

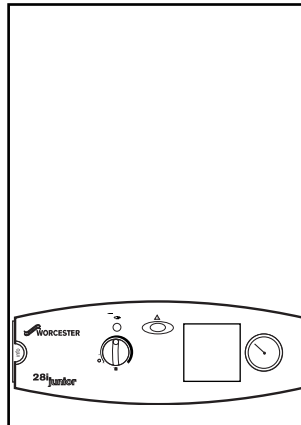
# WORCESTER

Bosch Group

## 24i / 28i junior

WALL MOUNTED COMBINATION BOILERS FOR CENTRAL HEATING  
AND MAINS FED DOMESTIC HOT WATER

# INSTALLATION AND SERVICING INSTRUCTIONS



For Boilers newer   
than FD485



Worcester Bosch supports the  
Benchmark code of practice

This appliance is for use with Natural Gas or LPG (Cat II 2H3P TYPE C12 & C32)

24i GC NUMBER 47 311 69 (N.G.)

GC NUMBER 47 311 71 (L.P.G.)

28i GC NUMBER 47 311 70 (N.G.)

GC NUMBER 47 311 72 (L.P.G.)

GB/IE

### APPLIANCE OUTPUTS

	Domestic Hot Water	Central Heating
Minimum	24i 7.5 kW	28i 8.0 kW
Maximum	23.5 kW	27.5 kW

IMPORTANT: THESE INSTRUCTIONS MUST BE LEFT WITH THE USER OR AT  
THE GAS METER

**Read the instructions before starting work - they have been written to  
make the installation easier and prevent hold-ups.**

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## 1. Installation Regulations

The appliance is suitable for installation in GB and IE only and should be installed in accordance with the rules in force.

### 1.1 Gas Safety (Installation & Use) Regulations 1998:

It is the law in GB that a competent person in accordance with the above regulations installs all gas appliances.

Failure to install appliances correctly could lead to prosecution.

It is in your interest, and that of safety, to ensure compliance with the law.

1.2 The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

1.3 The compliance with a British Standard or European Norm does not, in itself, confer immunity from legal obligations.

1.4.1 The installation of the appliance must be in accordance with the relevant requirements of the Gas Safety Regulations, current IEE Regulations, Building Regulations, Building Standards (Scotland) and local water by-laws.

1.4.2 In Eire, the installation must be carried out by a competent person and installed in accordance with IS813, Domestic Gas Installations (Edition 2), the current Building Regulations and the electrical installation must follow the ETCI rules.

1.5 The installation should follow the recommendations of the following British Standards unless otherwise indicated.

BS5440:1 - Flues and ventilation for gas appliances: Flues

BS5440:2 - Flues and ventilation for gas appliances: Air supply.

BS5449 - Central heating for domestic premises.

BS5482 - Domestic propane gas burning installations.

BS5546:1 - Installation of gas hot water supplies.

BS6700 - Domestic water supply in buildings.

BS6798 - Installation of gas fired hot water boilers.

BS6891 - Low pressure gas pipework installations upto 28mm (R1).

BS7593 - Water treatment.

BS7671 - Requirements for electrical installations (16th Edition).

British Standards and Regulations are not in force in Ireland, however useful information relating to the hydraulic aspects of heating systems may be found in IS 813: Annex M and in BS5546, BS5449, BS7074 and BS7593.

1.6 The appliance and components must conform, where applicable, to all relevant Directives.

1.7 The appliance does not contain any substances which are harmful to health.

1.8 In certain circumstances, the installer can be held responsible, not only for mistakes on his part but also for damage resulting from the use of faulty materials. We advise that, to avoid any risk, only quality approved branded fittings and the specified replacement parts are used.

### 1.9 LPG Installation:

The appliance shall not be installed in a room or internal space below ground level when it is intended for use with LPG. This does not preclude the installation into rooms, which are basements with respect to one side of the building but open to the ground on the opposite side.

#### 1.9.1 CARAVAN AND HOLIDAY HOMES

The installation must meet the following standards.

BS5482:2 LPG and EN721 ventilation.

#### 1.9.2 PARK HOMES AND RESIDENTIAL

The installation must meet the following standards.


BS5482:1 LPG and BS3632 ventilation.

1.10 These instructions cover, as far as possible, the foreseeable situations, which may arise.

Contact Worcester Heat Systems Technical Department, Telephone: 08705 266241, for advice on specific installations.

In Eire call 01 494 0099.

## 2. Introduction

 2.1 The **Benchmark** initiative is the new code of practice to encourage the correct installation, commissioning and servicing of domestic central heating boilers and system equipment.

**The 'Log-book' is a vital document that must be completed by the installer at the time of installation. It confirms that the boiler has been installed and commissioned according to the manufacturers instructions.**

**A Declaration of Conformity (refer to IS813 Annex D 1) must be completed by the installer and a copy supplied to the appliance operator for boilers installed in Eire.**

Without the completion of the Log-book and/or Declaration, manufacturers may refuse to respond to a call-out from a householder, who will be advised that he or she must call back the installer, who has not fulfilled his obligations to record the information required by the initiative.

#### Service:

To ensure the continued efficient operation of the appliance it must be checked at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but once per year should generally be adequate. The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers. Any service work must be carried out by competent registered (by CORGI in GB) engineers.

#### 2.2 General Information

The appliance is set to give the maximum output of 27.5 kW [28i] or 23.5kW [24i] to the domestic hot water and to the heating system. The hot water flow rate is limited to a nominal 10 l/min [28i] or 8 l/min [24i] at a maximum temperature rise of 40°C.

The sanitary water section of the appliance is suitable for a mains water pressure of up to 10bar.

An internal filling loop assembly approved by the WRAS is an optional extra.

The 28i is only manufactured for use with Natural Gas.

Kits are available for the 24i and 28i appliances to convert from Natural Gas to LPG operation and vice versa.

### 2.3 Electrical Supply

230V - 50Hz. Load 152 watts. External fuse 3A, Internal fuses F1 - 2A, F2 - 1.25A (20mm).

### 2.4 Gas Supply

The appliances require a maximum of 3.17 m<sup>3</sup>/h of natural gas (G20) or 1.23 m<sup>3</sup>/h of propane (G31) [28i] or 2.74 m<sup>3</sup>/h of natural gas (G20) or 1.06 m<sup>3</sup>/h of propane (G31) [24i].

The installation and the connection of the gas supply to the appliance must be in accordance with BS6891 in GB and, IS813 in Eire.

The meter or regulator should deliver a dynamic pressure of 20 mbar (G20) or 37mbar (G31) at the appliance, which is equivalent to about 18.5 mbar or 36 mbar at the gas valve inlet pressure test point.

### 2.5 Installation

The appliance is suitable for indoor installation only and for use with a sealed system only.

Do not place anything on top of the appliance.

This is a room sealed appliance and a separate combustion air supply is not required in any room or compartment in which the appliance is fitted.

If the appliance is fitted in a cupboard or a compartment is built around it after installation, then the structure must conform to the appropriate standards. However, because of the low casing losses, there is no need for cooling ventilation openings in the compartment provided that the specified clearances are maintained.

**The spaces specified for servicing must be maintained.** (See Table 8).

There is space for the service pipes to pass through the side channels at the back of the appliance.

### 2.6 Flue

**implefit** Standard Multi-Directional Horizontal Flue Kit can be adjusted from 425mm to 725mm without cutting.

The minimum length is 265 mm with cutting.

Extended flue lengths up to a maximum of 3m are available.

Optional 45° and 90° flue bend kits are available **NOTE:** When using flue bends the maximum flue length is reduced.

If access to the flue terminal will be a problem then a kit is available to enable the horizontal flue to be fitted from inside the house.

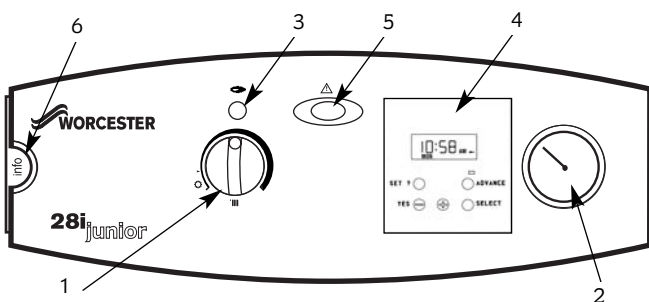
Do not allow the flue terminal fitted to the outside wall to become obstructed or damaged.

A terminal guard, Type K2, GC 393 553, is available from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.

A vertical flue system is available with a maximum height of 4.1m including the flue terminal assembly.

Refer to the separate vertical flue system booklet .

Fig. 1. Facia controls



1. Central Heating temperature control On/Off knob
2. System pressure gauge
3. Burner ON indicator
4. Optional timer
5. Fault indicator and reset button
6. User guide location

### 2.7 Controls

The electronic control system and gas valve modulate the heat input in response to the domestic hot water temperature and the central heating setting.

The Central Heating Temperature control knob provides for the selection of domestic hot water only (turned fully anti-clockwise) or central heating and domestic hot water (turned clockwise).

A facia mounted programmer is provided as an optional extra. A remote mounted programmer may be connected to the appliance.

There is provision for the connection of a mains voltage room thermostat and/or a frost thermostat.

The electronic controls prevent rapid cycling of the appliance in the central heating mode.

### 2.8 System

These appliances are suitable for sealed systems only.

**benchmark** All dirt must be flushed from the system before connecting the appliance. The system can be pre-piped and flushed before the appliance is fitted. If a system cleaner has been used then it must be completely removed before initially filling the system and adding, where necessary, an inhibitor.

The connections in the system must withstand an operating pressure of upto 3 bar.

Radiator valves must conform to BS2767: 10:1977.

Table 3 gives the pump head available for the system and the required temperature differential.

A drain cock must be fitted to the lowest point and an air vent to the highest point of the system.

In Eire the requirements in respect of the system given in the current Irish Building Regulations must be followed and further guidance is available in Annex M of IS813.

### 2.9 Showers, Bidets, Taps and Mixing Valves

All taps and mixing valves must be suitable for the available mains pressure and temperatures up to 65°C.

It may be necessary to fit a pressure reducing valve.

Hot and cold mains fed water can be supplied to overrim bidets but is subject to local water company requirements.

The flow of water from individual outlets varies on all mains fed systems that are not fitted with flow balancing valves.

Thermostatically controlled or pressure equalising shower valves give extra comfort and protection.

If a pressure equalising valve is fitted then the domestic hot water temperature should be set to maximum.

### 2.10 Safety

**The appliance must not be operated with the inner casing cover removed or without being full of water and pressurised.**

**The gas and electricity supplies must be turned off before working on the appliance.**

**The appliance can only be electrically isolated externally.**

**Temperature monitoring controls are fitted to prevent overheating.**

**Automatic frost protection is provided together with automatic pump seizure protection.**

**The gas valve solenoids are automatically checked for gas soundness.**

**IMPORTANT:** Where back-flow prevention devices, including water meters, are fitted the expansion of hot water into cold water main can be prevented. This can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc.

**In these cases we recommend that a mini-expansion vessel be fitted adjacent to the boiler in the cold water inlet pipe.**

**The domestic hot water circuit should be in copper pipe.**

### 2.11 Operation

#### 2.11.1 Central Heating:

A demand for heat will ignite the burner.

It will operate at minimum pressure for 19 seconds before increasing to the maximum pressure over a period of 1 minute and then automatically match the system requirements. At the end of the demand the burner will go out, the pump will continue to run for up to 3 minutes and the fan for 35 seconds. There is an anti-cycle time of 3 minutes.

### 2.11.2 Domestic Hot Water:

The appliance can provide domestic hot water whenever it is switched on electrically.

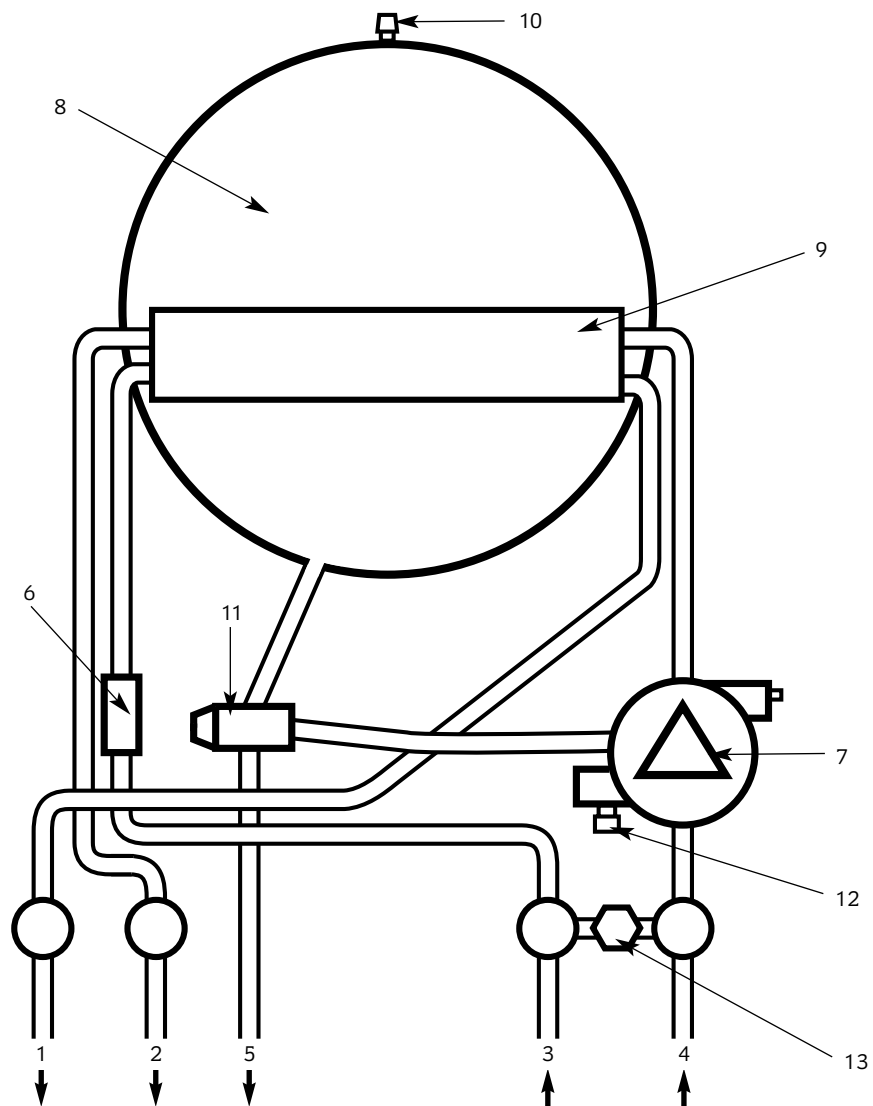
A demand for hot water will light the burner. The pressure will immediately rise to maximum. At the end of the demand the fan will continue to run for 35 seconds if there is no heating demand.

In winter it may be necessary to reduce the flow at the taps to maintain the delivery temperature.

### 2.11.3 Domestic Hot Water and Central Heating:

The demand for hot water will override the central heating function when the appliance is in the heating and hot water mode of operation.

Fig. 2. Water flow diagram.



- |                                    |                                    |
|------------------------------------|------------------------------------|
| 1. CH flow                         | 8. Expansion vessel                |
| 2. Domestic hot water flow         | 9. Primary heat exchanger          |
| 3. Mains cold water inlet          | 10. Expansion vessel charge point  |
| 4. CH return                       | 11. Relief valve                   |
| 5. Pressure relief valve discharge | 12. Boiler drain point             |
| 6. Domestic water flow turbine     | 13. Charging link (optional extra) |
| 7. Circulating pump                |                                    |

### 3. Technical Data

Table 1. 24i

NOMINAL BOILER RATINGS (10 Minutes After Lighting)			
BOILER ADJUSTED FOR G20 (Natural Gas)			
OUTPUT	INPUT (Net)	BURNER PRESSURE	GAS RATE
kW	kW	m bar.	m <sup>3</sup> /h
7.5	9.5	1.4	1.00
23.5	25.9	13.6	2.74
BOILER ADJUSTED FOR G31 (Propane)			
7.5	9.5	4.6	0.39
23.5	25.9	35.0	1.06

Natural Gas: Net Input = Gross Input x 0.901

Table 1. 28i

NOMINAL BOILER RATINGS (10 Minutes After Lighting)			
BOILER ADJUSTED FOR G20 (Natural Gas)			
OUTPUT	INPUT (Net)	BURNER PRESSURE	GAS RATE
kW	kW	m bar.	m <sup>3</sup> /h
8.0	9.5	1.2	1.00
27.5	30.0	14.7	3.17
BOILER ADJUSTED FOR G31 (Propane)			
8.0	9.5	3.4	0.39
27.5	30.0	35.3	1.23

LPG (Propane): Net Input = Gross Input x 0.921

Table 2.

FLUE DETAILS			
<b>HORIZONTAL FLUE</b>			
WALL HOLE DIAMETER	EXTERNAL FIX	mm	110
	INTERNAL FIX	mm	130
STANDARD FLUE	MINIMUM LENGTH	mm	275/*425
	MAXIMUM LENGTH	mm	725
EXTENDED FLUE	MAXIMUM LENGTH	mm	3000
FLUE ASSEMBLY DIAMETER		mm	100
<b>VERTICAL FLUE</b>			
VERTICAL DUCT	MAXIMUM LENGTH	mm	3000
TERMINAL ASSEMBLY		mm	1100

\* NOTE : Minimum uncut length

Table 3

MAXIMUM AVAILABLE PUMP HEAD			
BOILER OUTPUT	HEAD	MIN. FLOW RATE	FLOW/RETURN DIFFERENTIAL
kW	Metres	L/min.	°C
8	4.5	10.4	11
23.5	2.2	18.3	18
27.5	2.0	18.3	21

Table 4

MECHANICAL SPECIFICATIONS	24i	28i
CENTRAL HEATING FLOW - COMPRESSION	22mm	22mm
RETURN - COMPRESSION	22mm	22mm
COLD WATER INLET - COMPRESSION	15mm	15mm
DOMESTIC WATER FLOW - COMPRESSION	15mm	15mm
GAS INLET	Rp <sup>3</sup> / <sub>4</sub>	Rp <sup>3</sup> / <sub>4</sub>
RELIEF VALVE DISCHARGE	15mm	15mm
CASING HEIGHT	600mm	600mm
CASING WIDTH	400mm	440mm
CASING DEPTH	325mm	325mm
WEIGHT - LIFT	22kg	23.5kg
WEIGHT - PACKAGED	37kg	40kg
WEIGHT - DRY	34.7kg	37.5kg

**Table 5**

PERFORMANCE SPECIFICATIONS		24i	28i	
PRIMARY WATER CAPACITY	litres	3	3	
IP RATING (WHOLE OF BOILER)		IP 20	IP 20	
MAXIMUM MAINS INLET PRESSURE	bar	10	10	
MINIMUM MAINS INLET PRESSURE (WORKING) FOR MAXIMUM FLOW	bar	0.9	0.9	
MINIMUM MAINS INLET PRESSURE (WORKING) FOR OPERATION	bar	0.1	0.1	
DOMESTIC HOT WATER TEMPERATURE RANGE	°C	55	55	
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	°C	82 (nom)	82 (nom)	
MAXIMUM CENTRAL HEATING SYSTEM SET PRESSURE	bar	2.5	2.5	
MINIMUM CENTRAL HEATING SYSTEM PRESSURE	bar	0.5	0.5	
OUTPUT TO CENTRAL HEATING & DHW	kw	NATURAL GAS (G20)	23.5	27.5
		LPG - PROPANE (G31)	23.5	27.5
DOMESTIC HOT WATER SPECIFIC RATE -	30°C RISE l/min	11.2	13.1	
MAXIMUM DOMESTIC HOT WATER FLOW RATE -	40°C RISE l/min	8.4	9.8	
FLUE GAS MASS FLOW RATE		15.2	17.8	
FLUE GAS TEMPERATURE °C		150	150	
NO <sub>x</sub> CLASSIFICATION FOR BOTH 24i & 28i		Class 2		
SEDBUK NUMBER NG		78.0	78.9	
SEDBUK NUMBER LPG		80.4	82.1	
SEDBUK BAND*		D	D	

\* The value is used in the UK Government Standard Assessment Procedure [SAP] for the energy rating of dwellings. The test data from which it has been calculated have been certified by the GASTEC notified body.

**Table 6**

DOMESTIC HOT WATER TEMPERATURE RISE						
DISCHARGE RATE	l/min		7	8	9	10
TEMPERATURE RISE	°C	24i	48	42	37	34
TEMPERATURE RISE	°C	28i	56	49	44	39

**Table 7**

GAS SUPPLY SYSTEM - BASED ON NG (G20)				
TOTAL LENGTH OF GAS SUPPLY PIPE (COPPER) metres				
3	6	9	12	
GAS DISCHARGE RATE · PRESSURE DROP 1 mbar. — m <sup>3</sup> /h PIPE DIAMETER mm				
8.7	5.8	4.6	3.9	22
18.0	12.0	9.4	8.0	28

**Table 8**

	CLEARANCES (mm)		
	INSTALLATION	SERVICE	UNVENTILATED COMPARTMENT
* ABOVE FLUE ELBOW	30	30	30
BENEATH THE APPLIANCE	200	200	200
IN FRONT OF APPLIANCE	600	600	25**
RIGHT/LEFT HAND SIDE	10	10	25

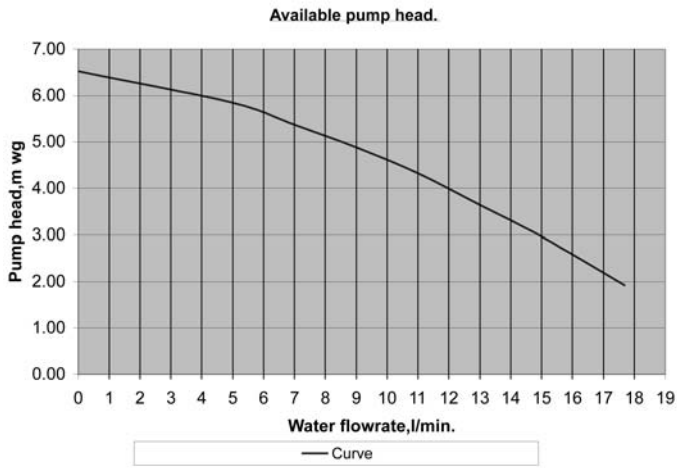
Refer to Section 6.

\* If vertical flue then 200mm above top of boiler.

\*\* Front clearance is to a removable panel (eg. door).

**Table 9**

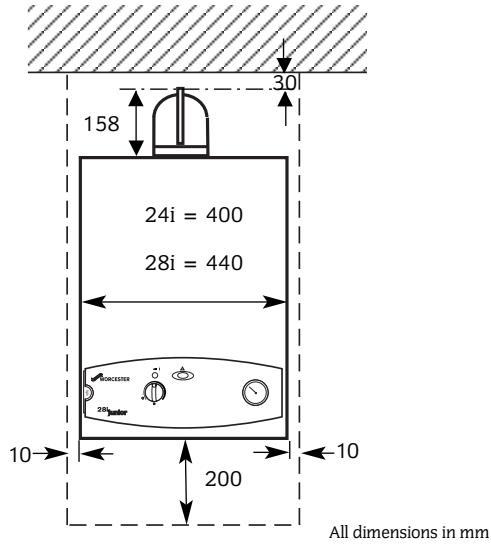
SYSTEM CAPACITY			
TOTAL SYSTEM VOLUME litres			
INITIAL PRESSURE bar	INITIAL CHARGE PRESSURE bar		
	0.5	1.0	1.5
1.0	57	75	N/A
1.5	31	42	52



**Minimum system flow rate**

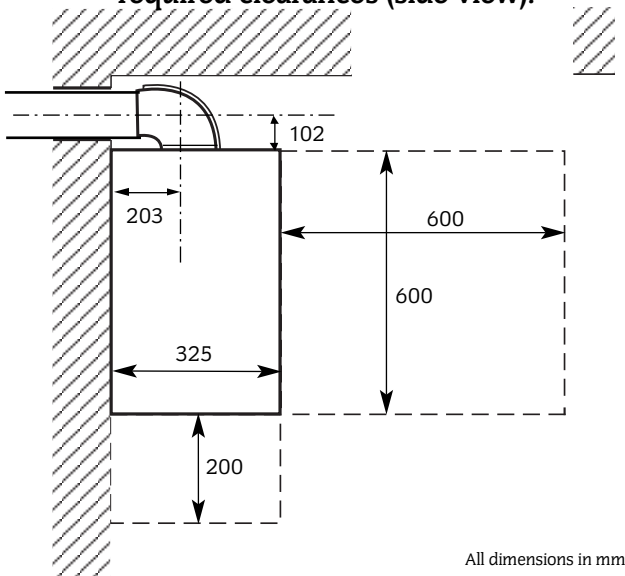
Please ensure that the external system flow rate returning to the appliance is greater than 2 litres/minute.

**Fig. 3. Appliance casing dimensions and required clearances for installation/servicing**



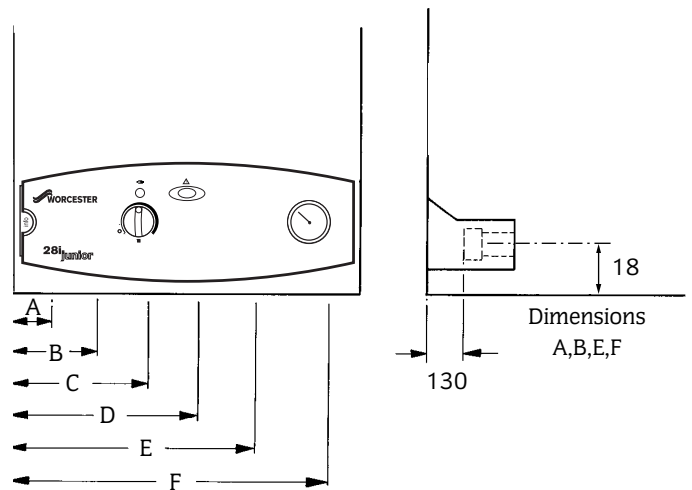
Unventilated Compartment — for clearances refer to Table 8

**Fig. 4. Appliance casing dimensions and required clearances (side view).**



Unventilated Compartment — Refer to Table 8

**Fig. 5. Pipework connections**



A	CH Flow	= 70	90
B	Relief Valve Discharge	= 88	108
C	DHW Outlet	= 135	155
D	Gas	= 200	220
E	Cold Water Inlet	= 265	285
F	CH Return	= 330	350

All dimensions in mm

## 4. Siting The Appliance

The appliance may be installed in any room but refer to the requirements of the current IEE Regulations and, in Scotland, the relevant electrical provisions of the Building Regulations with respect to the installation of appliances in rooms containing baths or showers. In Eire refer to the ETCI rules for electrical installations. Where a room sealed appliance is installed in a room containing a bath or shower, any switch or appliance control using mains electricity must NOT be able to be touched by a person using the bath or shower. The IP rating of the appliance may only allow it to be located in specific 'zones'. Refer to, in GB, Electrical Regulations 16th Edition (BS7671).

The appliance is NOT suitable for external installation. No special wall protection is required. The wall must be able to support the weight of the appliance. Refer to Table 4. The specified clearances must be available for installation and servicing. Refer to Table 8.

The appliance can be installed in a cupboard/compartiment to be used for airing clothes providing that the requirements of BS6798 and BS5440 Part 2 are followed. Refer to Section 2.5.

The clearance between the front of the appliance and the cupboard or compartment door should be not less than 25mm. The airing space must be separated from the boiler space by a perforated non-combustible partition.

Expanded metal or rigid wire mesh is acceptable provided that the major dimension is less than 13mm.

Notwithstanding the instructions given in BS 5440:2, these appliances can be fitted in a compartment with no vents as long as the clearances specified in Table 8 are maintained.

LPG Installation. Refer to Section 1.9.

## 5. Flue terminal positions

The flue system must be installed following the requirements of BS5440: 1. In Eire the flue terminal must be sited as described in Table 5 of the current edition of IS813.

Standard horizontal flue kit length is 265 – 725mm with extension kits for flues up to 3m.

The terminal must not cause an obstruction or the combustion products a nuisance. Under some conditions the terminal might emit steam and positions where this might be a nuisance should be avoided. Refer to Fig 6.

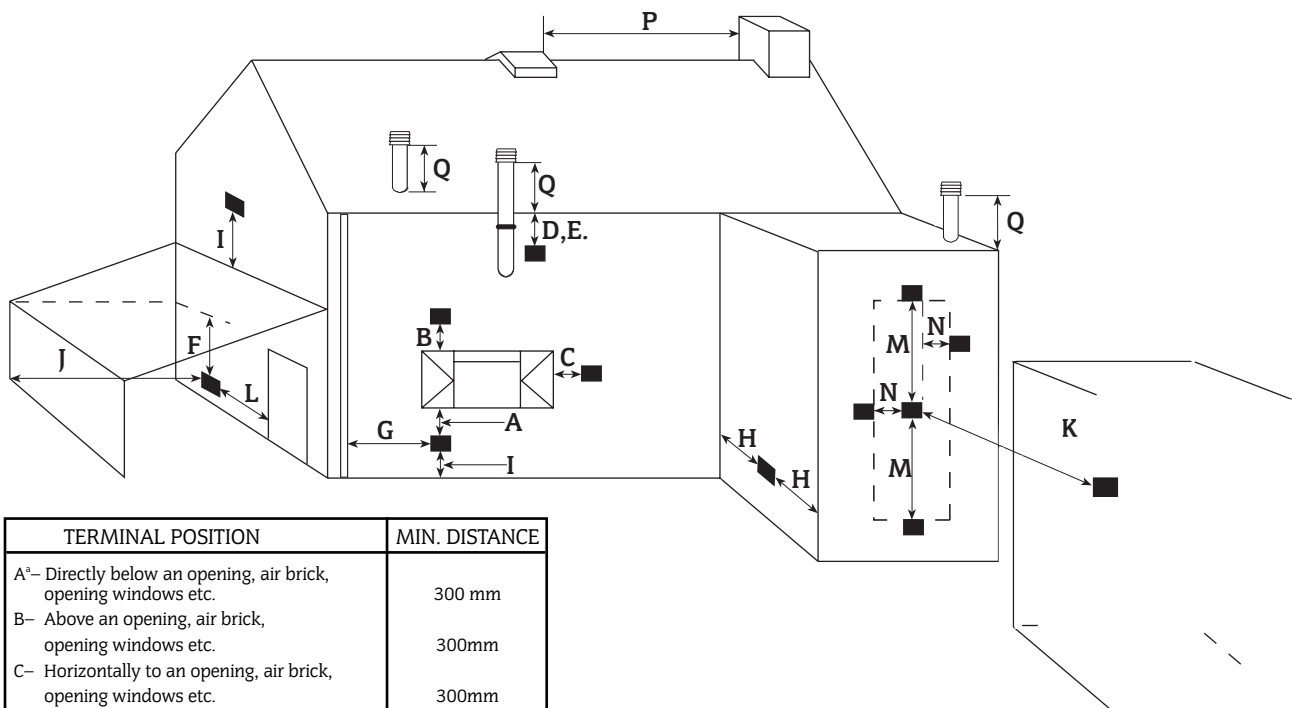
If the terminal is less than 2m above a surface to which people have access then a guard must be fitted. The guard must be evenly spaced about the terminal and fixed with plated screws.

A Type K2 guard is available from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.

A vertical flue kit is available giving a maximum height of 4.1m including the flue terminal assembly.

Refer to the separate vertical flue system booklet.

Fig. 6. Siting of the flue terminal.



TERMINAL POSITION	MIN. DISTANCE
A <sup>a</sup> - Directly below an opening, air brick, opening windows etc.	300 mm
B- Above an opening, air brick, opening windows etc.	300mm
C- Horizontally to an opening, air brick, opening windows etc.	300mm
D- Below gutters, soil pipes or drain pipes.	75mm
E- Below eaves.	200 mm
F <sup>b</sup> - Below balconies or car port roof (lowest point).	200 mm
G- From a vertical drain pipe or soil pipe.	150 mm
H- From an internal or external corner.	300 mm
I- Above ground, roof or balcony level.	300 mm
J- From a surface facing the terminal.	600 mm
K- From a terminal facing the terminal	1200 mm
L- From an opening in a car port (e.g. door window) into dwelling.	1200 mm
M- Vertically from a terminal on the same wall.	1500 mm
N- Horizontally from a terminal on the same wall.	300 mm
O- From the wall on which the terminal is mounted	N/A
P- From a vertical structure on the roof	N/A
Q- Above intersection with roof	See Vertical Flue Instructions

NOTE N/A = Not applicable

<sup>a</sup>In addition, the terminal should be not nearer than 150mm (fanned draught) to an opening in the building fabric formed for the purpose of accommodating a built-in element such as a window frame.

<sup>b</sup>Not recommended



## 6. Air Supply

6.1 A separate vent for combustion air is not required. Refer to BS5440:2.

## 7. Sealed System

The system must comply with requirements of BS6798 and BS5449 and, in Eire, the current edition of IS813. It must not be operated without being full of water and correctly pressurised. The pressure relief valve will operate at 3 bar. The discharge pipe, of 15mm diameter, must be directed such that the discharge of water or steam is visible, will not discharge onto the occupants of the premises or cause any damage to the premises, in particular any electrical components or wiring.

The expansion vessel, to BS4814, has a capacity of 6 litres charged to 0.5 bar, which is suitable for a static head of 5 metres. A schraeder type valve allows the pressure to be increased if the static head is greater than 5 metres.

If the expansion vessel fails then it must be replaced with the designated spare part.

Refer to BS 7074:1, BS5449 and Table 9 for a guide to the available system capacity. The maximum system design pressure is 1.5 bar. If the pressure is above 2.65 bar when the appliance is at maximum temperature then an additional expansion vessel must be fitted as near to the appliance as possible in the return pipe. The pressure gauge shows the system pressure.

Fill and pressurise the system through a WRAS approved filling loop.

**The system and the appliance must be fully vented.** Repeated venting loses water from the system, which must be replaced. The make-up connection must be close to the appliance in the heating return pipe through an approved non-return valve.

Plastic pipes must not be directly connected to the boiler. A copper to plastic transition piece should be positioned a minimum of 600mm from the boiler. A plastic pipe with a polymeric barrier must be used.

The connection to the mains water supply must have the approval of the local Water Company.

An integral non-adjustable by-pass is fitted .

The pump is set at maximum and should not be adjusted. All connections in the system must withstand a working pressure of up to 3 bar.

The radiator valves must conform to BS 2767:10 and other valves to BS1010.

Fig 8a - System make up

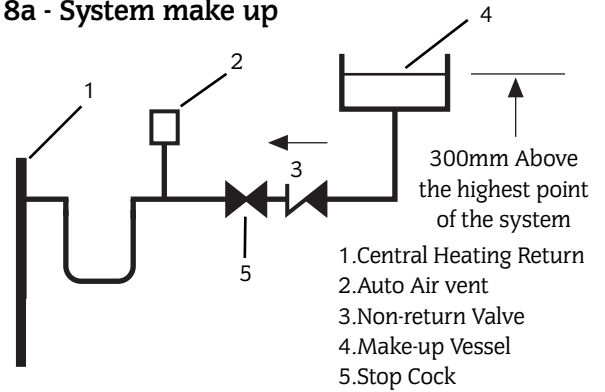
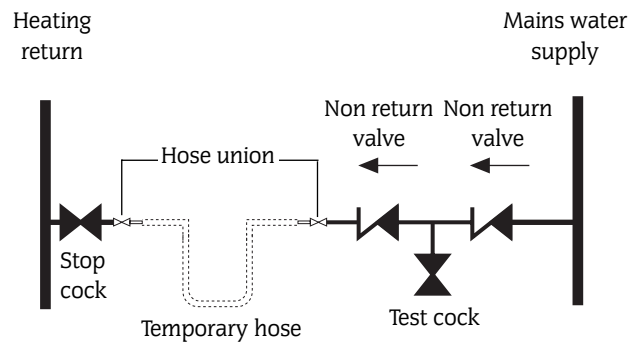


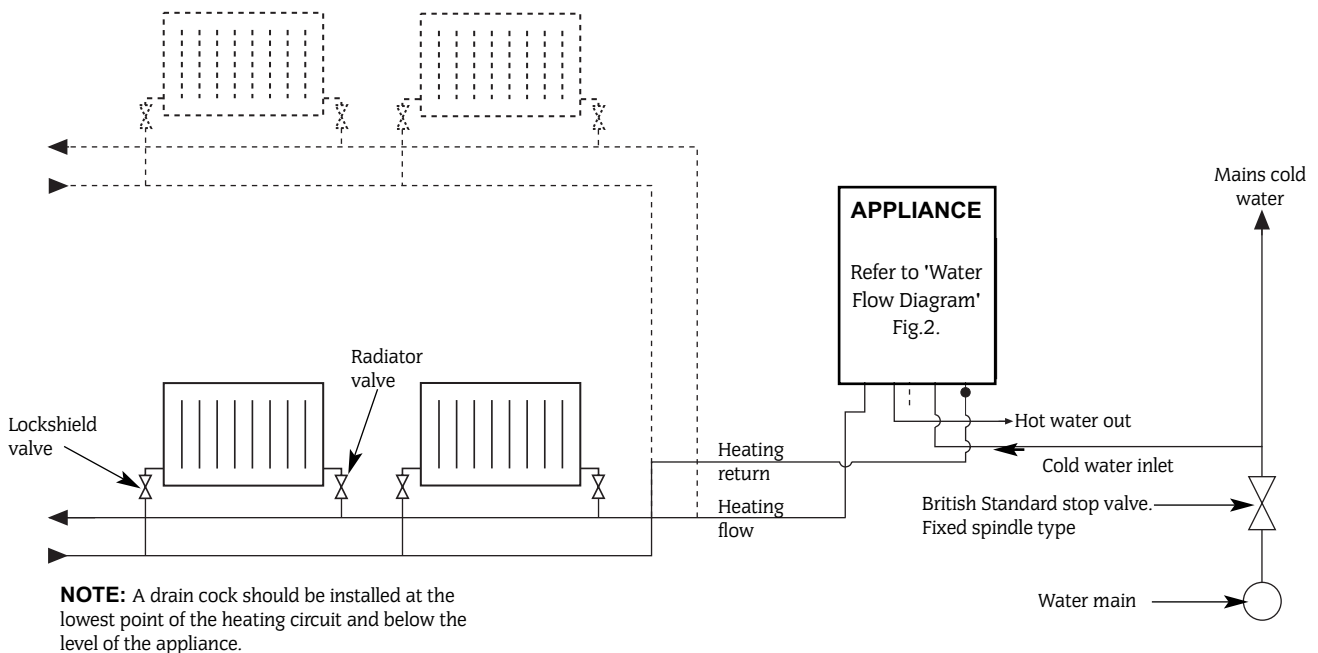
Fig 8b - Filling loop



## 8. Open Vent System

This appliance is NOT suitable for connection to an open vent system.

Fig. 7. Sealed primary water system.



## 9. Domestic Hot Water

It may be necessary to contact the local Water Company before connecting the appliance. Where back-flow prevention devices, including water meters, are fitted the expansion of hot water into cold water main can be prevented. This can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc.

In these cases we recommend that a mini-expansion vessel be fitted adjacent to the boiler in the cold water pipe.

In Eire advice on backflow protection is given IS813 Annex M4.3 and M4.4.

The connection in the domestic water system should be in copper pipe.

The domestic hot water circuit of the appliance is suitable for a mains pressure of up to 10bar. A pressure reducing valve must be fitted if necessary.

A mains water supply isolating valve is fitted.

The maximum hot water flow rate is set at the factory to 8 l/min [24i] and 10 l/min [28i] giving a nominal temperature rise of 40°C with the temperature control at maximum. This rate is equivalent to a Specific Rate of 11.2 l/min [24i] and 13.1 l/min [28i] at a rise of 30°C. Refer to Table 6. The temperature rise, upto the maximum, is maintained by the automatic modulation of the heat input. In winter (when the mains water temperature is lower) it may be necessary to reduce the water flow at the tap or shower to maintain the maximum delivery temperature.

It is recommended that long pipe runs to taps or showers are insulated to prevent the rapid cooling of the water.

Hot and cold taps and mixing valves must be suitable for the available mains pressure.

No anti-syphonage arrangements are necessary for fixed head showers. The hose of a loose-head shower must be fixed so that the shower head cannot get closer than 25mm to the top edge of the bath to prevent its immersion in the water. Alternatively the shower can be fitted with an anti-syphonage device at the flexible hose connection. Thermostatically controlled or pressure balancing shower valves will give extra comfort and guard against extreme temperature.

Hot and cold mains water direct to a bidet is, subject to the approval of the local water company, permissible provided that the bidet is of the overrim flushing type. The outlets must be shrouded and unable to be fitted with a hand-held spray. No anti-syphon arrangements are needed.

**LIME SCALE:** In areas of temporary hardness [ $>200\text{ppm}$  of calcium carbonate] it is suggested that a proprietary scale reducer is fitted in the mains cold water connection to the appliance. Installation of a scale inhibitor assembly must be in accordance with the requirements of the local Water Company. The water hardness can be determined by reference to the local Water Company.

An isolating valve should be fitted to allow servicing.

## 10. Gas Supply

The appliance requires a maximum of 2.74 m<sup>3</sup>/h [24i], 3.17m<sup>3</sup>/h [28i] of natural gas (G20) or 1.06 m<sup>3</sup>/h [24i], 1.23m<sup>3</sup>/h [28i] of propane (G31). Refer to Table 7.

A natural gas appliance must be connected to a governed meter. The installation and connection of the gas supply to the appliance must be in accordance with BS6891.

The meter (NG) or regulator (LPG) and the pipework to the appliance must be checked, preferably by the gas supplier, to ensure that a dynamic pressure of 20mbar for natural gas or 37mbar for propane is available at the appliance (contact gas supplier if in doubt) equivalent to about 18.5mbar [NG] or 36mbar [LPG] respectively at the gas valve inlet pressure connection and that the gas flow is adequate for all the installed gas appliances operating together.

## 11. Electrical

**Safety Check: If there is an electrical fault after installation check for fuse failure, short circuits, incorrect polarity of connections, earth continuity or resistance to earth.**

Mains supply: 230V ~ 50 Hz 150watts.

External fuse 3A to BS1362. Internal fuses F1-T2A, F2-TI.25A (20mm). Spare internal fuses are supplied with the appliance.

The mains cable must be 0.75mm<sup>2</sup> (24x0.20 mm) to BS6500 - Table 16 and must be connected to the terminal ST2 marked L (red or brown lead), N (black or blue lead) and the Earth stud (green or green/yellow lead) and secured with the cable clamp. The Earth lead must still be slack when the other leads are taut. Refer to Fig 29.

**The appliance must be earthed.**

The wiring between the appliance and the electrical supply shall comply with current IEE wiring regulations (and any local regulations which apply) for fixed wiring to a stationary appliance.

**NB.** It must be possible to completely isolate the appliance with at least 3mm contact separation in both poles.

A room thermostat or an externally mounted programmer must be suitable for mains voltage operation. The leads must be securely fixed in the cable clamps (see Fig 31).

A fascia mounted digital programmer or mechanical timer or receiver for wireless programmable room thermostat is available as an optional extra. Instructions are supplied with the product.

On very rare occasions it may be necessary to fit an external frost thermostat to protect remote parts of the system. In this case refer to the WHS Technical Department for more information

Tel: 08705 266241 (UK)

. 01 494 0099 (Eire)

Fig. 9. Wiring diagram.

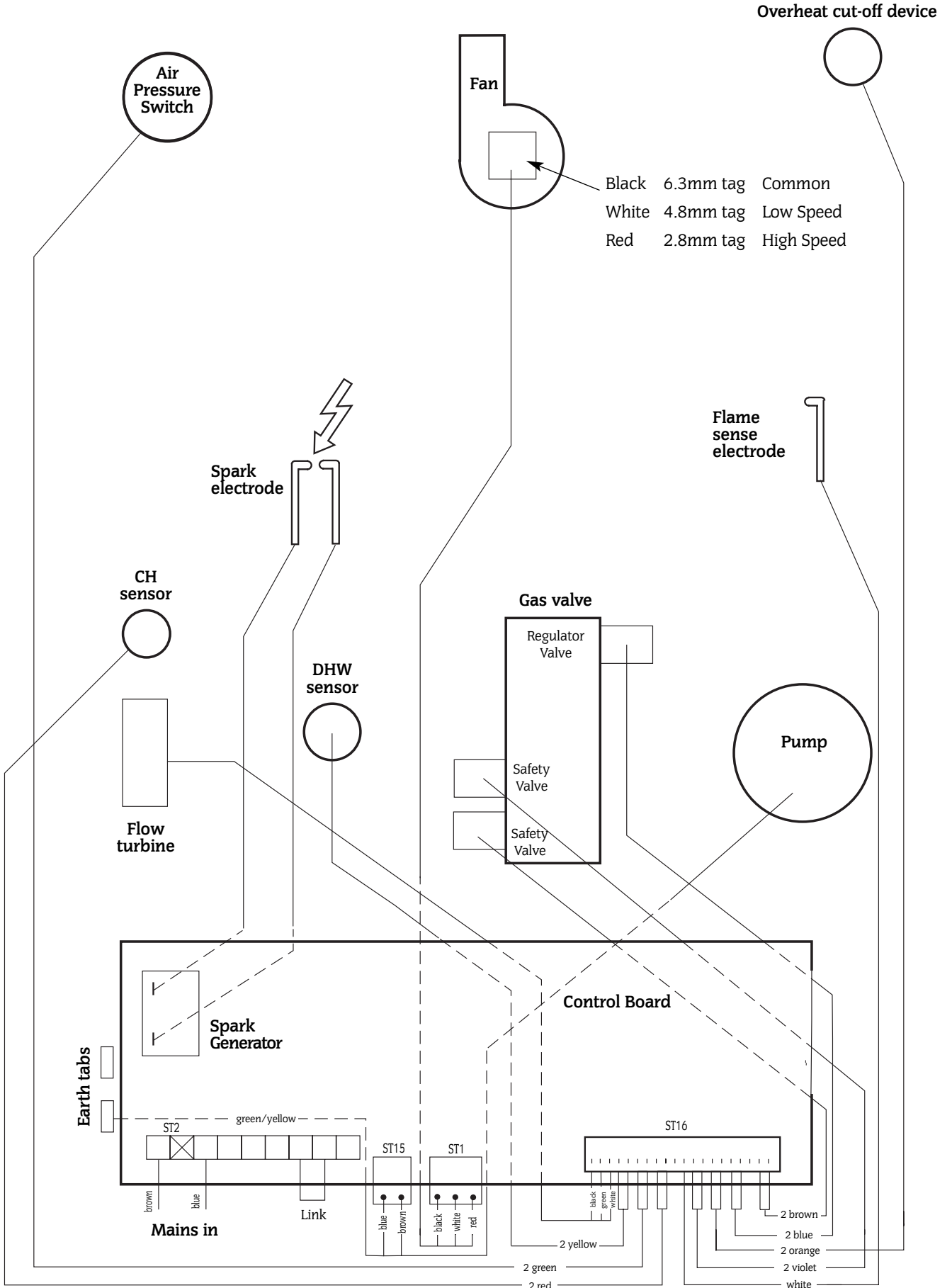
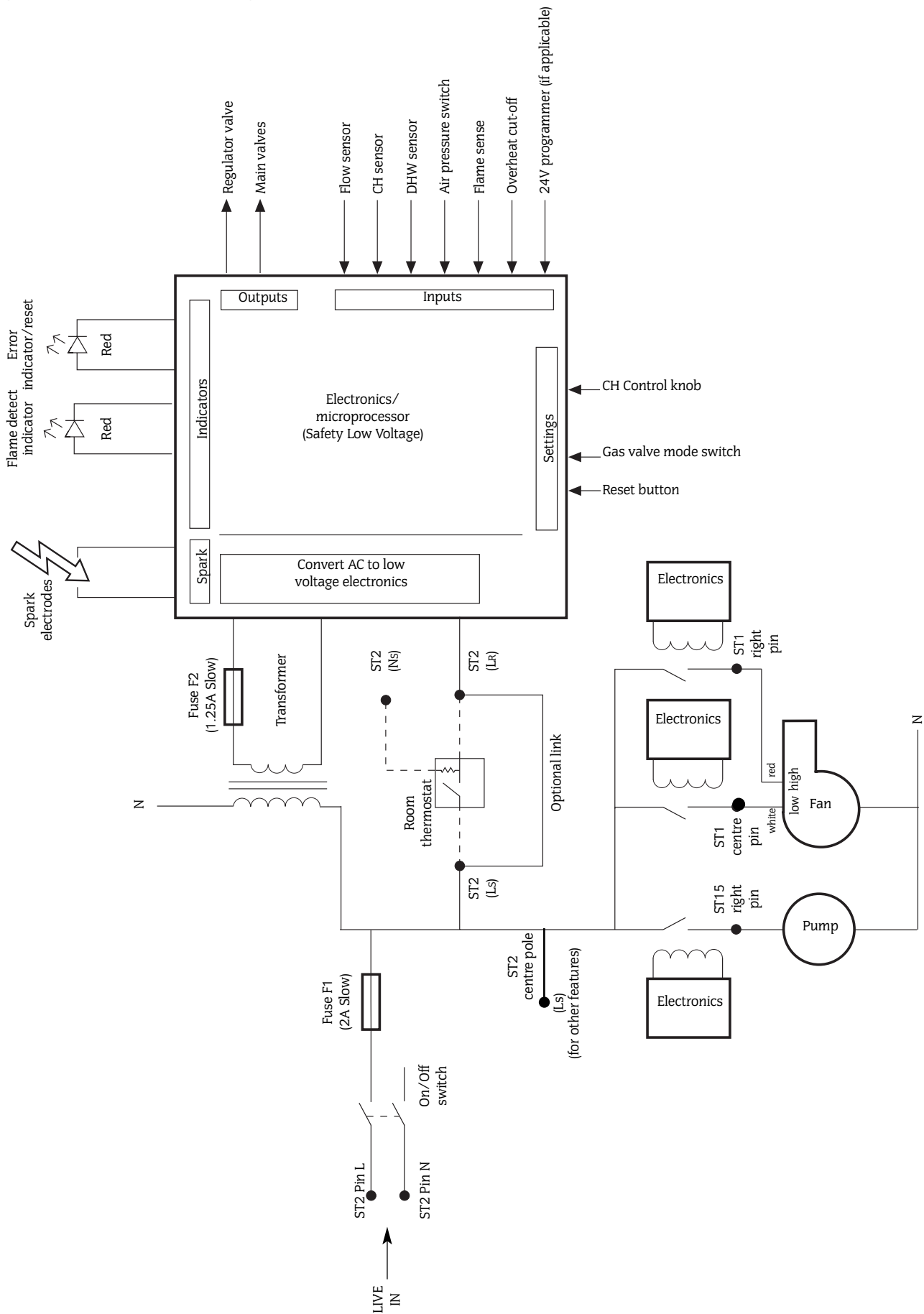


Fig. 10. Functional flow diagram.



## 12. Installing The Appliance

**NOTE: READ THIS SECTION FULLY BEFORE COMMENCING THE INSTALLATION.**

### 11.1 General

The appliance is only suitable for fitting to a sealed system. The flue must be installed as specified in BS5440:1 and the current Building Regulations, and, in Eire in accordance with the current edition of IS813.

### 11.2 Unpacking

Open the carton and check the contents against the packing list.

### 11.3 Boiler Preparation

Lift out the wall mounting assembly.

**NOTE:** The wall mounting assembly can be removed from the carton **without** having to remove the boiler.

### 11.4 Site Preparation

Check that the correct position for the appliance has been chosen. Refer to Section 4 and Table 8.

Check that the wall is flat and will support the weight of the appliance. Refer to Table 4.

### 11.5 Fixing Holes and Flue Opening

Hold the template against the wall.

Check that the template is level and mark the position of the upper keyhole fixing holes and the flue opening. Refer to Fig 11. Mark the centrelines of the pipe connections to aid the pre-plumbing of the system pipework if required.

Check the position of the fixing points and flue opening before drilling the fixing holes 60mm deep for the No. 12 size plugs and cutting the flue duct hole at 110mm diameter [150mm diameter for internally fitted flues].

### 11.6 Wall Mounting and Manifold Assembly

Fit the plugs and insert the screws.

Check that all the service valves are closed on the manifold assembly. Offer the assembly to the wall utilising the keyhole slots and fix to the wall. Refer to Fig 12 and 15.

Check that the assembly is properly aligned before tightening the screws.

### 11.7 Gas and Water Pipes

Fit the appropriate fitting to connect the gas cock to the gas supply pipe. Refer Fig 13.

Pre-plumbing is not recommended if no movement in the pipes is available. If it is necessary for any of the pipes to run up the back of the appliance then they must be arranged to pass each side of the expansion vessel in the channels provided. Refer to Fig 12. Pipework must not run horizontally within the limits of the casing. It is important that the pipes are not fixed near the appliance using clips that put a strain on the connections.

**benchmark** Before the appliance is fitted to the wall thoroughly flush the system and mains water supply.

Fig. 11. Side flue opening

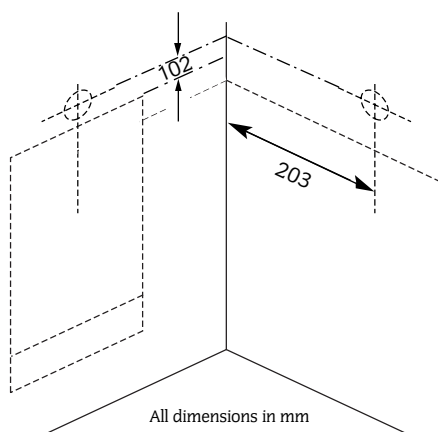
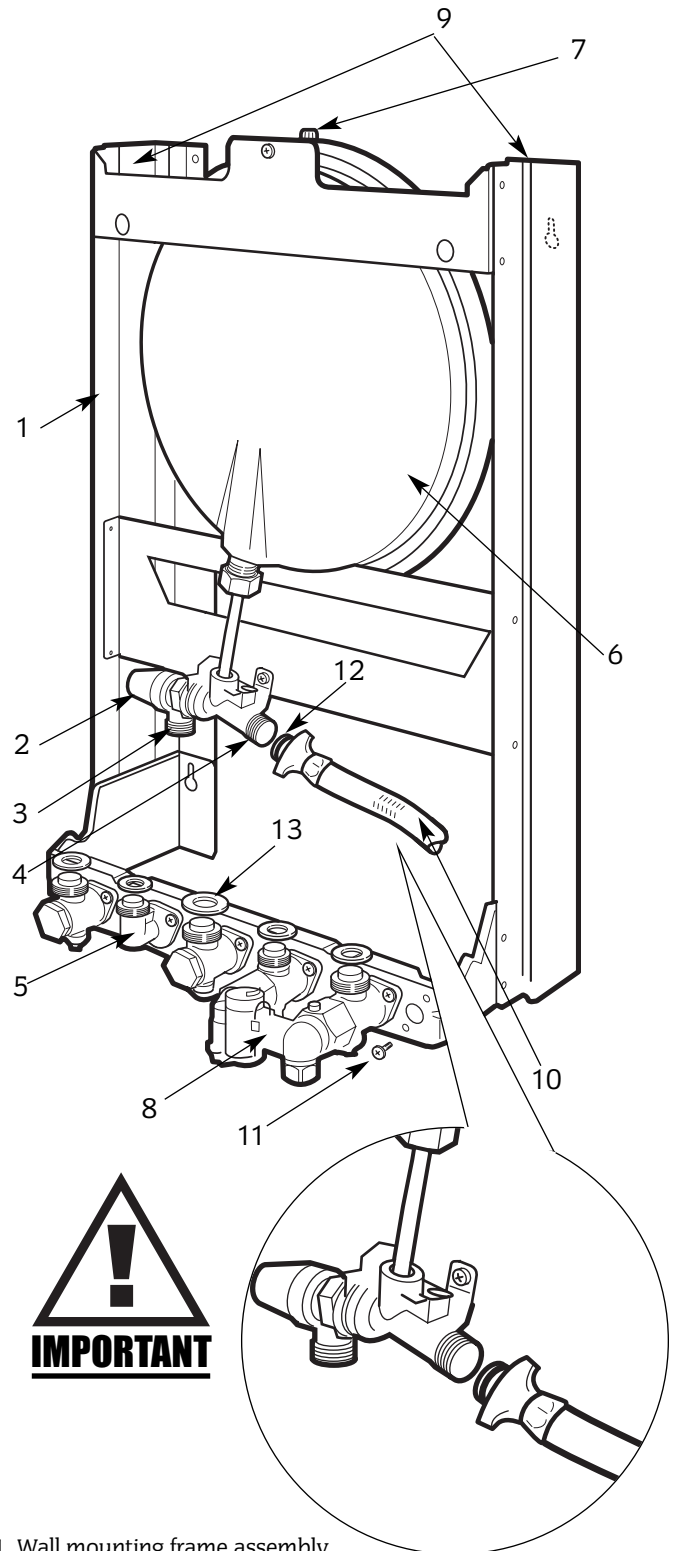

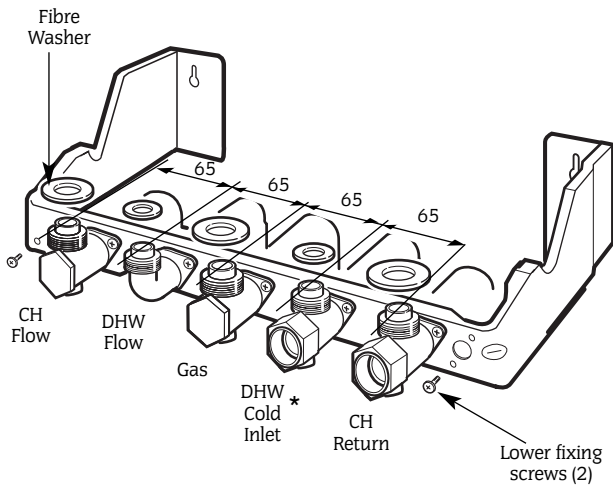


Fig. 12. Wall mounting assembly



1. Wall mounting frame assembly
2. Relief valve
3. Relief valve drain connection
4. System connection
5. Manifold assembly
6. Expansion vessel
7. Expansion vessel charging point
8. Filling Loop (optional extra)
9. Channels for system pipes
10. Flexible connector from pump ( **HAND TIGHTEN ONLY** ) 
11. Lower fixing screws (2)
12. O-Ring
13. Washers

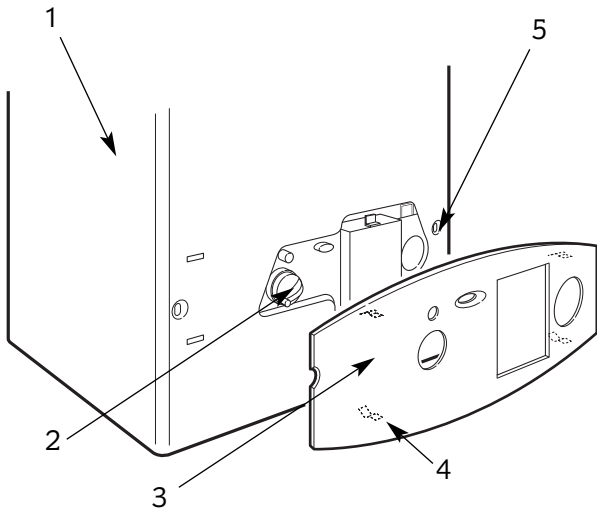
**Fig. 13 . Manifold assembly**



\* Filling loop not shown

All dimensions in mm

**Fig. 14 . Facia cover**

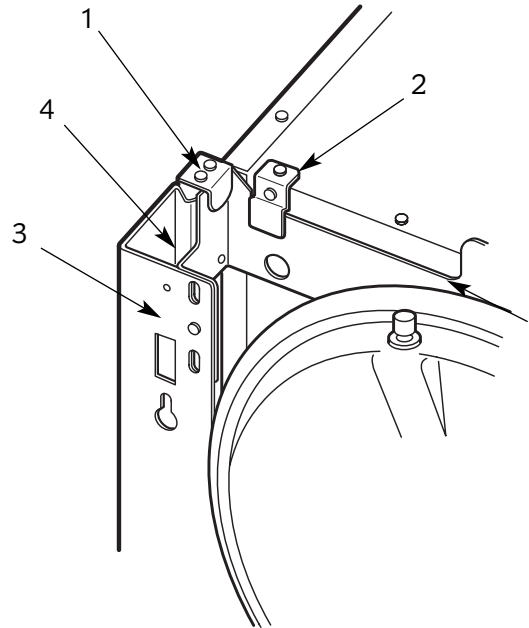


1. Cabinet
2. Control
3. Facia cover
4. Facia cover clips (4)
5. Cabinet fixing screws (2)

**11.7 Install the Boiler**

Check that the gas and water valves are closed. Refer to Fig 13. Fit the fibre washers, in the hardware pack, to the service valves on the manifold.  
Remove the two fixing screws.  
Lift the appliance to the wall, engage in the top support and lower onto the manifold assembly. Tighten the gas and water connections.

**Fig. 15 . Appliance location**



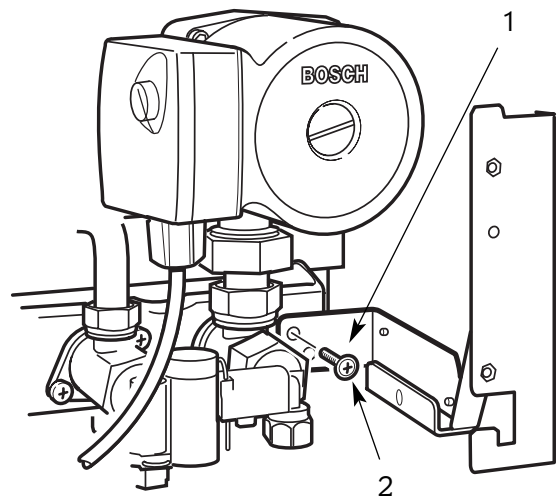
1. Casing location bracket
2. Appliance location bracket
3. Wall mounting frame
4. Pipe channel

Unscrew the facia fixing screws. Refer to Fig 18.  
Unhook the panel and lower it into the bottom support lugs. Do not strain the support strap. Refer to Fig. 18 and 41.  
Fix the boiler at the right and left to the mounting frame using the two lower fixing screws provided. Refer to Fig. 13 and 16.



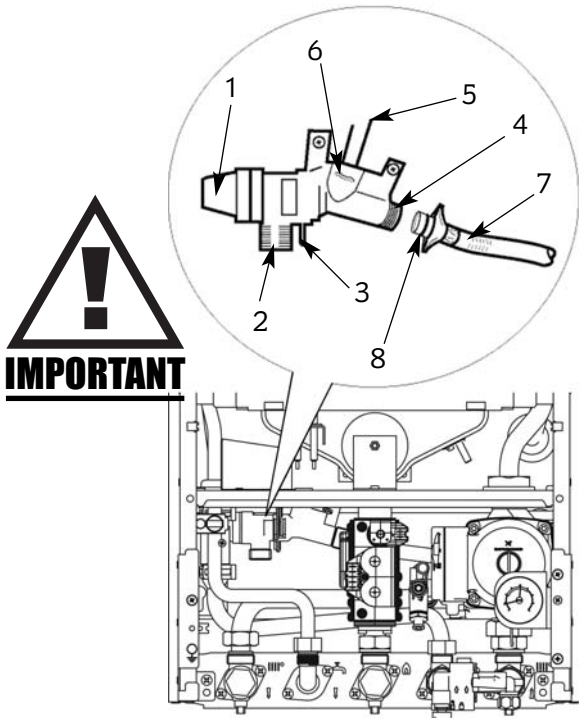
Remove the protective cap from the flexible hose. Check that the O-ring is in good condition. Connect the hose to the system connection point- **HAND TIGHTEN ONLY.** Refer to Figs 12 & 17.  
Fit a discharge pipe to the relief valve leading it away from any electrics or where it might be a hazard. The pipe must not be less than 15mm in diameter and must run continuously downward outside the appliance. Refer to Fig. 17.

**Fig. 16 . Appliance fixing**



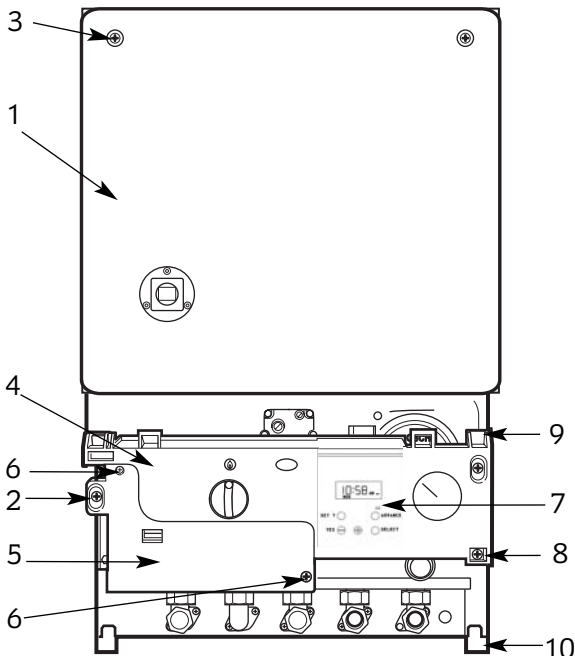
1. Appliance fixing bracket
2. Fixing screw

**Fig. 17 . Relief valve discharge connection**



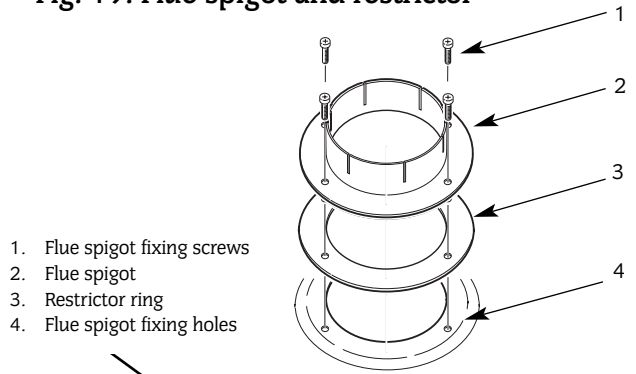
- 1. Relief valve
- 2. Relief valve discharge connection
- 3. Relief valve securing clip
- 4. System connection point
- 5. Expansion vessel connection
- 6. Expansion vessel securing clip
- 7. Flexible connector from pump
- 8. O-ring

**Fig. 18. Inner case and facia fixing**



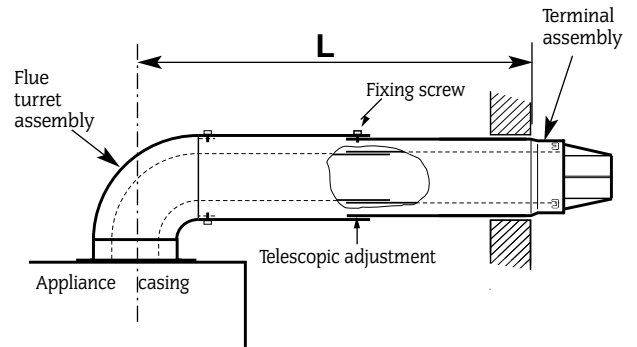
- 1. Inner casing cover
- 2. Control panel fixing screws (2)
- 3. Inner casing cover fixing screws (2)
- 4. Control panel
- 5. Controls connector cover
- 6. Controls connector cover fixing screws (2)
- 7. Programmer (optional)
- 8. Facia control panel fixing screw
- 9. Top support lug (2)
- 10. Bottom support lug (2)

**Fig. 19. Flue spigot and restrictor**



- 1. Flue spigot fixing screws
- 2. Flue spigot
- 3. Restrictor ring
- 4. Flue spigot fixing holes

**Fig. 20. Standard flue assembly**



**11.8 Air and Flue Duct Preparation**

11.8.1 The method of installation of the flue system may be varied to suit the actual site conditions. The instructions for connecting and fixing the ducts must, however, be strictly followed.

**Remove all packing material from the flue components.**

**11.8.2**

RESTRICTOR RINGS		
Flue length	24i	28i
Horizontal up to 1m	76mm	80mm
Horizontal above 1m	None	None
Vertical terminal and up to 1m flue	76mm	80mm
Vertical flue greater than 1000mm	None	None

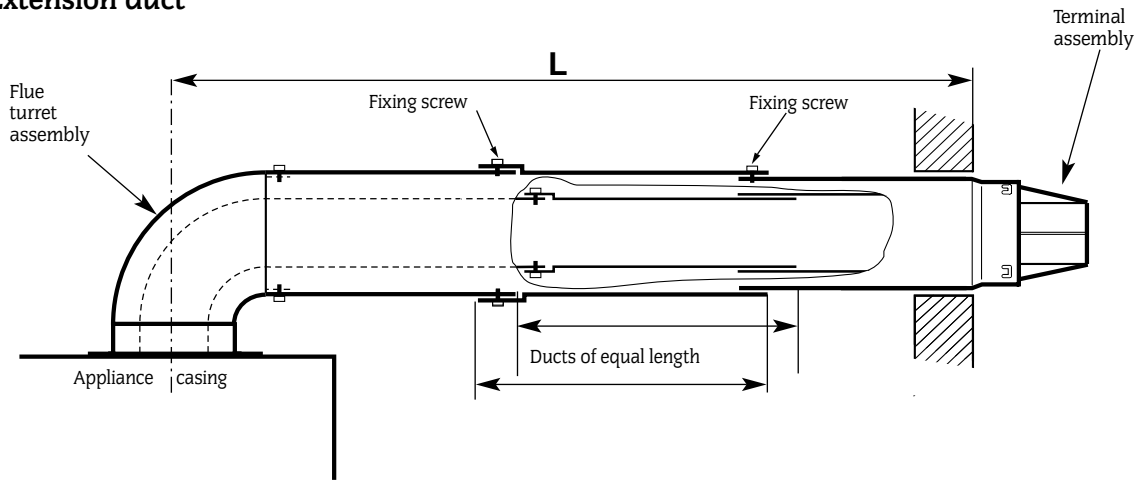
11.8.3 Fit the flue restrictor ring by unscrewing the flue spigot from the boiler. Refer to Fig. 19.

The standard telescopic flue assembly is suitable (without cutting) for flues from 425mm up to 725mm measured from the centre-line of the boiler flue outlet to the outer face of the wall. Refer to Fig. 20.

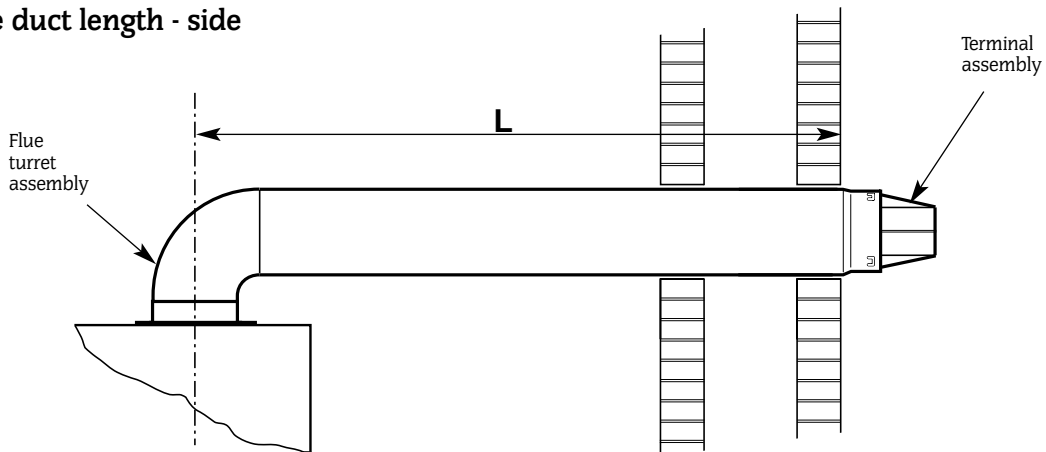
The minimum length of the standard flue, after cutting is 275mm. If L is greater than 725mm then extension duct kit/s will be required - each kit extends the flue by 750mm up to a maximum of 3000 mm.

EXTENSION	MAXIMUM FLUE LENGTH mm
1	1475
2	2225
3	2975

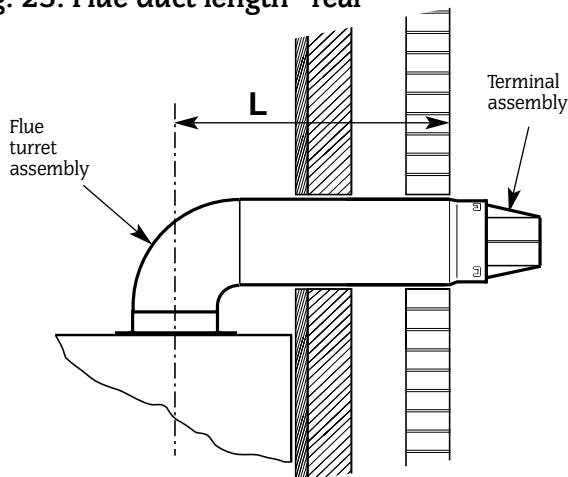
**Fig. 21. Extension duct**



**Fig. 22. Flue duct length - side**



**Fig. 23. Flue duct length - rear**



**11.9 Measure and Cut the Ducts.**

**General:** Cut the ducts as necessary, ensuring that the cuts are square and free from burrs. Always check the dimensions before cutting.

Measure the distance L. Refer to Fig. 20, 21, 22 and 23.

The standard flue can be telescopically adjusted to any length between 425mm and 725mm measured from the centre of the turret without the need to cut the ducts.

Fix the flue assembly together using the self-tapping screws provided. Refer to Fig. 20.

It will only be necessary to cut the standard assembly if L is less than 425mm. Cut the flue turret assembly and the terminal assembly by the same amount eg. if L=350 – remove 75mm (425 – 350) from each assembly.

**It is not necessary to cut the ducts**

If L is between	1175 - 1475mm	(1 extension)
	1925 - 2225mm	(2 extension)
	2675 - 2975mm	(3 extension)

**It will be necessary to cut the ducts**

If L is between	725 - 1175mm	(1 extension)
	1475 - 1925mm	(2 extension)
	2225 - 2675mm	(3 extension)

It is necessary to shorten the assembly by cutting the first extension duct assembly eg. L = 1000mm — remove 175mm from the air and flue ducts (1175 – 1000 = 175mm).

**NOTE:** Extension duct measurements do not include the socketed end. Unless specifically instructed the socketed end must not be removed.

Fix the flue ducts together before fixing the surrounding air duct. The cut ducts fit into the terminal assembly.

**11.10 Fitting the Flue Assembly with Access to the Terminal.**

Prepare the flue duct assembly as described in Section 11.8.

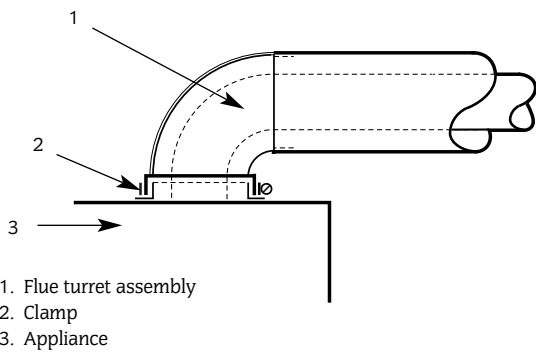
Apply the plastic tape to the air duct to be in contact with the external brickwork.

From inside push the assembly through the wall. Align the flue turret and push fully onto the spigot on the appliance. Tighten the clamping ring. Refer to Fig. 24.

Make good the internal wall face and the external brickwork or rendering.

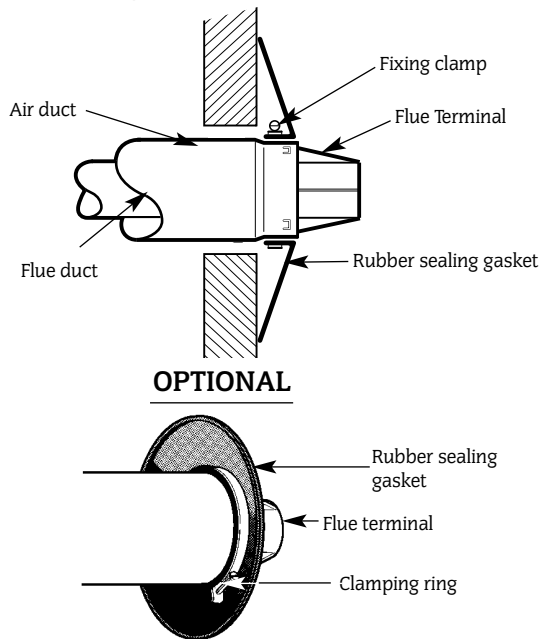


**Fig. 24 . Flue Turret Fixing**



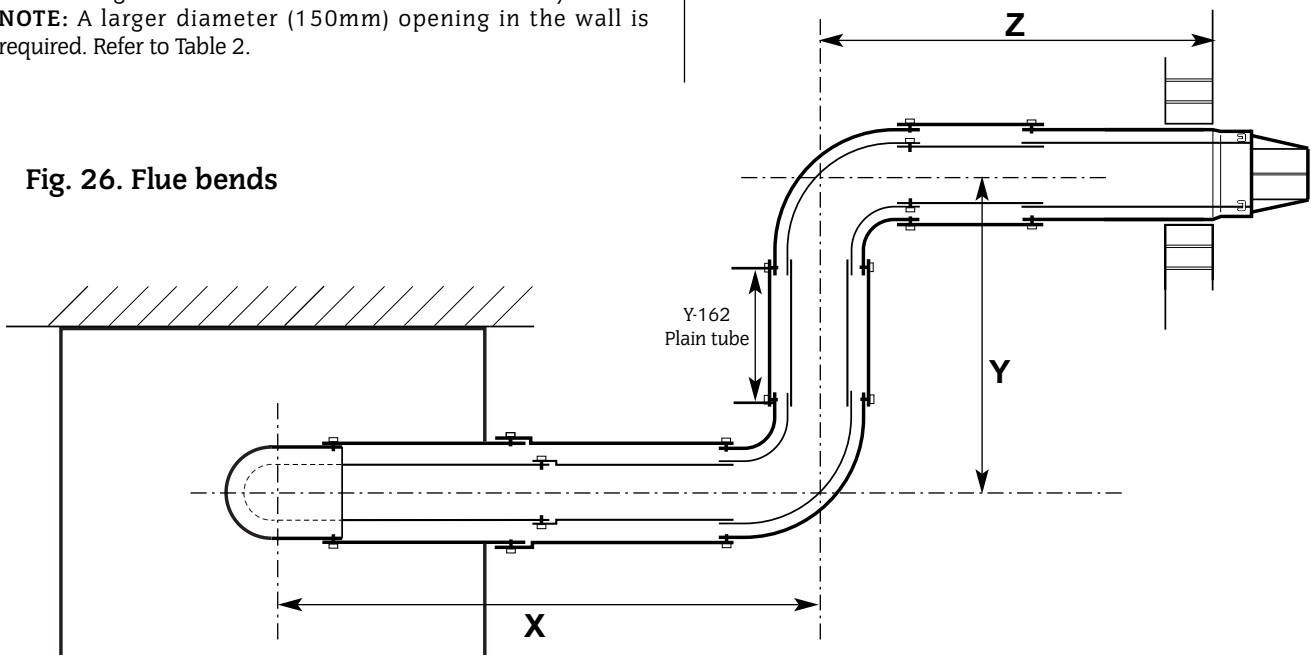
**11.11 Fitting of the Flue Assembly without access to the Terminal.**

**Fig. 25 . Terminal assembly for internal fitting of the flue.**



The rubber gasket kit is available from Worcester Heat Systems.  
**NOTE:** A larger diameter (150mm) opening in the wall is required. Refer to Table 2.

**Fig. 26. Flue bends**



Prepare the flue assembly as described in Section 11.8.

Fit the rubber sealing gasket centrally onto the terminal assembly and tighten the clamp. Refer to Fig. 25.

Apply the plastic tape to the air duct to be in contact with the external brickwork.

From inside push the assembly through the wall so that the gasket flange is against the outer face. Refer to Fig. 25. It may be necessary to adjust the legs of the flue centering ring. Align the flue turret and push fully onto the socket on the appliance. Tighten the clamping ring. Refer to Fig. 24. Seal the gap around the duct at the inner wall face with the flexible seal provided and make good.

**11.12 Flue Bends.**

90° and 45° bends are available. A maximum of two bends may be used in addition to the first bend on the flue turret. A 90° bend is equivalent to 750mm of straight duct. A 45° bend is equivalent to 375mm of straight duct.

The maximum flue assembly is 2250mm with 1x90° bend and 1500mm with 2x90° bends.

Measure the lengths X,Y and Z. Refer to Fig. 26.

The maximum value of X using the turret assembly only is 506mm. Reduce the ducts to the appropriate length eg. X = 406mm, cut 100mm from the air duct and 120mm (to cover the entry into the 45° or 90° elbow) from the flue duct. Refer to Fig. 27.

**NOTE:** The flue system ducts between the elbows, dimension Y, requires the socketed ends (of the first extension if two or more are used) to be removed and the air and flue tubes to be cut to the same length.

Cut the ducts to a length Y – 162mm. Refer to Fig.26.

The final section, dimension Z, of the flue system must include a section of plain duct assembly eg. an extension assembly with the sockets removed. Reduce the final section, including the terminal assembly, by the appropriate amount eg:

Air duct Z - 81 mm and the flue duct Z - 51mm. Refer to Fig.26.

If Z is less than 425mm it will be necessary to cut the air and flue ducts of the extension to a plain length of 100mm and reduce the length of the terminal assembly eg. Z = 350mm - remove 75mm from the terminal assembly.

If Z is between 425 - 725mm it is not necessary to cut the terminal assembly or use a second extension duct as the length can be set telescopically.

If Z is greater than 725mm then two extension duct assemblies will be required, the first assembly being cut to length as plain tubes.

If more than two extension ducts are needed in any section to achieve the required length then the final section of the assembly must not be less than 275mm without cutting the terminal assembly.

NOTE: The flue duct of the final extension must be 30mm longer than the air duct.

Each section must be connected to the previous section of the flue bend by fixing the flue ducts together and then similarly fixing the air ducts which engage the elbows.

Fit the assembly as described in Section 11.9, 11.10 as appropriate.

Make good the internal and external brickwork or rendering.

### 11.13 Vertical Adapter for Horizontal Flues

An adapter is available for an initial short section of vertical flue. Refer to Fig. 28.

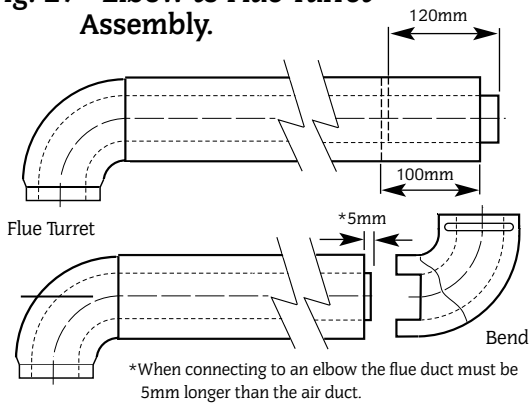
Measure and cut the flue as described in Section 11.12.

The first, vertical, section (equivalent to dimension X) is measured from the top of the boiler casing. Cut the vertical section of the extension duct to 167mm less than the measured distance. Do not remove the socketed ends.

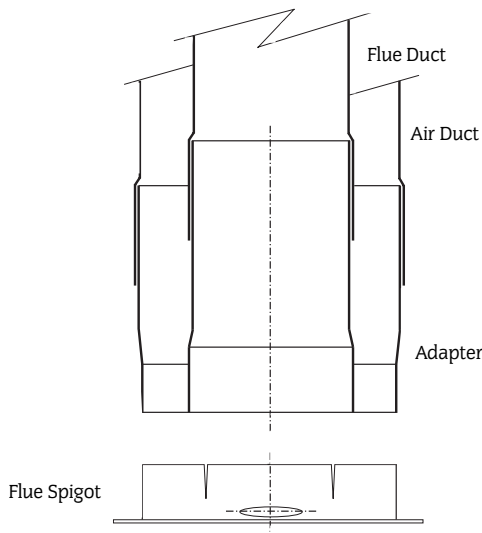
The minimum measured distance is 167mm.

Seal the air duct to the spigot using silicone sealant.

**Fig. 27 - Elbow to Flue Turret Assembly.**



**Fig. 28 Vertical Adapter.**



### 11.14 Completion of the Installation

Check that all the gas and water connections on the manifold have been tightened.

Undo the two screws and remove the connections cover panel. Refer to Fig. 29.

Connect the mains supply lead to the appliance and secure the cable clamp. Refer to Fig. 29.

Check that there is sufficient loose lead to allow the release of the fascia panel assembly.

Connect the earth lead. The earth lead of the mains supply must be longer than the live and neutral leads.

Fit the fascia mounted clock or programmer. Full instructions are sent with the control. Refer to Fig. 30.

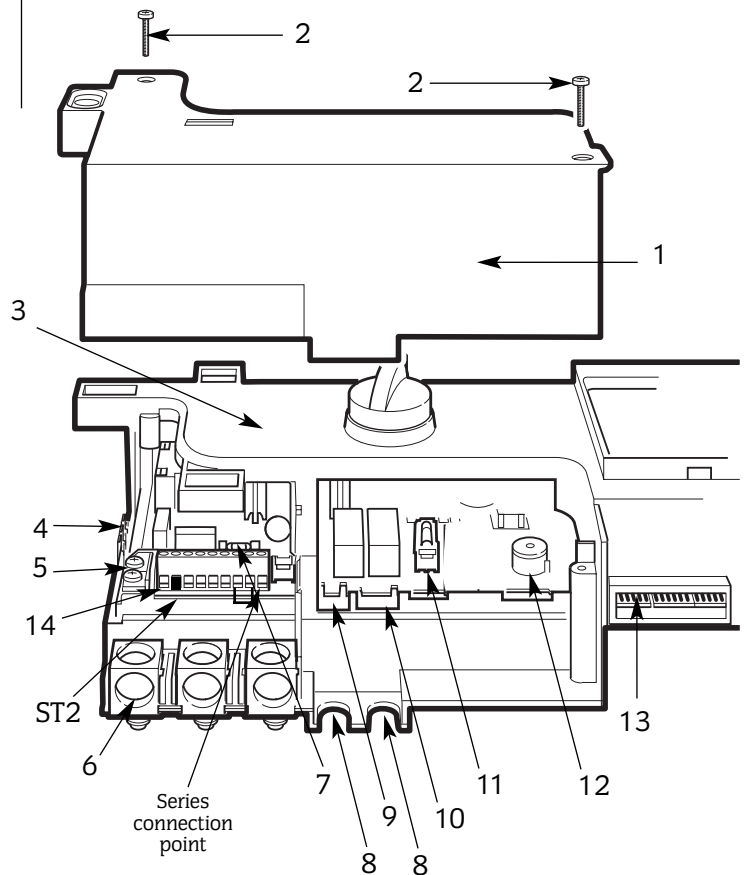
Connect any external controls ensuring that the leads pass through the appropriate cable clamp. Refer to Section 11 and Fig. 31.

Test for gas soundness as described in BS6891.

If the appliance is not to be commissioned immediately, replace the connection cover panel and the cabinet.

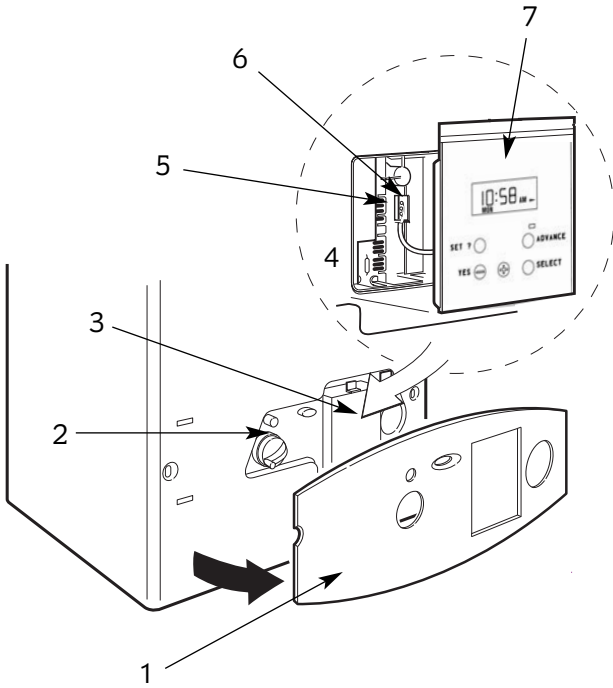
Check that the gas and electricity services have been turned off.

**Fig. 29. Facia connections**



- |   |  |
|---|--|
| 1. Controls connector cover                   | 9. ST15 Pump                                     |
| 2. Controls connector cover fixing screws (2) | 10. ST1 Fan                                      |
| 3. Facia control panel                        | 11. Fuse F2 1.25A (slow)                         |
| 4. Earth connection (tags)                    | 12. Commissioning switch (gas valve mode switch) |
| 5. Earth connection (screws)                  | 13. Internal controls connectors                 |
| 6. Cable clamp                                | 14. Mains and external controls connectors       |
| 7. Fuse F1 2A (slow)                          |  |
| 8. Cable clamps (pump and fan)                |  |

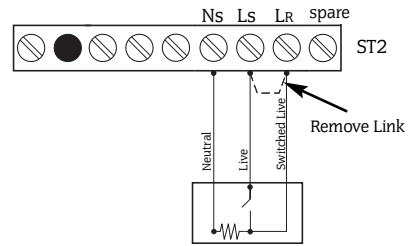
**Fig. 30. Optional programmer connection**



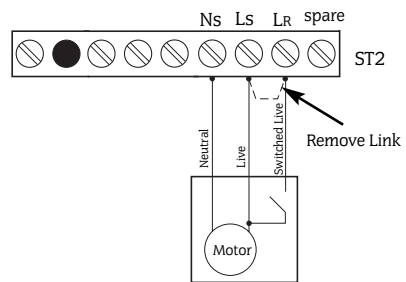
1. Facia (gently pull forward to un-clip and remove)
2. Control panel (boiler outer casing in place)
3. Programmer cover (un-clip to remove)
4. Programmer location in detail
5. Programmer connections
6. Programmer connector plug
7. Programmer

**Fig 31 - Mains Voltage External Controls Connections**

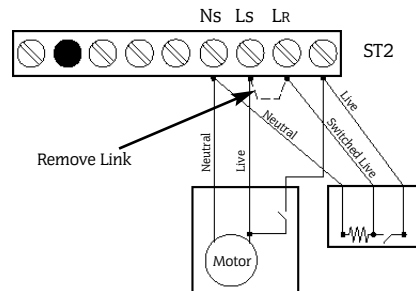
**230 V Room Thermostat Connections**



**230 V Programmer Connections**



**230 V room thermostat and Programmer Connections**



## 13. Commissioning The Appliance

In Eire additional guidance on commissioning is contained in paragraph 15 of IS 813:2001

**13.1 *benchmark* Water Treatment:** For optimum performance after installation, this boiler and its associated central heating system should be flushed in accordance with the guidelines given in BS7593 – Treatment of water in domestic hot water heating systems. Full instructions are supplied with proprietary cleansers sold for this purpose. If an inhibitor is to be used after flushing, it should be used in accordance with the manufacturers instructions. Remove all system cleanser before adding any inhibitor. Suitable flushing agents and inhibitors are available from Betz Dearborn on 0151 4209563 or Fernox Tel: 01799 550811.

**13.2** This text describes the filling and venting of the appliance and system when the optional internal filling loop is fitted.

Any external filling loop must be WRAS approved. Refer to Fig. 8 b. It is very important that the appliance and system are fully vented. Pull off the clip on bottom panel. Refer to Fig. 32.

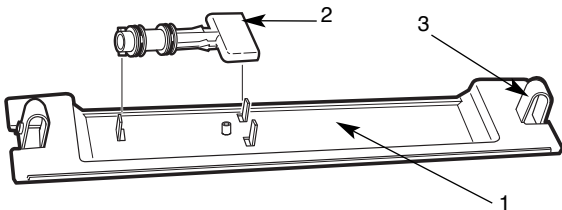
Remove the cabinet by pulling off the clip-on fascia cover. Unscrew the two fixing screws, release the sides and lift from the top location.

**Check that the electrical supply and the gas supply to the appliance are turned off and that all the water connections throughout the system are tight.**

Open the system valves at the appliance. Refer to Fig 13.

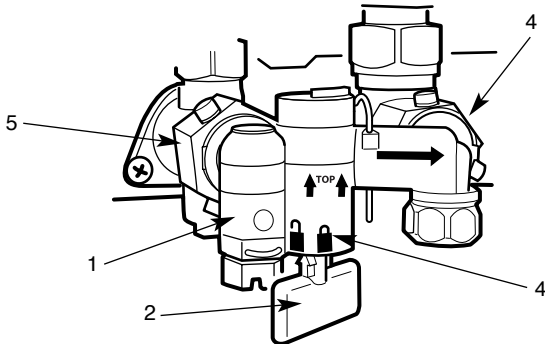
Open all the radiator valves.

**Fig. 32. Bottom Panel**



1. Bottom panel
2. Filling key
3. Fixing clips

**Fig. 33. Filling Loop (optional)**



1. Filling loop
2. Filling key
3. Lock/unlock Fill position
4. CH Return
5. Mains water inlet

**13.3** Remove the key from the bottom panel and insert into the filling loop. Refer to Fig. 32 and 33.

Open the mains cold water inlet valve .

Turn the key clockwise to unlock the filling loop.

The system will fill.

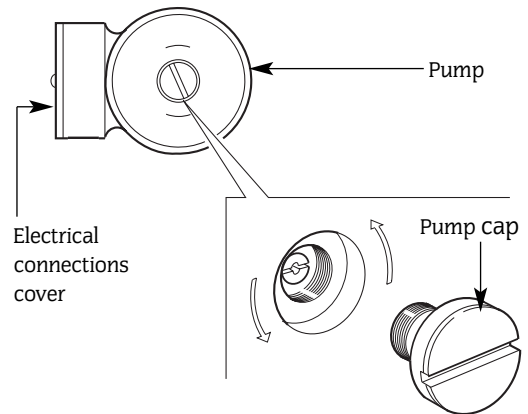
Vent each radiator in turn. The automatic air vent will vent the appliance.

**It is very important that the appliance and system are fully vented and that all air pockets are removed.**

Remove the cap from the pump and turn the shaft about half a turn. Replace the cap. Refer to Fig. 34.

Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Refer to Fig. 17. Water should be expelled from the discharge pipe.

**Fig. 34. Pump venting.**



### 13.4 Set the Expansion Vessel Pressure

The charge pressure of the expansion vessel as dispatched is 0.5bar, which is equivalent to a static head of 5m. The charge pressure must not be less than the static head at the point of connection. A Schraeder type valve is fitted to the top of the expansion vessel to allow the charge pressure to be increased if necessary. Refer to Fig. 15.

The expansion vessel must be charged to 0.35bar less than the initial system design pressure.

Note: 1bar = 10.2m of water.

### 13.5 Set the System Pressure

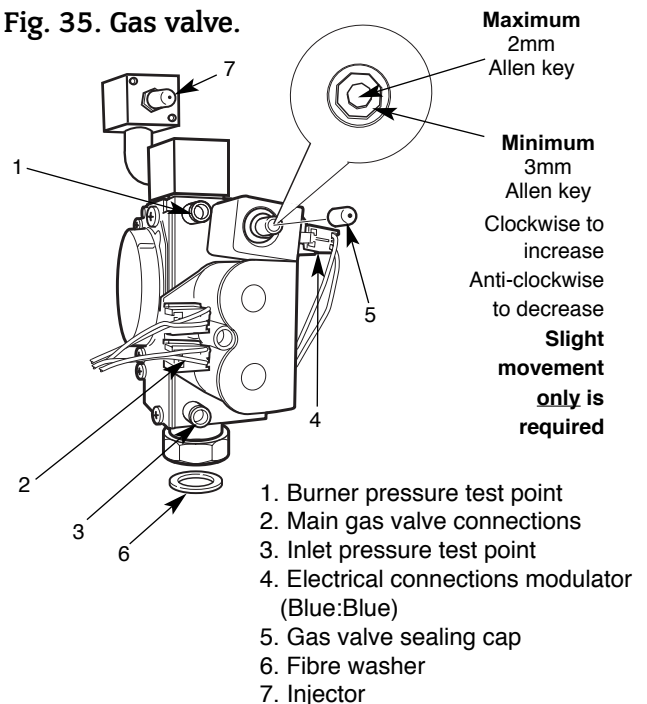
Fill the system until the pressure gauge is at 2.5bar and check for leaks. Turn the filling key anti-clockwise to shut the filling loop. Replace the key in the bottom panel. Release water from the system drain point until the required system pressure is obtained, upto a maximum of 1.5bar. Set the pointer on the pressure gauge to record the set system pressure.

If the pressure indicated on the gauge is greater than 2.65bar when operating at the maximum central heating temperature then an extra expansion vessel must be fitted to the system as close as possible to the appliance central heating return connection.

### 13.6 Clock/Programmer

The controls fitted to the appliance should be set up at this stage. Refer to the instructions sent with the control.

**Fig. 35. Gas valve.**

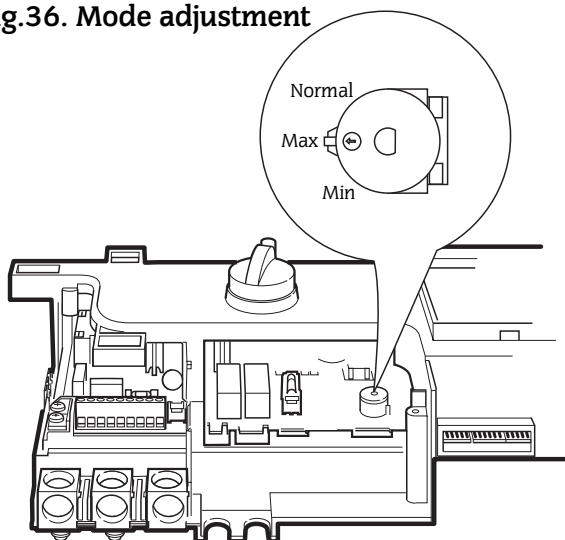


1. Burner pressure test point
  2. Main gas valve connections
  3. Inlet pressure test point
  4. Electrical connections modulator (Blue:Blue)
  5. Gas valve sealing cap
  6. Fibre washer
  7. Injector
- Maximum  
2mm  
Allen key
- Minimum  
3mm  
Allen key
- Clockwise to  
increase  
Anti-clockwise  
to decrease  
**Slight  
movement  
only is  
required**

### 13.7 Checking the Burner Pressure

Unscrew the fascia fixing screw. Unhook the panel and lower it into the bottom support lugs. Do not strain the support strap. Refer to Fig. 18.

**Fig.36. Mode adjustment**



Check that the gas and electricity supplies are turned off. Connect pressure gauges to the gas valve to measure the inlet pressure and the burner pressure. Refer to Fig. 35.

**The appliance is fully set up in the factory and no adjustment should be necessary.**

Unscrew and remove the control connector cover to display the mode switch. Refer to Fig. 18.

Check that all the radiator valves are open. Check that the system is fully vented and pressurised and set to the required pressure as indicated on the gauge.

Set the temperature control knob to maximum and the clock/programmer to operate continuously.

Fully open a hot tap.

Set the mode switch to MAX. Refer to Fig. 36.

Turn on the gas and electricity supplies.

A continuous spark will occur until the burner is alight and sensed by the control circuit. The burner will remain at its maximum domestic hot water pressure for 1 minute. Refer to Table 1. It should not be necessary for the gas valve to be adjusted.

**Note:** The burner pressure is factory set and if, after checking that the dynamic (working) supply pressure is sufficient i.e. 18.5mb approx. [NG] or 36mbar approx. [LPG] at the gas valve inlet pressure test point, the correct pressure cannot be obtained then Worcester Heat Systems Service Department should be contacted. If the appliance does not light then check that it is not in the 'lock-out' state by gently pressing the reset button for 5 seconds. Refer to Fig. 37.

Set the mode switch to Normal.

Turn off the hot tap.

The burner pressure will drop to the minimum setting and will ramp up to the maximum central heating pressure appropriate to the appliance and the gas. Refer to Table 1.

Set the mode switch to MIN.

The burner pressure will drop to the minimum burner pressure appropriate to the appliance and the gas for both the central heating and domestic hot water modes. Refer to Table 1.


Set the mode switch back to Normal.

Turn the electricity supply off and then back on to reset the controls.

Replace the controls connector cover.

### 13.8 Operation of the appliance

#### Domestic Hot Water

Turn the temperature control knob fully anti-clockwise to .

Open a hot tap near the appliance. The burner will light and go to the maximum burner pressure appropriate to the appliance and the gas. Refer to Table 1. Gradually close the tap and check that the burner pressure falls. Fully open the tap and check that the pressure rises. Close the tap and check that the burner goes out.

The fan may continue running until the appliance has cooled to a pre-set temperature.

#### Central Heating

Check that all the radiator valves are open.

Check that the system is fully vented and set to the required pressure as indicated on the gauge.

Check that the clock/programmer is set to operate continuously. Set the room thermostat and the heating temperature control to maximum.

The burner will light and the appliance will modulate its output from minimum to maximum over a period of about two minutes. Check that all the radiators are heating up evenly. Shut down all but one of the radiators and observe the burner pressure fall. Open all the radiators and check that the burner pressure rises.

Balance the system to give the required temperature differential. Refer to Table 3.

#### Minimum system flow rate

Please ensure that the external system flow rate returning to the appliance is greater than 2 litres/minute.


Set the room thermostat to minimum and check that the burner goes out.

Reset the room thermostat to maximum and the burner will re-light and follow the normal operating procedure.

#### Check flame failure device

Turn off the gas service cock. The burner will go out but sparking from the electrode will continue for 10 seconds when the appliance will 'lock-out'. After 60 seconds carefully open the gas service cock, press and hold-in before releasing the reset button and observe the burner re-light and follow the normal sequence of operation. Refer to Fig 13.

Turn off the gas service cock and the electricity supply to the appliance.

 Drain the system while the appliance is hot.

Refill, vent and re-pressurise the system as described in the text preceding, adding, if necessary, a suitable proprietary inhibitor.

Further information is available from Betz Dearborn Tel: 0151 4209563 or Fernox Tel: 01799 550811.

#### Domestic Hot Water and Central Heating

Set all controls to maximum. Turn on the electricity supply to the appliance and open the gas service cock at the appliance. The burner will light and heat will pass into the system.

Turn on a hot tap and check that hot water is soon discharged from the tap. Close the tap and the burner will go off. The appliance will then return to the central heating mode and automatically balance with the system requirements.

#### 13.9 Completion of Commissioning

Turn off the appliance and disconnect the pressure gauge and tighten the test point screw.

Restart the appliance and check for gas soundness around the test point screw.

Refit the control panel, cabinet and the bottom panel.

If the appliance is to be passed over to the user immediately then set the boiler and system controls to the users requirements.

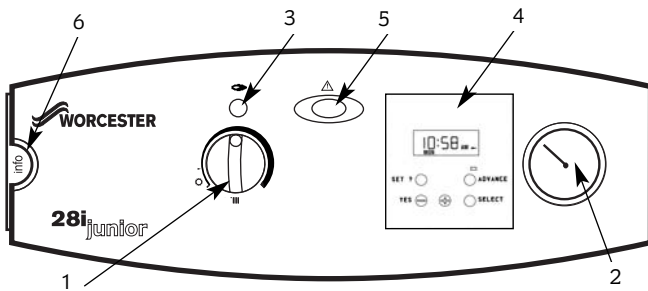
If the appliance is to be left inoperative in frosty conditions then set the programmer, if fitted, to off. Do not turn the electricity or gas supplies off. The appliance will operate under the control of the integral frost protection facility.

If there is any possibility of the appliance being left totally unused in freezing conditions then switch off the gas and electricity and drain the appliance and the system. The appliance must be fully commissioned when it is returned to service. **The venting of the system is very important.**



## 14. Hand Over

Fig. 37. Facia controls



1. Central Heating temperature control and On/Off knob
2. System pressure gauge
3. Burner ON indicator
4. Optional timer
5. Fault indicator and reset button
6. User guide location

**benchmark** Hand over the User Booklet and the completed Benchmark Logbook and/or, in Eire, the Declaration. Explain how to operate the appliance safely and efficiently. Tell the user what to do if the appliance is not to be used in very cold conditions.

Tell the user what to do if the system pressure falls.

Explain that regular servicing will maintain the safe and efficient operation and extend the life of the appliance. Worcester Heat Systems or their agent can offer a comprehensive maintenance contract.

Tell the user that any work on the appliance must only be carried-out by a competent, CORGI (in the UK) registered, person.

## 15. Inspection And Service

**15.1** To ensure continued efficient operation of the appliance it must be checked at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but once per year should generally be adequate. The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers. Any service work must be carried out by competent registered engineers (CORGI in GB).

### 15.2 Inspection

Check that the terminal and the terminal guard, if fitted, are clear and undamaged.

If the appliance is in a compartment or cupboard check that the specified service space around the appliance is clear. Refer to Table 8. Check all the joints and connections in the system and remake any that show signs of leakage. Refill and re-pressurise as described in Section 13-Commissioning.

Operate the appliance and take note of any irregularities. Refer to Section 19-Fault Finding for rectification procedures.

### 15.3 Combustion performance

It is not normally necessary to check the combustion performance of the appliance. A sampling point is, however, provided. Refer to Fig. 38.

The combustion performance figures given are for guidance.

Remove the cap from the sample point on the top of the appliance.

Connect the approved sampling meter.

With the appliance at maximum rate and stable in the DHW mode expect readings of:

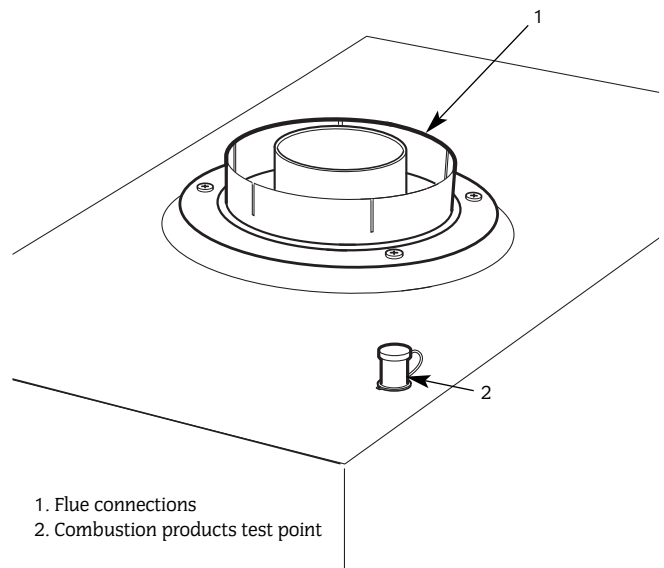
NG CO <sub>2</sub>	6.5—7.5 %	CO	0.002—0.010 %
LPG CO <sub>2</sub>	7.5—8.5 %	CO	0.002—0.010 %

**NOTE:** For flues greater than 725mm without a restrictor the CO<sub>2</sub> may be up to 0.5% lower.

These figures cover all flue conditions.

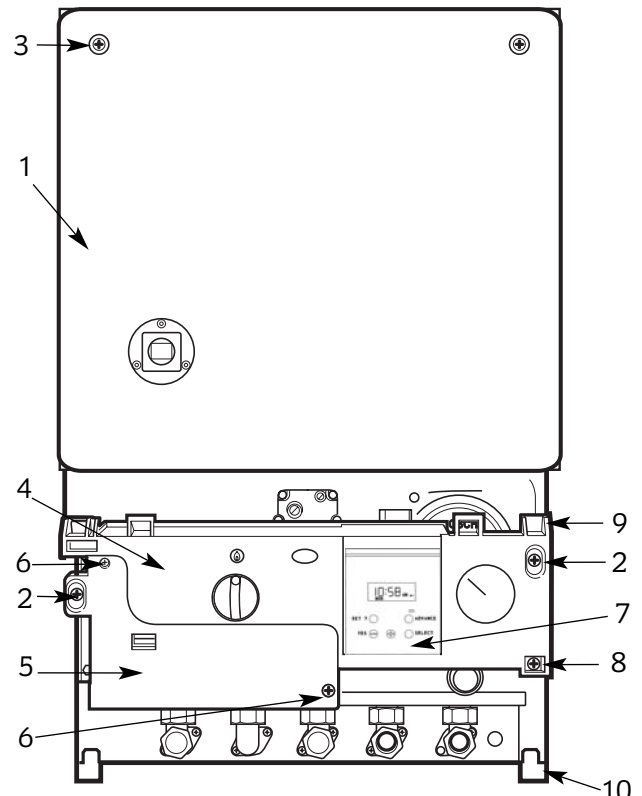
Refit the cap after the test.

Fig. 38. Combustion Test Point



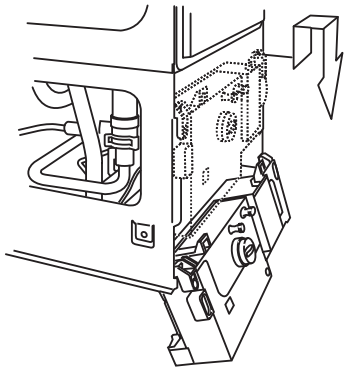
1. Flue connections
2. Combustion products test point

Fig. 39. Inner case and facia fixing



1. Inner casing cover
2. Cabinet fixing screws (2)
3. Inner casing cover fixing screws (2)
4. Facia control panel
5. Controls connector cover
6. Controls connector cover fixing screws (2)
7. Programmer (optional)
8. Facia control panel fixing screw
9. Top support lug
10. Bottom support lug

**Fig. 40. Facia in service position**



**15.4 Component Access**

Isolate the electrical supply at the mains and turn off the gas supply at the gas service cock on the appliance before starting any service procedures.

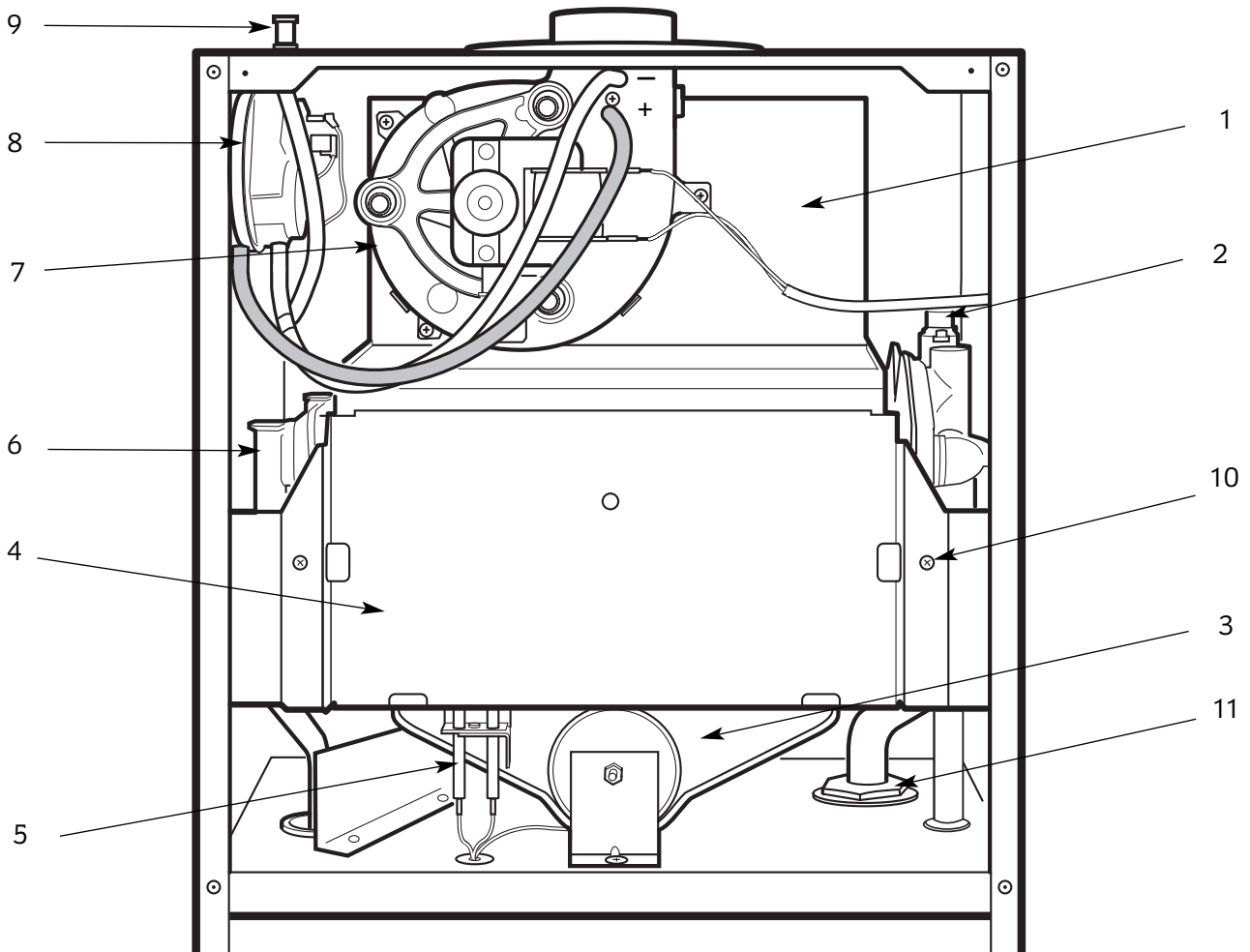
Always test for gas soundness after the service has been completed.

To service the appliance it may be necessary to remove some or all of the following parts to gain access to components which may need to be checked or replaced.

**Cabinet** Pull off the clip-on facia cover. Unscrew the two screws and release the cabinet sides. Lift up and away from the top locating pegs. Refer to Fig. 14 and 15.

**Facia Panel** Unscrew the single screw, lift off and reposition onto the lower support lugs. Refer to Fig. 18 and 40.

**Fig. 41. Inner case components**



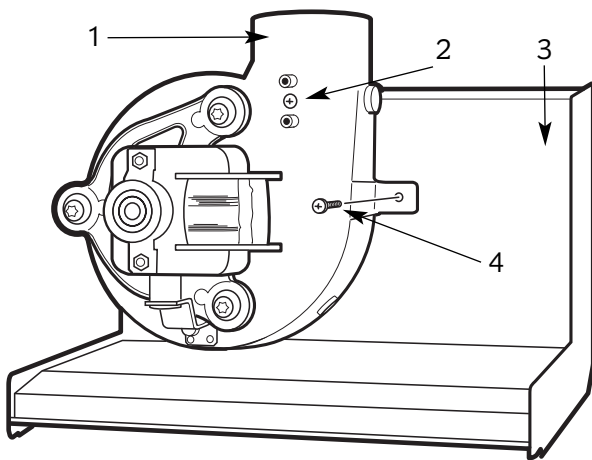
- |                             |  |
|-----------------------------|--|
| 1. Flue hood                | 7. Fan assembly                            |
| 2. Overheat thermostat      | 8. Air pressure switch                     |
| 3. Burner                   | 9. Flue gas sampling point                 |
| 4. Combustion chamber cover | 10. Combustion chamber cover fixing screws |
| 5. Spark electrode assembly | 11. Pump connection                        |
| 6. Heat exchanger           |  |

- Inner Case Cover** Unscrew the two screws and lift off. Refer to Fig. 39.
- Combustion Chamber Cover** Unscrew the two screws, lift and pull forward to remove. Refer to Fig. 41.
- Fan** Carefully pull off the electrical connections and the tubes from the airflow-sensing device. Unscrew the three screws and remove the fan assembly. Refer to Fig. 42.
- Flue Hood** Remove the fan. Slide out the hood. Ensure the rear seal is in good condition and secure before replacing the flue hood. Refer to Fig. 43.
- Burner** Remove the combustion chamber. Carefully pull-off the connections to the spark electrodes and disconnect the flame sense electrode lead. Unscrew the support bracket and withdraw the burner assembly. Refer to Fig. 44.

### 15.5 Component Cleaning

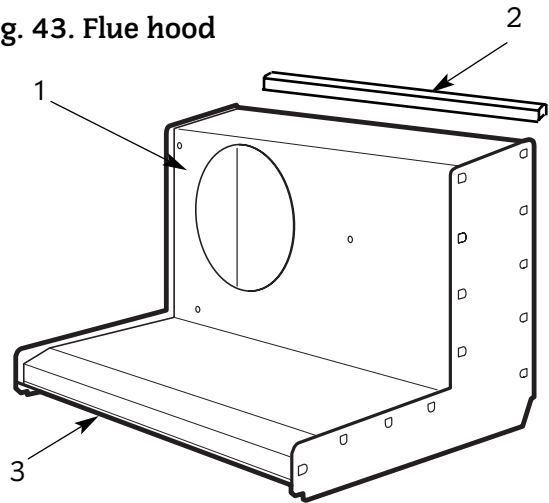
Only use a non-metallic brush to clean components. Do not use a metal probe to clean the injector. Clean the fan taking care not to block air flow sensor. Clean the burner to ensure that the blades are clear. Clean the electrodes, replace if there is any sign of deterioration. Clean the heat exchanger. **Cover the burner injector.** Remove any deposits from the heat exchanger from the top and bottom. Carefully straighten any distorted fins on the heat exchanger. Check the combustion chamber insulation and replace if there is any sign of damage or deterioration. Refer to Section 16.5. Clean the controls in-situ. Check that all screws are tight and the connections properly remade with the appropriate gaskets/O-rings/seals. Re-commission, as necessary, for correct operation to the users requirements. Refer to Section 13 Commissioning.

**Fig. 42. Fan assembly**



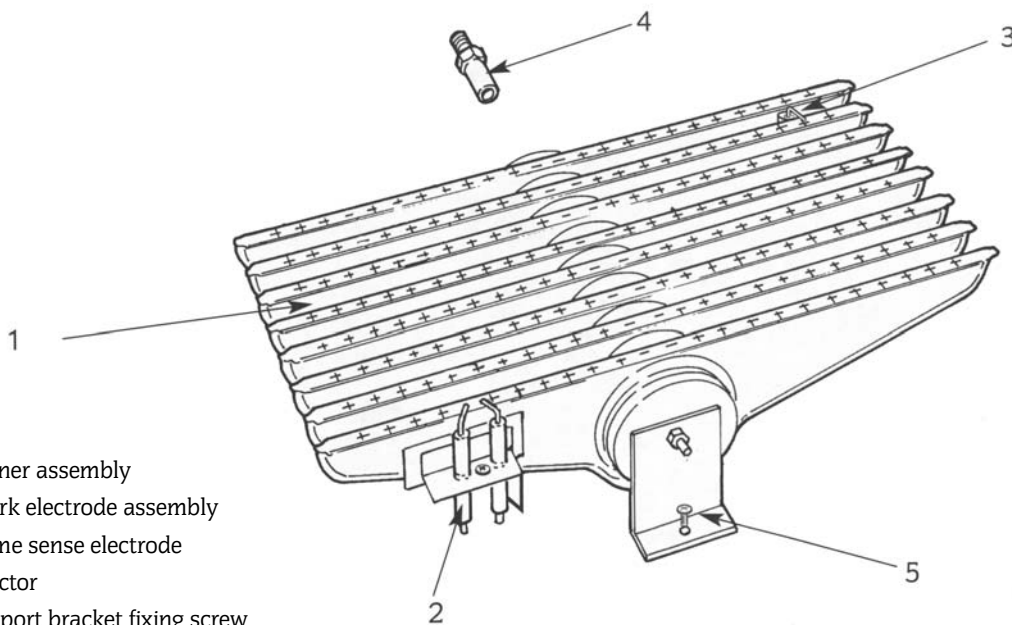
1. Fan assembly
2. Flow sensor
3. Flue hood
4. Fan fixing screws (3)

**Fig. 43. Flue hood**



1. Flue hood
2. Rear sealing strip (on back panel)
3. Combustion chamber cover locating channel

**Fig. 44. Burner assembly**



1. Burner assembly
2. Spark electrode assembly
3. Flame sense electrode
4. Injector
5. Support bracket fixing screw



## 16. Replacement Of Parts

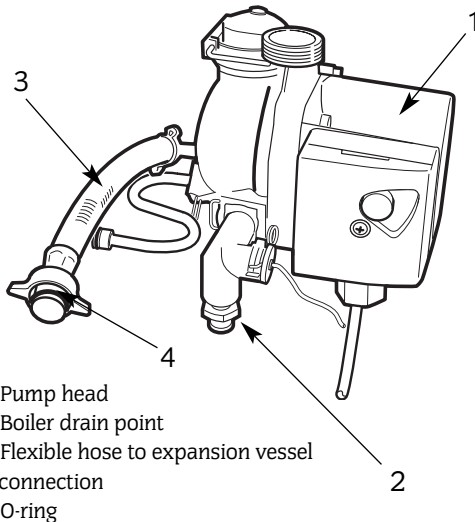
**IMPORTANT:** Turn off the gas supply and electrically isolate the appliance before replacing any components.

**NOTE:** Turning the control knob fully anti-clockwise does not isolate the appliance electrically.

After the replacement of any components always check for gas soundness where relevant and carry out functional checks as described in Section 13-Commissioning.

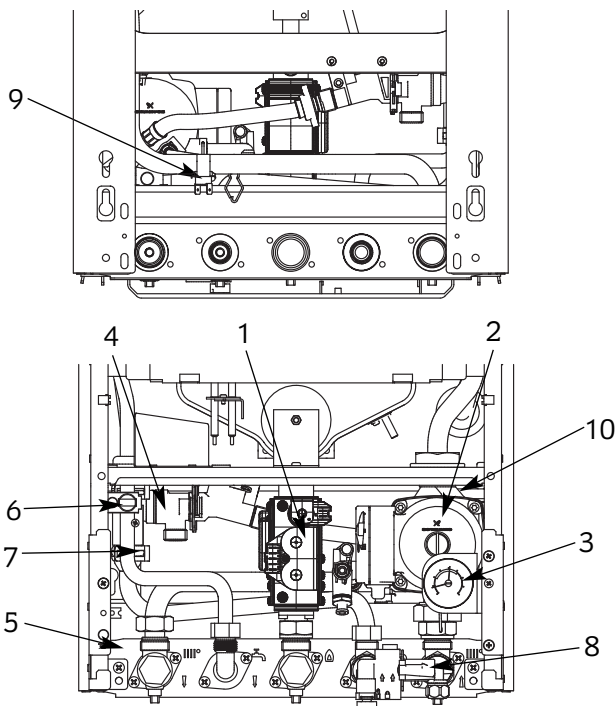
Complete gasket and O-ring packs are available for gas and water connections on the appliance.

Fig. 45 . Boiler drain point.



1. Pump head
2. Boiler drain point
3. Flexible hose to expansion vessel connection
4. O-ring

Fig. 46 . Lower casing - gas and water controls.



1. Gas valve
2. Pump
3. Pressure gauge
4. Relief valve
5. Manifold assembly
6. DHW sensor
7. DHW flow turbine
8. Filling loop assembly (optional extra)
9. CH sensor
10. Pump clip

**DHW Circuit:** Turn off the mains cold water supply at the appliance. Refer to Fig. 13. Open a hot tap below the level of the **Component Access**

Refer to Section 15, Inspection and Servicing for access to components.

### Draining the Appliance

Primary System: Turn off the heating flow and return valves at the appliance. Refer to Fig. 13.

Open the drain tap. Fit a tube to the drain tap. Refer to Fig. 45. Close the drain tap when the flow from the appliance has stopped.

appliance to drain the domestic hot water from the appliance.

**Important:** A small quantity of water will remain in some components even after the appliance has been drained. Protect any electrical components when removing items from the water circuits.

**NOTE:** After re-opening the mains cold water inlet valve, draw off a little water from a tap to ensure that there is water in the heat exchanger.

### Component Replacement

Refer to Fig. 41 and 46 for an indication of the location of the various components.

Replace any components removed from the appliance in the reverse order using new gaskets/O-rings/sealant/heat transfer paste where necessary. Always check that any electrical connections are correctly made and that all screws are tight.

Remove casing and cover panels and lower the facia onto lower lugs, as necessary, to gain access to the components. Refer to Section 15, Inspection and Servicing.

### 1 Gas Valve

Remove the burner assembly as described in Section 15.4.

Carefully pull-off the electrical connections to the valve.

Remove the injector and copper washer.

Remove the two screws securing the manifold at the rear of the combustion chamber.

Unscrew the union connection beneath the valve and ease the valve and injector manifold from the boiler.

Use new gaskets when replacing the valve.

**Do not forget to replace the burner injector and copper washer.**

### Set the Gas Valve:

Connect a pressure gauge to the burner and inlet pressure test points on the valve. Refer to Fig. 35.

Switch on the gas and electricity supplies.

Check for gas tightness at the gas valve inlet.

Refer to Section 13-Commissioning, for the method of checking the pressures.

Check for gas soundness at the gas valve outlet.

Adjust the maximum and start pressure [minimum], as necessary, to obtain the required pressures.

Switch off the appliance and disconnect the pressure gauge and tighten the screw.

Check for gas soundness at the test point.

**To set the burner pressure.** Refer to Fig. 35.

The minimum and maximum burner pressures must be set after a new gas control has been fitted.

**Only slight adjustment is required to change pressure.**

Follow the procedure described in Section 13 - Commissioning.

The maximum burner pressure must be set first, as any adjustment of the maximum pressure influences the minimum pressure setting.

Start the appliance in the domestic hot water mode as described in Section 13.8. - Appliance Operation.

Turn the gas valve mode switch to maximum. Refer to Fig. 36.

Adjust the maximum pressure adjustment screw on the gas valve to give a burner pressure of 13.6 mbar (24i), 14.7mbar (28i) for natural gas.

For propane, the maximum pressure adjustment screw should be adjusted to give a pressure of 35.3mbar (28i).

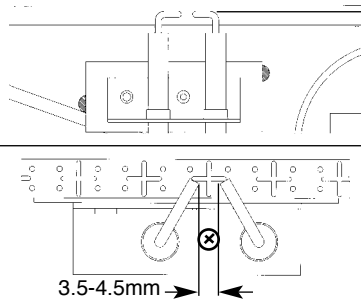
Turn the gas valve mode switch to minimum.

Adjust the start pressure adjustment screw on the gas valve to give a pressure of 1.4mbar (24i), 1.2mbar (28i) for natural gas or 3.4mbar (28i), 4.6mbar (24i) for propane.

**Turn the gas valve mode switch back to normal.**

After completing the adjustments, check the minimum and maximum pressures and re-adjust as necessary.

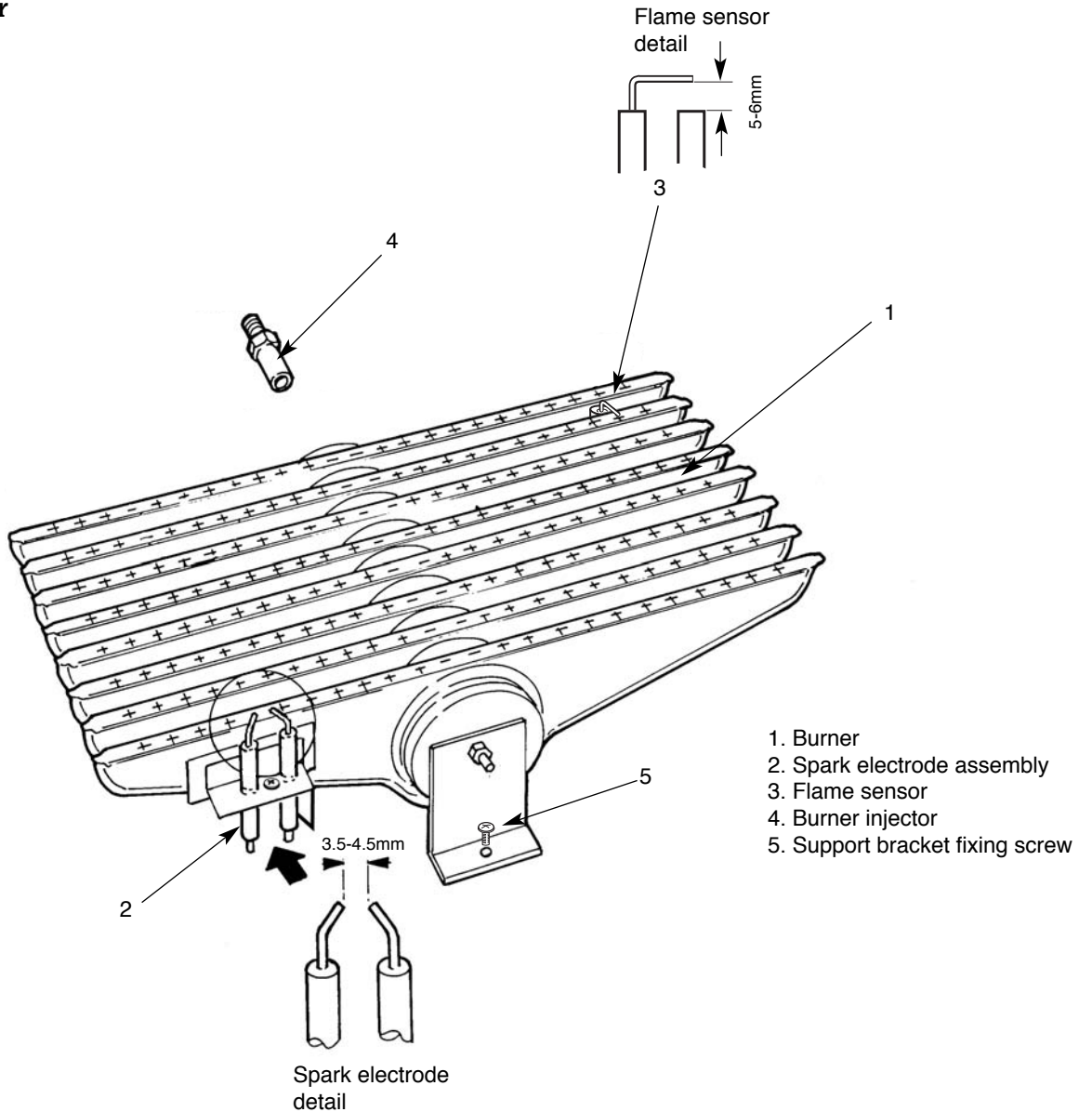
**Fig. 47. Spark electrode assembly.**



**2 Spark Electrode**

Remove the inner casing cover and the combustion chamber cover. Carefully pull off the lead from the electrode. Unscrew the screw and remove the assembly. Refer to Fig. 48. Ensure that the electrode is at the correct height above the burner blade.

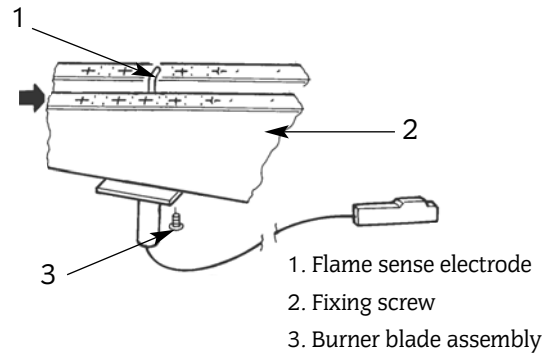
**Fig. 49. Burner**



**3 Flame Sense Electrode**

Remove the inner casing cover and the combustion chamber cover. Carefully pull off the lead from the electrode assembly. Remove the burner as described in the text following. Unscrew the screw and remove the assembly. Refer to Fig. 48.

**Fig. 48. Flame sense electrode (rear view)**



**4 Burner**

Remove the inner casing cover and the combustion chamber cover. Carefully pull-off the connections to the spark electrodes and disconnect the flame sense electrode. Unscrew the single screw fixing the support bracket and withdraw the burner assembly. Refer to Fig 49.

### 5 Combustion Chamber Insulation.

Remove inner casing door and combustion chamber cover.  
Slide the damaged insulation panel from the appliance

#### Rear

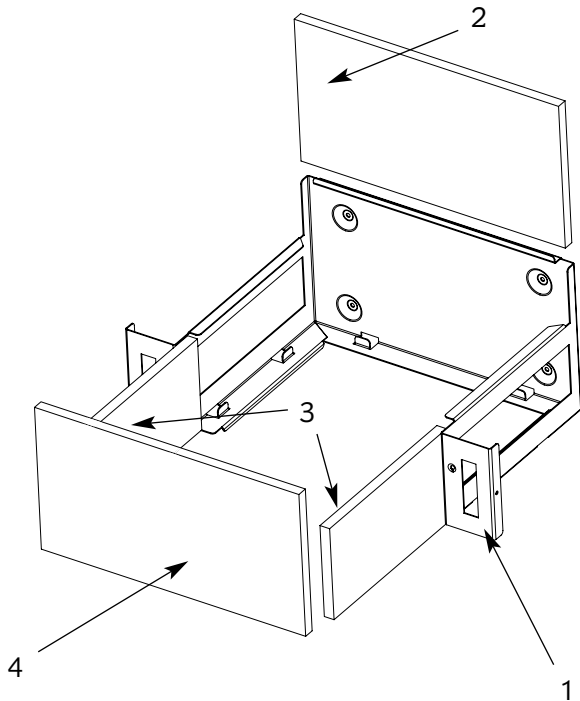
Remove heat exchanger. Refer to Fig 61.

Remove the side insulation panels.

Slide the rear insulation forward and up to remove.

Replacement is the reverse of removal. Refer to Fig 50.

**Fig. 50. Combustion Chamber Insulation.**



1. Combustion chamber assembly
2. Rear insulation panel
3. Side insulation panel
4. Front insulation panel (fixed to combustion chamber front cover)

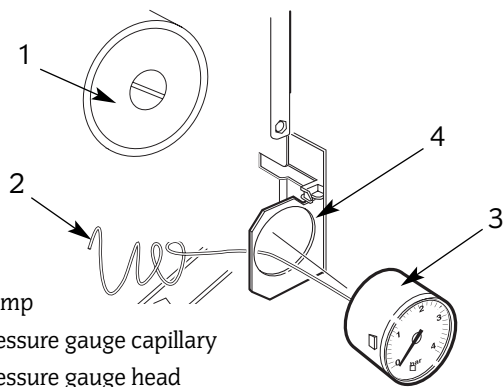
### 6 Pressure Gauge

Remove the clip-on fascia cover, cabinet, unscrew the single screw and lower the fascia panel onto the lower support lugs. Refer to Fig. 39 and 40. Check that the appliance has been fully drained. Slide the captive clip upwards and remove the pressure-sensing head. Refer to Fig. 52.

Unclip the gauge head from its mounting bracket and remove. Refer to Fig. 51.

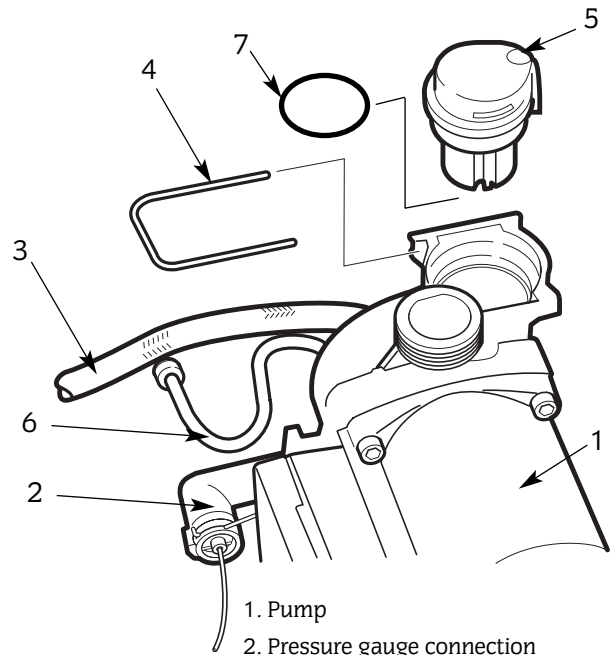
Check the condition of the O-ring at the pressure capillary head before fitting the replacement gauge.

**Fig. 51. Pressure Gauge head**



1. Pump
2. Pressure gauge capillary
3. Pressure gauge head
4. Mounting bracket

**Fig. 52. Pressure Gauge connection.**



1. Pump
2. Pressure gauge connection
3. System connection hose
4. Air vent fixing clip
5. Air vent cartridge
6. By-pass pipe
7. O-Ring

### 7 Relief Valve

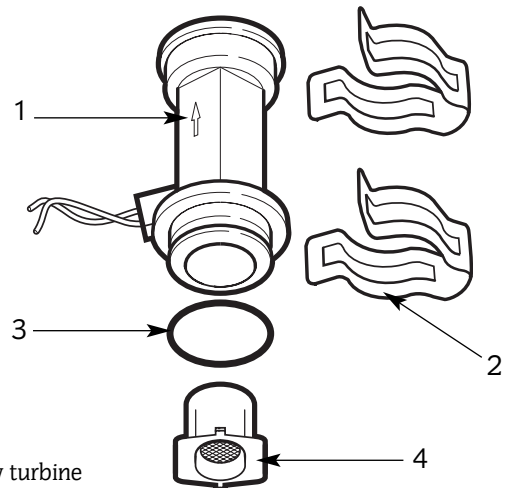
Remove the clip-on fascia cover, cabinet, unscrew the single screw and lower the fascia onto the lower support lugs. Check that the appliance has been fully drained.

Disconnect the relief valve discharge pipe .

Pull down the fixing clip and pull out the relief valve. Refer to Fig. 17.

**NOTE: The clip does not need to be fully removed.**

**Fig. 54. Water flow turbine.**



1. Flow turbine
  2. Clips (2)
  3. O-ring
  4. Filter/Flow restrictor
- 24i White 8 l/min  
28i Blue 10 l/min

### 8 Flow Turbine/ Filter/ Restrictor

Drain the DHW circuit as described at the start of Section 16.

Remove the clip-on fascia cover, cabinet, unscrew the single screw and lower the fascia panel onto the lower support lugs.

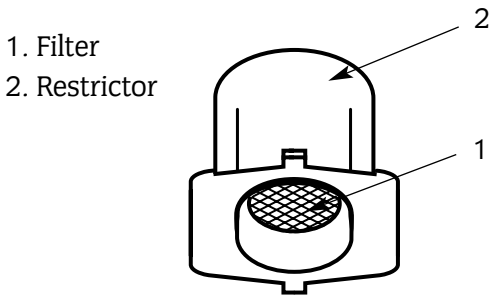
Separate the turbine in-line electrical connector.

Remove the two fixing clips and withdraw the turbine assembly.

**9 Inlet Water Filter and Flow Restrictor**

Remove the flow turbine as described in 16.8 preceding. Taking care, remove flow restrictor assembly from the flow turbine. Carefully clean wire mesh by back flushing with water or replace assembly if necessary. Refer to Fig. 55.

**Fig. 55. Inlet water filter**



- 1. Filter
- 2. Restrictor

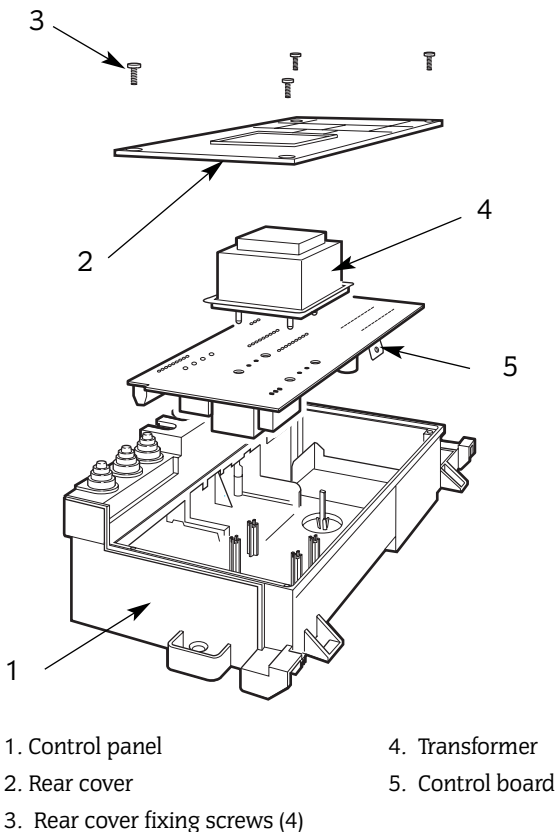
**10 Control Board**

Check that the appliance is electrically isolated. Remove the clip-on fascia cover, cabinet and the connections cover. Carefully disconnect all the electrical connections. Refer to Fig. 39. Remove the fascia panel unscrew the four screws and remove the cover from the rear of the fascia. Lift out the control board. Refer to Fig. 56. Pull out and transfer the transformer to the board. Re-commission the appliance to check and set the burner pressures. Refer to Section 13, Commissioning.

**11 Transformer**

Unscrew the four screws and remove the cover from the rear of the fascia as described in 16.10 preceding. Pull out the transformer. Refer to Fig. 56.

**Fig. 56. Control board**

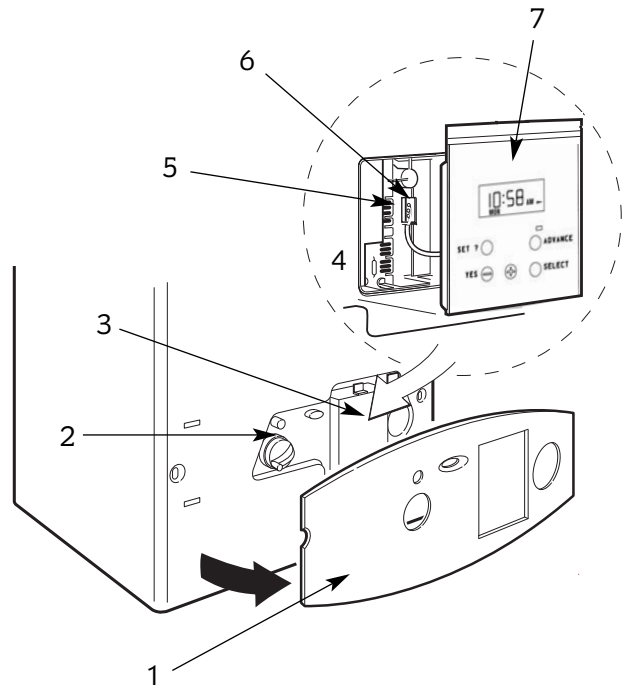


- 1. Control panel
- 2. Rear cover
- 3. Rear cover fixing screws (4)
- 4. Transformer
- 5. Control board

**12 Clock/Programmer**

Remove the clip-on fascia. Remove the clock/programmer assembly by releasing the clip at the top of the clock/programmer and ease away from the control panel being careful not to pull on the connector lead. Unplug the connector at the control board. Refer to Fig. 57. Comprehensive instructions are sent with the new control.

**Fig. 57. Programmer connection**



- 1. Fascia
- 2. Control panel (boiler outer casing in place)
- 3. Programmer cover
- 4. Programmer location
- 5. Programmer connections
- 6. Programmer connector plug
- 7. Programmer

**13 Fan**

Remove the inner casing cover. Remove the fan as described in Section 15.4, Inspection and Servicing. Ensuring that all the connections are correctly made to the new fan.

**14 Air Flow Detector**

Remove the fan as described in Section 15.4.13 Inspection and Servicing. Unscrew and withdraw, through the fan outlet, the airflow detector. Refer to Fig. 42.

### 15 Primary [ch] Sensor

Remove the clip-on fascia cover and the cabinet. Lower the fascia onto the support lugs.  
Carefully pull-off the connections. Release the clip and remove the sensor. Refer to Fig. 58.  
Do not omit the heat transfer paste when fitting the replacement sensor.

### 16 Primary Overheat Thermostat


Remove the clip-on fascia cover, cabinet and the inner casing cover.  
Carefully pull-off the connections. Unscrew the two screws and remove the thermostat and fixing bracket. Refer to Fig. 59.  
Apply a small quantity of heat transfer paste to the face of the replacement thermostat.  
Carefully position the thermostat so that the connections are away from the flue hood.

### 17 DHW Sensor

Remove the clip-on fascia cover and cabinet. Lower the fascia onto the lower support lugs.  
Carefully pull off the connections. Unscrew the clip and remove the sensor.  
Apply a small quantity of heat transfer paste to the face of the replacement sensor. Refer to Fig. 60.

### 18 Pump

Check that the system valves have been shut and the appliance has been fully drained. **NOTE:** A little water will remain in some components.  
Remove the clip on fascia cover and cabinet. Place the fascia control panel onto the lower support lugs.  
Remove the burner as described in Section 16.4 preceding.  
Disconnect the flexible hose at the relief valve assembly.  
Pull out the clip to disconnect the pressure gauge capillary head. Refer to Fig. 52.  
Raise and remove the clip securing the by-pass pipe to the central heating flow pipe. Refer to Fig. 52.  
Pull out the flat clip securing the brass fitting at the top of the pump. Unscrew the fitting from inside the combustion chamber. Refer to Fig. 41.  
Undo the union connection beneath the pump and carefully withdraw the pump. Take care when releasing the by-pass pipe.  
Support the pump and disconnect electrically.  
Transfer the by-pass pipe, expansion vessel flexible connector and the drain point and pressure gauge connector to the new pump. Transfer the inlet and outlet connections. Use new O-rings and seals where necessary.  
Reconnect the electrical leads.  
Fit the new pump assembly in the reverse order using new O-rings and seals where necessary.



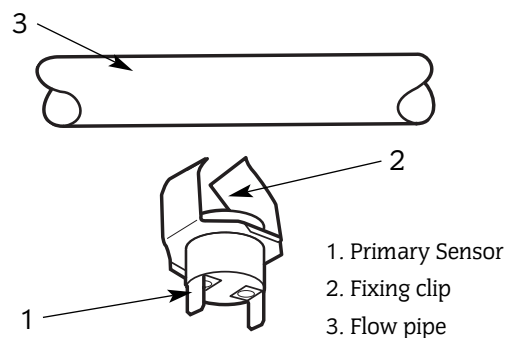
**Do not forget to re-connect the expansion vessel flexible pipe to the relief valve assembly. Refer to Fig. 17.**

Alternatively:  
Unscrew, using a 4mm Allen to release the four fixing screws, and remove the pump head. Refer to Fig. 45.  
Access is improved if the pressure gauge head and bracket are temporarily removed.  
Transfer the electrical connections to the new pump head and set the speed at maximum.  
Refit the pump head taking care not to scratch the pump mating faces.  
Open the system valves and re-fill, re-pressurise and fully vent the appliance and the system ensuring that there are no air-locks.

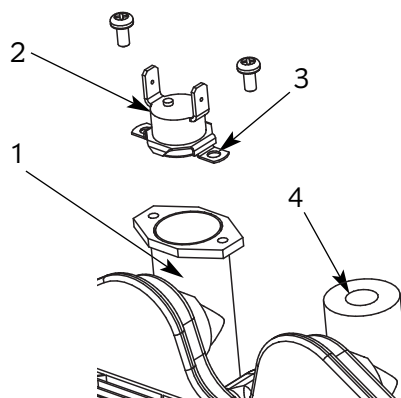
### 19 Expansion Vessel

It will be necessary to remove the appliance from the wall to replace the expansion vessel.  
Alternatively the specified replacement can be fitted into the heating system return as close to the appliance as possible.  
Re-fill and pressurise the system as described in Section 13 Commissioning.

**Fig. 58. Primary (CH) sensor.**



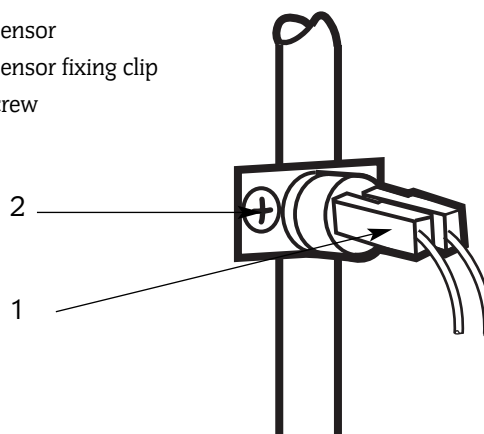
**Fig. 59. Overheat thermostat**



1. Heat exchanger manifold
2. Overheat thermostat
3. Fixing clamp
4. Water pressure switch connection point

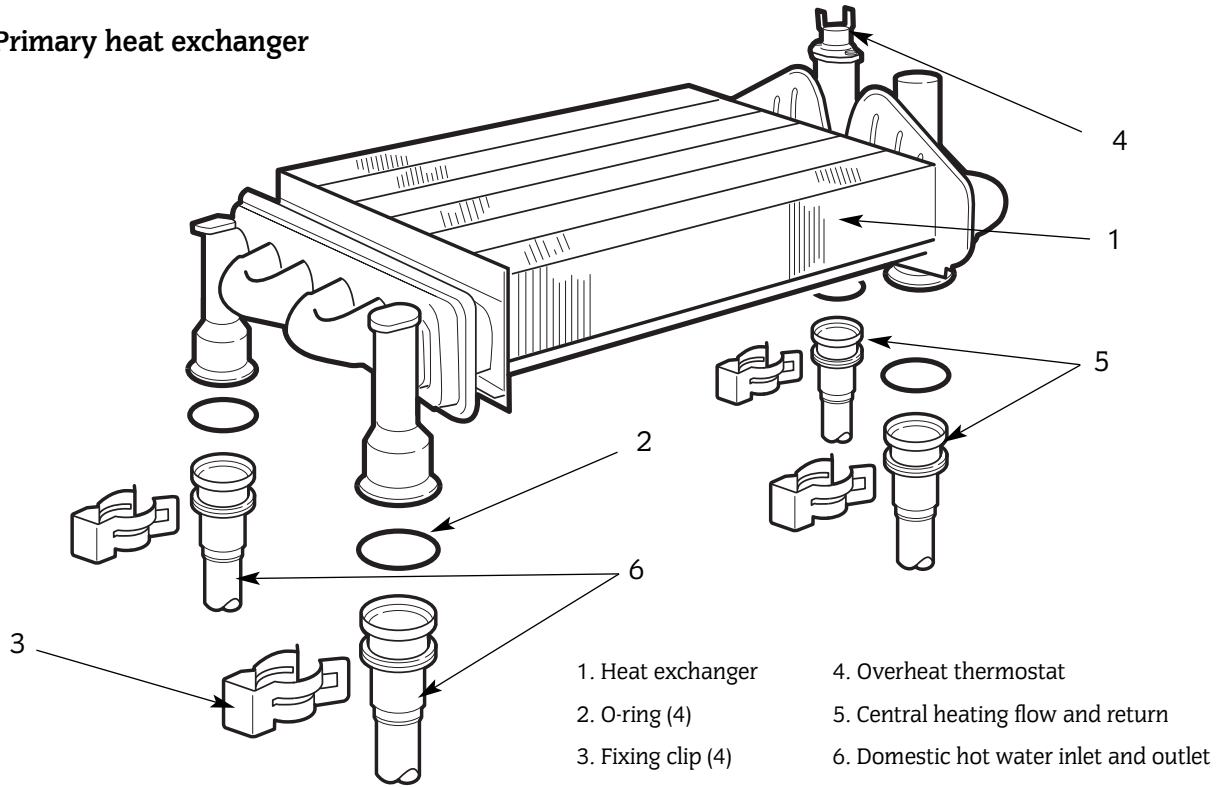
**Fig. 60. DHW sensor**

1. DHW sensor
2. DHW sensor fixing clip and screw





**Fig. 61. Primary heat exchanger**



- 1. Heat exchanger
- 2. O-ring (4)
- 3. Fixing clip (4)
- 4. Overheat thermostat
- 5. Central heating flow and return
- 6. Domestic hot water inlet and outlet

**20 Auto Air Vent**

Remove the complete pump assembly as described in Section 16.18. Take care not to strain the electrical connections. Pull out the clip securing the auto air vent cartridge. Refer to Fig 52. Do not omit the O-ring when fitting the new cartridge. Refit the pump assembly as described in Section 16.18 preceding.

**21 Primary Heat Exchanger**

Check that the appliance has been fully drained. Remove the temperature sensors as described in 15.15, 16 and 17 preceding. Remove the combustion chamber cover, fan and flue hood and burner as described in Section 15.3, Inspection and Servicing. Remove the combustion chamber insulation side panels. Prise off the fixing clips securing the copper pipes. Remove the heat exchanger. Do not omit the O-rings when fitting the replacement heat exchanger. Refer to Fig. 61. Check that the rear seal for the flue hood is in good condition and secure before replacing the flue hood.

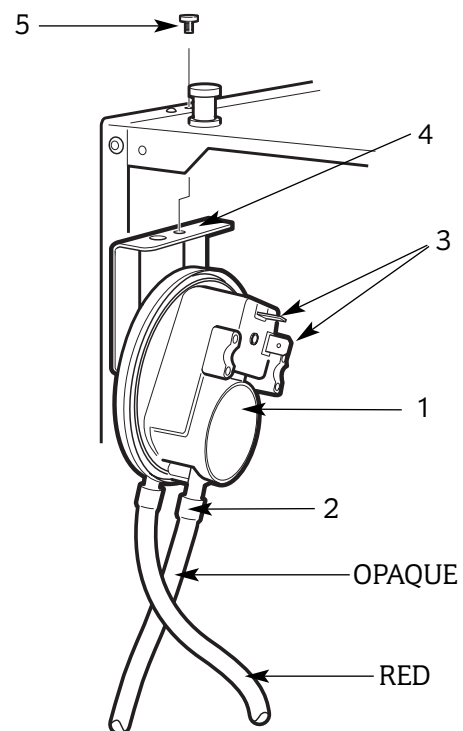
**22 Air pressure switch**

Pull-off the silicone sensing tubes. Unscrew the fixing bracket and remove the pressure switch. See Fig 62. Unscrew and remove the fixing clip and fit to the new air pressure switch ensuring that the orientation of the switch to the air connections is the same. Refit the switch assembly. Remove the electrical connections from the old switch and fit to the new switch in the same position. Refit the silicone sensing tubes - the red tube fixes to the rear of the switch.

**23 Sight Glass**

Remove and replace the inner casing cover complete. Inspection and Servicing. Refer to Section 15.

**Fig. 62. Air pressure switch**



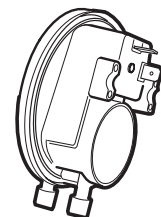
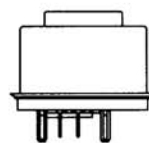
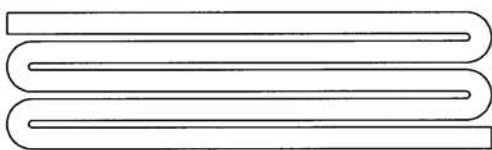
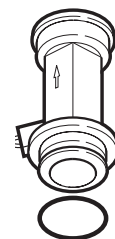
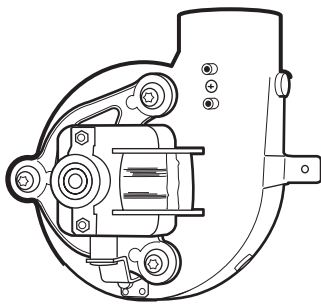
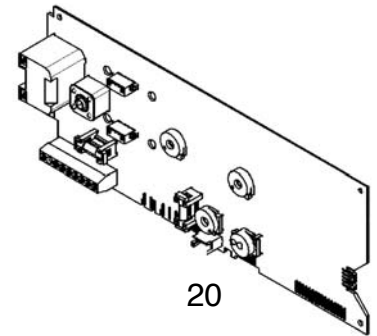
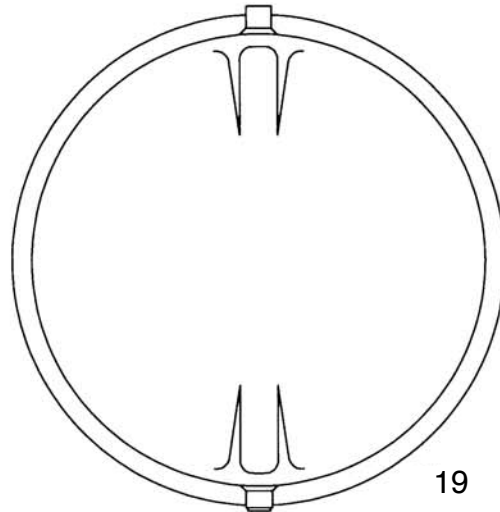
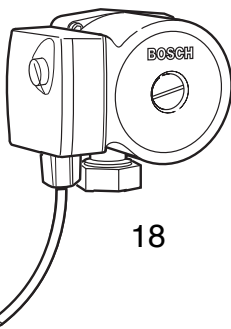
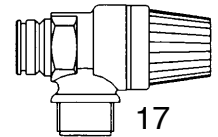
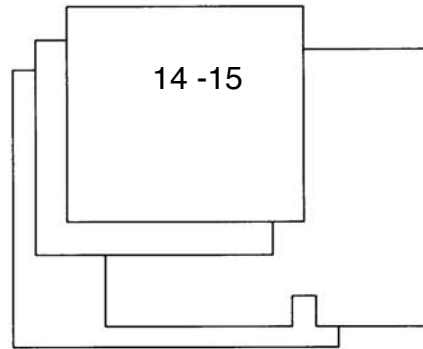
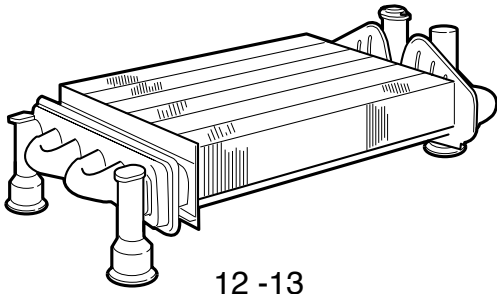
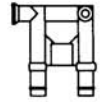
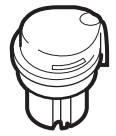
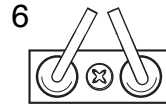
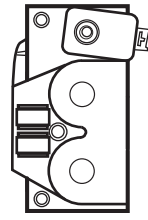
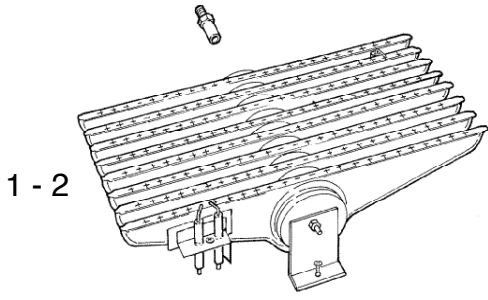
- 1. Air pressure switch
- 2. Tube connectors
- 3. Electrical connections
- 4. Air pressure switch fixing bracket
- 5. Fixing screw

## 17. Short Parts List

Key No.	G.C. No.	Part	Qty	WHS Part No.
1	H05-333	Burner 24 NG	1	8 716 105 484 0
2	H05-352	Burner 28 NG	1	8 716 105 485 0
3	H05-337	Gas Valve NG	1	8 716 105 654 0
4	H05-338	Gas Valve LPG	1	8 716 105 650 0
5	E80-454	Air Pressure Switch	1	8 747 004 461 0
6	E94-710	E lectrode Spark	1	8 716 105 186 0
7	E01-612	E lectrode FlameSense	1	8 716 120 345 0
8	H05-408	Fan	1	8 717 105 652 0
9	173-015	Overheat Stat	1	8 716 142 303 0
10	375-696	Thermistor Sensor	1	8 716 142 302 0
11	E88-181	Flow Sensor	1	8 716 146 164 0
12	H05-261	Heat Exchanger 24 kW	1	8 716 105 482 0
13	H05-264	Heat Exchanger 28 kW	1	8 716 105 483 0
14	H05-247	Insulation Set 24 kW	1	8 716 105 936 0
15	H05-248	Insulation Set 28 kW	1	8 716 105 937 0
16	E88-176	Pressure Gauge	1	8 716 142 398 0
17	375-699	Pressure Relief Valve	1	8 716 142 404 0
18	H05-366	Pump	1	8 716 105 656 0
19	H05-206	Expansion Vessel	1	8 716 105 545 0
20	H05-452	Control Board	1	8 748 300 484 0
21	H05-229	Silicone Sponge 24/28kW sides	1	8 716 105 766 0
22	H05-231	Silicone Sponge 24kW top/bottom	1	8 716 105 767 0
23	H05-239	Silicone Sponge 28kW top/bottom	1	8 716 105 768 0
24	E88-183	Transformer	1	8 747 210 294 0
25	E88-184	Flow Regulator 24kW White	1	8 716 141 255 0
26	E88-184	Flow Regulator 28kW Blue	1	8 716 141 253 0
27	H05-403	Auto Air Vent	1	8 716 106 142 0

## Accessories and Kits

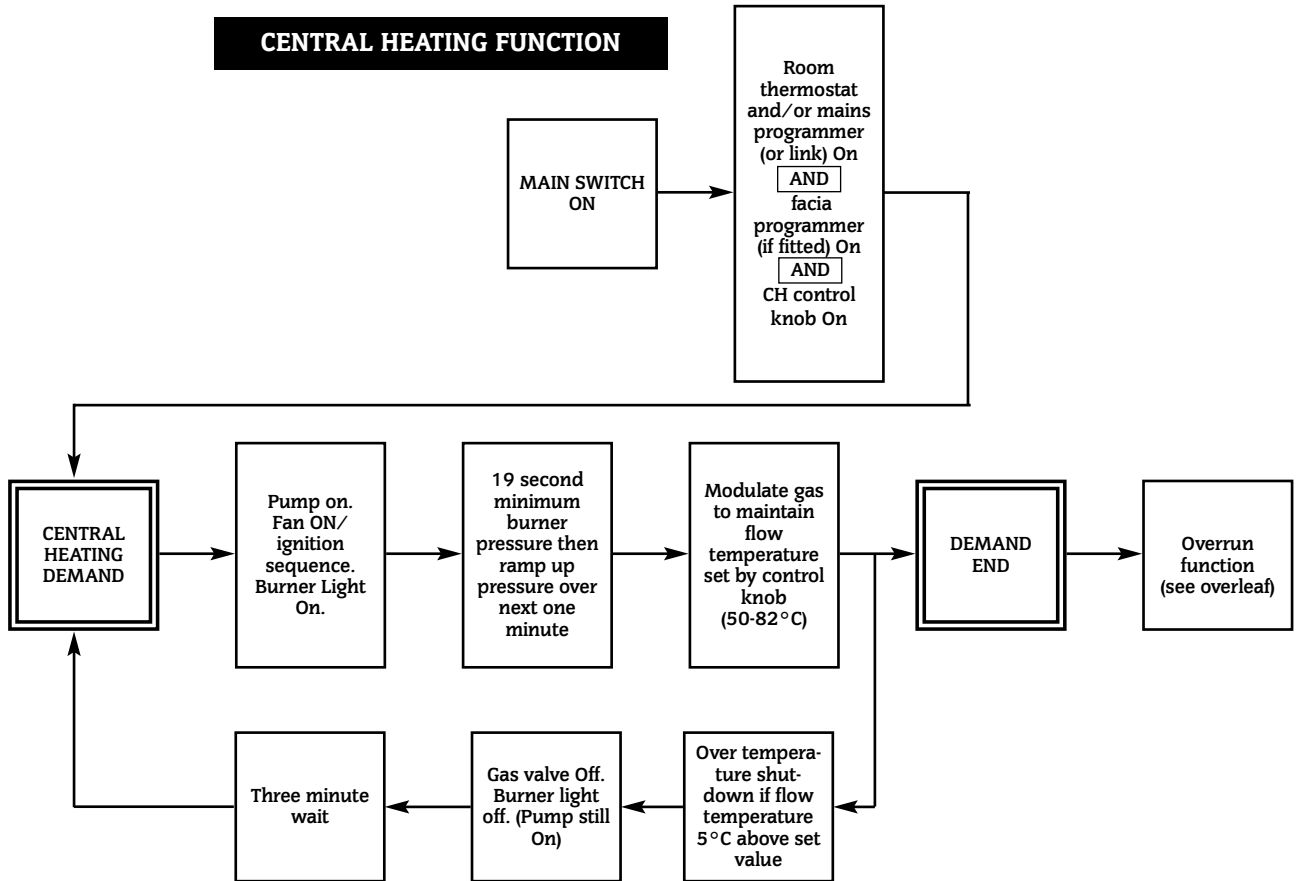
A001	Charging Link Assembly	1	7 716 192 281
A002	Installer Pre-Filling Kit	1	7 716 192 282
A004	Gas Conversion Kit NG to LPG 24kW	1	8 716 105 967
A005	Gas Conversion Kit NG to LPG 28kW	1	7 716 192 290
A006	Simplefit Telescopic Flue Kit	1	7 716 191 068
A007	Vertical Flue Kit	1	7 716 191 079
A008	90° Flue Elbow - F106E90	1	7 716 191 013
A009	45° Flue Elbow (Pair) - F 106E45	2	7 716 191 014
A010	Vertical Flue Adaptor Kit	1	7 716 191 016
A011	Security Kit	1	7 716 192 246
A012	Mechanical Programmer	1	7 716 192 027
A013	Digital Programmer	1	7 716 192 028
A014	Digistat	1	7 716 192 030



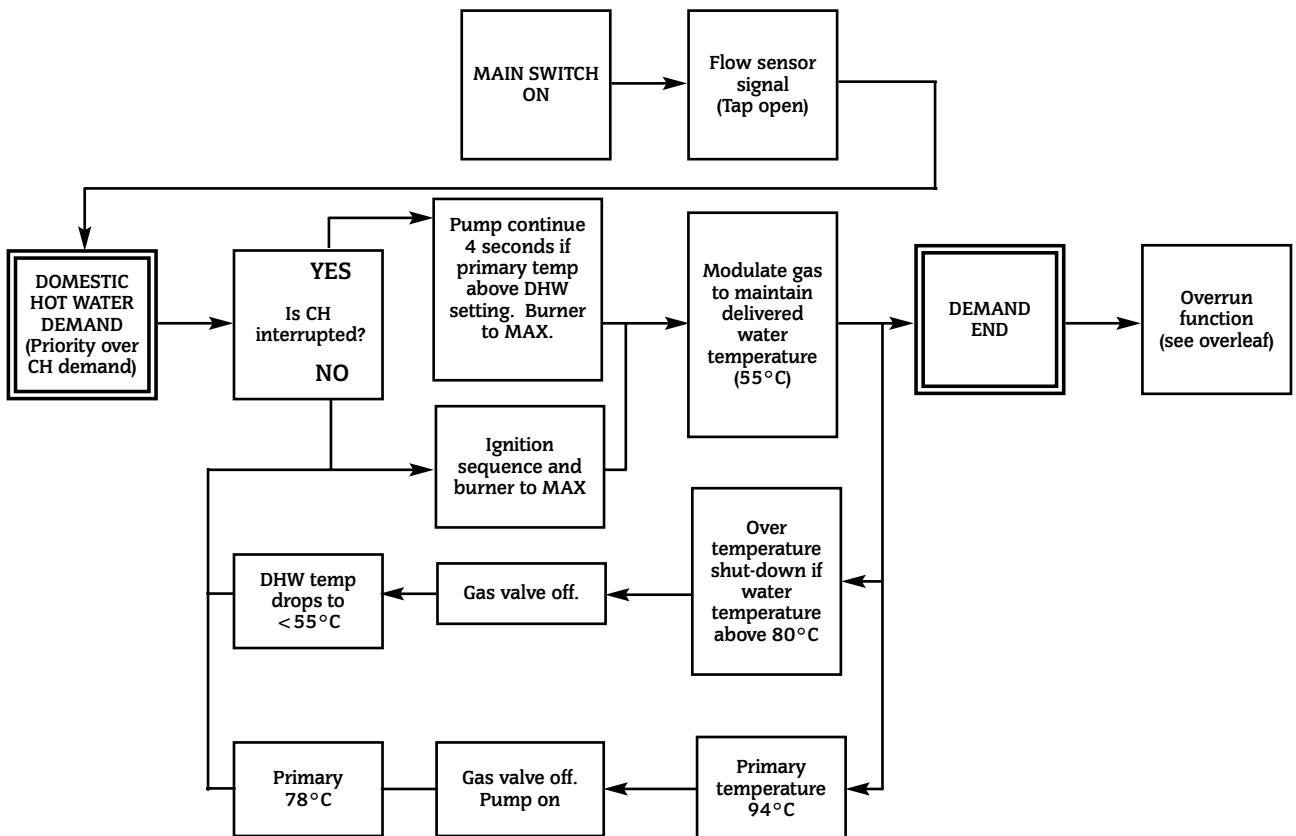


# 18. Operational Flow Diagrams

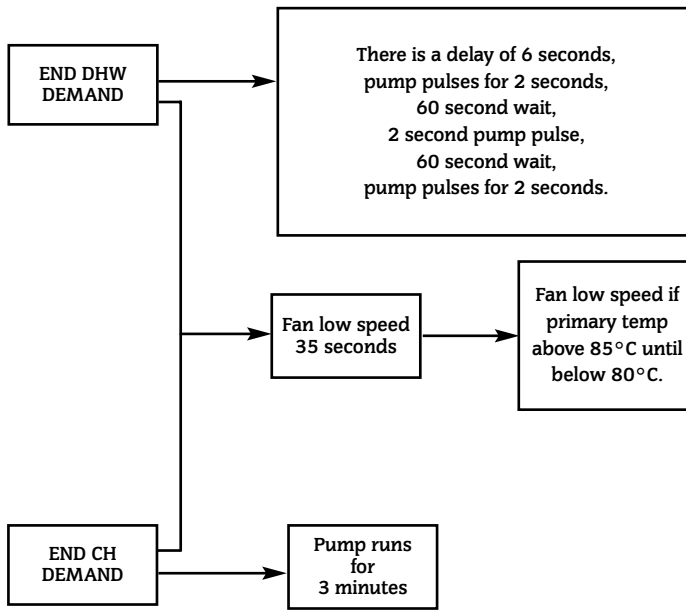
## CENTRAL HEATING FUNCTION



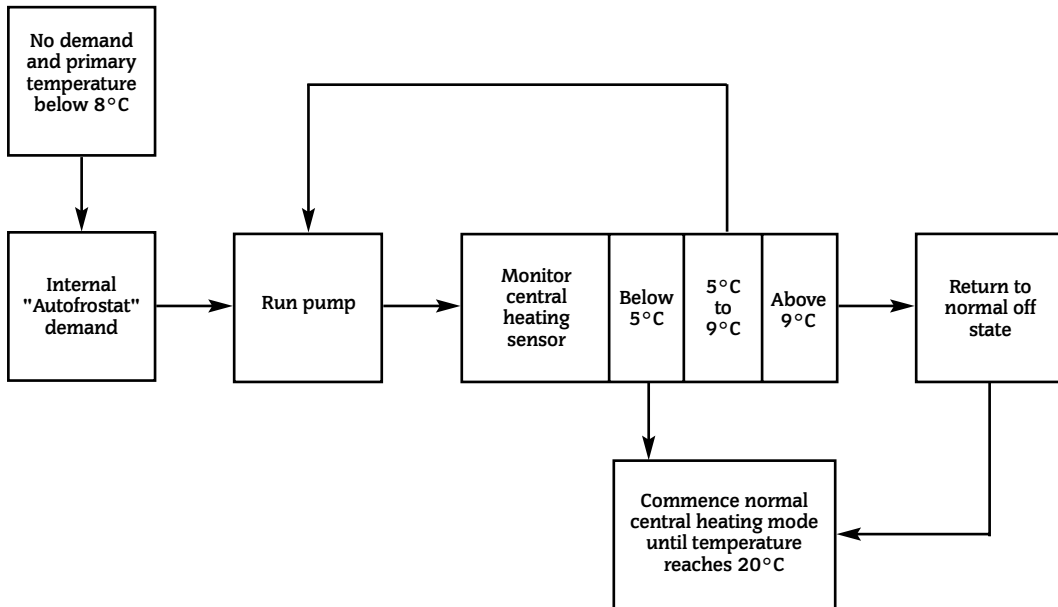
## DOMESTIC HOT WATER FUNCTION



## OVERRUN FUNCTION



## AUTOFROSTAT FUNCTION



## 19. Fault Finding

**Note:** This fault-finding information is for guidance only. Worcester Heat Systems cannot be held responsible for costs incurred by persons not deemed to be competent.

By flashing at various rates, the oval shaped facia light will indicate specific fault conditions. If this is used with other observations during a fault, then every normal fault can be identified.

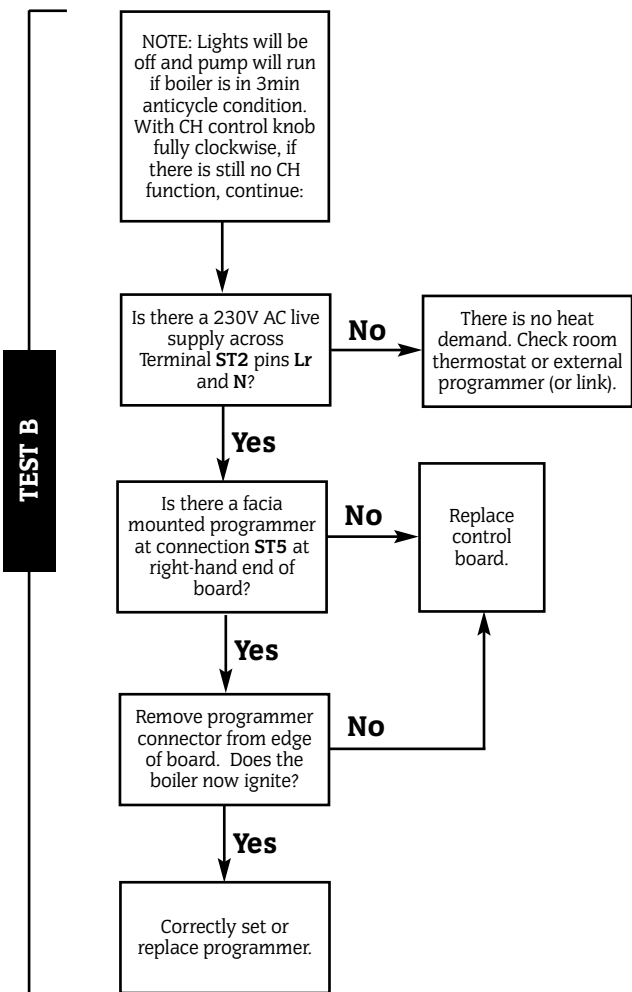
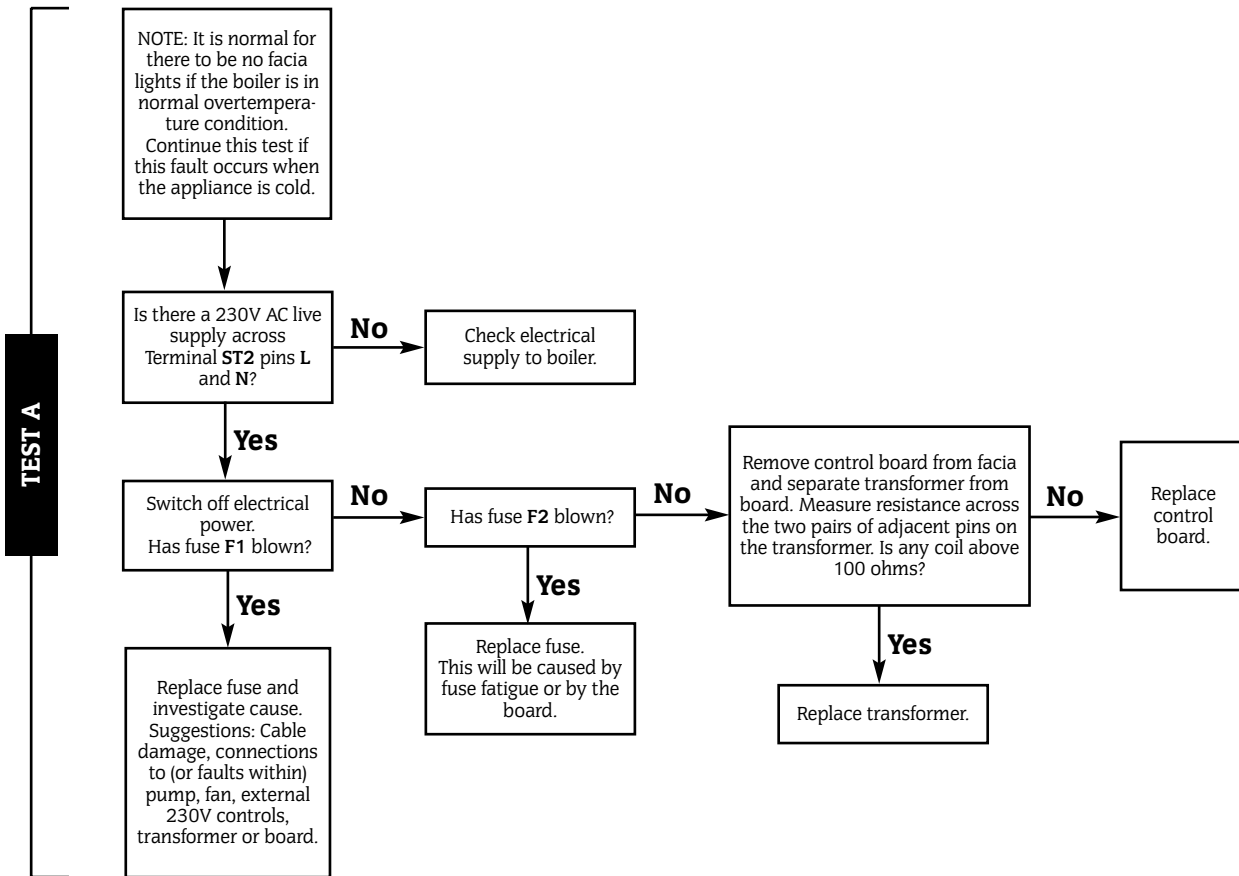
To use the fault finding system, use the table below to select the failure condition during your fault. The most common causes are listed, then refer to the test in the following section. This fault finding system assumes that the appliance has been operating normally until the time of failure (ie not a first installation fault).

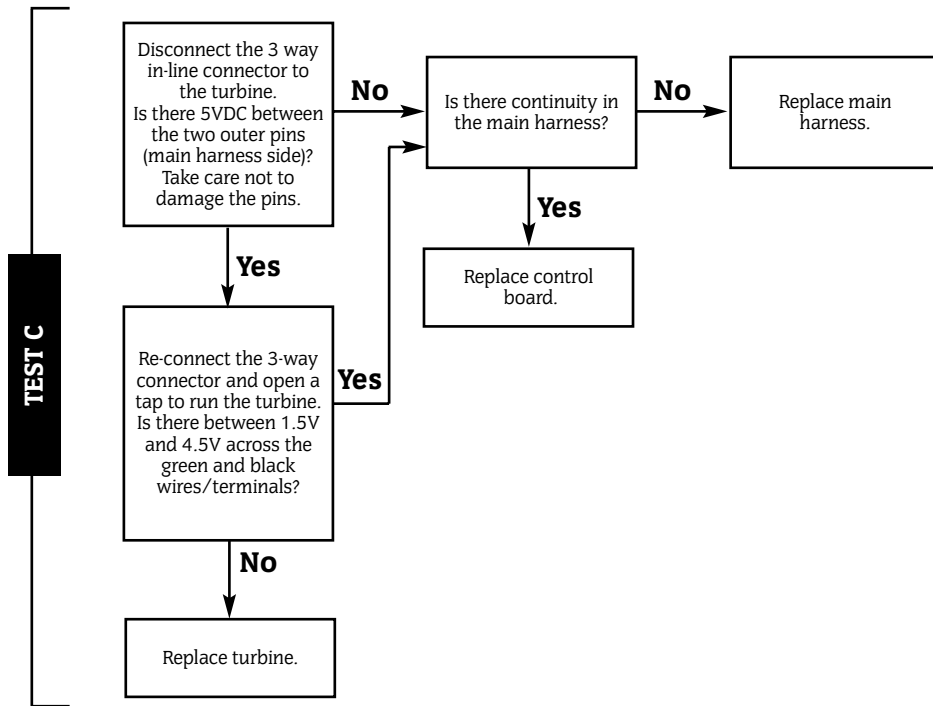
### PRELIMINARY CHECKS

Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check (a) EARTH CONTINUITY, (b) SHORT CIRCUIT CHECK, (c) POLARITY and (d) RESISTANCE TO EARTH.

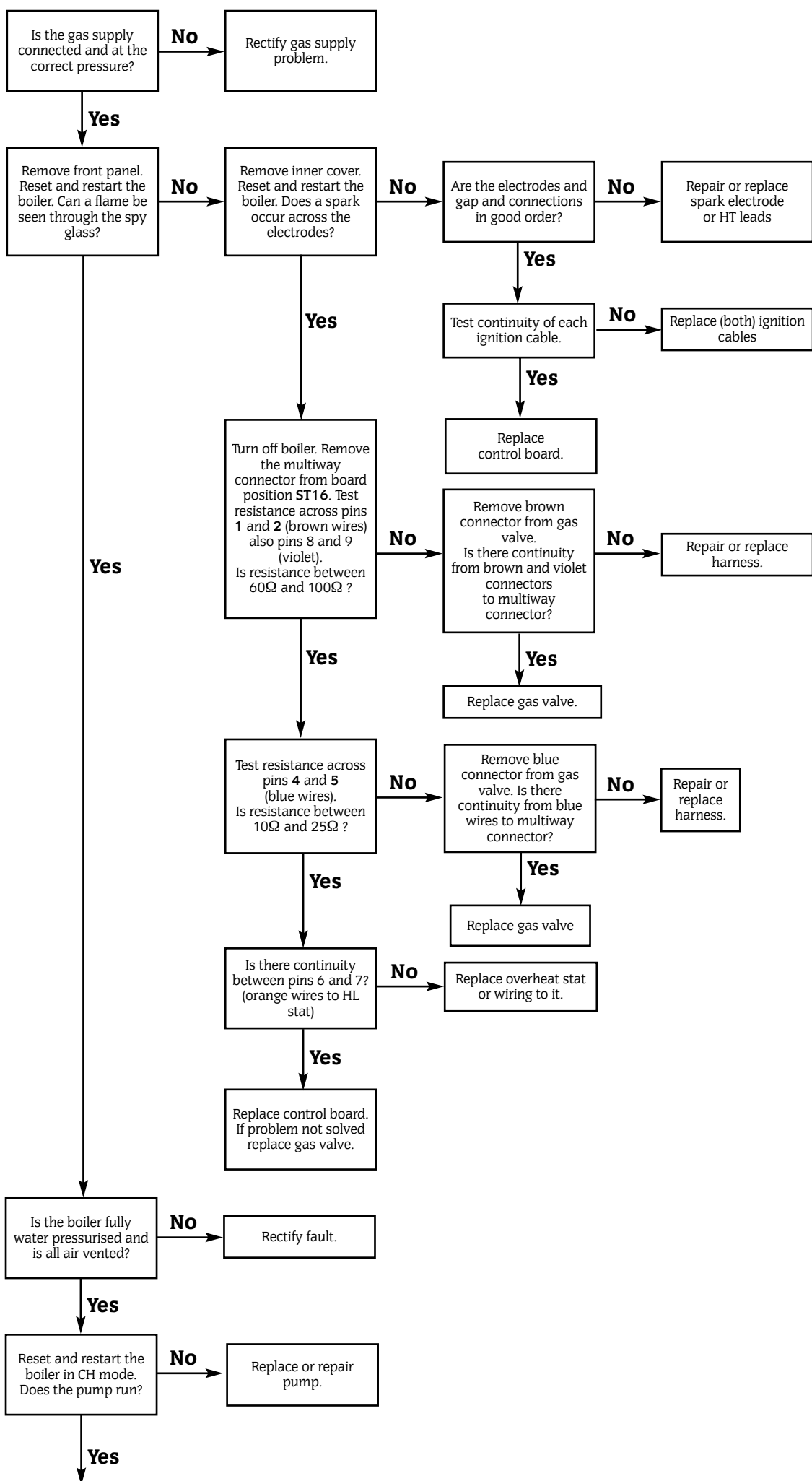
### FAULT LIST

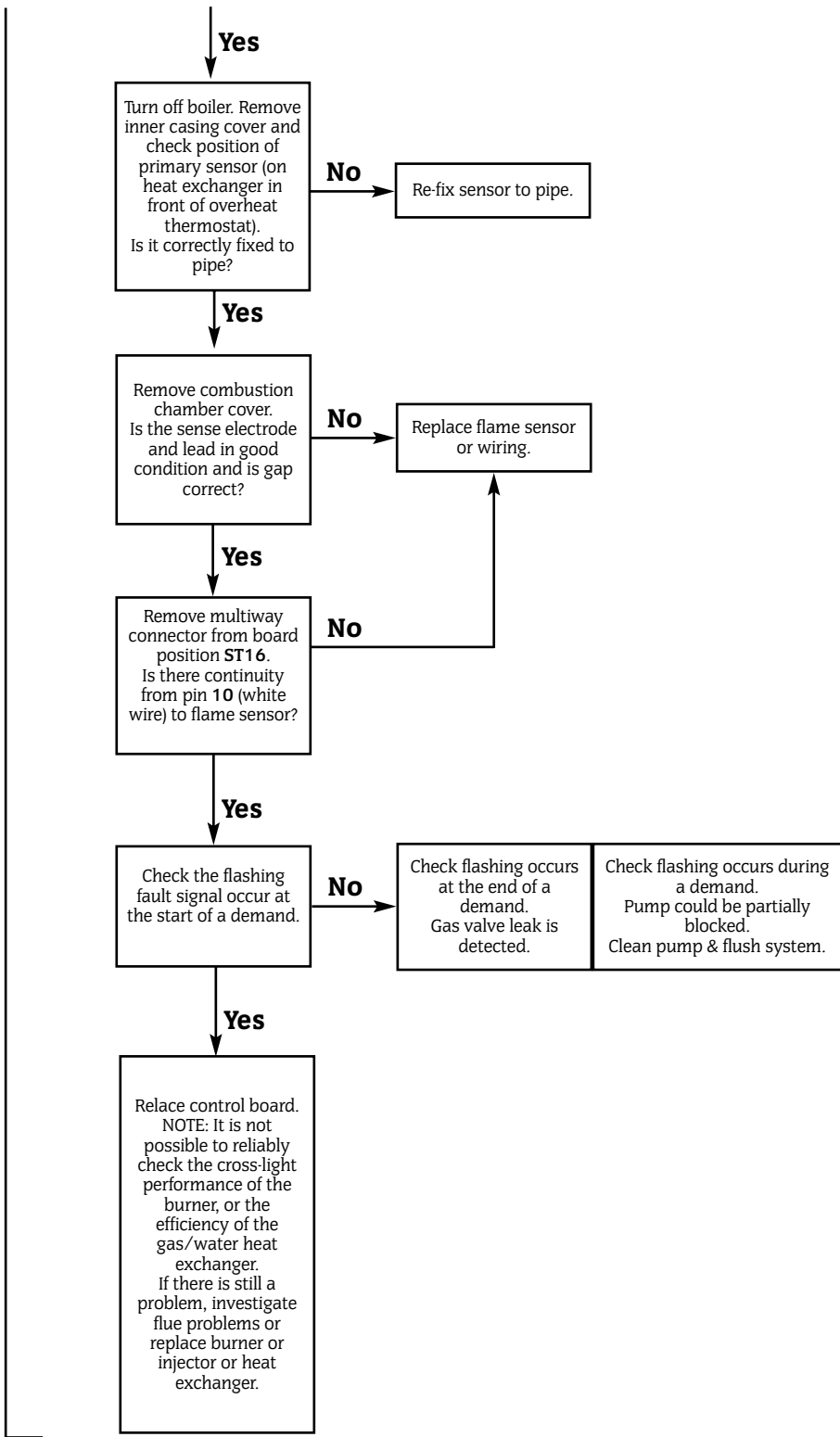
OBSERVED FAULT	COMMON CAUSES	SEE TEST
No lights and no functions (with demand)	No mains Voltage supply. Fuse F1 or F2 blown. Transformer or connector failed. Board fault.	<b>A</b>
No CH function (DHW OK)	No link at ST2 Ls to Lr, or failed external control input to Lr. Failed programmer. Board fault.	<b>B</b>
No DHW function (CH OK)	Flow sensor failure. DHW sensor (LED 4 flash/second). Board fault.	<b>C</b>
Flash once per second  <i>Ignition lockout</i> <i>Overheat lockout</i> <i>Internal error</i>  <i>(reset lockout by gently pressing reset button for 5 seconds)</i>	No gas or low gas pressure. Weak spark or spark not across electrodes. Gas valve leaking or failed. Low water pressure or boiler dry. Pump fail. Primary sensor position. Flame sensor fail or connector. Overheat stat tripped or disconnected or faulty. Blocked burner. Blocked heat exchanger. Faulty harness. Board fault.	<b>D</b>
Flash 4 times per second	CH or DHW Sensor fault or out of position. Air pressure switch fault or condense in tubes. Fan fail or stiff. Blocked flue. Faulty harness. Board fault.	<b>E</b>
Flash 4 times per second	Gas Valve mode switch on min or max.	<b>F</b>
Burner on with no demand	Autofroststat. Board fault.	<b>G</b>
Water temperature too hot	Sensor off pipe.	<b>H</b>
Water temperature too cool	Low gas pressure. Pot P1 not turned up. Stiff/sticking gas valve. Stiff/sticking flow sensor. Board fault.	<b>I</b>



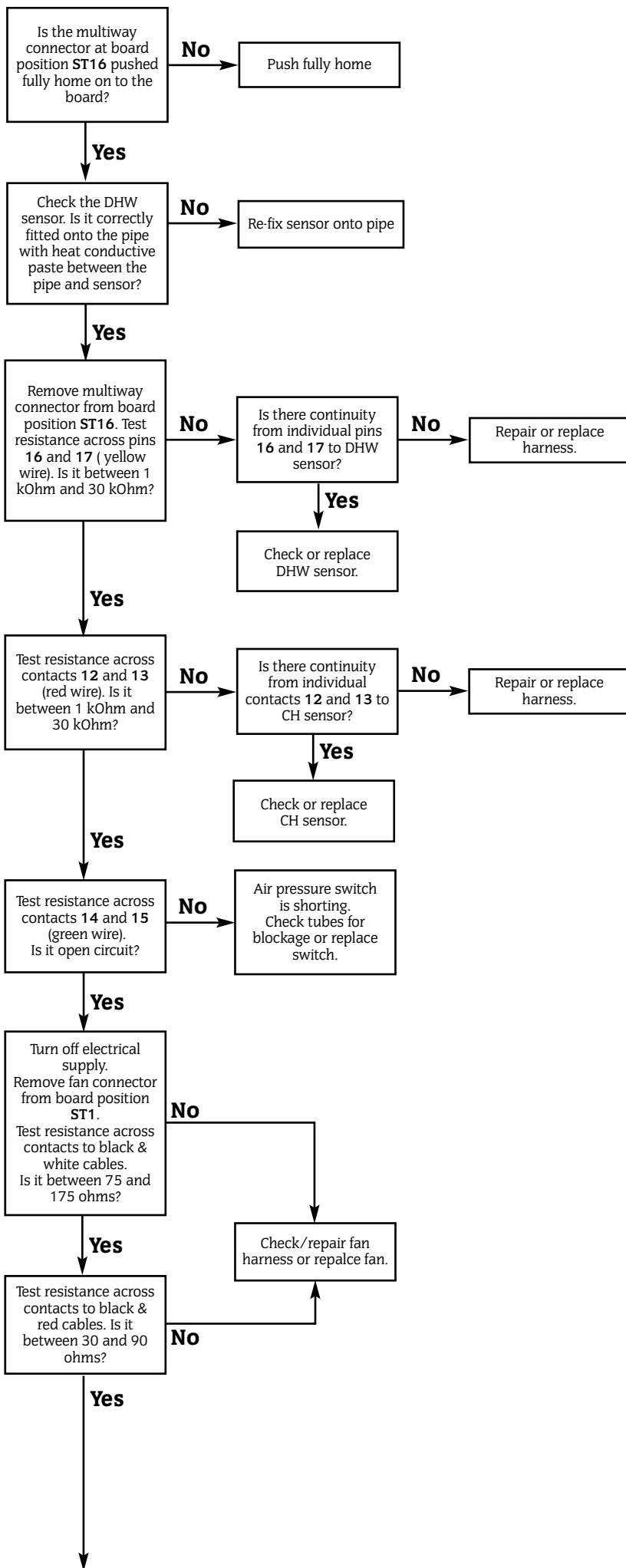


**TEST D**

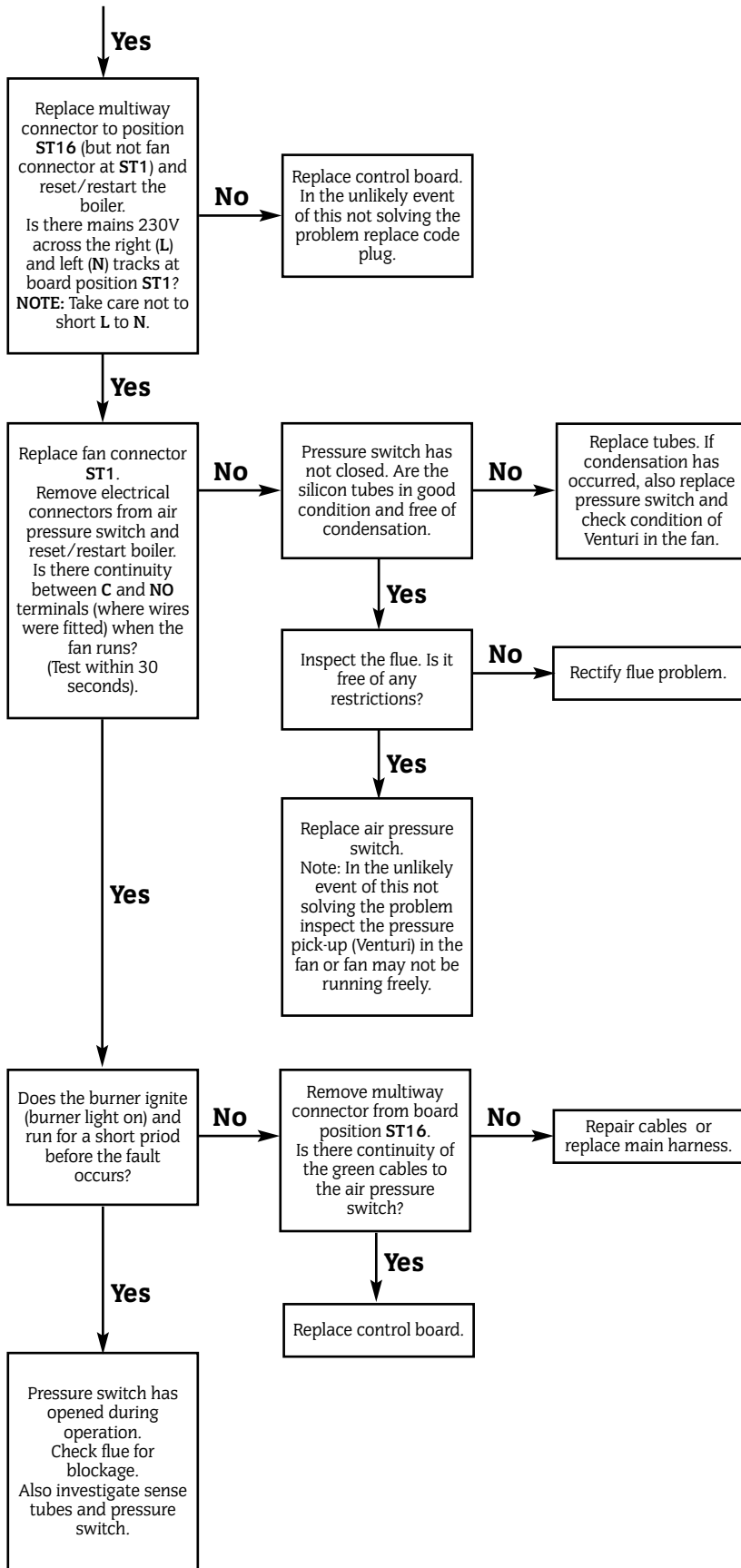




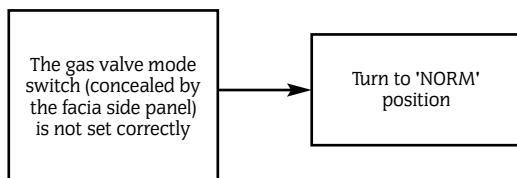
**TEST E**

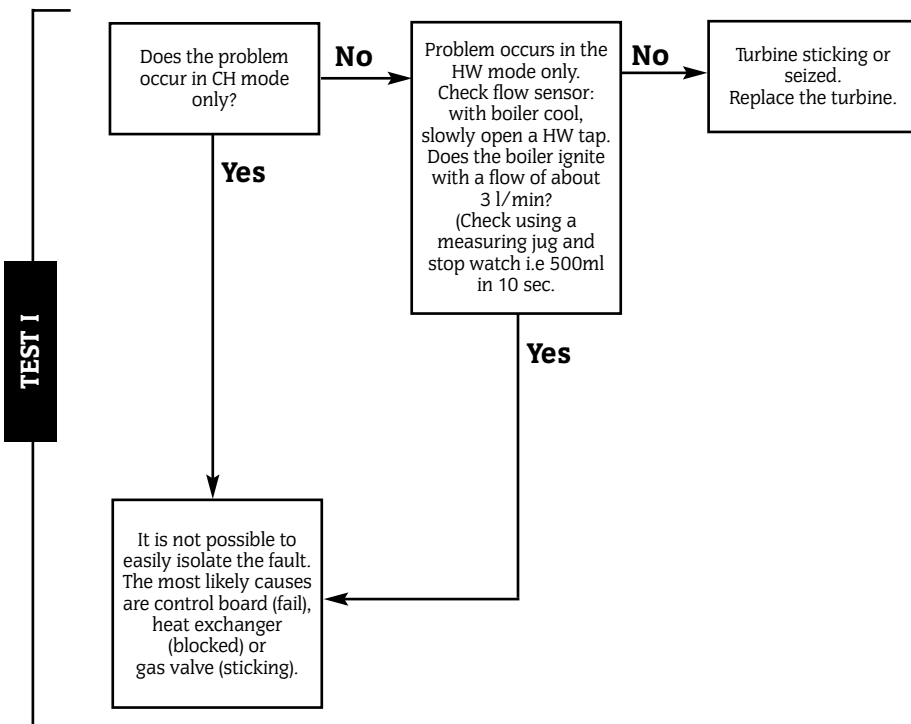
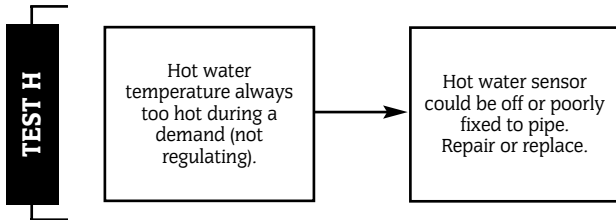
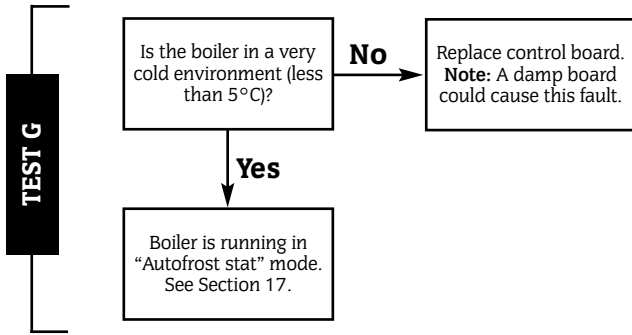






**TEST F**





## 20. Conversion Instructions

**ONLY COMPONENTS SUPPLIED BY WORCESTER HEAT SYSTEMS SHOULD BE USED**

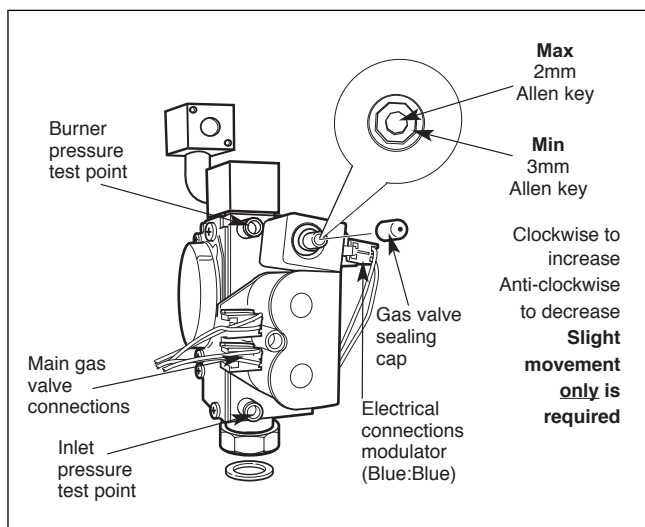
**ONLY COMPETENT PERSONNEL SHOULD ATTEMPT THE CONVERSION**

**CONVERSION FROM NATURAL GAS TO LPG SHOULD NOT BE CARRIED OUT ON APPLIANCES INSTALLED IN A ROOM OR INTERNAL SPACE BELOW GROUND LEVEL**

1. Ensure the gas service cock is turned OFF and the electrical supply is ISOLATED.
2. Refer to the Servicing Instructions to remove the cabinet front panel and inner casing.
3. Follow the dismantling instructions to remove the burner. Refer to Installation and Service Instructions Section: Inspection and Servicing.
4. Remove the injector and replace with the relevant injector from the kit. Refer to Installation and Service Instructions Section: Inspection and Servicing.
5. Remove the nut end cap and bracket at the opposite end of the burner and insert the gauze from the kit for NG to LPG or remove it for LPG to NG.
6. Refit the end cap ensuring that the support bracket is in the correct orientation.
7. Remove the gas valve and replace with the gas valve supplied in the kit. Refer to Installation and Service Instructions Section: Replacement of Parts.
8. Re-assemble the burner and inner-casing.
9. Turn on the gas and electricity supplies and follow the

commissioning procedure to confirm gas soundness and correct boiler operation.

10. Check and adjust the setting pressures to the values in the table overleaf and adjust if necessary. Refer to Installation and Service Instructions Section: Replacement of Parts. "To Set the Burner Pressure".



11. Refit the plastic sealing cap to the gas valve modulating valve adjuster and seal with a dab of paint or similar.
12. Turn off the boiler and when cool peel off the arrow from the data plate on the combustion chamber front panel and re-stick against the gas type for which the boiler has been converted and adjusted.
13. Replace the boiler front panel.

**The conversion is now complete.**

Table 1. 24i

NOMINAL BOILER RATINGS (10 Minutes After Lighting)			
BOILER ADJUSTED FOR G20 (Natural Gas)			
OUTPUT	INPUT (Net)	BURNER PRESSURE	GAS RATE
kW	kW	m bar.	m <sup>3</sup> /h
3.5	9.5	1.4	1.00
23.5	25.9	13.6	2.74
BOILER ADJUSTED FOR G31 (Propane)			
7.5	9.5	4.6	0.39
23.5	25.9	35.0	1.06

Natural Gas: Net Input = Gross Input x 0.901

Table 1. 28i

NOMINAL BOILER RATINGS (10 Minutes After Lighting)			
BOILER ADJUSTED FOR G20 (Natural Gas)			
OUTPUT	INPUT (Net)	BURNER PRESSURE	GAS RATE
kW	kW	m bar.	m <sup>3</sup> /h
8.0	9.5	1.2	1.00
27.5	30.0	14.7	3.17
BOILER ADJUSTED FOR G31 (Propane)			
8.0	9.5	3.4	0.39
27.5	30.0	35.3	1.23

LPG (Propane): Net Input = Gross Input x 0.922

QTY	DESCRIPTION	PART No
1	Conversion Instructions	
1	LPG Gas Valve Dungs BM771 sl 040 (for LPG to NG)	8 716 105 654
1	NG Gas Valve Dungs BM771 sl 040 (for NG to LPG)	8 716 105 650
1	Burner gauze	8 716 142 601
1	Fibre washer	8 710 103 043
2	O rings	8 716 140 827
1	Injector 2.7mm 24i LPG	8 716 156 373
1	Injector 2.78mm 28i LPG	8 716 140 209
1	Injector 4.3mm 24i NG	8 716 105 033
1	Injector 4.5mm 28i NG	8 716 140 208
1	Copper washer	8 716 101 994

This manual is to be used in conjunction with the variant part number of the bar code below:



*Worcester Heat Systems Limited (Bosch Group), Cotswold Way, Warndon, Worcester WR4 9SW.*

*Telephone: (01905) 754624. Fax: (01905) 754619.*

*Technical Helpline (08705) 266241.*

*[www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk)*

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**PUBLICATION 8 716 106 766a**