

NXR4

INSTALLATION, OPERATION & MAINTENANCE MANUAL



MAY 2007

POTTERTON
COMMERCIAL

heating specialists

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Fig. 1 – General Data & Dimensions (all dimensions in mm unless stated)

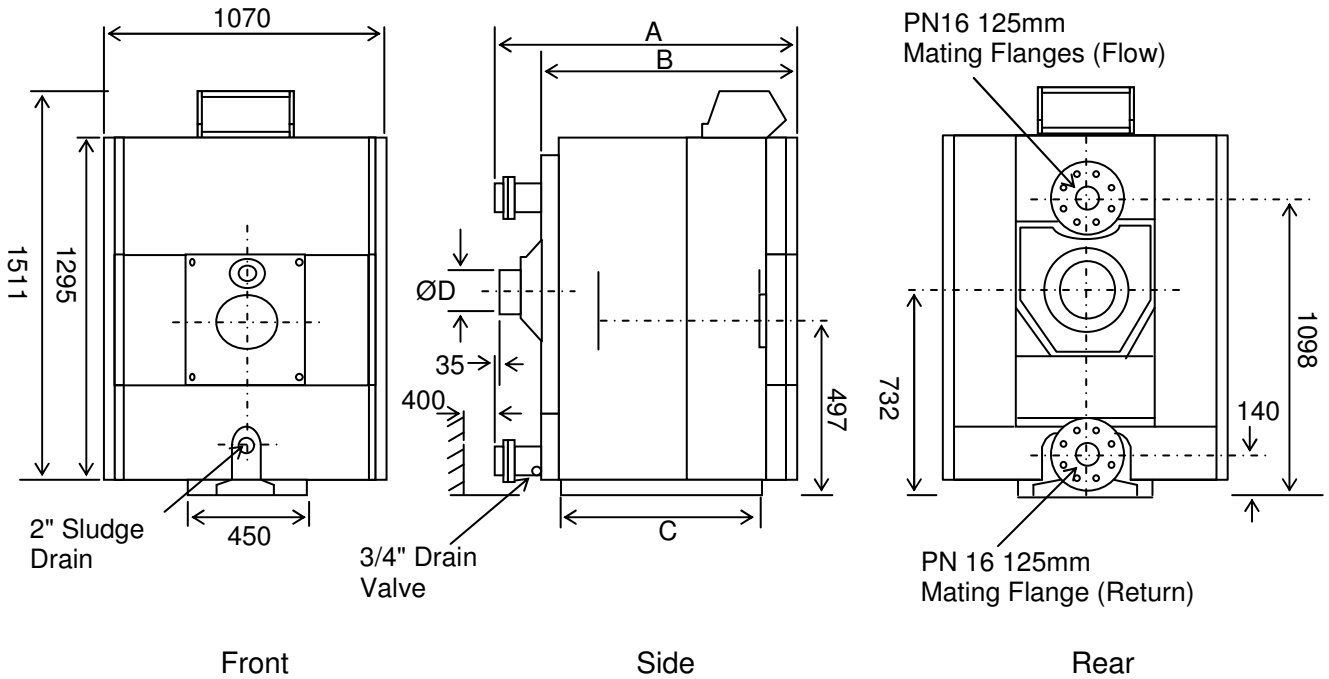


Table 1 – Boiler Dimensions

NXR4	Type	409	410	411	412	413	414	415	416	417
A	mm	1640	1780	1920	2060	2200	2340	2480	2620	2760
B	mm	1440	1580	1720	1860	2000	2140	2280	2420	2560
$\varnothing D$	mm	300				350				

Table 2 – Combustion Chamber Data

Model		409	410	411	412	413	414	415	416	417
Mean Diameter	mm	525								
Cross Sectional Area	m ²	0.216								
Length (X)	mm	1120	1260	1400	1540	1680	1820	1960	2100	2240
Volume	m ³	0.24	0.27	0.30	0.33	0.36	0.39	0.42	0.45	0.48
Surface Area	m ²	2.06	2.28	2.51	2.74	2.97	3.20	3.43	3.66	3.89
Resistance/Pressure	mbar	1.5	2.1	2.2	2.8	3.3	3.3	4.5	5	6
Flue Gas Temperature (Gross)	°C	180								
Percentage CO ₂	Oil	12								
	Gas	9								

Table 3

	Model		409	410	411	412	413	414	415	416	417	
	CE Number		0085AQ0752									
	Output	kW	320	380	440	500	560	620	680	740	800	
1	Fuel	Gas	m ³ /hr	36	42.7	49.4	56.1	62.9	69.7	76.4	83.2	89.9
	Consumption	Oil	lit/hr	35.7	42.4	49	55.7	62.5	69.1	75.8	82.5	89.2
	Input (Net)	Gas	kW	347.6	412.4	477.2	542.1	607.8	672.7	737.5	803.2	868.1
		Oil	kW									
	Input (Gross)	Gas	kW	386	458	530	602	675	747	819	892	964
		Oil	kW									
	Maximum Design Pressure	Bar	6 BAR ALL MODELS									
2	Minimum Operating Pressure	Bar	1 BAR ALL MODELS									
3	Nominal Flue Connection	Ømm	300				350					
4	Flue Gas Volume	Gas Oil	m ³ /hr	472	560	648	736	825	914	1002	1091	1179
	Flue Draught Requirements		Balanced									
5	High Level Natural Ventilation to BS6644	cm ²	695	825	954	1084	1215	1345	1475	1606	1736	
5	Low Level Natural Ventilation BS6644	cm ²	1390	1650	1908	2168	2430	2690	2950	3212	3472	
6	Mechanical Ventilation	m ³ /sec	0.425	0.504	0.583	0.662	0.743	0.822	0.901	0.981	1.06	
7	Water Connection Size	BSP	5" (125mm)									
8	Water Flow at 11°C Δt	lit/sec	6.93	8.23	9.52	10.82	12.12	13.42	14.72	16.02	17.32	
8	Hydraulic Resistance at 11°C Δt	kPa	1.56	2.16	2.84	3.61	4.46	5.39	6.42	7.51	8.68	
9	Cold Feed Size to BS 6644 Min Bore	mm	38					50				
9	Open Vent Size to BS 6644 Min Bore	mm	50					53	55	58	60	
9	Safety Valve Size to BS 6644 Nominal Bore	mm	25	32	40	50			65			
	Maximum Flow Temperature	°C	90°C ALL MODELS									
10	Minimum Return Temperature	°C	55°C ALL MODELS (DIRECT COMPENSATED)									
11	Dry Weight	kg	1589	1745	1884	2028	2166	2315	2445	2585	2725	
	Water Content	kg	302	334	366	398	430	462	494	526	558	
	Power Requirements		Boiler Control Circuit 240V 1Ph 50Hz, Fused 6.3A									

See page 3 for explanatory notes

Conversion table on inside of back cover

1 Fuel Consumption

Gas fuel consumption is based on natural gas with a gross calorific value of 38.6MJ/m³. The gas rate should be corrected for meter supply pressure particularly on high pressure supplies to prevent overfiring.

Fuel oil consumption is based on Class D (35 second) gas oil with a calorific value of 58.24 MJ/lit and a density of 0.855 kg/lit, Kerosene (Class C2) has a calorific value of 53.22 MJ/lit and a density of 0.795 kg/lit.

2 Minimum Operating Pressure

This is the minimum operating pressure of the boilers with pumps operating (NOT static pressure). The requirements of the Health & Safety Executive guidance note PM5 regarding maximum operating temperatures should be observed.

3 Boiler Flue Connection

This is the nominal flue size of the flue connection spigot, for dimensional details of the flue connection spigot see Fig. 1. Actual flue size required to achieve correct draught and operation under all running conditions may need to be increased.

4 Flue Gas Volume

Flue gas volumes are given at STP (standard temperature and pressure [15°C and 1013.25 mbar]). Typical flue gas temperatures are given in Table 2.

5 Natural Ventilation

The sizes indicated are free grille areas and are based on a single boiler installation.

6 Mechanical Ventilation

The volume given is for a single boiler installation.

7 Connection Sizes

The boiler water connections are flanged with 5" PN16 welded counter flanges provided.

8 Water Flow Rates

Water flow rates are given for boiler flow and return temperature differences of 11 °C.

9 Cold Feed/Open Vent/Safety Valve Sizes

Sizes indicated are minimum sizes for single boiler installations.

10 Minimum Return Temperature

If system return temperatures below 55°C are required then contact the Potterton Commercial Technical Department.

11 Weight

The dry weight is exclusive of the burner and gas train. Each section measures approximately 1220mm (high) x 860mm (wide) x 150mm (deep) and weighs 135kg (front), 142kg (inter), 160.5kg (rear).

ANY PERSON OR PERSONS MOVING OR LIFTING SHOULD BE TRAINED IN MANUAL HANDLING TECHNIQUES AND IF NECESSARY USE SUITABLE LIFTING EQUIPMENT TO REDUCE THE RISK OF INJURY TO THEMSELVES OR OTHER PEOPLE.

Clearances

The minimum boiler room clearances for access, erection and maintenance are given in Fig. 2 and Fig. 3, the dimensions are minimum values. There is no minimum clearance above the boiler, however, it is recommended that clearance is left above the top of the instrument panel to facilitate its removal. At the front of the boiler allow as a minimum the A dimension, this is to allow access to the combustion chamber for maintenance and servicing. For P dimension please refer to relevant burner card.

Fig. 2 – Boiler Clearances

Model	Minimum Clearance (Front)					
	Nu-Way Oil A (mm)	Nu-Way Gas A (mm)	Riello Oil A (mm)	Riello Gas A (mm)	EOGB Oil A (mm)	EOGB Gas A (mm)
409	1580	1733	1555	1725	1807	1810
410	1580	1733	1555	1725	1807	1810
411	1580	1733	1600	1725	1807	1810
412	1580	1733	1600	1785	1807	1810
413	1542	1885	1610	1785	2086	2296
414	1542	1885	1610	1785	2086	2296
415	1542	2183	1610	2000	2086	2296
416	1686	2183	1950	2000	2086	2296
417	1686	2183	1950	2100	2086	2296

No special plinth is required for this boiler, a simple dry base is sufficient. Boiler footprint and base clearance details are given in Fig. 3.

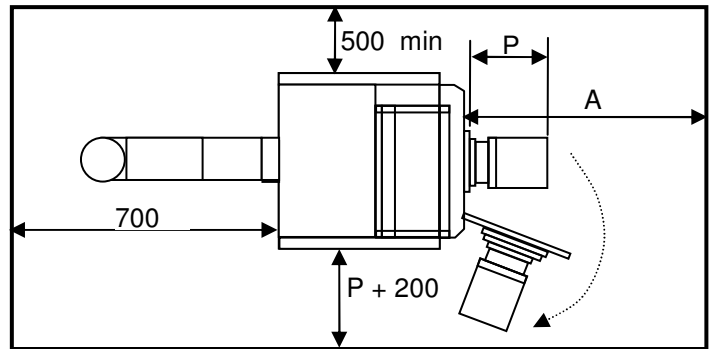
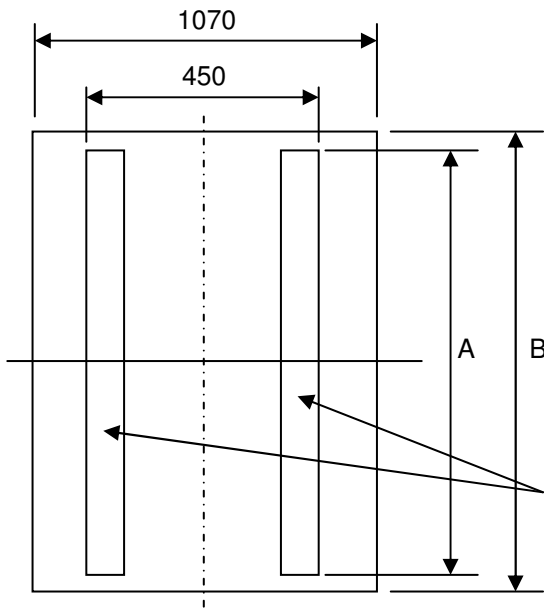


Fig. 3 – Boiler Footprint/Base Details



	409	410	411	412	413	414	415	416	417
A	1320	1460	1600	1740	1880	2020	2160	2300	2440
B	1540	1680	1820	1960	2100	2240	2380	2520	2660

Provision must be made to allow free movement of the boiler on its base.

*NOTE: Base MUST NOT protrude from rear of boiler.

150mm x 6mm Flat Plate (Not Supplied by Potterton)

General

This boiler is **NOT SUITABLE** for installation in a normally occupied area (i.e. kitchen)

A **LIFETIME GUARANTEE** is available on this boiler please refer to our standard terms and conditions for details.

The Potterton NXR4 is a cast iron sectional boiler available in outputs from 320kW (9 – sectional model) to 800kW (17 – section model). The heat transfer surfaces of the NXR4 have been specially designed to maximise the boiler efficiency and the large combustion chamber capacity ensures environmentally sound combustion reducing CO and Nox emissions. Specially designed and pre-wired control panels allow full boiler control and flow and return manifolds have facilities to fit sensor pockets for boiler management.

The boiler has match tested package burners, available for Natural Gas, 35 Second & 28 Second Oil. Dual Fuel options are also available. The package burner is supported by the front waterway section to which it is attached by hinges on one side and locking nuts on the other. Hinge points are interchangeable allowing for left or right hand door opening by turning the door assembly through 180° at the erection stage.

The NXR4 is suitable for use on fully pumped open vented systems or a sealed system with a maximum design pressure of 6-bar.

The NXR4 is an overpressure type with 5-pass reverse flame design. The first two passes are in the combustion chamber the rest in the convection tubes where turbulence to achieve high heat transfer is generated by the extended surface area achieving efficiencies of 92% (net), 86% (gross).

The NXR4 is constructed with BS1452 Grade220 cast iron heat exchanger, constructed in accordance with EN303.1. The boiler package meets Gas and Oil requirements of M&E3 and the burners EN767.

The waterway sections are joined by cast taper nipples and secured with tie rods. The combustion chamber is sealed by boiler cement and silicone.

The powder coated mild steel casings have a 50mm fibre insulation in the casing plus a 50mm fibre wrap around the castings, thus reducing fuel consumption and emissions.

The NXR4 is supplied unassembled.

Standard Supply

- Unassembled cast iron sections (number dependent on boiler output).
- Smoke box, optimising baffles, flueway door, combustion chamber door, burner adapter plate, flanged flow and return connections.
- Boiler wrap around insulation
- Insulated casing
- Cleaning brush
- Flow manifold complete with sensor pocket 3/4" screw socket and plug
- Eco control panel
- Burner

Controls

The NXR4 range is supplied as standard with an integral control panel which is fitted with, hours run meters, flue thermometer, on/off control and high/low stats, limit stat, water stat, reset button, high temperature warning light, mains on/off light and fuse.

A 240V single phase supply is taken to the control panel. A 415V three phase supply should be taken to the burner motor connections.

Optional Extras

- Sequence Controls

Shipping – Packaging

The boiler package is delivered unassembled on pallets with the burner separately either in a carton or pallet.

Pallet 1 - 4

Unassembled sections and door.

Pallet Common

Casing pack, boiler accessories, boiler fittings, tie rods, baffles, flow and return turrets and control panel.

It is recommended that the manufacturer's trained engineers should carry out erection and commissioning, as this will make the LIFETIME GUARANTEE valid, details on the rear of this manual.

Installation

Before starting work a risk assessment should be carried out in the boiler house and its access to determine and ensure a safe installation and working environment.

Any person installing or working on the boiler must be qualified and competent, and in the case of gas fired boilers attention is drawn to the mandatory requirement of CORGI. Registration and qualified to relevant ACS qualifications. They must also be electrically competent and adhere to the IEE regulations.

Manual Handling – Any person or persons moving or lifting the boiler or any part of it, should be trained in manual handling techniques and if necessary use suitable lifting equipment to reduce the risk of injury to themselves or other people.

The installation should comply with relevant British Standard Specifications, Codes of Practice and current Building Regulations, together with any special regional requirements of the Local Authorities, Gas Undertaking and Insurance Company. All electrical wiring must comply with the IEE Regulations for the Electrical Equipment of Buildings.

The installation of the boiler must be in accordance with the relevant requirements of: -

- Health & Safety at Work Act 1974
- Building Regulations 2006
- Electricity at Work Regulations 1989
- Management of H&S at Work Regulations 1992
- Manual Handling Regulations 1992
- Model Water By-laws 1986
- BS 7671: 1992 – Requirements of Electrical Installations, IEE Wiring Regulations 16th Edition
- BS 6644: 2005 – Installation of Gas Fired Hot Water Boilers for Inputs between 60kW and 2MW
- BS 7074: 1989 – Part 2 – Application Selection & Installation of Expansion Vessels & Ancillary Equipment for Sealed Water Systems
- BS 6880: 1988 – Codes of Practice for Low Temperature Hot Water Systems
- BS 779: 1989 – Cast Iron Boilers for Central Heating & Indirect Hot Water Supply (Rated Output 44kW and above)
- CP342.2 – Centralised Hot Water Supply
- Gas Safety (Installation & Use) Regulations 2002
- IM/11 Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters
- IGE/UP/1 – Soundness Testing & Purging Procedure for Non-domestic Installations

- IGE/UP/2 – Gas Installation Pipework, Boosters & Compressors for Industrial & Commercial Premises

Manufacturer's notes must not be taken in any way as overriding statutory obligations.

Boiler Siting and Base

The boiler should be sited in accordance with BS 6644 - 2005. This includes considerations for protecting the boiler from damage, air for combustion, clearances for service and access, temperatures, noise levels, the disposal of boiler water and the effects of flooding of the boiler house or seepage from a roof top boilerhouse. See Fig. 2 for required boiler clearances for service and access.

A level non-combustible floor capable of supporting the weight of the boiler filled with water, see Table 3, together with any additional weight bearing down on the base from connections, burner, etc, must be provided. This should be of an adequate height above the floor so as to be raised in case of flooding, but also low enough to allow ease of erection. Typically a 50mm concrete plinth with an area equal to that of the plan of the boiler.

For certain special installations a sound proof plinth may be necessary and a metal plinth resting on anti-vibration pads is recommended in these instances.

Consideration should also be given to fitting steel strips beneath the boiler feet for boiler base protection, see Fig. 3 for base details

The boiler has a water-cooled base and no special insulation is required. When preparing a site, reference should be made to Local Authorities and Building Regulations 2006.

LPG boilers should not be installed in basements/below ground or in a well.

Ventilation

Safe, efficient and trouble free operation of conventionally flued boilers is vitally dependent on the provision of an adequate supply of fresh air to the room in which the appliance is installed. Account must also be taken of any other fuel burning appliance existing or to be fitted when designing the ventilation and combustion air systems.

IMPORTANT: The use of an extractor fan in the same room as the boiler (or in an adjacent room in communication) can, in certain conditions, adversely affect the safe operation of the boiler and therefore must be avoided.

Further guidance on ventilation for gas appliances is provided by BS 6644 - 2005. For oil see relevant Standard.

Flue

To ensure safe and satisfactory operation the chimney system, which may be individual or common in the case of modular boiler installations, shall be capable of the complete evacuation of combustion products at all times. The effective height of the chimney terminal(s) above the boiler(s) flue outlet(s) shall ensure sufficient buoyancy to overcome the resistance of the bends, tees and runs of the flue pipe involved and shall terminate in a down draught free zone. The number of bends used should be kept to a minimum and runs of flue pipe less than 45° to the horizontal should be avoided in order to comply with the recommendations made in BS 6644 - 2005 and British Gas publication IM/11 "Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters". The third edition of the 1956 Clean Air Act Memorandum and Building Regulations should be strictly observed and approval obtained where applicable, combustion chamber details are given in Section 1.

IMPORTANT: 90° square bends must not be used on the flue system, including the boiler flue spigot, a straight length followed by an "easy sweep" or lobster back bend should be used.

Flue Size Considerations

Nominal flue connection sizes are given in Table 3, these sizes refer to the boiler flue connection spigot.

The actual size of the flue system will depend on individual site applications. Below are general considerations on sizing flue systems.

Horizontal Flue Runs

Horizontal flue runs are not recommended particularly over 3m in length, where these are unavoidable

advice should be sought from a flue system specialist.

Common Flue Systems

Where multiple boilers are installed on a common flue system the flue system should be designed to ensure the correct operation of the flue on varying load conditions. For the safe and reliable operation of the boiler plant it is recommended that the variance in flue draught available at each appliance under full and part load operation is designed to a minimum.

(It is essential that the services of a flue specialist flue system manufacturer are sought for design of common flue systems).

For further information regarding ventilation and flueing see relevant British Standard publication BS 6644 - 2005.

THE ABOVE RECOMMENDATIONS ARE FOR GENERAL GUIDANCE ONLY. POTTERTON COMMERCIAL DIVISION CANNOT ACCEPT RESPONSIBILITY FOR FLUE SYSTEM DESIGNS BASED ON THE ABOVE RECOMMENDATIONS.

Water Circulation Systems

The water circulation system should be indirect and installed in accordance with the relevant parts of British Standards Codes of Practice CP342.2 and BS 6644 - 2005.

The maximum and minimum design temperature differential across the boiler should be 20°C and 11°C and the boiler should be prevented from operating with flow rates giving a temperature difference across the boiler greater than 25°C based on the full boiler output.

Boilers operating under constant flow conditions can be more accurately controlled and are not subject to excessive temperature stresses.

The boilers **MUST NOT** be fired under any circumstances with less than the minimum water flow.

On systems with variable flow rates due to flow reducing devices, i.e. TRVs, zone valves, etc, or where the minimum heat demand, i.e. Summer domestic hot water load, does not achieve the minimum boiler flow rate then consideration shall be given to incorporating a primary loop system.

It is recommended that the system is designed to give a constant boiler flow rate.

Boiler Protection

The provision of pump overrun by a time delay relay or a thermostat situated in the flow pipe close to the boiler is essential to remove residual heat from the boiler, see Fig. 20, Section 6.

Unions and isolating valves should be fitted to the flow and return manifolds so that the boiler can be isolated from the system if the need arises. Your legal obligations must be adhered to (i.e. appropriate safety valves must be fitted).

System Water Quality

High efficiency boiler systems require the water quality of the system water to be controlled by the use of inhibitors to maintain a neutral Ph and inhibit corrosion. Additionally the water system should be free of leaks to prevent raw water make up which will dilute any inhibitors, promote corrosion and form lime scale.

Existing Systems

On existing systems where boilers are being replaced due to failure then the cause should be investigated before installing new boilers. This can normally be achieved by cutting open a failed boiler section and examination for system debris or contamination.

Lime scale is a positive indicator of continuous system water make up due to water loss. Evidence of magnetite (black sludge) in the system and the formation of gas in radiators causing air locking is a positive indicator of corrosion.

Where an old system shows evidence of contamination then system cleaning should be carried out before installation of new boilers. The heating system should be chemically flushed to remove any lime scale or corrosion and a corrosion and lime scale inhibitor added. Lime scale descalers if incorrectly used could cause any remaining system debris to continue to breakdown and contaminate the new boiler causing boiler failure.

Advice on system cleaning and suitable products should be sought from specialist suppliers of system cleaners such as Fernox or Sentinel.

It is important to note that corrosion inhibitor can only be used in an attempt to prevent corrosion from occurring, where a system has an existing corrosion problem, inhibitors will be ineffective and the system requires cleaning.

On existing systems where comprehensive descaling and de-sludging cannot be carried out then consideration should be given to separating the new

boiler system from the existing system pipe work by the use of plate heat exchangers.

New Systems

New pipe work systems should be thoroughly flushed with a suitable cleaning agent to remove debris and flux residues before filling. The system water should be dosed with a suitable corrosion and lime scale inhibitor.

System Water Monitoring

The system water should be monitored as part of a maintenance programme to ensure the following.

Raw water make up is not occurring.

Corrosion and lime scale inhibitors are still active.

Water Ph is below Ph 8.5 other wise on systems with aluminium content, component failures may occur.

Sealed Systems

General

Potterton Commercial boilers are suitable for use on sealed systems designed in accordance with BS 6644 - 2005 and BS 6880 Part 2. In addition, reference should be made to the Health & Safety Executive guidance note PM5 "Automatically Controlled Steam & Hot Water Boilers".

Boiler Erection

A lifetime guarantee is available on this boiler when erection and commissioning is carried out by the Potterton Commercial service department and the system meets with our recommendations. Please refer to our standard terms and conditions for further details.

Risk Assessment

Before starting work a risk assessment should be carried out on the boiler house and its access to determine and ensure a safe installation and working environment.

Regardless of the type of activity being assessed, the principles of risk assessments are the same. The basic steps are: -

- Classify Activity
- Identify Hazards
- Identify Existing Control Measures
- Determine Risk
- Assess Acceptability of Risk
- Prepare a Control Plan
- Implement Plan
- Review Plan
- Record Results

Manual Handling

Any person or persons moving or lifting the boiler or any part of the boiler, should be trained in manual handling techniques and if necessary use suitable lifting equipment to reduce the risk of injury to themselves and other people.

Personal Protective Equipment

When undertaking any work you must comply with the Personal Protective Equipment Regulations 1992.

Confined Spaces

A "confined space" as defined in the Health & Safety Confined Spaces Regulations 1997 means 'any place, including any chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk'.

Precautions should be taken in all areas where by virtue of its even partially enclosed nature, pose a reasonably foreseeable specified risk.

Electrical Safety

Working on appliances can be broken down into two main systems of work.

- 1 Safe systems of work are adapted for all boiler maintenance and repair work undertaken on site.
- 2 The work undertaken does not affect the electrical safety of the appliance. In particular the earth connected to the buildings fixed electrical installation

In the case of (1) above, electrical work should only be undertaken once the boiler has been isolated from the electricity supply and confirmed electrically dead. If this is impractical then suitable precautions must be undertaken to prevent injury.

In the case of (2) above, checks are specified to identify any abnormality in the electricity supply to the boiler, as well as to confirm that the boiler electrical connections are reinstated correctly where it is necessary to disconnect or reconnect any internal wiring within the boiler.

If it is necessary to disconnect and reconnect the appliance from the site electrical installation other than by means of a plug and socket then additional checks shall be undertaken by an approved engineer to check the earth loop impedance with IEE regulations.

Always carry out preliminary electrical safety checks.

All appliances and central heating systems must be provided with their own means of isolation for safety purposes especially during installation and maintenance.

Preparation

Preparatory to installation of the boiler a check must be made to ensure that suitable facilities are available for off-loading of the individual waterway sections and conveying them to the boiler room. Each waterway section weighs approximately 142 kg and measures 220mm x 860mm x 150mm. Ensure all manual handling techniques are followed.

Particular attention must be paid to ensuring the cleanliness of the boiler room and waterway sections, dust or moisture may result in imperfect adhesion of the sealants which are applied during the erection of the waterways. All tapped holes should be degreased before making connections.

C.O.S.H.H.

During the erection procedure there are a number of items which are subject to the Control of Substances Hazardous to Health (COSHH) Regulations, and may require specialist personal protective equipment (PPE) beyond what is normally required. Listed below are the items subject to the COSHH regulations and the recommended precautions that should be taken. For a full breakdown of any of the substances listed below, please contact the Commercial Technical Department.

- 1 **Boiler Gasket** - No special precautions need to be taken but the use of normal PPE equipment is recommended.
- 2 **Ceramic Sealing Braid** - Wear gloves, overalls and safety glasses. In the case of an irritation rinse the affected area with water and wash gently. In the case of eye contact, flush abundantly with water. If irritation persists seek medical advice.
- 3 **Silicone** - Wear gloves, overalls and safety glasses. In the case of an irritation rinse the affected area with water and wash gently. If irritation persists seek medical advice.
- 4 **Mastic** - Wear gloves, overalls and safety glasses. In the case of an irritation rinse the affected area with water and wash gently. If irritation persists seek medical advice.
- 5 **Ceramic Fibre Mineral Wool** - Wear gloves, overalls and safety glasses. In the case of an irritation rinse the affected area with water and wash gently. In the case of eye contact, flush abundantly with water. If irritation persists seek medical advice.

**Potterton Commercial Customer
Erection/Assembly Check List**

The items listed below have been put together as a guide to the actions that should be completed before the erection/assembly of a boiler takes place.

- 1 Site access available for persons carrying out the proposed work.
- 2 Site managers/personnel aware that work will be taking place.
- 3 Risk assessments carried out on possible risks that may affect the persons carrying out the proposed work.

- 4 Sections and fittings boxes should be positioned adjacent to the plinth(s) within the boiler house prior to persons carrying out the proposed work attending site. If this is unable to be done notice prior to attending site is to be given.
- 5 When boilers are to be stripped and rebuilt, labour and transport should be provided for moving the sections from the delivery point to the final erection point. If this is unable to be provided notice prior to attending site should be given.
- 6 Sections/casing, etc, should be kept in a clean dry area prior to erection/assembly.
- 7 Water should be available.
- 8 A drain off area should be available.
- 9 Power should be available
- 10 A site representative should be available at all times.
- 11 Clear instructions supplied to the persons carrying out the proposed work regarding positioning the boiler.
- 12 Fire evacuation procedures, facilities availability, specific health and safety information, etc, should be provided.

Items 7 to 10 are essential if boilers require pressure testing.

Boiler Erection

Section Assembly

The boiler sections are not self-supporting until the boiler block is fully assembled. The sections are connected using a nipple system. To ensure a sound water tight fit nipple sealing paste is provided for assembling the sections.

IMPORTANT: Ensure the boiler is adequately supported especially when pulling up sections. The Manual Handling Regulations should be followed.

Erect the Boilers as follows: -

- 1 Open the boiler fittings box.
- 2 Clean the nipples using a solvent cleaner (not supplied), ensuring all guidelines are followed.
- 3 Clean both the top and bottom nipple ports of **all sections** with a solvent cleaner and ensure that they are rust free, dirt-free and burr free, if necessary clean with emery cloth.
- 4 Stand the rear section up and ensure that it is supported securely. Ensure correct manual handling techniques are used.
- 5 On the rear section clean the groove with a metal brush prior to application of the heat-resisting compound. Paste the machined edges and external groove (see Fig. 5)

CAUTION: To ensure leak free assembly never use old nipples and only use the special compounds supplied with the boiler.

- 6 Using a clean brush coat the nipples and nipple ports with the compound supplied.
- 7 Insert the nipples into the nipple ports by hand and using a piece of wood and a hammer/mallet gently drive the nipples into place. Do not drive them in too far as tightening should be achieved when bringing the sections together.

Ensure that the nipples fit square and check depth of penetration by using the template supplied (see Fig. 5).

Ensure that the nipples are correctly aligned as an out of line nipple can cause the section to crack when it is pulled up.

- 8 Clean the nipple ports on the rear intermediate section and apply the sealing compound. Position the intermediate next to the rear section with the letters AR facing forwards.
- 9 Slide the sections together so that the intermediate section nipple ports slightly engage with the corresponding nipples on the rear section. Ensure all manual handling techniques are adhered too.
- 10 Using a piece of wood and a hammer/mallet hit the top and bottom nipple ports on the intermediate section alternately so as to achieve temporary assembly. Ensure that they fit perfectly and squarely and then proceed with tightening as described under "Tightening the Sections".

Ensure that the intermediate section is aligned parallel to the rear section.
- 11 Apply the heat-resisting compound to the nipple ports ready to receive the next section.

Fig. 4 – Fluegas Passes

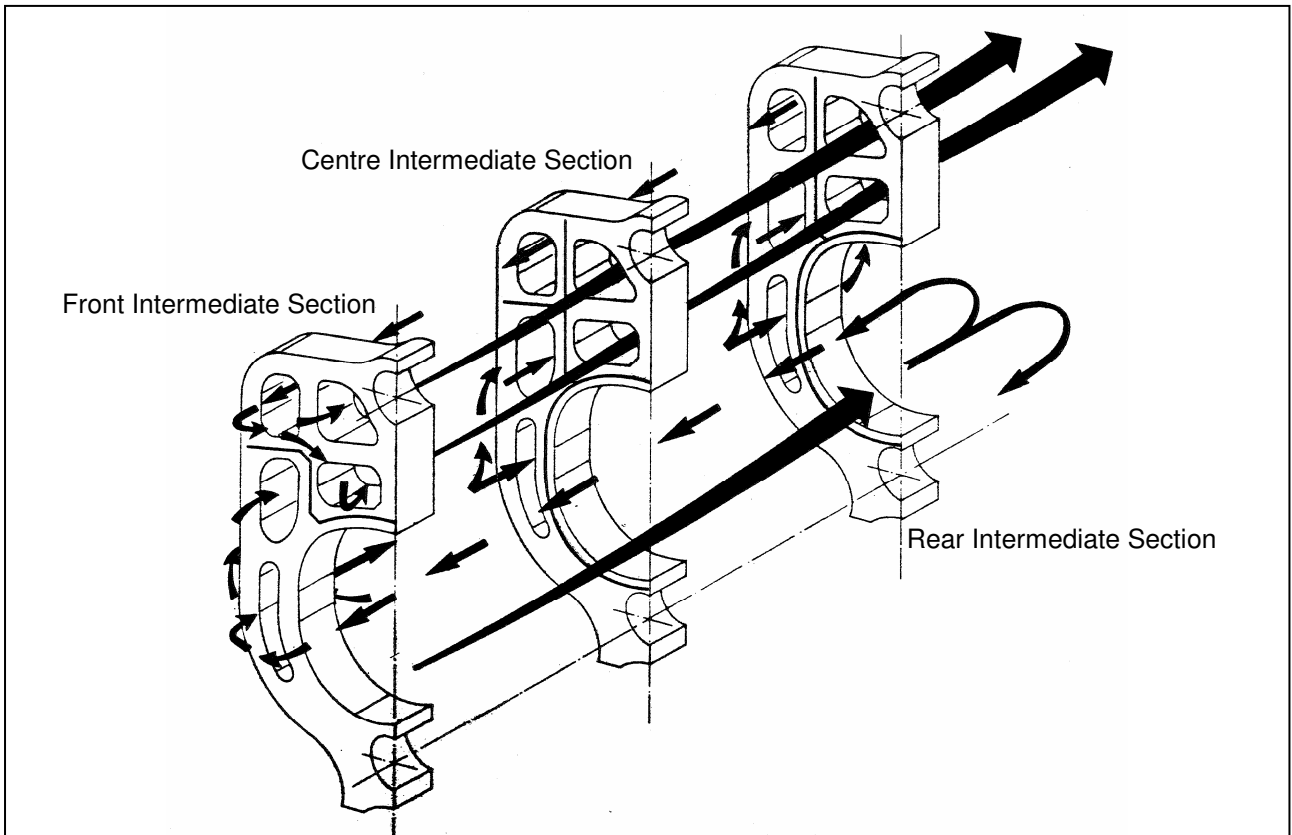


Fig. 5 – Section Build

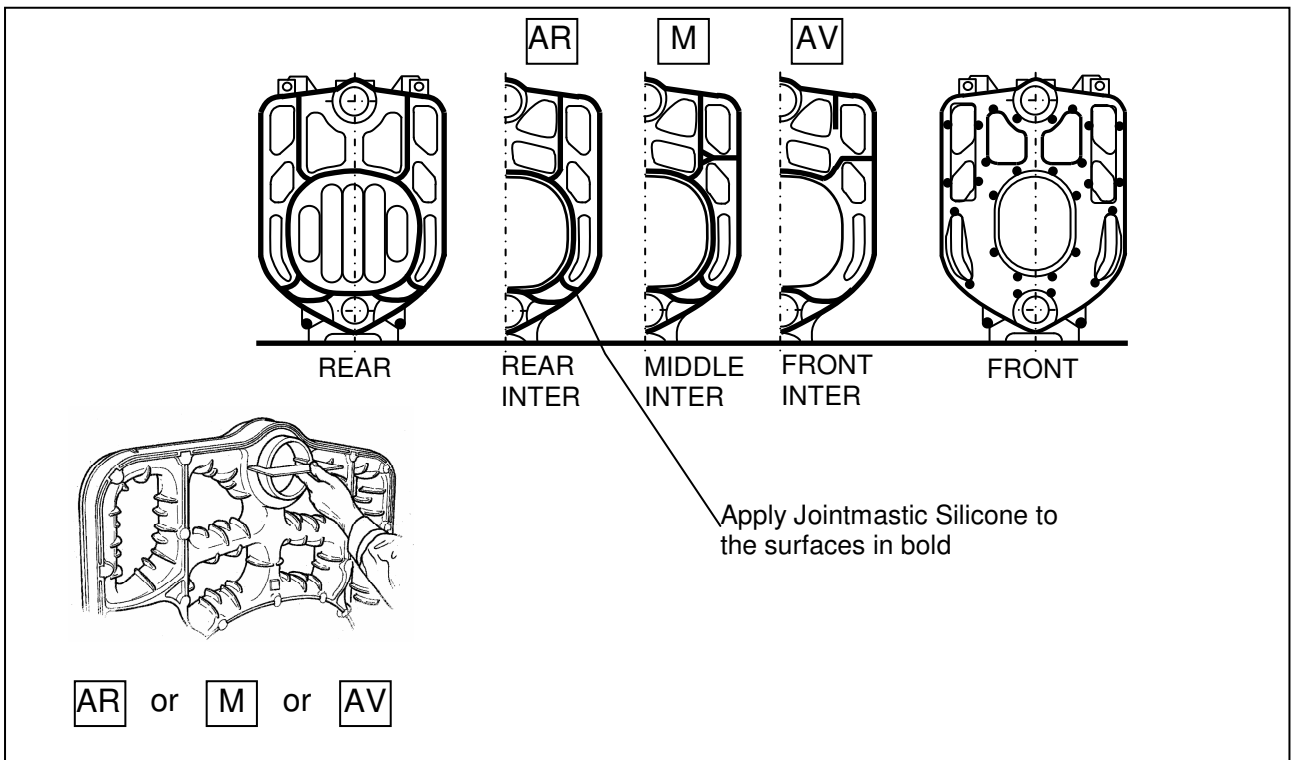
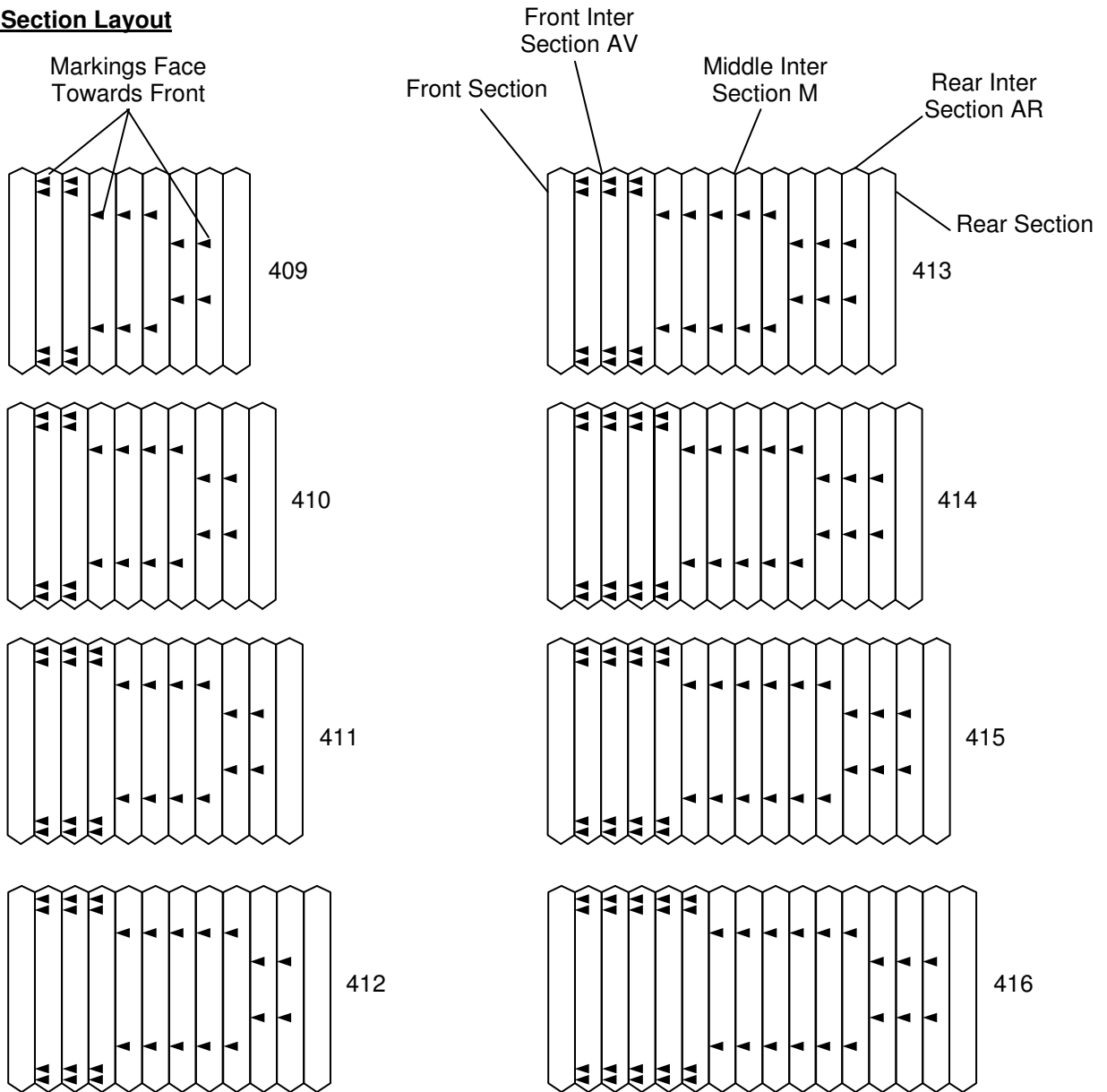
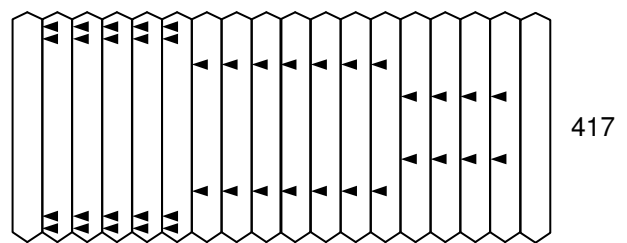


Fig. 6 – Section Layout



SIZE	No of Sections				
	Front	Front Inter	Middle	Rear Inter	Rear
409	1	2	3	2	1
410	1	2	4	2	1
411	1	3	4	2	1
412	1	3	5	2	1
413	1	3	5	3	1
414	1	4	5	3	1
415	1	4	6	3	1
416	1	5	6	3	1
417	1	5	6	4	1



Pulling Up The Sections

In order to erect the boiler it is necessary to use a set of assembly tools, please find options available:

- 1 Use our Potterton Commercial Service Department to erect the boiler.
- 2 Purchase of assembly tools from ourselves.
- 3 Supply your own assembly tools.

Note: Sections should be pulled together one at a time.

In each case the following method of assembly is recommended.

- 1 Assemble the top and bottom pulling up bars through the top and bottom nipple ports and pull up the sections until metal to metal contact is made. This will cause the compound between the sections to squeeze out.

The sections should be pulled up evenly applying equal pressure to top and bottom pulling up bars. Section alignment should be checked throughout the process.

To ease assembly tap around the periphery of the sections with a mallet.

NEVER HIT THE MACHINED SURFACES.

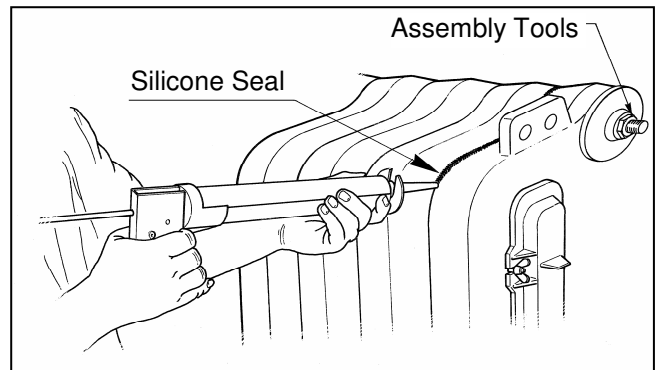
- 2 Proceed for the other sections one by one as before.

CAUTION: It is imperative that the intermediate section assembly order is adhered to (see Fig. 6). The markings AR, M and AV (see Fig. 5) must always be pointing towards the front and all arrows must face the same way.

After having assembled three or four sections fit the rear Stainless Steel Furnace Protective Plate in position against the rear section (see Fig. 10).

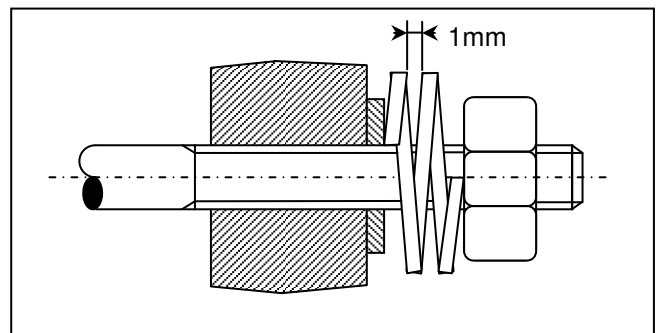
Complete the assembly with the front section proceeding as before.

- 3 Keep the assembly tight and seal the joints externally as follows:-
 - i) Clean the "V" groove between each pair of sections and allow to dry.
 - ii) Apply the silicone seal with the gun provided (see Fig. 7).
 - iii) Smooth the bead with a damp tool (e.g. A spatula).

Fig. 7 – Sealing

- 4 Fit the tie rods and tighten as follows:-

Fit the special spring washers (see Fig. 8) at the rear ends of the rods. Tighten the nuts leaving a 1mm gap between each turn of the spring washer. This operation should be carried out one rod at a time.

Fig. 8 – Tie Rod Fixing

- 5 Loosen the assembly bars and remove
- 6 Continue with assembly of the boiler.

Exchanger Assembly

Open the "Accessories for Exchanger" package.

Flow Distributor

Insert eight M16 x 65 studs around the rear section flow and return orifices. If necessary on sizes 412 to 417 insert the flow distributor with its gasket (see Fig. 10) into the return orifice.

Boiler Set Up

Set the exchanger in its final position and ensure it is level. Ensure that each section is in contact with the base, if not use metal shims.

Top Flange

Fit the four M16 x 66 studs on the upper part of the front section. Fit the top flange inserting its gasket and using four nuts and six washers.

Sensor Pocket

Screw the two sensor pockets into both of the threaded holes in the top flange.

Sludge Flushing Bottom Flange

Fit four M16 x 66 studs on the lower part of the front section. A 2" threaded hole is provided on this flange to enable a flushing valve to be fitted. This is not a United Kingdom requirement so the 2" blanking plug provided should be fitted.

Outlet Manifold

Fit the outlet manifold onto the four upper studs on the rear section with the 1/2" orifice on the top not forgetting to insert the gasket (see Fig. 10). Fit the 1/2" sensor pocket into this orifice.

Inlet Manifold

Fit the inlet manifold onto the four lower studs on the rear section with the 1/2" tapping on the top not forgetting to insert the gasket. Fit the 1/2" sensor pocket into this tapping. Fit the 1" - 3/4" reducing bush into the side tapping and fit the 3/4" drain cock into the bush.

Fig. 9 – Burner Door

Slip on the Welded Flange

Connect the PN16 – DN 125 flanges onto the pipework then fasten them to the manifolds inserting the seals (eight HM16 x 75 bolts, eight nuts, and eight washers for each flange).

Hydraulic Test

After checking the connections proceed slowly with filling the system ensuring that all air is purged. After filling carry out the hydraulic test (1.5 x working pressure).

Flue Hood (see Fig. 10)

Screw the shortest thread section of the four M8 x 40 studs into the upper part of the rear section. Fit and bond the ceramic cord. Fit the fluehood onto the studs and fasten with four HM nuts and four washers. Tighten the nuts.

Flue Connection

Connect by the most direct route possible without reducing the flue size into the stack. Check for correct connection.

Flue Access Doors

Screw the eighteen M8 x 45 studs into their positions in the front section (see Fig. 10). Position the pre-assembled flue access covers (see Fig. 10). Fasten into position with the wing nuts provided. On the door hinge side the access door wing nuts must be replaced with a standard HM8 nut in order to allow the door to open.

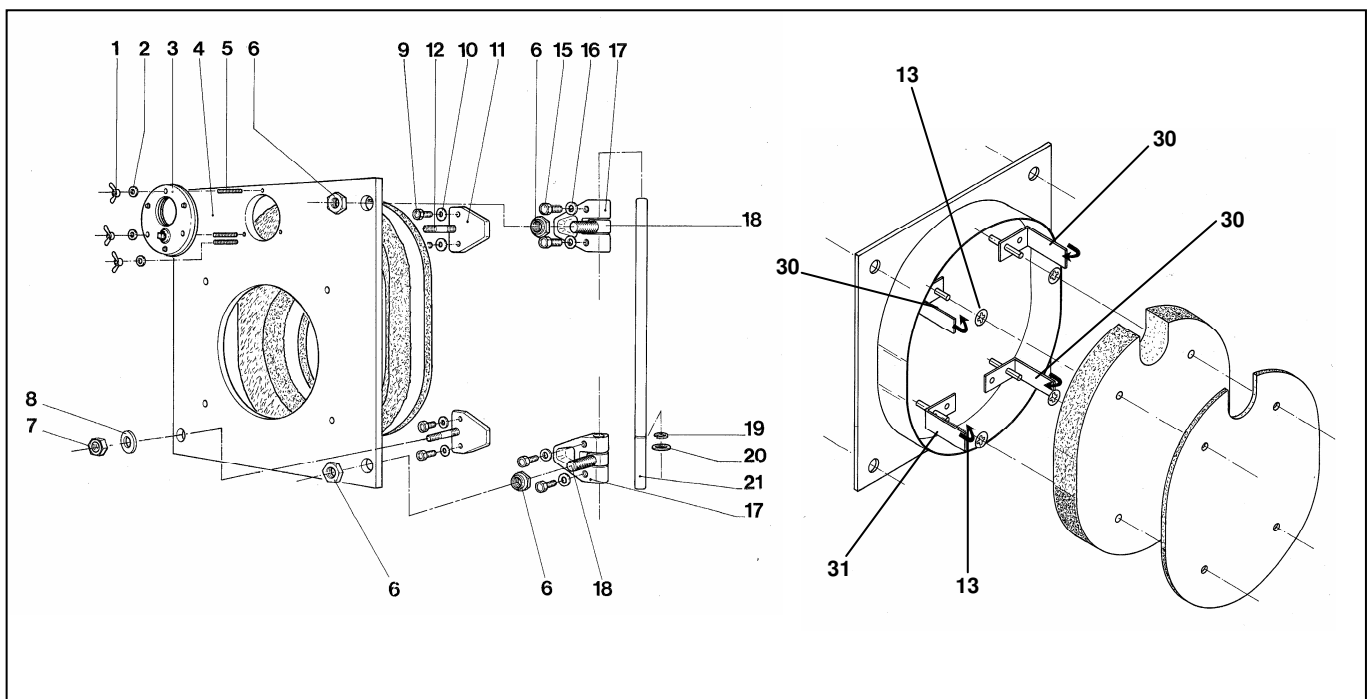
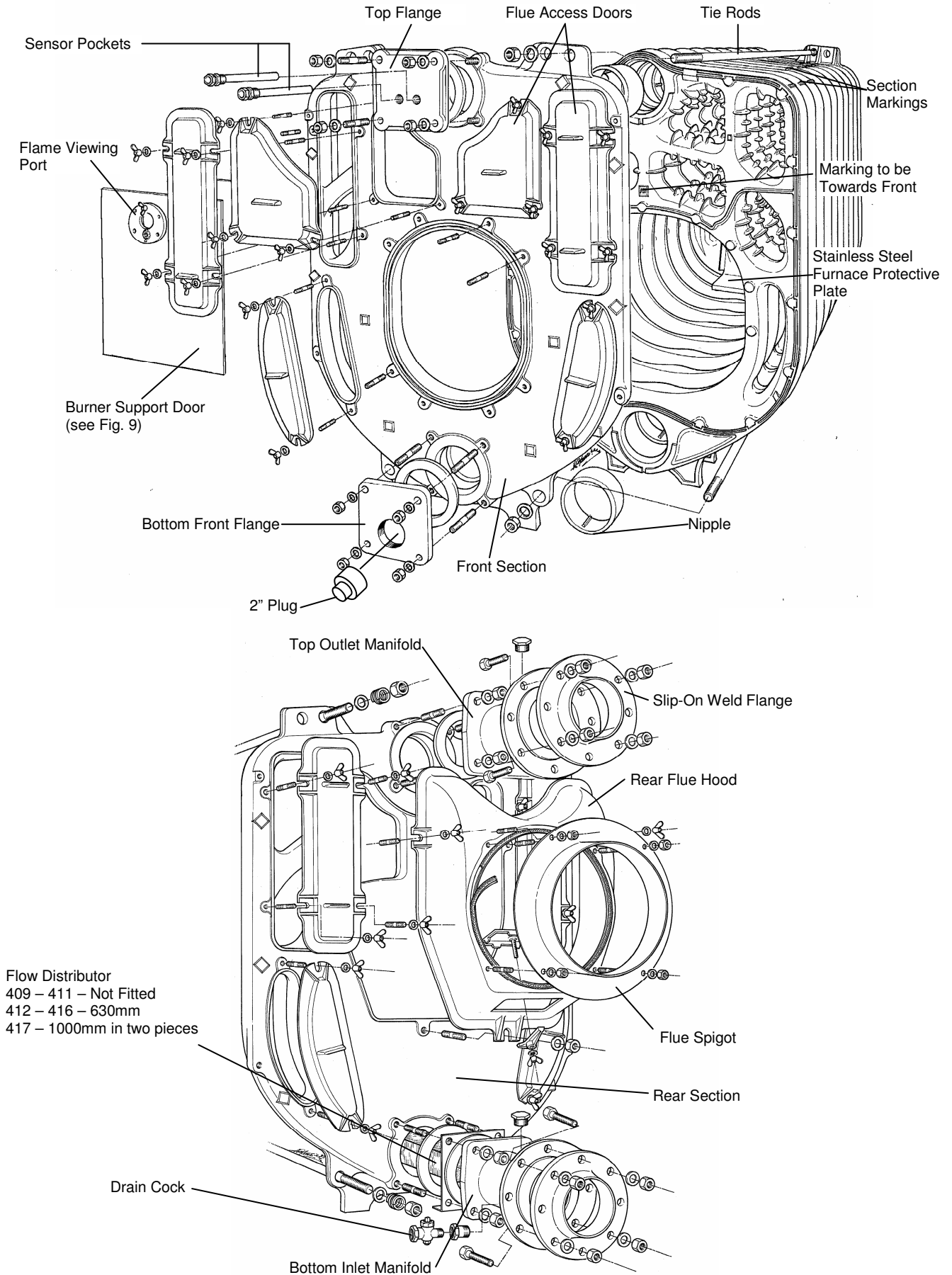


Fig. 10 – Exchanger (Exploded View)



Burner Support Plate (see Fig. 9)

Bond the ceramic fibre cord in the front section groove (the cord should be joined on the opposite side to the hinges).

Mount the complete sight glass (item 3) onto the door (item 4) with the studs (item 5), washers (item 2) and wing nuts (item 1) provided.

Place the circlip (item 19) onto the hinge pin (item 21). Slip the male (item 18) and female (item 17) hinge pieces and washers (items 20) onto the hinge pin.

Fit the complete assembly to the boiler using the screws (item 15) and washers (item 10).

Fit the fastening plates (item 11) onto the boiler with the screws (item 9) and washers (item 10). Screw the studs (item 12) into the fastening plates.

Screw the centring nuts (item 6) onto the male hinge piece (item 18). Fit the door onto the hinge (item 18) and screw the other two centring nuts (item 6) onto the hinge (item 18).

Burner Door (see Fig. 9)

Set the four stainless steel lugs (30 and 31) using the "Rapid" fastening system on Ø8 rods.

Place the mineral wool insulation (brown) against the door then the ceramic fibre (white) on the combustion chamber side (see Fig. 9).

Fold the four stainless steel lugs over the ceramic fibre.

Cut the insulation material using the burner draught tube as a template. This can be easily cut using a sharp knife or hacksaw blade.

Close the door and fasten using nuts (item 7) and washers (item 8). Adjust the door to ensure a leak-tight seal by adjusting nuts (Items 6 & 7).

IMPORTANT: After a few hours operation, check the door tightness. Adjust if necessary using the four adjusting nuts (item 6) on the hinge side and the two locknuts (item 7) on the opening side.

Fig. 11 – Insulation Blanket Position

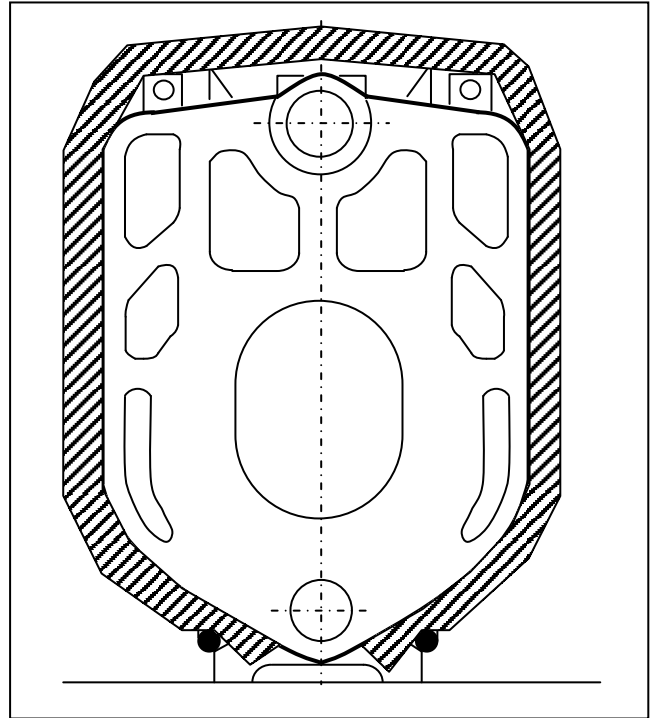
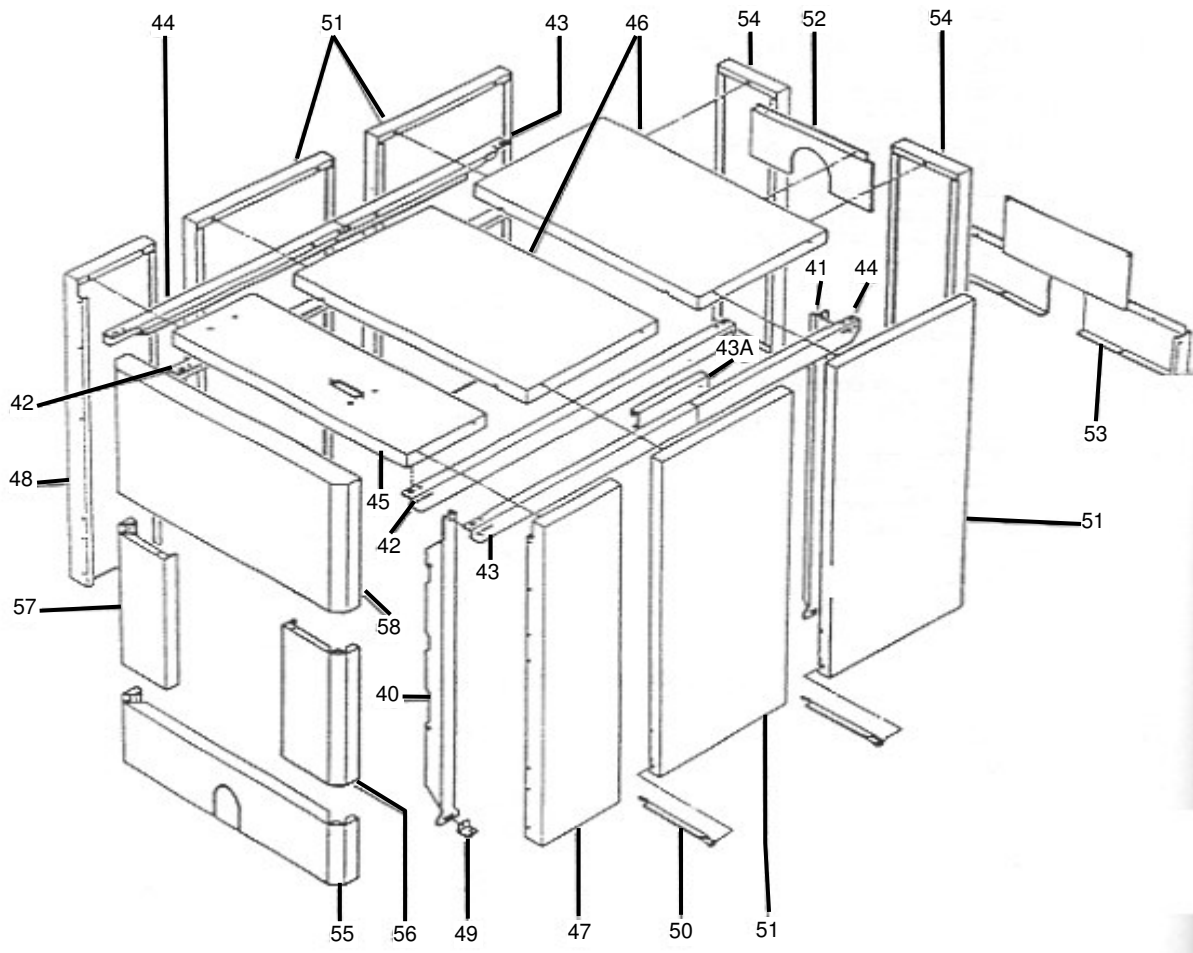


Fig. 12 – Number & Width of Side Panels

Boiler Size	Number & Width of Side Panels			
409	325	980		
410	325	560	560	
411	325	700	560	
412	325	700	700	
413	325	840	700	
414	325	840	840	
415	325	980	840	
416	325	980	980	
417	325	700	700	700

Fig. 13 – Casing (Exploded View)

- 40 Front Right / Rear Left Upright
- 41 Front Left / Rear Right Upright
- 42 Cross Member
- 43 Common ½ Cross Member
- 43A Splice Plate
- 44 ½ Cross Member
- 45 Front Top Panel
- 46 Top Panel
- 47 Front Right Side Panel
- 48 Front Left Side Panel
- 49 Side Fastening Bracket
- 50 Side Fastening Lug
- 51 Side Panel
- 52 Upper Rear Metal Plate
- 53 Lower Rear Panel
- 54 Rear Side Panel
- 55 Lower Front Panel
- 56 Right Front Panel
- 57 Left Front Panel
- 58 Upper Front Panel
- 59 Bag of Casing Screws

Fitting The Casing

Open both casing packages.

Exchanger Lagging Materials (see Fig. 11)

Cover the whole exchanger with the lagging blanket (50mm thick) which is supplied in several 3.2m long strips.

Assemble the strips using pins.

Wedge the ends of the lagging blanket between the exchanger and tie rods.

Vertical Uprights (40 & 41)

Place the vertical uprights on the boiler front (two screws HM8 x 16 with washers). Do the same at the back of the boiler.

Left & Right Hand Cross Member (42, 43, 43a & 44)

For boiler sizes 412 to 417 the cross member is supplied in two pieces with a splice plate (43a). Assemble these two half cross members (43 & 44) using the splice plate to join them.

Mount the cross members with a larger stud vertical on the uprights. Secure with one M8 x 16 screw in the front square hole and one M8 x 16 screw with washer in the rear oblong hole.

Align the front ends of the cross members with the vertical uprights on the front of the boiler.

Securely fasten the uprights and the cross members.

Front Top Panel (45)

Place the front top panel on the cross members with the locking pegs pointing to the back. Centring is carried out using the locking peg found underneath the top front panel which locates in the square hole in the top of the cross member. Secure using two M5 screws in the oblong holes.

Top Panels

Assemble as per Fig. 12 working from the front top panel locating the locking pegs in the square holes. Put two M5 screws in the oblong holes but do not tighten.

Right & Left Front Panels (47 & 48)

Hook the side front panel onto the top front panel using the two locking pegs. The side panel locking pegs are located on the front.

Side Fastening Bracket (49)

Insert the side panel fastening bracket pin into the lower fold of the side panel. Secure to the upright with one M5 x 10 screw.

Fastening Pin (50)

Clip the bottom bracket onto the boiler tie rod. Insert the pin into the side panel. Slide the pin along the tie rod to line up with the panel.

Side Panels (51)

Place the side panels on the fastening holes of the intermediate top panels (see Fig. 12). Rotate the panel to clip it in the pin of the bottom bracket. Continue in this way with the rest of the side panels finishing with two fastening pins.

Adjustment

To carry out complete casing adjustment start on the right, pull the top panel forwards and secure the fastening pin screw at the bottom. Do the same on the left front and then the rear.

Lower Back Panel (53)

Locate the panel around the manifold and slide it into the notches.

Upper Back Metal Plate (52)

Secure in place using two M5 x 10 screws.

Right & Left Rear Side Panels (54)

Hook the left and right side panels onto the fastening lugs.

Lower Front Panel (55)

There is a pre-cut recess in this panel to accommodate the flushing valve if fitted. The lagging blanket may need to be cut. Hook onto the side panel pegs.

Left & Right Front Panels (56 & 57)

Position these panels on the left and right of the burner door opening using the locking pegs.

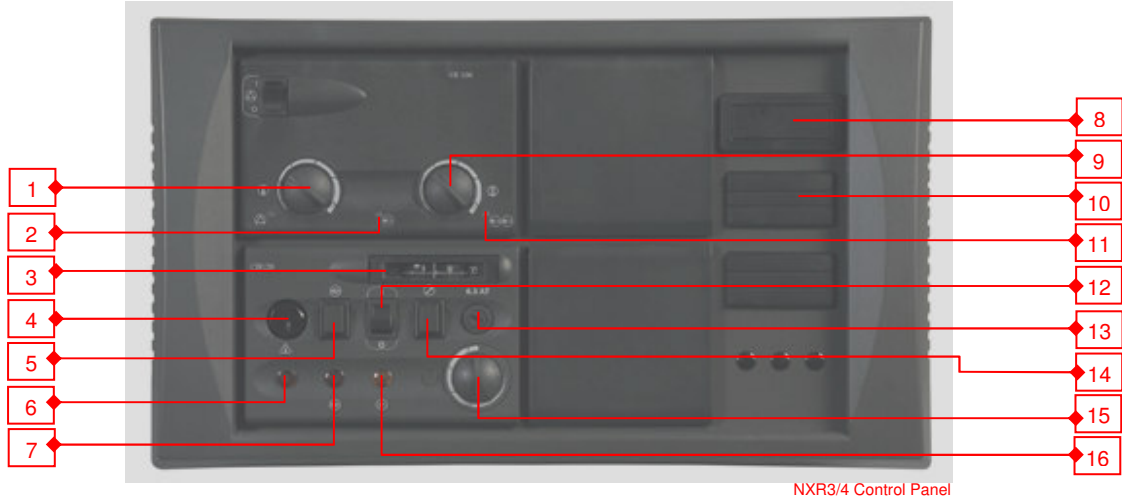
Control Panels

Assemble the panel as shown on in Fig. 14 & 15.

Upper Front Panel (58)

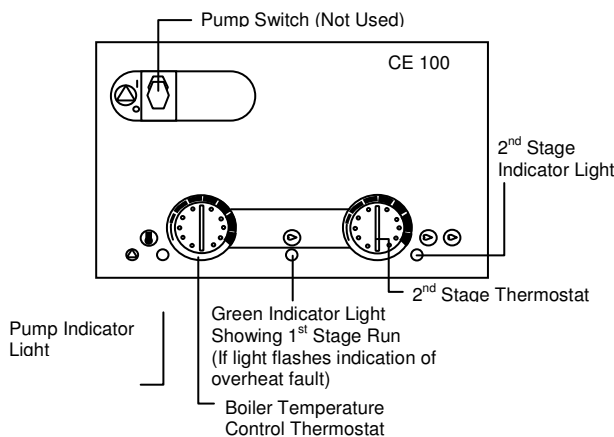
Locate this panel on the pins fitted in items 56 and 57. The panel is held in position with magnetic catches.

Fig. 14 - Control Panel Configuration



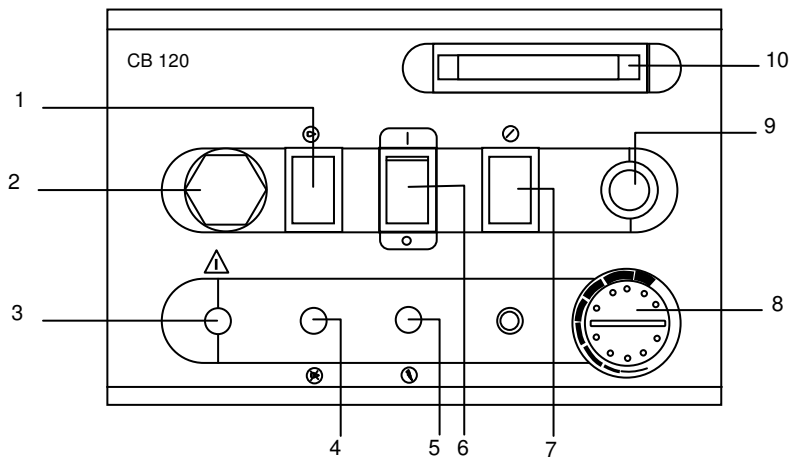
1	Control thermostat	9	2 nd stage time delay
2	1 st Stage indication light	10	1 st stage hours run meter
3	Boiler thermometer	11	2 nd stage indication
4	Overheat thermostat	12	On/off switch
5	Reset button	13	6.3 amp fuse
6	Overheat indicator	14	Over-ride button for safety checks
7	Lockout indicator	15	Over-ride thermostat
8	Flue gas thermometer	16	Mains supply indicator

Fig. 15 - Control Panel Operation



The CE 100 module provides the following functions

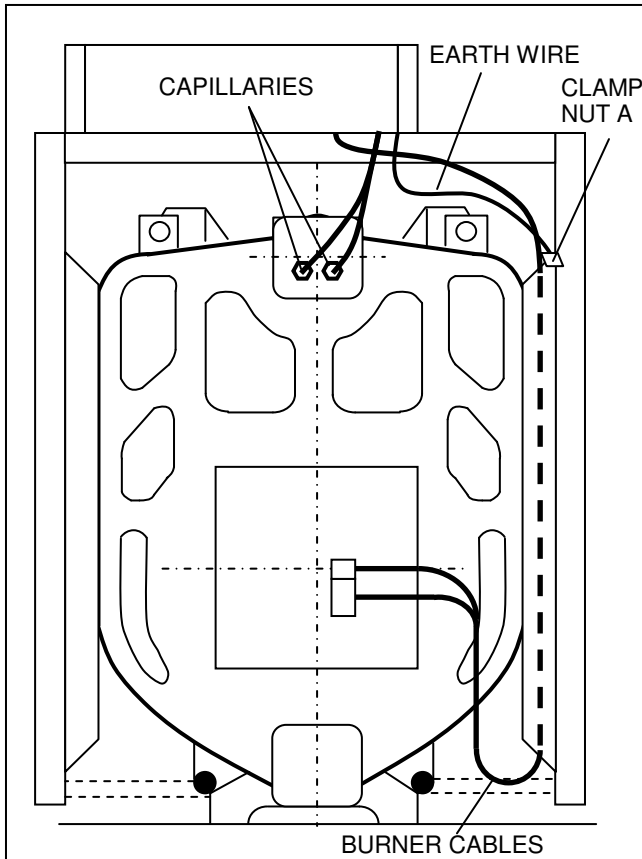
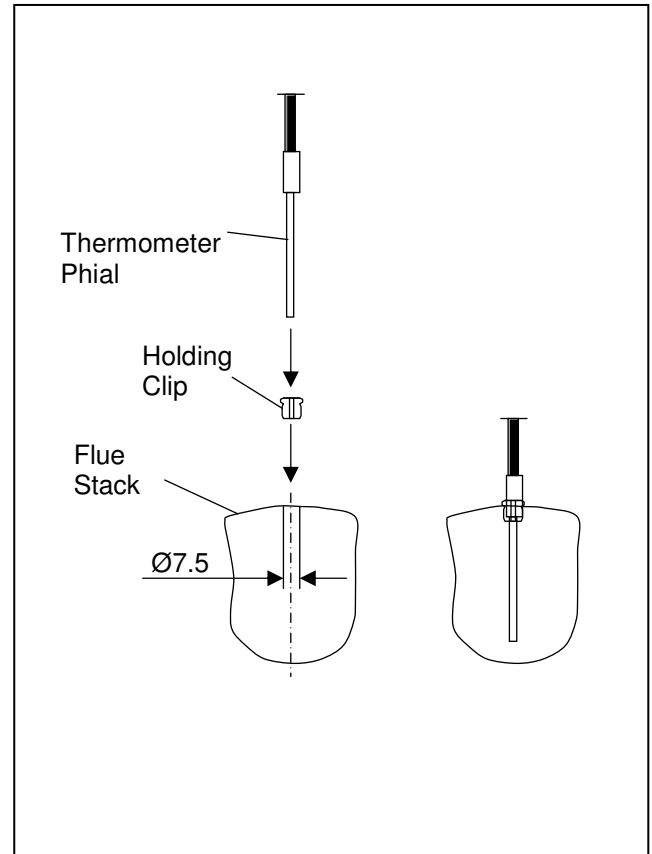
- Operation at 1st Stage
- Detection of boiler overheat, ionisation probe fault
- Ability to restrict max boiler temperature using jumper at back of module
- Indication of the operation mode of the boiler
- Operation of 2nd Stage operation



The CB 120 module provides the following functions:

- 1 **Reset button** – if during normal operation the flame is lost then the boiler will proceed to go to a lockout condition to reset the lockout press this button. For repeated lockouts please contact your service agent.
- 2 **Overheat thermostat** – if overheat indicator light is illuminated then the overheat thermostat needs to be re-set, this is achieved by removing the hexagonal cap and pressing the reset. The overheat thermostat will operate at 110°C, investigation into the reason of lockout should be carried out.
- 3 **Overheat indicator** – the indicator light will illuminate to inform you the boiler has gone to an overheat condition and will not re-start until a manual reset has taken place as described above.
- 4 **Lockout indicator** – if during the burner lighting sequence the control box fails to detect the pilot flame or it goes out during operation then the burner will go to lockout and the light will be illuminated.
- 5 **Mains supply indicator** – indicates that the power has been turned on to the boiler.
- 6 **On/Off switch** – turns the burner On or Off. **This is not a boiler isolator switch**, components are still live even when the switch is off (mains inlet to the boiler still requires a suitable 3-pole isolator).
- 7 **Over-ride button for safety checks** – if this button is depressed it bypasses the control and high/low thermostats and fires the boiler on high fire, it is used to check the operation of the overheat thermostat.
- 8 **Over-ride thermostat** – (set to the right (maximum position) allowing control by the 1st stage and 2nd stage thermostats).
- 9 **6.3 Amp Fuse**
- 10 **Boiler thermometer** – indicates the current boiler temperature.

Also supplied are a 1st Stage & 2nd Stage hours run meters for indication purposes. A flue gas thermometer is also supplied for indication of the flue gas temperature, to fit the flue gas thermometer drill a 7.5mm diameter hole, preferably vertically, in the flue between the flue hood and the stack, insert the thermometer and clip.

Fig. 16 – Cable Routing**Fig. 17 – Fitting Thermometer into Flue****Flue Gas Thermometer**

The housing for the thermometer is positioned on the control panel front and the thermometer in the flue stack.

- 1 Remove top of control panel and open the front.
- 2 Remove the factory mounted blanking plate and engage the capillary and the thermometer housing in the front aperture.
- 3 Guide the capillary through the control panel rear and casing front top parallel to the other installed capillaries. Run the capillary along the insulating blanket towards the back of the boiler to enable the thermometer to be placed in the connection pipe between the flue hood and the stack.
- 4 Drill, preferably vertically, the flue gas duct to 7.5mm \O and insert the thermometer holding clip (see Fig. 17).
- 5 Insert the thermometer into the clip.
- 6 Close the control panel and refit the top.

Burner Cables

The NXR4 is supplied as standard fitted with a 7-pin and a 4-pin Weiland plug for connection to the burner.

High/Low Burner

The 7-pin and 4-pin Weiland plugs should be connected to the respective plugs provided on the burner.

Fitting The Burner

- 1 Check that the burner which has been supplied is the correct burner for the boiler, by checking the specification on the burner card provided.
- 2 Fit the burner adaptor plates and the boiler gasket to the boiler using the fixing screws provided.
- 3 Place the burner gasket over the burner fixing studs.
- 4 Insert the burner draught tube into the firing door aperture with the gasket in position on the mounting flange. Secure in position with the nuts and washers provided.

- 5 Connect the fuel supply to the burner. The fuel supply pipes should be self supporting and not apply undue pressure on the burner.
- 6 Connect the burner cable and plug to the Weiland plugs from the control panel.
- 7 Check that the weight of the burner has not affected the sealing of the door to the front section, especially after the door has been opened and closed several times.
- 8 Larger burners, especially dual fuel types, should be supported independently with a suitable device whilst still allowing the door to be opened.

Connections

Boiler & Burner Power Supply

The NXR4 is supplied with either single phase or three phase burners. The electrical supply to the boiler installation should be connected via a fused isolator.

Single Phase Installation

Install a 230V 50Hz single-phase electrical supply (min cable rating – 6.3A) to the boiler instrument panel. No separate electrical supply for the burner is required. The burner is powered from the instrument panel lead provided (Fig. 18).

Fig. 18 – Boiler & Burner Power Supply

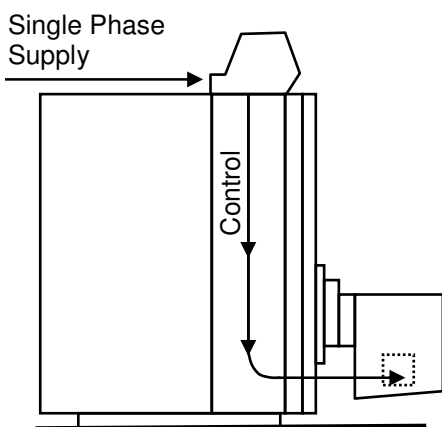
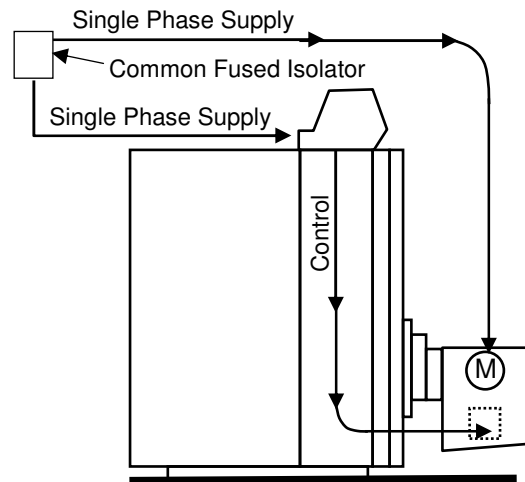


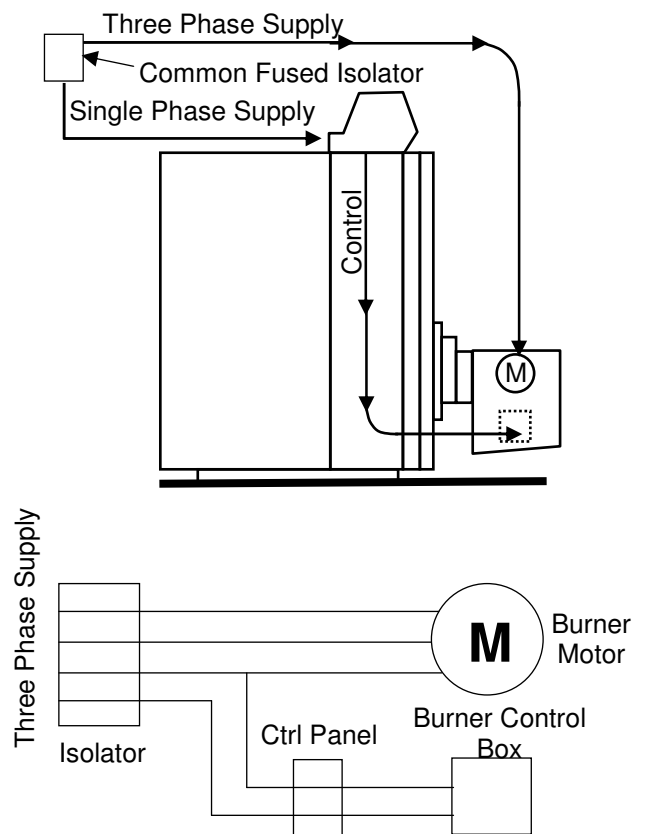
Fig. 18A – Boiler & Burner Single Phase Supply



Three Phase Installation

CAUTION: If the burner motor is supplied with three-phase power, control panel single-phase supply must be taken from one of the phases supplying the burner motor.

Install a three-phase supply direct to the burner via a fused isolator (sized to fit the burner manufacturer's specification), see Fig. 18. Install a separate 220 – 240V 50 Hz single-phase electrical supply derived from the three-phase supply to the boiler instrument panel. This is fused 6.3A in the instrument panel.



Volt Free Contacts

Volt free connection should be taken from the control panel where a 24V signal is provided, see Section 6 for further details.

Connecting The Gas Supply

The connection should be made to the burner connection (see burner card enclosed with this manual for size required). A union and isolating valve should be fitted close to the burner to allow disconnection of the burner for maintenance and repair.

The gas supply should be made through a suitable meter and the local gas undertaking should be consulted to determine the suitability of the meter and gas supply to meet existing and additional demands for gas.

The installation should be made in accordance with the requirements of the Gas Safety (Installation & Use) regulations and all other regulations and codes of practice.

In particular a manual valve for isolation of the boiler house shall be fitted in an accessible position and readily identifiable.

The gas supply should be supported adequately.

For large single and multiple installations consideration should be given to the installation of additional gas meters to assist in the monitoring of boiler performance.

Attention is drawn to the need for adequately sized pipework according to the maximum gas demand for multiple boiler installations and each boiler shall be provided with an isolating valve so that it is possible to isolate the boiler from a common gas supply for maintenance purposes.

Boosters are required if the inlet pressure under full load is less than that recommended by the burner manufacturer (see burner card for details).

If a booster is required, the local gas undertaking must be consulted and the booster shall be fitted with a low pressure cut off switch upstream of the booster in the event of reduced pressure and to prevent automatic restart on pressure restoration. The cut off pressure shall be decided by the local gas undertaking.

Connecting The Oil Supply

FUEL STORAGE AND HANDLING – The provisions of BS2869 will normally ensure that the fuel will be of adequate performance. There are winter and summer

fuel grades and in order to prevent the fuel waxing under sustained cold and exposed conditions, Class D grade fuel oil should be stored and supplied to the burner at a minimum temperature of 5°C, in line with the fuel supplier's recommendations to suit site conditions.

The supply pipe and, where fitted, the return line should consist of copper tube (galvanised steel must not be used), the final connection to the pump inlet port being made with the length of flexible pipe supplied with the burner. Joint should be made with compression fittings, not by soldering.

When gravity feed is used (the most common system) the maximum head should not exceed 4m (equivalent to a pressure of 35 kPa).

PUMP BLEEDING – If the fuel tank is allowed to drain completely it will be necessary to bleed the oil pump free of air by slackening the plug in the pressure gauge port allowing oil to run through until air free.

OIL FILTRATION – SEDIMENT REMOVAL – There is an oil strainer inside the body of the fuel pump and a separate oil filter between the oil pipe from the tank and the oil burner. The oil strainer should be removed and cleaned with paraffin during the pre-season check-up. At the same time the oil filter cartridge should be replaced or cleaned, as appropriate for the type fitted. Bleed fuel pump free of air, as described previous, to remove any trapped air.

Draw off any accumulation of water or sediment in the fuel tank by opening the sludge cock in the tank bottom, immediately before any new delivery of fuel. Do not run the burner while the tank is being refilled and, if possible, do not restart for one hour after refilling is concluded.

Connecting The Water Supply

The flow and return connections should be made to the appropriate manifolds, following the recommendations of CP342 and PM5.

It is essential that all pipework connections to the boiler are self-supporting, correctly aligned and allow for free expansion of both boiler and pipework.

Care should be taken in the pipework design to prevent strain on the connections. Excessive strain can lead to premature failure of the boiler, which is obviously outside the terms of our warranty.

The use of expansion bellows to take up both axial and lateral movement is recommended.

Potterton Commercial Customer Commissioning Check List

The items listed below have been put together as a guide to what actions should be completed before the commissioning of a boiler takes place.

- 1 Site access available for persons carrying out the proposed work.
- 2 Site Managers/Personnel aware that work will be taking place.
- 3 Boilers correctly erected and cased.
- 4 Risk assessments carried out on possible risks which may affect the persons carrying out the proposed work.
- 5 Site wiring complete to boilers.
- 6 Boilers filled and vented.
- 7 Controls connected, operable and calling for heat.
- 8 Sufficient system heating load available to run the boilers in order to complete combustion checks.
- 9 All system pumps operational and available.
- 10 Gas supply completed, purged and ready for use (if applicable).
- 11 Oil supply completed, bled and ready for use (if applicable).
- 12 Flue system complete, adequate and fully functional.
- 13 Permanent ventilation complete and adequate.
- 14 All safety systems fitted and fully operational (e.g. safety valves, fuel shut off devices, flue fans interlocked, etc.)
- 15 Safe working environment provided.

Contravention of Regulations

PLEASE NOTE THAT SHOULD ANY ITEMS BE INSTALLED ON A TEMPORARY BASIS, E.G. VENTILATION, FLUES ETC, THEN THE COMMISSIONING ENGINEER WILL NOT BE ABLE TO LEAVE THE BOILERS RUNNING UPON COMPLETION OF COMMISSIONING. THE BOILERS WILL NEED TO BE SHUT DOWN MAKING THEM INOPERABLE AND SHUT DOWN AND WARNING NOTICES WILL BE ISSUED.

Boiler Commissioning

A lifetime guarantee is available on this boiler when erection and commissioning is carried out by the Potterton service department. Please refer to our standard terms and conditions for further details.

IMPORTANT: The boiler must be commissioned following completion of the installation. Operation of an uncommissioned appliance may cause injury to personnel and damage to the boiler/burner unit and could invalidate the manufacturers' warranties.

Commissioning should only be carried out by personnel approved and competent to do so. This facility is available from Potterton Commercial service offices at the addresses as listed on the back page of this manual.

Commissioning of the burner unit should be carried out in accordance with the burner manufacturers handbook provided with combustion adjustments in accordance with the Potterton burner card also provided.

Before commencing to commission the burner check the following.

- 1 Electrical supply is of correct voltage and polarity and earthing is available with certification that all electrical checks have been carried out.
- 2 Fuel supply is tested for leakage and purged of air. Ensure the burner is suitable for the connected fuel supply and pressure, and purging certificates have been filled in.
- 3 Boiler and system are filled with water and the operating pressure is within the appliance range.
- 4 Pumps are operational and any flow proving interlocks are functional. The operation of the pump should be checked, particularly on sealed systems, to ensure that operation does not cause a reduction in pressure within the system below the minimum operating pressure.
- 5 Ventilation is adequate and, in the case of mechanical ventilation systems, operation of the boiler is inhibited unless the ventilation fan is proved.
- 6 On mechanically assisted flue systems the operation of the boiler plant should be inhibited unless the mechanical flue system is operational and flow proved.

- 7 The safety valve should be checked to ensure that it is of the correct size and pressure.
- 8 The cold feed and open vent sizes should be checked.
- 9 Ensure the burner fitted to the boiler is of the correct specification and size for the boiler and suitable for the fuel supply available (see burner card enclosed with this manual).
- 10 The burner blast tube has been sealed to the door refractory and the boiler door seal is correct.

Following completion of the above checks the burner should be commissioned in accordance with the burner manufacturers handbook provided with the burner. The commissioning form provided at the back of this manual **MUST** be completed and returned to Potterton Commercial at the address on the back page.

Typical combustion figures are:

CO ₂	- Gas: 9 – 9.5%	Oil: 12 – 13%
CO	- Gas: 0 – 100ppm	Oil: 0 – 1 Smoke

Flue gas temperature (taken at 600mm from the flue outlet on a clean boiler) should be within the range of 160 – 200°C.

Important – Safety

It is essential that the following instructions and adjustments are carried out by a qualified engineer who is experienced in blown gas/pressure jet burner commissioning.

In the UK it is a legal requirement that when working on blown gas appliances the engineer must be CORGI registered. The manufacturer cannot be held responsible for any consequential damage, loss or personal injury as a result of customers failing to follow these instructions, or as a result of misuse.

Emergency Instructions

The burners are designed and constructed to meet all of the essential requirements of the GAS APPLIANCE DIRECTIVE 90/396/EEC and under normal circumstances should not give occasion to any hazardous conditions. If such a condition should occur during commissioning or subsequent use of this product, be it a fault of the burner, the boiler or of any instrument, machine or service in the proximity of the burner then the GAS and ELECTRICITY supply to the burner should be **IMMEDIATELY ISOLATED** until such time that the fault has been investigated and rectified.

The commissioning of the appliance can be split into three main categories these being listed below.

Pre-Commissioning Dry Run

This will enable the checks on the safety controls to be done and should include:

- Air Control Devices
- Control Devices
- Control Box

Soundness Testing

This is to check the soundness of the gas train and valves and should include:

- Main Gas Pressure Governor
- Gas Valve Closure

Commissioning – Live Run

This will enable the burner to be commissioned fully and should include:

- Checking Inlet Pressures
- Checking Pipework
- Checking Pilot Flame
- Checking Low/High Flame
- Setting Gas Rates
- Setting Combustion Figures
- Checking Flame Signals
- Pressure Switch Settings

IMPORTANT: After each adjustment, gas flow rate and flue gas analysis should be re-checked.

ALWAYS use approved test equipment (continually monitoring electronic equipment is recommended).

NEVER rely on a visual inspection of the flame as a guide to combustion quality.

Following/during commissioning of the burner unit the following additional checks should be carried out.

- 1 Operation of the control, high/low and high limit thermostats should be checked for correct operation.
- 2 The flue draught available at the appliance flue outlet should be checked under all operating conditions (hot and cold) and should be within the boiler operating parameters.
- 3 Checking of lockout of burner on flame failure.
OIL – Cover the photocell.
GAS – Disconnect the ionisation probe in the control box (see manufacturer's instructions).
- 4 Shut down of the boiler plant by external controls does not cause a hazardous condition and pump overrun is provided to remove residual heat from the boiler.

- 5 Following commissioning the boiler overheat and control thermostats should be set to the required operating setting.

Additional Checks

Where possible the system should be checked to ensure that following purging of air there is no raw water make-up. In particular, when the system is operated in the hot condition, there should be no discharge of water from the safety valve, open vent or cold feed tank overflow that would otherwise lead to unregulated raw water make-up when the system cools down.

Fault Finding

General fault finding for burner failure should be in accordance with the burner manufacturer's handbook. Set out below are general guidance notes on system fault finding.

Overheat Operation

The boiler control panel has an inbuilt overheat indicator lamp. Operation of the boiler overheat thermostat is associated with a reduction in boiler water flow. Where overheat operation is reported the following should be checked.

- a) The boiler/system pump is adequate for the duty.
- b) Operation of flow reducing devices, ie, TRVs, compensated mixing valves, etc., do not reduce the water flow rate through the boiler below the minimum flow rate.
- c) Pump overrun is incorporated to dissipate residual heat from the boiler on system shut down.
- d) The operation of boiler back end valves incorporates a time delay to allow for removal of residual heat from the boiler.
- e) The boiler is operating at the correct rate and is not overfired.

The use of a primary loop system is highly recommended to provide a constant boiler flow rate under all operating conditions. For further information please refer to the Potterton Technical Bulletin series.

Burner Lockout

The package burners supplied with the boiler unit have an integral safety system to allow the safe and reliable operation of the burner. Failure of the burner to operate correctly will cause the burner control box to "lockout" and the lockout button on the burner will illuminate to indicate this.

The lockout condition can be manually reset by pushing the reset button and the control box should restart its control sequence in an attempt to light the burner. If the control box lockout will not reset or goes to lockout after being reset then the services of a boiler repair/maintenance company should be sought. This service is available from Potterton Commercial Division service offices at the addresses on the back page of this manual.

WARNING: The lockout reset button should not be repeatedly operated otherwise a hazardous situation may occur.

Should the boiler go to lockout, check the following before attempting to relight the burner.

- 1 Fuel is available at the burner.
- 2 The electrical supply to the appliance is of the correct voltage and polarity.

The boiler control boxes in some instances have indicator dials as an aid to fault finding on boiler lockout. In these instances refer to the control box manufacturer's data sheet for fault finding details.

Boiler Maintenance

Before starting work a risk assessment should be carried out on the boiler house to determine the safety of the working environment.

It is essential for efficient and trouble free operation that the boiler plant is regularly maintained. This must be carried out by qualified and experienced engineers and in the case of gas fired appliances attention is drawn to the mandatory requirement of CORGI registration of personnel undertaking work on these appliances. This facility is available from Potterton Commercial Division service department, details are available on the rear of this manual.

Before commencing servicing of a boiler a combustion test must be taken.

Boilers should be serviced and re-commissioned as a minimum on an annual basis for gas and twice a year for oil.

It is strongly advised that a maintenance contract be entered into with Potterton Commercial Division to ensure that the boiler/burner unit is correctly and properly maintained.

WARNING: Isolate the electrical and fuel supplies before attempting any maintenance work.

Cleaning of Flue Surfaces

The boilers are supplied with a set of cleaning tools comprising of flueway brushes and extension rods for routine cleaning. Boilers may require periodic cleaning with specialist mechanical equipment dependent on boiler conditions, fuel type, etc.

Cleaning of the boiler requires opening of the door and removal of the flue covers, front and rear under the flue cover.

Frequency of boiler cleaning varies and is dependent on site conditions, fuel type, heat load, design of controls and running conditions.

For maximum efficiency and economy in running, it is essential that the combustion chamber and flueway surfaces should be kept clean and free from deposits.

Deposits should be disposed of in a manner not to cause inconvenience to any persons.

A layer of deposits 1.5mm thick will reduce the heat transfer through the tube wall by up to 10%. Not only does this waste fuel but the higher flue gas temperatures that result will increase the thermal stress within the boiler and may lead to joint leakage or in extreme cases section failure.

Natural Gas & LPG Fired Boilers

We recommend brushing out, twice a year, of the combustion chamber and flueways and the removal of the rear clean out covers to check for deposits in the flue box.

Class 'D' Fuel Oil & Class 'C2' Kerosene

The boilers should be brushed out thoroughly at least bi-monthly for Class D (35 second) and Class 2 (28 second) during the heating season but more frequent attention may be necessary dependant on the operating conditions to prevent the formation of hard adherent scale on the tube surfaces.

It is essential to ensure that cleaning is carried out throughout the full length of the flue tube passes and that the rear clean out covers are taken off to allow for removal of deposits brushed through into the flue box.

Regular cleaning is essential, as a build up of hard deposits can be extremely difficult to remove.

Sludge Gas

Maintenance of boilers running on these fuels will be required at more frequent intervals, possibly on a weekly basis or even a daily basis dependent on fuel type and quality.

Boiler Ancillaries

Check the sealing rope on the boiler door is in place and sealing the combustion chamber. Keep a regular check on the condition of the door refractory around the burner draught tube. If there is any deterioration this must be made good immediately to prevent damage to the boiler and burner.

Boiler Controls

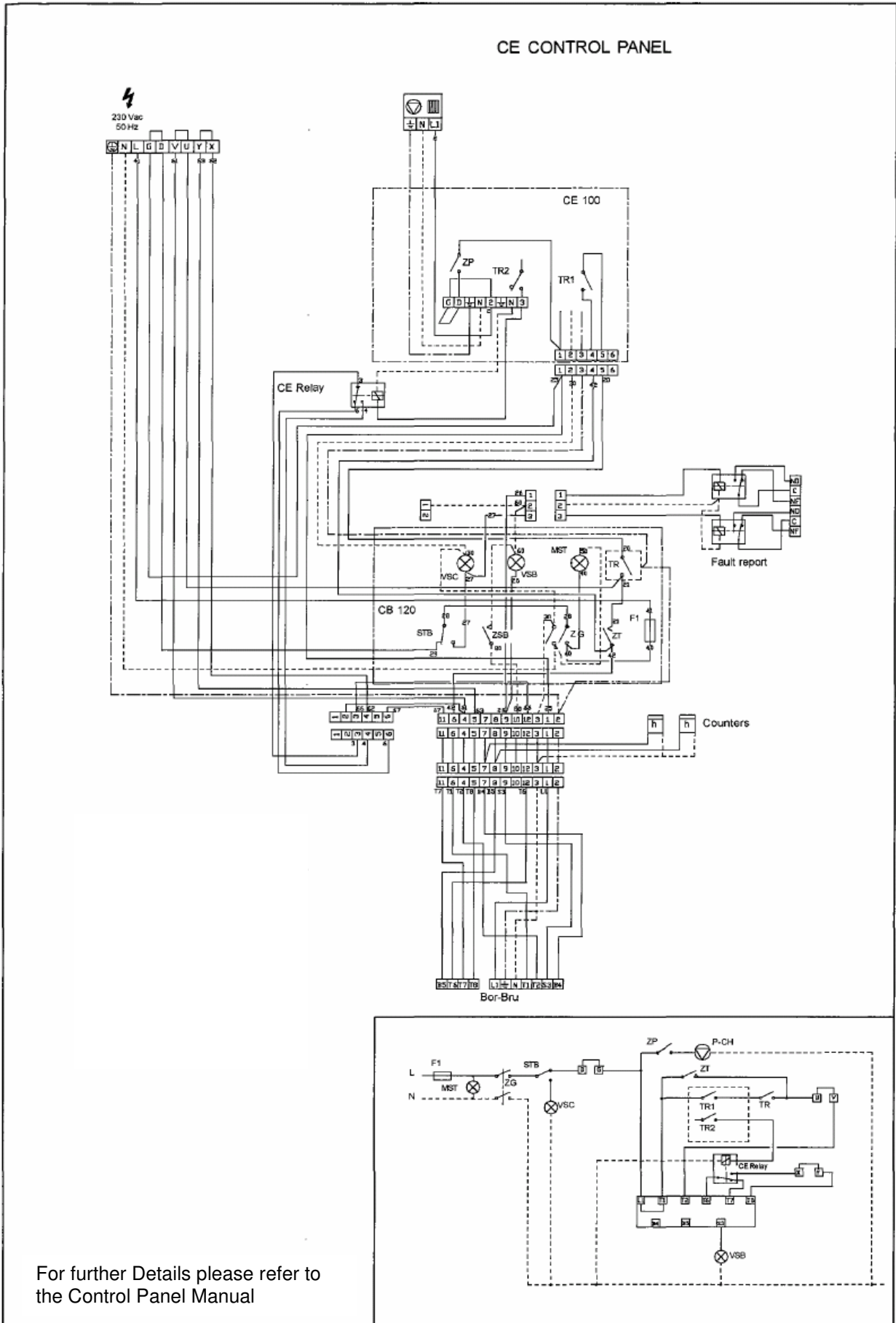
The operation of boiler controls including control thermostat, high/low thermostat and overheat thermostat must be checked every visit.

Safety Interlocks

The operation of safety interlocks such as flow proving on mechanical flue/ventilation systems must be checked to ensure that operation of the boiler is prevented on a fault.

FOLLOWING MAINTENANCE THE BOILERS MUST BE RECOMMISSIONED.

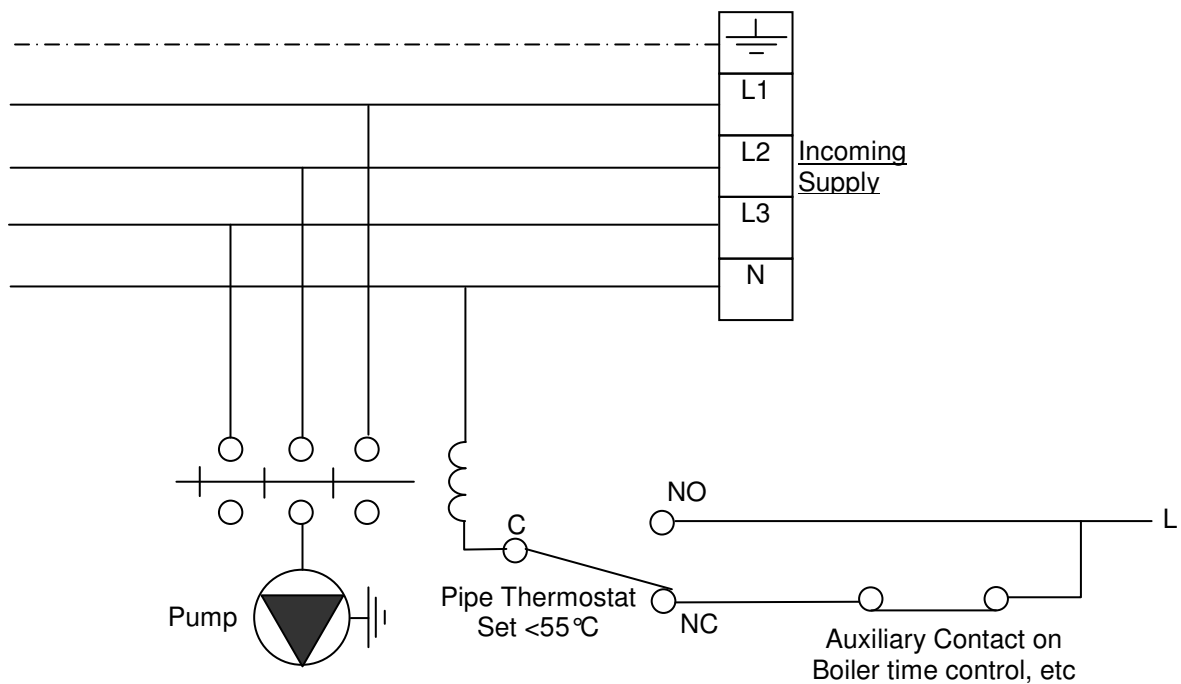
Fig. 19 – Boiler Wiring Diagram



For further Details please refer to the Control Panel Manual

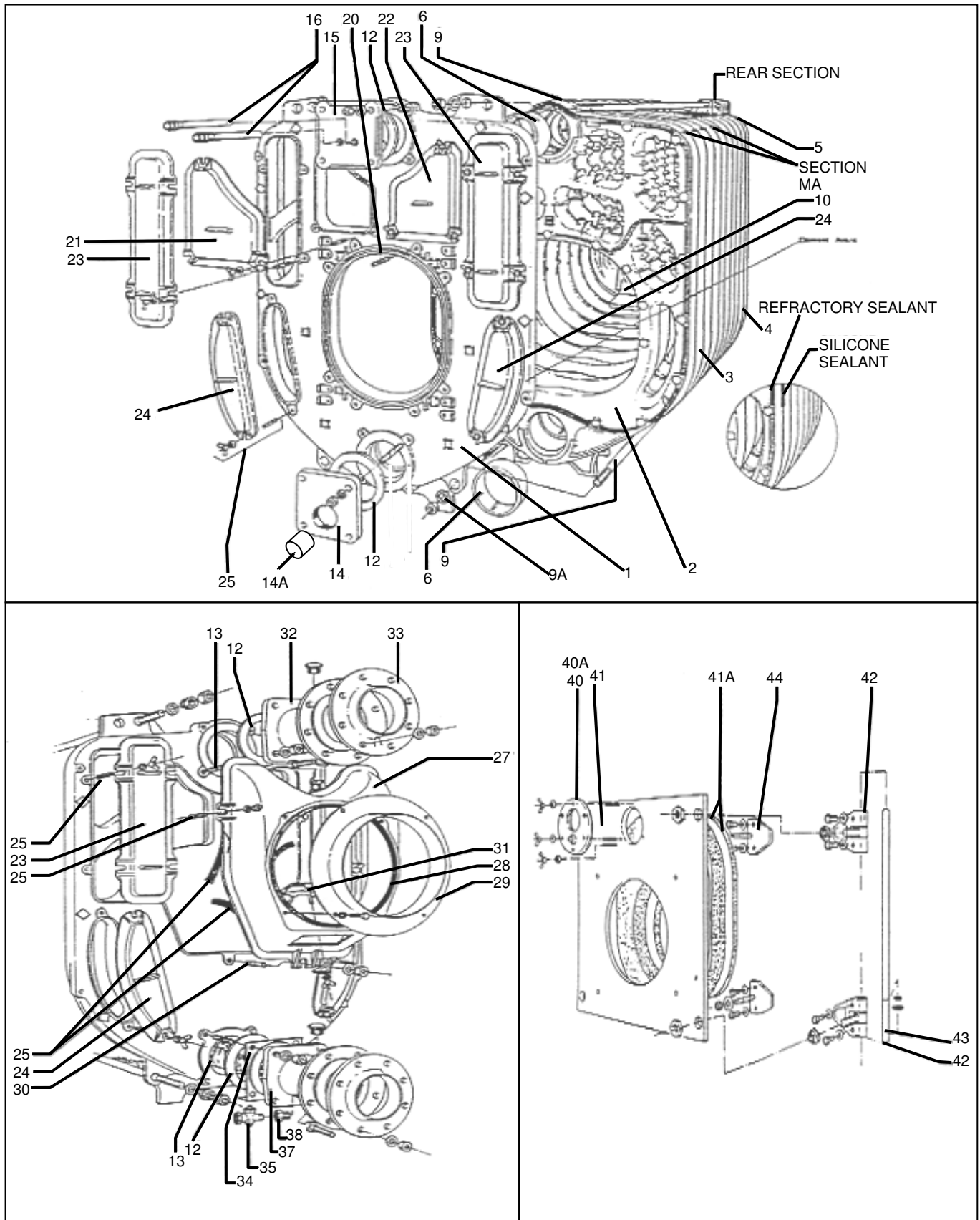
Wiring Diagram – Legend

Legend:	STB	-	Overheat thermostat
	ZSB	-	Burner reset
	ZT	-	Burner test switch
	F1	-	Fuse
	VSC	-	Overheat indicator light
	MST	-	Mains indicator light
	TR	-	Safety mode thermostat
	TR1	-	1 st stage regulation thermostat
	TR2	-	2 nd stage regulation thermostat
	ZP	-	Pump switch (not used)
	L	-	Live
	N	-	Neutral
	ZG	-	On/Off switch
	BRU	-	Burner connections
	H	-	Hours run counters
External Interlocks:	DG	-	External interlock
	UV	-	Safety interlock
	XY	-	Safety interlock
	Relays	-	Overheat & Fault

Fig. 20 – Pump Overrun Using Changeover Pipe Thermostat

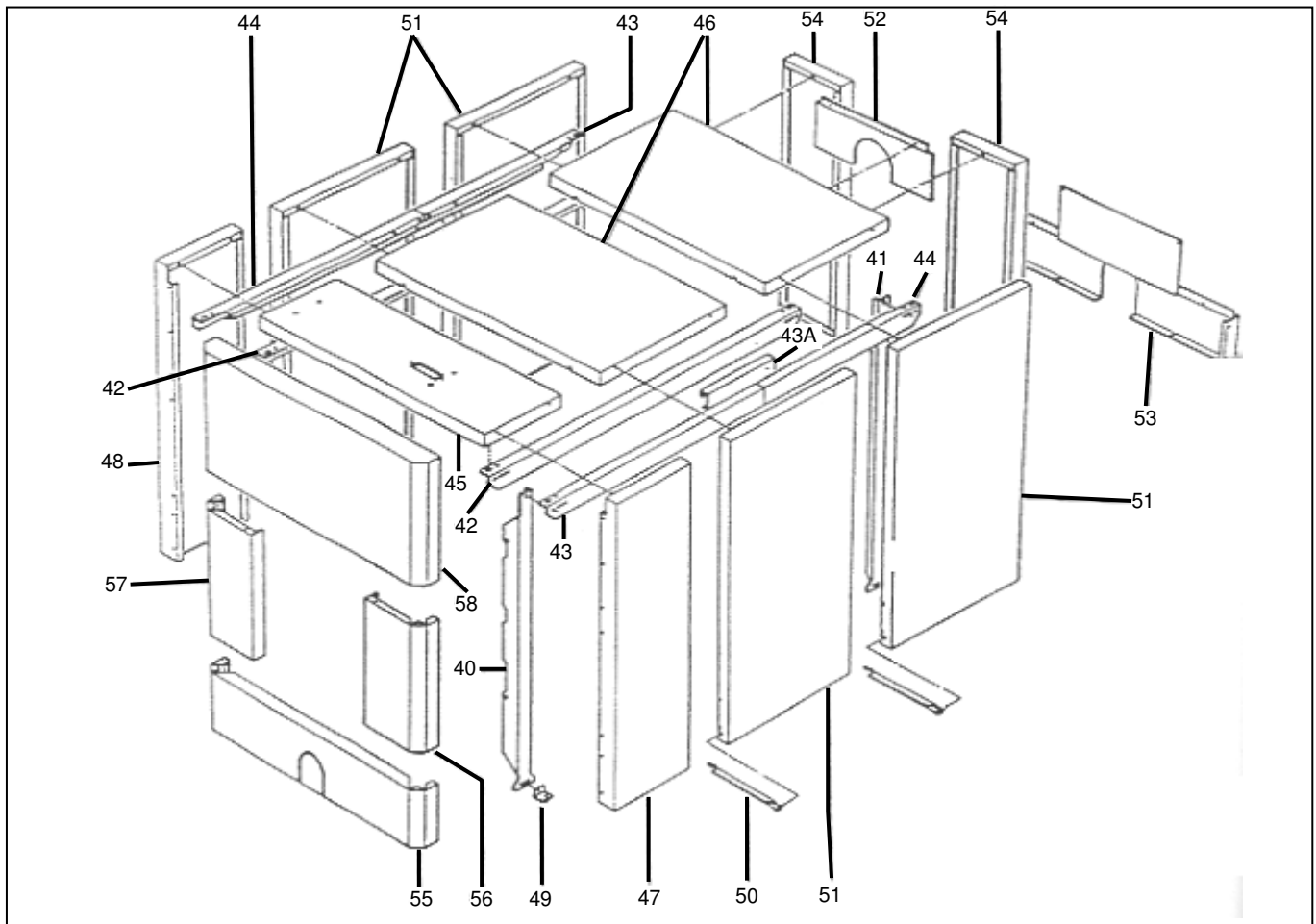
NOTES

Fig. 21 – Boiler Components



NXR4 Boiler Parts List (See Fig. 21)

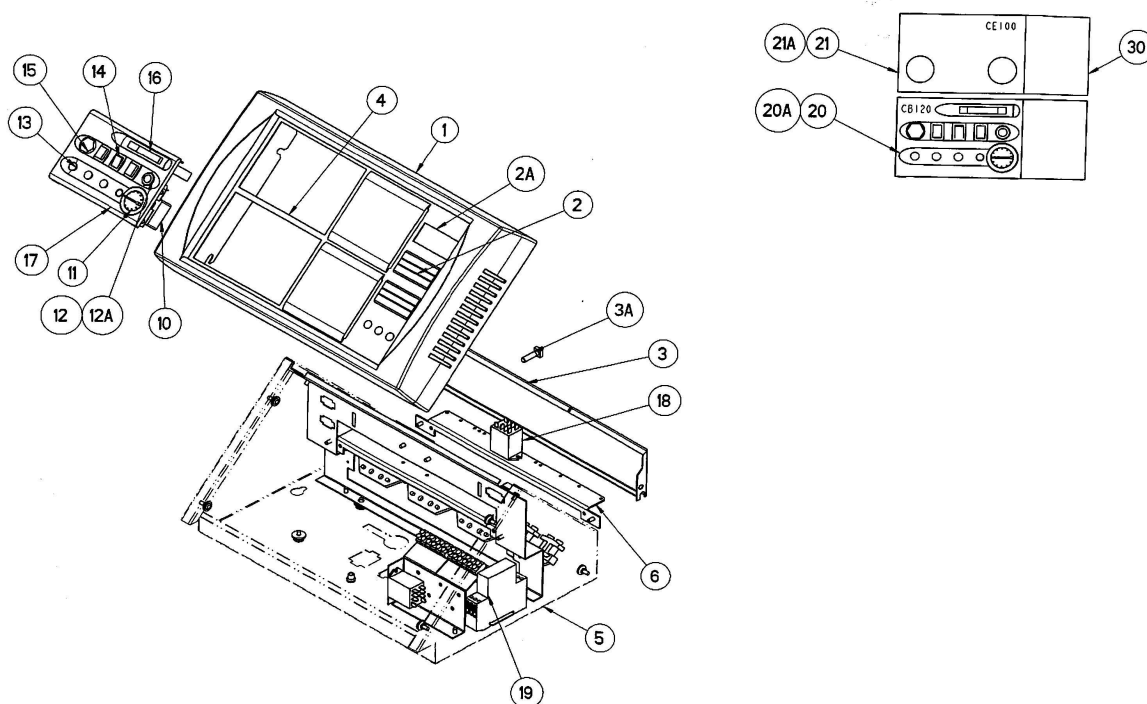
ITEM	DESCRIPTION	PART No	QUANTITY Per Boiler
	Tube of Silicone	COM17002086	Dependant
	Refractory Sealant	COM17004778	Dependant
1	Front Section	COM17801777	1
2	Front Intermediate Section	COM17806007	Dependant
3	Middle Intermediate Section	COM17803467	Dependant
4	Rear Intermediate Section	COM17806417	Dependant
5	Rear Section	COM17802437	1
6	Nipple	COM17809507	Dependant
9	Tie Rod – 409	COM17077340	4
	Tie Rod – 410	COM17077341	4
	Tie Rod – 411	COM17077342	4
	Tie Rod – 412	COM17077343	4
	Tie Rod – 413	COM17077344	4
	Tie Rod – 414	COM17077345	4
	Tie Rod – 415	COM17077346	4
	Tie Rod – 416	COM17077347	4
	Tie Rod – 417	COM17077348	4
9A	Tie Rod Spring Washer	COM15689250	4
10	Combustion Chamber Deflector Plate	COM17005986	1
12	Flange Joint Ring	COM15601300	2
14	Counter Flange Sludge Connection – Bottom Front	COM17000703	1
14A	2" Blanking Plug Not Shown		1
15	Counter Flange for Thermostat Pockets – Top Front	COM17862587	1
16	Thermostat Pockets	COM17001778	2
21	Flue Cover Plate – Centre Left	COM17843419	1
22	Flue Cover Plate – Centre Right	COM17843409	1
23	Flue Cover Plate – Large Left/Right Front & Rear	COM17843429	2
24	Flue Cover Plate – Curved Left/Right Rear	COM17843439	2
25	Stud – 8mm x 45mm long	COM15243514	
26	Sealing Tape – 15 x 6 for Flue Covers	COM17000190	
	Sealing Tape – 15 x 6 for Flue Covers (per metre)	COM17000191	
27	Flue Box 412 – 417	COM17850457	1
	Flue Box 409 – 411	COM17850469	1
28	Sealing Rope – 9mm x 9mm (per metre)	COM17000171	
29	Flue Adaptor – Ø300mm 409 – 411	COM17001115	1
	Flue Adaptor – Ø350mm 412 – 417	COM17001116	1
30	Stud – M16 x 55mm	COM17072162	
31	Flue Clean Out Cover (without stirrup)	COM17855309	2
32	Flow Manifold	COM17865247	1
33	Flow and return Flange – PN 16 125mm	COM17000766	2
34	Return Distributor – 417	COM17006538	1
	Return Distributor – 412 to 416	COM17006541	1
35	Drain Cock Handle	COM17001014	1
	Drain Cock	COM17006471	1
36	50 x 20 Bush	COM17869127	
37	Return Manifold	COM17865257	1
39	Pack of Screws for Boiler Body (Not Shown)	COM17880450	1
40	Sight Glass Cover	COM17834429	1
40A	Sight Glass	COM17007789	1
41	Burner Door – Undrilled	COM17005981	1
41A	Burner Door – 1 x Ceramic Fibre and 1 x Mineral Wool	COM17405410	1
42	Door Hinge Assembly	COM17834419	2
43	Door Hinge	COM17070293	2
44	Door Closure Plate	COM17071650	2
45	Pack of Screws for Door (Not Shown)	COM17880460	1

Fig. 22 – Casing Components**NXR4 Casing Parts List (See Fig. 22)**

ITEM	DESCRIPTION	RED CASING PART No	WHITE CASING PART No
40	Front Support Rail – Left & Right Vertical	COM17940414	COM17940414
41	Rear Support Rail – Left & Right Vertical	COM17940413	COM17940413
42	Longitudinal Support Rail – 409	COM17940424	COM17940424
	Longitudinal Support Rail – 410	COM17940434	COM17940434
	Longitudinal Support Rail – 411	COM17940444	COM17940444
43	Longitudinal Support Rail – 412 to 417	COM17940473	COM17940473
43A	Bracket 412 to 417 Only	COM17940724	COM17940724
44	Longitudinal Support Rail – Rear – 412	COM17940454	COM17940454
	Longitudinal Support Rail – Rear – 413	COM17940464	COM17940464
	Longitudinal Support Rail – Rear – 414	COM17940474	COM17940474
	Longitudinal Support Rail – Rear – 415	COM17940484	COM17940484
	Longitudinal Support Rail – Rear – 416	COM17940494	COM17940494
	Longitudinal Support Rail – Rear – 417	COM17940504	COM17940504
45	Top Panel Front	COM17940519	S139231EE
46	Top Panel – 560mm	COM17940529	S506323
	Top Panel – 700mm	COM17940539	S506325
	Top Panel – 840mm	COM17940549	S506327
	Top Panel – 980mm	COM17940559	S506321
47	Front Side Panel – Right	COM17940569	S506313
48	Front Side Panel – Left	COM17940568	S506314
49	Angle Fixings	COM17940639	COM17940639
50	Bottom Brackets	COM17940629	COM17940629
51	Side Panel – 560mm	COM17940589	S506324

ITEM	DESCRIPTION	RED CASING PART No	WHITE CASING PART No
	Side Panel – 700mm	COM17940599	S506326
	Side Panel – 840mm	COM17940609	S506328
	Side Panel – 980mm	COM17940619	S506322
52	Rear Panel Upper	COM17940719	S121136EE
53	Rear Panel Lower	COM17940688	S506319
54	Rear Vertical Panel – Left & Right	COM17940709	S506320
55	Rear Bottom Panel	COM17940649	S506315
56	Front Side Panel – Right	COM17940659	S506316
57	Front Side Panel – Left	COM17940658	S506317
58	Front Upper Panel	COM17940679	S506637
59	Pack of Fixing Screws (Not Shown)	COM17880404	COM17880404

Fig. 23 Control Panel




NXR4 Control Panel Parts List (see Fig. 23)

ITEM	DESCRIPTION	QTY	PART No
1	Front Panel	1	S137535
1a	Front Panel Cover (Not Shown)	1	S139461
2	Hours Run Meter	1	S17001213
2a	Flue Gas Thermometer	1	S17006951
2b	Hours Run Caballing (Not Shown)	1	S139461
3	Rear Panel	1	S137874A
3a	Bolt DZUS	1	S504314
4	Front Panel Support	1	S137873H
5	Control Panel Casing	1	S504313
6	Cable Terminal Support	1	S136979
10	Thermostat TXA4C 019	1	S17007004
11	Thermostat Lever	1	S17004738
12	Fuse Support	1	S15803999
12a	Fuse TFS 5 x 20 6.3A	1	S15803525
13	Bag of Lights	1	S501970
14	Bag of Switches	1	S503081
15	Thermostat TG400 Cap.2m	1	S17006955
16	Thermometer 68.5 x 14.5 0-120°	1	S134421

ITEM	DESCRIPTION	QTY	PART No
17	CB120 Module Front Panel	1	S137158
19	Relay LY2F 220AC	1	S15815049
19a	Alarm Relay	1	S137003
20	Basic CB 129 Module Assembly	1	S137157
20A	Basic CB 120 Module Wiring	1	S136811
21	CE 100 Module Assembly	1	S137160
21A	CE 100 Module Wiring	1	S136412
30	Mask G.M.AVA 30.200/109	1	S17000983

COMMISSIONING REPORT

ALL BOILER TYPES

 Wood Lane, Erdington, Birmingham, B24 9QP. Tel: (08706) 050607 Fax: (08706) 001516	REPORT SENT TO INSTALLER:	YES		NO
	SITE VISIT (<i>Italics</i>)	COMMISSIONING		
REPORT No:	INSTALLER NAME & ADDRESS:			
SITE ADDRESS:	COMMISSIONING/SITE VISIT DATE:			
(Office use Only) DATE: _____ SIGNATURE: _____				

1.0	BOILER			
1.1	Type:			
1.2	No. of Sections:	Boiler N°/Position		
1.3	Serial No.			
1.4	Fuel:	N/Gas	LPG	Class C Class D
2.0	BURNER/CONTROLS			
2.1	Type:	Atmospheric	Pre-Mix	Pressure Jet
2.2	Ionisation Probe:	UV Cell	Thermocouple	
2.3 ^P	Make/Model:			
2.4 ^P	Serial N°:			
2.5 ^P	Spec N°:			
2.6	Control Box Type:			
2.7	Electrical Supply:			
2.8	Main Gas Valve Type & Size:			
2.9	Pilot Gas Valve Type & Size:			
2.10	Gas Booster Type & Size:			
2.11	Gas Booster Serial No:			
3.0	BURNER SETTINGS			
3.1	Main Burner Injector Size	mm		
3.2	Pilot Burner Injector Size	mm		
3.3	Electrode/Ionisation Setting <small>(to manufacturers instructions)</small>			
3.4	Are Burners & Injectors Clean			
3.5 ^o	Oil Nozzles: High Fire	Size:		
	Low Fire	Type:		
4.0	PRE-COMMISSIONING CHECKS <small>(See Notes)</small>	Yes	No	N/A
4.1	Is boiler house ventilation as per the relevant B.S.			
4.2	Electricity supply fused, isolated & earth wire connected.			
4.3	Check external controls allow operation			
4.4	Check boiler/system filled and pumps operational & any isolation valves open			
4.5	Check gas available at burner			
4.6 ^o	Check oil available at burner			
4.7	Check gas meter fitted & sized adequately			
5.0	FLUE SYSTEM CHECKS	Yes	No	N/A
5.1	Flue Type	Conventional		
		Room Sealed		
		Fan Dilution System		
		Balanced Compartment		
		Plant Room Door Interlocked		
5.2	Draught Stabiliser Fitted			
5.3	Is Flue System Clear			
5.4	Flue Header Diameter	mm		
5.5	Stack Diameter	mm		
5.6	Flue Type & Diameter Of Connection To Boiler:-			
	TYPE...../DIAMETER(mm).			
	Where appropriate and for multi boiler installations sketch details of flue system showing length of runs and diameter			
Approximate Overall Height.....m				

6.0	COMBUSTION	Pilot	Low	High	Unit
6.1	Inlet Gas Supply Pressure (All Boilers running)				mbar
6.2	Burner Pressure				mbar
6.3	Gas Rate				m ³ /hr
6.4 ^o	Oil Pump Pressure				Bar
6.5*	Ionisation Probe Current				µA
6.6 ^{CP}	Air Shutter Position				----
6.7	O ₂				%
6.8	CO ₂				%
6.9	CO				ppm
6.10 ^o	Smoke Number				-
6.11	Nett Flue Gas Temperature				°C
6.12	Flue Draught				mmwg
6.13	CO² At Flue Dilution Outlet				%
6.14	Burner Fan Static Pressure				mmwg
6.15	Combustion Chamber Resistance				mmwg
7.0	OPERATIONAL SAFETY CHECKS				
7.1	Check Control Thermostat Operation				
7.2	Check Limit Thermostat Operation				
7.3	Check High/Low Thermostat Operation				
7.4	Check For Gas Leaks				
7.5	Check For Gas Leakage Past Valve Assembly				
7.6 ^o	Check For Oil Leaks				
7.7*	Check Boiler Locks Out On Loss Of Flame Signal				
7.8	Check boiler Locks Out On Air Pressure Switch Operation				
7.9	Check Boiler Inhibits On Gas Inlet Pressure Switch				
7.10	Boiler Locks Out On All Other Safety Functions				
7.11	Check For Flue Spillage				
7.12 ^B	Check Thermocouple Operation				
7.13 ^B	Check Thermocouple Interrupter Operation				
7.14	Check Gas Booster Interlock Operational				
7.15	Record Booster INLET and OUTLET Pressure Switch Settings:-				
	INLET OUTLET.....				
7.16	Record Burner/ Boiler INLET and OUTLET Pressure Switch Settings:-				
	INLET OUTLET.....				
8.0	BOILER/SYSTEM CHECK LIST				
8.1	Control Thermostat Setting				°C
8.2	High/Low Thermostat Setting				°C
8.3	Boiler Water Pressure				
8.4	Are Pipework Connections As Per Manual				
8.5	Is Safety Valve Fitted				
	If So, SIZE & MAKE:-..... PRESSURE RATING.....				
			YES	NO	
8.6	Are Water Isolating Valves Fitted				
8.7	Are Water Flow Switches Fitted				
8.8	Are Return Water Shut Off Or Diverter Valves Fitted				
8.9	Is Shunt Pump Fitted				
8.10	Is Pump Overrun Fitted				
SYSTEM WATER QUALITY					
8.11 ^c	PH Value				pH
8.12	TDS				PPM

COMMISSIONING REPORT (Continued)

		Yes	No	N/A
8.13	<i>Is The Fan Interlocked With The Boiler?</i>			
8.14	<i>Are Flue Dampers Fitted?</i>			
	<i>If So Are They Interlocked?</i>			
8.15	<i>Fan Assisted Ventilation?</i>			
	<i>If So Interlocked</i>			
8.16	Any Evidence Of Condensate Formation?			
8.17 c	Any Evidence Of Condensate Leakage?			
8.18	Any Evidence Of Water Leakage?			
8.19	<i>Any Evidence Of Flue Gas Leakage?</i>			
8.20	Has Boiler Been Built And Cased Correctly?			
8.21	<i>Is Gas Service Cock Installed?</i>			
	<i>If So Is It Accessible?</i>			
8.22	Is Oil Filter Fitted?			
8.23	<i>Is Fire Valve Fitted?</i>			
8.24	Oil Supply:			
	Single Pipe			
	Two Pipe			
	Ring Main			
9.0	NOTES & COMMENTS BY COMMISSIONING ENGINEER			

10.0	Comments On Accessibility For Maintenance

FINDINGS		
	YES	NO
<i>Is The Installation Safe For Use?</i>		
<i>If The Answer Is NO Has A Warning Label Been Raised?</i>		
<i>Is Any Remedial Work Required?</i>		
<i>Have Warning Labels Been Fitted?</i>		
<i>Has RIDDOR Form Been Raised?</i>		
CUSTOMER SIGNATURE:-		
PRINT NAME:-		
DATE:-		
ENGINEER DETAILS		
NAME		
COMPANY		
SIGNATURE	DATE	

NOTE: 6.7, 6.8 & 6.9 to be measured in secondary flue 600mm up from the flue socket or at the sampling point provided. Normally 6.12 and 6.14 are recorded when tappings provided. Position of measurement to be in accordance with boiler and/or burner manufacturer's instructions.

- * Fully Electric Boilers
- \$ Thermo-Electric Boilers
- c Condensing Boilers
- p Pressure Jet
- o Oil

Items in **italics** are MANDATORY

Note: It is the installer's responsibility to ensure that the boiler is correctly commissioned by a competent engineer and that this report is completed as a permanent record. A commissioning service is available from Potterton Commercial at the address listed on the back page of this manual. When a Potterton Commercial engineer commissions the boiler this commissioning report will be filled in and left with the boiler. Commissioning by Potterton Commercial engineers is restricted to equipment of our supply. No responsibility will be accepted for the on site assembly or installation of the equipment unless specifically carried out by Potterton Commercial. The installer must ensure that the boiler is installed in accordance with the manufacturer's instructions and all relevant B.S. Codes of Practice and Regulation (see manufacturer's instructions for full details).

CONVERSION CHART

	<u>IMPERIAL TO METRIC</u>	<u>METRIC TO IMPERIAL</u>
<u>HEAT</u> 1 Therm = 100,000 Btu/hr	1 Btu/hr = 0.2931 W 1 Btu = 1055 J 1 Btu/hr = 0.252 kcal/hr	1 kW = 3412 Btu/hr 1 J = 0.0009478 Btu 1 kcal/hr = 3.968 Btu/hr
<u>FUEL CONSUMPTION</u> 1 dm³ = 1 LITRE 1,000 dm³ = 1m³	1 ft ³ = 28.317 dm ³ (litre) 1 UK Gall = 4.546 litre 1 UK Gall = 1.2 U.S. Gallon	1 m ³ = 35.3147 ft ³ 1 litre = 0.2199 Imp. Gallon
<u>PRESSURE</u> 1 PSI = 2.307 FT 1 kPa = 1000 Pa 1 bar = 1000 mbar = 100 kPa	1 lb/in ² = 6895 Pa 1 lb/in ² = 68.95 mbar 1 in.w.g. = 249.1 Pa 1 in.w.g. = 2.491 mbar 1 in.w.g. = 25.4 mm.w.g.	1 bar = 33.45 ft.w.g. 1 kPa = 0.3345 ft.w.g. 1 bar = 14.5 lb/in ² 1 Pa = 0.3858 in.w.g. 1 mm.w.g. = 0.0394 in.w.g. 1 mm.w.g. = 9.8 Pa
<u>LENGTH</u> 1m = 1000mm	1 inch = 25.4mm 1 ft = 0.3048 m 1 yard = 0.9144 m 1 mile = 1.609 km	1 mm = 0.03937 in 1 m = 3.281 ft 1 m = 1.094 yard 1 km = 0.6214 mile
<u>VOLUME</u>	1 ft ³ = 0.02832 m ³ 1 ft ³ = 28.32 litre	1 m ³ = 35.3147 ft ³ 1 litre = 0.03531 ft ³
<u>AREA</u>	1 in ² = 645.2 mm ² 1 in ² = 6.452 cm ² 1 ft ² = 929 cm ² 1 ft ² = 0.0929 m ²	1 mm ² = 0.00155 in ² 1 cm ² = 0.155 in ² 1 m ² = 1550 in ² 1 m ² = 10.76 ft ²
<u>FLOW RATE</u> 1 kg/sec = 1 lit/sec @ 0°C reference temperature	1 gall/min = 0.07577 lit/sec 1 ft ³ /min = 0.4719 lit/sec 1 ft ³ /min = 0.00047 m ³ /sec	1 lit/sec = 13.2 gall/min 1 lit/sec = 2.119 ft ³ /min 1 m ³ /sec = 2119 ft ³ /min
<u>TEMPERATURE</u>	$^{\circ}\text{F to } ^{\circ}\text{C} = ({}^{\circ}\text{X}^{\circ}\text{F} - 32) \times 0.5556$	$^{\circ}\text{C to } ^{\circ}\text{F} = ({}^{\circ}\text{X}^{\circ}\text{C} \times 1.8) + 32$
<u>TEMPERATURE DIFFERENCE</u> 1°C = 1°K	${}^{\circ}\text{X}^{\circ}\text{F} \times 0.5556 = ^{\circ}\text{C}$	${}^{\circ}\text{X}^{\circ}\text{C} \times 1.8 = ^{\circ}\text{F}$
<u>WEIGHT</u>	1 lb = 0.4536 kg 1 cwt = 50.8 kg 1 ton = 1016 kg	1 kg = 2.205 lb 1 tonne = 0.9842 ton 1 tonne = 2204.6 lb

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Spares

Potterton Commercial spares are available nationwide through the **interpart** network of approved stockists. Alternatively please contact:-

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Applications and Installations

Our experienced technical and applications team are available to offer advice on any aspect of heating system design and boiler installation.

Please contact:

Tel: 08706 002322

Commercial Service

Our service organisation covers the whole of the UK to look after your needs for all Potterton Commercial products. We are also able to offer our services for other manufacturers products.

Our service department offers a wide range of specialised services including:-

- Boiler site assembly
- Burner commissioning for all fuels
- Boiler maintenance and maintenance contracts
- Breakdown and repair services
- Boiler dismantling and re-jointing
- Burner and boiler replacement
- Oil/gas conversions
- Systems conditioning
- Water treatment and descaling
- Packaged units

"All descriptions and illustrations contained in this leaflet have been carefully prepared but we reserve the right to make changes and improvements in our product which may affect the accuracy of the information contained in this leaflet"



heating specialists

Registered Office: The Wyvern Business Park, Stanier Way, Derby, DE21 6BF. Registered in England No. 03879156

Publication Number: M/NXR4/0507