoining space, even if the door is normally left open.

- C. Divide the volume of the boiler room by the input in thousands of BTU/hr. If the result is less than 50, the boiler room is a confined space.

Example:

A MWC116 and a water heater are to be installed in a room measuring 6ft – 3 in x 7ft with an 8 ft ceiling. The water heater has an input of 30000 BTU/hr:

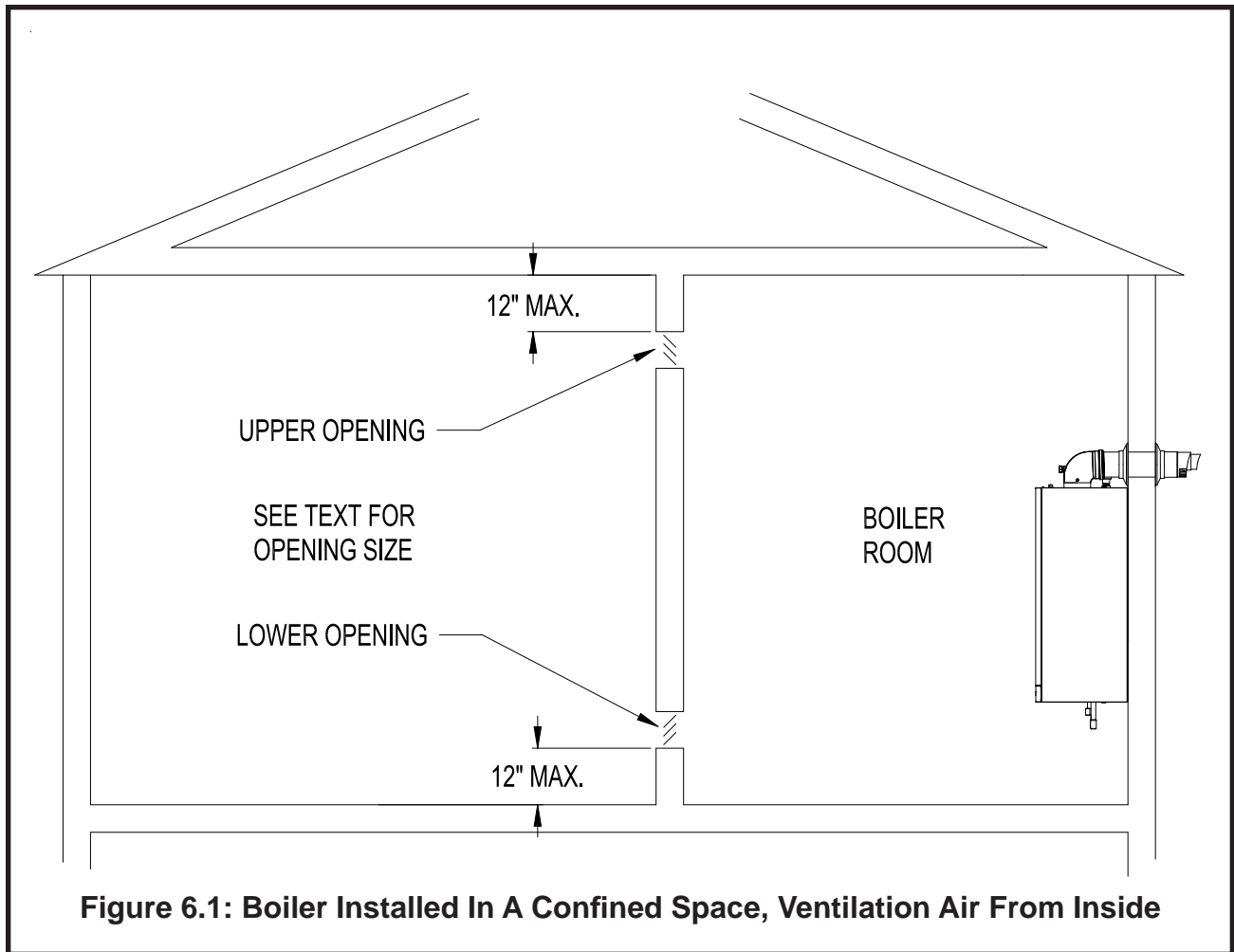
Total input in thousands of BTU/hr = (116000 BTU/hr + 30000 BTU/hr) / 1000 = 146 MBTU/hr

Volume of room = 6.25 ft x 7 ft x 8 ft = 350 ft³

350/146 = 2.40. Since 2.33 is less than 50, the boiler room is a confined space.

Step 2a: If the boiler is to be placed in a confined space, provide two openings into the boiler room, one near the floor and one near the ceiling. The top edge of the upper opening must be within 12” of the ceiling and the bottom edge of the lower opening must be within 12” of the floor (Fig 6.1). The minimum opening dimension is 3 inches.

- If the MWC boiler is the only gas-burning appliance in the boiler room, these openings must each have a minimum free area of 54 square inches.
- If other gas-burning appliances are in the boiler room, size the openings in accordance with the appliance manufacturer’s instructions or the National Fuel Gas Code ANSI Z223.1 /NFPA 54 and/or CAN/CSA B 149.1. Minimum opening free area is 54 square inches even if opening requirements for other appliances are less.



Step 2a (contd.)

- If the total volume of both the boiler room and the room to which the openings connect is less than 50 cubic feet per 1000 BTU/hr of total appliance input, install a pair of identical openings into a third room. Connect additional rooms with openings until the total volume of all rooms is at least 50 cubic feet per 1000 BTU/hr of input.
- The “free area” of an opening takes into account the blocking effect of mesh, grills, and louvers. Where screens are used, they must be no finer than $\frac{1}{4}$ " (4 x 4) mesh.

Step 2b: If the boiler is to be placed in an unconfined space the natural infiltration into the boiler room will provide adequate air for ventilation without additional openings into boiler room.

VII Venting

WARNING

Failure to vent this boiler in accordance with these instructions could cause flue gas to enter the building resulting in severe property damage, personal injury, or death:

- Do not attempt to vent this boiler with galvanized, PVC, or any other vent components not listed in Table 7.3.
- Do not obtain combustion air from within the building.
- Do not install a barometric damper or draft hood on this boiler.

CAUTION

Moisture and ice may form on the surfaces around the vent termination. To prevent deterioration, surfaces should be in good repair (sealed, painted, etc.).

A. Vent System Design

There are two basic ways to vent this boiler:

- **Horizontal (“Side Wall”) Concentric Venting** - Vent system exits the building through an outside wall. Concentric venting consists of a “pipe within a pipe”. Flue gas exits the building through the inner pipe and combustion air is drawn into the boiler through the space between the inner and outer pipe.
- **Vertical Concentric Venting** - Vent system exits the building through the roof. Concentric venting consists of a “pipe within a pipe”. Flue gas exits the building through the inner pipe and combustion air is drawn into the boiler through the space between the inner and outer pipe.

Both of these systems are considered “direct vent” because in both, combustion is drawn directly from the outdoors into the boiler. A description of all of these venting options are shown in Tables 7.1 and 7.6. For clarity, these vent options are numbered from 1 to 6. One of the vent option columns in Tables 7.1 or 7.6 must match the planned vent and air intake system exactly. In addition, observe the following guidelines:

- 1) Approved vent systems - Use only one Concentric vent system components supplied by Crown. The standard boiler is supplied with a concentric vent system having a maximum usable length of 25” (Figure 2.1). For longer runs, additional straight lengths and elbows are available from Crown. In some cases, larger diameter concentric pipe must be used. Each Crown concentric vent component consists of an inner pipe of polypropylene and the outer pipe of steel. Integral gaskets on each concentric fitting provide a gas tight seal. A list of all Crown concentric vent components is shown in Table 7.3.
In this manual, concentric pipe sizes are called out in terms of the inner and outer pipe nominal diameters in millimeters. For example, “60/100mm” pipe consists of a 60mm exhaust pipe inside a 100mm diameter outer pipe.
- 2) Maximum Vent and Air Intake Lengths - The maximum length of the vent air intake piping depends upon the vent option selected. See Table 7.1 or 7.6 for the maximum vent length. In horizontal vent systems, the lengths shown in Table 7.1 are in addition to the Elbow Adaptor on top of the boiler. If more elbows are desired, the maximum allowable vent length must be reduced by the amount shown in Table 7.5 for each additional elbow used. Termination fittings are never counted, although the length of the concentric terminal section is counted.

2 (contd.)

Example: A 60/100mm concentric vent system is planned for a horizontally vented MWC116 which has the following components:

- 60/100mm Elbow Adaptor (supplied with the boiler)
- 1 ft Straight Pipe
- 90 elbow
- Uncut Terminal Section (supplied with the boiler)

The Vent Option #2 column in Table 7.1 describes a horizontal direct vent system using 60/100mm concentric vent pipe. From this column, we see that a MWC116 may have a vent length of up to 8ft-10in. The 60/100 Elbow Adaptor supplied with the boiler is not considered. The length of the terminal section (not including the plastic terminal itself) is approximately 22 1/2" (1.9ft) installed. From Table 7.5, we see that the equivalent length of the 60/100mm elbow is 4.5ft. The total equivalent length of the planned venting system is therefore:

$$1\text{ft (Straight)} + 4.5\text{ft (90 Elbow)} + 1.9\text{ft (Uncut Terminal Section)} = 7.4\text{ft.}$$

Since Table 7.1 shows a maximum allowable vent length of 8ft-10in, the planned vent system length is acceptable. Note that the 82mm inlet air orifice supplied with the boiler is not used.

3) Minimum Vent and Air Intake Lengths - Observe the minimum vent lengths shown in Tables 7.1 and 7.6.

4) Permitted Terminals for Horizontal Venting:

- **Vent Option 1, 2** - The 60/100mm concentric vent terminal is supplied with the boiler as part of the standard vent system.
- **Vent Option 3** - Use the optional 80/125mm Concentric Vent Terminal (Crown PN 230531)

5) Horizontal Vent Terminal Location - Observe the following limitations on the vent terminal location (also see Figure 7.4).

- Vent terminal must be at least 1 foot from any door, window, or gravity inlet into the building.
- The bottom of the terminal must be at least 12" above the normal snow line. In no case should it be less than 12" above grade level.
- The bottom of the vent terminal must be at least 7 feet above a public walkway.
- Do not install the vent terminal directly over windows or doors.
- The bottom of the vent terminal must be at least 3 feet above any forced air inlet located within 10 feet.
- In the USA, maintain a clearance of at least 4ft horizontally from the vent terminal to gas meters, electric meters, regulators and relief equipment. In Canada, maintain a 6ft clearance between the vent terminal and these devices.
- Do not locate the vent terminal under decks or similar structures.
- Top of vent terminal must be at least 5 feet below eaves, soffits, or overhangs. Maximum depth of overhang is 3 ft.
- Vent terminal must be at least 6 feet from an inside corner.
- Vent Terminal must be at least 2ft from adjacent buildings.
- Under certain conditions, water in the flue gas may condense, and possibly freeze, on objects around the vent terminal including on the structure itself. If these objects are subject to damage by flue gas condensate, they should be moved or protected.
- If possible, install the vent and air intake terminals on a wall away from the prevailing wind. Reliable operation of this boiler cannot be guaranteed if these terminals are subjected to winds in excess of 40 mph.
- Air intake terminal must not terminate in areas that might contain combustion air contaminants, such as near swimming pools. See Section IV for more information on possible contaminants.

Table 7.1: Summary Of Horizontal Venting Options

VENT OPTION #	1	2	3	4
CLASSIFICATION USED IN THIS MANUAL	HORIZONTAL CONCENTRIC	HORIZONTAL CONCENTRIC	HORIZONTAL CONCENTRIC	RESERVED FOR FUTURE USE
ILLUSTRATED IN FIGURE	7.2	7.2	7.2	
VENT PIPE PENETRATION THROUGH STRUCTURE	WALL	WALL	WALL	
VENT PIPE SIZE	60/100 mm CONCENTRIC	60/100 mm CONCENTRIC	80/125 mm CONCENTRIC	
INLET AIR ORIFICE SIZE	82mm	Not Used	82mm	
MAX. VENT LENGTH	25in	8ft - 10in	27ft - 10in	
MIN. VENT LENGTH	6in	26in	6in	
VENT TERMINAL	CROWN #230520 (INCLUDED WITH BOILER)	CROWN #230520 (INCLUDED WITH BOILER)	CROWN #230531	
VENT MATERIAL	CROWN 60/100mm VENT COMPONENTS SHOWN IN TABLE 7.3a	CROWN 60/100mm VENT COMPONENTS SHOWN IN TABLE 7.3a	CROWN 80/125mm VENT COMPONENTS SHOWN IN TABLE 7.3b	

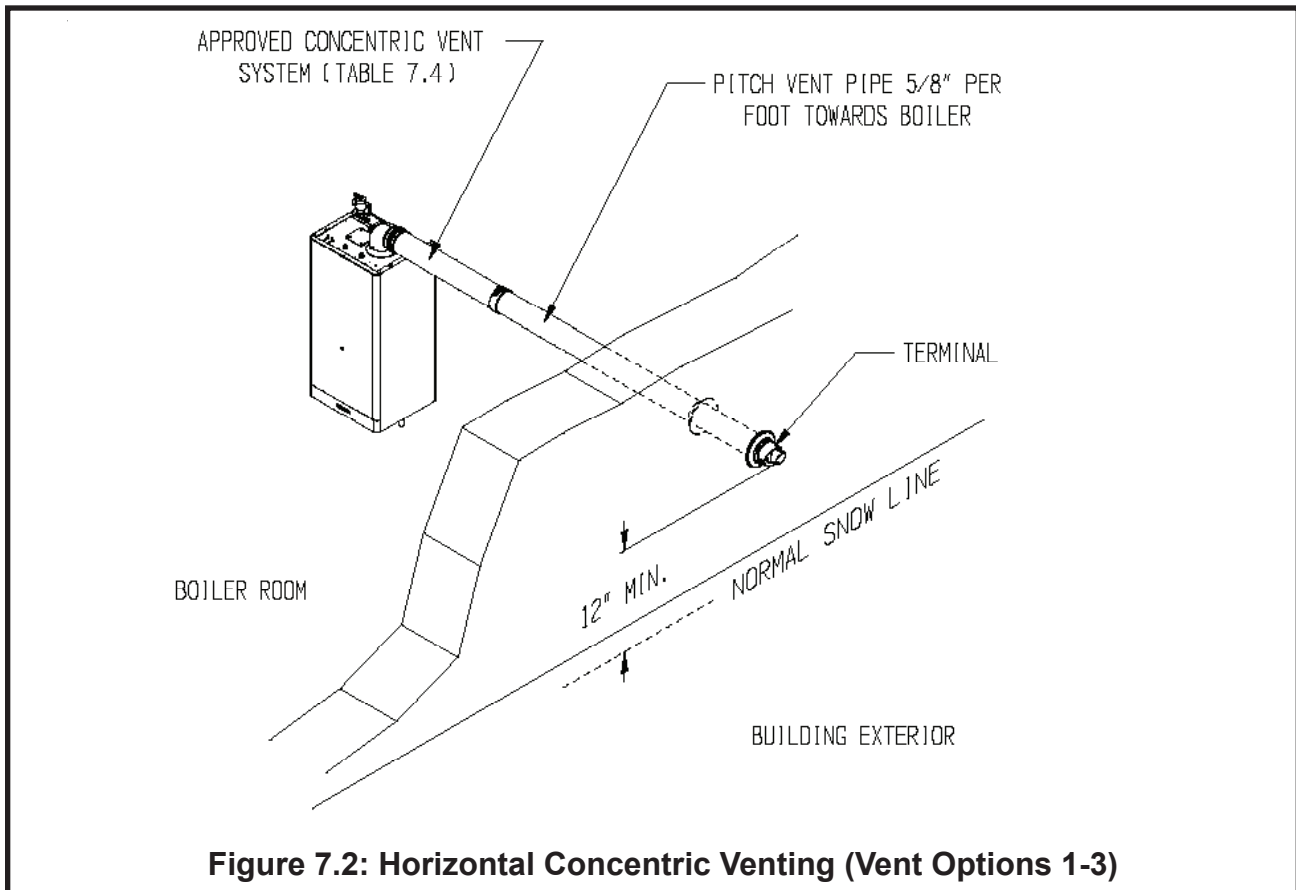


Table 7.3a: Crown Concentric 60/100 Vent Components (Vent Options 1,2)

CROWN PN	DESCRIPTION	SIZE	USED ON VENT OPTION #	COMMENTS
340509	60/100mm ELBOW ADAPTOR	60/100mm	1,2	INCLUDED WITH STANDARD BOILER
340503	60/100mm STRAIGHT ADAPTOR	60/100mm	2	OPTIONAL
230520	TERMINAL SECTION	60/100mm	1,2	INCLUDED WITH STANDARD BOILER
230522	WALL GROMMET	60/100mm	1,2	INCLUDED WITH STANDARD BOILER
230505	39" STRAIGHT	60/100mm	2	OPTIONAL - MAY NOT BE CUT
230504	78" STRAIGHT	60/100mm	2	OPTIONAL - MAY NOT BE CUT
230506	19 1/2" STRAIGHT	60/100mm	1,2	OPTIONAL - CAN BE CUT
230507	90 DEGREE ELBOW	60/100mm	2	OPTIONAL
230508	45 DEGREE ELBOW	60/100mm	2	OPTIONAL
230515	39" STRAIGHT	80/125mm	1	OPTIONAL - CAN BE CUT
340130	82mm AIR INLET ORIFICE	82mm ID	1	INCLUDED WITH STANDARD BOILER

Table 7.3b: Crown Concentric 80/125 Vent Components (Vent Options 3,5)

CROWN PN	DESCRIPTION	SIZE	USED ON VENT OPTION #	COMMENTS
340523	80/125 STRAIGHT ADAPTOR	80/125mm	3,5	
230527	90 DEGREE EL (STANDARD)	80/125mm	3,5	
230528	90 DEGREE EL (SWEEP)	80/125mm	3,5	
230526	45 DEGREE EL	80/125mm	3,5	
230517	19 1/2" STRAIGHT	80/125mm	3,5	CAN BE CUT
230515	39" STRAIGHT	80/125mm	3,5	CAN BE CUT
230518	39" STRAIGHT	80/125mm	3,5	MAY NOT BE CUT
230519	78" STRAIGHT	80/125mm	3,5	MAY NOT BE CUT
230525	TELESCOPING STRAIGHT	80/125mm	3,5	ADJUSTABLE FROM 12-1/2" TO 16-1/2"
230531	HORIZONTAL TERMINAL	80/125mm	3	
230532	VERTICAL TERMINAL	80/125mm	5	(NOTE #1)
230533	FLAT ROOF FLASHING	80/125mm	5	
230535	SLOPED ROOF FLASHING	80/125mm	5	(NOTE #2)
230530	SUPPORT ELBOW WITH CHIMNEY CHASE BRACKET	80/125mm	5	(NOTE #3)
230536	SUPPORT BAND	80/125mm	3,5	

Table 7.3b Notes:

- 1) Vertical terminal can be used with either of the roof flashings listed beneath it.
- 2) Sloped roof flashing suitable for roof angles between 25 and 45 degrees.
- 3) Used at base of vertical run inside unused masonry chimney.

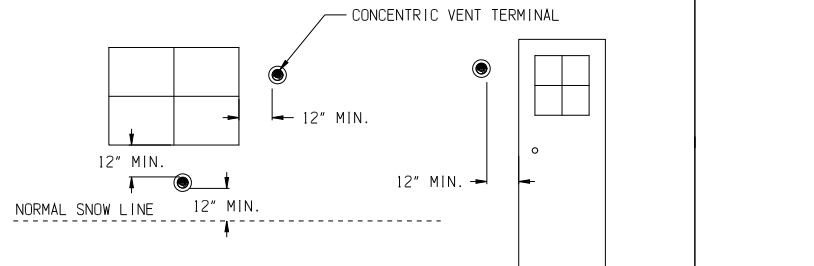


Figure 7.4a: Location Of Vent Terminal Relative To Windows, Doors, Grade

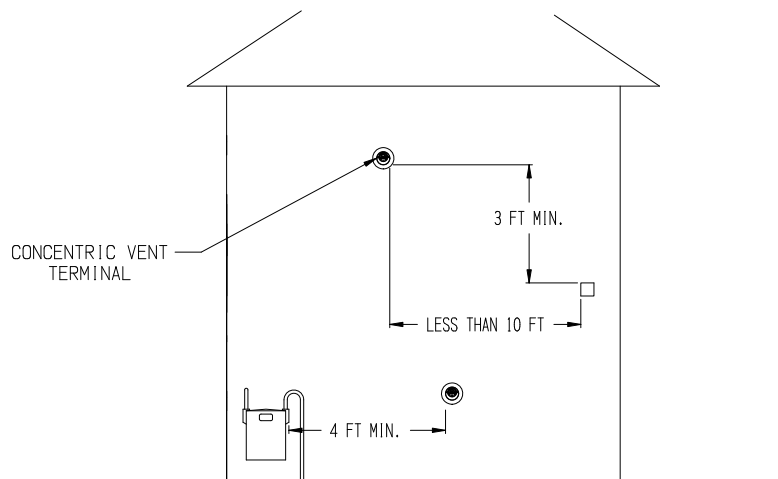


Figure 7.4b: Location Of Vent Terminal Relative To Meters And Forced Air Inlets

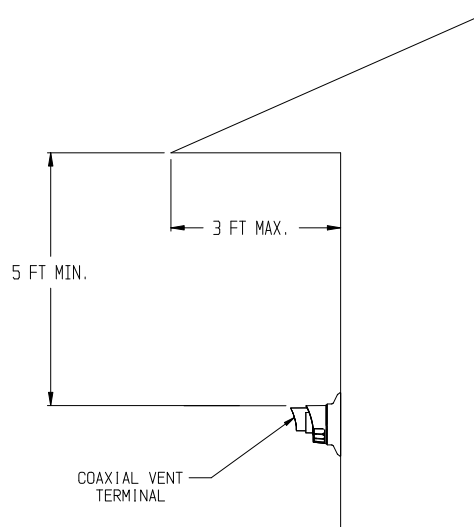


Figure 7.4c: Positioning Vent Terminal Under Overhangs

Table 7.5: Vent/ Air Intake Fitting Equivalent Length

VENT FITTING	EQUIVALENT LENGTH (ft)
60/100mm 90° CONCENTRIC ELBOW	4.5
60/100mm 45° CONCENTRIC ELBOW	4.0
80/125mm 90° CONCENTRIC ELBOW	8.5
80/125mm 90° SWEEP CONCENTRIC ELBOW	5.5
80/125mm 45° CONCENTRIC ELBOW	3.0
80/125mm 90° CONCENTRIC SUPPORT ELBOW	8.5

- 6) Permitted Terminals for Vertical Venting - Use Crown PN 230532 with the appropriate flashing (Table 7.3b)
- 7) Vertical Vent Terminal Locations (Vent Option 5) - Observe the following limitations on the location of all vertical vent terminals (see Figure 7.7):
 - The top of the vent pipe must be at least 2 feet above any object located within 10 feet.
 - The bottom of the air inlet terminal must be at least 12" above the normal snow accumulation that can be expected on the roof. The terminal used in Vent Option #5 has a fixed distance above the storm collar of 19". If a greater distance is needed to provide the clearance above the snow line, build a chase on the roof and mount the vertical terminal on top of the chase.
- 8) Wall thimbles – Concentric vent has a “zero” clearance to combustibles and therefore does not require the use of wall thimbles.
- 9) Pitch of Horizontal Piping - Pitch all horizontal piping so that any condensate which forms in the piping will run towards the boiler. Pitch Crown horizontal concentric venting 5/8" per foot
- 10) Supporting Pipe - Vertical and horizontal sections of pipe must be properly supported. Support Crown concentric venting near the female end of each straight section of pipe. Exception: Vertical runs of concentric pipe in an unused chimney (Figure 7.36) need only be supported at the terminal and at the base of the run.

Table 7.6: Summary Of Vertical Venting Options

VENT OPTION #	5	6
CLASSIFICATION USED IN THIS MANUAL	VERTICAL CONCENTRIC	RESERVED FOR FUTURE USE
ILLUSTRATED IN FIGURE	7.7	
VENT PIPE PENETRATION THROUGH STRUCTURE	ROOF	
VENT PIPE SIZE	80/125mm CONCENTRIC	
INLET AIR ORIFICE SIZE	82mm	
MAX. VENT LENGTH	27ft - 10in	
MIN. VENT LENGTH	6in	
VENT TERMINAL	CROWN #230532 CONCENTRIC TERMINAL (TABLE 7.3b)	
VENT MATERIAL	CROWN 80/125 mm VENT COMPONENTS SHOWN IN TABLE 7.3b	

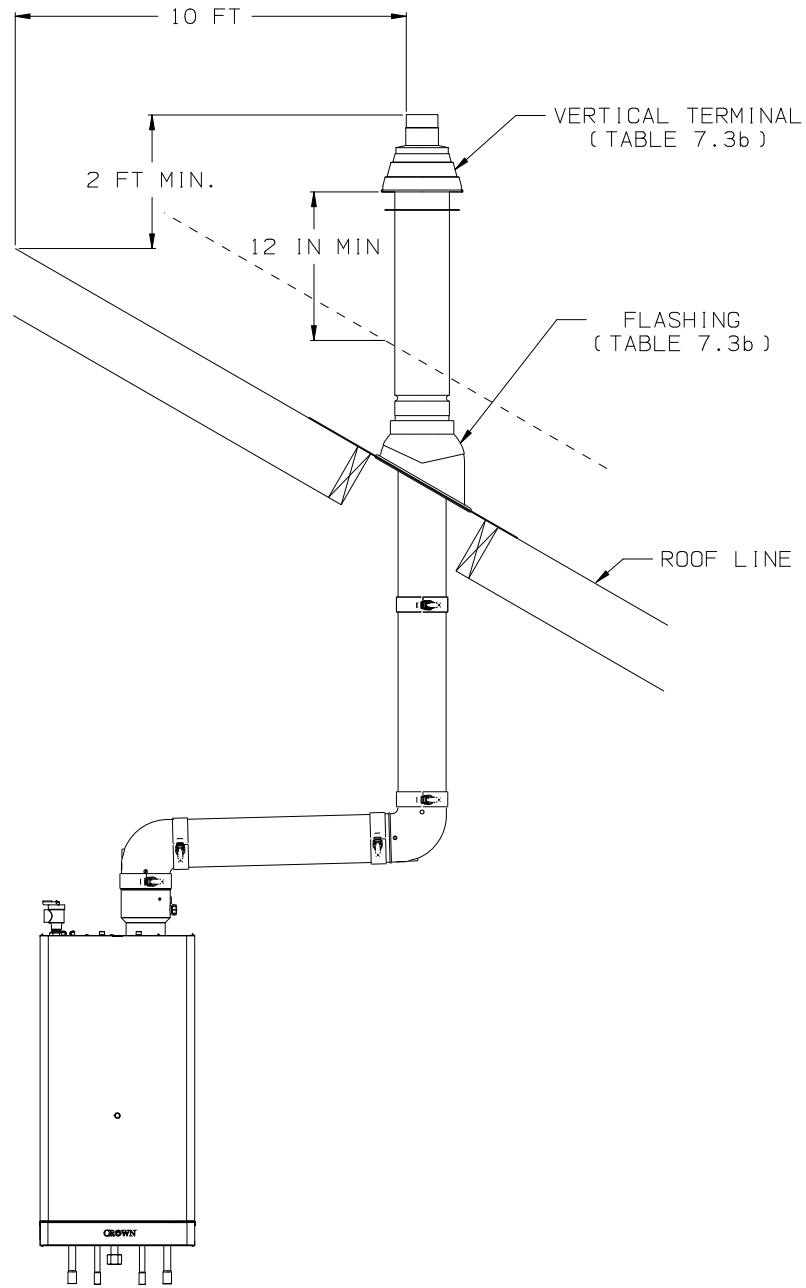


Figure 7.7: Vertical Concentric Vent System (Vent Option 5)

B. Removing an Existing Boiler From a Common Chimney

Read this only if the MWC boiler is replacing an existing boiler that is being removed from a common chimney. This section does not apply to the installation of a MWC boiler.

In some cases, when an existing boiler is removed from a common chimney, the common venting system may be too large for the remaining appliances. At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

- (a) Seal any unused openings in the common venting system.
- (b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- (c) Insofar as practical, close all building doors and windows and all doors between the space in which all the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- (d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so the appliance will operate continuously.
- (e) Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
- (f) After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliances to their previous condition of use.
- (g) Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1./NFPA 54 and/or CAN/CSA B 149.1 Natural Gas and Propane Installation Code. When re-sizing any portion of the common venting system, the common venting system should be re sized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1./NFPA 54 and/or CAN/CSA B 149.1

WARNING

Never common vent a MWC boiler with other appliances.

C. Assembly of Crown 60/100mm Concentric Venting

(IMPORTANT - Skip to Section D for 80/125mm Concentric Vent Assembly)

WARNING

Failure to follow the instructions could result in flue gas leakage into the combustion air or indoor air, resulting in unsafe or unreliable operation.

- **Do not lubricate concentric gaskets with anything other than water.**
- **Do not attempt to cut any piping except as permitted in this section. When cutting these sections, make sure all cuts are square and allow for proper insertion.**
- **Do not attempt to try to mix this concentric pipe with other venting systems.**

- 1) Concentric vent components supplied with the boiler are packed in a separate carton and include the following:
 - a) 60/100mm elbow adaptor (Crown PN 340509).
 - b) 60/100mm terminal section (straight section with a terminal and overall length of 27 3/4" (Crown PN 230520).
 - c) Two (2) Rubber wall grommets (Crown PN 230522).
 - d) Vent gasket and screws for attachment of vent system to boiler.

The 82mm air inlet orifice required for Vent Option 1 is packed in the boiler carton.

The 60/100 straight adaptor is optional equipment. It is supplied with the same screws and gasket as the 60/100 elbow adaptor.

- 2) Start by attaching the elbow adaptor (or straight adaptor, if used instead) to the top of the boiler using the gasket and four 4.2mm sheet metal screws provided in the vent kit as shown in Figure 7.20. For Vent Option 1, install the 82mm air inlet orifice as shown.
- 3) If no additional sections of concentric pipe are required, attach the terminal section to the elbow. In most cases, it will need to be cut before doing so. Use the following procedure to cut the pipe:
 - a) Measure distance "L" from the outside surface of the exterior wall to the end of the elbow as shown in Figure 7.21.
 - b) Add 2-1/8" to distance "L". Carefully mark this length on the pipe as shown in Figure 7.22.
 - c) Press in the two tabs holding the plastic terminal in the terminal section (Figure 7.22). Carefully pull out the terminal and the inner pipe.
 - d) Cut the **outer pipe only** at the point marked in Step (b) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. De burr the cut end with a file or emery cloth.
 - e) Cut the plastic inner pipe so that it will protrude 3/8" beyond the outer pipe when reinstalled in the terminal section (Figure 7.23). Use a fine tooth hacksaw or a PVC saw to cut the plastic pipe and be careful to cut the pipe square. De burr the cut edge of the plastic pipe with a file, razor blade, or fine sandpaper.
 - f) Reinstall the inner pipe in the terminal section. Slip the outside wall grommet over the terminal section and position so that it covers the joint between the outer pipe and the terminal (Figure 7.24).
 - g) Make a mark on the terminal section 1" from the cut end of the outer pipe as shown in Figure 7.24.
 - h) Pass the terminal section through the wall from the outside. Push the remaining wall grommet over the terminal section on the inside of the wall. Push the terminal section into the elbow until the mark made in Step (g) is no longer visible. If necessary, the brown gasket in the inner pipe may be lubricated with a few drops of water.
 - i) The terminal section must be attached to the elbow with a single #10 x 1/2" sheet metal screw (not supplied) at the top of the elbow. Drill a 1/8" hole in the location shown in Figure 7.25. **Use a short drill bit or a drill stop to ensure that the drill bit does not penetrate the pipe by more than 3/8"**. Install a #10 x 1/2" screw in this hole. **Do not use a screw longer than 1/2" long.**
 - j) If not already done, make sure that both wall grommets are firmly against the interior and exterior wall surfaces. Seal any cracks or other openings near the terminal through which exhaust could enter the building.

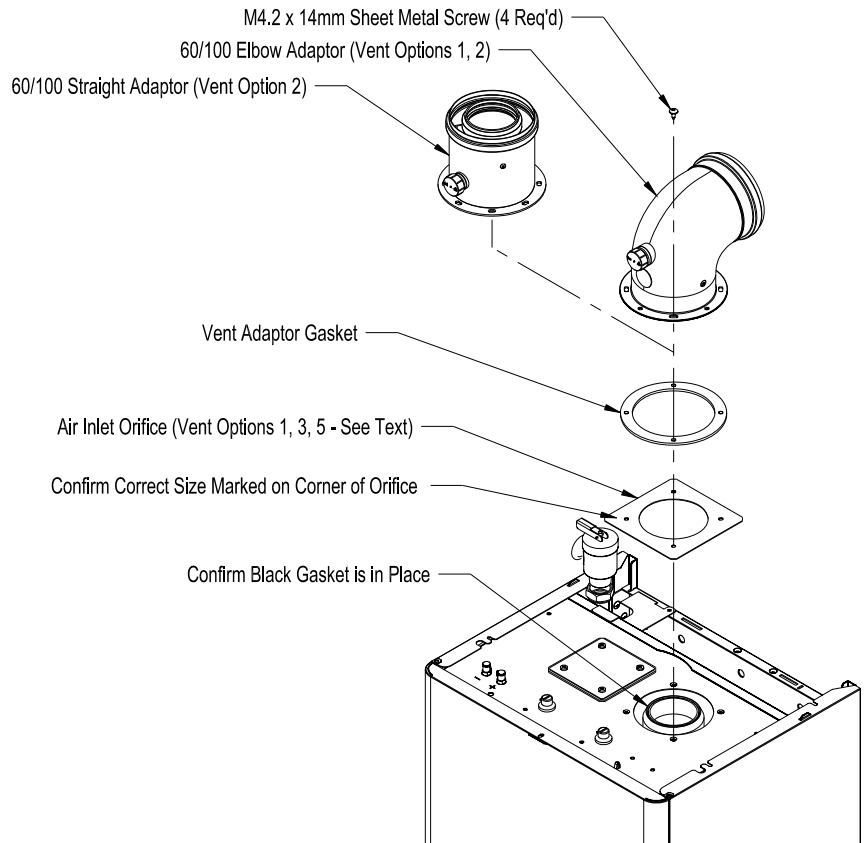


FIGURE 7.20: INSTALLATION OF 60/100 ADAPTORS ON BOILER

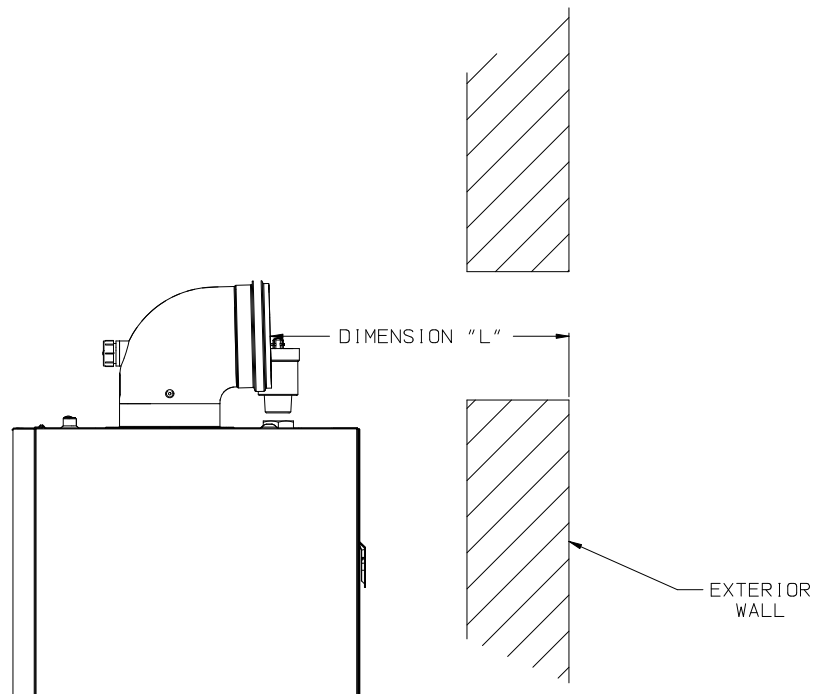
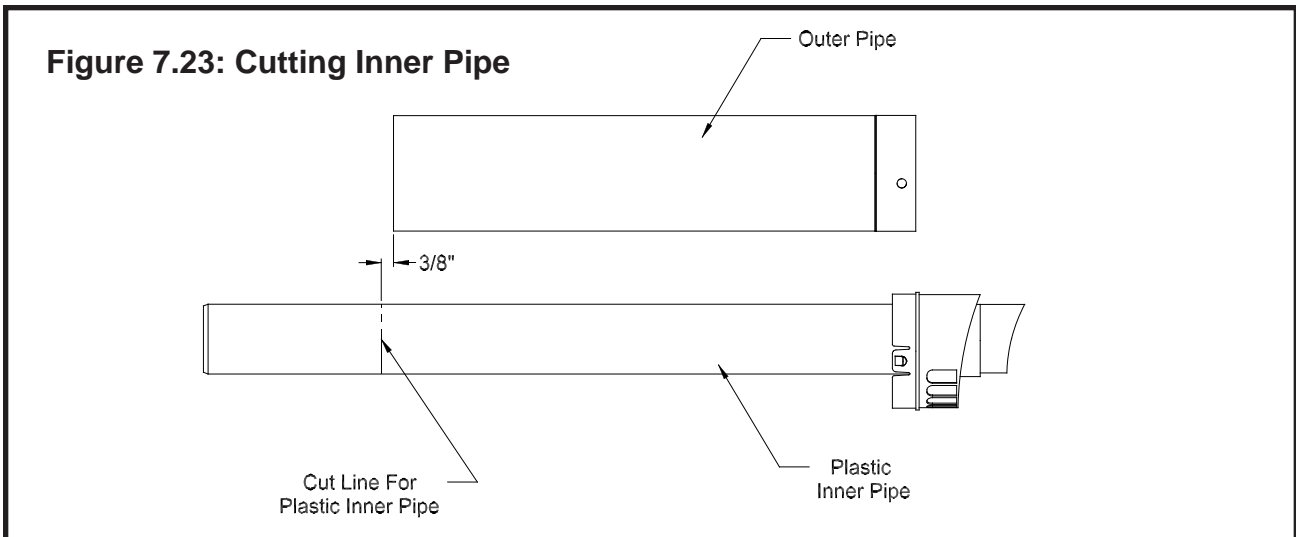
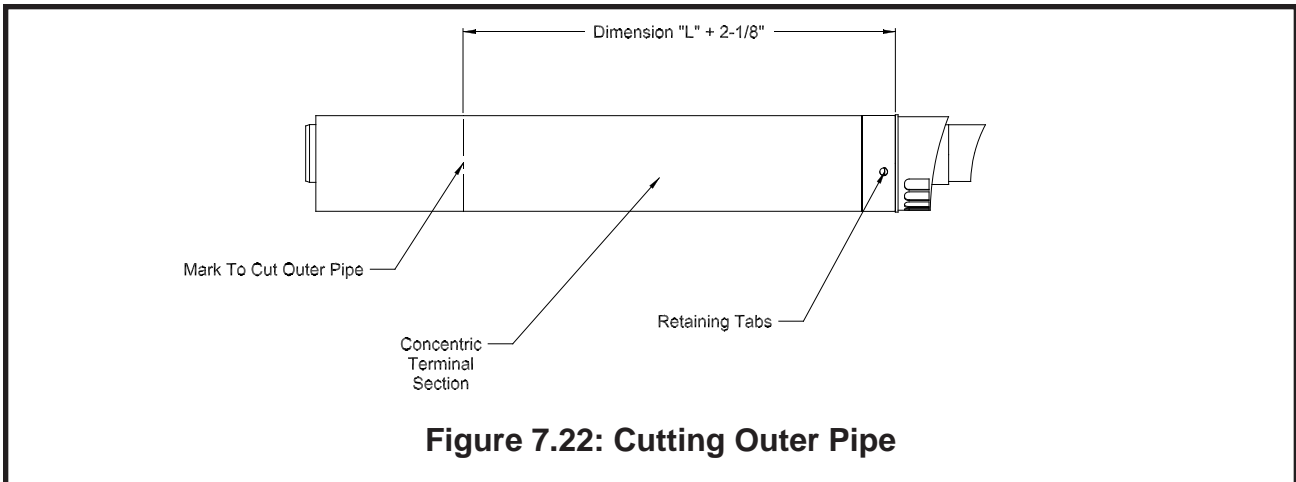


FIGURE 7.21: DIMENSION "L"

- 4) If additional pieces of pipe are used, install them starting at the boiler elbow. Support each section of straight pipe at its female end.
- 5) Use locking bands provided to join adjacent sections of non-cutable pipe as well as fittings. The male end of the terminal section and other cuttable sections must be be held to the female end of the adjoining pipe with at least three #10 x 1/2" sheet metal screws. Drill a 1/8 hole through both outer pipes to start this screw. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2".**
- 6) The only straight pipe that can be cut is the terminal section and the 19-1/2" section (Crown PN 230506). To cut this pipe:
 - a) Cut pipe from the male end. After marking the desired length of the outer pipe, remove the plastic inner pipe by pulling it out from the female end.
 - b) Cut the **outer pipe only** at the point marked in Step (b) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. De burr the cut end with a file or emery cloth.
 - c) Cut the plastic inner pipe so that it will protrude 3/8" beyond the outer pipe when reinstalled in the outer pipe. Use a fine tooth hacksaw or a PVC saw to cut the plastic pipe and be careful to cut the pipe square. De burr the cut edge of the plastic pipe with a file, razor blade, or fine sandpaper.
 - d) Reinstall the inner pipe.
- 7) Install the terminal as outlined in Step (4) above. Dimension "L" described in Step 3 is the distance from the exterior surface of the wall to the end of the last piece of pipe inside the building.



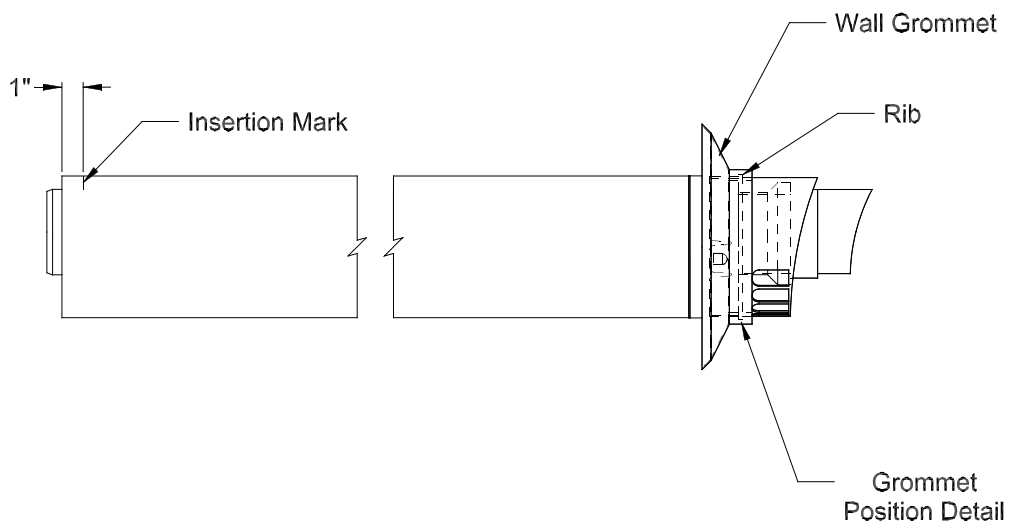


Figure 7.24: Preparing 60/100mm Terminal Section For Installation In The Wall

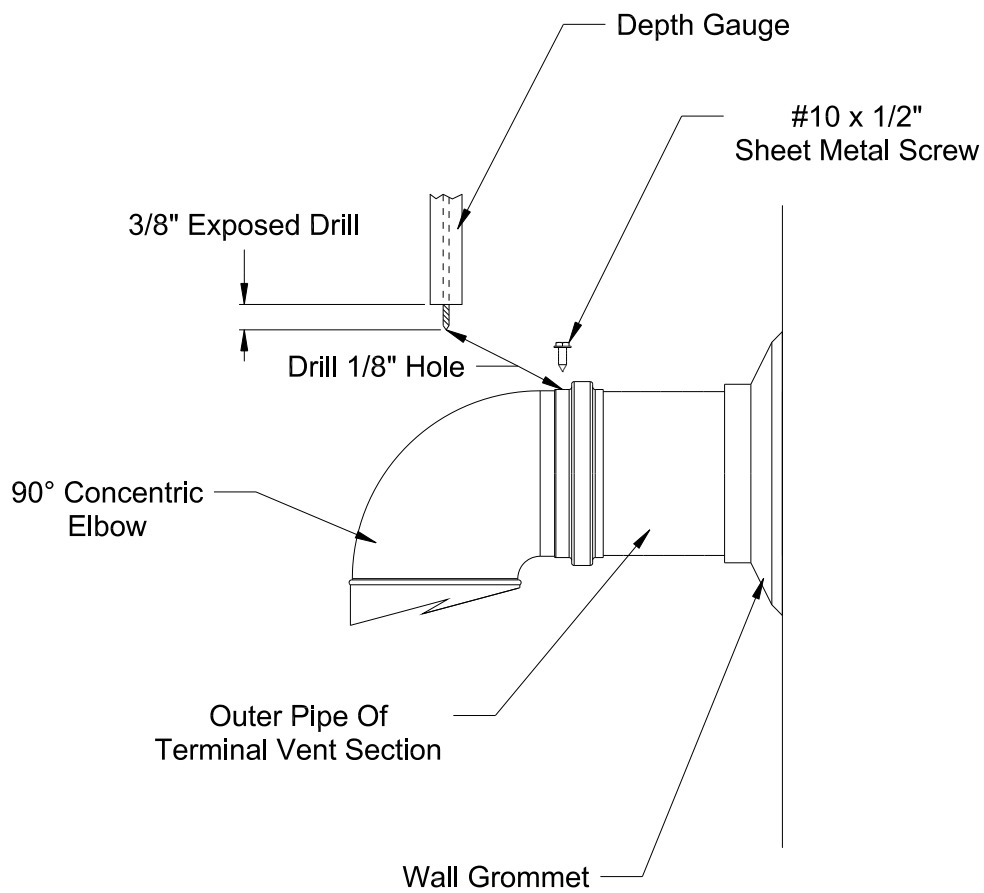


Figure 7.25: Attaching 60/100mm Terminal Section

D. Assembly of Crown 80/125mm Concentric Venting (IMPORTANT - See Section C for 60/100mm Concentric Vent Assembly)

WARNING

Failure to follow the instructions could result in flue gas leakage into the combustion air or indoor air, resulting in unsafe or unreliable operation.

- Do not lubricate concentric gaskets with anything other than water.
- Do not attempt to cut any piping except as permitted in this section. When cutting these sections, make sure all cuts are square and allow for proper insertion.
- Do not attempt to try to mix this concentric pipe with other venting systems.

- 1) The 60/100mm terminal section and concentric reducing elbow supplied with the boiler are not used in 80/125mm vent systems. The components listed in Table 7.3b are required for 80/125mm installations and are not supplied with the boiler. Before starting assembly of an 80/125mm vent system, make sure that the planned installation is in accordance with the "Vent System Design" section of this manual and that all required 80/125mm vent components are on hand. These components are available through Crown distributors.

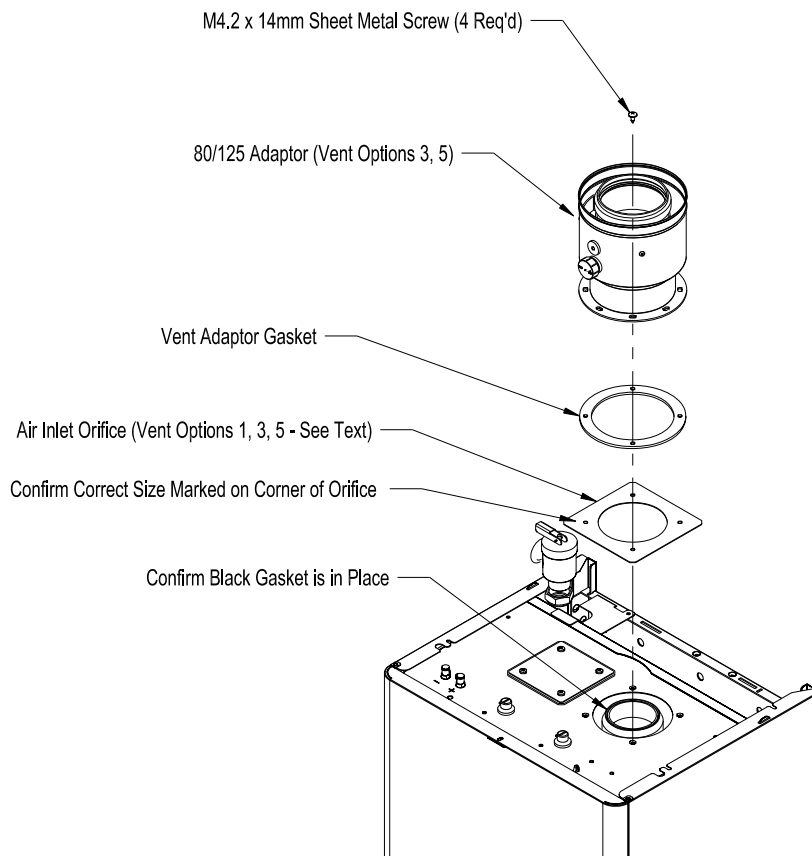
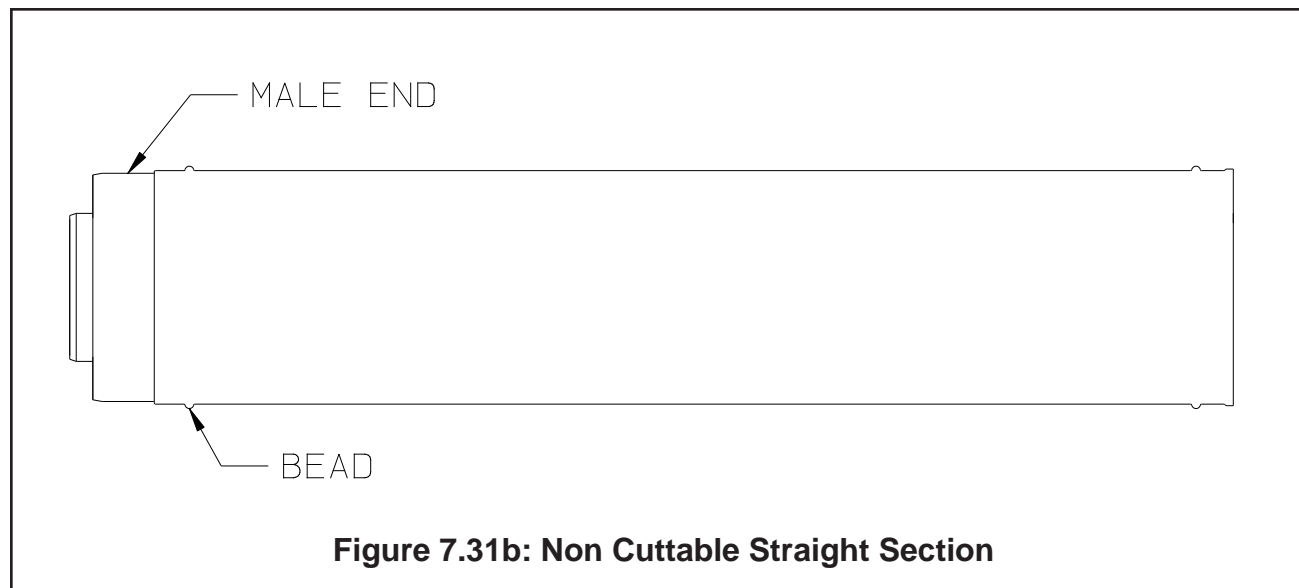
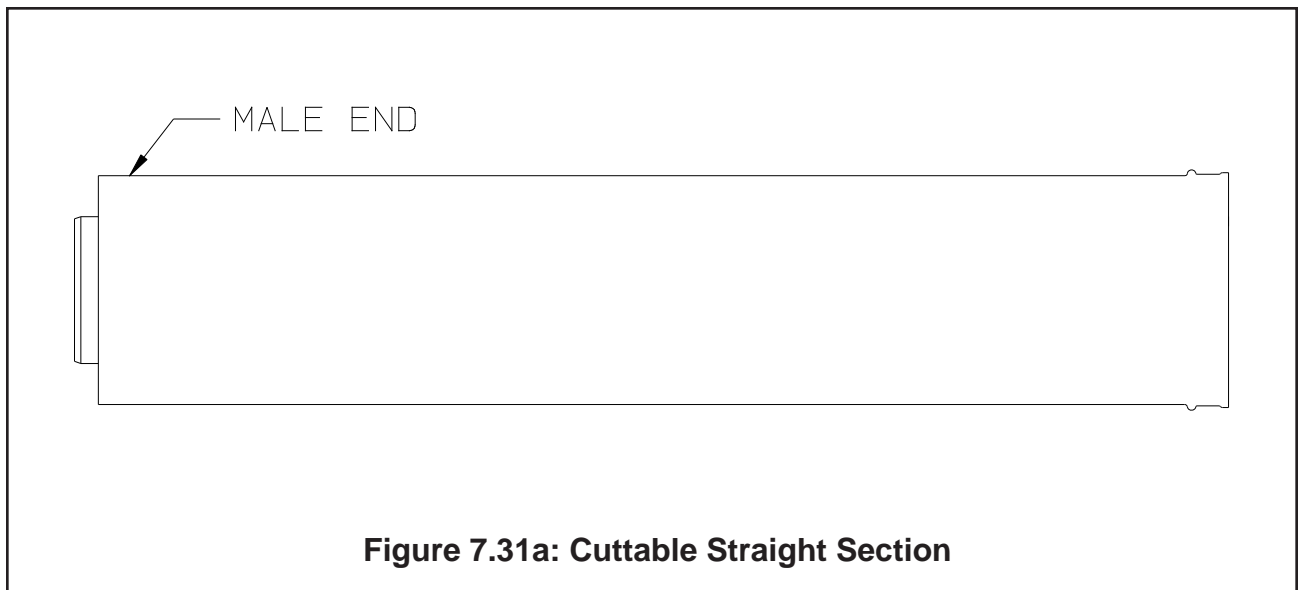


Figure 7.30: Installation Of 80/125 Adaptor On Boiler

- 2) Installation of the MWC116 with 80/125mm venting requires the use of the 80/125mm appliance adaptor (Crown PN 340523). This adaptor is installed on top of the boiler as shown in Figure 7.30. For vent options 3 and 5, sandwich the 82mm air inlet orifice between the boiler and the adaptor as shown.
- 3) Cutting Straight Pipe - The following straight pipe sections may be cut:

Part #	Description
230517	19 1/2" Straight
230515	39" Straight

These sections have a plain male end (without beads - see Figure 7.31a). They are always cut from the male end. Sections not shown on the above list may not be cut. These sections have beads on the male end (Figure 7.31b).

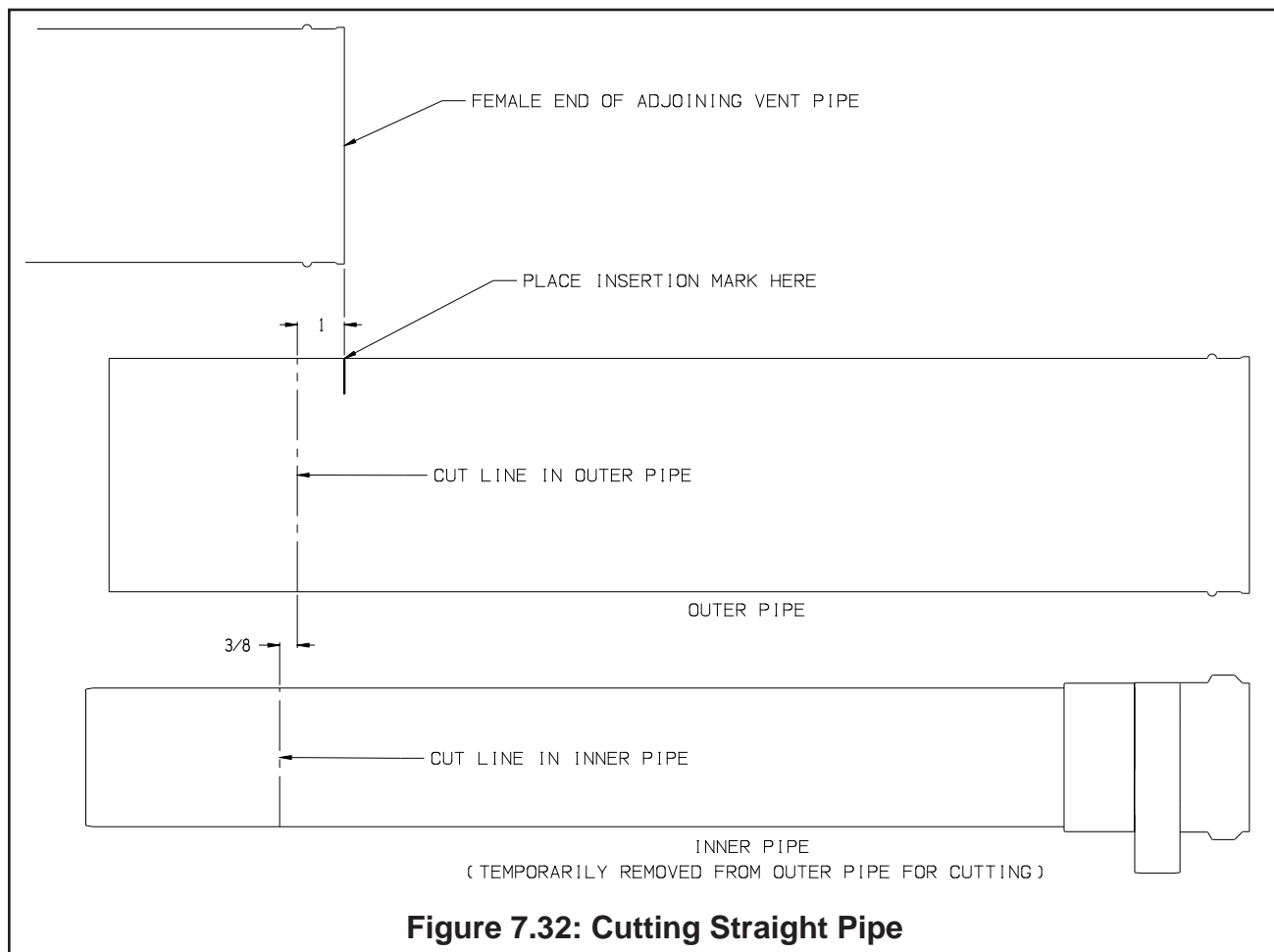


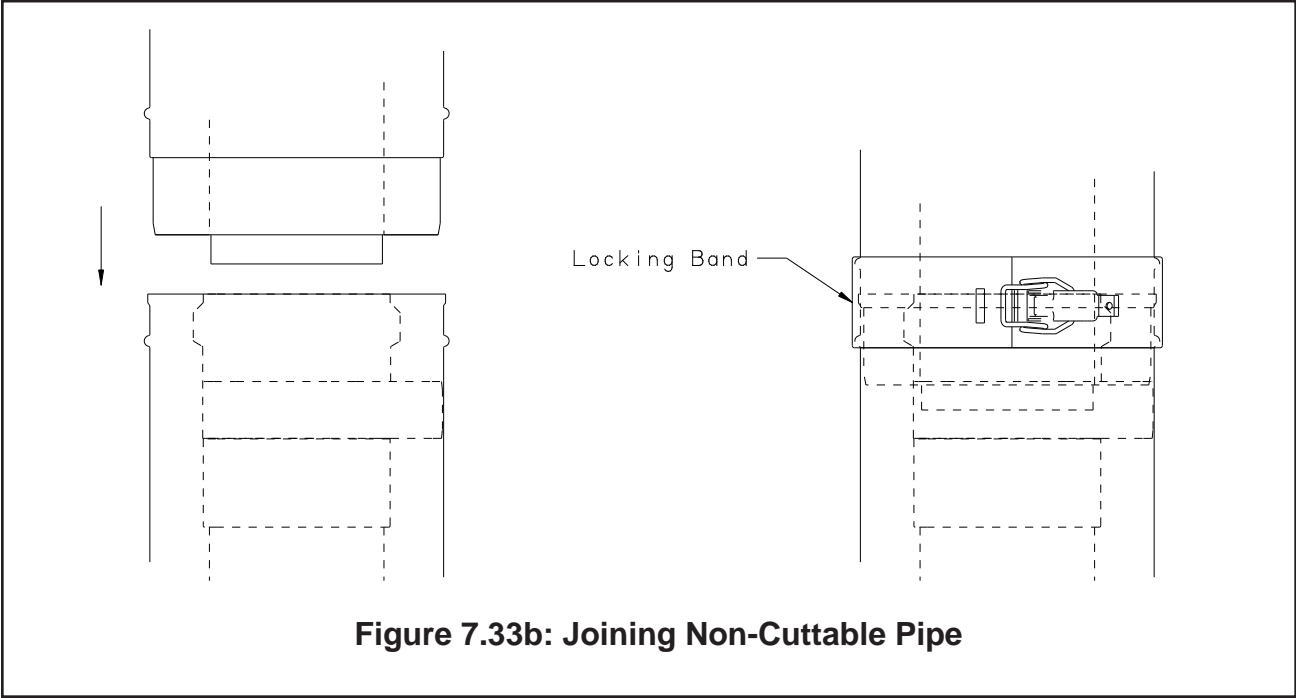
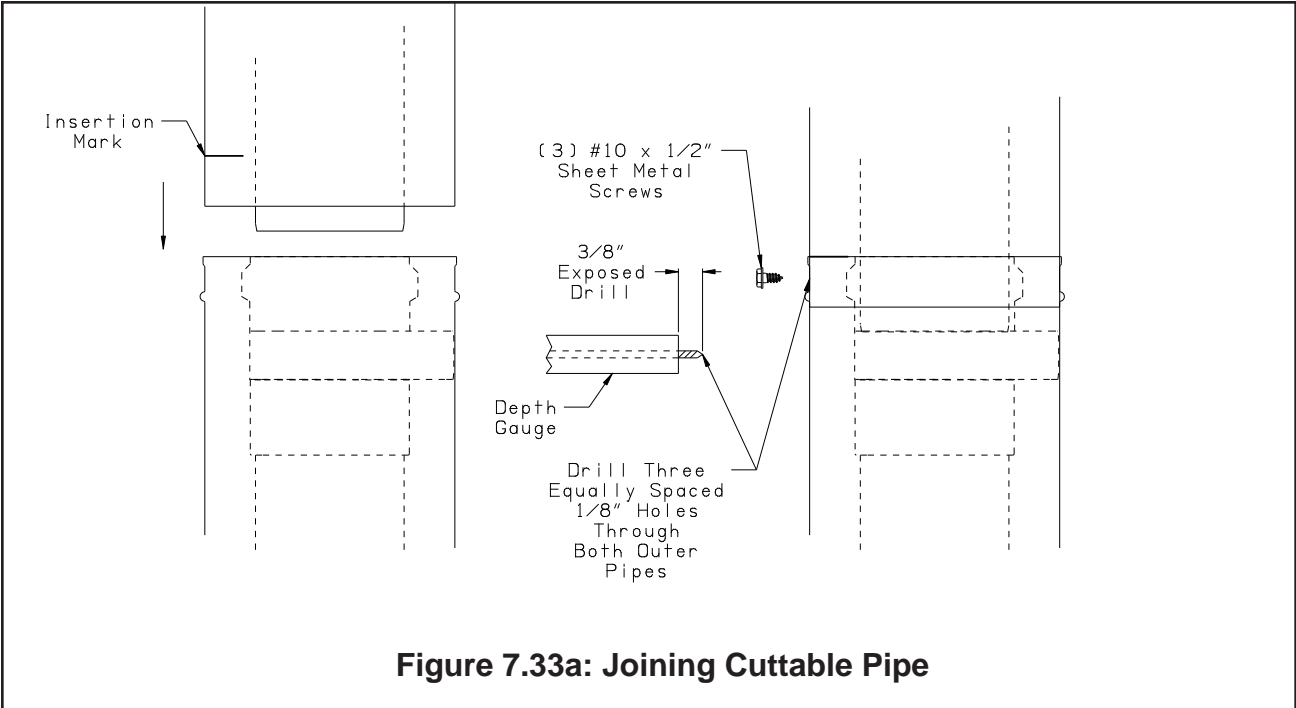
3) (contd.) To cut the straight sections listed above refer to Figure 7.32 and the following instructions:

- a) Determine the required length of the outer pipe. When doing this allow an additional 1" of length for insertion into the female end of the adjoining pipe. Mark the cut line on the outer pipe.
- b) Remove the plastic inner pipe by pulling it out from the female end.
- c) Cut the **OUTER PIPE ONLY** at the point marked in Step (a) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. De burr the cut end with a file or emery cloth.
- d) Make an insertion mark 1" from the male end of the outer pipe.
- e) Cut the plastic inner pipe so that it will protrude 3/8" beyond the male end of the outer pipe when reinstalled in the outer pipe. Use a fine tooth hacksaw or a PVC saw to cut the plastic pipe and be careful to cut the pipe square. De burr the cut edge of the plastic pipe with a file, razor blade, or fine sandpaper.
- f) Reinstall the inner pipe.

4) Joining Pipe -

- a) Start assembly of the vent system at the boiler. Lubricate the brown gasket in the boiler vent collar with a few drops of water.
- b) Push the male end of the first fitting into the boiler collar until it bottoms out. The male end of cuttable sections should go 1" into the collar until the insertion mark (made in Step 3d above) is covered. On other fittings, the bead on the male pipe will bottom out on the collar (Figure 7.33b).
- c) The male end of cuttable fittings must be held to the collar with three #10 x 1/2" sheet metal screws. Drill a 1/8 hole through both outer pipes to start this screw. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2"** (Figure 7.33a).
- d) Use locking bands (provided with all fittings) to secure non-cuttable pipe, as well as fittings, to the boiler collar (Figure 7.33b).
- e) Use the same method to join all remaining vent components except for the terminal.





5) 80/125mm Horizontal Terminal Installation -

- a) Cut a 5-1/2" diameter hole through the exterior wall at the planned location of the horizontal terminal.
- b) Measure distance "L" from the outside surface of the exterior wall to the end of the last fitting as shown in Figure 7.34a.
- c) Add 1-1/4" to distance "L". Carefully mark this length on the pipe as shown in Figure 7.34b.
- d) Remove the inner pipe from the terminal, by gently pulling on it from the male end. Set aside.
- e) Cut the **outer pipe only** at the point marked in Step (c) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. De-burr the cut end with a file or Emory cloth.
- f) Reinstall the inner pipe in the terminal, making sure that the female end of this pipe is completely bottomed out over the aluminum male connection visible behind the air intake grill. Place a mark on the inner pipe 3/8" beyond the end of the outer pipe (Figure 7.34c). Use a fine tooth hacksaw to cut the pipe and be careful to cut the pipe square (if necessary, the pipe can be removed from the terminal again for cutting). De-burr the cut edge of the pipe with a file, razor blade, or fine sandpaper.
- g) Make a mark on the terminal section 1" from the cut end of the outer pipe as shown in Figure 7.34c.
- h) Slip the terminal section through the wall from the outside. Pass the terminal through the inner wall plate and push into the last section of vent pipe until the mark made in Step (g) is not longer visible (Figure 7.34d). Secure the terminal to the last piece of pipe with three #10 x 1/2" sheet metal screws. Drill a 1/8" hole through both outer pipes to start these screws. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2".**
- i) Slip the outer wall plate over the terminal and secure to the wall (Figure 7.34d). Apply a 1/8" bead of weather resistant RTV over the joint between the outside wall plate and the terminal. Secure the other wall plate to the inside wall.

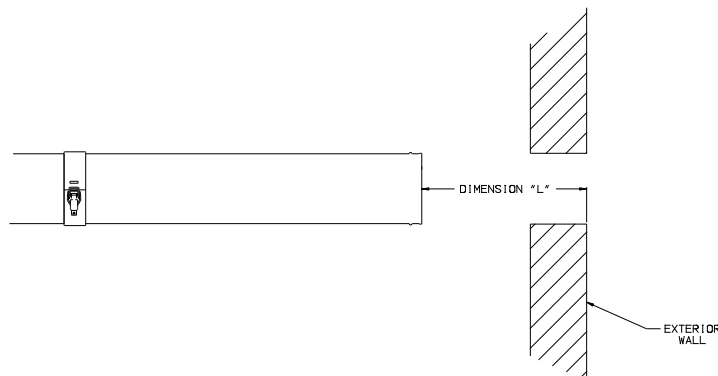


Figure 7.34a: Dimension "L", 80/125mm Horizontal Terminal

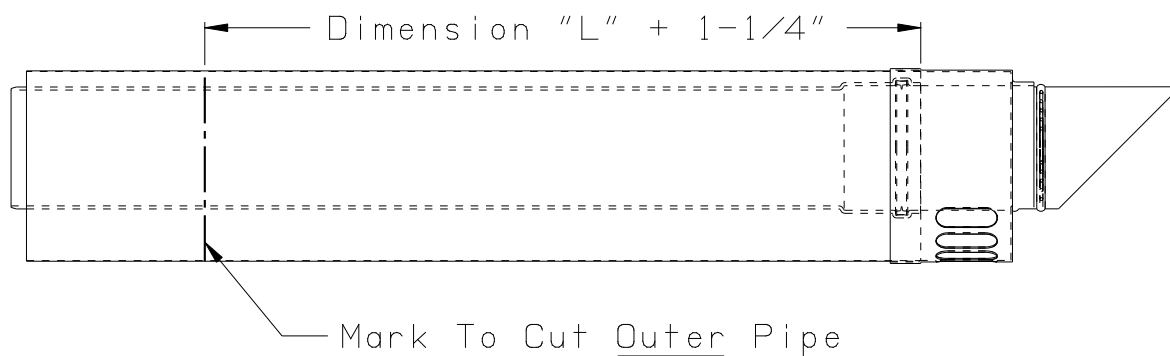
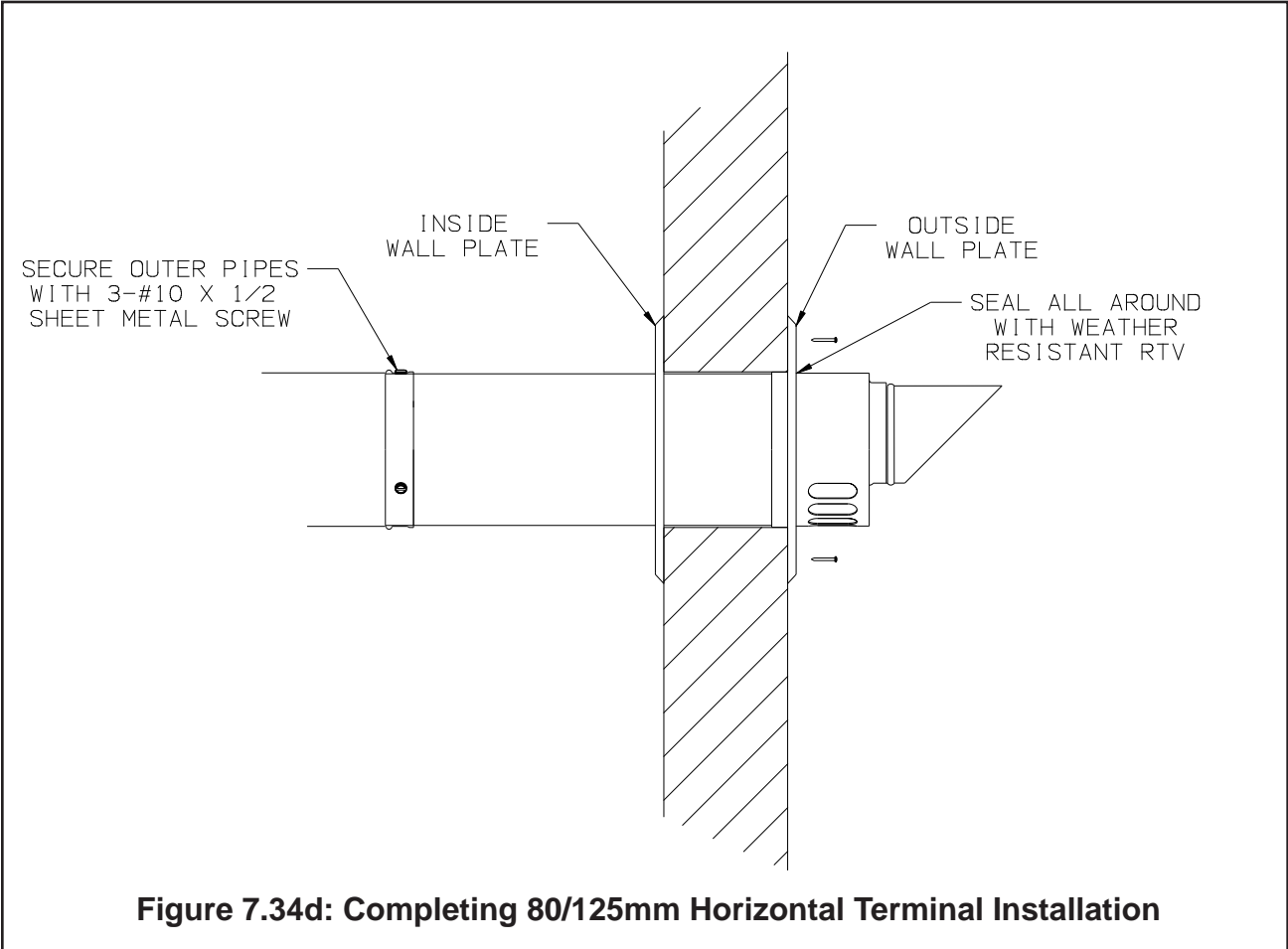
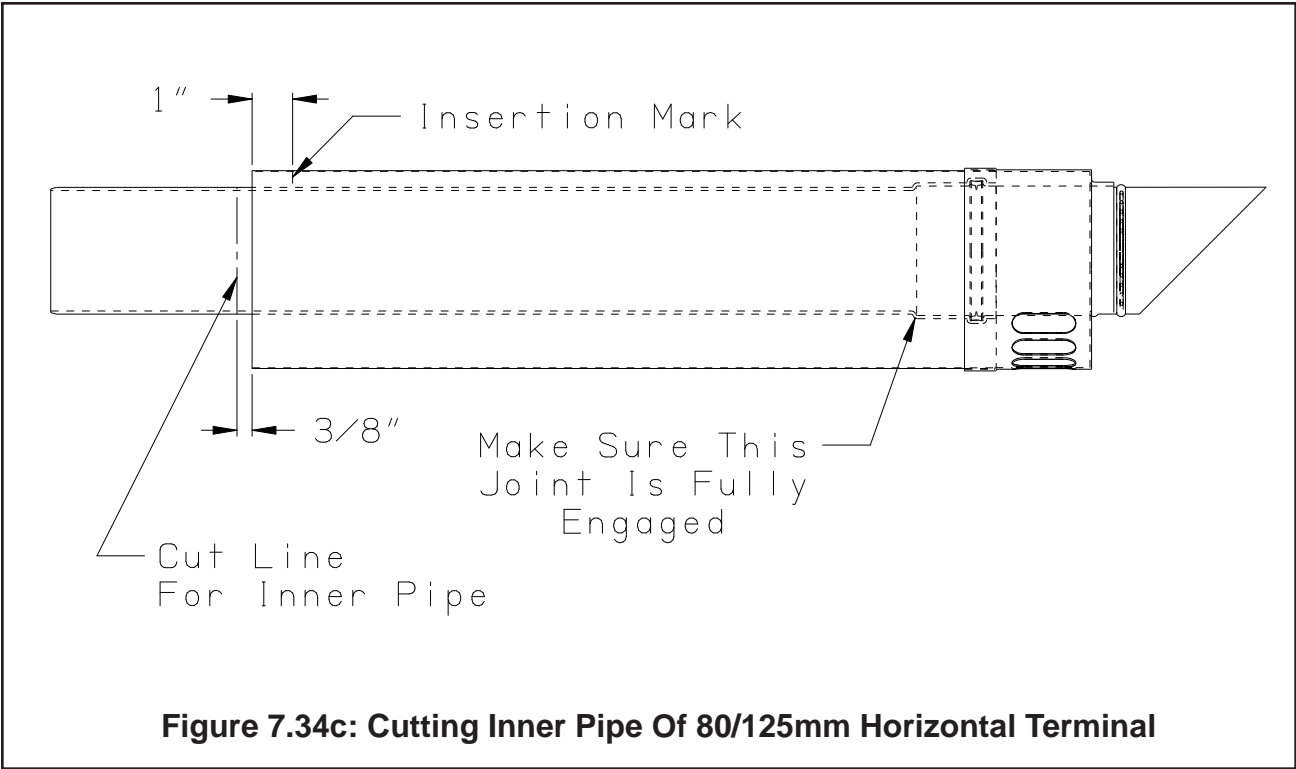
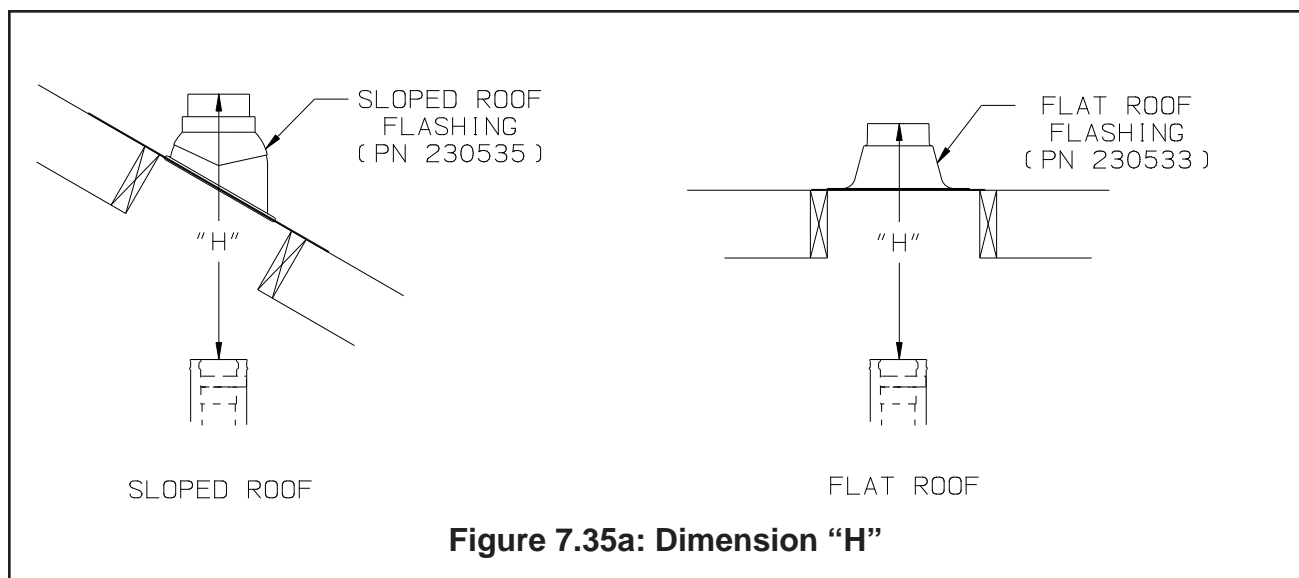
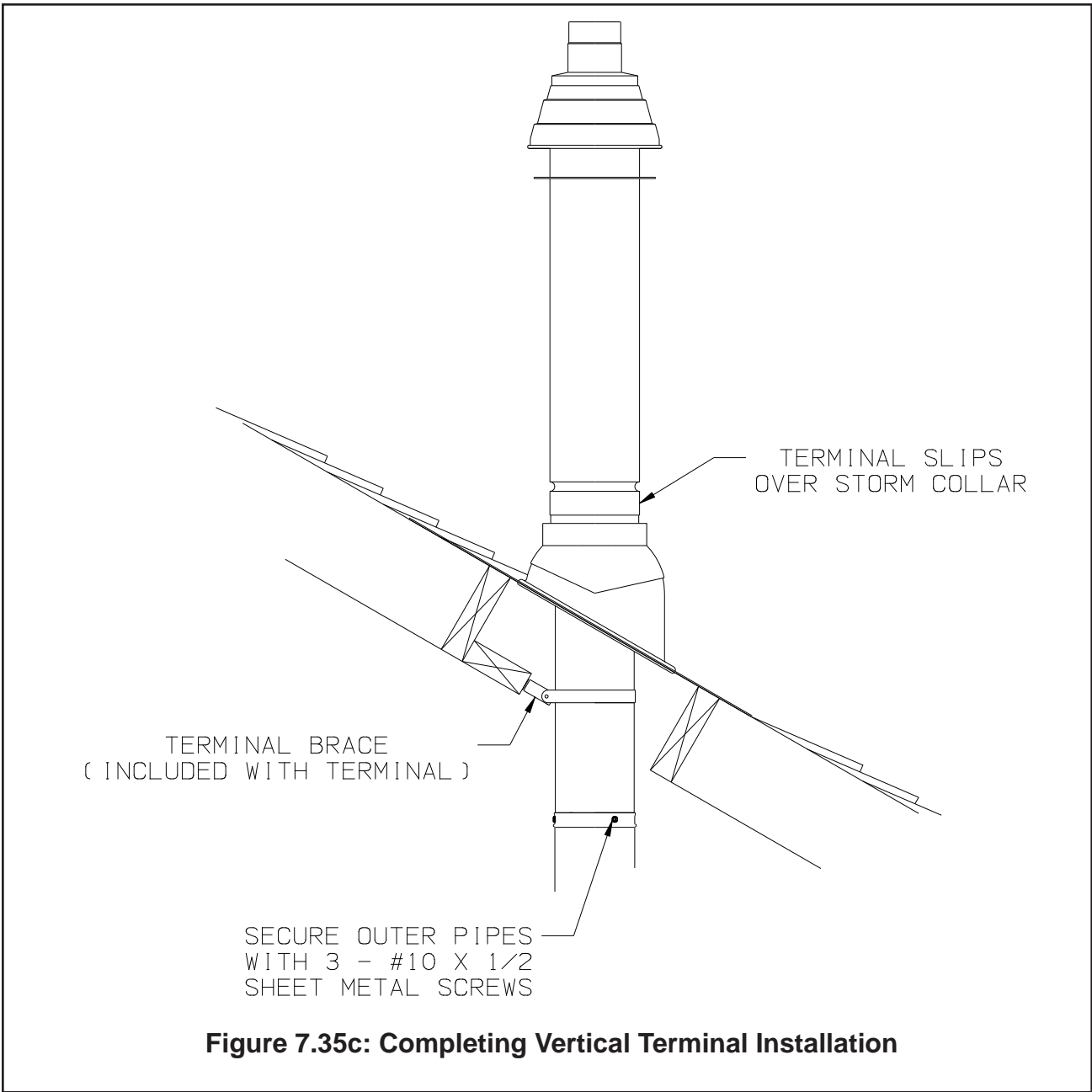
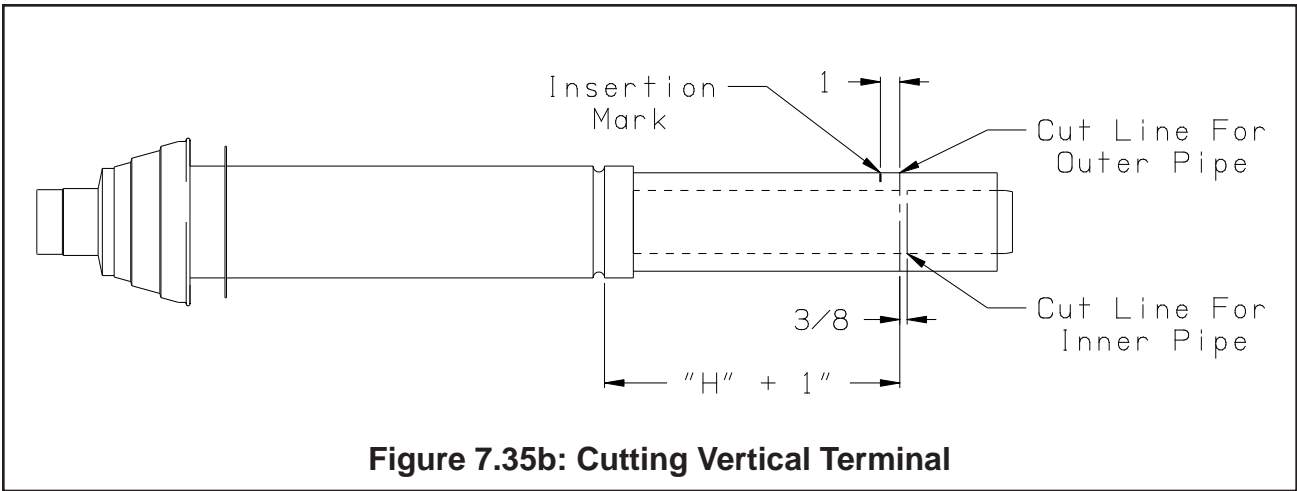


Figure 7.34b: Cutting Outer Pipe Of 80/125mm Horizontal Terminal



- 6) Vertical Terminal Installation - In addition to the vertical terminal, either a Flat Roof Flashing (PN 230533) or Sloped Roof Flashing (PN 230535) is required for this installation.
- Determine the center line of the terminal location on the roof. If the roof is flat, cut a 5-1/2" diameter hole for the terminal. If the roof is sloped, cut a hole large enough for the terminal to pass through the roof while remaining plumb. **Caution: If the boiler is installed directly under the hole, cover it while cutting the hole to prevent saw dust and other debris from falling into the boiler.**
 - Install the roof flashing using standard practice for the roofing system on the structure.
 - If not already done, assemble the venting system inside the building. The last section of pipe needs to be on the same center line as the terminal and within 19-1/4" of the top edge of the roof flashing (Figure 7.35a).
 - Measure distance "H" from the top edge of the storm collar to the end of the last fitting as shown in Figure 7.35a.
 - Add 1" to distance "H". Carefully mark this length on the pipe as shown in Figure 7.35b.
 - Cut the **outer pipe only** at the point marked in Step (e) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. De-burr the cut end with a file or emery cloth.
 - Place a mark on the aluminum inner pipe 3/8" beyond the end of the outer pipe (Figure 7.35b). Use a fine tooth hacksaw to cut the aluminum pipe and be careful to cut the pipe square. De-burr the cut edge of the aluminum pipe with a file or emery cloth.
 - Make a mark on the terminal section 1" from the cut end of the outer pipe as shown in Figure 7.35b.
 - Slip the terminal section through the roof from the outside. Push into the last section of vent pipe until the mark the mark made in Step (h) is not longer visible. Secure the terminal to the last piece of pipe with three #10 x 1/2" sheet metal screws. Drill a 1/8" hole through both outer pipes to start these screws. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2".**
 - Secure the terminal section to the inside of the roof structure using the mounting bracket provided with the terminal Figure 7.35c).
- 7) Chimney Chase Installation - A vertical 80/125mm vent system can be installed in an unused masonry chimney. This installation is similar to other vertical installations with the following exceptions (Also see Figure 7.36):
- The chimney chase elbow kit (PN230530) is used at the base of the chimney. This kit consists of a support elbow and a mounting bracket. Slip the elbow over the M10 x 35 screw in the support bracket. Determine the desired vertical location of the support elbow in the chimney and mark the location of the pin on the back of the support bracket on the back wall of the chimney. Drill a 7/16" dia x 2-1/2" deep hole at this location to support the back of the bracket. The front of the elbow mounting bracket is supported by the bottom of the opening into the chimney or by an installer supplied bracket.
 - Construct a weather-tight flat roof to cover the top of the old chimney. Install the vertical terminal through this roof using the flat roof flashing.





WARNING

- Do not attempt to construct a vertical vent system inside a chimney that is used to vent a fireplace or other appliances.
- Do not attempt to construct a vertical vent system inside a chimney flue adjacent to another flue used by a fireplace or other appliances.

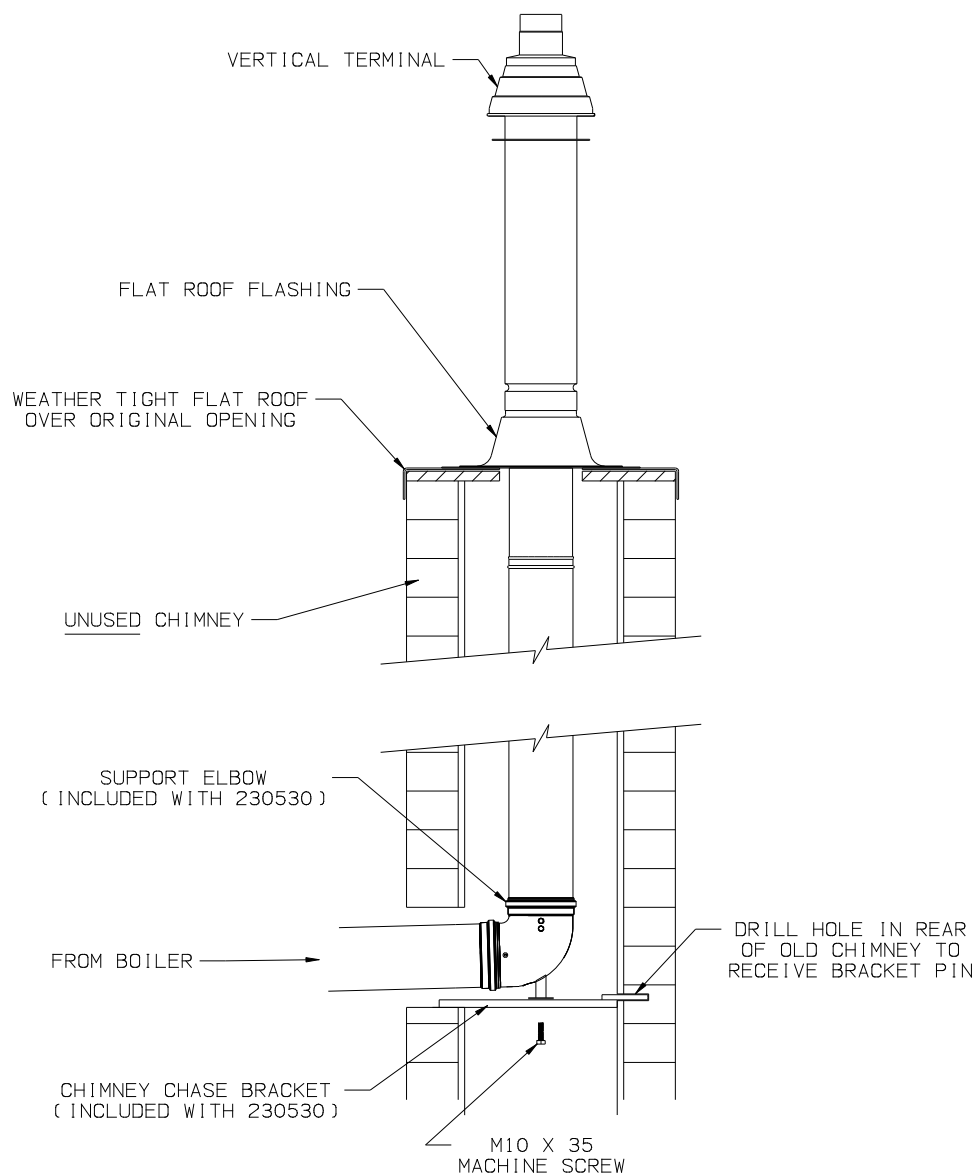


Figure 7.36: Chimney Chase Installation

E. Condensate Trap and Drain Line

All condensate which forms in the boiler or vent system leaves the boiler through the condensate trap. This trap allows condensate to drain while retaining flue gases in the boiler. This boiler is supplied with a length of drain hose already attached. Route this hose to a drain or other suitable location to dispose of the condensate. Note the following when disposing of the condensate:

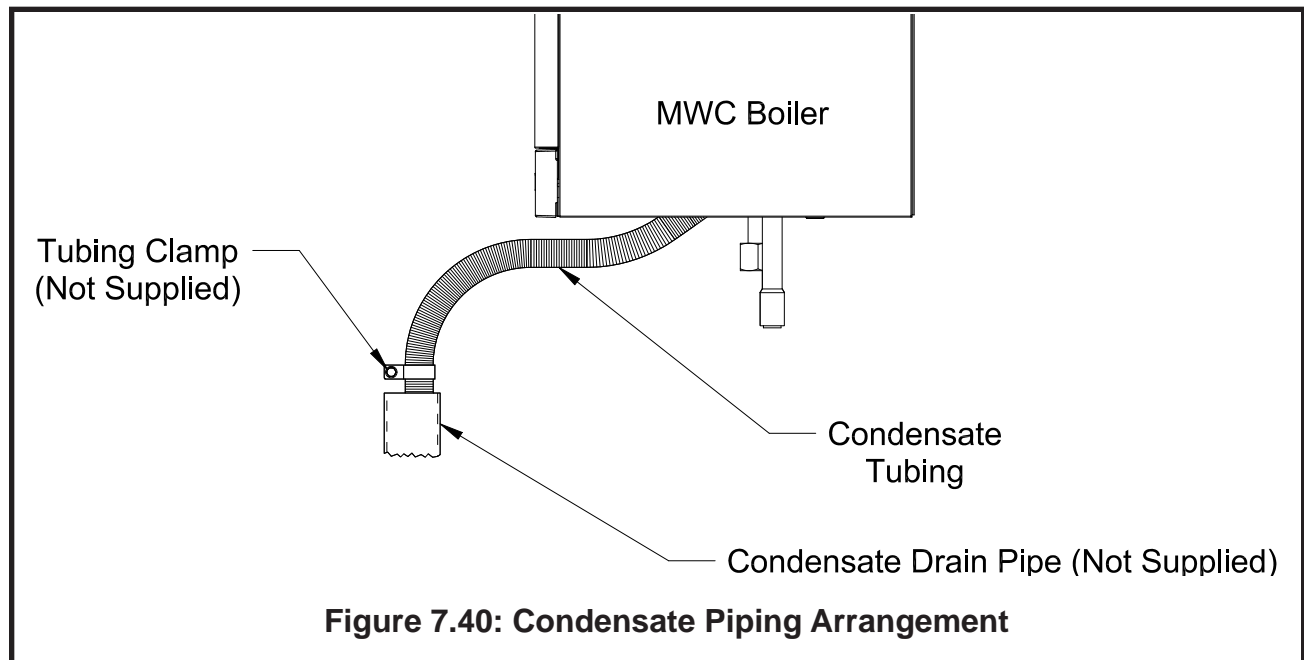
- If the condensate drain line must be extended, construct the extension from PVC or CPVC pipe. Insert the hose provided with the boiler into the end of the extension as shown in Figure 7.40.
- Condensate is slightly acidic. Do not use metallic pipe or fittings in the condensate drain line. Do not route the drain line through areas that could be damaged by leaking condensate.
- Some jurisdictions may require that the condensate be neutralized before being disposed of. Dispose of condensate in accordance with local codes.
- Do not route, or terminate, the condensate drain line in areas subjected to freezing temperatures.
- If the point of condensate disposal is above the trap, it will be necessary to use a condensate pump to move the condensate to the drain. In such cases, select a condensate pump that is approved for use with condensing furnaces. If overflow from this pump would result in property damage, select a pump with an overflow switch and use this switch to shut down the boiler. Alternatively, if heat is a necessity, use the overflow switch to trigger an alarm.
- Do not attempt to move the trap from the location shown in Figure 7.40. Do not attempt to substitute another trap for the one provided with the boiler.

WARNING

Failure to install the condensate trap and condensate drain in accordance with the above instructions could cause flue gas to enter the building, resulting in personal injury or death.

CAUTION

Boiler condensate is corrosive. Route condensate drain line in a manner such that any condensate leakage will not cause property damage. Some jurisdictions may require that condensate be neutralized prior to disposal.



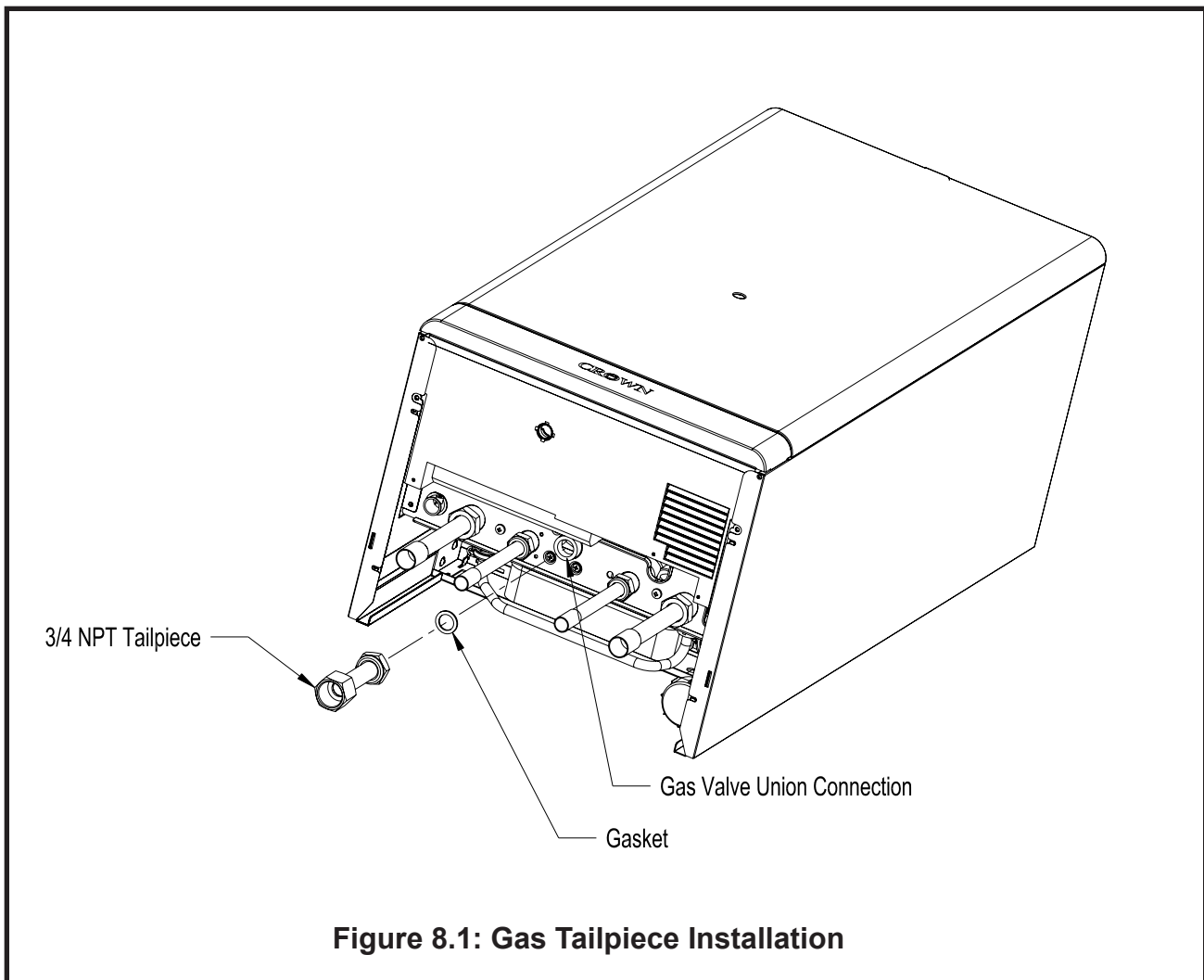
VIII Gas Piping

Gas piping to the boiler must be sized to deliver adequate gas for the boiler to fire at the nameplate input at an inlet pressure between the minimum and maximum values shown on the rating plate. For more information on gas line sizing, consult the utility or the *National Fuel Gas Code ANSI Z223.1 /NFPA 54* and/or *CAN/CSA B 149.1 Natural Gas and Propane Installation Code*.

The gas line is connected to the boiler using the 3/4" NPT female connection in the tailpiece shown in Figure 8.1. This tailpiece is supplied in the boiler's fitting package, along with the fiber gasket shown.

Figure 8.2 shows the finished gas piping connection to the MWC boiler. A sediment trap must be installed upstream of all gas controls. Install the factory provided manual shut-off valve outside the jacket with a ground joint union as shown.

The boiler and its gas connection must be leak tested before placing the boiler in operation. When doing this, the boiler and its individual shut-off must be disconnected from the rest of the system during any pressure testing of that system at pressures in excess of 1/2 psi. When pressure testing the gas system at pressures of 1/2 psi or less, isolate the boiler from the gas supply system by closing its individual manual shut-off valve.



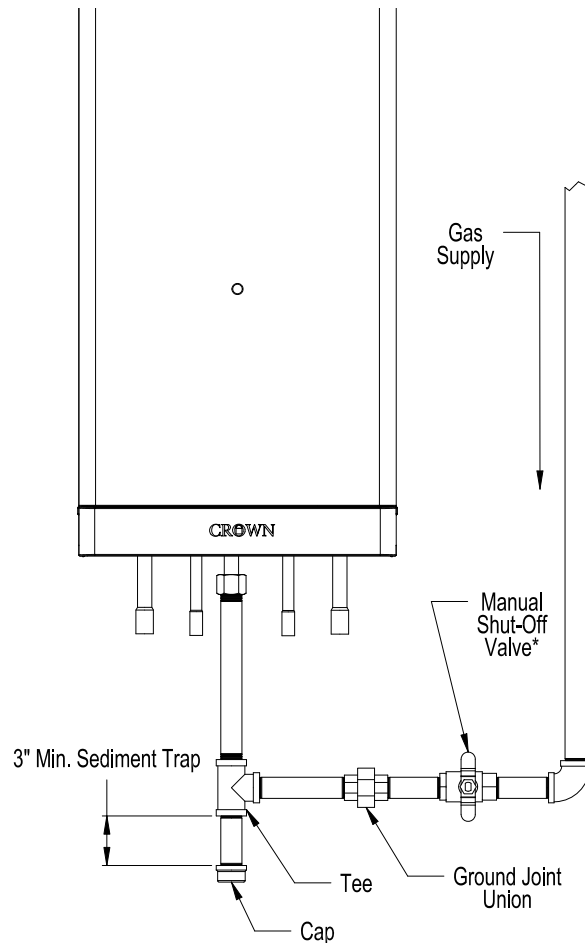


Figure 8.2: Gas Connection To Boiler

IX System Piping

CAUTION

- Install boiler so that the gas ignition system components are protected from water (dripping, spraying, rain, etc) during appliance operation and service (circulator replacement, etc).
- Operation of this boiler with continuous return temperatures below 86F can cause severe heat exchanger corrosion damage.
- Operation of this boiler in a system having frequent additions of make-up water can cause severe heat exchanger damage.
- Do not use toxic additives, such as automotive antifreeze, in a hydronic system.
- Before connecting boiler, make sure that the system is free of sediment, flux and any residual boiler water additives. Flush the system if necessary to ensure that these contaminants are removed.

A. Standard Piping

Figure 9.1 shows typical boiler system connections on a single zone system. Additional information on hydronic system design may be found in *Installation of Residential Hydronic Systems* (Pub. #200) published by the Hydronics Institute in Berkeley Heights, NJ. The components in this system and their purposes are as follows:

- 1) Relief valve (Included & Required) – Install the relief valve in the 3/4" connections on the top of the boiler as shown in Figure 9.3. The relief valve shipped with the boiler is set to open at 30 psi. This valve may be replaced with one having a setting at or below the Maximum Allowable Working Pressure (MAWP) shown on the ASME plate attached to the heat exchanger. If the valve is replaced, the replacement must have a relief capacity in excess of the Minimum Relief Valve Capacity shown on the rating plate.
Pipe the discharge of the relief valve to a location where water or steam will not create a hazard or cause property damage if the valve opens. The end of the discharge pipe must terminate in an unthreaded pipe. If the relief valve discharge is not piped to a drain, it must terminate at least 6 inches above the floor. Do not run relief valve discharge piping through an area that is prone to freezing. The termination of the relief valve discharge piping must be in an area where it is not likely to become plugged by debris.

DANGER

- Pipe relief valve discharge to a safe location.
- Do not install a valve in the relief valve discharge line.
- Do not move relief valve from factory specified location.
- Do not plug relief valve discharge.

- 2) Circulator (Included & Required) – This boiler is equipped with a factory piped circulator, which is often the only circulator required. Figure 9.2 is a performance curve for this circulator. Note that this curve has been adjusted to take into the account of all internal boiler piping. This performance curve therefore shows the amount of flow that can be achieved at various heating system pressure drops.
- 3) Throttling Valve or Flow Restrictor - This boiler is equipped with a differential pressure switch to prove that there is flow through the boiler before allowing it to fire. Reliable operation of this switch requires that there be a head loss across the heating system of at least 5.1ft wc. In order to assure that this head loss will always be present, either a throttling valve must be installed as shown in Figure 9.1 or the flow restrictor shown in Figure 9.4 must be installed. Use the following guidelines to determine which device to use:
 - If the boiler is installed on a single zone system, or one having zone valves, install the throttling valve. At start-up, start with this valve fully open and then close it just enough to obtain reliable operation of the pressure switch.
 - If the boiler is connected to a primary-secondary system (Figure 9.5), install the orifice in the supply tailpiece as shown in Figure 9.4.
 - If the boiler is connected to a circulator zone system, primary-secondary piping must be used. Install the orifice as shown in Figure 9.4.

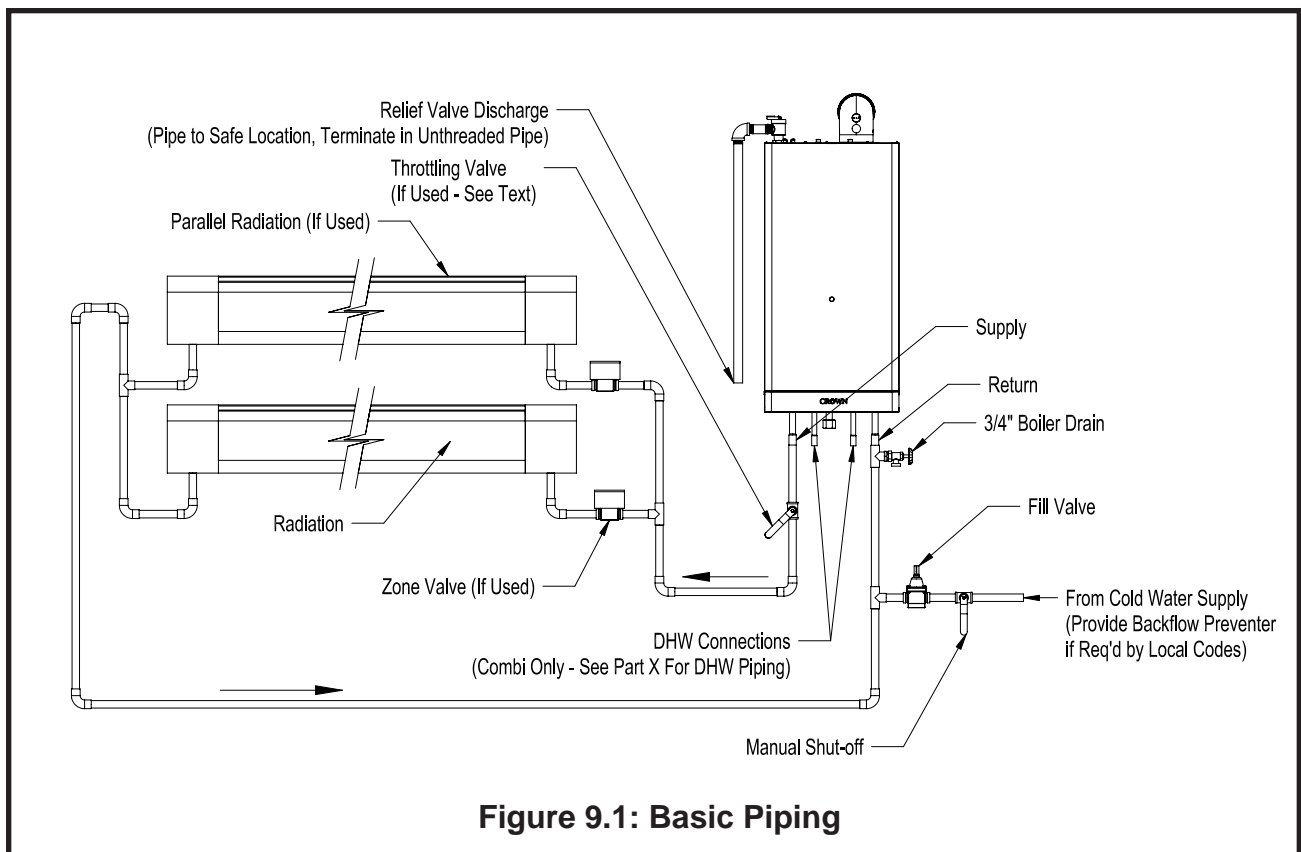


Figure 9.1: Basic Piping

CAUTION

Failure to install the throttling valve or flow restrictor described on the boiler supply could result in unreliable boiler operation

- 4) **Expansion Tank (Included & Required)** – This boiler is equipped with a built in expansion tank. This tank is suitable for use on systems having a water content of up to 40.6 Gal. This tank is pressurized to approximately 14.7 psi.
- 5) On systems having water content in excess of 40.6 gallons, a second expansion tank must be provided. Locate this tank as close as possible to the return connection on the boiler.
- 6) As shipped, the expansion tank is suitable for installations where the vertical distance between the relief valve and the highest point in the system is 23ft or less. Consult the factory if it is desired to install this boiler on a system having a greater height.
- 7) **Fill Valve (Required)** – Either a manual or automatic fill valve may be used. Connect the fill as shown in Figure 9.1.
- 8) **Automatic Air Vent (Included & Required)** – The boiler is equipped with an automatic air vent. Manual vents will usually be required in other parts of the system to remove air during initial fill.
- 9) **Low Water Protection** – This boiler is equipped with a flow switch which will only allow the boiler to fire when there is flow through the boiler, and therefore water in the heat exchanger.
- 10) **Isolation Valves (Optional - Not Shown)** – Isolation valves are useful if the boiler must be drained, as they will eliminate having to drain and refill the entire system.
- 11) **Drain Valve (Required)** – Install a 3/4" boiler drain (not supplied) in the return piping as shown in Figure 9.1.

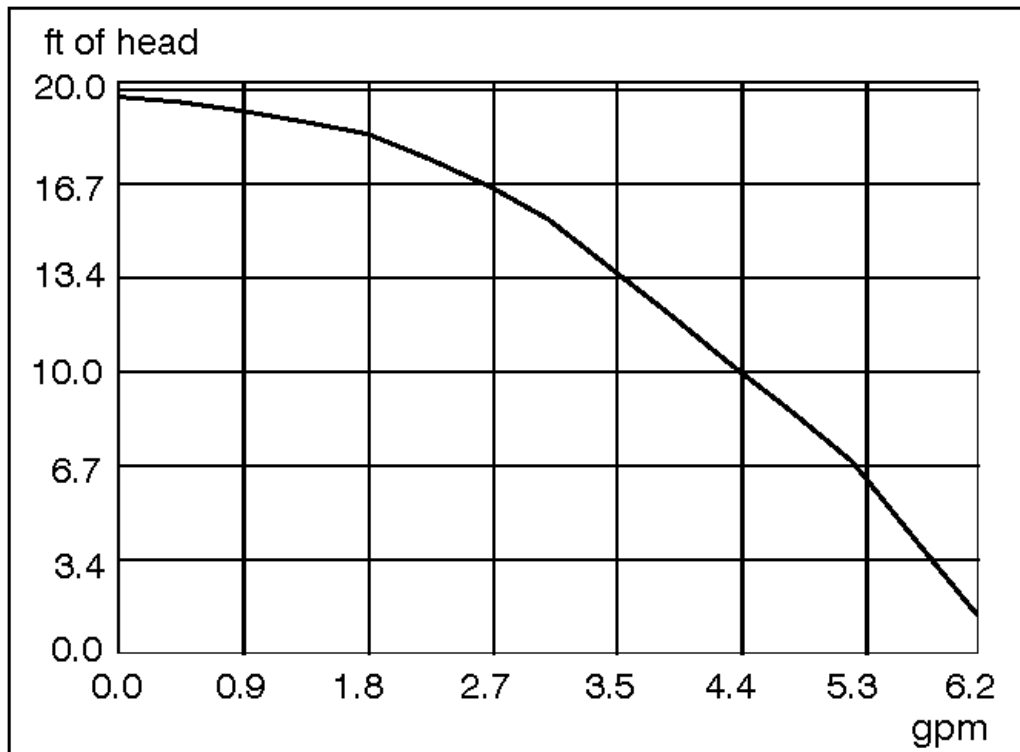


Figure 9.2: Circulator Performance Curve (Adjusted For Pressure Drop Through Boiler)

B. Boiler Connections

Boiler supply and return connections are located on the bottom of the boiler as shown in Figure 9.4. Copper 3/4" tail pieces are provided in the fitting bag along with gaskets. Sweat the first copper fittings to these tail pieces and then connect the tail pieces to the boiler using the gaskets provided. If required, install the flow restrictor in the supply as shown in Figure 9.4.

The relief valve is installed using the union connection on top of the boiler as shown in Figure 9.3. Route the relief valve discharge to a safe location as described on Page 36.

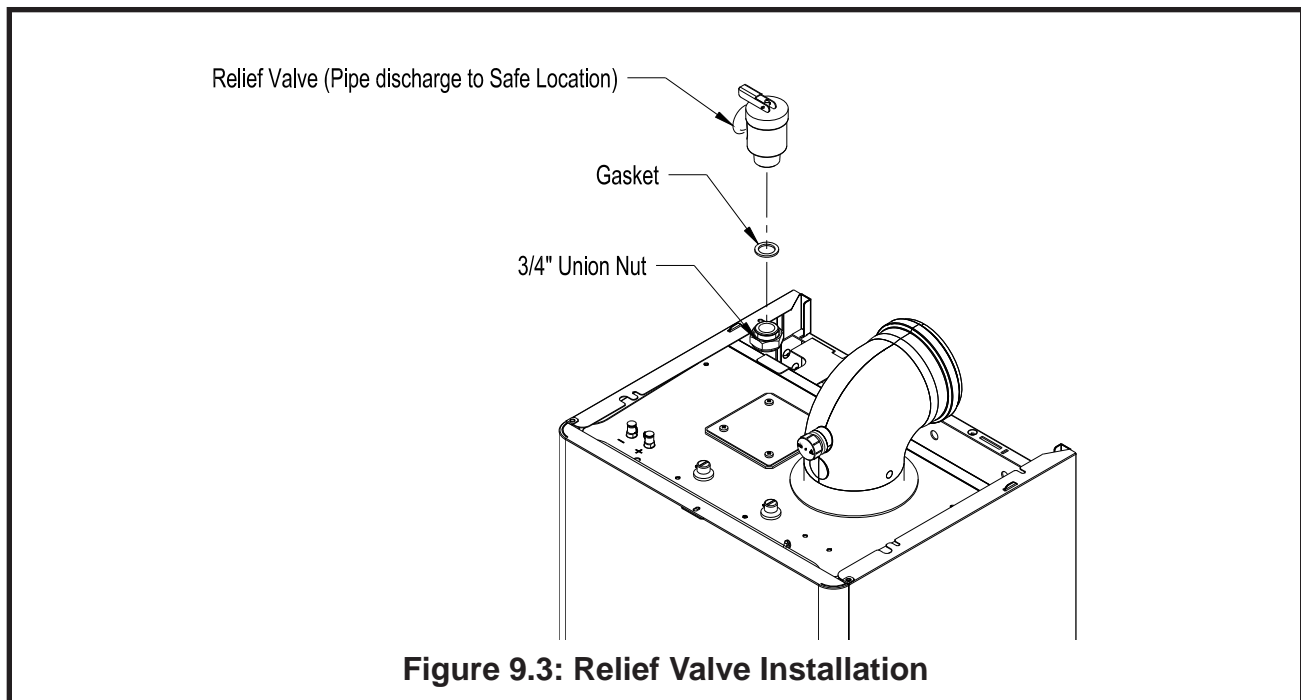
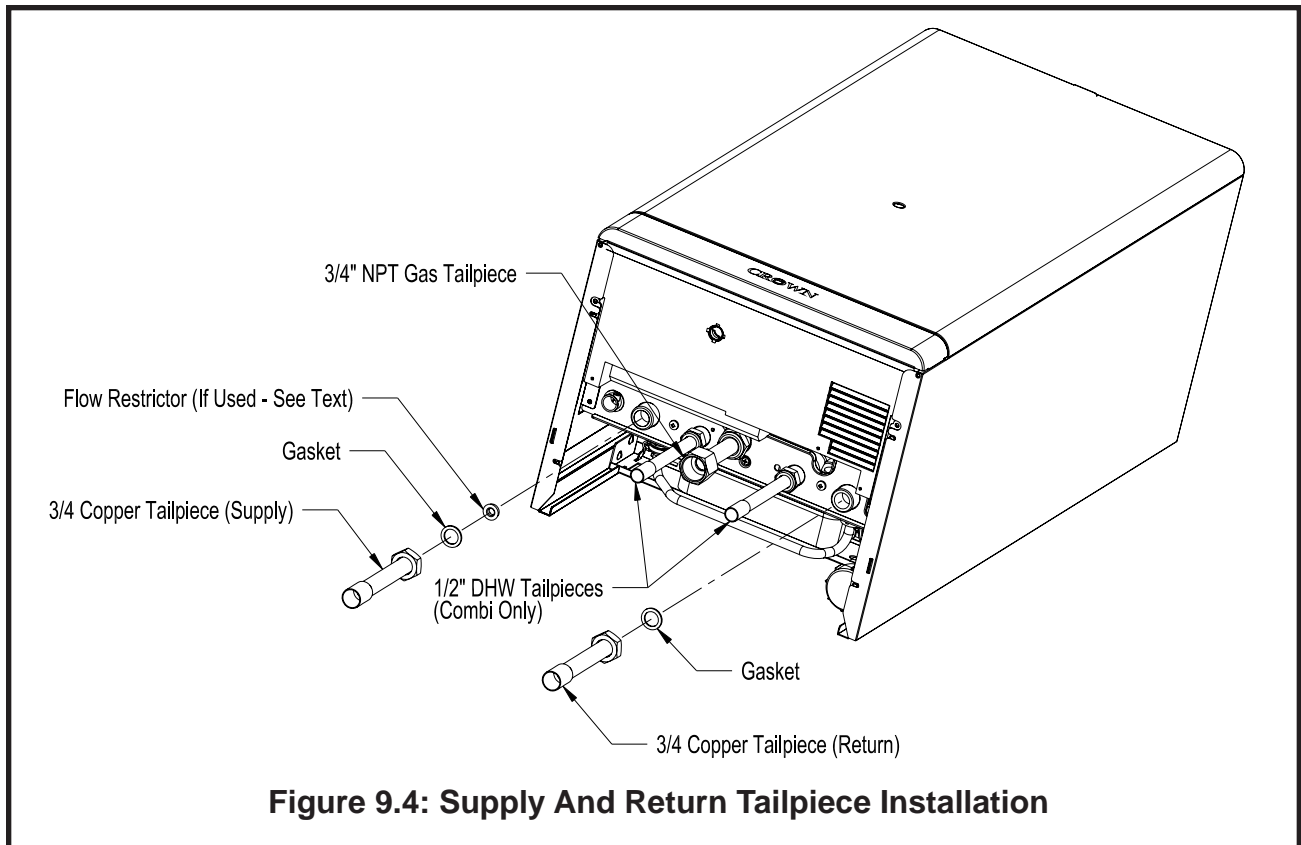


Figure 9.3: Relief Valve Installation



C. Piping for Special Situations

Certain types of heating systems have additional requirements. Some examples follow:

- 1) **Primary-Secondary Piping** – Primary-secondary piping is required when circulator zoning is used or when the system flow rate must be greater than 5.5 GPM. In these cases, the piping shown in Figure 9.5 is used so that the flow through the system is completely independent of the flow through the boiler. This ensures reliable operation of the boiler’s flow switch.
When assembling the piping shown in Figure 9.5, be sure to observe the minimum dimensions shown. The minimum pipe size of the primary piping in the vicinity of the tees is 1 1/4". At least 11" (8 diameters) of 1-1/4" straight pipe must be installed upstream of the tees as shown. At least 5 1/2" (4 diameters) of 1-1/4" straight pipe must be installed downstream of the tees.
- 2) **Piping with a Chiller** – If the boiler is used in conjunction with a chiller, pipe the boiler and chiller in parallel as shown in Figure 9.6. Use isolation valves to prevent chilled water from entering the boiler.
- 3) **Air Handlers** – Where the boiler is connected to air handlers through which refrigerated air passes, use flow control valves in the boiler piping or other automatic means to prevent gravity circulation during the cooling cycle.

D. Internal Boiler Piping

Schematics of the internal boiler piping are shown in Figures 9.7 and 9.8 for the MWC116E*T (combi) and MWC116E*L (heat-only) models respectively. A schematic of the internal domestic hot water piping for the MWCE*T is shown in Figure 10.3.

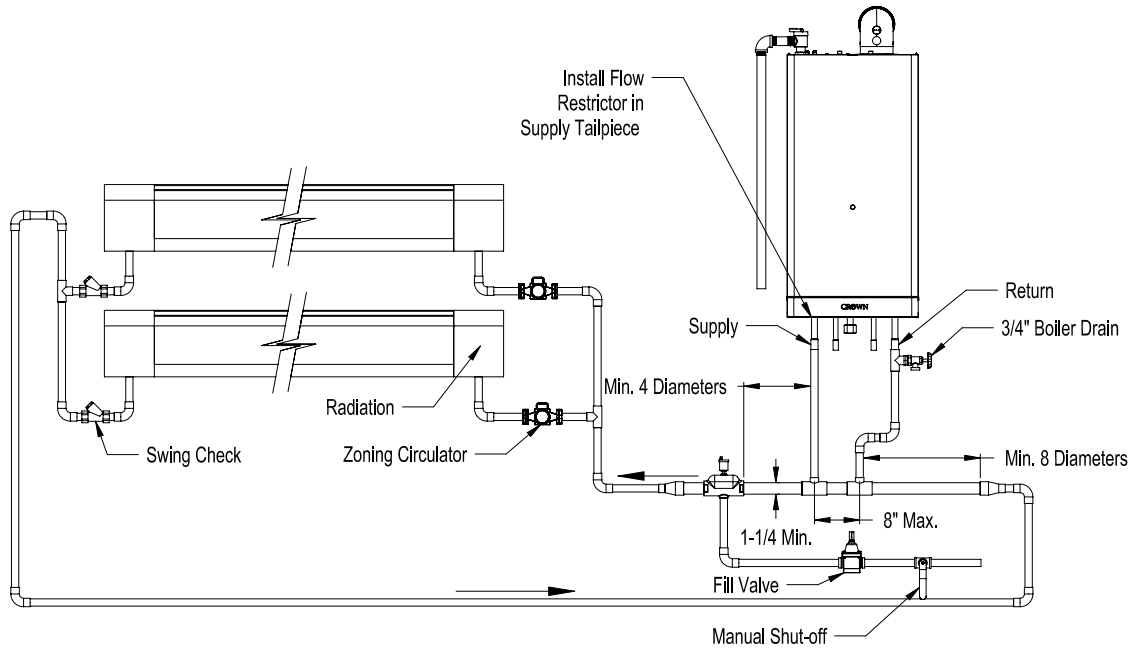


Figure 9.5: Primary-Secondary Piping

For Heating: Close Valves "A" and "B", Open Valves "C" and "D"
 For Cooling: Open Valves "A" and "B", Close Valves "C" and "D"

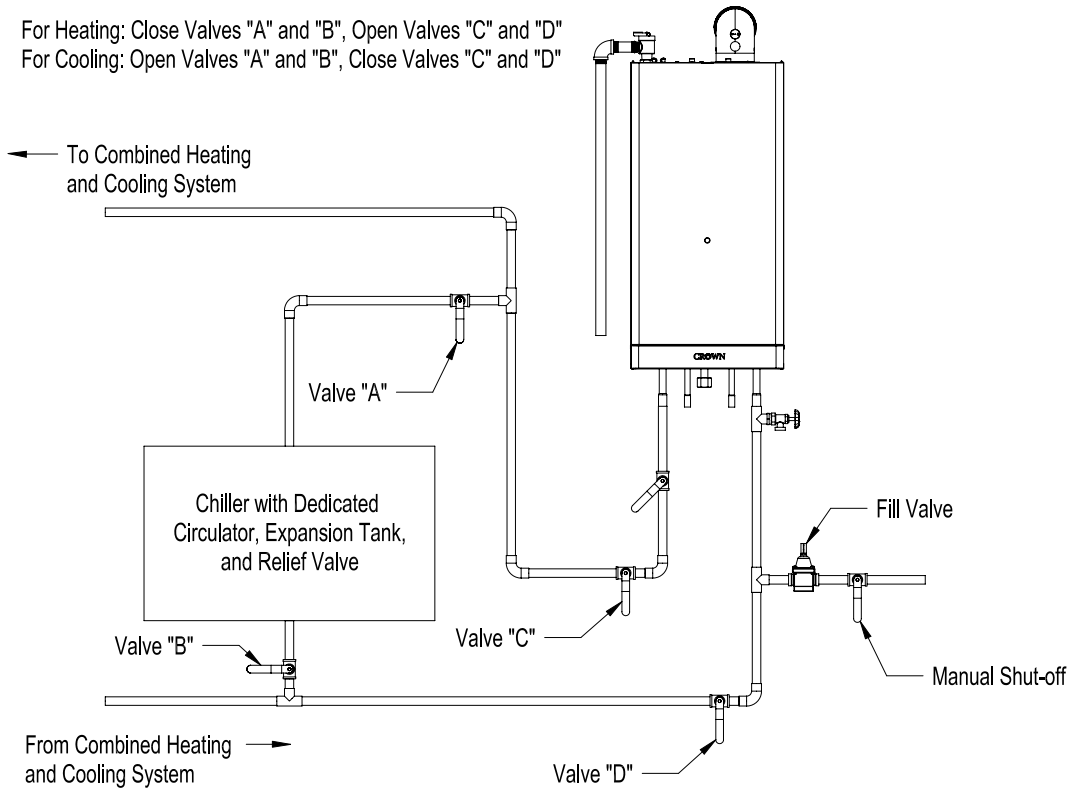
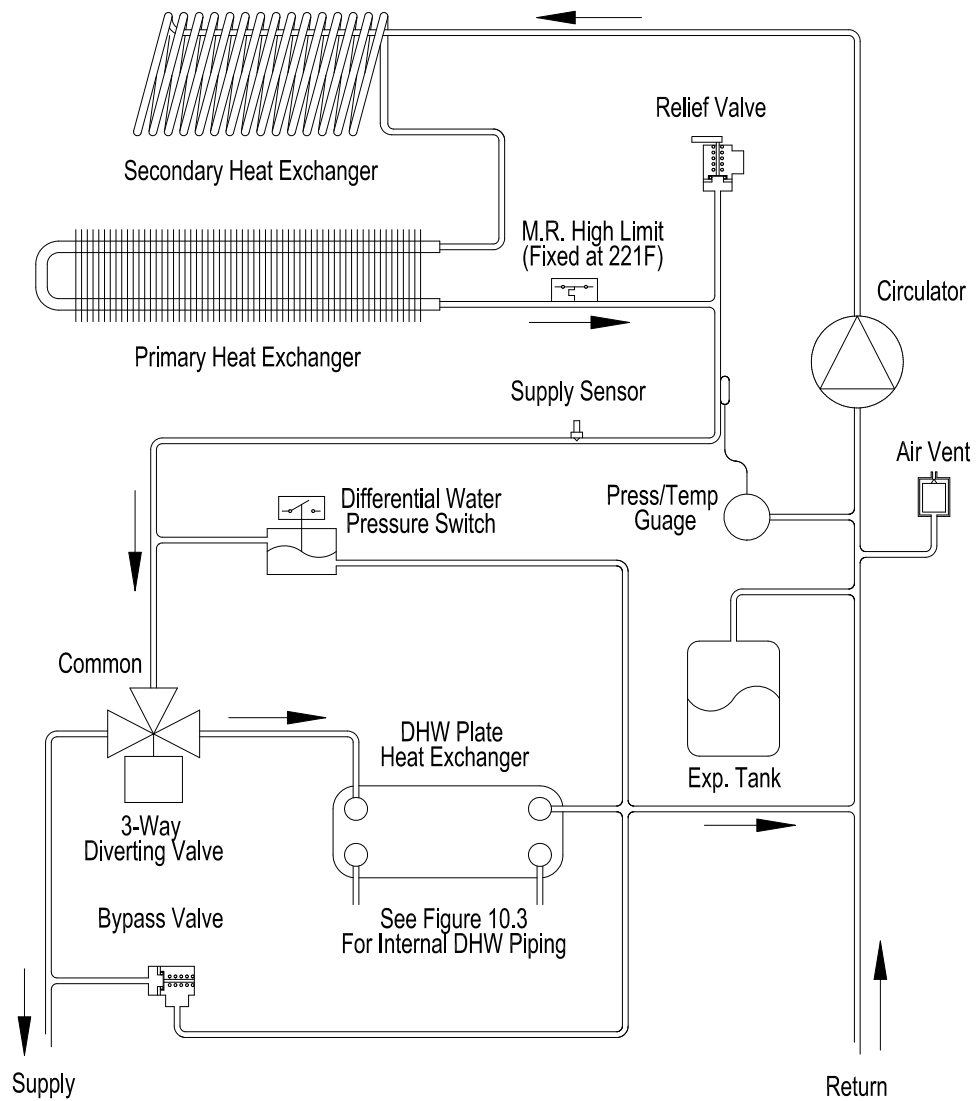


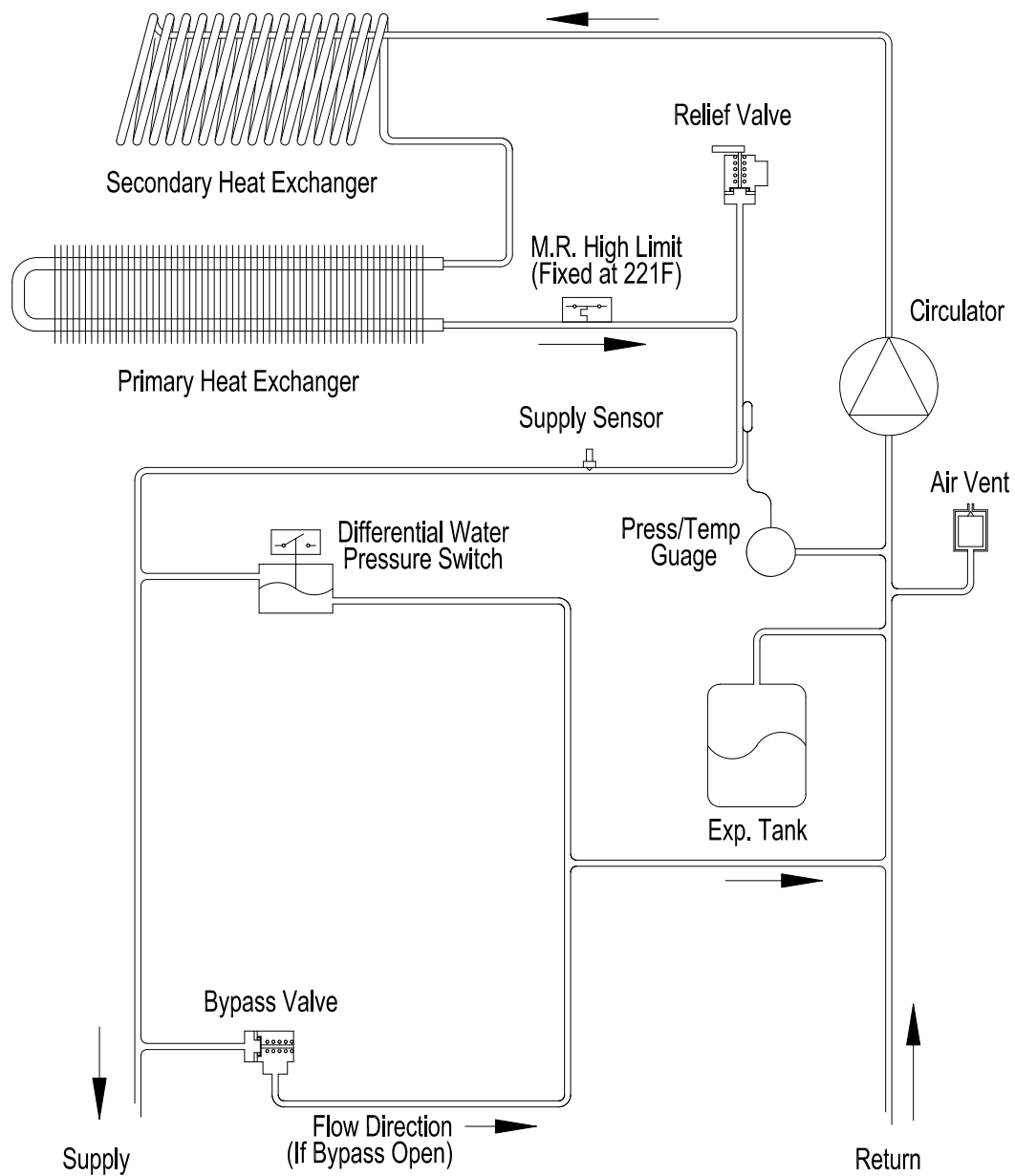
Figure 9.6: Chiller Piping



Notes:

- 1) Bypass Valve, 3-Way Valve, and Water Pressure Switch are physically combined into one assembly.
- 2) Air Vent, Pressure Gauge Tap, and Expansion Tank are physically connected into inlet side of Circulator body.
- 3) Bypass Valve is normally closed
- 4) Differential Water Pressure Switch closes when pressure difference between supply and return exceeds 5.1 ftwc

Figure 9.7: MWC116E*T (Combi) Internal Boiler-Side Piping Schematic



Notes:

- 1) Bypass Valve, and Water Pressure Switch are physically combined into one assembly.
- 2) Air Vent, Pressure Gauge Tap, and Expansion Tank are physically connected into inlet side of Circulator body.
- 3) Bypass Valve is normally closed
- 4) Differential Water Pressure Switch closes when pressure difference between supply and return exceeds 5.1 ftwc

Figure 9.8: MWC116E*L (Heat-Only) Internal Piping Schematic

X. Domestic Water Piping

CAUTION

If the MWC is connected to a water supply having a hardness in excess of 200PPM, scale may prematurely form in the DHW heat exchanger, significantly shortening its life. If necessary, soften the water upstream of the cold water connection to the MWC.

If the MWC is equipped for domestic hot water (DHW) production, connect the domestic hot water piping as shown in Figure 10.1. Connections to the boiler are made with 1/2" copper tail pieces as shown in Figure 10.2. Solder the first fitting to these tail pieces before mounting them on the boiler. The components in this system and their functions are as follows:

- 1) Anti-scald Devices (Required - Not Shown) - Install anti-scald protection devices in accordance with local codes. In the absence of any local Codes, install such devices as required by the *Uniform Plumbing Code* (IAPMO UPC).

WARNING

Like all domestic water heaters, the MWC is capable of generating water that is hot enough to cause injury or death due to scalding. To minimize the risk of scalding:

- **Set domestic hot water (DHW) thermostat as low as possible (see the Start-up Section of this manual for the location of this thermostat.**
- **Feel water before showering or bathing.**
- **If anti-scald or anti-chill protection is required, use devices specifically designed for such service. Install and maintain these devices in accordance with the manufacturer's instructions.**

- 2) Flow Restrictor (Recommended) - If domestic hot water is drawn from the MWC at a rate in excess of the rating in Table 2.2, the temperature of the hot water may be too low to be of use. The use of a flow restrictor will prevent this problem by limiting the rate at which water can pass through the DHW heat exchanger. If a restrictor is used, select one having a rating in GPM approximately equal to that shown in Table 2.2.
- 3) Pressure Relief Valve (Required) - Limits the pressure in the domestic hot water piping. Use a valve designed for DHW service, such as the Watts #3L or #53L. Note that this is a pressure relief valve, not a T&P valve. Select a valve with a pressure setting less than or equal to 145 psi. Pipe the discharge to a safe location using piping the same size as the discharge connection on the valve.
- 4) Hose Bib Valves (Recommended) - These valves permit the DHW plate heat exchanger be periodically "back flushed" to remove sediment.
- 5) Globe or Ball Valve (Recommended) - Used to aid in back flushing the heat exchanger and to isolate the DHW piping if it must be serviced. In addition, the upstream valve may be used to limit the DHW flow if necessary.

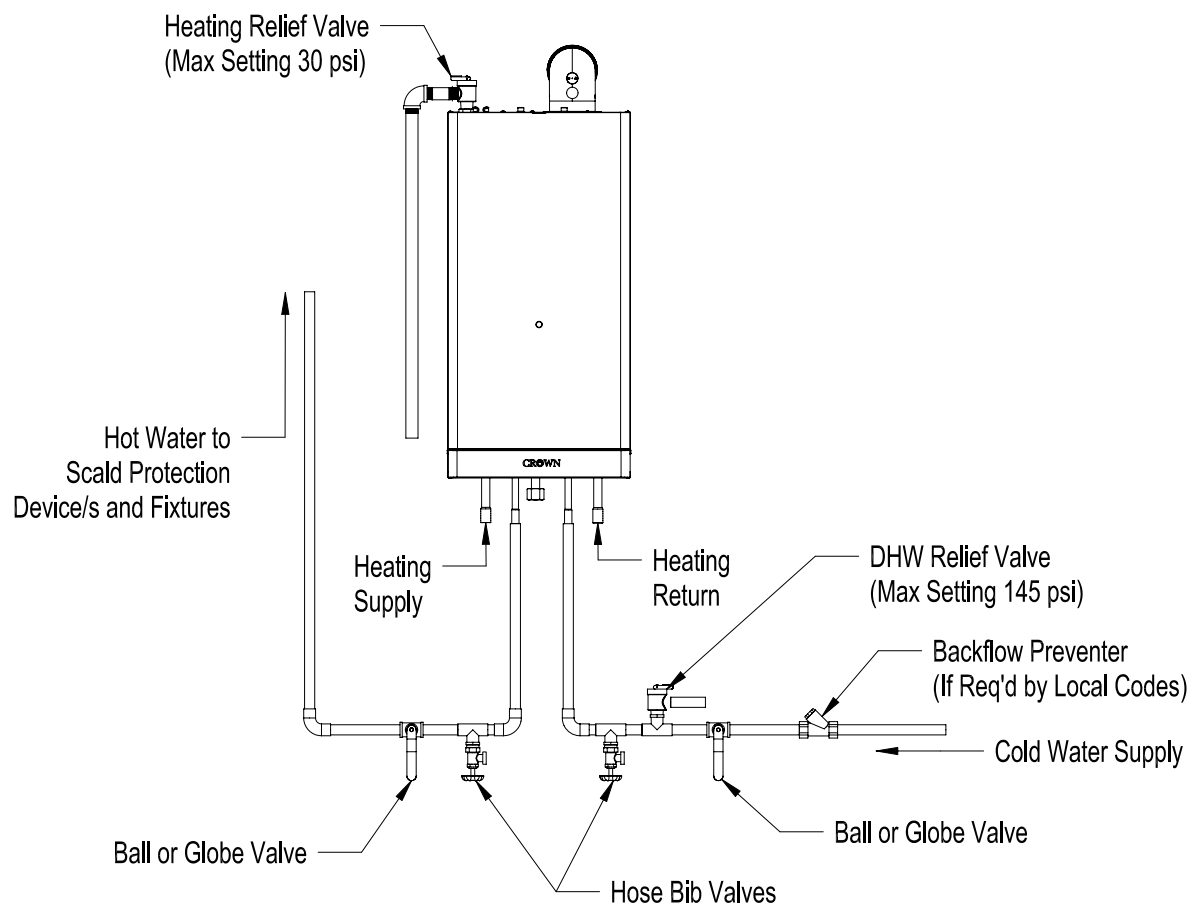


Figure 10.1: DHW Piping

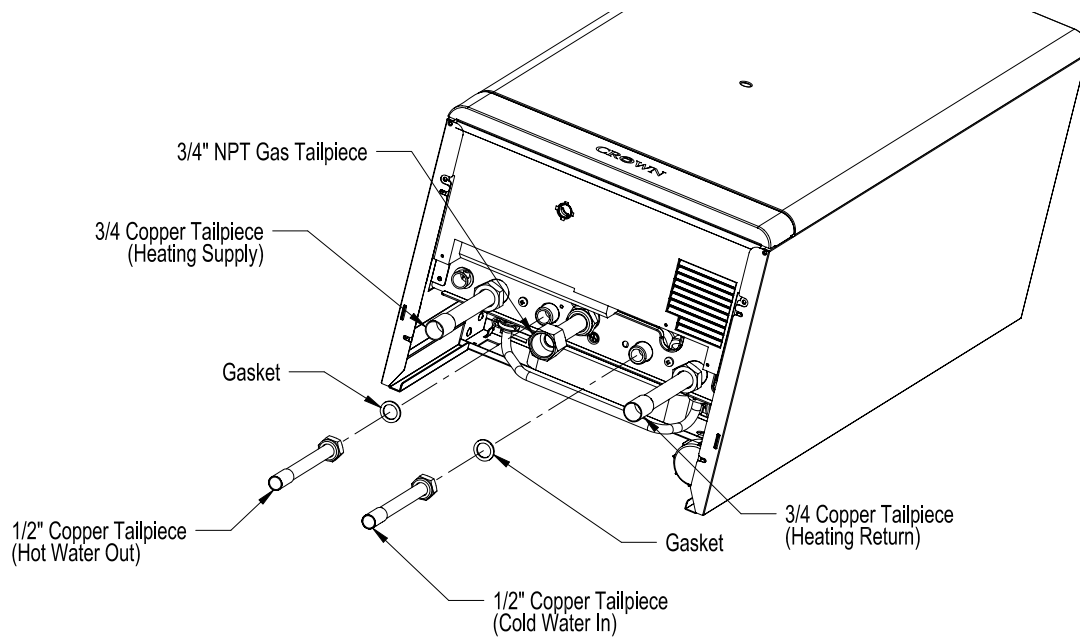
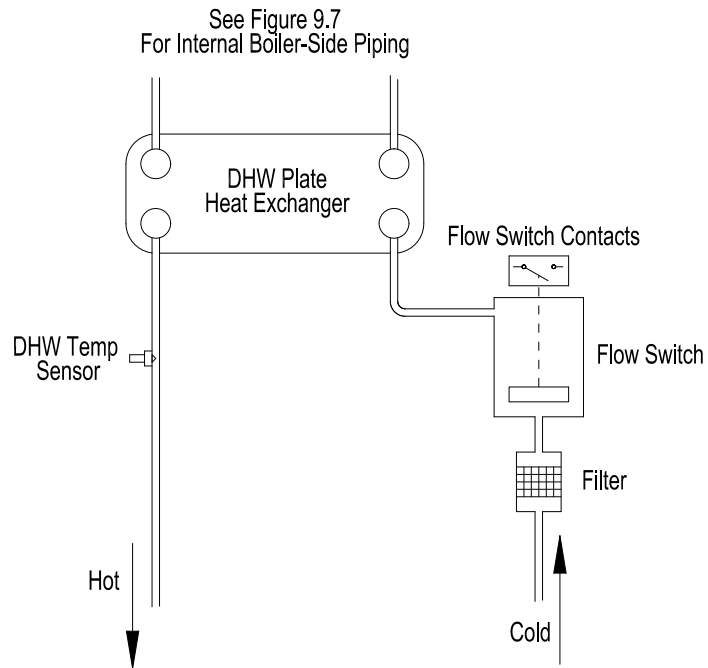


Figure 10.2: DHW Tailpiece Installation



- Notes:
- 1) Flow Switch and Filter are physically combined into one assembly.
 - 2) Flow Switch Contacts are magnetically linked to Flow Switch Plunger

Figure 10.3: MWC116E*T (Combi) Internal DHW-Side Piping Schematic

XI Wiring

WARNING

All wiring and grounding must be done in accordance with the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code (ANSI/NFPA 70), and / or, the Canadian Electrical Code Part I ,CSA C22.1,Electrical Code.

- 1) All electrical connections are line voltage (120 VAC) and are located under the cover on the cover on the top of the control box (Fig 11.1). To access these connections, use the following procedure:
 - a) Remove the three screws on the top of the front jacket panel and lift off the panel.
 - b) There are three screws in the bottom of each side jacket panel: two near the front and one near the back. Remove the two screws near the front and loosen the screw near the back.
 - c) Spread the side jacket panels apart slightly, slide the control box forward and then rotate the control box down as shown in Figure 11.1.
 - d) Remove the cover shown in Figure 11.1 to access the electrical connections.
- 2) Crown supplies the “Whip” shown in Figure 11.2 to route the power and thermostat wiring from an installer supplied junction box into the boiler’s control box. This Whip is designed to provide proper strain relief at the boiler and also permits the control box to be easily slid in and out of the boiler with all wiring connections intact. A 7/8 hole is located in the metal rail behind the control box as shown in Figure 11.3. Power and thermostat wiring is routed into the boiler from underneath (Figure 11.5) and the BX connector on the “boiler end” of the Whip is secured in this 7/8” opening.
- 3) Route the whip leads into the electrical connection compartment. **DO NOT CUT THE WHIP LEADS ON THE BOILER END.**
- 4) Two terminal blocks are located in the electrical connection compartment: one for power connections and one for the thermostat connections. Figure 11.3 shows the location of these terminal blocks in the connection compartment.
- 5) Connect the whip leads to the terminals as shown in Figure 11.4:

<u>Whip Color</u>	<u>To Factory Wire Color</u>	<u>Description</u>
Black	Brown	120VAC “Hot”
White	Blue	120 VAC Neutral
Green	Green/Yellow	Ground
Orange (either)	Blue	120VAC Thermostat
Orange (either)	Red	120VAC Thermostat

Important: Remove the factory installed jumper from the thermostat terminals (Figure 10.4)

- 6) Reinstall the compartment cover removed in Step #1d.
- 7) Figure 11.5 shows connections at the junction box end of the whip. Provide a dedicated circuit for the boiler with at least one emergency shut-off switch located in accordance with applicable codes. The thermostat connections provided are 120VAC. If a thermostat is directly connected to these leads, it and all intervening wiring, must be suitable for use with 120VAC power. If it is desired to control the boiler with a low voltage thermostat, or other low voltage control system, use a fan center to do so as shown in Figure 11.6

WARNING

Attempting to directly connect a low voltage thermostat and/or low voltage wiring to the orange thermostat leads could cause property damage and/or create hazard of fire or electricutuion.

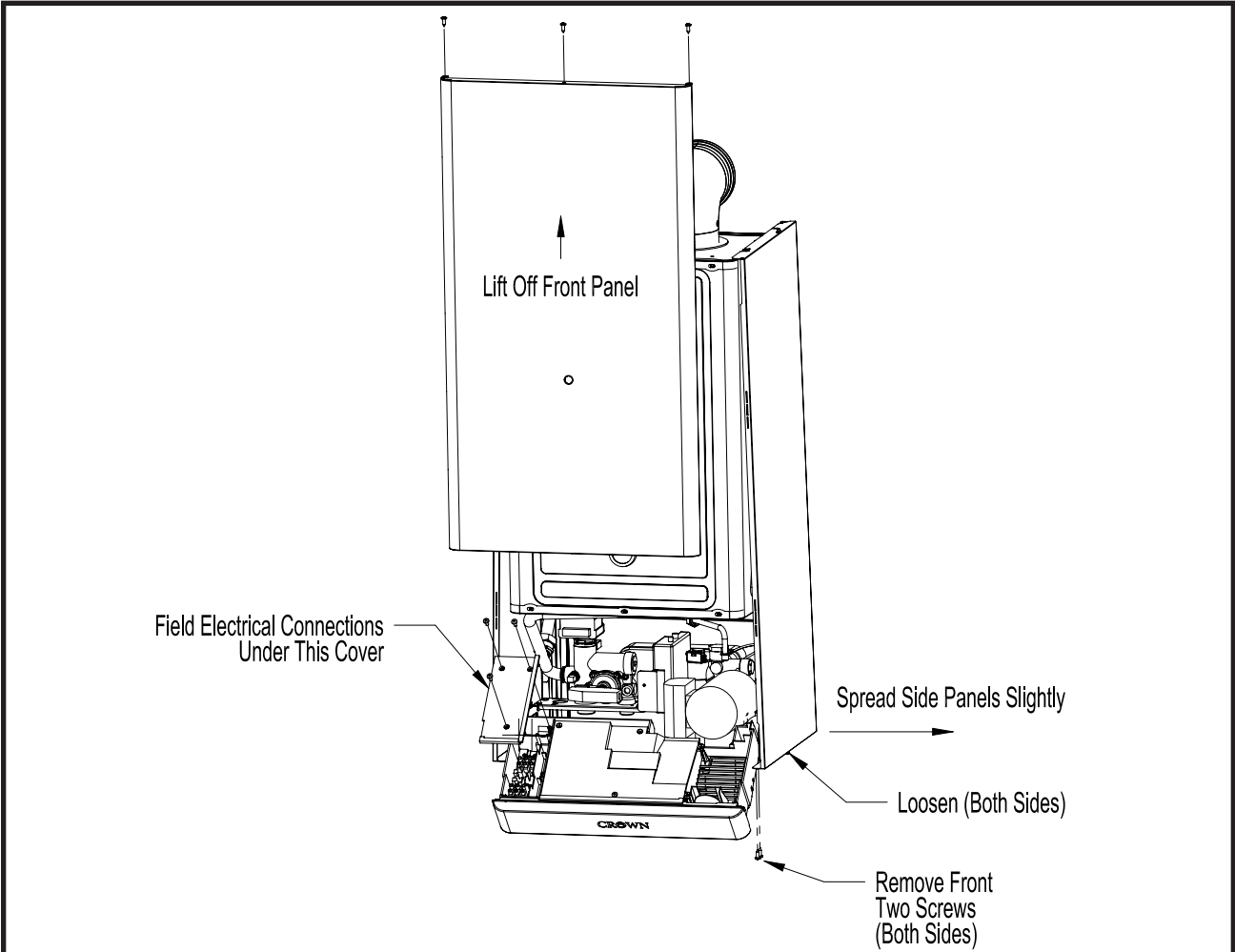


Figure 11.1: Accessing Electrical Connections

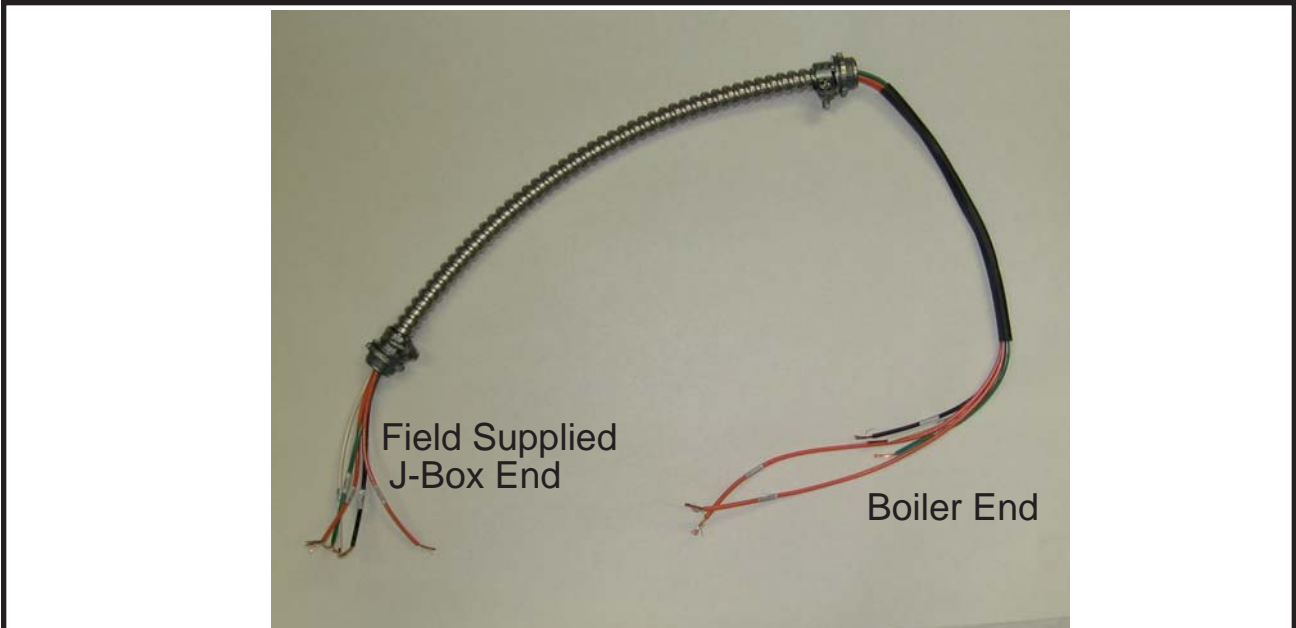


Figure 11.2: "Whip"

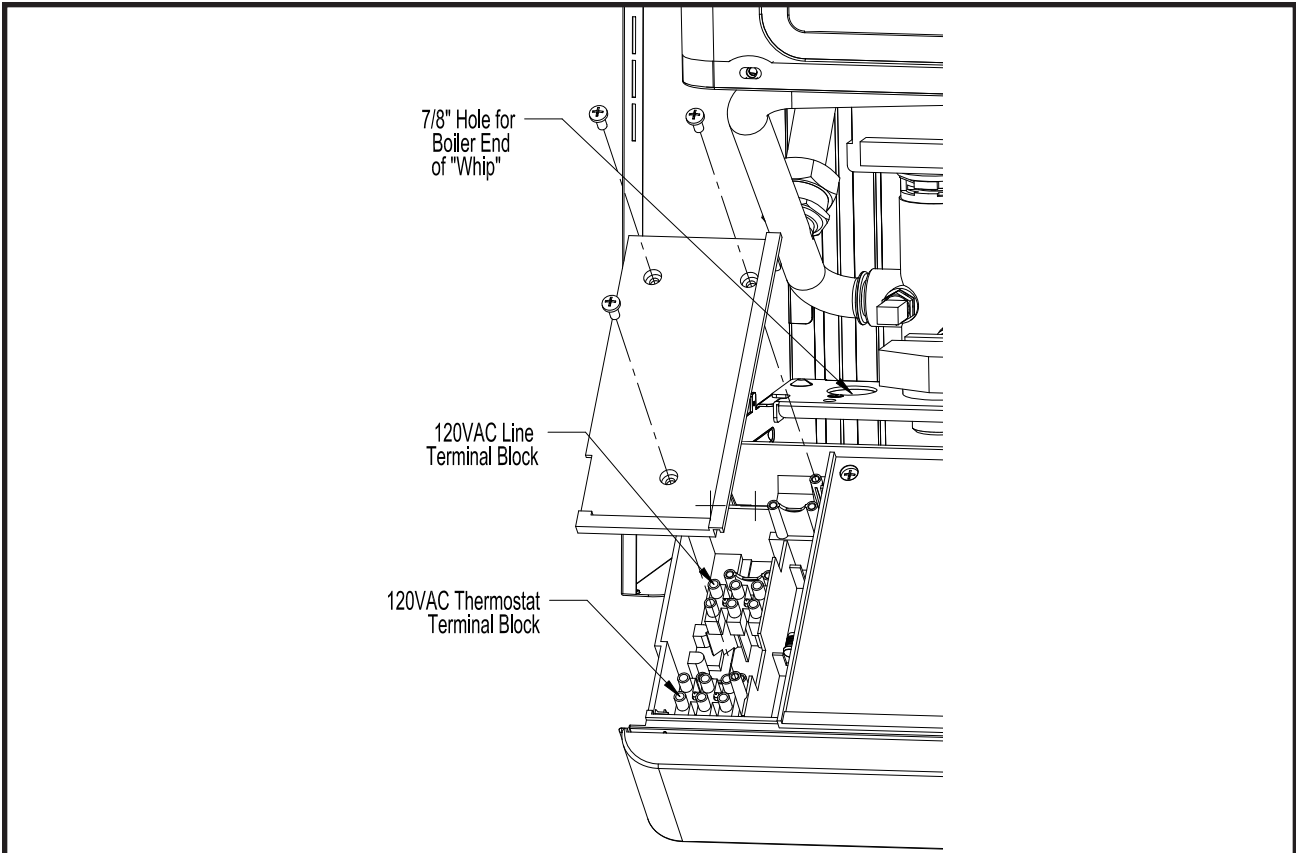


Figure 11.3: Location of Terminal Blocks and 7/8 Hole for Whip

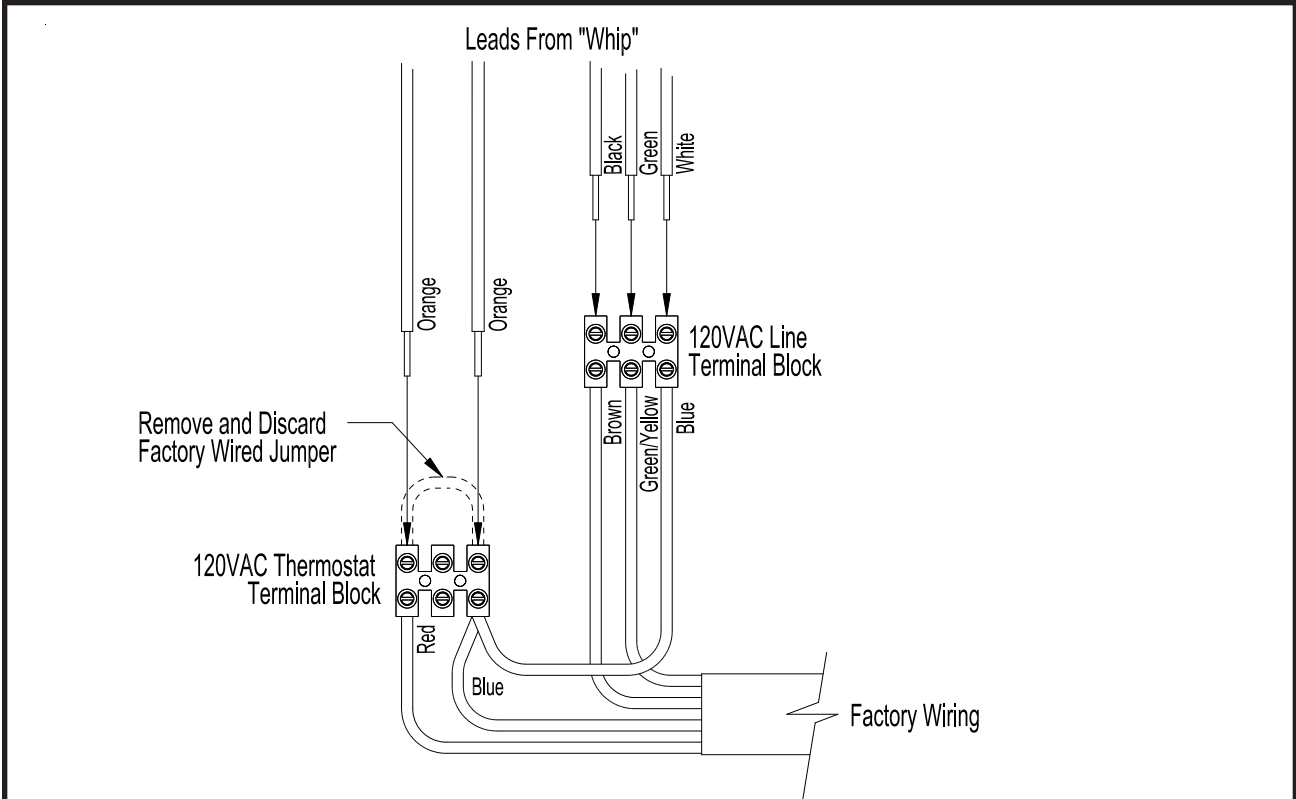
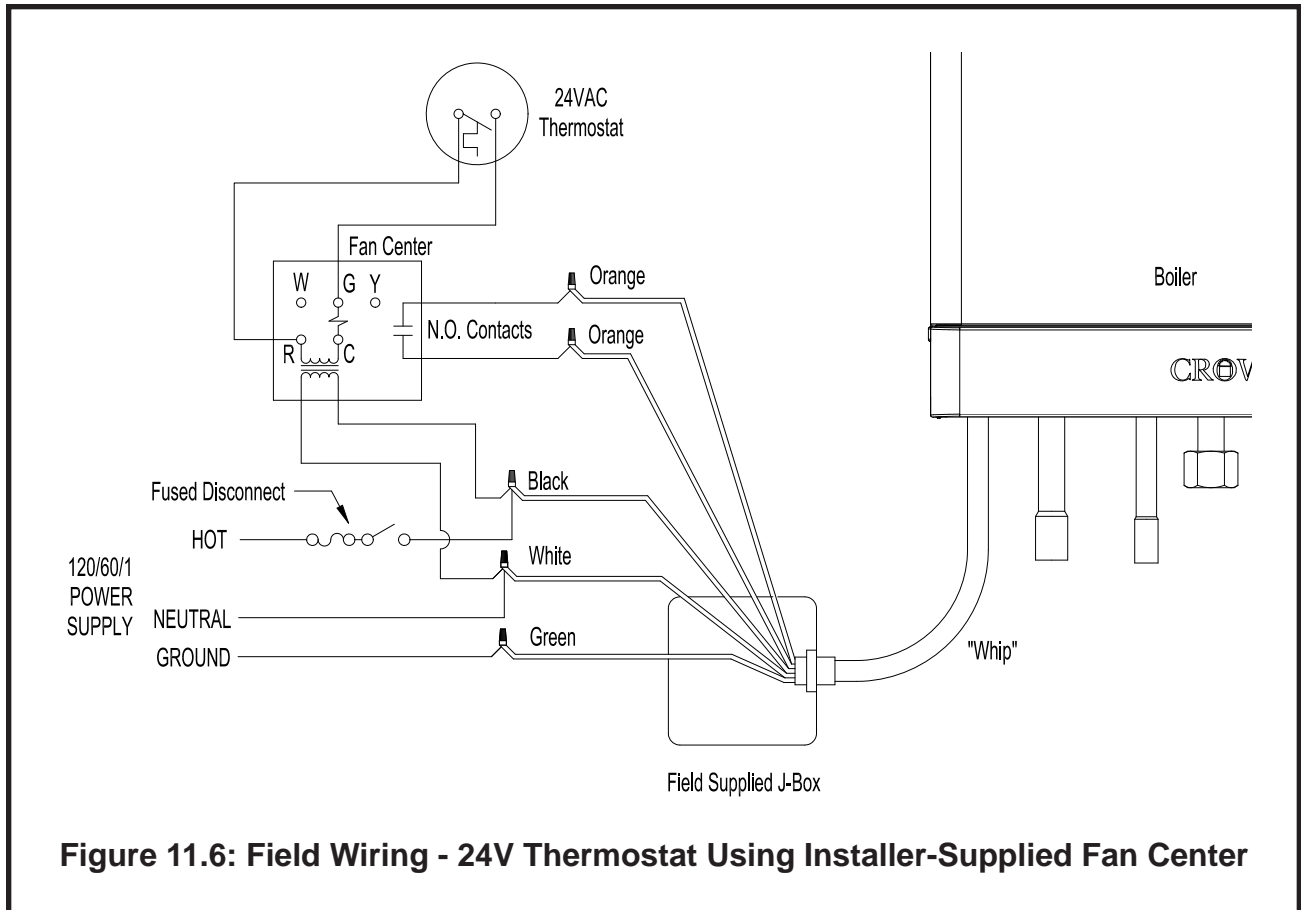
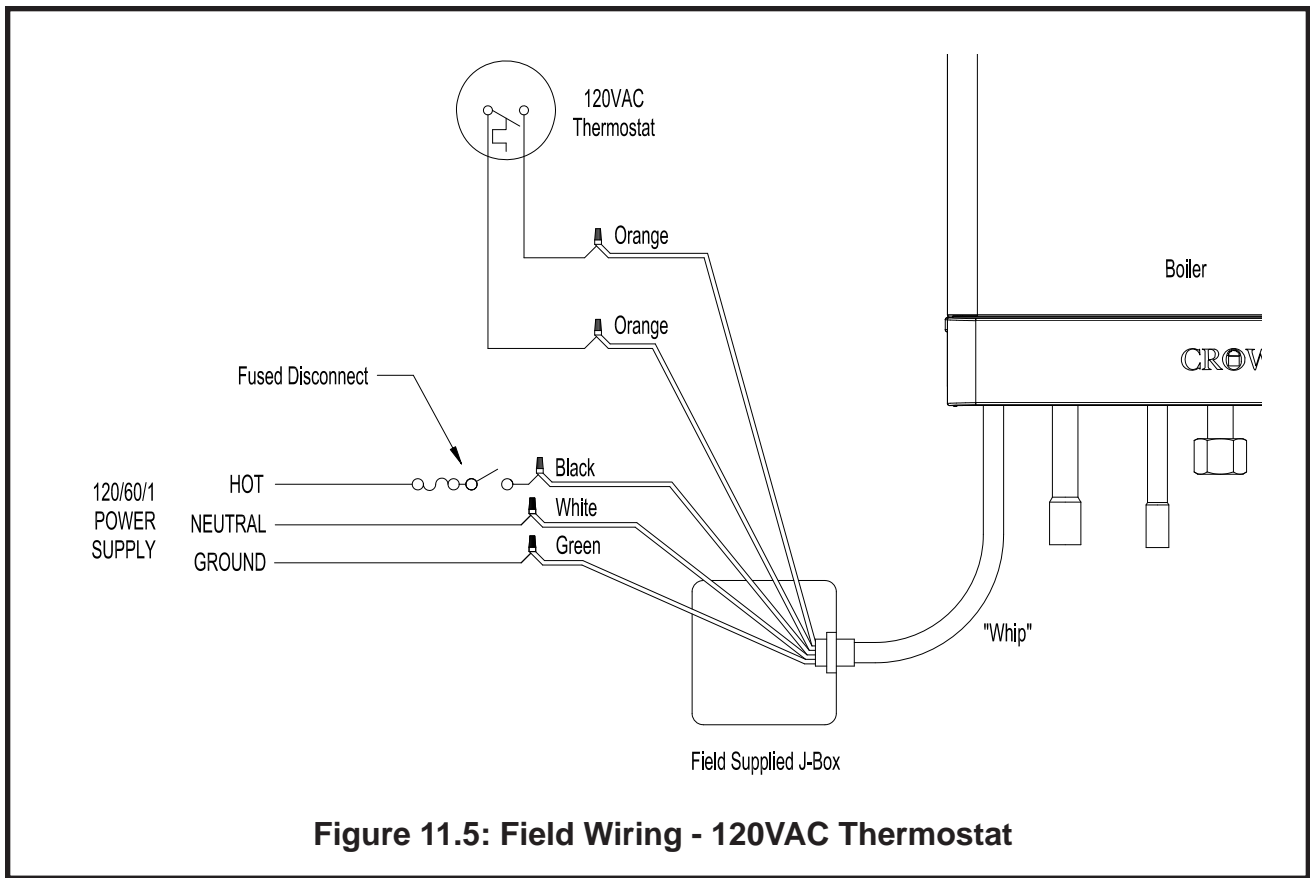
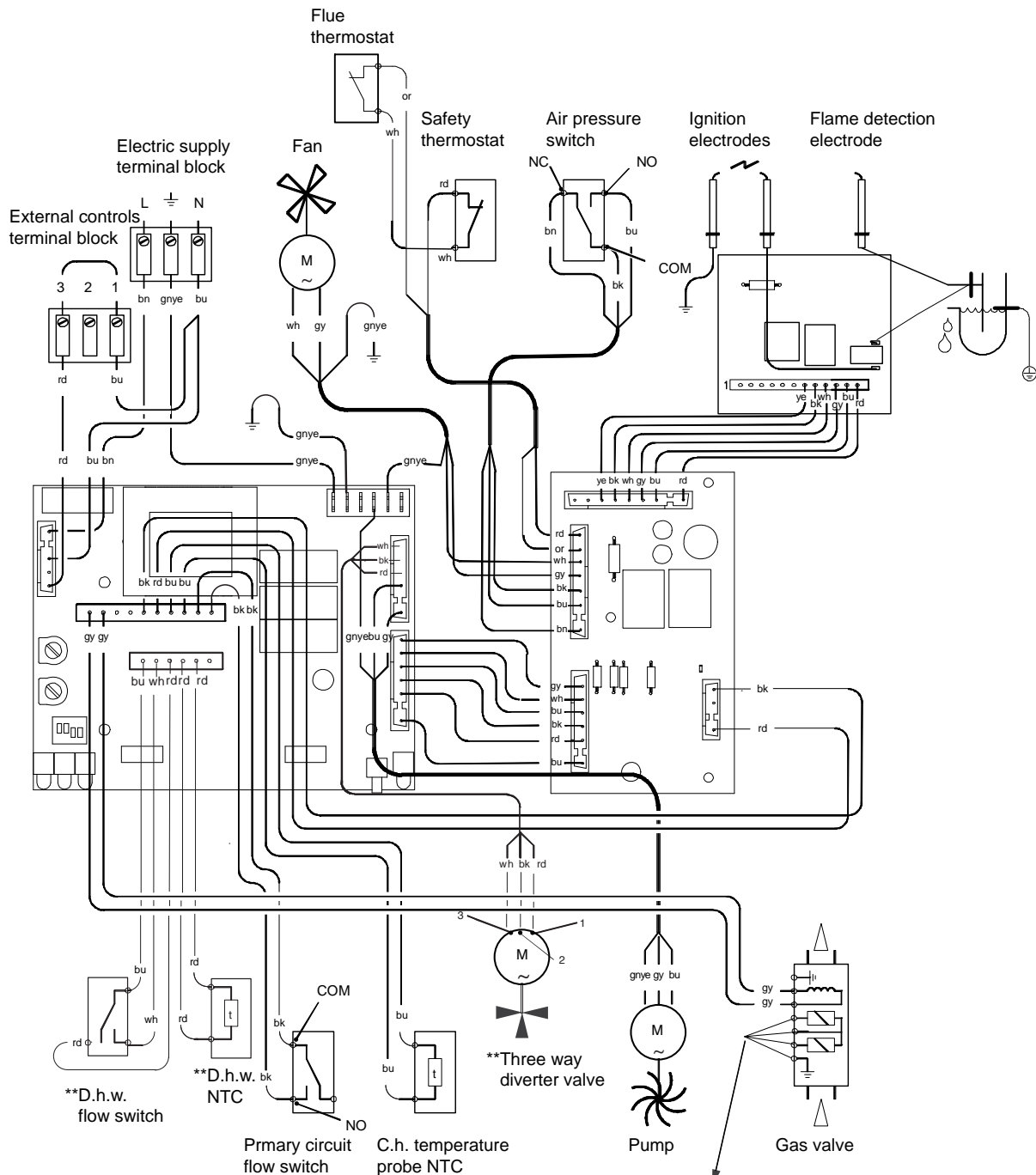


Figure 11.4: Electrical Connections Inside Control Box.





- bn - brown
- bu - blue
- bk - black
- gn - green
- gnye - green / yellow
- gy - grey
- or - orange
- rd - red
- wh - white
- vt - violet
- ye - yellow

*--- directly connected to the electronic ignition board
 ** - Not for model c.h. only

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

Figure 11.7: Internal Boiler Wiring

XII Start-up and Checkout

NOTE

Safe lighting and other performance criteria were met with the gas train assembly provided on the boiler when the boiler underwent the tests specified in Z21.13.

WARNING

Never attempt to fill a hot empty boiler

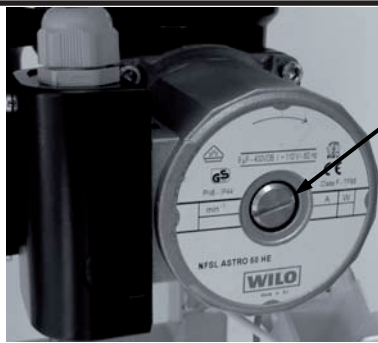
Use the following procedure for initial start-up of the boiler:

- 1) If not already done, flush the system to remove sediment and debris. This should be done with the boiler isolated from the system.
- 2) Fill the boiler and hydronic system with water and purge the system of air. To do this:
 - a) Unscrew the cap on the automatic air vent by one turn and leave open permanently. This air vent is located on top of the circulator (Figure 12.1).
 - b) Open the fill valve and pressurize the boiler to approximately 15psi
 - c) Bleed air out of each manual air vent in the system until a steady stream of water appears. Start with the lowest manual vents in the system and work towards the highest. If a manual fill valve is used, periodically add water to the system so that the pressure at the boiler is maintained at approximately 15 psi.
 - d) Remove the shaft cover screw on the front of the circulator (Figure 12.2). Using a screw driver, manually spin the shaft in the direction of rotation shown on the pump until a small amount of water appears at the end of the shaft. Replace the shaft cover screw.
 - e) At the end of the purging process, make sure that the pressure gauge on the boiler reads between 5 and 19 psi.
 - f) Make sure that a manual air vents are closed. If an automatic fill valve is used, make sure that it is set to the automatic position.



**Auto Air
Vent Cap**

Figure 12.1: Location of Automatic Air Vent Cap



Shaft Screw Cover

Figure 12.2: Location of Circulator Shaft Cover

WARNING

- **Never use a flame to check for gas leaks.**
- **Make sure that the area around the boiler is clear and free from combustible materials, gasoline and other flammable vapors and liquids**

CAUTION

Leaks in the hydronic system can result in the addition of excessive amounts of make-up water. This can cause severe damage to the boiler's heat exchanger from corrosion or calcium deposits. Repair any leaks in the system immediately.

- 3) Check all new water and gas piping for leaks and purge piping sections that are filled with air. Fix any leaks found immediately. See the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 and/or CAN/CSA B 149.1 Natural Gas and Propane Installation Code, for additional information on testing and purging gas lines.
- 4) Vent system must be complete and free of obstructions before attempting to fire boiler.
- 5) Inspect all line voltage wiring for loose or uninsulated connections.
- 6) Start the boiler using the lighting instructions on page 56. After the power to the boiler is turned on:
 - a) Initiate a call for heat from the thermostat. Once this is done, Lamp 1 on the control panel (Figure 12.3) should flash every 4 seconds.
 - b) Rotate the Heating System Knob clockwise from "0" to the maximum supply water temperature setting (at approximately 5:00) . Lamp 1 should then flash every two seconds and the boiler should light after approximately 15 - 30 seconds. Once the boiler has lit, Lamps 1 and 3 will flash continuously.

More information on the boiler controls and indicator lamps is presented in the Operation Section of this manual. Note: On a new installation, there is a good chance that one of the following two problems will occur:

- The differential water pressure switch may not close. If this switch does not close after 180 seconds, the boiler will lockout. Lamp #2 will stay on continuously and Lamp #1 will flash. If this happens, look for air in the system or insufficient pressure drop across the boiler supply and return connections. If the latter problem is suspected, close the throttle valve on the supply further. If no throttling valve is present, make sure that the flow restrictor is installed (See Part IX). To reset the boiler, turn the Heating System Knob to "0" for a few seconds and then return it to the max water temperature setting.

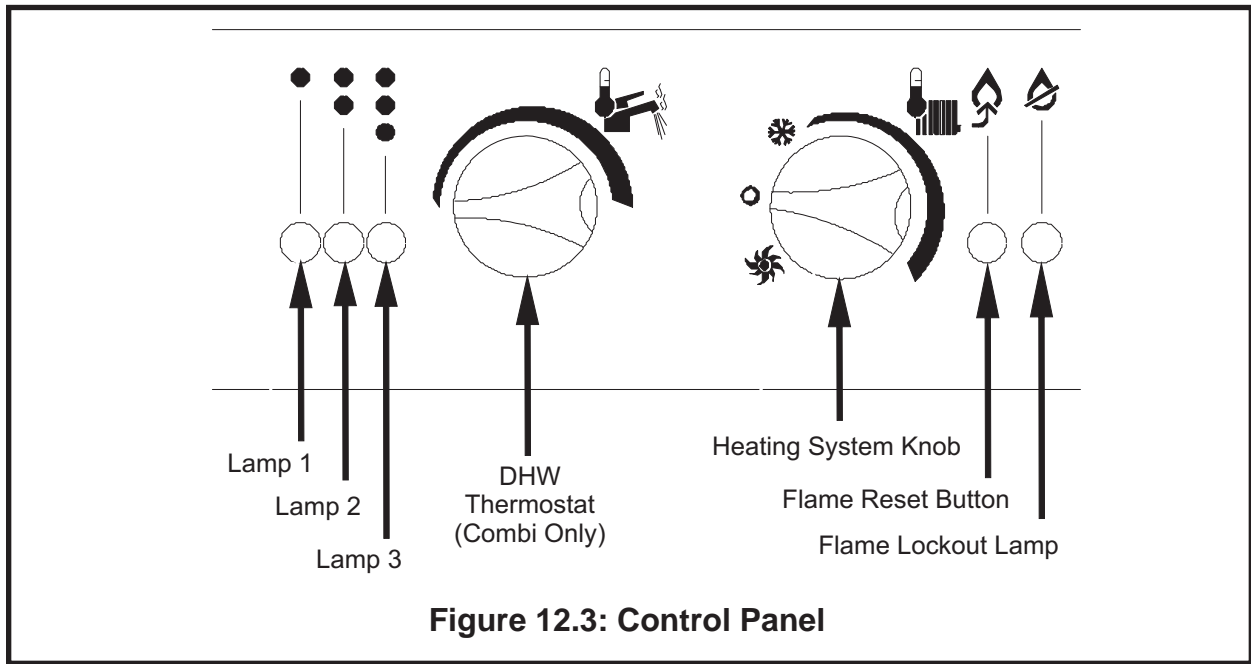


Figure 12.3: Control Panel

- The burner may not light on the first try. The most likely cause of this problem on a new installation is a gas line that has not been completely purged. Other possibilities include inadequate inlet gas pressure or a boiler that is configured for the wrong fuel. If the boiler does not light on the first try, it will go into a lockout condition. When this happens, the Flame Lockout Lamp (Figure 12.3) will be illuminated. In addition, Lamps 1 and 3 will flash and Lamp 2 will be on continuously. To reset the boiler, push the Flame Reset Button shown in Figure 12.3 AND rotate the Heating System Knob back to “0” for a few seconds.

- 7) Inspect the flame visible through the window. The flame should be stable and mostly blue (Fig.12.4). No yellow tipping should be present; however, intermittent flecks of yellow and orange in the flame are normal.
- 8) Check the inlet and manifold pressures. To do this, use the following procedure:
 - a) Remove the inner cover (figure 12.5). Note: this is necessary in order to read the manifold pressure accurately because the gas valve regulator is referenced to the burner area.

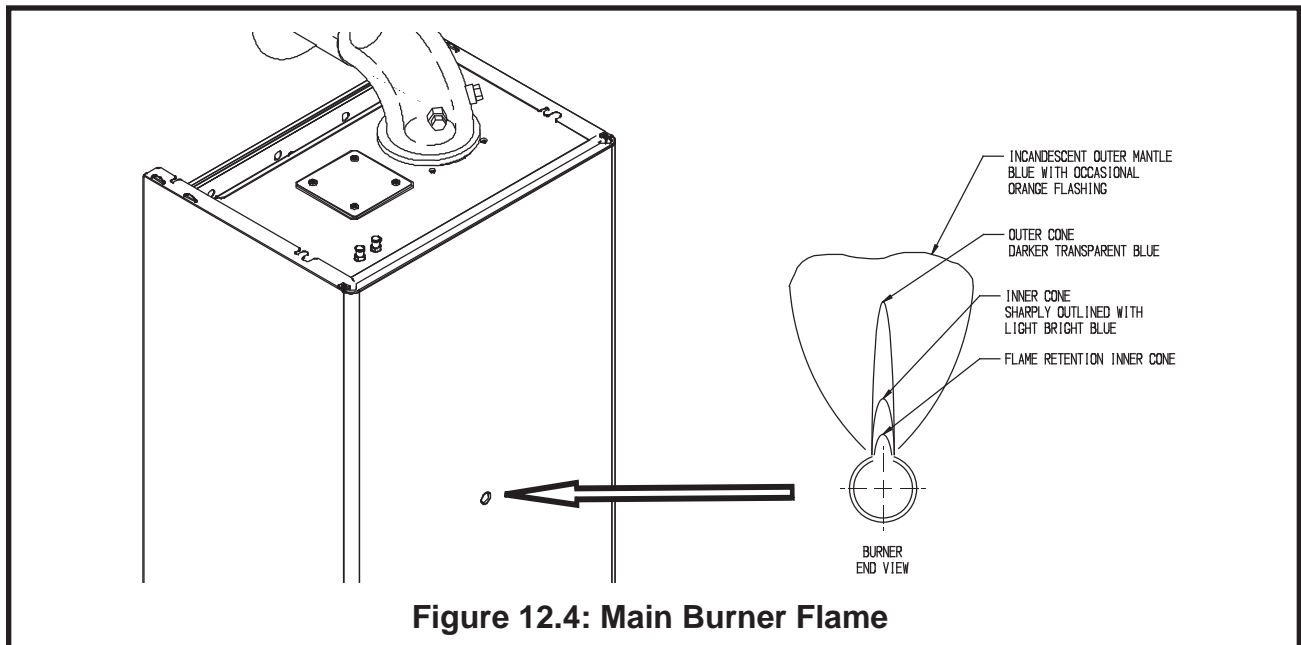


Figure 12.4: Main Burner Flame

- b) Loosen the screw in the gas inlet tap on the gas valve and connect a manometer (see Figure 12.6).
- c) Make sure the boiler is at high fire. To do this:
- On heat only boilers, make sure that the heating system knob is rotated fully clockwise and that the supply temperature is less than 150F during the entire conduct of this test.
 - For combi units, rotate the DHW knob fully clockwise and open enough hot water fixtures to keep the exiting hot water temperature under 110F during the entire conduct of this test.
- d) Check the inlet pressure with all the MWC, and all other gas appliances turned on and off. The inlet pressure at the boiler must be within the following limits regardless of what combination of appliances is firing:

<u>Inlet Press. (inches w.c.)</u>	<u>Natural Gas</u>	<u>LP Gas</u>
Minimum	5.6	10.4
Maximum	10.5	13.0

If the inlet pressure falls outside of these limits, find and correct the cause of the problem before proceeding further.

- e) Connect a manometer to the manifold (outlet) pressure tap on the gas valve (Figure 12.6).
- f) Read the high fire manifold pressure. It should be set at:

	<u>Natural Gas</u>	<u>LP Gas</u>
Manifold Press. (inches w.c.)	4.8 +/-0.25" w.c.	10.3 +/- 0.50" w.c.

- g) If an adjustment is necessary, pry the clear plastic cap off of the regulator. Turn the outer brass nut clockwise to increase the manifold pressure or counter-clockwise to reduce the pressure.
- h) Check the low fire manifold pressure. To do this, turn off the boiler and remove one of the modulation leads (Figure 12.6). Turn the boiler back on. Read the low fire manifold pressure. It should be set at:

WARNING

The gas valve manifold pressures are factory set and should rarely need to be adjusted. Failure to adjust the gas valve in strict accordance with these instructions could result in unreliable operation, property damage, personal injury or death due to carbon monoxide poisoning. When making adjustments, pay particular attention to the following precautions:

- **Be certain that the inlet pressure are within the limits shown before attempting to make manifold pressure adjustments.**
- **Be sure that the boiler is not modulating when making the high fire adjustment**
- **Be sure to remove the inner cover before reading or adjusting the manifold pressure.**

<u>Model Number</u>	<u>Fuel</u>	<u>L.F. Manifold Pressure (in w.c.)</u>
MWC116ENL (Heat Only)	Natural	2.2 +/- 0.10
MWC116ELL (Heat Only)	LP	4.8 +/- 0.10
MWC116ENT (Combi)	Natural	1.0 +/-0.10
MWC116ELT (Combi)	LP	2.0 +/-0.10

- i) If an adjustment is necessary, turn the inner black hex shaft clockwise to increase the manifold pressure or counter-clockwise to reduce the pressure (Figure 12.7).
- j) Turn off the boiler, reconnect the modulation lead removed in Step (h) and restart the boiler.
- k) Recheck the manifold pressure at high fire
- l) Recheck the inlet pressure
- m) Replace the inner cover.

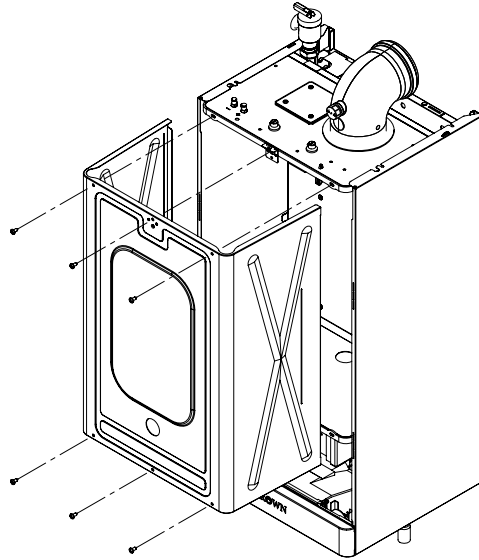


Figure 12.5: Inner Cover Removal

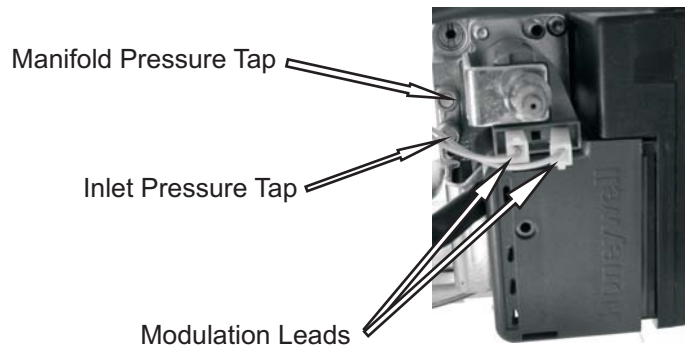


Figure 12.6: Gas Pressure Taps

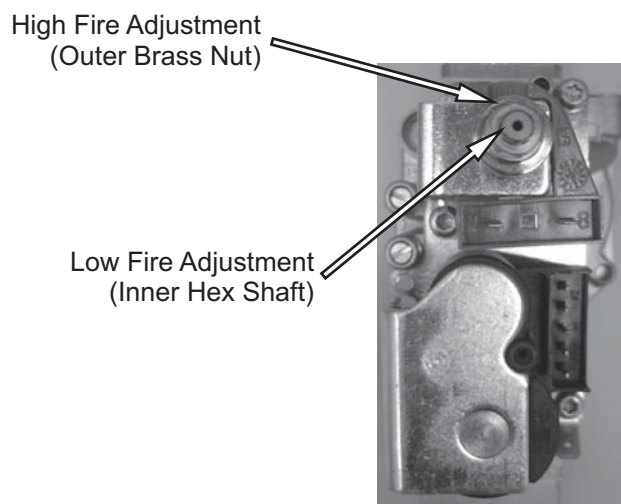


Figure 12.7: Gas Pressure Adjustments (Pry Off Transparent Cover to Access)

MWC Series Lighting and Operating Instructions

FOR YOUR SAFETY READ BEFORE OPERATING

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

- A This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- C Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Turn off all electric power to the appliance.
3. Set the thermostat to lowest setting.
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 main gas shut off valve.
6. Wait five (5) minutes to clear out any gas. Then smell for gas including near the floor. If you smell gas STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Open the main gas shut off valve and the valve on the domestic cold water inlet pipe.
8. Turn on the electricity supply to the boiler, switching on the circuit breaker. The appliance operation light 1 (figure 1) will flash every 4 seconds (stand-by condition).
9. If the boiler is to be used for c.h and d.h.w position the function selector 2 as in figure 2. The appliance operation light 1 will flash every 2 seconds (operating boiler). Position the knobs 2 and 3 for the desired c.h. and d.h.w. temperature (for detailed information see the user manual).
10. If the boiler is to be used for d.h.w. only position the function selector 2 as in figure 3. The appliance operation light 1 will flash every 2 seconds (operating boiler). Position the knob 3 for the desired d.h.w. temperature (for detailed information see the user manual).
11. If the appliance will not operate, follow the instructions "To turn off gas to appliance" and call your service technician or gas supplier.

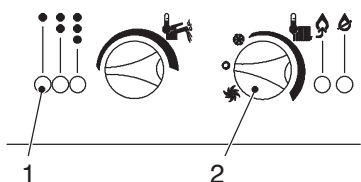


Figure 1

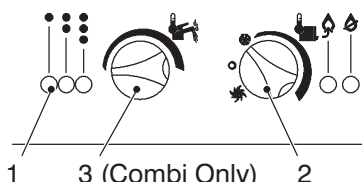


Figure 2

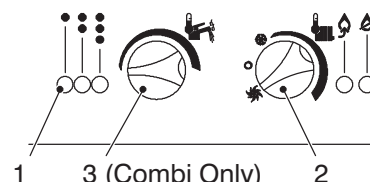


Figure 3

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Turn the boiler off by setting the function selector 2 to the position shown in figure 1.
3. Set the thermostat or other operating control to lowest setting
4. Close the main gas shut off valve and the valve on the domestic cold water inlet pipe.

- 9) Remove the monometer and make sure that the inlet and manifold pressure tap screws are closed
- 10) Check the entire gas train for leaks. Fix any leaks found immediately.
- 11) Run the gas valve safety shut-down test. With the boiler firing, close the gas cock upstream of the boiler. The gas valve should close as soon as loss of flame is detected (within a few seconds of closing the gas cock). The boiler should then make one attempt to relight before going into a hard lockout. To reset the boiler, push the red reset button, rotate the heating system knob back to zero for a few seconds, then rotate the heating system knob fully clockwise.
- 12) Run a combustion test with the boiler operating at high fire. CO₂ or O₂ readings should be reasonably close to the values shown in Table 12.8. The CO level should be less than 50PPM. Consult the factory if the CO level is exceeded or if the CO₂ or O₂ are significantly different from the values shown.

Table 12.8: High Fire Combustion Readings

Fuel	Approx. O ₂ (%)	Approx. CO ₂ (%)	Maximum CO (PPM)
Natural Gas	9.7	6.3	50
Propane	9.5	7.5	50

- 13) Verify that the flue system is tight and securely assembled in accordance with the Venting section in this manual.
- 14) Replace all jacket panels
- 15) After the boiler has operated for at least 30 minutes recheck the boiler and system for leaks. Repair any leaks found before leaving the boiler in operation.
- 16) Test any external limits or other controls in accordance with the manufacturer's instructions.
- 17) Verify that the boiler starts and stops in response to calls for heat from the heating thermostat/s. Make sure that the appropriate circulators also start and stop in response to the thermostats.
- 18) Set the Heating System Knob and the DHW knob for the desired target supply and DHW temperatures (see the Operation section for more information on how to do this).

XIII Operation

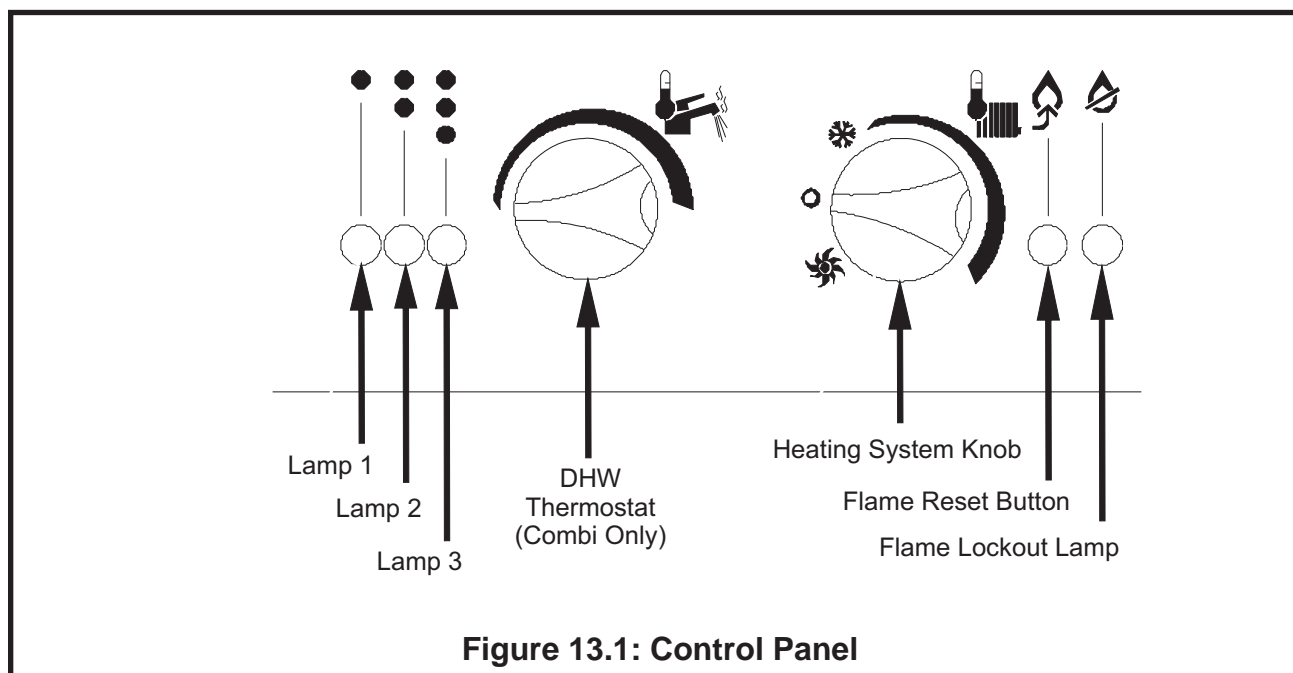
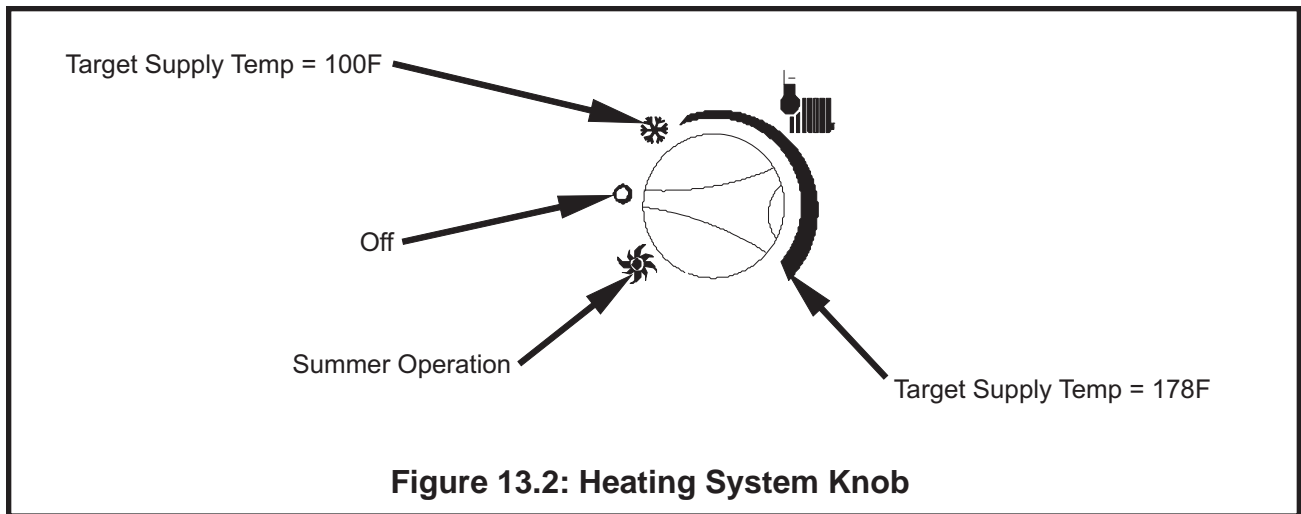


Figure 13.1: Control Panel

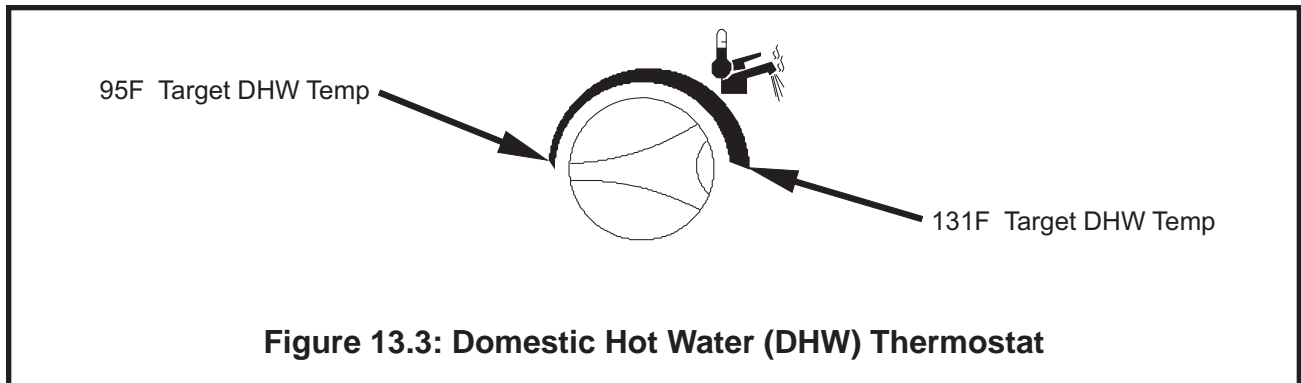
Figure 13.1 shows the control panel for the MWC boiler. The purpose of the adjustments and lamps on this panel are as follows:

- 1) **Lamps 1, 2, 3** - These lamps show the status of the boiler by lighting and/or flashing in various combinations. Table 13.4 shows lamp codes that will be seen during normal operation. Lamp codes indicating a problem are shown in Section XV.
- 2) **Heating System Knob** - A detail of the heating system knob is shown in Figure 13.2. This knob has three discrete settings:
 - **Off** - Boiler will not respond to a call for heat or domestic hot water (DHW). The boiler will fire, if necessary, to protect itself from freezing. In addition, it will operate the circulator and the 3-way valve for a few seconds every 24 hours to prevent these devices from sticking.
The "Off" setting is also used to reset the boiler after it experiences a lockout. To reset the boiler, rotate the Heating System Knob to "Off" for a few seconds and then return it to its original position (if the lockout is due to a loss of flame, it will ALSO be necessary push the Flame Reset Button).
 - **Summer Operation (Combi Only)** - Boiler will not respond to a call for heat from the heating thermostat, but will respond to a call for DHW.
 - **Target Supply Temperature Setting** - When the Heating System Knob is rotated clockwise to any position from "Off" the boiler will respond to a call for heat. During the call for heat, the boiler will attempt to maintain a "target" supply temperature. This target supply temperature can be set anywhere between 100F and 178F (Figure 13.2).
- 3) **DHW Thermostat (Combi Boilers Only)** - This knob determines the target domestic hot water (DHW) temperature. It is adjustable from 95F to 131F (Figure 13.3). If a call for heat is present at the same time as a call for DHW, the call for DHW has priority; no heat will be delivered to the heating system until the call for DHW is satisfied.
- 4) **Flame Reset Button** - This button is used to reset the boiler in the event that it locks out due to failure to establish a flame. In addition to pressing this button, it is also necessary to rotate the Heating System Knob back to "0" for a few seconds to reset the boiler.
- 5) **Flame Lockout Lamp** - Illuminates if the boiler locks out due to failure to establish a flame.



NOTE

Since a room thermostat will almost always be used to initiate a call for heat (either directly or through zone controls), it is generally recommended that the Heating System Knob be left at the appropriate Target Supply Temperature year round.



WARNING

The domestic water thermostat on the Maui is not intended to serve as a scald protection device. Under certain conditions, it is possible for the DHW temperature to climb significantly above the DHW Thermostat set point. Like all domestic water heaters, the MWC is capable of generating water that is hot enough to cause injury or death due to scalding. To minimize the risk of scalding:













- Set domestic hot water (DHW) thermostat as low as possible (see the Start-up Section of this manual for the location of this thermostat).
- Feel water before showering or bathing.
- If anti-scald or anti-chill protection is required, use devices specifically designed for such service. Install and maintain these devices in accordance with the manufacturer's instructions.





Sequence of Operation

(Also Refer to Figures 9.7, 9.8, 10.3, 11.7)

- 1) Upon a call for heat from the room thermostat, the circulator is started.
- 2) If the differential pressure switch connected between the supply and return sees a pressure in excess of 5.1 ft w.c., it closes, allowing the start sequence to continue. If the switch does not see 5.1ft w.c. after 180seconds, the boiler goes into lockout.
- 3) If the common and normally closed contacts on the air pressure switch are made, the inducer starts.
- 4) The air pressure switch measures the difference between the combustion air pressure in the cabinet and the negative pressure generated at a venturi located in the inducer discharge. In this way it measures the air flow through the boiler. If the pressure across the air pressure switch exceeds approximately 0.64" w.c., the switch will close. If the air pressure does not close after 4 minutes of inducer operation, the boiler will go into lockout.
- 5) After the air pressure switch closes, current can pass through the normally closed supply water and flue gas safety limits to the ignition module, initiating a call for burner operation.
- 6) The ignition module generates an ignition spark and opens the valve. The presence of flame is detected through a separate flame rod. If no flame is detected after 10 seconds, the boiler will go into lockout. If the flame is proven and this proof is subsequently lost at any point during the burner cycle, the boiler will attempt to re-light once, then go into lockout.
- 7) When responding to a call for heat, the boiler will attempt to maintain the target supply temperature selected by the Heating System Knob. The boiler does this by monitoring the supply temperature sensor shown in Figure 9.7/9.8 and modulating the input based on the difference between the current supply temperature and the target supply temperature. Modulation is achieved by varying a 0-24VDC voltage across a coil on the gas valve regulator (0V=minimum input).
- 8) If the supply water temperature exceeds the target supply temperature while the call for heat is present, the burner will shut down and the circulator will continue to run. The burner will relight when the supply temperature drops below the target temperature.
- 9) If the supply temperature exceeds 221F (which should never happen unless there is a problem with the supply sensor), the manual reset supply water high limit will open.
- 10) If the condensate trap becomes blocked, the condensate level will rise to the point where it covers two electrical contacts: a contact connected to ground, and a contact in the flame rod lead. The condensate will complete an electrical circuit between these two contacts, grounding out the unrectified flame signal. This will be detected by the ignition module as a loss of flame and result in a lockout.
- 11) If the flue temperature exceeds 248F, the manual reset supply water high limit will open. This protects the PPs venting from excessive temperatures.
- 12) When responding to a call for heat, combi boilers use exactly the same sequence of operation as heat-only models. When a combi boiler receives a call for domestic hot water (DHW), it responds as follows:
 - a) The flow switch shown in Figure 11.7 detects a call for DHW draw when a hot water fixture is opened having a flow rate in excess of approximately 0.5 GPM.
 - b) The main control drives the 3-way diverting valve so that all boiler water flow is directed though the plate heat exchanger.
 - c) If not already running, the circulator starts
 - d) The boiler fires after going through the same start sequence described in steps (3-6) above.
 - e) The boiler monitors the exiting DHW temperature using the sensor shown in Figure 11.7. The boiler's microprocessor control determines the target boiler supply temperature that is needed to meet the DHW demand and modulates the input accordingly.

**Table 13.4: Flash Codes During Normal Operation
(See Part XV for Error Codes)**

Lamp Number			Meaning
1	2	3	
			(Short pulse every 4 seconds): Heating System Knob in "Off" position. Boiler will not respond to call for heat or DHW. Frost protection and pump/valve exercise function still active (1 second pulse every 2 seconds): Heating System Knob set to target supply temperature. Boiler will respond to a call for heat.
			Boiler responding to a call for heat
			Boiler responding to a call for DHW
			Boiler responding to a call for frost protection

			
Lamp OFF	Lamp ON	Flashing lamp, alone or simultaneously with another lamp.	Flashing lamp, alternate with another lamp

XIV. Service and Maintenance

IMPORTANT

Warranty does not cover boiler damage or malfunction if the following steps are not performed at the intervals specified.

- 1) Continuously:
 - a) Keep the area around the boiler free from combustible materials, gasoline and other flammable vapors and liquids.
 - b) Keep the area around the combustion air inlet terminal free from contaminants .
 - c) Keep the boiler room ventilation openings open and unobstructed.
- 2) Monthly Inspections:
 - a) Inspect the vent system to verify that it is open, unobstructed and free from leakage or deterioration. Call the service technician to make repairs if needed.
 - b) Inspect the condensate drain system to verify it is leak tight, open and unobstructed. Call the service technician if the condensate drain system requires maintenance.
 - c) Inspect the water and gas lines to verify they are free from leaks. Call the service technician to make repairs if required.
 - d) Check the pressure on the boiler and make sure that it is approximately 15psi. If the pressure is less than 5psi, add water to bring the pressure up to 15psi.

CAUTION

Water leaks can cause severe corrosion damage to the boiler or other system components. Immediately repair any leaks found.

- 3) Annual Inspections and Service: In addition to the inspections listed above the following should be performed by a qualified service technician once every year:
 - a) Follow the procedure for turning the boiler off found in the MWC Series Lighting and Operating Instructions.
 - b) Inspect the wiring to verify the conductors are in good condition and attached securely.
 - c) Access the combustion chamber. To do this remove the front and side jacket panels as shown in Figure 11.1 Remove the inner cover as shown in Figure 12.5. Remove the Combustion Chamber cover as shown in Figure 14.1.
 - d) Inspect the fins on the primary heat exchanger. If any dirt is observed on the fins, cover the burner to protect it from falling debris and clean the heat exchanger with a soft brush.

CAUTION

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

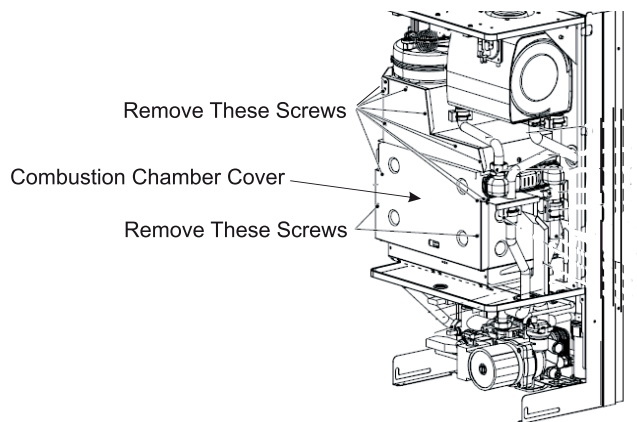


Figure 14.1: Removing Combustion Chamber Cover

WARNING

Soot deposits in the flue passages are a sign that the boiler may be operating at high carbon monoxide (CO) levels. After cleaning the boiler of soot deposits, check the CO level in the flue gas to insure that the boiler is operating properly.

If it is necessary to check CO, use a combustion analyzer, or other instrument which is designed to measure CO in flue gas (see Start-up section). A CO “sniffer” designed for testing CO levels in ambient air cannot be used to check boiler combustion.

A normal CO reading for an MWC series boiler is less than 50ppm (0.005%). A higher reading is indicative of a combustion problem.

Some causes of excessive CO include:

- Incorrectly sized or drilled burner orifice
- Partially plugged flue passages
- Improper manifold pressure
- Partial blockage of vent or intake system
- Foreign material in burner venturis or burner ports
- Disconnected regulator reference tube
- Damaged fan impeller or housing
- Damaged or missing inducer or flue gas gaskets
- Distorted or missing combustion chamber or flue collector components.
- Flue gas recirculation in damaged or improperly assembled concentric venting

- e. Inspect the burner ports for debris. The burner can be cleaned with a soft brush. If the burner shows signs of deterioration, replace it.
- f. Inspect the electrodes and flame rod for deposits. Clean as necessary.
- g. Disconnect and remove the inducer from the boiler. The inducer is equipped with sealed ball bearings and does not require lubrication. Inspect the impeller and the pressure switch venturi (Figure 14.2) for dirt or debris. Clean as necessary with a soft brush.
- h. Inspect the secondary (stainless steel) heat exchanger coil for debris. Clean as necessary by flushing with clean water. A soft nylon brush may be used in accessible areas. Drain and flush the inside of the heat exchanger and condensate collector as required. Do not use any cleaning agents or solvents.
- i. Reinstall the inducer. If either of the inducer gaskets show signs of deterioration, replace them.
- j. Inspect the vent system and terminal for obstructions and clean as necessary.
- k. For direct vent appliances, proper reassembly and resealing of the vent-air intake system.
- l. Inspect internal boiler piping for leaks and/or deteriorating gaskets. Repair as necessary.
- m. Remove, inspect, and clean the condensate trap (Figure 14.3). Disconnect the wires from the trap. Use pliers to compress the spring clip on the drain hose (the hose leading from the secondary heat exchanger) and slide it upwards. Disconnect the drain hose from the trap. After removing the condensate trap from the boiler, disassemble the trap in a tray or pan, being careful to note the way in which the float ball and retainer fit into the trap. Flush all parts of the trap with water and reassemble. Reinstall the trap on the boiler.
- n. Reinstall the combustion chamber cover, inner cover, and all jacket panels and any wiring removed during the inspection/.cleaning process.
- o. Perform the start-up and checkout procedure described in Section XII of this manual.

Service Notes

- 1) Orifice Size – Sea level orifice sizes are:

Natural Gas – 1.30 mm

LP Gas – 0.85 mm

Consult your Crown representative for correct orifice sizes for use at altitudes above 2000 ft. Orifice for this boiler cannot be drilled in the field.

- 2) Operating the Boiler with Inner Cover Removed – For inspection and troubleshooting purposes, this boiler may be started and run with the Inner Cover (Figure 12.5) removed.

- 3) Pressure Switch – If necessary, the air pressure switch signal may be read using a slant tube or electronic monometer connected across the taps on top of the boiler (Figure 14.4). The N.O. contacts on the pressure switch make, allowing the boiler to fire, when the switch signal exceeds the “make setting” shown below. Once the switch is made, the boiler will fire as long as the pressure at the switch is above the “break setting” shown below. It is normal for the pressure reading across the switch to drop as the boiler heats up.

Make Setting - 0.64 w.c.

Break Setting - 0.59 w.c.

- 4) Limit Reset Buttons - Manual reset buttons for the flue temperature and supply water limits are located on the top of the boiler as shown in Figure 14.4. To access the buttons, unscrew the plastic covers.

WARNING

- Do not leave the boiler in service with the Inner Cover removed.
- Do not attempt to fire this boiler with the Combustion Chamber Cover (Fig. 14.1) removed

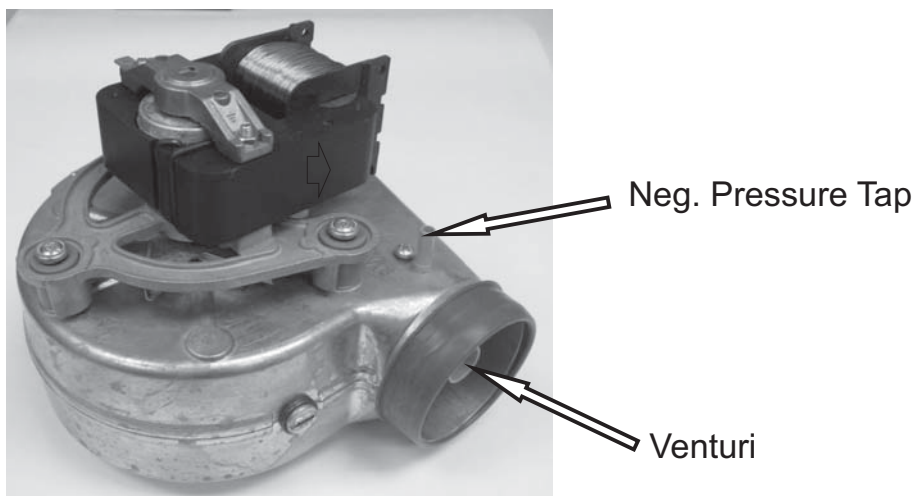
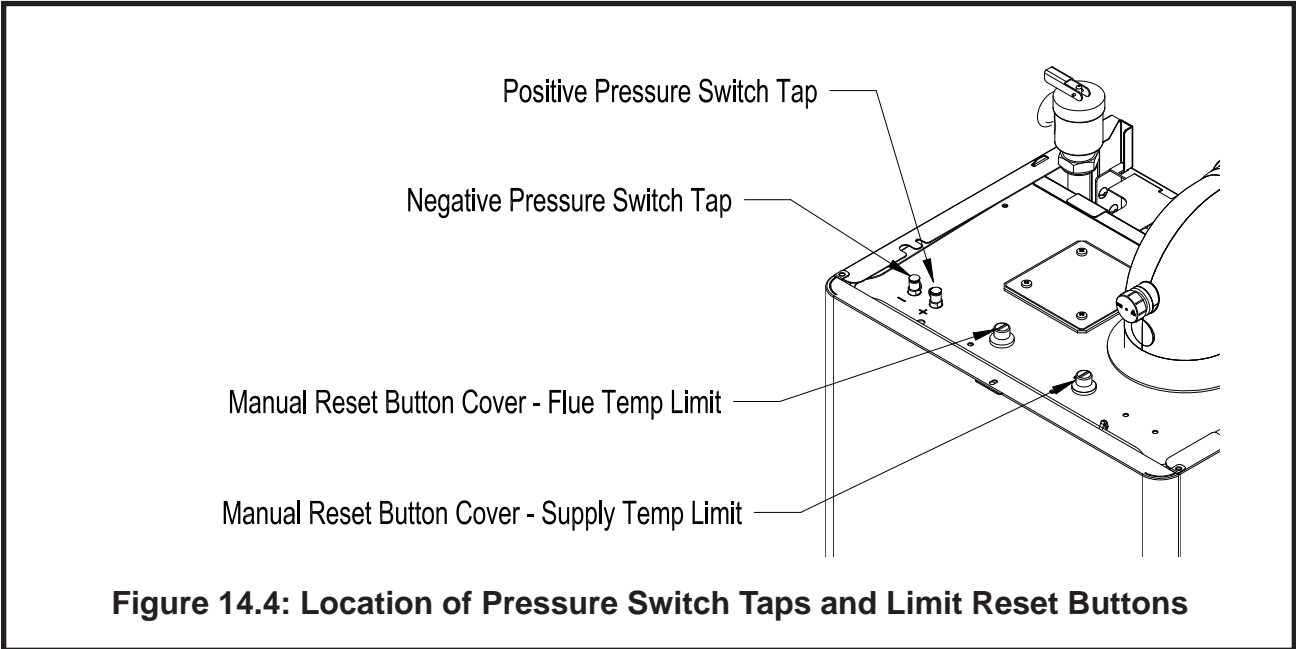
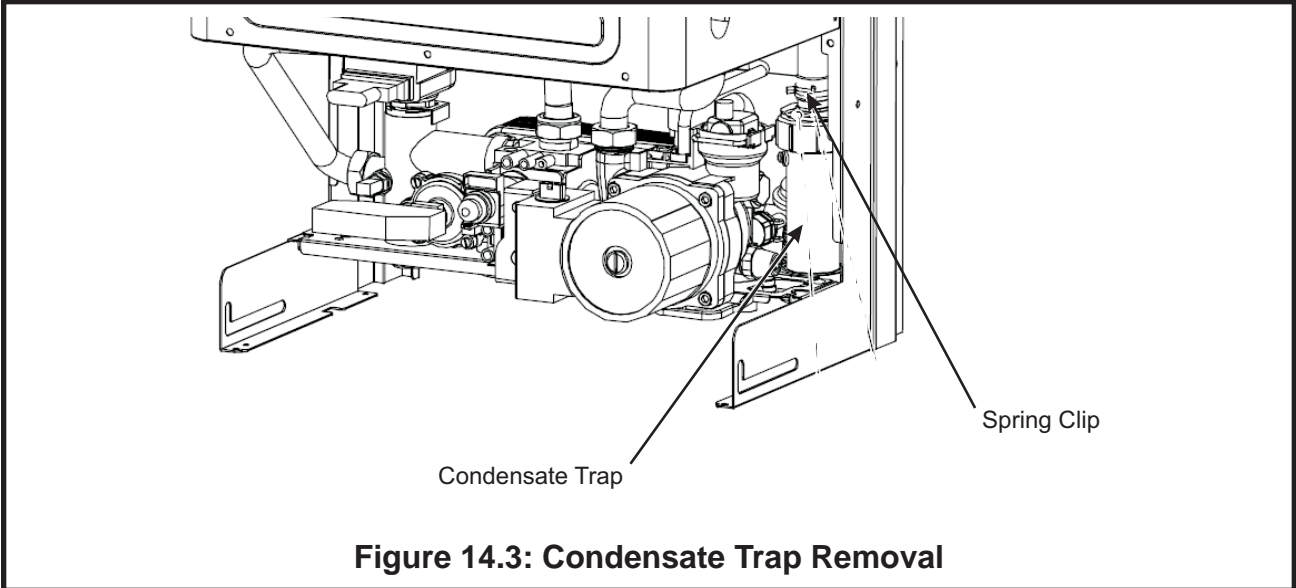


Figure 14.2: Inducer



XV. Troubleshooting

WARNING

Turn off power to boiler before replacing fuses or working on wiring.

Table 15.1: No Error Code Displayed

CONDITION	POSSIBLE CAUSES
Boiler does not run, no lights are on or flashing	<ul style="list-style-type: none"> • No 120VAC Power at boiler. Check breaker and wiring between breaker panel and boiler • Fuse on main PCB is blown (Figure 15.2). Check for short in boiler wiring, then replace with an identical 4.0A fuse.
Lamp 1 flashes every two seconds, but boiler does not respond to a call for heat.	<ul style="list-style-type: none"> • Problem with thermostat or zone wiring
Combi boiler does not respond to a call for domestic hot water (DHW).	<ul style="list-style-type: none"> • Domestic draw less than 0.5GPM • Defective flow switch (LED inside flow switch will glow red when it responds to a call for DHW). • Inlet and outlet connections reversed.
Combi boiler responds to a call for DHW, but hot water output is inadequate.	<ul style="list-style-type: none"> • Draw rate is in excess of that shown in Table 2.2 • Inlet and/or manifold pressures incorrect (see Start-up Section). • Plate heat exchanger is fouled. • DHW filter is dirty
Boiler responds to a call for heat, but room temperature never gets high enough to satisfy room thermostat	<ul style="list-style-type: none"> • Air in radiation • Inlet and/or manifold pressures incorrect (see Start-up Section). • No flow, or insufficient flow, through system. • Boiler is undersized. • Insufficient radiation
Boiler short cycles AND heat (or DHW) output is inadequate	<ul style="list-style-type: none"> • Flue gas recirculation into combustion air • See causes for inadequate heat or DHW above

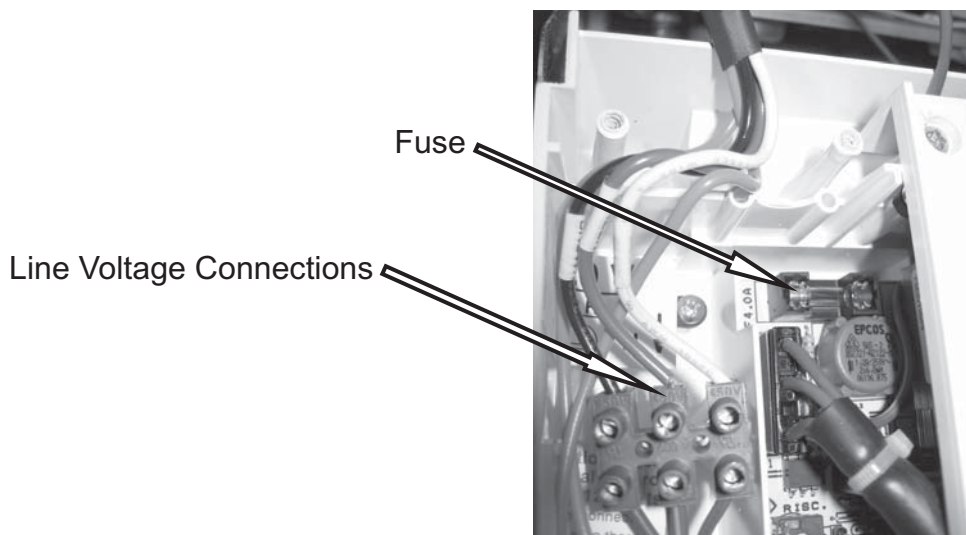


































Figure 15.2: Fuse Location

Table 15.3: Error Codes

Lamp Number			Flame L.O. Lamp	Meaning	Corrective Action
1	2	3			
				Differential Water Pressure Switch Failed to Close After 180s	Reset the boiler by turning the Heating System Knob to "0" for a few seconds, then returning it to its original position. Then: <ul style="list-style-type: none"> • Verify that that boiler and system are purged of air • Verify that there is at least 4.5psi at the boiler gauge • Verify that circulator is running • Close the throttling valve on the supply more or install flow restrictor in supply (see piping section)
				Failure to Establish Flame or Blocked Condensate Trap or Reversed Line Voltage Polarity (Note: LED #2 will not illuminate until error has been present for 4 minutes)	Reset the boiler by turning the Heating System Knob to "0" for a few seconds then returning it to its original position. Push Flame Reset Button. Then verify that: <ul style="list-style-type: none"> • Gas line is purged of air (new installations) • Inlet gas and manifold pressures are correct (see Start-up Section) • Manifold pressure is correct (see Start-up section) • Electrodes have a gap of 0.149" – 0.157" • Electrodes, flame rod, and wiring are in good condition • Condensate trap is draining correctly • 120VAC exists between the hot (brown) connection and ground and <u>not</u> between the neutral (blue) and ground.
				Air Pressure Switch Problem or Supply Limit Open or Flue Gas Limit Open (Note: LED #2 will not illuminate until error has been present for 4 minutes)	Use the flow chart in this section to diagnose the exact problem.
				Defective Supply Sensor	Replace Supply Sensor
				Defective DHW Sensor	Replace DHW Sensor
				Excessive Temperature on Primary Circuit	Consult Factory
					Consult Factory
					Consult Factory





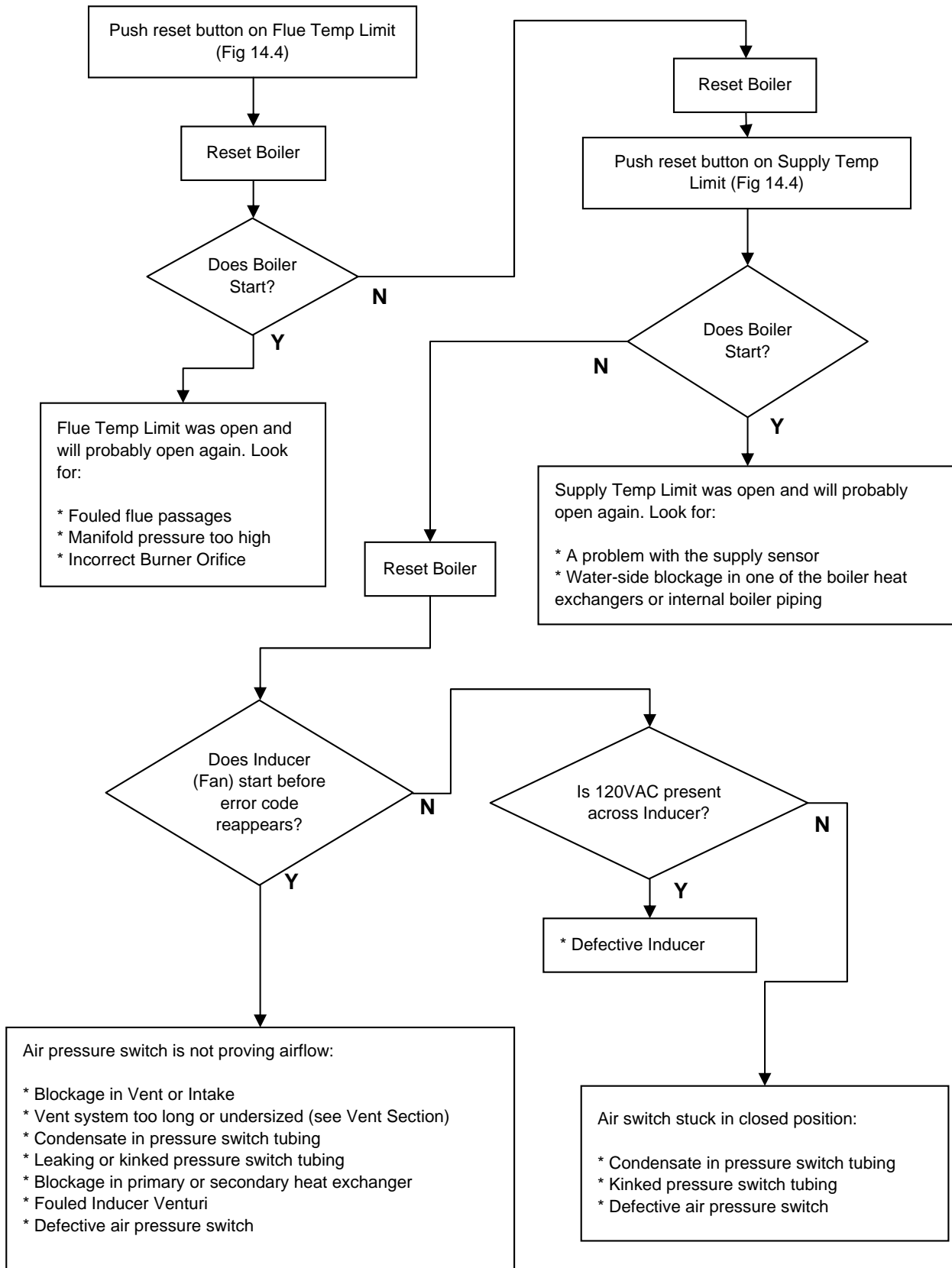
			
Lamp OFF	Lamp ON	Flashing lamp, alone or simultaneously with another lamp.	Flashing lamp, alternate with another lamp

Figure 15.4 Flow Chart for Isolating Limit and APS Errors (See Table 15.3)

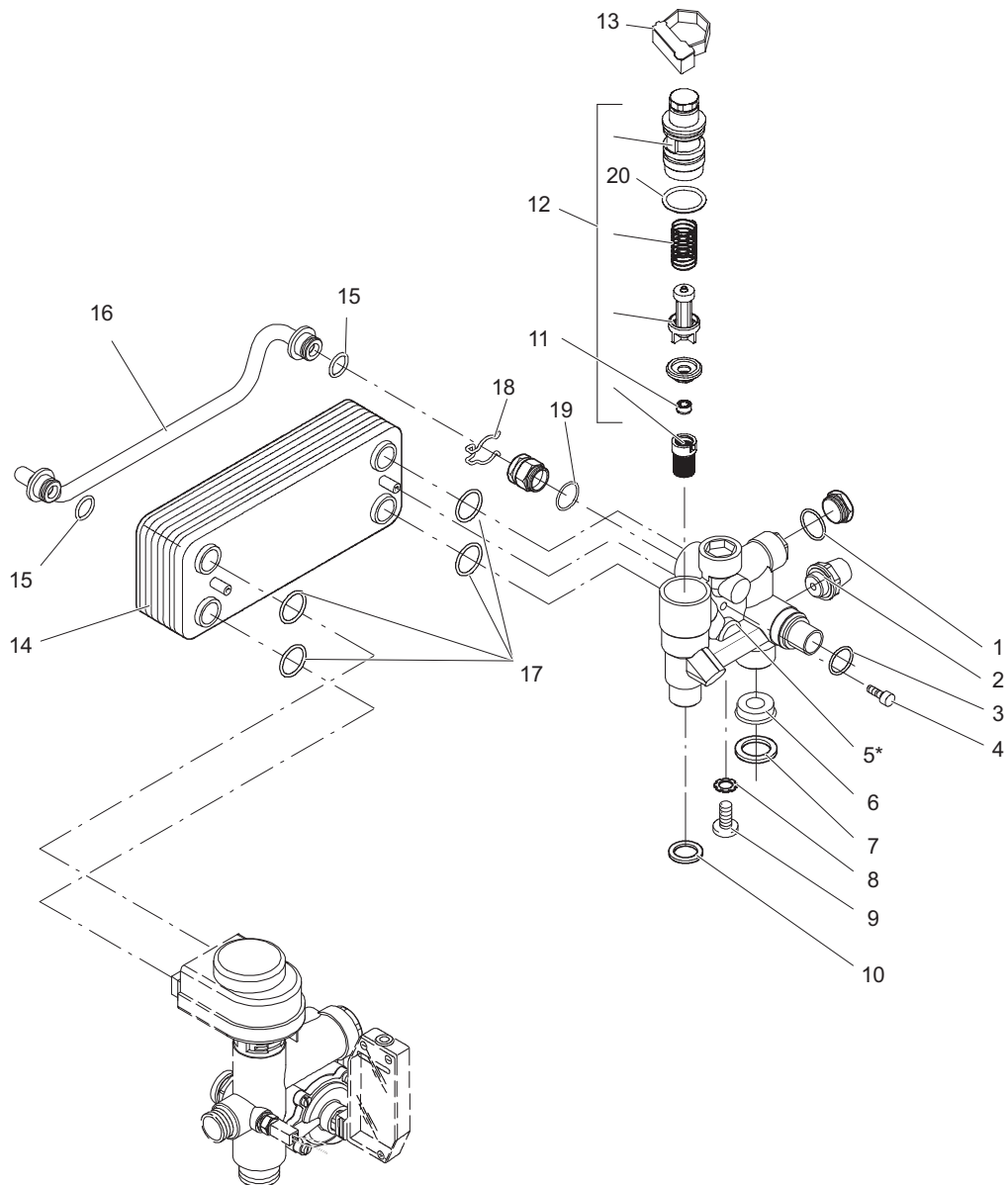


XVI Parts

The following parts may be obtained from any Crown distributor. To find the closest Crown distributor, consult the area Crown representative or the factory at:

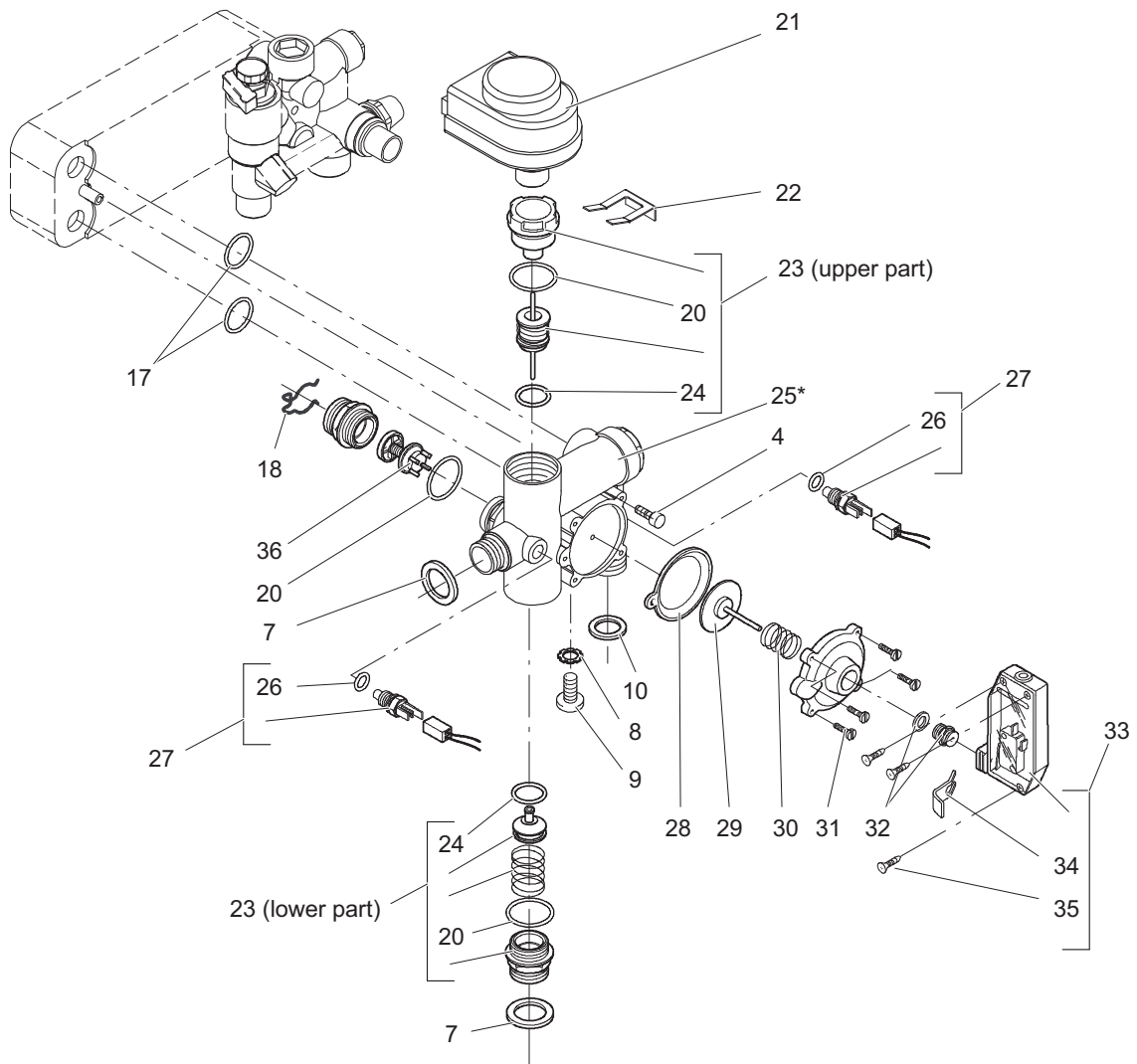
Crown Boiler Co.
Customer Service
P.O. Box 14818
Philadelphia, PA 19134
www.crownboiler.com

C.h. return group and d.h.w. heat exchanger (Model combi)



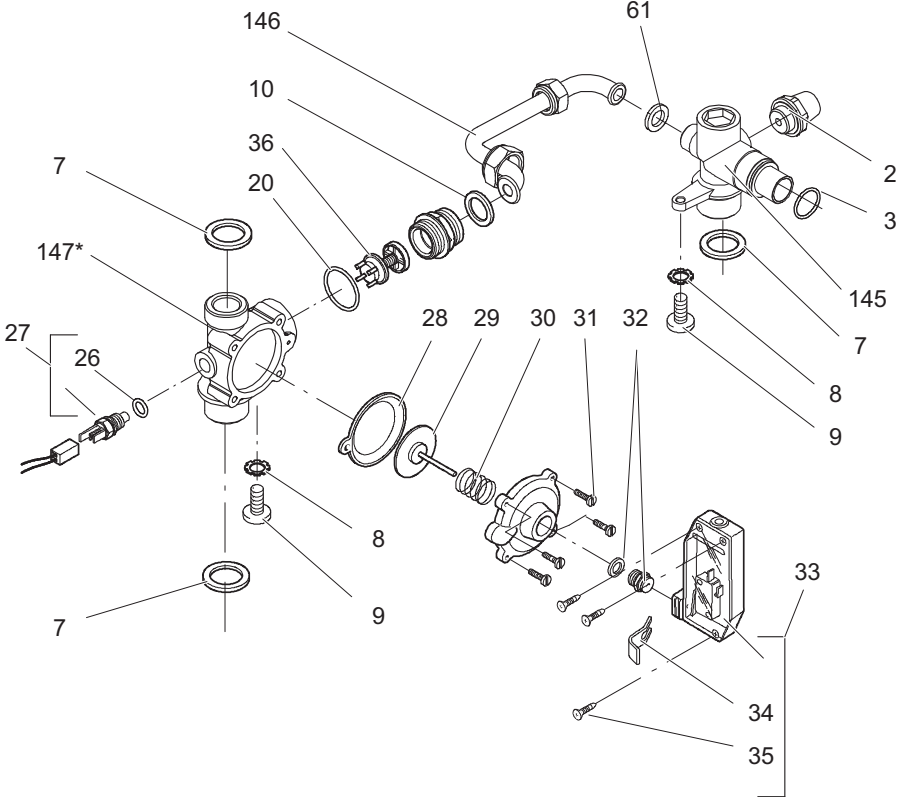
* Includes items 1, 12, 19

C.h. flow group and three way diverter valve (Model combi)



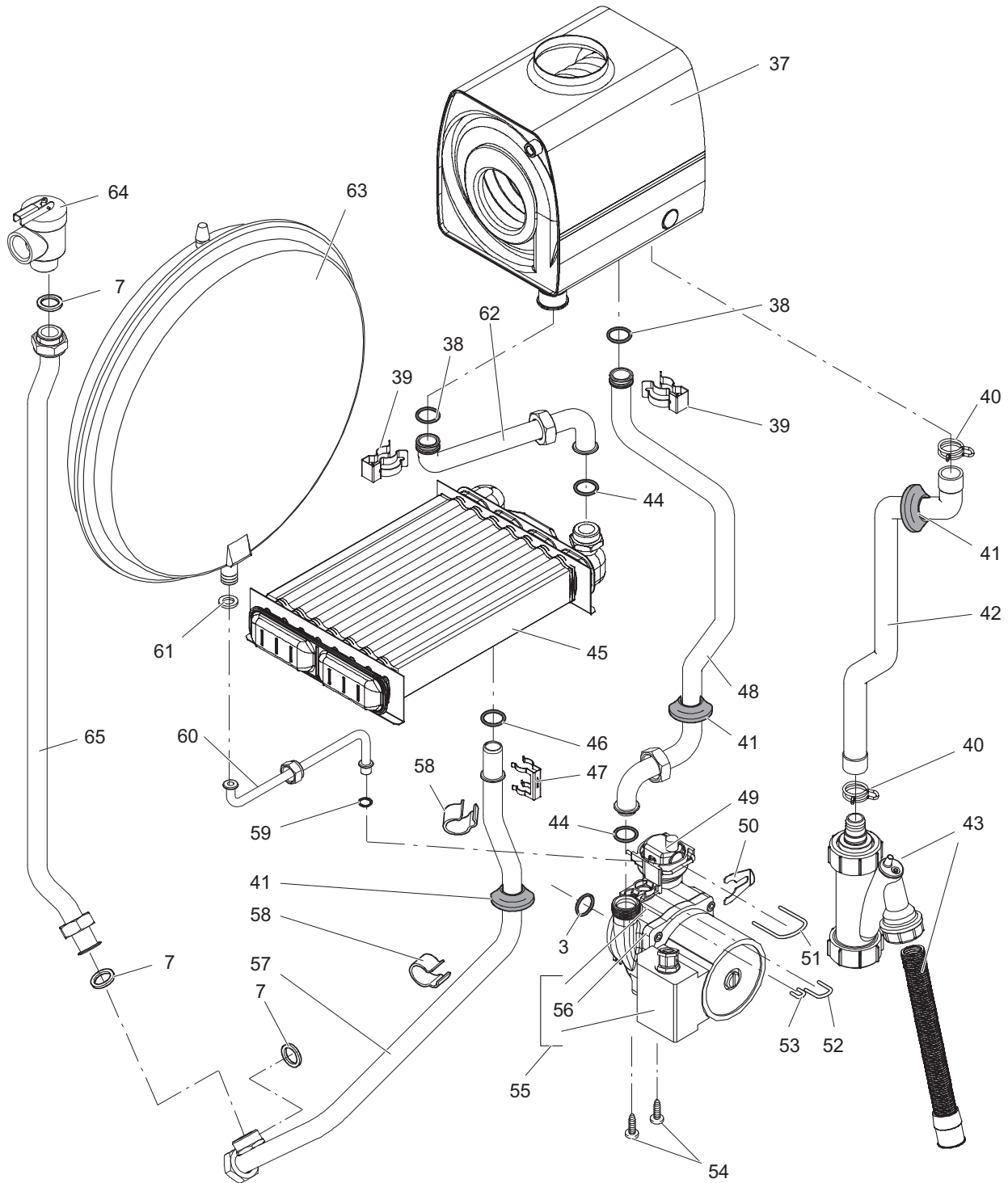
* Includes items 23, 28, 29, 30, 31, 32, 20, 36

C.h. flow and return groups (Model c.h. only)

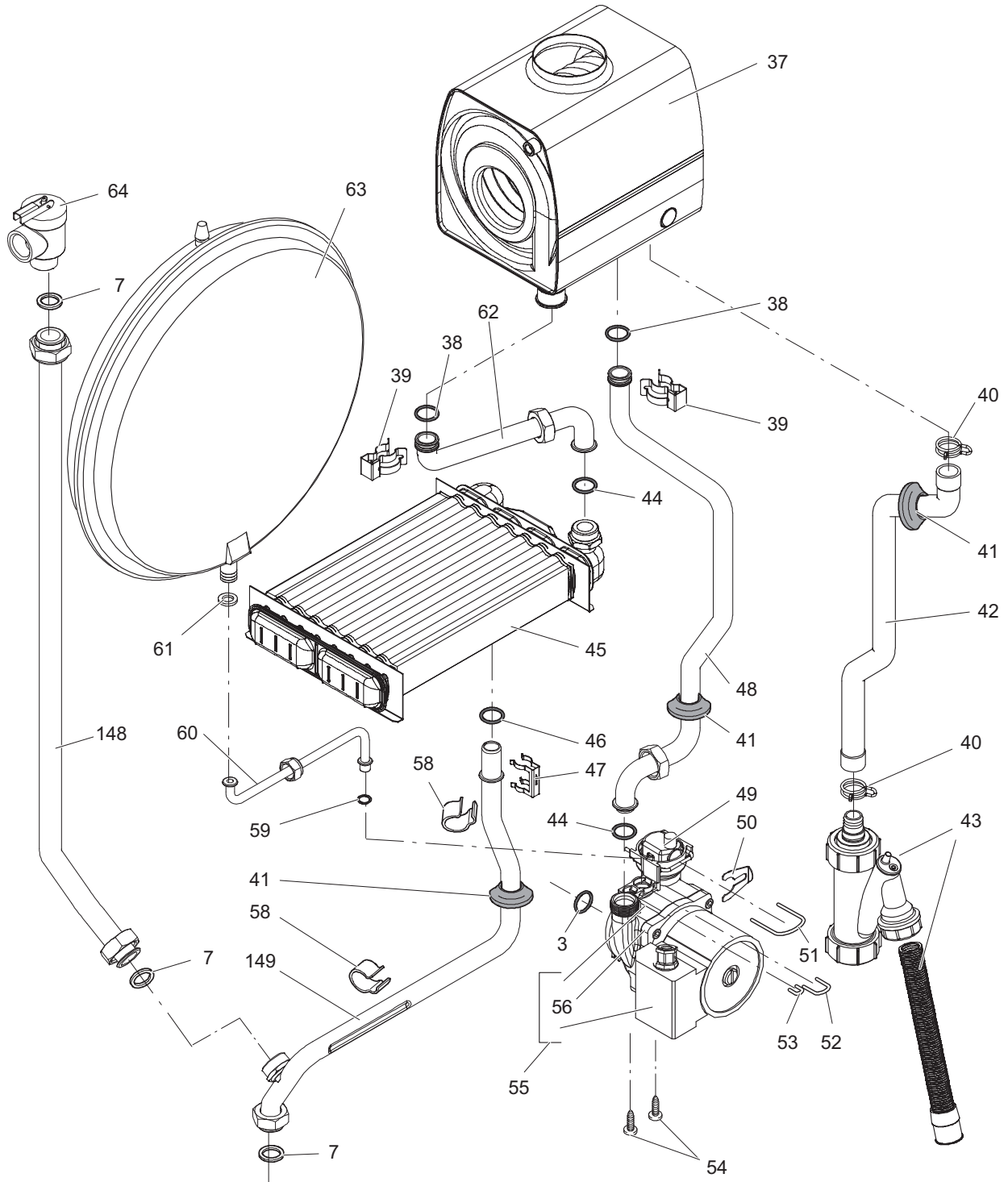


* Includes items 20, 28, 29, 30, 31, 32, 36

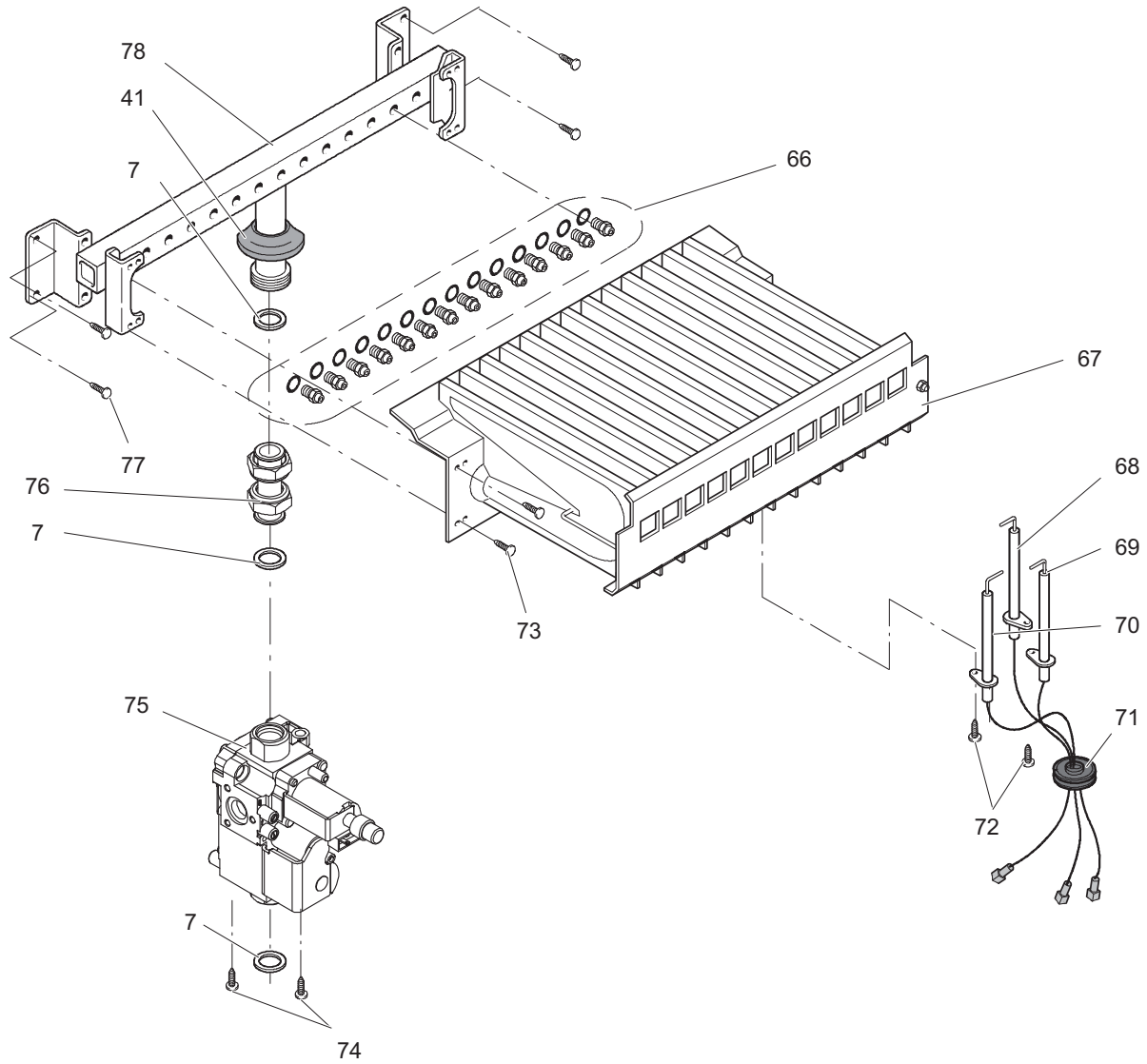
Pump and main circuit assembly (Model combi)



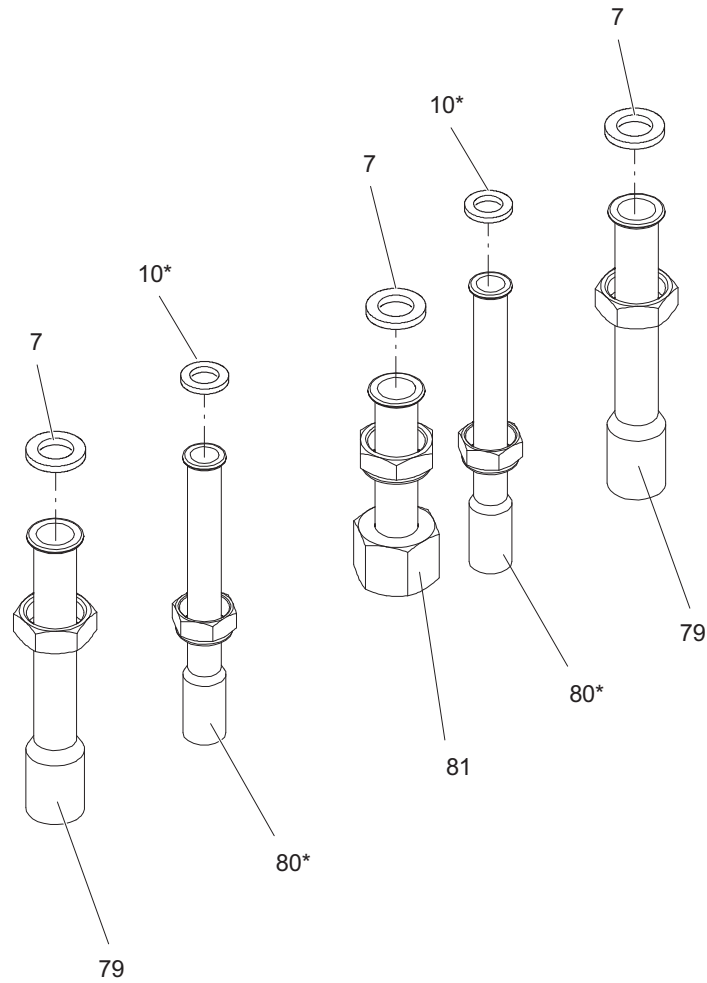
Pump and main circuit assembly (Model c.h. only)



Gas assembly

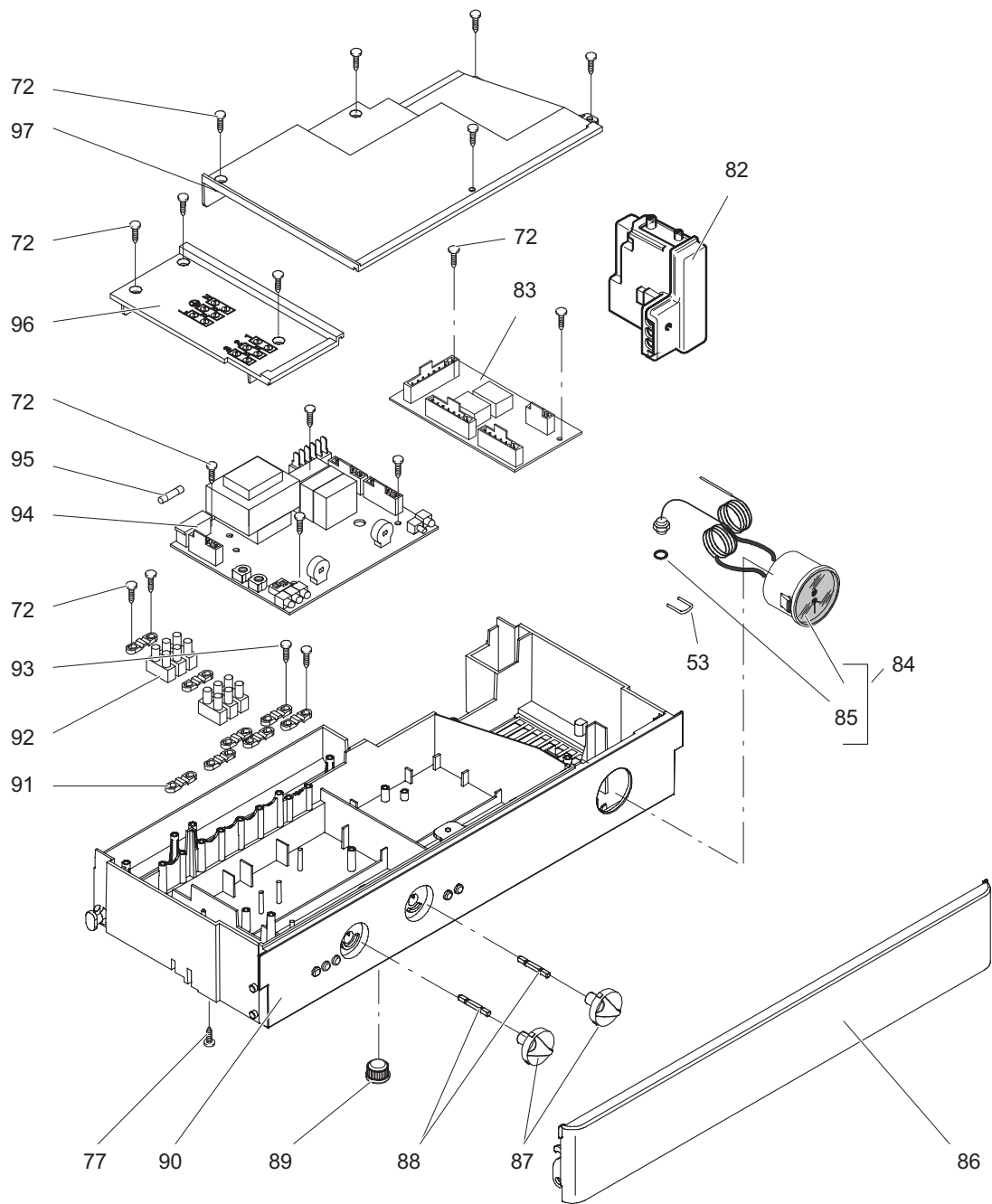


Connection pipes

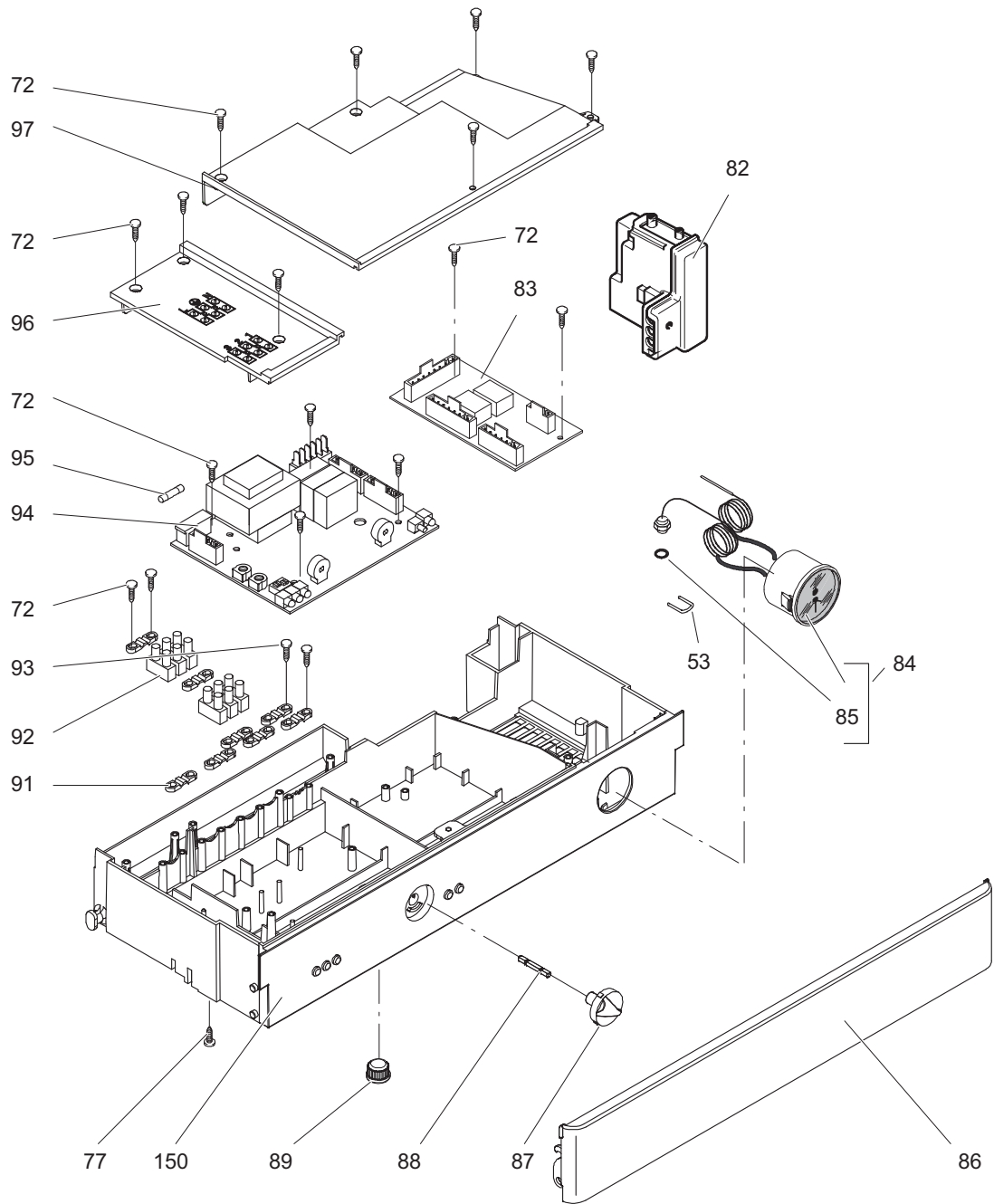


* Not for model c.h. only

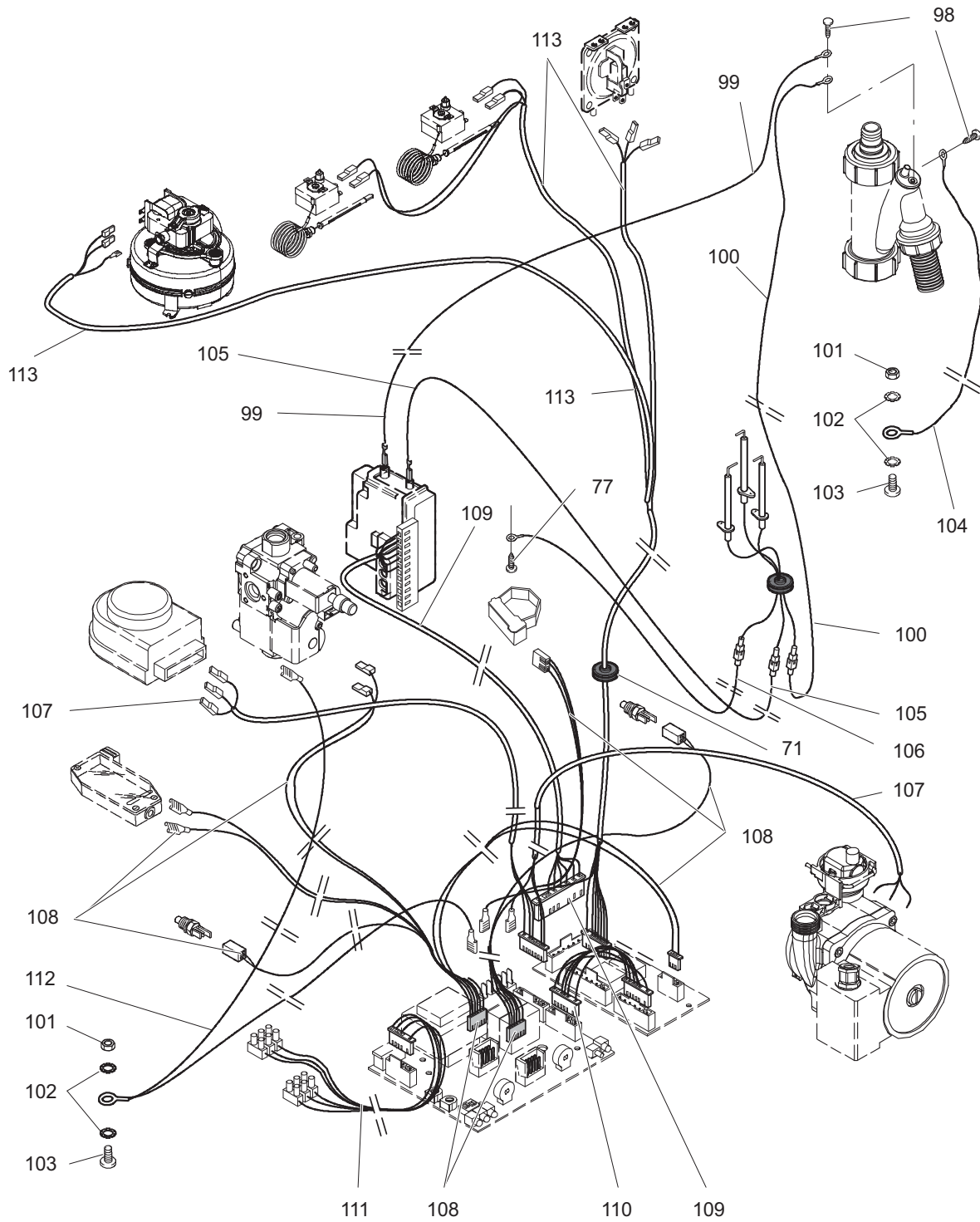
Control panel and ignition device (Model combi)



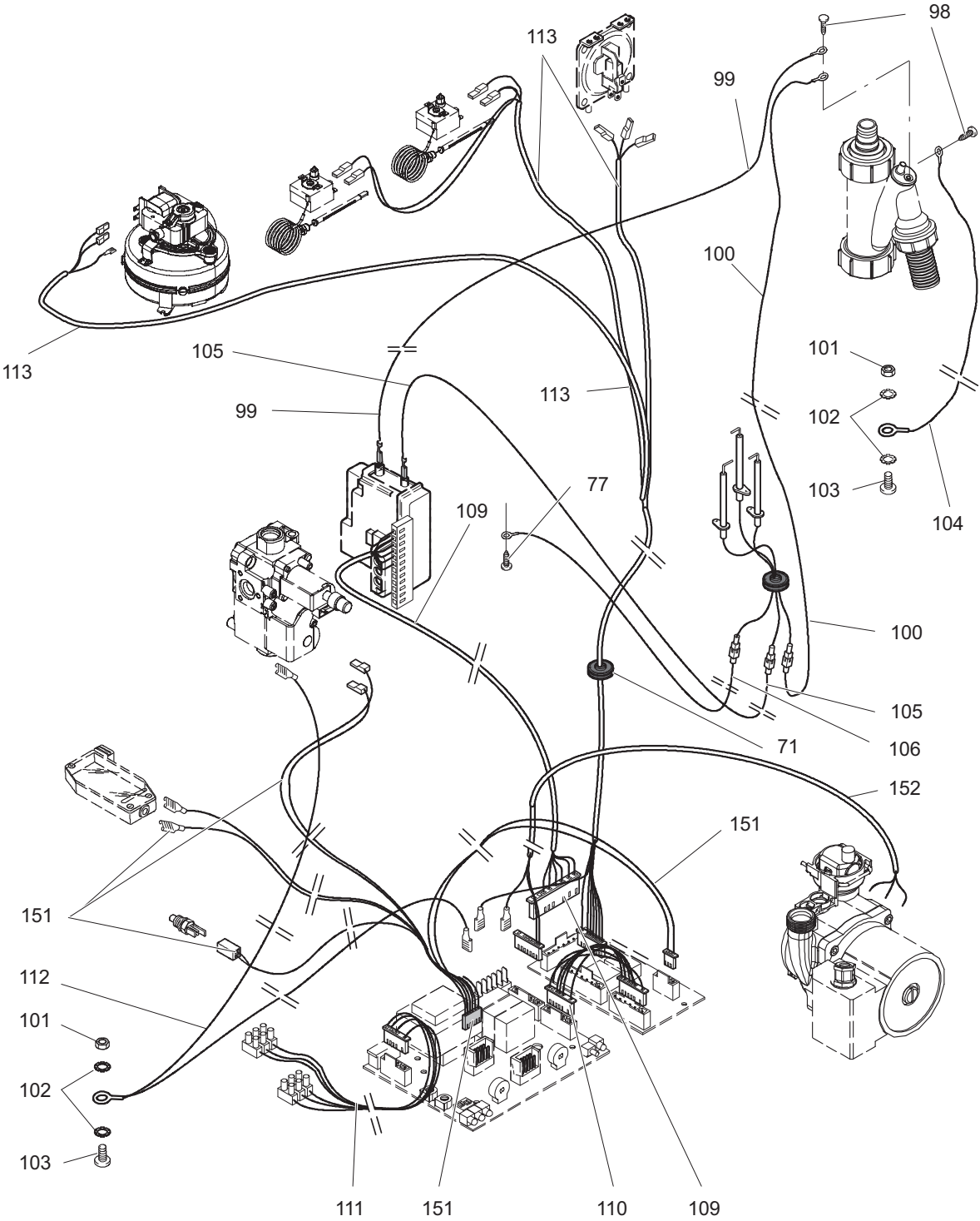
Control panel and ignition device (Model c.h. only)



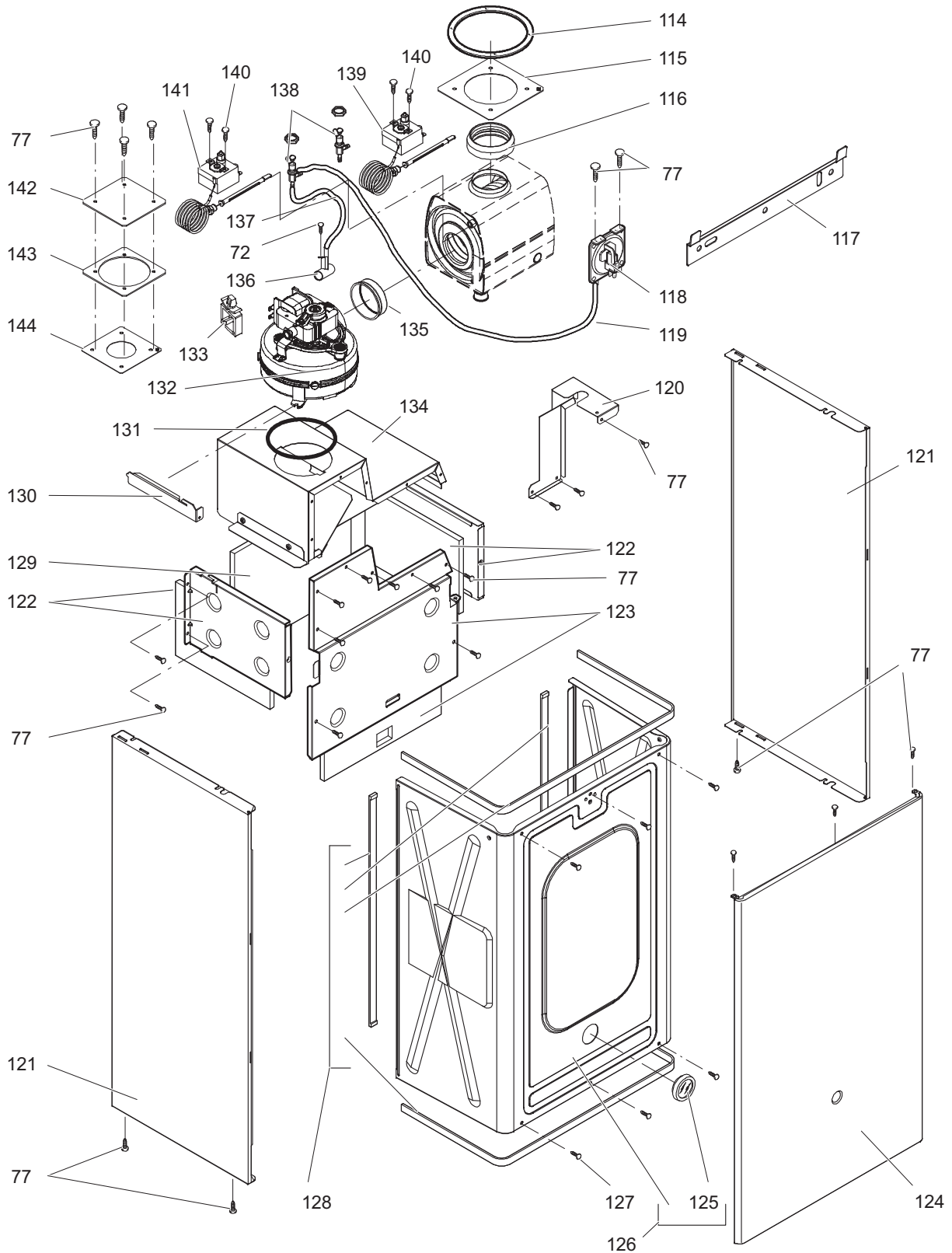
Wiring (Model combi)



Wiring (Model c.h. only)



Fan, combustion chamber and case panels



Key no.	Description	Spare part code
1	O-ring gasket 1,78x15,6	BI1001 131
2	Drainage valve	BI1011 104
3	O-ring gasket 17,04x4,00 mm	BI1212 112
4	Screw M5x25 mm - Hexagon socket cap	BI1131 107
5	Return group kit (Model combi)	BI1271 504
6	Domestic water restrictor	BI1271 102
7	Flat gasket 3/4"	BI1001 108
8	Toothed lock washer external 6,4 mm	BI1001 124
9	Screw M6x8 mm - BZP RPH	BI1001 123
10	Flat gasket 1/2"	BI1001 106
11	Flow limiter 10 Litres/min	BI1091 102
11A	Flow limiter 12 Litres/min	BI1091 103
11B	Flow limiter 14 Litres/min	BI1161 101
12	Magnetic flow switch and filter kit	BI1271 501
13	D.h.w. flow switch	BI1271 101
14	Exchanger Domestic Hot Water	BI1001 102
15	O-ring gasket 1,78x12,42 mm by-pass pipe	BI1001 115
16	By-pass pipe (Model combi)	BI1271 100
17	O-ring gasket 18,64x3,53 mm	KI1043 144
18	By-pass pipe fixing fork	BI1001 111
19	O-ring gasket 1,78x14 mm	BI1001 129
20	O-ring gasket 2,62x23,47 mm	BI1011 107
21	Diverter valve actuator	BI1201 100
22	Diverter valve actuator fixing spring	BI1101 101
23	Diverter valve kit	BI1141 501
24	O-ring gasket 2,7x13,6 mm	BI1011 117
25	Flow group kit (Model combi)	BI1251 503
26	O-ring gasket 9,25x1,78 mm (NTC)	KI1001 128
27	Temperature probe (special)	BI1001 117
28	Central heating pressure switch membrane	BI1011 103
29	Central heating pressure switch disk	BI1011 111
30	Central heating pressure switch spring	BI1011 110
31	Screw M4x12 mm Stainless steel SCH	BI1011 109
32	Microswitch guide bush	BI1011 502
33	Microswitch kit	BI1011 505
34	Microswitch box fixing clip	BI1011 105
35	Screw 2,9x13 mm AB self tapping BZP - RCH	BI1011 108
36	By-pass kit	BI1141 505
37	Condensing heat exchanger	BI1262 122
38	O-ring gasket 2,62x17.86 mm	BI1262 112
39	Condensing heat exchanger connection clip	BI1172 101
40	Connection spring	BI1262 117
41	Grommet	BI1002 113
42	Condensate discharge pipe	BI1262 110
43	Condensate trap (withdrawn)	BI1262 118
44	O-ring gasket 1,9X16 mm	BI1262 114
45	Main exchanger	BI1262 135
46	O-ring gasket 17,04x3,53	KI1043 114

Key no.	Description	Spare part code
47	Main exchanger connection clip	BI1182 106
48	Condensing heat exchanger inlet pipe	BI1262 136
49	Automatic air purger valve	BI1212 107
50	Pump connection fork	BI1262 116
51	Fork	BI1262 120
52	Fork	KI1042 101
53	Fork	KI1042 115
54	Screw 5X16	BI1262 115
55	Pump (complete)	BI1262 137
56	Pump gasket	BI1172 113
57	Main exchanger outlet pipe (Model combi)	BI1262 138
58	Probe holder	BI1105 108
59	O-ring gasket 2,62X9,92 mm	BI1262 113
60	Expansion vessel connection pipe	BI1262 134
61	Flat gasket 3/8" O.D 15 mm, i.d. 8.5 mm	BI1202 105
62	Condensing heat exchanger outlet pipe	BI1262 107
63	Expansion vessel	BI1182 105
64	Safety valve 30 psi	BI1262 133
65	Safety valve connection pipe (Model combi)	BI1262 132
66	Injectors with gaskets 130 - NG	BI1203 502
66A	Injectors with gaskets 85 - LPG	BI1203 503
67	Burner	BI1203 103
68	Detection electrode	BI1123 102
69	Ignition electrode - right	BI1123 103
70	Ignition electrode - left	BI1123 101
71	Grommet	BI1002 115
72	Tapping screw 3,5x9,5 mm recessed pan head	BI1013 115
73	Taptite screw M4x8 mm Recessed pan head	BI1013 111
74	Screw self tapping 3,9x9,5 mm type AB Recessed Pan Head	BI1013 112
75	Gas valve	BI1203 104
76	Gas pipe to the manifold	BI1203 105
77	Tapping Screw ISO No8 B 4,2x9,5 Recessed Pan Head	BI1013 110
78	Gas manifold with injectors NG	BI1183 105
78A	Gas manifold with injectors LPG	BI1203 106
79	C.h. connection pipe	BI1124 120
80	D.h.w. and d.c.w. connection pipe	BI1124 118
81	Gas connection pipe	BI1124 119
82	Full sequence control device	BI1555 109
83	Fan and APS device	BI1555 108
84	Temperature-pressure gauge	BI1555 111
85	O-ring gasket 1,78 x 6,75 mm	BI1475 119
86	Cover panel	BI1555 112
87	Knob	BI1555 113
88	Shaft	BI1475 105
89	Control panel plug	BI1475 110
90	Control panel box (Model combi)	BI1555 114
91	Cable holder	KI1066 208
92	Terminal block	BI1475 109

Key no.	Description	Spare part code
93	Screw 3,5x16 mm self tap RPH	BI1165 101
94	Electronic control - ignition p.c.b.	BI1555 107
95	Fuse 2AF	BI1165 112
96	Service panel cover	BI1475 111
97	Control panel cover	BI1475 112
98	Screw 3,5X9,5 mm self tap RPH	BI1615 104
99	Flame detection electrode cable	BI1615 111
100	Detection to trap wiring	BI1615 108
101	Full nut M5 Hexagon	BI1035 111
102	Toothed lock washer external 5,3x10 mm stainless	BI1035 110
103	Machine Screw M5x10 mm Recessed Pan Head	BI1035 109
104	Trap to earth wiring	BI1615 102
105	Ignition electrode cable	BI1615 112
106	Ignition electrode cable	BI1615 110
107	Pump-diverter valve cable (Model combi)	BI1615 113
108	Flow switches, temp. probes and modulator cable (Model combi)	BI1615 115
109	Ignition p.c.b. cable	BI1615 109
110	Electronic control p.c.b.-fan and APS device connection cable	BI1615 114
111	Power supply and external control cable	BI1615 116
112	Earth wiring	BI1615 117
113	Fan cable	BI1615 107
114	Flue pipe gasket	BI1016 104
115	Air restrictor d. 82 mm	BI1406 124
116	Flue outlet gasket	BI1406 112
117	Wall mounting plate	BI1124 104
118	Air pressure switch	BI1406 125
119	Venturi device tube	BI1256 101
120	Air deflector - right	BI1406 114
121	Side case panel	BI1416 100
122	Combustion chamber side panel	BI1326 100
123	Combustion chamber front panel	BI1406 119
124	Front case panel	BI1406 127
125	Window (glass + rubber frame)	BI1206 118
126	Sealed chamber lid	BI1406 105
127	Screw 4,8x13 mm AB self tapping RPH BZP	BI1336 114
128	Sealed chamber gaskets kit	BI1406 500
129	Combustion chamber rear panel	BI1326 108
130	Fan holder bracket	BI1406 120
131	Fan inlet gasket	BI1406 111
132	Fan	BI1406 126
133	Wire saddle	BI1406 123
134	Flue hood	BI1406 122
135	Fan outlet gasket	BI1406 113
136	Venturi	BI1406 128
137	Flue pressure switch tube	BI1016 107
138	Air switch pressure test point	BI1036 101
139	Overheat thermostat	BI1262 139
140	Screw M4x5 mm - BZP RPH	BI1406 117

Key no.	Description	Spare part code
141	Flue thermostat	BI1262 104
142	Twin flue cover plate	BI1366 114
143	Gasket - Air intake twin kit	BI1016 101
144	Air restrictor d. 45 mm	BI1406 129
145	Return group (Model c.h. only)	BI1171 107
146	By-pass pipe (Model c.h. only)	BI1171 106
147	Flow group kit (Model c.h. only)	BI1171 103
148	Safety valve connection pipe (Model c.h. only)	BI1262 140
149	Main exchanger outlet pipe (Model c.h. only)	BI1262 141
150	Control panel box (Model c.h. only)	BI1555 115
151	Flow switch, temp. probe and modulator cable (Model c.h. only)	BI1615 118
152	Pump cable (Model c.h. only)	BI1615 119

Appendix A: Special Requirements For Side-Wall Vented Appliances In The Commonwealth of Massachusetts

IMPORTANT

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of side-wall vented gas appliances as follows:

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

1. INSTALLATION OF CARBON MONOXIDE DETECTORS.

At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.

- a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
- b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS.

Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE.

A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION.

The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

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

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

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

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

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

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

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



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