POTTERTON

COMMERCIAL

# POTTERTON GA

## LE Version

## (Fully Automatic Flame Control)

## 40 - 70 kw
## Natural Gas

## Installation, Operation & Maintenance Manual

February 1998

# INDEX

Fig.1.1 - General Data & Dimensions

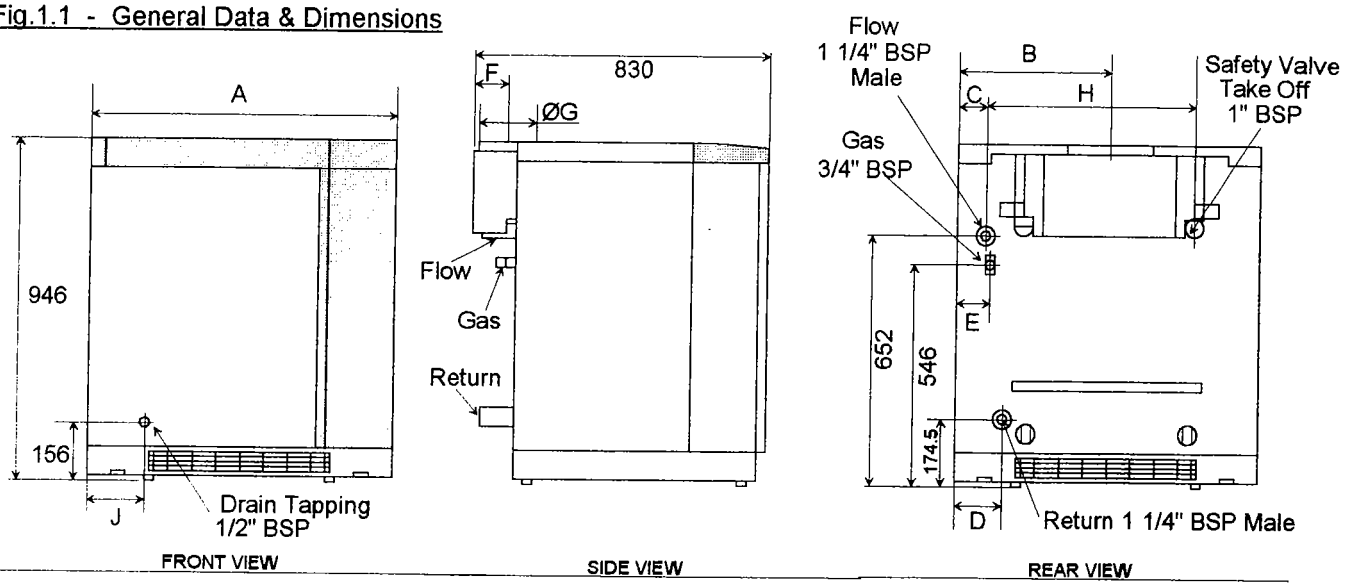
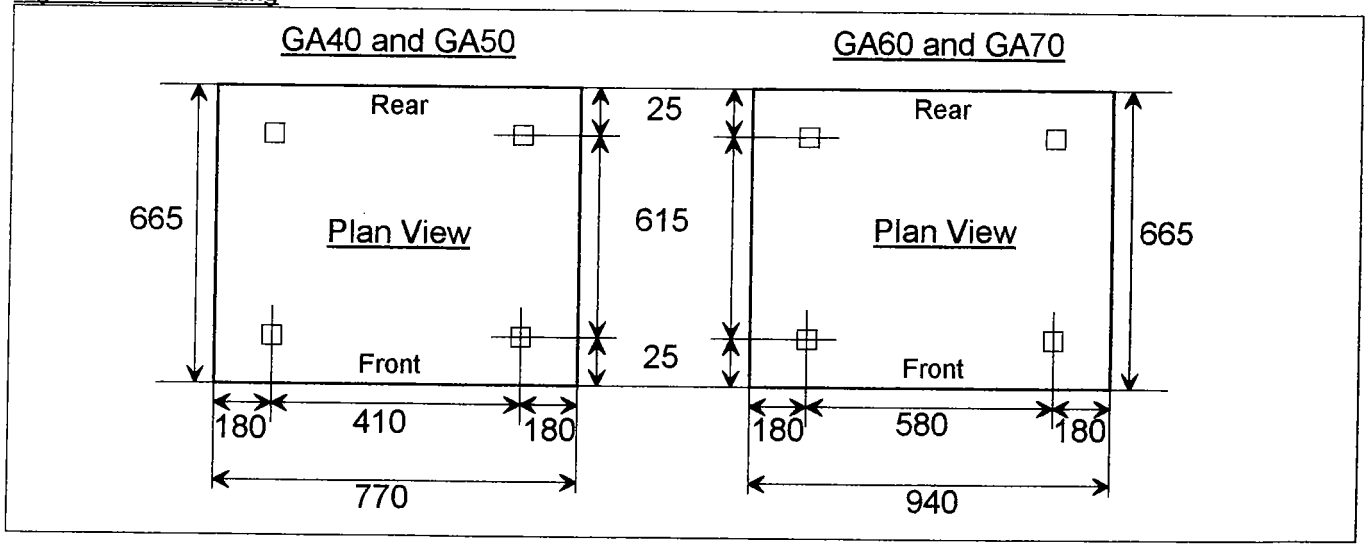



Table 1.1 - Boiler Dimensions

| Model | No of Sections | A mm | B mm | C mm | D mm | E mm | F mm | Ø G mm | H mm | J mm | Pressure Drop Across Boiler Δt 11°C (Pa) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GA 40 | 5 | 780 | 390 | 93 | 110 | 104 | 104 | 167 | 485 | 176 | 166 |
| GA 50 | 6 | 780 | 390 | 52 | 69 | 63 | 104 | 180 | 567 | 135 | 397 |
| GA 60 | 7 | 950 | 475 | 96 | 113 | 107 | 105 | 200 | 649 | 179 | 529 |
| GA 70 | 8 | 950 | 475 | 55 | 72 | 66 | 105 | 200 | 731 | 138 | 595 |

Fig.1.2 - Boiler Siting




Connections

Water - Flow & Return: 1 1/4" BSP (male)
Drain: 1/2" BSP *
Gas: 3/4" BSP (male)
Safety: 1" BSP

Clearances (minimum)

Sides: Left - 100mm
Right - 250mm (access for water/gas connections)
Rear: 200mm (from flue outlet)
Front: 600 mm
Top: 600 mm

* Drain connection is located inside boiler casing (drain cock provided).

TABLE 1.2 - Technical Data

| | | Model | | GA 40 | GA 50 | GA 60 | GA 70 |
|---|---|---|---|---|---|---|---|
| | | CE Number - 0049 AQ 0 .. | | 802 | 803 | 804 | 805 |
| | | Number of Sections | | 5 | 6 | 7 | 8 |
| | | Output | kW | 41 | 50 | 60 | 70 |
| | | Input | kW | 44.65 | 53.8 | 64.8 | 76.4 |
| | | Number of Burners | | 4 | 5 | 6 | 7 |
| | Natural Gas | Number of Burner Injectors / Type | | 4 / 255 | 5 / 255 | 6 / 255 | 7 / 260 |
| 1 | | Fuel Consumption (Nat Gas) | $m^3/hr$ | 4.62 | 5.57 | 6.7 | 7.9 |
| | | Gas Supply Pressure | mbarr | 20 | 20 | 20 | 20 |
| | | Gas Pressure (Injector) | mbar | 15.7 | 15.3 | 15.5 | 13.5 |
| | | Maximum Design Pressure | Bar | 4 | | | |
| 2 | | Minimum Operating Pressure | Bar | 0.5 | | | |
| 3 | | Internal Diameter of Diverter Socket | mm | 167 | 180 | 200 | |
| | | Nominal Flue Size | mm | 180 | | 200 | |
| 4 | | Flue Gas Volume | $m^3/hr$ | 108 | 136 | 163 | 190 |
| | | Flue Draught Requirements | | 1-4 mm ALL SIZES | | | |
| 5 | | High Level Natural Ventilation to BS 5440 & BS 6644 | $cm^2$ | (BS 5440) 201 | (BS 5440) 242 | (BS 6644) 281 | (BS 6644) 307 |
| 5 | | Low Level Natural Ventilation to BS 5440 & BS 6644 | $cm^2$ | (BS 5440) 402 | (BS 5440) 484 | (BS 6644) 562 | (BS 6644) 614 |
| 6 | | Mechanical Inlet to BS 6644 | $m^3/sec$ | 0.066 | 0.066 | 0.072 | 0.084 |
| 7 | | Water Connection Size | BSP | 1 1/4" | | | |
| 8 | | Water Flow at 11°C Δ t<br>Min Water Flow at 25°C Δ t | lit/sec<br>lit/sec | 0.87<br>0.38 | 1.08<br>0.48 | 1.3<br>0.57 | 1.5<br>0.67 |
| 8 | | Hydraulic Resistance at 11°C Δ t | Pa | 430 | 529 | 661 | 793 |
| 9 | | Cold Feed Size to BS 6644 - Minimum Bore | mm | 19 | | 25 | |
| 9 | | Open Vent Size to BS 6644 - Minimum Bore | mm | 25 | | | 32 |
| | | Safety Valve Size to BS 6644 - Nominal Size | mm | 19 | | | |
| 2 | | Maximum Flow Temperature | °C | 90 | | | |
| 10 | | Minimum Return Temperature | °C | 35°C | | | |
| 11 | | Dry Weight | kg | 235 | 265 | 295 | 325 |
| | | Water Content | lit | 41 | 47 | 53 | 59 |
| | | Power Requirements | | 230V 50Hz 1Ph - (1A Run Nominal)<br>Isolator and 6.3A fuse required | | | |

For metric to imperial conversions refer to conversion table on insode of back cover.

1. FUEL CONSUMPTION

Gas fuel consumption is based on natural gas with a gross calorific value of 38.6 MJ/$m^3$, maximum and minimum gas pressures for natural gas are 35 mbar and 17.5 mbar respectively. 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

The boilers are provided with a socket with internal diameters as shown in Table 1.2.

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 130°C at 4% $CO_2$ 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 for further details on ventilation.

6. MECHANICAL VENTILATION

The volume given is for a single boiler installation. See section 3 for further details on mechanical ventilation.

7. CONNECTION SIZES

The boiler connections are: Flow and Return = 1 1/4" BSP, Drain = 1/2" BSP, Gas = 3/4" BSP, Safety = 1" BSP.

8. WATER FLOW RATES

Water flow rates are given for boiler flow and return temperature differences of 11°C. See section 3 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 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 casing and controls.

## GENERAL

The GA LE range of boilers are of cast iron sectional construction fitted with blue flame burners with electronic automatic ignition and ionisation flame control.

The GA boiler is fitted with a flue down draught surveillance device (see page 4.1).

Sections are joined together using steel taper nipples.

The GA boiler is supplied fully assembled and cased ready for final connections.

The GA LE boiler complies with BS EN 297, (and PrEN 656 for 70 kw boilers).

## INSTALLATION

The installation should comply with relevant British Standard Specifications, Codes of Practice and current Building Regulations, together with any special regional requirements of the Local Authorities, Gas Undertaking and Insurance Company. All electrical wiring must comply with 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 Act 1974.

BS 5440: 1990 Parts 1 & 2 Installation of Flues & Ventilation for Gas Appliances (1st, 2nd & 3rd Family Gases)

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

BS 779: 1989 Cast Iron Boilers for Central Heating & Indirect Hot Water Supply (Rated Output 44 kw and above).

BS 7074: 1989 Part 2 Application, Selection & Installation of Expansion Vessels & Ancillary Equipment for Sealed Water Systems.

PM5 Health & Safety Executive Guidance Note for Automatically Controlled Steam & Hot Water Boilers.

BS6880: 1988 Codes of Practice for Low Temperature Hot Water Systems.

CP342:2 Centralised Hot Water Supply.

Also for gas fired appliances the following British Gas publications:-

Gas Safety (Installation & Use) Regulations 1994.

IM/11 Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters.

IM/2 Purging Procedure for Non-Domestic Installations.

IM/5 Soundness Testing for Non-Domestic Installations.

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

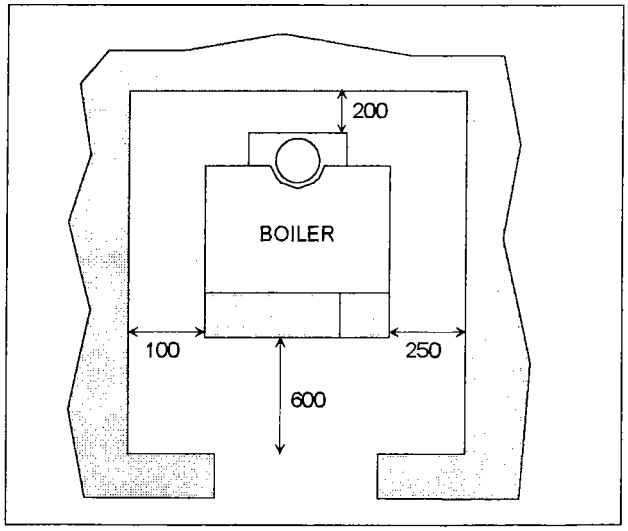
## BOILER SITING AND BASE

The boiler should be sited in accordance with BS 6644: 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 water and the effects of flooding of the boiler house or seepage from a roof top boiler house.

Minimum clearances for a single boiler are left hand side 100mm, right hand side 250mm (access for water/gas connections), rear 200mm (from flue outlet), top 600mm and front 600mm, see Fig.2.1.

Side clearances can be reduced to 50mm for multiple boiler installations as long as there is access to the rear of the boiler for installation and maintenance.

Fig.2.1 - Clearances



A level non-combustible floor capable of supporting the weight of the boiler filled with water, see Table 1.2, together with any additional weight bearing down on the base from connections, etc, must be provided. This will typically be a 50mm concrete plinth with an area equal to that of the plan of the boiler.

The boiler has adjustable feet which can be used for final levelling (see Fig.1.2 for feet details).

The boiler has an air cooled base and no special insulation is required. When preparing a site, reference should be made to Local Authorities and Building Regulations 1992.

## ELECTRICAL SUPPLY

A 230V, 50Hz, single phase supply is required fitted with a fused isolator rated at 6.3A mounted adjacent to the boiler. The boiler must be earthed and all on site wiring must conform to IEE Regulations.

**NOTE**: The switch on the boiler does not replace the need for the separate isolator.

### Electrical Connections

Electrical connections should be made to terminal block in the control panel, see page 4.1.

### Pump Wiring

A pump overrun thermostat must be fitted, this is to ensure that all residual heat in the boiler is utilised to heat the building. It is also required to prevent nuisance limit thermostat trips. See wiring diagram on page 6.1.

If the current rating of the pump is greater than 3A an electrical contactor should be used and the control coil only connected to the common on the thermostat.

## FUEL SUPPLY

### NATURAL GAS

The GA boiler is supplied as standard for use with natural gas (H-G20) at 20 mbar pressure.

Where there is an existing primary gas meter, the gas supplier 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 35 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 IM/16 "Guidance Notes on the Installation of Gas Pipework, Boosters and Compressors in Customers Premises" published by British Gas Plc. The gas booster should be electrically interlocked to the burner.

## 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. A minimum free area of the grilles for a single boiler are given below. Where plant is likely to be used at or near maximum capacity during the summer months, additional ventilation may be required to prevent excess temperatures.

| Boiler | GA 40 | GA 50 | GA 60 | GA 70 |
|---|---|---|---|---|
| High Level $cm^2$ | 201 | 242 | 281 | 307 |
| Low Level $cm^2$ | 402 | 484 | 562 | 614 |

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.

For boiler houses with multiple boiler installations the minimum ventilation should be sized in accordance with BS 6644 for total rated inputs 60 kW and above and BS 5440 for total rated input below 60 kW as follows.

### Up To 60 kW Total Rated Input

Low Level (inlet) - 9 $cm^2$ per kW total rated input.
High Level (outlet) - 4.5 $cm^2$ per kW total rated input.

60 kW and Above Total Rated Input

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.

Position ventilation grilles to avoid accidental obstruction by blockage or flooding.

Further guidance on ventilation for gas appliances below 60 kW total rated input is provided by BS 5440: Part 1: 1990. For gas appliances above 60 kw total rated input guidance is provided in 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 extract. Mechanical ventilation with natural inlet must not be used, see below for mechanical inlet ventilation rates for single boiler applications.

| Boiler | GA 40 | GA 50 | GA 60 | GA 70 |
|---|---|---|---|---|
| Mechanical Input $m^3$/sec | 0.066 | 0.066 | 0.072 | 0.084 |

For multiple boiler installations the ventilation rate is based on a 1.1 $m^3$/sec flow rate per 1000 kW total rated input above 60 kW.

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.

**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, 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.

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, 2 x 45° bends or easy sweep pattern 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 1-4 mm.w.g. (0.04-0.16 in.w.g.) should be 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 1.2, these sizes refer to the boiler flue connection socket.

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 socket given in Table 1.2. 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 GA has a typical nett flue gas temperature of 130°C. Assuming an ambient temperature of 20°C, a typical mean flue gas temperature for the GA boiler would be:-

$$130 + 20 - \frac{17}{2} = 141.5°C$$

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: $\Delta P$ = Buoyancy force in mm
$H$ = Stack height in m
$t_1$ = Ambient temperature °C
$t_2$ = Mean flue gas temperature °C

For a GA boiler $\Delta P$ is typically 0.35 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 3.2 (page 3.6) 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 1.2.

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.

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.

Mechanically 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 3.1.

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.

Table 3.1 - Typical Duct Sizes & Fan Volumes

| Size | *Flue Volume @ 1% $CO_2$ $m^3/sec$ | Duct Size (Diameter) mm | Velocity $m^3/sec$ | ** "U" m |
|---|---|---|---|---|
| GA40 | 0.151 | 200 | 4.82 | 0.211 |
| GA50 | 0.189 | 200 | 6.01 | 0.241 |
| GA60 | 0.226 | 250 | 4.61 | 0.269 |
| GA70 | 0.265 | 250 | 5.4 | 0.295 |

* 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"

Table 3.2 - Flue Losses

| Boiler Size | 150 mm I.D. Flue | | | |
|---|---|---|---|---|
| | Flue Exit Losses mm.w.g | 45° Bend Loss mm.w.g | Loss/m Straight Flue mm.w.g | Flue Gas Velocity m/sec |
| GA 40 | 0.249 | 0.05 | 0.042 | 2.32 |

| Boiler Size | 180 mm I.D. Flue | | | |
|---|---|---|---|---|
| | Flue Exit Losses mm.w.g | 45° Bend Loss mm.w.g | Loss/m Straight Flue mm.w.g | Flue Gas Velocity m/sec |
| GA 40 | 0.135 | 0.027 | 0.02 | 1.71 |
| GA 50 | 0.211 | 0.042 | 0.029 | 2.13 |

| Boiler Size | 200 mm I.D. Flue | | | |
|---|---|---|---|---|
| | Flue Exit Losses mm.w.g | 45° Bend Loss mm.w.g | Loss/m Straight Flue mm.w.g | Flue Gas Velocity m/sec |
| GA 50 | 0.122 | 0.024 | 0.016 | 1.63 |
| GA 60 | 0.178 | 0.036 | 0.022 | 1.95 |
| GA 70 | 0.244 | 0.049 | 0.028 | 2.29 |

| Boiler Size | 250 mm I.D. Flue | | | |
|---|---|---|---|---|
| | Flue Exit Losses mm.w.g | 45° Bend Loss mm.w.g | Loss/m Straight Flue mm.w.g | Flue Gas Velocity m/sec |
| GA 70 | 0.099 | 0.02 | 0.01 | 1.47 |

EXAMPLE
A GA 60 boiler connected to a 200 mm diameter flue 6m high, from the Tables above the flue loss is:-

| | | |
|---|---|---|
| Flue Exit Loss | | 0.178 |
| 45° Bend Loss x 2 | + | 0.072 |
| Straight Flue Loss | + | 0.132 |
| TOTAL LOSS $P_1$ | = | 0.382 mm |

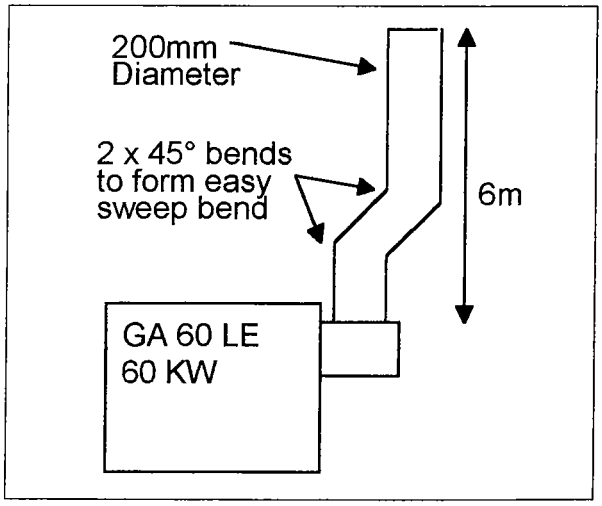
The buoyancy available is 6 x 0.35 mm = 2.1 mm

Subtracting the loss from the buoyancy force;

P2 = ΔP - P1
= 2.1 - 0.382
= 1.718 mm draught

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

NOTE: P2 = 1.718 mm draught
= -1.718 pressure at boiler flue exit



## 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 1.2, 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 rise of between 10°C and 20°C. The hydraulic resistance at 11°C $\Delta T$ is given in Table 1.2, 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
$\Delta T_1$ = 11°C
$\Delta T_2$ = 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 connection sizes are given in Table 1.2.

It is recommended that the system is designed to give a constant boiler 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 Publication 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 Fig.6.3, 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. The boiler control thermostat should be set to provide a 17°C safety margin below the saturated steam absolute pressure given in Table 3.3 corresponding to the minimum design operating pressure.

## 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 1.2 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 3.5.

Table 3.3 - 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.

## 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.**

**TABLE 3.4**

| Open Vent Pipe Sizes from BS 6644: 1991 | | |
|---|---|---|
| Rated Output | Minimum Bore | Nominal Size (DN[1]) |
| kw | mm | mm |
| 40 - 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 | | |

Multiple or modular boiler installations shall have an open vent pipe or pipes of the size stated in Table 3.4 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 1.2 for individual boiler open vent sizes). The open vent pipe shall rise continuously by the shortest practical route to the venting point.

The open vent pipe shall discharge into the feed and expansion cistern above the overflow level 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.

**TABLE 3.5**

| Cold Feed Pipe Sizes from BS 6644: 1991 | | |
|---|---|---|
| Rated Output | Minimum Bore | Nominal Size (DN[1]) |
| kw | mm | 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.

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 3.6 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 3.6 for safety valve sizes on open vented systems. Refer to notes on sealed systems for safety valve sizes on sealed systems.

**TABLE 3.6**

| Safety Valve sizes to BS 6644 1991 (Open Vented Systems Only) | | |
|---|---|---|
| Rated Output | Nominal Size | Minimum Area (A) |
| kw | mm | $mm^2$ |
| 40 - 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 inadvertant 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 3.3 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**

GA atmospheric boilers are regarded as being commercially quiet, ie. < NR60, under typical operating conditions. Caution should be exercised in siting the boiler in kitchen or living areas.

Fig.4.3 - Removal of Cover Panels

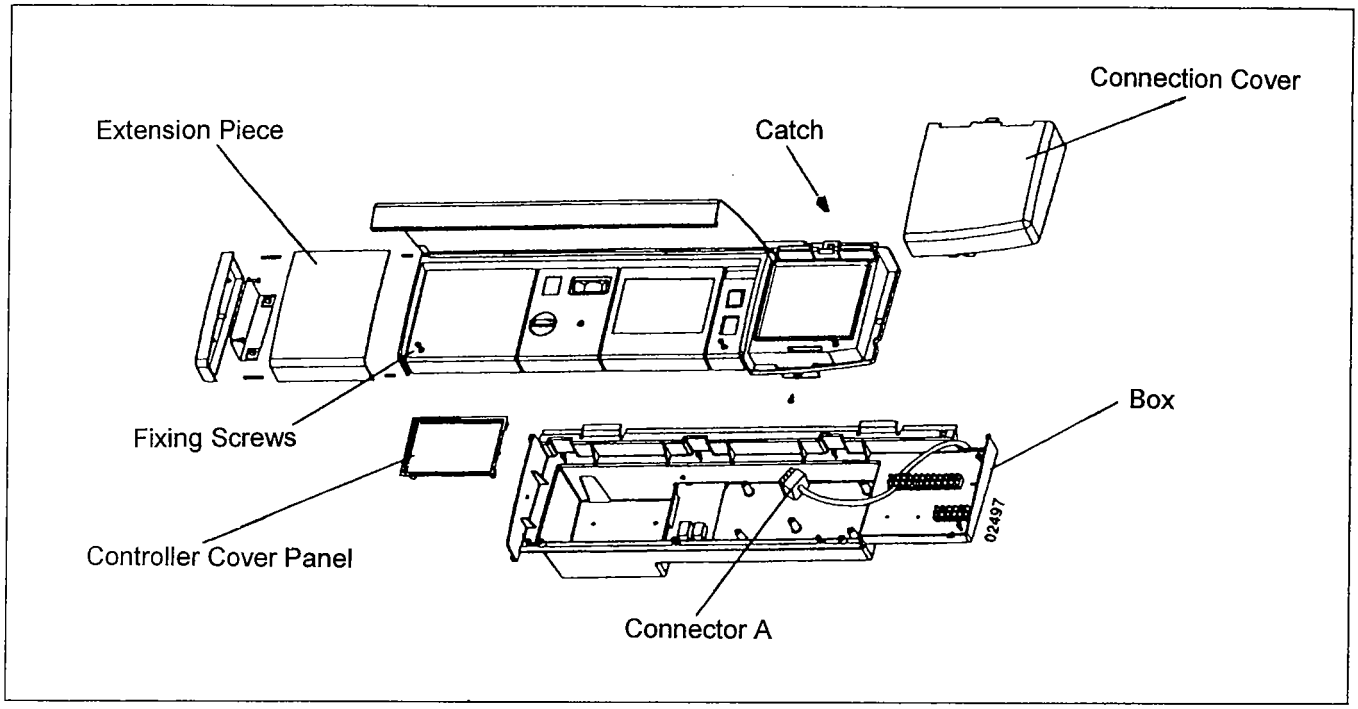
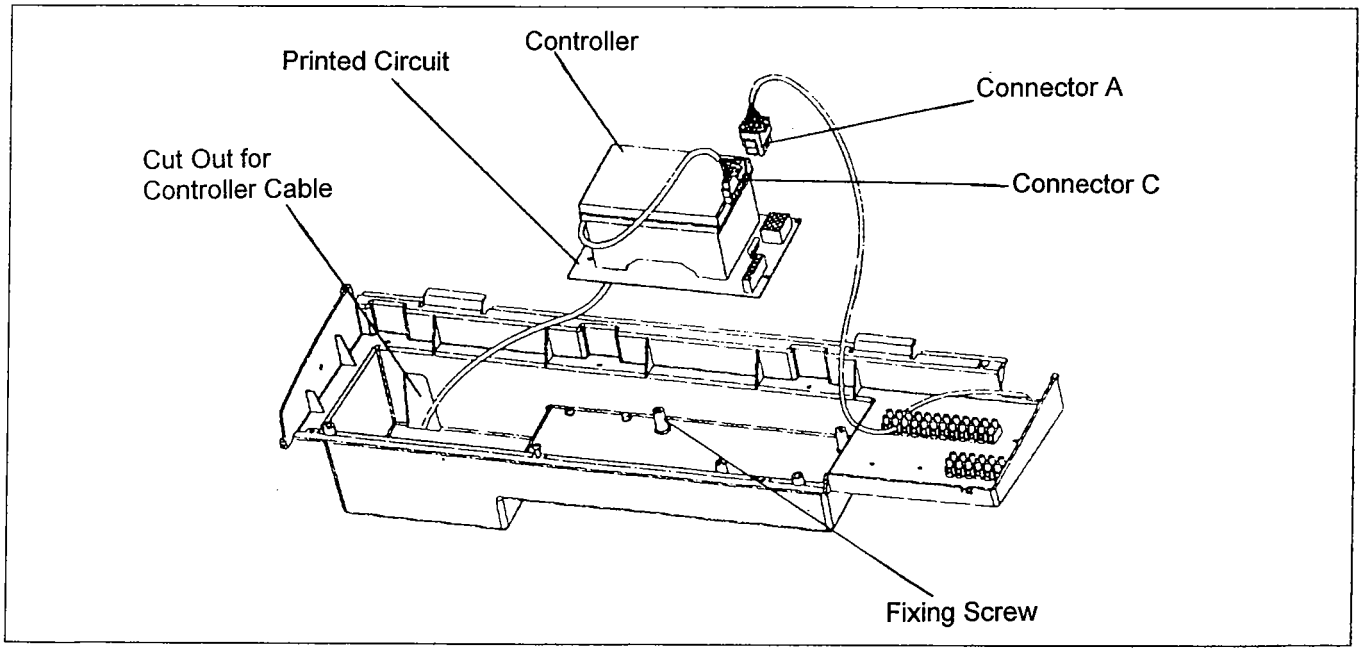



Fig.4.4 - Connections



## 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 requirements 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 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 on page 5.2 of this section.

## REMOVAL OF CASING

1. Undo the screws at top rear of the boiler (2 off) and remove the top panel, see Fig.5.1.

2. To remove the boiler rear panel loosen off the gas pipe bracket and mains inlet cable and undo the fixing screws (8 off).

   NOTE: Gas and water pipes need to be disconnected to facilitate removal of the bac panel.

3. Undo the screw at the front of the cable box (front, top, right hand side). Half turn the black plastic retaining screw and remove the control panel end cover revealing the electrical terminal block.

4. Disconnect all electrical controls as follows;

   i) Disconnect mains (terminal block)
   ii) Pull apart the flue sensor connector (located right hand side of boiler)
   iii) Pull apart gas pressure switch connector (located right hand side of boiler)
   iv) Pull apart system controls connector block (located right hand side of boiler)
   v) Pull apart gas burner controls connector (located front top right hand side)
   vi) Disconnect casing earth

5. Remove the three screws on the control panel fascia and lift up the controls fascia cover.

6. Remove the thermostats from their pockets.

7. Remove thge eight screws from the controller housing and lift off controls and controller housing.

   NB: Ensure that thermostat wires are not damaged as controller housing is lifted apart.

8. Remove the front panel by undoing the black plastic fastener, one turn operation, located at the top right hand side.

9. Remove the left hand top black cover plate.

10. To remove the control housing frame, remove the two off srews that secure the casing to the boiler sections. Unscrew the control mounting frame from the small right and left hand panels (2 off screws). Detach the lagging retaining pins. Lift off the control panel mounting frame.

11. Slide the small left and right hand side panels upwards, lift out of the lugs and remove.

12. Slide the large left and right hand side panels forward and remove.

## FIXING CASING

1. Fit the small and large right and left hand side panels into lugs, slide back to secure.

2. Fit the burner controls access door into hinge holes then fit controls mounting frame to small left and right hand side panels. Secure to the side panels with two screws located top left hand side and top right hand side.

3. Secure controls mounting frame to boiler block (2 off screws). Using pin secure lagging in place.

4. Fit front panel. Locate bottom lugs and clip panel into place. Tighten black plastic screw (top left hand side) to secure.

5. Fit small black covering to top of boiler, front left hand side.

6. Carefully thread the thermostats through the rear of the controller housing frame and fit controls and controller housing in place. Secure with eight screws.

7. Put thermostats into pocket on boiler block.

8. Secure controls fascia (3 off screws).

9. Connect electrical controls as follows;

   i) Gas burner controls connector
   ii) Gas pressure switch connector
   iii) System controls connector
   iv) Flue sensor connector
   v) Re-connect mains (in cable box)
   vi) Re-connect casing earth

10. Fit and secure cable box cover.

11. Fit and secure back panel (8 off screws).

12. Fit ans secure top panel (2 off screws) at rear.

## 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. The boiler should be fully re-commissioned as described on page 5.2 with attention also paid to:-

A. The effectiveness of natural and mechanical ventilation and in particular the safe operation of an air flow switch on a mechanical ventilation system.

B. That the chimney system is sound and adequately evacuating the products of combustion and that htere is no spillage of flue products.

C. That the burner gas pressure is correct and that the boiler is still on rate.

D. That the low pressure switch on the boiler, if fitted, is operating correctly.

E. 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. Turn off gas supply to the boiler.

2. Open the small front door and locate the locking clip for the front panel. Turn the locking clip one quarter turn to release it.

3. Pull the main door forward to release from the clips and remove.

4. Disconnect wiring plug to the gas valve.

5. Disconnect the gas valve from the supply (top flange) - 4 off M6 screws.

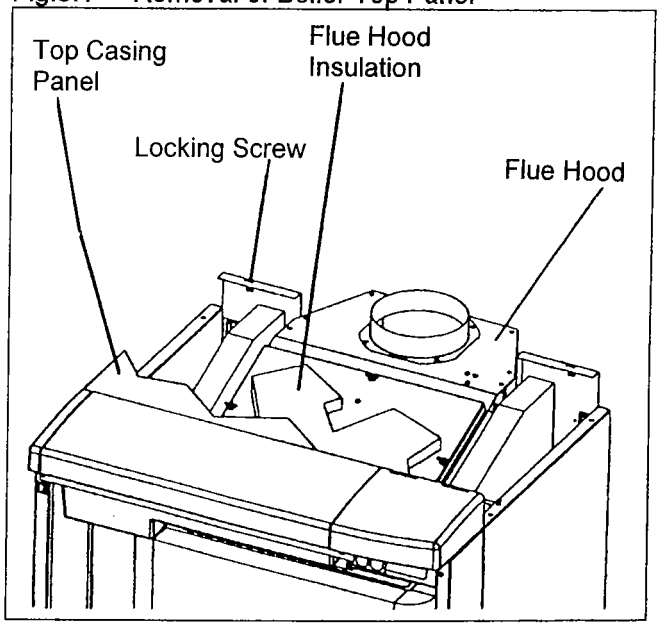
6. Undo the 4 off screws securing the burner bar assembly, DO NOT ALLOW THE BURNER BAR TO DROP. Remove the burner bar.

   **WHEN REMOVING THE BURNER ASSEMBLY PARTICULAR CARE SHOULD BE TAKEN WITH THE IGNITION GLOW COIL WHICH IS VERY FRAGILE**

7. Remove the boiler top panel (see Fig.5.1).

8. Undo the clips on the boiler insulation and carefully expose the top flue hood cover plate.

Fig.5.1 - Removal of Boiler Top Panel

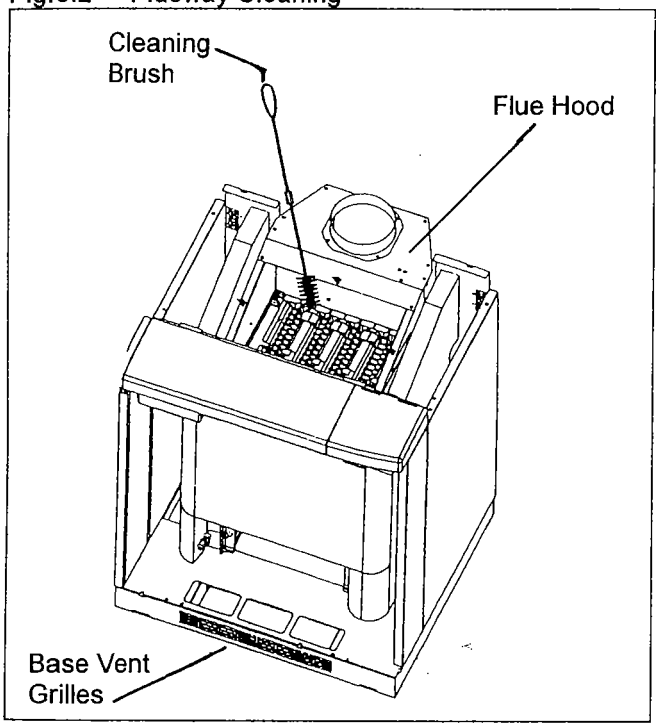


9. Undo the 4 wing nuts securing thte cover plate and remove this and the plate located underneath. See Fig.5.1.

10. Remove the two vent grilles from the boiler base.

11. With the flue brush provided clean the flueways by brushing diagonally through the flueways from both top and bottom of the cast iron heat exchanger, see Fig.5.2.

Fig.5.2 - Flueway Cleaning




12. Following completion remove all debris fron from the bottom of the boiler and air ducts ensuring that the air ducts and front and rear grilles are clean.

13. Clean the bottom vent grilles and replace.

14. The burner bars should be cleaned using a soft brush and vacuum cleaner.

15. Following completion check the integrity of gaskets, insulation and the condition of the burner bars and pilot assembly. Replace as necessary prior to re-assembly.

16. Re-assembly is the reverse of the above procedure.

Following completion of cleaning check for soundness of all gaskets and test for gas soundness, as detailed under Commissioning.

All gas joints should be checked for gas soundness.

## 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.**

Commissioning should onle 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 commissioning the boiler ensure that any cling film 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 the boiler are correctly earthed.

3. Gas supply is tested for soundness and purged of air.

4. Appliance gas cocks are all turned off.

5. Gas Supply is turned on at the meter.

6. Boiler and system are filled with water.

7. Flow and return valves are open.

8. Any external controls and the on-off switch are in the "ON" position.

9. The circulating pumps are operational. Check that the pump is scheduled to run and not on pump overrun if the boiler gas previously been fired.

10. Check that the high limit thermostat is not in the tripped position by pressing the green button on the stat located on the boiler control panel, see Fig.5.3.

11. The boiler is suitable for your gas supply, ie. natural gas.

## CONNECTING THE GAS SUPPLY

Gas connection is made by means of the threaded 3/4" male union located on the rear right hand side of the boiler. 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 given on page 2.1.

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

The gas supply should be supported adequately.

For large single and multiple 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. Each boiler shall be provided with an isolating valve so that it is possible to isolate the boiler from a common gas supply for maintenance purposes.

Boosters are not necessary if a minimum inlet pressure of 7 in.w.g. (17.5 mbar) is 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 connections.

The water system should be in accordance with the notes given on page 3.7. A low water pressure switch should be provided on the flow side of the installation.

## 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 brought from the rear of the boiler. (The central heating switch on the boiler panel does not replace the need for the statutory wall mounted switch).

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 6.1 and also on the front inner panel of the boiler.

To connect the boiler the electrical control panel must be opened. Insert the edge of a coin into the slot provided in the ctach and loosen the self tapping screw at the front, remove the cable box cover (see Fig.4.1), this gives access to the connector block (see Fig.4.2). The connection should be made in accordance with the electrical wiring diagram on page 6.1.

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

Fig.4.1 - Cable Box Cover Removal

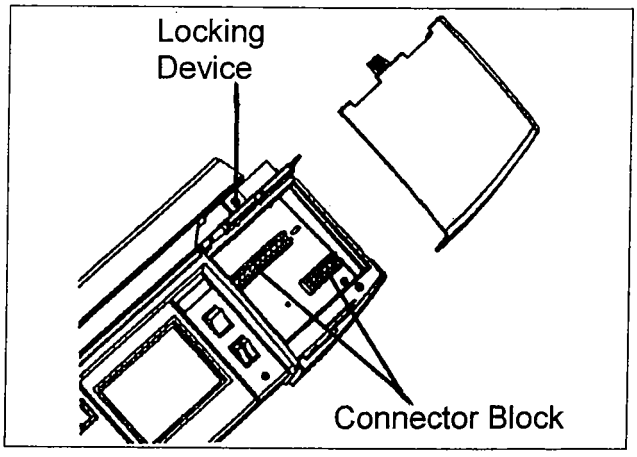
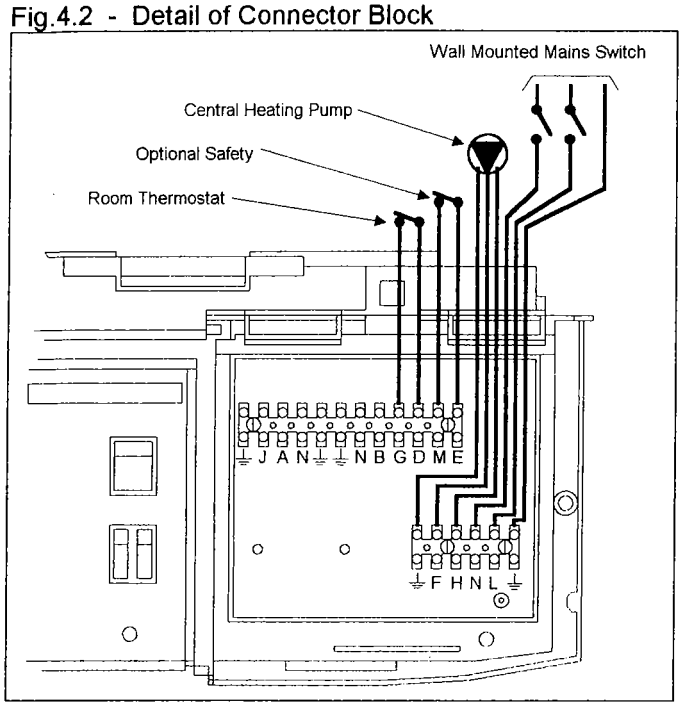


Fig.4.2 - Detail of Connector Block




Boiler Controls

The operation of the boiler is under the control of it's own multi-functional control valve, 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 links D-G and E-M and providing volt free contacts across these terminals to switch the boiler.

For building management system monitoring a common fault signal (high limit trip/boiler lockout) can be obtained from connection J.

Optional control devices are available - see separate instructions supplied with the equipment.

Connecting the Flue System

The flue system should be made in accordance with the notes given on page 3.2. 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.

Flue Gas Down Draught Surveillance Device

The GA boiler is supplied with a flue gas down draught surveillance device consisting of an automatic reset thermostat located in the draught diverter which cuts off the burner in the event of the flue failing to operate correctly.

If this does happen the temperature of the burnt gas will trip the thermostat and will switch off the burner for a period of up to 10 minutes.

The device is designed to operate under pre-defined conditions and under no circumstances should it be disconnected.

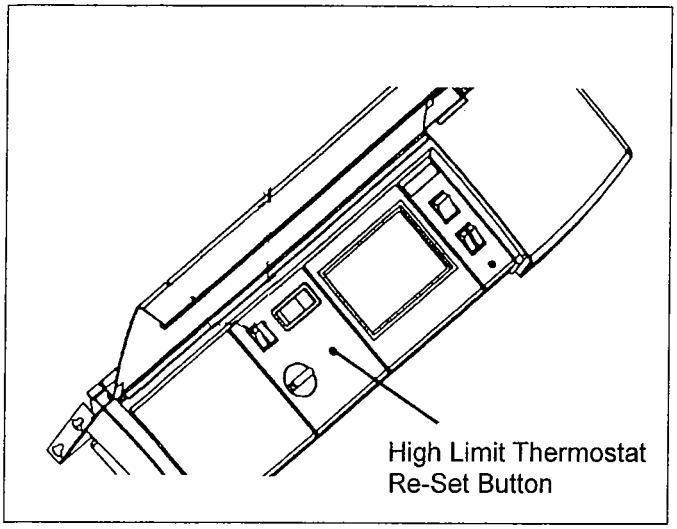
For installation of the flue gas safety device refer to the installation instructions provided.

## INSTALLATION OF OPTIONAL CONTROLS

The optional control devices are supplied ready mounted on a printed circuit board for installation in the boiler control panel.. The installation procedure is as follows (see Fig.4.3 and 4.4).

1. Insert a coin into the catch on the connection cover to open and remove it.
2. Undo the two connecting screws and remove the control panel being careful not to damage the wires.
3. Remove the controller cover panel.
4. unpack the five self tapping screws and unscrew and remove the five spacers from the printed circuit board.
5. Attach the printed circuit board by using the five self tapping screws and position and secure the controller.
6. Remove the end of connector A and connect to the printed circuit.
7. Connect cable C.
8. For installation and electrical connection of the controller refer to the instructions packed with it.

Fig.5.3 - High Limit 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 for further details.

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

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 shown on the back page.

Commissioning figures should be taken at a boiler 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 | $CO_2$ | - | 4 - 5% |
| | CO | - | 0 - 50 ppm |
| | Flue Gas Temp | - | 110 - 160°C |

**IMPORTANT: The boiler/burner units are supplied in accordance with Potterton Commerical Quality Assurance plan registered to meet the requirements of BS EN ISO 9002. A condition of the supply of the appliance for compliance with this Quality Assurance plan is the return of the appliance commissioning report.**

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

1. Operaton of the control, high/low and high limit thermostats should be checked for correct operation.

2. The flue draught available at the appliance flue outlet should be checked under all operating conditions (hot and cold) and should be within the boiler operating parameters, see Table 1.2.

3. The fuel supply to the appliance should be isolated and the burner operated to ensure safety shut down and lockout of the burner on flame failure.

4. Shut down of the boiler plant by external controls does not cause a hazardous condition and pump overrun is provided to remove residual heat from the boiler.

5. Following commissioning the boiler overheat and control thermostats should be set to the required operating setting. See section 3 for maximum operating temperatures.

6. 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 pumpingof 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.

## INITIAL LIGHTING

The boler is fully automatic and when the burner control receives a signal calling for heat the burner will light.

1. Switch on the boiler from the external mains isolator. The orange boiler mains light will illuminate (see Fig.5.4).

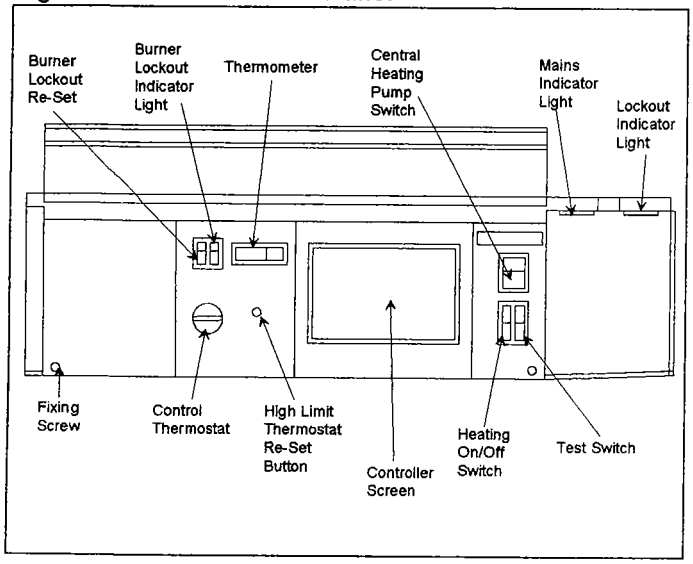
2. Set the central heating pump switch to " " (ensure external pump interlocks are made, if any).

3. Set the heating switch to " " (off).

Boiler switch (5) at " | " = Boiler ON

Boiler switch (5) at " O " = Boiler OFF

Fig.5.4 - Boiler Indicator Panel




4. Open the main gas cock.

5. Set the heating switch to " " and the boiler will light.

6. Check the burner manifold pressure - see Table 1.2, page 1.2 for values.

Under normal circumstances the regulator should not need to be re-adjusted however, if it is necessary to adjust the gas pressure:-

a) Remove screw cover and retain.

b) With a small screwdriver screw he adjuster anti-clockwise to decrease pressure and clockwise to increase pressure.

c) Following final adjustment replace screw cover.

Check for spillage from the draught diverter (there is a heat detector in the base of the diverter which will shut the boiler down in the event of spillage. It is essential therefore to ensure that the flue system is capable of evacuating the products of combustion under all conditions otherwise frequent nuisance shut downs and a potentially dangerous situation can occur.

## LIGHTING SEQUENCE

1. Power to glow coil/ionisation probe - unti will glow brightly.

2. Gas safety shut off valves will open.

3. Ignition.

4. Flame detection.

5. Glow coil/ionisation probe will stop glowing.

6. Gas valves will continue opening to give full throughput.

The GA LE is fitted with a hot glow coil ignition unit. If the boiler will not light check that all control interlocks are made, ie. high limit thermostat, control thermostat, pump operation, gas pressure switch and flue gas surveillance device.

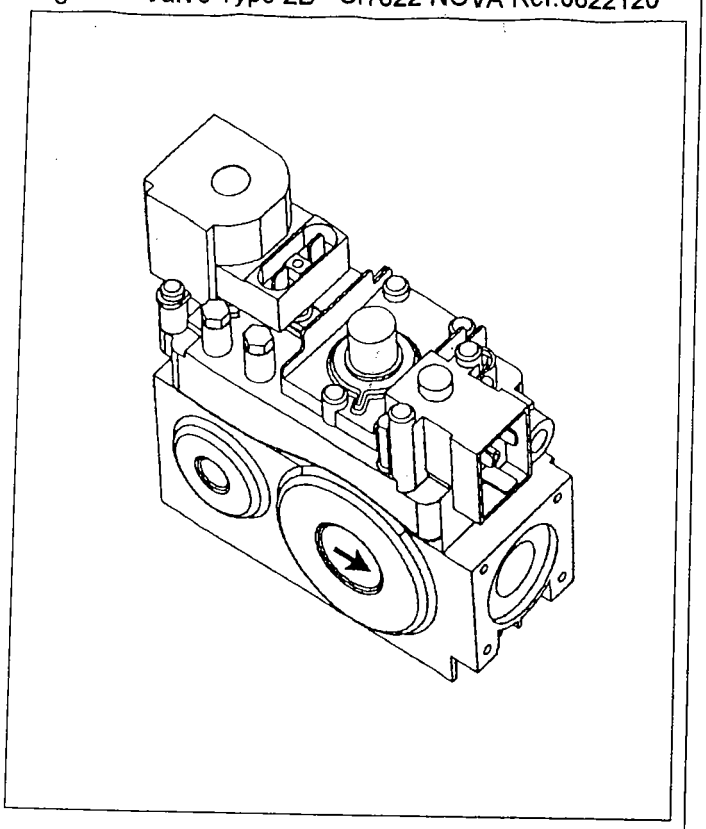
If the burner locks out (the red burner lock out light will illuminate) check that the gas supply has been correctly purged, the gas pressure switch is made, the hot glow coil/flame ionisation probe are correctly located and connected and that there is no short circuit to earth.

If the burner will still not light see Operating Faults, section 5, page 5.8.

## GAS VALVES

The gas pressure regulator is pre-set to the correct pressure with the specified inlet pressure however, the burner manifold pressure and inlet pressure should be checked as part of the commissioning against the values given in Table 1.2.

Fig.5.5 - Valve Type 2B - SIT822 NOVA Ref.0822120



## FINAL CHECKS

With the boiler hot and cold check for spillage of combustion products with a smoke bomb or smoke wand. 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 hte flue above the flue adpator socket.

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

For boiler houses with mechanical ventilation, the suitability of the ventilation and extract system should be checked against the notes given on mechanical ventilation in section 3.

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.

## OPERATION OF ANCILLARY CONTROLS

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

## NORMAL BOILER OPERATION

The GA LE boiler will respond to it's controller and thermostats automatically. Oncew commissioned the boiler should be left in the ON position. The boiler will then be operated by the system controller, eg. RD3032B or RB2010.

If the burner locks out for any reason (indicated by a red light on the top of the boiler) re-set the burner by pressing the control box re-set button on the control panel.

If the boiler trips out on the overheat thermostat check the cause of the high temperature and re-set by pressing the green overheat re-set button on the control panel.

NOTE: If the boiler is firing when the overheat thermostat trips the burner will lockout.

## TO SHUT DOWN BOILER

1. Temporarily - Switch the on/off switch to "OFF". Switch off the electrical supply so that the mains indicator lamp is not lit.

2. Long Periods - As above but in addition turn off both gas cocks on the gas train at the side of the boiler.

## SETTING THE FLOW TEMPERATURE

Factory Adjustment of Control Thermostat

The temperature range is set in the factory at 35-85°C.

In order to adjust the temperature range proceed as follows (see also Fig.5.7):-

1. Remove the control knob.
2. Undo the collar (item 3) and the two stop disks (items 1 and 2) located inside the knob.

Adjustment of Minimum Temperature (Disk 1)

3. Place disk (item 1) in such a way so that the slot in the tab aligns with the rib number insode the knob (item 4) corresponding to the minimum temperature value as shown in Table 5.1.

Adjustment of Maximum Temperature (Disk 2)

4. Place disk (item 2) in such as way so that the slot in the tab aligns with the rib number inside the knob (item 4) corresponding to the maximum temperature value as shown in Table 5.1.

5. Replace the collar.

6. Replace the knob on the shaft in a position where the stop screw found on the boiler is situated between the two tabs.

## CHECKING THE HIGH LIMIT THERMOSTAT

The test switch (see Fig.5.8) allows the control thermostat to be short circuited to allow checking of the high limit thermstat operation. THIS TEST MUST BE CARRIED OUT BY A QUALIFIED ENGINEER. The high limit thermostat is set at 110°C and it is likely therefore that onm open vented systems considerable quantities of steam may be produced whilst carrying out this test.

Fig.5.7 - Control Thermostat Temperature Adjustment

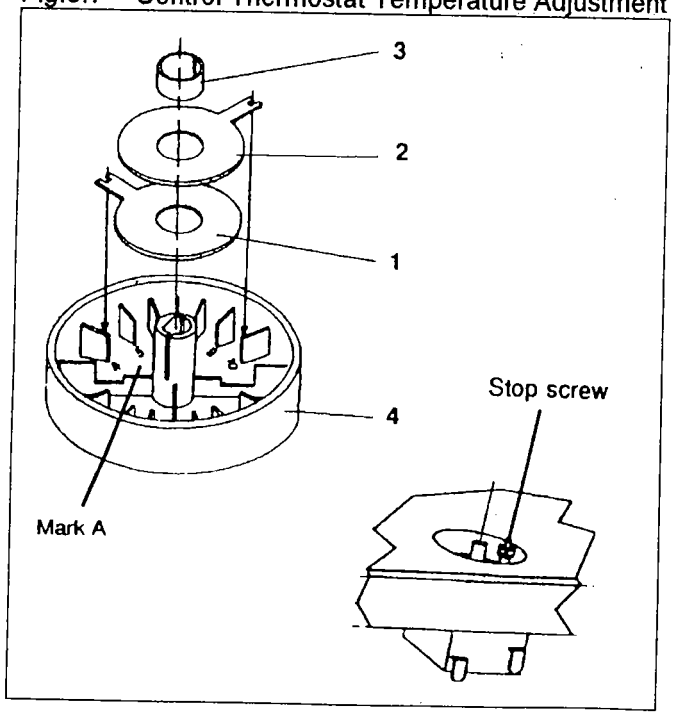
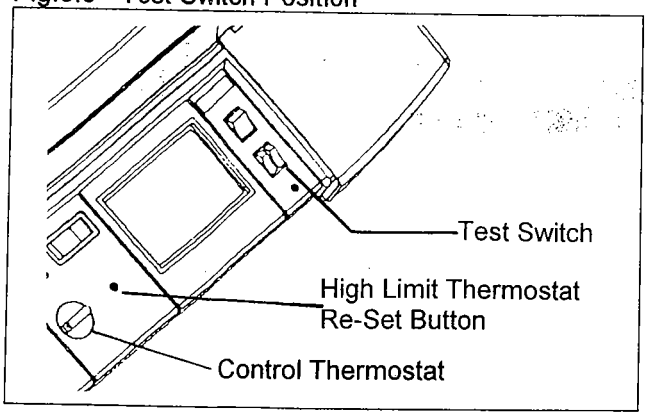



Table 5.1 - Minimum & Maximum Disk Settings

| Minimum Temperature | | Minimum Temperature | |
|---|---|---|---|
| Temp °C | Disk No.1 | Temp °C | Disk No.2 |
| 30 | 1 | - | 1 |
| 35 | 2 | 30 | 2 |
| 40 | 3 | 35 | 3 |
| 45 | 4 | 40 | 4 |
| 50 | 5 | 45 | 5 |
| 55 | 6 | 50 | 6 |
| 60 | 7 | 55 | 7 |
| 65 | 8 | 60 | 8 |
| 70 | 9 | 65 | 9 |
| 75 | 10 | 70 | 10 |
| 80 | 11 | 75 | 11 |
| 85 | 12 | 80 | 12 |
| 90 | 13 | 85 | 13 |
| - | 14 | 90 | 14 |

Fig.5.8 - Test Switch Position




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.

NOTE: Overheat thermostat trip may cause burner lockout, therefore the burner controller will also need resetting.

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

**FAULT FINDING - LE Version**

| | Fault | Possible Cause |
|---|---|---|
| 1 | Boiler does not attempt to light | a) Check mains power is switched on.<br>b) Check that the heating controls are calling for heat (including any optional controller if fitted).<br>c) Check that the boiler has not locked out on flame failure (is lockout light illuminated?).<br>d) Low gas pressure - pressure switch tripped?<br>e) High flue box temperature (indicating spillage from flue) - flue gas surveillance device tripped? |
| 2 | Boiler locks out before ignition | a) Check that the gas supply is turned on and ensure that the system is purged of air.<br>b) Check that the ignitor glow coil.ionisation probe is connected correctly and glows brightly.<br>c) Check that the gas multi-block valve has power.<br>d) Check overheat thermostat has not tripped |
| 3 | Boiler locks out after ignition | a) Check glow coil/ionisation probe is correctly aligned.<br>b) Check ionisation probe circuit for correct ionisation current.<br>c) Check gas pressure is correct.<br>d) Rapid cycling of boiler.<br>e) Overheat thermostat tripped.<br>f) Check gas multi-block valve. |
| 4 | Boiler overheat thermostat tripped | a) Pump overrun inadequate leading to build up of residual heat in boiler.<br>b) Insufficient water flow rate through boiler.<br>c) Restriction in flow/return pipework, eg. valve closed/partly open.<br>d) Reset by pressing green button on ontrol panel. |
| 5 | Boiler operational but low heat output | a) Check heating controller is set correctly<br>b) Intermittent low gas presure - gas pressure switch.<br>c) Flue product spillage - flue sensor switch (check the flue draught limiter using a mirror to detect traces of condensation indicating flue gas spillage). |
| 6 | Poor combustion - yellow flame, sooting | a) Inadequate ventilation to boiler.<br>b) Inadequate or obstruction of the flue.<br>c) Incorrect gas supply. |

## COMPONENT REPLACEMENT

Before commencing 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

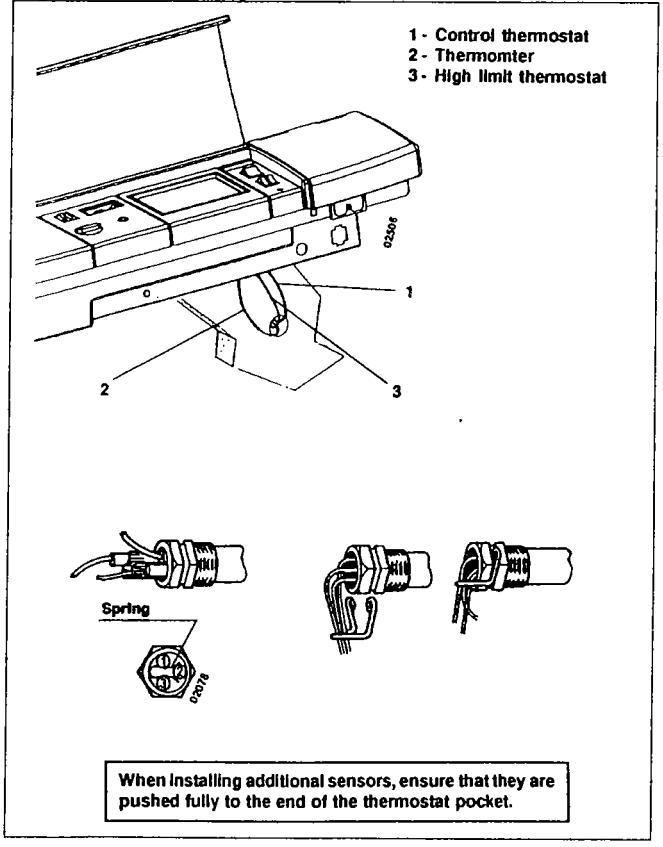
1. Remove the main burner assembly as described under "Cleaning the Boiler" on page 5.1.

2. Release the four self tapping screws securing the burner bar to the burner manifold and remove burner.

3. Fitting new burners is the reverse of the above procedure.

Control Thermostat & Thermometer Replacement

Fig.5.9 - Positioning of Thermostat Phials




1. Remove the boiler top casing panel.

2. Release the electrical connections cover locking device by turning 1/4 turn using a suitable tool.

3. Undo the screw clamp holding the front of the cover and remove the cover.

4. Undo the three fixing screws then hinge the whole control panel backwards to expose the underside of the controls.

Thermostat

5. Remove the thermostat phial from the pocket and thread this through the aperture into the control panel base.

6. Remove the electrical connections (push on connectors) noting their positions for re-connections.

7. Pull off the control knob.

8. Remove the two screws securing the thermostat to the housing (NOTE: One of these screws has a pip - this is the control knob stop and must be re-fitted in the same position).

9. Fitting the new thermostat is the reversal of the above procedure.

Thermometer

10. Remove the thermometer phial as in step 5 above.

11. The body of the thermometer is held in position with in-built plastic clips. Press these inwards whilst pushing the body through the control panel.

12. Fitting of the new thermometer is the reversal of the above procedure.

Switches

13. Undo the control panel as above.

14. Disconnect the electrical push on connectors noting their positions.

15. Both switches are held in position with in-built plastic clips. Press these inwards whilst pushing the switch through the control panel.

16. Fitting of the new switch(es) is the reversal of the above procedure. Ensure that the switches are fitted in the correct orientation.

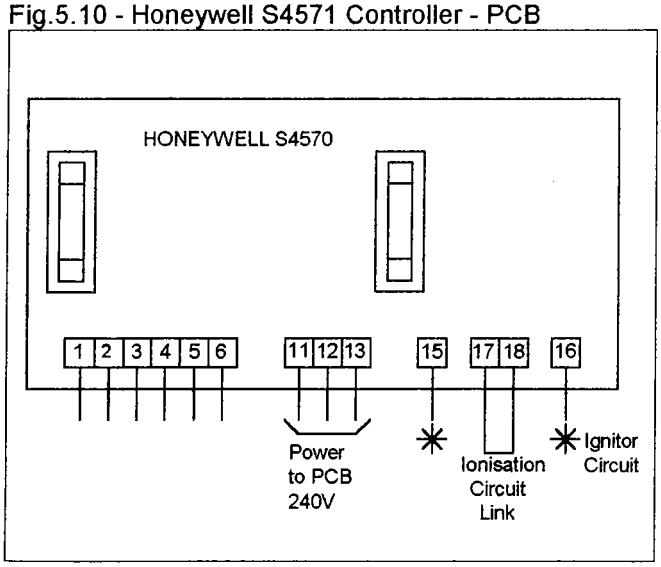
Gas Valve Replacement

1. Disconnect electrical connections.
2. Disconnect glow coil connections.
3. The gas valve is mounted in the pipework between two flanges. undo the four screws in each flange and remove valve.
4. Recover the sealing rings.
5. Replacement is the reversal of the above procedure. Ensure that the restrictor is refitted and hte joint ring upstream of the valve.
6. Check for gas soundness and leaks using a weak soap solution.

## BURNER CONTROLLER

Burner Control Box: Honeywell S4571 AS 1003

Fig.5.10 - Honeywell S4571 Controller - PCB




Ignition/Ionisation Circuits

The GA LE is fitted with a combined ignition, flame detection probe. During the lighting sequence the burner control box first utilises the probe as a glow coil ignitor then, once the gas valve has opened, it switches to operate as a flame detection probe. The ignitor and flame ionisation circuits can be checked as follows.

1. Ignitor Circuit

   The ignitor circuit voltage can be checked by connecting a voltmeter across connections 15 and 16 of the control box. Voltage should be approximately 50V DC.

   The resistance of the ignitor (glow coil/ionisation probe) can be checked by disconnecting the ignitor from connections 15 and 16 of the control box and connecting an ohmmeter to the ignitor circuit. Resistance should be approximately 48Ω.

2. Ionisation Circuit

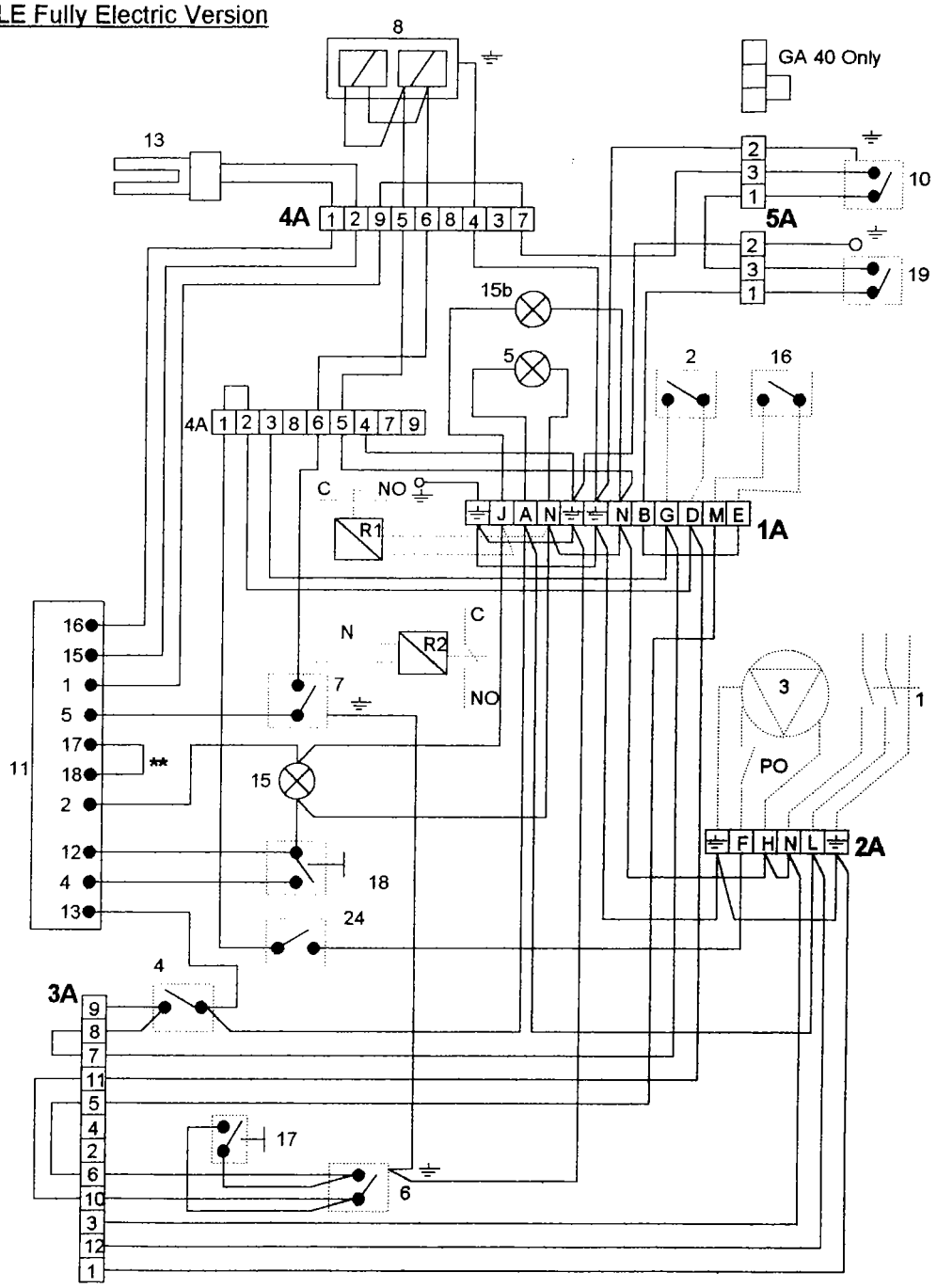
   The ionisation current can be checked by connecting an ammeter across connections 17 and 18. remove link and connect ammeter in series with the circuit. A current of between 1 and 3 µA should be measured. (NOTE: Ionisation circuit voltages - approximately 75V AC and 35V DC).

Fig.6.1 - Wiring Diagram - LE Fully Electric Version

Remote Control/Monitoring
(Optional Extra)

R1 - Common Fault
(Volt Free)

R2 - Boiler Running
(Volt Free)




LEGEND

| | | | | | |
|---|---|---|---|---|---|
| 1 | 230V 1Ph Electrical Supply | 11 | Ignition & Safety Circuit - PCB | 1A | 12 Way Connector |
| 2 | Room Thermostat | 13 | Ignition & Ionisation Electrode | 2A | 6 Way Connector |
| 3 | Central Heating Pump | 15 | Lockout Indicator Light | 3A | 12 Way Connector |
| 4 | Central Heating Switch | 15b | Lockout Indicator Light (External) | 4A | 9 Way Connector |
| 5 | Mains Indicator Light | 16 | Optional Safety System | 5A | 3 Way Connector |
| 6 | Control Thermostat | 17 | Boiler Test Button | | |
| 7 | High Limit Thermostat | 18 | Lockout Reset Switch | G-D | Remote Interlock |
| 8 | Gas Valve | 19 | Flue Gas Spillage Thermostat | | |
| 10 | Low Gas Pressure Switch (except GA40) | 24 | Central Heating Pump Switch | | |

** Ionisation Current Check

PO - Pump Overrun Thermostat

Fig.6.2 - Schematic Wiring Diagram - LE Fully Electric Version

1 230V 1Ph Electrical Supply
2 Room Thermostat
3 Central Heating Pump
4 Central Heating Switch
5 Mains Indicator Light
6 Control Thermostat
7 High Limit Thermostat
8 Gas Valve
10 Low Gas Pressure Switch (except GA40)
11 Ignition & Safety Circuit - PCB
13 Ignition & Ionisation Electrode
15 Lockout Indicator Light
15b Lockout Indicator Light (external)
16 Optional Safety System
17 Boiler Test Button
18 Lockout Re-Set Switch
19 Flue Gas Spillage Thermostat
24 Central Heating Pump Switch

1A - 12-way Connector
2A - 6-way Connector
3A - 12-way Connector
4A - 9-way Connector
5A - 3-way Connector

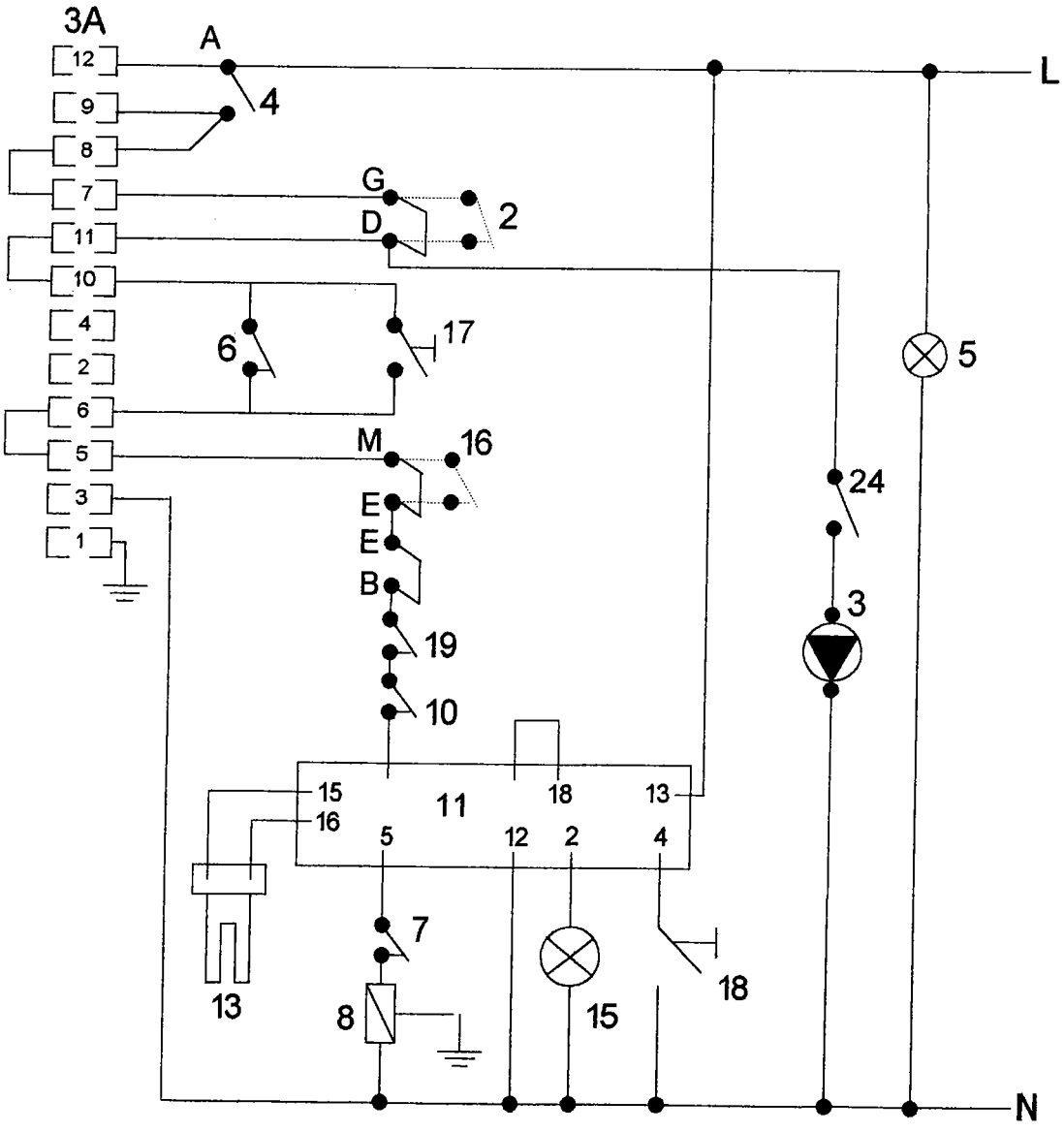
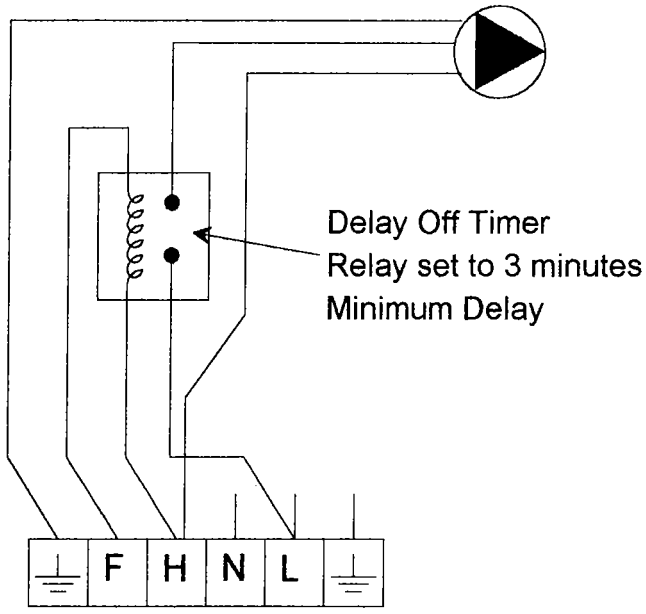


Fig.6.3 - Pump Overrun Using Timer Relay as Alternative to Pipe Thermostat



GA 40, 50, 60, 70 LE

| Item | Description | Potterton Part No |
|---|---|---|
| **BOILER BODY (See Fig.7.1)** | | |
| 1 | Assembled Waterway - GA40 | COM17882175 |
| | Assembled Waterway - GA50 | COM17882176 |
| | Assembled Waterway - GA60 | COM17882177 |
| | Assembled Waterway - GA70 | COM17882178 |
| 2 | Thermostat Pocket | COM170864EA |
| 3 | Drain Cock | COM17006472 |
| 4 | Blanking Plug | COM15929250 |
| 5 | Capillary Retaining Clip | COM17001776 |
| 6 | Bulb Spring | COM17006458 |
| 7 | Base - GA40 | COM17880650 |
| | Base - GA50 | COM17880651 |
| | Base - GA60 | COM17880652 |
| | Base - GA70 | COM17880653 |
| 8 | Waterway Fixing Studs | COM15245348 |
| 9 | Heating Unit Insulation - GA40 | COM17070595 |
| | Heating Unit Insulation - GA50 | COM17070594 |
| | Heating Unit Insulation - GA60 | COM17070593 |
| | Heating Unit Insulation - GA70 | COM17070592 |
| 10 | Flue Hood - GA40 | COM17880579 |
| | Flue Hood - GA50 | COM17880580 |
| | Flue Hood - GA60 | COM17880581 |
| | Flue Hood - GA70 | COM17880582 |
| 11 | Overspill Safety Thermostat | COM17071459 |
| 12 | Flue Hood Insulation - GA40 & GA50 | COM17070591 |
| | Flue Hood Insulation - GA60 & GA70 | COM17070590 |
| 13 | Control Panel Fixing Plate - GA40 | COM17931584 |
| | Control Panel Fixing Plate - GA50 | COM17931594 |
| | Control Panel Fixing Plate - GA60 | COM17931604 |
| | Control Panel Fixing Plate - GA70 | COM17931614 |
| 14 | Flue Hood Gasket - GA40 | COM17070589 |
| | Flue Hood Gasket - GA50 | COM17070588 |
| | Flue Hood Gasket - GA60 | COM17070587 |
| | Flue Hood Gasket - GA70 | COM17070586 |
| 15 | Seal for Blanking Plug | COM156761EA |
| 16 | Burner Gasket - GA40 | COM17070585 |
| | Burner Gasket - GA50 | COM17070584 |
| | Burner Gasket - GA60 | COM17070583 |
| | Burner Gasket - GA70 | COM17070582 |
| 17 | Cleaning Brush (Not Illustrated) | COM170250EA |
| 18 | Set of Fixings (Not Illustrated) | COM17880369 |
| **BURNER (See Fig.7.2)** | | |
| 1 | Gas Supply Pipe | COM17007198 |
| 2 | Gas Pipe Coupling | COM17006302 |
| 3 | Set of Gas Burner Seals | COM17880461 |
| 4 | 3/4" Flat Jointed Union Bend | COMN9125920 |
| 5 | Pressure Test Point | COM17006201 |
| 6 | Gas Valve | COM17007706 |

| Item | Description | Potterton Part No |
|---|---|---|
| 7 | Gas Feed Pipe - GA40 | COM17006256 |
| | Gas Feed Pipe - GA50 | COM17006257 |
| | Gas Feed Pipe - GA60 | COM17006258 |
| | Gas Feed Pipe - GA70 | COM17006259 |
| 8 | Burner Bar Support - GA40 | COM17931004 |
| | Burner Bar Support - GA50 | COM17931014 |
| | Burner Bar Support - GA60 | COM17931024 |
| | Burner Bar Support - GA70 | COM17931034 |
| 9 | Burner Bar Support Insulation - GA40 | COM17070541 |
| | Burner Bar Support Insulation - GA50 | COM17070542 |
| | Burner Bar Support Insulation - GA60 | COM17070543 |
| | Burner Bar Support Insulation - GA70 | COM17070544 |
| 10 | Set of Injectors - GA40, GA50, GA60 | COM17003218 |
| | Set of Injectors - GA70 | COM17003199 |
| 10a | Set of Seals - GA40, GA50, GA60, GA70 | COM17006504 |
| 11 | Burner Bar | COM17000879 |
| 12 | Ignition Glow Coil/Ionisation Unit | COM17070649 |
| 13 | Mica | COM170491EA |
| 14 | Set of Gas Thermocouple Cables - GA40 – GAS VALVE LEADS | COM17071511 |
| 15 | Low Gas Pressure Switch (Kromschroder) - GA50, GA60, GA70 | COM17003991 |
| | Low Gas Pressure Switch (Dungs) - GA50, GA60, GA70 | COMN9020380 |
| 15A | Pressure Switch Wiring - GA50, GA60, GA70 COM17071421 | |
| 16 | Set of Burner Fixings | COM17880458 |

**CASING (See Fig.7.3)**

| | | |
|---|---|---|
| 1 | Side Casing - Right Hand (Yellow) | COM17931649 |
| 2 | Side Casing - Left Hand (Yellow) | COM17931648 |
| 3 | Front Side Panel - Right (Grey) | COM17931668 |
| 4 | Front Side Panel - Left (Yellow) | COM17931678 |
| 5 | Door Panel - GA40, GA50 (Yellow) | COM17931708 |
| | Door Panel - GA50, GA60 (Yellow) | COM17931718 |
| 6 | Swinging Door Panel (Grey) | COM17075300 |
| 7 | Top Panel - GA40, GA50 (Yellow) | COM17931688 |
| | Top Panel - GA60, GA70 (Yellow) | COM17931698 |
| 8 | Rear Panel - GA40 | COM17931549 |
| | Rear Panel - GA50 | COM17931559 |
| | Rear Panel - GA60 | COM17931569 |
| | Rear Panel - GA70 | COM17931579 |
| 9 | Control Unit Support Panel - GA40, GA50 | COM17931724 |
| | Control Unit Support Panel - GA60, GA70 | COM17931734 |
| 10 | Gas Pipe Support | COM17931524 |
| 11 | Gas Pipe Collar | COM17001096 |
| 12 | Set of Casing Screws | COM17880294 |

**CONTROL PANEL (See Fig.7.4)**

| | | |
|---|---|---|
| 1 | Box | COM17002291 |
| 2 | Control Panel Fascia | COM17002293 |
| 3 | Control Panel Cover (Grey) | COM17070820 |
| 4 | Control Panel End Cover (Grey) | COM17002295 |

CONTROL BOX. HONEYWELL

COM 17070713 = 8170713.

| Item | Description | Potterton Part No |
|---|---|---|
| 5 | End Cover Support | COM17931634 |
| 6 | Catch | COM17002402 |
| 7 | Control Panel Extension Piece - GA60, GA70 | COM17070821 |
| 8 | 4 x 16 Groove Dowel Pin | COM15970100 |
| 9 | 4 x 30 Groove Dowel Pin | COM |
| 10 | Left Hand End Cap (Grey) | COM17002297 |
| 11 | End Support - GA60, GA70 | COM17931534 |
| 12 | Mains On Light (Orange) | COM170026EA |
| 13 | Lock Out Light (Red) | COM17002602 |
| 14 | Test Button & Heating On/Off Switch | COM15804082 |
| 15 | Central Heating Pump Switch | COM15804020 |
| 16 | Control Thermostat | COM17006993 |
| 17 | Control Thermostat Knob | COM17004739 |
| 18 | Adjustment Stop | COM17001767 |
| 19 | Knob Attachment | COM15237568 |
| 20 | High Limit Thermostat Support | COM179369E4 |
| 21 | High Limit Thermostat | COM17006940 |
| 23 | Rectangular Thermometer | COM17007061 |
| 24 | Re-Set Button - Lock Out Indicator | COM158314FA |
| 27 | Spare Panel (for controller installation) | COM17005591 |
| 28 | Ignition Circuit CONTROL BOARD (GAS Box) | COM17070713 |
| 28A | Packet of Fuses | COM |
| 29 | Indicator Bulb | COM158267FA |
| 30 | Company Name Plate | COM |
| 31 | Electrical Wiring | COM17880565 |
| 32 | Set of Fixings | COM1788457 |

Fig.7.1 - Boiler Body

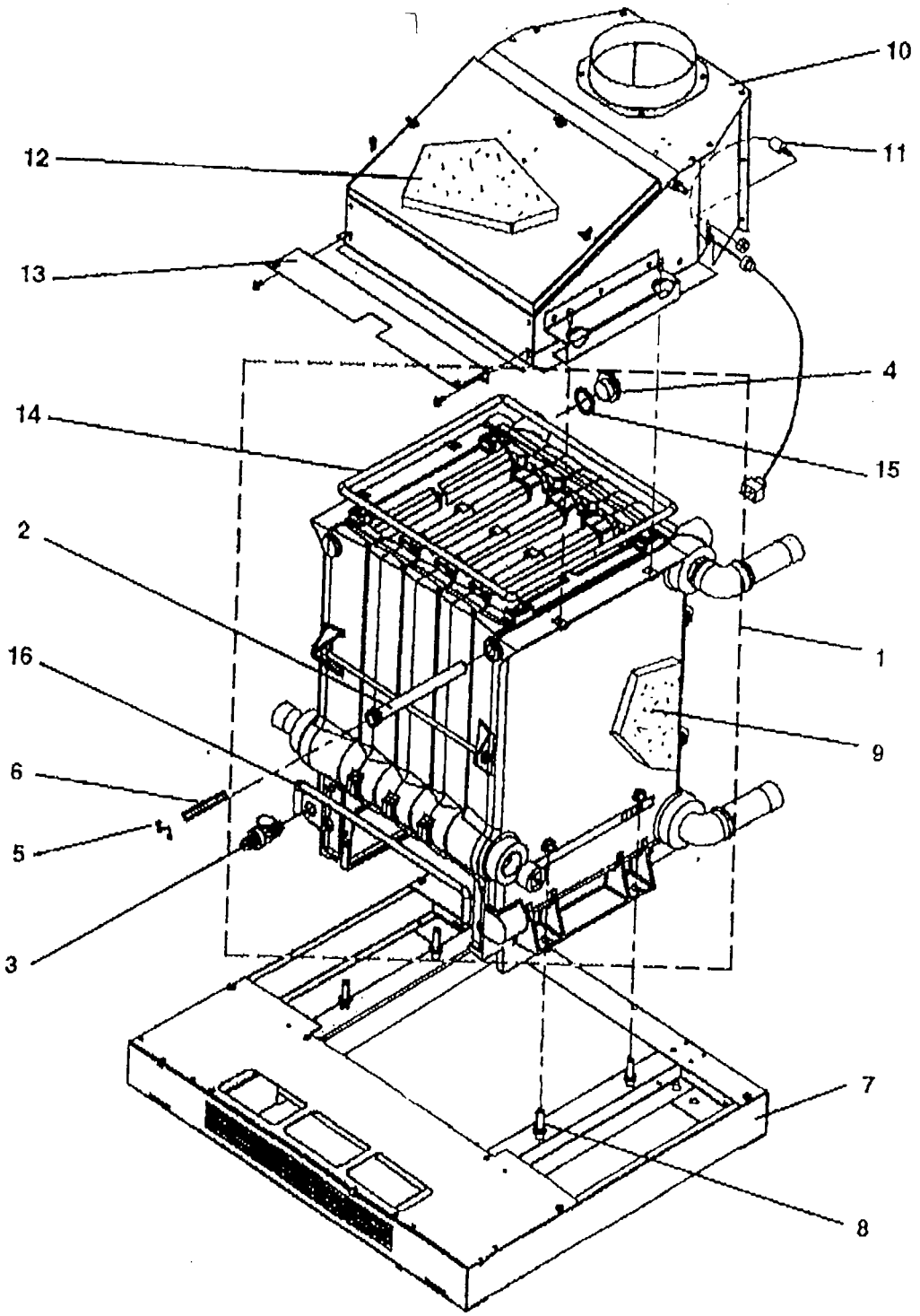


Fig.7.2 - Burner Assembly

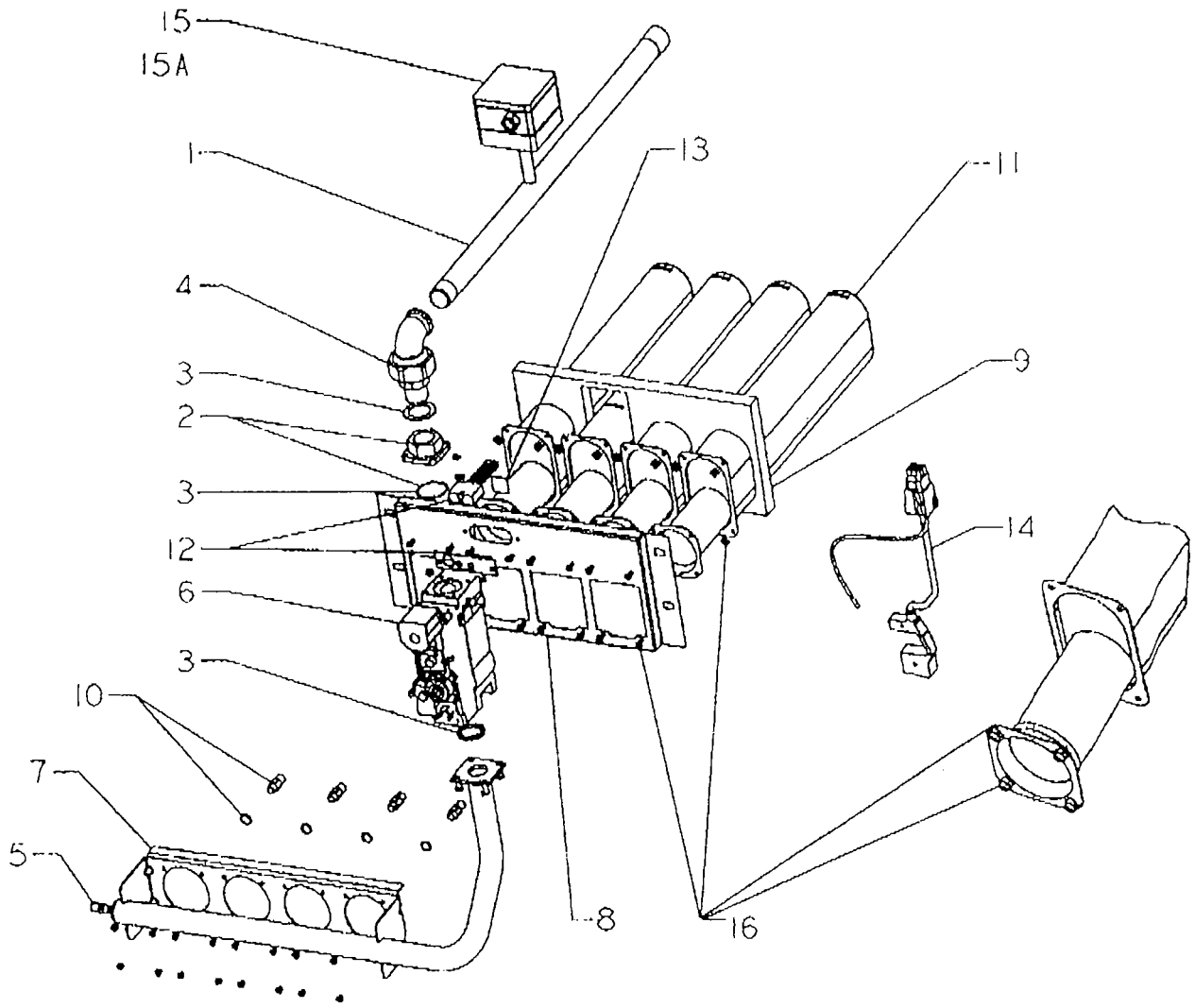


Fig.7.3 - Casing Panels

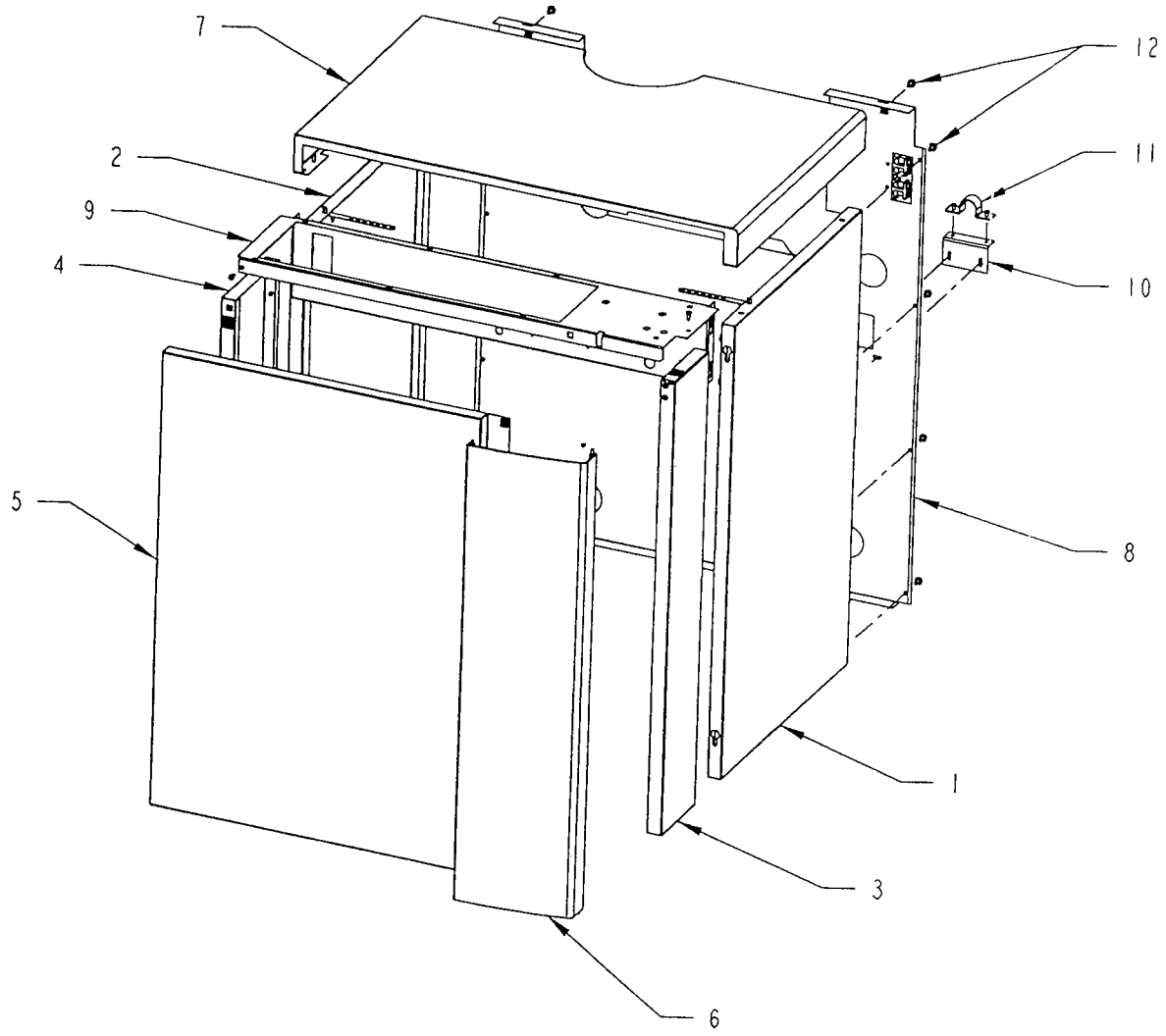
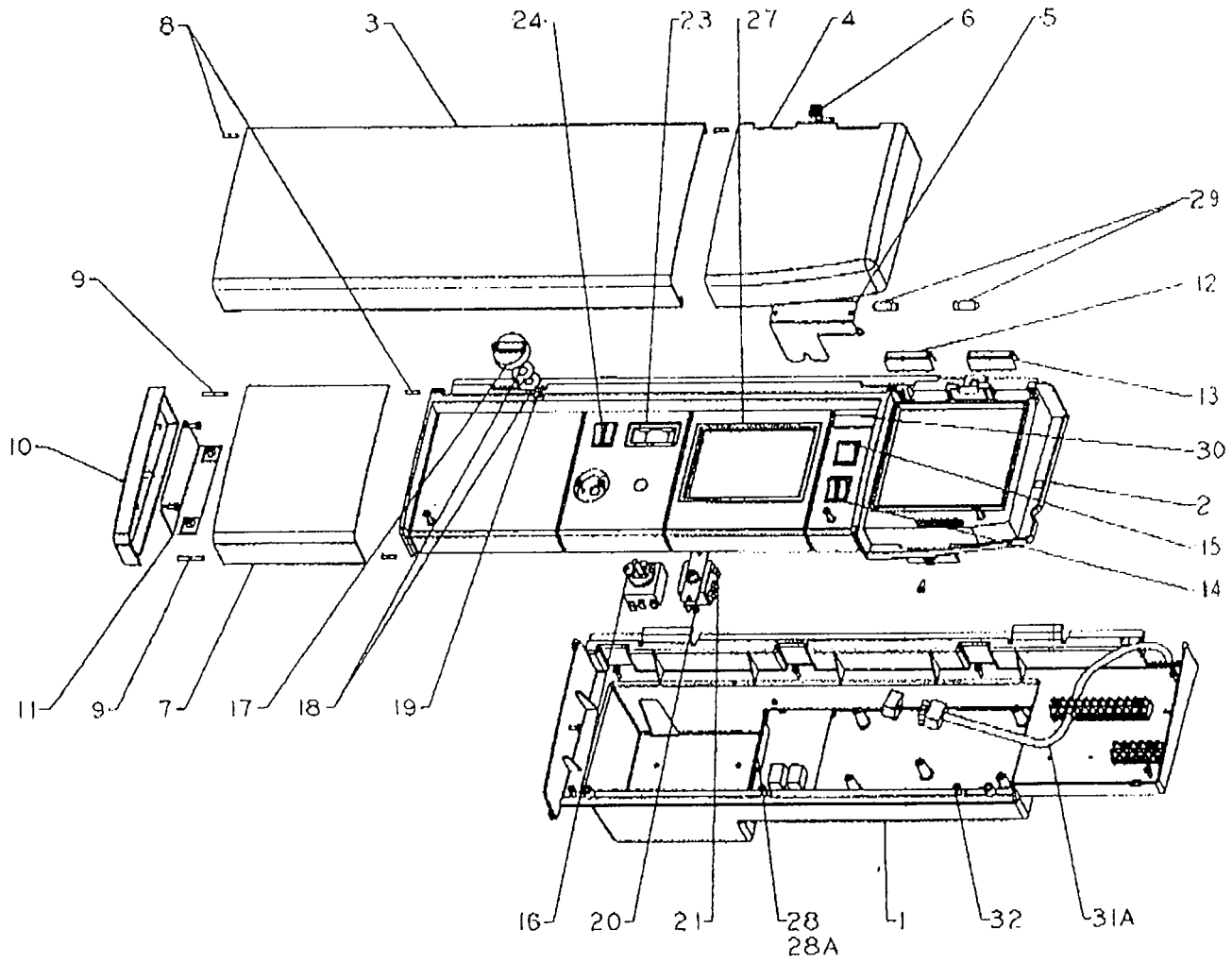


Fig.7.4 - Control Panel



ATMOSPHERIC NATURAL GAS/L.P.G. BOILER (INC CONDENSING VERSIONS) COMMISSIONING REPORT IN ACCORDANCE WITH BS5750

POTTERTON
JUNO DRIVE, QUEENSWAY
LEAMINGTON SPA CV31 3RG
Tel: 08706 050607 Fax: 01926 880612

REPORT SENT TO INSTALLER:

Date: .....

Signature: .....

REPORT NO: .....

SITE ADDRESS: .....

.....

.....

.....

INSTALLER NAME & ADDRESS: .....

.....

.....

.....

.....

DATE OF COMMISSIONING: .....

| 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: | Nat Gas | | | LPG | | | | |

| 2.0 | **BURNER** | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.1 | Type: | Standard | | Modified 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 No | | | | | | |

| 3.0 | **BURNER SETTINGS** | |
|---|---|---|
| 3.1 | Main Burner Injector Size | mm |
| 3.2 | Pilot Burner Injector Size | mm |
| 3.3 | Are Burners and 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 | |
| 4.6¢ | 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 | | | | µA |
| 5.5¢ | Air Shutter Position | | | | - |
| 5.6 | $CO_2$ or $O_2$ | | | | % |
| 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
¢ CONDENSING BOILERS ONLY
§ CONVENTIONAL ATMOSPHERIC BOILERS ONLY

NOTE: It is the installers responsibility to ensure that the boiler is correctly commissioned by a competant engineer and that this report is completed and kept as a record. A commissioning service is available from Potterton at the address listed on the back page of the boiler 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. Commisioning 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 manufacturers 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 thermocouple interrupter operation | |
| 6.4¶ | Check thermocouple operation | |
| 6.5 | Check for gas leaks | |
| 6.6 | Check for gas leakage past valve assembly | |
| 6.7* | Check boiler locks out on loss of flame signal | |
| 6.8¢ | Check boiler locks out on air pressure switch operation | |
| 6.9 | Check boiler locks out on all other safety functions | |
| 6.10 | Check for spillage of flue gas products at draught diverter | |

| 7.0 | BOILER/SYSTEM CHECK LIST | |
|---|---|---|
| 7.1 | Control stat left at | °C |
| 7.2 | Limit stat left at | °C |
| 7.3 | Maximum flow temperature recorded | °C |
| 7.4 | Maximum return temperature recorded | °C |
| 7.5 | Boiler water pressure | |
| 7.6 | Are pipework connections as per manual? | |
| 7.7 | Is safety valve fitted?<br>If so, SIZE _____ PRESSURE RATING _____ | |
| 7.8 | Are water isolating valves fitted? | |
| 7.9 | Are water fow switches fitted? | |
| 7.10 | Are return water shut off or diverter valves fitted? | |
| 7.11 | Is shunt pump fitted? | |
| 7.12 | Is pump overrun fitted? | |
| 7.13 | Flue type and diameter of connection to boiler:-<br>TYPE<br>DIAMETER (mm)<br>Where appropriate and for multi boiler installations sketch details of flue system showing length of runs and diameters.<br>Conventional ..... Fan assisted ..... Flue Dilution .....<br>Approximate overall height ..... m<br>Is the fan interlocked with the boiler YES / NO | |
| 7.14 | Are flue dampers fitted? YES / NO<br>If so, interlocked? YES / NO | |
| 7.15 | Fan assisted ventilation? YES / NO<br>If so, interlocked? YES / NO | |
| 7.16§ | Any evidence of condensate formation? YES / NO | |
| 7.17¢ | Any evidence of condensate leakage? 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<br>If so, accessible? YES / NO | |

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

| 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 notice been raised? | | |
| Is any remedial work required? | | |
| Have warning labels been fitted? | | |

Customer Signature:

Print Name:

Date:

| ENGINEER DETAILS | |
|---|---|
| NAME | |
| COMPANY | |
| SIGNATURE | |
| DATE | |

# NOTES

# NOTES

# CONVERSION TABLE

| IMPERIAL TO METRIC | | | METRIC TO IMPERIAL | | |
|---|---|---|---|---|---|
| **HEAT** | **1 Therm = 100,000 Btu/hr** | | | | |
| 1 Btu/hr | = | 0.2931 W | 1 kW | = | 3412 Btu/hr |
| 1 Btu/hr | = | 1055 J | 1 J | = | 0.0009478 Btu/hr |
| 1 Btu/hr | = | 0.252 kcal | 1 kcal | = | 3.968 Btu/hr |
| **VOLUME** | | | **1 $dm^3$ = 1 LITRE** | | **1,000 $dm^3$ = 1$m^3$** |
| 1 $ft^3$ | = | 28.317 $dm^3$ | | | |
| 1 $ft^3$ | = | 0.02832 $m^3$ | 1 $m^3$ | = | 35.3147 $ft^3$ |
| 1 Imp. Gall | = | 4.546 litre | 1 litre | = | 0.2199 Imp. Gallon |
| 1 Imp. Gall | = | 1.2 U.S. Gallon | 1 litre | = | 0.03531 $ft^3$ |
| **PRESSURE** | **1 PSI = 2.307 FT** | | **1 kPa = 1000 Pa** | | **1 bar = 1000 mbar = 100 kPa** |
| 1 $lb/in^2$ | = | 6895 Pa | 1 bar | = | 33.45 ft.w.g. |
| 1 $lb/in^2$ | = | 68.95 mbar | 1 kPa | = | 0.3345 ft.w.g. |
| 1 in.w.g. | = | 249.1 Pa | 1 bar | = | 14.5 $ib/in^2$ |
| 1 in.w.g. | = | 2.491 mbar | 1 Pa | = | 0.3858 in.w.g. |
| 1 in.w.g | = | 25.4 mm.w.g. | 1 mm.w.g. | = | 0.0394 in.w.g. |
| | | | 1 mm.w.g. | = | 9.8 Pa.w.g. |
| **LENGTH** | | | **1m = 1000mm** | | |
| 1 inch | = | 25.4mm | 1 mm | = | 0.03937 in |
| 1 ft | = | 0.3048 m | 1 m | = | 3.281 ft |
| 1 yard | = | 0.9144 m | 1 m | = | 1.094 yard |
| 1 mile | = | 1.609 km | 1 km | = | 0.6214 mile |
| **AREA** | | | | | |
| 1 $in^2$ | = | 645.2 $mm^2$ | 1 $mm^2$ | = | 0.00155 $in^2$ |
| 1 $in^2$ | = | 6.452 $cm^2$ | 1 $cm^2$ | = | 0.155 $in^2$ |
| 1 $ft^2$ | = | 929 $cm^2$ | 1 $m^2$ | = | 1550 $in^2$ |
| 1 $ft^2$ | = | 0.0929 $m^2$ | 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 lit/sec | = | 13.2 gall/min |
| 1 $ft^3$/min | = | 0.4719 lit/sec | 1 lit/sec | = | 2.119 $ft^3$/min |
| 1 $ft^3$/min | = | 0.02832 $m^3$/sec | 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 kg | = | 2.205 lb |
| 1 cwt | = | 50.8 kg | 1 tonne | = | 0.9842 ton |
| 1 ton | = | 1016 kg | 1 tonne | = | 2204.6 lb |

For further details on Potterton Commercial boiler products contact the following:-

## COMMERCIAL SALES & TECHNICAL ENQUIRIES

Potterton Commercial Products Division
Juno Drive
Queensway
LEAMINGTON SPA
CV31 3RG

Tel: (08706) 050607
Fax: (01926) 880612

## COMMERCIAL SERVICE OFFICES

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

Southern Region
Potterton Commercial Service Dept
Unit 5, Newtons Court,
Crossways Business Park,
DARTFORD
Kent DA2 6QL
Tel: (01322) 280388
Fax: (01322) 287575

Northern Region
Potterton Commercial Service Dept
Unit 102, Batley Enterprise Centre,
513 Bradford Road,
BATLEY
West Yorkshire WF17 8JY
Tel: (01924) 420035
Fax: (01924) 420276

Our service offices offer a wide range of specialised services including:-

- Boiler Site Assembly
- Burner Commissioning for all Fuels
- Boiler Maintenance & Maintenance Contracts
- Breakdown & Repair Services
- Boiler Dismantling & Rejointing
- Burner & Boiler Replacement
- Oil/Gas Conversions
- System Conditioning
- Water Treatment & Descaling
- Packaged Units

## SPARES

Potterton Commercial spares are available nationwide through the Potterton Myson Interpart Division at:-

Potterton Myson Parts & Distribution Centre
Juno Drive, Queensway
LEAMINGTON SPA
Warwickshire
CV31 3RG

Tel: (01926) 880600
Fax: (01926) 880680



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Registered in England No.412935

Publication Number: M/GALE/0298