

INSTALLATION & OPERATING INSTRUCTIONS

XPak[®]

NINETY PLUS



XPak 85
XPak 120



WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliance. To do so may result in an explosion or fire.

WHAT TO DO IF YOU SMELL GAS:

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

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

This manual should be maintained in legible condition and kept adjacent to the boiler or in a safe place for future reference.

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

Ne pas entreposer ni utiliser d'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareils.
- Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dans le bâtiment où vous vous trouvez.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le service des incendies.

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

Cette notice doit être conservée de manière à être lisible et à proximité de la chaudière ou dans un endroit sûr pour une utilisation future.

Raypak[®]
A Rheem[®] Company

Subject to technical changes!

Slight changes may be made to the illustrations, process steps and technical data as a result of our policy of continuous improvement.

About these instructions

These Installation Instructions contain important information for the safe and professional installation, start-up and maintenance of the boiler with boiler capacities 87,000 and 120,000 btu/hr. These Installation Instructions are intended for qualified installers, who have the necessary training and experience for working on heating and gas systems.

About the XPak

The boiler was designed for heating water for a space heating system and generating hot water e.g. for domestic purposes. The boiler can be fitted with a remote control or an On/Off room thermostat (24 V), external sensor and with a 3-way valve for DHW indirect storage tank controlled either with a tank thermostat or a tank sensor (accessories).

Dear Costumer,

Thank you for choosing the XPak boiler. This Raypak product provides more efficiency and greater comfort to the living space, thanks to its unique features.

The new patented aluminum heat exchanger provides ultra low emissions, higher efficiency and easier recycling after the boiler life.

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1 - WARNINGS - PAY ATTENTION TO THESE TERMS

DANGER:

Indicates the presence of immediate hazards which will cause severe personal injury, death or substantial property damage if ignored.

WARNING:

Indicates the presence of hazards or unsafe practices which could cause severe personal injury, death or substantial property damage if ignored.

CAUTION:

Indicates the presence of hazards or unsafe practices which could cause minor personal injury or product or property damage if ignored.

NOTICE:

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

CAUTION: This boiler requires forced water circulation when the burner is operating. See minimum and maximum flow rates. Severe damage will occur if the boiler is operated without proper water flow circulation.

NOTE: Minimum 18 AWG, 105°C, stranded wire must be used for all low voltage (less than 30 volts) external connections to the unit. Solid conductors should not be used because they can cause excessive tension on contact points. Install conduit as appropriate. All high voltage wires must be the same size (105°C, stranded wire) as the ones on the unit or larger.

NOTE: When the boiler has been filled for the first time or the system has been drained and refilled, it will be necessary to release any air that may have become trapped within the appliance heat exchanger. Loosen the bleed screw until water is released and then close.

IMPORTANT, THERE ARE NO OTHER MANUAL AIR RELEASE VALVES LOCATED ON THE APPLIANCE.

DANGER: Make sure the gas on which the boiler will operate is the same type as that specified on the boiler rating plate and on the coloured sticker near the boiler gas connection.

WARNING: Should overheating occur or the gas supply valve fail to shut, do not turn off or disconnect the electrical supply to the boiler. Instead, shut off the gas supply at a location external to the boiler.

WARNING: Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control which has been under water.

AVERTISSEMENT: En cas de surchauffe ou de non fermeture de la vanne d'alimentation en gaz, n'éteignez ou ne débranchez pas l'alimentation électrique de la chaudière. Coupez plutôt l'alimentation en gaz à l'extérieur de la chaudière.

AVERTISSEMENT: N'utilisez pas cette chaudière si une partie de celle-ci s'est retrouvée sous l'eau. Appelez immédiatement un technicien de service qualifié pour inspecter la chaudière et pour remplacer toute partie du système de contrôle et toute commande de gaz s'étant retrouvée sous l'eau.

WARNING: To minimize the possibility of improper operation, serious personal injury, fire, or damage to the boiler:

- Always keep the area around the boiler free of combustible materials, gasoline, and other flammable liquids and vapors.
- Boiler should never be covered or have any blockage to the flow of fresh air to the boiler.

WARNING: Risk of electrical shock. More than one disconnect switch may be required to de-energize the equipment before servicing.

WARNING - CALIFORNIA PROPOSITION

65: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

The following instructions must be observed

- The boiler must only be used for its designated purpose, observing the Installation Instructions.
- Only use the boiler in the combinations and with the accessories and spares listed.
- Other combinations, accessories and consumables must only be used if they are specifically designed for the intended application and do not affect the system performance and the safety requirements.
- Maintenance and repairs must only be carried out by authorized professionals.
- You must report the installation of a condensing gas boiler to the relevant gas utility company and have it approved.
- You are only allowed to operate the condensing gas boiler with the combustion air/flue gas system that has been specifically designed and approved for this type of boiler.
- Please note that local permission for the flue system and the condensate water connection to the public sewer system may be required.

You must also observe:

- The local building regulations stipulating the installation rules.
- The local building regulations concerning the air intake and outlet systems and the chimney connection.
- The regulations for the power supply connection.
- The technical rules laid down by the gas utility company concerning the connection of the gas burner fitting to the local gas main.
- The instructions and standards concerning the safety equipment for the water/space heating system.
- The Installation Instructions for building heating systems.
- The boiler must be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the boiler or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.
- The boiler must be installed such that the gas ignition system components are protected from water (dripping, spraying, rain etc.) during boiler operation and service.
- The boiler must not be installed on carpeting.
- The boiler must only be installed on a wall.
- Do not restrict or seal any air intake or outlet openings.
- If you find any defects, you must inform the owner of the system of the defect and the associated hazard in writing.

DANGER

if flammable gas explodes.

Beware if you smell gas: there may be an explosion hazard!

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

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other boiler.

What to do if you smell gas

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

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Observe these instructions as general warnings:

- Chemicals used to clean the system and/or inhibit corrosion must be pH neutral, i.e. they should ensure that the level of the pH in the system water remains neutral. Premature failure of certain components can occur if the pH level in the system water is out of normal levels.
- Raypak recommends that an inhibitor - suitable for use with aluminum heat exchangers - is used to protect the boiler and system from the effects of corrosion and/or electrolytic action. The inhibitor must be administered in strict accordance with the manufacturers instructions.
- A properly sized expansion tank must be installed in the boiler system. No valve is to be placed between the boiler and the expansion tank.
- When the boiler has been filled for the first time or the system has been drained and refilled, it will be necessary to purge any air that may have become trapped within the appliance heat exchanger.

NOTE: Glycol in the system must not exceed 40%.

Observe these instructions for space heating water:

- Thoroughly flush the system prior to filling. Only use untreated main water to fill and top off the system.
- Do not use water softeners in the system.
- Do not use inhibitors or other additives!
- The maximum permissible flow rate of the XPAK 85 this is 5.7 GPM (1,300 ltr/hr), for the XPAK 120 is 6.2 GPM (1,400 ltr/hr).
- When using oxygen-permeable pipes, e.g. for floor heating systems, you must separate the system using heat exchangers. Unsuitable heating system water promotes the formation of sludge and corrosion. This may damage the heat exchanger or affect its operation.
- A properly sized expansion tank must be installed in the boiler system.

Tools, materials and additional equipment

For the installation and maintenance of the boiler you will need the standard tools for space heating, gas and water fitting. In addition, a handtruck with a fastening belt is very useful.

Disposal

- Dispose of the boiler packaging in an environmentally sound manner.
- Dispose of components of the heating system (e. g. boiler or control device), that must be replaced, by handing them in to an authorized recycling facility.

2 - GENERAL SAFETY

To meet domestic hot water use needs, the high limit safety control on this boiler is adjustable up to 140°F (60°C). Water temperatures over 125°F (50°C) can cause instant severe burns or death from scalds.

When supplying general purpose hot water, the recommended initial setting for the temperature control is 125°F (50°C). Safety and energy conservation are factors to be considered when setting the water temperature on the thermostat. The most energy-efficient operation will result when the temperature setting is the lowest that satisfies the needs of the application.

Water temperature over 125°F (50°C) can cause instant severe burns or death from scalds. Children, disabled and elderly are at highest risk of being scalded.

- Feel water before bathing or showering.
- Temperature limiting valves are available.

NOTE: When this boiler is supplying general purpose hot water for use by individuals, a thermostatically controlled mixing valve for reducing point of use water temperature is recommended to reduce the risk of scald injury. Contact a licensed plumber or the local plumbing authority for further information.

Maximum water temperatures occur just after the boiler's burner has shut off. To determine the water temperature being delivered, turn on a hot water faucet and place a thermometer in the hot water stream and read the thermometer.

WARNING: This boiler cannot supply hot water for use by individuals directly. A heat exchanger must be used in conjunction with this boiler to meet DHW needs.

TIME / TEMPERATURE RELATIONSHIPS IN SCALDS

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

Water Temperature	Time to Produce Serious Burn
120°F	More than 5 minutes
125°F	1-1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1-1/2 seconds
155°F	About 1 second

Table courtesy of The Shriners Burn Institute

The temperature of the water in the boiler can be regulated by using the Raypak Remote Control REC08. To comply with safety regulations, the control is set when shipped from the factory.

CAUTION: Hotter water increases the risk of scalding! There is a hot water scald potential if the thermostat is set too high.

3 - BEFORE INSTALLATION

Raypak strongly recommends that this manual be reviewed thoroughly before installing your XPak boiler. Please review the General Safety information before installing the boiler. Factory warranty does not apply to boilers that have been improperly installed or operated. (Refer to the warranty at the back of this manual.) Installation and service must be performed by a qualified installer, service agency or gas supplier. If, after reviewing this manual, you still have questions which this manual does not answer, please contact the manufacturer or your local Raypak representative. Thank you for purchasing a Raypak product. We hope you will be satisfied with the high quality and durability of our equipment.


Product Receipt

On receipt of your boiler it is suggested that you visually check for external damage to the shipping package. If the package is damaged, make a note to that effect on the Bill of Lading when signing for the shipment. Remove the boiler from the shipping packaging. Report any damage to the carrier immediately. On occasion, items are shipped loose. Be sure that you receive the correct number of packages as indicated on the Bill of Lading. Claims for shortages and damages must be filed with the carrier by consignee. Permission to return goods must be received from Raypak prior to shipping. Goods returned to the factory without an authorized Returned Goods Receipt number will not be accepted. All returned goods are subject to a restocking charge. When ordering parts, you must specify the model and serial number of the boiler. When ordering under warranty conditions, you must also specify the date of installation. Purchased parts are subject to replacement only under the manufacturer's warranty. Debits for defective replacement parts will not be accepted and will be replaced in kind only per Raypak's standard warranty.

Model Identification

The model identification number and boiler serial number are found on the boiler rating plate located on the casing right side. Also the boiler serial number can be found on the back page of this manual and inside the front control panel flap.

! DANGER



Water temperature over 125°F- 50°C can cause instant severe burns or death from scalds.

Children, disabled, and elderly are at highest risk of being scalded.

See instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

Ratings and Certifications

Standards:

- Gas fired hot water boiler for either direct vent installation or for installation using indoor combustion air. Design according to: ANSI Z21.13b 2007 – CSA 4.9b 2007 – Fired low pressure hot water boilers. Category IV.
- SCAQMD Rule 1146.2

All Raypak boilers are National Board Approved, and design-certified and tested by the Canadian Standards Association (CSA) for the U.S. and Canada. Each boiler is constructed in accordance with Section IV of the American Society of Mechanical Engineers (ASME) Boiler Pressure Vessel Code and bears the ASME H stamp. This boiler also complies with the latest edition of the ASHRAE 90.1 Standard.

WARNING: Altering any Raypak pressure vessel by installing replacement heat exchangers, tube bundle headers, or any ASME parts not manufactured and/or approved by Raypak will instantly void the ASME and CSA ratings of the vessel and any Raypak warranty on the vessel. Altering the ASME or CSA ratings of the vessel also violates national, state, and local approval codes.

Installations at Elevation

Rated inputs are suitable for up to 4,500 ft elevation (see technical data table). Consult the factory for installations at altitudes over 4,500 ft above sea level. No hardware changes are required to the boilers for installations up to 10,000 ft (adjustments may be required).

4 - REGULATIONS AND GUIDELINES

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the latest edition of the National Fuel Gas Code, ANSI Z223.1. In Canada, installation must be in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code. Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

Install CO detectors per local regulations. Boiler requires yearly maintenance, see chapter "Checks, adjustments and fault finding".

Operating Limits of the boiler:

Max. boiler temperature: 194°F (90 °C)
Max. operating pressure: 45 psi (3.1 bar)

The hot water distribution system must comply with all applicable codes and regulations. When replacing an existing boiler, it is important to check the condition of the entire hot water distribution system to ensure safe operation.

5 - INTRODUCTION

The **XPak** boiler is a wall hung, fan assisted, direct vent, heating boiler only. These boilers – by design – incorporate electronic ignition, circulating pump, pressure relief valve, pressure gauge, and automatic bypass.

As supplied, the boiler will automatically modulate to provide central heating outputs between 25,600 - 87,000 Btu/hr (7.5-25.5 kW) - XPak 85 and 27,300 - 119,500 Btu/hr (8-35 kW) XPak 120.

IMPORTANT

It is the law that all gas appliances are installed by a competent person.

It is in your own interest and that of safety to ensure that the law is complied with.

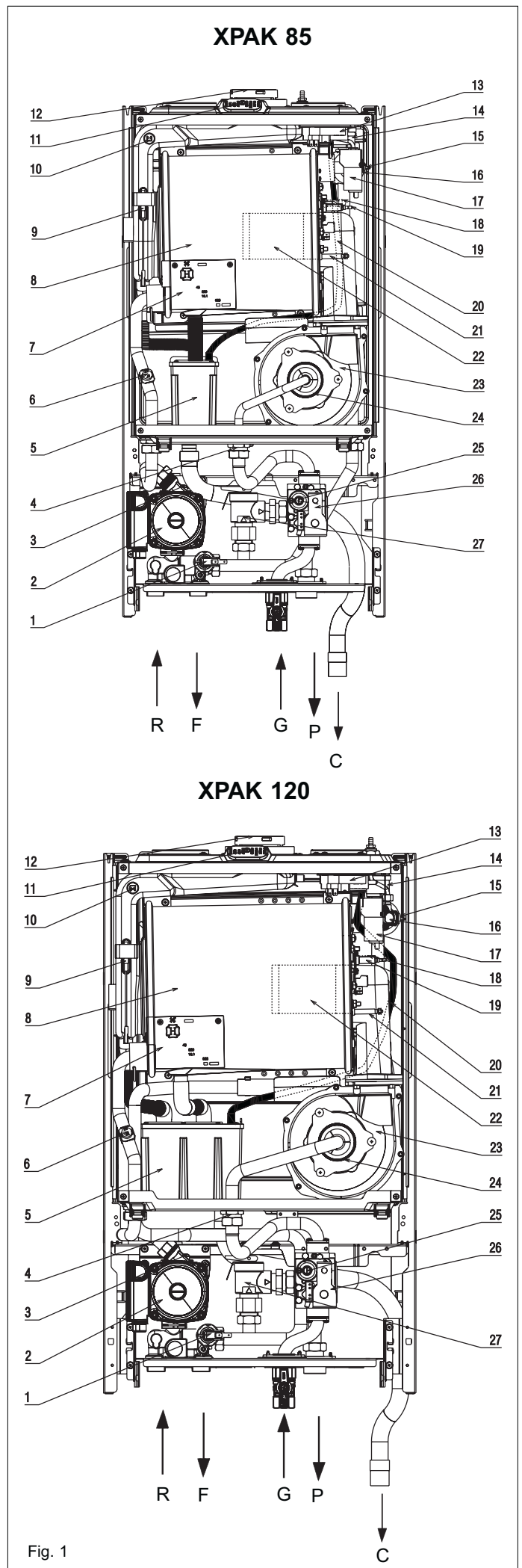
- The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.
- The installation should conform with CGA B149 INSTALLATION CODE and/or local installation Code, plumbing or waste water codes and other codes as applicable.
- Clearances from combustible material must be strictly adhered to.
- Manufacturers instructions must NOT be interpreted in anyway as overriding statutory obligations.

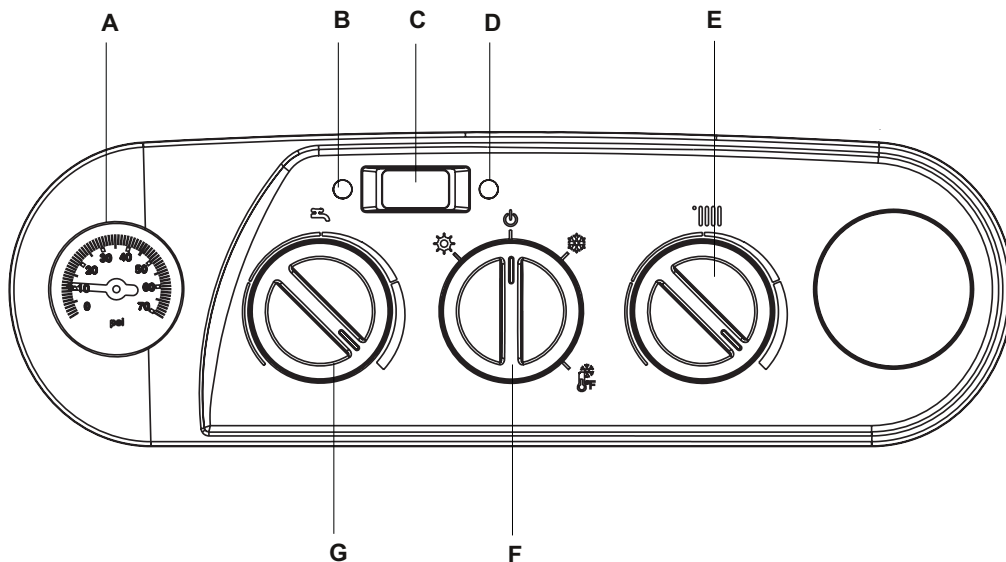
The **XPak** family comprises a range of high-efficiency hot water boilers with outputs ranging from 87,000 Btu/hr (25.5 kW) to 119,500 Btu/hr (35 kW). Each appliance is provided with a fan powered flue outlet with an annular co-axial combustion air intake that can be rotated – horizontally – through 360 degrees for various horizontal or vertical applications. The XPak can also be used with two pipe flue vent system. These appliances are designed for use with a sealed system only; consequently they are not intended for use on open vented systems.

This booklet is an integral part of the appliance. It is therefore necessary to ensure that the booklet is handed to the person responsible for the property in which the appliance is located/ installed. A replacement copy can be obtained from Raypak customer services.


General layout (Fig. 1)


- 1 Water pressure switch
 - 2 Pump
 - 3 Bottom auto air vent (AAV)
 - 4 Gas injector
 - 5 Condense trap
 - 6 Return sensor
 - 7 H stamp main heat exchanger
 - 8 Main heat exchanger
 - 9 Flue thermostat
 - 10 Flue sensor
 - 11 Flue gas analysis test point
 - 12 Flue outlet & air intake
 - 13 Blocked flue switch
 - 14 Top automatic air vent
 - 15 Flow sensor
 - 16 High limit thermostat
 - 17 Ignition transformer
 - 18 Sensing Electrode
 - 19 Spark Electrode
 - 20 Top automatic air vent drain pipe
 - 21 Condensate level sensor
 - 22 Cylindric Burner
 - 23 Fan assembly
 - 24 Mixer
 - 25 Gas modulator coil
 - 26 Gas valve
 - 27 Pressure relief valve
- R Boiler IN connection
 F Boiler OUT connection
 G Gas connection
 P Pressure relief valve drain
 C Condensate drain pipe








- A Pressure gauge
- B Green led
- C 2-digit LED display
- D Red led
- E Temperature selector space heating
- F Mode selector switch
- G Temperature selector Domestic Hot Water


 **Off/reset** - Select this position when the boiler needs to be reset or switched off.


 **Summer mode** - The domestic hot water function provided by the water tank is activated. The display indicates the storage tank temperature (only with the external water tank connected with a sensor).


 **Winter mode** - The boiler produces hot water for heating and, if connected to an external water tank, it provides domestic hot water. The display indicates the boiler flow temperature.


 **Winter mode tank temperature** - The boiler produces hot water for heating and, if connected to an external water tank with a sensor, it provides domestic hot water. The display indicates the storage tank temperature.


 **Temperature selector DHW** - Move the temperature selector clockwise to increase the hot water temperature in the water tank or counter-clockwise to reduce the temperature (working only if a tank sensor is connected).

 **Temperature selector Heating** - Move the temperature selector clockwise to increase the heating temperature or counterclockwise to reduce the temperature.

 **2-digit LED display** - Displays the temperature according the mode selector switch. During a fault condition, the appropriate code will be displayed (refer to the installation instructions regarding fault codes).

 **Green LED lit** - Boiler is working/responding to a heating/tank request (flame ON).

 **Red LED lit** - Boiler has identified a fault and has shut down. Refer to installation instructions on how to reset.

 **Pressure gauge** - Ensure the system pressure is set correctly (minimum 7 p.s.i. (0.45 bar))

TECHNICAL DATA

Tab. 1

		XPak 85	XPak 120
Input - Output			
Input - (0 - 2000 ft / 0 - 610 m)	Btu/hr	25,600 - 87,000	27,300 - 119,500
	kW	7.5 - 25.5	8.0 - 35.0
Input - (2000 - 4500 ft / 610 - 1375 m)	Btu/hr	25,600 - 82,900	27,300 - 114,300
	kW	7.5 - 24.3	8.0 - 33.5
Output (176°F - 86°F / 80°C - 30°C)	Btu/hr	25,200 - 76,600	26,600 - 108,300
	kW	7.4 - 22.5	7.8 - 31.7
Energy Guide			
AFUE	%	91.8	92.6
Gas			
Gas supply pressure Natural Gas (A)	in w. c.		6.82
	kPa		1.70
Min. gas supply pressure Natural Gas (A)	in w. c.		3.5
	kPa		0.87
Max. gas supply pressure Natural Gas (A)**	in w. c.		10.5
	kPa		2.62
Gas supply pressure LPG (E)	in w. c.		11
	kPa		2.75
Min. gas supply pressure LPG (E)	in w. c.		8
	kPa		1.99
Max. gas supply pressure LPG (E)**	in w. c.		13
	kPa		3.24
Gas Rate max natural gas (A)	ft ³ /hr	87.77	121.01
	sm ³ /hr	2.49	3.43
Gas Rate min natural gas (A)	ft ³ /hr	26.14	28.01
	sm ³ /hr	0.74	0.79
Gas Rate max LPG (E)	lbs/hr	4.02	5.55
	kg/hr	1.82	2.52
Gas Rate min LPG (E)	lbs/hr	1.20	1.28
	kg/hr	0.54	0.58
System Data			
Minimum relief valve capacity	lbs/hr	87	119.50
Maximum operating pressure	p.s.i.		45
	bar		3.1
Minimum operating pressure	p.s.i.		6.52
	bar		0.45
Recommended system pressure	p.s.i.		15
	bar		1
Boiler max flow rate (litr/hr)	GPM	5.72	6.2
	litr/hr	1,300	1,400
Pump residual head at max flow rate	in w. c.	60.22	44.11
	mbar	150	110
Primary water content	CAN G	0.70	0.84
	USG	0.85	1.0
	litr	3.2	3.8
Boiler Water Temperature			
Adjustable high limit range - high temp. (radiators heating)*	°F		104 - 176
	°C		40 - 80
Adjustable high limit range - low temp. (space heating)*	°F		68 - 113
	°C		20 - 45
DHW production - set point	°F		95 - 140
	°C		35 - 60
Max boiler temperature	°F		194
	°C		90
Electric Data			
Electric rate voltage	V - Hz		120 - 60
Current less than	A	1.19	1.25
Electric consumption (pump included)	W	133	141
Electrical protection rating	IP		IPX5D
Fuses	A - VAC		4 - 250
Flue Gas Values			
CO ₂ setting natural gas (A)	%		8.5%
CO ₂ setting LPG (E)	%		10.0%
NO _x @ max (A)	ppm	< 20	< 20
NO _x @ min (A)	ppm	< 15	< 15
CO @ max (A) without air	ppm	< 135	< 170
CO @ min (A) without air	ppm	< 15	< 25
NO _x @ max (E)	ppm	< 20	< 20
NO _x @ min (E)	ppm	< 15	< 20
CO @ max (E) without air	ppm	< 200	< 220
CO @ min (E) without air	ppm	< 40	< 35

		XPak 85	XPak 120
Boiler flue gas connection	in	2 3/8	2 3/8
	mm	60	60
Combustion air connection outer dia.	in	4	4
	mm	100	100
Free fan unit feed pressure	in w. c.	0.26	0.18
	Pa	65	45
Flue gas mass flow rate at rated full load (A)	lbs/hr	90.39	123.17
	kg/hr	41	55.87
Flue gas mass flow rate at rated full load (E)	lbs/hr	88.89	121.18
	kg/hr	40.32	54.97
Flue gas mass flow rate at rated partial load (A)	lbs/hr	26.58	28.48
	kg/hr	12.06	12.92
Flue gas mass flow rate at rated partial load (E)	lbs/hr	25.08	27.99
	kg/hr	11.88	12.70
Condensate flow rate (A) at max - 122/86 °F (50/30°C)	USG/hr	0.37	0.41
	ltr/hr	1.41	1.56
Condensate flow rate (A) at min. - 122/86 °F (50/30°C)	USG/hr	0.13	0.16
	ltr/hr	0.48	0.6
Flue temperature at boiler return temp. 86°F/30°C at full load (A)	°F	186.0	170.0
	°C	86.0	77.0
Flue temperature at boiler return temp. 86°F/30°C at partial load (A)	°F	163.0	165.0
	°C	73.0	74.0
Flue temperature at boiler return temp. 140°F/60°C at full load (A)	°F	194.0	186.0
	°C	90.0	86.0
Max flues length de-rate less 2%			
Max length horizontal coaxial 60/100 mm	ft	6.5	6.5
	m	2	2
Max total length 2 pipe 3" (80 mm) (air + flues)	ft	40+40	16+16
	m	12+12	5+5
Max flues length de-rate less 5%			
Max length horizontal coaxial 60/100 mm	ft	26	26
	m	7.8	7.8
Max total length 2 pipe 3" (80 mm) - (air + flues)	ft	130+130	115+115
	m	40+40	35+35
Minimum Clearances To Combustibles			
Top - front - rear	in	0 - 0 - 0	
	mm	0 - 0 - 0	
Left - right - vent pipe	in	0 - 0 - 0	
	mm	0 - 0 - 0	
Recommended Minimum Service Clearances			
Top - front - rear	in	12 - 24 - 0	
	mm	300 - 600 - 0	
Left - right	in	1 - 1	
	mm	25 - 25	
Pipe Connections			
Gas supply connection (shut off valve)	in	3/4 NPT - female	
Boiler in connection	in	3/4 NPT - male	
Boiler out connection	in	3/4 NPT - male	
Pressure relief valve	in	3/4 NPT - female	
Condensate connection diameter (rubber flexible)	in	0.825 female	
	mm	21 female	
Boiler drain valve - open-ended wrench dimension	in	7/16	
	mm	11	
Boiler Dimensions And Weight			
Height x Width x Dept	in	30.7 x 15.75 x 14.1	30.7 x 17.7 x 14.1
	mm	780 x 400 x 358	780 x 450 x 358
Weight net	lbs	73	80
	kg	33	36
Components			
Burner	Stainless Steel		
Main heat exchanger	ASME approved extruded aluminum		
Gas valve	SIT 848		
Pump	Groundfos UPM 15-52	Groundfos UPM 15-62	
Pressure relief valve	Watts M350 - M2 ASME approved		
Fan	MVL RG 128		
3-way valve for DHW tank (field supply)	Honeywell VC6011 + VCZMK6000		
Injector Natural Gas (A) Ø	0.20 inch (5.1 mm)	0.26 inch (6.7 mm)	
Injector LPG (E) - black coated Ø	0.15 inch (3.9 mm)	0.19 inch (5.0 mm)	

notes

*See jumpers configurations for heating temperature range setting

**If the gas supply pressure exceeds the maximum gas supply pressure value, a separate gas pressure regulator must be installed upstream of the heating system.

PRINCIPLE COMPONENTS

A fully integrated electronic control board featuring electronic temperature control, anti-cycle control, pump over-run, actuator anti-block function, self-diagnostic fault indicator, full air/gas modulation.

- Radial aluminum heat exchanger.
- Electronic ignition with flame supervision
- Integral pump
- Fan
- Water pressure switch
- Condensate level sensor
- Pressure gauge
- Pressure relief valve
- Flue thermostat
- Flue sensor
- Blocked flue switch

MODE OF OPERATION (AT REST)

When the appliance is at rest and there are no requests for heating or hot water, the following functions are active:

- 2-stage freeze protection system – the freeze protection system protects the appliance against the risk of freeze damage. The first stage enables activation of the pump should the temperature of the appliance fall to 43°F (6°C). Should the first stage become active, the appliance will function on minimum +25% power until it reaches 95°F (35°C).
- Anti-seize function – the anti-seize function enables the pump to be energized for short periods, when the appliance has been inactive for more than 24-hours.

MODE OF OPERATION

When there is a request for heat and/or hot water, via the programmer/time clock and/or any external control, the pump and fan are started, the fan speed will modulate until the correct signal voltage is received at the control PCB. At this point an ignition sequence is enabled.

Ignition is sensed by the electronic circuitry to ensure flame stability at the burner. Once successful ignition has been achieved, the electronic circuitry increases the gas rate to 75% of the MAX Heating (set by the corresponding HTG trimmer) for a period of 15 minutes. Thereafter, the boiler's output will either increase to maximum or modulate to suit the set requirement.

When the appliance reaches the desired temperature the burner will shut down and the boiler will perform a three-minute post purge (timer delay).

When the request for heat has been satisfied the appliance pump and fan may continue to operate to dissipate any residual heat within the appliance.

SAFETY DEVICES

When the appliance is in use, safe operation is ensured by:

- a water pressure switch that monitors system water pressure and will de-activate the pump (when lockout condition is reached), fan and burner should the system water pressure drop below the rated tolerance;
- blocked flue switch that monitors flue pressure and will deactivate the pump (when lockout condition is reached), fan and burner should the flue pressure increase over the rated tolerance;
- fan speed sensor to ensure safe operation of the burner;
- a high limit thermostat that over-rides the temperature control circuit to prevent or interrupt the operation of the burner;
- flame sensor that will shut down the burner when no flame signal is detected;
- a sensor that interrupts the operation of the appliance if the condensate pipe becomes blocked;
- a pressure relief valve which releases excess pressure from the primary circuit;
- a flue sensor that controls the flue temperature continuously checking to be right according the output;
- a flue thermostat that over-rides the temperature control circuit to prevent or interrupt the operation of the burner.

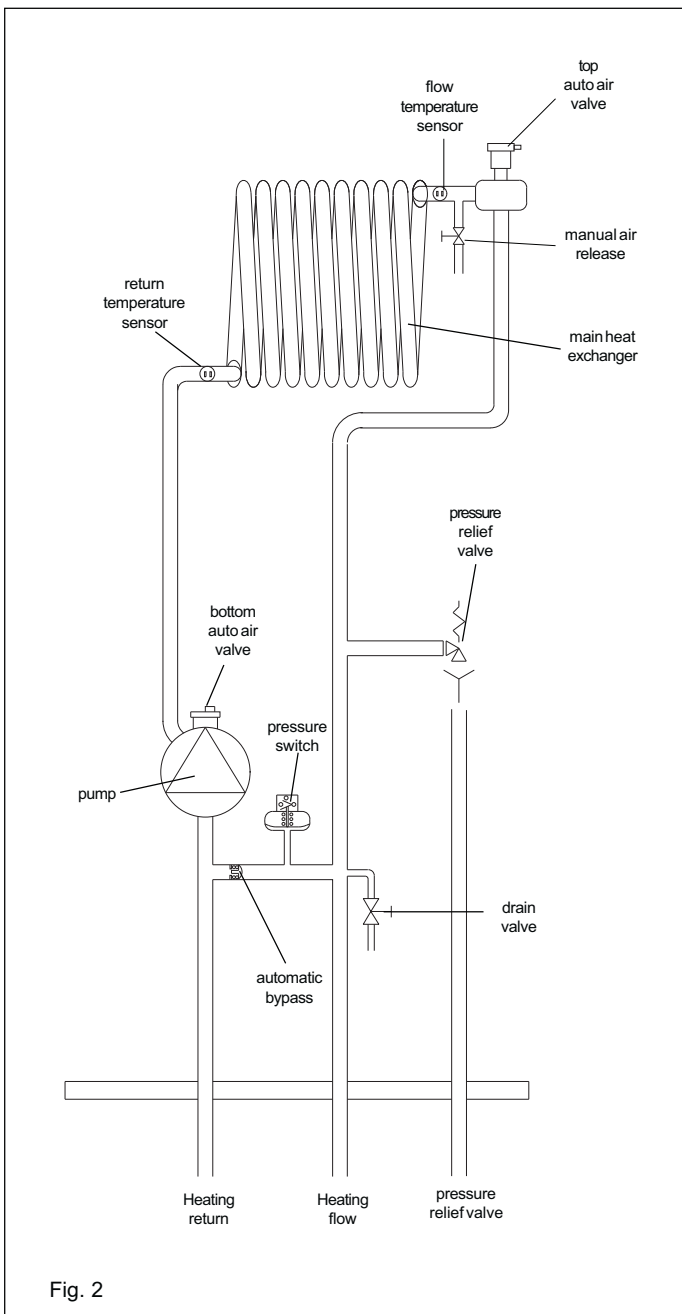
BANNED MATERIAL STATEMENT:

No banned materials or substances have been used in the manufacture or production of this appliance or its inherent components

MANUAL HANDLING STATEMENT:

CAUTION: This appliance may require 2 or more persons to lift or carry it to the installation location; due to the weight of the appliance it may be necessary for two people to lift and attach the appliance to its mounting. To avoid the possibility of injury during the installation, servicing or cleaning of this appliance, care should be taken when handling component edges.

XPAK INTERNAL HYDRAULIC CIRCUIT (FIG. 2)



PIPING CONNECTIONS (FIG. 3)

Legend

A - boiler in connection	3/4" NPT - male
B - boiler out connection	3/4" NPT - male
C - gas supply connection	3/4" NPT - female
D - pressure relief valve drain connection	3/4" NPT - female
E - condensate connection Ø (rubber flexible)	0.825" (21 mm) female
F - boiler drain valve - open-ended spanner dimension	7/16" (11 mm)

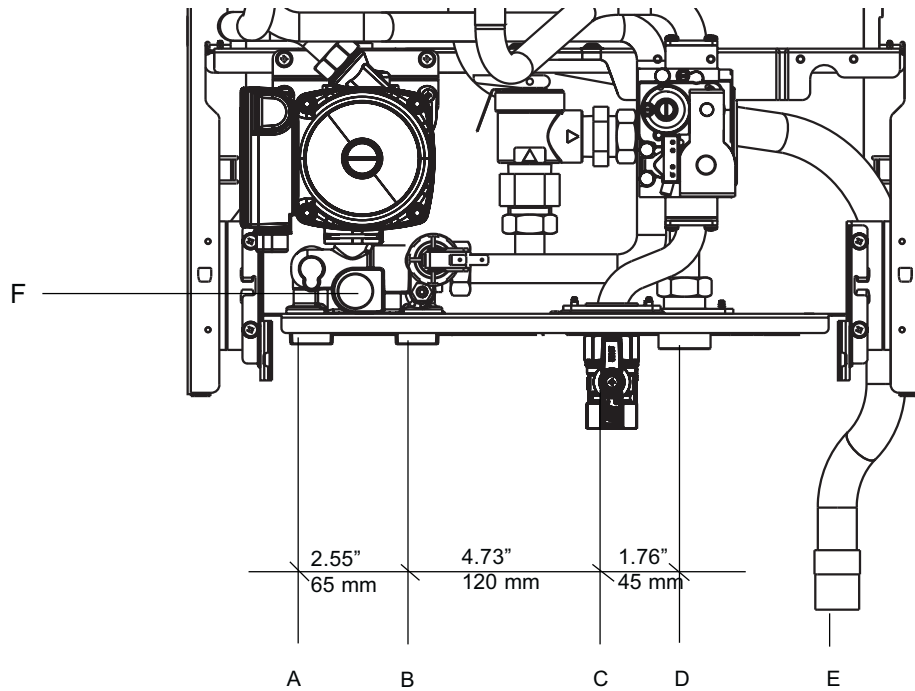


Fig. 3

DIMENSIONS AND CONNECTIONS (Fig. 4)

Recommended minimum service clearances

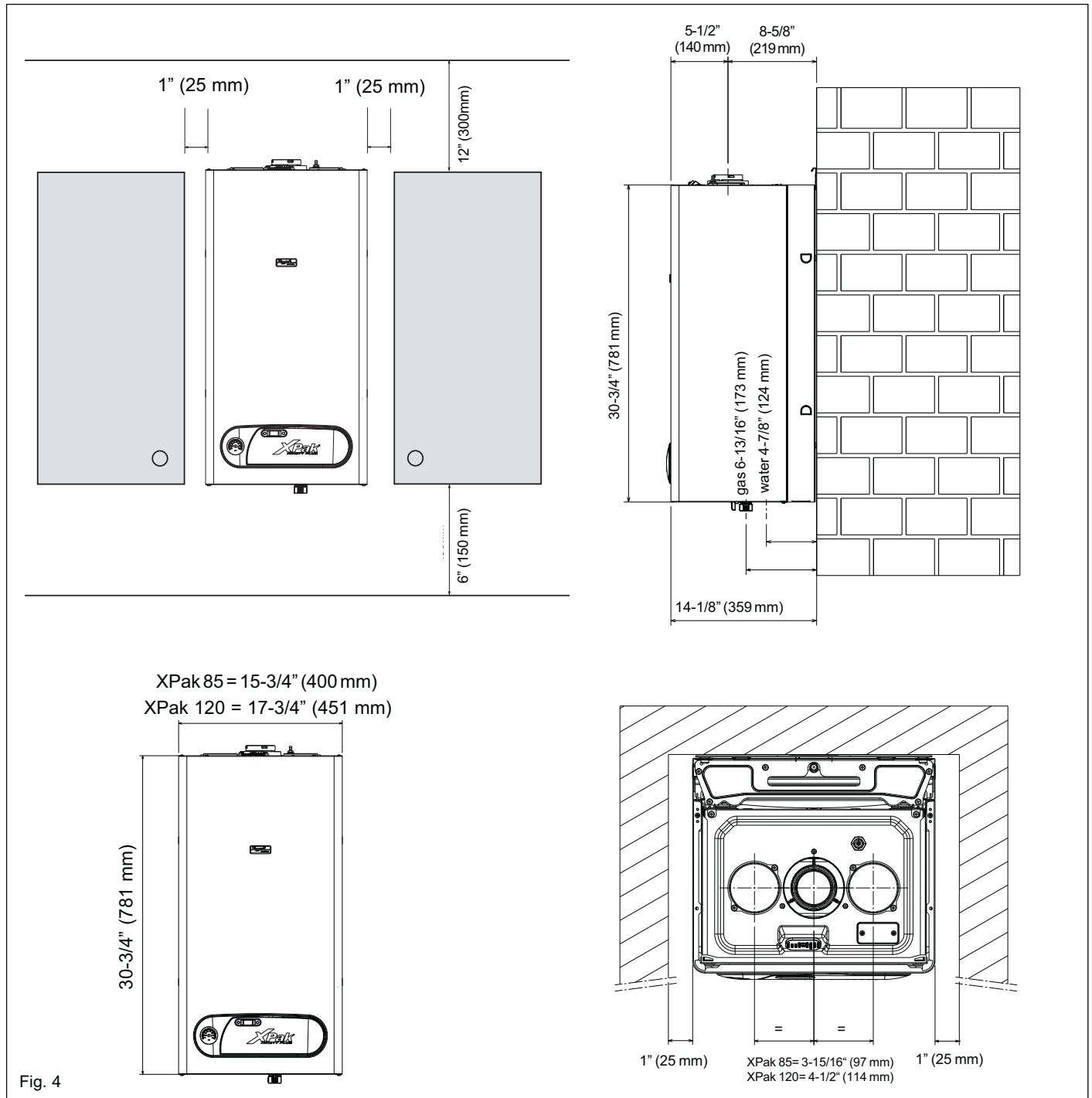


Fig. 4

Minimum Clearances to Combustibles

- Top=0
- Front =0 AL, CL
- Rear=0
- Left=0
- Right=0

AL = Alcove
CL = Closet

Note:

The XPak boiler has passed the zero inches vent clearance to combustibles testing requirements provided by the boiler Harmonized Standard ANSI Z21.13b 2007 – CSA 4.9b 2007 and therefore is listed for zero clearance to combustibles when vented with a single wall special venting system (AL29-4C material) or UL/ULC-listed gas vent material. The zero inches vent clearance to combustibles for the XPak boiler supercedes the clearance to combustibles listing that appears on the special venting system label.

PACKAGING AND TRANSPORTATION

1. SCOPE OF DELIVERY

The boiler is delivered fully assembled.

- When receiving the delivery, check if the packaging is intact.
- Check that all the items listed in Table 2 are included in the delivery.

2. TRANSPORTING THE BOILER

CAUTION: The boiler may be damaged when it is improperly secured.

- Only transport the boiler using the right transportation equipment, such as a handtruck with a fastening belt or special equipment for maneuvering steps.
- During transportation the boiler must be secured on the transportation equipment to prevent it from falling off.
- Protect all parts against impacts if they are to be transported.
- Observe the transportation markings on the packaging.
- Packaged boilers must always be lifted and carried to their destination by two people, or you must use a handtruck or special equipment to transport them to their destination.
- Transport the boiler to the room where it is to be installed.

3. BOILER BOX CONTENT (Table 2)

Pos.	Parts	Quantity	Packaging
1	Boiler with casing	1	1 box
2	Wall bracket	1	
3	Technical documents including: - User's Instructions - Installation Instructions - Wall Mounting Template	1	
4	Top manual air vent drain pipe	1	
5	Gas shut off valve	1	
6	Flue gas adaptors including: - vent adaptor for two pipes vent system - intake air adaptor for two pipes - 3" adaptor - 4 screws	1	
7	LPG conversion kit including: - injector black coated - LPG sticker - LPG conversion labelling - Conversion instructions	1	

Refer to Fig. 5 for Boiler box contents.

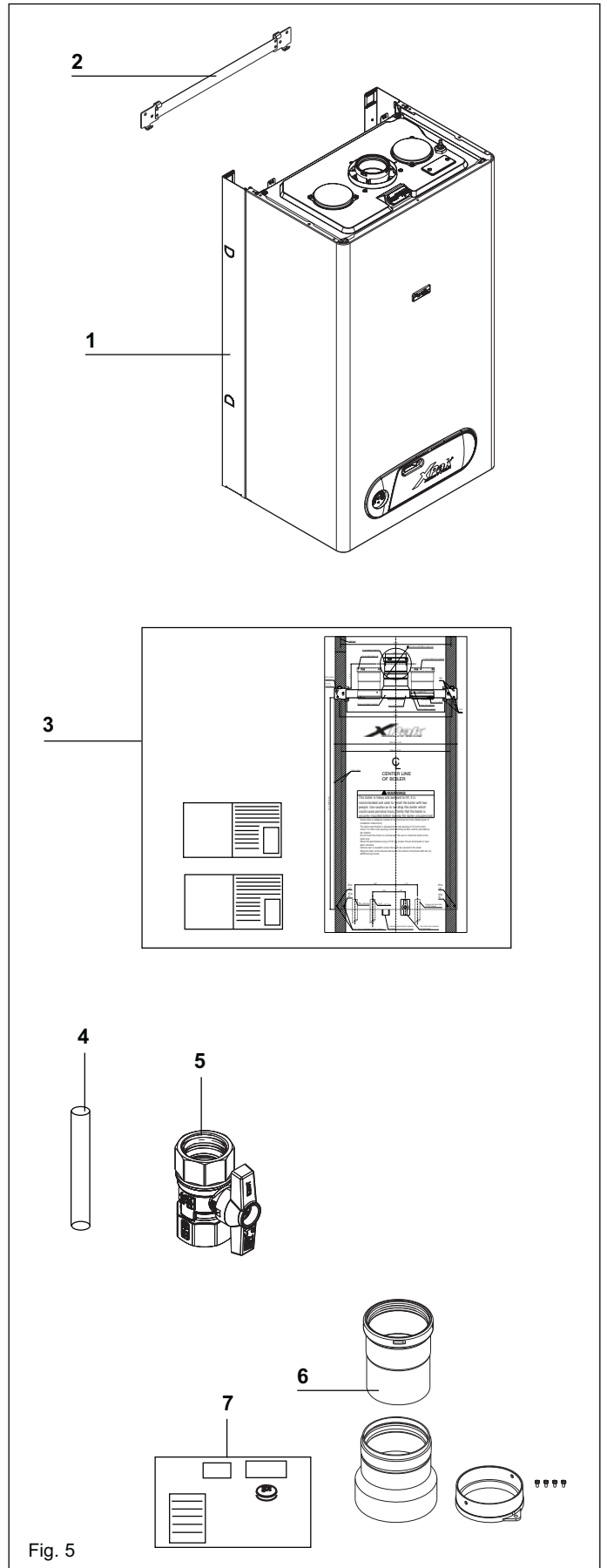


Fig. 5

6 - INSTALLATION

PREPARE XPAK LOCATION

1. INSTALLATIONS MUST COMPLY WITH:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1 – latest edition.
- National Electrical Code.
- For Canada only: B149 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

NOTICE: The XPak boiler gas manifold and controls meet safe lighting and other performance criteria as specified in ANSI Z21.13b 2007 – CSA 4.9b 2007

2. BEFORE LOCATING THE XPAK BOILER

1. Check for nearby connection to:
 - System water piping
 - Venting connections
 - Gas supply piping
 - Electrical power
2. Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

WARNING: Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

3. The XPak must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
4. If the new XPak is to replace an existing boiler, check for and correct any existing system problems such as:
 - System leaks.
 - Incorrectly-sized expansion tank.
 - Lack of freeze protection in heating water causing system and boiler to freeze and leak.
 - Excessive glycol which will affect the boiler system operation.

3. CLEARANCES FOR SERVICE ACCESS

1. See figure for recommended service clearances. If you do not provide minimum clearances shown, it might not be possible to service the boiler without removing it from the space.

WARNING: The space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the XPak boiler. The boiler internal front cover must be securely fastened to the boiler to prevent boiler from drawing air from inside the boiler room in the case of sealed combustion operation. This is particularly important if the boiler is located in the same room as other appliances. Failure to comply with the above warnings could result in severe personal injury, death or substantial property damage.

4. RESIDENTIAL GARAGE INSTALLATION

Precautions

Take the following special precautions when installing the XPak in a residential garage. If the boiler is located in a residential garage, per ANSI Z223.1, paragraph 5.1.9:

- Mount the boiler with a minimum of 18 inches above the floor of the garage to the bottom of the boiler to ensure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or protect the boiler so it cannot be damaged by a moving vehicle.

5. EXHAUST VENT AND INTAKE AIR VENT

XPaks are rated ANSI Z21.13b 2007 – CSA 4.9b 2007 – Fired low pressure steam and hot water boilers. Category IV. (pressurized vent, likely to condense in the vent). Also installations with air dependent operation are allowed providing proper openings in the room are provided.

NOTICE: To prevent combustion air contamination when considering exhaust vent and intake air vent termination. Intake and exhaust may be vented vertically through the roof or out a side wall.

The intake and exhaust venting methods are detailed in the Venting Section. Do not attempt to install the XPak Boiler using any other means. Be sure to locate the boiler such that the air intake and exhaust vent piping can be routed through the building and properly terminated. The air intake and exhaust vent piping lengths, routing and termination method must all comply with the methods and limits given in the Venting section.

6. PREVENT COMBUSTION AIR CONTAMINATION

Install intake air piping for the XPak as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

WARNING: You must pipe outside air to the boiler air intake for sealed combustion operation. Ensure that the intake air will not contain any of the contaminants below. Contaminated air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage. For example, do not pipe intake air vent near a swimming pool. Also avoid areas subject to exhaust fumes from laundry facilities. These areas may contain contaminants.

7. WHEN REMOVING AN EXISTING BOILER FROM AN EXISTING COMMON VENT SYSTEM

Do not install the XPak boiler into a common vent with any other appliance.

This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death or substantial property damage.

WARNING: Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

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 non blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- e. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 — latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Table 13 of ANSI Z223.1 2006 of that code. Canadian installations must comply with B149 Installation Code.

PREPARE XPAK

CAUTION: Cold weather handling — If boiler has been stored in a very cold location (below 0°F (-18°C)) before installation, handle with care until the plastic components come to room temperature.

1. REMOVE XPAK BOILER FROM BOX

1. XPak is heavy and awkward to lift. Care must be taken to place it in a safe location prior to installation on the wall to prevent damage to the bottom mechanical connections.

2. PLACING THE WALL-MOUNTED XPAK BOILER

XPak boilers are wall mounted. Use only the XPak boiler wall mounting instructions included in the box.

WARNING: The wall must be capable of carrying the weight of the boiler and its related components. The weights of the boiler are approximately:
XPak 85 = 82 lbs (37 kg).
XPak 120 = 93 lbs (42 kg).
Failure to comply with above could result in severe personal injury, death or substantial property damage

3. XPAK WALL MOUNTING INSTRUCTIONS

WARNING: This boiler is heavy and awkward to lift. It is recommended and safer to install the boiler with two people. Use caution as to not drop the boiler which could cause personal injury. Verify that the boiler is securely mounted before leaving the boiler unsupervised.

The wall must be vertically plumb and capable of carrying the weight of the XPak and its related components.

The building frame (studs) must be 16" on center. If not, you must use 1/2" minimum plywood 24" x 48", fastened with at least (14) #12 x 3" (3/16" x 3") round head tapping screws to the frame of the building to provide proper support for the boiler. Alternate methods of mounting must not be used. (ex. toggle bolts, hollow wall anchors) or any other fastener other than #12 x 3" (3/16" x 3") round head tapping screws.

CAUTION: If the XPak is not vertically plumb, improper and unsatisfactory operation may occur. This will cause excessive condensation build-up causing unnecessary maintenance and nuisance fault codes.

4. INSTALLATION STEPS

Prior to lifting the XPak Boiler onto the wall, use the enclosed template to level and locate the wall bracket. Mount the wall bracket using lag screws. Ensure the bracket is level when mounted. Extreme care is needed to ensure the bolts are secured in the studs. Hang the boiler on the bracket and secure the bottom of the boiler with two (2) additional lag screws. This will provide additional strength and support to the XPak boiler.

XPAK PIPING

1. RELIEF VALVE

The XPak has a pressure relief valve factory fitted. Connect discharge piping to safe disposal location, following guidelines in the WARNING below:

WARNING: To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the valve discharge.
- Discharge line must be as short as possible and be the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate no more than 6" (150 mm) above the floor drain where any discharge will be clearly visible.
The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375 °F (190°C) or greater.
- Do not pipe the discharge to any place where freezing could occur.
- Do not plug or place any obstruction in the discharge line.
- Test the operation of the valve after filling and pressurizing system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve.
- For boilers installed with only a pressure relief valve, the separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with the standard for Relief Valves for Hot Water Supply Systems, ANSI Z21.22/CSA4.4.
- Failure to comply with the above guidelines could result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

2. GENERAL PIPING INFORMATION

CAUTION: Use two wrenches when tightening water piping at boiler, using one wrench to prevent the boiler return line or supply line from turning. Failure to support the boiler piping connections to prevent them from turning could cause damage to boiler components.

NOTICE: The XPak boiler control module uses temperature sensors to provide both high limit protection and modulating temperature control. The PCB also provides low water protection using a water pressure switch (minimum 6.5 psi (0.45 bar)) and blocked flue switch. Some codes/jurisdictions may require additional external controls for high limit and/or low water cutoff protection.

3. SEPARATE LOW WATER CUTOFF

A low water cutoff may be required by state local code or some insurance companies. Check code requirements before installation of the XPak boiler.

If required:

- Use a low water cutoff designed for hydronic installations
- Follow low water cutoff manufacturer's instructions

NOTICE:

A hot water boiler installed above radiation level or as required by the Authority having jurisdiction, must be provided with a low water cut off device either as apart of the boiler or at the time of the boiler installation.

4. BACKFLOW PREVENTER

Use a backflow preventer specifically designed for hydronic boiler installations. This valve should be installed on the cold water fill supply line per local codes.

5. FITTING THE HEATING CIRCUIT SUPPLY AND RETURN PIPES

NOTICE:

- To protect the entire heating system Raypak recommends installing a filter in the return circuit. When connecting the boiler to an existing heating system this filter must definitely be installed.
- Install shut-off valves immediately before and after the dirt particle filter to enable the filter to be cleaned.
- Install a filling and drain cock in the heating system supply pipe if required.
- Also install a safety valve in the system.

NOTICE: When using oxygen-permeable pipes, e. g. for floor heating systems, you must separate the system using heat exchangers.

- Thoroughly flush all pipes and radiators.
- Refer to the installation template for the pipe connection dimensions.
- Connect the pipes so that they are free from strain.

6. EXPANSION TANK AND MAKE-UP WATER

1. Ensure expansion tank size will handle boiler and system water volume and temperature. Allow 2 gallons for the boiler and its piping.

CAUTION: Undersized expansion tanks cause system water to be lost from relief valve and makeup water to be added through fill valve. Eventual failure can result due to excessive make-up water addition.

2. Expansion tank must be located near to the boiler as shown in Piping "XPak installation diagrams". No valve is to be placed between the boiler and the expansion tank.

7. SIZING SPACE HEAT SYSTEM PIPING

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

NOTICE:

- The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler and with appropriate valves to prevent the chilled medium from entering the boiler.
- The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

8. BOILER WITH DHW TANK

- Connect the external hot-water tank according to the Installation instructions of the hot-water tank and fittings concerned.

Domestic Hot Water Production via DHW Storage Tank

XPak boilers can be used in conjunction with the stand-alone DHW storage tanks.

The boiler can control the DHW tank temperature directly from the boiler control panel. In case a tank sensor is installed (see boiler configuration jumpers Fig. 61) adjust the tank temperature via the DHW selector. The display shows the tank temperature if main selector in proper position.

Boiler can accept also a DHW tank controlled by a thermostat (see boiler configuration jumpers Fig. 61), in this case the DHW set point can not be adjusted on the control panel but only on the tank thermostat (field supplied).

Both cases the supplied water temperature to the tank is 176°F (80°C) and it goes ahead with priority over heating until the tank request is satisfied (either the sensor or the thermostat open).

The boiler can control a 3-way valve directly from the boiler control panel (see 3-way installations Fig. 38).

Refer to electrical connections for 3-way valve installation.

Size and select the DHW storage tank based on the forecast DHW consumption of the building in question.

If different method of DHW production are used, the boiler flow temperature is set as heating mode (see boiler configuration jumpers Fig. 61).

9. WATERSIDE FLOW (PRIMARY CIRCUIT)

The boiler is designed only for closed loop, forced circulation hot water heating systems.

XPak is equipped with an internal 3 speed pump.

PUMP DUTY

Fig. 6 below shows the flow-rate available – after allowing for pressure loss through the appliance – for system requirements. When using this graph, apply only the pressure loss of the system. The graph is based on a 36°F (20°C) temperature differential.

CAUTION: The XPak should not be operated as a potable Hot Water Boiler. The XPak should not be operated in a open system.

10. PROCEDURE SUMMARY

1. Connect the system return marked "In".
2. Connect the system supply marked "Out".
3. Install a Back Flow preventor on the Cold Feed Make-Up Water line.
4. Install a Pressure Reducing Valve if required on the Cold Feed Make-Up Water line, 15 PSI (1 bar) nominal on the system return. Check Pressure Gauge which should read minimum pressure of 12 PSI (0.8 bar)
5. Install an Expansion Tank on the system supply. Consult the tank manufacturer's instruction for specific information relating to expansion tank installation. Size the expansion tank for the

required system volume and capacity, no valve is to be placed between the boiler and the expansion tank.

6. Install an Air Elimination Device on the system supply if required, the boiler has two auto air vents built in.
7. Install a drain valve at the lowest point of the system. Note: The XPak has a proper internal drain valve. (see Fig. 42a)
8. The Safety Relief Valve is installed at the factory. Pipe the discharge of the safety relief valve to prevent injury in the event of pressure relief. Pipe the discharge to a maximum of 6" (152 mm) above the floor to a drain. Provide piping that is the same size as the safety relief valve outlet. **Never block the outlet of a safety relief valve.**

11. FILL AND PURGE HEATING SYSTEM

CAUTION: For installation that incorporates standing Iron Radiation and systems with manual vents at the high points. Follow above section and starting with the nearest manual air vent, open vent until water flows out, then close vent. Repeat procedure, working your way toward furthest air vent. It may be necessary to install a basket strainer in an older system where larger amounts of sediment may be present. Annual cleaning of the strainer may be necessary.

WARNING: Use only inhibited propylene glycol solutions which are specially formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems. Glycol mixtures should not exceed 40%.

1. Glycol in hydronic applications which is specially formulated for this purpose includes inhibitors that prevent the glycol from attacking metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level.
2. The glycol solution should be tested at least once a year and as recommended by the glycol manufacturer.
3. Anti-freeze solutions expand more than water. Allowances must be made for this expansion in the system design.

CAUTION: It is highly recommended that you carefully follow the glycol manufacturer's recommended concentrations, expansion requirements and maintenance recommendations (pH additive breakdown, inhibitor reduction, etc.). You must carefully calculate the additional friction loss in the system as well as the reduction in heat transfer co-efficients; pH must be maintained between 6-8.

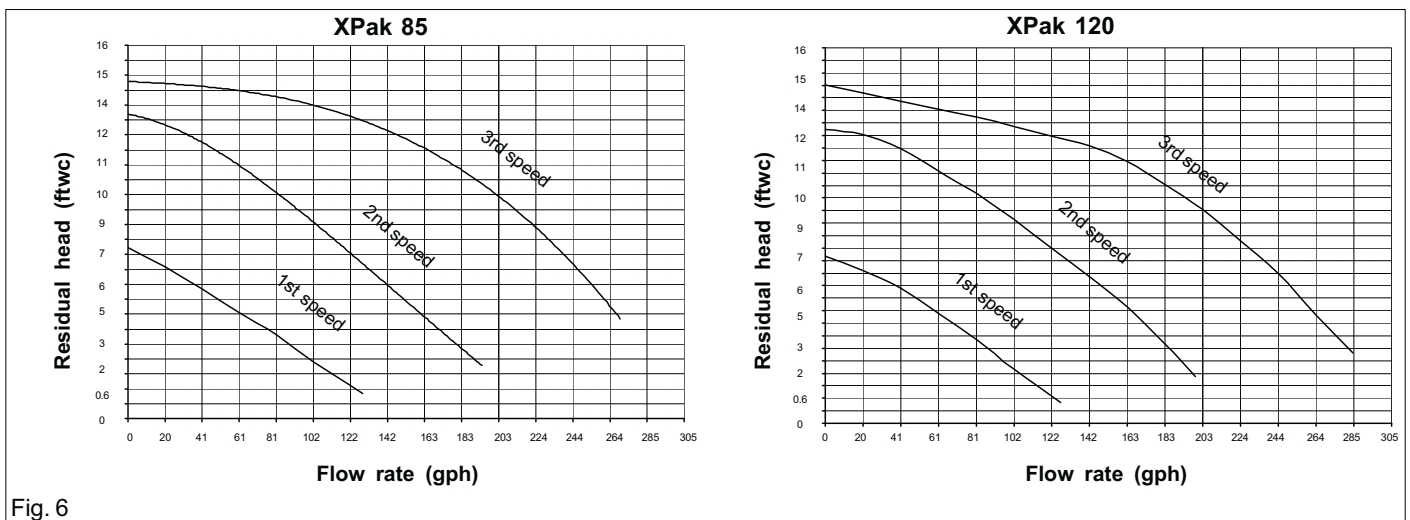


Fig. 6

XPAK INSTALLATION DIAGRAMS

NOTICE: The following illustrations are simplified conceptual illustrations only.

Key for installation sample diagrams

1. XPak boiler
2. Gas shut off valve
3. Expansion vessel
4. Radiators
5. Under floor heating
6. Pressure relief valve discharge pipe
7. Indirect DHW tank
8. 3-way valve
9. Room thermostat (24V)
10. Remote control (Raypak)
11. Condensate drain pipe
12. Valve ball
13. Hydraulic manifold box package
14. High limit thermostat floor heating
15. Outdoor sensor
16. Tank thermostat
17. Tank sensor
18. Mixing valve anti scald
19. Radiator valve
20. Condense neutralizer
21. Tank drain valve
22. Tank pressure relief valve
23. Pump
24. 3-way mixing valve
25. Pressure gauge
26. Bypass radiator

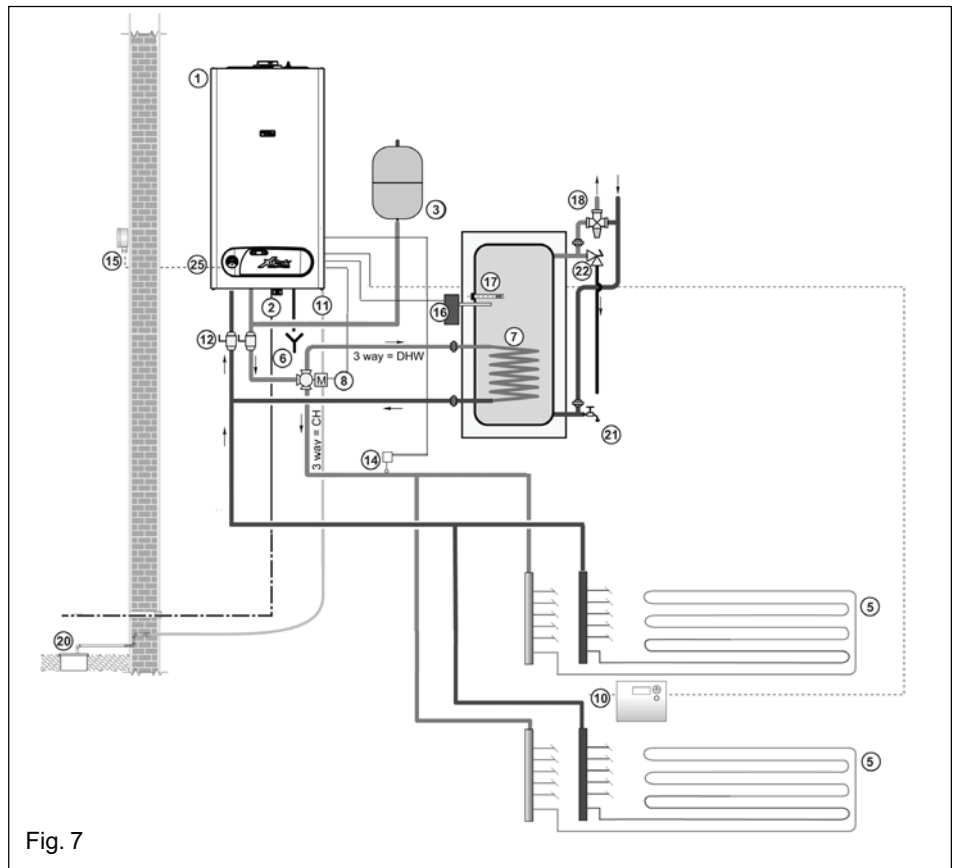


Fig. 7

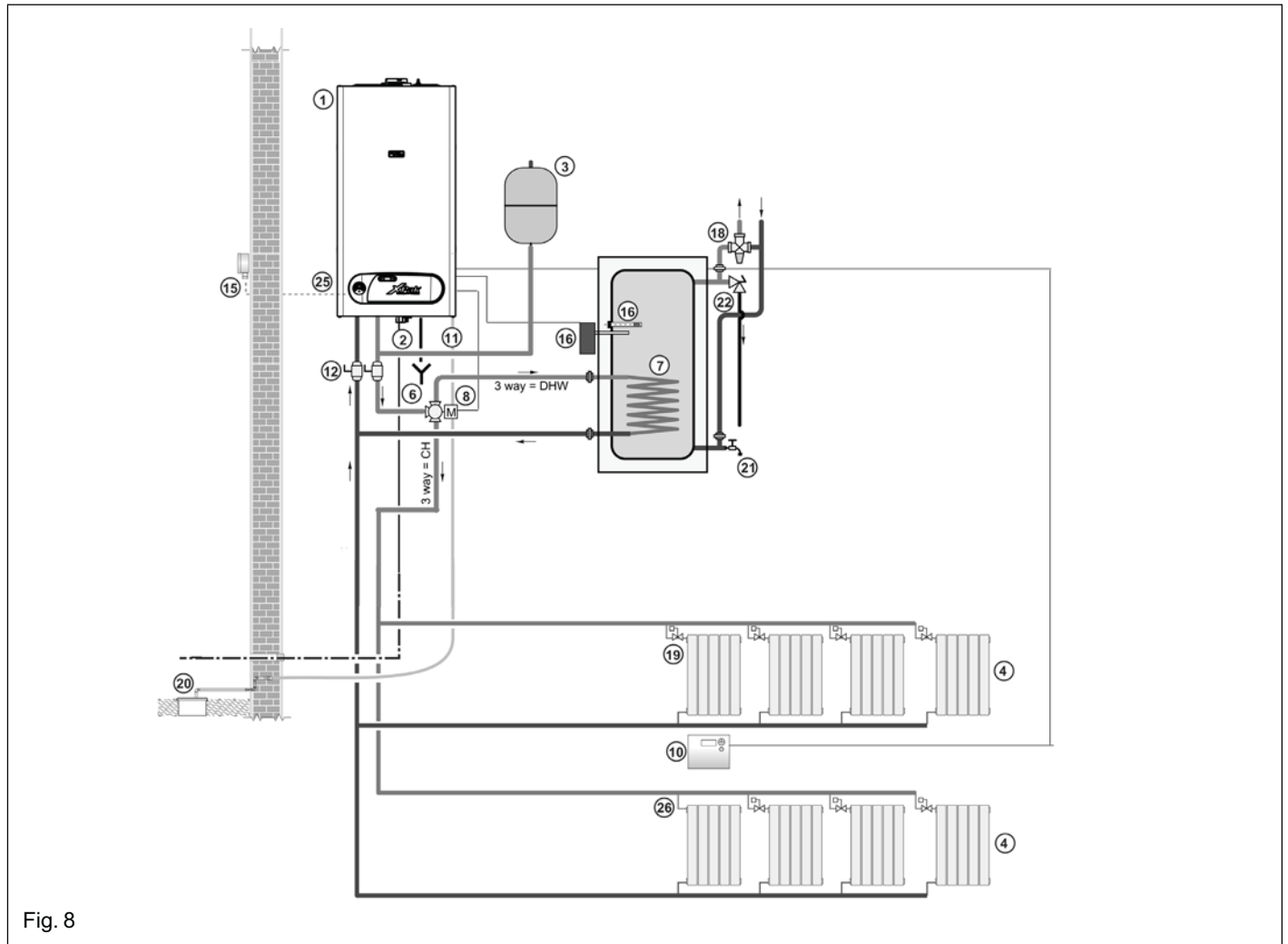


Fig. 8

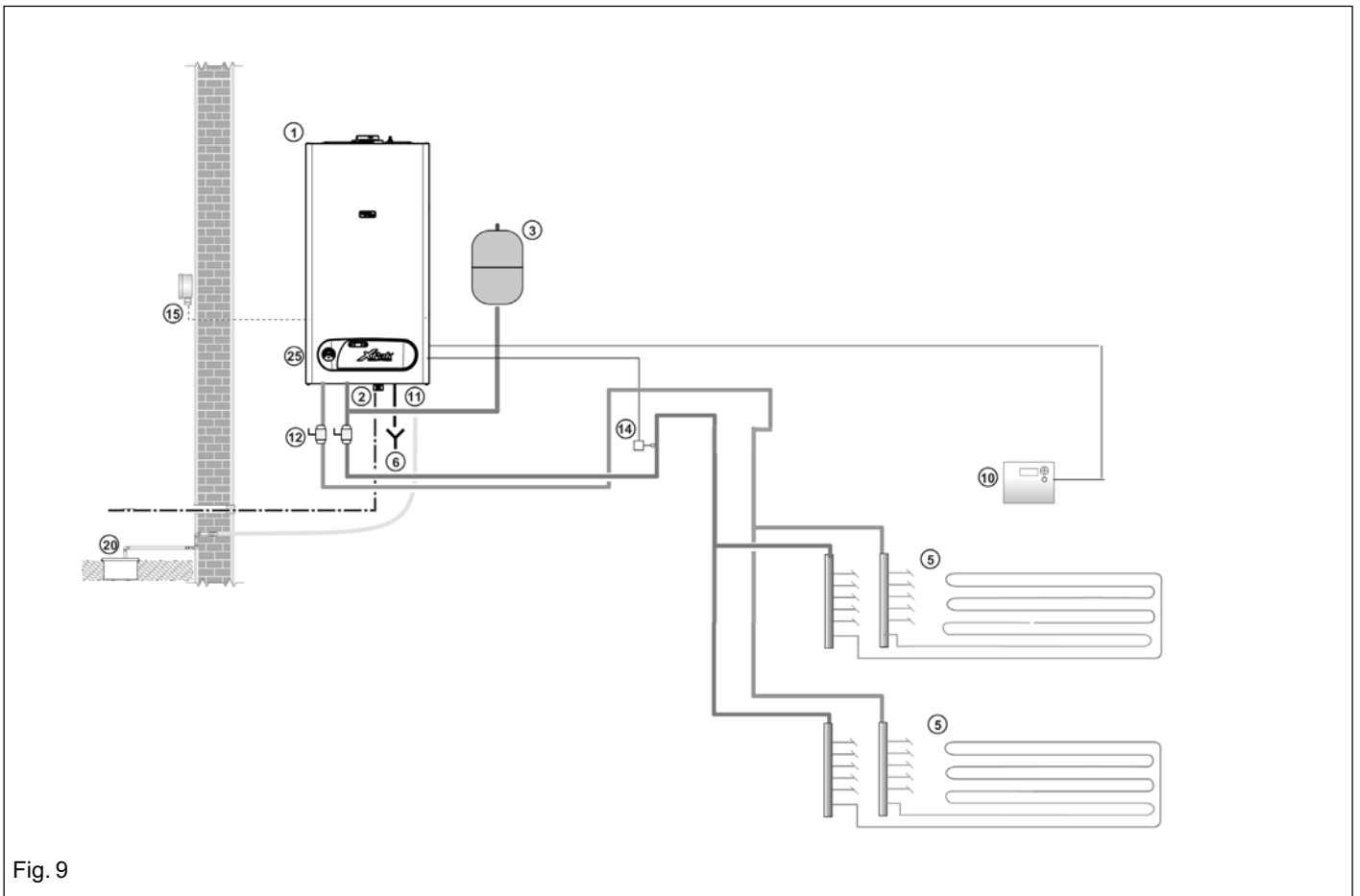


Fig. 9

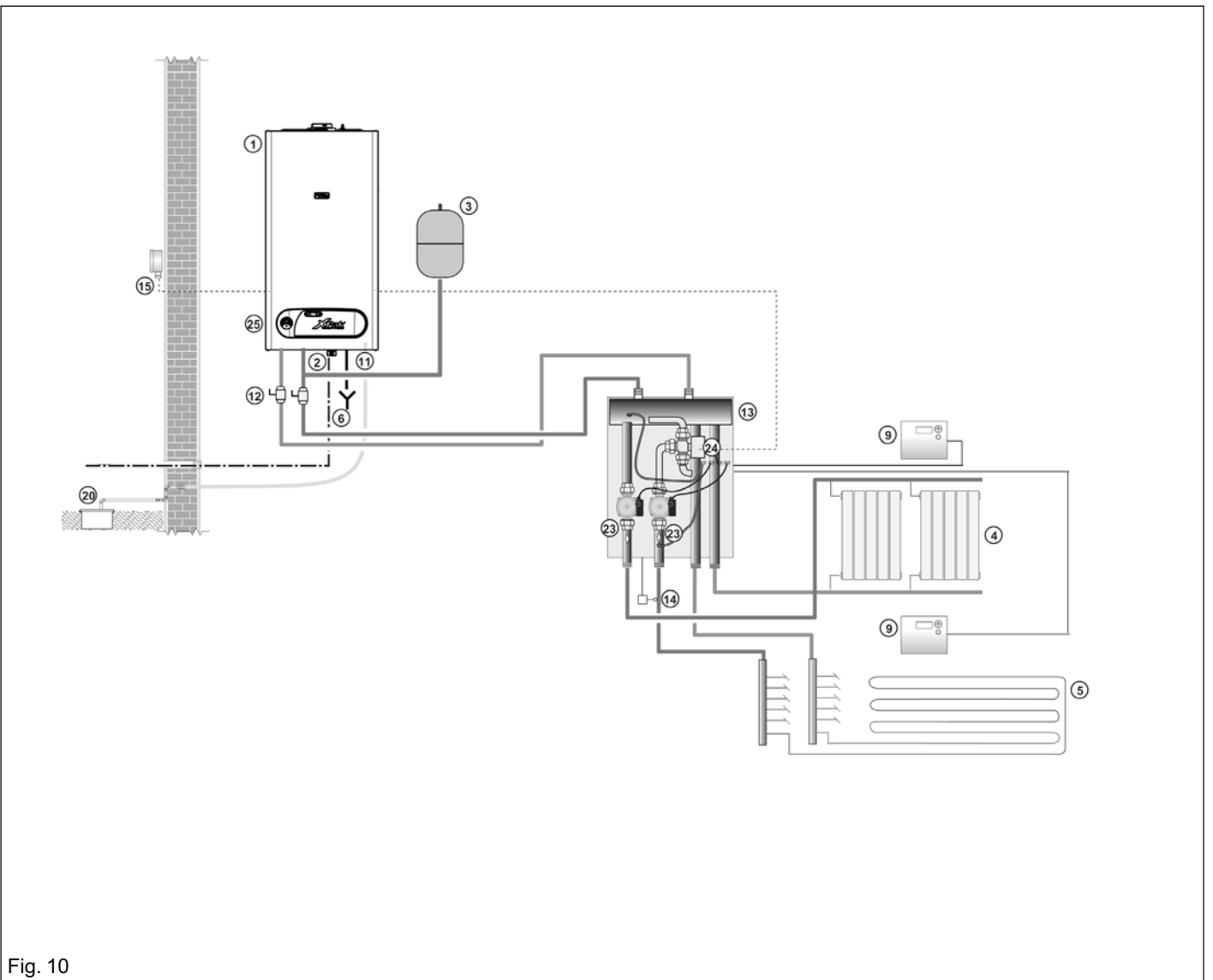


Fig. 10

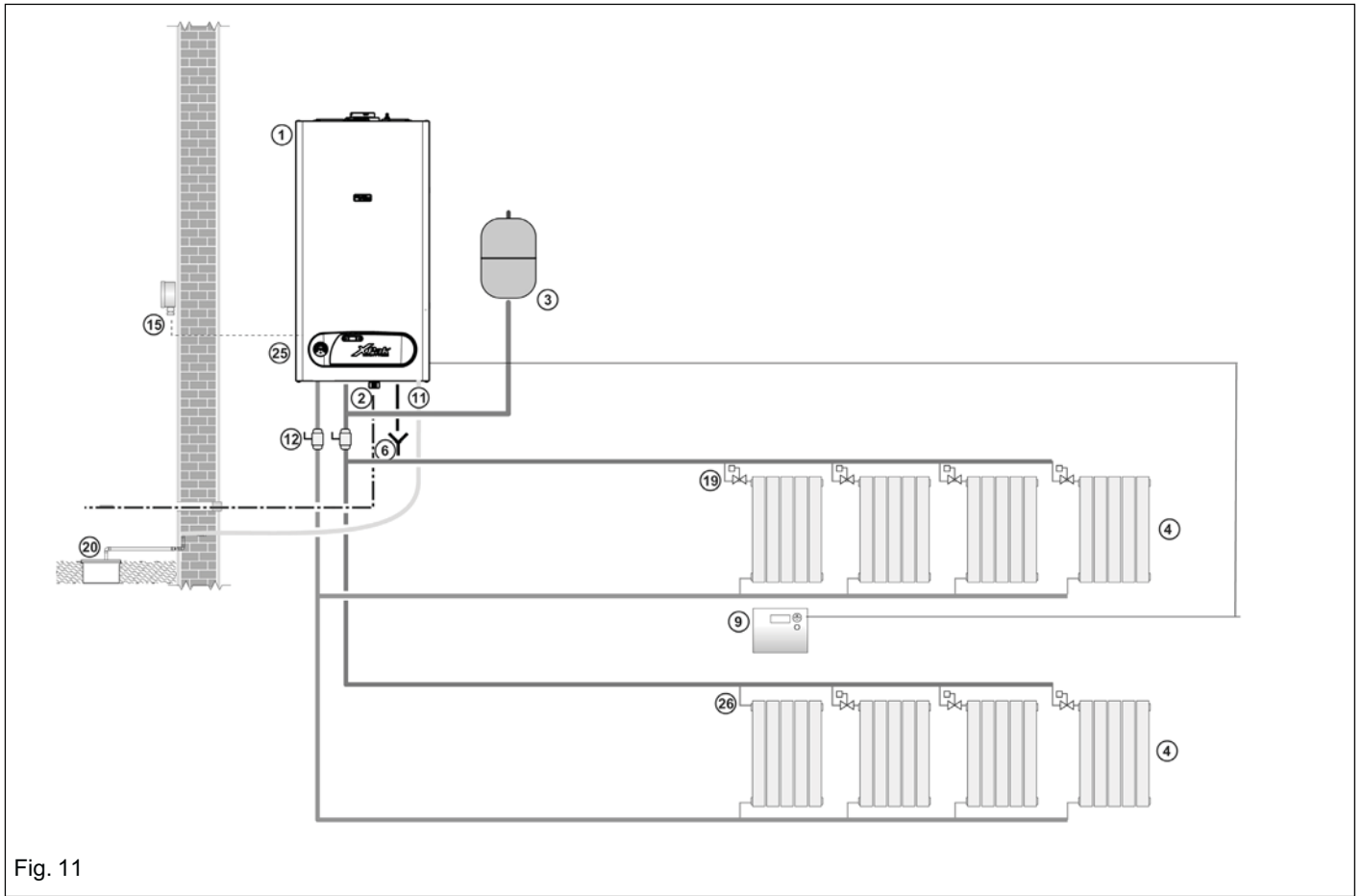


Fig. 11

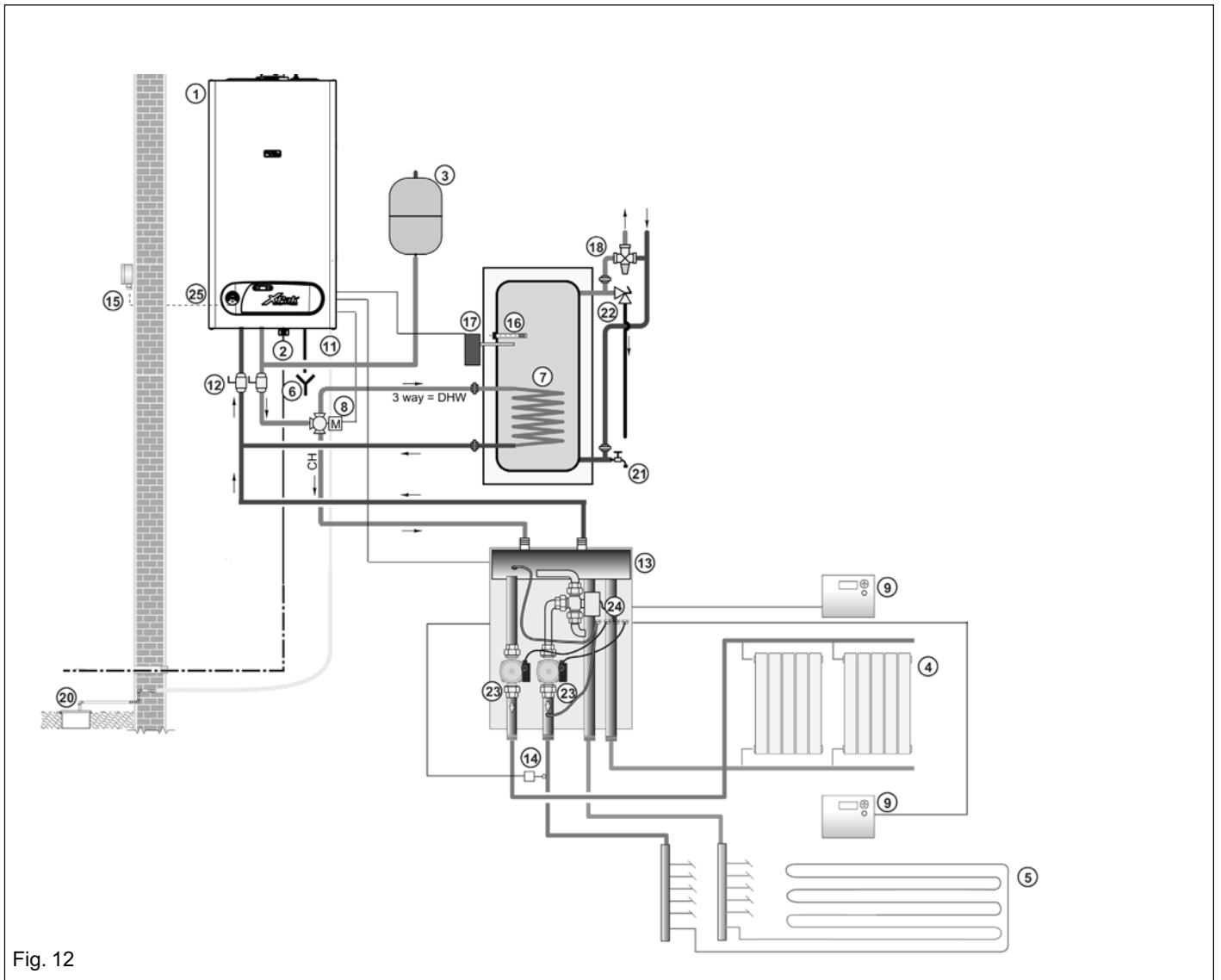


Fig. 12

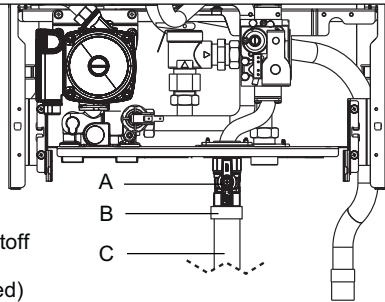
MAKING THE GAS CONNECTION

DANGER: Only carry out work on gas conduits and fittings if you are licensed for such work.

- Determine proper size gas pipe for the installation using Table 3 and Table 4. Do not forget the pipe fitting losses and observe proper size of the fittings.
- Install the furnished 3/4" female gas cock on the gas connection (3/4" male on the boiler) (Fig. 13).
- Connect the gas pipe to the gas cock so that it is free from any strain.

CAUTION: The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa).

Fig. 13



- A- Manual main gas shutoff valve (supplied)
- B- Coupling (field supplied)
- C- To gas supply

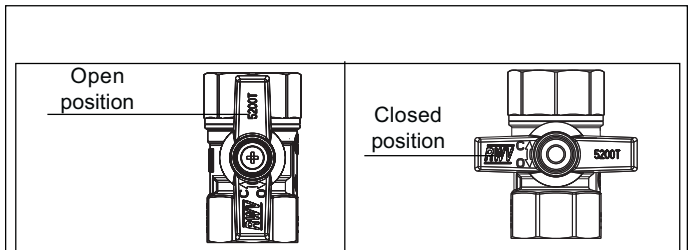


Fig. 14

NOTICE: When installing the gas supply connection, it must comply with local regulations or, if such regulations do not exist, with the National Fuel Gas Code, ANSI Z 223.1.

In Canada, the gas supply connection must comply with local regulations or, if such regulations do not exist, with CAN/CSA B149, Natural Gas and Propane Installation Code. A sediment trap must be provided upstream of the gas controls.

Gas Pipe Capacity for different pipe sizes Tab. 3

Length of pipe (feet)	Gas Volume Capacity (ft ³ /h)*			
	3/4"	1"	1 1/4"	1 1/2"
10	278	520	1,060	1,600
20	190	350	730	1,100
30	152	285	590	890
40	130	245	500	760
50	115	215	440	670
75	93	175	360	545
100	79	160	305	480
150	64	120	250	380

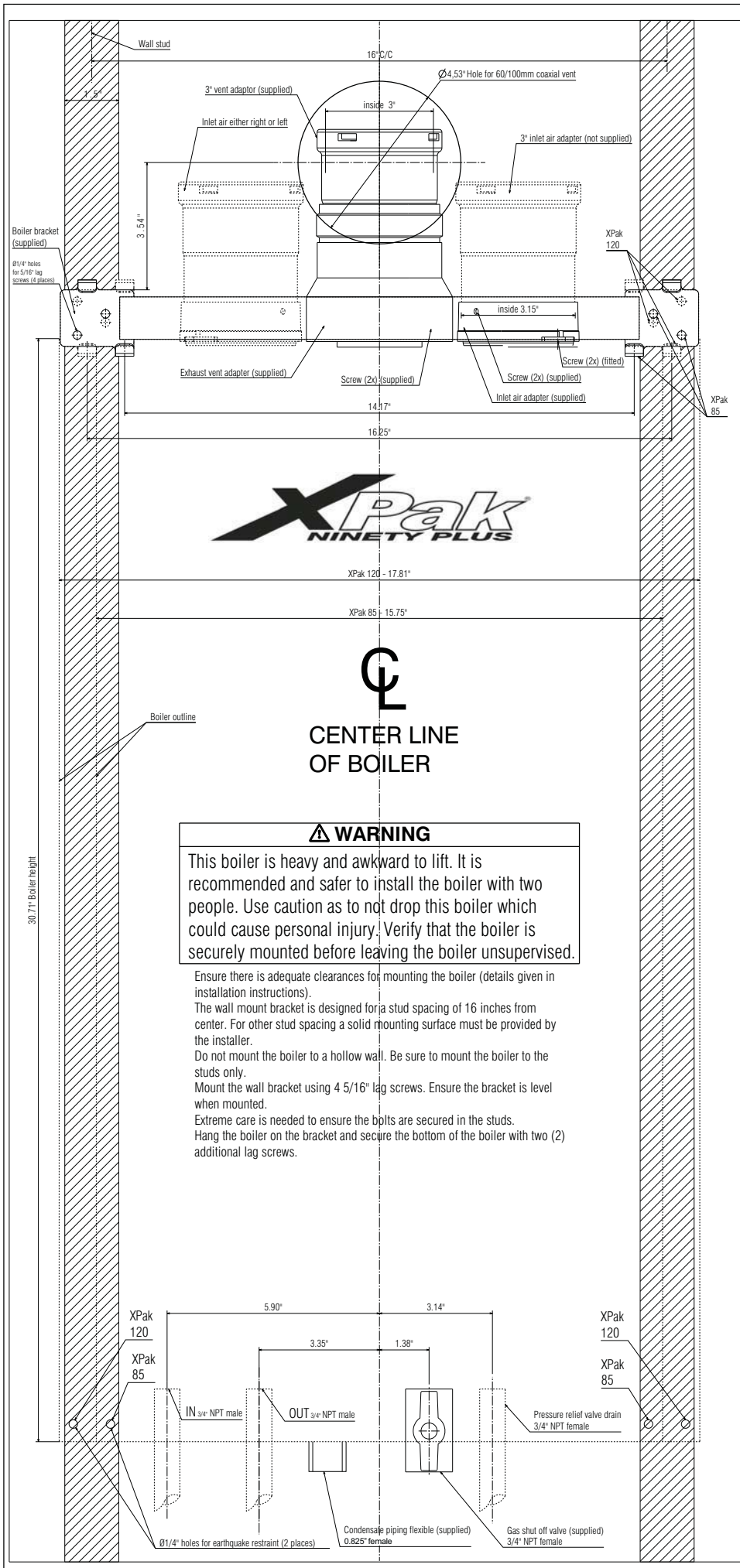
* Maximum pipe capacity in ft³/hr, based on a specific gravity of 60 (42 mbar) and an inlet gas pressure of 14 inches W.C. (35 mbar) or less and a pressure drop of 0.3 inches W.C. (20 mbar)

Equivalent length for pipe fittings in feet Tab. 4

Steel pipe diameter in inches	Equivalent length for Pipe Fittings in feet			
	Type of pipe fitting			
	90° Elbow	Tee (flow thru branch)	Gate valve	Gas cocks
	Equivalent length in feet			
3/4	2.1	4.1	0.5	1.25
1	2.6	5.2	0.6	1.60
1 1/4	3.5	6.9	0.8	2.15
1 1/2	4.0	8.0	0.9	2.50

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

BOILER TEMPLATE (Fig. 15)



Wall Mounting Information
 XPak comes with a template, which allows you to easily mark the location of the screws for the mounting bracket and the location of the flue gas pipe on the wall (Raypak coaxial PP vent system only).

The connection to the gas circuits must be made on site, 3/4" gas cock is supplied with the boiler.

Fig. 15

COMBUSTION AIR AND INSTALLATION OF THE EXHAUST AND VENTILATION OPENINGS AND AIR INTAKE SYSTEM

Provisions for combustion and ventilation air must be made in accordance with section 5.3, Air for Combustion and Ventilation, of the National Flue Gas Code, ANSI Z223.1, or Sections 7.2, 7.3 or 7.4 of CAN/CGA B149, Installation Codes, or applicable provisions of the local building codes.

CAUTION: BOILER DAMAGE AND OPERATIONAL FAILURES !

Due to insufficient or lacking openings for combustion air and/or ventilation of the boiler room. Provisions for combustion air and ventilation are always required, regardless whether the combustion air is taken from the outside (sealed combustion) or inside (room air for combustion). Insufficient ventilation of the boiler room can lead to high air temperatures.

This can result in boiler damage.

- Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of openings takes place.
- When the problem is not resolved, do not operate the boiler.
- Please note these restrictions and its dangers to the operator of the boiler.

WARNING: BOILER DAMAGE !

Due to contaminated air.

- Boiler must be clear and free from combustible materials, gasoline and other flammable vapors and liquids, and corrosive liquids and vapors. Never use chlorine and hydrocarbon containing chemicals (such as spray chemicals, solution and cleaning agents, paints, glues etc) in the vicinity of the boiler.
- Do not store and use these chemicals in the boiler room.
- Avoid excessive dust formation and build-up.

NOTICE: When one expects contaminated combustion air (near swimming pools, chemical cleaning operations and hair salons), sealed combustion operation is recommended.

DANGER: FIRE DANGER !

Due to flammable materials or liquids.

- Do not store flammable materials and liquids in the immediate vicinity of the boiler.

All Air from Inside the Building (room air)

The room shall be provided with two permanent openings communicating directly with an additional room(s). The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 square inch per 1,000 Btu per hour of total input rating of all gas utilization equipment in the confined space, but no less than 100 square inches. One opening shall commence within 12 inches (305 mm) of the top, and one opening shall commence within 12 inches (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall be not less than 3 inches (75 mm).

All Air from Outdoor (sealed combustion)

The room shall be provided with two permanent openings, one commencing within 12 inches (305 mm) from the top, and one commencing within 12 inches (305 mm) from the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

The minimum dimension of air openings shall be no less than 3 inches (75 mm).

1. Where directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/hr of total input rating of all equipment in the enclosure.
2. Where communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/hr of total input rating of all equipment in the enclosure.
3. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu/hr of total input rating of all equipment in the enclosure.
4. Where ducts are used, they shall be of the same cross-sectional area as the free area of the opening to which they connect.

NOTICE: Consult local and state codes pertaining to special building code and fire department requirements. Adhere to national code requirements.

NOTICE: Observe the listed maximum lengths of vent system, which are boiler model dependent. The maximum permissible lengths are listed in the main specification Tab. 5.

An optional concentric vent/air intake body can be used for the installation of a vertical venting system as well as for a horizontal venting system. The concentric vent/air intake body can be ordered through Raypak Inc.

The boiler can also be operated with separate air intake and exhaust piping.

The termination shall be at least 4 ft (1220 mm) for the U.S. and 6ft. (1830 mm) for Canada away from a gas utility meter, service regulator or the like (for room air applications only).

The termination shall terminate at least 4 ft (1220 mm) horizontally from, or 1 ft (305 mm) above any door, window, or gravity air inlet into any building.

Vent must be at least 12 inches (305 mm) above grade, anticipated snow line or roof surface (Canada 18" (457 mm) minimum).

Vent termination must be at least 7 ft (2135 mm) above a public walkway (see Fig. 20).

Vent must be 3 ft (915 mm) above any forced air intake within 10 ft (3050 mm) (see Fig. 20).

Do not extend exposed vent pipe outside the building beyond recommended distance. Condensate could freeze and block vent pipe.

Vent should terminate at least 3 ft (915 mm) away from adjacent walls, inside corners and below roof overhang.

It is not recommended to terminate vent above any door or window, condensate can freeze causing ice formations.

Do not use chimney as a raceway if another boiler or fireplace is vented into or through chimney.

All vent pipes must be glued, except for the flue gas adapter which is fix into place and the first connection to the flue gas adapter.

Installed you can slide the pipe onto the adapter, properly supported and the exhaust pipe must be pitched a minimum of a ¼ inch per foot back to the boiler. This allows the condensate to drain away.

NOTICE:

- Do not use cellular core pipe.
 - A minimum clearance of 4 feet horizontally from and in no case above and below, unless a 4-foot horizontal distance is maintained, from electric meters, gas
- Below are approved examples of vertical and horizontal venting installation
- Place pipe supports every 5 feet (1525 mm) of horizontal run, beginning with support near boiler.
 - Periodic cleaning of the vent terminal and air-intake screens is mandatory.
 - The minimum covering wall thickness is 1" (25 mm).
 - The maximum covering wall thickness is 16" (406 mm).
 - For Direct venting properly reassemble and reseal the vent and air-intake systems.

CAUTION: Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

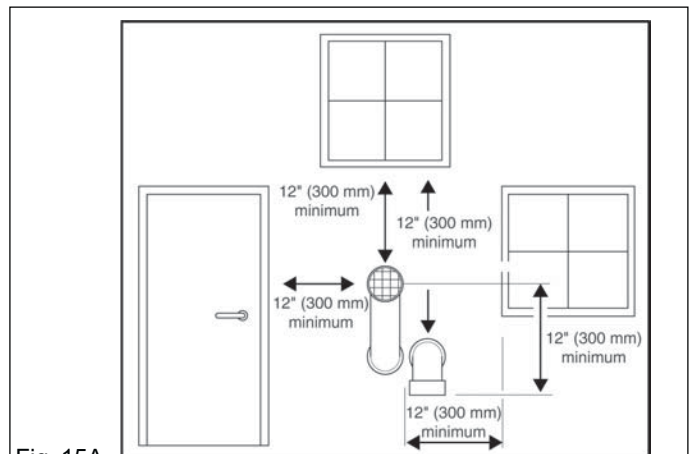


Fig. 15A

VENT SYSTEMS

1. FLUE GAS SYSTEM

Raypak coaxial PP (Polypropylene/Aluminium) concentric flue gas/fresh air systems, Raypak coaxial Alu/Alu concentric flue gas/fresh air systems and two-pipe aluminum systems for room air independent operation (sealed combustion) and air dependent operation and side wall venting are tested to ANSI ANSI Z21.13b 2007 – CSA 4.9b 2007 standards and are certified together with the XPak boiler as a constructional unit.

The XPak boiler may also be vented vertically or horizontally, using a metallic AL29-4C® special stainless steel - Suggested sources: ProTech System Inc., or room air dependent venting system (UL/ULC listed for category IV).

For a more detailed description of the direct vent and single-wall vent system, please refer to the following installation Instructions.

NOTICE:

Brick or masonry surfaces directly behind the horizontal vent termination should be protected with a rust-resistant sheet metal plate.

Tab. 5

		FasNseal stainless steel vent			
Country		US + CANADA			
Diameter		3"			
Material		Stainless steel			
Single wall	Maximum Equivalent Length 3" (80 mm)				
	De-rate less 2%		De-rate less 5%		
		XPak 85	XPak 120	XPak 85	XPak 120
Horizontally/ vertically vented (air+flues)	ft	40+40	16+16	130+130	115+115
	m	12+12	5+5	40+40	35+35

Always follow XPak Installation Instructions.

Select vent material based on

- Country of the installation
- Vent configuration
- Preferred material
- Necessary maximum equivalent length

NOTICE:

The minimum covering wall thickness is 1" (25 mm)
The maximum covering wall thickness is 16" (406 mm)

2. BOILER SUPPLY

XPak boilers are supplied with the following vent components and they are certified together with the XPak boiler as a constructional unit.

- 60/100 mm vent exit (Fig. 16 pos. 1)
- Left side intake air (factory sealed with two screws) for two pipes solutions (Fig. 16 pos. 2)
- Right side intake air (factory sealed with two screws) for two pipes solutions (Fig. 16 pos. 3)
- Vent adaptor for two pipes vent system – 80 mm dia exit (Fig. 16 pos. 5) (Fig. 19)
- Intake air adaptor for two pipes vent system – 80 mm dia exit (Fig. 16 pos. 6) (Fig. 18)
- 3" adaptor (inside diameter 3") (Fig. 16 pos 4, Fig. 17)
- Paper template to fix the boiler and the flues (Fig. 15)

3. INSTALLATIONS OF SUPPLIED VENT COMPONENTS

In the case of installations using two pipes or room dependent air the following instructions must be observed.

1. Install the vent adaptor (Fig. 19) to the boiler vent connection (Fig. 16 pos. 1)
2. Use the two supplied screws to ensure the closing between the adaptor and boiler (Fig. 16 pos. 5)
3. Insert the 3" adaptor (Fig. 17) into the vent adaptor (Fig. 19) in the case using 3" vents
4. Install the air adaptor (Fig. 18) to the boiler air connection (choose right or left installation (Fig. 16 pos. 2 - 3), using the two supplied screws (Fig. 16 pos. 6) in the case of two pipes, room sealed vent installation.

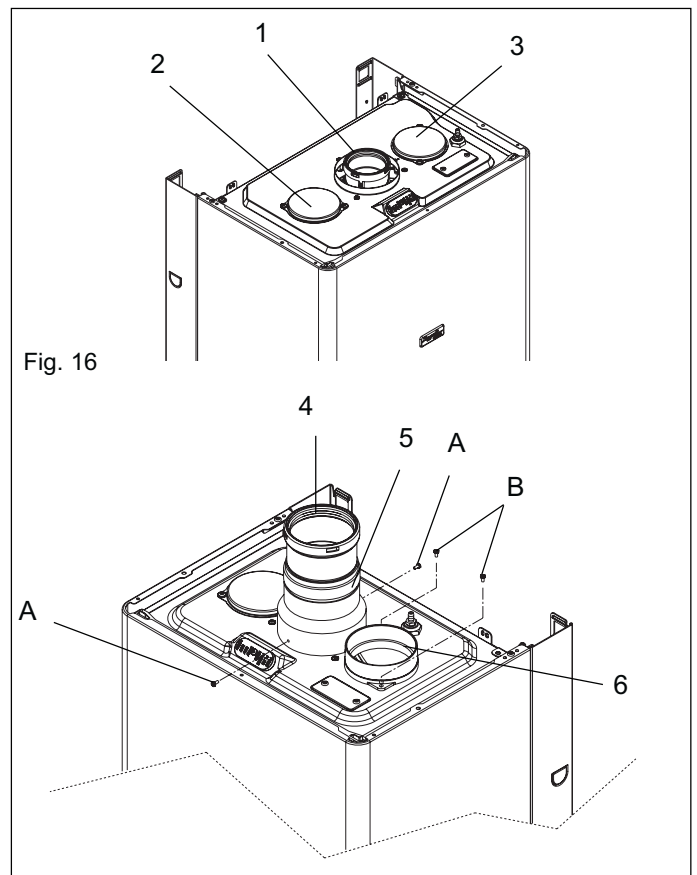


Fig. 16

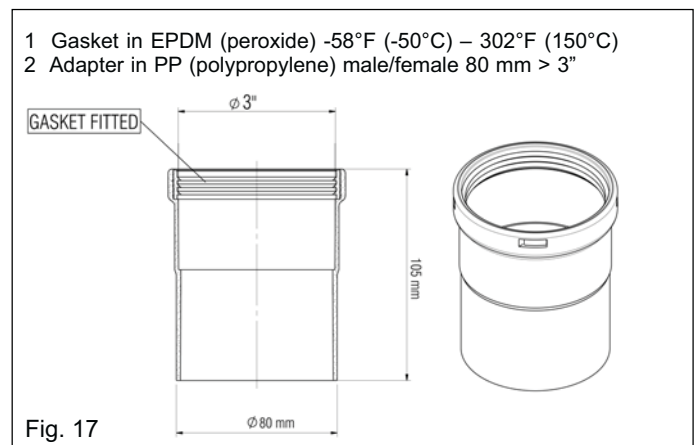


Fig. 17

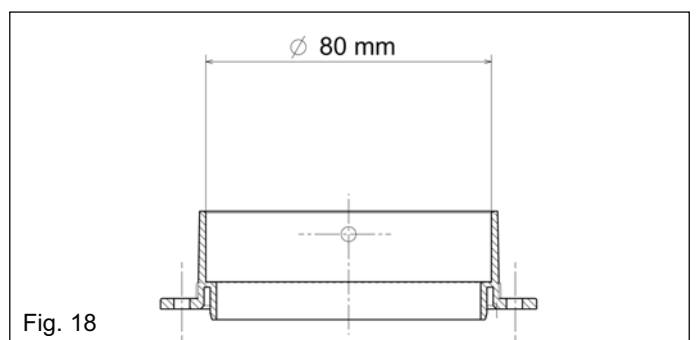


Fig. 18

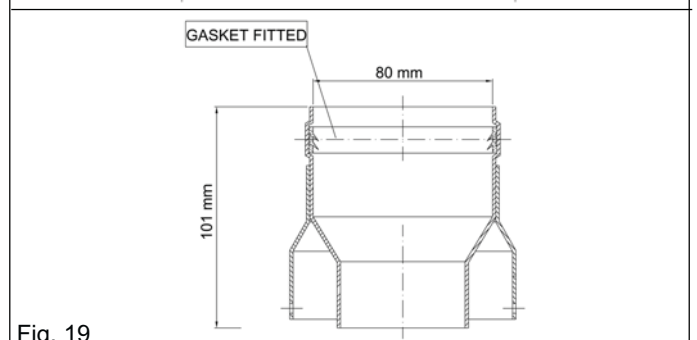
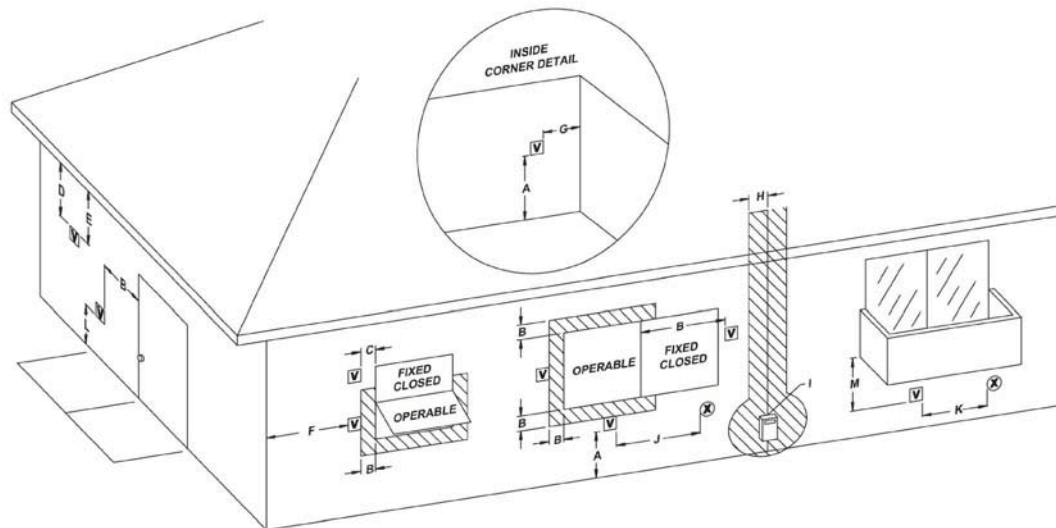


Fig. 19

4. MINIMUM CLEARANCES FROM VENT/AIR INLET TERMINATION

Fig. 20



V = vent terminal X = air supply inlet \ \ = area where terminal is not permitted

Tab. 6

		U.S. Installations ¹	Canadian Installations ²
A	Clearance above grade, veranda, porch, deck, or balcony	1 ft (30 cm)	1 ft (30 cm)
B	Clearance to window or door that may be opened	4 ft (1.2m) below or to side of opening; 1 foot (30 cm) above opening	3 ft (91 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61cm) from the centerline of the terminal	5 ft (1.5m)	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	6 ft (1.83m)	*
H	Clearance to each side of center line extended above meter/regulator assembly	*	3 ft (91 cm) within a height 15 ft above the meter/ regulator assembly
I	Clearance to service regulator vent outlet	*	6 ft (1.83m)
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 ft (1.2m) below or to side of opening; 1 ft (30 cm) above opening	3 ft (91 cm)
K	Clearance to mechanical air supply inlet	3 ft (91 cm) above if within 10 ft (3m) horizontally	6 ft (1.83m)
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13m)	7 ft (2.13m) ^t
M	Clearance under veranda, porch, deck or balcony	*	12 in. (30 cm) ^{TT}

¹ In accordance with the current ANSI Z223.1/NFPA 54 National Fuel Gas Code

² In accordance with the current CAN/CGA-B149 Installation Codes

^t Vent terminal shall not terminate directly above sidewalk or paved driveway located between 2 single family dwellings that serves both dwellings
^{TT} Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor and top of terminal and underside of veranda, porch, deck or balcony is greater than 1 ft (30cm)

* Clearances in accordance with local installation codes and the requirements of the gas supplier

NOTICE: The following illustrations are simplified conceptual illustrations only.

Legend for illustrations 23-24-25-26-27-28-29-30-31-32

Two pipes vent adaptors (included with the boiler)	Pos. 1
Mounting Clip (set of 4) 3.94" (100 mm) for coaxial	Pos. 2 (Fig. 24)
90° Elbow 3" (80 mm) single wall	Pos. 2 (Fig. 25-26-27-28)
Adaptor 80 mm > 3" (included with the boiler 1 pcs)	Pos. 2 (Fig. 29-30-31-32)
45° Elbow 3" (80 mm) single wall	Pos. 3 (Fig. 25-26-28)
Vertical vent termination 3.28 ft (1 m) 3.94" (100 mm) coaxial	Pos. 3
Straight Pipe 1.64 ft (0.5 m) 3" (80 mm) single wall	Pos. 4 (Fig. 25-26-28)
Roof Flashing flat universal	Pos. 4 (Fig. 23)
Straight Pipe 3.28 ft (1 m) 3" (80 mm) single wall	Pos. 5
Straight Pipe 6.56 ft (2 m) 3" (80 mm) single wall	Pos. 6 (Fig. 28)
Roof Flashing sloping universal	Pos. 6 (Fig. 24)
45° Elbow 3.94" (100 mm) coaxial	Pos. 7
Horizontal inlet air vent 2.82 ft (0.86 m) 3" (80 mm) single wall	Pos. 8 (Fig. 25-26-27)
Straight Pipe 1.64 ft (0.5 m) 3.94" (100 mm) coaxial	Pos. 8 (Fig. 24)
Adaptor for room air dependent operation	Pos. 9 (Fig. 28)
Straight Pipe 3.28 ft (1 m) 3.94" (100 mm) coaxial	Pos. 9 (Fig. 24)
90° Elbow 3.94" (100 mm) coaxial	Pos. 10 (Fig. 24)
Mounting Clip (set of 4)	Pos. 10 (Fig. 25-26-27-28)
Vertical vent termination 3" (80 mm) single wall	Pos. 11

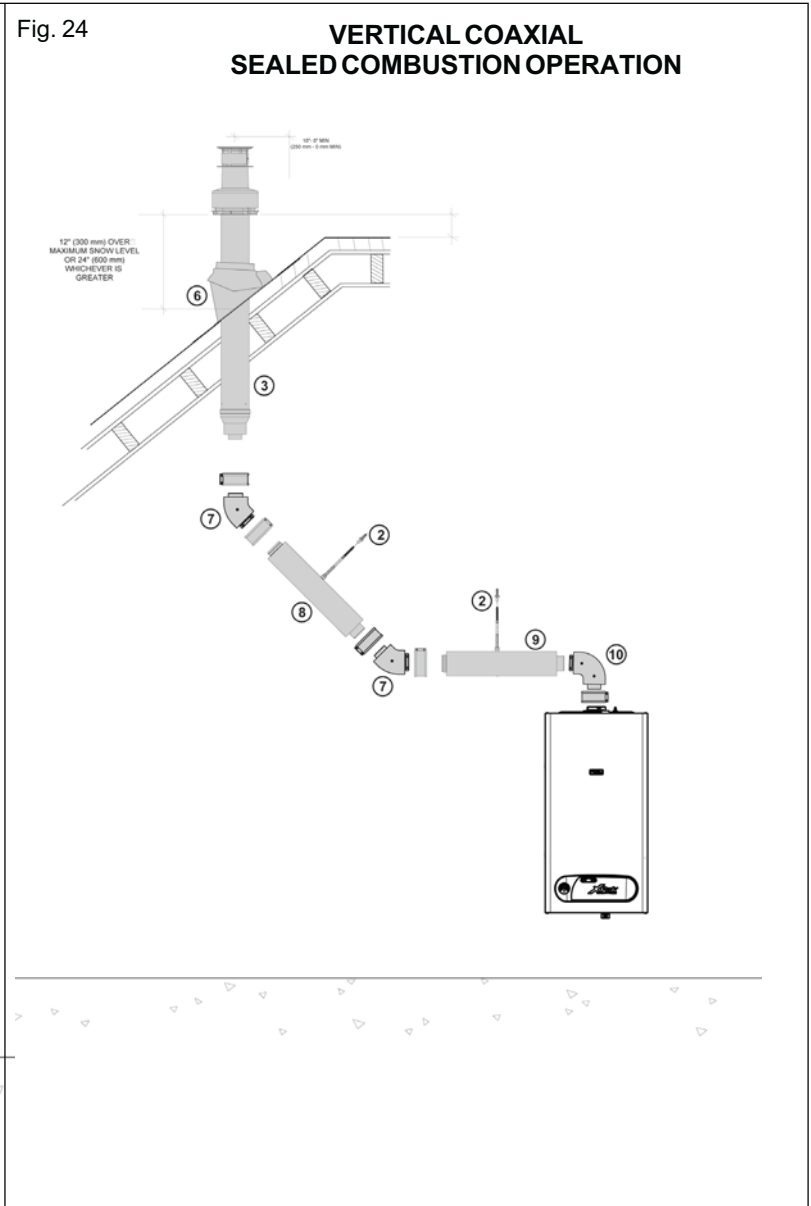
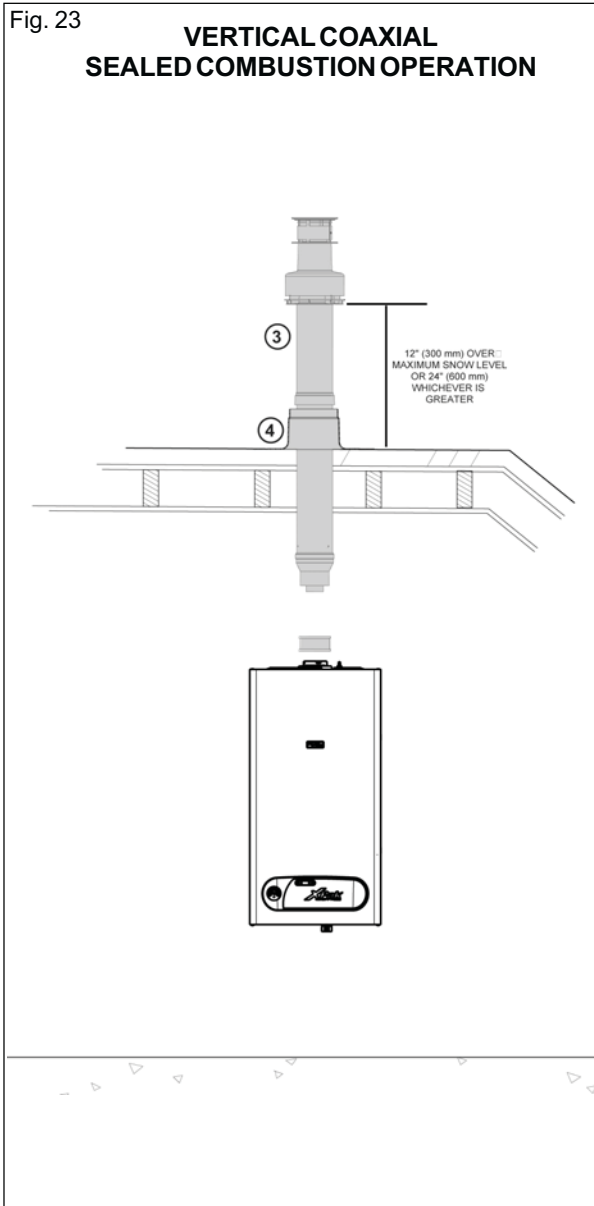


Fig. 27

TWO PIPES SINGLE WALL SEALED COMBUSTION OPERATION

a = total intake length = INTAKE
b = total flue length = EXHAUST

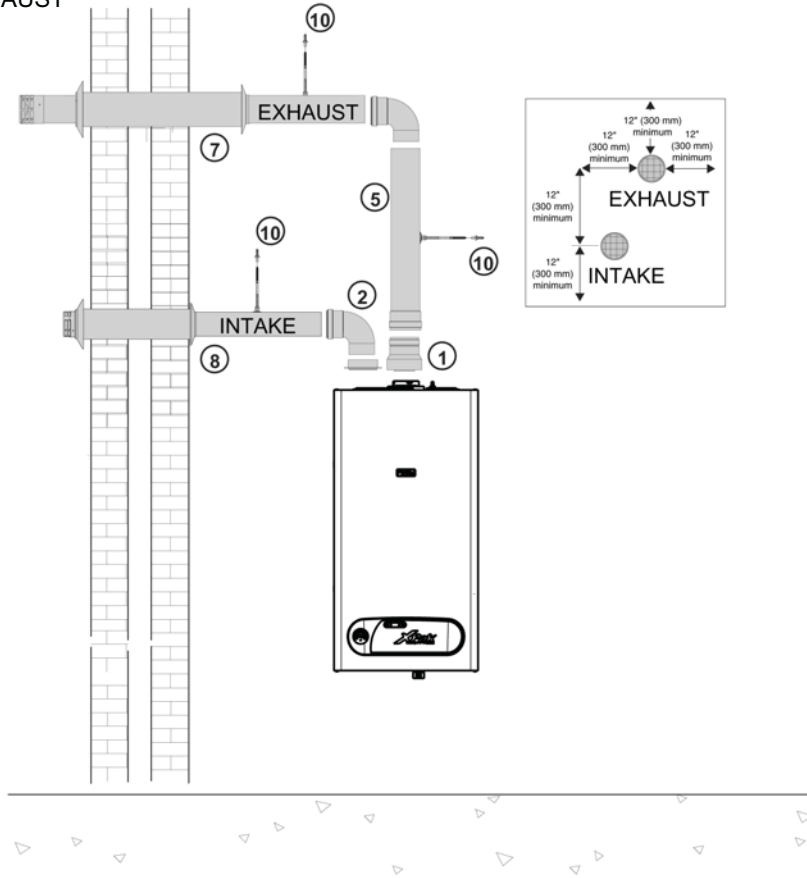
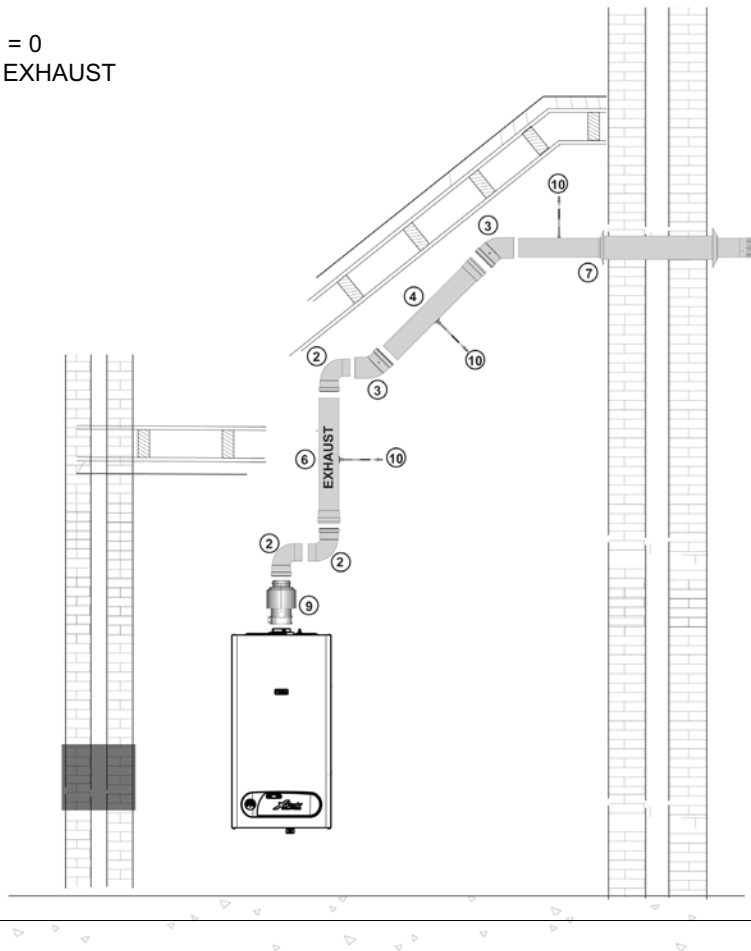


Fig. 28

TWO PIPES SINGLE WALL ROOM AIR DEPENDENT OPERATION

a = total intake length = 0
b = total flue length = EXHAUST

a = 0



Stainless Steel 3” Vent System¹

US + CANADA

Vent System - Room Air independent Operation (Sealed Combustion Operation) - Fig. 12-14-15-17

Tab. 7

Vent System diameter	3”	
Vent system material	Stainless steel	
Two pipes vent adaptors (included with the boiler)	-	-
adaptor 80 mm > 3” (included with the boiler 1 pcs) for flue	-	-
adaptor 80 mm > 3” for intake air	Field supplied	Order No.
Combustion air intake vent material ³	Field supplied	Order No.
ULC/UL listed ¹		
Stainless steel Vent material		
45° elbow EqL = 2 ft / 0,6m	Field supplied	Order No.
90° elbow EqL = 3 ft / 0,9m		
Bird Screen c/w Termination	Field supplied	Order No.
Venting support ² dia. 3”	Field supplied	Order No.

¹stainless steel vent material must be ULC/UL listed, stainless steel AL29-4C® for category IV boilers. Sources FasNseal – Protech System Inc.

² Order Mounting Clip for each straight length of vent pipe installed, boiler can not support weight of vent system

³ allowable material for combustion air ABS – CPVC – PVC or stainless steel

- Do not exceed maximum equivalent vent length.

- Always follow XPak Venting System Installation Instructions.

Stainless Steel Vent System¹

US + CANADA

Vent System - Room Air Dependent Operation - Fig. 13-16-18

Tab. 8

Vent System diameter	3”	
Vent system material	Stainless steel	
Adaptor for room air dependent operation ³	013102	Order No.
adaptor 80 mm > 3” (included with the boiler 1 pcs)	-	-
ULC/UL listed ¹		
Stainless steel Vent material		
45° elbow EqL = 2 ft / 0,6m	Field supplied	Order No.
90° elbow EqL = 3 ft / 0,9m		
Bird Screen c/w Termination	Field supplied	Order No.
Venting support ² dia. 3”	Field supplied	Order No.

¹ Stainless steel vent material must be ULC/UL listed, stainless steel AL29-4C® for category IV boilers. Sources FasNseal – Protech System Inc.

² Order Mounting Clip for each straight length of vent pipe installed, boiler can not support weight of vent system

³ Provide a proper air opening in the room (size according indication pg. 7)

- Do not exceed maximum equivalent vent length.

- Always follow XPak Venting System Installation Instructions.

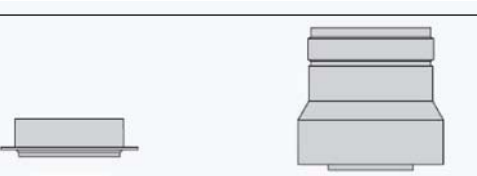

DESCRIPTION	DIAGRAM	DRAWING
P/N 013040 Two pipes vent adaptors (included with the boiler)	Fig. 29-30-31-32 Pos. 1	
P/N 013040 adaptor 80 mm > 3" (included with the boiler 1 pcs)	Fig. 29-30-31-32 Pos. 2	

Fig. 29

a = total intake length = INTAKE
 b = total flue length = EXHAUST

TWO PIPES SINGLE WALL SEALED COMBUSTION OPERATION

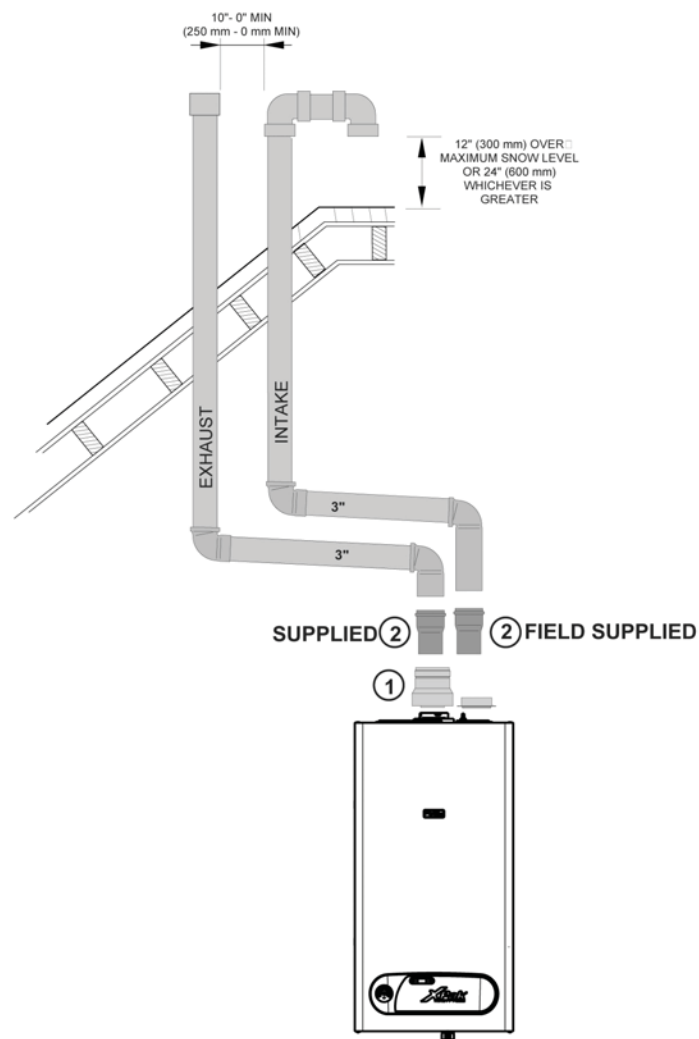


Fig. 30

a = total intake length = INTAKE
b = total flue length = EXHAUST

TWO PIPES SINGLE WALL SEALED COMBUSTION OPERATION

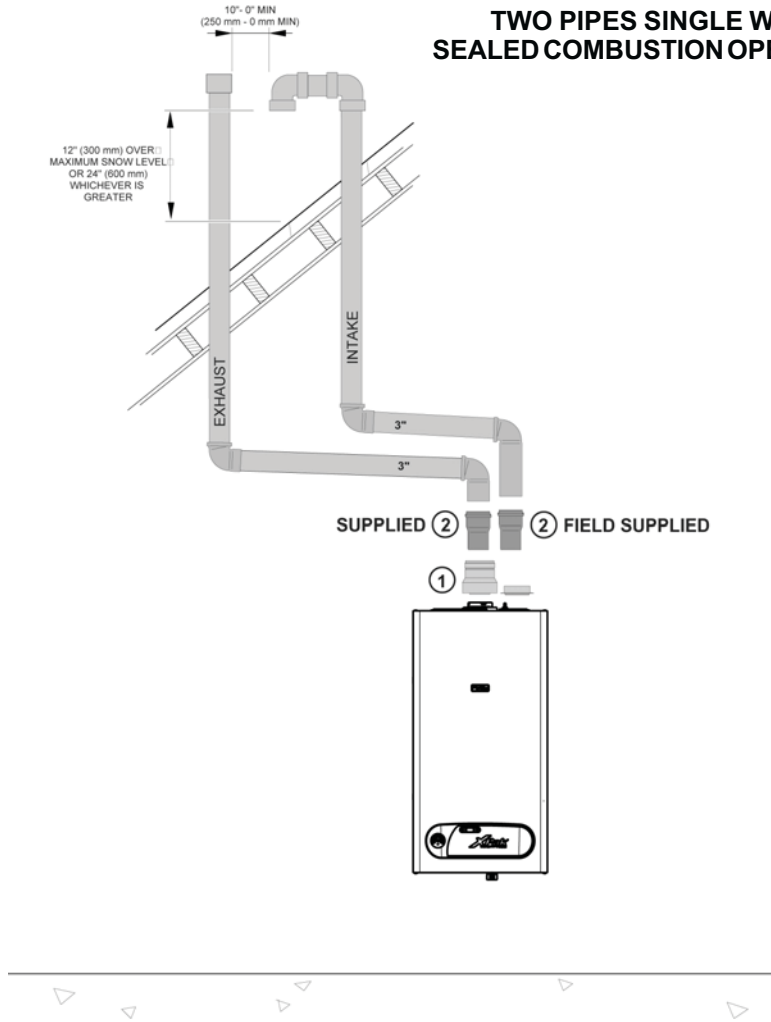


Fig. 31

a = total intake length = INTAKE
b = total flue length = EXHAUST

TWO PIPES SINGLE WALL SEALED COMBUSTION OPERATION

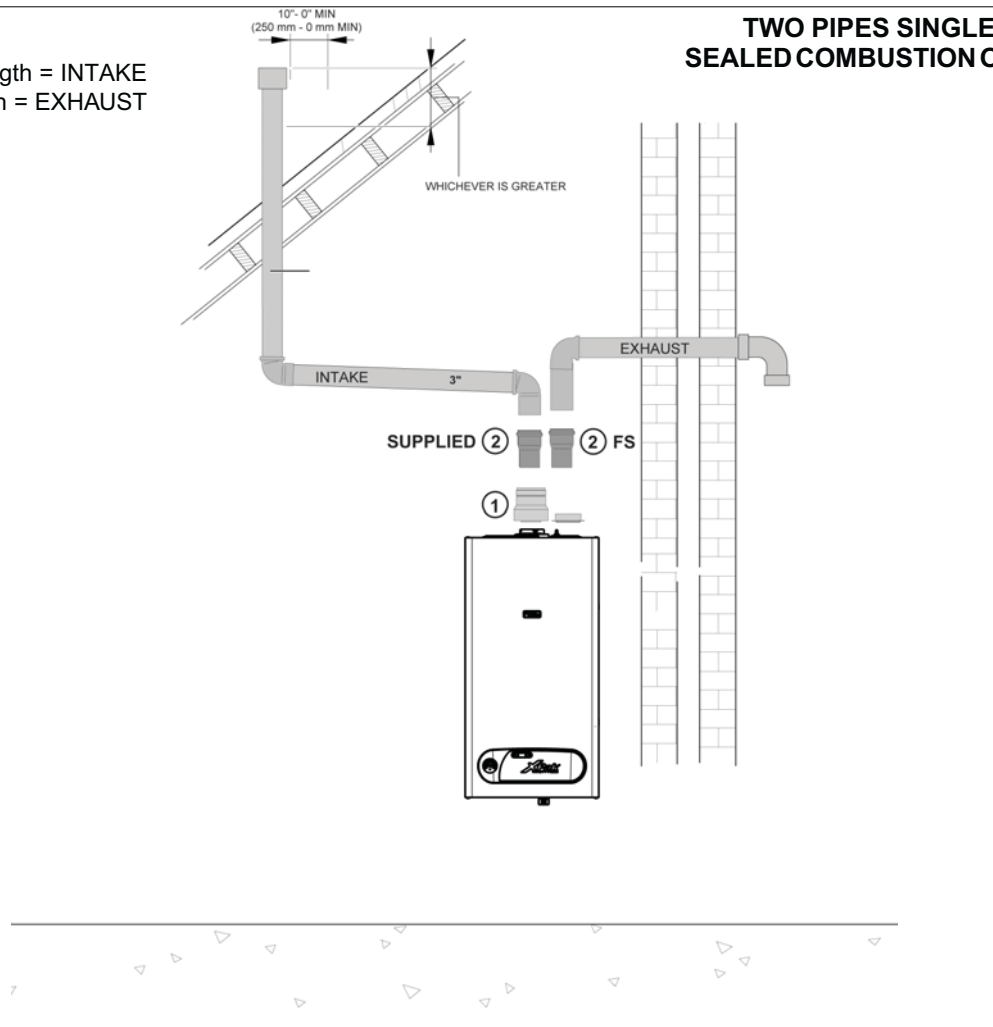
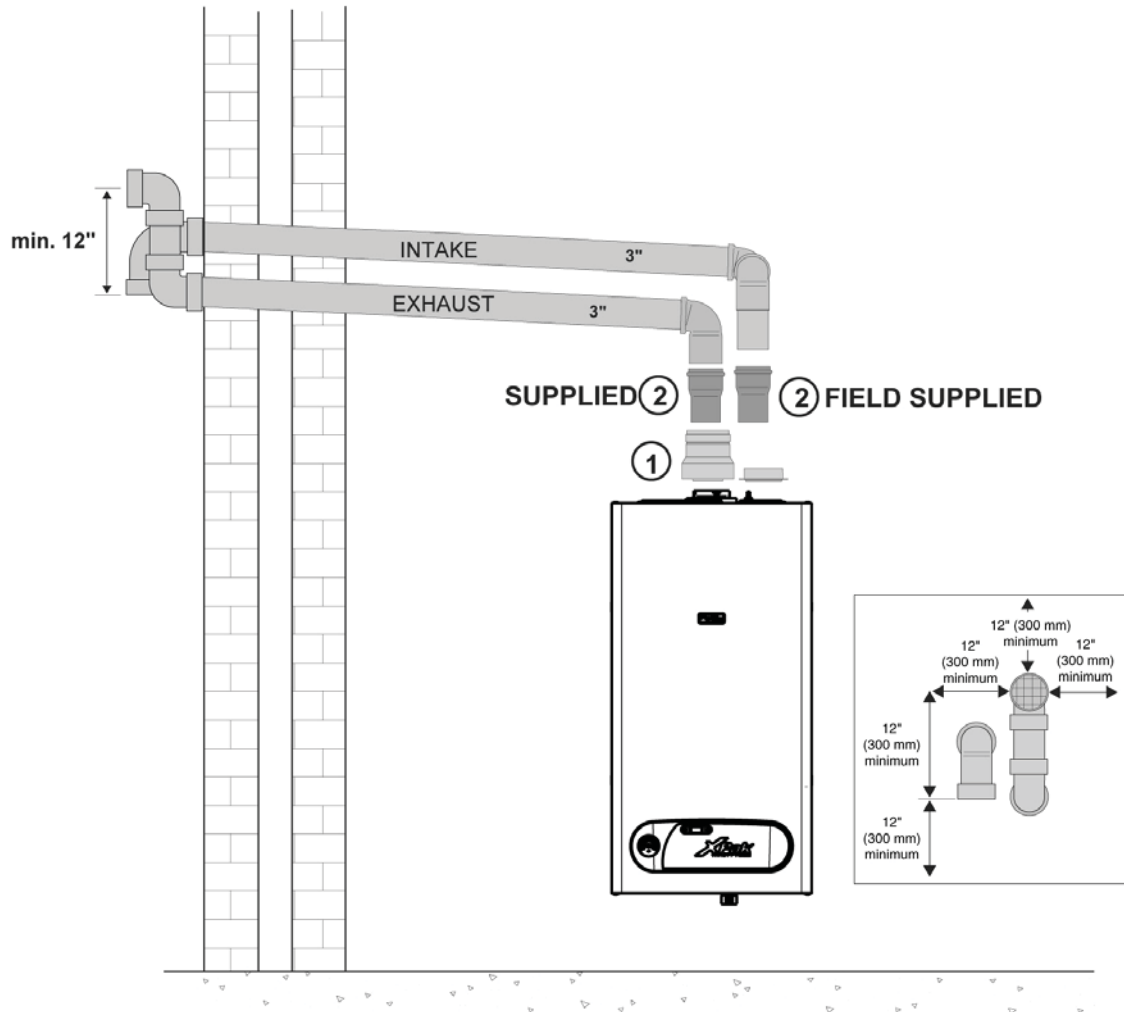


Fig. 32

a = total intake length = 0
b = total flue length = EXHAUST

TWO PIPES SINGLE WALL SEALED COMBUSTION OPERATION



CONNECTING THE CONDENSATE WATER DRAIN

Install the condensate drain flexible pipe (Ø 0.825" - 21mm female flexible rubber connection) with a suitable gradient (min. 2.5%).

Discharge condensate from the boiler into the drainage system, either directly or (if required) via a neutralization unit (not supplied).

1. CONDENSATE CONNECTION

The condensate drain of the boiler is equipped with a built-in siphon trap in order to keep flue gases from being discharged via the condensate drain.

The condensate formed both in the condensing boiler and in the flue gas pipe must be discharged into the public sewage system in accordance with all applicable local regulations.

The condensate produced by a gas-fired heating system has a pH value between 3 and 4.

Some local codes may require the use of a separate neutralization unit to treat the aggressive and corrosive condensate.

Raypak offers a Condensate Neutralizer Kit (Z-12 option) for use when managing the condensate is desired or required. Order part number 013141.

With a neutralization unit installed, all condensate from the boiler and the flue gas pipe enters into the neutralization unit where it is treated and released into the public sewage system with a safe pH value of above 6.5.

The use of neutralization granulate (performing the neutralizing process) is dependent on the operation of the heating system.

To determine the required refill amount, check granulate level several times during the first year of operation. In some cases one granulate fill may last an entire year.

The condensate discharge outlet to the drainage system connection must be clearly visible. It must be installed with a suitable gradient and provided with a stench trap.

If the condensate outlet of the boiler is lower than the drain, a condensate pump must be used (see electrical wiring to lock out the boiler in the case of failure of the condensate pump - alarm 21). Only corrosion-resistant materials may be used for condensate drainage purposes (e.g. braided hose). Do not use galvanized materials or materials containing copper for piping, couplings etc. Please note that other requirements may apply depending on local regulations and/or project-specific details.

It is advisable to contact your local waterworks office (authority responsible for waste water regulations) well before commencing with the installation of the neutralization unit in order to establish details of local regulations that apply.

NOTICE: Pipe ventilation must take place between the siphon trap and the neutralization unit (if applicable).

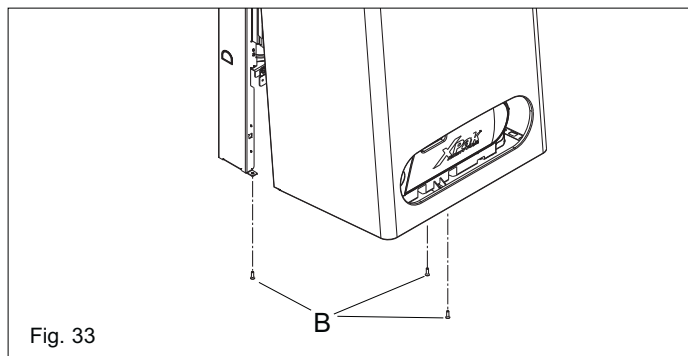


Fig. 33

7 - ELECTRICAL CONNECTIONS

Devices such as outdoor sensor, 3-way valve, tank sensor, tank thermostat, remote controls are all connected to the external connection board.

The electrical connections to the boiler must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, ANSI/NFPA-70.

Installations should also conform with CSA C22.1 Canadian Electrical Code Part 1 if installed in Canada.

1. EXTERNAL CONNECTION BOARD CONNECTIONS

A qualified electrician should connect the electrical supply to the appliance. If controls – external to the appliance – are required, a competent person must undertake the design of any external electrical circuits. ANY EXTERNAL CONTROL OR WIRING MUST BE SERVED FROM THE SAME ISOLATOR AS THAT OF THE APPLIANCE. Wiring to the appliance must be rated for operation in contact with surfaces up to 194°F (90°C).

WARNING: ELECTRICAL SHOCK HAZARD — For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

AVERTISSEMENT: RISQUE DE CHOC ÉLECTRIQUE — Pour votre sécurité, coupez l'alimentation électrique au niveau du tableau de distribution avant d'effectuer tout raccordement électrique afin d'éviter un risque éventuel de choc électrique. La non-observation du dernier point peut provoquer de graves blessures ou la mort.

NOTICE: Wiring must be N.E.C. Class 1. If original wiring as supplied with heater must be replaced, use only TEW 221°F (105 °C) wire or equivalent. Heater must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 — latest edition.

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

Verify proper operation after servicing.

2. ELECTRICAL SUPPLY

The boiler requires a 120V 60Hz power supply. Ensure the electrical supply is properly polarized.

The boiler must be grounded.

There must only be one common isolator, providing complete electrical isolation for the boiler and any external controls using PVC insulated cable 18 AWG x3C 105 °C /221°F.

All wiring must be installed in accordance with requirements of National Electrical Code and any additional national, state, or local code requirements having jurisdiction. All wiring must be N.E.C. Class 1. The boiler must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No. 70-latest edition.

In Canada, installation must conform to CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

3. FIELD WIRING

The electrical junction box has a 24 volt terminal compartment and 120 volt terminal compartment. Each terminal connection is clearly marked to ensure correct installation.

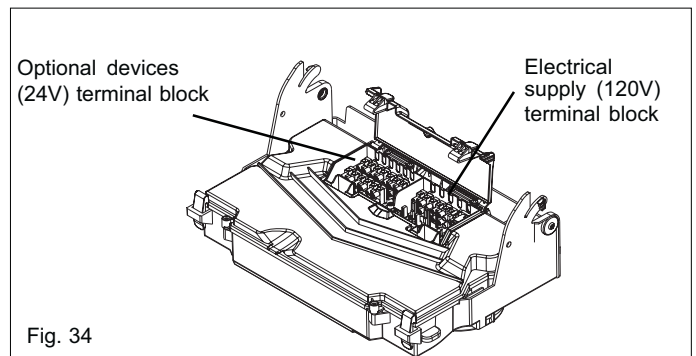


Fig. 34

4. CASING REMOVAL (Fig. 33)

To gain internal access to the appliance you must first remove the casing, proceed as outlined below:

- remove the 3 screws (B) located at the Left/Right/Front of the underside of the casing
- lift the casing upward to disengage it from the top locating hooks and then remove
- store the casing and screws (B) safely until required. Re-fit in the reverse order.

5. APPLIANCE TERMINAL BLOCK

The appliance terminal block is located on the rear of the control panel. Remove the casing. Gently pull the control panel forwards and down. Locate the terminal block cover (see Fig. 34).

NOTICE: The appliance comes with a factory installed jumper for room thermostat connection to allow basic operation of the boiler via the mode selector switch. If it is anticipated that external controls will be required please refer to the wiring diagrams (remove room thermostat jumper if there is the remote control installed on the low voltage terminal strip - M4 Fig. 35).

External connection board connections

Make all electrical connections inside the external connection box.

- Open the cover of the external connection box (Fig. 34).

Connecting incoming power

The boiler must be electrically grounded in accordance with local codes, or in absence of local codes, with the National Electrical Code, ANSI/INFPA 70 and/or the CSA C22.1, Electrical Code.

Boiler terminal strip (Fig. 35)

The XPak terminal strip is divided in two separated area: low voltage and high voltage area.

The high voltage area is dedicated to:

- connections incoming power: ground neutral line, a fuse (4A) is factory fit directly on the terminal strip, 3 pins - M3
- connection for 3-way DHW valve (field supplied) 3 pins - M3a

The low voltage area is dedicated to:

- external sensor (2 pins - M4)
- remote control (2 pins - M4)
- DHW tank sensor (2 pins - M4a)
- DHW tank thermostat (2 pins - M2)
- Room thermostat (2 pins - M4a) factory jumper
- External alarm (3 pins - M3b) factory jumper

6. CONNECTING THE ELECTRICAL SUPPLY (120V)

Unhook and remove the terminal block cover (120V). Pass the cable through the cable anchorage point on the control panel. Pass the cable through the Strain Relief Bushings (field supplied) (Fig. 39).

The boiler is equipped with 4 holes in the lower support .

- Chose the circle holes in the case of using Heyco-Flex Metallic (SR 7K-2) (Fig. 39 ref. 2).
- Chose the non-circle holes in the case of using Strain Relief Bushings (1/2" HFC-Z 1/2) (Fig. 39 ref. 1).

Connect the supply cable wires (LIVE, NEUTRAL & GROUND) to their corresponding terminals (L, N & G) on the appliance - 120V - terminal block. When connecting the GROUND wire, ensure that it's left slightly longer (about 1 in (20 mm)) that the others, this will prevent strain on the GROUND wire should the cable become taut.

Do not remove the link wire unless additional external controls are to be fitted. The securing screw on the cable anchorage should now be tightened (Fig. 37). This must be done before the control panel is reinstalled in the upright position. The appliance casing, screws and lower cover can now be reinstalled.

NOTICE: It is the installer's responsibility to ensure that the appliance is properly grounded. Raypak cannot be held responsible for any damages or injuries caused as a result of incorrect ground wiring.

7. EXTERNAL WIRING

The appliance comes with a factory installed room thermostat link to allow basic operation of the boiler via the mode selector switch. If external controls are to be added to the system, they must be connected to the appliance as shown in the following diagrams. For advice on controls that are not featured in this book, please contact Raypak technical department.

8. EXTERNAL WIRING LIMITATIONS

Any external wiring must remain within the limits as detailed in the table below

CONNECTION	MAX. LENGTH
Outdoor air sensor	100 ft (30 metres)
Room thermostat	100 ft (30 metres)
Remote control connection	100 ft (30 metres)

9. CONNECTING THERMOSTAT

1. Connect room thermostat or end switch, terminal strip is 24V (Fig. 35 ref. M4a)
2. Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, direct sunshine or fireplaces.

10. OTHER DEVICES

Contact Raypak technical department should you require more specific information on the suitability of a particular control. Further guidance on the recommended practice for the installation of external controls, can be found.

IMPORTANT

- The boiler must always be supplied with a permanent 120V electrical supply.
- Always remove the link on M4a terminal strip on the appliance low voltage 24V terminal strip whenever additional controls are connected to the appliance.
- Do not connect any controls or auxiliary equipment to the 24V terminal strip, other than that approved/supplied by the manufacturer.

11. TERMINAL STRIP DETAILS

	Terminal strip reference	Description	Technical specifications	Indications
High voltage (Fig. 35)	M3	Main supply	120 VAC – 60 Hz	The main supply cable must be anchored to the boiler frame (Fig. 39) and pass through the strains relief (field supplied). Cable as specified in the electrical supply.
	M3a	3-way valve: Connections for DHW external 3-way valve	120 VAC – 60 Hz	Model: Honeywell VC6011 (actuator) + VCZMK6000 (Cartridge valve) The 3-way valve cable must be anchored to the boiler frame (Fig. 39) and pass through the strains relief (field supplied) (Fig. 39). Cable as specified in the electrical supply.
Low voltage (Fig. 35)	M4	Outdoor sensor	12 K Ohm B3760	
	M4	Remote control	Open therm plus protocol	Only Raypak Part No. 013073
	M4a	Room thermostat	24 VDC	Volt free (Jumper when not used)
	M4a	Tank sensor for DHW	10 K Ohm B3435	Immersion type. If the boiler is installed with a tank sensor, the Jumper on the PCB must be in position 2 (Fig. 61)
	M2a	Tank thermostat for DHW	On/off (NO)	Volt free If the boiler is installed with a tank thermostat, the Jumper on the PCB must be in position 3 (Fig. 61)
	M3b	Under-floor heating limit thermostat and condensate	On/off (NC)	Volt free. This is a generic input to lock out the boiler. Jumper when (generic available alarm) not used). If the contact will be open the alarm number 21 will appear on the display and the boiler is lock out

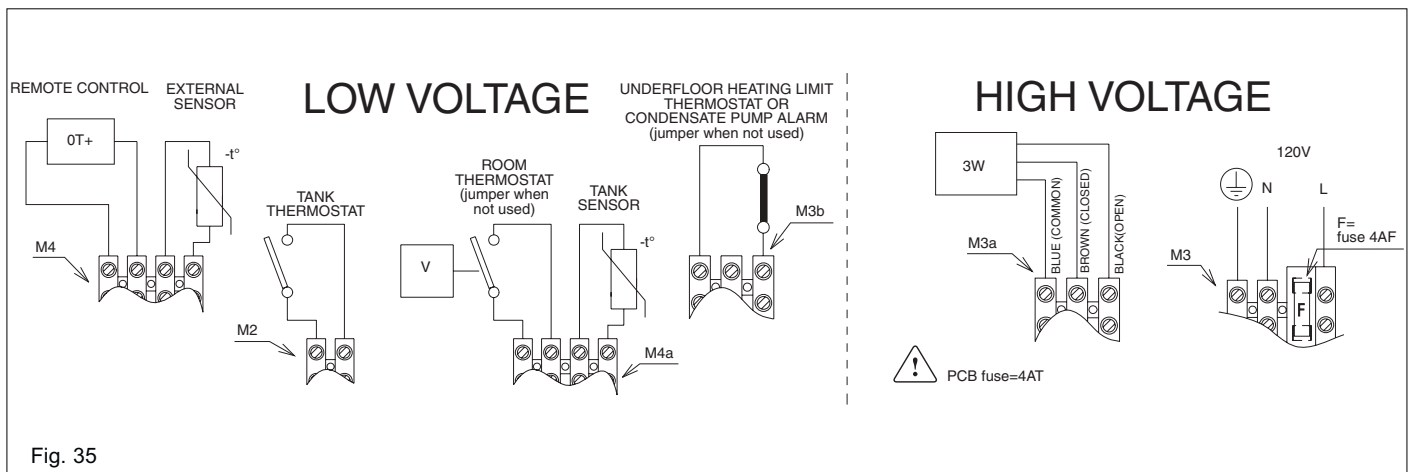


Fig. 35

12. OUTDOOR SENSOR CONNECTION

The user can program the desired supply temperature based on the outdoor temperature. Once the outdoor sensor is connected to the control board, the water temperature of the boiler will adjust to run the boiler more efficiently and provide greater comfort to the living space.

Connection Specification – Wire 22 AWG maximum to 100 ft (30 m). Outdoor Sensor is connected in the junction box on the XPak. Route wires from the terminal strip to your outdoor sensor, which will allow the user to change the temperature going to the Central Heating loop automatically. Place the outdoor sensor preferably to the north or northwest or to the side which will be affected by changing weather conditions outside. NOTE: Do not locate the sensor in the direct sunlight.



Fig. 36

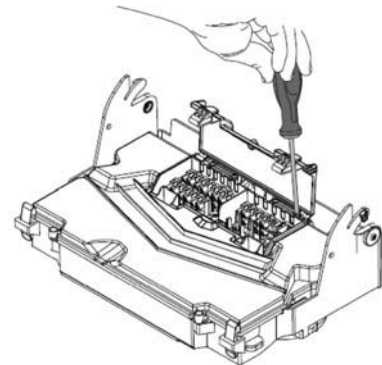


Fig. 37

13. 3-WAY VALVE WIRING CONNECTION

XPak boiler can manage an external 3-way valve (field supplied), the terminal strip (M3a) output is 120V – 60 Hz (see electric diagram).

Logic of the boiler managing 3-way valve

1. Boiler configuration in DHW (case A and case B), see Fig. 61 for boiler jumper configuration.
2. Once the jumper has set in DHW mode (tank with probe or tank with thermostat), when there is a heat request from the sensor or from the thermostat, there is power out (120V – 60 Hz) to the boiler terminal strip M3a (Fig. 35).
3. The output to the 3-way valve DHW pin is continuously supply up to the heat is satisfied.
4. The room thermostat request is independent from the DHW request (Priority is always given to DHW production).
5. The 3-way valve is always powered, even if there is no DHW demand.

WARNING: The 3-way valve is continuously powered even if there is no heat request from the tank.

Wiring connections 3-way valve

Suggested source: Honeywell VC6011 (actuator) + VCZMK6000

Wiring the valve as per diagram Fig. 38.

Follow the installation of the piping referring to the diagram showing the logic of working Fig. 38.

The connections colors and schematic refer to the Honeywell VC6011 (actuator) + VCZMK6000.

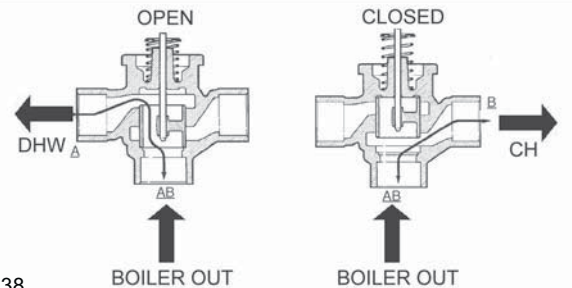
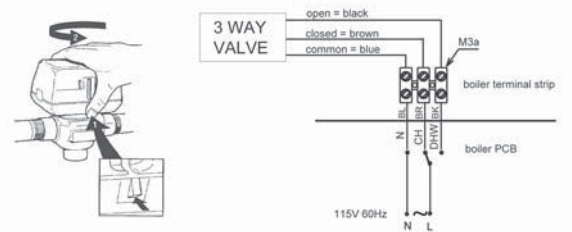


Fig. 38

14. REMOTE CONTROL CONNECTION

The boiler can be fully remoted using an open therm plus remote control (use only Raypak REC 08 Part No 013073).

When the control is installed with the boiler display shows as per Fig. 36. No operation can be made on the boiler control panel once the remote control is installed.

All the boiler settings can be made only by Remote Control once it is connected.

See Remote Control instruction for setting and use.

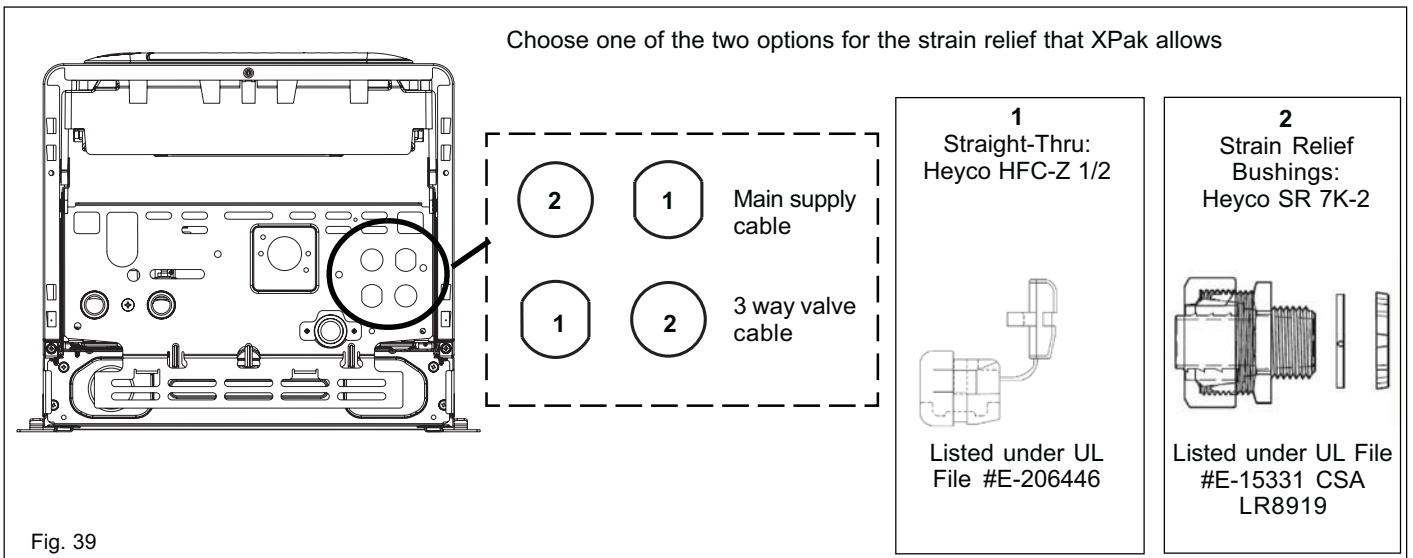


Fig. 39

WIRING FUNCTIONAL DIAGRAM

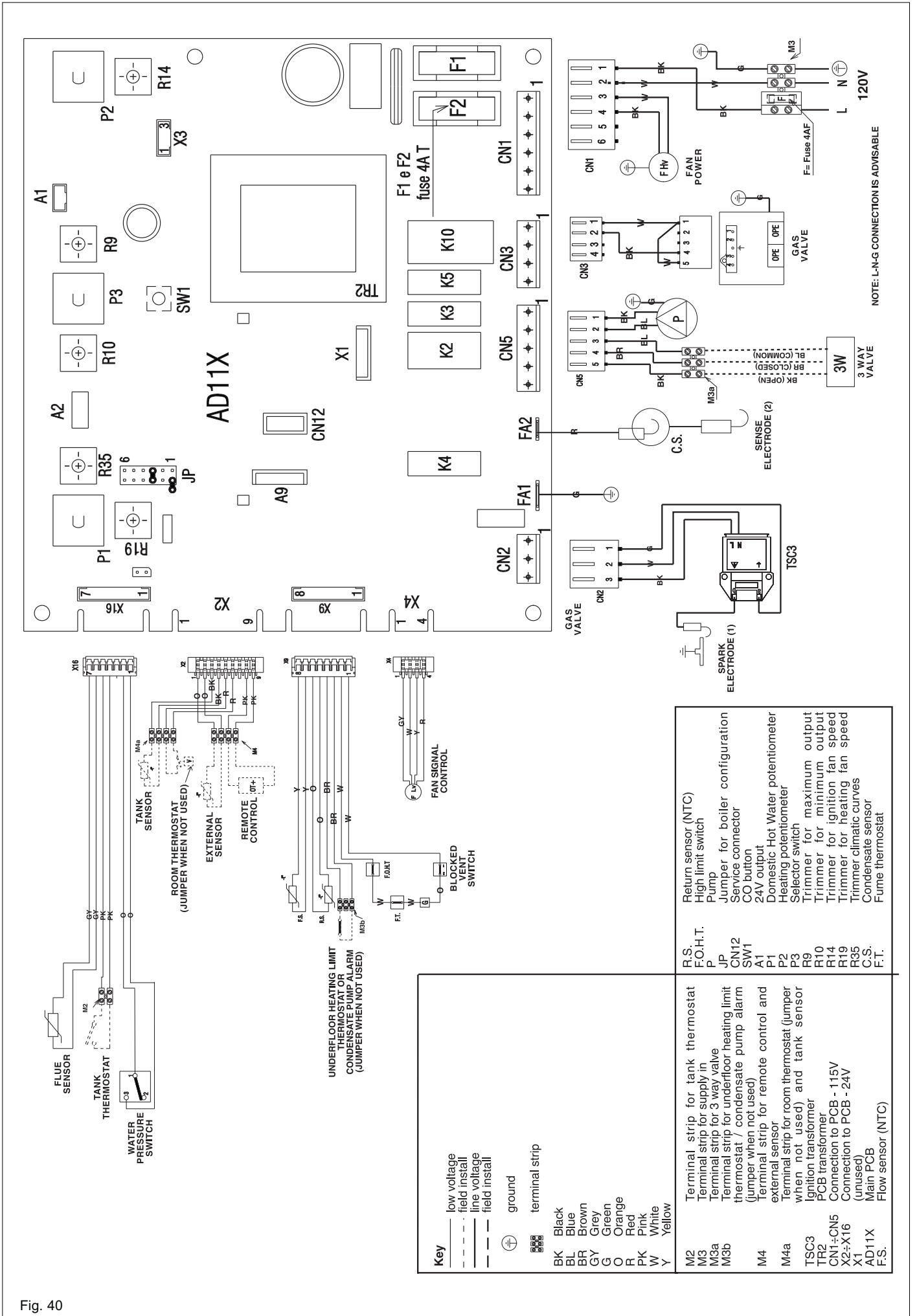


Fig. 40

8 - START-UP PROCEDURE

There are several steps involved in starting up the boiler.

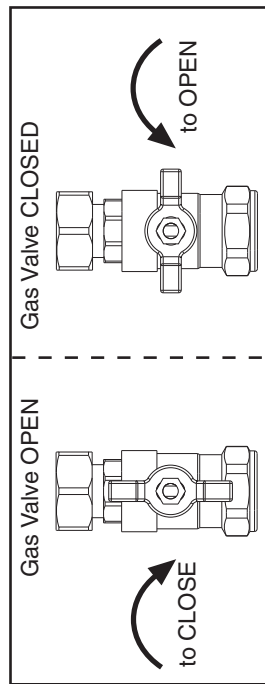
FOR YOUR SAFETY READ BEFORE OPERATING

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.
- C. If you cannot reach your gas supplier, call the fire department.
- Use only your hand to turn the gas control knob. Never use tools. If the handle will not 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. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove top cover.
6. Turn gas shutoff valve clockwise to close valve. Handle will be perpendicular to pipe. Do not force.
7. Wait five (5) minutes to clear out any gas.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove top cover.
4. Turn gas shut off valve clockwise to close valve. Handle will be perpendicular to pipe. Do not force.
5. Install top cover.

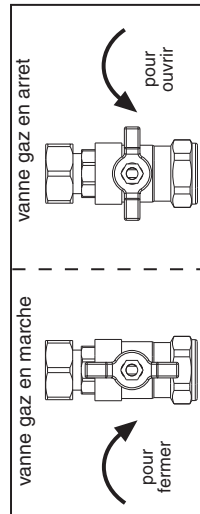
POUR VOTRE SÉCURITÉ LISEZ AVANT DE METTRE EN MARCHÉ

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

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
- B. **AVANT DE FAIRE FONCTIONNER**, renifllez tout autour de l'appareil pour déceler une odeur de gaz. Renifllez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.
- QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:**
 - Ne pas tenter d'allumer l'appareil
 - Ne touchez à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment
 - Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur
- C. Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.
- C. Ne poussez ou tournez la manette d'admission du gaz qu'à la main; ne jamais utiliser d'outil. Si la manette reste coincée, ne pas tenter de la réparer; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.
- D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

INSTRUCTIONS D'ALLUMAGE

1. **ARRÊTEZ!** Lisez les instructions de sécurité sur la portion supérieure de cette étiquette
2. Réglez le thermostat à la température la plus basse
3. Coupez l'alimentation électrique de l'appareil
4. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
5. Retirez le couvercle du haut
6. Tournez le bouton de la vanne de gaz dans le sens horaire à la position "arrêt" (OFF)
7. Attendez cinq (5) minutes pour laisser échapper tout le gaz. Si vous sentez une odeur de gaz, **ARRÊTEZ!** Passez à l'étape "B" des instructions de sécurité sur la portion supérieure de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
8. Tournez le bouton de commande de gaz dans le sens antihoraire à la position "marche" (ON)
9. Remontez le couvercle du haut
10. Mettez l'appareil sous tension
11. Réglez le thermostat à la température désirée
12. Si l'appareil ne se met pas en marche, suivez les instructions intitulées "Comment couper l'admission de gaz de l'appareil" et appelez un technicien qualifié ou le fournisseur de gaz.



COMMENT COUPER L'ADMISSION DE GAZ L'APPAREIL

1. Réglez le thermostat à la température la plus basse
2. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien
3. Retirez le couvercle
4. Tournez le bouton de commande de gaz dans le sens horaire à la position "arrêt"
5. Remontez le couvercle du haut.

Cod. 20003235

Fig. 141

9 - COMMISSIONING

1. CHECK/CONTROL WATER CHEMISTRY

WARNING: Do not use petroleum-based cleaning or sealing compounds in heater system. Damage to elastomer seals and gaskets in system could occur, resulting in substantial property damage.

Water pH between 6.0 and 8.0

1. Maintain heater water pH between 6.0 and 8.0. Check with litmus paper or have chemically analyzed by water treatment company.
2. If pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains.

1. Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chlorine concentration less than 200 ppm

1. Filling with chlorinated fresh water should be acceptable since drinking water chlorine levels are typically less than 5 ppm.
2. Do not use the heater to directly heat swimming pool or spa water.
3. Do not fill heater or operate with water containing chlorine in excess of 200 ppm.

Clean system to remove sediment

1. You must thoroughly flush the system (without heater connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.
2. Flush system until water runs clean and you are sure piping is free of sediment.

Test/replace freeze protection fluid

1. For systems using freeze protection fluids, follow fluid manufacturer's instructions to verify inhibitor level and that other fluid characteristics are satisfactory.
2. Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer's instructions.

2. FREEZE PROTECTION (WHEN USED)

WARNING: NEVER use automotive or standard glycol antifreeze, even ethylene glycol made for hydronic systems. Use only freeze-prevention fluids certified by fluid manufacturer as suitable for use with aluminum heaters, verified in fluid manufacturer's literature.

Thoroughly clean and flush any system that has used glycol before installing the new XPak Boiler. Provide XPak boiler owner with a material safety data sheet (MSDS) on the fluid used (if requested).

1. Determine freeze protection fluid quantity using total system water content, following fluid manufacturer's instructions. Remember to include expansion tank water content.
2. Local codes may require back flow preventer or actual disconnect from city water supply.
3. When using freeze protection fluid with automatic fill, install a water meter to monitor water makeup. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

3. THE HEATING SYSTEM

The appliance contains components that may become damaged or rendered inoperable by oils and/or debris that are residual from the installation of the system, consequently it is essential that the system be flushed in accordance with the following instructions.

4. INITIAL FILLING OF THE SYSTEM

Ensure both flow and return service valves are open, remove appliance casing as described, identify the automatic air release valves (AAV) and loosen the dust cap/s by turning the cap counterclockwise one full turn. Ensure all manual air release valves located on the heating system are closed. Fill the system via proper filling method (field supplied). As water enters the

system the pressure gauge will begin to rise. Once the gauge has reached 15 p.s.i. (1 bar) close both valves and begin venting all manual air release valves, starting at the lowest first. It may be necessary to go back and top-up the pressure until the entire system has been filled. Inspect the system for water tightness, fixing any leaks.

WARNING: Eliminate all system leaks. Continual fresh make-up water will reduce boiler life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure.

5. The system may have residual substances that could affect water chemistry. After the system has been filled and leak tested, verify water pH and chlorine concentrations are acceptable.

CAUTION: It is important that you purge the system of air to avoid damage to the heater.

5. PURGE AIR FROM BOILER MANUAL AIR RELEASE (Fig. 42)

When the boiler has been filled for the first time or the system has been drained and refilled, it will be necessary to release any air that may have become trapped within the appliance heat exchanger. Slacken the bleed screw using a 7/16" (11mm) open-ended spanner until water is released and then close. IMPORTANT, THERE ARE NO OTHER MANUAL AIR RELEASE VALVES LOCATED ON THE APPLIANCE.

WARNING: Never open the Manual Air Vent while the boiler is hot. Allow boiler to cool to room temperature to avoid scalding while purging.

Fill the system and watch that system pressure rises to correct cold-fill pressure.

After the system has operated for a while, eliminate any residual air.

6. SYSTEM DRAIN (Fig. 42a)

Use a open-ended wrench (dimensions 7/16" (11 mm)) to drain the water inside the boiler:

- attach the rubber pipe supplied to the drain valve (A)
- locate the wrench hole under the boiler
- fit the wrench to the valve
- gently rotate the wrench counterclockwise
- drain the boiler
- close the valve rotating the wrench clockwise
- remove the rubber pipe from the valve once the valve as been closed

DANGER: The system water temperature could be very hot, be sure when the valve is opening that the rubber pipe is well attached. Frontal water flushing can occur and cause instant severe burns or death from scalds.

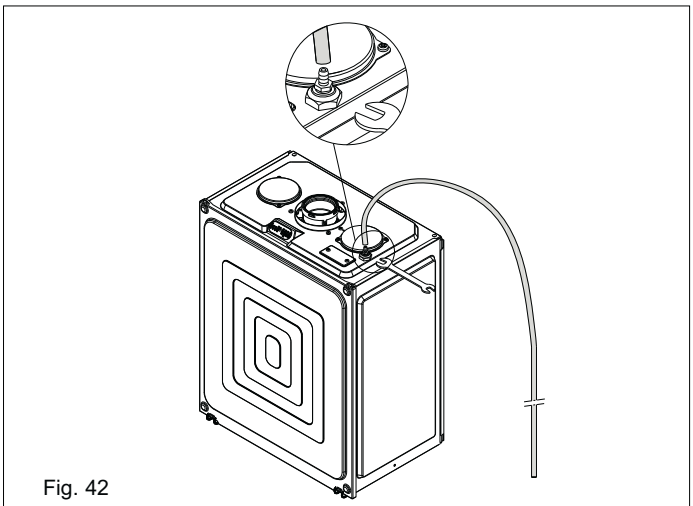


Fig. 42

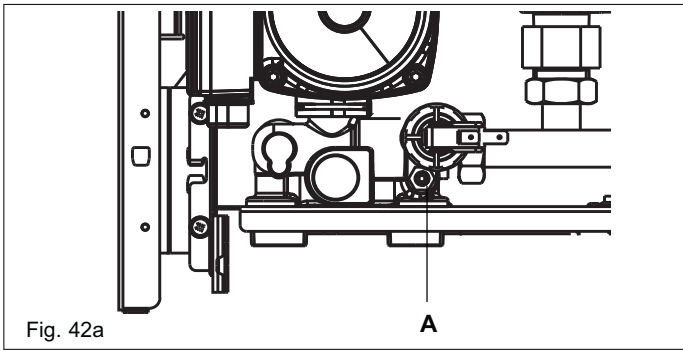


Fig. 42a

7. CHECK THERMOSTAT CIRCUIT(S)

1. Disconnect the two external wires connected to the boiler thermostat terminals (low voltage terminal strip M4a).
2. Connect a voltmeter across these two incoming wires. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the incoming wires.
3. There should NEVER be a voltage reading.
4. If a voltage does occur under any condition, check and correct the external wiring.
5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to boiler low voltage terminal strip. Allow the boiler to cycle.

8. TESTING FOR GAS LEAKS

Prior to start-up of the boiler you must check the external tightness of the gas supply valve and confirm this in the start-up report. Inspect the entire installation including the gas meter.

WARNING: Before starting the XPak, and during initial operation, smell near the floor and around the heater for gas odorant or any unusual odor. Remove heater front door and smell interior of heater enclosure. Do not proceed with startup if there is any indication of a gas leak. Repair any leak at once.

WARNING: LPG boiler only — Your propane supplier mixes an odorant with the LPG to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the LPG supplier verify the correct odorant level in the gas.

WARNING:

- Cover endangered positions before leak testing.
- Do not spray the leak testing agent onto cables, plugs or electrical connection lines.
- Do not allow it to drip onto them either.

DANGER: Leaks may be caused to pipes and screw connections during commissioning and maintenance activities.

- Carry out a proper leak test.
- Only use approved leak detection agents for leak detection.
- Disconnect the heating system from the power supply.
- Check the exterior tightness of new pipe sections up to and including the direct sealing point on the gas burner fitting.

9. INITIAL FLUSHING OF THE SYSTEM

The whole of the heating system must be flushed both cold and hot as detailed in Fig. 42a. Open all radiator or heating valves and the boiler flow & return service valve. Drain the boiler and system from the lowest points. Open the drain valve full bore to remove any installation debris from the boiler prior to lighting. Refill the boiler and heating system.

10. PRE-OPERATION CHECKS

Before attempting the initial lighting of the appliance, the following checks must be carried out:

- Ensure all gas service valves from the meter to the appliance are open and the supply pipe has been properly purged;
- Ensure the proper electrical checks have been carried out, particularly continuity, polarity, and resistance to ground;

- Ensure the 4 AMP fuses are installed;
- Ensure the system has been filled, vented, and the pressure set to 15 p.s.i. (1 bar);
- Ensure the flue system has been installed properly and in accordance with the instructions;
- Ensure all appliance service valves are open.

11. INITIAL LIGHTING AND IGNITION SAFETY SHUTOFF DEVICE TEST

Ensure the electrical supply to the appliance is switched on. Ensure any external controls are switched to an 'ON' position and are calling for heat.

Move the selector switch to the ON position (☀ - ❄ - ☀_{CF}), the appliance will now operate.

NOTICE:

After installation, the boiler must be turned ON and the thermostat set for CFH and operated with the manual gas shut-off valve below the unit closed. Allow the boiler to go through its 5 ignition tries and then lock out. The display should indicate the alarm code 10. After the test, reset the control, open the gas valve, set the thermostat to the proper setting and ensure that the boiler operates properly.

12. CHECKING GAS PRESSURE AND COMBUSTION ANALYSIS

The boiler is factory set and requires no additional adjustment once installed.

If the installation does not include a gas meter (for example LPG) and there are no means by which to calculate the gas rate, then a combustion analysis test must be carried out in accordance with local regulations to ensure the appliance is left working safely and correctly.

Additionally, if the gas valve has been adjusted, replaced, or the appliance has been converted for use with another gas type, then it becomes necessary to carry out a combustion analysis/check to ensure that correct combustion is occurring.

If there are no means to gas rate the appliance and/or carry out a combustion analysis check, then it will not be possible to complete the commissioning procedure.

Details on how to carry out the combustion analysis can be found in Section 11.

NOTICE: It's imperative that a sufficient dynamic – gas – pressure is maintained at all times. Should the dynamic gas pressure fall below an acceptable level, the appliance may malfunction or sustain damage.

13. FINAL FLUSHING OF THE HEATING SYSTEM

The system shall be flushed. Cleaners or chemicals used, must be suitable for Aluminum heat exchangers and shall be from a reputable manufacturer and shall be administered in strict accordance with the manufacturers' instructions.

NOTICE: Chemicals used to clean the system and/or inhibit corrosion must be pH neutral, i.e. they should ensure that the level of the pH in the system water remains neutral. Premature failure of certain components can occur if the level of pH in the system water is out of normal levels.

14. SETTING THE BOILER OPERATING TEMPERATURE

The flow outlet temperature can be adjusted between 104-176°F (40-80°C) depending on the boiler configuration via the Heating thermostat knob (Fig. 1A).

If the 3-way valve is connected, the flow outlet temperature to the tank can be adjusted between 95-140°F (35-60°C) via the DHW temperature selector (Fig. 1A).

15. REGULATING THE CENTRAL HEATING SYSTEM

Fully open all radiator and circuit valves and run the appliance for both heating and hot water until heated water is circulating. If conditions are warm remove any thermostatic heads. Adjust radiator return valves and any branch circuit return valves until the individual return temperatures are correct and are approximately equal.

16. FINAL CHECKS

- ENSURE ALL TEST NIPPLES ON THE APPLIANCE GAS VALVE ARE TIGHT AND CHECKED FOR TIGHTNESS.
- ENSURE THE APPLIANCE FLUE SYSTEM IS INSTALLED CORRECTLY AND IS PROPERLY SECURED.
- ENSURE ALL PIPE WORK IS RE-CHECKED FOR SOUNDNESS.
- REATTACH APPLIANCE CASING.
- COMPLETE CHECKLIST

Complete details of the boiler, controls, installation and commissioning in the checklist at the back of this book. It is important that the checklist is correctly completed and handed to the user. Failure to install and commission the appliance to the manufacturers instructions may invalidate the warranty.

17. INSTRUCTING THE USER

Hand over all documentation supplied with this appliance – including these instructions – and explain the importance of keeping them in a safe place.

Explain to the user how to isolate the appliance from the gas, water and electricity supplies, and the locations of all drain points. Show the user how to operate the appliance and any associated controls correctly.

Show the user the location of any isolating valves and the location of all manual air release points.

Explain to the user how to turn off the appliance for both long and short periods and advise on the necessary precautions to prevent freeze damage.

Explain to the user that for continued safe and efficient operation, the appliance must be serviced annually by a qualified service person.

18. WARRANTY

To validate the appliance warranty, it's necessary to register the appliance details with us. The warranty can be registered in several ways, see last pages of this manual for details.


10 - START-UP AND OPERATION

XPak wall-mounted condensing boiler is designed for the production of heating and domestic hot water if a storage tank is connected.

The control panel contains the main boiler control and management functions.

1. SWITCHING ON THE APPLIANCE

Switch on the boiler as follows:

- Open the gas tap under the boiler by turning it counterclockwise (Fig. 46)
- Turn on the general switch of the system and then, after lowering the flap, turn the function selector to summer ☀, winter ❄ or winter tank temperature  (Fig. 54) depending on the chosen operating mode.

Pump cycle mode: when power is restored to the boiler and/or the boiler is powered for the first time, the boiler will enter a 2-minute purge cycle whereby only the pump will run for 15-seconds then off for 15-seconds and will not “fire” until this period has elapsed. To interrupt the purge cycling remove the knob of the main selector switch and press the CO button (Fig. 59).

Off/reset - Select this position when the boiler needs to be reset or switched off.

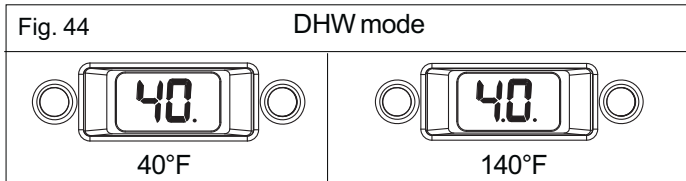
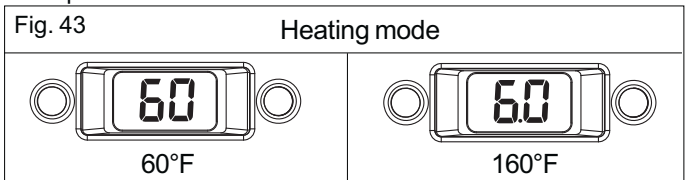
Summer mode ☀ - The domestic hot water function provided by the water tank is activated. The display indicates the storage tank temperature (only with the external water tank connected with a sensor).

Winter mode ❄ - The boiler produces hot water for heating and, if connected to an external water tank, it provides domestic hot water. The display indicates the boiler flow temperature.

Winter mode tank temperature  - The boiler produces hot water for heating and, if connected to an external water tank with a sensor, it provides domestic hot water. The display indicates the storage tank temperature.


2. HOW TO READ THE DISPLAY TEMPERATURE

- (dot in the middle)= means hundred (Fig.43)
- (dot on RIGHT side)= means DHW mode (Fig. 44)



NOTICE:
For temperature over 199°F (93°C) the display shows .

Adjusting heating water temperature

To adjust the heating water temperature turn the knob marked  (Fig. 50) clockwise to increase and counterclockwise to decrease.

When turning the knob, the required temperature automatically appears on the digital display.

NOTICE: Depending on the type of system, it is possible to pre-select the suitable temperature range:

- standard systems 104-176°F (40-80°C)
- floor systems 68-113°F (20-45°C).

For further details, consult the “Boiler configuration” (Fig. 61)

3. ADJUSTING HEATING WATER TEMPERATURE WITH AN OUTDOOR PROBE CONNECTED

When an outdoor probe is connected, the value of the delivery temperature is automatically chosen by the system which rapidly adjusts ambient temperature to the changes in outdoor temperature.

To increase or decrease the temperature with respect to the value automatically calculated by the PCB, turn the heating water selector (Fig. 50) clockwise to increase and counterclockwise to decrease.

Adjustment settings range from comfort levels - 5 to + 5 which are indicated on the digital display when the knob is turned.

4. ADJUSTING DOMESTIC HOT WATER TEMPERATURE (IF A STORAGE TANK WITH SENSOR AND 3-WAY VALVE IS INSTALLED)

When turning the knob, the required temperature automatically appears on the digital display. The domestic hot water adjustment ranges lies between 95°F (35°C) and 140°F (60°C). When choosing the temperature, both for heating and domestic hot water, the display shows the value being selected. About 4 seconds after the selection has been made, the modification is recorded and the display returns to the delivery or domestic hot water temperature read by the probe. Priority is always given to DHW production.

The boiler setting depends from the jumper JP position (Fig. 63).

- **CASE A (factory set)** heating only + external water tank with thermostat adjustment inapplicable - jumper in position 3
- **CASE B** heating only + external water tank with sensor - to adjust the temperature of the domestic hot water in the water tank, turn the temperature selector clockwise to increase and counterclockwise to decrease - jumper in position 2.


5. WORKING THE BOILER

If a programmable timer or ambient thermostat are mounted, these must be switched on and adjusted to higher than ambient temperature in order to allow the boiler to start.


The boiler remains on standby until the burner ignites as a result of a demand for heat. The green indicator LED (B, Fig. 52), located on the left-hand side of the panel, lights up to indicate the flame is present. The boiler continues to work until the selected temperatures have been reached. It then returns to “stand-by” while displaying delivery temperature.


In the event of a starting or operating fault, the boiler performs a “SAFETY STOP”: the green indicator LED on the control panel goes out, a fault code flashes on the display (Fig. 53) and a red indicator LED (D) lights up in the event of a shutdown. To identify the fault codes and reset the boiler, consult the “Indicator LEDs and faults” section.

6. RESET FUNCTION


To reset the boiler, turned the function selector to  (Fig. 54) then move it to the required position and check that the red indicator LED has gone out.

At this point, the boiler starts automatically if correct operating conditions have been restored; when the burner ignites, the green indicator led lights up and the digital display indicates the instantaneous operating temperature.

NOTICE: Simply turning the selector to  does not reset the boiler.
If the boiler continues not to work, call your local Service Technician.

In normal operating conditions, when the function selector is turned to , the digital display indicates “- -” (Fig. 55) unless the anti-freeze phase (AF - Fig. 56) is in progress or the combustion analysis function is activated (CO - Fig. 58).

7. SWITCHING OFF

For short absences (weekends, brief journeys, etc.) turn the function selector to  OFF/RESET.

As the boiler remains powered with the gas tap open, it is protected by the following systems:

- **Freeze protection:**
Heating
The function starts if the temperature measured by the flow sensor falls below 43°F (6°C). In this mode, a heat demand is generated and the burner ignites at minimum power. This is maintained until the temperature of the water flow reaches 95°F (35°C).

Domestic hot water (with connection to an external water tank with probe)

The function starts if the temperature measured by the water tank probe falls below 40°F (4°C). In this mode, a heat demand is generated and the burner ignites at minimum power. This is maintained until the temperature of the delivery water reaches 95°F (35°C).

NOTICE: During the freeze protection mode, AF flashes on the display (Fig. 56)

- **circulator anti-block:** if the boiler remains inactive, the circulator performs a 30-second operating cycle every 24 hours. If the boiler is planned not to be used for a long period, proceed as follows:
- move the function selector to OFF-RESET
- turn the main system switch to "off"

8. INDICATOR LEDS AND FAULTS

Green indicator LED (Fig. 52)

Off = boiler on stand-by, no flame

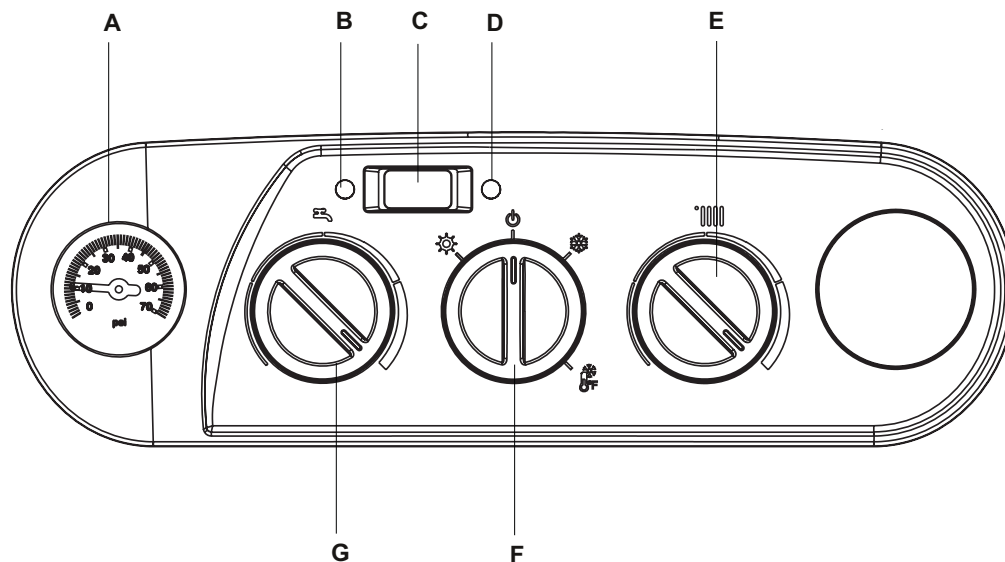
On = burner on, the boiler works regularly.

Red indicator LED (Fig. 53)

Stop: just the fault code flashes on the digital display.

Block: the red indicator LED lights up and the fault code flashes on the digital display.

The fault code is not displayed in the OFF/RESET (⏻) mode. To display it, move the function selector to ⚙️, ❄️ or ❄️_F. During combustion analysis and the freeze protection mode, instead, it is displayed. To reset the boiler, turn the function selector to ⏻ (OFF/RESET) and then move it to be required position (Fig. 47). If the boiler still doesn't work, call in the local Service Technician.



- A Pressure gauge
- B Green led
- C 2-digit LED display
- D Red led
- E Temperature selector space heating
- F Mode selector switch
- G Temperature selector Domestic Hot Water*

* The parts of the manual referring to the DHW circuit should be only considered if a indirect water tank with sensor is installed, case B (Fig. 61)

Fig. 45

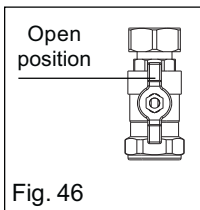


Fig. 46

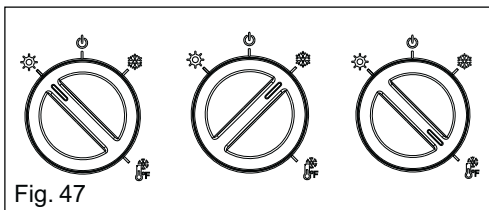


Fig. 47

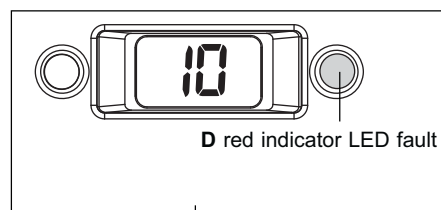


Fig. 53

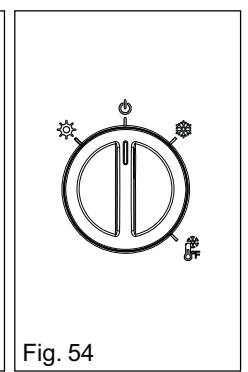


Fig. 54

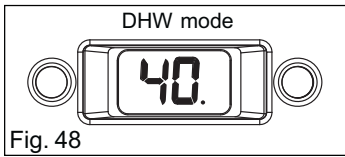


Fig. 48

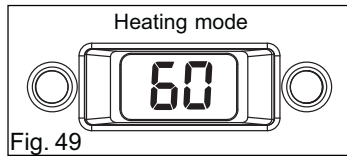


Fig. 49

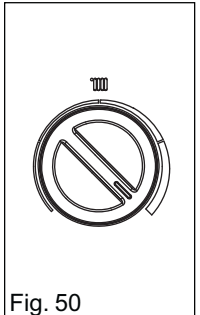


Fig. 50

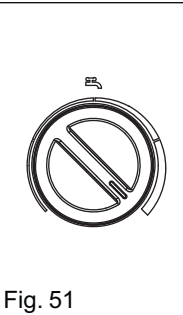


Fig. 51

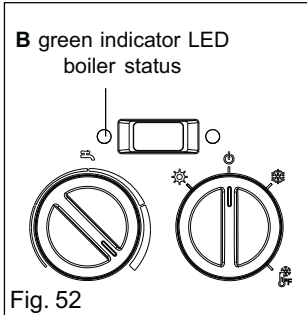


Fig. 52

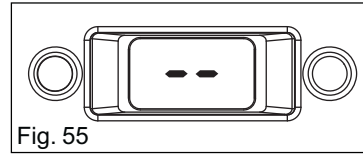


Fig. 55

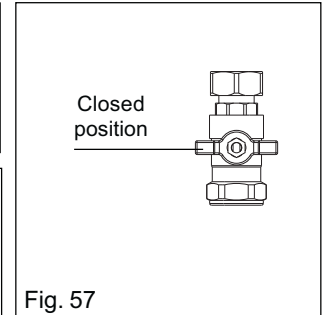


Fig. 57

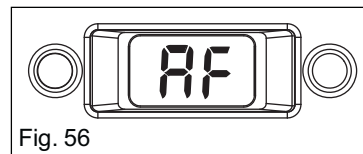



Fig. 56

Code	Description of alarm	Status
AL10	Ignition attempts finished (no flame/condensate present)	Block
AL20	Limit thermostat fault, blocked flue switch, flue thermostat	Block
AL21	Low temperature thermostat/condensate pump safety device fault	Block
AL29	Flue sensor over temperature lock out	Block
AL60	Water tank probe fault	Block
AL71	Delivery probe fault (open/short circuit)	Stop
AL73	Return probe fault (open/short circuit)	Stop
AL28	Return/delivery probe differential fault	Block
AL26	Return over temperature	Block
AL79	Delivery over temperature / return-delivery probe differential fault	Block
AL41	System water pressure low	Stop
AL40	System water pressure low (after 10 minutes)	Block
AL34	Fan tachometer fault	Block
AL52	Generic electronic fault	Block
AL55	No boiler mode configuration fault (corresponding jumper absent)	Block
AL91	The main heat exchanger need to be cleaned – call the Raypak technical service	Advice

For AL41 faults

If the pressure on the water gauge located on the control panel is less than 7 psi (0.5 bar), proceed as follows:

- Turn the function selector to  (Fig. 54)
- Fill the system until the pressure indicated on the water gauge lies between 14-21 psi (1-1.5 bar) (Fig. 45 pos. A)
- Move the function selector to the desired position.

In case of frequent pressure drops, call your local Service Technician.

For alarm AL91

The boiler has an internal self diagnostic system that can advise if it is necessary to clean the main heat exchanger (alarm code AL91) after 2500 hours of working in particular conditions. After the heat exchanger cleaning (using the cleaning kit – Raypak Part No. 013142F) it is necessary to reset the hour meter with the following instructions:

Switch off the electric supply to the boiler

Remove the knob of the main selector

Switch on the boiler while pressing the CO button for at least 4 seconds (Fig. 59). To check if the counter has been reset, switch OFF and ON the boiler main supply, after the lighting of all the segments of the display, the value of the counter will appear.

NOTICE

The reset counter procedure must carry on after every heat exchanger deep cleaning and in any case after heat exchanger replacement.

NOTICE

To check the hours of the counter, switch off the main supply, than switch on. After the lighting of all the elements of the display, a number will appear: multiply for 100 to get the hours (18 = 1800 hours, 01 = 100 hours)

11 - CHECKS, ADJUSTMENTS AND FAULT FINDING

1. CHECKING APPLIANCE OPERATION

When carrying out any repairs or servicing to the appliance, the relevant commissioning procedure must be undertaken to ensure the continued safe operation of the appliance. Particular attention should be made to ensure gas tightness, water tightness, and the electrical integrity of the appliance.

2. APPLIANCE MODES OF OPERATION NOTICE

There must be sufficient system water pressure min 7 psi (0.5 bar) to ensure the water pressure switch is activated. If there is insufficient system pressure the pump and fan will be prevented from operating and the low-pressure fault code will be displayed.

The 2-digit display can show several different modes of operation.

3. SELECTOR SWITCH IN THE OFF/STAND BY POSITION

When the selector switch is in the Off/reset position, the following functions are active.

Active functions:

- Freeze protection system
- Pump anti-seize

4. ON-BOARD FUNCTIONS

- **THERMOREGULATION:** When an outdoor air sensor is connected to the appliance, the electronic circuitry will automatically adjust the flow outlet temperature to suit local weather conditions in order to maintain comfort and efficiency. A specific operating curve that is most suited to the system type and geographical area can also be selected (Fig. 65).
- **CO FUNCTION:** the CO function when activated, will allow the appliance to run at maximum and minimum output while a combustion analysis check is being carried out. While the CO function is active, all other functions are disabled (minimum power operating period, anti-cycle, set-point, etc). Once enabled, the CO function will remain active for a 15-minute period, or until the function is manually deactivated (refit and rotate in any direction the main selector switch).
- **FREEZE PROTECTION:** This function is only active when there are no requests for heating or DHW. If the temperature drops below 43°F (6°C), the boiler will operate on minimum power until the temperature of the primary thermistor reaches 95°F (35°C). Thereafter the pump & fan will post-purge for 30-seconds.
- **ANTI-CYCLE FUNCTION:** The anti-cycle function ensures the burner remains switched off for at least 3-minutes after the set-point hysteresis (set-point + 9°F (5°C)).
- **PUMP ANTI-SEIZE FUNCTION:** When there has been no heating or DHW request for 24-hours, the anti-seize cycle is activated. The pump will be activated for a period of 30-seconds.
- **ACTUATOR ANTI-SEIZE FUNCTION:** When there has been no heating or DHW request for 24-hours, the anti-seize cycle is activated. The divertor valve actuator (3-way valve) will cycle briefly to the heating position, and then back to the DHW position.

5. HEATING MODE

With the selector switch in the ON position (☀ - ❄ - 🔌) and any additional controls (time clock, programmer, room thermostat, etc.) calling for heat, the appliance will operate in the heating mode. The pump and fan will be activated via the flow temperature sensor. When the fan is sensed to be operating correctly (blower signal), the ignition sequence commences. Ignition is sensed by the electronic circuitry to ensure flame stability at the burner. Once successful ignition has been achieved, the electronic circuitry increases the gas rate to 75% of the MAX Heating (set by the corresponding HTG trimmer) for a period of 15 minutes. The speed of the fan and therefore the output of the boiler is determined by the temperature of the water sensed by the flow temperature sensor, consequently a high temperature at the flow sensor results in a lower fan speed. As the water temperature increases, the temperature sensors – located on the flow pipe of the boiler – reduce the fan speed via the electronic circuitry. Depending on the load, either the water temperature will continue to rise until the set point is achieved or the water temperature will fall whereby fan speed will increase relative to the output required. When the boiler has reached the set point (+ hysteresis), the burner will switch off. The built-in anti-cycle device prevents the burner from re-lighting for approximately 3-minutes. When the temperature of the flow sensor falls below the set point (- hysteresis), the burner will re-light.

NOTICE: If the spark/sensing electrode does not sense ignition the appliance will re-attempt ignition a further 4-times then go to lockout. When the set-point has been reached (the position of the heating temperature selector) as measured at the primary thermistor, the appliance will begin the modulation phase whereby the fan and gas valve will continuously modulate to maintain the set-point. If the temperature continues to rise and exceeds the set-point by 9°F (5°C) (hysteresis), the burner will shut down. A new ignition sequence will be enabled when the 3- minute anti-cycle has been performed and the temperature at the primary thermistor has dropped 9°F (5°C) (hysteresis) below the set-point.

NOTICE: When the request for heating and/or hot water has been satisfied, the appliance pump and fan may continue to circulate to dissipate any residual heat within the appliance.

6. DHW MODE

With the selector switch in either the hot water only or heating & hot water position, the appliance will operate in the hot water mode whenever a tank sensor/thermostat is in request. If there is a request the pump and fan will be activated via the flow temperature sensor. When the fan is sensed to be operating correctly (blower signal), the ignition sequence commences. Ignition is sensed by the electronic circuitry to ensure flame stability at the burner. Once successful ignition has been achieved, the electronic circuit allows the gas rate to achieve the modulation value.

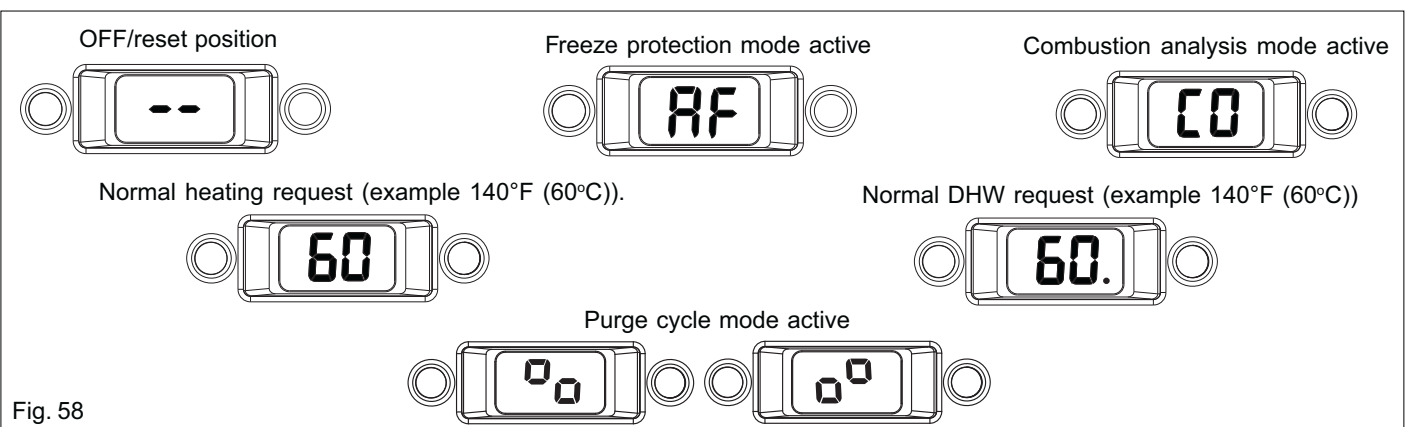


Fig. 58

NOTICE: When the request for heating and/or hot water has been satisfied, the boiler pump and fan may continue to circulate to dissipate any residual heat within the boiler.

7. BOILER FAN SPEEDS

The boiler fan speeds require to be checked and/or adjusted prior to making any adjustments to the gas valve or if the main PCB has been replaced.

ATTENTION

Gas type and appliance fan speed (output) **must be set** according to the specific appliance specification. Raypak accepts no responsibility if the gas type and/or fan speed is not correctly adjusted according to the respective appliance specification as detailed on the appliance data badge.

CHECKING/ADJUSTING THE BOILER FAN SPEEDS

Move the selector switch to the OFF position and remove the 3-selector knobs.

ABSOLUTE MAX FAN SPEED

Locate the MAX trim pot (Fig. 59) and gently adjust clockwise or counterclockwise to achieve the correct fan speed (see Table 10 below).

NOTICE: The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

ABSOLUTE MIN FAN SPEED

Locate the MIN trim pot (Fig. 59) and gently adjust clockwise or counterclockwise to achieve the correct fan speed (see Table 10 below).

NOTICE: The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

IGNITION FAN SPEED

NOTICE: Do this operation only after the adjusting of absolute max and min fan speed.

Locate the IGN trim pot (Fig. 59) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see Table 10 below).

NOTICE: The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

HEATING FAN SPEED

Locate the HTG trim pot (Fig. 59) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see Table 10 below).

NOTICE: The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

FAN SPEED TABLE

Use the following table to set the corresponding fan speeds that are relative to the boiler you are working on.

FAN SPEED (rpm) TABLE Tab. 10

MODEL	MAX	MIN	HTG	IGN
85	5,800	2,000	5,800	3,700
120	5,600	1,500	5,600	3,700

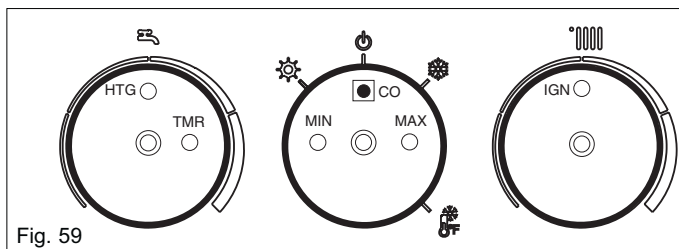


Fig. 59

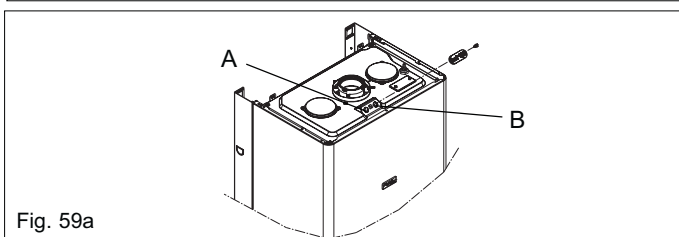


Fig. 59a

8. CHECKING THE CO2 AND ADJUSTING THE GAS VALVE

THE GAS VALVE MUST BE SET-UP OR ADJUSTED WITH THE AID OF A PROPERLY CALIBRATED FLUE GAS ANALYZER.

Isolate the boiler from the electrical supply and remove the casing as described in Fig. 33. Set the flue gas analyzer to read CO2 and insert the probe into the flue analysis test point (Pos. B in Fig. 59a). Restore the electrical supply to the boiler and switch the boiler to the OFF mode. To adjust the gas valve you must first ensure that the fan speed potentiometers (trim pot) have been set correctly (Tab. 10).

Remove the 3-selector knobs, locate and press the CO button (Fig. 59). The appliance will now operate in CO mode for approximately 15-minutes.

9. GAS VALVE MAXIMUM PRESSURE SETTING (Fig. 61)

Locate and gently turn the HTG trim pot until the maximum value (max fan speed) is obtained and check that it corresponds with the appropriate CO2 value (Maximum) for the respective boiler (see the data table for values). If the CO2 reading is correct, proceed to gas valve minimum setting. However, if the CO2 reading is incorrect, the maximum gas pressure must be adjusted as follows:

- Using a suitable screwdriver, very slowly turn the maximum pressure adjustment screw (Fig. 60) – clockwise to decrease, counter clockwise to increase – until the correct value is displayed on the CO2 analyzer (allow time for the analyzer to stabilize).

10. GAS VALVE MINIMUM PRESSURE SETTING

Locate and gently turn the HTG trim pot until the minimum value (min fan speed) is obtained and check that it corresponds with the appropriate CO2 value (Minimum) for the respective appliance. If the CO2 reading is correct, rotate the HTG trim pot until the correct value is obtained for the respective appliance (see fan speed Tab. 10). However, if the CO2 reading is incorrect, the minimum gas pressure must be adjusted as follows:

- Remove the sealing screw
- Using a suitable screwdriver, very slowly turn the minimum pressure adjustment screw (Fig. 60) – clockwise to increase, counter clockwise to decrease - until the correct value is displayed on the CO2 analyzer (allow time for the analyzer to stabilize).

COMPLETION

On completion of the combustion analysis check and/or any gas valve adjustment, set the HTG trim pot to the corresponding value as detailed in the fan speed table. Reattach the 3-selector knobs. Remove the test probe from the test point and reattach the sealing screws and/or cap.

DANGER: A GAS TIGHTNESS CHECK MUST BE CARRIED OUT IF ANY GAS CARRYING COMPONENTS HAVE BEEN REMOVED, REPLACED, OR DISTURBED.

11. COMBUSTION ANALYSIS TEST

A combustion analysis check can easily be carried out on the boiler via the test points located on the top of the appliance.

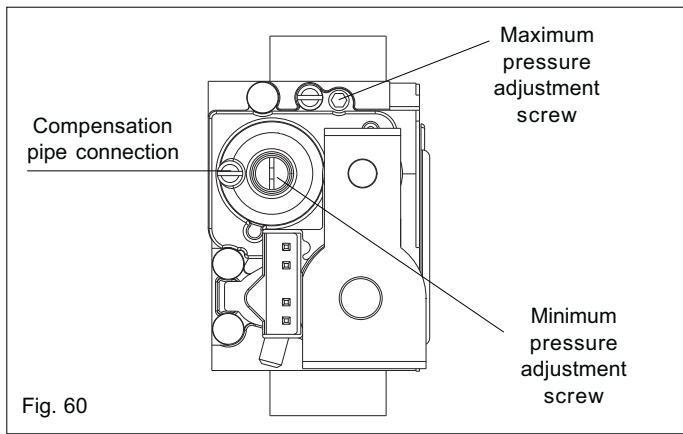
- Insert the flue gas analyzer probe into the flue gas test point (Pos. B in Fig. 59a).
- Operate the boiler in CO mode and compare the values with those shown in Tab. 1 (Nat. Gas) or Section 13 (LPG). If different adjust the gas valve accordingly.

12. EXTERNAL FAULTS

Before carrying out any troubleshooting or component replacement, ensure the fault is not attributable to any aspect of the installation.

INSTALLATION FAULTS

Symptom	Possible cause
No display/ignition	Check wiring/check electrical supply
No hot water	Check external controls
No heating	Check external controls
Fault code	Possible cause
10	Check gas supply, check flue system, check polarity, check condensate



NOTE: The gas valve sticker "WARNING: VALVE IS NOT FIELD SERVICEABLE" means the valve can be adjusted but not disassembled.

13. ELECTRICAL CHECKS

Any electrical checks must be carried out by a Service Technician Qualified.

GROUND CONTINUITY TEST

Isolate the boiler from the electrical supply, and using a suitable multi-meter carry out a resistance test. Connect test leads between an appliance ground point and the ground wire of the appliance supply cable. The resistance should be less than 1 OHM. If the resistance is greater than 1 OHM check all ground wires and connectors for continuity and integrity.

SHORT CIRCUIT CHECK

Isolate the boiler from the electrical supply, and using a suitable multi-meter, carry out a short circuit test between the Live & Neutral connections at the appliance terminal strip (Fig. 35). Repeat above test on the Live & Ground connections at the appliance terminal strip.

NOTE: Should it be found that the fuse has failed but no fault is indicated, a detailed continuity check will be required to trace the fault. A visual inspection of components may also assist in locating the fault.

POLARITY CHECK

With the boiler connected to the electrical supply and using a suitable multimeter, carry out the following voltage tests:

- Connect test leads between the Live & Neutral connections at the boiler terminal strip (Fig. 35). The meter should read approximately 120VAC. If so proceed to next stage.
- Connect test leads between the Live & Ground connections at the boiler terminal strip (Fig. 35). The meter should read approximately 120VAC. If so proceed to next stage.
- Connect test leads between the Neutral & Ground connections at the boiler terminal strip (Fig. 35). The meter should read less than 1 VAC. If so polarity is correct.

REVERSED POLARITY OR SUPPLY FAULT

Repeat the above tests at the appliance isolator, if testing reveals correct polarity and/or supply at the isolator, re-check wiring and connections between the isolator and the boiler. If tests on the isolator also reveal reversed polarity or a supply fault, consult the local electricity supplier for advice.

RESISTANCE TO GROUND CHECK

Isolate the boiler from the electrical supply, and using a suitable multi-meter carry out a resistance test. Connect test leads between the Live & Ground connections at the appliance terminal strip (Fig. 35). If the meter reads other than infinity there is a fault that must be isolated, carry out a detailed continuity check to identify the location of the fault.

These series of checks must be carried out before attempting any troubleshooting procedures on the appliance. On completion of any task that required the disconnection and re-connection of any electrical wiring or component, these checks must be repeated.

FAULT FINDING

Before attempting any faultfinding, the electrical checks must be carried out. Isolate the appliance from the electrical supply. Disconnect any external controls from terminal plug (Fig. 35), and insert a jumper between the two wires at the room thermostat connections (Fig. 35 ref. M4a).

NOTICE: Restore the electrical supply to the boiler and turn the main selector switch to the heating request position . The boiler should now function. Should the boiler fail to respond, the internal fuses and connectors should be checked to ensure integrity and continuity.

14. COMPONENT VALUES & CHARACTERISTICS

COMPONENT	VALUE
Fan	120VAC
Pump	120VAC
3-way valve (field supplied)	120VAC
Ignition transformer	120VAC
Gas valve	120VAC
Room thermostat connection	24 Vdc
NTC sensor (dry contact)	10Kohm
NTC sensor (wet contact)	10Kohm
FUNCTION	VALUE
Standard Heating Range °F (°C)	104-176 (40-80)
Floor Heating Range °F (°C)	68-113 (20-45)
CH limited power at 75%	15 Min
Heating OFF hysteresis °F (°C)	SP+8 (+5)
Heating ON hysteresis °F (°C)	SP-8 (-5)
Anti-cycle delay	3-min
Pump over-run	30-sec
Low output (min. output + %)	Min+25
CO function max temp. °F (°C)	203 (95)
CO re-light temp. °F (°C)	167 (75)
CO function time	15-min
Flow NTC max temp. °F (°C)	203 (95)
High limit thermostat °F (°C)	221 (105)
Maximum differential °F (°C)	95 (35)
IGNITION CONTROL	VALUE
Ignition attempts before L/O (lockout).	5
Re-ignition attempts after loss of flame signal	5

15. BOILER CONFIGURATION

The electronic board contains a series of jumpers that can be used to configure the boiler; access these by loosening the fasteners B and removing the control panel cover A after turning off the main switch (Fig. 62). Locate the JP positioning (Fig. 63).

JUMPER IN POSITION 1 (Fig. 61):

The position nr. 1 of the jumper indicates the boiler heating temperature; pre-selection of the most suitable heating temperature adjustment field according to the type of system.

Jumper not inserted (factory set) - case 1

Standard system (radiators) 104-176°F (40-80°C)

Jumper inserted - case 2

Floor system (radiant heating) 68-113°F (20-45°C).

NOTICE: The boiler has been factory-configured for standard systems.

JUMPER IN POSITION 2:

Jumper inserted:

heating + indirect water tank with sensor

JUMPER IN POSITION 3:

Jumper inserted:

heating + indirect water tank with thermostat - factory set

JUMPER IN POSITION 4:

unused

JUMPER IN POSITION 5:
unused

JUMPER IN POSITION 6:
unused

The boiler is supplied standard with the jumper in position 3 (standard heating + indirect water tank with thermostat); if you wish to use an external water tank with sensor, move this jumper from position 3 to position 2 (case B, Fig 61); if you wish to have low temperature for floor space heating move the not inserted jumper in position 1 (Fig 61).

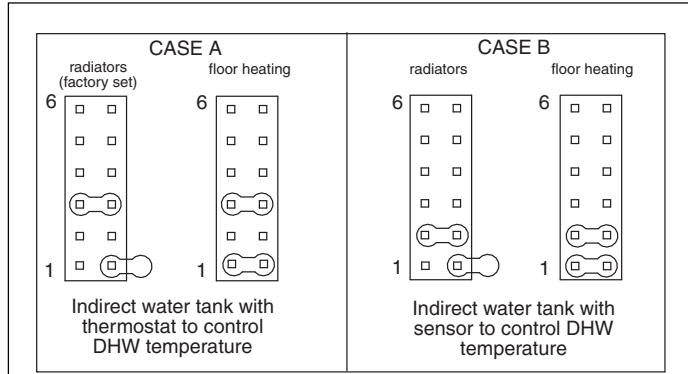


Fig. 61

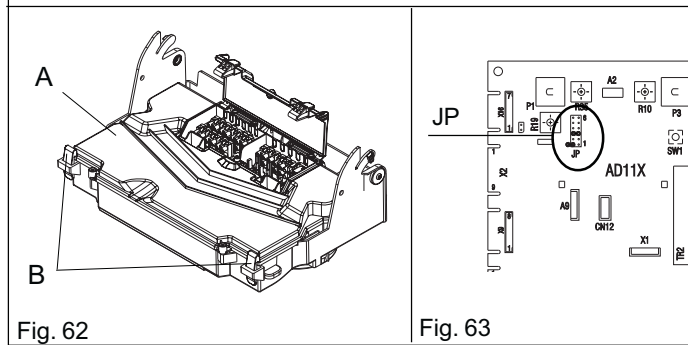


Fig. 62

Fig. 63

16. SETTING THE OUTDOOR RESET CURVE WITH OUTDOOR SENSOR

Outdoor temperature reset only works with the outdoor air sensor connected, therefore, after installation, connect the outdoor air sensor to the relative connections on the boiler terminal board (Fig. 35).

This enables the outdoor temperature reset function. The user can program the desired supply temperature based on the heat transmitter that will be used in the installation. Once the outdoor sensor is connected to the control board, the water temperature of the boiler will adjust to run the boiler more efficiently and provide greater comfort to the living space.

NOTICE: The DHW temperature is independent from the outdoor air sensor.

Selecting the offset heating curve (Fig. 65)

The offset heating curve maintains a theoretical ambient temperature of 68°F (20°C) at outdoor temperatures ranging from 68°F to -4°F (+20°C to -20°C). The choice of the curve depends on the rated minimum outdoor temperature (of the geographical area) and the rated delivery temperature (on the type of system) and must be carefully calculated by the installer using the following formula using the correct values in °F or °C:

$$TMR = \frac{\text{Nominal flow Temp.} - T_{\text{shift}}}{68^{\circ}\text{F} (20^{\circ}\text{C}) - \text{min. external design Temp.}}$$

Tshift =86°F (30°C) standard systems (radiators)
77°F (25°C) underfloor systems
If the calculation generates an intermediate value between two curves, choose the nearest offset heating curve to that value. E.g.: if the value obtained by the calculation is 1.3, it lies between curve 1 and curve 1.5. In this case, select the nearest curve, i.e.: 1.5.

Select KT by turning the trimmer located under the domestic hot water temperature knob (A).
The settable values of KT are:
- standard system: 1,0-1,5-2,0-2,5-3,0
- floor system: 0,2-0,4-0,6-0,8

TYPE OF HEAT REQUEST

STANDARD

If a room thermostat is connected to the boiler: room thermostat

The room thermostat makes a heat request when its contact closes, while it stops it when its contact opens. Though delivery temperature is automatically calculated by the boiler, the user may manually override it. By modifying HEATING on the user interface (C), the HEATING SET POINT will no longer be available but just a value that can be set from +5 to -5 as required. Please note that the number displayed is a comfort level: +5 means feel hotter, -5 means feel colder. Modifications to this value do not directly change flow temperature but affect the calculation made to automatically determine its value by modifying the reference temperature of the system (0 = 68°F (20°C)).

PROGRAMMABLE TIMER (DAY+NIGHT)

If a programmable timer (day+night selector) is connected to the boiler, set parameter 51 = 1 (this parameter can only be modified from the remote control unit) (Fig. 67) available only from Raypak technical service.

When the contact is closed, the heat request is made by the delivery probe on the basis of the external temperature in order to maintain the rated ambient temperature at the DAY level 68°F (20 °C). When the contact opens, it does not stop the heat request but reduces (parallel shift) the temperature curve to the NIGHT level 61°F (16 °C).

This activates the night mode. Though flow temperature is automatically calculated by the boiler, the user may manually override it. By modifying HEATING on the user interface (C, Fig. 13.2), the HEATING SET POINT will no longer be available but just a value that can be set from +5 to -5 as required. Please note that the number displayed is a comfort level: +5 means feel hotter, -5 means feel colder. Modifications to this value do not directly change flow temperature but affect the calculation made to automatically determine its value by modifying the reference temperature of the system (0 = 68°F (20°C) for DAY level; 61°F (16°C) for NIGHT level).

If a remote control (Raypak REC 08) is installed refer to instructions for setting the outdoor sensor using.

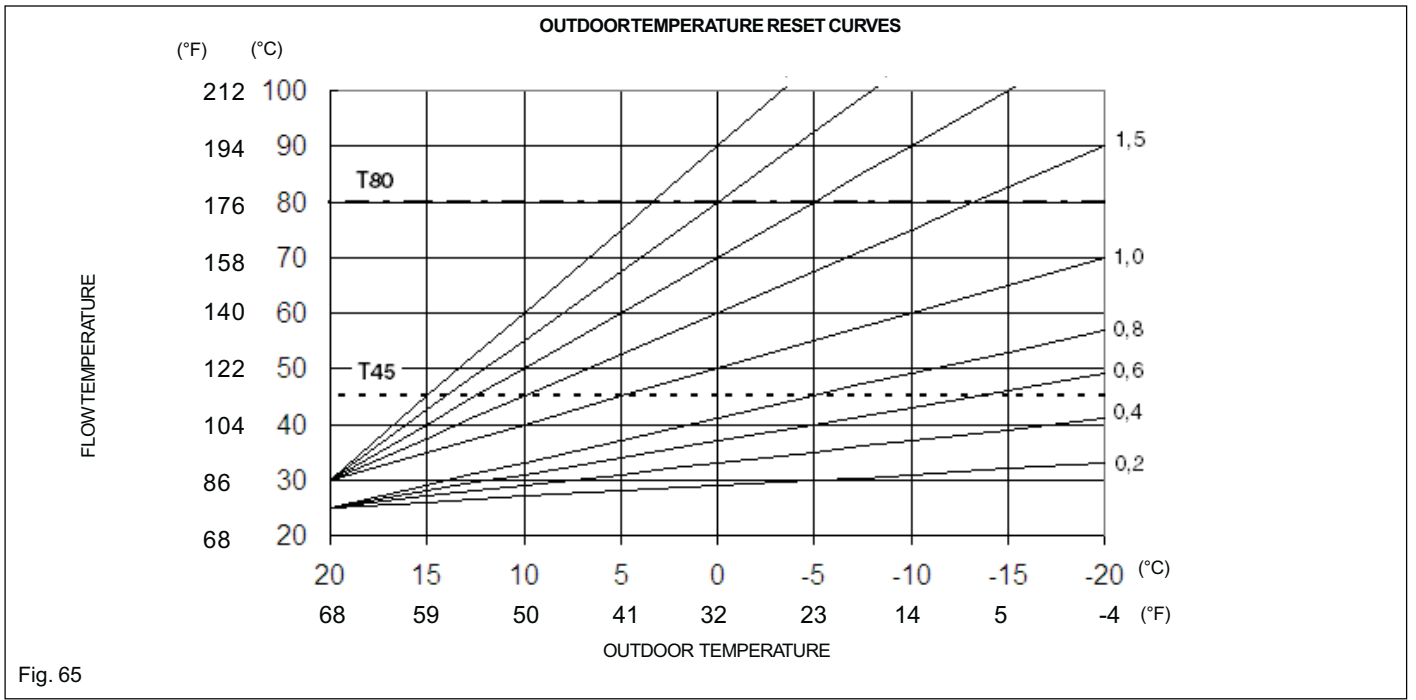


Fig. 65

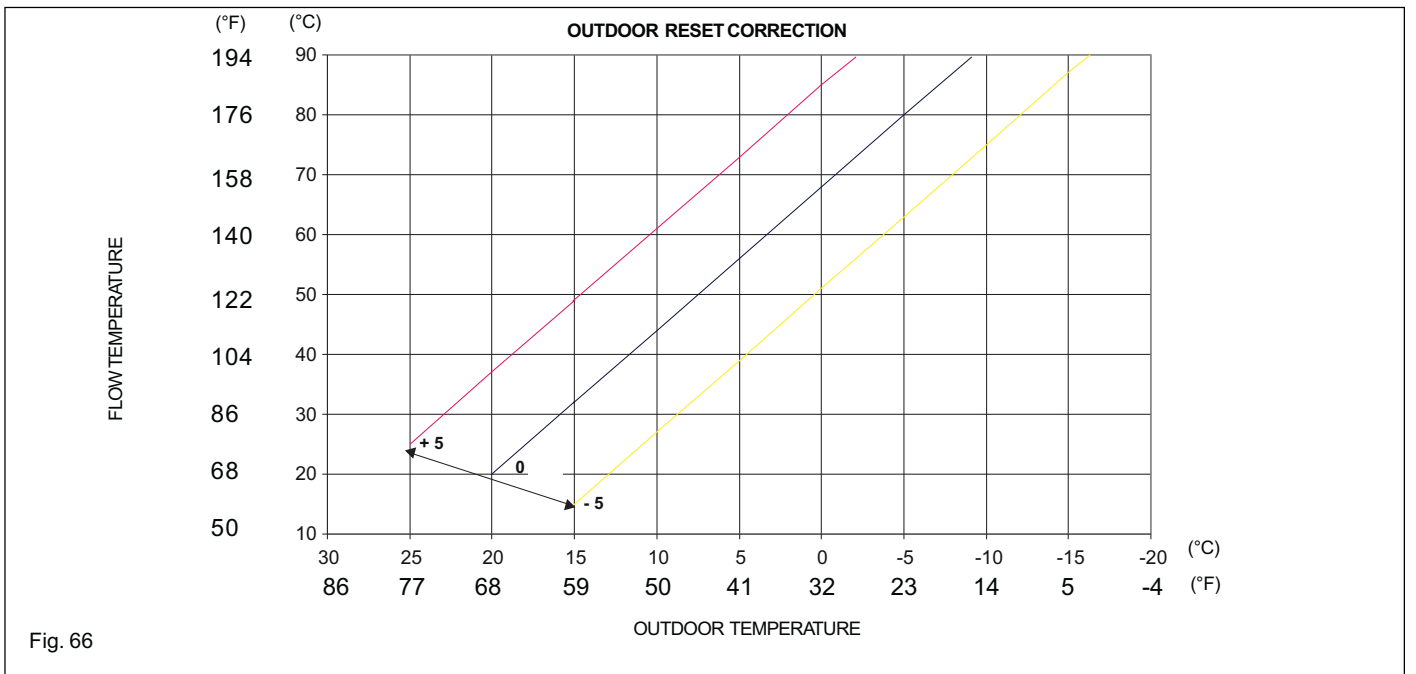


Fig. 66

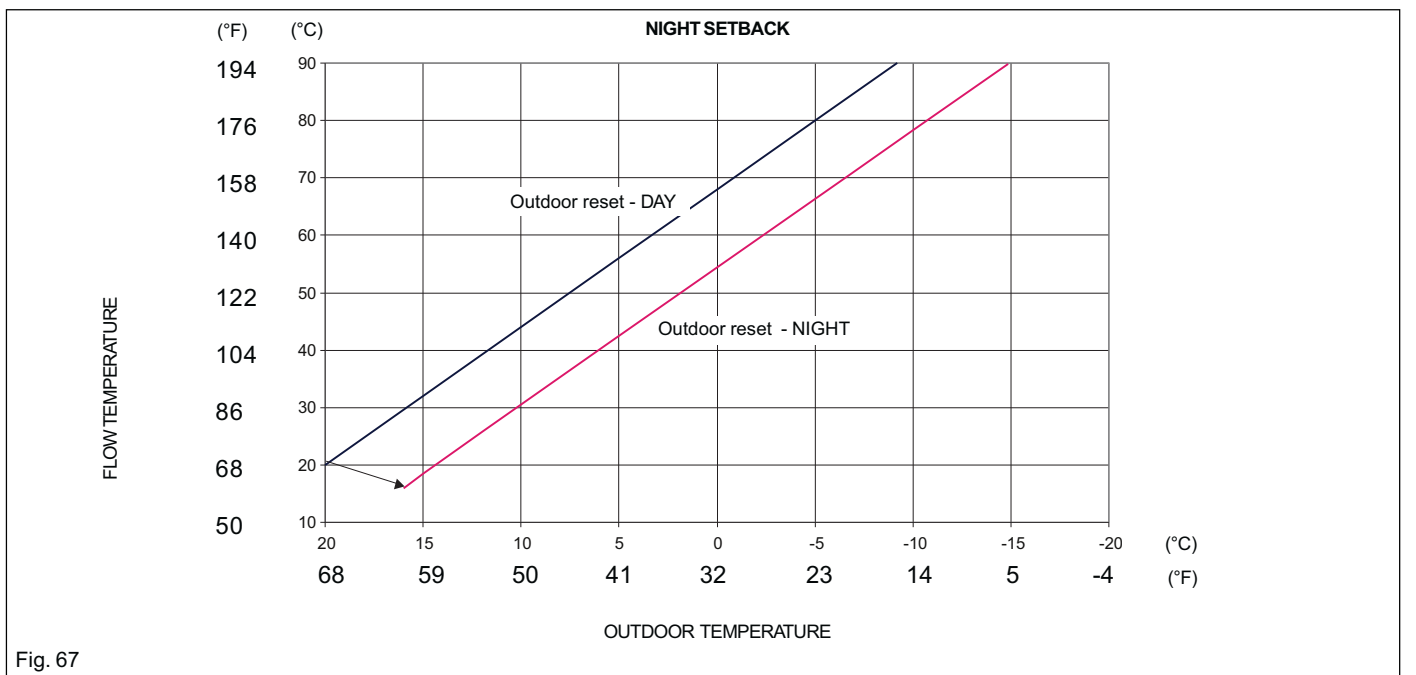


Fig. 67

17. FAULT CODES

When the boiler detects a temporary fault condition, the appropriate code is shown flashing on the display. If/when the fault code is final, the pump will perform a 60-second post circulation and the red LED will be illuminated.

CODE	CAUSE	ALARM TYPE	ACTION
AL10	Ignition failure/not flame sensed, condense sensor activated	Final	Reset, check appliance operation
AL20	Limit thermostat fault, blocked flue switch, flue thermostat	Final	Reset, check appliance operation
AL21	External device fault (UHT/CPA)	Final	Reset, check appliance
AL26	Return temperature too high	Final	Reset, check pump, ensure there is sufficient flow sensor temperature). Circulation around heating circuit/s
AL28	Temperature differential inverted (return sensor temperature higher than flowsensor temperature)	Final	Reset, check pump, ensure there is sufficient circulation around heating circuit/s thermistors
AL29	Flue sensor over temperature lock out	Final	Reset check appliance operation
AL34	Fan blower signal fault	Final	Reset check appliance operation, check fan
AL40	Insufficient system water pressure	Final appliance operation	Check/refill system pressure, reset, check
AL41	Insufficient system water pressure	Temporary	Check/refill system pressure, check appliance operation
AL52	Internal fault	Final	Reset, check boiler operation
AL55	Jumper tag fault	Final	Check jumper tag configuration
AL60	Jumper tag fault	Temporary	Check jumper tag configuration
AL71	Primary (flow) sensor fault	Temporary	Check primary thermistor, check wiring
AL73	Return sensor fault	Temporary	Check return thermistor, check /wiring
AL74	Variation on temperature of primary	Final	Reset, check boiler operation, check and/or return too high pump, ensure there is sufficient circulation around heating circuit/s
AL79	Flow temperature too high, or temperature differential between primary and return too high	Final	Reset, check appliance operation, check thermistors
AL91	The main heat exchanger need to be cleaned	Advice	Call the Raypak technical service

12 - SERVICING INSTRUCTIONS

1. GENERAL

To ensure the continued safe and efficient operation of the boiler, it is recommended that it is checked and serviced at regular intervals. It is essential that any worn or failed component be replaced only with a **genuine XPak spare parts**. It should be remembered that although certain generic components may look similar, they will be specific to an individual appliance or product range. Use of non-genuine XPak spare parts could invalidate your warranty and may pose a potential safety hazard. The frequency of servicing will depend upon the particular installation conditions, but in general, once per year should be sufficient. It is the law that any servicing work is carried out by competent person such as a Raypak Technician, an approved service agent, or other suitably qualified personnel. The following instructions apply to the appliance and its controls, but it should be remembered that the central heating and the domestic hot water systems would also require attention from time to time.

2. ROUTINE ANNUAL SERVICING

- Check the operation of the boiler and ensure it functions as described in Section "11. Checks, adjustments and fault finding".
- Thoroughly inspect the boiler for signs of damage or deterioration especially the flue system and the electrical apparatus.
- Check and adjust – if necessary – the system design pressure (see pg. 63 ref. 10).
- Carry out an analysis of the flue gases (pg. 73), and visually check the condition of the entire flue assembly.
- Check that the burner and main heat exchanger are clean and free from any debris or obstruction.
- Check and clean – if necessary – the condensate trap to ensure correct operation.
- Compare the performance of the appliance with its design specification. The cause of any noticeable deterioration should be identified and fixed without delay.
- The combustion blower motor does not require lubrication for proper operation. DO NOT attempt to oil the motor or damage may occur.

3. REPLACEMENT OF COMPONENTS

Although it is anticipated that this appliance will give years of reliable, trouble free service, the life span of components will be determined by factors such as operating conditions and usage. Should the appliance develop a fault, the troubleshooting section will assist in determining which component is malfunctioning.

4. COMPONENT REMOVAL PROCEDURE

To remove a component, access to the interior of the boiler is essential. Isolate the appliance from the electrical supply. And when necessary, close all service valves on the boiler, remove the casing and drain the water content from the boiler via the drain valve. Ensure some water absorbent cloths are available to catch any residual water that may drip from the boiler or removed component. Undertake a complete commissioning check, after replacing any component.

ALWAYS TEST FOR GAS TIGHTNESS IF ANY GAS CARRYING COMPONENTS HAVE BEEN REMOVED OR DISTURBED.

AIR BOX FRONT COVER REMOVAL (Fig. 68)

Locate the two clips and remove air box front cover. If it's necessary to remove the air box side cover, locate and remove the 4 securing screws.

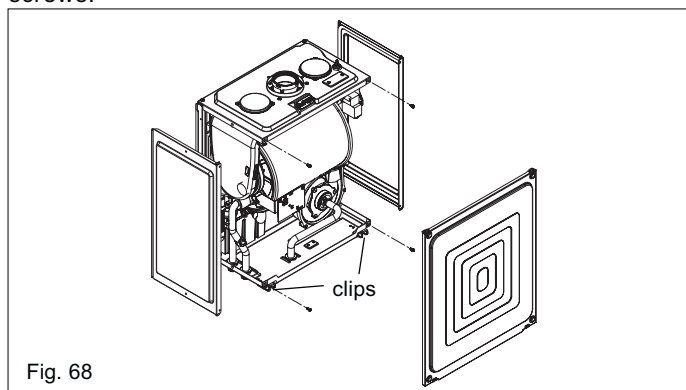


Fig. 68

PUMP ASSEMBLY (Fig. 69)

Locate and remove the 2 securing screws (A) at the rear of the pump assembly. Disconnect the flow pipe (B, only for XPak 120) from the combustion chamber connection, slacken the pipe at the hydraulic assembly and swing/rotate clear of the pump assembly. Disconnect and remove the pump outlet pipe (C) from the pump assembly/combustion chamber connection. Locate and remove the pressure gauge securing pin (D) and disconnect the pressure gauge from the pump assembly.

Disconnect the electrical wiring from the pump's electrical connection point (E). Remove locking pin (F) from pump base and lift pump assembly clear of the hydraulic manifold. The pump assembly can now be removed from the appliance. Replace carefully in the reverse order.

PRESSURE RELIEF VALVE (Fig. 69)

Disconnect the outlet pipe (L) and the flow pipe (M) from the safety valve, remove pressure release valve. Replace in the reverse order.

LOWER AUTOMATIC AIR RELEASE VALVE (Fig. 69)

Locate and remove the AAV locking pin (G) from the pump assembly and remove the AAV assembly (H). Replace in the reverse order.

TOP AUTOMATIC AIR RELEASE VALVE (Fig. 70)

Remove the drain pipe (A). Unscrew the top AAV (B). Replace in the reverse order. Loctite or similar should be used as a thread sealant for the AAV.

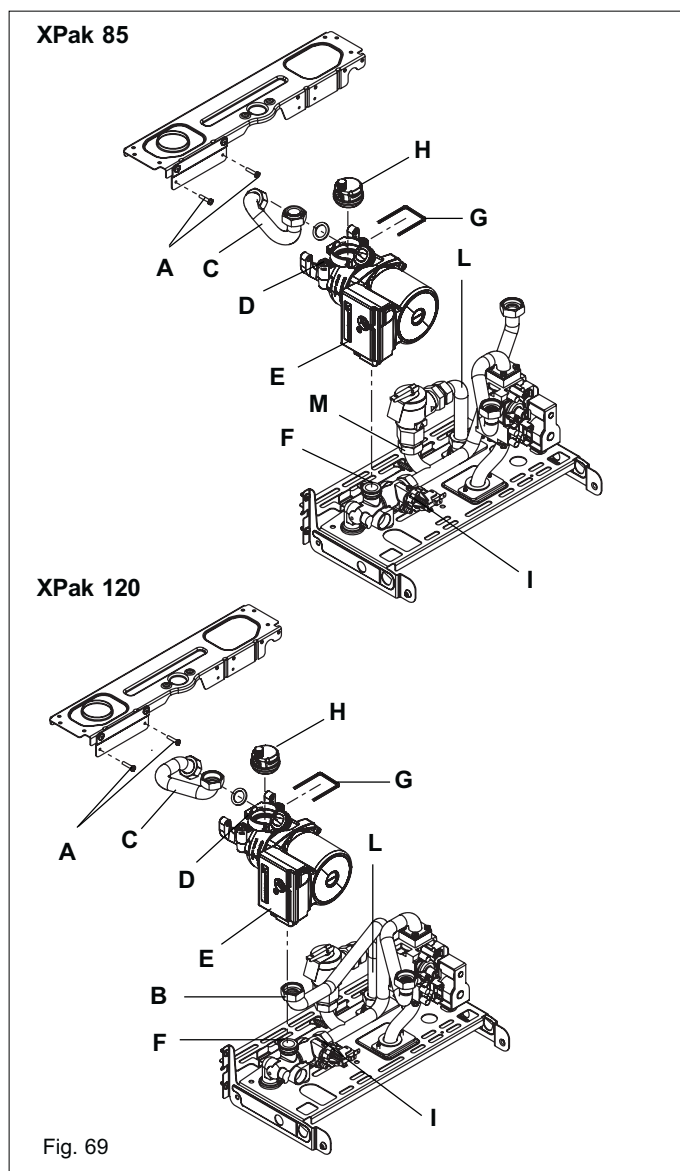


Fig. 69

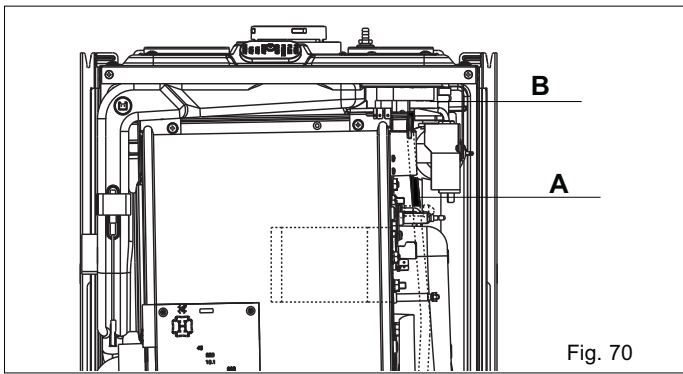


Fig. 70

WATER PRESSURE SWITCH (Fig. 69)

Locate and remove the screw (I) from the water pressure switch. Remove the wiring. Carefully remove the switch. Replace in the reverse order.

FLOW SENSOR (PRIMARY THERMISTOR) (Fig. 1)

Unclip and remove the air chamber front cover. Unclip the primary thermistor from the flow outlet pipe. Disconnect thermistor electrical plug. Replace in the reverse order.

RETURN SENSOR (RETURN THERMISTOR) (Fig. 1)

Unclip and remove the air chamber front cover. Unclip the return sensor from the return inlet pipe. Disconnect sensor electrical plug. Replace in the reverse order.

PRINTED CIRCUIT BOARD (Fig. 71)

Pull the control slightly forward and lower it. Push the clips (A) and remove cover, after carefully taking note of all wiring connections and jumper tag configurations; unhook and remove connection block (B). Disconnect all wiring from the PCB, locate and remove the PCB securing screws, remove the required PCB. Replace in the reverse order ensuring that the position of the 3 control knobs are correctly aligned with the respective potentiometers on the PCB.

Ensure that the correct jumper configuration has been made. It will be necessary to check the functioning of the PCB is set for the correct boiler type/application.

GAS VALVE (Fig. 72)

The gas valve must be changed as complete unit. Disconnect the electrical plug and leads from the gas valve, slacken and unscrew upper gas valve pipe, please note that the gas injector is located in this upper part. Disconnect the compensation pipe (C). Locate and remove the two retaining screws (D); locate and remove the four gas valve retaining screws (E). Replace in the reverse order. Check and adjust burner pressure settings.

WARNING, A GAS TIGHTNESS CHECK MUST BE CARRIED OUT.

NOTICE: The gas valve sticker "WARNING: VALVE IS NOT FIELD SERVICEABLE" means the valve can be adjusted but not disassembled.

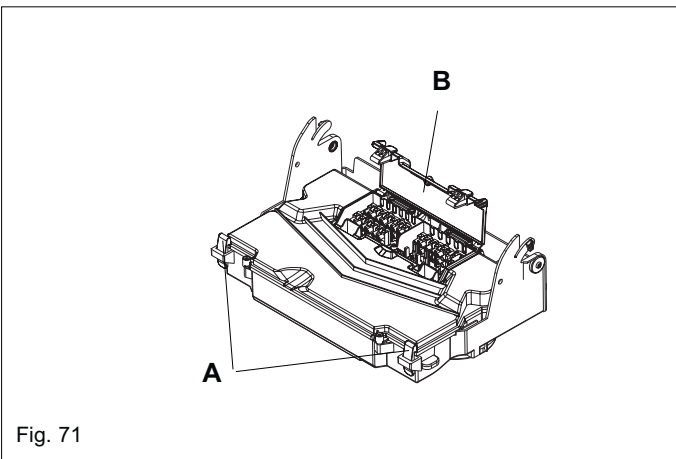


Fig. 71

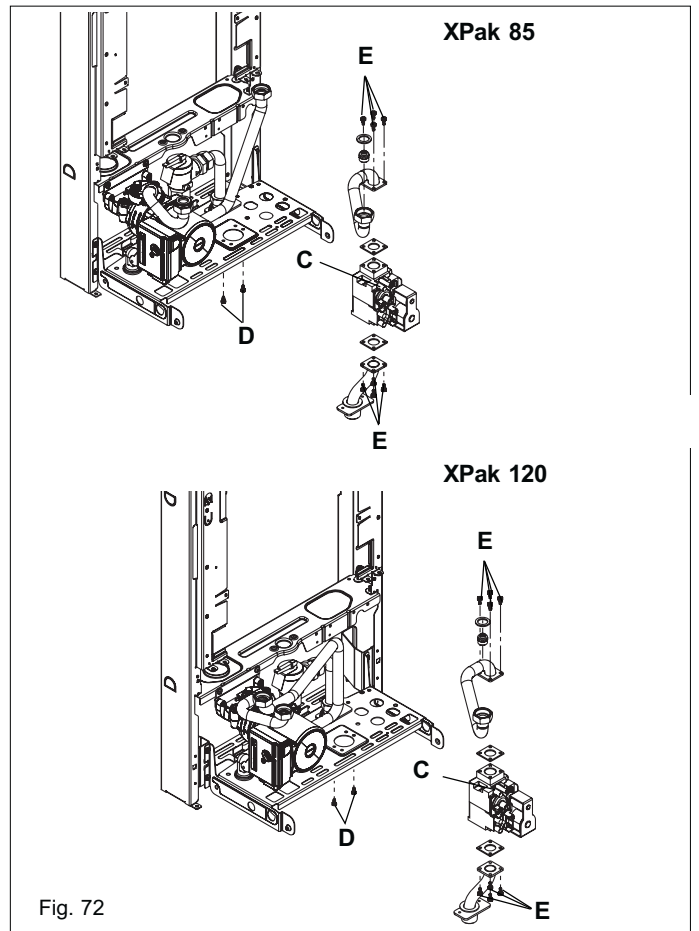


Fig. 72

INJECTOR (Fig. 72)

Slacken and unscrew upper gas valve pipe; locate and remove only two screws (D). Locate and remove the injector (F) inside the pipe. Replace in the reverse order. Check and adjust burner pressure settings.

WARNING, A GAS TIGHTNESS CHECK MUST BE CARRIED OUT.

ELECTRODES & CONDENSATE SENSOR (Fig. 73)

Unclip and remove the air chamber front and right hand side covers. Disconnect the electrode leads and ancillary wiring from their respective connectors. Remove the retaining screws (A) for spark and sensing electrodes and remove. Remove the retaining nut (C) for condensate sensor (D) and remove.

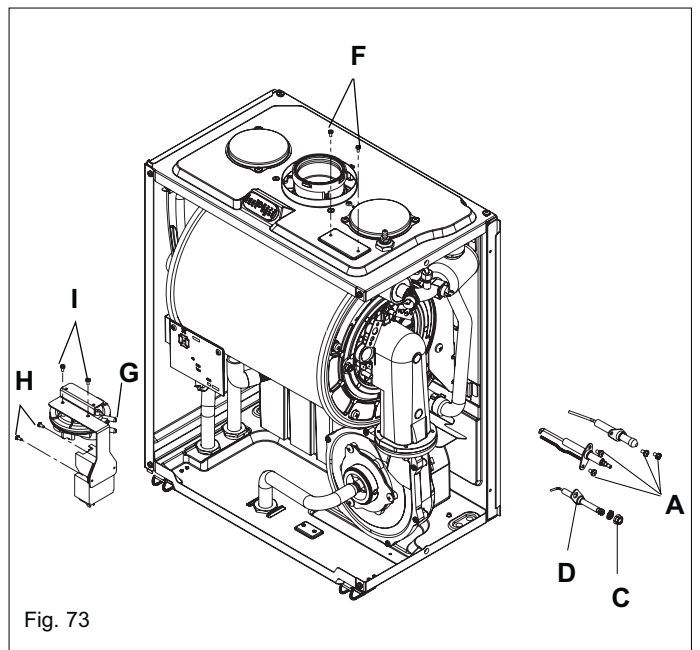


Fig. 73

FLUE FAN & MIXER (Fig. 74)

Unclip and remove the air chamber front and the right hand side covers. Slacken the gas pipe (A) at the air box connection and swing/rotate away from the fan assembly. To remove the mixer (B) locate and remove the three screws (C). To remove the fan (D), disconnect the electrical connections attached to the fan, locate and remove the four screws (E). Gently ease the fan from its location.

Replace in the reverse order. Ensure all seals are in good condition, taking care to ensure they are replaced correctly.

BURNER (Fig. 75)

Unclip and remove the air chamber front and the right hand side covers. Slacken the gas pipe (A) at the air box connection and swing/rotate of the fan assembly. Locate and remove the 3 internal nuts (B) which secure the fan assembly in position (C) to the heat exchanger (D). Disconnect the electrode leads and ancillary wiring from their respective connectors. Remove the retaining screws (A fig. 73) for sensing electrode and remove. Remove the retaining nut (C fig. 73) for condensation sensor (D fig. 73) and remove. Gently ease the fan assembly out of its location. Once the assembly has been removed, the burner (E) can be withdrawn from the heat engine. Ensure the seal (F) is in good condition, taking care to ensure it is replaced correctly. Replace in the reverse order.

BLOCKED FLUE PRESSURE SWITCH/IGNITION TRANSFORMER (Fig. 73)

Disconnect the compensation pipe (G).

Disconnect the electric wiring from the pressure switch/ignition transformer.

Remove the two screw (F) on the upper part of the combustion chamber.

Remove the screw (I).

Remove the pressure switch. Replace in reverse order.

Remove the two screw (H), remove the ignition transformer. Replace in reverse order.

MAIN HEAT EXCHANGER (Fig. 76-77)

Unclip and remove the three air chamber covers (front, left hand, right hand sides). Disconnect all the wiring connections.

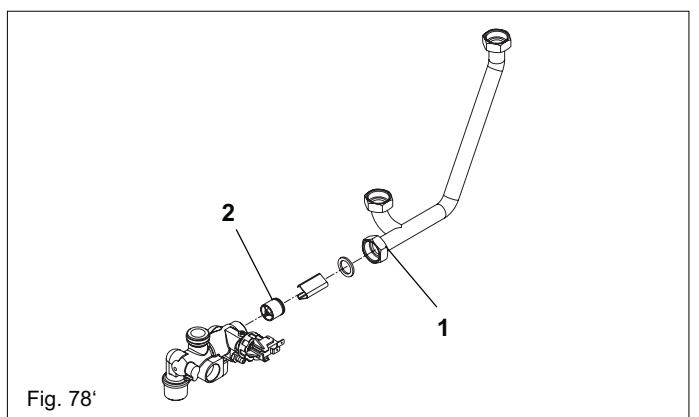
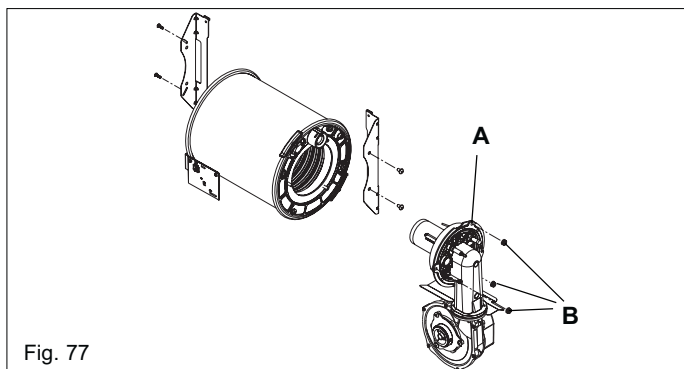
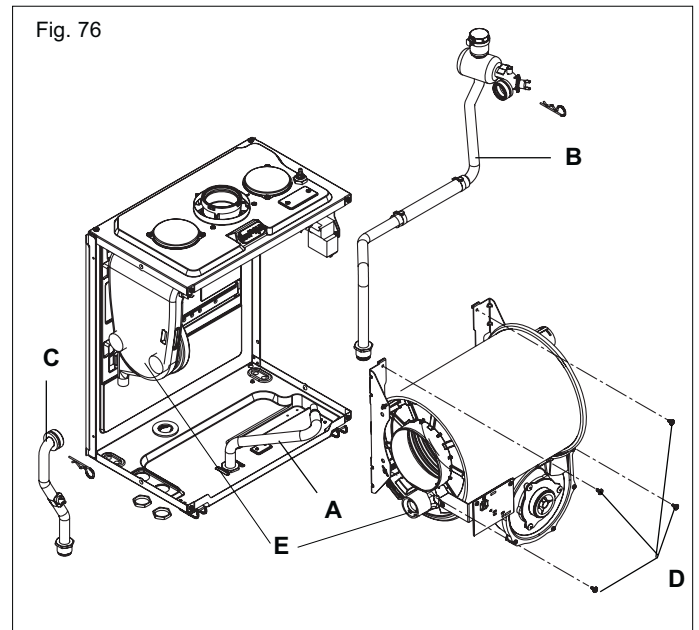
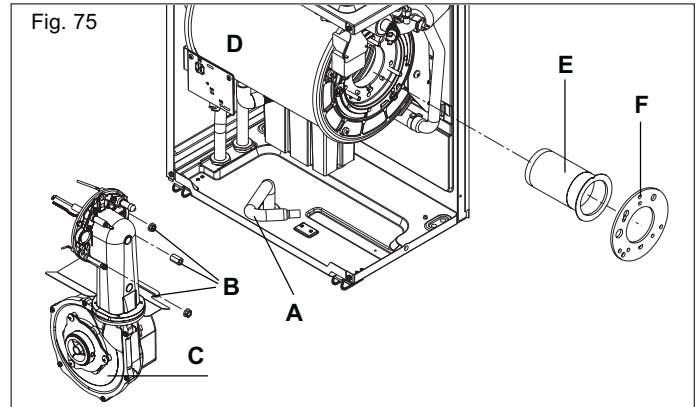
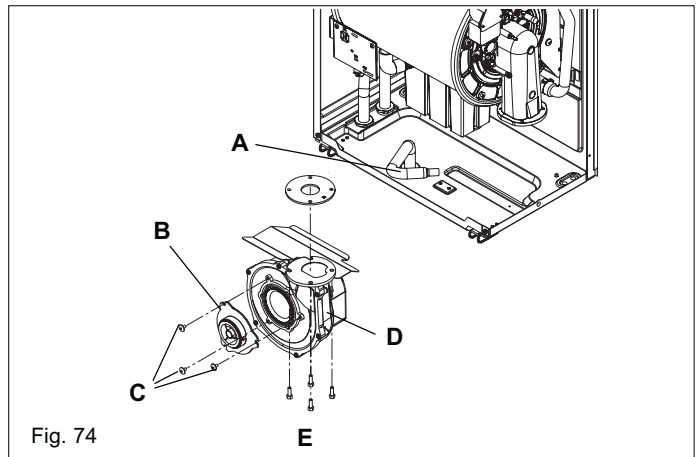
Fig. 76: slacken the gas pipe (A) at the air box connection and swing/rotate of the fan assembly. Disconnect the flow (B), return (C) and condensation connections on the heat exchanger. Locate and remove the 4-screws that secure the heat exchanger to the combustion chamber (D). Move the heat exchanger to the right and disconnect it from the flue collector (E). The heat exchanger can now be lifted up and removed from the boiler.

Fig. 77: to remove the fan burner assembly (A) locate and remove the 3 external nuts (B). Replace in the reverse order. Ensure all seals are in good condition, taking care to ensure they are replaced correctly.

AUTOMATIC BYPASS (Fig. 78)

Disconnect and remove the flow pipe (1), at the connection to the pressure relief valve, at heating manifold and at the connection to the air chamber. Using a hooked piece of wire, carefully withdraw the bypass cartridge (2).

Ensure all seals are in good condition, taking care to ensure they are replaced correctly. Replace in the reverse order ensuring the cartridge is facing the correct way.

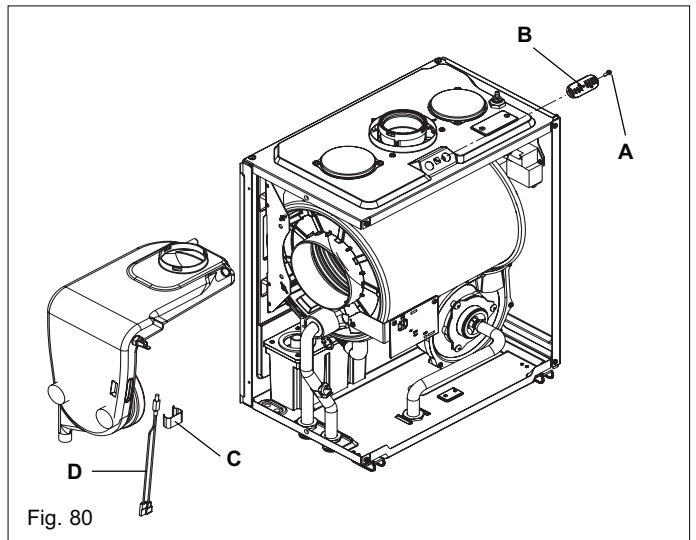
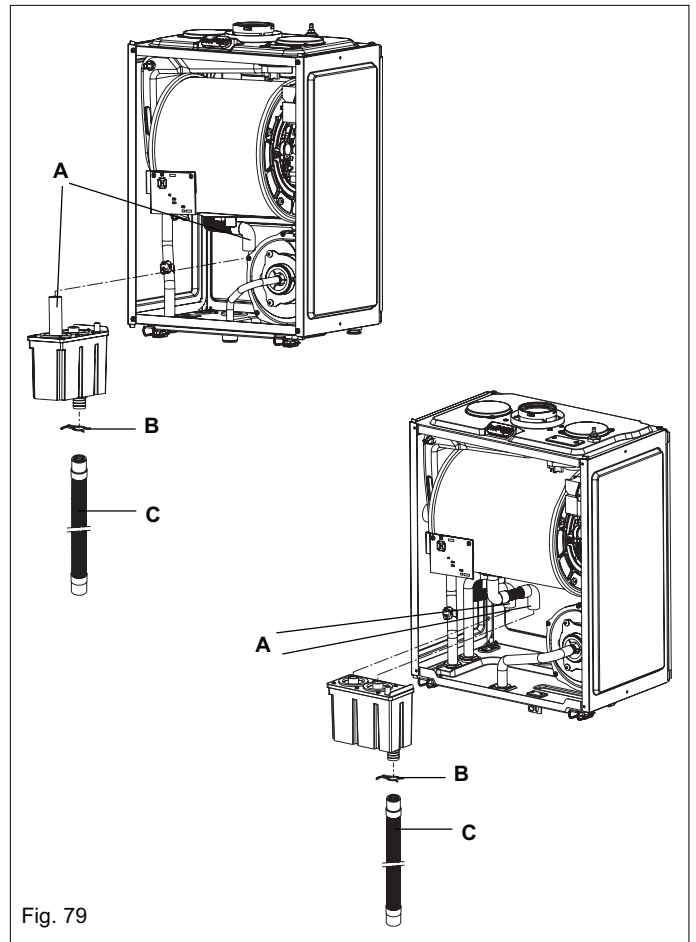


CONDENSATE TRAP REMOVAL (Fig. 79)

Disconnect the 2 upper rubber condensate pipes (A). Remove the pin (B) that secures the trap to the air box plate. Disconnect the lower rubber condensate pipe (C) from the condensate trap. Carefully remove the condensate trap. Replace in the reverse order.

FLUE COLLECTOR AND FLUE THERMOSTAT REMOVAL (Fig. 80)

Unclip and remove the air chamber front and left side covers. Locate and remove the screw (A) that secures the flue gas analysis test point cover (B). Disconnect the silicon pipe (right hand) of the blocked flue switch. Remove the clip (C) and the flue thermostat (D). Gently pull down and to the left and ease the flue collector from its location. Replace in the reverse order.



13 - LPG INSTRUCTIONS

This instruction must be retained adjacent to the boiler as they contain important details about the conversion made.

WARNING: This conversion kit shall be installed by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. If the information in this instructions is not followed exactly, a fire, an explosion or production of carbon monoxide may result causing property damage, personal injury or loss of life. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied with the kit.

LPG INSTRUCTIONS PROPANE GAS:

CAUTION: The gas supply shall be shut off prior to disconnecting the electrical power, before proceeding with the conversion.

Installation Codes

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances
- National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition (NFGC)
- For Canada only: CAN/CSA B149 Natural Gas and Propane Installation Code and CSA C22.1 C.E.C. Part 1 (C22.1)

WARNING: XPak boilers are shipped ready to fire natural gas ONLY. You must install the propane orifice and regulate the gas valve if the boiler will be connected to propane. Failure to comply could result in severe personal injury, death or substantial property damage.

Pipe sizing for natural gas

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

Propane supply pressure requirements

1. Adjust propane supply regulator provided by gas supplier for 13" w.c. maximum pressure.
2. Pressure required at gas valve inlet pressure port: Maximum: 13" w.c. with no flow (lockup) or 8" w.c. minimum with boiler operating

The XPak boiler is factory supplied to use natural gas. The boiler can use also LPG gas by installing a kit (supplied with every unit). The conversion to LPG is possible by:

1. Install the new gas injector
2. Modify the fan speed according the data in the table.

The kit is composed by:

1. Injector black coating (to be recognized from the natural gas that is not black coated)
2. Relative gas sticker (red color) to be attached under the boiler instead of the natural gas sticker (yellow color factory installed)
3. Instruction of the kit
4. LPG label to be affixed on the boiler casing and completed in by the organization making this conversion.

Operations for conversion

1. Switch off the boiler
2. Change the gas injector
3. Apply the red sticker
4. Switch on the boiler
5. Set the new fan speed
6. Fill the final part of this instruction

GAS SUPPLY

The gas supply must be connected to the boiler by a competent LPG installer and must be of sufficient size to supply the boiler at its maximum output. An existing supply must be checked to ensure that it is of adequate size to deal with the maximum rated input of this and any other appliances that it serves.

GAS SUPPLY INSTALLATION

The entire installation including the meter must be purged and checked for gas tightness.

CONVERTING THE BOILER GAS TYPE

To convert the boiler to another gas type it is necessary to change the gas injector, adjust the fan speed and the gas valve.

NOTICE: The gas valve sticker "WARNING: VALVE IS NOT FIELD SERVICEABLE" means the valve can be adjusted but not disassembled.

CHANGE THE GAS INJECTOR

Slacken and unscrew upper gas valve pipe; locate and remove the two screws shown as (A). Locate and remove the natural gas injector (B) inside the pipe, insert the LPG injector (black coating). Replace in the reverse order. Check and adjust burner pressure settings.

WARNING:

A gas tightness check must be carried out if any gas carrying components have been removed, replaced or disturbed.

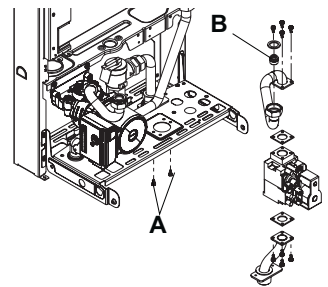


Fig. 1

CHECKING THE RELATIONSHIP OF THE IGNITER TO MAIN BURNER

Remove the burner assembly as indicated in the boiler manual "Servicing instructions".

Check the distance between the burner and the two electrodes according the distances indicated in Fig. 1A. Replace in the reverse order.

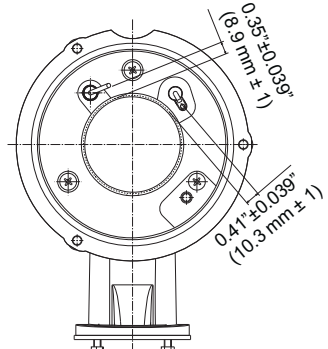


Fig. 1A

TECHNICAL DATA - LPG

Gas pressure		XPak 85	XPak 120
Input - (0 - 2000 ft / 0 - 610 m)	Btu/hr	25,600 - 87,000	27,300 - 119,500
	kW	7.5 - 25.5	8.0 - 35.0
Input - (2000 - 4500 ft / 610 - 1375 m)	Btu/hr	25,600 - 82,900	27,300 - 114,300
	kW	7.5 - 24.3	8.0 - 33.5
Gas supply pressure LPG	in w. c.	11	11
	kPa	2.75	2.75
Min. gas supply pressure LPG	in w. c.	8	8
	kPa	1.99	1.99
Max. gas supply pressure LPG	in w. c.	13	13
	kPa	3.24	3.24
Burner pressure (max-min)	in w. c.	1.92-0.24	2.00-0.16
	kPa	0.48-0.06	0.50-0.04
Rate			
Gas Rate max LPG	lbs/hr	4.02	5.55
	kg/hr	1.82	2.52
Gas Rate min LPG	lbs/hr	1.20	1.28
	kg/hr	0.54	0.58
Emissions			
CO2 setting	%	10.0%	10.0%
NOx @ max	ppm	< 20	< 20
NOx @ min	ppm	< 15	< 20
CO @ max without air	ppm	< 200	< 200
CO @ min without air	ppm	< 40	< 35
Injector size			
Injector LPG (E) - black coated	Ø	0.15 inch (3.9 mm)	0.19 inch (5.0 mm)

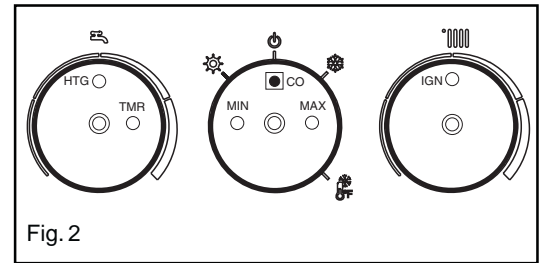


Fig. 2

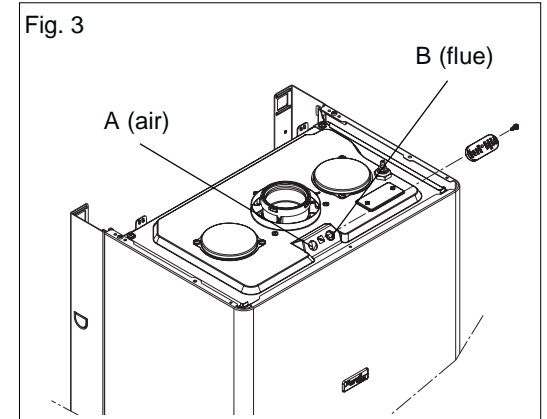


Fig. 3

BOILER FAN SPEEDS

The boiler fan speeds require to be checked and/or adjusted prior to making any adjustments to the gas valve or if the main PCB has been replaced.

ATTENTION

Gas type and boiler fan speed (output) **must be set** according to the specific appliance specification. Raypak accepts no responsibility if the gas type and/or fan speed is not correctly adjusted according to the respective specification as detailed on the boiler data badge.

ADJUSTING GAS PRESSURE

The gas pressure can not be adjusted as the boiler is equipped with a pneumatic gas valve.

CHECKING/ADJUSTING THE APPLIANCE FAN SPEEDS

Move the selector switch to the OFF position and remove the 3-selector knobs.

ABSOLUTE MAX FAN SPEED

Locate the MAX trim pot (Fig. 2) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see table below).

NOTE

The display shows the fan RPM in multiples of 1000, i.e. 2.5=2500RPM.

ABSOLUTE MIN FAN SPEED

Locate the MIN trim pot (Fig. 2) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see table below).

NOTE

The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

IGNITION FAN SPEED

ATTENTION

Do this operation only after the adjusting of absolute max and min fan speed.

Locate the IGN trim pot (Fig. 2) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see table below).

NOTE

The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

HEATING FAN SPEED

Locate the HTG trim pot (Fig. 2) and gently adjust clockwise or counter clockwise to achieve the correct fan speed (see table below).

NOTE

The display shows the fan RPM in multiples of 1000, i.e. 2.5 = 2500RPM.

FAN SPEED (rpm) TABLE

MODEL	MAX	MIN	HTG	IGN
XPak85	5,700	1,900	5,700	3,700
XPak120	5,400	1,400	5,400	3,700

ADJUSTING THE GAS VALVE

THE GAS VALVE MUST BE SET-UP OR ADJUSTED WITH THE AID OF A PROPERLY CALIBRATED FLUE GAS ANALYZER.

CHECKING THE CO2 AND ADJUSTING THE GAS VALVE

THE GAS VALVE MUST BE SET-UP OR ADJUSTED WITH THE AID OF A PROPERLY CALIBRATED FLUE GAS ANALYZER.

Isolate the boiler from the electrical supply and remove the appliance casing. Set the flue gas analyzer to read CO2 and insert the probe into the flue analysis test point (A-air, B-flue Fig. 3). Restore the electrical supply to the boiler and switch the boiler to the OFF mode. To adjust the gas valve you must first ensure that the fan speed potentiometers (trim pots) have been set correctly. Remove the 3-selector knobs, locate and press the CO button). The appliance will now operate in CO mode for approximately 15-minutes.

GAS VALVE MAXIMUM SETTING

Locate and gently turn the HTG trim pots until the maximum value (max fan speed) is obtained and check that it corresponds with the appropriate CO2 value (Maximum) for the respective boiler. If the CO2 reading is correct, proceed to gas valve minimum setting. However, If the CO2 reading is incorrect, the maximum gas pressure must be adjusted as follows:

- Using a suitable screwdriver, very slowly turn the maximum adjustment screw (Fig. 4) – clockwise to decrease, counter clockwise to increase – until the correct value is displayed on the CO2 analyzer (allow time for the analyzer to stabilize).

GAS VALVE MINIMUM SETTING

Locate and gently turn the HTG trim pot until the minimum value (min fan speed) is obtained and check that it corresponds with the appropriate CO2 value (Minimum) for the respective appliance. If the CO2 reading is correct, rotate the HTG trim pot until the correct value is obtained for the respective appliance (see fan speed table) and proceed.

However, If the CO2 reading is incorrect, the minimum gas pressure must be adjusted as follows:

- Using a suitable screwdriver, very slowly turn the minimum adjustment screw (Fig. 4) – clockwise to increase, counter clockwise to decrease - until the correct value is displayed on the CO2 analyzer (allow time for the analyzer to stabilize).

INSTALLATIONS AT ELEVATION

Rated inputs are suitable for up to 4,500 ft elevation (see technical data table). Consult the factory for installations at altitudes over 4,500 ft above sea level. No hardware changes are required to the boilers for installations up to 10,000 ft (adjustments may be required).

COMPLETION

On completion of the combustion analysis check and/or any gas valve adjustment, set the HTG trim pot to the corresponding value as detailed in the fan speed table. Reattach the 3-selector knobs. Remove the test probe from the test point and reattach the sealing screws and/or cap.

IMPORTANT

A GAS TIGHTNESS CHECK MUST BE CARRIED OUT IF ANY GAS CARRYING COMPONENTS HAVE BEEN REMOVED, REPLACED, OR DISTURBED.

XPAK LPG LABEL

1. Fill in the enclosed LPG label with all the information required and affix the label as close as possible to existing rating plate
2. Affix the enclosed RED color label over the existing YELLOW color label under the boiler near to the boiler gas connection.

SEQUENCE OF THE IGNITION SYSTEM

Switch on the boiler as follows:

- Open the gas tap under the boiler by turning it counterclockwise
- Turn on the general switch of the system and then, after lowering the flap, turn the function selector to summer ☀, winter ❄ or winter tank temperature 🌡 depending on the chosen operating mode.

The boiler start to run according the automatic sequence: heat request, fan start-up, tachometer check, ignition trials, gas opening and ignition start-up.

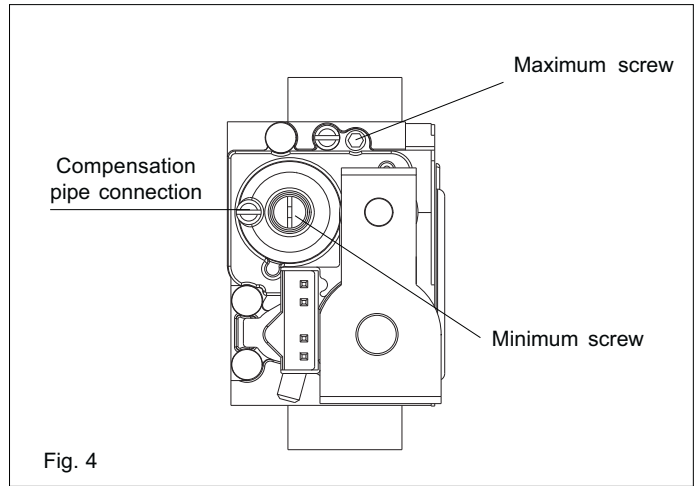
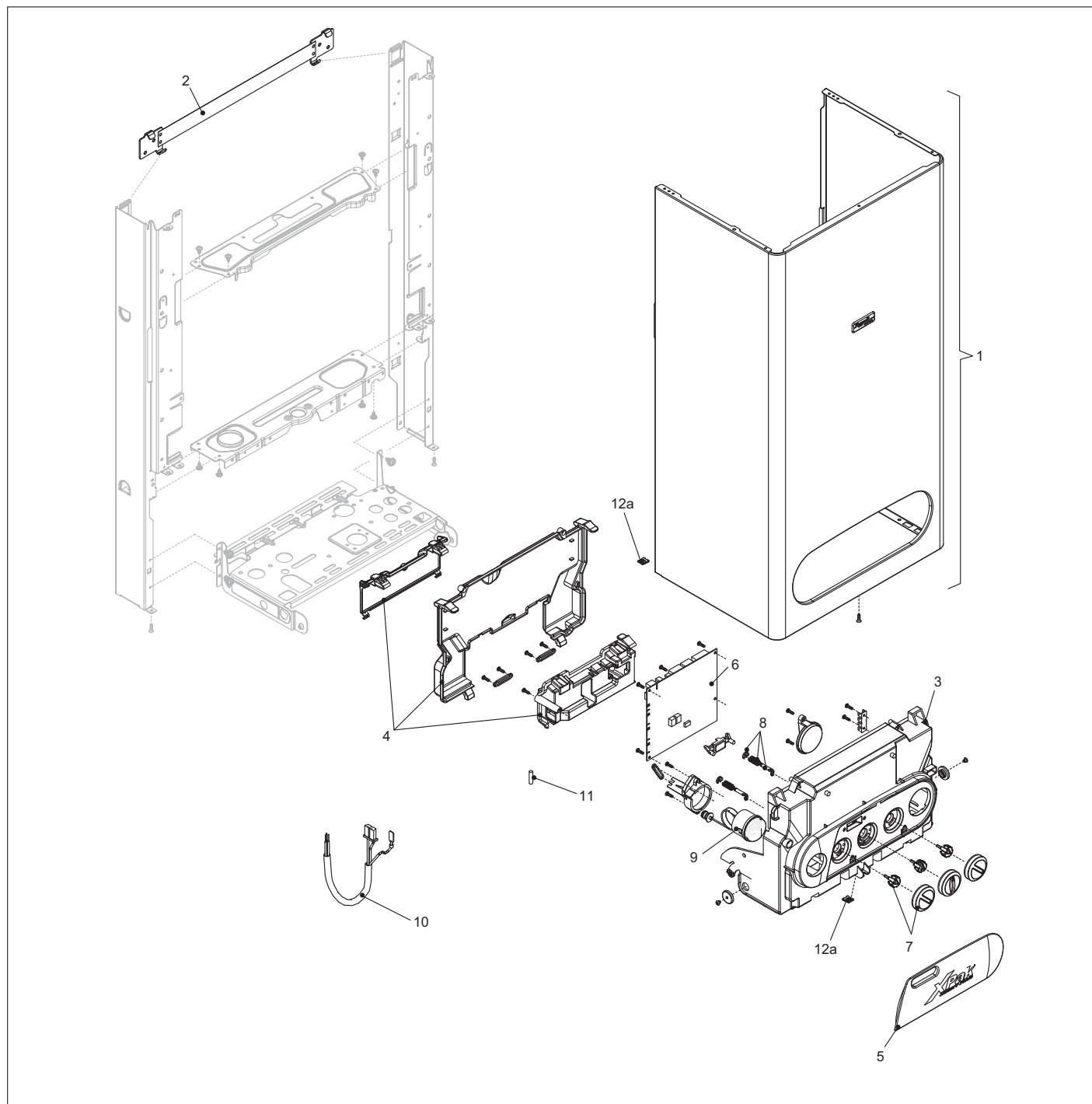


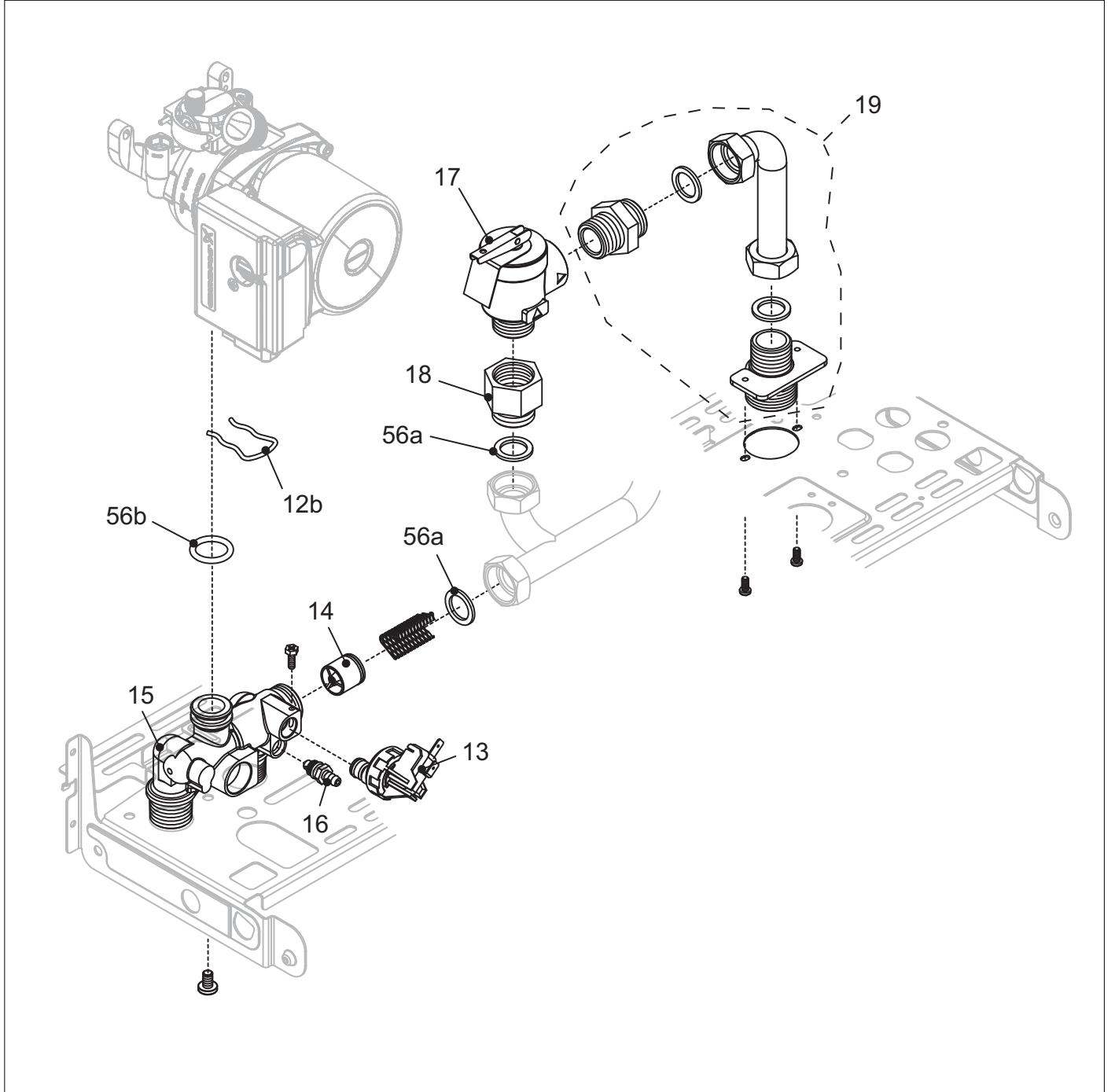
Fig. 4

14 - EXPLODED DIAGRAMS

Drawing 1



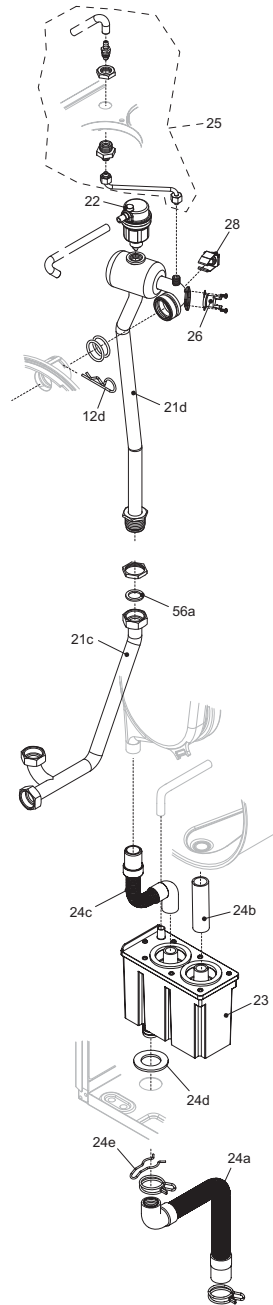
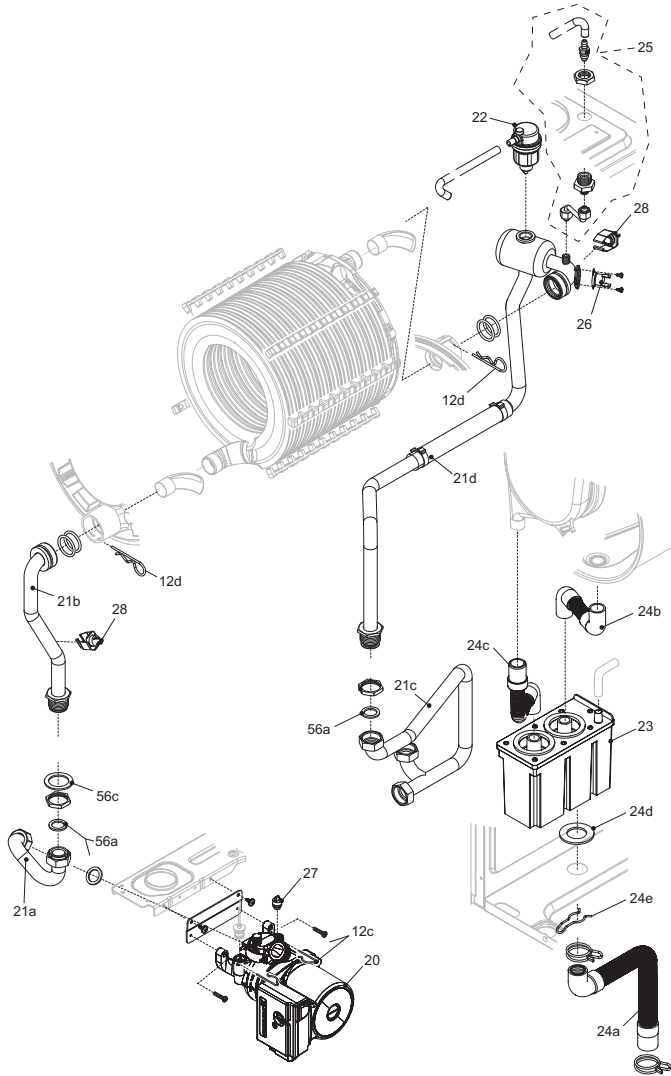
Drawing 2



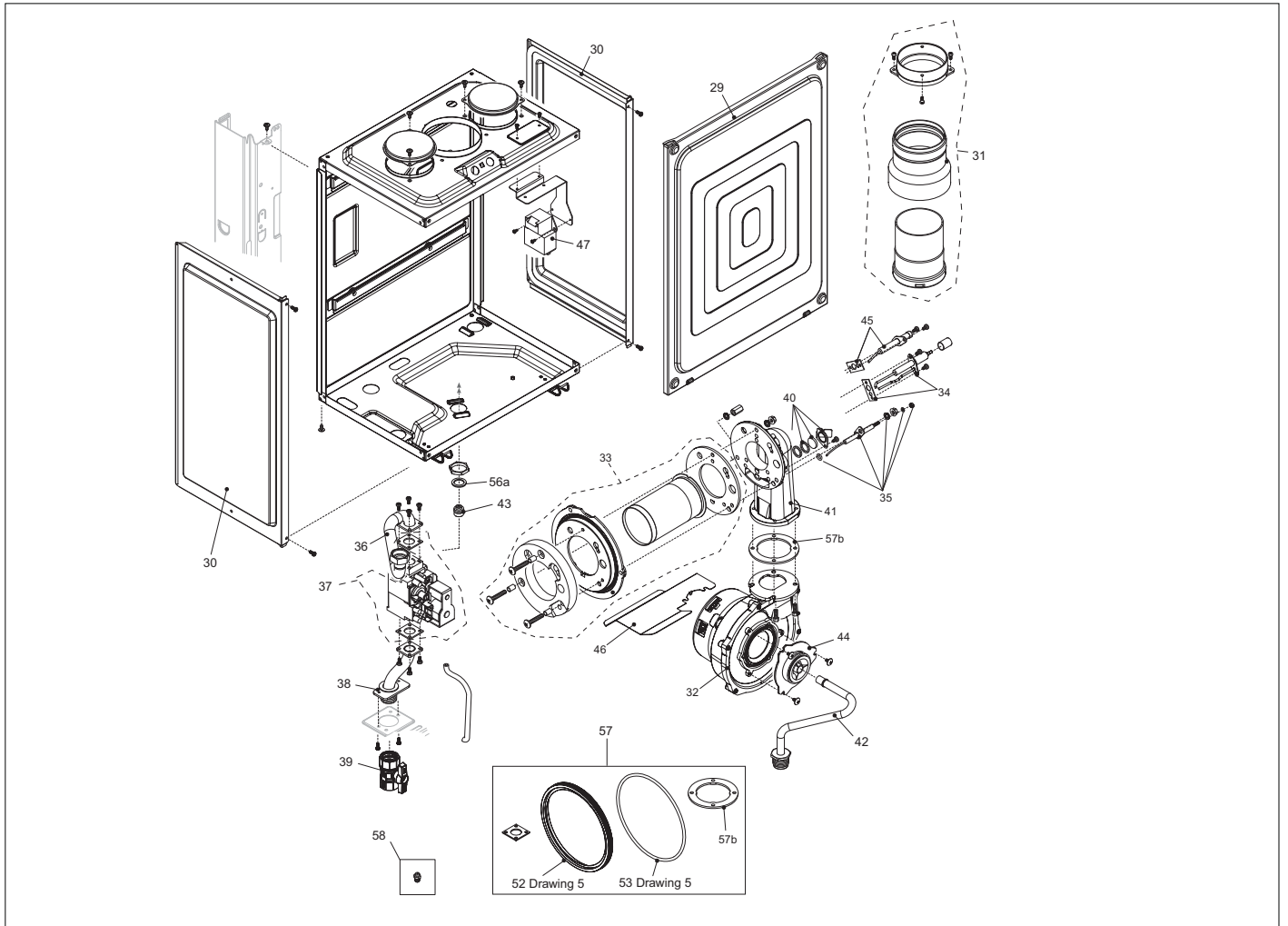
Drawing 3

XPAK 85

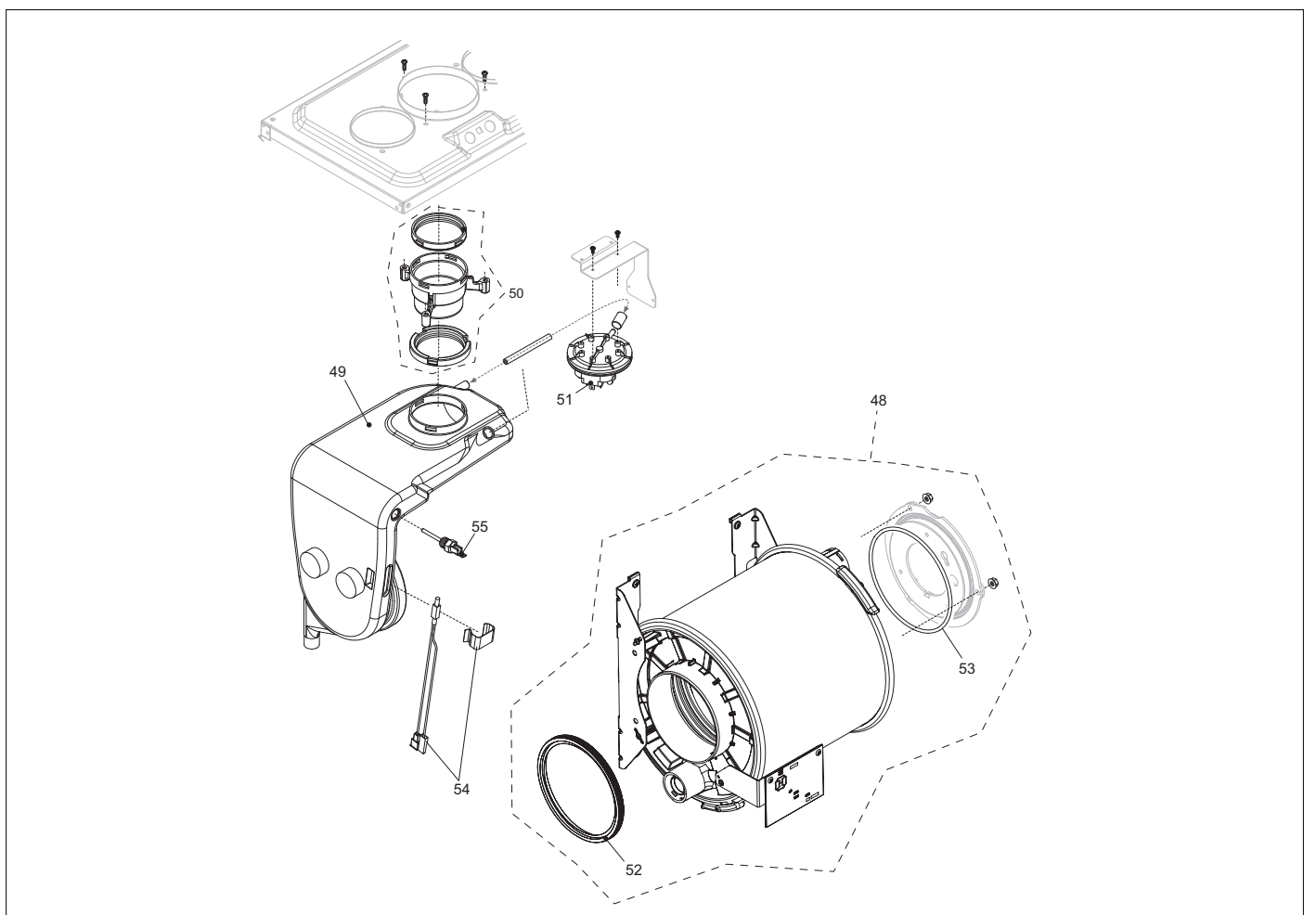
XPAK 120



Drawing 4



Drawing 5



CALL OUT	DESCRIPTION	XPak85	XPak120
Electric/Case Components		See Drawing #1	
1	Jacket Front	012831F	012832F
2	Boiler Mounting Bracket	013004F	013004F
3	Control Panel	012829F	012829F
4	Control Panel Cover	012827F	012827F
5	Control Panel Door	012833F	012833F
6	PC Board	012828F	012828F
7	Control Knob	012830F	012830F
8	Control Panel Hinge	012834F	012834F
9	Pressure Gauge	012826F	012826F
10	Wire Harness Kit - (Includes Complete Set of Boiler Harnesses)	012836F	012999F
11	Control Panel Fuse Kit - (Includes Complete Set of Fuses)	013003F	013003F
12	Retainer Clip Kit - (Includes 12a {20pcs}, 12b {1 pc}, 12c {10 pcs} and 12d {10 pcs})	013011F	013011F
Hydraulic Components - 1		See Drawing #2	
13	Water Pressure Switch	013005F	013005F
14	Bypass Valve	013006F	013007F
15	Distribution Header	013008F	013008F
16	Vent Plug	013009F	013009F
17	PRV - 45#	013012F	013012F
18	PRV Adapter	013013F	013013F
19	PRV Discharge Plumbing Kit	013010F	013010F
Hydraulic Components - 2		See Drawing #3	
20	Pump	013014F	013015F
21	Plumbing Kit - (Includes 21a, 21b, 21c and 21d)	013016F	013017F
22	Air Vent	013018F	013018F
23	Condensate Reservoir	013019F	013019F
24	Condensate Plumbing Kit - (Includes 24a, 24b, 24c, 24d and 24e)	013020F	013021F
25	Air Venting Plug Kit	013022F	013023F
26	High Limit	013024F	013024F
27	Pump Plug	013025F	013025F
28	Water Detector	013026F	013026F
Burner Components - Air Box		See Drawing #4	
29	Air Chamber Access Panel	013037F	013038F
30	Air Chamber Side	013027F	013027F
31	Intake Air/Flue Adapters	013040F	013040F
32	Combustion Air Blower	013028F	013028F
33	Burner Assembly	013029F	013029F
34	Igniter	013030F	013030F
35	Condensate Electrode Kit	013031F	013031F
36	Outlet Gas Manifold	013032F	013033F
37	Gas Valve Kit	013034F	013034F
38	Inlet Gas Manifold	013035F	013035F
39	Gas Shut-Off Valve	013036F	013036F
40	Burner Observation Port Kit	013039F	013039F
41	Air/Gas Manifold	013041F	013041F
42	Manifold Gas/Blower Inlet	013042F	013064F
43	Gas Orifice - Nat	013043F	013044F
43	Gas Orifice - Pro	013045F	013046F
44	Combustion Air Mixer	013047F	013048F
45	Flame Sensor	013049F	013049F
46	Blower Heat Shield	013050F	013050F
47	Ignition Transformer	013051F	013051F
Combustion Chamber Components - Flue Drain		See Drawing #5	
48	Heat Exchanger Assembly	013054F	013055F
49	Flue Exhaust Condensate Collector	013056F	013057F
50	Flue Exhaust Condensate Collector Adapter	013058F	013058F
51	Air Pressure Switch	013059F	013059F
52	Outlet Heat Exchanger Seal Gasket	013060F	013060F
53	Inlet Heat Exchanger Seal Gasket	013061F	013061F
54	High Limit	013062F	013062F
55	Flue Sensor	013063F	013063F
56	Water Gasket Kit - (Includes 56a, 56b and 56c - 10pcs ea.)	013000F	013000F
57	Flue Exhaust/Gas Gasket Kit - (Includes 57a and 57b)	013001F	013001F
58	Nat to Pro Gas Conversion Kit	013052F	013053F

For gas conversions, consult the factory for information.

Important Instructions for the Commonwealth of Massachusetts

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR 4.00 and 5.00 for installation of through – the – 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; and

2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

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

1. Detailed instructions for the installation of the venting system design or the venting system components; and

2. A complete parts list for the venting system design or venting system.

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

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

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

LIMITED WARRANTY

MODULATING - CONDENSING BOILER

XPAK™ HEATING BOILERS MODELS 85 & 120

SCOPE OF WARRANTY:

Raypak, Inc. ("Raypak") warrants to the first retail purchaser of the XPAK Heating Boiler that was delivered with this limited warranty certificate (the "Boiler") that the Boiler will be free from defects in materials and workmanship under normal use and service for the Applicable Warranty Periods specified below. Under this Limited Warranty, Raypak will, at its option, repair or replace any defective part of the Boiler in accordance with the terms of this Limited Warranty. The Limited Warranty does not include labor or transportation costs, which are borne by the warranty claimant. The repair or replacement Boiler or part will be warranted for only the unexpired portion of the original Applicable Warranty Period. This Limited Warranty applies only to a Boiler that has NOT been moved from its original installation site. In the event that replacement or repair parts are no longer available, or significant design changes have occurred, Raypak reserves the right to replace, at its option, the Boiler or part with a current equivalent part. Please read this entire Limited Warranty to fully understand all of its terms and conditions.

APPLICABLE WARRANTY PERIODS

XPAK™ Residential Extruded Aluminum Heat Exchanger:

The Applicable Warranty Period for the aluminum heat exchanger of the Boiler in a residential installation (as defined in "Additional Warranty Exclusions and Terms", below) is twenty (20) years after the original installation date of the Boiler. During the first ten (10) years, Raypak will pay for 100% of the cost of the replacement part or repair (excluding labor and transportation costs). For years 11-20 of the Applicable Warranty Period for the residential Boiler's aluminum heat exchanger, Raypak will provide a replacement part for a defective part, **provided that** the warranty claimant pays the following percentages of the cost of the replacement part:

RESIDENTIAL WARRANTY	
The table below lists the portion of the replacement part's cost that the original homeowner will be responsible to pay	
Years into Warranty	% of List Price
First 10	0%
11	20%
12	30%
13	40%
14	50%
15	55%
16	60%
17	65%
18	70%
19	75%
20	80%

XPAK Commercial Extruded Aluminum Heat Exchanger:

The Applicable Warranty Period for the aluminum heat exchanger of the Boiler in a commercial installation (as defined in "Additional Warranty Exclusions and Terms", below) is five (5) years after the original installation date of the Boiler. During the first three (3) years of the Applicable Warranty Period, Rheem will pay for 100% of the cost of the replacement part or repair (excluding labor and transportation costs). For years 4 and 5 of the Applicable Warranty Period for the commercial Boiler's aluminum heat exchanger, Raypak will provide a replacement part for a defective part, **provided that** the warranty claimant pays the following percentages of the cost of the replacement part:

COMMERCIAL WARRANTY	
The table below lists the portion of the replacement part's cost that the original owner will be responsible to pay	
Years into Warranty	% of List Price
First 3	0%
4	20%
5	30%

RESIDENTIAL BOILER FAN:

The Applicable Warranty Period for the fan of a Boiler in a residential installation (as defined in "Additional Warranty Exclusions and Terms", below) is three (3) years from the date of original installation, or thirty-seven months (37) months from the date that the residential Boiler was shipped from Raypak's factory based on Raypak's records, whichever comes first. This Applicable Warranty Period does not apply to Boiler fans in commercial installations (as defined in "Additional Warranty Exclusions and Terms", below).

ALL OTHER COMPONENTS OF THE BOILER:

Except as otherwise specified above for the heat exchangers and residential Boiler fan, the Applicable Warranty Period for all components in the Boiler is one (1) year from date of the Boiler's original installation, or thirteen (13) months from date that the Boiler was shipped from Raypak's factory based on Raypak's records, whichever comes first.

SATISFACTORY PROOF OF ORIGINAL INSTALLATION DATE, SUCH AS INSTALLER'S INVOICE, IS REQUIRED. THIS WARRANTY WILL BE VOID IF THE BOILER RATING PLATE IS ALTERED OR REMOVED.

ADDITIONAL WARRANTY EXCLUSIONS AND TERMS:

This Limited Warranty does **NOT** apply:

1. if the Boiler has been moved from its original place of installation, or if the original purchaser no longer owns the property where the original installation was made;
2. to damage, malfunctions or failures resulting from improper installation, operation, or maintenance of the Boiler in accordance with the manufacturer's instructions;

3. to damage, malfunctions or failures resulting from misuse, neglect, alteration, accident, fire, flood and the like;
4. to damage, malfunctions or failures resulting from sediment or lime buildup, freezing, or other conditions causing inadequate water circulation;
5. to damage, malfunctions or failures resulting from high velocity flow exceeding boiler design rates;
6. to damage, malfunctions or failures resulting from connected systems devices, such as pump or controller;
7. to damage, malfunctions or failures resulting from use of accessories or other components that are not authorized in writing by Raypak for use in conjunction with the Boiler system;
8. to damage, malfunctions or failures resulting from failure to eliminate air from, or replenish water in, the connected water system;
9. to damage, malfunctions or failures resulting from chemical contamination of combustion air or use of chemically contaminated combustion air, including, but not limited to contaminants such as chlorine gas, halogenated hydrocarbons, and Freon.
10. to damage, malfunctions or failures resulting from ingestion by the Boiler of drywall, sheetrock or plasterboard dust and particles, lint or dirt.
11. to Boilers that have been installed by anyone other than a heating professional whose principal occupation is the sale and installation of heating, plumbing and/or air conditioning equipment.

For purposes of this Limited Warranty, a residential installation is defined as the installation of a Boiler in any of the following residential spaces:

- a) Single-family detached dwelling;
- b) Two-family attached dwelling; or
- c) Dwelling unit of a residential building in which each dwelling unit has an individual Boiler.

For purposes of this Limited Warranty, a commercial installation is defined as the installation of a Boiler in any site other than:

- a) Single family detached dwelling;
- b) Two family attached dwelling; or
- c) Dwelling unit of a residential building in which each dwelling unit has an individual Boiler.

HOW TO MAKE WARRANTY CLAIM:

Promptly notify the original installer, supplying the model and serial numbers of the unit, date of installation and description of the problem. The installer must then notify a Raypak distributor for instructions regarding the claim. If neither the installer nor the distributor is available, immediately notify Raypak at 800-278-5300, supplying model number, serial number, date of original installation and a description of the problem. **Proper authorization MUST be obtained PRIOR to any repairs for the Limited Warranty to apply. This Limited Warranty is VOID if the Boiler is repaired or altered in any way by ANY persons or agencies other than those authorized by Raypak.** Raypak reserves the right at all times to inspect, or require the return of, the defective Boiler or component part and to verify warranty coverage at its factory. The failed part must first be returned to Raypak if requested, with transportation charges prepaid, and all applicable warranty conditions satisfied. The replacement part will be warranted for only the unexpired portion of the original warranty. Raypak makes no warranty whatsoever on parts manufactured by others, but Raypak will apply any such warranty as may be provided by the parts manufacturer.

EXCLUSIVE WARRANTY-LIMITATION OF LIABILITY

The Limited Warranty is the only warranty given by Raypak. No one is authorized to make any other warranties on Raypak's behalf. ANY IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE APPLICABLE WARRANTY PERIOD SPECIFIED ABOVE. RAYPAK'S SOLE LIABILITY WITH RESPECT TO ANY DEFECT, SHALL BE AS SET FORTH IN THIS LIMITED WARRANTY. IT IS AGREED THAT RAYPAK SHALL HAVE NO LIABILITY WHETHER UNDER THIS LIMITED WARRANTY OR IN CONTRACT, TORT OR NEGLIGENCE OR OTHERWISE FOR CLAIMS FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING NO LIABILITY FOR DAMAGE FROM WATER LEAKAGE), ALL OF WHICH ARE EXPRESSLY EXCLUDED. Some states do not allow limitations on how long an implied warranty lasts, or for the exclusion of incidental or consequential damages, so the above limitation or exclusion may not apply to you. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. We suggest you immediately record the model and serial number and date of original installation and retain this Limited Warranty Certificate in the event warranty service is needed.

DO NOT RETURN THIS DOCUMENT TO RAYPAK. KEEP IT WITH YOUR BOILER OR BUSINESS RECORDS.

Name of Owner	Name of Installer
Owners Address	Installers Address
Date of Boiler Installation	Telephone Number of Installer
Model Number of Your Boiler	Serial Number of Your Boiler

START-UP CHECKLIST FOR FAN-ASSISTED RAYPAK PRODUCTS

This start-up checklist is to be completely filled out by the service technician starting up the Raypak Boiler for the first time. All information may be used for warranty purposes and to ensure that the installation is correct. Additionally this form will be used to record all equipment operation functions and required settings.

GAS SUPPLY DATA

Regulator Model & Size _____ / _____ CFH
 Gas Line Size (in room) _____ In. NPT
 Length of Gas Line _____ Eq Ft
 Gas Shut-Off Valve Type _____
 (Ball, Lube cock)
 Sediment Trap _____ Y/N
 Port _____ Std _____ Full

CLEARANCES

Front Clearance _____ In.
 Right Side Clearance _____ In.
 Left Side Clearance _____ In.
 Rear Clearance _____ In.
 Overhead Clearance _____ In.

ELECTRICAL

Voltage Supply (VAC) No Load _____ Load _____
 Voltage -24 VAC _____ VAC
 Voltage Com to Ground _____ VAC
 Operating Control Setting _____ deg F

VISUAL INSPECTION OF COMPONENTS

Verify inspection was done and condition of components are in good working order with a "yes"

Wiring Harness _____ Y/N
 Burner/s (flame) _____ Y/N
 Remote flame sense _____ Y/N

Sketch plumbing on reverse side

WATER SUPPLY

Flow Rate in GPM or Delta T _____ If Avail
Measure flow rate at full fire
 Number of Tanks and Size Qty _____ Gallons
 Plumbing Size _____
 Pump Size: _____ (boiler) Pump HP: _____
 Impeller trim _____ Pump Model _____
 Louvers _____ Screens _____

VENTING

Vent Size: _____ Stack Height: _____
 Category: _____ sketch vent on reverse side ***
 Vent Material: _____
 Vent Termination Type: _____
 Combustion Air Openings: Low _____ in2
 Ventilation air High _____ in2

Nominal Factory Recommended Settings

See manual or card tag
 See manual or card tag
 See manual or card tag

EMISSIONS SETTINGS AND TEST INFORMATION (AT FULL FIRE)

Blower Pressure Setting _____ In. WC
 Supply Gas Pressure _____ In. WC
 Verify stable pressure static & dynamic condition
 Manifold Gas Pressure _____ In. WC
 Tracking Pressure (clean filter) _____ In. WC

The following measurements must be obtained with a Combustion Analyzer.

NOX	_____ PPM	Less than 20 PPM (If required by Certifying Agency)
Free Oxygen	_____ %	See manual
CO	_____ PPM	Less than 170 PPM
CO2	_____ %	See manual

Model Number: _____

Serial Number: _____

*** Note: draw venting with details, such as extractors, barometric dampers, blast dampers or draft inducers

Site Altitude Above Sea Level _____ Ft.

Job Name _____

Address _____

Physical Location of Boiler: Indoors _____; Outdoors _____; Ground Level _____; Roof _____; Below Grade _____

Mechanical Contractor / Installer _____

Date and Time of Start-up _____ Print Name and Signature of Start-up Technician _____

Information must be faxed to: (805) 278-5471 in order to ensure warranty consideration Attn: Service Manager

Your XPak serial number



for future reference



www.raypak.com