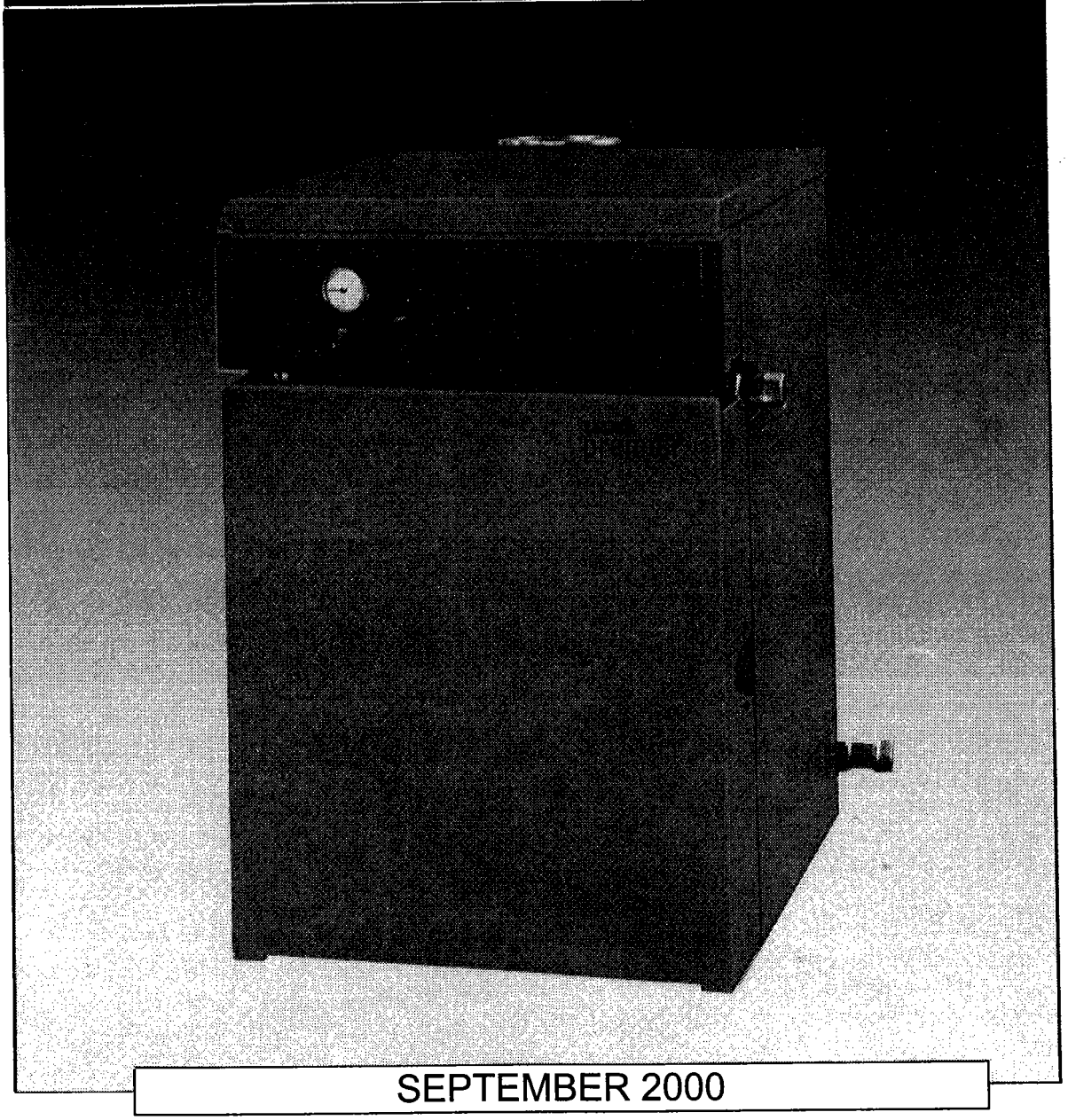
1969

derwent premier

INSTALLATION, OPERATION & MAINTENANCE MANUAL



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POTTERTON
COMMERCIAL

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Fig.1.1 - General Data & Dimensions

NOT TO SCALE

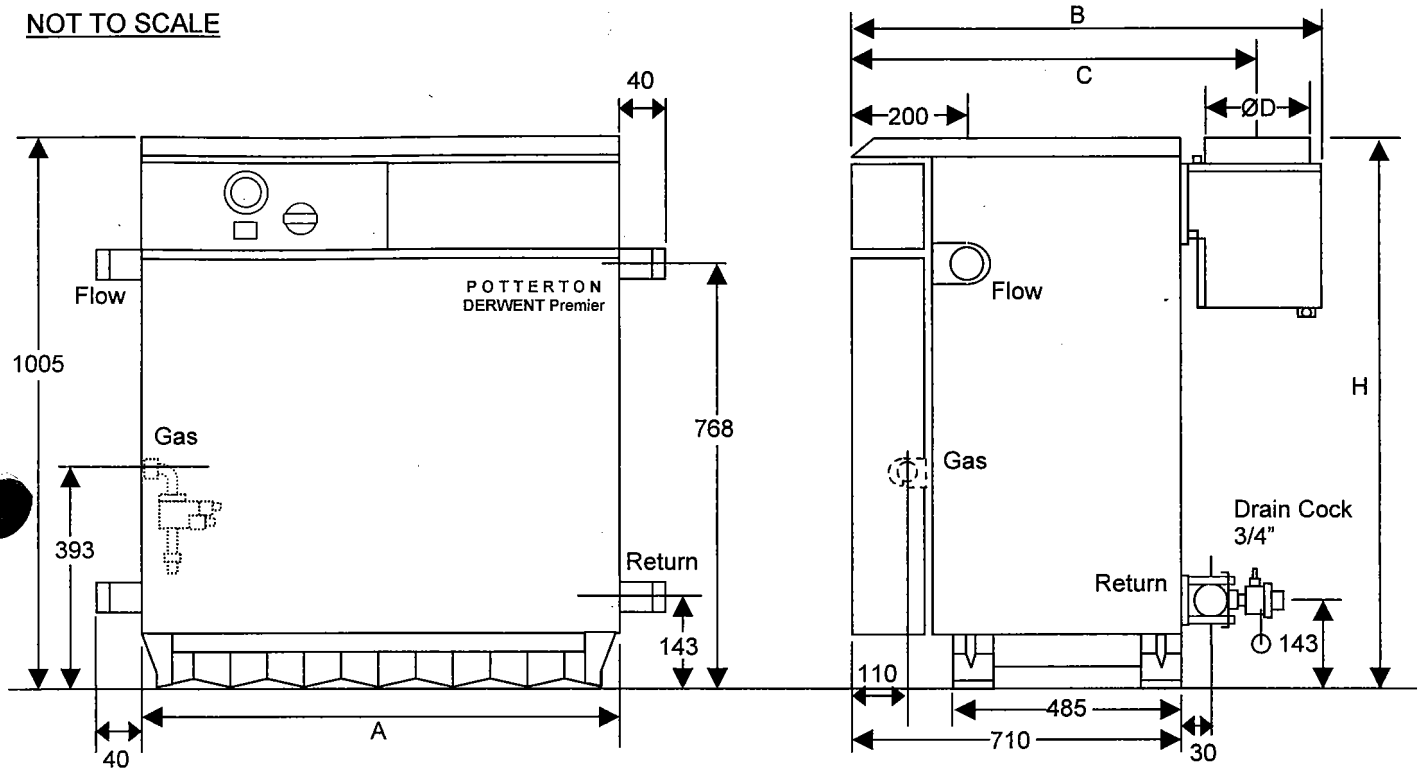


Table 1 - Boiler Dimensions

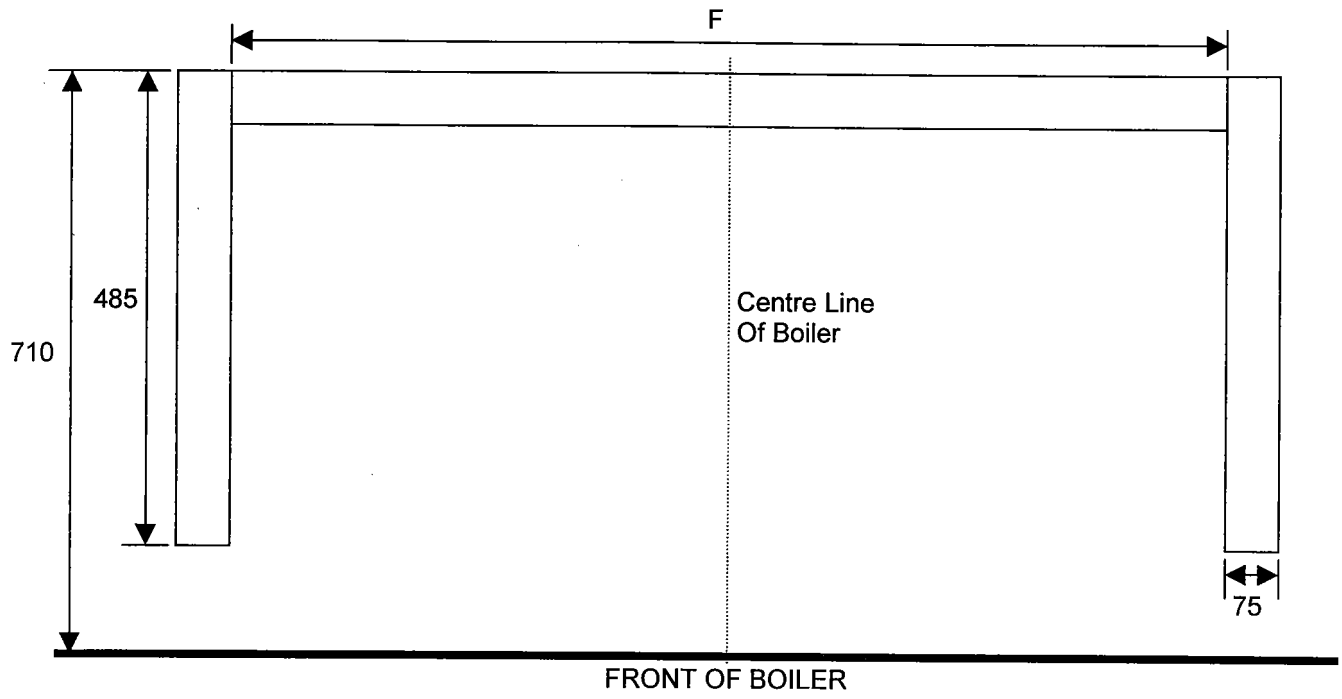
No of Sections		5	6	7	8	9	10	11	12	13
A	mm	465	545	630	710	790	870	950	1035	1115
B	mm	980	1000		1050				1100	
C	mm	865	875		900				925	
D Ø	mm	180	200		250				300	
H	mm	1005			1015					

Table 2 - Connections

	5	6	7	8	9	10	11	12	13
Water	1 1/2" BSP							2" BSP	
Drain	3/4" BSP – drain cock supplied								
Gas	1" BSP			1 ¼" BSP					

Refer to section 4 for details on handing options for boiler flow and return connections.

Fig.2 - Steel Base Strip Details (See Section 2 - Boiler Siting & Base)



No of Sections	5	6	7	8	9	10	11	12	13
F mm	243	324	405	486	567	648	729	810	891

CLEARANCES

The minimum boiler room clearances for access, erection and maintenance are as follows:-

REAR - 100mm (4 in) from rear of flue hood.

SIDES - 200mm

FRONT - 700mm to allow for burner removal.

TOP - 1000mm to allow for cleaning.

BURNER INFORMATION

The Derwent Premier boiler comes with Bray atmospheric burners.

GAS VALVE, PILOT BURNER & THERMOCOUPLE INTERRUPTER CONFIGURATION

The Premier boiler is supplied with one or two of the above items dependent on boiler size as follows.

- 5-7 section boilers have one gas valve, pilot burner and thermocouple interrupter.
- 8-13 section boilers have two gas valves, pilot burners and thermocouple interrupters. The gas valves are mounted at either end of the burner manifold and are supplied by a single gas manifold. The gas supply should be connected at one end of the gas manifold only with the opposite end plugged off.

1. **FUEL CONSUMPTION**
Gas fuel consumption can be based on natural gas with a gross calorific value of 38.6 MJ/m³, refer to page 7 for minimum and maximum fuel pressures. The gas rate should be corrected for the meter supply pressure particularly on high pressure supplies to prevent overfiring.

2. **MINIMUM OPERATING PRESSURE**
This is the minimum operating pressure of the boiler with pumps operating (NOT static pressure). The requirements of the Health & Safety Executive guidance note PM5 regarding maximum operating temperatures should be observed. See Section 3 for further details.

3. **BOILER FLUE CONNECTION**
A spun aluminium flue adaptor is included for convenience that is designed to accommodate BS835 twin wall flue pipe. It is not obligatory to use this adaptor but always ensure that the internal diameter of the flue used is no smaller than the connection on the flue collector hood (see Table 2, page 2). For transport the adaptor is tie wrapped to the flue hood

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 for flue sizing are 180°C at 6.5% CO_2 with 1mm draught at the boiler flue connection.

5. **NATURAL VENTILATION**
The sizes indicated are free grille areas and are based on a single boiler installation. See section 3 (page 7) for further details on ventilation.

6. **MECHANICAL VENTILATION**
The volume given is for a single boiler installation. See section 3 (page 7) for further details on mechanical ventilation.

7. **WATER CONNECTION SIZES**

Only one flow connection and one return connection can be used on each boiler.

8. **WATER FLOW RATES**
Water flow rates are given for boiler flow and return temperature differences of 11°C. See section 3 (page 12) for further details of maximum/minimum flow rates and hydraulic resistances at alternative flow rates.

9. **COLD FEED/OPEN VENT/SAFETY VALVE SIZES**
Sizes indicated are minimum sizes for single boiler installations. See section 3 (page 13) for further details.

10. **MINIMUM RETURN TEMPERATURE**
This is the minimum operating return temperature to prevent condensation within the boiler system. See section 3 for further details on back end protection.

11. **WEIGHT**
The dry weight is inclusive of the gas train.

GENERAL

The Potterton Derwent Premier cast iron sectional boiler is available in nine sizes with outputs from 64 kw (5 section model) to 193 kw (13 section model). Table 3 (page 2) gives kw output and technical data for each model.

They are approved for use on open vented systems, however, they are suitable for use on sealed systems with a maximum operating pressure of 5 bar (73.5 p.s.i.). Refer to relevant British Standards and Codes of Practice re installation of Derwent Premier boilers on sealed systems.

All the boilers are delivered with waterway, fluehood and burners assembled and packed on one pallet with control panel, casing pack and gas train.

For sites with restricted access the boiler block, with burner and drain off cock removed, will pass through a 660 mm (26 inch) doorway.

If necessary the boiler block can be easily stripped down into individual sections. Each section weighs approximately 90 lb and the principle dimensions are 800 x 500 x 90 mm.

All assembled boilers are delivered with the flow and return tappings suitable for left or right hand connection. The gas connection is made to the left hand side.

The boiler sections are cast iron with pips to aid heat transfer and they are joined by EPDM flat sealing washers to flow and return manifolds.

The control system incorporates full safety features including control and high limit thermostats, thermometer and on/off mains switch with lamp. All models have thermoelectric flame protection.

The boiler sections are insulated with glass fibre insulation ranging in thickness from 25 to 50 mm. The case is finished in a powder coat paint.

INSTALLATION

The installation should comply with the 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 I.E.E. 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 Act1974.

BS 5540: 1990: Part 1 – Specification for Installation of Flues

BS 5440: 2000: Part 2 – Specification for Installation of Ventilation for Gas Appliances

BS 6644: 1991 – Installation of Gas Fired Hot Water Boilers for Inputs Between 60 kw and 2 MW

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 44 kw and Above)

CP342:2 – Centralised Hot Water Supply

Gas Safety (Installation & Use) Regulations 1994

ACOPS 1-5, 15 and 16

IM/11 – Flues for Commercial & Industrial Gas Fired Boilers & Air Heaters

IGE/UP/1 – Soundness Testing & urging Procedure for Non-Domestic Installations

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

Manufacturers notes must not be taken in any way as overriding statutory obligations.

BOILER SITING & BASE

The boiler is for installation in boiler rooms only. The boiler must not be installed in occupied areas such as living spaces or kitchens.

The boiler should be sited in accordance with BS 6644: 1991 with respect to protecting the boiler from damage, air for combustion and ventilation, discharge of products of combustion, clearances for service and access, temperatures, noise levels, the disposal of boiler house water and the effects of flooding of the boiler house or seepage from a roof top boiler house. See section 1 (page 4) for required boiler clearances for services 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 will typically be a 50mm concrete plinth with an area equal to that of the plan of the boiler.

It is recommended that steel strips should be provided (not supplied by Potterton Commercial) to support the left and right hand section feet and the back feet of the intermediate sections, see Fig.2 (page 4) for details. These strips should typically be 3" wide and 1/8" thick.

It is not recommended to install commercial boilers in kitchens or living areas.

ELECTRICAL SUPPLY

A 230V 50Hz AC single phase electrical supply is required. The incoming mains supply should be terminated via a double pole fused isolator to the boiler, see Section 6 for wiring details. A 6.3A fused supply is required for all sizes.

Power Requirements

The electrical supply is to feed control circuits and gas valves. Typical loading is 0.22 KVA.

The external supply must be fitted with a 6.3A fuse.

All on site wiring shall conform to I.E.E. Regulations.

FUEL SUPPLY

NATURAL GAS

Where there is an existing primary gas meter, the appropriate gas supplier/undertaking must be consulted to ensure that the service/meter supply capacity is adequate for the proposed installation.

The burner gas connection sizes are given in section 1 and minimum and maximum inlet pressures are 17.5 mbar and 20 mbar respectively.

The gas supply pipe should be sized to allow the minimum operating pressure to be available at the burner inlet under full running conditions. The pipe should be sized to prevent excessive pressure drops under full running conditions.

Where gas boosters are required attention is drawn to the Gas Act 1986, Schedule 5, Part II, paragraph 8 (4). Guidance is given in IGE/UP/2 Gas Installation Pipework, Boosters & Compressors for Industrial & Commercial Premises. Any gas booster should be electrically interlocked to the burner. The inlet gas pressure should not be able to exceed the input rating of the appliance gas governor.

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.

The air supplied for boiler house ventilation shall be such that the maximum temperatures within the boiler house shall not exceed 25°C at floor level, 32°C at mid level (1.5m above floor level) and 40°C at ceiling level (or 100mm below ceiling level). Refer to BS 6644: 1991 for further details.

Air Supply by Natural Ventilation

Ventilation by grilles communicating directly with the outside air is required at both high and low levels.

The minimum free area of the grilles for a single boiler is given in Table 3 (page 2). Where plant is likely to used at or near maximum capacity during the summer months, additional ventilation may be required to prevent excess temperatures.

For boiler houses with multiple boiler installations the minimum ventilation should be sized in accordance with BS 6644 as follows:-

Low Level (inlet) - 540 cm^2 plus 4.5 cm^2 per kW in excess of 60 kW total rated input.

High Level (outlet) - 270 cm^2 plus 2.25 cm^2 per kW in excess of 60 kW total rated input.

The above calculated areas are "free" grille areas. Grilles should be designed to minimise high velocity air streams within the boiler house. Typical free area of a standard louvre is approximately 50%.

For boilers installed in a basement boiler house or similar, it is recommended that the inlet air be ducted to low level in ducting not less than equal to the free grille area. Should the inlet duct length be excessive then mechanical ventilation should be used. Position ventilation grilles to avoid accidental obstruction by blockage or flooding.

Further guidance on ventilation for gas appliances is provided by BS 6644: 1991.

Air Supply by Mechanical Ventilation

The supply of air to a space housing the boiler by mechanical means should be by mechanical inlet with natural or mechanical extraction. Mechanical ventilation with natural inlet must not be used, see Table 3 for mechanical inlet ventilation rates for single boiler applications

For multiple boiler installations the ventilation rate is based on a 1.1 m^3/sec flow rate per 1000 kW total rated input. The design extract rate should be based on 0.45 m^3/sec flow rate per 1000 kW total rated input.

For mechanical ventilation systems, an automatic control should be provided to cut off the supply of fuel to the boiler(s) in the event of failure of air flow in either inlet or extraction fans.

Flue Exit Loss		0.4674
45° Bend Loss x 2	+	0.094 x 2
Straight Flue Loss	+	0.0424 x 6
TOTAL LOSS P1	=	0.9098 mm

The buoyancy available is 6 x 0.44 mm = 2.64mm

Subtracting the loss from the buoyancy force;

P2 = ΔP - P1
= 2.64 - 0.9098
= 1.73 mm draught

Thus P2 is an acceptable draught (between 1 and 4 mm.w.g.).

NOTE: P2 = 1.73 mm draught
= -1.73 mm pressure at boiler flue exit

Difference between cold and hot running;

0.9098 + 1.73 mm = 2.64 mm

This is less than 4 mm and should give reliable cold start operation.

TABLE 4 - Flue Losses

Flue Diameter mm I.D.	Boiler Size	Flue Exit Losses mm.w.g	45° Bend Loss mm.w.g	Loss/m Straight Flue mm.w.g	Flue Gas Velocity m/sec
180	5	0.444	0.0888	0.063	3.1544
200	5	0.291	0.0582	0.0383	2.555
	6	0.456	0.912	0.0567	3.1954
	7	0.655	0.1316	0.0779	3.8325
250	6	0.1867	0.0323	0.0198	2.0451
	7	0.2686	0.0532	0.0273	2.4528
	8	0.3654	0.073	0.0357	2.8605
	9	0.4776	0.0955	0.0451	3.2704
	10	0.6041	0.1208	0.0554	3.6781
	11	0.7462	0.1492	0.0666	4.088
	12	0.9025	0.1804	0.0787	4.4957
300	10	0.2913	0.0582	0.0235	2.5543
	11	0.3598	0.022	0.0282	2.8389
	12	0.4652	0.87	0.0333	3.122
	13	0.5182	0.1036	0.0338	3.4067

Where horizontal flue runs are unavoidable owing to building constraints advice should be sought from a flue specialist with a view to installing an induced draught fan. Flue draught should be kept between 1 and 4 mm.w.g., draught conditions in excess of this should be alleviated by the use of a draught stabiliser.

Common Flue Systems

Where multiple boilers are installed on a common flue system then the flue system should be designed to ensure the correct operation of the flue on varying load conditions. In particular that the appliance flue draught is within the operating parameter under full load and partial load conditions. For 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 recommended that the services of a specialist flue system manufacturer are sought for the design of common flue systems).**

For initial flue design a flue size equivalent to the total free area of the boiler flue outlet should be used as a minimum.

Mechanical Assisted Flue Systems

Where mechanical assisted flue systems are being considered it is recommended that the advice of a flue system specialist is sought to ensure the duty and suitability of the fan. On mechanically assisted flues the boilers must be interlocked to prevent operation unless the fan is operating and air flow is proved.

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

FAN DILUTION SYSTEMS

Potterton Commercial gas fired boilers are suitable for fan dilution systems for low level discharge of products of combustion in accordance with BS 6644.

The fan dilution system should be designed to reduce the CO_2 concentration of the vented combustion products to 1% (volumetric) or less.

The discharge velocity from the fan dilution system should be a minimum of 7.5 m/sec and should be at least 2m above ground level for systems up to 1MW input.

The outlet grille should diffuse the products of combustion upwards and be located so that recirculation of combustion products is avoided, in particular the positioning of fan dilution systems in totally enclosed wells or courtyards should be avoided. The inlet and outlet grilles must be located on the same face of the building.

Fan dilution systems must be interlocked to prevent operation of the boilers unless adequate air flow is proved.

In accordance with BS 6644: 1991 the position of the outlet grille should comply with the following:-

1. The outlet grille shall not be less than 2 x 'U'm from any fan assisted intake, where 'U' is the uncorrected chimney height in metres, as defined in the Clean Air Act and is calculated from:-

   $$'U' = 1.3\ Q^{0.6}$$

   (where 'Q' is the heat input in MW)

2. The outlet shall not be within 2 x 'U' of an openable window or 6 x 'U' from an adjacent building.

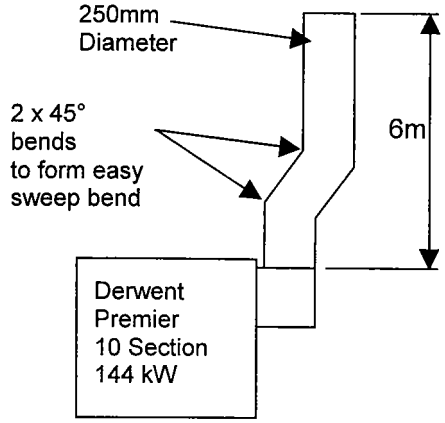
3. The fan dilution system should be designed to provide a flue draught at each boiler of 1-2 mm.w.g.

Typical duct sizes, fan volumes and values of 'U' are given in Table 5 (page 12).

It is important that adequate ventilation is provided into the boiler house especially as a proportion of the dilution air is drawn through the draught diverters on atmospheric appliances. Ventilation requirements must take this into account and may require larger louvres.

EXAMPLE

A Derwent Premier 10 section boiler connected to a 250 mm diameter flue 6m high, from the Tables above the flue loss is:-



provided at the flue socket under full load running conditions. The flue system should be designed to evacuate the products of combustion when all boilers are firing. The Local Authority should be consulted with regard to Clean Air Act approval.

FLUE SIZE CONSIDERATIONS

Nominal flue connection sizes are given in Table 3 (page 2), these sizes refer to the boiler flue connection socket, detailed dimensions of the flue adapter to BS 835 are given in Table 3 (page 2).

The actual size of the flue system will depend on individual site applications. Detailed below are general considerations on sizing flue systems. These notes are for guidance only and Potterton Commercial Division cannot accept responsibility for any flue system designs.

Natural Draught Flue Systems

Buoyancy Force

Natural draught flue systems are designed so that the buoyancy force due to the hot flue gases create a draught (suction) that, after overcoming resistance losses, is adequate for the flue draught requirements at the boiler connection spigot given in Table 3 (page 2).

Where the flue draught is inadequate to meet the minimum boiler flue draught requirements or excessive horizontal runs of flue have been utilised that may prevent satisfactory start-up of the boiler and flue system, then mechanical assistance should be considered. The buoyancy force is directly proportional to the flue gas temperature of the exhaust gas.

The flue system should be designed, and insulated where necessary, to maintain a temperature drop of less than 17°C between the flue gas entry and flue gas exit.

For flue calculation purposes the mean flue gas temperature is equated from flue gas temperature (nett) + ambient temperature – 17°C/2 (this assumes a maximum temperature drop of 17°C across the flue system and represents the mean temperature).

The Derwent Premier has a typical net flue gas temperature of 180°C on high fire. Assuming an ambient temperature of 20°C, a typical mean flue gas temperature for the Derwent Premier boiler would be:-

$$180 + 20 - \frac{17}{2} = 191.5°C$$

NOTE: Nett flue gas temperature = gross flue gas temperature - ambient

The buoyancy force available due to the vertical height of the flue can be calculated as follows:-

$$\Delta P = 353 \times H\left[\frac{1}{t^1 + 273} - \frac{1}{t^2 + 273}\right]$$

where: ΔP = Bouyancy force in mm

H = Stack height in m
t^1 = Ambient temperature °C
t^2 = Mean flue gas temperature °C

For a Derwent Premier boiler ΔP is typically 0.44 mm per metre stack height measured vertically from the flue connection on the boiler to the chimney exit point.

Flue System Losses

Losses in flue systems are attributed to friction losses owing to flue gas velocities, plus pressure losses owing to fittings and the chimney exit point. Table 4 (page 11) gives the pressure loss for each metre of flue pipe and the pressure drop for each flue fitting. The flue system pressure drops should be totalled including all horizontal flue runs and the chimney exit loss.

Subtraction of the total loss from the buoyancy available will give the flue draught available at the boiler flue outlet spigot. The flue system should be sized so that the draught available is within the operating range of the boiler as given in Table 3 (page 2).

Horizontal Flue Runs

Horizontal flue runs are not recommended particularly over 2m in length, where these are unavoidable advice should be sought from a flue system specialist.

Cold Start Considerations

When the boiler starts up from cold no flue draught is available and therefore the flue design should allow for a continuous rise to the top of the stack to ensure that adequate buoyancy is created as quickly as possible after start up, to prevent spillage from the draught diverter.

Horizontal flue runs only add to the flue resistance without creating any buoyancy and must be avoided. Sloping flue runs should not be less than 45° to the horizontal. Flue resistance should be kept to a minimum but flues should not be oversized as this may lead to cold start spillage.

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.

Tests for spillage of products from the flue system when the extractor fan is running and all doors and windows are shut should be carried out during commissioning. If spillage is detected, the area of permanent ventilation must be increased.

Contaminated Combustion Air

It is essential that fresh and uncontaminated air is introduced to the boiler for combustion.

Air contaminated with chlorine vapours and CFC gases must not be allowed to enter boiler combustion chambers or formation of chlorine gas and hydrochloric acid will create severe and rapid boiler corrosion There is also a danger that toxic chlorine gas will be emitted from the boiler flue.

In areas where such products are used, and these include degreasants, dry cleaning fluids, refrigerants and aerosol propellants, steps must be taken to isolate the boiler from the area by situating it in a separate area where fresh air can be introduced. Care should be taken in positioning extract ducts from contaminated areas in relation to boiler house grilles to ensure that cross contamination will not occur.

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: 1991 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 the Building Regulations should be strictly observed and approval obtained where applicable.

The chimney design should avoid the formation of condensate which may be achieved by insulating the flue.

In the case of flue systems which are exposed and have an overall height of 12m or more then consideration should be given to lining the flue.

In the case of brick or similar structures a stainless steel rigid or flexible flue liner (Grade 304/316) may be used backed up with a 50mm minimum thick layer of vermiculite or perlite granules between the inner skin and the chimney body. Cavities around the liner should be sealed at both top and bottom.

A flue system should be no nearer than 50mm to combustible material except where it passes through it enclosed in a sleeve of non-combustible material with an annular (air) space of 25mm.

Flues below 200 mm diameter should have effective protection to prevent ingress of rain, snow, leaves, birds, etc while having minimum resistance to the egress of flue products. For flues 200 mm and above no special flue terminal is required.

The flue termination should be at least 1m above the roof surface and away from any wind pressure areas where the flue products could re-enter the building, eg. near an openable window, mechanical air inlet, etc. Flues should not be terminated in areas where down draught may occur.

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. A minimum of 600mm straight vertical flue should be taken off the boiler flue outlet prior to any fittings.

On multiple boiler installations where a common flue header is utilised, boiler connections to the flue header and connection of the flue header to the chimney stack should utilise 135° swept "T" connections.

Drainage points positioned at the bottom of all vertical chimney sections should be provided. Drain pipes should be no less than 25mm I.D. and should be manufactured from acid condensate resistant material such as high temperature polypropelene or stainless steel and positioned so that pipe runs and discharge points are not subject to the effects of frost. Copper pipe is not suitable due to the mildly acidic properties of the condensate. These runs should fall with a gradient of at least 3% and at no point must the drain pipe rise above the level of the drainage point connection.

A draught of 1-4mm.w.g. (0.04-0.16 in.w.g.) should be

Table 5 - Typical Duct Sizes & Fan Volumes

Boiler Size	* Flue Volume @ 1% CO_2 m^3/sec	Duct Size (Diameter) mm	Velocity m^3/sec	** "U" m
5	0.218	200	6.92	0.285
6	0.272	250	5.534	0.326
7	0.326	250	6.647	0.364
8	0.381	250	7.754	0.399
9	0.435	300	6.154	0.433
10	0.489	300	6.923	0.464
11	0.544	300	7.693	0.495
12	0.598	350	6.217	0.524
13	0.653	350	6.782	0.552

* Flue gas volume @ 1013.25 mbar and 15°C. Typical diluted flue gas temperature is 14°C above ambient.

** Uncorrected chimney height from "Clean Air Act".

WATER CIRCULATION SYSTEMS

The water circulation systems should be indirect and installed in accordance with the relevant parts of British Standards Codes of Practice CP342 and BS 6644: 1991.

The maximum and minimum design temperature differential across the boiler should be 20°C and 10°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.

On systems with variable flow rates due to flow reducing devices, ie. TRVs, zone valves, etc, or where the minimum heat demand, ie. summer domestic hot water load, does not achieve the minimum boiler flow rate then consideration shall be given to incorporating a primary loop system. For further information see Potterton Publication Technical Bulletin No.1 Issue 2.

The flow rate and hydraulic resistance for an 11°C boiler temperature rise are given in Table 3 (page 2), alternatively, flow rates through boilers can be calculated from:-

$$\text{FLOW (lit/sec)} = \frac{\text{kW (Boiler Output)}}{4.2 \times \text{Boiler Temperature Rise °C}}$$

The minimum design flow rate relates to a 20°C boiler temperature rise and should not be misinterpreted as the system design temperature drop particularly where systems have been designed with stand-by capacity.

The hydraulic resistance of the boiler is proportional for flow rates equating to a boiler temperature of between 10°C and 20°C. The hydraulic resistance at 11°C is given in Table 3 (page 2), hydraulic resistance at alternative flow rates can be calculated from:-

$$R_2 = R_1 \times \left(\frac{\Delta t_1}{\Delta t_2}\right)^2$$

where:- R_1 = Boiler Resistance at 11°C
R_2 = Boiler Resistance at T_2 °C
T_1 = 11°C
T_2 = Alternative Boiler Temperature Rise

The maximum and minimum design pressures are 4 bar (136 ft.w.g.) and 0.3 bar (10 ft.w.g.). Care is needed in siting the pump relative to the cold feed and open vent connections. (NOTE: The above are not static pressures).

The boiler flow and return connections sizes are given in Table 2 (page 1).

It is recommended that the system is designed to give a constant flow rate. For further information on water circulation systems see Potterton publication Technical Bulletin No.1 Issue 2.

Boiler Condensation

If the system water content is large, and the start up period before which the water return temperature attains the minimum operating temperature exceeds 20 minutes then consideration should be given to the fitting of a shunt pump or by-pass valve controlled by a pipe thermostat to raise the return water temperature to prevent formation of condensation within the boiler and flue system. It should be noted that shunt pumps should not be used to boost low water flow rates. See Potterton Publicaton Technical Bulletin No.1 Issue 2 for further information.

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 Section 6.

The boiler and system should be protected by suitable frost thermostats.

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.

Strainers

Migrating sludge and debris will have a detrimental effect on the life and operation of the boiler and this must not occur. If all debris cannot be removed, strainers and/or other devices should be fitted. Consideration should be given to water treatment and inhibitors to maintain water quality. Migration of system debris or scaling of the waterways will impair the life expectancy of the boiler sections.

System Filling

When filling the boiler system with water care should be taken that the water does not backwash system debris into the boiler via the flow connection by-passing any strainers that may have been fitted.

It is essential that all systems are thoroughly flushed through with a flushing agent to remove all debris and scale prior to fitting the boilers. Cleaning systems with acidic descaling agents is not generally recommended as, if incorrectly used, the scale and deposits may continue to break up after the system has been flushed and the boiler installed.

Where the boiler is being installed as a replacement for an existing boiler it is recommended that where possible sections of the removed boiler are cut open and internally examined to determine the presence of scale or system debris to foresee and rectify any potential problems for the new boilers.

The fitting of strainers is strongly recommended.
The system should be checked to ensure that there is no raw water make-up. It is strongly recommended that a suitable water meter is fitted to the cold feed supply of the boiler system to monitor for unregulated water make-up.

The quality of the water in both the heating system and the water supply should be checked to ensure that the hardness (100 ppm) and salinity (TDS) are not excessive. In the case of systems containing aluminium components the pH should be monitored to prevent corrosion.

On systems where unregulated raw water make-up or system debris is known to exist but remedial action cannot be implemented then consideration should be given to installing a heat exchanger to isolate the boiler from the water system to protect the boiler otherwise premature failure may occur.

A specialist water treatment company should be consulted if in doubt.

OPEN VENTED SYSTEMS

Maximum Operating Temperature

The maximum operating temperature of a system is dependent on the operating pressure. The minimum design operating pressure (not static) at any point of a system should be sufficient to prevent boiling within any part of the heating system and the boiler control thermostat should be set to provide a 17°C safety margin below the saturated steam absolute pressure given in Table 6 corresponding to the minimum design operating pressure.

TABLE 6 - Saturated Steam Pressures

Temperature °C	110	120	130	140	160
Saturated Steam Absolute Pressure *	1.43 Bar	1.98 Bar	2.7 Bar	3.61 Bar	6.18 Bar

* **NOTE: These are absolute pressures not gauge. For gauge pressure 1 bar must be subtracted.**

EXAMPLE: A boiler system with a maximum operating temperature of 93°C and allowing for a safety margin of 17°C the temperature would be 93°C + 17°C = 110°C. From above the minimum gauge pressure within the system should be 1.43 bar - 1 bar = 0.43 bar.

COLD FEED SUPPLY

A cold feed pipe should be provided and taken directly from a feed and expansion cistern which shall not

supply water for any other purpose. It shall not be smaller than as specified in Table 3 (page 2) and shall be connected to the boiler or boiler side of any valve on the return pipe.

The cold feed pipe shall be situated within the building and shall be insulated along those parts of it's length where freezing conditions or condensation may be expected to occur.

For multiple and modular boiler installations the cold feed connection shall be either to the common return pipe upstream of the individual boiler isolating valves or to each individual boiler return pipe downstream of the isolating valve.

The cold feed to a multiple or modular boiler installation shall be provided with a lockable isolating valve and sized in accordance with Table 7.

TABLE 7 – Cold Feed Pipe Sizes from BS 6644: 1991

Rated Output kw	Minimum Bore mm	Nominal Size (DN[1]) mm
Below 60	19	20
60 - 150	25	25
150 - 300	32	32
300 - 600	38	40
Over 600	50	50
[1] Steel pipe sizes complying with medium or heavy quality of BS 1387		

For further details see BS 6644: 1991.

CISTERN SIZING

The cistern should be sized to accommodate the water expansion in the system from 0°C to the maximum operating temperature. Where the volume of the system is not known then it can be estimated at 12 litres per kw of design load.

For systems with a maximum operating temperatures of up to 100°C the water can expand by 4% (for systems up to 140°C the expansion is 8%). Therefore assuming a system loading of 1000 kw, the approximate system volume is 1000 x 12 litres = 12000 litres and the expansion of water in a system with a maximum design temperature of 100°C is 4% x 12000 = 480 litres. In this instance the cistern should have an expansion capacity between the cold fill level and the overflow pipe of 480 litres (minimum), (overflow should be 80mm above the highest expansion level).

IMPORTANT: The water level in the cistern or expansion tank should be minimal on cold charge to allow expansion without discharge from the overflow between cold and hot operating conditions.

Multiple or modular boiler installations shall have an open vent pipe or pipes of the size stated in Table 8 as appropriate. Individual open vent pipes shall be either routed independently to the venting point or be connected to a common open vent pipe of appropriate size for the total rated heat input of the installation (see Table 3 (page 2) for individual boiler open vent sizes).

The open vent pipe shall rise continuously by the shortest practical route to the venting point.

TABLE 8 – Open Vent Pipe Sizes from BS 6644: 1991

Rated Output kw	Minimum Bore mm	Nominal Size (DN[1]) mm
45 - 60	25	25
61 - 150	32	32
151 - 300	38	40
301 - 600	50	50
[1] Steel pipe sizes complying with medium or heavy quality of BS 1387		
For rated outputs above 600 kW the minimum cross sectional area of the venting pipe A (in mm^2) shall be determined as:- 3.5 x QR where QR is the rated output in kW		

The open vent pipe shall discharge into the feed and expansion cistern above the overflow level and for a single boiler installation the pipe shall not be fitted with valves (apart from a 3-way type such that when closed the boiler is open to atmosphere through the third port and shall incorporate means of indicating the position of the open port).

The nominal bore of the valve shall be not less than that of the open vent pipe in which it is fitted). Nor shall there be any obstruction which could prevent safe venting of the boiler. The vent pipe shall be insulated along those parts of it's length where freezing may be expected and shall be situated as far as is practicable inside the building to reduce freezing problems.

Boiler Safety Valves

Each boiler, whether in single or multiple installations, shall be fitted with an individual safety valve complying with BS 6759 Part 1.

In the case of modular boiler installations each bank of boilers shall be provided with a common safety

valve sized in accordance Table 9 to suit the total rated output of the boiler bank. Any boiler in a modular installation that can be isolated from the water supply shall be fitted with an individual safety valve.

The safety valve shall be sized to suit the total rated output of the boiler and shall be located between the boiler and the water isolating valve. See Table 9 for safety valve sizes on open vented systems. Refer to notes on sealed systems for safety valve sizes on sealed systems.

TABLE 9 – Safety Valve Sizes to BS 6644: 1991 (Open Vented Systems Only)

Rated Output Kw	Nominal Size mm	Minimum Area (A) mm^2
45 - 264	19	284
265 - 352	25	491
353 - 440	32	802
441 - 528	40	1135
529 - 732	50	2050
733 - 1142	65	3210
1142 - 1640	80	4540

Alternatively:-
'A' can be calculated from:- $A = \frac{R}{0.659 \times P1 \times Kdr}$

where R = Boiler Output in kW
P1 = 7.6
Kdr = The derated coefficient of discharge available from the safety valve manufacturer.
A = Flow Area in mm^2

The safety valves shall be fitted in the flow pipework between the boiler and the next valve in line and the safety valves shall not be more than 1m from the boiler measured along the flow pipe.

Boiler safety valves shall be of the direct spring loaded type or dead weight type and the maximum setting shall not exceed the following equation:-

MAXIMUM VALVE SETTING (IN BAR) = 0.1 + MAX BOILER DESIGN PRESSURE (IN BAR)

NB: 1 Bar = 33.5 ft head or 14.5 lb/in^2

On systems containing components with lower maximum operating pressures than the boiler, the rating of the safety valve should be reduced accordingly or additional safety valves provided to protect these items.

Spring loaded valves are recommended where the static head exceeds 2.5 bar and/or where the boiler may be affected by external vibrations.

The size of the connecting pipe from the safety valve shall terminate in a visible position where discharge will not result in hazard to the user or plant. The size of the discharge pipe shall be not less than the nominal size of the valve outlet.

For further guidance on safety valve sizes see BS 6644: 1991.

SEALED SYSTEMS

General

Potterton Commercial boilers are suitable for use on sealed systems designed in accordance with BS 6644: 1991 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".

Expansion Vessels

The sealed system should incorporate an expansion vessel complying with BS 4814 sized to accommodate the volumetric hydraulic expansion of the heating system between 0°C and the temperature setting of the overheat thermostat without exceeding the maximum design pressure of the boiler. The position of the expansion vessel(s) should be such that the manufacturers maximum operating temperature is not exceeded and the provision of an anti gravity tank may be required for systems operating above 100°C.

In addition, the position of the expansion vessel(s) should prevent inadvertent isolation of the boiler system from the expansion vessel, where isolating devices, ie, valves, etc, are incorporated between the boiler(s) and the expansion vessel these should be capable of being locked in the open position during normal operation. See BS 6880 Part 2 for further details.

System Filling & Water Make-Up

The sealed system should incorporate suitable means for initial filling, ie. pressure boost pump, which shall comply with the local water authority bye laws and the cold feed supply to the system should incorporate a non-return valve and an isolating valve with the capability of being locked in the open position during normal operation. An automatic air vent should be provided between the isolating valve and the non-return valve and provision should be made within the sealed system to allow automatic replacement of water lost from the system. This may include a pressure boost pump and associated controls or an independent primary feed cistern. However, it is recommended that a suitable device such as a water

meter is installed to detect unregulated raw water make-up. See BS 6644: 1991 for further details on provision for filling and make-up on sealed systems.

Maximum Operating Temperature

The maximum operating temperature of a sealed system is dependent on the operating pressure. The minimum design operating pressure (not static) at any point of a sealed system should be sufficient to prevent boiling within the any part of the heating system and the boiler control thermostat should be set to provide a 17°C safety margin below the absolute saturated steam pressure given in Table 6 (page 13) corresponding to the minimum design operating pressure.

The boiler overheat thermostat should provide a safety margin of at least 6°C below the absolute saturated steam pressure.

Minimum Operating Pressure

The minimum operating pressure (not static) or cold fill pressure should be sufficient to maintain a positive pressure within the heating system to prevent boiling as detailed above. Care should be taken in positioning of the circulating pump(s) relative to the expansion vessel (zero or null point) particularly on systems where a high hydraulic resistance is present to ensure that operation of the pump does not cause a reduction in operating pressure at any point in the system below the minimum operating pressure.

A low water pressure cut off device shall be incorporated to prevent operation of the boiler plant on low water pressure. The pressure cut off device should be set at a pressure to prevent boiling in any part of the heating system while operating at the design working temperature.

Consideration should be given to the positioning of safety valves, low level cut off devices and automatic air vents relative to the minimum operating pressure to ensure that the influence of pump operation does not cause or prevent operation of these devices.

Maximum Operating Pressure

The boiler plant should be prevented from operating when the system pressure rises to within 0.35 bar of the safety valve setting.

Safety Valves

The safety valve on a sealed system should be sized in accordance with the following equation.

$$A = \frac{R}{2.5 \times Kdr}$$

where; R = Boiler output in kW
Kdr = the derated coefficient of discharge available from the safety valve manufacturer.
A = flow area in mm

NOISE LEVEL

Derwent Premier atmospheric boilers are regarded as being commercially quiet, ie. <NR60, under typical operating conditions

The boiler is designed for installation in boiler rooms only and must not be fitted in occupied areas such as kitchens or living areas.

BOILER INSTALLATION

Boilers are delivered with fully assembled heat exchangers on a pallet for 5 to 13 section boilers and the control panel and casing is packed in separate cardboard boxes.

Each package is clearly labelled.

For all boiler sizes remove the shrink wrap polythene and the cardboard protecting the boiler block. The boiler block is held to the pallet by metal tie straps only.

When moving the boiler block into position the burner assembly should be removed if there is any likelihood of damage occurring. The burner assembly is fixed by two M8 studs, washers and brass lock nuts on each end section.

Jacks and crow bars should not be used against the flow and return manifolds.

Assembly of Flue Hood

For 5 to 13 section boilers the flue hood is already fitted before delivery. It should however be removed, particularly where there is difficult access to the back of the rear casing panel. Remove the flue hood by releasing four wing nuts and clamps as shown in Fig.11 (page 26).

Assembly of Burners

The burners are in position when the boiler is delivered. If the burners were removed during siting of the boiler then re-fit as follows.

When the boiler is sited the burner assembly should be refitted by using the M8 nuts on the studs in the end sections if it has been removed during positioning.

The front combustion chamber panel should be removed by undoing the four M8 nuts and the burner should be inspected and checked with a spirit level to ensure that they are horizontal and remedial action taken if they are not.

Assembly of Casing

See Fig.5 (page 20) for number references

Rear Panel (Stage 1)

1. Loosen (but do not remove) the four wing screws securing the flue hood to the boiler and locate the back casing panel and insulation panel over the two cast lugs near the lower edge of the flue hood.
2. Retighten the four wing screws to secure the flue hood.

Side Panel Support Strips

3. Locate the side casing panel support strips (item 12 x 2) along the inside bottom flange of the side casing panels (items 4 and 6). Using the central fixing hole secure the support strip to the panel using one the wing screws provided. Then using two more wing screws in the two outer holes loosely fasten the support strip to the panel leaving approximately 8mm of thread protruding below the panel (see Fig.3).

Side Panels

4. Locate the side panels with support strips attached onto the cast lugs on the boiler end sections ensuring that the wing screws, previously left protruding from the bottom of the panel, slide into the slots — do not tighten the wing screws at this stage.

Boiler Front Plate

5. Locate the boiler front plate (item 3) by gently easing apart the front edges of the side panels to enable the boiler front plate flange to locate behind the side casing front return edges.
6. At this stage tighten the wing screws along the lower edge of the side casing panels (left loose in step 4).

Upper Door Catches

7. Take the two upper door catches (item 17) and secure to the front edge of the side casing panels – the lower fixing point on the door catch also secures the upper fixing point on the boiler front plate. The upper fixing point of the door catch is secured to the side casing only by means if the spire clip provided on the casing panel (see Fig.4, page 19).

Bottom Door Supports

8. Take the two bottom door supports (items 18 and 19) and secure to the side casing panels using self tapping screws in the fixing holes provided. NOTE: These brackets are handed, please ensure they are fitted the correct way round (see Fig.5, page 20).

Rear Panel (Stage 2)

9. Using 4 x hexagon screws provided secure the rear panel (previously positioned in step 1) to

back edge of the side panels using the spire clips provided.

Control Panel Handing

10 The boilers are supplied as standard with the controls on the left hand side of the control panel. If these are needed to be on the right hand side of the control panel the following must be carried out.
11 The control thermostat, on/off and temperature gauge are mounted onto a plate which is secured to the front casing panel by six plastic pegs. Remove these pegs by pressing out the centre peg and remove the pin.
12 Retain all pegs and pins but at this stage do not make any electrical disconnection's. Pass the plate through the aperture in the housing panel.
13 Remove the housing panel securing screws (four screws two at each end) and remove panel and turn it through 180° so that the control aperture is on the right hand side and replace the four fixing screws.
14 The terminal strip is mounted on a removable plate secured to the control panel by two screws. Remove the plate and reposition it on the other end of the control panel using the original fixings.
15 Reposition the plate containing the control thermostat, ect into its new position on the right hand side and secure in place with the original plastic pegs.

Control Panel Fixing

16 Take the control panel housing (item 9) and offer it up to the front of the boiler and line up with the side casing panel ensuring that the top of the control panel housing lines up flush with the top edge of the side casing panels. Secure with 4 x hexagon screws provided.

Top Insulation

17 Position the top insulation blanket ensuring that it is pushed fully forward and down behind the control panel housing to meet the top of the flow header and that it is pushed under the cable channels along the top of the side casing panels.
18 At this stage all external connections (water, gas, electrics) should be finalised.
19 Insert the high limit thermostat, control thermostat and thermometer phials into the pocket adjacent to where the flow pipe is connected. Also connect the white plug from the gas valve(s) into the socket underneath the control panel housing.

Top Panel

20 Take the top panel and locate he return lip along the front of the top panel into the slots on the front edges of the control panel housing. Gently slide the top panel towards the rear of the boiler and locate over the top of the side casing panels. Secure at the rear with two hexagon screws provided.

Door

21 Take the door cut out blanking plate (item 13) and secure in place over the gas pipe cut out not required on the boiler door (item 5).
22 Position the door in front of the boiler and attach the earth cable to the connection on the bottom edge of the boiler door.
23 Hook the door onto the lower door supports and lift slightly to locate over the upper door catches.

Fig.3 – Fitting Side Casing Support Strips

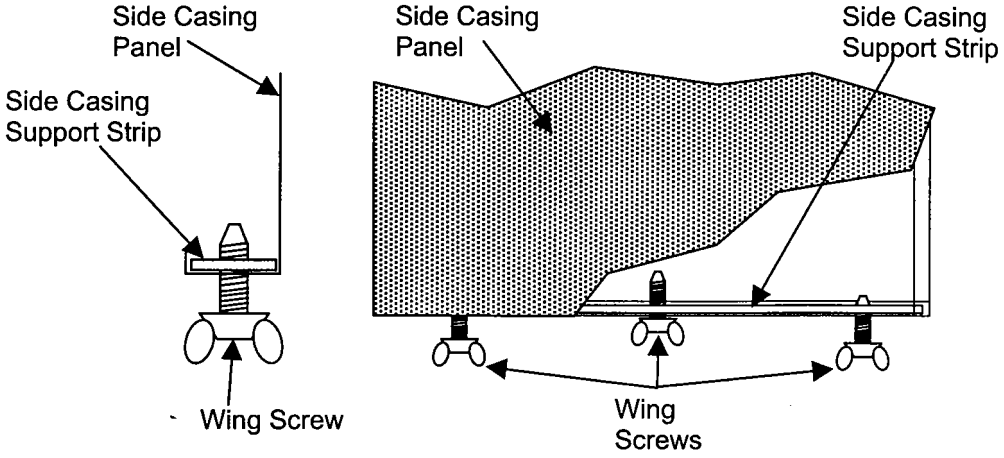


Fig.4 – Fitting Upper Door Catch & Boiler Front Plate

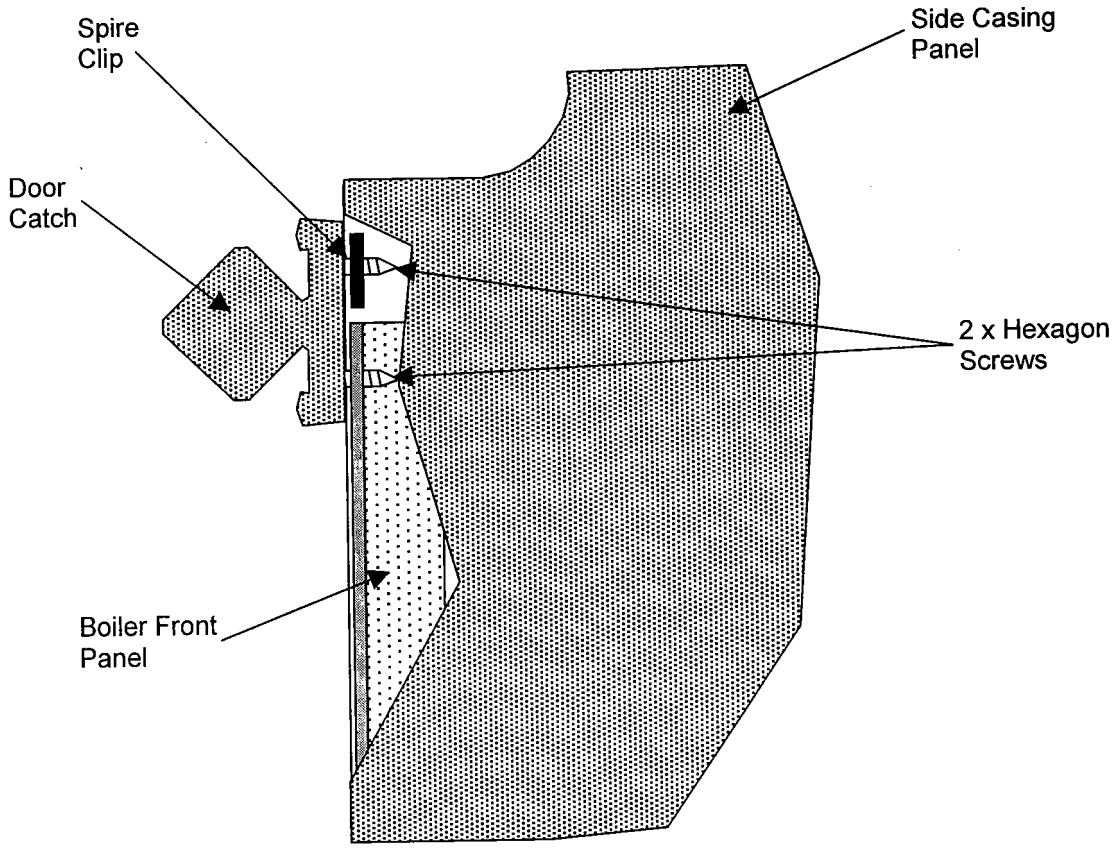
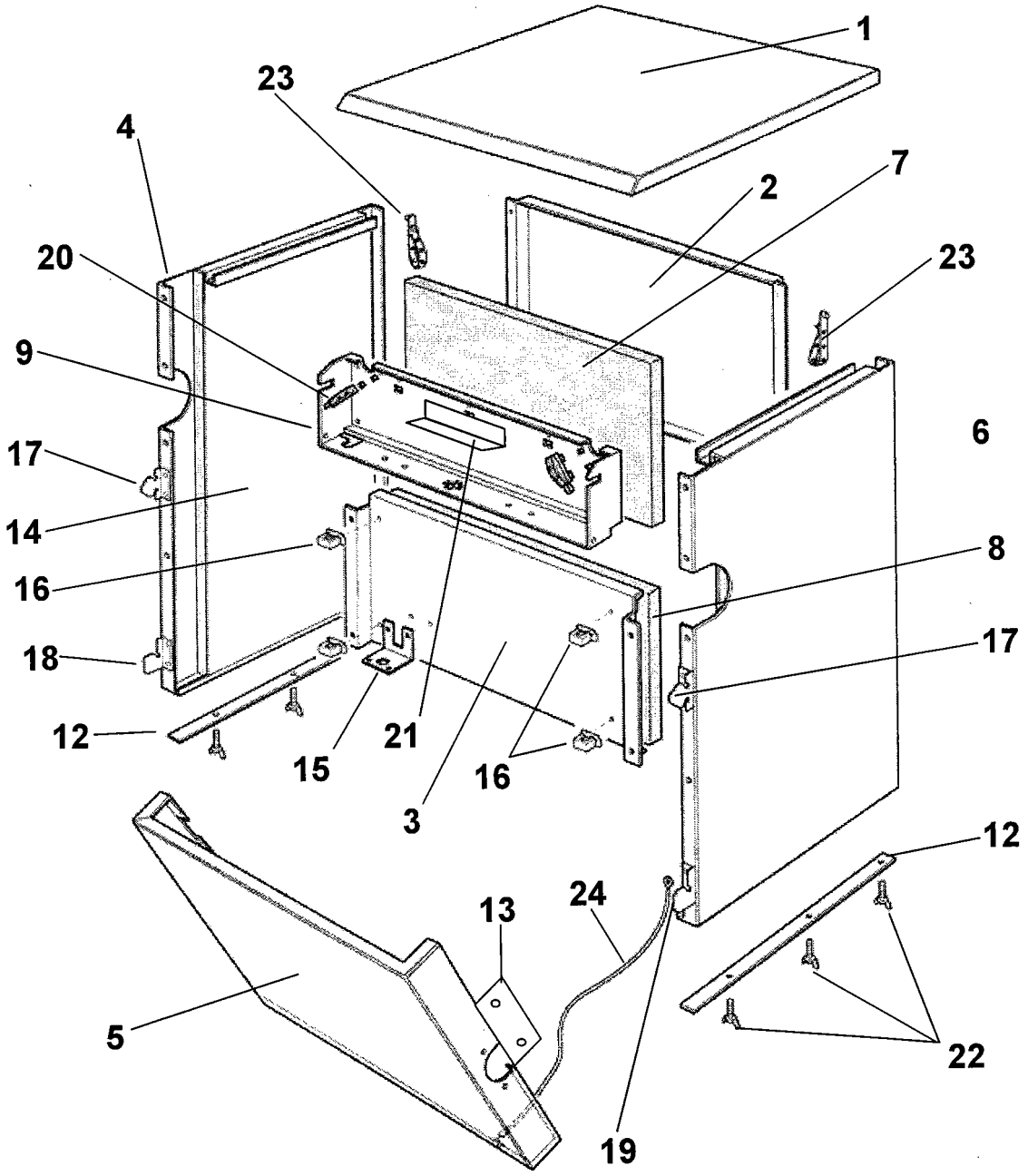


Fig.5 – General Arrangement of Casing



1. Boiler Top Panel [Red] (1 per size)
2. Boiler Rear Panel [Grey] (1 per size)
3. Boiler Front Panel [Galvanised] (1 per size)
4. Right Hand Side Panel [Red] (same all sizes)
5. Boiler Door [Red] (1 per size)
6. Left Hand Side Panel [Red] (same all sizes)
7. Rear Insulation [50mm Glass Fibre] (1 per size)
8. Front Insulation (1 per size)
9. Control Panel Housing [Grey] (1 per size)
12. Side Casing Support Strip [Galvanised] (same all sizes) – 2 per boiler
13. Door Cut Out Blanking Plate [Red] (same all sizes)
14. Side Casing Insulation [50mm Glass Fibre] (same all sizes) – 2 per boiler
15. Thermocouple Interrupter Support Bracket (5-8 Sect x 1, 9-13 Section x 2)
16. Cable Clips [Plastic] – 4 per boiler
17. Door Catch [Red] – 2 per boiler
18. Right Hand Door Support [Red] – 1 per boiler
19. Left Hand Door Support [Red] – 1 per boiler
20. Cable Clamp [Plastic] – 2 per boiler
21. Terminal Strip Support [Galvanised] (1 per size)
22. Wing Screws
23. Flue Brush Support

Connecting the Gas Supply

The connection should be made to the female connection (size given on page 1). A union and isolating valve should be fitted close to the boiler to allow disconnection of the boiler controls 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 as given in section 2.

In particular, before commissioning the boiler, ensure that the gas supply has been purged of air and a manual valve for isolation of the boiler is fitted in an accessible position, readily identifiable and adjacent to the boiler.

The gas supply should be supported adequately.

For large single and multiple boiler 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 will not be necessary if a minimum inlet pressure of 7.5 in.w.g. (19 mbar) can be provided at the inlet to each gas train and maintained during full load conditions. 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 Water System

The flow and return connections should be made to the appropriate manifolds.

The water system should be in accordance with the notes given in section 3 (page 12).

Connecting the Electrical Supply

The electrical supply should be 230V 1Ph 50Hz. A 6.3A fuse and a suitable two pole isolator having a contact separation of at least 3mm in all poles has to be provided by the installer for isolation of the boiler.

All on site wiring shall conform to I.E.E. Regulations.

The supply should be made to the left or right hand side of the boiler control panel by flexible conduit.

The entry should be made by a spare bulkhead connector on the control panel. The bulkhead connectors can be switched from one side to the other and blanking caps should be fitted over the unused entry holes. The blanking caps should always be used to cover spare holes.

Fig.6 – Boiler Base Tray Fitting & General Arrangement of Boiler
(8-13 Section Double Valve/Pilot Version Shown)

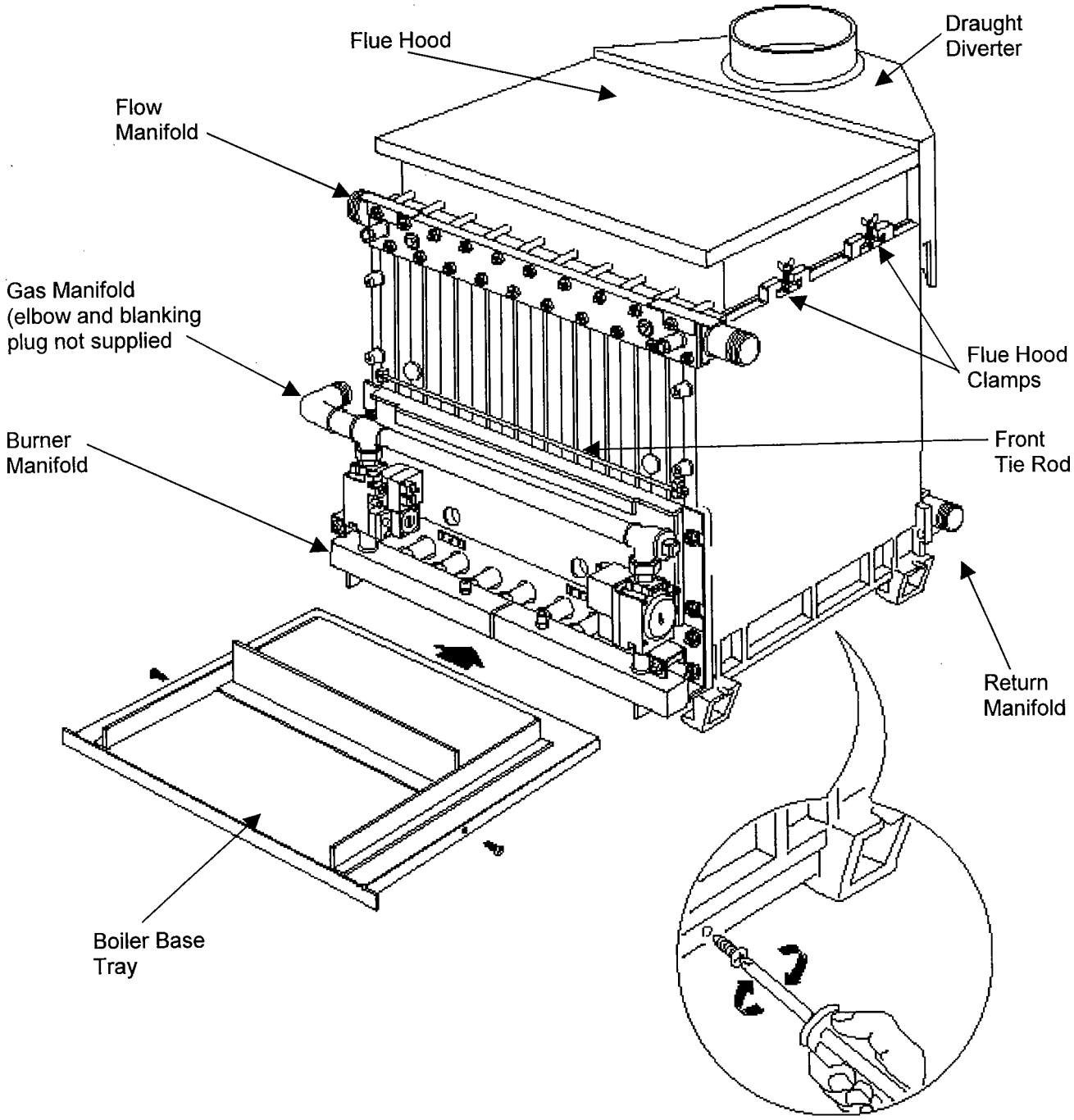
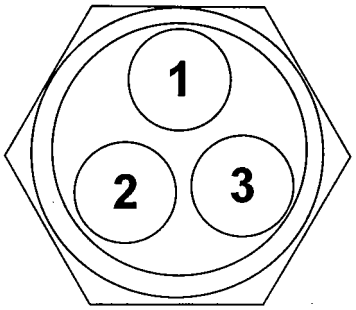


Fig.7 – General Arrangement of Thermostat Pocket



1. Overheat Thermostat
2. Boiler Flow Thermometer
3. Control Thermostat

The live, neutral and earth connections should be made to the control panel terminal block. The length of the conductors between the cord anchorage and the terminals must be such that the current carrying conductors become taut before the earth conductor if the cable or cord slips out of the cord anchorage. The wiring diagram is included in this manual on page 35 and also on the front inner panel of the boiler.

For multiple boiler installations each boiler shall have an isolator and fuse as detailed above to protect the boiler and allow for maintenance.

Fig.8 – General Arrangement of Boiler Block

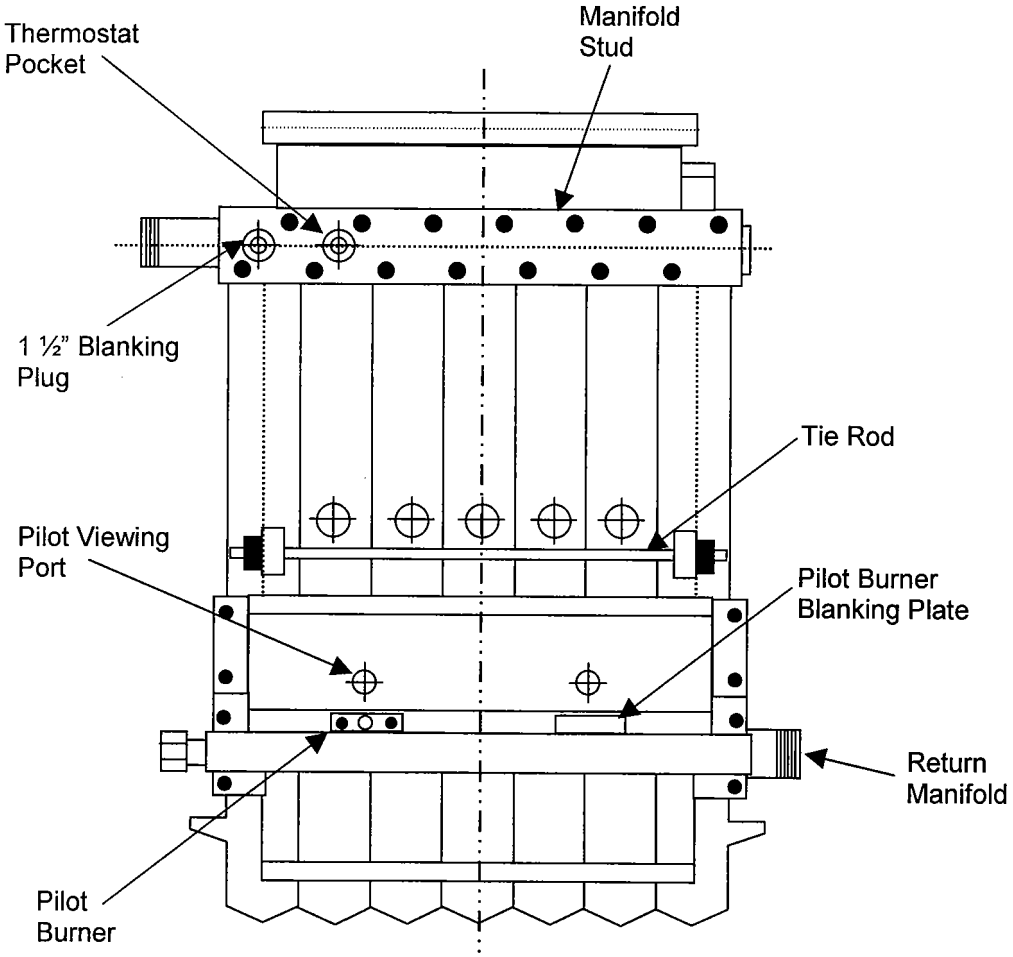
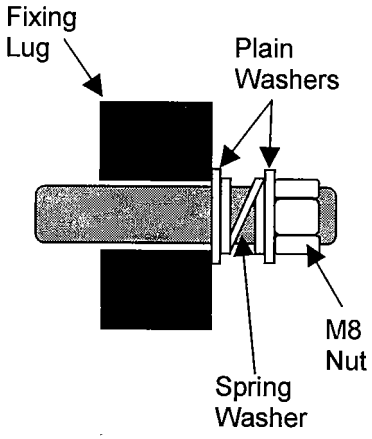


Fig.9 – Tie Rod Fixing



Boiler Controls

The operation of the boiler is under the control of it's own control box, boiler thermostat and high limit thermostat.

In addition, the boiler should be controlled by a time switch, frost thermostat, pump overrun facility and, for multiple boiler installations, a boiler sequence controller. The boiler can be controlled by removing link 4-5 and providing volt free contacts across these terminals to switch the boiler.

Connecting the Flue System

A flue adaptor socket is provided with each boiler for use with flues to BS 835, for flues to BS 715 this flue adaptor socket can be discarded.

The flue system should be made in accordance with the notes given in section 3 (page 8). The flue pipe should be supported so that no weight is transferred to the boiler draught diverter. Facilities for disconnecting the flue system from the boiler should be provided.

BOILER DISASSEMBLY

WARNING: THE BOILER MAY COLLAPSE IF THE FLOW AND RETURN HEADERS ARE REMOVED AT THE SAME TIME

To disassemble the heat exchanger proceed as follows:-

1. Remove the boiler casing, control panel, insulation, gas train and burner bars to leave the heat exchanger exposed.
2. Loosen and remove the tie rods.
3. Remove the flow manifold, fixed to each section by 2 studs/nuts.
4. Prise apart the first intermediate section and remove by sliding it forward. The section should come away complete with the return manifold O ring. Remove the other intermediate sections in the same way.
5. Support the end sections then undo the nuts holding one of the end sections in place and remove the section.

RE-ASSEMBLING BOILERS

To re-assemble the boiler glue, vaseline and a clean dry rag will be required.

Fit the M10 studs to the sections, two at the front and two at the back. Stud length is 82mm.

Add the sealing rope to the right hand side of the sections. The rope is pre-cut to two different lengths, one for the front and one for the back, and should be glued with the adhesive provided and trimmed to length if necessary.

WARNING: The adhesive gives off a flammable vapour and skin and eye contact should be avoided.

If the adhesive comes into contact with:-

a) **SKIN – then resin removing cream should be used and not a solvent to remove it.**
b) **EYES – the eye should be irrigated with water and medical treatment sought.**
c) **INHALATION – continued exposure should be prevented and the user should be removed to open air and if necessary medical advice sought.**

The adhesive should be used sparingly as it is only used to keep the rope in position until the sections are clamped together.

Stand the left and right hand end sections up and secure to the front manifold using the two small clamping plates provided. See Fig.10 (page 25). The manifold connections should be made to the left or right hand as required.

The front manifold has four BSP tappings, ¾" and ½", while the rear manifold has one ¾" BSP tapping.

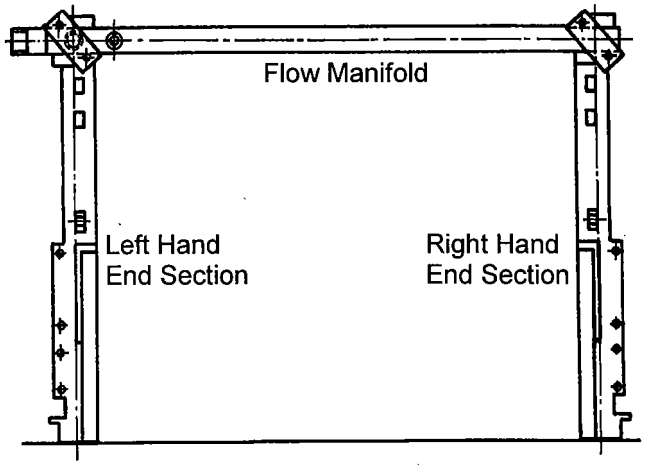
The end sections should be at right angles to the floor and sitting on the steel strips required under the section feet (see Fig.10, page 25).

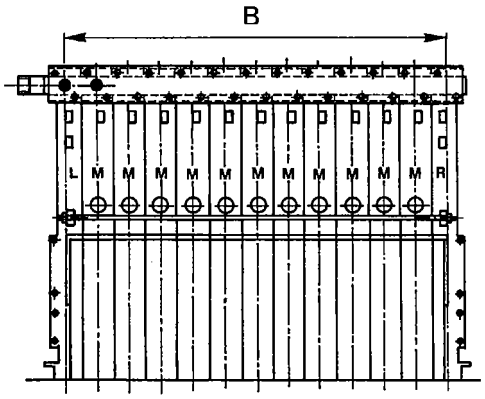
The sections should be spaced so that the distance between the centres of the sections are as dimension B + 2cm as given in Fig.10, page 25. It is essential that this dimension is maintained at top and bottom otherwise the bottom feet of the end sections may toe in and it will be difficult to fit the base tray.

The boiler should now be sitting in it's final position to avoid further movement when it is fully assembled.

Take an intermediate section and hang it on the front manifold against the left hand end section taking care not to snag and pull off the sealing rope. Add all of the intermediate sections until the last one is in place.

Fig.10 - Re-Assembling Boilers





No of Sections	5	6	7	8	9	10	11	12	13
B (mm)	324	405	486	567	648	729	810	891	972

Loosen the clamping plate holding the right hand end section and push the section up against the intermediate sections.

Add the three tie bars, one at the front and two at the rear. Loosen the two clamping plates, fit the base tray in position as shown in Fig.6 (page 22) and tighten the tie rods on the boiler up to dimension B, Fig.10.

Check this dimension carefully and check that the sections are at right angles , sitting on the steel base strips and that the sealing ropes are still in position. The base tray should be sitting on the lugs on the inside of the end section feet and not on the boiler base.

Fit the return manifold to the back of the boiler with the return connection to the left or right hand as required as follows;

- Fit the O rings to the section using the Vaseline provided. No other compound should be used on the O rings or ports.
- Push the manifold up against the O rings, position the U channel capping so that the hole in it lines up with the drain off cock tapping and fasten with the plain washers, spring washers and nuts. There should be one plain washer against the U channel capping, a spring washer above it and then the nut. The nuts should be tightened evenly until the spring washers are nearly flat.
- Remove the clamping plates holding the front manifold and pull the manifold back but do not take it off the studs.
- Fit the O rings into the sections using the Vaseline provided to hold them in place. Do not use any other type of compound.
- Reposition the manifold and fit the U channel capping and secure with the plain washers, spring washers and nuts as for the rear manifold.

The drain off cock, the two thermostat pockets and the ½" BSP blanking plug are fitted to the manifolds before despatch.

The boiler is now ready for hydraulic testing.

HYDRAULIC TEST OF BOILER

This is to be carried out on boilers assembled on site or where water manifolds have been disturbed.

Fit a hydraulic test pump to the return manifold and fit a valve to vent air from the flow connection.

Fill the boiler with cold water and, in accordance with BS 779: 1976, pressurise up to 1.5 times the design pressure, ie. 7.5 bar maximum, and observe for 30 minutes.

ASSEMBLY OF FLUE HOOD AND BURNERS

Locate the burner assembly on the lower four M8 studs and fasten with the washers and brass nuts provided.

The burners should be checked with a spirit level to ensure that they are horizontal and remedial action should be taken if they are not.

The flue hood is fitted onto the top of the boiler block

and a seal must be made using the ceramic felt provided between the sections and the flue hood.

Take a roll of ceramic felt packed with the boiler and cut a strip and glue it across the front end of the sections. Next cut two pieces of sealing strip to form the side seal on top of each end section. See Fig.11 for the position of the flue hood sealing strip.

Finally add the rear sealing strip. This sealing strip does not sit on top of the end sections but underneath the lip at the back of each section. See Fig.13 (page 27) for the position of the rear flue hood sealing strip.

Fit the flue hood taking care that the seal is correctly made and secure the flue hood with the four clamps and butterfly screws as shown in Fig.11.

Fig.11 - Flue Hood Sealing Arrangement

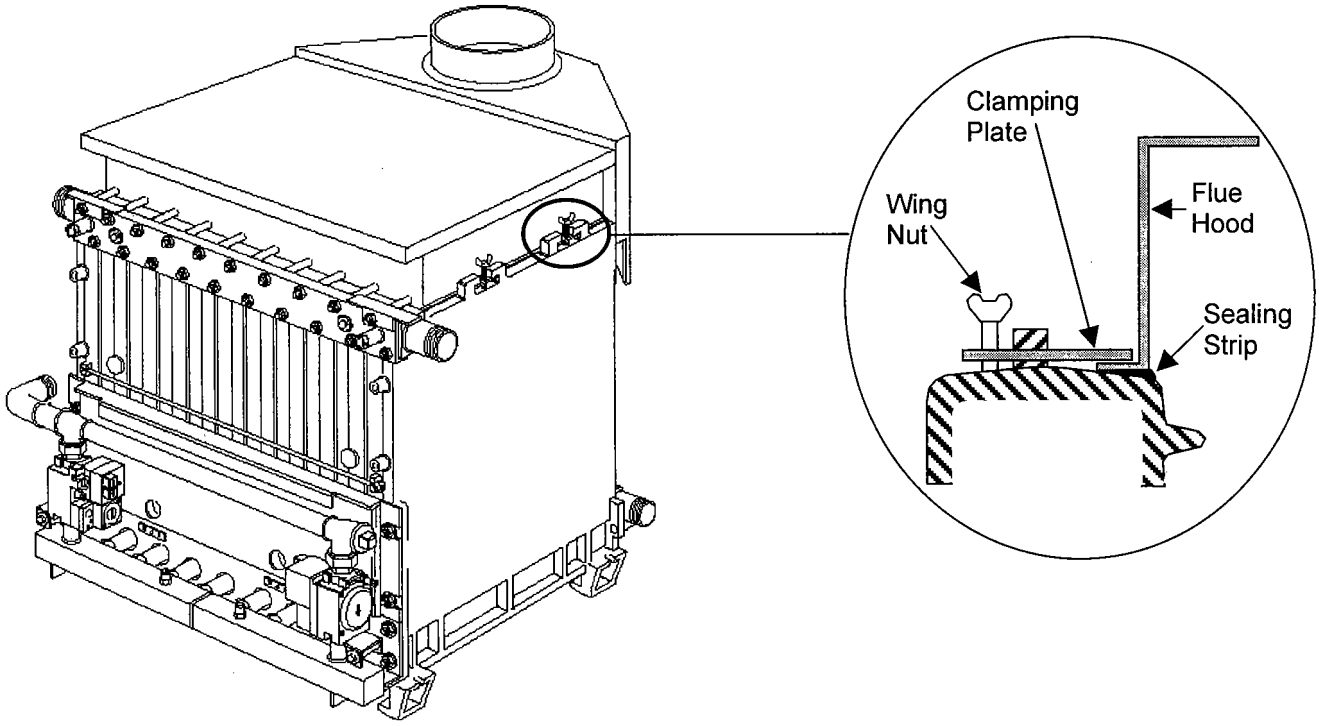


Fig.12 - Control Panel Layout (Not to Scale)

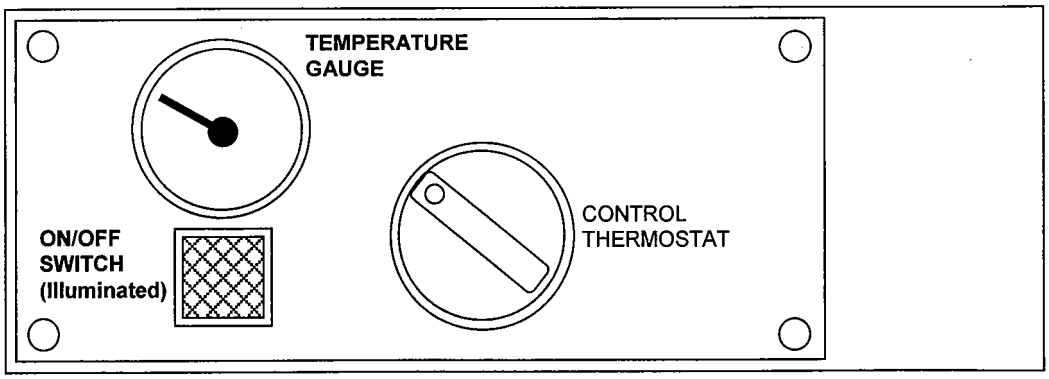


Fig.13 - Arrangement of Insulation & Rear Sealing

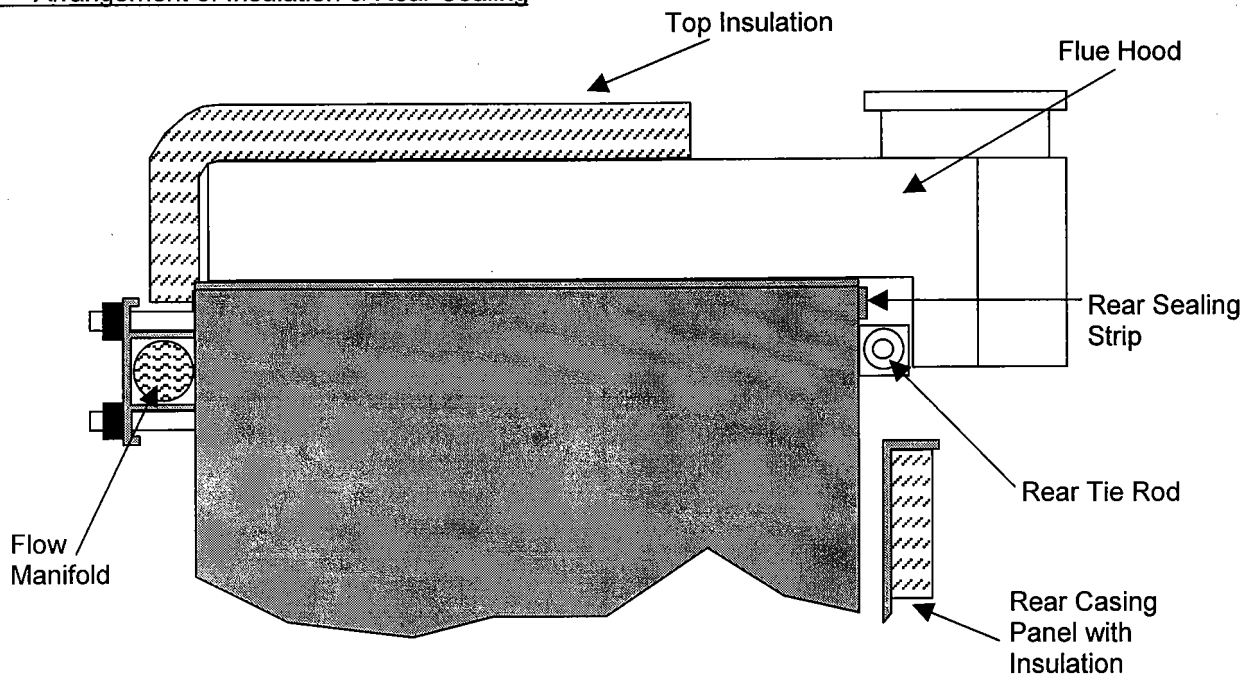
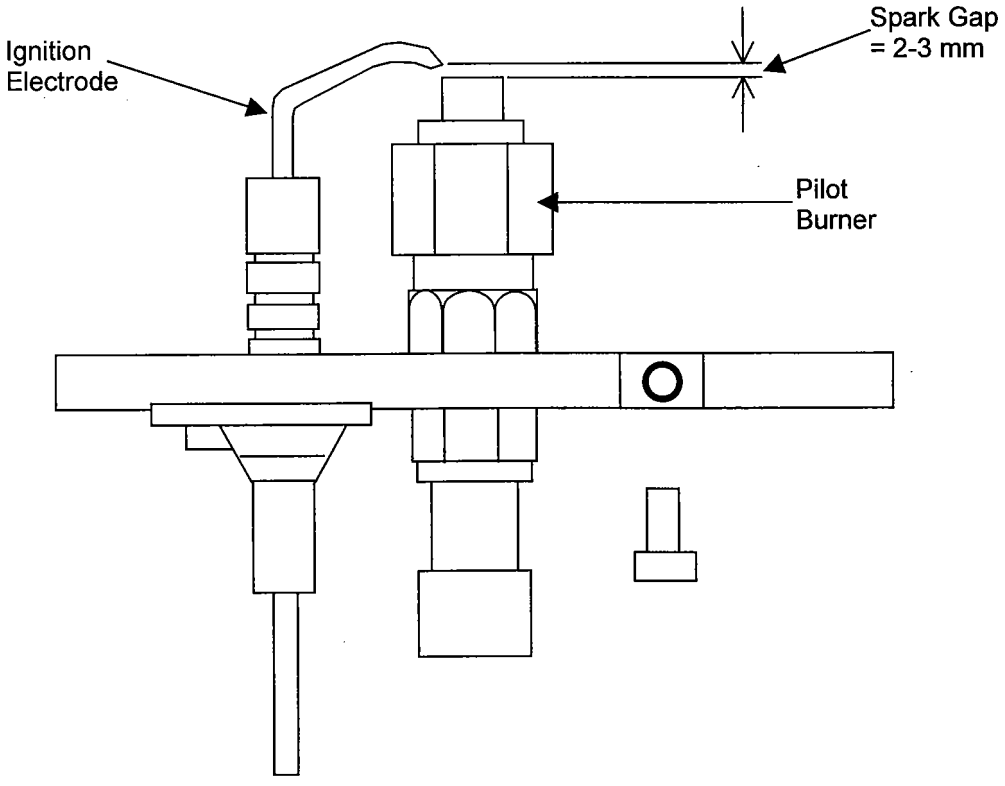


Fig.14 - General Arrangement of Pilot Burner



BOILER MAINTENANCE

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 (Confederation of Registered Gas Installers) registration of personnel undertaking work on these appliances. This facility is available from Potterton Commercial Division, details are available from the regional service offices listed on the back page of this manual.

Boilers should be serviced and re-commissioned as a minimum on an annual basis but frequency may depend on usage and application of the boiler.

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.

Following completion of maintenance on the boiler the boiler should be re-commissioned as detailed below.

BOILER CLEANING

At every service visit the boiler should be cleaned as detailed below and the soundness of the gas control assembly must be checked as described on below. The boiler should be fully re-commissioned as described on page 29 with attention also paid to:-

- The effectiveness of natural and mechanical ventilation and in particular the safe operation of any air flow switch on a mechanical ventilation system.
- That the chimney system is sound and adequately evacuating the products of combustion and that there is no spillage of flue products.
- That the burner gas pressure is correct and that the boiler is still on rate.
- That the low pressure switch on a booster system, if fitted, is operating correctly.
- That the water flow switch, if fitted, is operating correctly.

To clean the boiler it will be necessary to remove the boiler flue hood cover and burner assembly as detailed below.

1. Remove the boiler door by lifting upwards and forwards.
2. Disconnect the burner manifold from the gas train union.
3. Disconnect the ignition and thermocouple from the pilot burner. This will allow removal of the pilot burner.
4. Release the four M8 nuts securing the front combustion chamber cover mounted above the burner assembly and remove the panel.
5. Release the four M8 nuts securing the burner assembly to the boiler and remove the burner assembly.
6. Remove the boiler top panel.
7. Remove the screws securing the flueway clean out cover and remove the cover.
8. With the flue brushes provided clean the flueways of the cast iron heat exchanger.

Following completion remove the debris from the bottom of the boiler.

9. Following completion of the above the boiler should be re-assembled. The integrity of the gaskets and insulation should be checked and replaced if necessary during reassembly.
10. Clean the burner bars and ensure that the holes/slots are clear. If necessary blow the slots and internals clear with compressed air or soft brush and vacuum. On no account should the burners be wire brushed.
11. After reassembly test for gas soundness as detailed under Commissioning and check the burner manifold union and pilot burner union for gas leaks.

COMMISSIONING

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

Soundness Test Procedure

- Where appliances are connected, check that they are isolated or that all operating taps and pilots are turned off.

- Connect a pressure gauge to the system either:
  - to a suitable pressure test point where the installation is already connected to a gas supply; or,
  - to one branch of a T piece which is valved on the other branch for air to be pumped into the installation.
- Slowly raise the pressure to 20 mbar (with gas or air as appropriate) and turn off making sure that the test pressure does not exceed 25 mbar.
  - NB: When an installation is connected to a gas supply, pressures above 25 mbar may cause governor lock-up and give misleading test results. Therefore at the end of the testing for soundness, and with the emergency control turned on it may be advisable to test the meter inlet pipe with leak detection fluid.
- Allow 1 minute for temperature stabilisation. If a pressure rise is observed, either the temperature of the system is rising, in which case the temperature has not stabilised adequately, or the means of isolation from the pressurising source is leaking. If it is the meter control that is leaking, report this fact to the fuel supplier immediately for rectification.
- Record any pressure loss in the next 2 minutes and check that there is no smell of gas.
- On completion of a satisfactory test, either plug or seal ends of the pipework or, where a meter is available, purge the pipework.

TEST ALL PURGE AND PRESSURE TEST POINTS WITH LEAK DETECTION FLUID.

Purging the Installation

Every installation should be purged after passing the soundness test. The purge procedure is to ensure that the whole installation is free from air and that gas is available throughout the pipe lengths.

- Inform the customer that you are about to purge the installation.
- Ventilate the premises.
- Extinguish any naked light.
- Do not use electric switches or appliances.
- Choose a purge point furthest away from the meter, however do not purge in a confined space.
- Purge with a volume of gas not less than 5 times the badged capacity per revolution of the meter mechanism. (NB: The badge capacity per revolution is marked on each meter).

  A typical U6 meter will most likely have a badge capacity per revolution of 0.071 ft³. Therefore to calculate the purge volume:

  Badge capacity pr revolution = 0.071 ft³ x 5
  Purge Volume = 0.355 ft³

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.

Before commencing commissioning ensure that any cling film wrapping is removed from the casing panels and then check the following.

1. Electrical supply is switched off. All electrical connections are sound and correctly made.
2. Electrical system and boiler are correctly earthed and of the correct supply voltage and polarity.
3. Gas supply is tested for soundness in accordance with BS689 and purged of air. Ensure that the burner is suitable for connected gas supply and pressure.
4. Test for gas soundness of gas trains as described on page 28.
5. Appliance gas cocks are all turned off.
6. Gas supply is turned on at the meter.
7. Boiler and system are filled with water and operating pressure is within appliance range.
8. Flow and return valves are open.
9. Any external controls and the on/off switch are in the "ON" position.
10. The circulating pumps are operational. Check that the pump is scheduled to run and not on pump overrun if the boiler has previously been fired. Check that any flow proving interlocks are functional.
11. Check that the overheat thermostat has not tripped by pressing the reset button.
12. Ventilation is adequate and, in the case of mechanical ventilation systems, operation of the boiler is inhibited unless that ventilation fan is proved.

13. On mechanically assisted flue systems the operation of the boiler plant should be inhibited unless the mechanical flue system is operational and flow proved.

14. The safety valve should be checked to ensure that it is of the correct size and pressure. See section 3 (page 15) for further details.

15. The cold feed and open vent sizes should be checked. See section 3 for further details.

Pre-Lighting

Before attempting to light the boiler start the circulating pump and check that it is scheduled to run and not on pump overrun if the boiler has been fired previously.

1. Check that the appliance isolation valves and the electrical supply are turned off.

2. See the boiler control thermostat to the required position and the time clock to an "ON" position. Check that the high limit thermostat has not tripped by pressing the green button on the control panel fascia.

3. Ensure that the gas pipework to the boiler has been adequately purged.

COMMISSIONING INSTRUCTIONS

1. Turn on the appliance isolation valve. Where two gas valves are fitted (8 to 13 section boilers) turn on the isolation valve to one gas valve only. NOTE – individual manual isolation valves are NOT fitted to each gas valve on double gas valve models.

2. Connect a pressure gauge to the burner manifold pressure test point.

3. Ensure that the electrical supply to the boiler is turned off.

4. Depress and hold the pilot ignition button on the gas valve and light the pilot using the piezo ignitor. Keep pressing the pilot ignition button for approximately 30 seconds. Slowly release the pilot ignition button. The pilot should remain alight. If the pilot goes out re-light the pilot following the same procedure keeping the button depressed for a little longer.

   If the pilot still goes out check that there is no air in the pilot gas line and re-light the pilot.

   For 8 to 13 section boilers repeat the above for the other gas valve and pilot.

5. Once the pilot is established turn on the electrical supply to the boiler. Set any external control systems to call for heat. Set the boiler control thermostat to 80°C. The main gas burner will now ignite.

6. Check the gas pressure at the burner manifold and adjust to 14 mbar at the gas regulator on the gas valve. For 8 to 13 section boilers this process should be carried out for both burners.

7. Check the flue for spillage as described below.

8. Test the gas connection between the appliance isolation valve and the burner manifold for soundness with a soap solution or other approved method and seal any leakages.

9. Check the reliability of ignition of the boiler by switching the boiler off using the ON/OFF switch on the boiler control panel. After 2 minutes turn the switch back to ON. The boiler will now relight. Check that the pilot has a stable flame and that the main burners light smoothly.

10. Turn the appliance isolation valve off. The main and pilot burners should go off. Turn the appliance isolation valve on and attempt to relight the pilot. There should be no gas supply at the pilot. Re-light the pilot by following the instructions above.

Flue Spillage Test

With the boiler hot and cold check for spillage of combustion products by using a smoke bomb or smoke wand (the smoke should be observed being drawn up the flue). Check that air is moving onto the front of the boiler and that combustion products are not spilling out of the draught diverter at the back.

The flue draught should be checked with a draught gauge and a draught of 1 mm.w.g. (0.04 in.w.g.) is required and should be measured at a suitable test point in the flue above the flue adaptor socket.

Ventilation Checks

For boiler houses with natural ventilation, the area of the grilles should be checked against the notes given on ventilation in section 3 (page 7).

For boiler houses with mechanical ventilation, the suitability of the ventilation and extract systems should be checked against the notes given on mechanical ventilation in section 3 (page 7).

In addition, the installer must check that it is not possible for the boiler to operate if either the ventilation or extract fans are not running.

WARNING: THE BOILER SHOULD NOT BE OPERATED WITHOUT ADEQUATE VENTILATION

Following completion of the above checks the burner should be commissioned. Typical combustion figures are detailed below. The combustion figures, etc. should be completed on the commissioning form provided at the back of this manual and returned to Potterton Commercial at the address on the back page of this manual.

Commissioning figures should be taken with the boiler at high fire and a flow temperature of 80°C. The combustion measurements should be taken in the secondary flue at a minimum of 600mm above the draught diverter.

GAS	CO_2	-	6.5 – 7.5%
	CO	-	0 – 50 ppm
	Flue Gas Temp	-	140 – 180°C

IMPORTANT The boiler/burner units are supplied in accordance with current EC Directives and it is a condition of the supply of the appliance for compliance with these directives that the appliance commissioning report is completed and returned.

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

- The control and overheat thermostats should be checked for correct operation.
- 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, see Table 3 (page 2).
- 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.
- Following commissioning of the boiler the control thermostat should be set to the required operating temperature. See section 3 (page 13) for maximum operating temperatures.
- Following completion of commissioning the soundness of all automatic fuel valves should be checked for leakage.

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.

OPERATION OF ANCILLARY CONTROLS

After lighting the boiler the operation of the above mentioned controls, eg. time clock and thermostats, should be checked.

TO LIGHT BOILER – NORMAL OPERATION

1. Turn on the main appliance isolation valve.
2. Depress the pilot ignition button and light the pilot keeping the pilot ignition button depressed.
3. After approximately 30 seconds release the pilot ignition button. The main burner will now light if the boiler control is calling for heat.

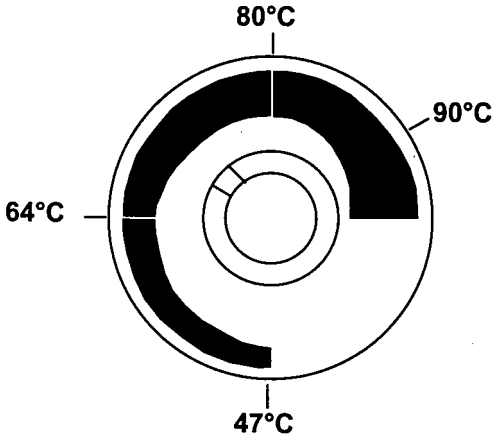
TO SHUT DOWN BOILER

1. Temporarily – Switch off the boiler ON/OFF switch located on the boiler control panel. NOTE: The pilot burner will remain alight.
2. Long Periods – Switch off the boiler ON/OFF switch located on the boiler control panel and turn off the main appliance isolation valve. NOTE: This will extinguish the pilot and isolate the boiler from the gas supply.

SETTING THE FLOW TEMPERATURE

The required flow setting should be set by control thermostat against the expanding scale. The temperatures which correspond to the positions on this scale are given in Fig.15. The boiler thermometer should be used to check and adjust the setting as necessary.

Fig.15 – Control Thermostat Expanding Scale



WATER FLOW SWITCH

For boilers fitted with a water flow switch, the installer should check that it is not possible for the boiler to fire when there is no water flow. This may be done by checking that the boiler closes down when the pumps are switched off or the water flow is gated off. Always restore the water flow before completing commissioning.

FAULT FINDING

Set out below are general guidance notes on system fault finding.

Overheat Operation

The Derwent Premier 5 to 7 section boilers are fitted with one overheat thermostat device. The 8 to 13 section boilers have two overheat thermostats fitted.

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 has not tripped.
b) Pump overrun is operational to dissipate residual heat from the boiler on system shut down.
c) System valves are open.
d) The boiler is operating at the correct rate and is not overfired.

To reset the overheat thermostat allow the boiler to cool down, remove the overheat thermostat knob and press the reset button.

The use of a primary loop system is highly recommended to provide a constant boiler flow rate under all operating conditions. Fir further information refer to Potterton publication Technical Bulletin No.1 Issue 2.

Burner Fails to Light

The Derwent Premier has an integral safety system to allow safe and reliable operation of the burner. Protection against flame failure is provided by a thermocouple which controls the pilot burner. Should the pilot burner fail then the thermocouple will shut down the supply of gas to both the pilot and main gas burners, safely shutting down the boiler.

If difficulty is experienced trying to light the pilot check that the pilot flame is playing on the thermocouple and check that the thermocouple is properly connected to the gas valve.

THERMO-ELECTRIC PILOT OUT KIT

Where remote indication of the boiler failure is required, e.g. BEM's systems, it is possible to fit a pilot out kit to give volt free contacts.

The storage water heater is fitted with a thermocouple interrupter, which switches off the thermocouple current in the event of the boiler tripping at high temperature. This will extinguish the pilot and therefore if the pressure in the pilot line is detected this will give an indication of whether the boiler is available to run.

The pilot out kit contains a pressure switch with changeover contacts, which can be fed from the BEMs system to give a signal in the event of pilot failure.

The kit consists of the following components: -

Item	Part No
1 × Air Pressure Switch (Dungs GW10).	907901
1 × Pressure Switch Bracket.	907909
2 × M5 Nuts.	635404
2 × Screw – No. 8 × 16mm self-tapping.	612831
1 × Locknut – HOBBS.	907903
1 × Elbow – ¼" BSP to 6mm HOBBS.	907904
1 × Sealing Washer – HOBBS.	907905
1 × Tee – 6mm Compression.	907906
4 × Olive – 6mm.	907907
4 × Tube Nut – 6mm (male).	907908
1 × Bundy – 6mm Aluminium.	700705
2 × Set Screws – M5 × 25mm.	633937

Installation

The installation of this kit should comply with relevant British Standard specifications, Codes of Practice and current Building Regulations together with any special regional requirements of the Local Authority, gas region and insurance company. All electrical wiring must comply with IEE Regulations for the Electrical Equipment in Buildings. An approved and competent gas engineer should only undertake the installation.

Fit the ¼" BSP to 6mm O/D elbow to the rear connection on the air pressure switch using the HOBBS locknut and sealing washer as shown in Fig. 10. The elbow should be positioned in such a manner to keep the gas pipe connection to a minimum and the connection sealed using the locknut and sealing washer.

1. The locknut should be tightened adequately to compress the plastic sealing washer to form a gas seal. It is important that the locknut is fitted with the chamfer on its sealing face, the sealing washer should fit in the chamfered edge, (see Fig16).

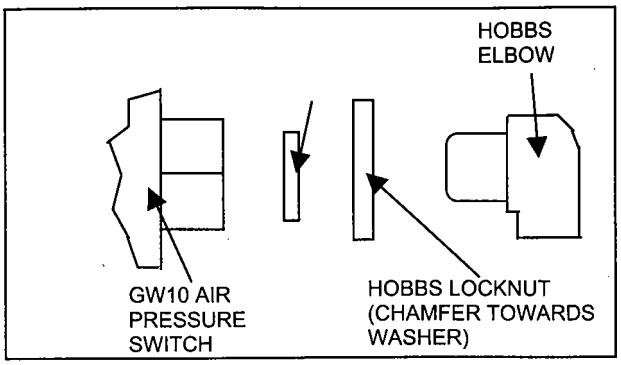


Fig.16 – Locknut Sealing

2. Fit the two pressure-switch brackets to the air pressure switch with the fixing screws provided (see Fig.17).

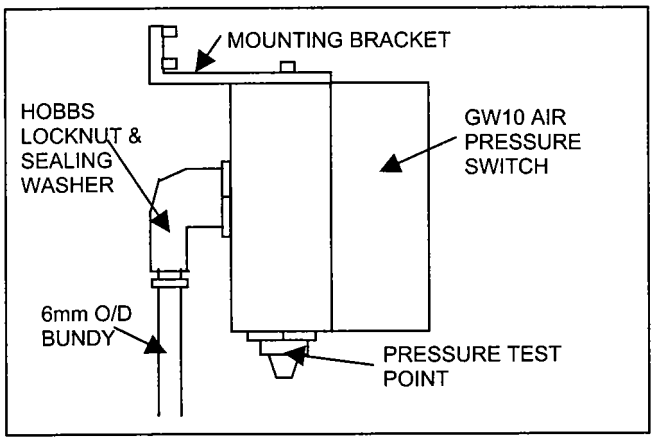


Fig.17– Mounting Bracket

3. Mount the air pressure switch on the appliance using the four No. 8 × 16mm self-tapping screws. The air pressure switch should be mounted close to the pilot line to keep the gas pipe length to a minimum. Care should be taken on the location of this pressure switch to ensure that it is not placed in a position where it is likely to be damaged either mechanically or thermally.

4. Fit the 6mm-compression tee into the pilot line between the thermo-electric valve and the pilot burner. This will require a 10mm piece of pipe to be removed from the pilot line and the compression tee will fit directly without alteration to the pipework (see Fig 18)

IMPORTANT: The pilot pipe should be removed before any cutting takes place and thoroughly cleaned internally before replacing to ensure ingress of swarf and debris is avoided.

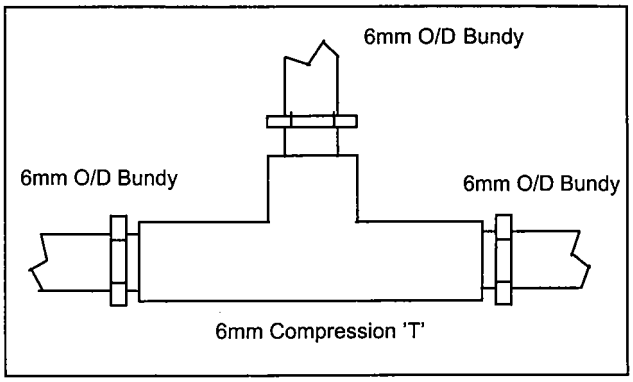


Fig. 18 – 6mm Compression 'T' Fitting

5. Using the aluminium Bundy provided connect between the compression elbow and the air pressure switch ensuring that the gas pipe run is kept to a minimum.

6. Test the installation for gas leaks using the approved method.

Electrical Connection

Connect the air pressure switch using terminals 'P' (common) and '1' (NC). When the gas pressure falls in the pilot line below the pre-set level (which should be set at 2 bar) continuity will be made between terminals 'P' and 'I' and a suitable relay or indicator can be powered through these terminals (see Fig. 19).

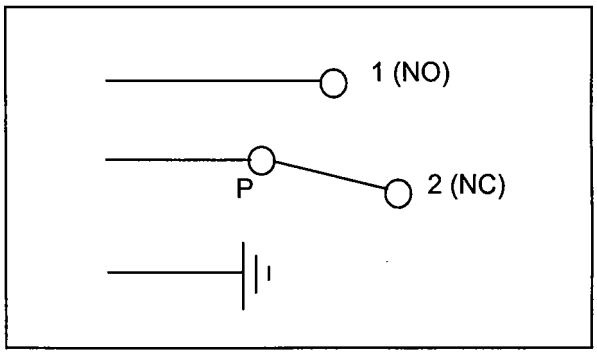
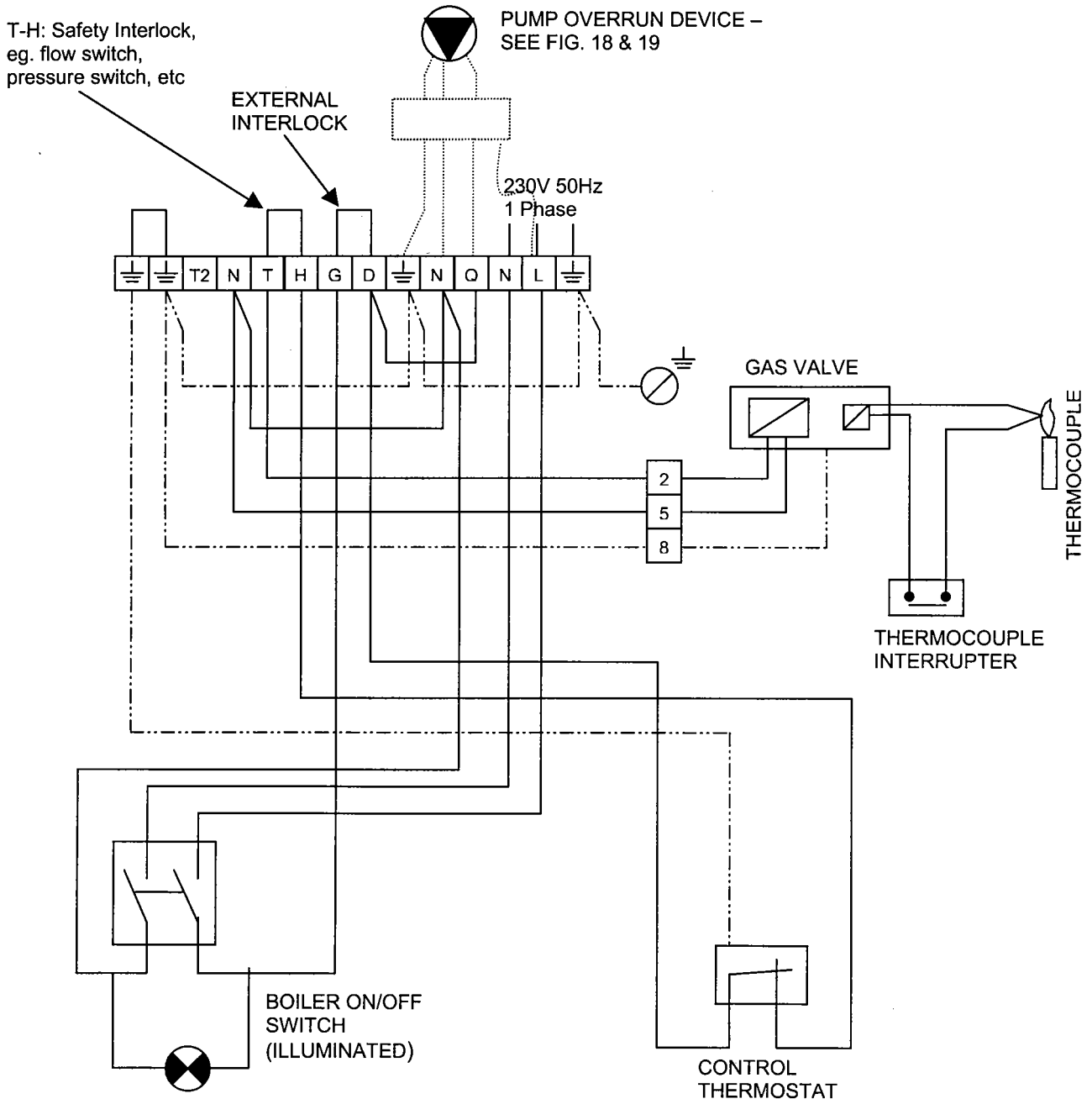


Fig. 19 – Switch Contacts

The air pressure is rated at 5A (3A inductive) at 240V.

1.	Difficulty lighting the pilot and main burner	a) Air in the gas line – ensure that the gas pipe has been properly purged and contains no residual air. b) Check that the pilot flame is heating the thermocouple. c) Check that the electrical connections on the high limit thermostat and thermocouple are correct.
2.	Pilot is lit but main burner will not light	a) Check that the valve is properly switched on. b) Check that the control thermostat is set to a heating position. c) Check that the gas valve control knob is set to ignition.
3.	The boiler cuts off and needs to be completely re-ignited after cooling down.	a) Ensure that the control thermostat is operating correctly. b) Check the water level in the boiler. c) Check that the central heating pump is working.
4.	Overheat thermostat tripped	a) The high limit thermostat will trip and cut the burner in the event of an abnormal rise in boiler water temperature. Before re-setting the thermostat the cause of the temperature rise should be investigated.
5.	Pilot found un-lit.	Check to see if the pilot has gone off due to:- a) An interruption in the gas supply. b) An abnormal drop in gas pressure. c) Blockage of the gas supply. d) A worn thermocouple. e) A weak pilot flame. f) High draught – blowing the pilot away from the thermocouple.
6.	Reduced heating or domestic hot water service.	a) Check the operation and position of the control thermostat. b) Ensure that the high limit thermostat has not tripped.
7.	Poor flame picture (yellow, loose flame	a) Incorrect gas pressure. b) Poor/insufficient ventilation. c) Boiler requires servicing. d) Check flue for spillage. **IF THE PROBLEM CANNOT BE RECTIFIED IMMEDIATELY THE BOILER SHOULD BE SWITCHED OFF, DISCONNECTED AND A WARNING NOTICE FITTED.**

Fig.20 - Boiler Wiring - 5 to 7 Section Boilers



IMPORTANT: THE BOILER AND THE BOILER HOUSE CONTROL PANEL SHOULD BE ISOLATED BY THE SAME ISOLATOR.

COMPONENT REPLACEMENT

Before connecting any component replacement, isolate the electrical and gas supplies to the boiler. After every service visit the soundness of the gas control assembly must be checked.

Main Burner Bar

1. Remove the boiler door (remembering to disconnect the earth cable).
2. Disconnect the gas supply to the gas valve.
3. Remove the thermocouple from the gas valve and then remove the pilot interrupter cables.
4. Disconnect the electrical supply to the gas valve.
5. Remove the four M8 nuts that secure the front combustion chamber cover mounted above the burner assembly and remove the panel.
6. Remove the four M8 nuts which secure the burner assembly to the boiler and remove the burner assembly.

Pilot Burner

1. Remove boiler door (remembering to disconnect the earth cable).
2. Disconnect the pilot supply pipe from the gas valve.
3. Disconnect the ignition lead from the piezo ignitor.
4. Disconnect the thermocouple from the gas valve.
5. Remove the two screws which secure the pilot burner assembly and remove the complete assembly.

High Temperature Thermostat

1. Remove the two screws securing the control panel front fascia and hinge it down. This will require removal of the boiler door.
2. Remove the thermostat phial from the thermostat pocket and thread it through the bulkhead grommet into the control panel.
3. Remove the electrical connections to the thermostat which are made by push on female connectors.
4. Remove the two screws securing the thermostat to the control panel fascia. For the control thermostat the screws are located beneath the thermostat knob which can be pulled off.
5. Fitting the new thermostat is the reversal of the above procedure. The thermostat phial should be positioned as shown in Fig.7 (page 23).

Thermometer

1. Remove the two screws securing the control panel front fascia and hinge it down. This will require removal of the boiler door.
2. Remove the thermometer phial from the thermometer pocket and thread it through the bulkhead grommet into the control panel.
3. Remove the two knurled nuts and clamping pieces securing the thermometer body.
4. Fit the new thermometer as the reversal of the above procedure. The thermometer phial should be positioned as shown in Fig.7 (page 23.

On/Off Switch

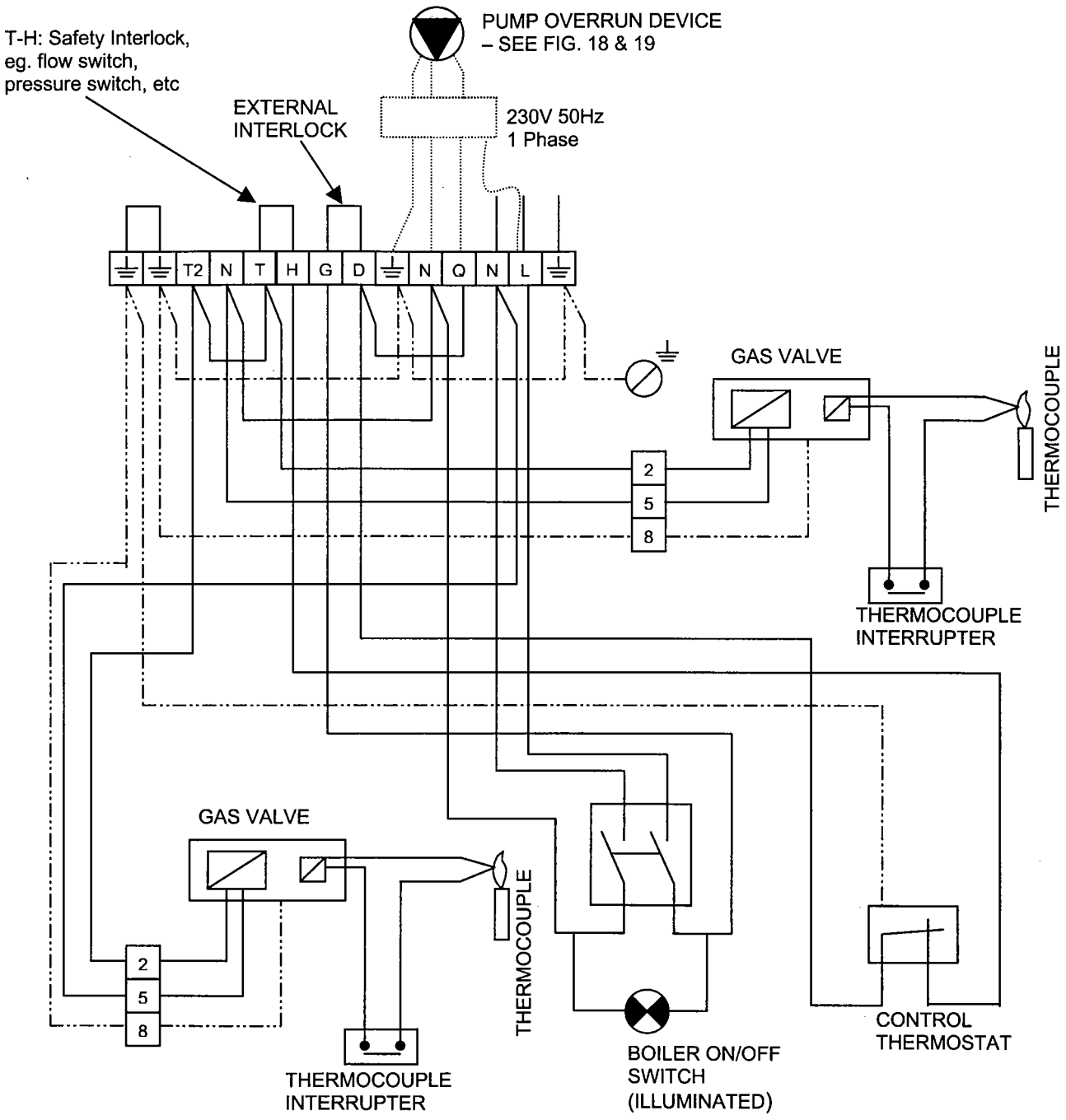
1. Remove the two screws securing the control panel fascia and hinge it forward. This will require removal of the boiler door.
2. Remove the electrical connections which are made by female push on connectors.
3. Push the switch out through the control panel fascia.
4. Fit the new switch as the reverse of the above procedure.

Main Gas Valve

1. Remove the main burner assembly as detailed above.
2. Disconnect the ignition lead from the piezo ignitor.
3. Disconnect the pilot supply pipe from the gas valve.
4. Remove the gas valve.

NOTE: When replacing the door make sure that the earth cable is re-connected.

Fig.21– Boiler Wiring – 8 to 13 Section Boilers



IMPORTANT: THE BOILER AND THE BOILER HOUSE CONTROL PANEL SHOULD BE ISOLATED BY THE SAME ISOLATOR.

Fig.22 – Pump Overrun Using Changeover Pipe Thermostat

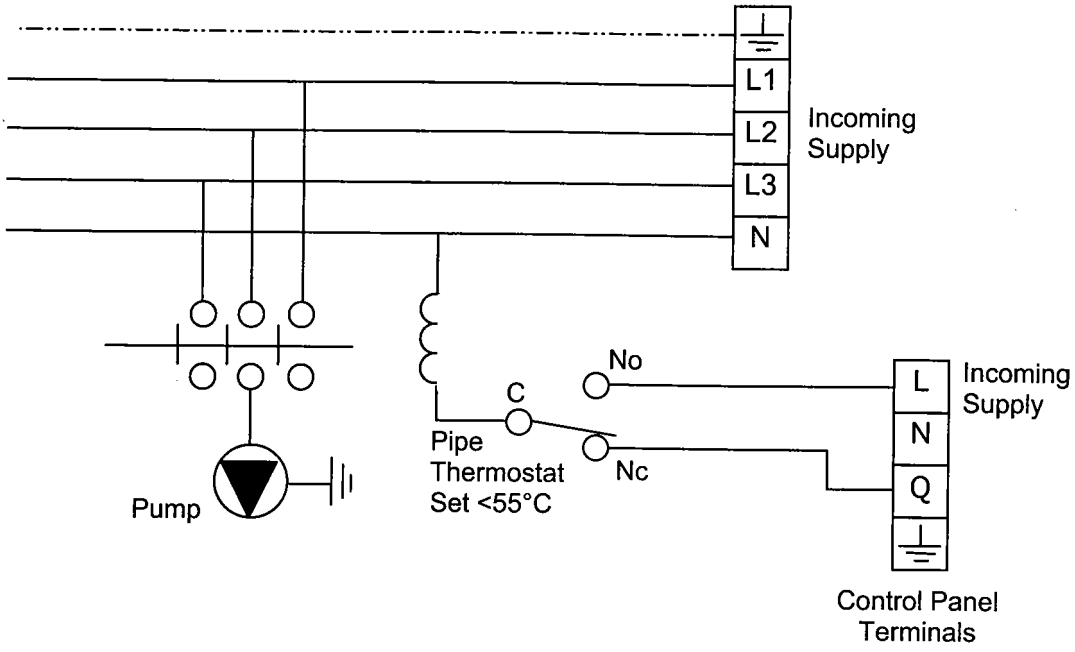
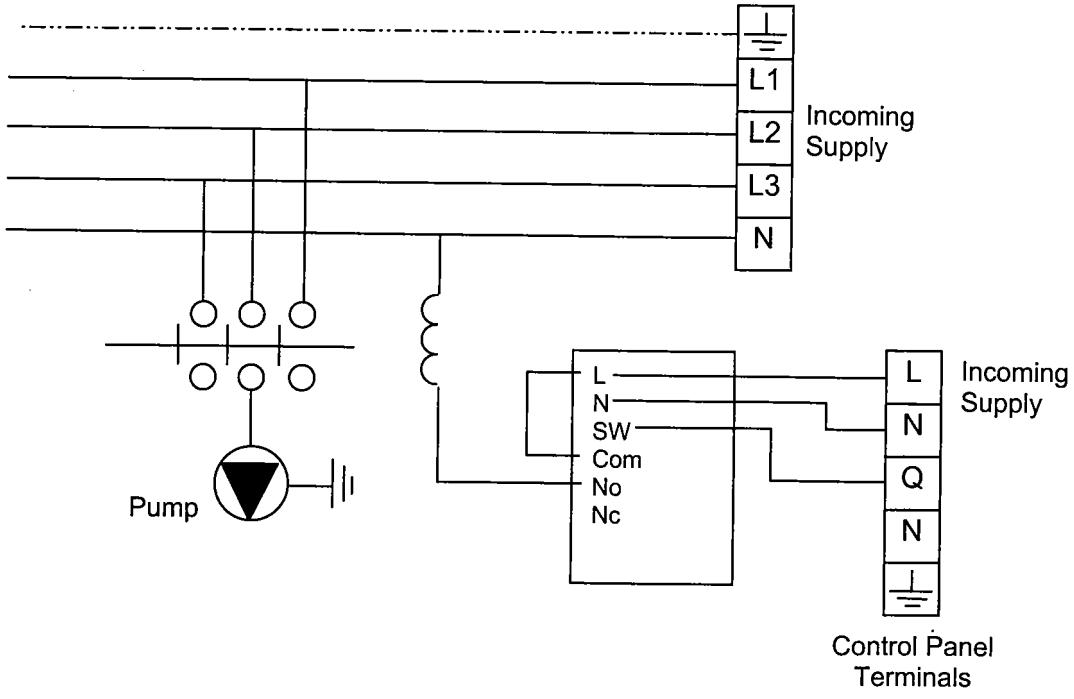
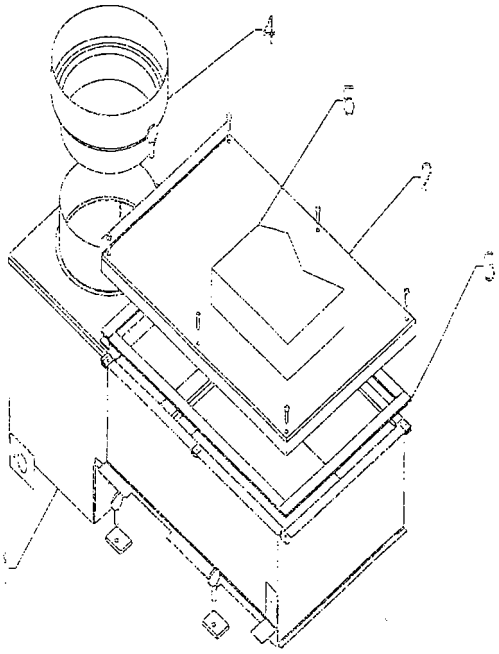


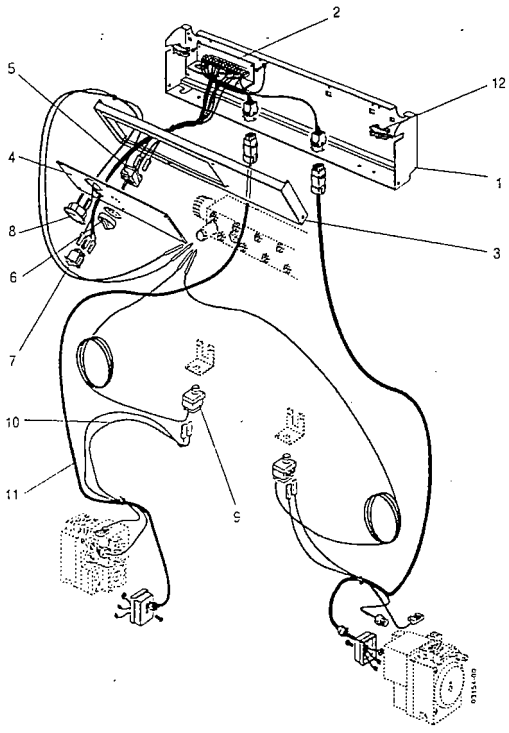
Fig.23 – Pump Overrun Using Overrun Timer Kit



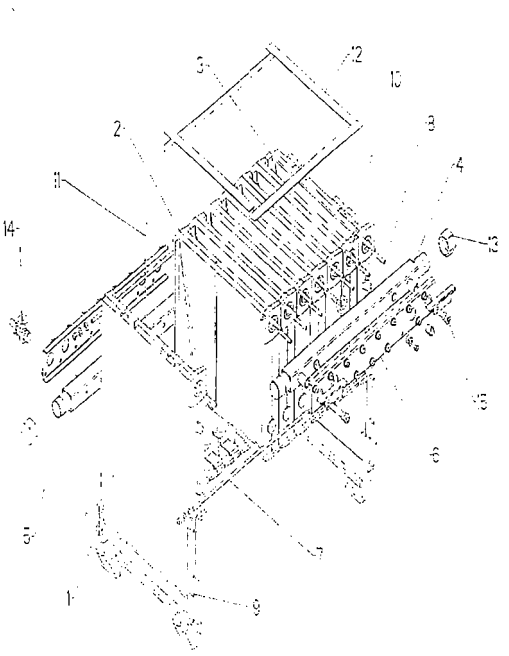
DERWENT PREMIER SPARE PARTS LIST

Description	Qty	Potterton Part No.
1.Flue Box (5 Section)	1	COMN9079260
Flue Box (6 Section)	1	COMN9079270
Flue Box (7 Section)	1	COMN9079280
Flue Box (8 Section)	1	COMN9079290
Flue Box (9 Section)	1	COMN9079300
Flue Box (10 Section)	1	COMN9079310
Flue Box (11 Section)	1	COMN9079320
Flue Box (12 Section)	1	COMN9079330
Flue Box (13 Section)	1	COMN9079340
2.Flue Box Cover (5 Section)	1	COMN9078944
Flue Box Cover (6 Section)	1	COMN9078954
Flue Box Cover (7 Section)	1	COMN9078964
Flue Box Cover (8 Section)	1	COMN9078974
Flue Box Cover (9 Section)	1	COMN9078984
Flue Box Cover (10 Section)	1	COMN9078994
Flue Box Cover (11 Section)	1	COMN9079004
Flue Box Cover (12 Section)	1	COMN9079014
Flue Box Cover (13 Section)	1	COMN9079024
3.Ceramic Felt (20 x 3mm)	1	COMN9205320
4.Flue Adaptor - (5 Section)	1	COMN9094094
Flue Adaptor - (6-7 Section)	1	COMN9094104
Flue Adaptor - (7-11 Section)	1	COMN9094114
Flue Adaptor - (12-13 Section)	1	COMN9094124
5.Flue Cover Insulation (5-12 Section)	1	COM17070530
Flue Cover Insulation (13 Section)	1	COM17070531
Control Panel		
1.Control Panel Housing (5 Section)	1	COM17934309
Control Panel Housing (6 Section)	1	COM17934319
Control Panel Housing (7 Section)	1	COM17934329
Control Panel Housing (8 Section)	1	COM17934339
Control Panel Housing (9 Section)	1	COM17934349
Control Panel Housing (10 Section)	1	COM17934359
Control Panel Housing (11 Section)	1	COM17934369
Control Panel Housing (13 Section)	1	COM17934379
2.Terminal Support Bracket	1	COM17934598
3.Control Panel Front (5 Section)	1	COM17934396
Control Panel Front (6 Section)	1	COM17934406
Control Panel Front (7 Section)	1	COM17934416
Control Panel Front (8 Section)	1	COM17934426
Control Panel Front (9 Section)	1	COM17934436
Control Panel Front (10 Section)	1	COM17934446
Control Panel Front (11 Section)	1	COM17934456
Control Panel Front (12 Section)	1	COM17934466
Control Panel Front (13 Section)	1	COM17934476
4.Control Panel Fascia (5 to 7 Section)	1	COM17934579
Control Panel Fascia (8to13 Section)	1	COM17934589
5.Control Panel Thermostat	1	COM17007030
6.Control Thermostat Knob	1	COM17072186
7.On/Off Switch	1	COM15804072
8.Temperature Gauge	1	COMN9005060



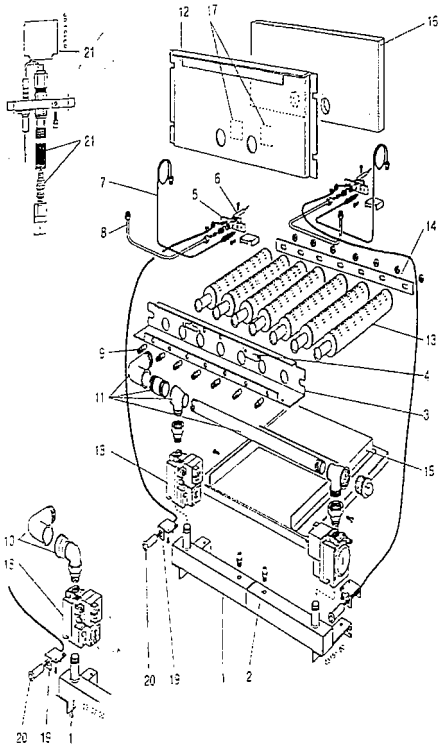


Description	Qty	Potterton Part No.
9.Limit Thermostat	1	COM170C56FA
10.Thermocouple Interrupter Cables	1	COMN7261460
11.Gas Valve Mains Cable	1	COM17071669
12.Mains Cable Clamp	2	COM17072187
Waterway		
1.Left Hand Section	1	COM17800856
2.Intermediate Sections	1	COM17804056
3.Right Hand Section	1	COM17800846
4.Flow Header (5 Section)	1	COMN9270000
Flow Header (6 Section)	1	COMN9270010
Flow Header (7 Section)	1	COMN9270020
Flow Header (8 Section)	1	COMN9270030
Flow Header (9 Section)	1	COMN9270040
Flow Header (10 Section)	1	COMN9270050
Flow Header (11 Section)	1	COM9N9270060
Flow Header (12 Section)	1	COMN9270070
Flow Header (13 Section)	1	COMN9270080
5.Return Header (5 Section)	1	COMN9270160
Return Header (6 Section)	1	COMN9270170
Return Header (7 Section)	1	COMN9270170
Return Header (8 Section)	1	COMN9270180
Return Header (9 Section)	1	COMN9270190
Return Header (10 Section)	1	COMN9270200
Return Header (11 Section)	1	COMN9270210
Return Header (12 Section)	1	COMN9270220
Return Header (13 Section)	1	COMN9270230
6.Manifold Clamp Plate (5 Section)	2	COMN9083564
Manifold Clamp Plate (6 Section)	2	COMN9083574
Manifold Clamp Plate (7 Section)	2	COMN9083584
Manifold Clamp Plate (8 Section)	2	COMN9083594
Manifold Clamp Plate (9 Section)	2	COMN9083604
Manifold Clamp Plate (10 Section)	2	COMN9083614
Manifold Clamp Plate (11 Section)	2	COMN9083624
Manifold Clamp Plate (12 Section)	2	COMN9083634
Manifold Clamp Plate (13 Section)	2	COMN9083644
7.Tie bar M10 (5 Section)	3	COMN9170980
Tie Bar M10 (6 Section)	3	COMN9170990
Tie Bar M10 (7 Section)	3	COMN9171000
Tie Bar M10 (8 Section)	3	COMN9171010
Tie Bar M10 (9 Section)	3	COMN9171020
Tie Bar M10 (10 Section)	3	COMN9171030
Tie Bar M10 (11 Section)	3	COMN9171040
Tie Bar M10 (12 Section)	3	COMN9171050
Tie Bar M10 (13 Section)	3	COMN9171180
8.Fixing Stud M10 x 80		COMN9170040
9.Fixing Stud M8 x 20	8	COMN9171150
10.Sealing Ring		COMN9195220
11.Ceramic Sealing Strip		COMN9195370
12.Ceramic Felt Strip		COMN9205350
13.Manifold Blanking Cap 1 1/2" BSP	2	COMN9125010

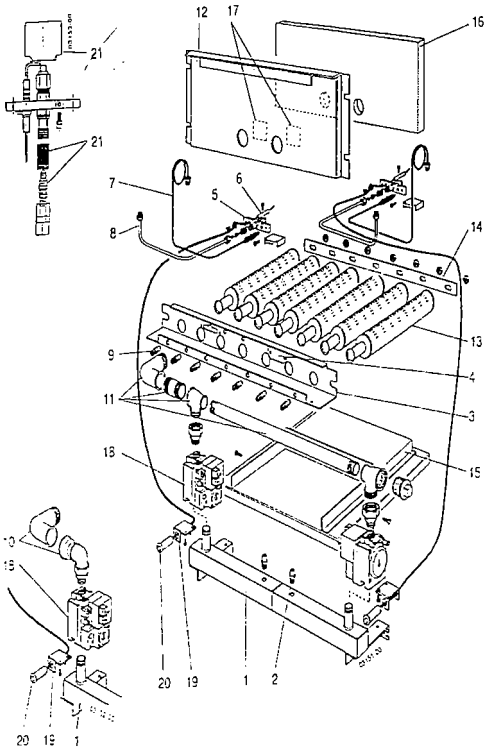


DERWENT PREMIER

Description	Qty	Potterton Part No.
14.3/4" Drain Cock	1	COMN9010050
15.Thermostat Phial Pocket	2	COMN9115030
Burner		
1.Gas Manifold (5 Section)	1	COMN9112360
Gas Manifold (6 Section)	1	COMN9112370
Gas Manifold (7 Section)	1	COMN9112380
Gas Manifold (8 Section)	1	COMN9114580
Gas Manifold (9 Section)	1	COMN9114590
Gas Manifold (10 Section)	1	COMN9114600
Gas Manifold (11 Section)	1	COMN9114610
Gas Manifold (12 Section)	1	COMN9114620
Gas Manifold (13 Section)	1	COMN9114630
2.Pressure Test Point		COMN9030000
3.Burner Mounting Plate (5 Section)	1	COMN9089459
Burner Mounting Plate (6 Section)	1	COMN9089469
Burner Mounting Plate (7 Section)	1	COMN9089479
Burner Mounting Plate (8 Section)	1	COMN9089489
Burner Mounting Plate (9 Section)	1	COMN9089499
Burner Mounting Plate (10 Section)	1	COMN9089509
Burner Mounting Plate (11 Section)	1	COMN9089519
Burner Mounting Plate (12 Section)	1	COMN9089529
Burner Mounting Plate (13 Section)	1	COMN9089539
4.Pilot Blanking Plate		COMN9230879
5.Pilot & Bracket		COMN9025119
6.Ignition Electrode		COM17071016
7.Thermocouple		COMN9050020
8.Pilot Supply Tube		COM17071017
9.Injector G20		COM17405511
10.Gas Inlet Connections (5 to 7 Section)		COM17880660
11.Gas Inlet Connection (8 Section)		COMN9107439
Gas Inlet Connection (9 Section)		COMN9107449
Gas Inlet Connection (10 Section)		COMN9107459
Gas Inlet Connection (11 Section)		COMN9107469
Gas Inlet Connection (12 Section)		COMN9107479
Gas Inlet Connection (13 Section)		COMN9107489
12.Combustion Chamber (5 Section)	1	COMN9089059
Combustion Chamber (6 Section)	1	COMN9089069
Combustion Chamber (7 Section)	1	COMN9089079
Combustion Chamber (8 Section)	1	COMN9089089
Combustion Chamber (9 Section)	1	COMN9089099
Combustion Chamber (10 Section)	1	COMN9089109
Combustion Chamber (11 Section)	1	COMN9089119
Combustion Chamber (12 Section)	1	COMN9089129
Combustion Chamber (13 Section)	1	COMN9089139
13.Bray Burner		COMN9020320
14.Burner Support Plate (5 Section)	1	COMN9089684
Burner Support Plate (6 Section)	1	COMN9089694
Burner Support Plate (7 Section)	1	COMN9089704
Burner Support Plate (8 Section)	1	COMN9089714
Burner Support Plate (9 Section)	1	COMN9089724

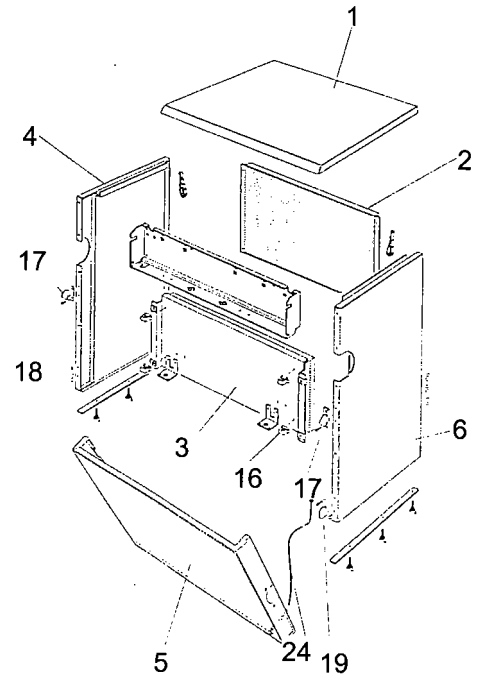


Description	Qty	Potterton Part No.
Burner Support Plate (10 Section)	1	COMN9089734
Burner Support Plate (11 Section)	1	COMN9089444
Burner Support Plate (12 Section)	1	COMN9089754
Burner Support Plate (13 Section)	1	COMN9089764
15.Base Panel (5 Section)	1	COMN9230514
Base Panel (6 Section)	1	COMN9230524
Base Panel (7 Section)	1	COMN9230534
Base Panel (8 Section)	1	
Base Panel (9 Section)	1	COMN9230544
Base Panel (10 Section)	1	COMN9230554
Base Panel (11 Section)	1	COMN9230564
Base Panel (12 Section)	1	COMN9230574
Base Panel (13 Section)	1	COMN9230584
16.Combustion Insulation (5 Section)	1	COM17071018
Combustion Insulation (6 Section)	1	COM17071019
Combustion Insulation (7 Section)	1	COM17071020
Combustion Insulation (8 Section)	1	COM17071021
Combustion Insulation (9 Section)	1	COM17071022
Combustion Insulation (10 Section)	1	COM17071023
Combustion Insulation (11 Section)	1	COM17071024
Combustion Insulation (12 Section)	1	COM17071025
Combustion Insulation (13 Section)	1	COM17071026
17.Mika Viewing Window		COMN9190150
18.Honywell Gas Valve		COM17007736
19.Piezo Ignitor Mounting Brkt		COMN9083209
20.Piezo Ignitor		COM17071027
21.Pilot Injector & Filter		COM17071028



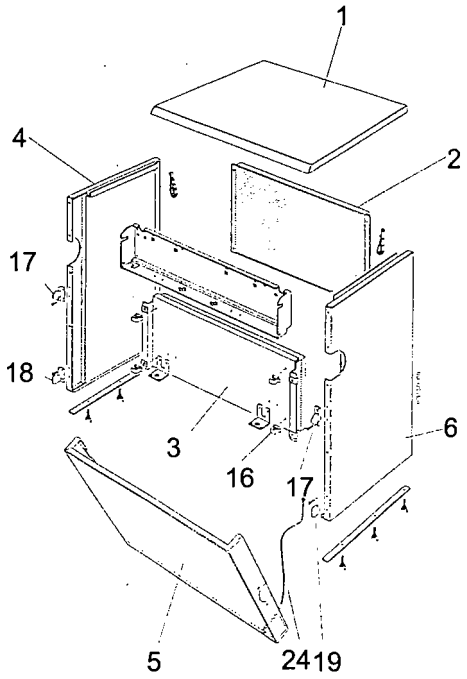
Casing

1.Top Panel (5 Section)	1	COMN9233148
Top Panel (6 Section)	1	COMN9233158
Top Panel (7 Section)	1	COMN9233168
Top Panel (8 Section)	1	COMN9233178
Top Panel (9 Section)	1	COMN9233188
Top Panel (10 Section)	1	COMN9233198
Top Panel (11 Section)	1	COMN9233208
Top Panel (12 Section)	1	COMN9233218
Top Panel (13 Section)	1	COMN9233228
2.Rear Panel (5 Section)	1	COM17934489
Rear Panel (6 Section)	1	COM17934499
Rear Panel (7 Section)	1	COM17934509
Rear Panel (8 Section)	1	COM17934519
Rear Panel (9 Section)	1	COM17934529
Rear Panel (10 Section)	1	COM17934539
Rear Panel (11 Section)	1	COM17934549
Rear Panel (12 Section)	1	COM17934559
Rear Panel (13 Section)	1	COM17934569
3.Front Panel (5 Section)	1	COMN9251489
Front Panel (6 Section)	1	COMN9251499
Front Panel (7 Section)	1	COMN9251509
Front Panel (8 Section)	1	COMN9251519



DERWENT PREMIER

Description	Qty	Potterton Part No.
Front Panel (9 Section)	1	COMN9251529
Front Panel (10 Section)	1	COMN9251539
Front Panel (11 Section)	1	COMN9251549
Front Panel (12 Section)	1	COMN9251559
Front Panel (13 Section)	1	COMN9251569
4.Side Panel Left Hand	1	COM19235378
5.Door (5 Section)	1	COM19236659
Door (6 Section)	1	COM19236669
Door (7 Section)	1	COM19236679
Door (8 Section)	1	COM19236689
Door (9 Section)	1	COM19236699
Door (10 Section)	1	COM19236709
Door (11 Section)	1	COM19236719
Door (12 Section)	1	COM19236729
Door (13 Section)	1	COM19236739
6.Side Panel Right Hand	1	COM19235368
16.Cable Clips (plastic)	4	COM17880658
17.Door Catch	1	COMN9072759
18.Door Support Left Hand	1	COMN9072769
19.Door Support Right Hand	1	COMN9072779
24.Earth Cable	1	COM17071662



POTTERTON
COMMERCIAL
Brooks House, Coventry Road
Warwick CV34 4LL
Telephone 08706 050607 Fax 01926 880612

REPORT SENT TO INSTALLER:	YES		NO		
SITE VISIT		COMMISSIONING			

Date:.....
Signature: .....

REPORT No:.....
SITE ADDRESS: .....
.....
.....
.....
.....

INSTALLER NAME & ADDRESS:.....
.....
.....
.....
.....
VISIT/COMMISSIONING DATE: .....

1.0	BOILER							
1.1	Type:							
1.2	No of Sections:							
1.3	Boiler No/Position:		RH		LH		Centre	
1.4	Serial No:							
1.5	Fuel: N/Gas			LPG				
2.0	BURNER							
2.1	Type:	Standard		Low NOx		Ultimate		
2.2	Flame Detection Probe:		UV Cell		Thermocouple			
2.3*	Control Box Type:							
2.4	Electrical Supply:							
2.5	Main Gas Valve Type & Size:							
2.6	Pilot Gas Valve Type & Size:							
2.7	Gas Train Serial Number:							
3.0	BURNER SETTINGS							
3.1	Main Burner Injector Size:						mm	
3.2	Pilot Burner Injector Size:						mm	
3.3	Are Burners & Injectors Clean?:							
3.4	Kanthal Bars Fitted? (Modified & Ultimate only):							
3.5*	Is the Probe of the Correct Type?							
3.6	Electrode Settings as Manual?							
4.0	PRE-COMMISSIONING CHECKS (See Note)							
4.1	Is boiler house ventilation as per manual?							
4.2	Electric supply fused, isolated & earth wire attached?							
4.3	Check external controls allow operation							
4.4	Check boiler/system flooded and pumps operational and any isolation valves open							
4.5	Check gas available at burner							
4.6c	Check condensate trap fitted, filled and connected to drain with air break							
4.7	Check gas meter sizing adequate							
4.8	Check flue system clear							

5.0	COMBUSTION	Pilot	Low	High	Unit
5.1	Gas rate				m^3/hr
5.2	Main Burner Pressure				mmwg
5.3	Pilot Burner Pressure				mmwg
5.4*	Ionisation Probe/UV Cell Current				uA
5.5c	Air Shutter Position				-
5.6	CO2 or O2				%
5.7	CO				ppm
5.8	Gross Flue Gas Temperature				°C
5.9	Ambient Temperature				°C
5.10	Flue Draught				mmwg
5.11	Inlet Gas Pressure (Main Burner). If multi-boiler installation, inlet gas pressure all boilers high fire)				mmwg

NOTE: 5.5 to 5.9 TO BE MEASURED IN SECONDARY FLUE 600mm UP FROM THE FLUE SOCKET OR AT THE SAMPLING POINT PROVIDED (CONDENSING BOILERS ONLY). THESE MEASUREMENTS ARE INTENDED AS SAFETY CHECKS ONLY. LEVELS ARE DEPENDENT ON FLUE DRAUGHT AND SITE CONDITIONS AND HENCE CANNOT BE USED FOR COMBUSTION EFFICIENCY DETERMINATION.

* FULLY ELECTRIC BOILERS ONLY
¶ THERMO-ELECTRIC BOILERS ONLY
c CONDENSING BOILERS ONLY
§ CONVENTIONAL ATMOSPHERIC BOILERS ONLY

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 and kept as a record. A commissioning service available from Potterton at the address listed on the back page of this manual. When a Potterton engineer commissions, this completed report will be sent to the installer. It is the installers responsibility to action any points arising. Commissioning by Potterton engineers is restricted to equipment of our supply. No responsibility is accepted for the on site assembly or installation of the equipment unless specifically carried out by Potterton. The installer must ensure that the boiler is installed in accordance with the manufacturer's instructions and all relevant BS Codes of Practice and Regulations (see manufacturers instructions for full details). Items 4.1 to 4.6 are related to the boiler installation and as such these pre-commissioning checks should be carried out in the presence of the installer.

6.0	OPERATIONAL SAFETY CHECKS	
6.1	Check control stat operation	
6.2	Check limit stat operation	
6.3	Check high/low stat operation	
6.4*	Check for gas leaks	
6.5*	Check for gas leakage past valve assembly	
6.5¶	Check for oil leaks	
6.6	Check boiler locks out on loss of flame signal	
6.7	Check boiler locks out on air pressure switch operation	
6.8	Check boiler locks out on all other safety functions	
6.9*	Check gas booster interlocks operational	
6.10	Record INLET and OUTLET pressure switch settings:- INLET ..... OUTLET	
7.0	BOILER/SYSTEM CHECK LIST	
7.1	Control stat left at	°C
7.2	Limit stat left at	°C
7.3	High/low stat left at	°C
7.4	Maximum flow temperature recorded	°C
7.5	Maximum return temperature recorded	°C
7.6	Boiler water pressure	
7.7	Are pipework connections as per manual?	
7.8	Is safety valve fitted? If so, SIZE _____ PRESSURE RATING _____	
7.9	Are water isolating valves fitted?	
7.10	Are water flow switches fitted?	
7.11	Are return water shut off or diverter valves fitted?	
7.12	Is shunt pump fitted?	
7.13	Is pump overrun fitted?	
7.14	Flue type and 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 diameters. Conventional ☐ Fan Assisted ☐ Flue Dilution ☐ Approximate overall height ..... m Is the fan interlocked with the boiler? YES / NO	
7.15	Are flue dampers fitted? YES / NO If so, interlocked? YES / NO	
7.16	Fan assisted ventilation? YES / NO	
7.17	Any evidence of condensate formation? YES / NO	
7.18	Any evidence of water leakage? YES / NO	
7.19	Any evidence of flue gas leakage? YES / NO	
7.20	Has boiler been built and cased correctly? YES / NO	
7.21*	Is gas service cock installed? YES / NO If so, accessible? YES / NO	
7.22¶	Is oil filter fitted? YES / NO	
7.23¶	Is fire valve fitted? YES / NO	
7.24¶	Oil supply: Single Pipe	
	Two Pipe	
	Ring Main	

8.0	COMMENTS ON ACCESSIBILITY FOR MAINTENANCE

9.0	NOTES & COMMENTS BY COMMISSIONING ENGINEER

FINDINGS	YES	NO
Is the installation safe for use?		
If the answer is NO, has a warning label been raised?		
Is any remedial work required?		
Have warning labels been fitted?		
Has RIDDOR form been raised?		

Customer Signature:

Print Name:

Date:

ENGINEER DETAILS
NAME
COMPANY
SIGNATURE
DATE

CONVERSION TABLE

	IMPERIAL TO METRIC	METRIC TO IMPERIAL
HEAT **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
FUEL CONSUMPTION **1 dm^3 = 1 LITRE** **1,000 dm^3 = 1m^3**	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
PRESSURE **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
LENGTH **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
VOLUME	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
AREA	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
FLOW RATE **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
TEMPERATURE	°F to °C = ("X"°F - 32) x 0.5556	°C to °F = ("X" °C x 1.8) + 32
TEMPERATURE DIFFERENCE **1°C = 1°K**	"X"°F x 0.5556 = °C	"X" °C x 1.8 = °F
WEIGHT	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