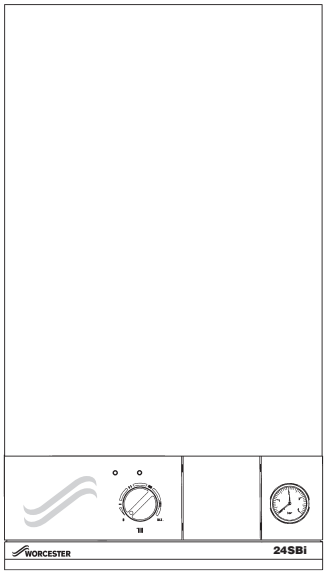
WORCESTER
Bosch Group

15SBi / 24SBi

WALL MOUNTED BOILERS FOR CENTRAL HEATING
and Indirect supply of domestic hot water

INSTALLATION AND SERVICING INSTRUCTIONS



This appliance is for use with Natural Gas or LPG (Cat II 2H3P).

15SBi GC NUMBER 41 311 43 (N.G.) 24SBi GC NUMBER 41 311 44 (N.G.)

15SBi GC NUMBER 41 311 45 (L.P.G.) 24SBi GC NUMBER 41 311 46 (L.P.G.)

WORCESTER
Bosch Group

CE

APPLIANCE OUTPUTS

	Natural Gas	LPG (Propane)
	24SBi	
Minimum	15.0 kW	15.0 kW
Maximum	24.0 kW	24.0 kW
	15SBi	
Minimum	6.0 kW	6.0 kW
Maximum	15.0 kW	15.0 kW

IMPORTANT: THESE INSTRUCTIONS APPLY IN THE UK ONLY

AND 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.

Contents

1. Installation Regulations

1.1 Gas Safety (Installation & Use) Regulations 1998.
It is the law that all gas appliances are installed by a competent person in accordance with the above regulations. 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 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 bye-laws.

1.5 The installation should follow the recommendations of the following British Standards unless otherwise indicated and to any other relevant standards.

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 (when relevant).
BS6798 - Installation of gas fired hot water boilers.
BS6891 - Low pressure gas pipework installations up to 28mm (R1).
BS7593 - Water treatment.

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

1.7 In accordance with COSSH the appliance does not contain any substances which are harmful to health.

1.8 Product Liability regulations indicate that, 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 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.

1.10 These instructions cover, as far as possible, the foreseeable situations which may arise. Contact Worcester Heat Systems Technical Department, Telephone: 0990 266241, for advice on specific installations.

2. Introduction

2.1 General Information
The appliance is set to give the mid-range output of 19.5kW [24SBi] or 10.8kW [15SBi].
Kits are available to convert the appliance from Natural Gas to Propane operation and vice versa.

2.2 Electrical Supply
230V - 50Hz. Load 180 watts. External fuse 5A, Internal fuse F1 - 4A.

2.3 Gas supply
The 24SBi appliance requires a maximum of 2.86 m^3/h of natural gas (G20) or 1.1 m^3/h of propane (G31).
The 15SBi appliance requires a maximum of 1.78 m^3/h of natural gas (G20) or 0.68 m^3/h of propane (G31).
The installation and the connection of the gas supply to the appliance must be in accordance with BS6891.
The meter or regulator should deliver a dynamic pressure of 20 mbar (G20) or 37mbar (G31) at the appliance, which is equivalent to about 19 mbar or 36 mbar at the gas valve inlet pressure test point.

	Total length of gas supply pipe (metres)				**Pipe size (Ømm)**
Gas Discharge Rate (m^3/hr)	3	6	9	12	
	Propane				
	1.5	–	–	–	15
	8.0	5.2	4.2	3.6	22
	15.9	8.8	8.5	7.2	28
	Natural Gas				
	8.7	5.8	4.6	–	22
	18.0	12.0	9.4	–	28

2.4 Installation
The appliance is suitable for indoor installation and for use with a sealed system only and includes a built in filling loop.
If the appliance is fitted in a cupboard or a compartment is built around it after installation, then the structure must conform with the requirements of BS6798. However, because of the low casing losses, there is no need for cooling ventilation openings in the compartment. The spaces specified for servicing **must** be maintained. Refer to Section 6.
An optional wall frame is available to create space for the service pipes to pass at the back of the appliance.

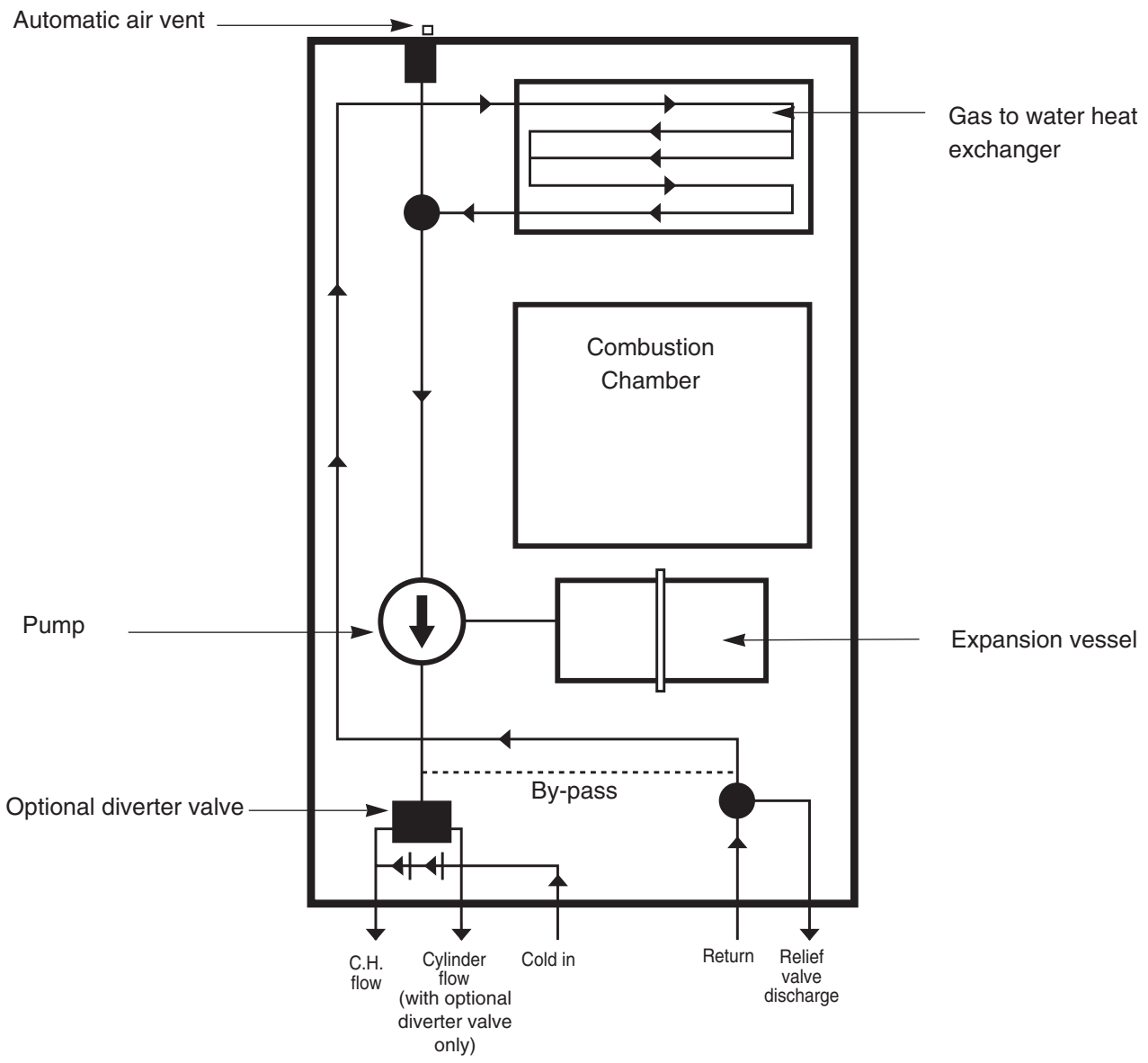
2.5 Flue
The flue can be to the right, left or rear. A vertical flue system is available.
An internal flue fitting kit is available. Fitting instructions are given in Section 11.9.

2.6 Controls
A control knob adjusts the CH temperature and switching.
A facia mounted mechanical clock is available.
Only mains voltage external controls can be used.
A plug- in mid-position diverter valve is available as an optional extra.

2.7 System
All dirt must be flushed from the system before connecting the appliance. Refer to Fig. 5,6 and 7.
The system can be pre-piped and flushed before the appliance is fitted.
The connections in the system must withstand a pressure of up to 3 bar.
Radiator valves must conform to BS2767:10:1977.
2.8 Domestic Hot Water
Single feed direct cylinders are not suitable and must not be used.
A HW cylinder must be of the indirect coil type and suitable for working at a gauge pressure of, at least, 0.35bar above the relief valve setting.
Where a storage system will not have a vent to atmosphere the installation must comply with Building Regulations and Water Company bye-laws. If connecting to an existing system the local authority should be informed.

2.9 Safety
The appliance must not be operated with the inner casing cover removed.
The gas and electricity supplies must be turned off before servicing or working on the appliance.
2.10 Operation
Central Heating
A demand for heat will ignite the burner. The temperature is controlled by the integral sensor. At the end of the demand the burner will go out and the pump will continue to run for up to 3 minutes to dissipate the heat.
Domestic Hot Water:
The supply of domestic hot water depends upon the type of hot water equipment installed and the control system. Refer to the separate leaflet.
The use of unvented cylinders must be in accordance with the manufacturers instructions relevant to British Standards

Fig. 1. Water flow diagram.



3. Technical Data

The data plate is fixed to the inner casing cover.

Table 1. 15SBi

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^3/h
6	6.93	1.6	0.73
10.8	12	6.4	1.27
15	16.65	12	1.76
BOILER ADJUSTED FOR G31 (Propane)			
6	6.93	4.3	0.28
10.8	12	13.9	0.49
15	16.65	28.6	0.68

Natural Gas: Net Input = Gross Input x 0.901

Table 1. 24SBi

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^3/h
15	17.5	4.5	1.85
19.5	22.1	8	2.34
24	27	12.5	2.86
BOILER ADJUSTED FOR G31 (Propane)			
15	17.5	13.5	0.72
19.5	22.1	22.5	0.9
24	27	35.5	1.1

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

Table 2.

FLUE DETAILS		
HORIZONTAL FLUE		**mm**
WALL HOLE DIAMETER	EXTERNAL FIX	110
	INTERNAL FIX	150
STANDARD FLUE	MINIMUM LENGTH	100
	MAXIMUM LENGTH	725
EXTENDED FLUE	MAXIMUM LENGTH	4000
FLUE ASSEMBLY DIAMETER		100

Table 3

MAXIMUM AVAILABLE PUMP HEAD			
BOILER OUTPUT kW	HEAD Metres	MIN. FLOW RATE L/min.	FLOW/RETURN DIFFERENTIAL °C
6.0	5.7	7.8	11
15.0	3.8	19.5	11
24.0	2	27	12.7

Table 4

MECHANICAL SPECIFICATIONS	
CENTRAL HEATING FLOW - COMPRESSION	22mm
RETURN - COMPRESSION	22mm
COLD WATER INLET - COMPRESSION	15mm
CYLINDER FLOW - COMPRESSION	22mm
GAS INLET	Rp ¾
RELIEF VALVE DISCHARGE - COMPRESSION	15mm
CASING HEIGHT	850mm
CASING WIDTH	450mm
CASING DEPTH	365mm
WEIGHT - LIFT	15SBi 35kg 24SBi 37kg
WEIGHT - PACKAGED	15SBi 42kg 24SBi 44kg

Table 5

PERFORMANCE SPECIFICATIONS		
PRIMARY WATER CAPACITY		2.0 litres
MAXIMUM MAINS INLET PRESSURE		10 bar
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE		85°C (nom)
MAXIMUM CENTRAL HEATING SYSTEM SET PRESSURE		2.5 bar
MINIMUM CENTRAL HEATING SYSTEM SET PRESSURE		0.5 bar
OUTPUT TO CENTRAL HEATING	NATURAL GAS (G20)	**15SBi** 6.0 - 15.0kw **24SBi** 15.0 - 24.0kw
	LPG - PROPANE (G31)	**15SBi** 6.0 - 15.0kw **24SBi** 15.0 - 24.0kw
NOx CLASSIFICATION FOR BOTH 15 & 24SBi		Class 2

Table 6

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

Table 7

CLEARANCES (mm)		
	INSTALLATION	**SERVICE**
ABOVE APPLIANCE FLUE ELBOW	30	30
IN FRONT OF APPLIANCE	600	600
BENEATH APPLIANCE	200	200
RIGHT AND LEFT HAND SIDE	10	10

Refer to Section 6.

Table 8

SYSTEM CAPACITY			
TOTAL SYSTEM VOLUME litres			
INITIAL	INITIAL CHARGE PRESSURE bar		
PRESSURE bar	0.5	1.0	1.5
1.0	72	92	N/A
1.5	39	53	64

4. Siting The Appliance

The appliance may be installed in any room subject 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.

If the 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 appliance is NOT suitable for external installation.

The wall must be able to support the weight of the appliance. Refer to Table 4.

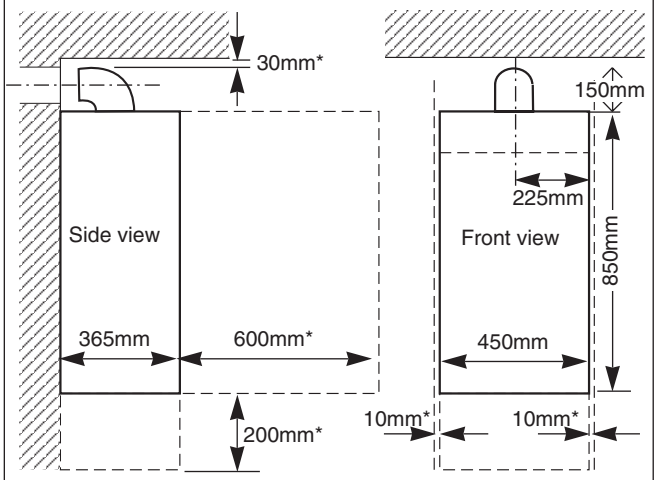
The specified clearances must be available for installation and servicing. Refer to Table 7 and Fig.2.

The appliance can be installed in a cupboard/compartment to be used for airing clothes providing that the requirements of BS6798 and BS5440/2 are followed. Refer to Section 2.4.

The clearance between the front of the appliance and the cupboard/compartment door should be not less than 250mm.

LPG Installation. Refer to Section 1.10.

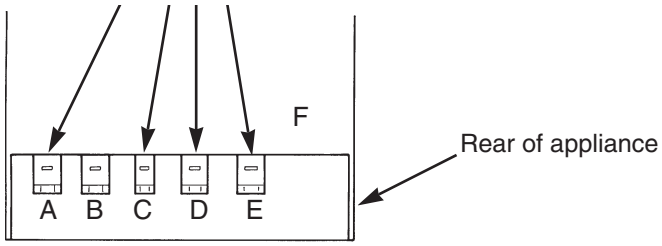
Fig. 2. Appliance casing dimensions and required clearances.



* Space required for installation and servicing

Fig. 3. Appliance pipework connections

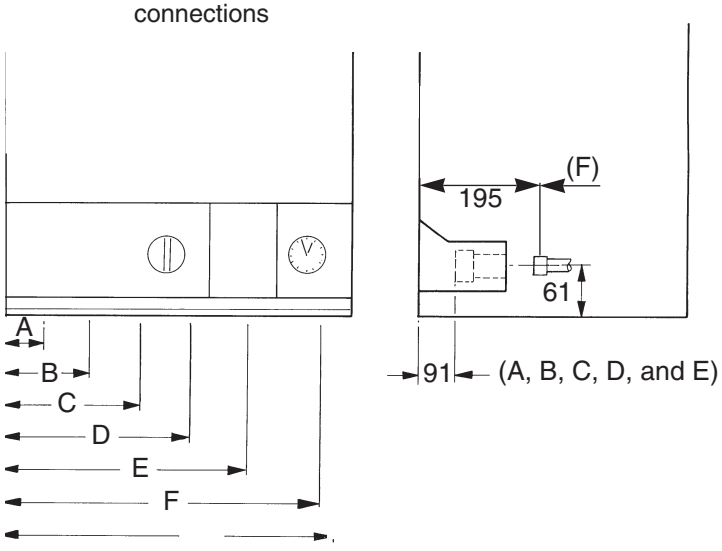
Screw driver required to operate Valves.
Valves shown closed.



View on underside of appliance showing connections

A	CH Flow	= 62.5
B	Cylinder Flow*	= 127.5
C	Cold In	= 192.5
D	Gas Inlet	= 257.5
E	Return	= 322.5
F	Safety Discharge	= 382.5

*Use with optional diverter valve



5. Flue terminal positions

The flue system must be installed following the requirements of BS5440:1.
The standard flue kit length is 425 - 725mm. Extension kits for flues up to 4m are available.
The terminal must not cause an obstruction nor the combustion products a nuisance.
If the terminal is within 1m of a plastic or painted gutter or within 500mm of painted eaves then an aluminium shield at least 750mm long should be fitted to the underside of the gutter or painted surface.
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 guard Type K2 can be obtained from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.
It is essential that products of combustion cannot re-enter the building. Refer to Fig 4.

6. Air Supply

A separate vent for combustion air is not required.
If the appliance is in a cupboard or compartment it is not necessary to have additional ventilation for the boiler providing that the following clearances are provided:

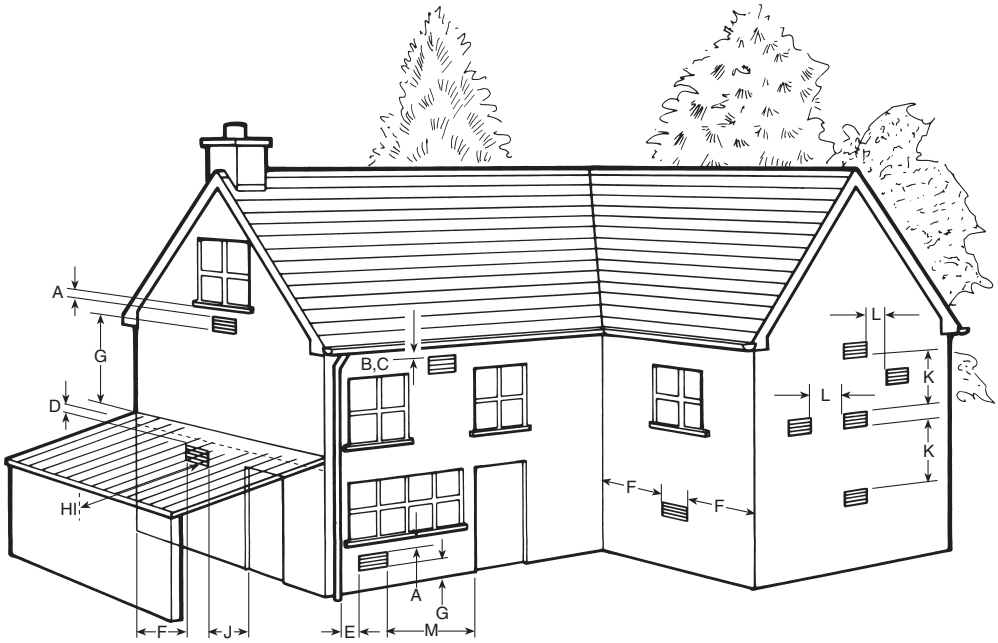
Above the flue turret	30mm
In front*	250 mm
Below	200mm
Right-hand side	75 mm
Left-hand side	75mm

* Clearance to a removable panel i.e. door.

If the appliance is installed in a cupboard or compartment that does not allow these clearances then permanent air vents are required in the compartment, one at a high level and one at a low level. Both high and low level air vents must communicate with the same room or must both be on the same wall to the outside air. The minimum requirements are:

Model	Position of vent	Air from room	Air from outside
24SBi	High	315cm^2	158cm^2
	Low	315cm^2	158cm^2
15SBi	High	315cm^2	158cm^2
	Low	315cm^2	158cm^2

Fig. 4. Siting of the flue terminal.



TERMINAL POSITION	MIN. DISTANCE	TERMINAL POSITION	MIN. DISTANCE
A– directly below an openable window or other opening e.g. air brick.	300mm (12in.)	I– From a terminal facing a terminal	1200mm (47in.)
B– Below gutters, soil pipes or drain pipes.	75mm (3in.)	J– From an opening in a car port (e.g. door window) into dwelling.	1200mm (47in.)
C– Below eaves.	25mm (1in.)	K– Vertically from a terminal on the same wall.	150mm (6in.)
D– Below balconies or car port roof.	25mm (1in.)	L– Horizontally from a terminal on the same wall.	300mm (12in.)
E– From vertical drain pipes and soil pipes.	25mm (1in.)	M– From door, window or air vent (achieve where possible).	150mm (6in.)
F– From internal or external corners.	25mm (1in.)		
G– Above ground, roof or balcony level.	300mm (12in.)		
H– From a surface facing a terminal.	600mm (24in.)		

7. Sealed System

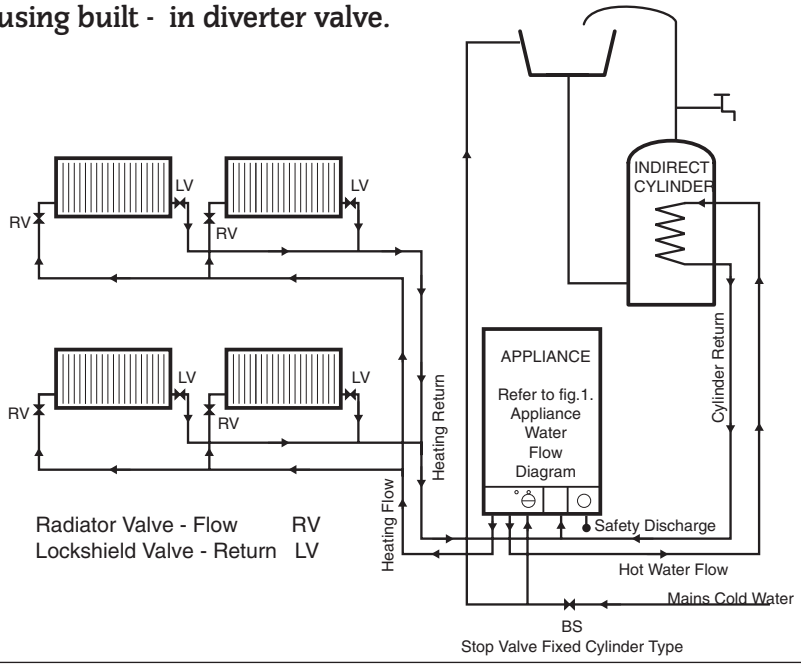
7. Sealed System
The system must comply with requirements of BS6798 and BS5449.
The appliance must not be operated without the system being full of water and correctly pressurised.
The pressure relief valve will operate at 3 bar. The discharge pipe must be directed away from any electric's or from where it might be hazard.
All connections in the system must withstand a pressure of up to 3 bar.
The expansion vessel, to BS4814, has a capacity of 10 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. Refer to BS 7074:1, BS5449 and Table 9 for a guide to the available system capacity. If the expansion vessel fails then it must be replaced with the designated spare part.
The maximum system design pressure is 1.5 bar. If the pressure is above 2.6 bar when at maximum temperature then another expansion vessel must be fitted as near to the appliance as possible in the return pipe.
A filling loop is fitted to the appliance. Refer to Fig 8.
The system and the appliance must be properly vented. Repeated venting loses water from the system and usually indicates that there is a leak.
An adjustable by-pass is fitted to the appliance. Refer to Fig 9.
The pump is set at maximum and must be adjusted to suit the system load

8. Domestic Hot Water

It is NOT suitable for direct water supply.
Do not connect to a direct cylinder.
The SBi can be connected to any indirect cylinder, i.e unvented or thermal store, all the benefits of a "dry loft" and mains pressure hot water can be realised. Refer to a separate leaflet or contact Worcester Heat Systems Technical Helpline. 0990 266241.

Fig. 5. System layout if using built - in diverter valve.

Note:
A drain cock should be fitted at the lowest point of the heating circuit and beneath the appliance

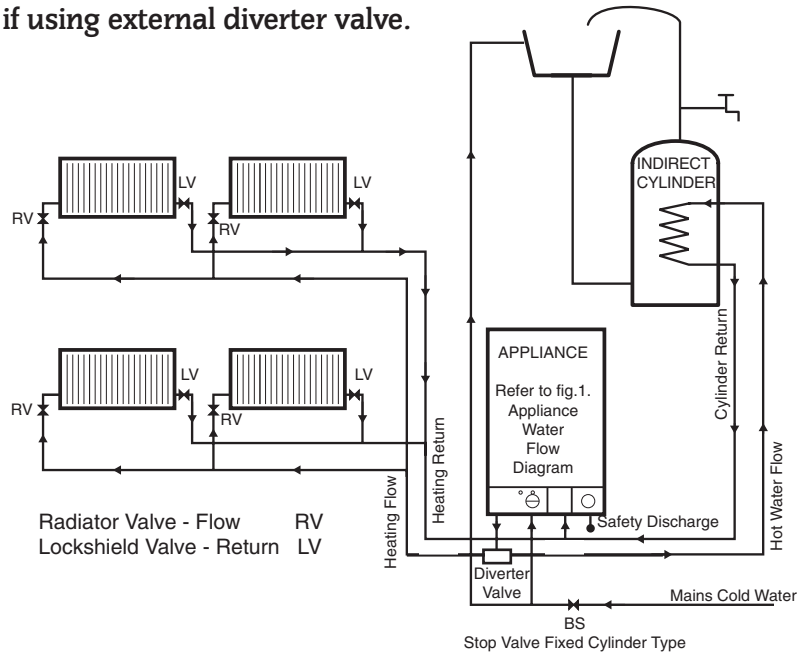


IMPORTANT

For Details of the wiring requirements for the system controls, please refer to the SBi System Wiring Guide and the Instructions supplied with the Built-in Mid-Position Valve.

Fig. 6. System layout if using external diverter valve.

Note:
A drain cock should be fitted at the lowest point of the heating circuit and beneath the appliance

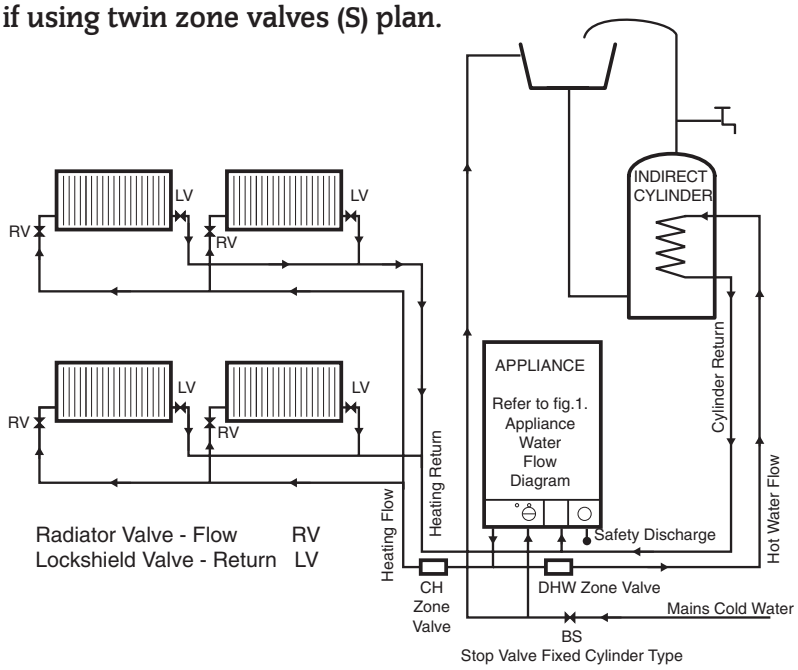


IMPORTANT

For Details of the wiring requirements for the system controls, please refer to the SBi system wiring guide.

Fig. 7. System layout if using twin zone valves (S) plan.

Note:
A drain cock should be fitted at the lowest point of the heating circuit and beneath the appliance



IMPORTANT

For Details of the wiring requirements for the system controls, please refer to the SBi system wiring guide.

Fig. 8. Filling Loop.

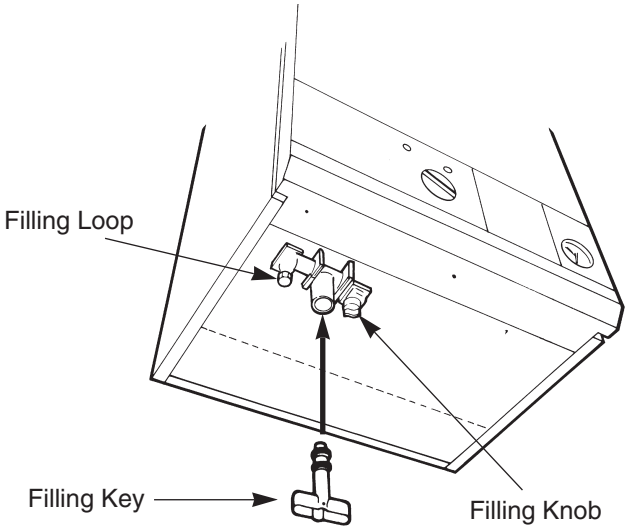
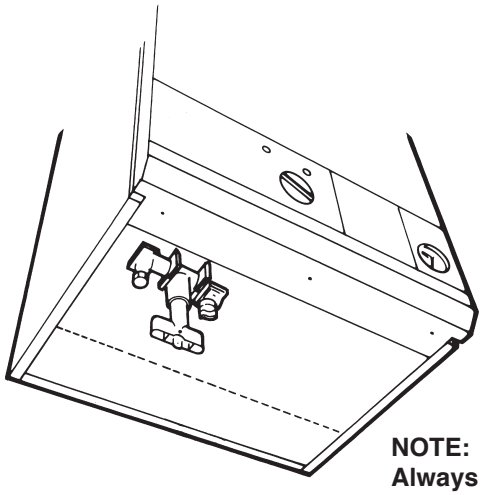
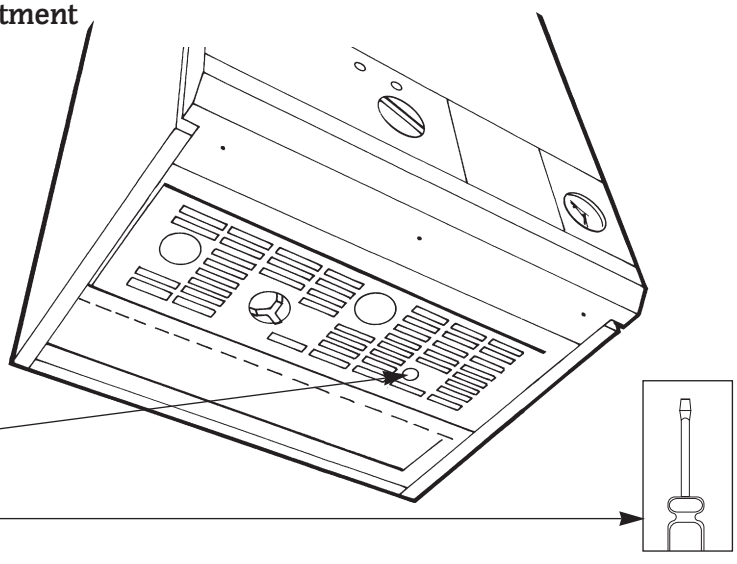


Fig. 8a. Filling Key inserted for filling.



NOTE:
Always remove the filling key after filling

Fig. 9. Central heating by-pass adjustment



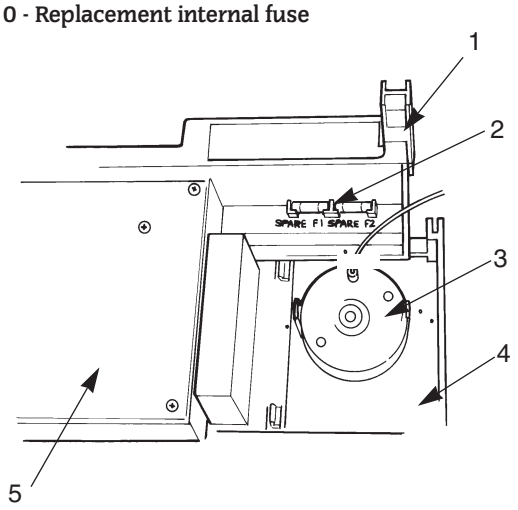
9. Gas Supply

The 24SBi appliance requires a maximum of 2.86m^3/h of natural gas (G20) or 1.1m^3/h of propane (G31). Refer to Table 1.
The 15SBi appliance requires a maximum of 1.76m^3/h of natural gas (G20) or 0.68m^3/h of propane (G31). Refer to Table 1.
A natural gas appliance must be connected to a governed meter.
The installation of the gas supply to the appliance must be in accordance with BS6891.
The meter 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 [equivalent to about 18mbar or 35mbar at the gas valve inlet pressure connection] and that the gas flow is adequate for all the installed gas appliances.

10. Electrical

Mains supply: 230V (50 Hz 180watts. External fuse 5A. Internal fuse F1-4A. Spare internal fuse is supplied with the appliance.

Fig 10 - Replacement internal fuse



1. Control Panel Pivot Point
2. Fuse -F1
3. Pressure Gauge
4. Facia Panel
5. Control Board Assembly

The appliance must be earthed and it must be possible to completely isolate the appliance.
The mains cable must be 0.75mm2 (24x0.20 mm) to BS6500 - Table 15 or 16.
The mains cable must be connected to the terminal 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 connection to the mains must be either : A 3A fused three-pin plug and unswitched socket outlet (both complying with BS1363) or a double pole isolator with a contact separation of 3mm in all poles and supplying the appliance and controls only.

Fig.11 . Mains electricity connections.

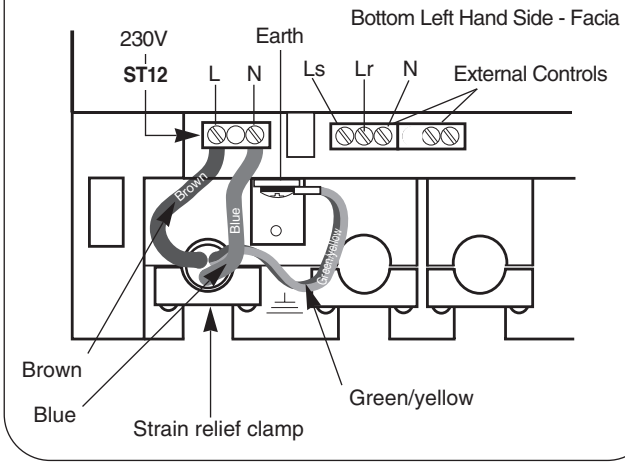
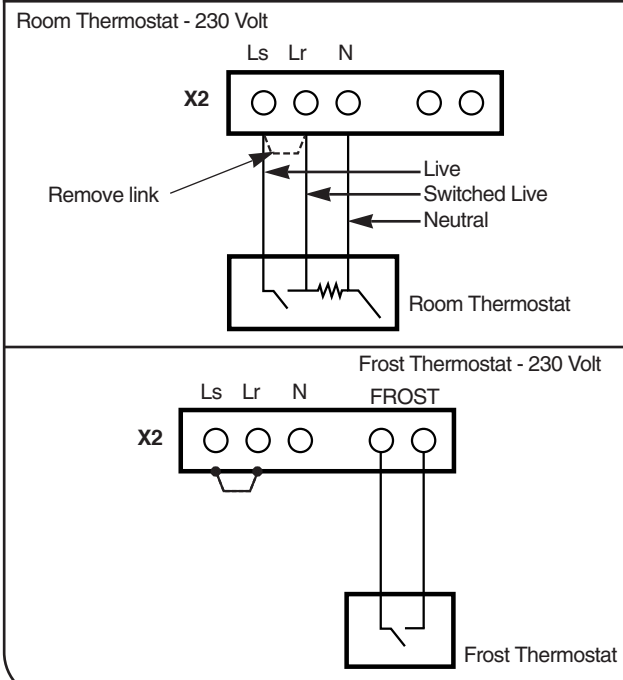


Fig 12 - Mains Voltage External Controls Connections



A room thermostat must be suitable for mains voltage operation.
A mechanical timer, to fit into the facia, is available.
A frost thermostat should be considered where parts of the system are remote from the appliance. For any frost thermostat function, the boiler temperature control knob must not be set to the 'off' position.
NOTE: In some cases these devices should not be connected at these points. Refer to separate system wiring guide booklet.
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.

Fig.13 . Wiring diagram - pictorial.

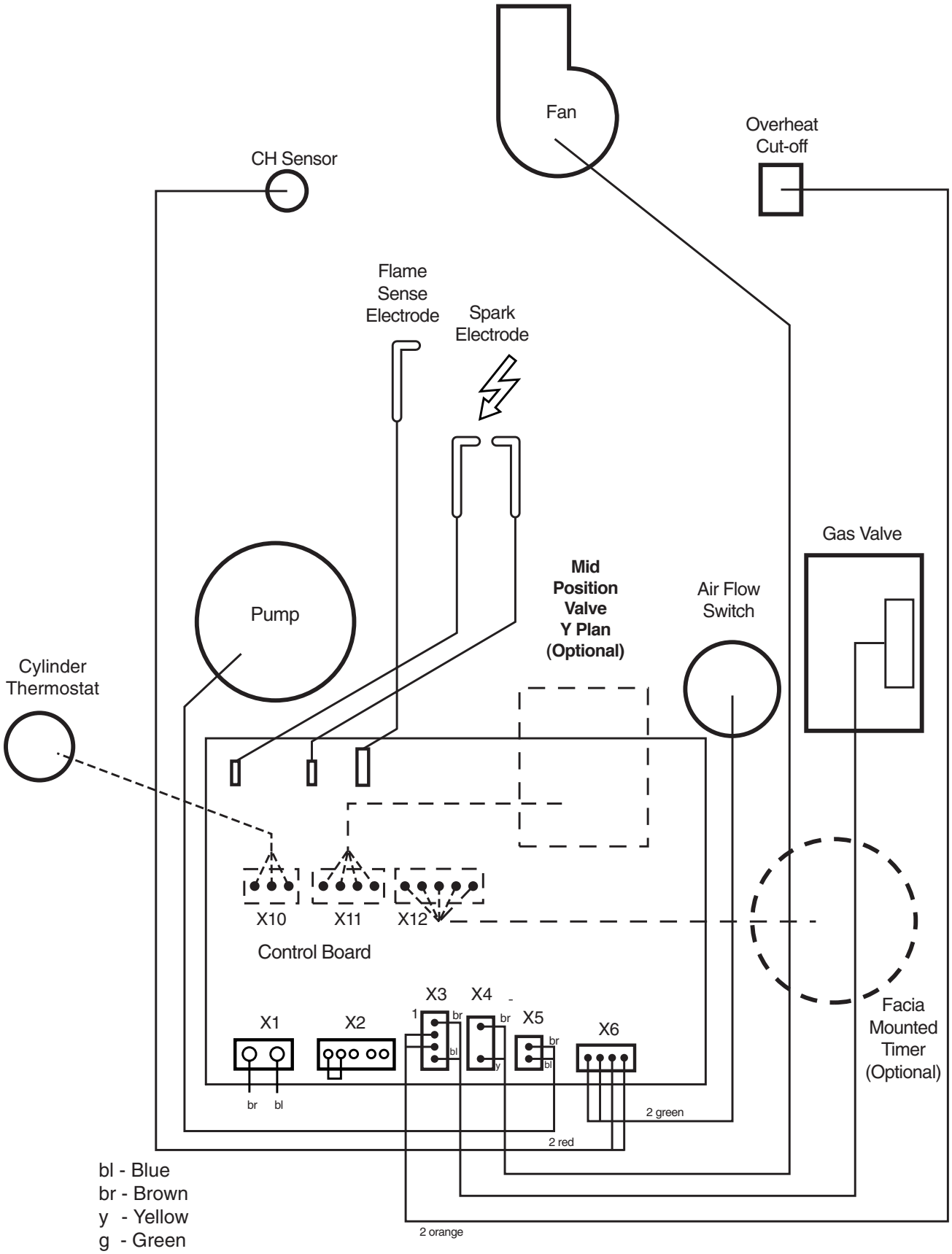
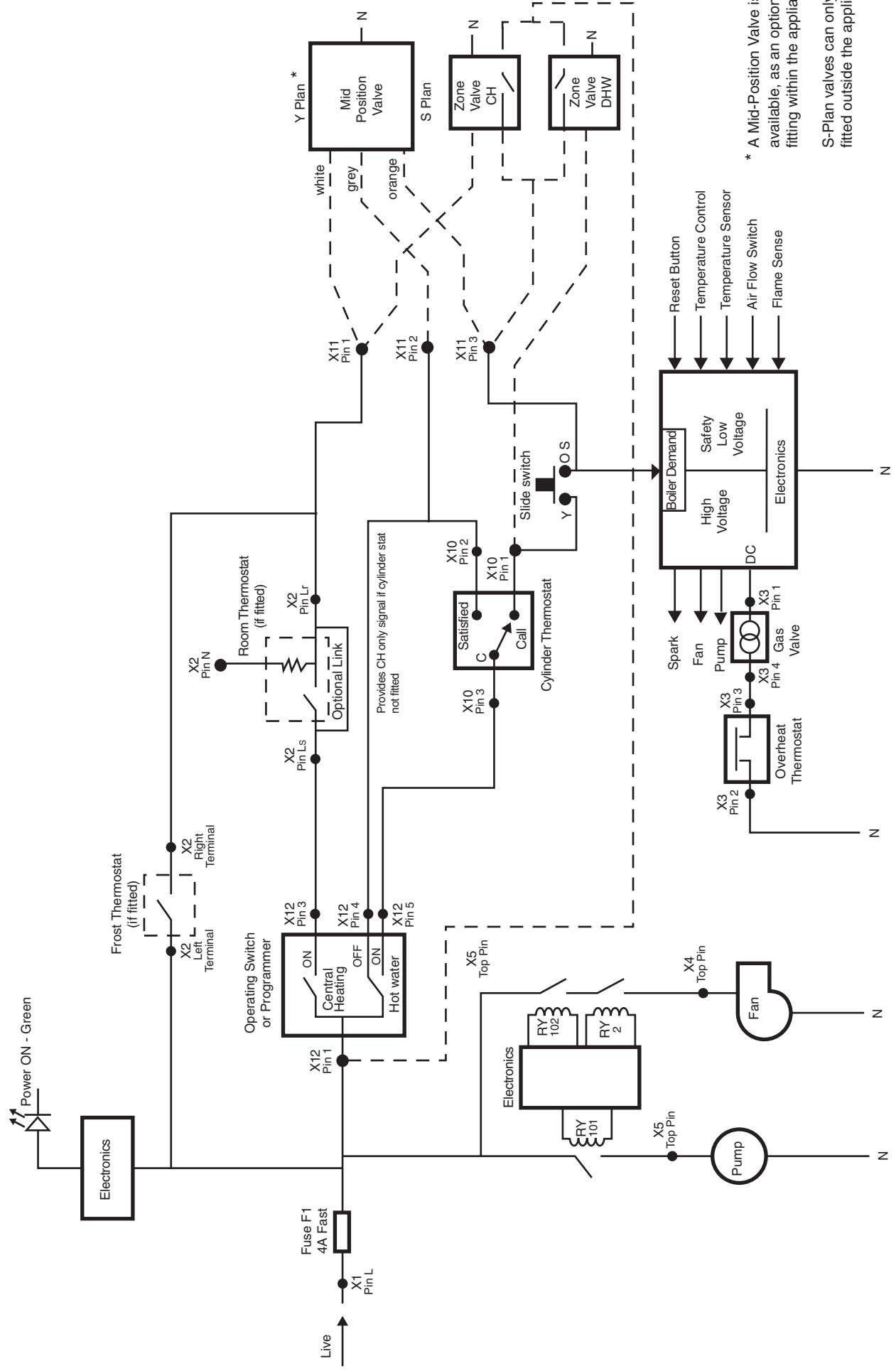


Fig.14 . Wiring diagram - functional



11. Installing The Appliance

Note: READ THIS SECTION FULLY BEFORE COMMENCING THE INSTALLATION

11.1 Unpacking

Check the contents against the packing list.

Remove the wall mounting template and the manifold/mounting plate assembly.

11.2 Site Preparation

Check that the correct position for the appliance has been chosen and that the wall is sound, flat and will support the weight of the appliance. Refer to Sections 4 & 5 and Tables 4 and 8.

11.3 Fixing Holes and Flue Opening

If it is necessary for any of the pipes to run up the back of the appliance then the, optional extra, space frame must be fitted to the wall.

Hold the template to the wall. Check that the template is level.

Mark the position of the fixing holes and the flue opening. Refer to Fig 15.

Drill the fixing holes 60mm deep for the No. 12 size plugs.

Cut the flue duct hole at 110mm diameter [150mm diameter for internally fitted flues].

11.4 Wall Mounting Plate and Manifold

Fit the plugs and fix the mounting plate and manifold assembly to the wall. Refer to Fig 15.

11.5 Gas and Water Pipes

Fix the appropriate fitting to the gas cock to connect the inlet supply pipe. Refer Fig 16.

It is important that the system pipes are not fixed near the appliance using clips that put a strain on the connections.

Before the appliance is connected to the wall manifold thoroughly flush the system.

11.6 Install the Boiler

Lift off the cabinet front panel.

Check that the gas and water valves on the manifold are closed. Refer to Fig 16.

Remove the plastic cover and fit the seals to the service valves on the manifold. Refer to Fig 16.

Fig. 15 . Fixing the wall mounting plate.

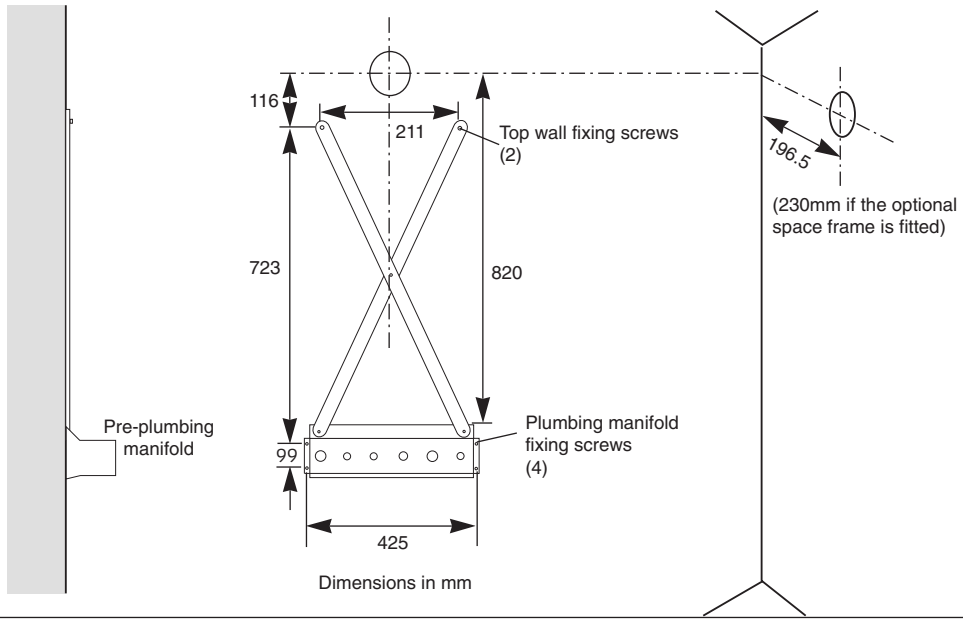
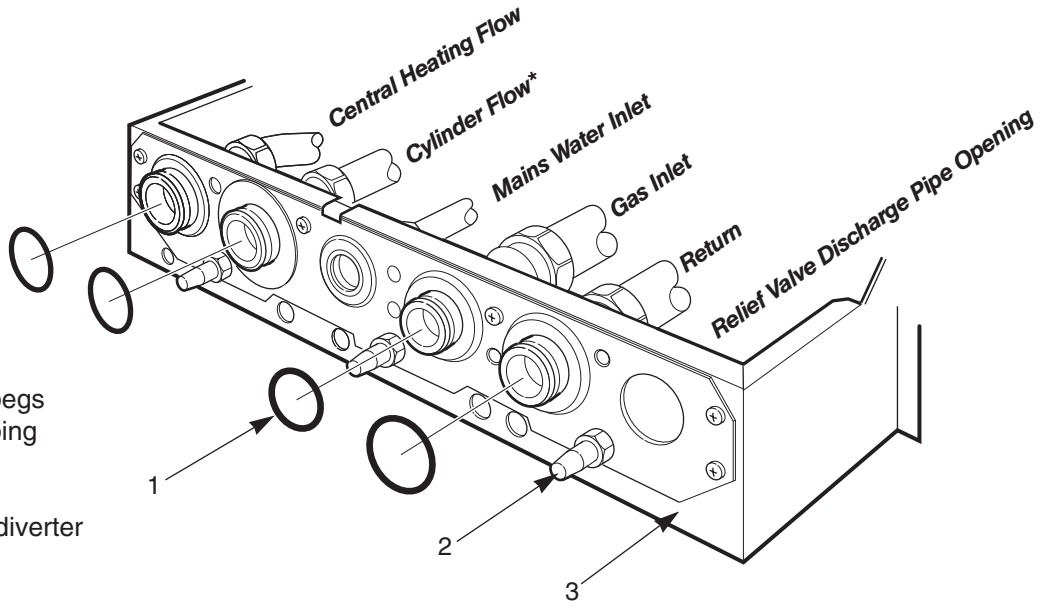


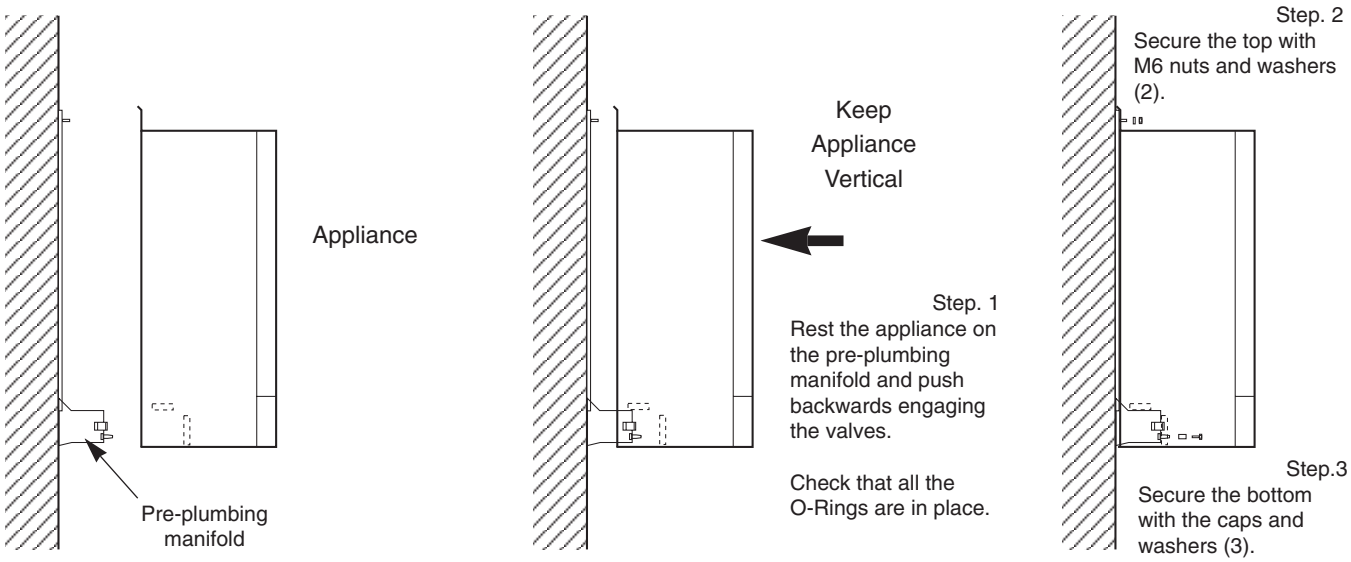
Fig. 16 .Mounting plate manifold.



1. O-Ring
2. Locating pegs
3. Pre-plumbing manifold

* With optional diverter valve only

Fig. 17 . Fixing the appliance to the wall mounting plate.



Lift the appliance against the wall to engage in the top support plate and lower onto the manifold assembly. Refer to Fig. 17.
Tighten the gas and water connections. Lower the facia and fit a discharge pipe to the relief valve leading it away from any electric's. The pipe must not be less than 15mm in diameter and must run continuously downward outside the appliance. Refer to Fig 47.
If the optional internally fitted diverter valve is to be connected then full instructions are sent with the valve. Refer to Fig. 20.

11.7 Air and Flue Duct Preparation
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.
Fit the appropriate flue restrictor ring by unscrewing the flue spigot from the boiler. Refer to Fig.21.

24SBi	- 75mm	Horizontal flue	up to 1m
	- 75mm	Vertical flue	up to 1m
15SBi	- 74mm	Horizontal flue	up to 1m
	- 79mm	Vertical flue	up to 1m

The standard telescopic flue assembly is suitable 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.22.

Fig.18. Appliance casing and control equipment fixings.

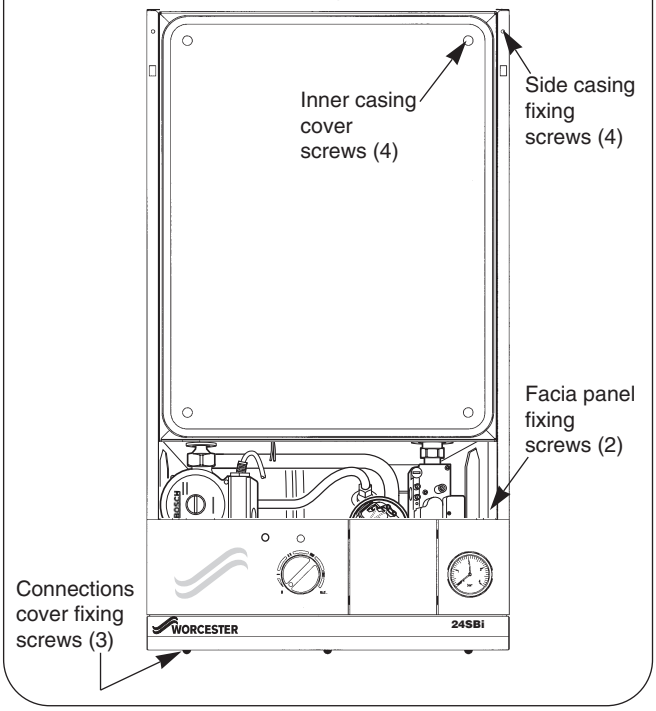
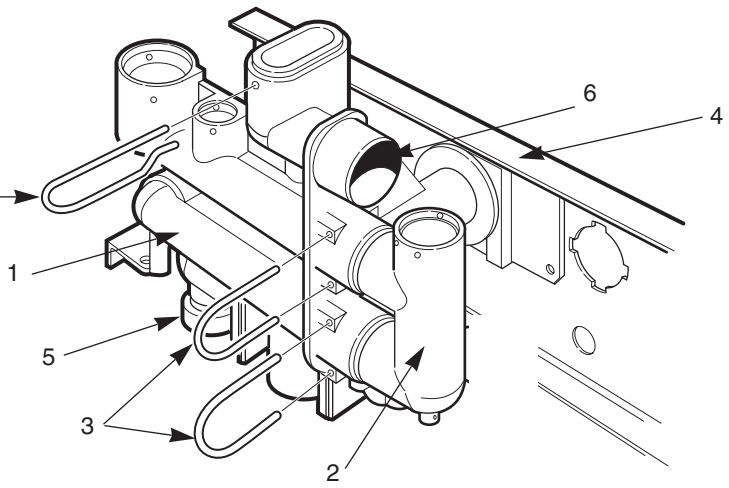
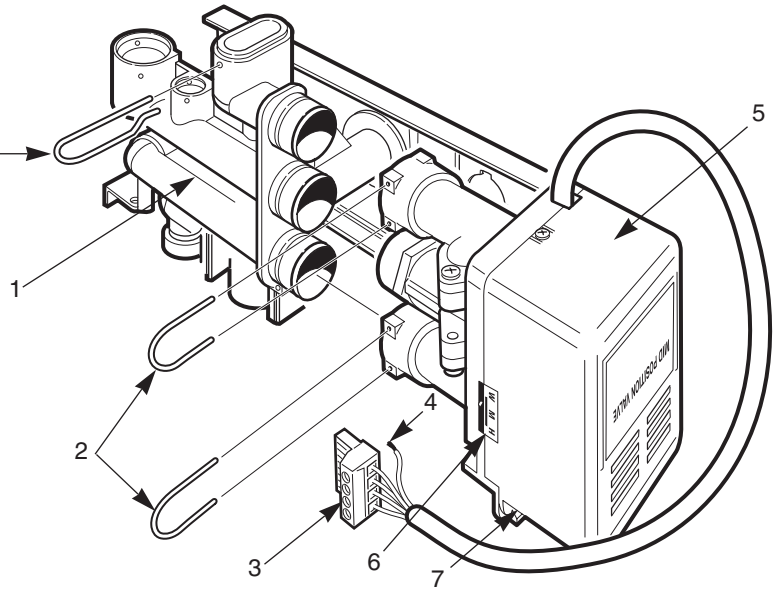


Fig.19. Flow manifold assembly



1. Flow manifold assembly
2. Connector
3. Clips (Removable)
4. Assembly mounting plate
5. Filling Loop
6. Protection cap

Fig.20. Mid-position diverter valve (Optional)



1. Flow manifold assembly
2. Clips (Removable)
3. Diverter valve connector plug
4. Earth connection
5. Mid-position diverter valve
6. Valve status indicator
7. Manual operating switch

If L>725mm then extension duct kit/s will be required - each kit extends the flue by 750mm up to a maximum of 4m. See table below.

EXTENSION	MAXIMUM FLUE LENGTH mm
1	1475
2	2225
3	2975
4	3725
5	4000

11.8 Measure and Cut the Ducts.
General: Cut the ducts as necessary, ensuring that the ducts are square and free from burrs. Always check the dimensions before cutting.
Measure the distance L. Refer to Fig.24 and 25.

The standard flue can be telescopically adjusted to any length between 425mm and 725mm.

Fix the flue assembly together using the self-tapping screws provided. Refer to Fig.22.

It will only be necessary to cut the standard assembly if L<425mm. Cut the flue turret assembly and the terminal assembly by the same amount i.e L=350 - remove 75mm from each assembly.

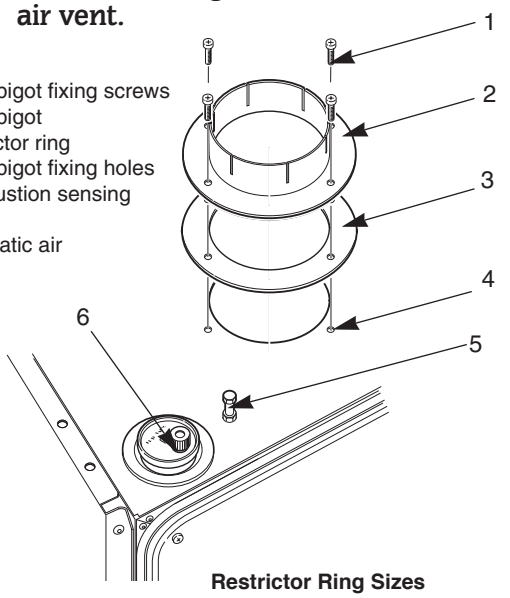
Minimum side flue length = 335mm (accommodating a 10mm Service clearance and a 100mm wall)

Minimum rear flue length = 296mm (accommodating a 100mm wall)

If L is between 1175 - 1475mm (1 extension)
1925 - 2225mm (2 extension)
2675 - 2975mm (3 extension)
3425 - 3725mm (4 extension) it is not necessary to cut the ducts.

Fig.21. Flue turret fixing and automatic air vent.

1. Flue spigot fixing screws
2. Flue spigot
3. Restrictor ring
4. Flue spigot fixing holes
5. Combustion sensing point
6. Automatic air vent



Restrictor Ring Sizes
24SBi - 75mm horizontal and vertical flue up to 1m
15SBi - 74mm horizontal flue up to 1m
15SBi - 79mm vertical flue up to 1m

Fig.22 . Standard flue assembly.

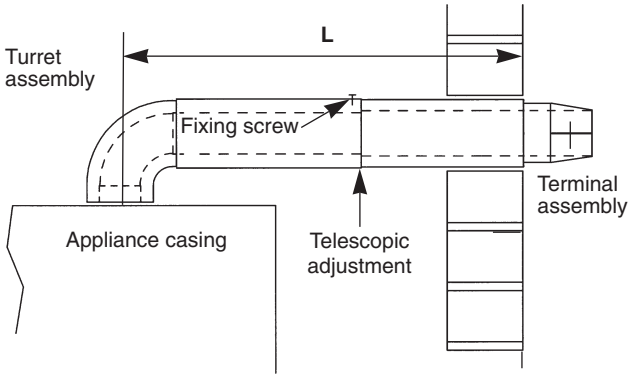


Fig.23 . Extension Duct.

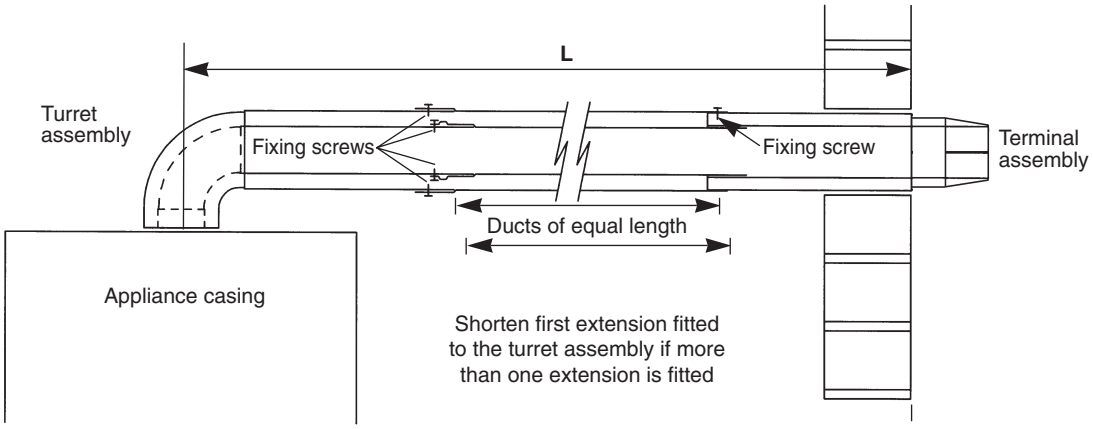


Fig.24. Flue duct length (side flue).

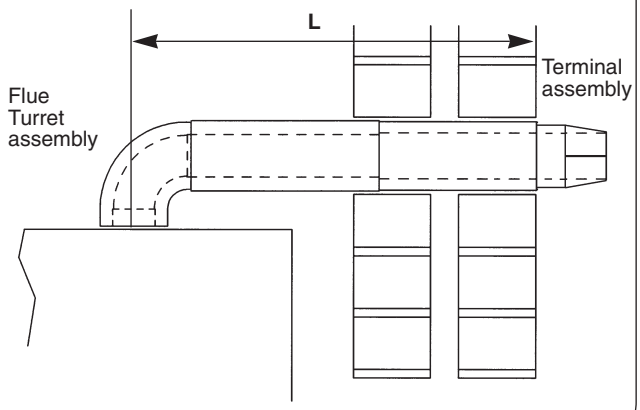
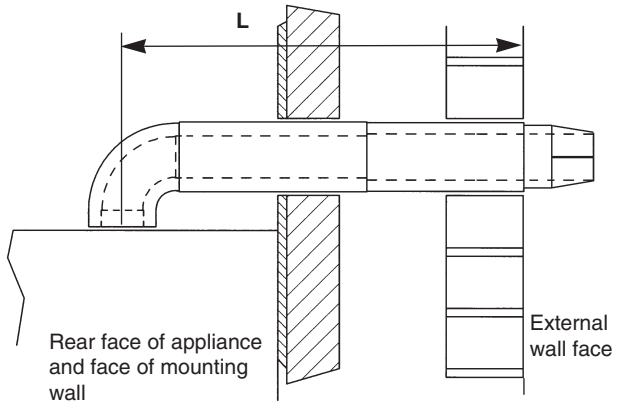


Fig.25 . Rear flue.



If L is between

725 - 1175mm	(1 extension)
1475 - 1925mm	(2 extension)
2225 - 2675mm	(3 extension)
2975 - 3425mm	(4 extension)
3725 - 4000mm	(5 extension)

It is necessary to shorten the assembly by cutting the first extension duct assembly i.e. L = 1000mm - remove 175mm from the air and flue ducts.
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 flue assembly.

11.9. 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 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 and fix using the self drilling screw provided. Refer to Fig.26.

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

Replace the inner casing.

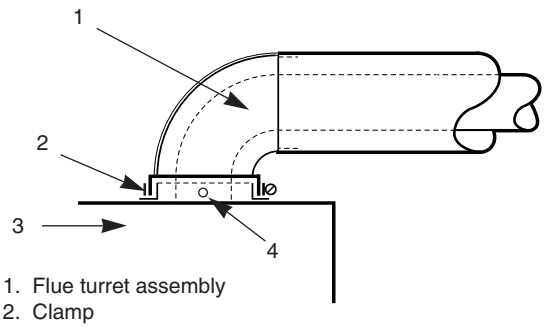
11.10 Fitting of the Flue Assembly without access to the Terminal.
The rubber gasket kit is available from Worcester Heat Systems.
NOTE: A larger diameter opening opening in the wall is required. Refer to Table 2.

Prepare the flue assembly as descried in Section 11.8.

Fit the rubber sealing gasket centrally onto the terminal assembly and tighten the clamp. Refer to Fig. 27.
Apply the plastic tape to the air duct 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. 27.
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 26.
Seal the gap around the duct at the inner wall face with the flexible seal provided and make good.

Fig.26 . Flue Turret Fixing .

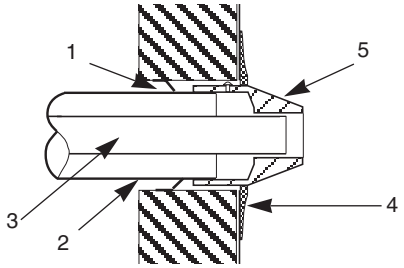


1. Flue turret assembly
2. Clamp
3. Appliance
4. Fixing screw

Replace the inner casing.

11.11 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 1m of straight duct.

Fig.27 . Terminal assembly for internal fitting of the flue.



1. Flue centering ring
2. Air duct
3. Flue duct
4. Rubber sealing gasket
5. Flue Terminal

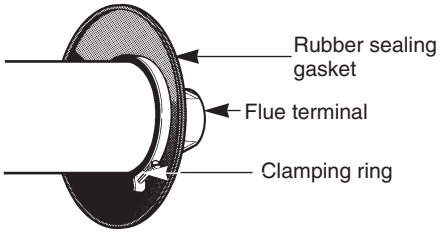
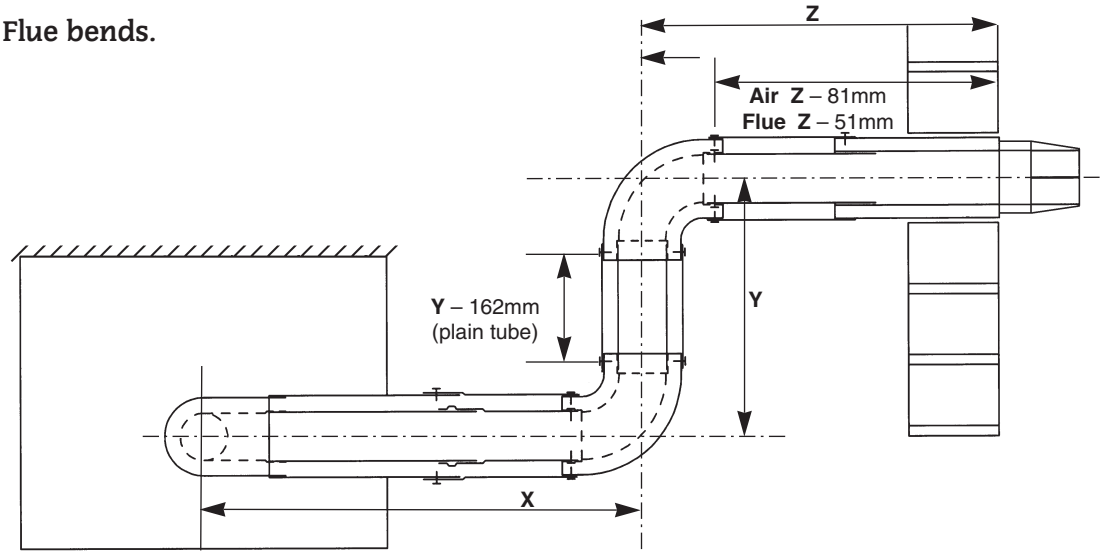


Fig. 28. Flue bends.



A 45° bend is equivalent to 0.5m of straight duct.
A maximum flue assembly of 3m is possible with 1 X 90° bend and 2m with 2 X 90° bends.
Measure the lengths X,Y and Z. Refer to Fig.28.
The maximum value of X using the turret assembly only in 506mm. Reduce the ducts to the appropriate length i.e. 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.29.
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.28.
The final section, dimension Z, of the flue system must include a section of plain duct assembly i.e . an extension assembly with the sockets removed. Reduce the final section, including the terminal assembly, by the appropriate amount i.e. Air duct Z - 81mm and the flue duct Z - 51mm. Refer to Fig.28.

If Z<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 i.e Z=350mm - remove 75mm from the terminal assembly.
If Z in 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>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 325mm 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.

Fig. 29 - Elbow to Flue Turret Assembly.

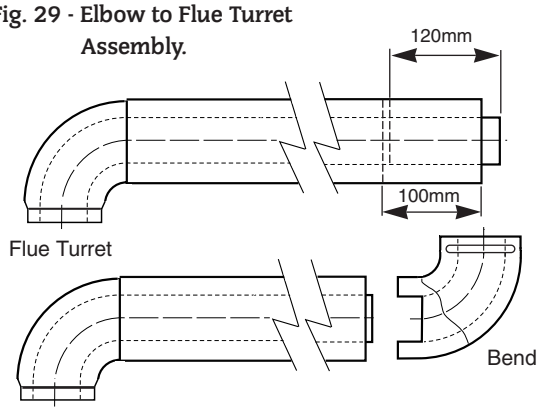
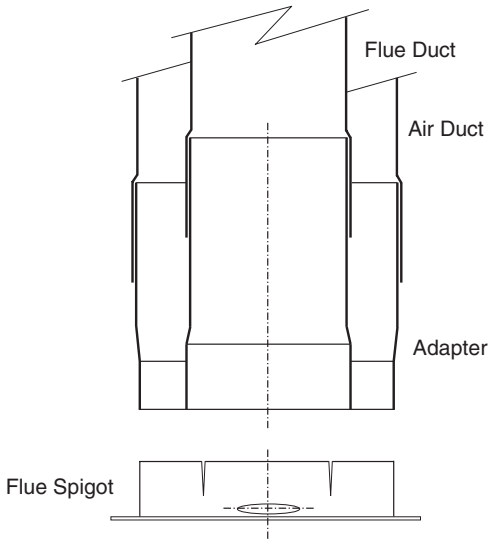


Fig.30 Vertical Adapter.



11.12 Vertical Adapter for Horizontal Flues.
An adapter is available for an initial short section of vertical flue. Refer to Fig. 30.
Measure and cut the flue as described in Section 11.11.
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 turret using silicone sealant.

11.13 Completion of the Installation.
Check that all the connections on the manifold have been tightened. Refer to Fig.16.

Remove the facia bottom panel. Refer to Fig.31.

Connect the mains electricity supply lead to the appliance and secure the cable clamp. Refer to Fig.11.
Check there is sufficient loose lead to allow the release of the facia panel assembly and that the earth lead of the mains supply cable is longer than the live and neutral leads.

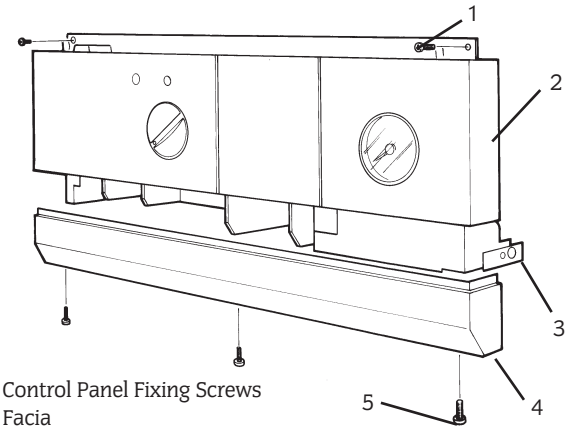
Fit the facia mounted clock. Refer to Fig.34.

Connect any external controls ensuring that the leads pass through the appropriate clamps. refer to Fig.12 and 33.

Test for gas soundness as described in BS6891.

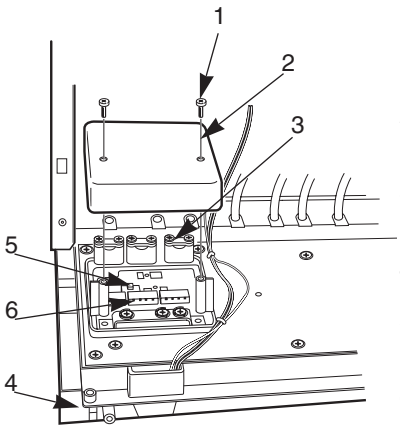
If the appliance is not commissioned immediately, replace the cabinet and facia bottom panel. Check that the gas and electricity services have been turned off.

Fig. 31 - Facia Connections Cover.



1. Control Panel Fixing Screws
2. Facia
3. Control Panel Pivot Point
4. Connection Cover
5. Connection Cover Fixing Screws

Fig.32. Rear Connections Cover



1. Rear Connections Cover Fixing Screws (2)
2. Rear Connections Cover
3. Cable Entry With Clamps
4 Facia
5 System selector Switch
6 Controls Connections

Fig.33. Rear Connection Point

1. Cable Clamps
2. System selector Switch
3. Cylinder Thermostat Connector
4. Diverter Valve Connector
5. Timeswitch Connections
6. Earth Connections
7. Appliance Earth

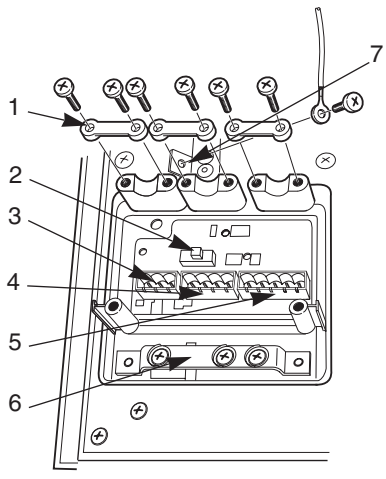
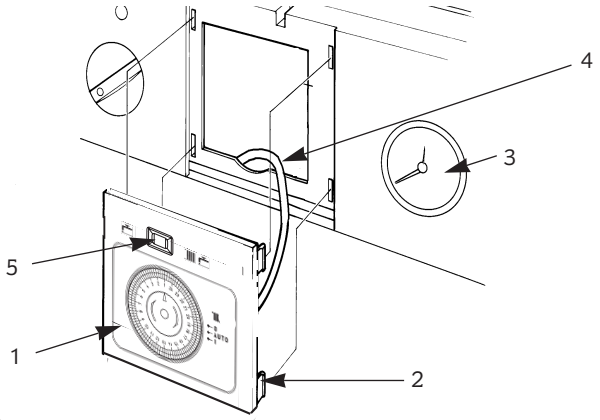


Fig 34 - Programmer Connection - Facia Position

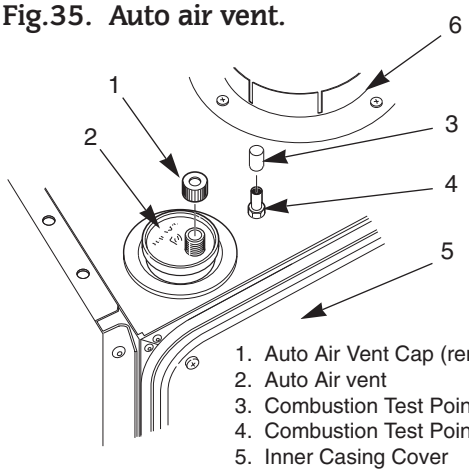


1. Programmer
2. Programmer Fixing Clip
3. Pressure Gauge
4. Programmer Connector
5. switch

12. Commissioning The Appliance

12.1 Lift off the cabinet front panel. .
Check that the electricity and gas supplies 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 16. Open all the radiator valves. Remove the automatic air vent cap. Refer to Fig 35.

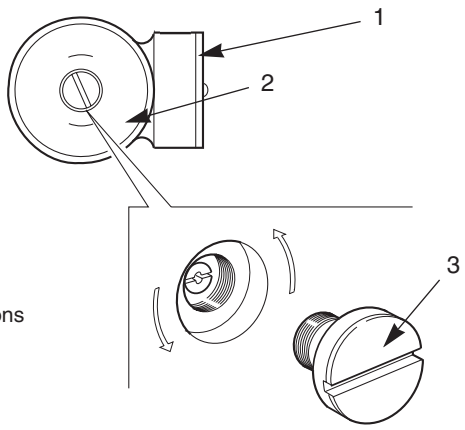
Fig.35. Auto air vent.



1. Auto Air Vent Cap (remove)
2. Auto Air vent
3. Combustion Test Point Cap
4. Combustion Test Point
5. Inner Casing Cover
6. Flue Spigot

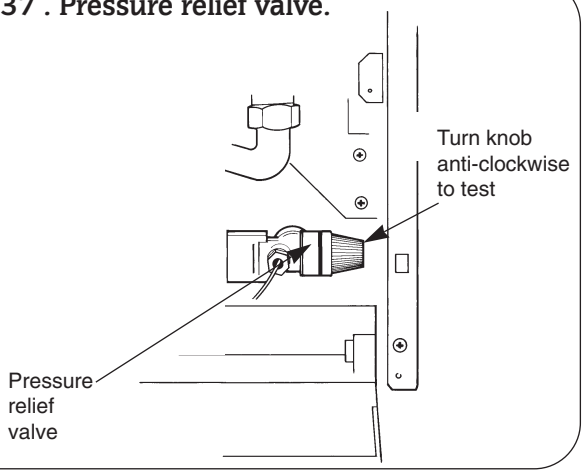
Fill the system.
Remove the bottom panel to gain access to the filling loop.
Insert the bayonet end of the filling key into the corresponding cut-outs in the filling loop housing and twist to lock the key in place. Refer to Fig. 8
Turn the grey knob anti-clockwise to allow water to fill the system until the pressure gauge shows 2.5bar.
Turn the grey knob clockwise to stop the water flow and remove the filling key by lining up the bayonet end of the key with the cut-outs in the filling loop housing and withdraw the key.
Note: The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with the Water Regulations.
Check for water soundness throughout the system.
Vent each radiator in turn.
Remove the cap from the pump and turn the shaft about half a turn. Replace the cap. Refer to Fig. 36.
Lower the facia and check that the relief valve operates by turning the knob anti-clockwise until it releases. Refer to Fig. 37.
12.2 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 [17ft].

Fig. 36. Pump venting.



1. Electrical Connections Cover
2. Pump
3. Cap

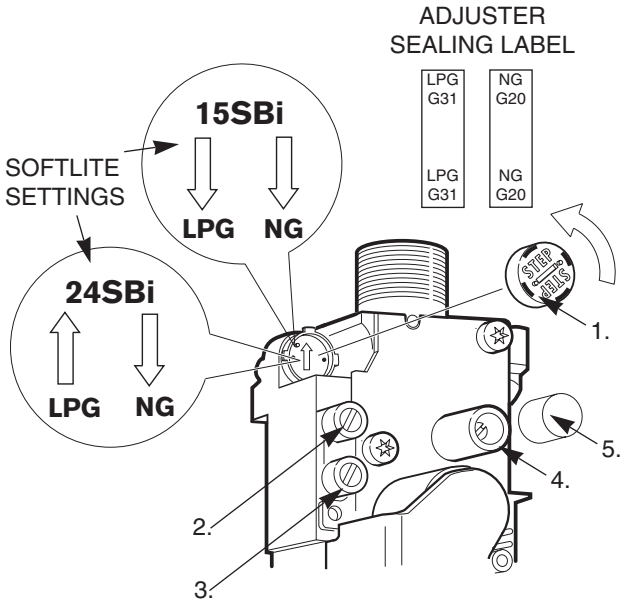
Fig.37 . Pressure relief valve.



The charge pressure must not be less than the static head at the point of connection. A Schraeder type valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary. Refer to Fig. 52. The expansion vessel must be charged to 0.3bar less than the initial system design pressure.
Note: 1bar = 10.2m = 33.5ft of water.
12.3 Set the System Pressure
Fill the system through the filling loop until the pressure gauge is at 2.5bar and check for leaks.
Release water through the relief valve until the required system pressure is obtained, up to 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 2.6bar when operating at the maximum central heating temperature,

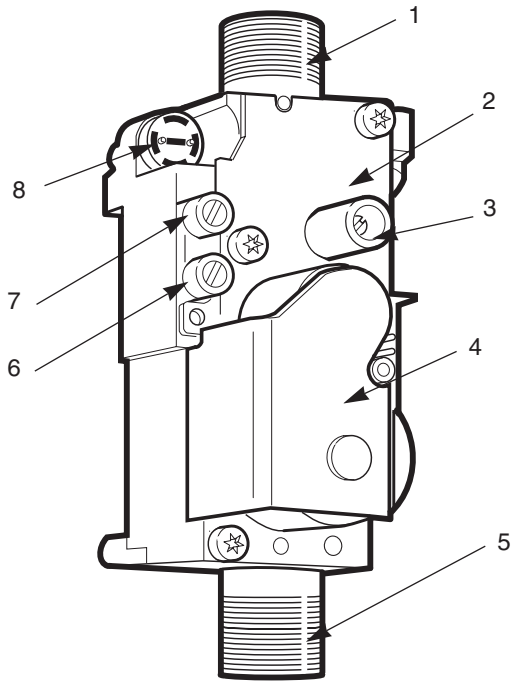
an extra expansion vessel must be fitted to the system as close as possible to the appliance in the central heating return connection.
The appliance [as despatched] can accommodate a system volume of about 90 litres. Refer to BS7074 Part 1, BS5449 and Table 9. If the system volume is greater then an extra vessel must be fitted as close as possible to the appliance in the central heating return connection and pressurised to the same figure as the integral vessel.
12.4 Clock/Programmer: The controls fitted to the appliance should be set up at this stage.
12.5 Check that the gas and electricity supplies are turned off. Refer to Fig. 16.
Connect a pressure gauge to the gas valve. Refer to Fig. 39.
12.6 Checking the Burner Pressure
Set the temperature control knob to maximum and the clock/programmer to operate continuously.
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 light and ramp up to the factory set pressure. If the burner does not light then press the 'lock-out' reset button. Refer to Fig 40. Note: The burner pressure is factory set at the mid point of the range of the boiler and may be reset to match the system requirements. If, after checking that the supply pressure is sufficient i.e. 18.0mb approx [NG] or 35mb approx [Propane] at the gas valve inlet pressure test point, the required pressure cannot be obtained then contact Worcester Heat Systems Service Department.
Reset the pressure as necessary by adjusting the screw on the gas valve. Refit the plastic cap and re-seal using the sealing label Refer to Table 1 and Section 15.4.1. Refer to Fig.38.
Test for gas soundness at the joint between the burner and the gas valve with leak detection fluid.
12.7 Domestic Hot Water
Check that all external controls are calling for heat and that the flow pipe to the cylinder is hot after a short period. Check that the cylinder thermostat, if fitted, is set to about 55°C.
12.8 Central Heating
Check that all the radiators heat up evenly. If necessary carefully vent.
12.9 Balance the system to give a temperature differential of 11°C. An adjustable by-pass is fitted to the appliance.
12.10 Set the room thermostat to minimum and check that the burner goes out. Reset the room thermostat and the burner will re-light.
Turn off the gas service cock. The burner will go out but, after a short pause, the appliance will attempt to restart and spark for 10 seconds and then 'lock-out'. After 60 seconds carefully open the gas service cock, press the reset button and observe the burner re-light and follow the normal sequence of operation. Refer to Fig 16 and 40.
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 Section 12.1, adding a suitable proprietary inhibitor. Further information is available from WHS Technical Information Dept, Telephone 0990 266241.
12.11 Completion of Commissioning
Disconnect the pressure gauge from the gas valve and tighten the test point screw.
Replace the facia panel covers.
Restart the appliance and check for gas soundness around the test point screw.
Refit the cabinet casing.
If the appliance is to be passed over to the user immediately then set the controls to the users requirements.
If the appliance is to be left inoperative in frosty conditions then set the programmer, if fitted, to continuous and the appliance to operate at a low temperature under the control of a frost thermostat, if fitted.
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.

Fig. 38. Gas valve - Softlite adjustment.



1. Softlite Adjustment Cover
2. Burner Pressure Test Point
3. Inlet Pressure Test Point
4. Burner Pressure Adjustment Screw
5. Plastic Cap

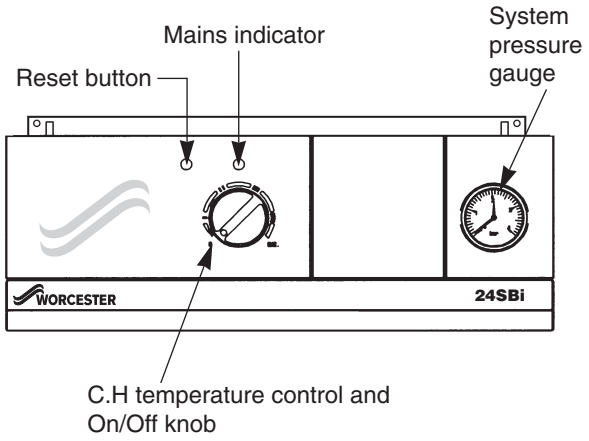
Fig. 39. Gas Valve.



1. Gas Valve Outlet
2. Gas Valve
3. Pressure Adjustment
4. Solenoids
5. Gas valve Inlet
6. Inlet Pressure Test Point
7. Burner Pressure Test Point
8. Softlite Adjustment Point

13. Instructions To The User

Fig.40 . User controls.



13.1 Hand over the User Booklet and explain how to operate the appliance safely and efficiently.
13.3 Tell the user what to do if the appliance is not to be used in very cold conditions.
13.4 Tell the user what to do if the system pressure falls.
13.5 Explain that regular servicing will maintain the safe and efficient operation and extend the life of the appliance. WHS can offer a comprehensive maintenance contract.
13.6 Tell the user that any work on the appliance must only be carried-out by a competent person.

14. Inspection And Service

14.1 The extent of the service will be determined by the operating condition of the appliance. It is the law that any service work is carried-out by a competent person.

14.2 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 clearances are 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 12-Commissioning.
Operate the appliance and take note of any irregularities. Refer to Section 18-Fault Finding.
Check the combustion performance
Remove the cap from the sample point on the top of the appliance and connect the meter. Refer to Fig 35.
With the appliance at maximum rate and stable expect readings of about 6.5% - 7.00% CO2 and 0.002% CO.
Refit the sample point cap after the test.
Always test for gas soundness after the service has been completed.
Disconnect 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.
14.3 Component Access
Remove some or all of the following parts to gain access to components.

Cabinet Front Panel. Lift off the supports.

Facia. Unscrew the two screws and lower. Refer to Fig 18.

Inner Casing. Unscrew the four screws and remove. Refer to Fig 18.

Combustion Chamber. Unscrew the two screws at the top. Loosen but do not remove the two wing-nut extended screws at the sides, unhook the clips and remove the chamber. Refer to Fig 41 and 42.
Fan. Carefully pull off the electrical connections and the tubes from the air flow detector. Unscrew the three screws to remove the fan assembly. Refer to Fig 51.

Flue Hood. Remove the fan. Unscrew the two screws at the front and withdraw the hood. Ensure that the replaced hood passes under the lip at the rear of the appliance.

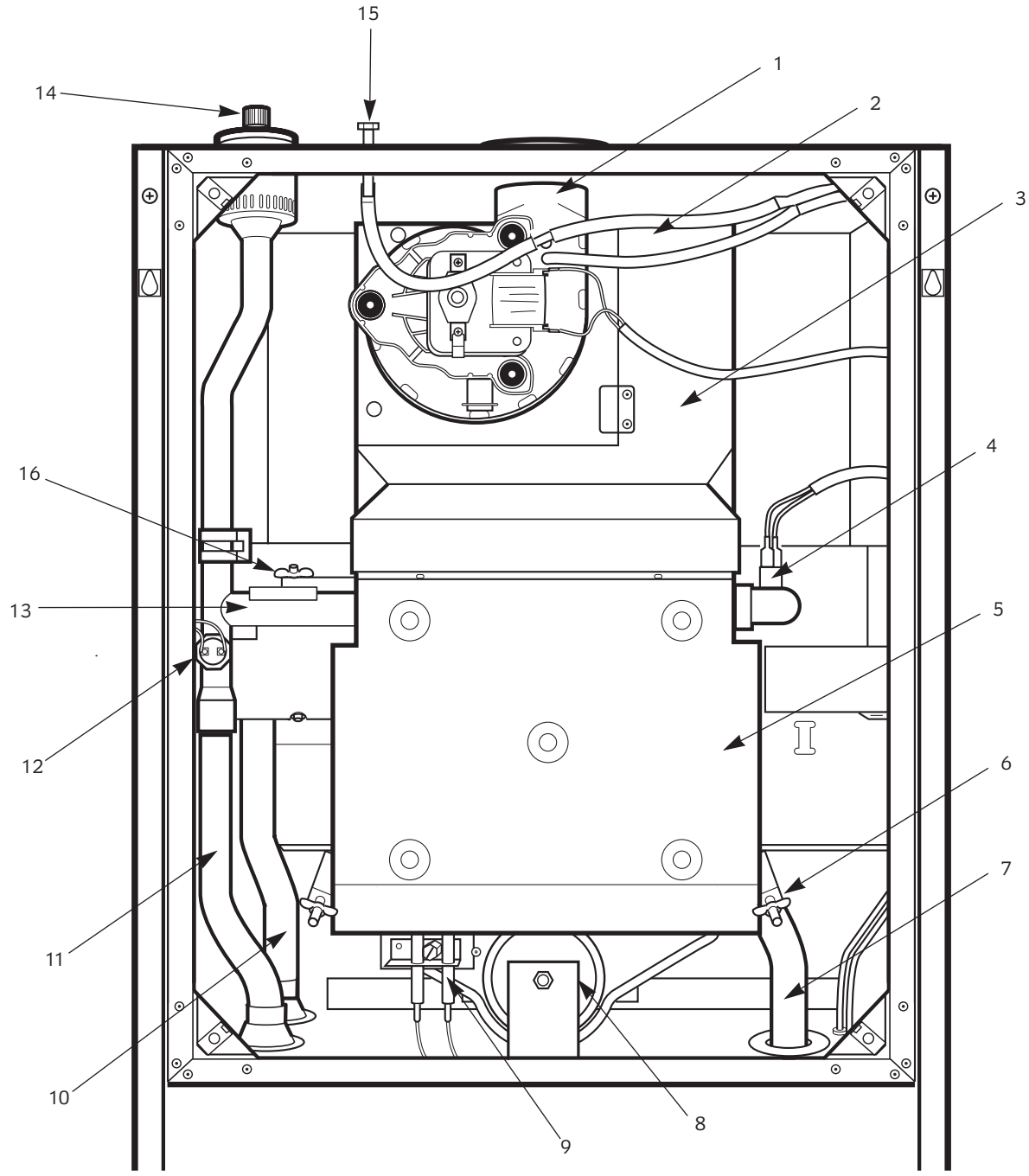
Burner. Remove the combustion chamber. Release the union nut at the top of the gas valve. Carefully pull-off the connections to the spark electrode and separate the in-line connector to the flame sensing electrode. Refer to Fig 43 and 44.
14.4 Component Cleaning
Do not use a brush with metal bristles to clean components.
Clean the fan taking care not to block air flow detector.
Clean the burner to ensure that the blades and injector are clear.
Do not us a metal probe to clean the injector.
Clean the electrodes and check the alignment. Replace if there is any sign of deterioration.

Clean the heat exchanger after covering the gas inlet tube. 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 15.4.5.
Carefully refit any components removed and check that all screws are tight and the connections properly re-made with the appropriate gaskets/O-rings.
Re-commission, as necessary, for correct operation to the users requirements. Refer to Section 12 Commissioning.

15. Replacement Of Parts

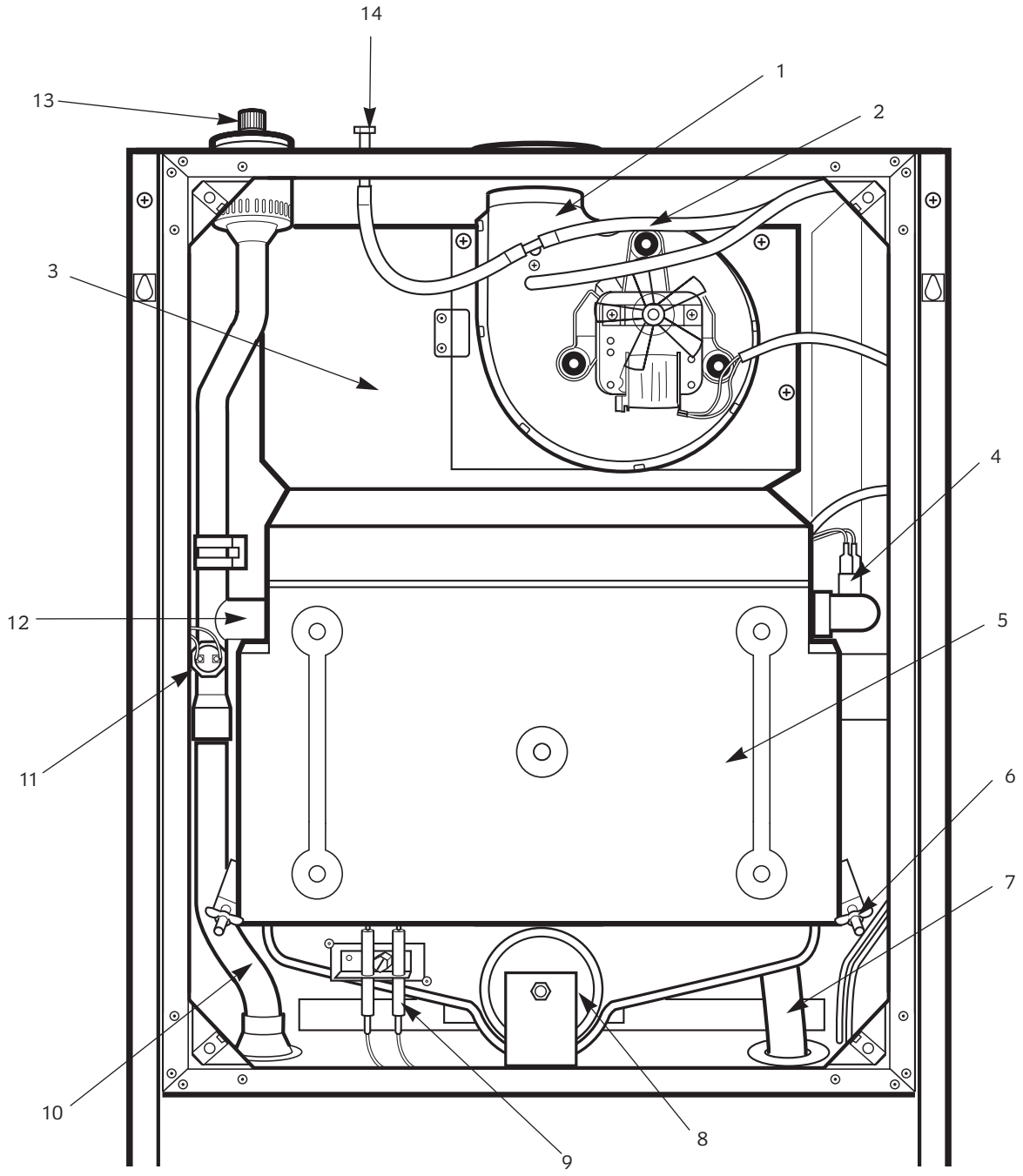
Important: Turn off the gas and electricity supplies and drain, where necessary, before replacing any components.
15.1 Always check for gas soundness where relevant and carry-out functional checks as described in Section 12-Commissioning. Any O-ring or gasket that appears damaged must be replaced.
15.2 Component Access
Refer to Section 14.3 Inspection and Servicing for access to components.
15.3 Draining the Appliance
Turn off the heating flow and return valves at the appliance. Refer to Fig 16.
Remove the casing bottom panel by releasing it from the clips. Fit a tube to each of the drain connections and open the taps. Refer to Fig 47. Close the taps when the flow has stopped.
Important: A small quantity of water will remain in some components. Protect any electrical components when removing items that might retain water.
15.4 Component Replacement
Refer to Fig 41, 42 and 43 for the location of the 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.

Fig. 41. Inner Casing 15SBi



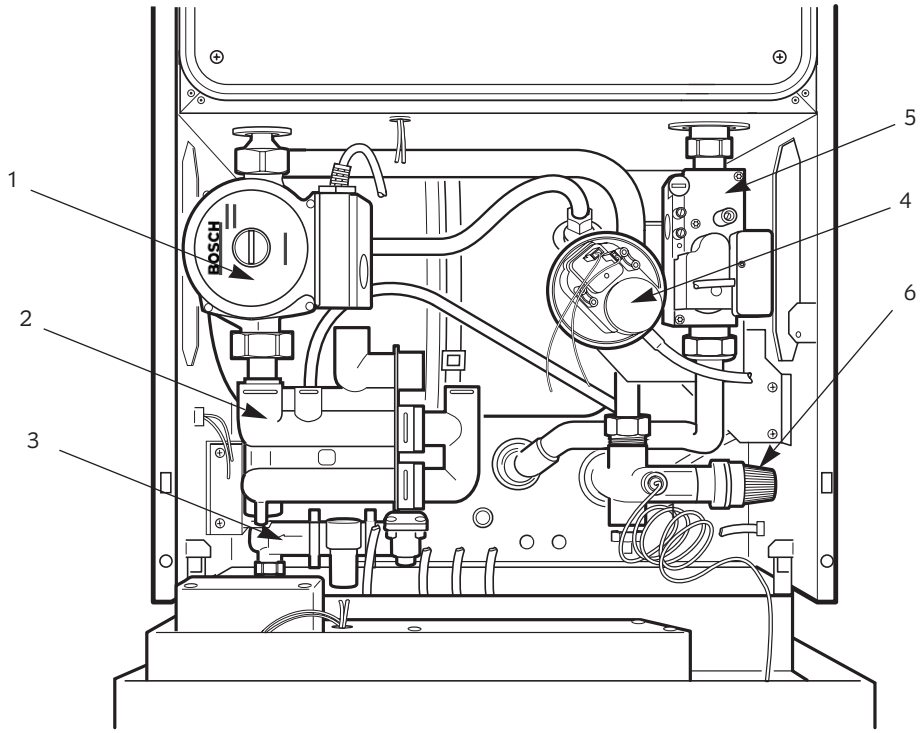
1. Fan Assembly
2. Air Flow Sensing Tubes
3. Flue Hood
4. Overheat Thermostat
5. Combustion Chamber
6. Combustion Chamber Fixing Screws
7. Gas Pipe (Burner Assembly)
8. Burner Assembly
9. Spark Electrode Assembly
10. Return Pipe
11. Flow Pipe
12. Flow Sensor
13. Heat Exchanger
14. Auto Air Vent
15. Combustion Sampling Point
16. Wing Nut

Fig. 42. Inner Casing 24SBi



1. Fan Assembly
2. Air Flow Sensing Tubes
3. Flue Hood
4. Overheat Thermostat
5. Combustion Chamber
6. Combustion Chamber Fixing Screws
7. Gas Pipe (Burner Assembly)
8. Burner Assembly
9. Spark Electrode Assembly
10. Flow Pipe
11. Flow Sensor
12. Heat Exchanger
13. Auto Air Vent
14. Combustion Sampling Point

Fig.43 . Lower Casing - Gas and Water Controls.



1. Pump
2. Flow manifold
3. Filling Loop
4. Air pressure switch
5. Gas Valve
6. Pressure relief valve
7. Connector
8. Bypass

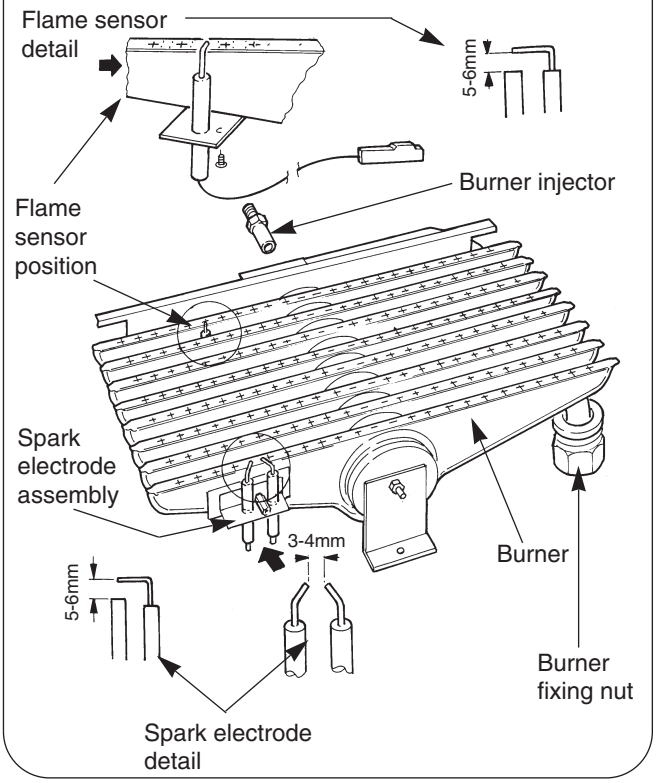
15.4.1 Gas Valve
Do not remove the inner casing.
Unscrew the fixing screw and unplug the connections.
Remove the air pressure switch. refer to section 15.4.19.
Unscrew the union connections above and below the gas valve, unscrew the mounting bracket and remove the assembly. Use new gaskets when replacing the valve. Refer to Fig. 43.
Set the Gas Valve:
Connect a pressure gauge to the burner pressure test point on the valve. Refer to Fig. 39.
Switch on the gas and electricity supplies. Check for gas soundness at the gas valve inlet.
Refer to Section12-Commissioning for the method of checking the pressures.
Check for gas soundness at the gas valve outlet.
Adjust the gas valve to obtain the required pressure.
Switch off the appliance, disconnect the pressure gauge and tighten the test point screw. Refer to Fig. 43.

15.4.2 Spark Electrode
Remove the inner casing and the combustion chamber.
Lower the facia
Carefully pull off the leads at the electrodes. Loosen the screw and remove the electrode assembly. Refer to Fig .44.

15.4.3 Flame Sense Electrode
Remove the inner casing and the combustion chamber.
Lower the f`acia.
Separate the in-line connector located in the controls compartment. Remove the burner. Refer to Section 15.4.4. Loosen the screw and remove the electrode assembly. Refer to Fig.44. Ensure that the new electrode is at the correct height above the burner blade.

15.4.4 Burner
Remove the inner casing and the combustion chamber.
Separate the flame sense electrode in-line connector located in the controls compartment.

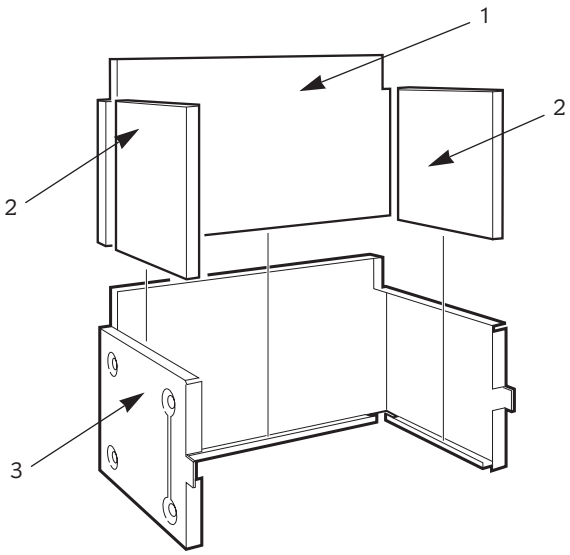
Fig.44 . Burner and Electrode



Release the union connection beneath the burner and remove the burner from the appliance. Refer to Fig. 43 and 44.
Do not omit the gasket when fitting the new burner.

15.4.5 Combustion Chamber Insulation
Remove the burner and the primary heat exchanger. Refer to Section 15.3.4, 15.4.21.
Replace the side and front pads in the combustion chamber assembly.
Replace the rear insulation pad. Refer to Fig.45

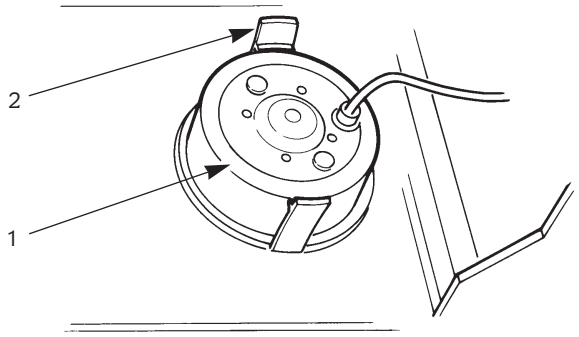
Fig.45. Combustion Chamber Insulation.



1. Combustion Chamber Insulation - Front Panel
2. Combustion Chamber Insulation - Side Panel
3. Combustion Chamber Assembly

15.4.6 Pressure Gauge
Remove the cabinet front panel and lower the facia panel. Drain the appliance as described in Section 15.3 preceding.
Withdraw the clip and remove the pressure sensor. Unclip the gauge head and remove. Refer to Fig. 46 and 47.
Do not omit the O-ring from the pressure capillary when fitting the replacement gauge.

Fig.46. Pressure Gauge Fixing.

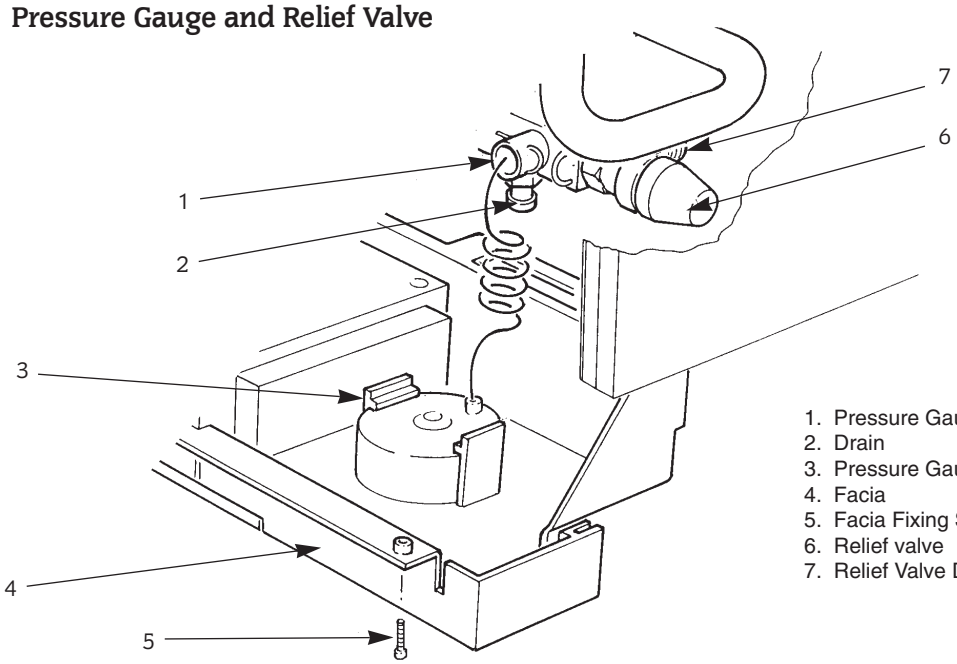


1. Pressure Gauge Head
2. Pressure Gauge Head Fixing Clips

15.4.7 Relief Valve
Remove the cabinet front panel and lower the facia panel.
Drain the appliance as described in Section 15.3 preceding.
Remove the casing bottom panel and disconnect the discharge pipe and pressure gauge sensor. Refer to section 15.4.6.
Withdraw the clip and withdraw, at an angle, the valve. Refer to Fig .37 and 43.

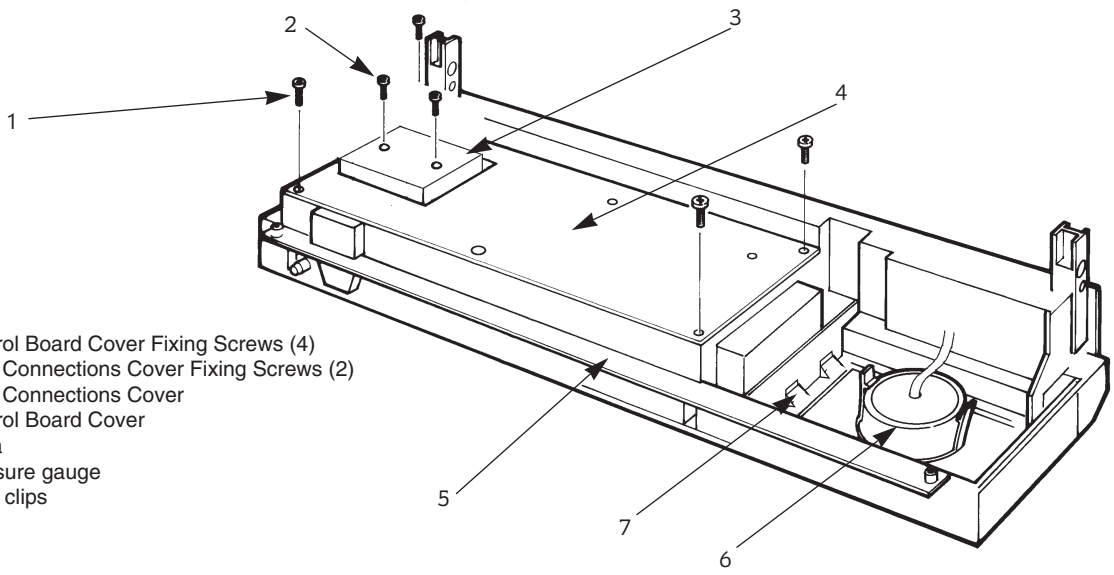
15.4.8 Diverter Valve. [if fitted]
Remove the cabinet front panel and lower the facia panel.
Drain the appliance as described in Section 15.3 preceding.
Disconnect the electrical connections. Pull out the correct clips and remove the valve. Refer to Fig.20

Fig.47. Pressure Gauge and Relief Valve



1. Pressure Gauge Sensor Fixing
2. Drain
3. Pressure Gauge Head Fixing
4. Facia
5. Facia Fixing Screw (2)
6. Relief valve
7. Relief Valve Discharge Pipe Connection

Fig.48. Rear Control Board Cover.



1. Control Board Cover Fixing Screws (4)
2. Rear Connections Cover Fixing Screws (2)
3. Rear Connections Cover
4. Control Board Cover
5. Facia
6. Pressure gauge
7. clock clips

15.4.9 Control Board

Remove the facia bottom panel and carefully disconnect all the electrical connections. Refer to Fig. 11 and 12.
Lower the facia panel and remove the splash cover. Refer to Section 14.3.
Disconnect the earth connection at the appliance. Refer to Fig. 33.
Remove the rear connection cover, unplug the connections and release the cable clamps.
Unscrew the four screws to remove the metal cover. Refer to Fig. 48.
Lift out the control board.

15.4.10 Clock

Remove the cabinet front panel and lower the facia panel. Remove the splash cover and the rear connection cover.
Disconnect the clock/programmer. Refer to Fig. 34
Release the two clips adjacent to the pressure gauge and remove clock. Refer to Fig. 44.

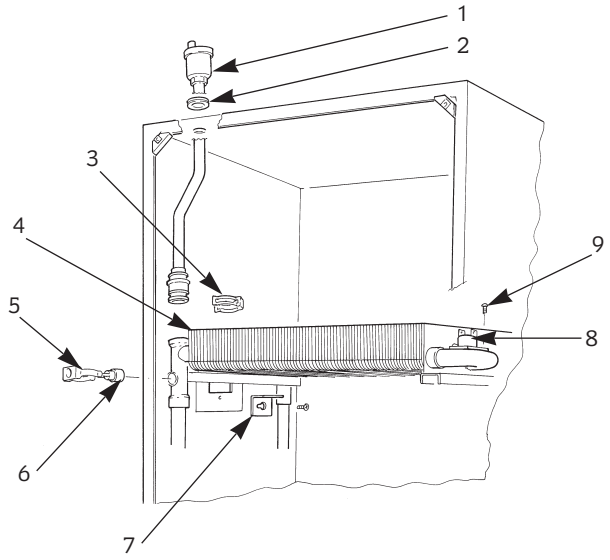
15.4.11 Heat Exchanger

Drain the appliance as described in Section 15.3 preceding.
Remove the combustion chamber, fan and flue hood as described in Section 14.3, Inspection and Servicing.
Remove the temperature sensors as described in 15.4.15, 16, 17. Refer to Fig.49.
Remove the auto-air vent and connecting pipe.
Release the connections and remove the heat exchanger

15.4.12 Pump

Remove the cabinet front panel and lower the facia panel.
Drain the appliance as described in Section 15.3 preceding.
Release the water connections and remove the pump. Refer to Fig.50.
Disconnect and transfer the electrical connections to the new pump. Set the pump speed to that of the replaced pump. Do not forget to fit the gaskets at the connections.
Alternatively replace the pump head only by unscrewing the four Allen screws.

Fig.49 . Heat exchanger (24SBi)



1. Auto Air Vent
2. Inner Casing Seal
3. Auto Air Vent Assembly Clip
4. Gas to Water Heat Exchanger
5. Flow Sensor Clip
6. Primary flow Sensor
7. Heat Exchanger Support Bracket
8. Overheat Thermostat
9. Overheat Thermostat Fixing Screws

Fig.50 . Circulating pump

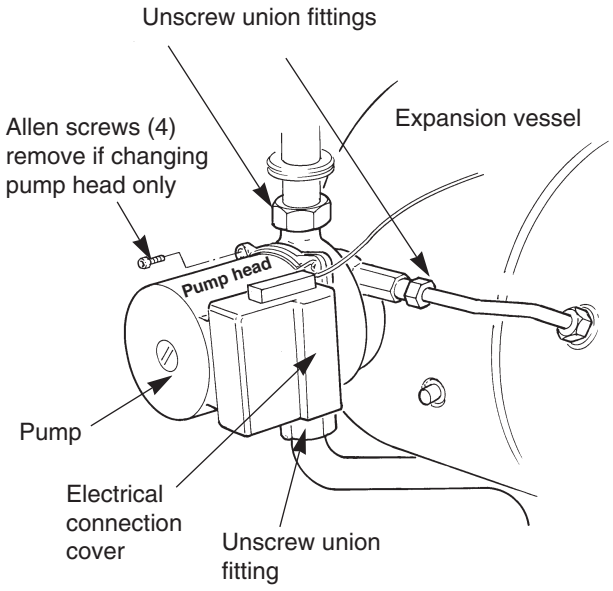
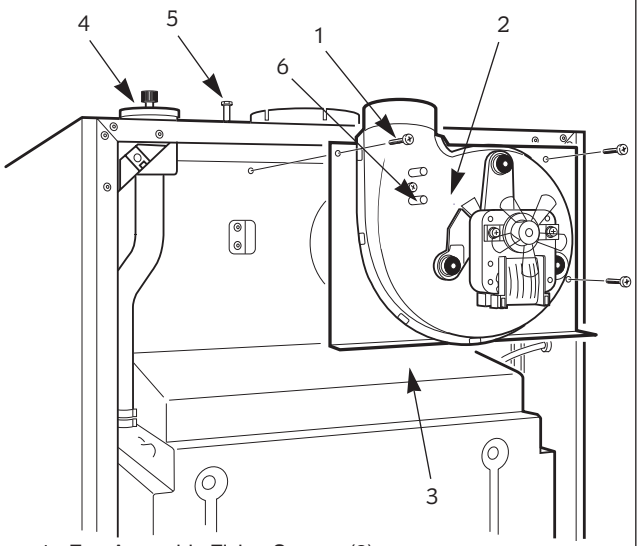


Fig.51. Fan /Flue Hood Assembly



1. Fan Assembly Fixing Screws (3)
2. Fan Assembly
3. Flue Hood
4. Auto Air Vent
5. Combustion Products Test Point
6. Air Flow Sensor

15.4.13 Fan

Remove the inner casing.

Remove the fan as described in Section 14.3 Inspection and Servicing. Ensure that all the connections are correctly made to the new fan. Refer to Fig. 51.

Do not use any sealant on the fan/flue duct connection.

15.4.14 Expansion Vessel

Drain the appliance as decribed in Section 15.3 preceding.

Remove the cabinet front and lower the facia.

Remove the air flow switch and bracket. Refer to Section 15.4.19.

Remove the pump. Refer to Section 15.4.12.

Remove the bypass pipe by removing the clips.

Remove the flow manifold and mid-position diverter valve (if fitted) and the filling loop assembly.

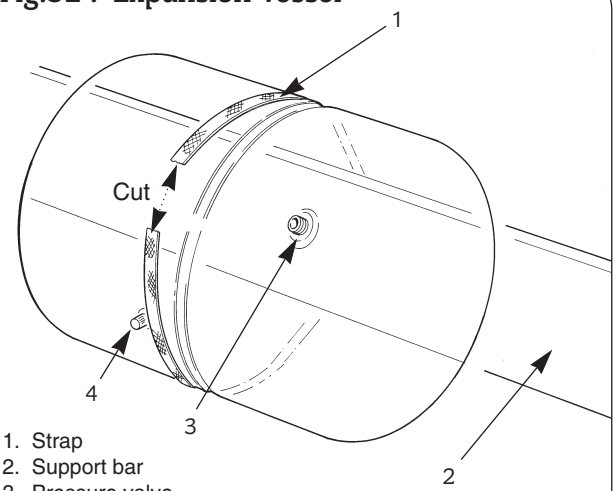
Disconnect the return pipe from the relief valve. Refer to Fig 43 and 52.

Cut the plastic retaining clip and remove the expansion vessel.

When replacing the components do not omit any seals, gaskets or O-rings replace any that are damaged

Alternatively the specified replacement can be fitted into the system return as close to the appliance as possible. Re-fill and pressurise the system as described in Section 12 Commissioning.

Fig.52 . Expansion Vessel



1. Strap
2. Support bar
3. Pressure valve
4. Connection

15.4.15 Air Flow Detector

Remove the fan as described in 15.3.13. Unscrew and withdraw, through the fan outlet, the air flow detector. Refer to Fig .51.

The detector is 'handed' - do not force it into place.

15.4.16 Primary Flow Sensor

Carefully pull-off the connections.

Pull off the clip and remove the sensor. Refer to Fig .49.

15.4.17 Overheat Thermostat

Carefully pull-off the connections. Twist the sensor to expose the fixing screws. Refer to Fig.49.

Unscrew and remove the sensor.

Carefully position the replacement sensor so that the connections are away from the flue hood.

15.4.18 Auto Air Vent

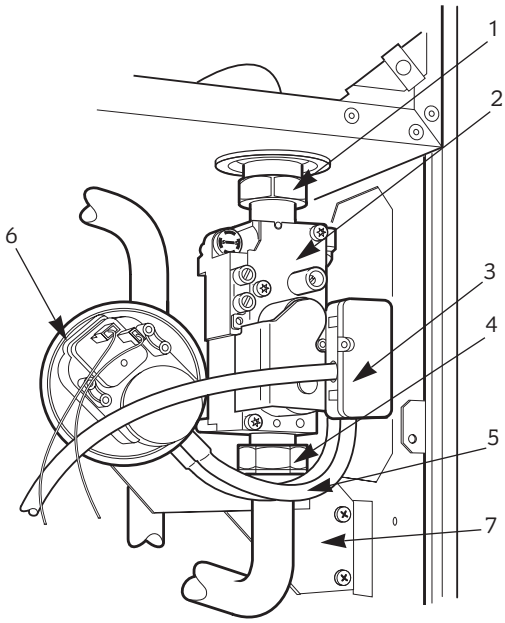
Drain the appliance as described in Section 15.3 preceding.

Unscrew and remove the auto air vent.

Do not omit the O-ring when fitting the replacement air vent. Remove the cap. Refer to Fig.49.

Ensure that the casing seal is not disturbed.

Fig.53 . Air pressure switch.



1. Gas Valve Outlet connection
2. Gas Valve
3. Gas Valve Electrical Connection
4. Gas valve Inlet Connection
5. Air Flow Sensing Pipes, Clear (front), Red (rear)
6. Air Pressure Switch
7. Gas Valve Mounting Bracket

15.4.19 Air Pressure Switch

Carefully disconnect the air (note the position of each tube) and electrical connections to the switch. Unscrew the fixing screws and remove the switch. Refer to Fig.53.

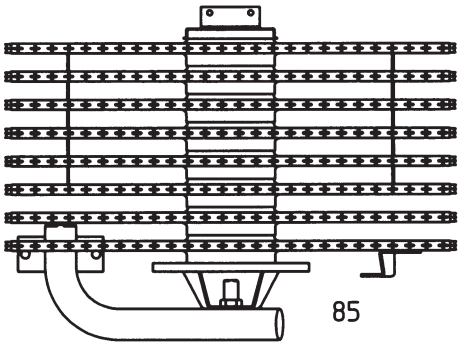
Ensure that the connections are correctly made on the replacement switch.

15.4.20 Sight Glass

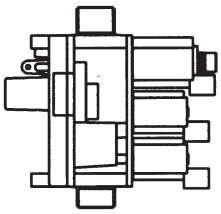
Remove and replace the complete inner casing cover if the sight-glass is damaged. Refer to Section 14.3, Inspection and Servicing..

16. Short Parts List

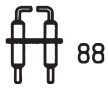
Key No.	G.C. No.	Part	Manufacturer's Reference	Qty	WHS Part No.
		15SBi Burner NG	Aeromatic AC23/053591	1	8 716 142 647 0
		15SBi Burner LPG	Aeromatic AC23/053592	1	8 716 142 648 0
85		24SBi Burner NG	Aeromatic AC23/053593	1	8 716 142 649 0
		24SBi Burner LPG	Aeromatic AC23/053594	1	8 716 142 650 0
		15SBi Burner Injector NG	Stereomatic, type 7, 3.6mm dia.	1	8 716 156 396 0
		15SBi Burner Injector LPG	Stereomatic, type 7, 2.35mm dia.	1	8 716 156 397 0
86	173 091	24SBi Burner Injector NG	Stereomatic, type 7, 4.5mm dia.	1	8 716 140 208 0
	E00 741	24SBi Burner Injector LPG	Stereomatic, type 7, 2.78mm dia.	1	8 716 140 209 0
29		Gas Valve Assembly	Honeywell, VK4105T1009	1	8 716 156 751 0
112		24SBi Air Pressure Switch	HUBA 605.99487	1	8 716 156 765 0
113		15SBi Air Pressure Switch	HUBA 605.99483	1	8 716 146 156 0
88	375 697	Spark Electrode Assembly	Buccleuch, BE/3462/SI	1	8 716 142 100 0
90	E01 903	Harness - Flame Sensor		1	8 716 120 126 0
104	E01 598	Ignition Harness Assembly		1	8 716 120 236 0
		15SBi Heat Exchanger	ELM 8716142812	1	8 716 142 812 0
68	299 352	24SBi Heat Exchanger	Giannoni, ref PR22 323 003, spec D2107	1	8 716 142 800 0
117		15SBi Insulation Pack		1	7 716 192 204 0
117		24SBi Insulation Pack		1	7 716 192 204 0
75	E00 717	Auto Air Vent 3^{8}in BSP	Caleffi, Mini Call 502030	1	8 716 140 500 0
93	299 506	Pressure Gauge 4 Bar Dark Gray		1	8 716 142 300 0
45	375 699	Pressure Relief valve	Caleffi, 312439	1	8 716 142 404 0
36	E01 602	Pump c/w Harness Assembly		1	8 716 143 107 0
105		Pipe - Expansion Vessel		1	8 716 100 642 0
91		PCB Control Board	Honeywell	1	8 716 146 328 0
69	173 015	Overheat Thermostat	Elmwood, 2455R98789	1	8 716 142 303 0
67	375 696	Thermister Sensor	Elmwood, 665590035	1	8 716 142 302 0
49		Charging Link assembly		1	8 716 121 443 0
		15SBi Fan	MVL-RLD76/0027-3020L-207	1	8 716 121 484 0
72		24SBi Fan	Sifan FFB0226-029/FIME GR00590	1	8 716 121 456 0
120		Fuse 4A Fast blow 20X5mm (10 Pack)		1	8 716 156 008 0
118	299 355	Fibre Washer Pack		1	8 716 192 205 0
119		SBi O-Ring Pack		1	8 716 192 244 0
128		SBi Twin Channel Mechanical Timer		1	8 716 192 020 0
137		Mid Position Diverter Valve		1	8 716 192 195 0


85


86


29


112


88

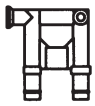

90

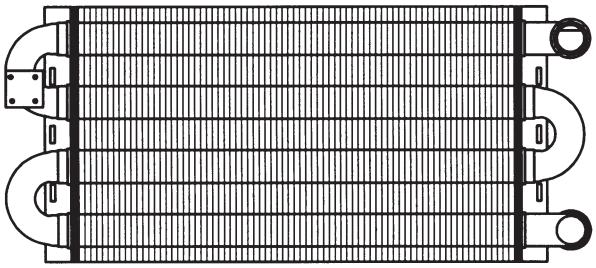

104

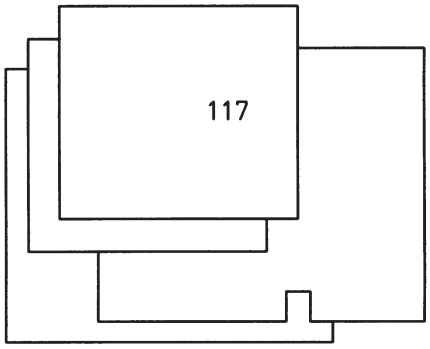

69

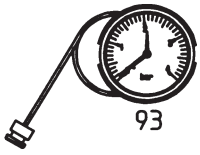

67

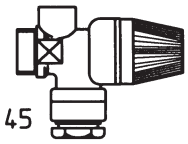

75

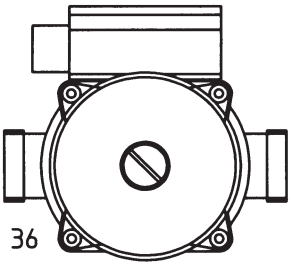

112

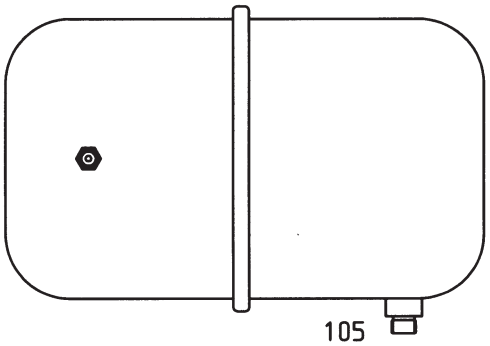

68

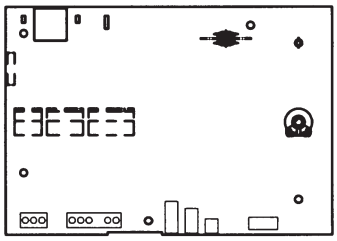

117

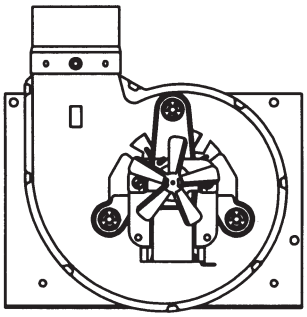

93

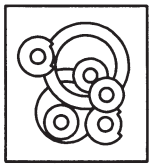

45

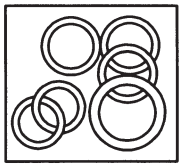

36


105

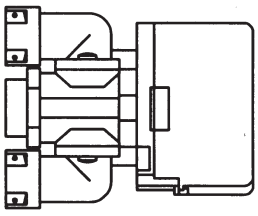

91

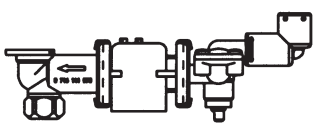

72

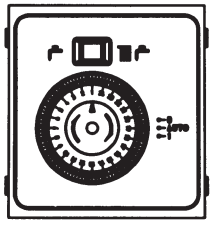

118


119

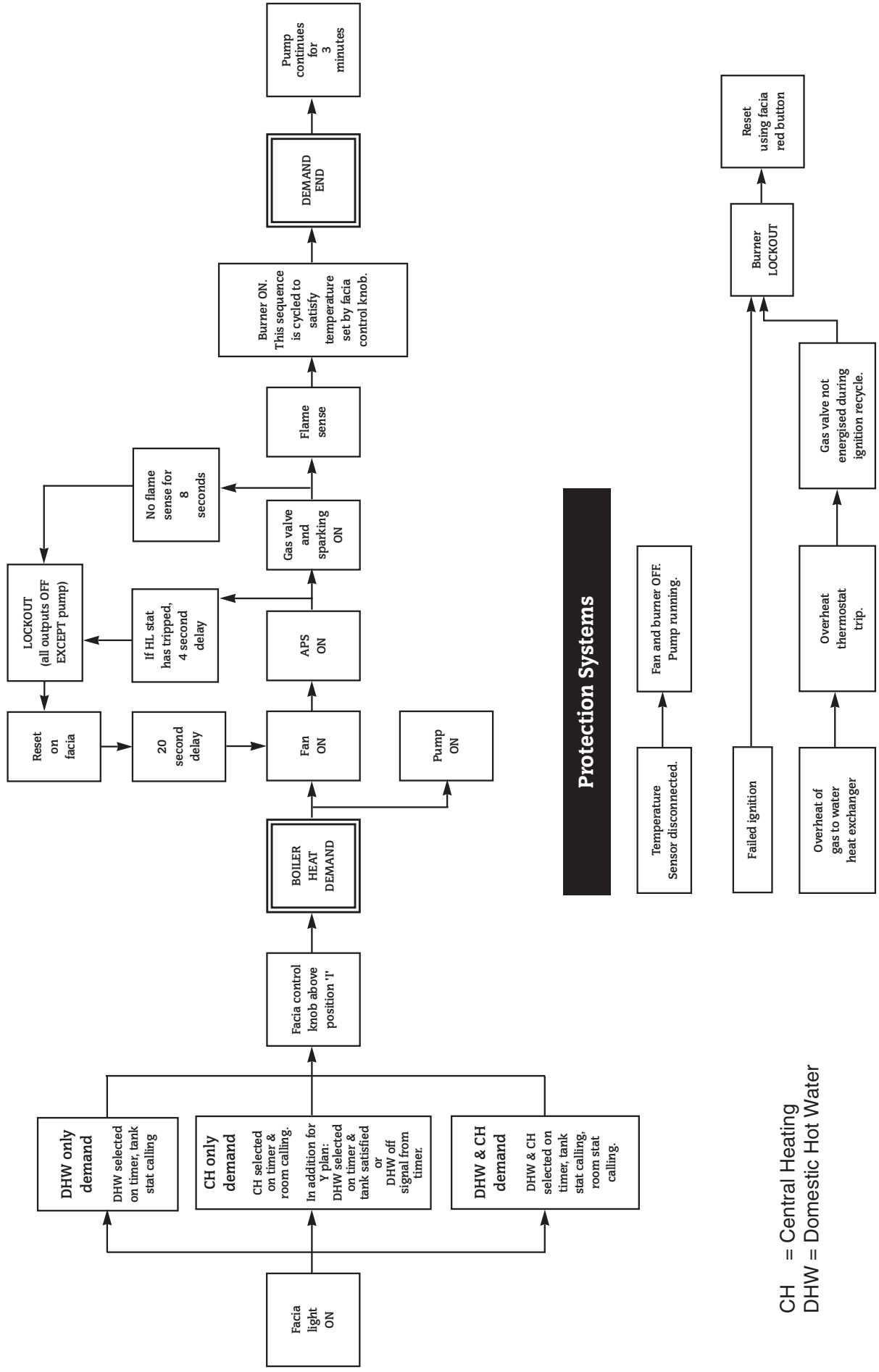

120


137


49


128

17. Operational Flow Diagram



CH = Central Heating
DHW = Domestic Hot Water

18. Fault Finding

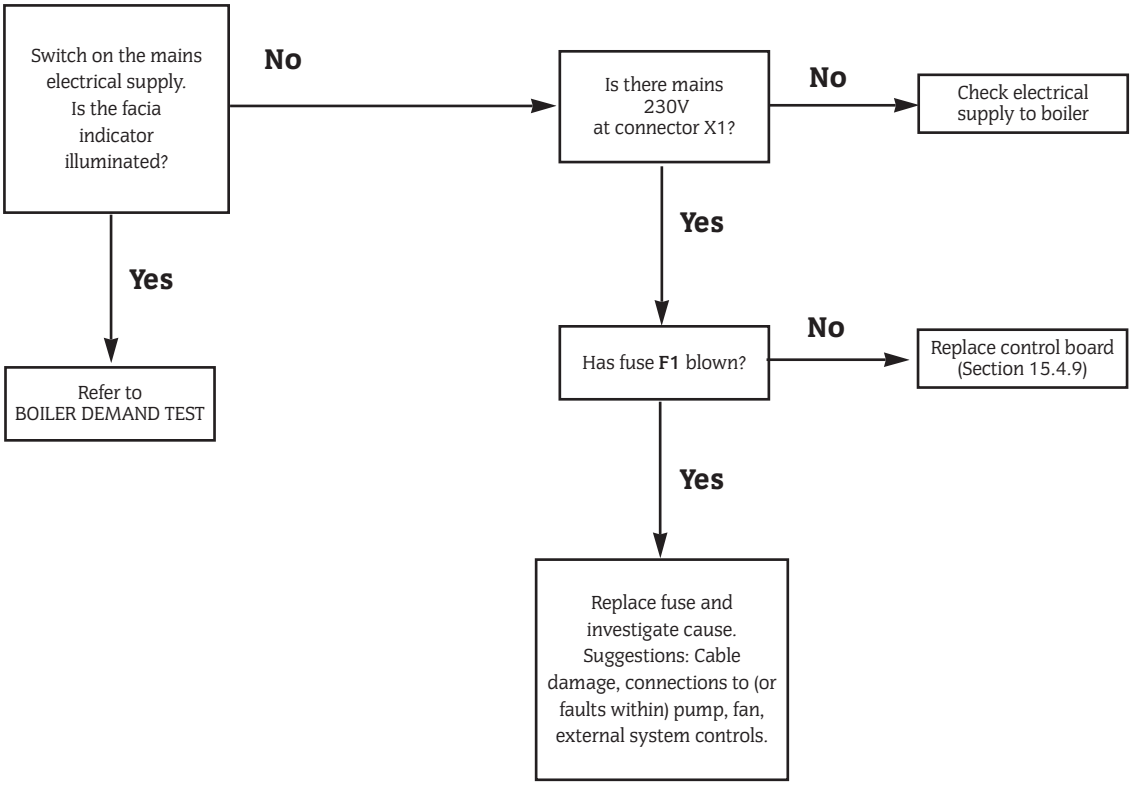
NOTE: This fault finding information is for guidance only. Worcester Heat systems cannot be held responsible for costs incurred by persons not deemed to be competent.

To use this guide, operate the boiler and follow the observations down the left hand column until the boiler fails. The associated tests will help find the fault.

This guide assumes a component failure has occured following a period of normal runing. It is not intended to solve installation errors.

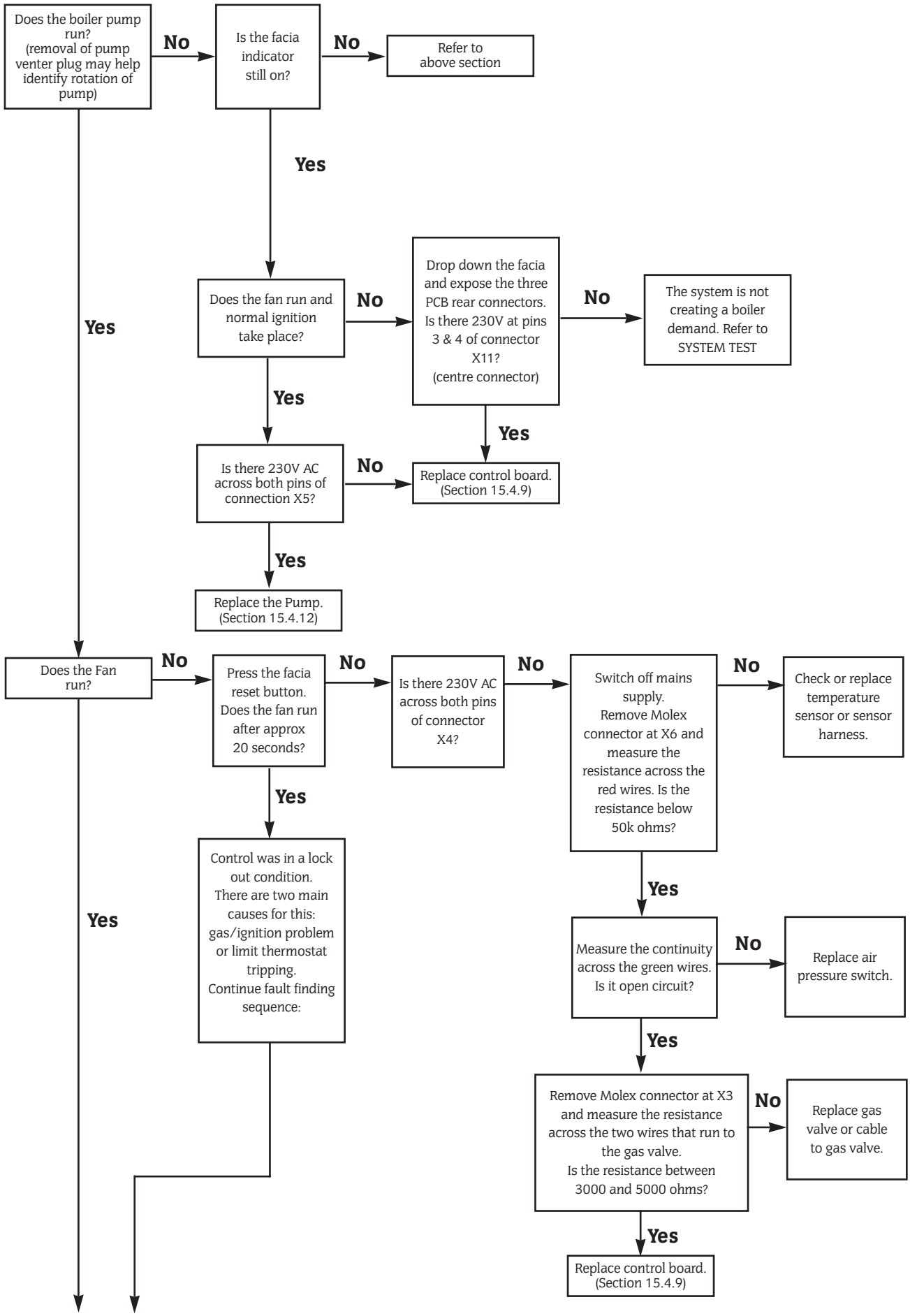
PRELIMINARY CHECKS
Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-finding task which has required the breaking and remaking of electrical connections, check (a) EARTH CONTINUITY, (b) SHORT CIRCUIT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

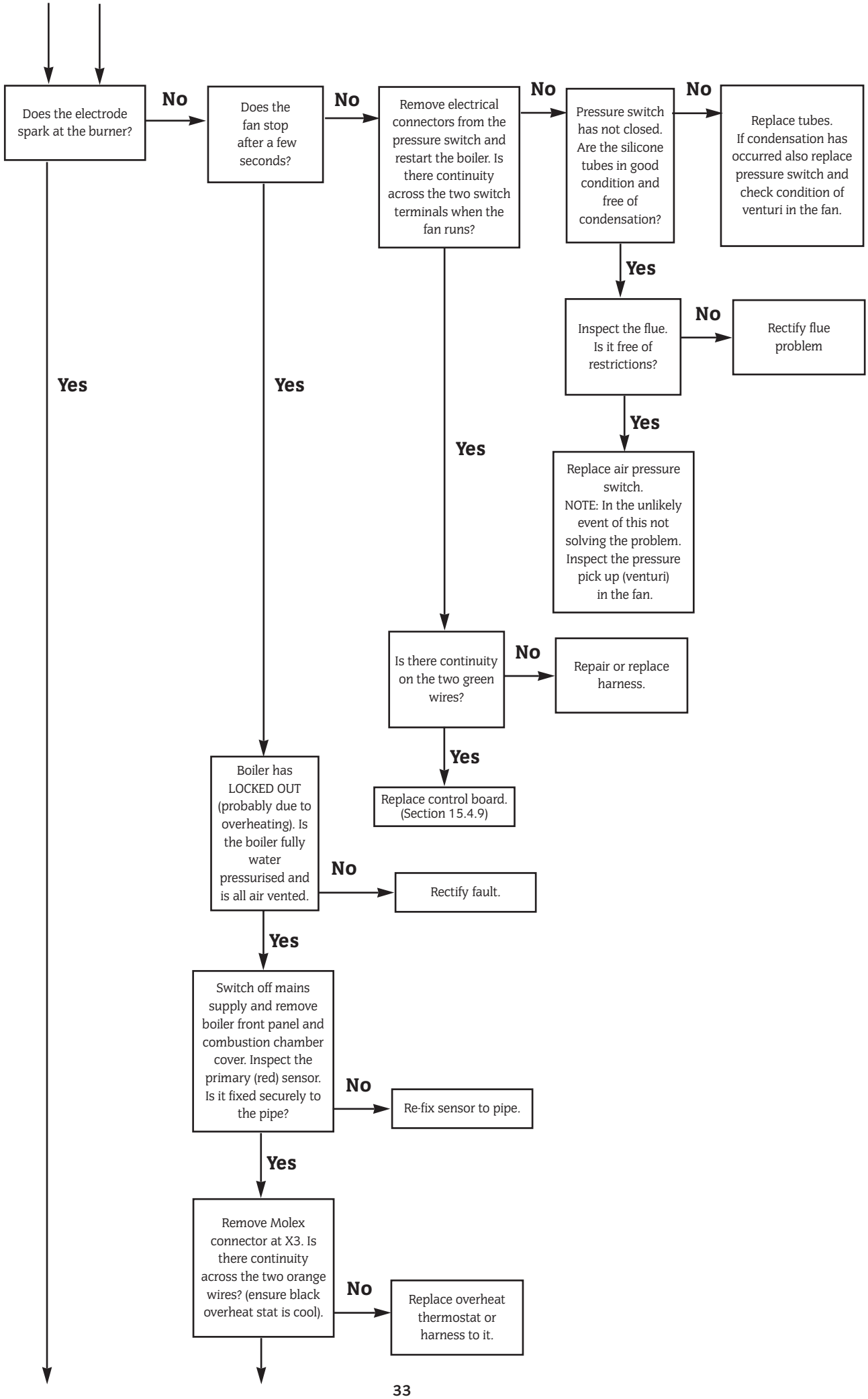
FACIA INDICATOR TEST

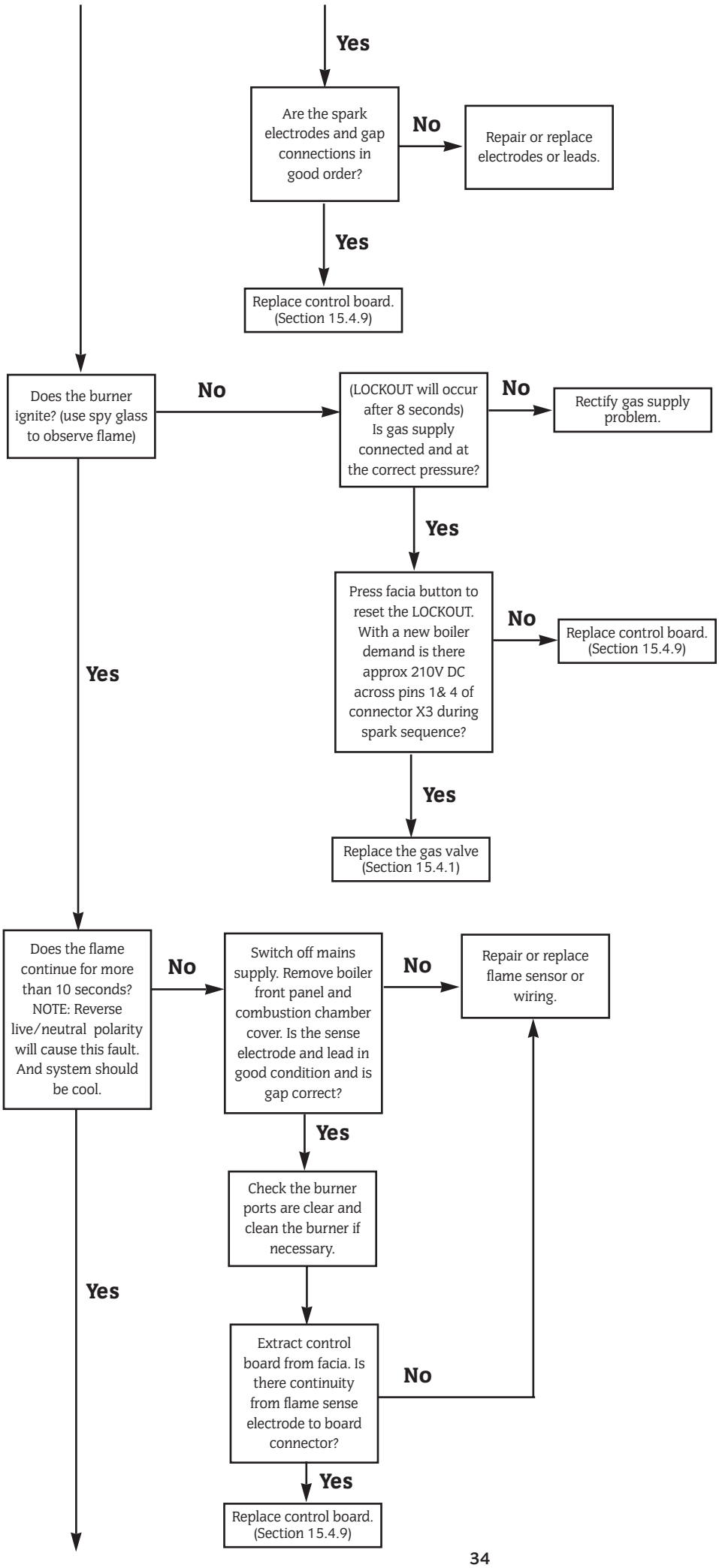


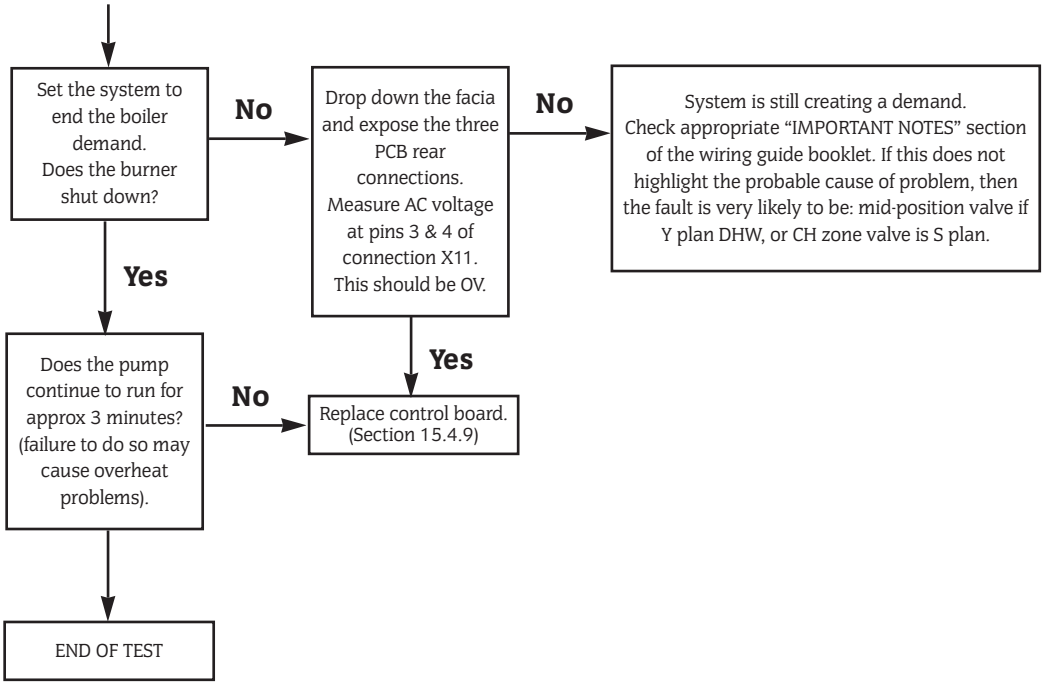
BOILER DEMAND TEST

Set the system to create a boiler demand. Turn facia control knob to maximum.



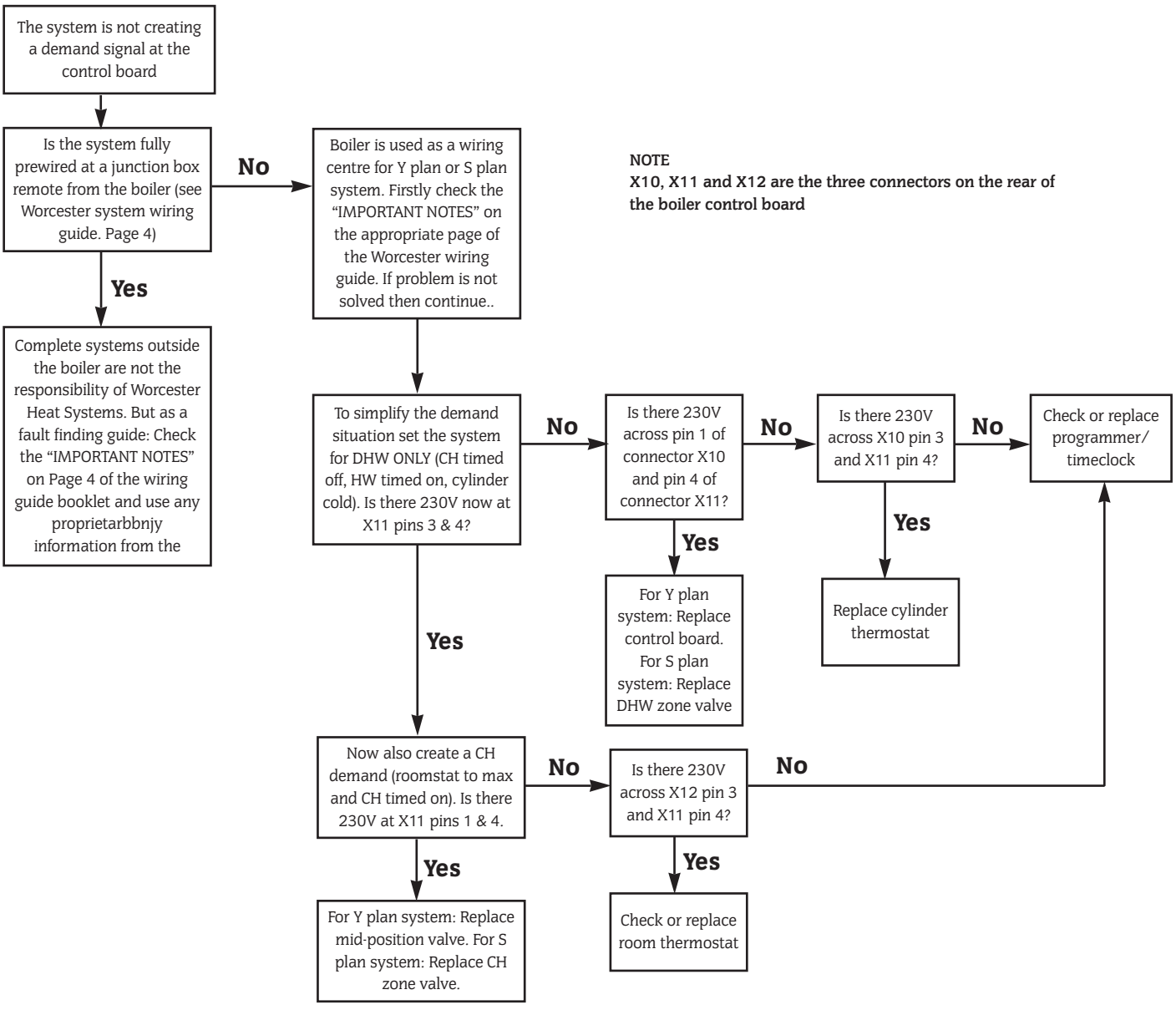

Does the electrode spark at the burner?
No
Does the fan stop after a few seconds?
No
Remove electrical connectors from the pressure switch and restart the boiler. Is there continuity across the two switch terminals when the fan runs?
No
Pressure switch has not closed. Are the silicone tubes in good condition and free of condensation?
No
Replace tubes. If condensation has occurred also replace pressure switch and check condition of venturi in the fan.
Yes
Inspect the flue. Is it free of restrictions?
No
Rectify flue problem
Yes
Replace air pressure switch. NOTE: In the unlikely event of this not solving the problem. Inspect the pressure pick up (venturi) in the fan.
Yes
Yes
Yes
Is there continuity on the two green wires?
No
Repair or replace harness.
Yes
Replace control board. (Section 15.4.9)
Boiler has LOCKED OUT (probably due to overheating). Is the boiler fully water pressurised and is all air vented.
No
Rectify fault.
Yes
Switch off mains supply and remove boiler front panel and combustion chamber cover. Inspect the primary (red) sensor. Is it fixed securely to the pipe?
No
Re-fix sensor to pipe.
Yes
Remove Molex connector at X3. Is there continuity across the two orange wires? (ensure black overheat stat is cool).
No
Replace overheat thermostat or harness to it.


Yes
Are the spark electrodes and gap connections in good order?
No
Repair or replace electrodes or leads.
Yes
Replace control board. (Section 15.4.9)
Does the burner ignite? (use spy glass to observe flame)
No
(LOCKOUT will occur after 8 seconds) Is gas supply connected and at the correct pressure?
No
Rectify gas supply problem.
Yes
Press facia button to reset the LOCKOUT. With a new boiler demand is there approx 210V DC across pins 1& 4 of connector X3 during spark sequence?
No
Replace control board. (Section 15.4.9)
Yes
Yes
Replace the gas valve (Section 15.4.1)
Does the flame continue for more than 10 seconds? NOTE: Reverse live/neutral polarity will cause this fault. And system should be cool.
No
Switch off mains supply. Remove boiler front panel and combustion chamber cover. Is the sense electrode and lead in good condition and is gap correct?
No
Repair or replace flame sensor or wiring.
Yes
Check the burner ports are clear and clean the burner if necessary.
Yes
Extract control board from facia. Is there continuity from flame sense electrode to board connector?
No
Yes
Replace control board. (Section 15.4.9)



SYSTEM TEST

This test assumes the system is set to create a boiler demand, but mains voltage is not present at the connector X11 pins 3 & 4



NOTE
X10, X11 and X12 are the three connectors on the rear of the boiler control board

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

WORCESTER

Bosch Group

Worcester Heat Systems Limited, Cotswold Way, Warndon, Worcester WR4 9SW.
Telephone: (01905) 754624. Fax: (01905) 754619.
Technical Helpline (0990) 266241.

PUBLICATION 8 716 145 191 e 06/01

WORCESTER
Bosch Group

CONVERSION INSTRUCTIONS FOR 15SBi & 24SBi System Boilers

THESE INSTRUCTIONS SHOULD BE USED IN CONJUNCTION WITH THE MAIN INSTALLATION INSTRUCTIONS WHEN CONVERTING APPLIANCES FROM NATURAL GAS TO LPG AND VICE-VERSA

ONLY COMPONENTS SUPPLIED BY WORCESTER HEAT SYSTEMS MUST BE USED

ONLY COMPETENT PERSONNEL MUST CARRY OUT THE CONVERSION

Conversion from Natural Gas to LPG must 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 boiler front panel and inner casing.

   Follow the dismantling instructions to remove the burner.

3. Remove the injector and replace with the appropriate injector from the kit.

4. Remove the nut, end cap and bracket at the opposite end of the burner to the injector.

4.1. For conversion to Natural Gas remove the gauze.

4.2. For conversion to LPG fit the gauze to the burner body.

5. Re-assemble the burner and inner casing.

6. Turn on the gas and electricity supply and follow the commissioning procedure to confirm gas soundness and correct boiler operation.

7. Remove the seal and plastic cap from the gas valve adjusting screw.

8. Reset the gas pressure to the required rate for the gas type specified on the data plate. (See Installation and Servicing Instructions. “To set the burner Pressure”.)

9. Refit the plastic sealing cap and the appropriate sealing label to the gas valve adjuster.

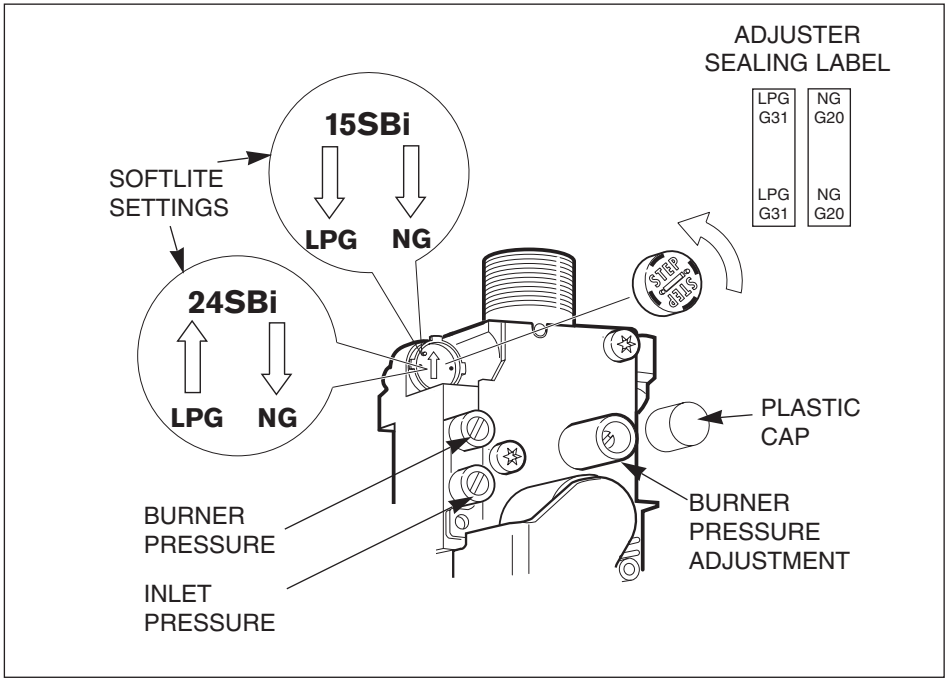
10. Adjust the Softlite setting on the gas valve as opposite.

11. Turn off the boiler and when cool peel off the arrow from the data plate and re-stick against the gas type and setting pressure for which the boiler has been converted and adjusted to.

12. Replace the boiler front panel.

The conversion is now complete

SOFTLITE ADJUSTMENT



PARTS LIST

	NG to LPG	LPG to NG
CONVERSION INSTRUCTIONS	8 716 145 204	8 716 145 204
BURNER INJECTOR (15SBi)	8 716 156 3970	8 716 156 3960
BURNER INJECTOR (24SBi)	8 716 140 2090	8 716 140 2080
BURNER GAUZE	8 716 142 6010	REMOVE
ADJUSTER SEALING LABEL NG	REMOVE	8 716 144 233
ADJUSTER SEALING LABEL LPG	8 716 144 230	REMOVE

INJECTOR SIZES

MODEL	15SBi	24SBi
NATURAL GAS	3.6MM	4.5MM
LPG	2.35MM	2.78MM

WORCESTER HEAT SYSTEMS
Cotswold Way,
Warndon,
Worcester WR4 9SW
Tel: 01905 754624 Fax: 01905 754619

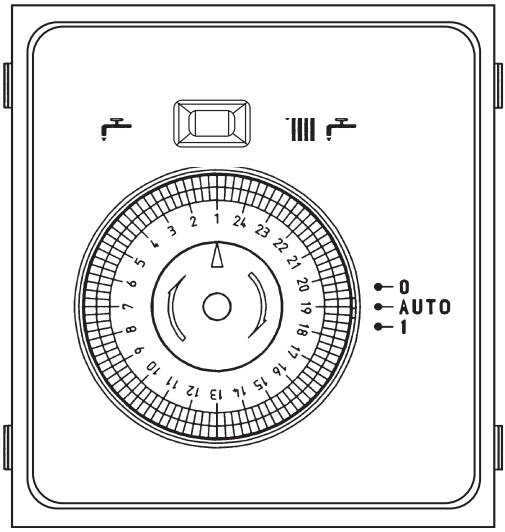
8 716 145 204a 03/99

WORCESTER
Bosch Group

15SBi & 24SBi System Boilers

TWIN CHANNEL MECHANICAL TIMESWITCH INSTALLATION & OPERATING INSTRUCTIONS

THESE INSTRUCTIONS APPLY IN THE U.K. ONLY
THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE APPLIANCE



General information is given in the users instruction leaflet dispatched with the appliance and on the lighting instruction plate fitted on the appliance.

Gas Safety (Installation and Use) Regulations 1998: All gas appliances must be installed by a competent person, in accordance with the above regulations. Failure to install the appliance correctly could lead to prosecution. The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

IMPORTANT: Read these instructions carefully in order to get the best from your appliance.

WARNING: This appliance must be earthed and protected by a 3A fuse if a 13A plug is used, or, if any other type of plug is used, by a 5A fuse either in the plug or adaptor or at the distribution board.

TIMESWITCH

24 hour twin channel mechanical timeswitch. User maintenance is not possible.

CONTROL

Any number of **ON** and **OFF** periods can be chosen within a 24 hour period.

There will be at least a 15 minute separation between the operations.

TO FIT THE TIMESWITCH

Before starting work, turn off the mains electricity supply to the appliance.

Remove the front panel from the appliance by sliding it upwards to clear the locating pegs and securing clips.

Remove the three screws securing the bottom panel to the fascia.

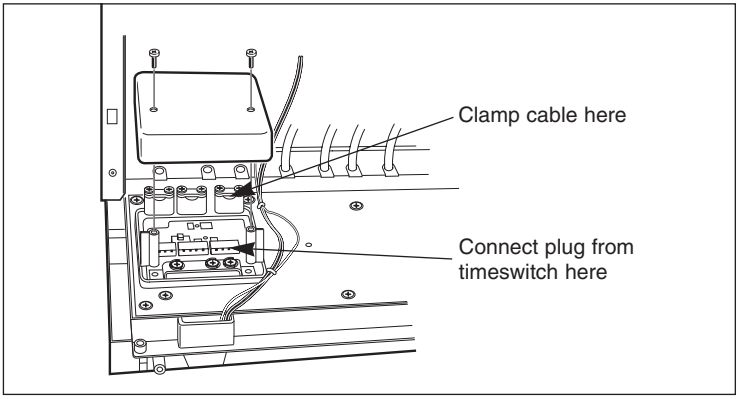
Remove the two screws securing the fascia assembly to the appliance and lower it forwards to the servicing position.

Remove the timeswitch blanking plate from the front of the fascia by carefully releasing the clips at the rear right-hand side and withdrawing the plate from the front.

Feed the electrical lead from the timeswitch through the fascia to exit directly underneath it and fit the timeswitch by hooking the top two lugs up into the facia slots and then push the bottom two clips until they snap into position.

From the rear of the fascia, remove the plastic splash cover to reveal the electrical connection box and remove the two screws securing the cover to the box.

Secure the cable from the timeswitch using the clamping positions on the underside of the fascia and the rear of the electrical connection box and plug the cable into the corresponding five-way socket on the rear of the fascia.



Replace the electrical box cover, splash cover and fascia bottom panel, secure the fascia using the two screws and refit the front panel

TO SET THE TIMESWITCH

The selector switch allows the timer to control either the hot water only or both the central heating and the hot water.

TO SET THE CLOCK

Turn the dial clockwise until the correct time of day is at the pointer.

TO SET THE DEMAND PERIODS

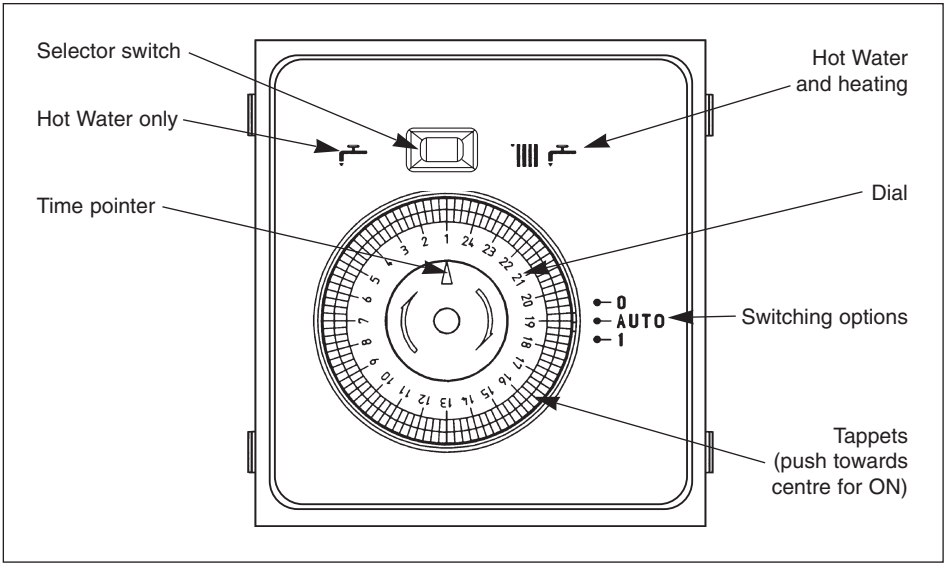
To set the **ON** periods push the grey tappets towards the centre from the start of the period until the end of each period. Each tappet represents a 15 minute time period.

OPERATIONAL NOTES

Switching:

The switching options are:

0	Off all the time
AUTO	On and Off as selected by the adjustment of the tappets
I	On all the time



TO LIGHT AND STOP THE APPLIANCE

Refer to the User operating instruction leaflet or the lighting instruction plate on the appliance.

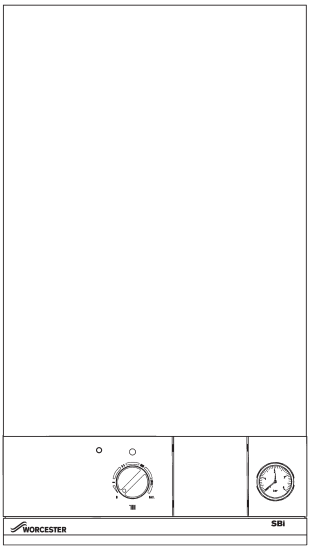
Bosch Group

WORCESTER HEAT SYSTEMS
Cotswold Way,
Warndon,
Worcester WR4 9SW
Tel: 01905 754624 Fax: 01905 754619

8 716 145 202b 09/01

WORCESTER

Bosch Group



15/24SBi SYSTEM BOILER

benchmark™

Worcester Bosch supports the Benchmark code of practice

	G. C. NUMBERS	
APPLIANCE	**NATURAL GAS**	**L. P. G.**
15SBi	**41 311 43**	**41 311 45**
24SBi	**41 311 44**	**41 311 46**

USER INSTRUCTIONS & CUSTOMER CARE GUIDE

IMPORTANT: THIS APPLIANCE IS FOR USE WITH NATURAL GAS OR LPG.
THESE INSTRUCTIONS APPLY IN THE UK ONLY.
THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE GAS METER

EXCELLENCE COMES AS STANDARD

Thank you for purchasing a Worcester gas-fired system boiler.

Worcester system boilers are made by Worcester Heat Systems and the strictest quality control standards are demanded throughout every stage of production.

Indeed, Worcester Heat Systems have led the field in innovative appliance design and performance for more than 30 years.

The result is that your new Worcester system boiler appliance offers you the very best of everything - quality, efficiency, economical running costs, proven reliability and value for money.

What's more, you also have the assurance of our no-nonsense 1 year parts and labour guarantee.

And it's backed up by Worcester Care Call - a complete maintenance scheme to keep your boiler operating at peak condition and efficiency.

No wonder that more and more people are agreeing that when it is gas, it has to be a Worcester system boiler.

CONTENTS

GENERAL INFORMATION

GAS SAFETY (INSTALLATION AND USE) REGULATIONS 1998

It is the law that all gas appliances must be installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest and that of safety to ensure compliance with the law. The manufacturers notes must not be taken, in any way, as over-riding statutory obligations.

WARNING: This appliance must be earthed and protected by a 3 amp fuse.

ELECTRICITY SUPPLY: 230V ~ 50Hz

IMPORTANT: To get the best from your Worcester system boiler please read these instructions carefully.

In the event of a fault the appliance should not be used until the fault has been corrected by a competent person.

GENERAL DESCRIPTION

(See Fig.1.)

The WORCESTER system boilers are sealed system central heating aplliances. They consist of a gas fired boiler having a varying output of between 6 - 15kW (15SBi) and 15 - 24kW (24SBi), a circulating pump and all necessary controls to provide central heating.

They can be connected to a domestic hot water supply system through an optional, internally fitted diverter valve or to an external S or Y plan system.

Central Heating

When a demand is made for heating by the system controls (i.e. a programmer or room thermostat). The pump will energise circulating primary water around the heating system and the burner will light. The heat output from the appliance in this mode has been factory set to mid-range or as reset by your installer. The appliance will operate as necessary to maintain the temperature of the radiators at the level set by the adjustment of the Heating Temperature Control Knob. (See Fig. 2.)

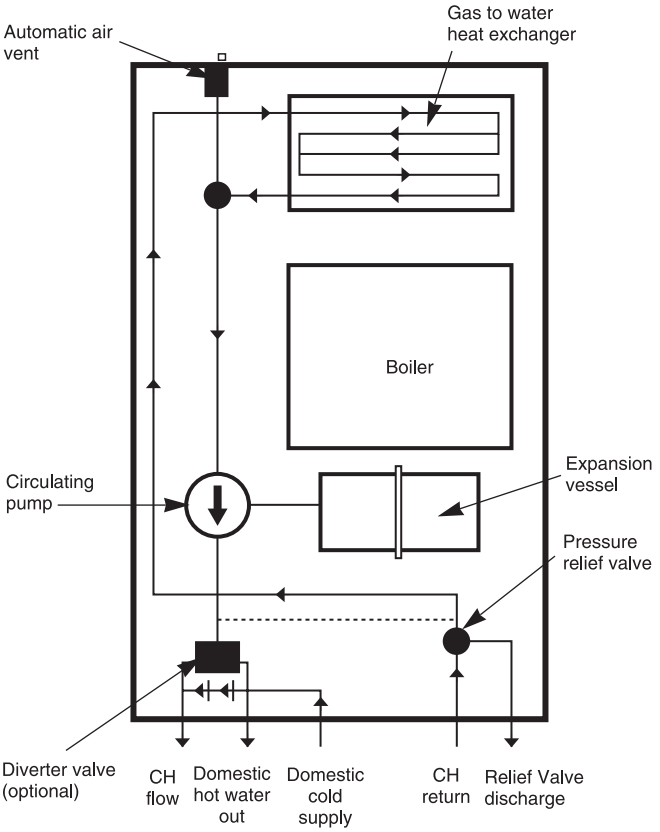
If the system no longer requires output to maintain the desired room temperature, the burner will extinguish. The pump will continue to run for a short period to dissipate the residual heat from the appliance and then switch off.

The appliance will supply heat to the central heating system as required.

Hot Water

A hot water cylinder will be maintained full of hot water under the control of a cylinder thermostat.

Fig. 1. System Diagram.

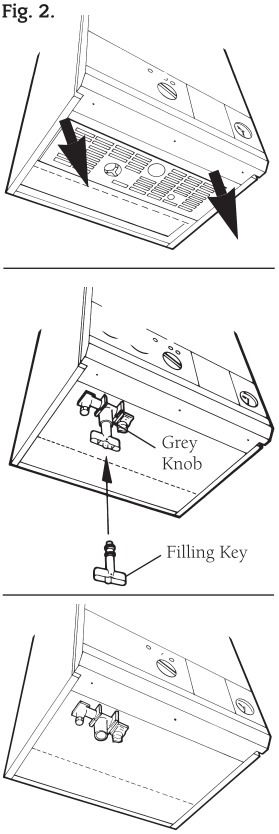


GENERAL NOTES

CENTRAL HEATING SYSTEM

During the first few hours of operation of the central heating system, check that all radiators are being heated at an even rate. Should the upper area of a radiator be at a lower temperature than the base of the radiator, it should be vented by releasing air through the venting screw at the top of each radiator. Make sure your installer shows you how to carry out the operation. Repeated venting will reduce the quantity of water in the system and this must be replenished for safe and satisfactory operation of the appliance. Should water leaks be found in the system or excessive venting be required from any radiator, a service engineer should be contacted and the system corrected.

Fig. 2.



SEALED HEATING SYSTEM

The appliance must be fitted to a sealed heating system which is pre-pressurised. In this case your installer will advise you on the minimum and maximum pressure that should be indicated on the pressure gauge. See Fig. 3. Check regularly that this pressure is maintained and contact your installer or maintenance engineer if there is a permanent significant drop in pressure indicated on the gauge. If the system loses pressure it should be re-pressurised as instructed by the installer **(N.B. Maximum operating pressure 2.5 bar)**.

Pressurising The System (See Fig. 2).
(If in doubt leave this procedure to your installer).

Remove the bottom panel to gain access to the filling loop assembly.

Insert the bayonet end of the filling key into the corresponding cut outs in the filling loop housing and twist to lock the key in place.

Turn the grey knob anti-clockwise to allow water ingress and fill until the required pressure is reached.

Turn the grey knob clockwise to stop filling and remove the filling key by lining up the bayonet end of the key with the cut outs in the filling loop housing and withdrawing the key.

N.B. The key must always be removed from the filling loop housing after the system has been filled to prevent accidental filling and to comply with Byelaw 14 of the Water Byelaws Scheme.

Store the key in a safe place for future use and refit the bottom panel

CLEARANCES

Your installer will have provided adequate space around the appliance for safety and servicing. Do not restrict this space by the addition of cupboards, shelves etc. close to the appliance.

	15SBi	24SBi
Left-hand side	10	10
Right-hand side	10	10
In Front	600	600
Above	180	180
Below	200	200

Minimum clearances in millimetres.

ROOM THERMOSTAT

A room thermostat may be fitted for control of the central heating temperature. It will be located in one room of the home. The method of setting a room thermostat varies with the type and manufacture. Refer to the instructions supplied with the room thermostat.

THERMOSTATIC RADIATOR VALVES

If thermostatic radiator valves are to be fitted to the system then they must conform to the requirements of BS2767:1972. It is advisable to leave one valve permanently set at maximum to prevent the boiler short cycling.

VENTILATION OF ROOM SEALED FANNED FLUE (RSF) APPLIANCES

These are room sealed appliances and any ventilation openings in a wall or door must not be obstructed. Do not allow the flue terminal fitted on the outside wall to become obstructed or damaged.

NOTE: Do not place anything on top of the appliance. If the appliance is fitted in a compartment do not use the compartment for storage purposes unless it conforms to the requirements of BS 6798:1987: Section 6. It is essential that the airing space is separated from the boiler space by a perforated non-combustible partition as described in BS 6798:1987.

CIRCULATING PUMP

This may be fitted with a speed adjuster. If so it will be factory set at maximum and should be adjusted by the installer to suit the heating load.

FROST PRECAUTIONS

If the appliance is not to be used for a long period of time and there is a likelihood of freezing, then the appliance should be drained. The Worcester Heat Systems Technical Helpline will advise you on suitable frost precautions.

SERVICE

Annual servicing is important in order to ensure continuing high efficiency and long life for your appliance. In the event of any difficulty in making suitable servicing arrangements, Worcester Heat Systems Limited or other competent persons will discuss regular servicing arrangements and offer a comprehensive maintenance contract.

WARNING

If a gas leak exists, or is suspected, turn off the gas supply to the appliance at the service cock and consult your local service engineer.

Do not touch any electrical switches to turn them either on or off. Open all windows and doors. Do not smoke. Extinguish all naked lights.

CLEANING

Do not use abrasive cleaners on the outer casing. Use a damp cloth and a little detergent.

OPERATION OF CONTROLS

(See also label on inside of appliance front panel).

The appliance is fitted with the following controls:

CENTRAL HEATING TEMPERATURE CONTROL

The position of this knob will determine the temperature of the water delivered to the radiators between the **'I'** and **'MAX'** position. When the knob is turned anti-clockwise past the **'I'** position to the **'OFF'** (Summer Position) the appliance is off.

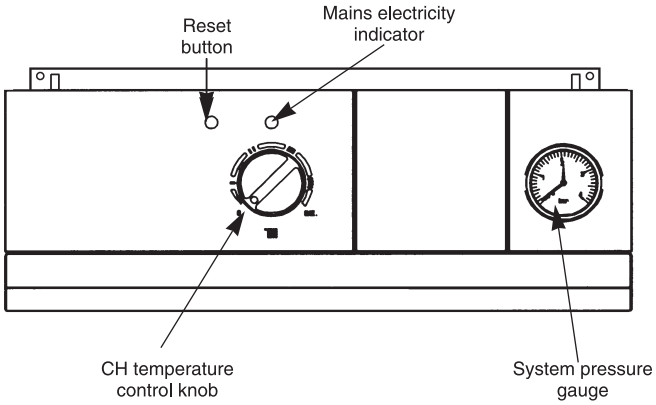
FACIA MOUNTED PROGRAMMER (if fitted)

Your installer may have mounted a mechanical programmer into the facia of your appliance. Operating instructions are supplied with the programmer.

RESET BUTTON

Press and release this button if the appliance fails to operate - if the appliance still fails to operate then contact Worcester Heat Systems or your installer.

Fig. 3. Controls.



TO LIGHT AND STOP THE APPLIANCE

INDICATOR LIGHTS

Green light:

MAINS : 'ON'

TO LIGHT THE APPLIANCE

Check that the water valves to the central heating circuit are open.

Check that the grey needle on the pressure gauge is not below the required pressure.

Switch on the mains electricity. Set the room thermostat, if fitted, to maximum. Turn the central heating temperature control knob to **'MAX'.** The burner will light.. Set the central heating and hot water temperature control knobs and the room thermostat/cylinder thermostat, if fitted, to the desired temperature.

TO STOP THE APPLIANCE

For Short Periods

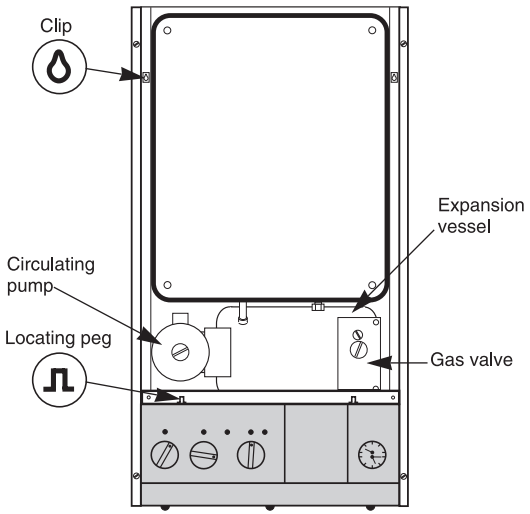
Turn the central heating temperature control knob fully anti-clockwise to the **'O'** position.

For Long Periods

Turn the CH temperature control knob switch to the **'O'** position. Switch off the mains electricity.

A facia mounted mechanical programmer will require resetting if mains supply has been disconnected.

Fig. 4. 15/24SBi with front panel removed.



ELECTRICITY SUPPLY FAILURE

If the electricity supply fails the appliance will not operate. Once the supply is restored the appliance will return to normal operation. If a programmer is fitted, check that the settings have been maintained.

APPLIANCE LOCKOUT

The appliance can be reset by pressing the reset button. Check that the gas supply has not been interrupted.

If this condition continues to occur, then call a service engineer.

REMOVAL AND REPLACEMENT OF THE FRONT PANEL (See Fig. 4)

Removal:

Holding the panel at the edges, slide it upwards to disengage the clips and ease the top edge forwards and upwards to raise it clear of the two pegs on the top edge of the facia.

Replacement:

Locate the two holes in the bottom edge of the front panel over the two pegs on the top edge of the facia and reverse the removal procedure.

APPLIANCE FAILS TO OPERATE

More than 30% of all calls made to Worcester Heat Systems to report appliance faults or breakdowns prove to be false alarms, as there is often a simple explanation for the apparent malfunction.

So, to help you save time and money – not to mention frustration and inconvenience – please refer to the General Information, Notes and Lighting Instructions ensuring all controls are set correctly.

If, after following the instructions the appliance still fails to operate correctly call the Worcester Heat Systems Service Centre. Arrangements will be made for an engineer to call as soon as possible.

CALL-OUT CHARGES

All of our field service engineers are factory trained.

If you request a visit from an engineer and your appliance has been installed within the last 12 months, no charge will be made for parts and/or labour, providing:

- The appliance was commissioned correctly on installation.
- An appliance fault is found and the appliance has been installed within the past 12 months.

A call-out charge will be made where:

- The appliance has been installed for over 12 months, or
- Our Field Service Engineer finds no fault with the appliance (see note), or
- The cause of breakdown is with other parts of your plumbing/heating system, or with equipment not supplied by Worcester.

NOTE: Invoices for attendance and/or repair work carried out on your appliance by any third party will not be accepted.

MAINTAINING YOUR APPLIANCE

Your new Worcester system boiler represents a long-term investment in a reliable, high quality product.

In order to realise its maximum working life, and to ensure it continues to operate at peak efficiency and performance, it is essential that your boiler receives regular, competent servicing and annual maintenance checks beyond the initial 12 month guarantee period.

Regular service contracts can be arranged with your installer – however if you have difficulty making a satisfactory arrangement simply contact Worcester Heat Systems on **0345 256206** for help.

If you would like to know more about Worcester's extended warranty options please tick the appropriate box on your warranty registration card.

SERVICE CENTRES

CONTACT NUMBERS:

UK Call Centre	Tel.	08457 256 206
UK Call Centre	Fax.	01905 757536
Scotland only	Fax.	01506 441 687

OPERATING HOURS:

Mon - Fri	8.00am to 6.00pm
Sat	8.30am to 1.00pm

Please contact our UK Call Centre number where our friendly operators will book your call with one of our team of nationwide engineers.

NOTE:
Sunday and Bank Holiday cover is not available

IMPORTANT
Do not touch or adjust any sealed component

YOUR WORCESTER SYSTEM BOILER GUARANTEE

This appliance is guaranteed against faulty materials or workmanship for a period of twelve calendar months from the date of installation subject to the following conditions and exceptions.

1. That during the currency of this guarantee any components of the unit which are proved to be faulty or defective in manufacture will be exchanged or repaired free of material charges and free of labour charges by Worcester Heat Systems Limited.

2. That the householder may be asked to prove the date of installation, that the appliance was correctly commissioned and, where appropriate, the first 12 month service has been carried out to the satisfaction of Worcester Heat Systems Limited when requested.

3. That any product or part thereof returned for servicing under the guarantee must be accompanied by a claim stating the Model, Serial Number, Date of Installation.

4. That Worcester Heat Systems Limited will not accept responsibility for damage caused by faulty installation, neglect, misuse or accidental damage, the non-observance of the instructions contained in the installation and Operating Instructions Leaflets.

5. That the appliance has been used only for normal domestic purposes for which it was designed.

6. That this guarantee applies only to equipment purchased and used in mainland Great Britain.

This guarantee is given in addition to all your normal statutory rights.

GUARANTEE REGISTRATION

You should complete and return the postpaid Guarantee Registration Card within 14 days of purchase.

The card will register you as the owner of your new Worcester system boiler and, while this will not affect your statutory rights in any way, it will assist us to maintain an effective and efficient customer service by establishing a reference and permanent record for your boiler.

IMPORTANT: SERIAL NUMBER. Copy the number off the Guarantee Card.

FOR YOUR OWN RECORD

MODEL	SERIAL NUMBER

(See identity label inside appliance casing)

TYPE/SIZE	DATE OF INSTALLATION

CORGI CONTACT

All **CORGI Registered** installers carry a **CORGI ID** card and have a registration number. Both should be recorded in your central heating log book. You can check your installer is **CORGI Registered** by calling **CORGI** on **01256 372300**

WORCESTER
Bosch Group

EXCELLENCE COMES AS STANDARD

Worcester Heat Systems Limited. Cotswold Way, Warndon, Worcester WR4 9SW.
Telephone: (01905) 754624. Fax: (01905) 754619.
Technical Service Helpline 08705 266241.
www.worcester-bosch.co.uk

8 716 145 192d 11/(

WORCESTER
Bosch Group

SYSTEM WIRING GUIDE

15SBi & 24SBi System Boilers

THESE INSTRUCTIONS SHOULD BE USED IN CONJUNCTION WITH THE MAIN INSTALLATION INSTRUCTIONS.

ONLY COMPONENTS SUPPLIED BY WORCESTER HEAT SYSTEMS MUST BE USED

ONLY COMPETENT PERSONNEL MUST CARRY OUT THE INSTALLATION

1. Gas Safety Regulations

Gas Safety (Installation and Use) Regulations 1998: All gas appliances must be installed by a competent person, in accordance with the above regulations. Failure to install the appliance correctly could lead to prosecution. The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

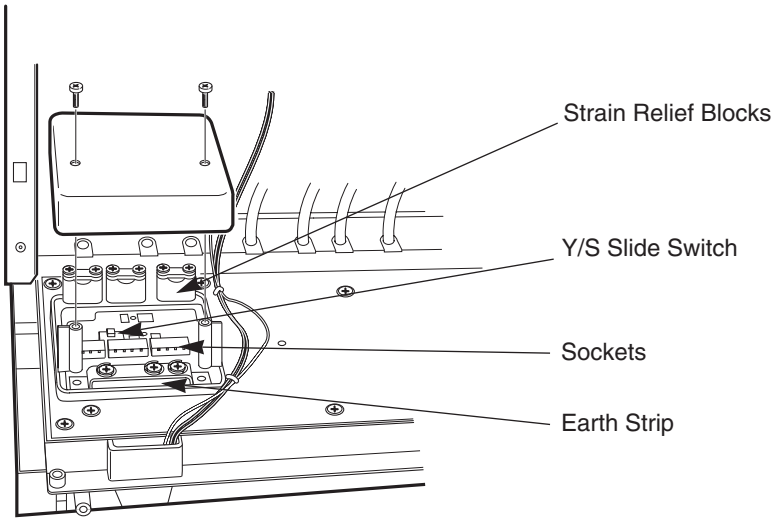
IMPORTANT: Read these instructions carefully in order to get the best from your appliance.

WARNING: This appliance must be earthed and protected by a 3A fuse if a 13A plug is used, or, if any other type of plug is used, by a 5A fuse either in the plug or adaptor or at the distribution board.

2. Boiler Electronic Control Board & Wiring Centre

In addition to fully controlling the System Boiler (see main installation book), the control board also uniquely provides for the connection of the electrical components of any Y or S plan system, either pre-wired remotely from the boiler or wired directly to the boiler. This is provided by a group of three plugs arranged at the rear of the control board, referred to as the 'internal wiring centre'. The Y/S slide switch is selected depending on the system installed.

Fig.1. Internal Wiring Centre.



3. Gaining Access to the Wiring Centre

Isolate the boiler electrical mains supply. Remove cabinet front panel. Unscrew the two upper screws and hinge down the facia into the service position (take care not to damage the pressure gauge capillary tube). Remove the water splash cover and the electrical box cover on the rear of the facia to reveal the three connector plugs.

4. Wiring Centre Details.

4.1 The plugs must be removed from the sockets when the wires are being fitted. This avoids damage to the sockets or the control board.

4.2 Support the facia when connecting earth wires to the earth strip. This avoids damage to the facia hinges.

4.3 The strain relief blocks must be used to secure all cables entering the internal wiring centre. This is designed for maximum cable diameter of 8.5mm.

5. Schematic Diagram of Sockets.

It may be useful to understand how the three sockets on the rear of the control board (internal wiring centre) are interconnected with each other and the roomstat etc.

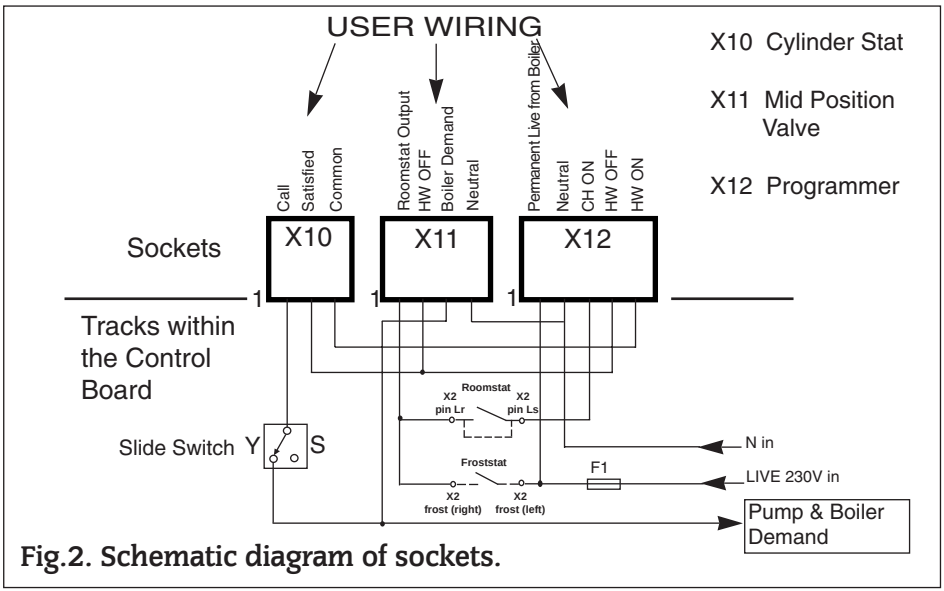


Fig.2. Schematic diagram of sockets.

6. Wiring to your System.

6.1 The following diagrams show the wiring options for your system. Any other combinations of wiring are not recommended as it would increase complexity of the system. Please also follow wiring instructions of any proprietary system. Worcester Heat Systems cannot be held responsible for any incorrect wiring external from the boiler.

6.2 Mains electrical supply - The boiler should be connected to the mains supply as described in Section 10 of the main installation book. This also provides the electrical supply to the system through connector X12. **NOTE: IN ALL CASES THIS MUST BE THE ONLY ELECTRICAL SUPPLY TO THE SYSTEM**. This ensures the safety of a single fused supply.

6.3 Pump - the boiler is fitted with an internal pump. Any other system pump must be disconnected and removed.

6.4 These diagrams show connection details of two popular proprietary systems (Honeywell and Siebe, formerly ACL), for systems from other manufacturers, refer to manufacturers instructions or contact Worcester Technical Services 0990 266241 for assistance.

Pre-wired Remote Y Plan or S Plan System

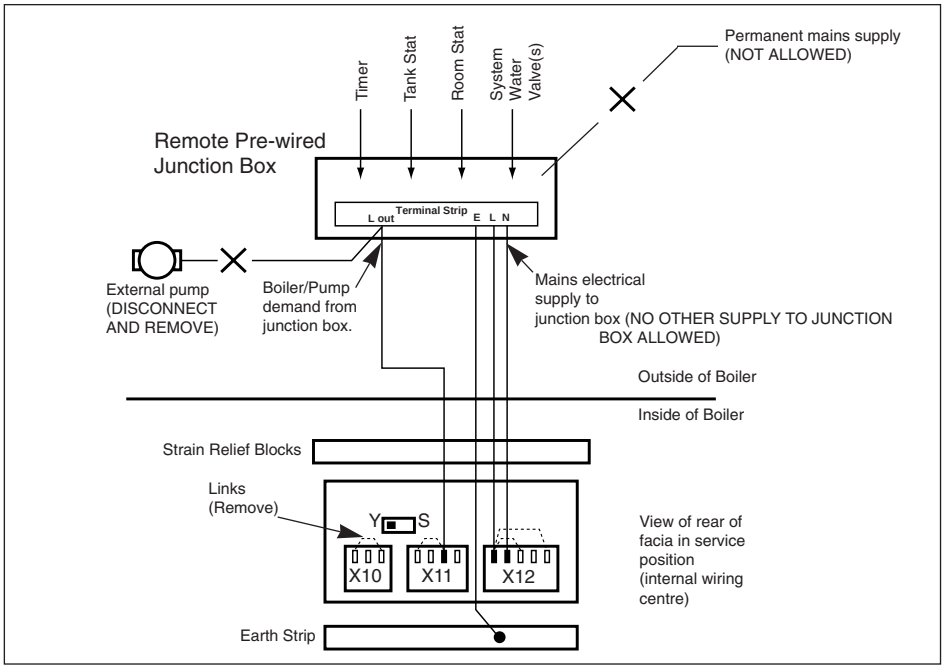
If the system is fully pre-wired at a junction box remotely from the boiler, it can be easily connected back to the Worcester System Boiler.

Drop down the facia and gain access to the boiler wiring centre as described in Section 3.

Connect the junction box as shown:

IMPORTANT NOTES:

- Observe wiring details given in Section 4 and 6.
- Remove all pre-fitted links from the three plugs.
- The position of the Y/S slide switch is not important.
- If a room thermostat is required, it must be wired to the remote junction box according to the proprietary instructions.
- If a frost thermostat is required, it can be wired to the remote junction box OR connector X2 on the boiler control board according to Fig.12 of the main installation book. In this case the link at X11 must be fitted.



Y Plan System (Boiler used as wiring centre)

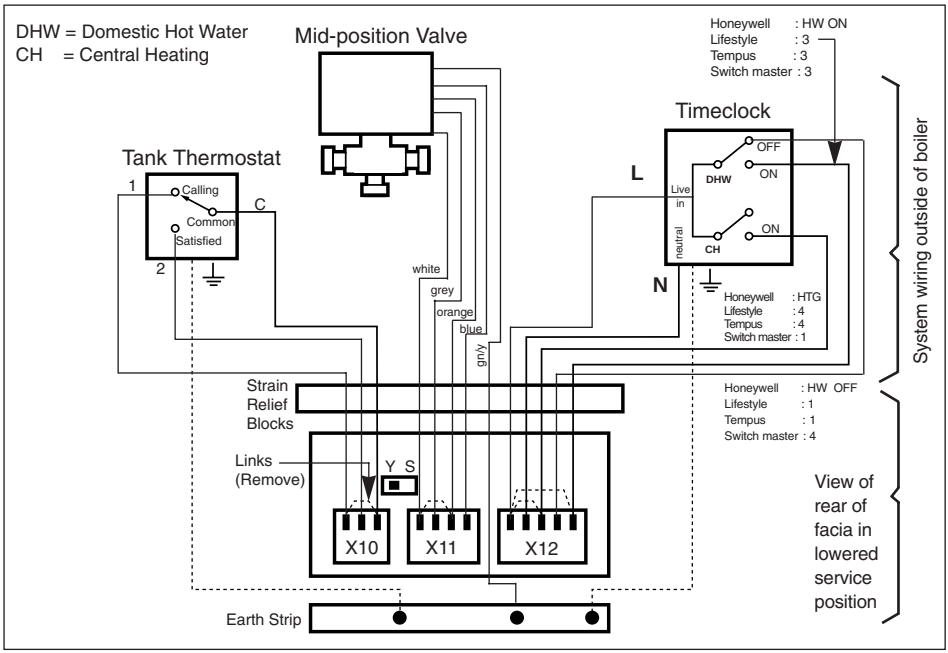
If it is required to use the boiler as a wiring centre for a Y plan system (mid position valve, tank stat, room and/or frost stat, programmer), the following diagram shows how this can be done. If the Worcester optional valve and timeclock are used, these simply plug into sockets X11 and X12.

Drop down the facia and gain access to the boiler wiring centre as described in Section 3.

Connect the system as shown:

IMPORTANT NOTES:

- Observe wiring details given in Section 4 and 6.
- Remove all pre-fitted links from the three plugs.
- The Y/S slide switch must be in the Y position.
- The HW OFF wire from the timeclock is only needed if the system is to have independent CH time control.
- If a room thermostat is required, this should be wired to connector X2 at the lower front section of the control board as shown in Fig.12 of the main installation book. If it is not required, then a link must be fitted at X2 across pins Ls and Lr.
- If a frost thermostat is required, this should be wired to connector X2 at the lower front section of the control board as shown in Fig.12 of the main installation book.
- Dotted lines show routing of earth wires which may be required.
- A tank stat is recommended for this application. But if it is not required, fit the link at X10.
- If a timeclock is not required, fit the two links at X12.



S Plan System (Boiler used as wiring centre)

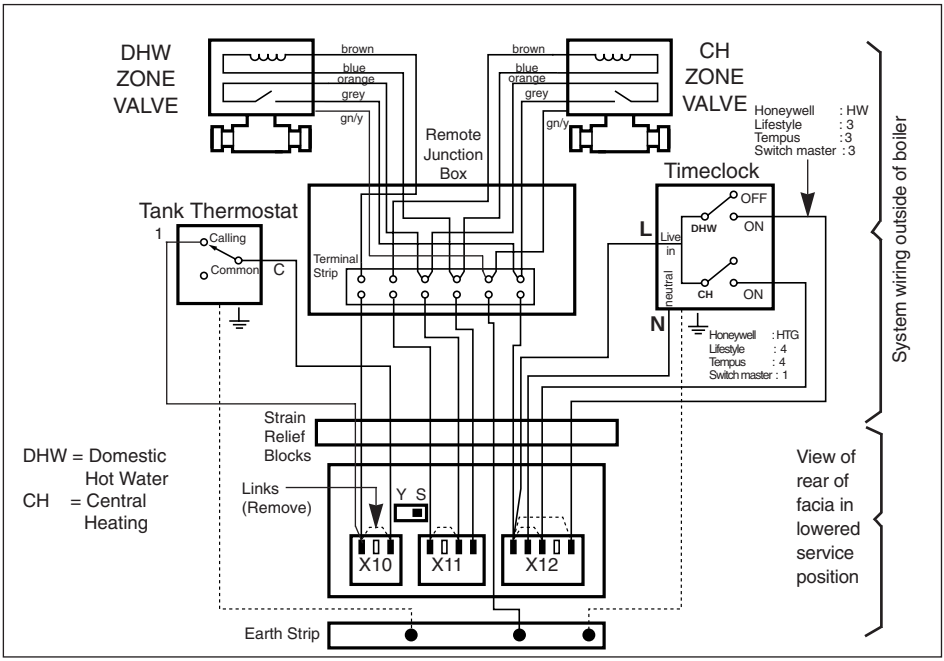
If it is required to use the boiler as a wiring centre for an S plan system (two zone valves, tank stat, room and/or frost stat, programmer), the following diagram shows how this can be done. In order to simplify wiring at the boiler, it is suggested that the two zone valves are pre-wired remotely from the boiler in a separate junction box as shown, and a six core cable run to the internal wiring centre.

Drop down the facia and gain access to the boiler wiring centre as described in Section 3.

Connect the system as shown:

IMPORTANT NOTES:

- Observe wiring details given in Section 4 and 6 as before.
- Remove all pre-fitted links from the three plugs.
- The Y/S slide switch must be in the S position.
- If a room thermostat is required, this should be wired to connector X2 at the lower front section of the control board as shown in Fig.12 of the main installation book. If it is not required, then a link must be fitted at X2 across pins Ls and Lr.
- If a frost thermostat is required, this should be wired to connector X2 at the lower front section of the control board as shown in Fig.12 of the main installation book.
- Some zone valves may have a white wire. If so, this must be electrically isolated.
- Dotted lines show routing of earth wires which may be required.
- A tank stat is recommended for this application. But if it is not required, fit the link at X10.
- If a timeclock is not required, fit the two links at X12.



Bosch Group

WORCESTER HEAT SYSTEMS
Cotswold Way,
Warndon,
Worcester WR4 9SW
Tel: 01905 754624 Fax: 01905 754619

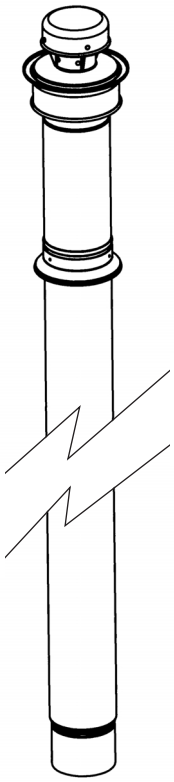
8 716 145 206 C 11/00

WORCESTER

Bosch Group

VERTICAL BALANCED FLUE SYSTEM

INSTALLATION INSTRUCTIONS



ROOM SEALED NON-CONDENSING COMBINATION/SYSTEM BOILERS AND WATER HEATERS

24i	47 311 37/38	15SBi	41 311 43/45
28i	47 311 54	24SBi	41 311 44/46
25Si	47 311 49/50	9/14 CBi	41 311 50/51
28Si	47 311 51/52	14/19 CBi	41 311 52/53
C1	47 311 51	19/24 CBi	41 311 54/55
24CDi	47 311 30/31	WR325	52 311 02
28CDi	47 311 34/35	WH1	52 311 03
35CDi II	47 311 51/52		

IMPORTANT: THIS BOOKLET MUST BE READ FULLY IN CONJUNCTION WITH THE APPLIANCE INSTALLATION AND SERVICING INSTRUCTIONS

THESE INSTRUCTIONS APPLY IN THE UK ONLY

THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE GAS METER

1. Flue Terminal Position

The Flue System must be installed in accordance with BS 5440: Part 1 2000 where applicable.

When installed the minimum clearance between the terminal and any adjoining vertical walls or obstructions must be at least 500mm.

The terminal must not be installed within 600mm of an openable window, air vent or any other ventilation opening. See Fig. 1.

If the flue needs to go through a wall next to the appliance adequate space must be allowed for the flue bend to be fitted.

When the flue is taken through the ceiling and into the roof space, or room above there must be a minimum air gap of 25mm between any part of the flue system and any combustion material.

Note: It is absolutely essential to ensure, that in practice, products of combustion discharging from the flue terminal cannot re-enter the building or any other adjacent building through ventilators, windows, doors, other sources of natural air infiltration, or forced ventilation/air conditioning. If this should occur, the appliance **MUST** be turned off immediately and the local Gas region called in to investigate.

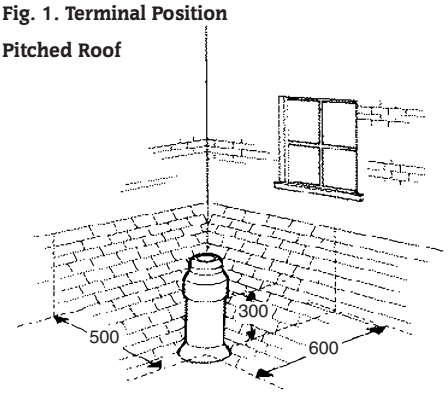
The Flue System must be supported by brackets (not supplied) such that the weight of the flue system is not resting on the appliance flue connection.

The Flue System is suitable for installation in dwellings with pitched or flat roofs.

The minimum distance the Flue Terminal Assembly shall extend above the surface of the roof is 300mm. This dimension is measured from the outside surface of a flat roof or the highest point on a pitched roof to the underside of the air inlet flange on the terminal assembly. See Fig 2.

Fig. 1. Terminal Position

Pitched Roof



Flat Roof

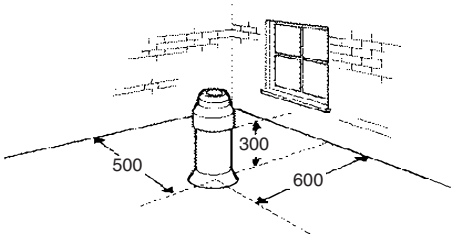
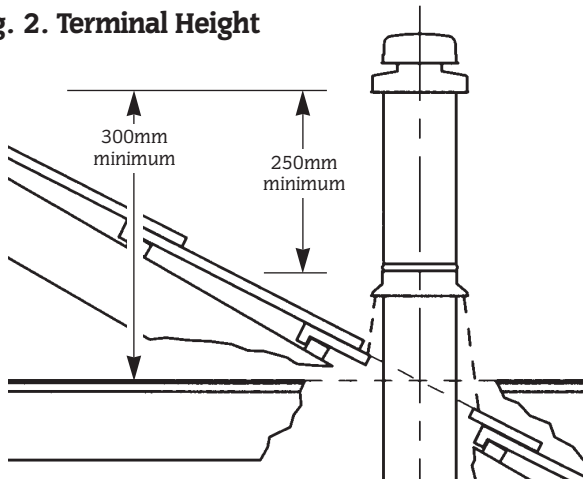


Fig. 2. Terminal Height



2. Vertical Balanced Flue Options

Important: All the Flue items referred to in this section are supplied as optional extras and should be purchased before the installation is started. The components should be checked against the parts and part numbers shown in Table 1.

Table. 1

Key No.	The Vertical Flue Kit consists of:-	Quantity	Part Number
1	Flue Terminal Assembly	1	7 716 191 079
2	Weather Sealing Collar	1	8 716 102 321
3	Flue Adaptor*	1	7 716 191 016
4	Fire Stop Spacer	2	8 716 100 281
5	Silicone Sealant	1	ZJADH 019
The following components MUST be ordered separately to suit the installation requirements			
6	Extension Flue Kit (750mm) including Flue Spacer	As req'd	7 716 191 006
7	90° Flue Bend	1	7 716 191 013
8	45° Flue Bend	1 pair	7 716 191 014

*NOTE: A Vertical Flue Adaptor is supplied in the Vertical Flue Kit, and the separate Part No. should therefore only be ordered in the case of a vertical exit from the boiler but horizontal termination

2.1. TERMINAL ASSEMBLY

The overall height of the terminal assembly is 1100mm.

Note. A minimum of 300mm shall extend above the surface of the roof. Refer to Fig. 2.

2.2. NOMINAL FLUE HEIGHT (NO OFFSET).

The maximum equivalent flue heights, excluding the flue terminal assembly are:

Table 2.

24i, 28i, 35CDi II	2.3m
WR325, WH1	2.6m
25Si, 28Si, C1	3.0m
15SBi, 24SBi, 24CDi, 80ic	4.0m
9/14, 14/19CBi	3.0m
19/24CBi	2.25
28CDi	3.5m
Highflow 400 Electronic	4.5m

2.3. FLUE WITH OFFSET USING TWO FLUE BENDS.

A flue offset can be provided using, 2 at 90° **(except for WH1 and WR325 RSF water heaters where 90° bends cannot be used)** or 2 at 45° bends.

When using an offset the overall length of the system is reduced.

A 90° bend is equivalent to 750mm of straight flue.

A 45° bend is equivalent to 375mm of straight flue.

Note: For the 24i, 28i and 35CDi II 2 x 90° bends allows a maximum straight length to not exceed 800mm or 1550mm for 2 x 45° bends.

When measuring between the centre-lines of flue ducts an allowance must be made for the relevant elbow. Refer to Fig. 3.

Fig. 3. Flue Offset

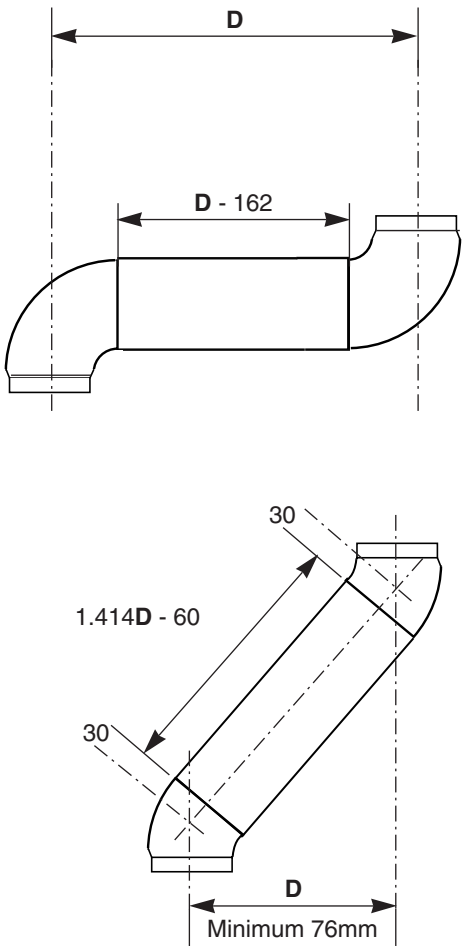
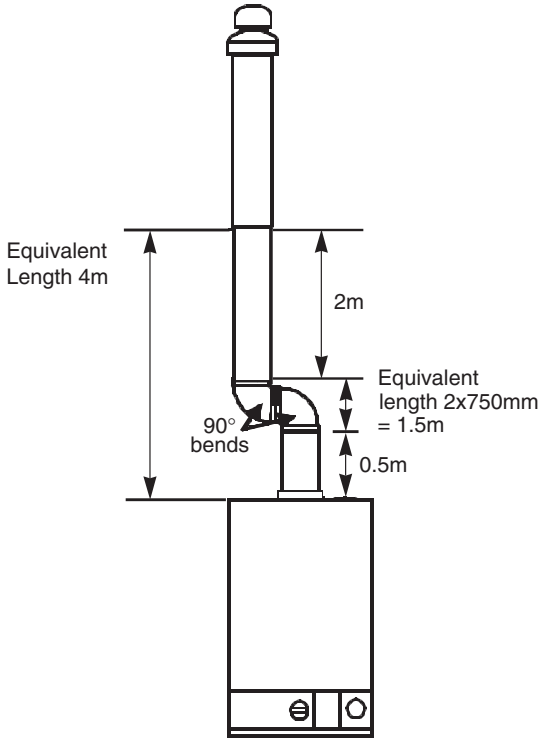


Fig. 4. Example of vertical flue assembly showing equivalent straight flue lengths



IMPORTANT: The flue terminal assembly must always be vertical at the roof outlet.

2.4. FLUE RESTRICTOR RINGS

The flue restrictor rings are in the appliance installation pack. Refer to the relevant Installation/service instructions for the method of fitting a restrictor ring.

Table. 3.

MODEL	EQUIVALENT FLUE LENGTHS UP TO 1M	EQUIVALENT FLUE LENGTHS 1M TO 4M
15SBi	79mm	NONE
24SBi	75mm	NONE
	EQUIVALENT FLUE LENGTHS UP TO 725MM	**EQUIVALENT FLUE LENGTHS 725MM TO 3M**
C1 & Si Series	79mm	NONE
	TERMINAL ASSEMBLY ONLY	**EQUIVALENT FLUE LENGTHS UPTO MAX LENGTH**
9/14CBi 14/19CBi	72mm	NONE
19/24CBi	79mm	NONE
WR325 RSF WH1	UP TO 2600mm	
	NONE	
35CDi II	UP TO 1m	1m-2.3m
	85	NONE
24CDi	NONE	
28CDi	NONE	

3. Preparation and General Notes

3.1. FLUE HEIGHT AND OFFSETS.

Determine the height of the flue system and if offsets are needed for the system to miss ceiling/roof joists and any other obstruction. Refer to Fig. 8.

3.2. INSTALLATION OF BOILER.

Refer to the relevant Installation and Servicing Instructions for the fitting of the wall-mounting frame assembly and the boiler.

Flush the system and, where required, the cold water supply before connecting the boiler.

3.3. FLUE KITS AND EXTENSIONS.

Remove all the packing from the ducts, flue terminal assembly and flue bends.

Important: The air duct, flue duct, flue bends and the terminal assembly are made from aluminium and must be handled appropriately.

3.4. FLUE ADAPTOR

For some options a flue adaptor must be fitted into the spigot on the top of the appliance casing. Refer to Fig. 9,10.

Fix the flue adaptor in position with the clamping screw ensuring that it is correctly located against the stop. Refer to Fig. 5.

If a flue bend **(WH1 and WR325 RSF may only use 45° bends)** is to be fitted directly to the top of the appliance then the flue adaptor is not required.

3.5. FLUE SUPPORT

Flue assembly lengths over 2000mm should be appropriately supported. Refer to Fig. 6 and Section 5.4.

3.6. FIRE STOP SPACER

The fire stop spacer is supplied with the flue kit. Refer to Fig. 7 and Section 5.3.

3.7. ROOF FLASHING

The roof flashing is not supplied. This is available, as a proprietary item (Selkirk or similar) from the building suppliers to suit a flue size of 125mm diameter and to suit pitched and flat roofs.

Fig. 5. Adaptor

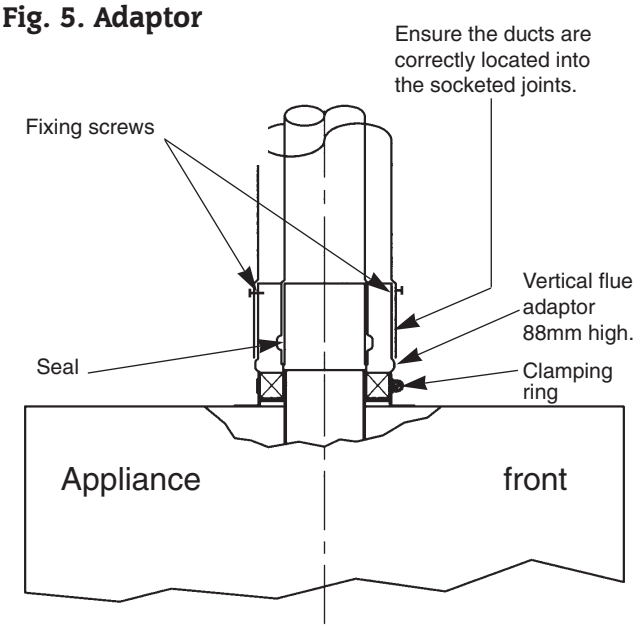


Fig. 6. Flue support - not supplied

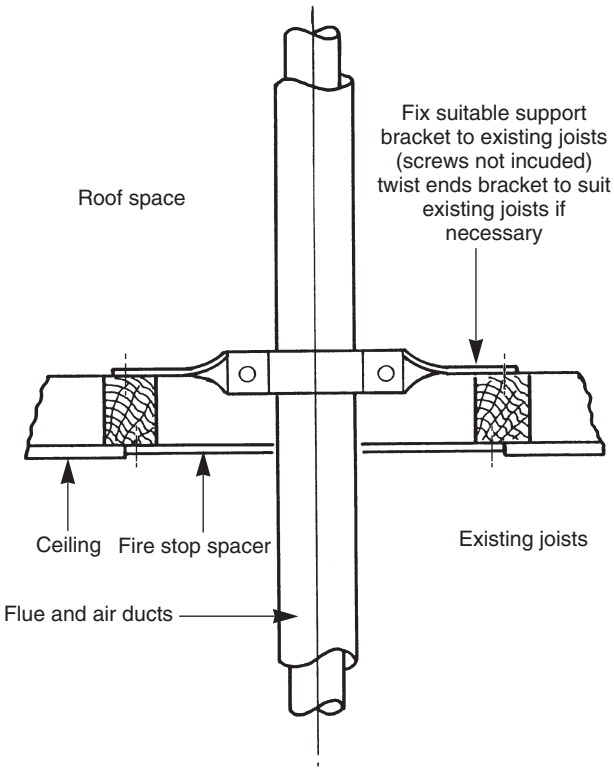
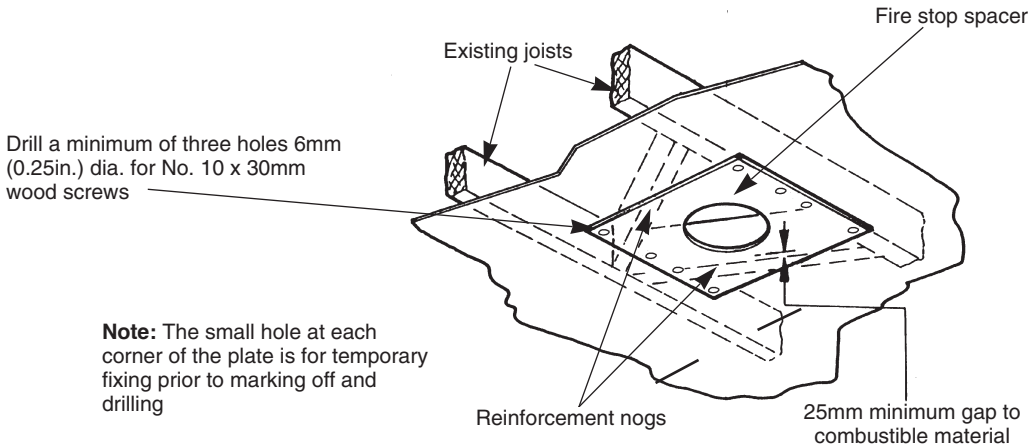


Fig. 7. Fire Stop Spacer



3.8. POSITIONING THE FLUE SYSTEM

It may be necessary to deviate from the following method of installation because of site conditions. However, joints must be sealed and fixed as described.

Align the centre of the flue spigot with the ceiling and mark the centre position. Refer to Fig. 8. Cut a hole 175mm (7in.) diameter in the ceiling.

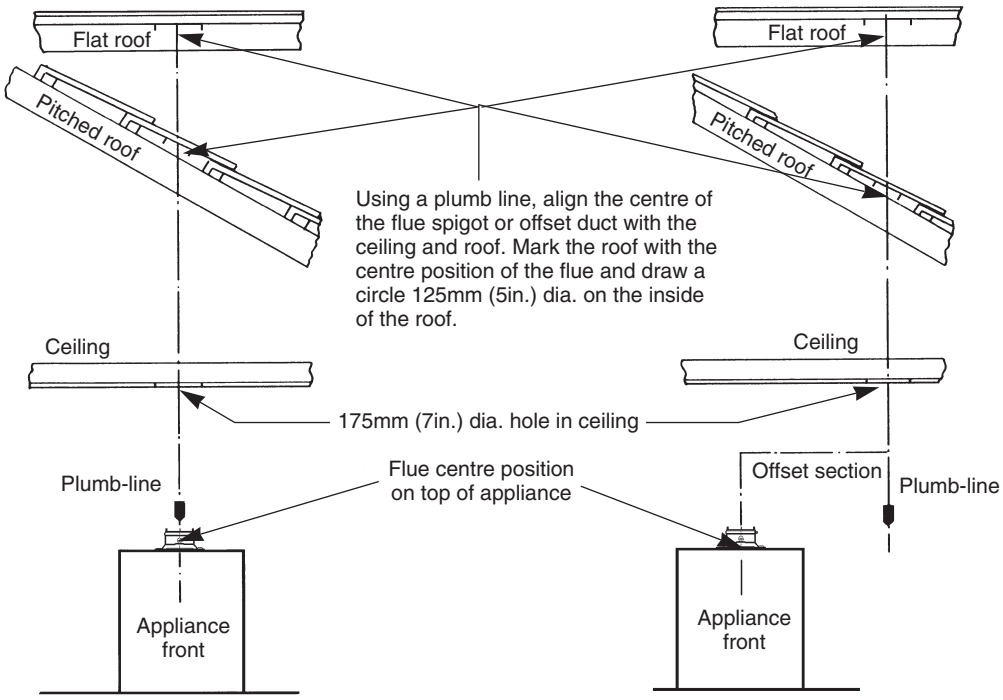
Working within the roof space repeat the procedure and mark the centre position of the flue on the inside surface of the roof.

Mark a 125mm diameter circle on the inside surface to represent the outside diameter of the flue. Refer to Fig. 8.

This procedure is the same for flat and pitched roofs.

Important: The terminal assembly must extend at least 300mm above the surface or pitch of the roof. The distance may vary depending upon the type of roof and surrounding structures. In these instructions the distance is refered to as dimension 'F'. Refer to Fig. 9.10.11.12.

Fig. 8. Marking out the flue assembly position.



Vertical Flue System (no offset)

Vertical Flue System (with an offset)

4. Measurement of Ducts

4.1 AIR AND FLUE DUCT LENGTHS - NO OFFSET

For a flat roof measure the distance from the appliance top panel to the outside edge of the hole diameter marked on the inside surface of the roof. This is dimension **'E^1'** Refer to Fig. 9.

For a pitched roof, measure the distance from the appliance top panel to the highest point of the hole diameter. This is dimension **'E^2'**. Refer to Fig. 9.

Determine dimension **'F'** which must not be less than 300mm.

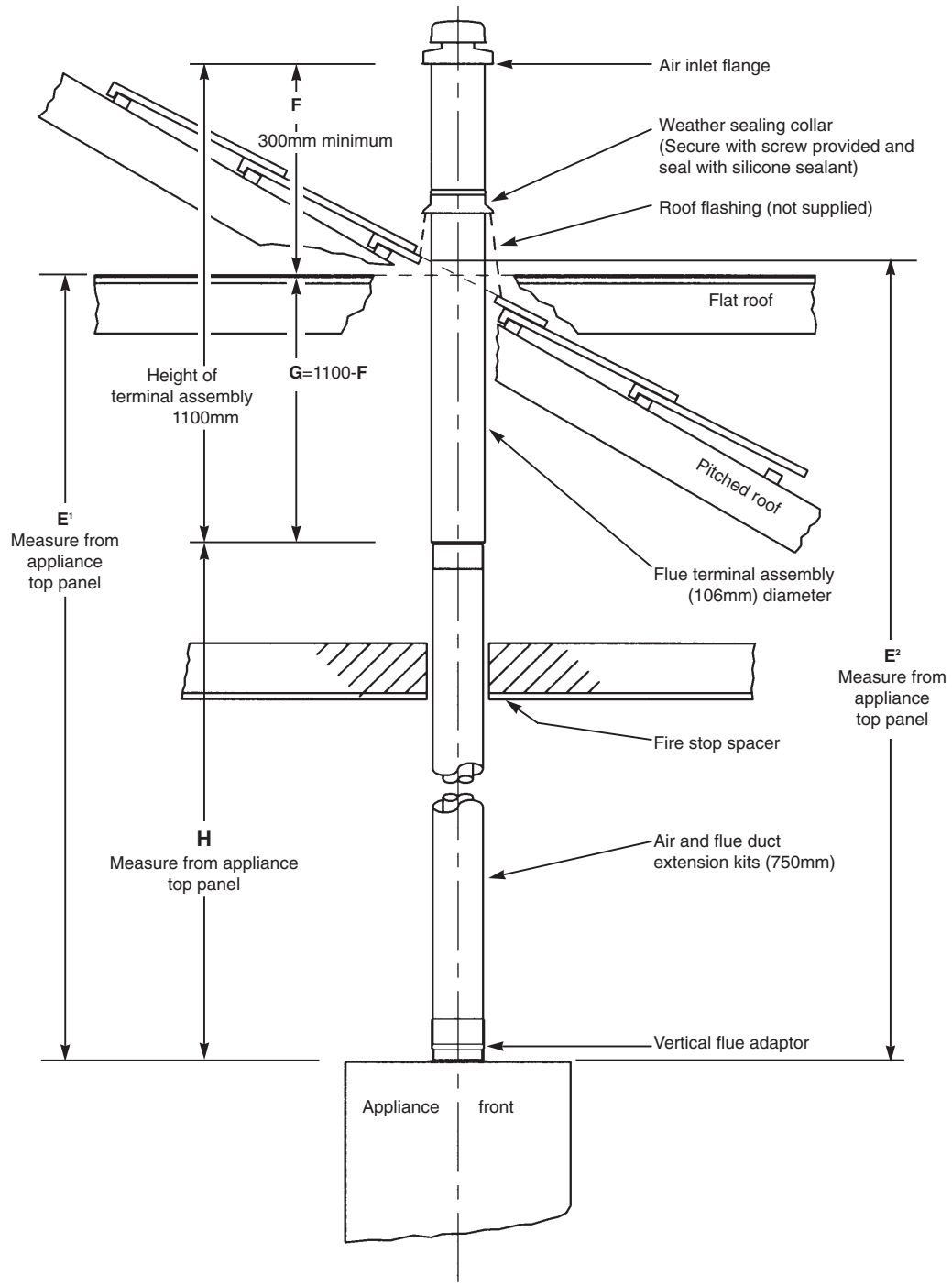
Duct Length = **H** — 92mm

Derivation: Dimension **G** = 1100 — **F**mm

Dimension **H** = **E** — **G**

Refer to 2.2 for maximum duct length.

Fig. 9. Vertical flue system (No offset)



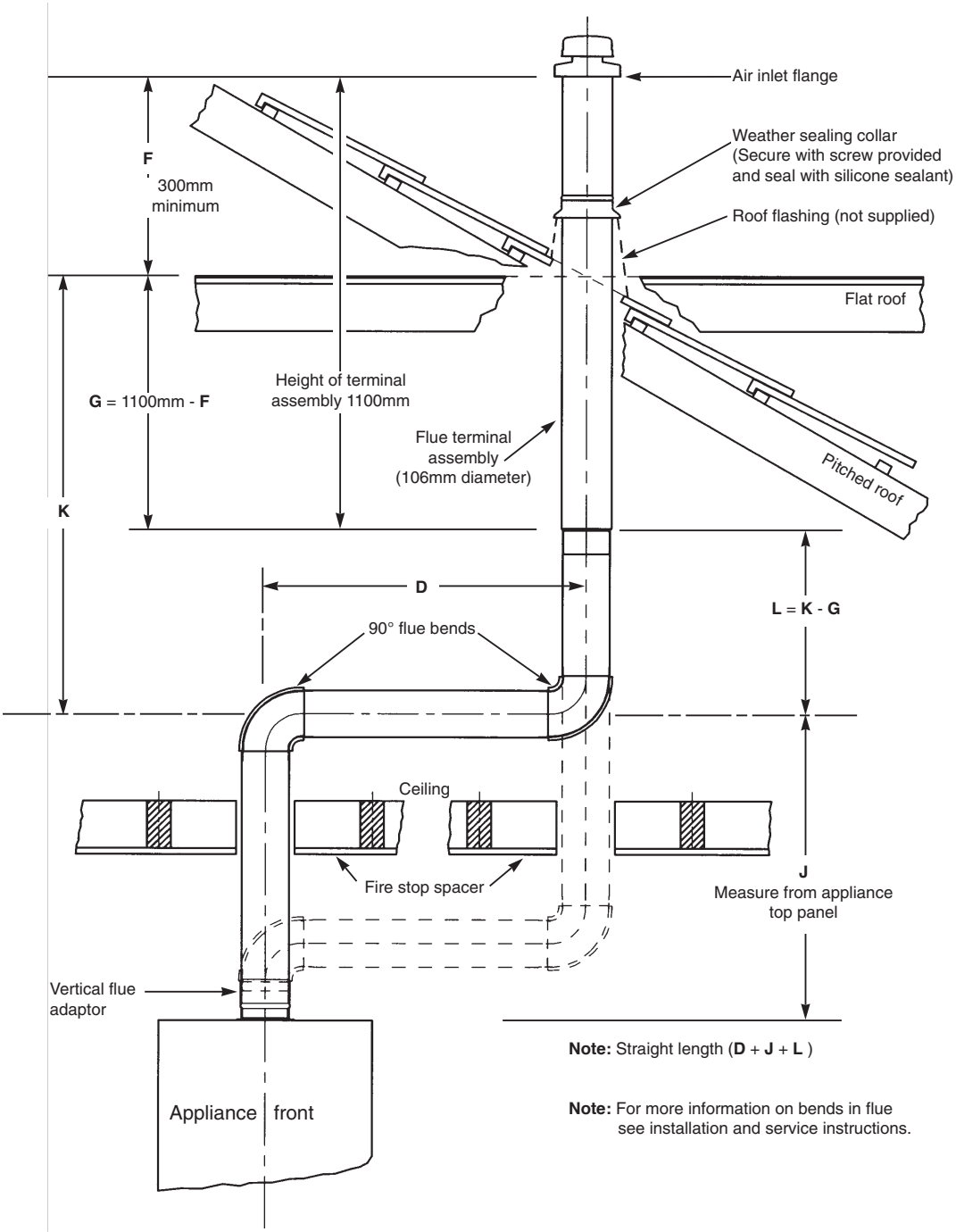
4.2 AIR AND FLUE DUCT LENGTHS - OFFSET WITH VERTICAL ADAPTER (90° or, where applicable, 45° bends)

1st Vertical Section:
Measure from the top of the flue spigot on the appliance to the centre-line of the horizontal section of the offset. Dimension **'J'**.
Refer to Fig. 10.
Duct Length = **J** — 173mm
Note: The air duct must not be less than 25mm.
If the elbow fits directly onto the spigot then **J** = 173mm.

Offset (Horizontal) Section:
Measure from the centre of the flue spigot on the appliance to the centre-line of the 2nd vertical section. Dimension **'D'**.
Refer to Fig. 10.
Duct Length = **D** — 162mm
Note: The dimension **D** must not be less than 210mm.

2nd Vertical Section:
Measure the distance from centre-line of the horizontal offset to the outside edge of the hole diameter marked on the inside surface of the roof. Dimension **'K'**. Refer to Fig. 7.
Note: Dimension **K**, for a pitched roof, must go to the highest point of the hole diameter.
Determine dimension **'F'**. Refer to Fig.1 and 7 for the limiting figure.
Duct Length = **L** — 81mm
Derivation: Dimension **G** = 1100 — **F**mm
Dimension **L** = **K** — **G**
Note: The air duct must not be less than 100mm.

Fig. 10. Vertical flue system offset with vertical adaptor (Not to be used with WH1 and WR325 Water Heaters)



4.3 AIR AND FLUE DUCT LENGTHS - OFFSET WITHOUT VERTICAL ADAPTER (90° or, where applicable, 45° bends)

Measure the distance from the centre of the flue spigot on top of the appliance to the centre line of the vertical sections. Dimension **D.** Refer to Fig. 11,12.

Duct Length: 90° bends = **D** — 162mm

45° bends = (1.414 x **D**) — 60mm

Note: D must not be less than 210mm with 90° bends or 76mm with 45° bends.

Minimum length of air/flue duct is 48mm.

When 45° bends are used the equivalent overall height of that section is D + 60mm.

Vertical Section:

Measure the distance from the centre-line of the horizontal offset to the outside edge of the hole diameter marked on the inside surface of the roof. Dimension **'K'**. Refer to Fig. 6 and 7.

Note: Dimension K For a pitched roof must go to the highest point of the hole diameter.

Determine dimension **'F'** which must not be less than 300mm.

Duct Length = **L** — 81mm

Dimension **G** = 1100 — **F** mm

Dimension **L** = **K** — **G**

Fig. 11. Vertical flue system offset without vertical adaptor (Not to be used with WH1 Boilers and WR325 Water Heaters)

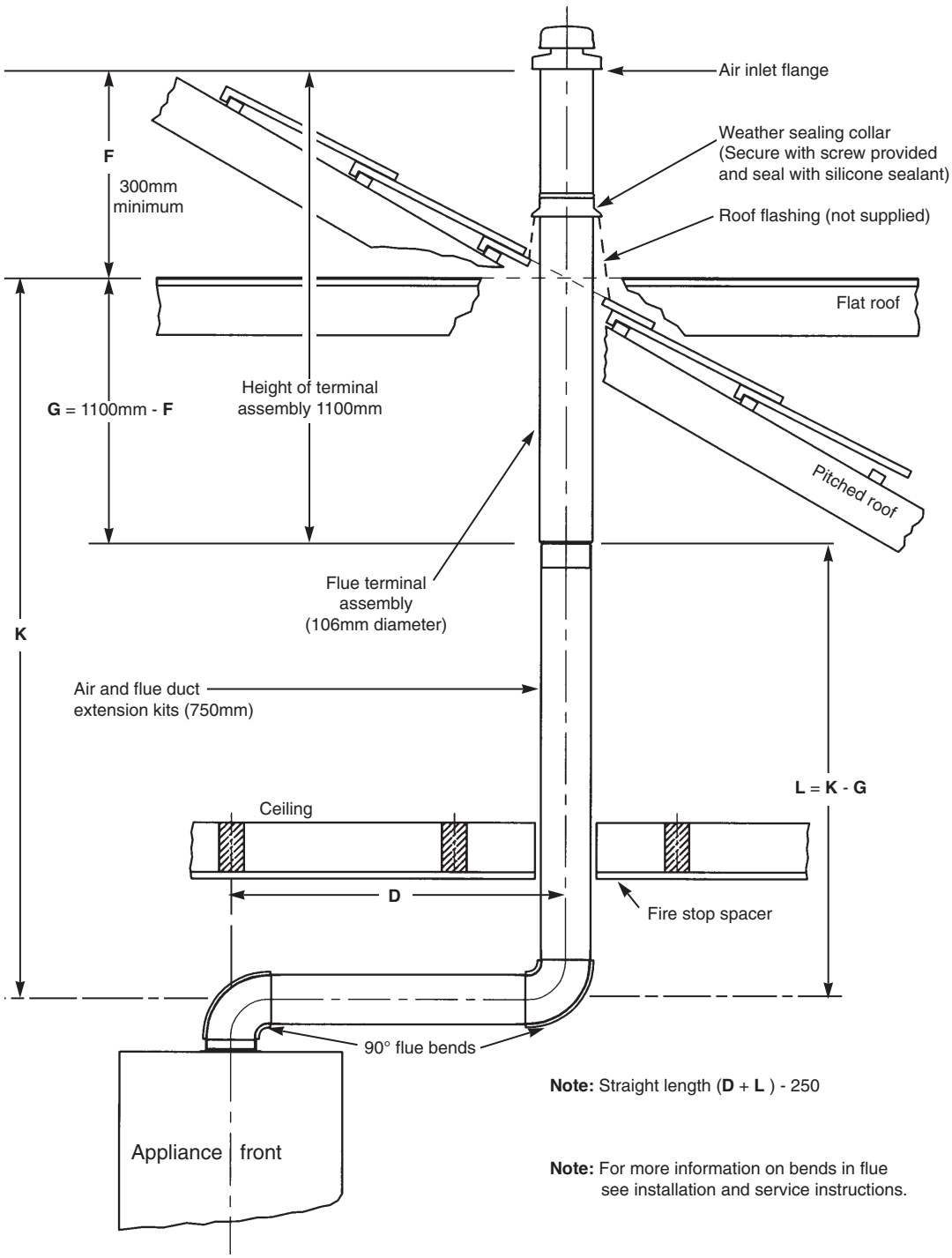
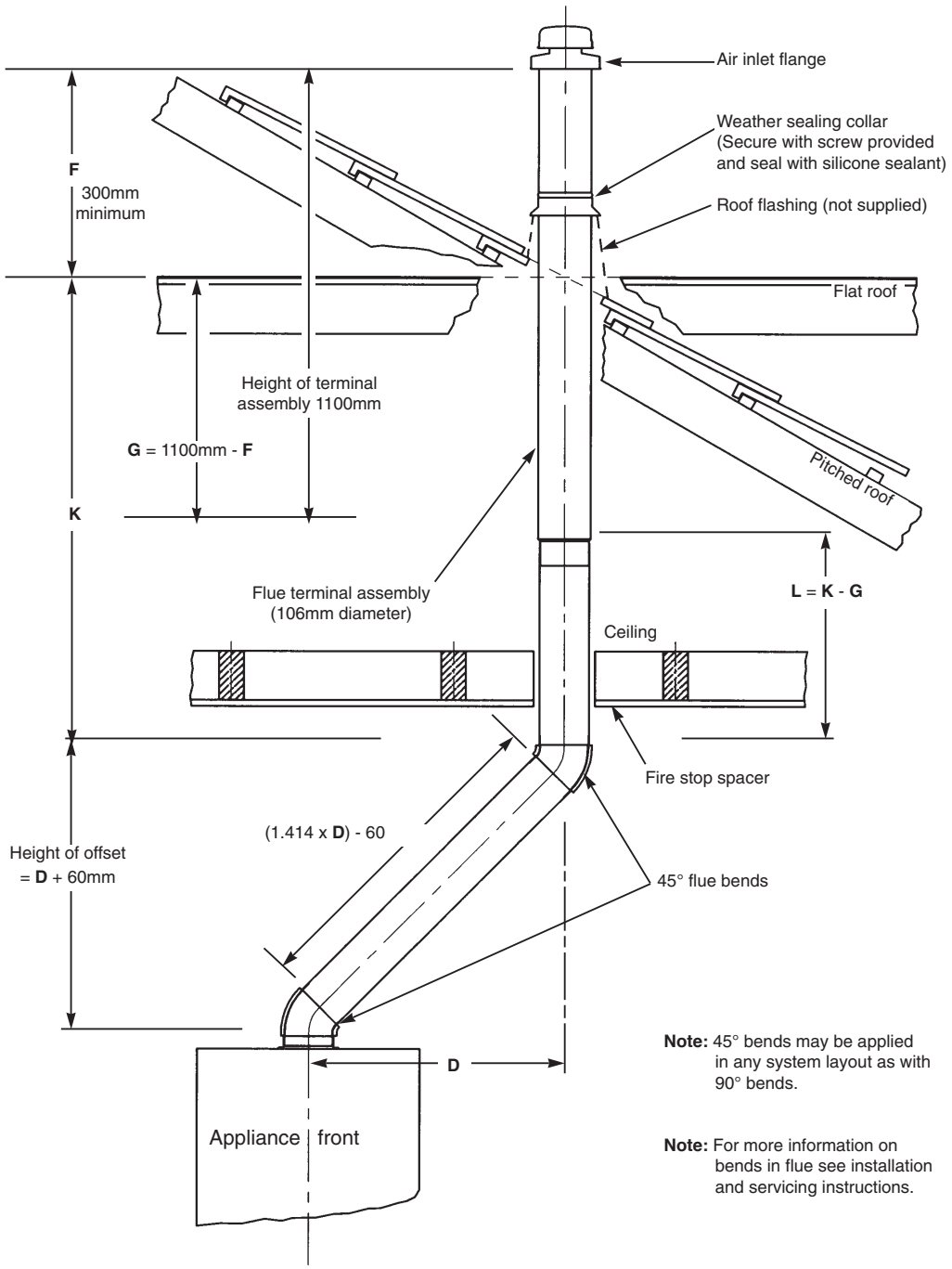


Fig. 12. Vertical flue system (offset with 45° flue bends)



5. Installation of Flue

5.1 It may be necessary to deviate from the following method of installation because of site conditions, however, the joints must be sealed and fixed as described.

5.2 CUT DUCTS

When measurements have been made and **checked**, cut the air and flue ducts to length ensuring that the cuts are square and free from burrs.

All dimensions refer to straight lengths and do not include the expanded ends. Do not cut the expanded ends unless specifically instructed to do so.

5.3 POSITION OF THE FIRE STOP SPACER ASSEMBLY

Fit the fire stop spacer centrally over the hole in the ceiling. Ensure the hole aligns with the flue spigot on top of the appliance casing.

Mark the four fixing hole positions in each half for No.10 x 30mm wood screws (not supplied) and fix either into the existing joists or into reinforcement nogs. Alternatively, the plate may be fixed to the ceiling using plasterboard toggle screws. Refer to Fig. 7.

5.4 POSITION OF THE FLUE DUCT SUPPORT BRACKET

From inside the roof space fit the support centrally over the hole in the ceiling. Ensure the hole aligns with the fire stop spacer and flue spigot on top of the appliance casing.

Mark and fix into position as previously described for the fire stop spacer. Refer to Fig. 6.

Remove the fire stop spacer and support bracket until the flue is assembled.

5.5 ASSEMBLY OF DUCTS

5.5.1 AIR DUCTS

Check the assembled length of the ducts. Drill two holes through the pilot holes in the expanded end of the air duct and fix the ducts together with the screws provided.

5.5.2 FLUE DUCTS

Fix the flue ducts together with screws provided ensuring that any extension ducts have the seals fitted. Refer to Fig. 8.

The 750mm extension kits come complete with one flue spacer. These must be fitted at about half distance, before the ducts are finally assembled.

Assemble the flue duct into the air duct.

5.6 FITTING FLUE AND AIR DUCTS ONTO AN ELBOW AT THE APPLIANCE

Fit the flue duct to the elbow ensuring that it is fully against the stop.

Drill two holes through the duct into the elbow. Separate and apply a smear of silicone sealant and fix with screws provided. Fit the air duct over the elbow entry and repeat the above process.

5.7 PREPARE THE ROOF

Remove sufficient roof tiles, or if a flat roof, cut a hole approximately 175mm diameter for the flue terminal assembly.

5.8 FIX THE FLUE SYSTEM ASSEMBLY TO THE APPLIANCE

From inside the building, assemble the flue system starting at the appliance. refer to Fig. 6, 8, 9 and 10.

Align the flue assembly or the first section of flue with the flue adapter fitted on top of the appliance casing. Drill two holes through the air duct and flue adapter and fix with the screws provided.

If an elbow is fitted straight onto the boiler then locate the elbow against the stop on the spigot on the boiler and fix with the clamp. Refer to Fig. 8, 9 and 10.

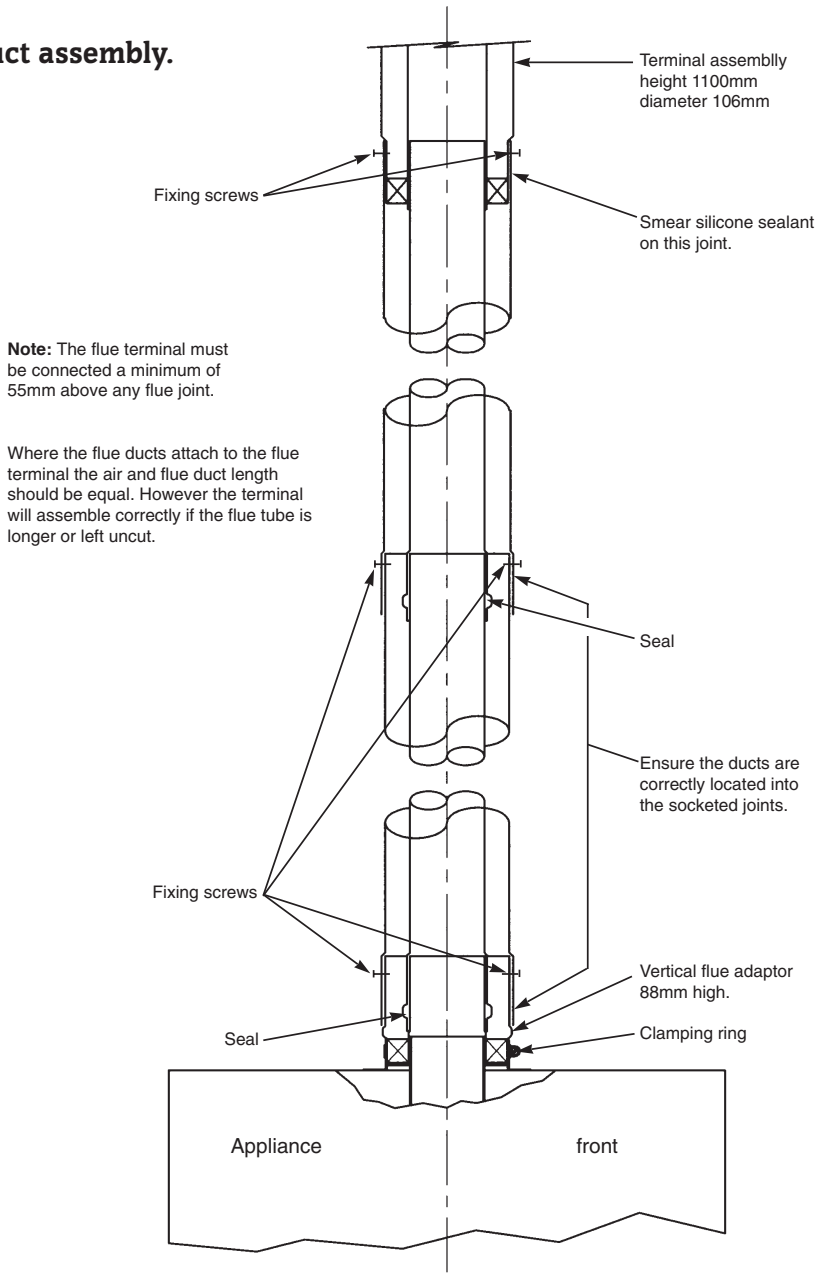
Note: All ducts must be truly horizontal or vertical unless the 45° elbows are being used.

Check at each stage of the system assembly that each section is properly aligned.

Each air and flue duct joint must be sealed and fixed. Each air and flue duct connection to an elbow must be sealed with silicone sealant and fixed with the screws provided.

Support any sections of the system until they are permanetely fixed into place using suitable support brackets.

Fig. 13. Typical duct assembly.



Important: Do not forget to fix the fire stop spacer as the assembly of the system proceeds.

5.9 FIX THE FLUE TERMINAL ASSEMBLY

Fit the roof flashing loosely to the roof.

From outside, pass the terminal assembly through the roof flashing.

From inside the roof space align the assembly with the air and flue ducts. If required, loosely fit the support bracket ensuring that the assembly is located correctly. Refer to Fig. 6.

Drill two holes through the holes in the air duct. Separate the assembly and apply silicone sealant to the outside of the air duct.

Re-connect the assembly and fix with the screws provided.

Note: The sealant and screws are not required for the flue duct. Refer to Fig. 13.

5.10 SEAL THE TERMINAL ASSEMBLY TO THE ROOF

From outside the building make good the roof structure and ensure the roof is weather sealed by fixing the roof flashing.

Apply sealant around the air duct at the top of the flashing.

Lower the weather-sealing collar over the roof flashing and tighten the self tapping screws provided and apply sealant around the top edge of the weather sealing collar.

Refer to Fig. 9, 10, 11,12.

WORCESTER
Bosch Group

Worcester Heat Systems Limited, Cotswold Way, Warndon, Worcester WR4 9SW.
Telephone: (01905) 754624. Fax: (01905) 754619.
Technical Helpline (0990) 266241.
www.worcester-bosch.co.uk

PUBLICATION 8 716 145 030d 08/01