



# Reno



## High Efficiency System Boiler

Model: HE25S

GC No: 41-416-02

Installation, Maintenance and Service Instructions

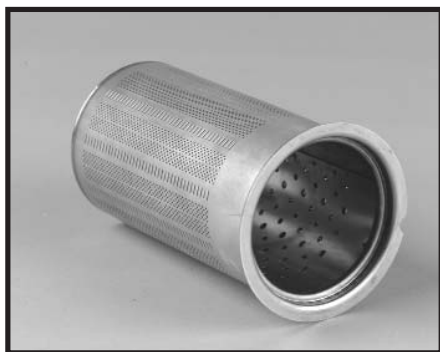


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### BENCHMARK LOG BOOK

In order to comply with Building Regulations Part L (Part J in Scotland) the boiler MUST be fitted in accordance with the manufacturer's instructions. In order to demonstrate that the installation of this appliance complies with current Building Regulations, you should complete and sign the Benchmark log book.



*The code of practice for the installation,  
commissioning & servicing of gas fires and wall heaters*

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## 1. IMPORTANT INFORMATION

**IT IS A STATUTORY REQUIREMENT THAT ALL GAS APPLIANCES ARE INSTALLED BY COMPETENT PERSONS, (i.e. CORGI REGISTERED INSTALLERS) IN ACCORDANCE WITH THE GAS SAFETY (INSTALLATION AND USE) REGULATIONS (CURRENT EDITION). FAILURE TO COMPLY WITH THESE REGULATIONS MAY LEAD TO PROSECUTION.**

This appliance has been Tested and Certified in order to meet the necessary European Directives and comply with the latest Building Regulations, including the efficiency requirements of the SEDBUK scheme.

Efficiency of Hot Water Boilers Directive 92/42/EEC

Gas Appliance Directive 90/396/EEC

Low Voltage Directive 93/68/EEC

Electromagnetic Compatibility Directive 92/31/EEC

No modifications to this appliance should be done unless they are fully approved by the manufacturer.

The installation of this appliance must be carried out by a competent person and must be in accordance with the current rules in force at the time of installation, in the country of destination.

The manufacturers instructions supplied must not be taken as overriding any statutory requirements.

The weight of this appliance exceeds that recommended for a one-man lift. It will therefore be necessary to gain assistance at times during the installation procedure.

**GAS LEAKS. DO NOT OPERATE ANY ELECTRICAL SWITCHES, OR USE A NAKED FLAME. TURN OFF THE GAS SUPPLY. VENTILATE THE AREA BY OPENING DOORS AND WINDOWS. CALL OUT YOUR LOCAL GAS SUPPLIER.**

## 2. APPLIANCE DESCRIPTION

The appliance is a high efficiency system boiler that is designed to provide the user with both central heating and domestic hot water. Its design is such that it is room sealed, taking combustion air from outside and expelling the products of combustion to the outside again. The heat exchanger is constructed of stainless steel, which is corrosion free.

Its fluing options ensure that the appliance can be installed in many locations within a building.

The appliance is controlled by fully featured microprocessor based electronics that monitor each of the operational procedures. An LCD display indicates the operational state of the appliance which illuminates for a short period when the user control is operated. This starts with the full sequence automatic ignition and continues with monitoring the demand requirements of either the central heating or the domestic hot water.

Should any fault occur the appliance will be shutdown to a safe condition with the fault code being displayed on the LCD panel.

### 2.1 Appliance Safety Devices

#### Heating System Pressure Relief Valve

The appliance incorporates a pressure relief valve to protect the sealed water system from being over pressurised. The discharge from this must be piped away to a safe place in accordance with the building regulations. Should there be a discharge of water / steam from this device, the appliance should be switched off and a service engineer or the installer called.

#### Frost Protection

The microprocessor based controls within the appliance monitor the water temperature in order to protect from freezing. To ensure that this function is active the main switch on the appliance should be left on and the gas supply also left on.

This does not protect remote areas of the heating system, which should be protected by other means (e.g. an independent frost thermostat that is linked back to the appliance).

#### Overheating Safety

There are a number of overheat safety devices on the appliance. Should any of these operate (see the fault codes table in section 6.1) you should call a service engineer or the installer

#### Electrical Supply Failure

In the event of electrical voltage supply failure, the appliance will stop operating but remain in a safe condition. When the electrical supply is resumed, the appliance will start from its safe off condition and continue to operate in the normal manor under the control of the system components. Should the appliance fail to resume, switch the appliance off and then on again to allow the safety control to be reset. Normal operation should then continue.

## 2.2 Technical Data

Maximum Lift Weight Total Weight (installed)	42.5 Kg
Gas Connection	15 mm copper
Heating flow and return	22 mm copper
Safety valve discharge	15 mm copper
Condensate Drain	3/4 inch plastic overflow pipe
Maximum heating system water content using fitted expansion vessel, pressurised at 1 bar	73 litres
Electrical supply	230V
Electrical rating	145W
IP classification	IP 20
External fuse rating	3 A
Expansion vessel capacity	8 litres
Expansion vessel initial charge pressure	1.0 bar
Heating system minimum pressure	0.7 bar
Ball valves are fitted in water and gas connections	
For larger systems use an additional expansion vessel	

**Table 2-1  
General Data**

		Nat Gas G20		LPG G31	
		Maximum	Minimum	Maximum	Minimum
<b>Offset (Pascal)</b>		-3.0 (Minus three)			
<b>Burner CO2 (%)</b>	<b>Case off</b>	9.3 (+0.5)	8.4 (ref only)	10.2 (+0.5)	9.4 (ref only)
	<b>Case on</b>	9.5 (+0.5)	8.6 (ref only)	10.4 (+0.5)	9.6 (ref only)

**Table 2-2  
Performance Data**

			Nat Gas G20		LPG G31	
			Maximum	Minimum	Maximum	Minimum
<b>CH Input Qm</b>	<b>Net</b>	kW	25.5	7.14	25.5	7.29
	<b>Gross</b>	kW	28.3	7.92	28.3	7.92
<b>Gas Consumption</b>		m <sup>3</sup> /h	2.6	0.74	1.06	0.30
<b>CH Output P</b>	<b>Non Condensing</b>	kW	25.0	7.0	25.0	7.0
	<b>Condensing</b>	kW	27.85	7.76	27.85	7.76
<b>SEASONAL EFFICIENCY (SEDBUK)</b>			'A'			
<b>NOX CLASSIFICATION</b>			Class 5			

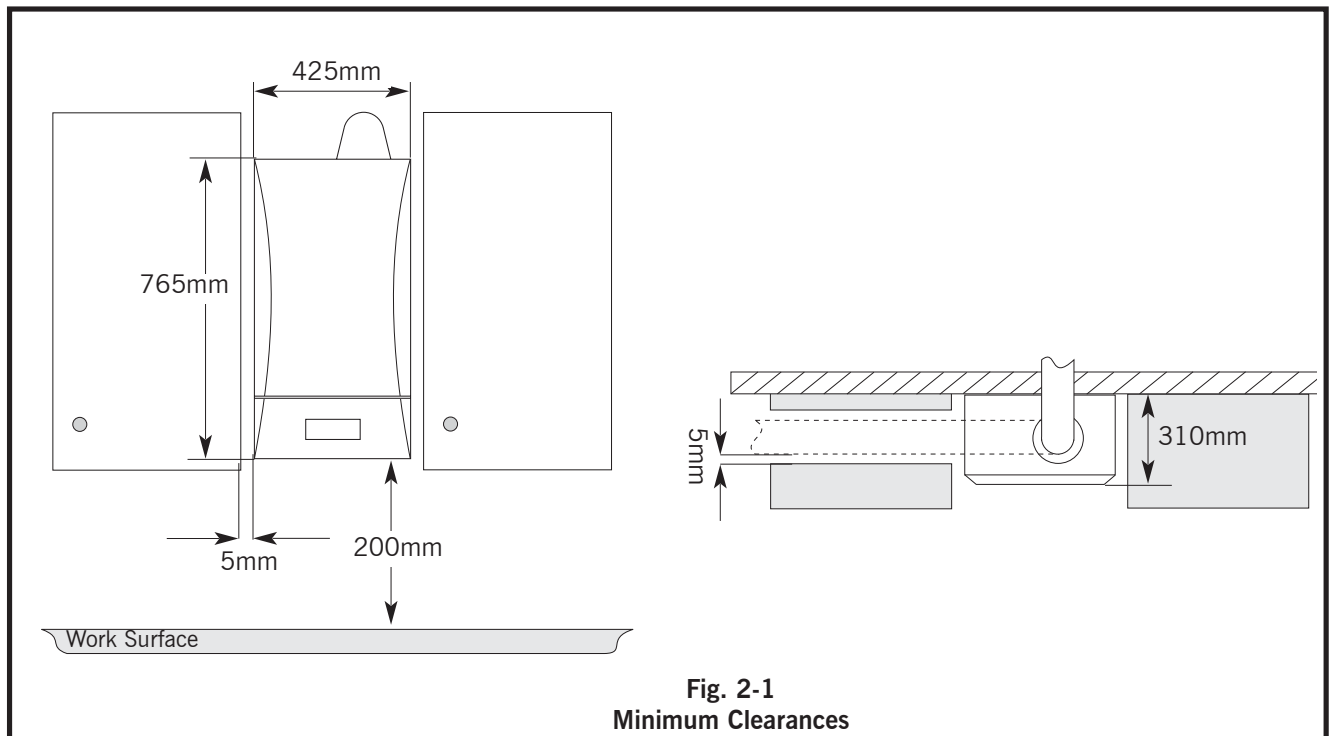
**Table 2-3  
Performance Data (Central Heating)**

**Please Note:**

Natural Gas (G20) consumption is calculated using gross CV of 38.7 MJ/m<sup>3</sup> or 34.9 MJ/m<sup>3</sup> net.

LPG (G31) consumption is calculated using gross CV of 95.6 MJ/m<sup>3</sup> or 88.0 MJ/m<sup>3</sup> net.

## 2.3 Dimensions and Clearances:



It is recommended that where the appliance is located in a kitchen, or next to other combustible materials, a gap of 5mm be left on either side and where the flue run is through a void in kitchen units, similarly a minimum gap of 5mm should be left. For the purpose of servicing, it is also recommended that the appliance be located with a minimum gap of 200mm above any surface.

## 2.4 General Information

### Appliance Classification

The appliance is certified as a type C13 C33 C53. As such it can only be installed with the flue components specified within this document. The flue types are:

- Horizontal and vertical balanced flue using concentric ducts.
- Air entry and flue exit in zones of different pressure using twin (separate) flue and air ducts.

### Gas Categories:

The appliance is certified as a CAT II 2H 3P appliance. This allows conversion between Natural gas (G20) and LPG (G31). Their supply pressures are 20 mbar and 37 mbar respectively.

For natural gas to LPG conversion, kit number NG30 (complete with instructions) is available.

For LPG to natural gas conversion, kit number LPG30 (complete with instructions) is available.

### Statutory Requirements:

The appliance must be installed in accordance with the current editions of:

- Building Standards (Scotland)(Consolidation) Regulations.
- Building Regulations
- Gas Safety (Installation and Use) Regulations (as amended)
- BS 7671 Institute of Electrical Engineers (I.E.E) Wiring Regulations
- BS 6891 Installation of Low Pressure Gas Pipework of up to 28 mm (R1) in domestic premises (2nd family gases).
- BS 5440 Pt.1 (Flues for Gas Appliances)
- BS 5440 Pt.2 (Air Supply for Gas Appliances)
- Model and Local Authority Byelaws
- BS 5546 Installation of Domestic Hot Water Supplies.

### Gas Supply:

The gas installation must be completed in accordance with the relevant standards (BS 6891).

The supply must be capable of providing a steady inlet working pressure to the appliance of 20 mbar at a rate of 2.7 m<sup>3</sup>/h (Calculated with a Gas CV of 38.7MJ/m<sup>3</sup>)

The installation must be tested for gas soundness using suitable methods. The pipework should also be purged of air in accordance with the above standard.

#### **Additional Plumbing Kit for Top Outlet CH Pipes:**

Should the installation require the heating flow and return pipes to exit the appliance upwards, provision has been made to allow the installation of two pipes (flow & return) to pass up the rear left hand side. These pipes are made on site. Pre-fabricated pipes (kit number VPK30) are available direct from Johnson & Starley should they be required.

#### **Additional Control Options:**

Should an outside temperature compensation system be required, Opentherm kits are available direct from Johnson & Starley. (Part No.1000-0019720)

#### **2.5 Appliance Location:**

The appliance is not suitable for external installation unless it is protected from the elements by a suitable enclosure. The enclosure must provide the required clearances for installation, servicing and maintenance as well as the correct level of ventilation. The selected position should allow for a suitable flue system to be installed.

When installed in a timber frame building guidance should be taken from the British Gas publication IGE/UP-7 (Guide for Gas Installations in Timber Frame Housing).

BS 6798 gives details of the essential features for a compartment or cupboard where a gas appliance is to be installed. An existing cupboard may require modification.

If the appliance is installed in a room containing a bath or shower it is important to locate the electrical switch in a position where it cannot be touched by anyone using the bath or shower. The current IEE Wiring Regulations (BS 7671) for England and the electrical provision of the Building Regulations for Scotland gives details.

Room ventilation for the appliance is not necessary as the appliance draws its combustion air from outside of the building and cupboard or compartment ventilation is not necessary providing that the minimum clearances are maintained. However, reference should be made to BS5440 Pt.2

#### **2.6 Heating System Requirements:**

This appliance incorporates all the necessary components to allow it to be connected to a sealed central heating system. A typical system is shown at fig. 2.2 which incorporates radiators, an automatic by-pass valve and a drain facility that must be provided at the lowest point in the system to allow complete drain down. The installation should be designed to operate with a flow temperature of up to 90 deg.C.

**Expansion Vessel:** The integral expansion vessel is pre-charged to a pressure of between 0.5 and 1.0 bar. This should be checked before the water system is filled. Details below show the water system volume that is acceptable for this vessel. If the system water volume is larger then an additional vessel must be fitted to the system. BS 5449 and BS 6798 give further details regarding expansion vessel sizing and sealed systems. See table 3-2 page 9

**Pressure Gauge:** The appliance has two components that monitor pressure. Firstly there is a mechanical pressure gauge on the plumbing jig, this allows the heating system to be pre-plumbed and filled with a visual check on the pressure. The second is an electronic device used by the microprocessor control to monitor the system pressure and block the heat input, should there be a lack of pressure.

**LCD Display:** When the electrical supply is connected, the liquid crystal display indicates the system water pressure. This pressure is also monitored by the microprocessor controls.

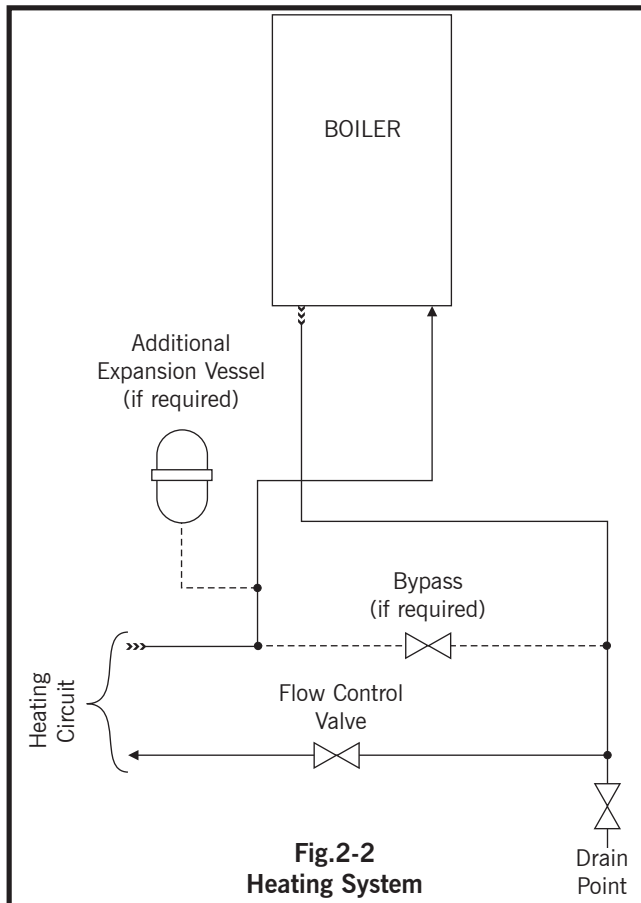
**Pressure Relief Valve:** The pressure relief valve protects the system from over pressurisation. It is set to be fully open at 3 bar, however it will start to open at approximately 2.7 bar. It should not be used to flush the system.

**Filling:** Provision for filling the CH system must be made and three methods are shown in fig. 2.3 Connections to the mains supply must not be permanent, even through a non-return valve. Fittings used for connection to potable water must comply with the water supply (water fittings) regulations 1999 Section G24.1 and G24.2.

**Pipework Sizing:** In order to keep the noise of the system to a minimum, the velocity of water should be kept below 1.5 m/s and it should be noted that the appliance is designed to operate with a temperature differential of 20°C between flow and return. The maximum flow rate is 0.3 kg/s which through a 22mm pipe gives a velocity of 1.00 m/s. Therefore, the recommended minimum pipe size for the main carcass is 22mm.

**Water Treatment:** It is important that the system is cleansed and flushed thoroughly before the appliance is left to operate (as recommended in BS 7593) in order to maintain an efficiently operating heating system. Once the system has been flushed, an inhibitor that is suitable for stainless steel heat exchangers should be added. Appropriate inhibitors are available from both Sentinel and Fernox.

**Note: Failure to carry out the above procedure will invalidate the guarantee!**

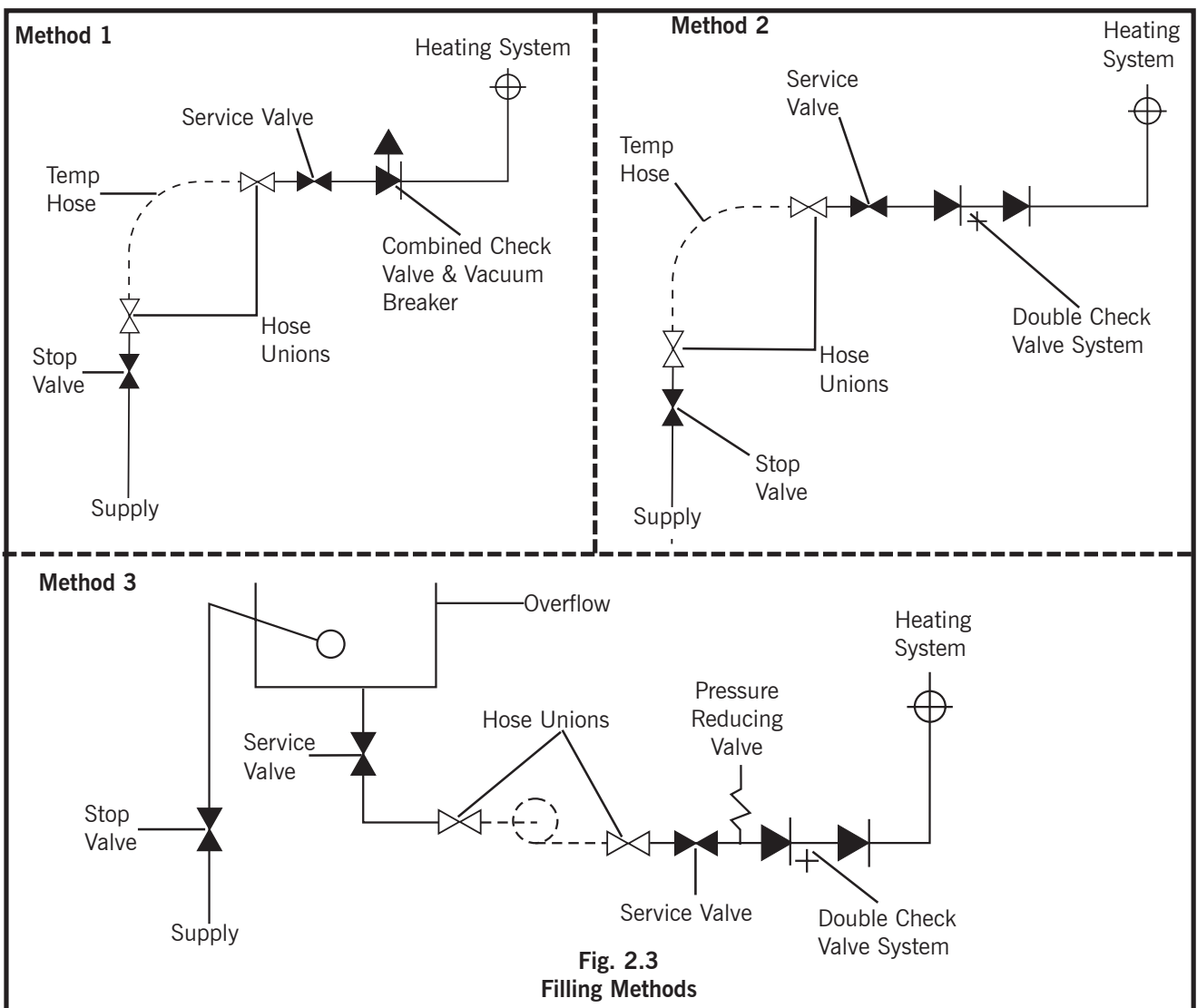


**Controls:** As a minimum it is recommended that a 2 channel timer and room thermostat is installed to control the appliance. Thermostatic radiator valves may be fitted to the system but must not be fitted in the room where the room thermostat is fitted. There must be at least one radiator installed with lock shield valves that should not be closed. Further guidance can be obtained from the Domestic Heating and Hot Water Guide to the building regulations and GPG 302

**NOTE:** a differential pressure bypass valve **MUST** be installed to maintain a minimum flow rate of 18 L/min (20° differential at maximum heat input).

**2.7 Domestic Hot Water System Requirements:**

Domestic hot water circuits and their components must be in accordance with the relevant standards and water supply regulations. Further guidance and recommendations can be found in the building regulations G17 to 24 and R17 to 24.



### 3. FITTING

#### 3.1 Unpacking the Appliance:

The appliance is supplied packaged in two cartons which are strapped together and need separation prior to unpacking. The first carton contains the wall template and jig, the second contains the boiler and controls.

**Caution: this appliance exceeds the recommended weight for a one-man lift as detailed in the Manual Handling Operations, 1992 Regulations.**

#### Carton 1

With the carton upright, cut the tape securing the top of the carton and open so that the contents can be removed. Care should be taken not to damage the paper template which is packed in a plastic protective sleeve.

#### Carton 2

With the carton on its back, cut the tape securing the top of the carton and open so that the contents can be removed. Remove and unpack the Installation Instructions, the side & front panels and control module. The boiler can then be lifted from the carton.

#### 3.2 Preparing the Wall:

Ensuring the wall is flat, unpack the wall template from its protective sleeve and place it on the wall giving consideration to: the flue position; water/gas connection positions and clearances. Use the plumb line on the template to ensure it is square! Mark the positions on the wall of the flue and the fixing points. Using a 105 mm core drill make the hole through the wall in the correct place. Installations that are made from within the building only will require a 125 mm diameter hole in order to fit the flue system. Using a 7mm bit, drill a total of 8 fixing holes (four of which MUST be at the top of the jig) and insert the rawplugs. Remove the template.

#### 3.3 Wall Fixing/Plumbing Jig:

The fixing jig is supplied in three parts and requires assembly prior to fixing. Assemble the upper bracket; spine and lower bracket as shown and using a light hammer, tap the 8 tags over so that they form a secure assembly.

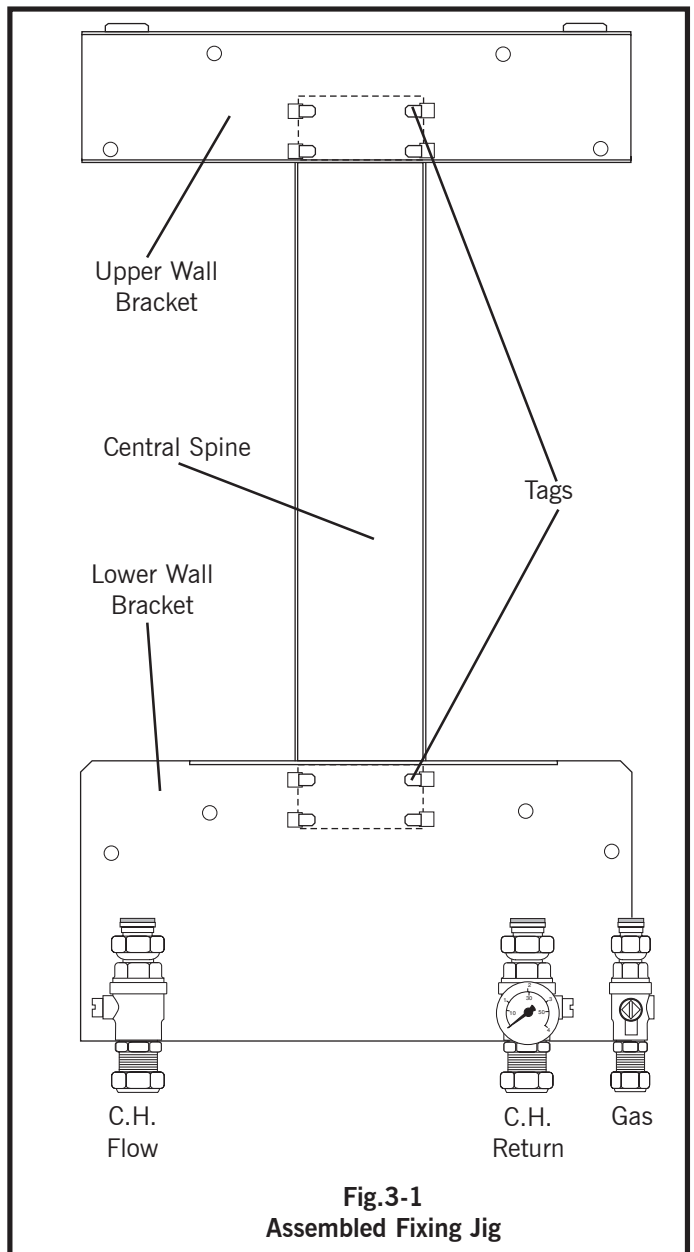
Lift the wall fixing/plumbing jig up to the wall, ensuring it is level and secure it with the screws provided. The gas and water connections can now be made to the appropriate positions on the jig. Should the heating pipes be required to exit vertically upwards, there is a kit available. It is acceptable to fit pipes vertically upwards without the kit, provided that the correct route is used. It is advisable to fit additional isolation valves at the top of the appliance to allow complete removal of the appliance and its wall plate. Once the heating system and the domestic water connections are complete the system can be filled, checked for soundness and flushed. See COMMISSIONING section.

#### 3.4 Fitting the Appliance:

It is important to note that this appliance exceeds the recommended weight for a one-man lift as detailed in the Manual Handling Operations, 1992 Regulations. Lift the appliance onto the wall jig and locate the unit on the two lugs on the top of the wall jig. The boiler then drops into place and needs no further fixing, notwithstanding that there is the option to secure the boiler with a padlock should the need arise. Ensure the gas and water connections are in correct alignment. Connect the gas and water swivel nut joints (the seals are captive inside the joints). The two remaining connections must now be made. These are the condensate drain and the pressure relief outlet.

Contents of Carton 1	Contents of Carton 2
● Upper Wall Bracket	● Boiler
● Central Spine	● Side & Front Panels
● Lower Wall Bracket (Complete with Group Set)	● Control Module (including MMI, display and controls)
● Paper Template	● Installation & User Instructions
● Rawplug/Screw Pack	● Benchmark Book
	● Guarantee Card

**Table.3-1**

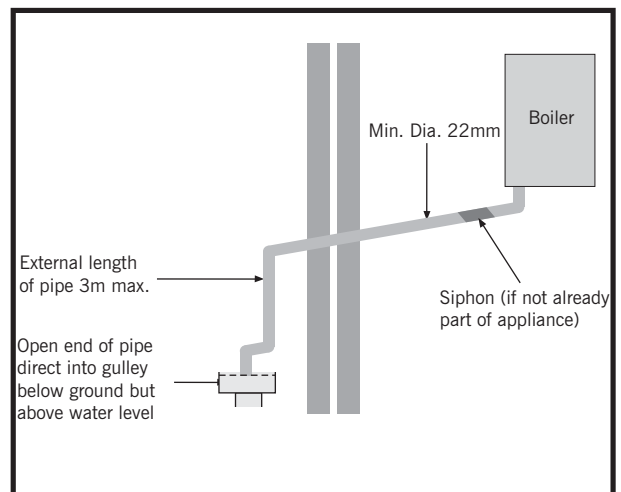
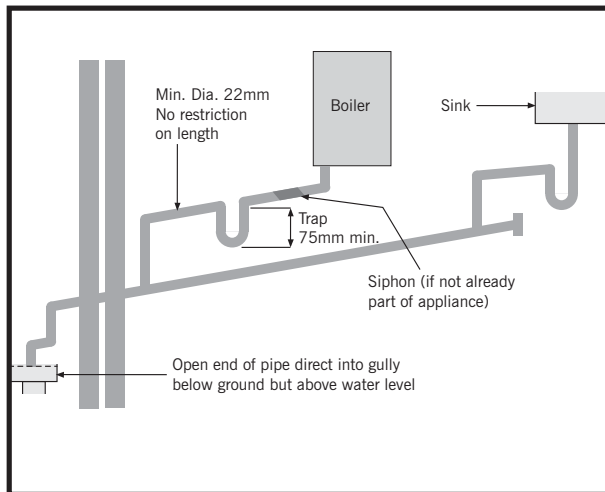
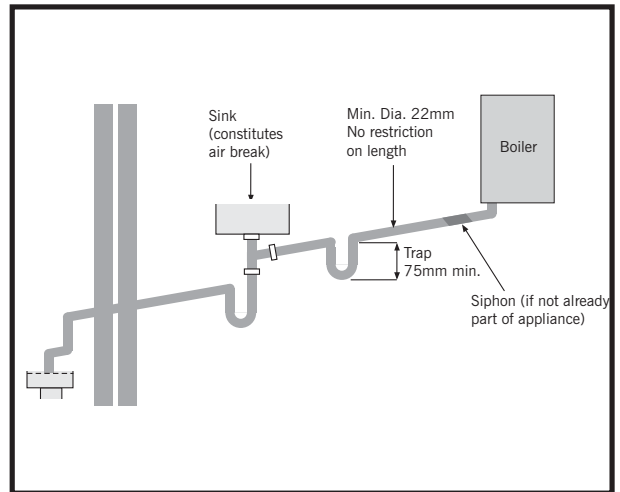
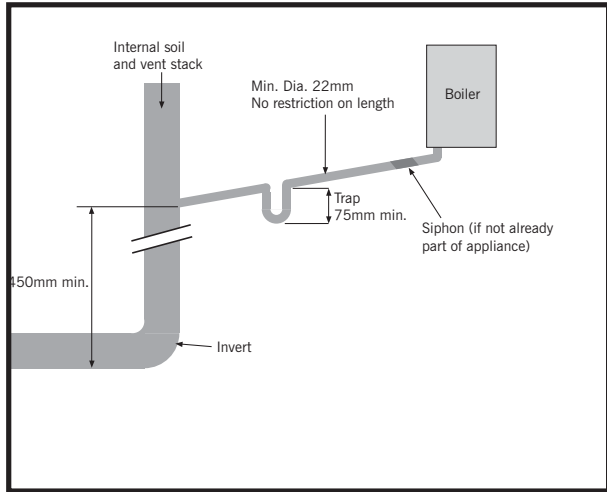




### 3.5 Condensate Drain:

The condensate drain utilises plastic 3/4 inch push fit or adhesive overflow pipes and fittings. It should be piped to drain, preferably within the building, maintaining a 2.5° fall away from the appliance. If the drain is routed to outside it should be to a drain or soak away. Protection from freezing in cold weather conditions is also advisable.

#### Typical Condensate Drain Arrangements:



Expansion Vessel Requirements					
Vessel charge and initial system pressure	bar	0.5	0.75	1.0	1.5
Total water content of system using 8 ltr (1.54 gal) capacity expansion vessel supplied with appliance.	ltr	95	84	73	50
For systems having a larger capacity multiply the total system capacity in litres (gallons) by the factor to obtain the total minimum expansion vessel capacity required litres.		0.0833	0.09	0.109	0.156

Table 3-2

### 3.6 Pressure Relief Outlet:

Using no less than 15 mm diameter copper pipe, the discharge pipe must be extended to a safe place outside the building. The discharge position must be visible, not onto a public access area or above any window or entrance. The pipe must have a continuous fall and discharge to a safe place. It is possible that boiling water and/or steam could be discharged if the safety valve operates.

### 3.7 Preparing & Installing The Flue Components (100/60 Concentric):

With the appliance fitted to the wall and the gas and water connections complete.

#### Horizontal Flues:

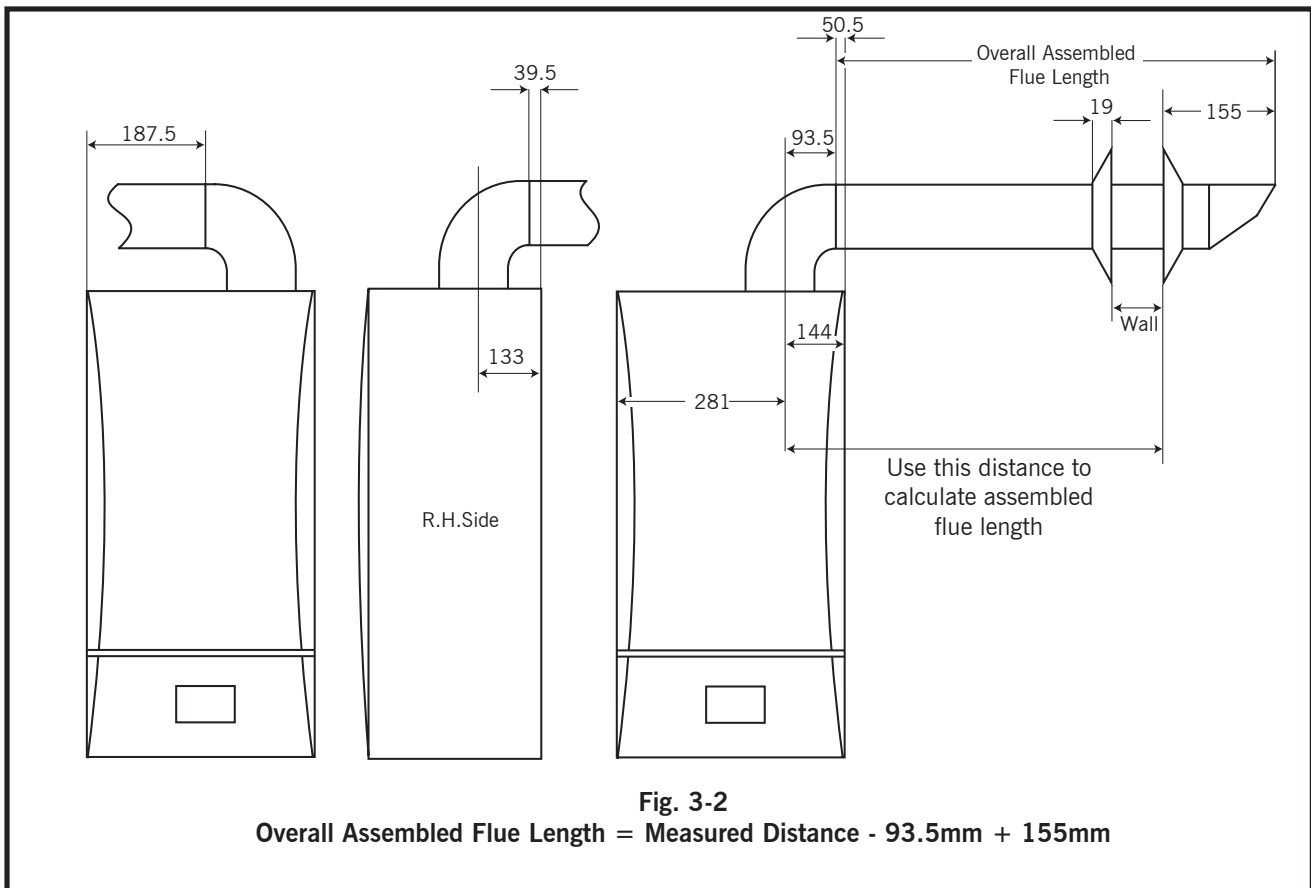
Fit the turret to the appliance with the outlet in the correct direction. Measure the distance between the turret centre line and the outside wall face where the terminal is to be fitted. Using fig. 3.2 assemble and if necessary cut the flue to the correct length and ensure any seals are made correctly. If fitting from outside the building assemble the outer wall-sealing disc onto the flue to its correct position. Insert the flue from outside. Fit the inner wall-sealing disc. Using the clamp arrangement join the flue to the turret, ensuring all the seals are made correctly. The terminal must be installed with the flue outlet at the top. Brackets are provided for extended flues to locate and fix the flue in position should they be necessary.

#### Vertical Flues.

Flat roof: Measure the distance between the appliance top and the outer surface of the flat roof.

Pitched roof:f Measure the distance between the appliance top and the outer surface of the pitched roof at a point that is central to the flue. Where necessary cut the flue to the correct length, ensuring that seals are made correctly.

It is advisable to assemble the roof flashing onto the vertical terminal and inset this from outside the building. Continue to assemble the remaining flue components and connect to the appliance using the vertical adaptor. Finally make a good seal between the roof and the flashing piece. Brackets are provided to locate and fix the flue in position should they be necessary.



### 3.8 Flue Terminal Location:

Both the horizontal and vertical terminals must be positioned on the outside of the building and the free passage of air must be available at all times. It is not recommended to position the terminal close to projections especially under a balcony or near to a drainpipe.

Ensure that combustion products cannot enter the building where the heater is installed or near to any other building where doors or windows may be open.

Recommended terminal positions for both horizontal and vertical flues are shown and flue components and installation options are detailed on page 15.

For the installation of a vertical flue either a flat or pitched roof with an angle of between 25° and 50° should be used.

The British Gas publication "Guide for Gas Installations in Timber Framed Housing DM2", or your local gas region, MUST be consulted when installing the appliance into a timber-framed building.

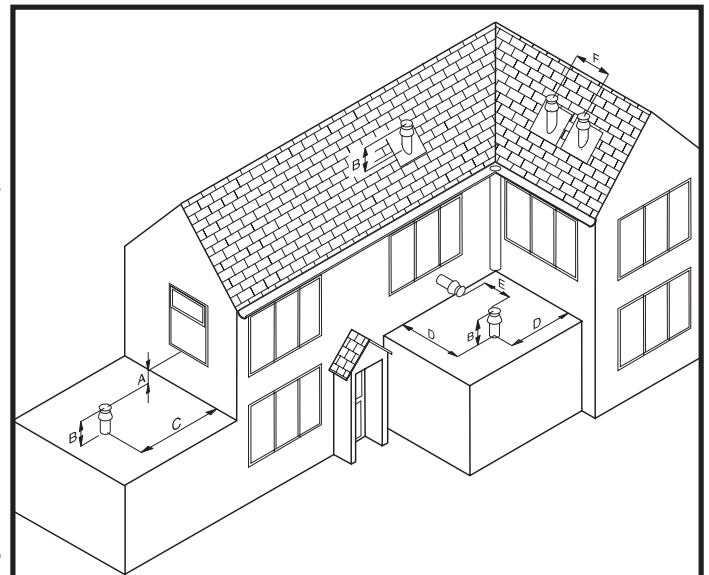
Where the lowest part of the flue terminal is located less than 2 metres above the ground, a balcony or above a flat roof across which there is access, the terminal MUST be fitted with a guard (part No:1000-0019710) which is available from Johnson & Starley. The distance between the guard and the nearest part of the terminal must not be less than 50 mm.

### 3.9 Flue Components & Fitting Options (100/60 Concentric Flue System):

The appliance is supplied with a standard flue kit that includes a horizontal flue, complete with terminal, turret and fitting kit. Details of optional flue components are also listed along with their resistance in Pascals in order that flue length calculations can be made.

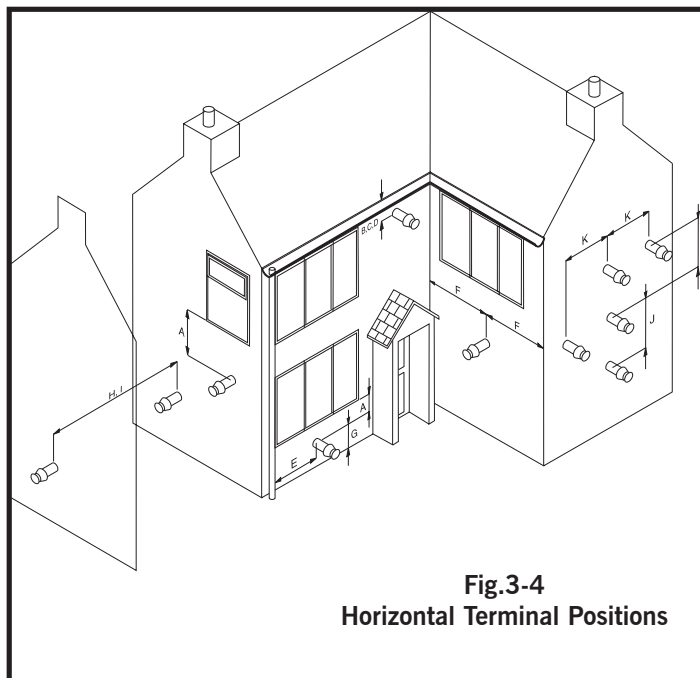
Horizontal and vertical concentric flues (60/100 diameter) with balanced terminals and vertical and horizontal flues (twin 80 diameter) with the flue and air inlet terminals terminating at least 500 mm apart may be installed on this appliance.

**Note:** If a twin duct system is to be used (type C5) then the air inlet and flue outlet must not be on the opposite sides of the building.



	Location	Min Distance
A	Directly below (or above) a window or other opening.	300mm
B	Above roof level (to base of terminal).	300mm
C	From adjacent wall to flue	300mm
D	From internal corner to flue	400mm
E	From facing terminal	1200mm
F	Between terminals	300mm
G	Below eaves or balcony	200mm (NOT RECOMMENDED)

**Fig. 3-3**  
**Vertical Terminal Positions**



**Fig.3-4**  
**Horizontal Terminal Positions**

	Location	Min Distance
A	Directly above or below a window or other opening	300mm
B	Below gutters, soil pipes or drain pipes.	75mm
C	Below eaves	200mm
D	Below balcony	200mm
E	From vertical drain/soil pipes	150mm
F	From internal or external corners.	300mm
G	Above ground or balcony level	300mm
H	From a surface facing terminal	600mm
I	From a terminal facing a terminal	1200mm
J	Vertically from a terminal on the same wall.	1500mm
K	Horizontally from a terminal on the same wall.	300mm

If an extended horizontal flue is being used (any flue length longer than the standard kit) it must have a continuous fall back towards the appliance of 2.5°. This ensures that condensate runs back into the appliance from the flue system. Reference should be made to table 3.5 for relevant part numbers.

The maximum length of flue permissible is calculated using the component pressure drop and examples are given on page 15 which include the maximum lengths at 95% of input.

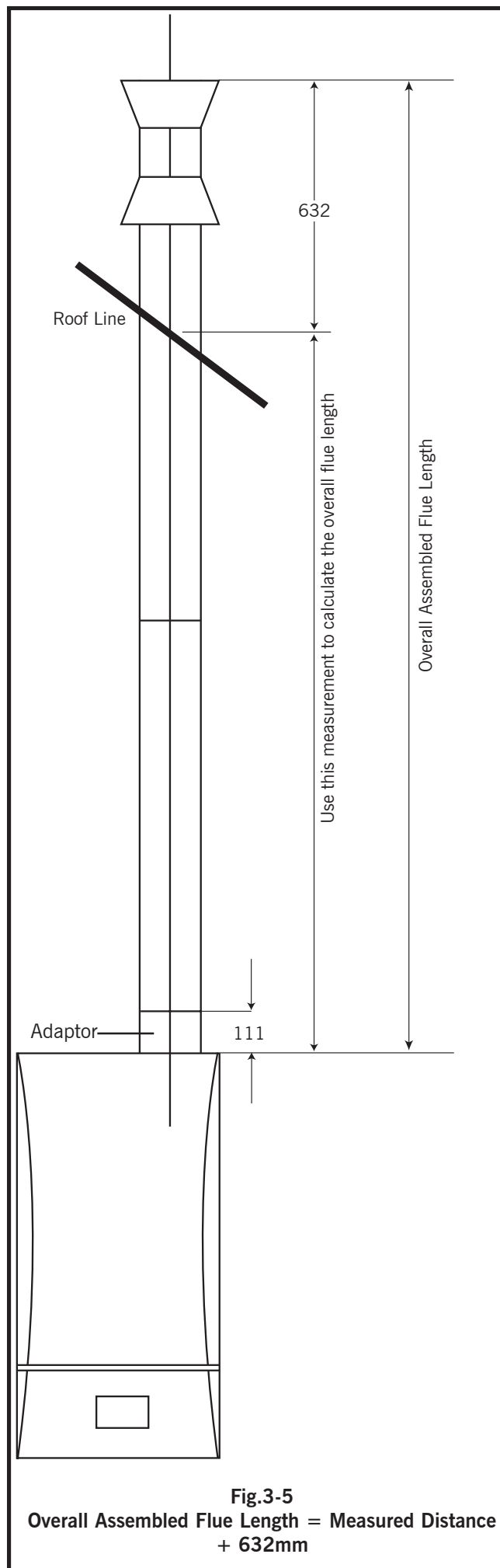
The minimum 60/100 concentric horizontal flue length measured from the centre line of the turret to the outside of the wall is 247mm.

The minimum vertical flue length is 1.14 m measured from the top of the appliance case to the top of the terminal.

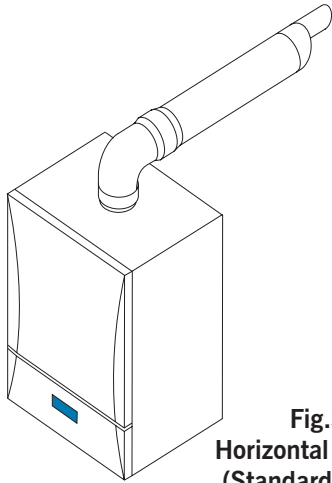
The minimum combined 80 twin flue length is 600mm.

Longer flues may be fitted, however the input of the appliance will be reduced accordingly.

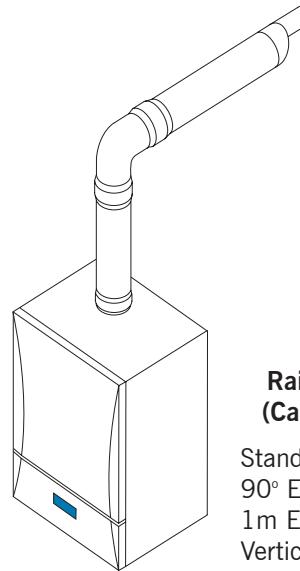
Elbows may be fitted within the flue system with a corresponding reduction in overall flue length based on the component pressure drop. Reference should be made to tables 3-3 to 3-5 on page 15.



**Typical Concentric Flue Configurations**

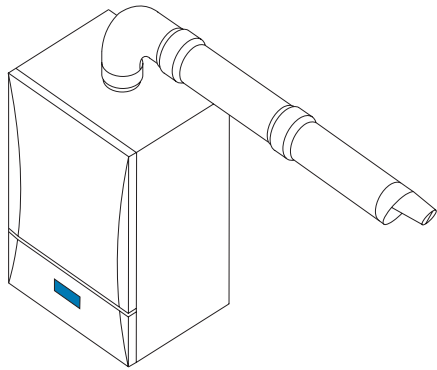


**Fig.3-6**  
**Horizontal Rear Flue**  
**(Standard Flue Kit)**



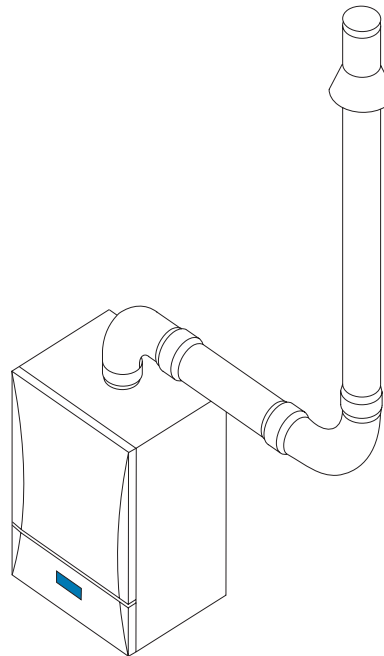
**Fig.3-7**  
**Raised Horizontal Flue**  
**(Can also be LH or RH)**

Standard Flue Kit  
90° Elbow  
1m Extension  
Vertical Appliance Adaptor



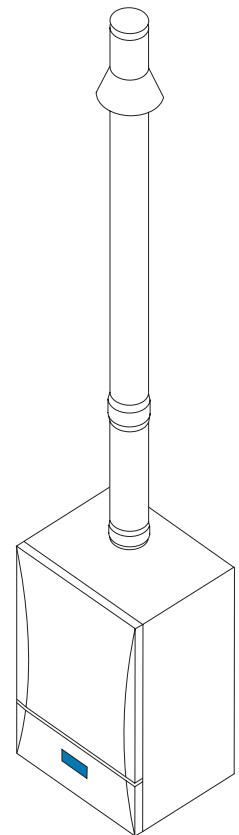
**Fig.3-8**  
**Horizontal Side Flue**  
**(Can be left or right)**

Standard Flue Kit  
500 mm Extension



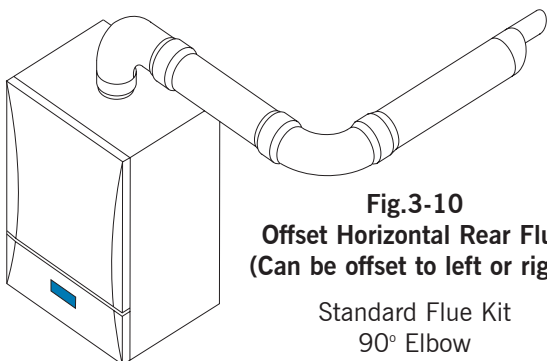
**Fig.3-9**  
**Offset Vertical Flue**  
**(may be offset to the rear, left or right)**

Standard Flue Kit  
500 mm Extension  
90° Elbow  
Vertical Appliance Adaptor  
Vertical Terminal



**Fig.3-11**  
**Vertical Flue**

1m Extension  
500 mm Extension  
Vertical Appliance Adaptor  
Vertical Terminal

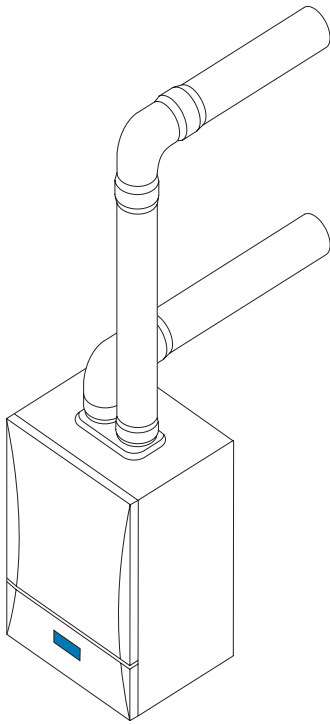


**Fig.3-10**  
**Offset Horizontal Rear Flue**  
**(Can be offset to left or right)**

Standard Flue Kit  
90° Elbow  
1m Extension

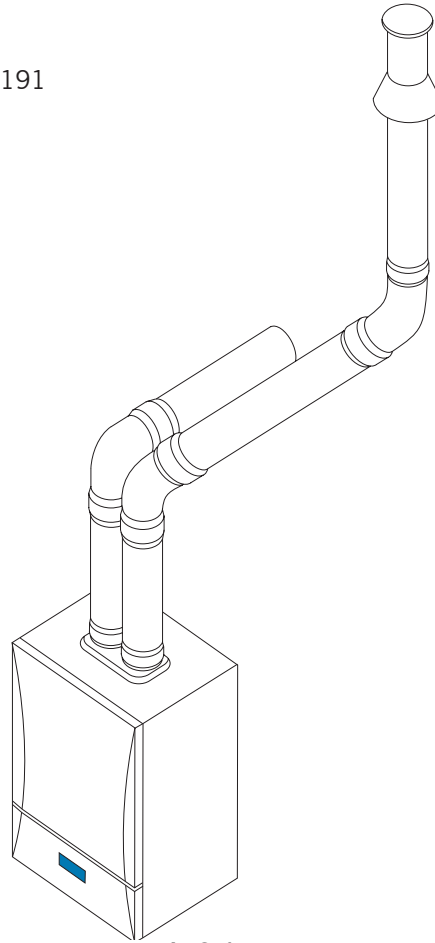
**Typical Twin Flue Configurations**

Full details of twin flue components can be found in publication ZZ1191



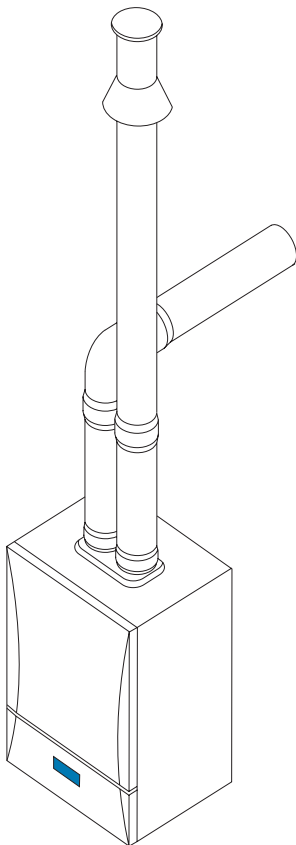
**Fig.3-12**  
**Horizontal Air & Flue Ducts**

May be LH RH or as shown. Standard 90° elbow



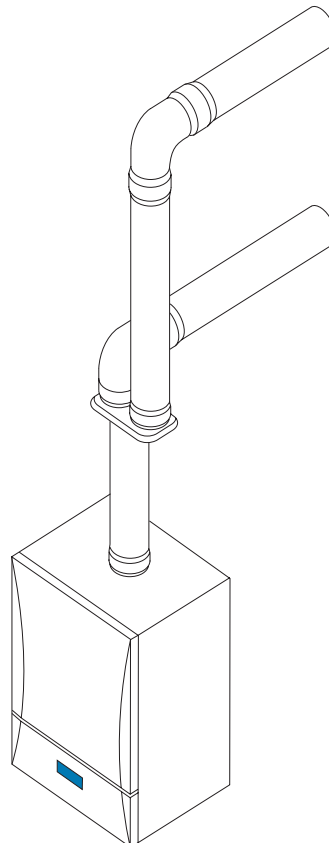
**Fig.3-14**  
**Raised Horizontal Air & Vertical Flue Outlet (offset)**

Standard 90° and 45° elbows and standard vertical terminal standard 90° elbow

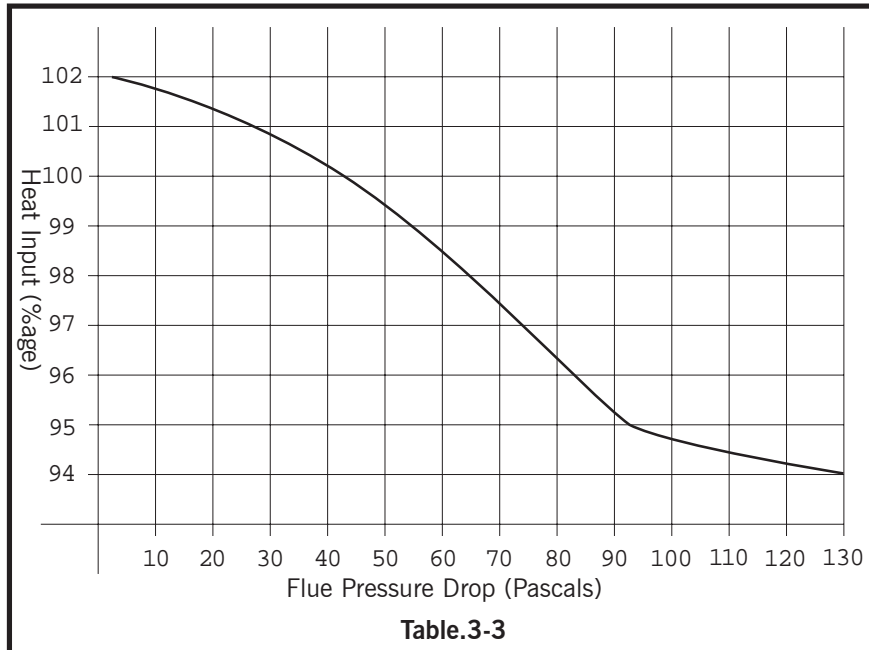


**Fig.3-13**  
**Horizontal Air Duct & Vertical Flue Duct**

Standard 90° elbow and standard vertical terminal.



**Fig.3-15**  
**Concentric to twin conversion**



60/100 Concentric flue systems			
Pa	Direction	Overall Assembled Flue Length mm	Heat input %
42	Horizontal	450	100
45	Horizontal	800	99
90	Horizontal	9800	95
5	Vertical	1140	101.5
42	Vertical	8540	100
90	Vertical	17740	95

**Output in relation to flue resistance.**

**Table.3-4**

60/100 Flue Components				
Description	Parts included	Application	Pt No	Pascal
Std flue kit (horizontal terminal)	1 x Boiler connection elbow.	Horizontal	1000-0018920	45
	1 x Appliance seal.			
	1 x 60/80 adaptor.			
	1 x 800 mm horizontal terminal.			
	1 x 100 mm diameter clamp.			
	2 x EPDM wall cover plate.			
1000 mm straight extension	1 x 1000 mm straight extension.	Horizontal Vertical	1000-0018940	5
	1 x 100 mm diameter clamp.			
	2 x screws.			
500 mm straight extension	1 x 500 mm straight extension.	Horizontal Vertical	1000-0018950	2.5
	1 x 100 mm diameter clamp.			
	2 x screws.			
250 mm straight extension	1 x 250 mm straight extension.	Horizontal Vertical	1000-0018960	1.25
	1 x 100 mm diameter clamp.			
	2 x screws.			
Vertical terminal 1140 mm	1 x vertical terminal assembly.	Vertical	1000-0018930	5
	1 x support bracket			
Vertical Appliance Adaptor	1 x Adaptor	Vertical	1000-0018990	0
90° elbow	1 x Elbow	Horizontal Vertical	1000-0018980	10
45° elbow	1 x Elbow	Horizontal Vertical	1000-0018970	5
Flat Roof Weather Collar	1 x Aluminium circular flat roof seal	Vertical	1000-0014900	N/A
Pitched Roof Weather Collar	1 x Plastic & lead pitched roof seal	Vertical	1000-0014890	N/A
Fixing Bracket (5 Pack)	5 x clamps for 100 mm tube	Horizontal Vertical		N/A

**Table.3-5**

### 3.10 Electrical Connections:

External wiring must be correctly earthed, polarised and in accordance with BS 7671 (current edition).

All system components must be an approved type and all electrical components should have been tested and meet the requirements of BEAB or equivalent. All the electrical connections to the heating system must be through a common double pole isolation switched spur that has a 3 mm separation on each pole and has a 3A rated fuse. It should be used for the heating system only and no other household components. A fused three pin plug and shuttered outlet may also be used provided they both comply with BS 1363.

Important. This appliance must be earthed and it must be wired in accordance with these instructions. In addition, it must have a permanent electrical supply that is not interrupted by a timing device or thermostat.

Fit the electrical supply cable as shown using the connection plug provided. The cable must be at least 0.75 mm<sup>2</sup>, PVC insulated to BS 6500 table 16.

If a frost 'stat is required to protect remote parts of the heating system, this should be fitted as shown.

**All cables entering/leaving the appliance MUST be restrained by use of the cable clamps.**

An external controller can be fitted, in which case reference should be made to the appropriate diagram.

**Optional System Controls:** Controls are available for outside temperature compensation and room temperature sensing. These should be used to improve the heating system control. They must be connected to the correct terminals as described in their own instructions. A room thermostat **MUST NOT** be used with these controls.

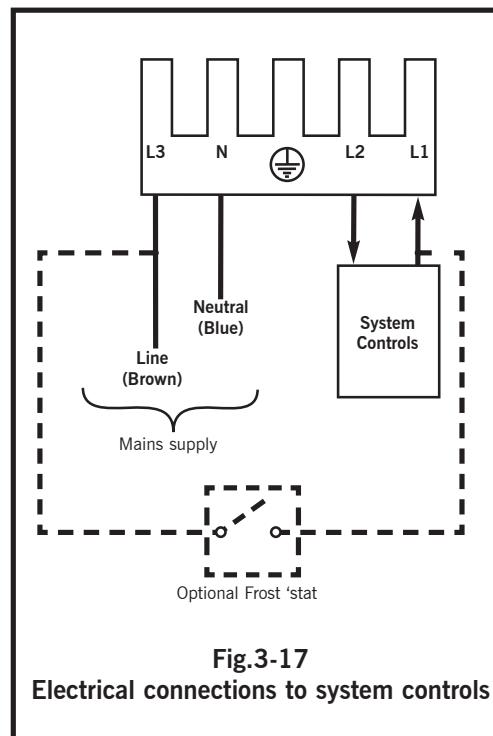
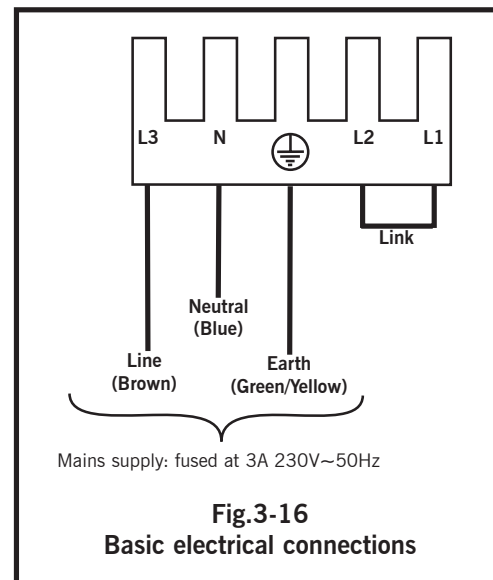
### 3.11 Fitting The Case & Control Module:

Remove the case components from their packaging. Fit the LH and RH case panels to the appliance. Each panel hooks over the two lugs at the top of the appliance and screws to the base with the screws provided. Remove the controls door from the module panel and slide the hinge pins inwards. Offer the controls module up to the side case panels and slide the hinge pins to locate into the case side panels. Fit the support strap to the appliance LH side to support the controls in the horizontal position. Connect the electrical connections to the controls. Swing the controls up into their vertical position and secure to the side case with the two screws provided. Refit the controls door and fit the front upper case and secure with the screw in the top of the boiler.

### 3.12 Electrical Testing:

Carry out electrical checks:

- Earth continuity and short circuit of cables
- Polarity of the mains supply
- Insulation resistance to earth





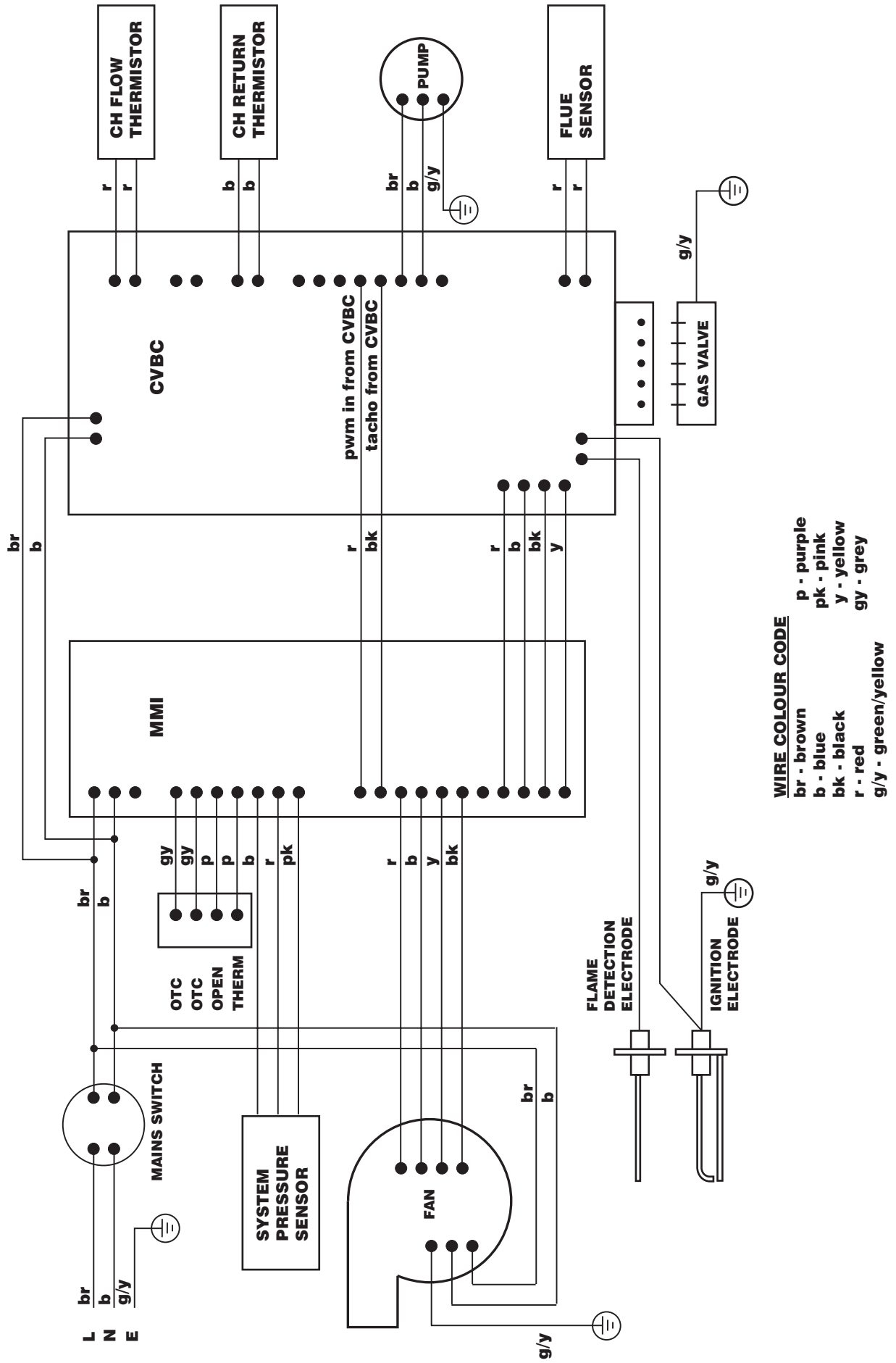


Fig.3-18  
Functional Flow Diagram

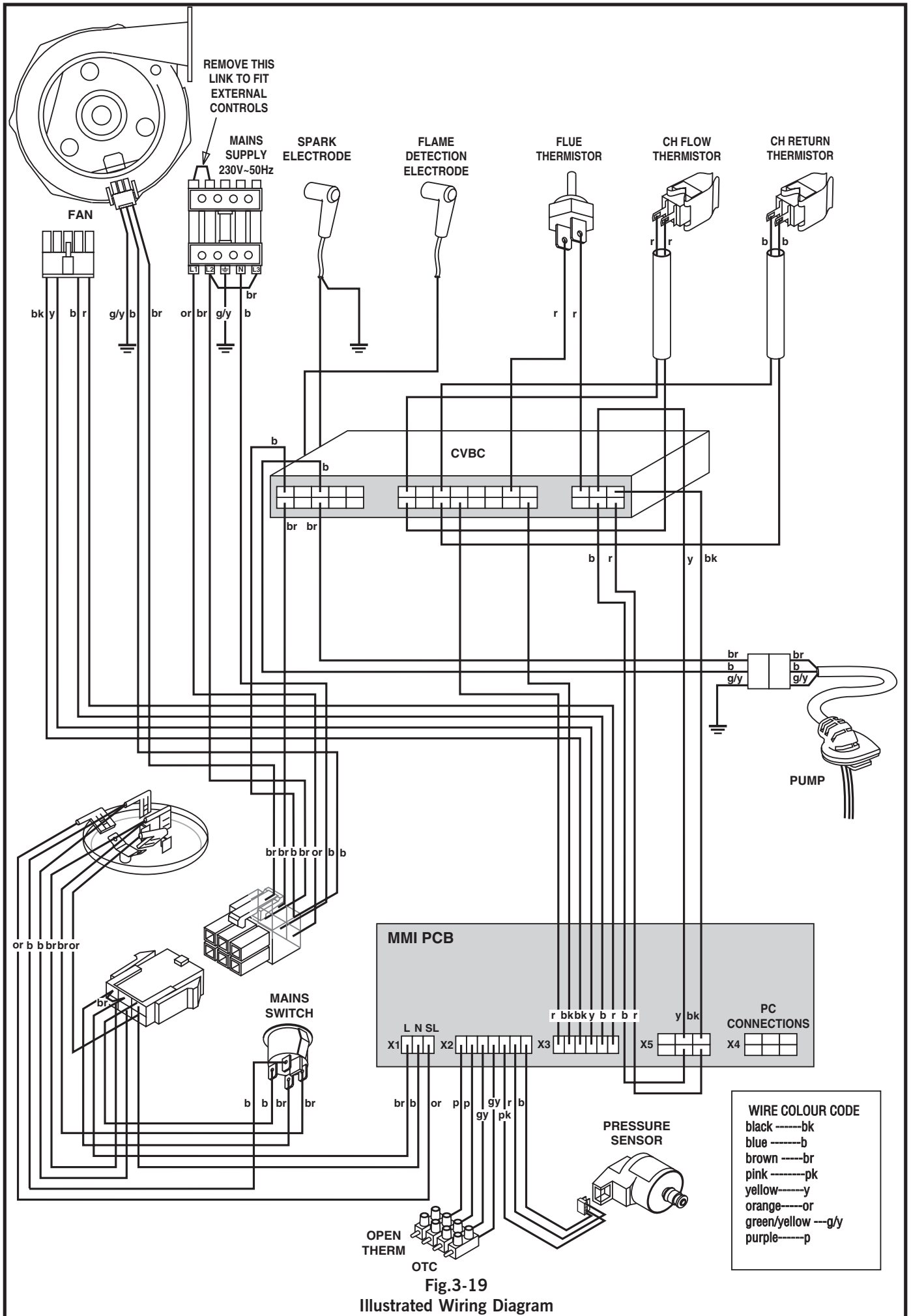


Fig.3-19  
Illustrated Wiring Diagram

## 4 COMMISSIONING AND HANDOVER

### 4.1 Commissioning the Appliance:

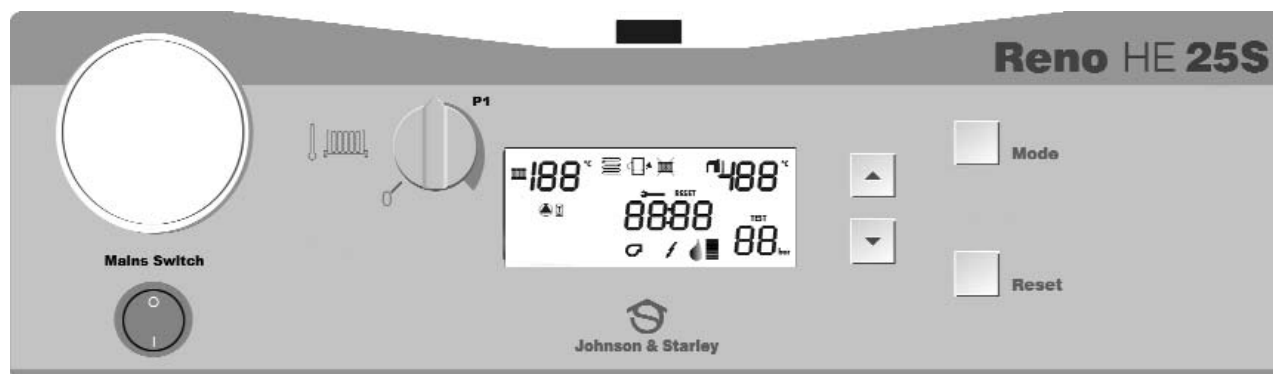
With all the pipe connections made, open the cold supply water valve on the filling loop and the CH flow and return valves at the base of the appliance. Open the manual vent at the top of the appliance and bleed, close the manual vent when all the air is removed.

Ensure that all isolating valves are open and that the system is pressurised to the correct level.

Having tested for gas soundness, purge air from the gas supply and turn on the gas service cock.

Ensure the domestic cold water system, all system radiators and the boiler, have been bled using the manual vent at the top of the appliance.

Switch on the electricity supply to the appliance. Turn ON the ON/OFF switch on the boiler control panel and turn the central heating (P1) control to minimum.



The LCD display will become active, whilst the microprocessor control completes a number of checks and sets the appliance to a standby position.

The display will indicate the system pressure in the lower RH corner of the LCD panel and a numerical display in the upper and lower LH side of the LCD panel.

Check that any external controls are calling for heat, and turn the CH temperature knob (P1) clockwise. The set point temperature will be displayed on the LCD screen, set it to 60°. The fan will start and the ignition sequence will take place. The display will indicate the burner is on as well as an indication of fan speed. A stylised flame will be displayed when the flame is established.

If ignition does not take place during the first ignition attempt, there will be a further 2 attempts. If the burner has still not lit, a fault code will be displayed and this may be due to air being present in the gas supply. Pressing the reset button will initiate a second sequence of ignition attempts.

When the boiler lights, allow the appliance to operate at low temperature and vent all the air from the boiler and system. If necessary, re-pressurise the system to between 1.1 and 1.5 bar.

Turn OFF the appliance by turning the control knob (P1) to the OFF position.

When the above checks have been completed, a combustion performance test (as detailed in the SERVICING section) can be carried out if required.

### 4.2 Handing over:

After completion of the commissioning procedure, the installer should hand the appliance over to the occupier of the house by the following procedure:

- Hand the User Instructions (ZZ1187) to the occupier and explain their responsibilities in respect of current legislation and regulations, both national and local.
- Explain and demonstrate how to light and shut down the appliance.
- In order to gain the best possible fuel economy in relation to the heating and hot water requirements of the household, carefully explain the operation of the appliance and the use/adjustment of all the system controls.
- Advise on the precautions required to prevent damage to the appliance; the system and the building in the event of the appliance being shut down in very cold weather.
- Explain how to control the temperature of the radiators by use of the controls on the appliance.

- Explain how, in the event of a fault, the appliance will display a fault code, emphasising that if a fault is indicated they should note the fault code, turn off the appliance and contact a “competent person” which in normal circumstances would be a CORGI registered engineer.
- Explain and demonstrate the function/operation of time/temperature controls and thermostatic radiator valves, emphasising the economic use of the appliance.
- If a programmer has been fitted, hand the user instructions that were supplied with the programmer to the occupier.
- Point out the water pressure gauge and explain what it indicates and that if the pressure falls over a period of time when the system is cold, a water leak should be suspected and that a “competent person” should be contacted.
- Emphasise the importance of a regular service and that servicing of the appliance **MUST** only be carried out by a “competent person” which in normal circumstances would be a CORGI registered engineer.
- As the installer you may wish to offer a service contract yourself, or alternatively you may wish to explain to the occupier that they can take advantage of an extended warranty scheme offered by Johnson & Starley Ltd.

**Reminder: following the commissioning and handover of the appliance, complete the Benchmark Log Book and leave it with the occupier.**

## 5. SERVICING SCHEDULE

To ensure that the appliance gives continued operation that is both safe and efficient, it is necessary to carry out regular service checks and whilst the period between servicing will depend on the installation condition and the demands placed upon the appliance, it is recommended that the appliance be serviced annually.

**NOTE: it is a statutory requirement that ALL work be carried out by a “competent person” which in normal circumstances would be a CORGI registered engineer.**

### 5.1 Servicing Sequence:

- Light the boiler and carry out a pre-service check, noting any operational faults.
- Check the gas consumption.
- Put the appliance in test mode and connect a suitable gas analyser to the sampling point on the top of the boiler or into the flue terminal if access is possible (optional test).

For correct boiler operation, the CO/CO<sub>2</sub> content of the flue gas should not be greater than 0.004 ratio.

Check that the gas input is at least 90% of the nominal.

- Clean the main burner.
- Clean the heat exchanger.
- Check the condition of the combustion chamber insulation. Any cracked or damaged pieces should be replaced.
- Wherever possible, remove and clean the condensate 'S' trap (refer to section 6.12) and check the drain for blockage.
- Check that the flue terminal is unobstructed and that the flue system is sealed correctly.

Note. In order to carry out either servicing or replacement of components the boiler front panel and sealing panel must be removed. (Refer to section 6.2)

**WARNING.** Always turn OFF the gas supply at the gas service cock and switch OFF and disconnect the electricity supply to the appliance before servicing.

- After completing the servicing or exchange of components always test for gas soundness and carry out functional checks as described above.
- When work is complete, the sealing panel **MUST** be correctly refitted, ensuring that a good seal is made.

**WARNING: Do not operate the boiler if the sealing panel is not fitted!**

- If, for any reason, the condensate 'S' trap has been removed ensure the trap is refilled with water before reassembling.
- Complete the service section in the Benchmark log book.

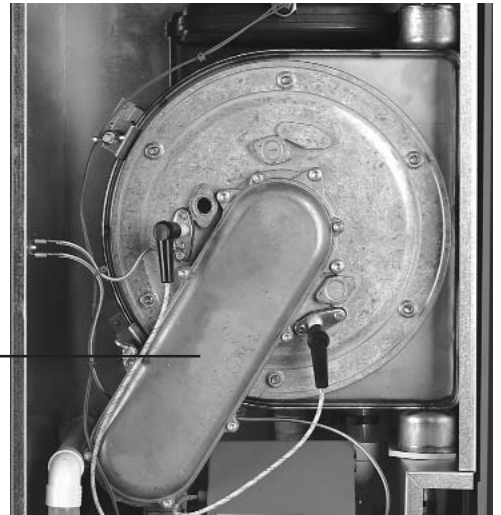
### Test Mode

To put the appliance in test mode, press both the **MODE** and ▼ buttons together for a minimum of 3 seconds. “TEST” will be displayed in the LCD lower right hand corner and the flow and return temperatures will be displayed along with the flame current value. The appliance will stay in test mode for 30 minutes and the remaining time left in test mode will be displayed. Whilst in test mode, the appliance overrides all temperature setting and runs at minimum rate. Pressing the ▲ button will cause the appliance to run at maximum rate, whilst still overriding all temperature settings. Press RESET to take the appliance out of test mode.

### 5.2 Gas/Air Duct and Internal Volume of the Burner

Remove the cover from the gas / air manifold (8 screws) and inspect the inside of the duct and burner for debris. Clean with a soft brush if necessary. Inspect the 'O' ring seal. Re-assemble the cover ensuring the seal is fitted correctly.

Gas/Air Duct



### 5.3 Combustion Assembly Complete

Remove the CVBC (refer to S6.16) and disconnect the gas pipe at the top of the isolation valve, which will already have been turned off. Unscrew the six retaining nuts from the studs that hold the assembly to the heat exchanger, supporting the assembly as the last one (bottom) is removed and slowly withdraw the complete assembly, including the gas inlet pipe and the case seal. As the assembly is withdrawn, disconnect the two electrical connections from the fan. Inspect and clean the spark ignition and flame sensing electrode, removing any debris and oxidation and check the spark gap and position of the spark electrode and the position of the flame-sensing electrode. Refer to the illustration and adjust if necessary. Inspect the two seals and the ceramic pad on the inside of the mounting plate and clean or replace as necessary.



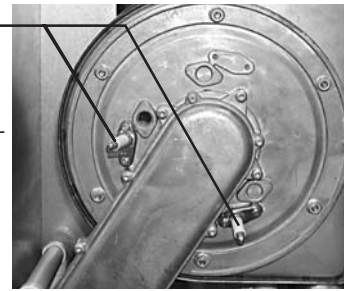
### 5.4 Combustion Chamber/Heat Exchanger

Inspect the inside of the combustion chamber for debris. If necessary, brush clean the inside of the tubes with a soft brush. Do not brush the insulation at the rear, if this part is damaged it will require replacement.



### 5.5 Ignition and Detection Electrodes

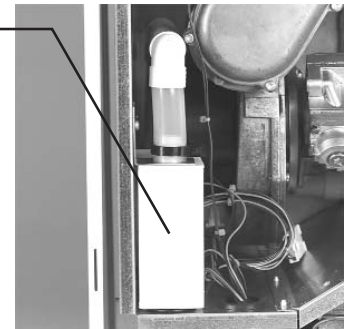
Remove the plug cap from the top and the earth wire from the base of the spark electrode. Unscrew the two screws that retain the electrode in the cover plate and remove the assembly. Inspect and clean the electrode, removing any debris and oxidation. If necessary use an abrasive paper or cloth. Inspect the gasket and replace if necessary during re-assembly. Repeat the sequence for the flame detection electrode with the exception of the earth lead.



### 5.6 Condensate Siphon

The condensate siphon has a removable cap that allows the removal of debris that may be caught within it. Place a bowl under the cap to catch the condensate that is expelled and remove the cap. Any debris inside will be expelled at this point. Replace the cap ensuring a good seal is made. Discard the condensate and debris.

**Note: The condensate is a weak acid with a ph value of between 4 and 6.**



## 6. FAULT FINDING AND REPAIR

### CAUTION:

Before commencing any mechanical servicing the appliance should be isolated from the electrical supply and the gas service cock on the appliance closed. All parts that are removed during a service operation should be replaced in reverse order, ensuring correct seals are made and wires are connected correctly. During the service remove any debris from within the appliance. When gas-carrying components are serviced the appliance must be tested for gas soundness after re-assembly. On completion of a service carry out a full functional test of all appliance components and ensure system controls are operating correctly.

Remove the upper front case that is retained by a screw in the top of the appliance.

Remove the control fascia by removing the plastic door, unscrewing the two screws that hold the control pod in place, rotate downward. Unplug the wires, slide the hinge pins inwards and remove the fascia from the appliance.

Remove the sealed door by removing the two screws and lifting the door clear.

Should a fault occur the boiler will shut down and the letter E followed by a two digit error code will be displayed.

### ATTENTION:

**The flip door at the bottom of the boiler is held in the closed position by a concealed latch that has a push and release mechanism and is located on the upper edge of the door in the centre. To gain access to the control panel, apply light pressure on the upper edge of the flip door at the centre, the latch will then release allowing the door to drop into the open position**

## 6.1 Fault Codes

Code	Fault	Reason	Action
N/A	Boiler will not run	No call for heat to boiler control board	Check all external controls if fitted. Check settings of the time clock. Check settings of boiler controls
01	Flame lockout after several ignition attempts	Flame not detected	Check gas supply and gas cock If burner lights check flame sensor and wiring to control board. Check operation of gas valve
03	High water temperature limit	Air in boiler. No water flow.	Vent boiler. Check pump.
05	No tacho from fan	Fan not running or wiring fault	Check that fan runs. Check wiring between control board and fan
07	High flue gas temperature	Reduced water flow	Check pump operation.
08	Flame circuit error	Flame sensing lead shorted to earth.	Check flame detection lead between sensing probe and ignition control board.
09	Valve driver circuit error	Gas valve not detected	Replace ignition control board or gas valve
10-25	Internal control board fault		Replace main control board
26	Flame signal lost 5 times in 4 minutes	Flame sensing error. Falling gas pressure. Fan fault. Flue blockage.	Check flame detection lead between sensor and ignition control board. Check gas supply: does pressure fall when boiler fires? Check that flue system is not blocked.
30	Boiler flow temperature sensor short circuit	Temperature sensor shorted to earth or failed.	Check wiring and connections for shorting to earth Check sensor resistance
31	Boiler flow temperature sensor open circuit	Temperature sensor not connected or failed	Check wiring and connections. Check sensor continuity
34	Low mains supply voltage	Electrical supply fault to property. Faulty wiring to appliance	Check incoming mains supply and wiring to appliance
35 & 36	Power supply fault	No fault on boiler	Boiler power supply should be checked by a qualified electrician
37	Low system water pressure	Water pressure low or sensor failed.	Check system pressure on dial gauge and if correct check pressure sensor and wiring. Re pressurize system.
39	Opentherm sensor (if fitted) shorted to earth	Short circuit in wiring between sensor and control board	Check wiring to sensor. Check the electrical resistance of the sensor.
40	High system water pressure	System water pressure too high. Pressure sensor failed.	Check cold system pressure. Check expansion tank charge pressure with system pressure released. Check pressure sensor
43	Boiler return temperature sensor short circuit	Temperature sensor shorted to earth or failed	Check wiring and connections for shorting to earth Check sensor resistance
44	Boiler return temperature sensor open circuit	Temperature sensor not connected or failed	Check wiring and connections Check sensor continuity
45	Flue gas temperature sensor short circuit	Short circuit in wiring between sensor and control board	Check wiring to sensor Check the electrical resistance of the sensor
46	Flue gas temperature sensor open circuit	Temperature sensor not connected or failed	Check wiring and connections Check sensor continuity

## Replacement of Parts

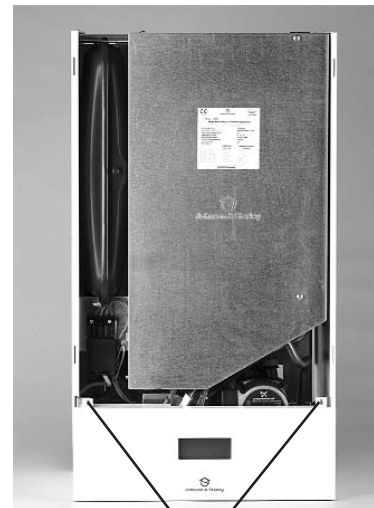
### 6.2 Initial Disassembly

Remove the upper front case that is retained by a screw in the top of the appliance.

Remove the control fascia by removing the plastic door, unscrewing the two screws that hold the control module in place, rotate downward. Unplug the wires, slide the hinge pins inwards and remove the fascia from the appliance.

Remove the sealed door by removing the two screws and easing it to the left to disengage it from the LH side of internal casing.

Front case retaining screw



Control module fixing screws

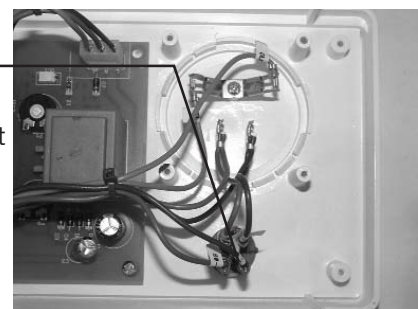
### 6.3 Control Panel (complete)

Because of the complexity and delicate nature of the control PCB, it is supplied as a complete kit with the plastic fascia.

Remove the control panel as described at section 6.2. and fit the new assembly in reverse order.

### 6.4 Electrical Switch

Unscrew the metal cover plate from the rear of the control panel. Unplug the wires from the switch and remove the switch. Replace with a new component in reverse order.





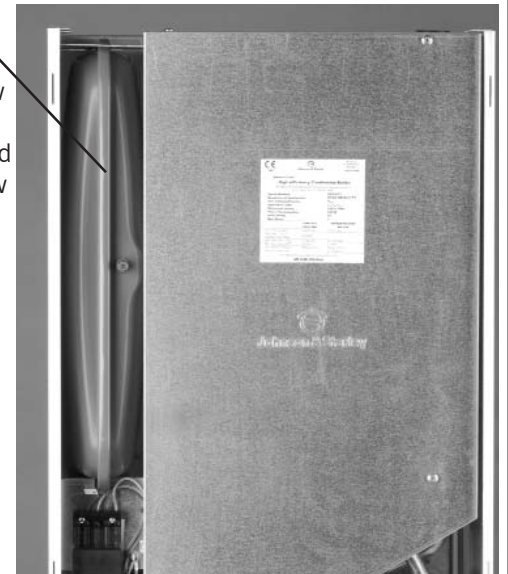
### 6.5 Pump (Complete)

Close the CH flow and return valves, ensuring the drain point on the flow valve is connected to the appliance side. Drain off the water from within the appliance using the drain valve, unplug the electrical connector from the flying lead and unscrew the lower screw that retains the pump to the appliance. Withdraw the retaining clip at the rear of the body and remove the pump complete. Replace with a new component in reverse order.



### 6.7 Expansion Vessel

Close the CH flow and return valves, ensuring the drain point on the flow valve is connected to the appliance side. Drain off the water from within the appliance using the drain valve, remove the LH painted case side and unscrew the flexible hose connection from the expansion vessel. Unscrew the upper retaining bracket and remove the expansion vessel. Replace with a new component in reverse order.



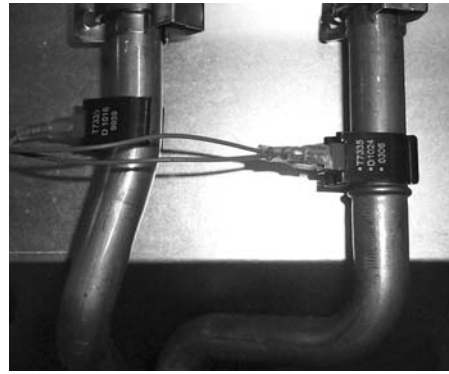
### 6.8 Pressure Relief Valve

Close the CH flow and return valves, ensuring the drain point on the flow valve is connected to the appliance side. Drain off the water from within the appliance using the drain valve, remove the pump as described in section 6.5 and unscrew the discharge connection. Withdraw the retaining clip and remove the pressure relief valve. Replace with a new component in reverse order.



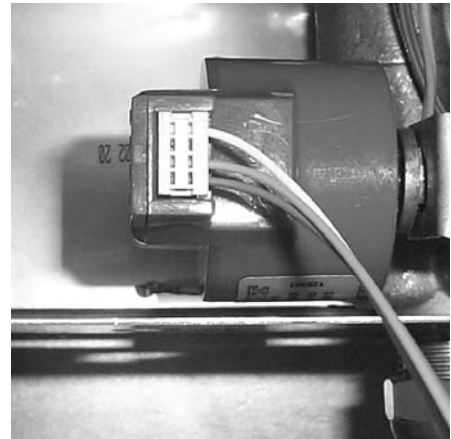
### 6.9 Primary Water Temperature Sensors (2 off)

Unplug the two wires from the temperature sensor to be replaced and unclip the sensor from the pipe. Replace with a new component in reverse order, ensuring it is fitted in the same position.



### 6.10 Primary Water Pressure Sensor

Close the CH flow and return valves, ensuring the drain point on the flow valve is connected to the appliance side. Drain off the water from within the appliance using the drain valve, unplug the electrical plug connection, withdraw the retaining clip forwards and remove the pressure sensor. Replace with a new component in reverse order.



### 6.11 Condensate Drain

The pipe work to the siphon can be replaced once the combustion assembly and siphon have been removed. It is a push fit onto the heat exchanger and the plastic flue outlet. Replace with a new component in reverse order.



### 6.12 Condensate Siphon

Pull the condensate pipe off the top of the siphon and remove the fixing screw retaining the support bracket. Unscrew the knurled ring underneath the siphon to free it from the sub assembly. Replace with a new component in reverse order.

Fixing screw

Knurled Ring

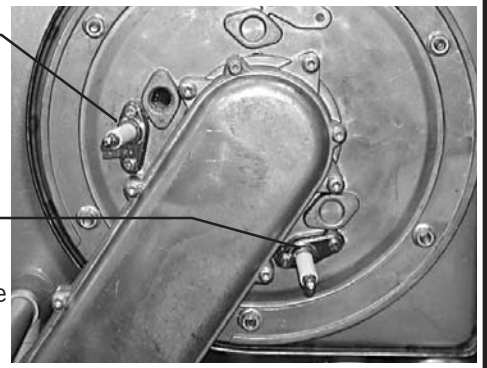


### 6.13 Ignition Electrode

Remove the plug cap and the earth wire from the electrode. Remove the two retaining screws and withdraw the electrode. Replace with a new unit, ensuring that the gasket is replaced with a new one, or that the existing gasket reused if it is in good condition.

### 6.14 Flame Detection Electrode

Remove the plug cap from the electrode. Remove the two retaining screws and withdraw the electrode. Replace with a new unit, ensuring the gasket is replaced with a new one, or the existing gasket reused if it is in good condition.



### 6.15 Burner

Unscrew the gas joint at the top of the gas cock. Unscrew the fan and gas/air manifold assembly (3 screws) from the heat exchanger. Unplug the multi pin plug connections from the top of the control and the fan. Remove the assembly.

Remove the assembly to allow the burner to be withdrawn from the heat exchanger assembly. Replace with a new component in reverse order. Ensure the rotational position of the burner is correct. Replace with a new component in reverse order ensuring that the grommet sealing the casing is correctly positioned.



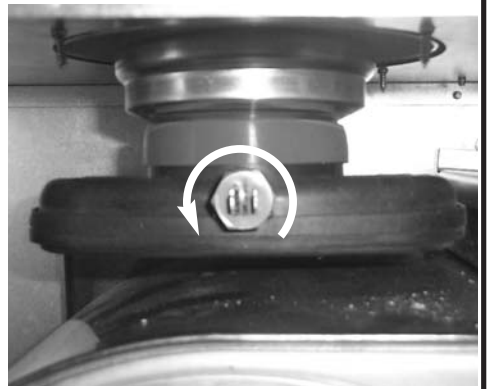
### 6.16 Main Ignition/Control PCB (CVBC Grey/Red Housing on Gas Valve)

Unplug the multi pin plug connections from the top of the control and remove the spark detection wires. Unscrew the single retaining screw and slide the housing off the gas valve electrical connections. Replace with a new component in reverse order.



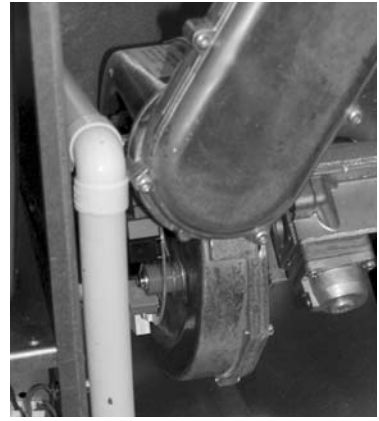
### 6.17 Flue Temperature Sensor

Carefully pull the two spade connectors from the sensor and unscrew the sensor from the plastic flue hood. Replace with a new component in reverse order.



### 6.18 Fan

Unscrew the gas joint at the top of the gas cock and remove the CVBC (red box) from the gas valve. Unscrew the fan and gas/air manifold assembly (3 screws) from the heat exchanger. Unplug the multi pin plug connections from the top of the control and the fan. Remove the assembly. Replace with a new component in reverse order.

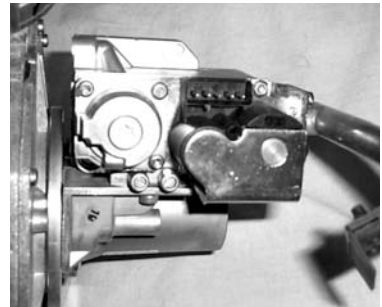


### 6.19 Gas Valve & Venturi Assembly

**NOTE: the gas valve is factory preset and a replacement valve must only be supplied by Johnson & Starley Ltd.**

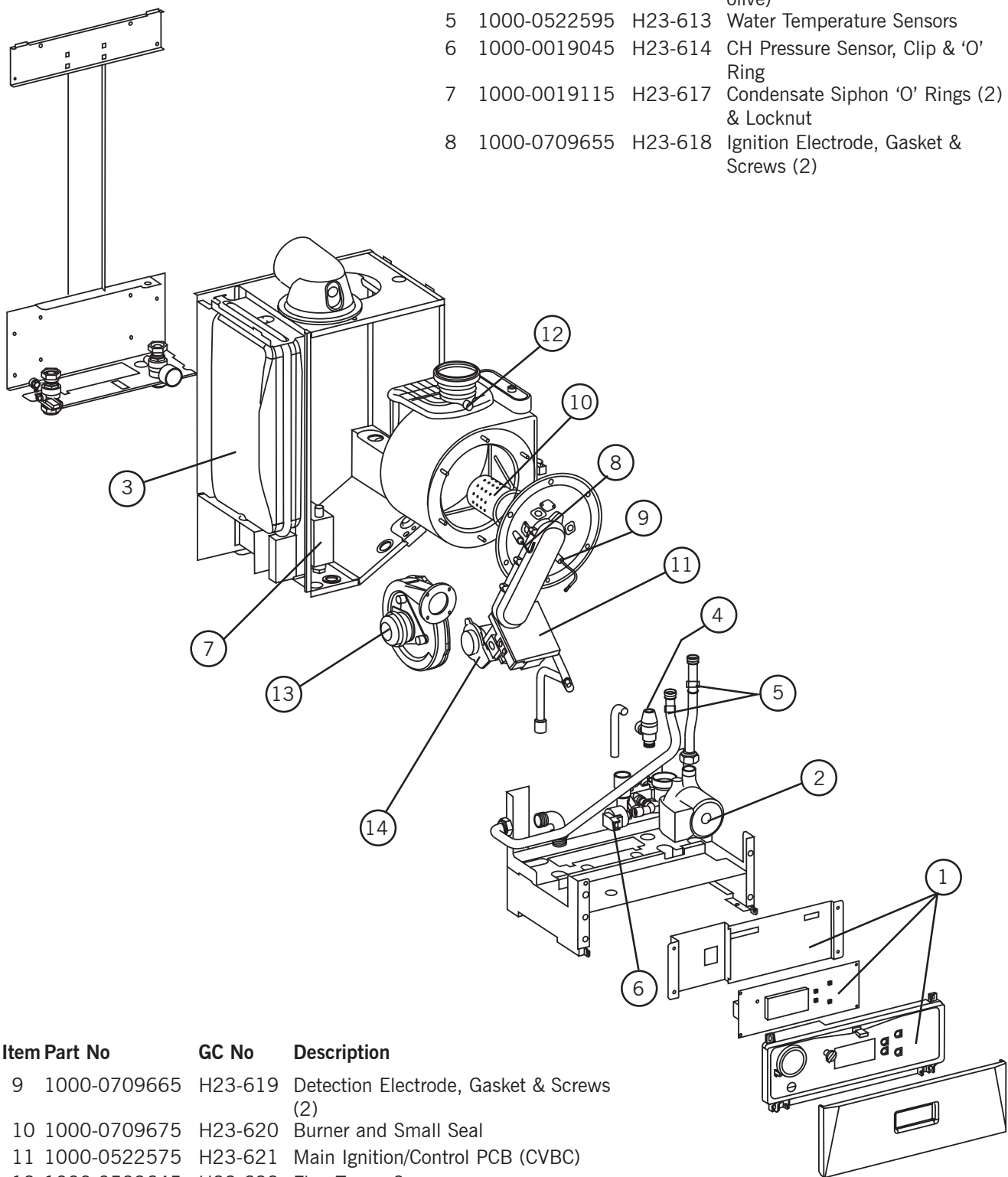
Remove the complete fan assembly as shown at section 6.18 and remove the 4 fixing screws holding the gas feed flange on the gas valve. Remove the 2 fixing screws securing the venturi (and gas valve) to the fan and remove the assembly from the fan carefully removing the gasket.

Replace with a new component in reverse order, ensuring that all seals are in good condition and correctly positioned. Check the gas rate and combustion as described in section 5 Servicing Instructions.



**7 SHORT SPARE PARTS LIST**

Item	Part No	GC No	Description
1	R300-0510005	H23-607	Control Panel (complete)
2	1000-0301485	H23-609	Pump
3	1000-0019005	H23-610	Expansion Vessel (with Washer)
4	1000-0019015	H23-612	Pressure Relief Valve (with nut & olive)
5	1000-0522595	H23-613	Water Temperature Sensors
6	1000-0019045	H23-614	CH Pressure Sensor, Clip & 'O' Ring
7	1000-0019115	H23-617	Condensate Siphon 'O' Rings (2) & Locknut
8	1000-0709655	H23-618	Ignition Electrode, Gasket & Screws (2)



Item	Part No	GC No	Description
9	1000-0709665	H23-619	Detection Electrode, Gasket & Screws (2)
10	1000-0709675	H23-620	Burner and Small Seal
11	1000-0522575	H23-621	Main Ignition/Control PCB (CVBC)
12	1000-0522645	H23-622	Flue Temp. Sensor
13	1000-0522635	H23-623	Fan, Gaskets (2) & Fixing Screws
14	1000-0709635	H23-624	Gas Valve & Venturi Assy (inc fan gasket, pipe gasket & screws (4))







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