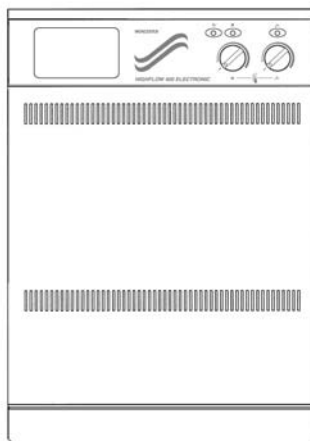


Highflow 400 ELECTRONIC BF

FLOOR STANDING COMBINATION APPLIANCE FOR CENTRAL
HEATING AND MAINS FED DOMESTIC HOT WATER

INSTALLATION AND SERVICING INSTRUCTIONS



Worcester Bosch supports the
Benchmark code of practice

GC NUMBER NATURAL GAS

47 311 62

BOILER OUTPUT

Automatic Modulating Control

Domestic Hot Water and Central Heating

Minimum 8.8 kW DHW

11.0 kW CH

Maximum 24.0 kW

IMPORTANT: THIS APPLIANCE IS FOR USE WITH NATURAL GAS ONLY

THESE INSTRUCTIONS APPLY IN THE UK ONLY

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

This appliance must be installed by a competent person in accordance
with the Gas Safety (Installation and Use) Regulations 1998

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1. Installation Requirements

1.1 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 appliances correctly could lead to prosecution.

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

1.3 The compliance with a British Standard does not, of itself, confer immunity from legal obligations. In particular the installation of this appliance must be in accordance with the relevant requirements of the following: Gas Safety (Installation and Use) Regulations 1998, current IEE Wiring Regulations, local Building Regulations, Building Standards (Scotland) (Consolidation), byelaws of the local Water Company and Health and Safety Document No. 635 (Electricity at Work Regulations 1989). It should be in accordance with the relevant recommendations of the following British Standards:

BS 6798: Specification for Installation of gas fired hot water boilers of rated input not exceeding 60 kW (Gross)

BS 5449: Central Heating for Domestic Premises

BS 5546: Installation of gas hot water supplies for domestic purposes.

BS 5440:1: Flues and Ventilation for gas appliances of rated input not exceeding 60kW (Gross): Flues.

BS 5440:2: Flues and ventilation for gas appliances of rated input not exceeding 60kW (Gross): Air Supply.

BS 6891: Installation of low pressure gas pipework installations up to 28mm (R1).

BS 6700: Domestic Water Supply in Buildings.

BS 7593: Water Treatment in domestic heating systems.

1.4 To ensure that the installation will perform to the highest standards, the system and components should conform to any other relevant British Standards in addition to those mentioned in the instructions.

1.5 In accordance with the requirements of COSHH the appliance does not contain any substances which are harmful to health.

1.6 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.

1.7 The advice and instructions given in this document covers, as far as possible, the foreseeable situations which may arise. Contact Worcester Heat Systems Technical Department, Telephone: 08705 266241, for advice on specific installations.

2. General Information

2.1. GENERAL INFORMATION

2.1.1 The appliance is set to provide the maximum output of 24kW to the domestic hot water and to the central heating .

2.1.2. The domestic water section of the appliance is suitable for mains water pressures of up to 10bar.

2.2 ELECTRICAL SUPPLY

Mains supply: 230V ~ 50 Hz. 95 Watts.

External fuse: 3A. Internal fuses: T 2A (F1), and T 1A (F2).

2.3 GAS SUPPLY.

Check the data plate (located on the inner cover of the appliance) to ensure the appliance has been set up for the correct gas supply. The boiler requires a gas flow of 2.9 m³/h of natural gas (G20).

The meter governor or regulator should deliver a dynamic pressure of 20mbar for natural gas at the appliance, which is about 18.5mb at the gas valve inlet pressure test point.

The complete installation, including the gas meter (G20), must be tested for soundness and purged. Refer to BS 6891.

2.4 PACKING

The appliance and flue components are packed in separate cartons.

2.5 INSTALLATION.

The appliance is suitable for indoor installation only.

The appliance is supplied for connection to a sealed system but is suitable for use with an open vent system.

Any specified ventilation openings made into a wall or compartment door must not be obstructed.

If the appliance is to be fitted into a compartment then the compartment must conform to the requirements of BS 6798:1987: Section 6.

The clearances specified for installation and servicing must be maintained.

A water filter, flow turbine and regulator, nominal flow 18 l/min. to supply water at an average temperature rise of 40°C, are fitted to the mains cold water inlet on the appliance.

A heatbank of 60 litres of circulating primary water with a diverter valve to direct the primary water to the heat store or to the central heating system system is contained within the casing.

NOTE: As the dry weight of the appliance is 96kg, more than one person will be required when moving the appliance.

2.6 FLUE

The appliance has a balanced flue system.

A terminal guard, Type E, GC No 393 547, is available from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.

The standard horizontal flue assembly length is from 229mm to 407mm.

Extended flue lengths up to 610mm are available using the optional extended flue kit.

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

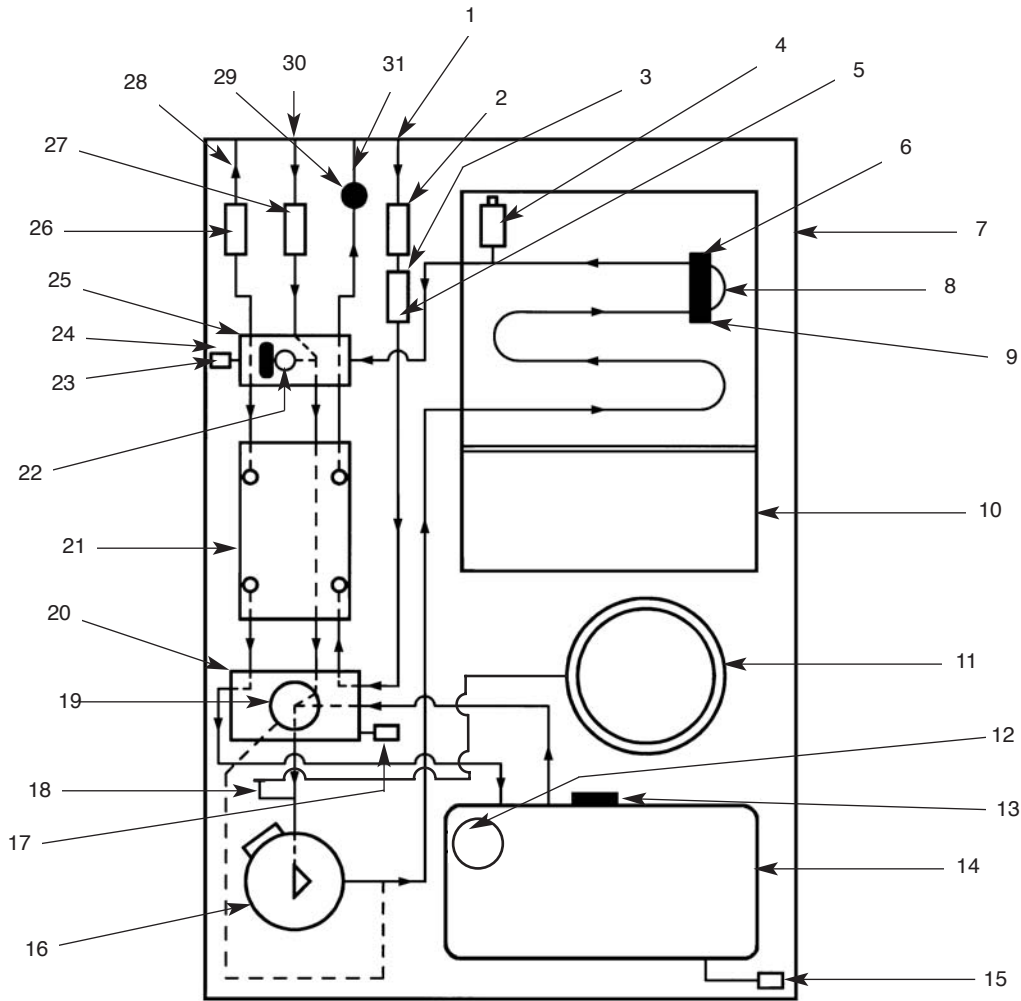
2.7 CONTROLS.

The electronic control system via the gas valve modulates the heat input in response to the central heating and domestic hot water temperature settings. The control circuit provides automatic ignition of the main burner through an intermittent pilot.

A full range of control and safety devices are provided including an additional safety cut-off as required by the regulations relating to unvented systems.

A fascia mounted twin-channel programmer is available as an optional extra. A remote mounted twin-channel programmer may be connected to the appliance.

Fig. 1. Appliance water flow diagram.



- | | | |
|--------------------------------------|-------------------------------------|----------------------------------|
| 1. Mains Cold Water IN | 12. Tank Sensor | 23. Pressure Relief Valve |
| 2. Water Filter | 13. Heatbank Overheat Thermostat | 24. Manual Air Vent |
| 3. Flow Turbine | 14. Heatbank (Capacity 60 Litres) | 25. Water Manifold (Top Section) |
| 4. Automatic Air Vent | 15. Drain (Primary Water) | 26. CH Flow Valve |
| 5. Water Flow Regulator | 16. Circulating Pump | 27. CH Return Valve |
| 6. C.H. Primary Sensor (Front) | 17. Drain (Secondary Water) | 28. Central Heating Flow |
| 7. Appliance cabinet | 18. Open Vent Connection | 29. H.W. Sensor |
| 8. Gas to Water Heat Exchanger | 19. Water Diverter Valve | 30. Central Heating Return |
| 9. Safety Temperature Limiter (Rear) | 20. Water Manifold (Bottom Section) | 31. Domestic Hot Water OUT |
| 10. Inner Casing | 21. Water to Water Heat Exchanger | |
| 11. Sealed System Expansion Vessel | 22. By-Pass Adjuster | |

The temperature controls for central heating and domestic hot water are mounted on the fascia.

There is provision for the connection of a mains voltage room thermostat. Refer to Section 10.

Frost Protection.

An automatic frost protection facility is incorporated within the control system. If some parts of the system are remote from the appliance then it may be advisable to fit an external remote frost thermostat. Refer to Section 10.

Thermostatic radiator valves should be used in the system. The appliance incorporates an adjustable by-pass between the central heating flow and return.

2.8 SYSTEM NOTES.

WARNING:

CHECK THAT NO DIRT IS LEFT IN EITHER THE GAS OR WATER PIPEWORK AS THIS COULD CAUSE DAMAGE TO THE APPLIANCE. THOROUGHLY FLUSH THE HEATING SYSTEM AND THE WATER SUPPLY IN ACCORDANCE WITH THE RECOMMENDATIONS OF BS 7593:1992 AND THE BENCHMARK CODE OF PRACTICE.

The water pipe connections throughout a sealed system must be capable of sustaining a pressure of up to 3 bar.

Radiator valves must conform to the requirements of BS2767(10):1972.

The relief valve drain outlet must be directed away from any electrical components or where it would cause a hazard to the user.

A drain cock to BS 2879 must be fitted to the lowest point of the system.

For circuit design purposes it is important that due note is taken of the information given in Table 4 relating to the available pump head.

2.9 SHOWERS, BIDETS, TAPS AND MIXING VALVES.

Hot and cold taps and mixing valves used in the system must be suitable for operating at the available mains pressure.

Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

Hot and cold mains fed water can be supplied direct to an over-rim flushing bidet subject to local water company requirements.

With all mains fed systems the flow of water from the individual taps will vary with the number of outlets operated simultaneously and the cold water mains supply pressure to the property. Flow balancing using 'Ball-o-Fix' type valves is recommended to avoid an excessive reduction in flow to individual outlets. For further information contact Worcester Heat Systems Ltd.

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

In these cases a mini-expansion vessel should be fitted adjacent to the boiler in the cold water supply pipe.

2.10 SAFETY CONSIDERATIONS.

The appliance must not be operated in a waterless condition.

The appliance must not be operated with the boiler inner casing cover removed.

Work must not be carried out on the appliance without the gas and electricity supplies being turned off.

Checks must be made to ensure that, where applicable, the ventilation openings made into walls and partitions are of the correct size and are not obstructed.

2.11 OPERATION. See Fig. 1.

HOT WATER MODE:

With the appliance in a standby condition, i.e. heatbank at the temperature set by the hot water temperature control, burner off, pump off, a demand is made for hot water:

The flow turbine will energise the pump and circulate primary hot water around the boiler, heatbank and water to water heat exchanger. The burner will light and modulate to maintain the temperature of the delivered water.

When hot water is no longer required the appliance will continue to operate for a short time until the heatbank has returned to temperature. The pump may continue to run for a few seconds to dissipate the residual heat from the appliance.

NOTE: The appliance may be used for Hot Water only before the central heating circuit is completed. **The primary system in the appliance must be filled with water.**

CENTRAL HEATING MODE:

With the appliance in a standby condition, a demand is made for heating.

The water diverter valve will open, pump will energise and circulate primary water around the heating system. The fan will start and the burner will light at minimum and modulate as necessary.

With the system at the temperature set by the heating temperature control, on the fascia, the burner will modulate to maintain the required output to the system.

If the system no longer requires heat to maintain the desired room temperature, the burner will extinguish. The pump will continue to run for about four minutes to dissipate the residual heat from the appliance through the heatbank and then switch off.

When there is another heat demand the operating sequence will re-start. If the primary temperature is greater than the temperature control setting then there will be an anti-cycle period of three minutes.

HOT WATER AND CENTRAL HEATING MODE:

The appliance will supply heat to the central heating system as required. A demand for hot water at a tap or shower will override the central heating function for the period of the hot water demand.

When hot water is no longer required the burner and pump will continue to operate until the CH circuit is back to the required temperature.

The appliance will then return to the central heating state and its normal mode of operation.

3. Technical Data

See Fig. 2 and 3.

The Data Plate is fixed to the top of the control box casing.

Table 1

NOMINAL BOILER RATINGS (10 minutes after lighting)		BOILER ADJUSTED FOR G20 (Natural Gas)
MAX. OUTPUT	kW	24.0
MAX. INPUT (net)	kW	26.8
BURNER PRESSURE	mbar	14.1
GAS RATE	m ³ /h	2.80
MIN. OUTPUT (CH)	kW	11.0
MIN. INPUT (CH) (net)	kW	12.9
BURNER PRESSURE	mbar	3.2
GAS RATE	m ³ /h	1.33
MIN. OUTPUT (DHW)	kW	8.8
MIN. INPUT (DHW) (net)	kW	10.4
BURNER PRESSURE	mbar	2.2
GAS RATE	m ³ /h	1.10

NOTE: Gross Heat Input x 0.901 = Net Heat Input.

Table 2

FLUE DETAILS	
	mm
WALL HOLE WIDTH	380
WALL HOLE DEPTH	280
STANDARD FLUE MINIMUM LENGTH	229
STANDARD FLUE MAXIMUM LENGTH	407
EXTENDED FLUE MAXIMUM LENGTH	610

Table 3

PUMP HEAD			
BOILER OUTPUT	HEAD	MIN. FLOW RATE	FLOW/ RETURN DIFFERENTIAL
kW	Metres	L/min.	°C
11.0	6.1	11.5	11 °C
24.0	5.0	16.5	21 °C

Table 4: Nominal Weight of Appliance

DRY WEIGHT OF APPLIANCE	96kg
PACKAGED WEIGHT OF APPLIANCE	98kg
MAXIMUM INSTALLED WEIGHT	156kg

Table 5

SPECIFICATIONS	
CENTRAL HEATING FLOW	22mm Copper Tube
CENTRAL HEATING RETURN	22mm Copper Tube
COLD WATER MAINS INLET	15mm Copper Tube
DOMESTIC HOT WATER OUTLET	15mm Copper Tube
GAS INLET	22mm Copper Tube
PRESSURE RELIEF VALVE DRAIN CONNECTION	15mm Copper Tube
OVERALL CASING HEIGHT	860mm
OVERALL CASING WIDTH	600mm
OVERALL CASING DEPTH	600mm

Table 6

SPECIFICATIONS	
PRIMARY CAPACITY INCLUDING HEATBANK	60 Litres
MAXIMUM INLET DOMESTIC WATER PRESSURE	10 Bar
MINIMUM INLET DOMESTIC WATER PRESSURE (WORKING) FOR MAXIMUM HOT WATER FLOW	2.2 Bar 1.3 Bar with flow regulator removed
MINIMUM INLET DOMESTIC WATER PRESSURE (WORKING) TO OPERATE THE APPLIANCE	0.1 Bar
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	Nominally 82°C
MAXIMUM STATIC HEAD – PRIMARY	30m
MINIMUM STATIC HEAD – PRIMARY	1.0m
OUTPUT TO CENTRAL HEATING & DOMESTIC HOT WATER	8.8 (DHW), 11.0 (CH) to 24.0kW (Modulating)
MAXIMUM DOMESTIC HOT WATER FLOW RATE FROM THE APPLIANCE	Nominally 18.0 l/min. ± 15%
EQUIVALENT HOT WATER FLOW RATE FROM THIS APPLIANCE TO GIVE 30°C RISE (SPECIFIC RATE D)	20 l/min.
FLUE PRODUCTS	11.7 gm/sec
FLUE PRODUCTS TEMPERATURE	140°C
NOx CLASSIFICATION	Class 2
SEDBUK	80.0 % BAND D

Table 7

Minimum Clearances	Installation	Service
Above the appliance	450mm	10mm
In front	600mm	600mm
Right side	5mm	5mm
Left side	300mm	5mm

Table 8 Gas Supply

	Total Length of Gas Supply Pipe (metres)			Pipe Diameter (mm)
	3	6	9	
Gas Discharge Rate (m ³ /hr)	8.7	5.8	4.6	22
	18.0	12.0	9.4	28

Fig. 2. Appliance cabinet dimensions and minimum clearances required.

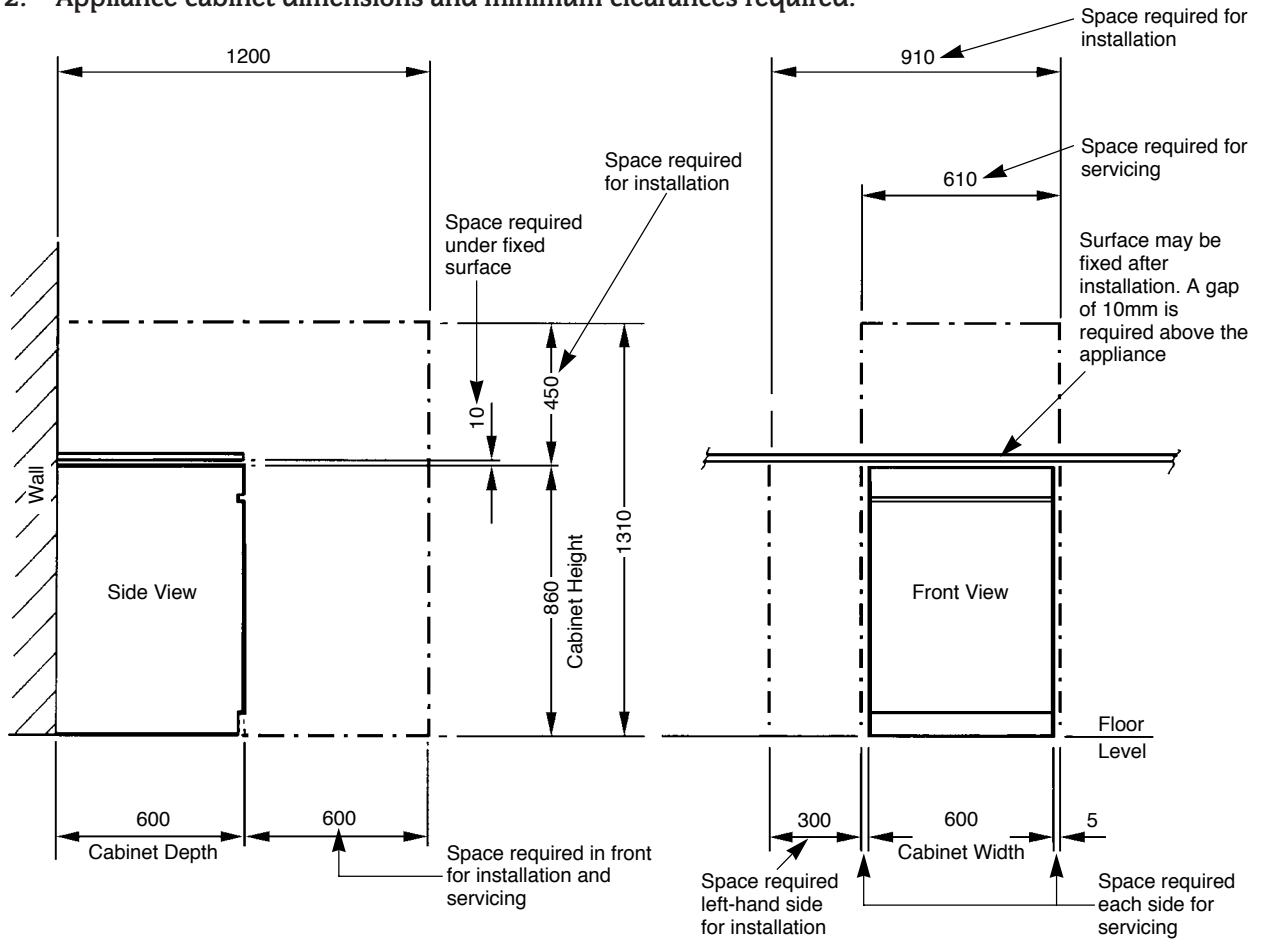
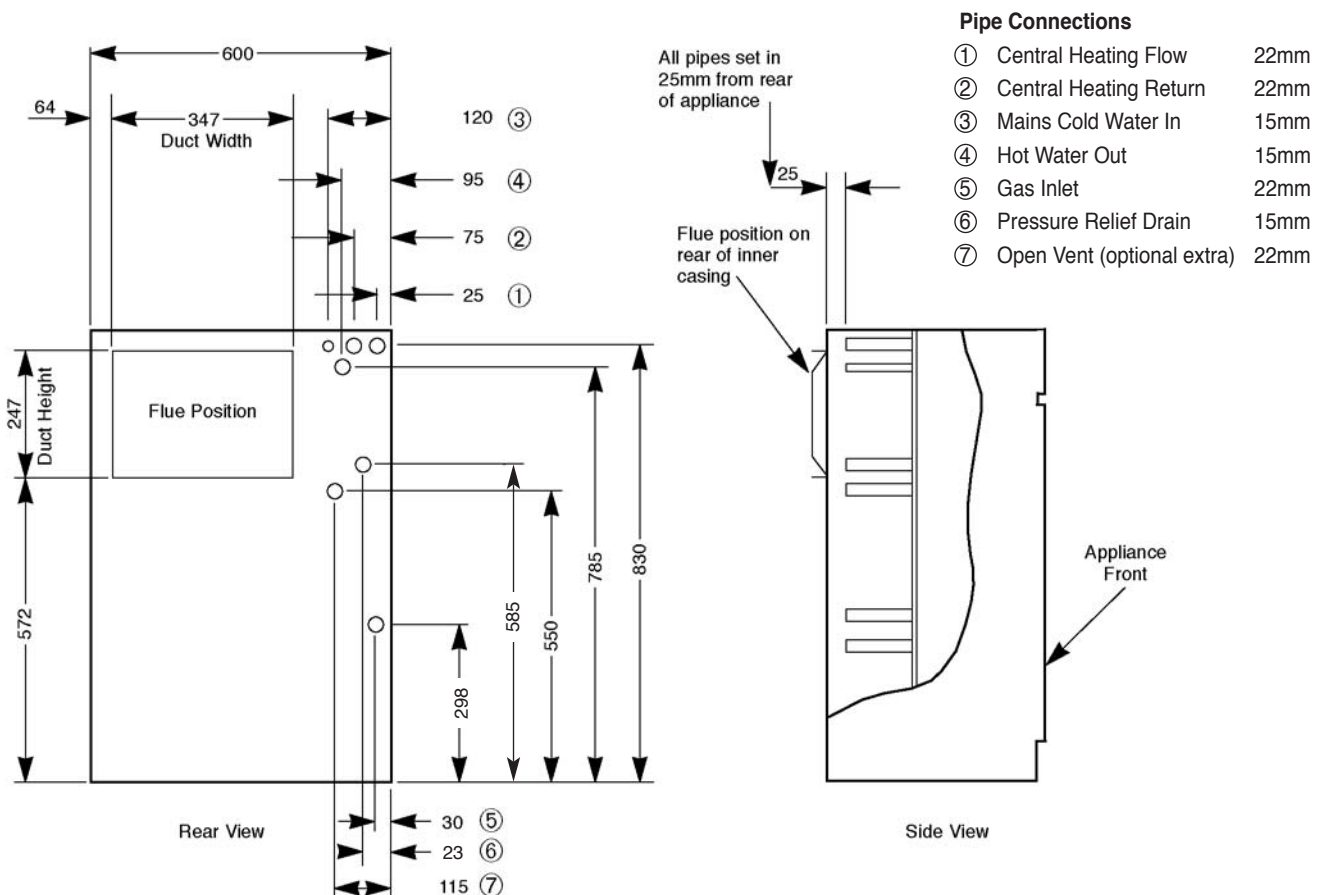


Fig. 3. Appliance pipework connections and flue position.



4. Siting The Appliance

4.1 THE APPLIANCE MAY BE INSTALLED IN ANY ROOM ALTHOUGH PARTICULAR ATTENTION IS DRAWN TO THE REQUIREMENTS OF THE CURRENT I.E.E. WIRING REGULATIONS AND, IN SCOTLAND, THE ELECTRICAL PROVISIONS OF THE BUILDING REGULATIONS APPLICABLE IN SCOTLAND, WITH RESPECT TO THE INSTALLATION OF APPLIANCES IN ROOMS CONTAINING BATHS OR SHOWERS.

WHERE A ROOM SEALED APPLIANCE IS INSTALLED IN A ROOM CONTAINING A BATH OR SHOWER, ANY ELECTRICAL SWITCH OR APPLIANCE CONTROL USING MAINS ELECTRICITY MUST NOT BE ABLE TO BE TOUCHED BY A PERSON USING THE BATH OR SHOWER.

4.2 The appliance is not suitable for external installation.

4.3 The appliance is floor standing, the floor must be firm and level. Special floor protection is not required.

4.4 The floor must be capable of supporting the weight of the appliance. Refer to Section 3 Table 4.

4.5 If the appliance is to be fitted in a timber framed building refer to the CORGI guidelines and BS 5440.

4.6 Minimum clearances must be available for installation and for servicing. Refer to Fig. 2 and Table 7.

4.7 The appliance can be installed in a cupboard to be used for airing clothes provided that the requirements of BS 6798 and BS 5440:2 are strictly followed.

4.8 The airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh are acceptable provided that the major dimension is less than 13mm. See BS 6798:1987.

4.9 The distance between the inner face of a cupboard door and the cabinet front should not be less than 75mm for air circulation.

5. Flue Terminal Position

5.1 The flue must be installed as specified by BS 5440:Part 1 and the building regulations.

NOTE: Installations coming under the jurisdiction of Building Control should adhere to the increased clearances.

5.2 **TERMINAL POSITION.** See Fig. 4.

5.3 The terminal must not cause an obstruction nor the discharge a nuisance.

5.4 If the terminal is fitted within 850mm of a plastic or painted gutter or within 450mm of painted eaves then an aluminium shield at least 750mm long should be fitted to the underside of the gutter or painted surface.

5.5 If a terminal is fitted less than 2 metres above a surface to which people have access then a guard must be fitted. Refer to Section 2, Item 2.6.

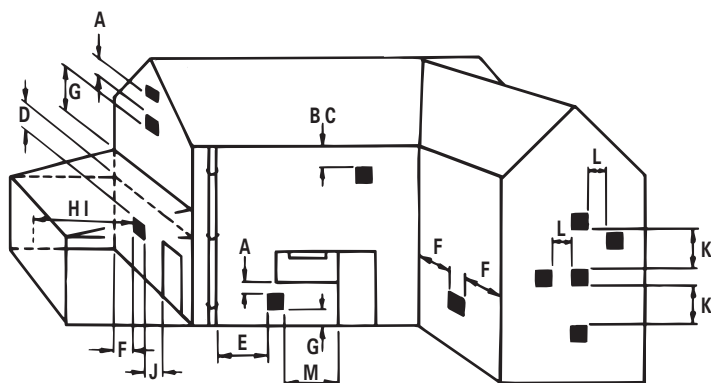
5.6 The terminal guard must be evenly spaced about the flue terminal and fixed to the wall using plated screws

5.7 In certain weather conditions a terminal may steam and siting where this could cause a nuisance should be avoided.

5.8 Take care to ensure that combustion products do not enter ventilated roof voids.

Fig. 4. Siting of the flue terminal.

MINIMUM SITING DIMENSIONS FOR POSITIONING THE BALANCED FLUE TERMINAL



TERMINAL POSITION	MIN. DISTANCE
A- Directly below an openable window or other opening e.g. air brick.	1500 mm
A1- Above an openable window or other opening e.g. air brick.	300 mm
A2- Horizontally to an openable window or other opening e.g. air brick.	600 mm
B- Below gutters, soil pipes or drain pipes.	300 mm
C- Below eaves.	300 mm
D- Below balconies or car port roof.	600 mm
E- From vertical drain pipes and soil pipes.	75 mm
F- From internal or external corners.	600 mm
G- Above ground, roof or balcony level.	300 mm
H- From a surface facing a terminal.	600 mm
I- From a terminal facing a terminal	1200 mm
J- From an opening in a car port (e.g. door window) into dwelling.	1200 mm
K- Vertically from a terminal on the same wall.	1500 mm
L- Horizontally from a terminal on the same wall.	300 mm
M- From door, window or air vent.	300 mm

6. Air Supply

6.1 The appliance does not require a separate vent for combustion air.

6.2 Installations in cupboards or compartments require permanent vents for cooling purposes, one at high level and one at low level, either direct to outside air or to a room. Both vents must pass to the same room or be on the same wall to the outside air.

6.3 There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. Refer to Section 4, Item 4.9.

6.4 The minimum free areas required are given below.

POSITION OF VENTS	AIR FROM THE ROOM	AIR DIRECT FROM OUTSIDE
HIGH LEVEL	270 cm ² (42 in ²)	135 cm ² (21 in ²)
LOW LEVEL	270 cm ² (42 in ²)	135 cm ² (21 in ²)

6.5 Refer to BS 6798 and BS 5440:2 for additional information.

7a. Sealed System

See Fig. 4 and 5.

7a.1 The system must comply with the requirements of BS 6798 and BS 5449:1.

7a.2 The appliance must not be operated without the system being full of water, properly vented and pressurised.

7a.3 The safety valve operates at 3bar. The discharge must be directed away from electrical items or where it might be a hazard to the user. The pressure relief valve must not be used for any other purpose.

7a.4 The pressure gauge indicates the system pressure which must be maintained.

7a.5 The 12 litre expansion vessel is charged to 0.5 bar and is suitable for a static head of 5m. The pressure can be increased if the static head is greater than 5m.

7a.6 With an initial system pressure of 0.5 bar, a system capacity of about 104 litres can be accommodated. Refer to BS 7074 Pt 1 for more information.

7a.7 The filling point must be at low level. See Fig. 6.

7a.8 Water loss must be replaced. The connection should be made in the central heating return as close to the appliance as possible. See Fig. 5.

7a.9 The make-up vessel must be fitted with a non-return valve.

7a.10 Repeated venting loses water from the system. It is essential that this water is replaced and the system pressure maintained.

7a.11 The pump is set at maximum and must not be adjusted.

7a.12 Connections in the system must resist a pressure of up to 3 bar.

7a.13 Radiator valves must conform to BS 2767(10):1972.

7a.14 Other valves used should conform to the requirements of BS 1010.

Fig. 5. Sealed primary water system.

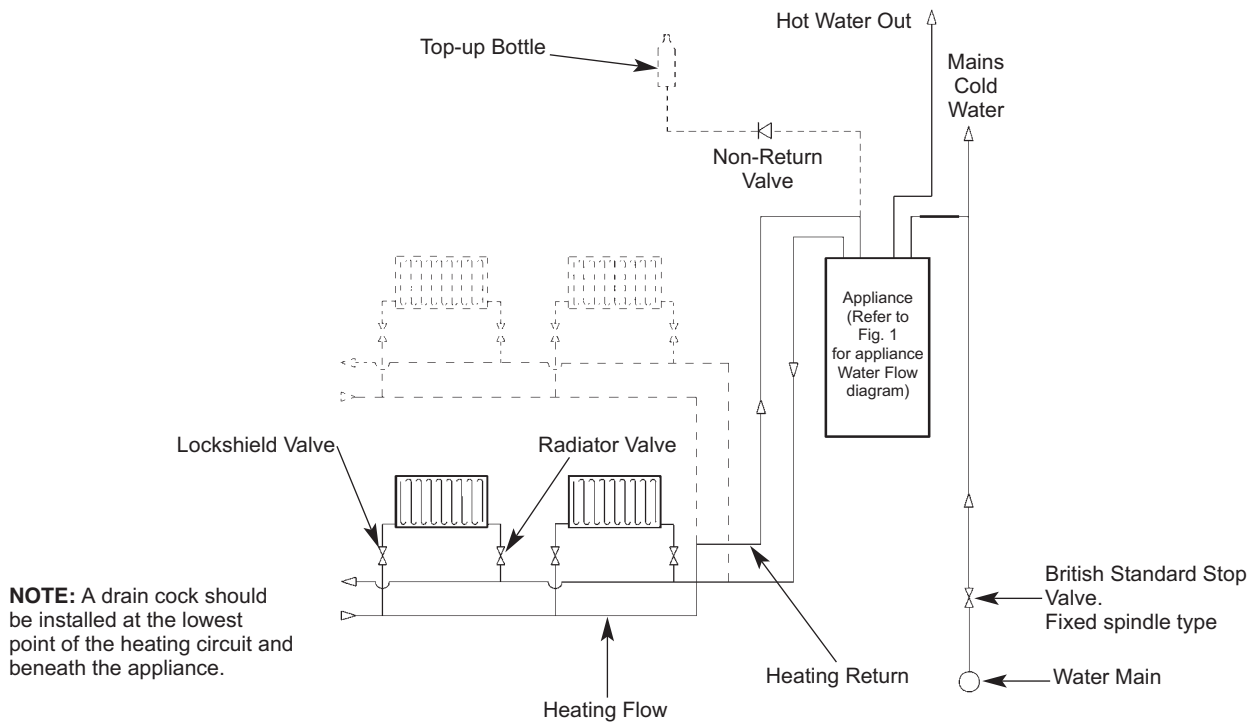
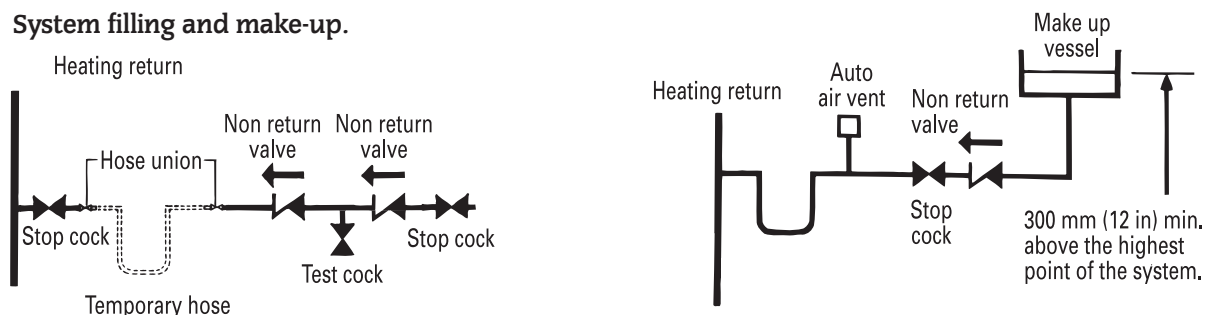


Fig. 6. System filling and make-up.



7b. Open Vent Primary System

See Figs. 6 and 15.

7b.1 The appliance is supplied suitable for connection to a sealed system. If it is to be used with an open vent system then the instructions given below must be followed.

7b.2 A 22mm pre-formed combined feed and vent pipe available as an optional extra must be connected to the appliance. See Section 11.3 and Fig.15.

Note: Refer to Section 3 - Table 5, for the sizes of the flow and return pipework.

7b.3 The feed and expansion cistern should be arranged so that a minimum static head of 1.0m above the top of the

appliance or above the highest point in the heating circuit, whichever is the highest, is achieved. See Fig. 6.

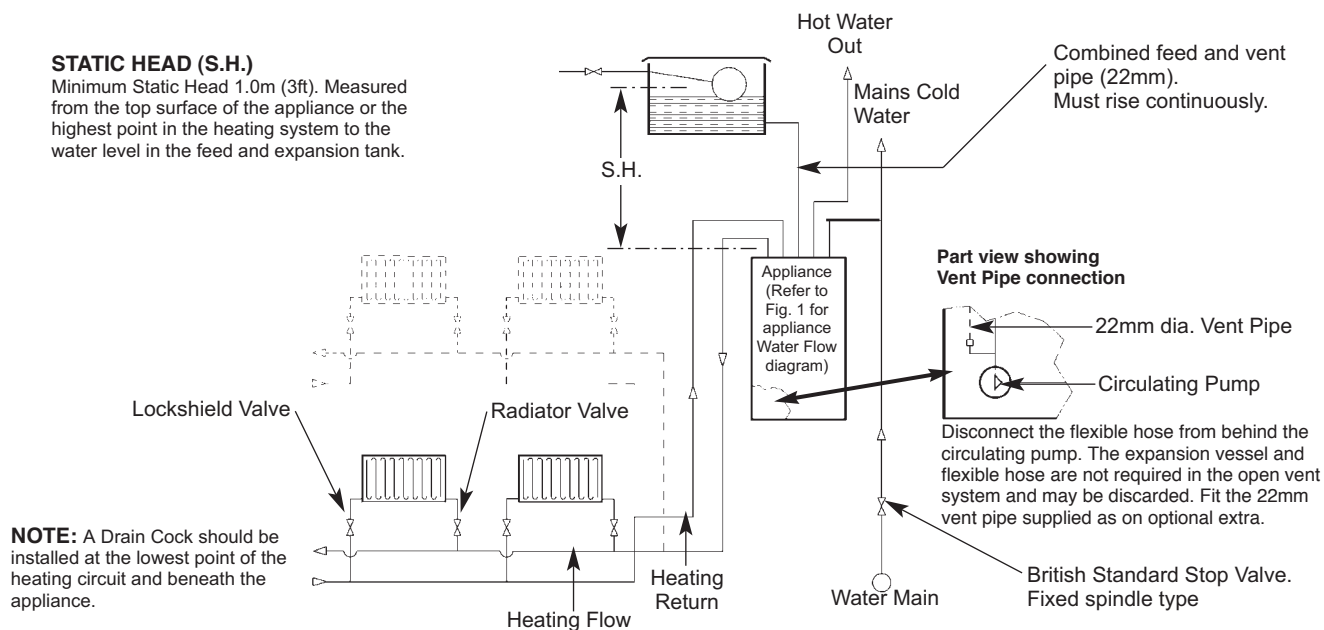
8.4 The feed and vent pipe must rise continuously from the appliance to the feed and expansion cistern.

8.5 A safety valve is not required on an open vented system. If the safety valve is left in position then a pipe must be fitted which terminates such that any discharge does not cause a hazard to the occupants or damage to electrical components.

8.6 Air within the appliance will be expelled via the feed and vent connection or dissipated into the rest of the system which must be fitted with manual air vents at any high points.

8.7 The pump is set to maximum and must not be reset.

Fig. 7. Open vent water system.



8. Domestic Water Supply

8.1 The final 600mm of the mains cold water connection to the appliance should be made in copper tube only.

8.2 The appliance is suitable for a mains pressure of up to 10 bar.

8.3 The appliance is fitted with a mains supply isolating valve. A pressure reducing valve should be fitted if necessary.

8.4 The maximum hot water flow rate, via the flow regulator, is nominally 18 l/m \pm 15%.

8.5 In winter, when the mains inlet water temperature is lower a reduced flow rate, achieved at the tap, will increase the required delivery temperature.

8.6 Hot and cold taps and mixing valves used with this appliance must be suitable for operating at the available mains pressure and up to 65°C.

8.7 Anti-syphonage arrangements are normally not necessary except for some loose-head showers. See paragraph 8.10 following.

8.8 Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

8.10 The head of a loose head shower must not fall closer than 25mm above the top edge of the bath to prevent its immersion in bath water. Alternatively the shower must be fitted with an anti-syphonage device at the point of the flexible hose connections.

8.11 The supply of hot and cold mains water direct to a bidet is permitted, subject to local Water Company requirements, provided that the bidet is of the over-rim flushing type. The outlet(s) should be shrouded and unable to have any temporary hand held spray attached. No anti-syphonage arrangements are necessary.

8.12 As the maximum temperature of the hot water heat exchanger is limited by the control circuit, there is normally no need for water treatment to prevent scale accumulation. In exceptional circumstances a device to prevent scale formation can be fitted.

8.13 Installation of a scale inhibitor assembly should be in accordance with the requirements of the local Water Company. An isolating valve to allow servicing should be fitted.

8.14 The temporary water hardness can be determined using a standard test paper or by reference to the local water company.

8.15 A miniature expansion vessel (Zilmet R $\frac{1}{2}$, 160ml, 15bar), available as an optional extra, should be fitted into the domestic water supply circuit if there is evidence of water hammer.

8.16 A mini-expansion vessel must also be fitted if a back-flow prevention device or a water meter has been fitted to the cold water mains supply.

9. Gas Supply

9.1 The boiler requires a gas flow of 2.9m³/h (NG-G20). Check that the supply system can accommodate this together with any other appliances connected to it.

9.2 A natural gas appliance must be connected to a governed meter.

9.3 There must be a dynamic pressure of 20 mbar (G20) at the inlet to the appliance. This is equivalent to a pressure of 18.5 - 19.0 mbar (G20 at the inlet pressure tapping on the gas valve).

10. Electrical

Refer to Figs. 8, 9, 10 and 11.

10.1 Mains Supply 230V ~ 50Hz 95 watts. External Fuse 3A. Internal Fuses: 2A Slow (F1), 1A Fast (F2). Both 20mm long.

10.2 Mains cable. PVC insulated 0.75mm (24 x 0.20mm) to BS 6500 Table 16. The mains cable must be connected into terminal **X1**, marked **L** (brown or red lead), **N** (blue or black lead), and the earth cable fixed to the earth bracket at the top of the

electrical box, using a screw and cup washer. Ensure the earth cable is longer than the other two cables so that it will not be taut, should the mains cable be pulled.

Feed the mains cable through the top hole at the rear of the electrical box. Do not omit the cable clamp.

For access to the electrical box, refer to Section 15.

10.3 The appliance must be earthed.

10.4 The wiring between the appliance and the electricity supply shall comply with current IEE wiring regulations (and any local regulations which apply) for fixed wiring to a stationary appliance. NB It must be possible to completely isolate the appliance with at least 3mm contact separation in both poles.

10.5 If a room thermostat and/or frost thermostat is to be fitted, refer to Fig.10. These must be suitable for mains voltage operation.

10.6 A fascia mounted twin channel digital programmer is available as an optional extra. Instructions are supplied with the programmer kit. Alternatively an external programmer or timeswitch may be fitted. Refer to Fig.11. This must be suitable for mains voltage operation.

10.7 SAFETY CHECK

After installation or as a result of an electrical fault, the electrical system shall be checked for short circuits, fuse failure, incorrect polarity of connections, earth continuity and resistance to earth.

Fig. 8. Wiring diagram.

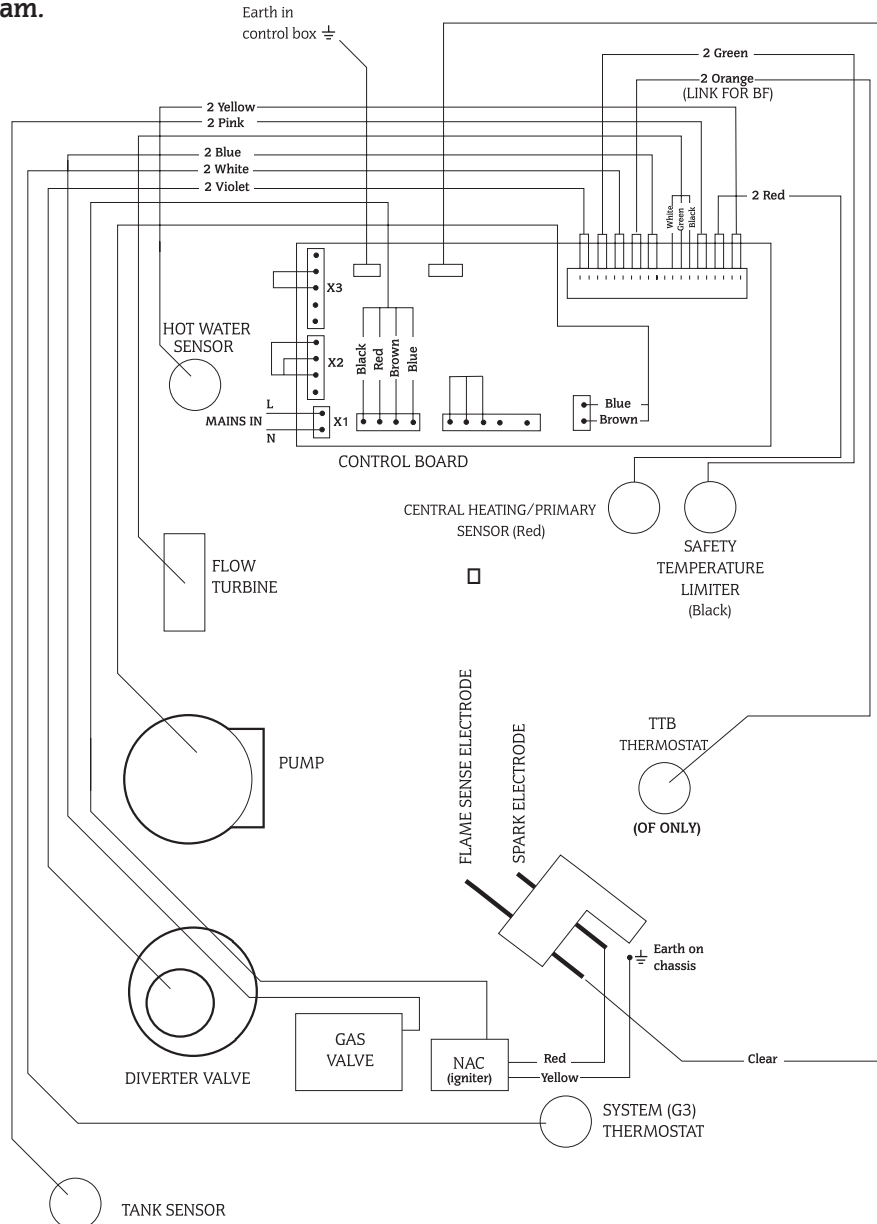


Fig.9. Functional flow diagram.

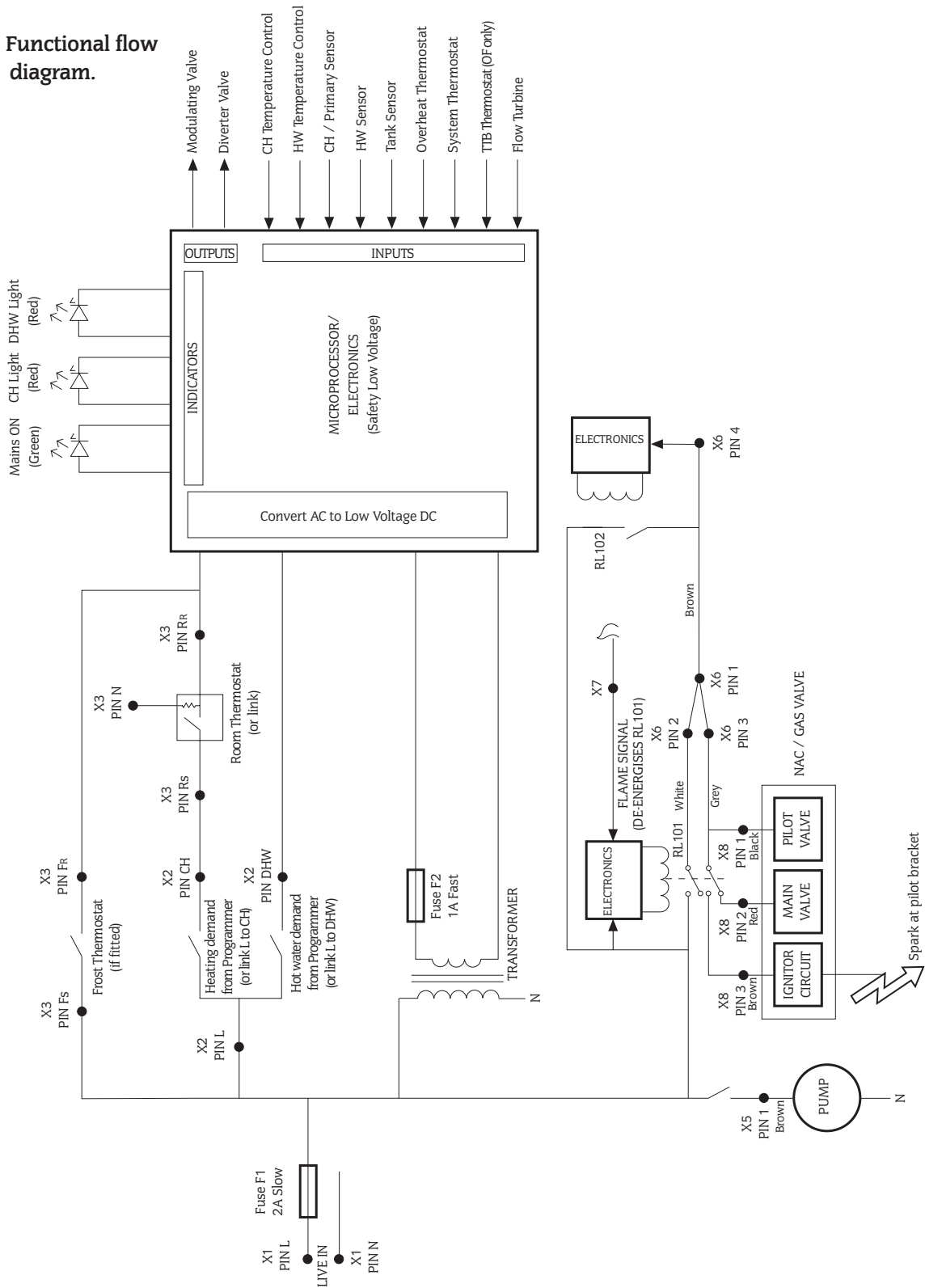


Fig. 10. Room/frost thermostats.

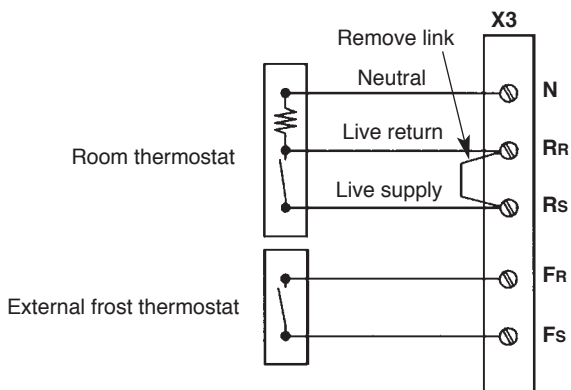
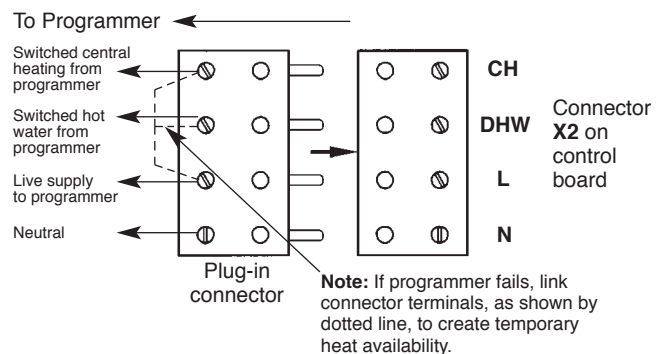


Fig. 11. Programmer connections.



11. Installing The Appliance

The appliance is supplied suitable for fitting to a sealed system. If it is to be fitted to an open vent system refer to paragraph 11.3 and Section 8.

11.1 GENERAL FITTING

11.1.1 The following description covers one method of installation. Extra space may be required for installation if connections are made in a different way.

Compression fittings may be used on all water connections to allow for the fitting of the appliance and servicing.

Pipework must be routed so as not to obstruct access to the circulating pump, diverting valve, gas valve, water to water heat exchanger or heat bank.

Removable sections are provided in the cabinet top panel to facilitate vertical pipe connections if required.

11.1.2 Check that the appliance carton contains: Installer's Instruction Pack, User's Information Pack, Hardware Pack, Appliance.

11.1.3 Carefully remove the appliance from the cardboard package and plinth.

Check the position chosen for the appliance is in accordance with the instructions given in Sections 4 and 5. Also refer to fig.2.

Do not place the appliance in its final position at this stage.

11.2 FLUE PREPARATION

Having decided upon the most suitable position for the appliance the hole for the balanced flue assembly must now be marked on the wall.

From the dimensions given in Fig. 13 carefully mark the wall to position the hole for the balanced flue assembly.

Cut a hole in the wall 380mm wide x 280mm high for the balanced flue air duct. Make good any plaster or brickwork.

Measure the wall thickness **W** from the inner face of the wall to the outside face. See Fig. 13.

From the carton containing the flue kit (either standard or extended) remove the flue terminal, flue duct, air duct and the package containing the following items :-

- 4 off - M5 Hex Head screws
- 2 off - M5 Shakeproof Washers
- 4 off - No 8 wall plugs
- 4 off - No 8 wood screws
- 1 off - roll of ducting tape
- 1 off - tube of silicon sealant

Fit the air ducts together and adjust their total length until it corresponds with the dimension **W** + 40mm.

Using the ducting tape provided firmly tape the joint. See Fig. 14. Check the total length before continuing.

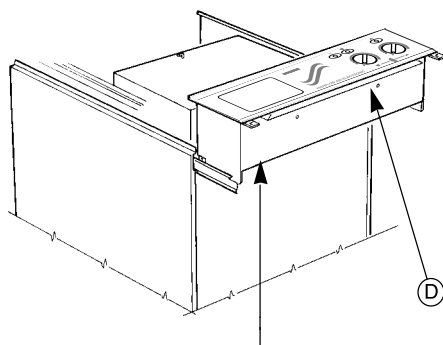
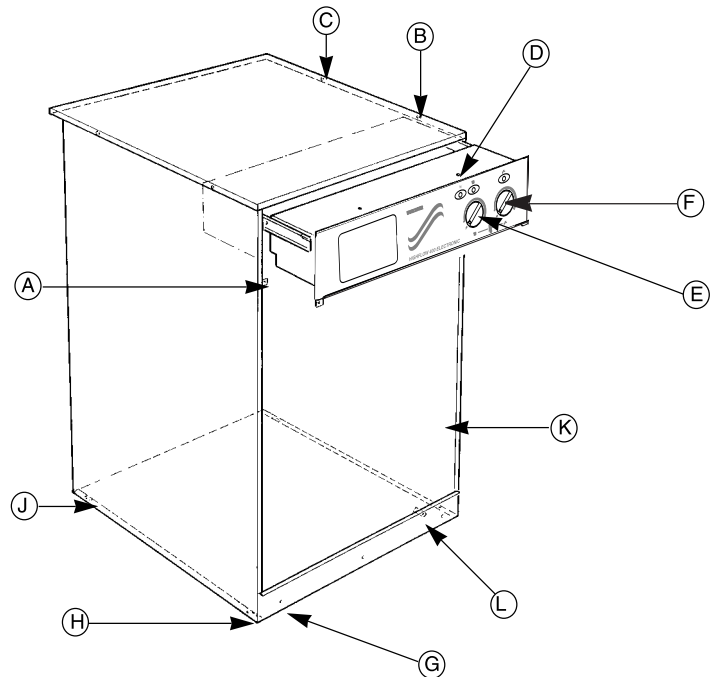
Fig. 12. Cabinet, facia, control box and flue assembly fixing screws.

To gain access to the appliance:

1. Lift cabinet front panel **L** off top location and clear the return edge over the kick strip.
2. Remove screws **A** and ease facia and control box forwards on the slide rails.
3. Remove screws **B**, accessible under cabinet top panel. Ease panel forwards clear of location **C** and remove.
4. Lift facia and control box through 90° into the service position. Lodge in position on the outer locations.

To gain access to the control box from the service position:

1. Pull the thermostat knobs **F** and **G** clear of the facia.
2. Remove screws **E**.
3. Ease facia out of control box.
4. Support the facia out of the control box when carrying out installation or service operations.



Lift facia and control box into the service position

- (A) Facia and control box fixing screws
- (B) Cabinet top panel fixing screws
- (C) Cabinet to panel fixing lugs
- (D) Facia fixing screws
- (E) Hot water control thermostat knob
- (F) Heating control thermostat knob
- (G) Kick strip fixing screws
- (H) Cabinet side panel front location
- (J) Cabinet side panel fixing lugs
- (K) Cabinet front panel (no fastenings)
- (L) Primary system drain. Remove kick strip for access

Apply the silicone sealant in a bead approximately 10mm (0.3 in) diameter around the air duct spigot located on the rear of the inner casing. See Fig. 15.

Fit the air duct to the appliance, secure with the two M5 bolts and shakeproof washers provided, through the holes in the rear of the inner casing. See Fig. 15.

Carefully slide the appliance into the final position, passing the air duct through the hole in the wall, with the rear of the appliance base plate parallel with the wall or skirting board. See Fig. 15.

Remove one screw holding the expansion vessel in position and gently lower until resting on the floor. See Fig. 16.

Unscrew the four screws securing the inner casing cover. Remove the cover. See Fig. 16.

Remove the two screws fixing the front of the flue hood to the top of the combustion chamber. Ease the flue hood clear of the combustion chamber. See Fig. 15.

From outside, make good the gap between the air duct and the brickwork. Ensure the air duct is not distorted when filling the gap.

Fit the flue terminal to the air duct and mark the position of the four fixing holes. Drill four holes 5mm (0.19 in.) diameter x 30mm (1.25 in.) deep in the wall and fit the wall plugs provided.

Fix the flue terminal to the wall using the four No. 8 wood screws.

Note: The flue terminal is not symmetrical and the narrow air inlet gap is at the top. The top flange is marked **TOP**.

From inside the appliance enter the flue duct, plain end first. Engage the flue duct over the front half of the flue duct attached to the flue terminal. Slide in the flue duct and secure the flange to the inner casing with the screws provided but do not tighten. See Fig. 15.

Engage the spigot on the flue hood into the flue duct and slide into position on the heat exchanger. Fix into position with the two screws at the front.

Tighten the screws securing the flange of the flue duct to the inner casing.

11.3 FIXING THE APPLIANCE

11.3.1 Depending on site conditions it may be helpful to pre-plumb the appliance before moving it into position. Fitting unions or stub pipes to the appliance pipework should be done at this stage. Refer to Section 3 and Fig.3.

Before the appliance is fitted to the central heating system, thoroughly flush the heating system and the mains cold water supply pipe.

IMPORTANT: Any proprietary cleaner must be flushed from the system.

11.3.2 To gain access to the appliance remove the cabinet front and top panel and place the fascia and control box in the Service Position:

- (i) Lift the cabinet front panel off the top location and clear the lower return over the kick strip. See Fig. 11.
- ii) Unscrew the two screws securing the fascia to the outer edges of the cabinet accessible under the fascia. Ease the fascia and control box forwards on the slide rails until fully extended. See Fig. 11.
- iii) Lift the assembly upwards through 90° into the Service Position. Lodge in the Service Position on the outer locations. See Fig.11.
- iv) Unscrew the two screws behind the control panel securing the cabinet top panel. See Fig.11.
- v) Lower the fascia and control box to the fully extended position. Ease the cabinet top panel forwards approximately 20mm and lift clear of the appliance. See Fig. 11. Return the fascia and control box to the Service Position.

Sealed System

Connect a 15mm copper drain pipe to the discharge connection at the rear of the appliance.

Ensure:

- (i) any discharge does not fall onto electrical components or where it might be a hazard to the user. See Fig. 14.
- (ii) the drain pipe must fall throughout its length.

Open Vent System

If the appliance is to be used on an open vent system the expansion vessel and flexible hose are not required. Remove from the bottom manifold connection and discard. Fit the 15mm copper vent pipe, supplied as an optional extra, to this connection. See Fig. 15.

Carefully ease the appliance into position. Ensure the flue socket located on top of the appliance is correctly aligned with the centre-line of the flue pipe.

NOTE: The weight of the appliance empty is 96 Kg, more than one person may be required when moving the appliance.

Connect the gas and water system pipes to the rear of the appliance.

Always support the appliance pipework when tightening.

11.3.3 Connect the first section of flue pipe to the socket on top of the appliance. Refer to Section 5. Seal the gap between the flue pipe and the socket. Complete the installation of the flue.

The flue must be supported so that its weight is not put upon the appliance. Connect and make good the flue system and terminal as specified in BS 5440:1.

Do not operate the appliance without the flue fully connected.

11.4 FINAL INSTALLATION

11.4.1 Check that all the water connections and the gas connection have been tightened.

11.4.2 Facia Mounted Programmer (where applicable).

Remove the facia panel as described in Section 11.1. Refer to Fig. 11.

Fit the programmer to the facia and fix using the four nuts and washers. Plug the lead into the connection on the control board. See Fig.10. The programmer can be set when the electricity supply has been turned on at the commissioning stage.

11.4.3 Connect the mains electricity supply to the appliance and connect any room and/or frost thermostats. Refer to Section 10, Figs. 8 and 10. The leads from the thermostats must pass through holes provided in the control box at the left hand side and be clamped using the strain relief bushes provided in the pack. Check that the control box and facia can be withdrawn into the Service Position before fixing any leads outside the appliance.

Refit the control box and facia in the reverse order.

11.4.4 Test the gas supply for soundness as indicated in BS 6891.

11.4.5 If the appliance is not to be commissioned immediately, replace the cabinet top and front panel. See Fig. 11.

Check that the gas supply, the electricity supply and the water connections are all turned off.

Fig. 13. Balanced flue appliance wall preparation.

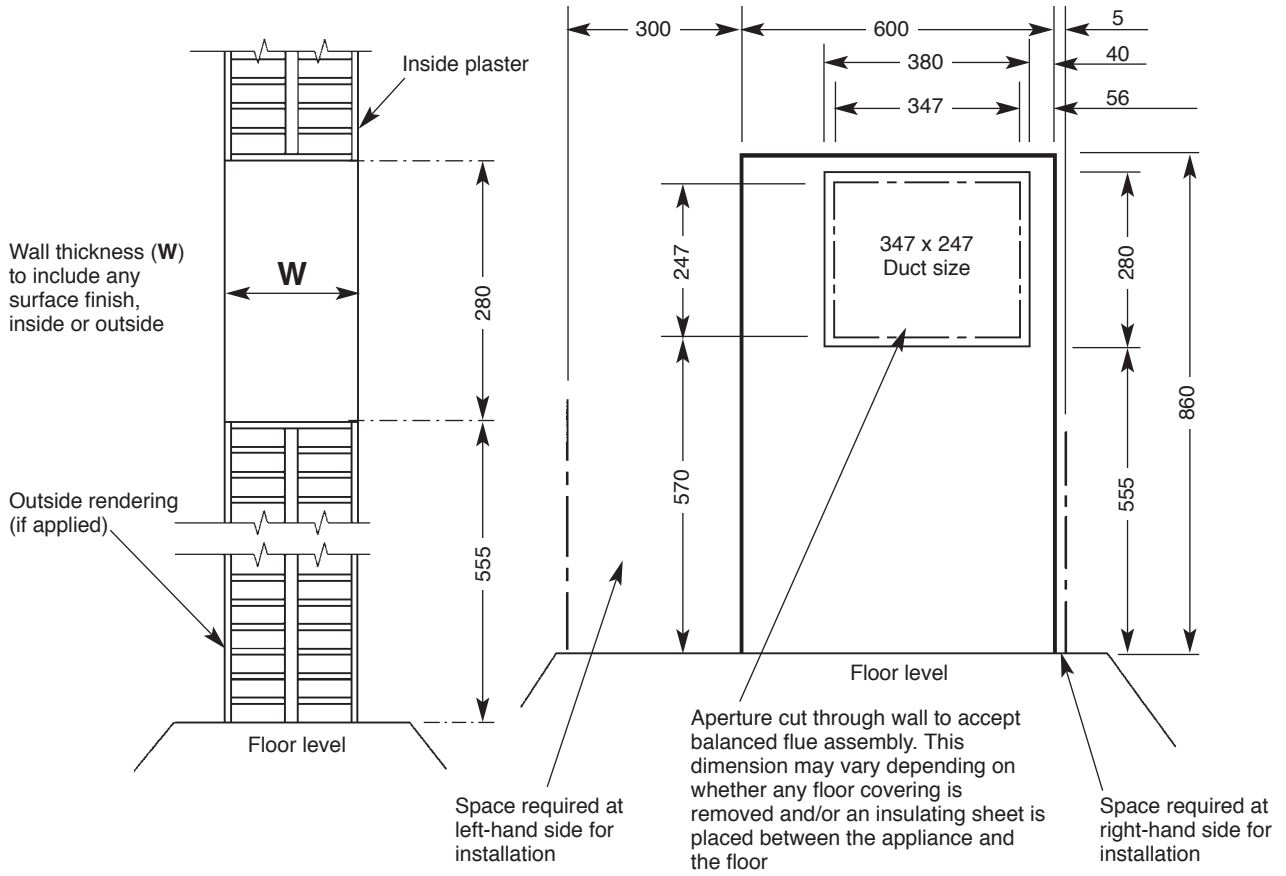


Fig. 14. Air duct adjustment.

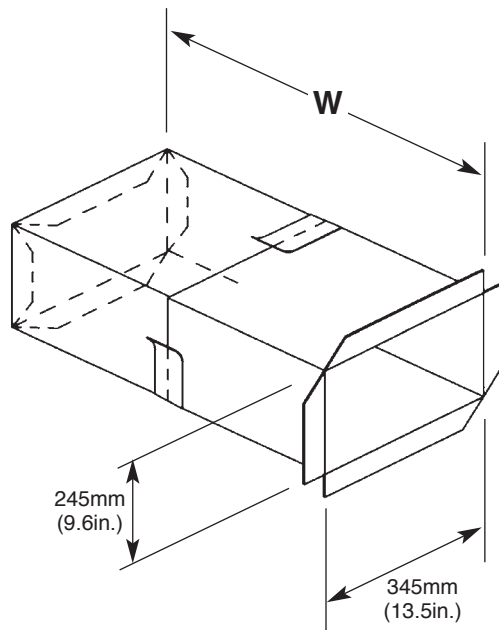


Fig. 15. Arrangement of balanced flue and terminal.

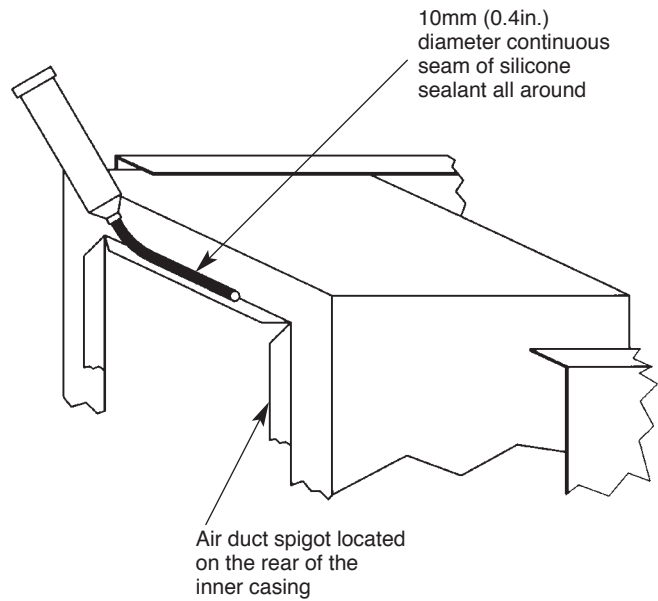
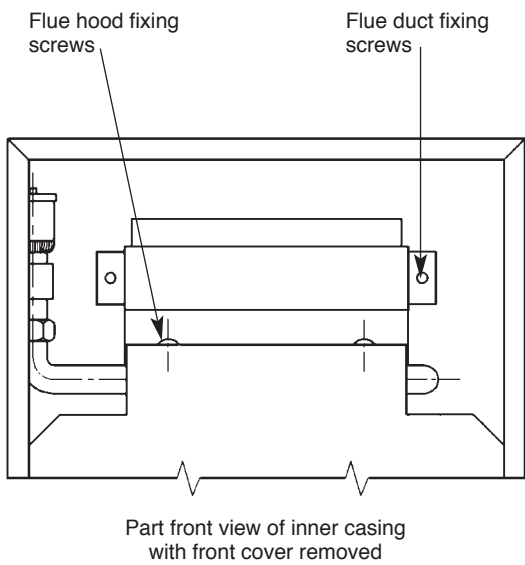
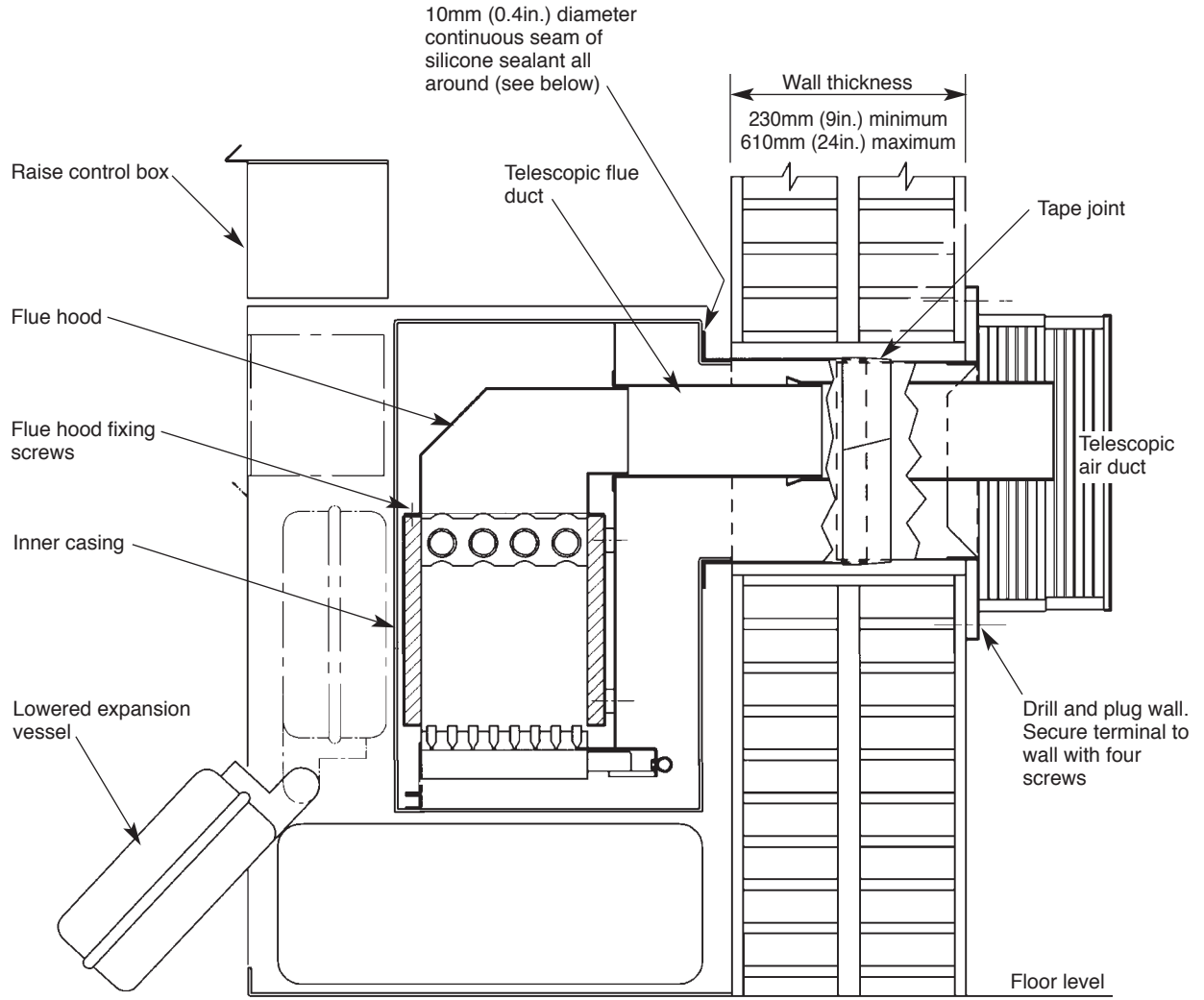
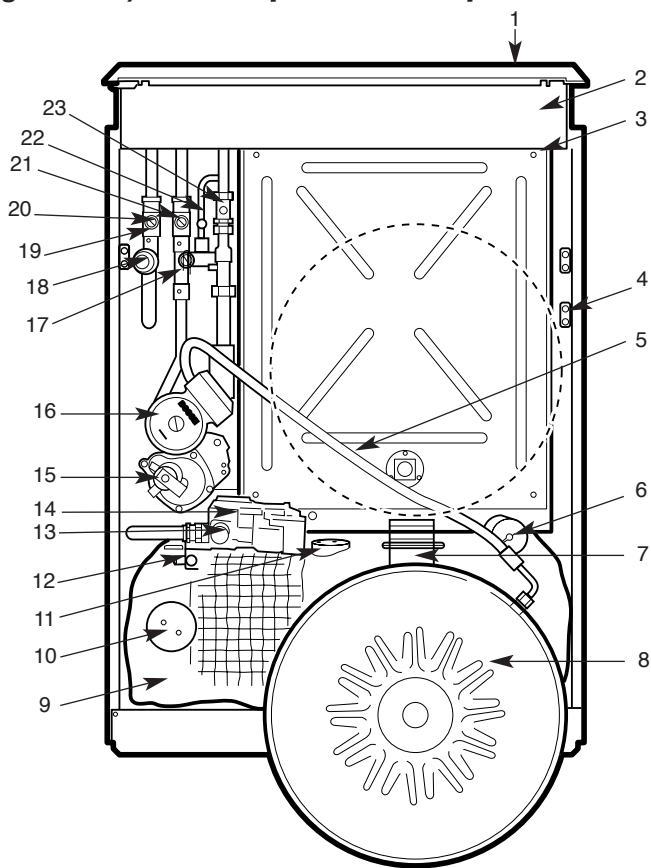


Fig. 16. Layout of components with expansion vessel in service position.



1. Facia.
2. Control box.
3. Inner casing cover fixing screws (4).
4. Expansion vessel fixing screw.
5. Expansion vessel flexible hose.
6. Pressure gauge.
7. Expansion vessel hinge.
8. Expansion vessel.
9. Heat bank.
10. Tank temperature sensor.
11. Unvented system thermostat.
12. Domestic water drain cock.
13. Gas service cock.
14. Gas valve.
15. Water diverter valve.
16. Pump.
17. By-pass adjustment screw.
18. Relief valve.
19. Primary manual air vent.
20. Central heating flow valve.
21. Central heating return valve.
22. Hot water sensor.
23. Mains cold water inlet valve.

Fig. 17. Central heating flow and return valves, by-pass adjustment, pressure relief and manual air vent.

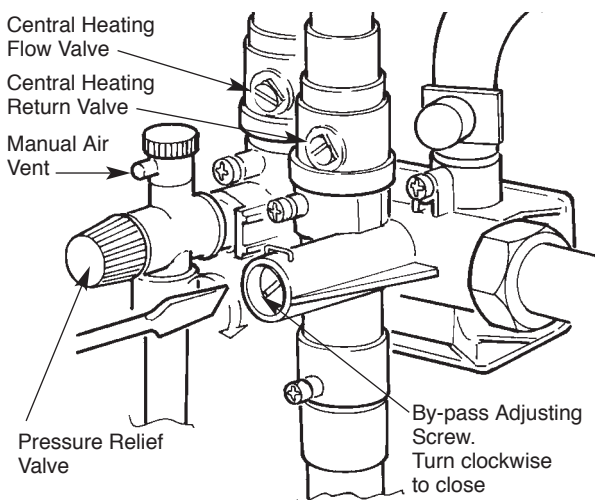


Fig. 18. Discharge pipe connection for sealed system.

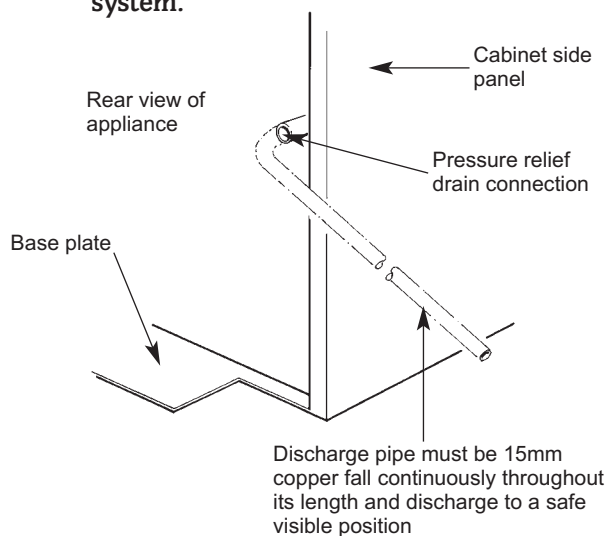


Fig. 19. Open vent position and pipework.

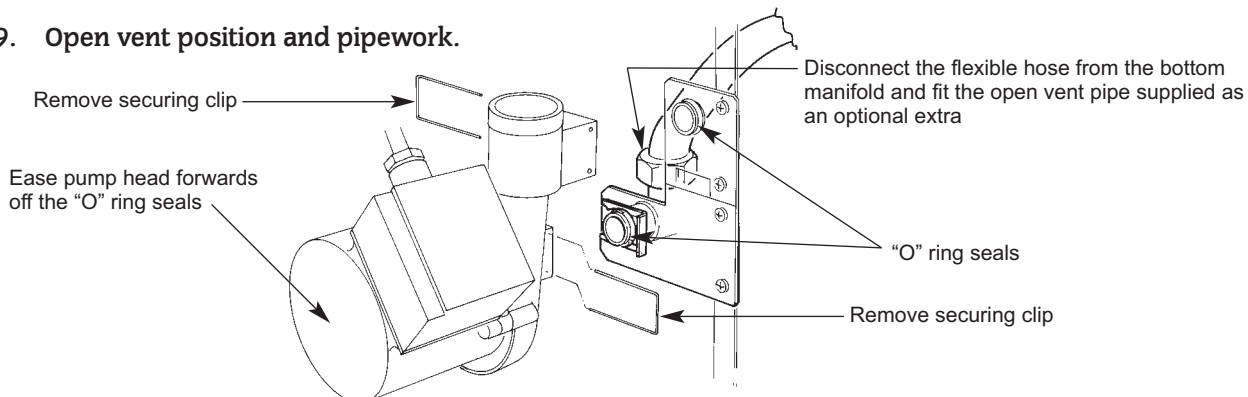
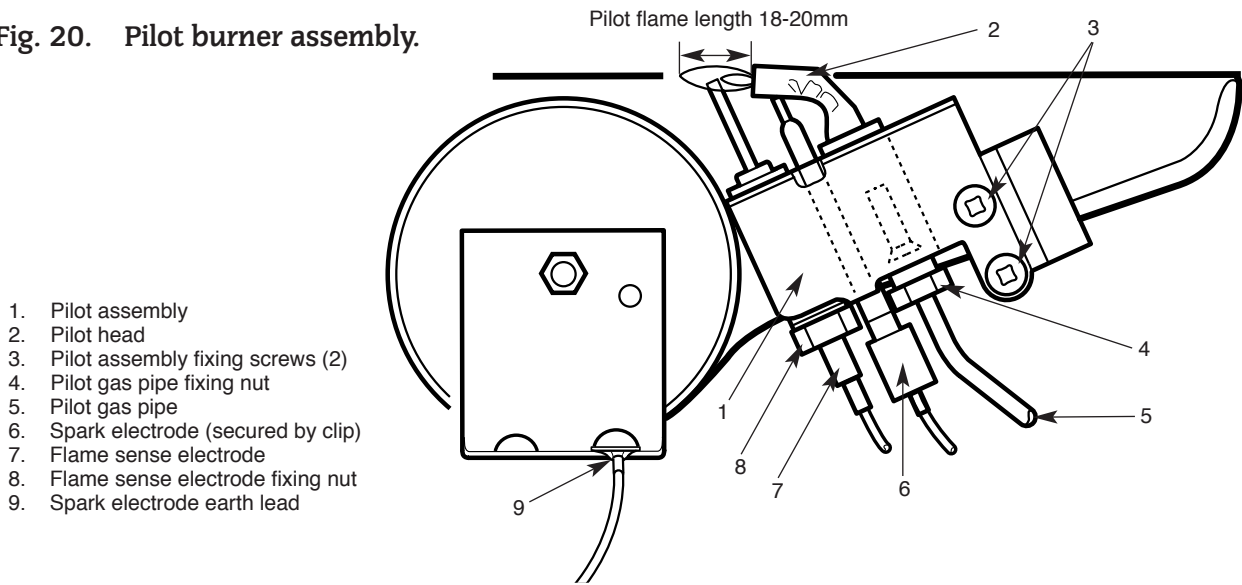
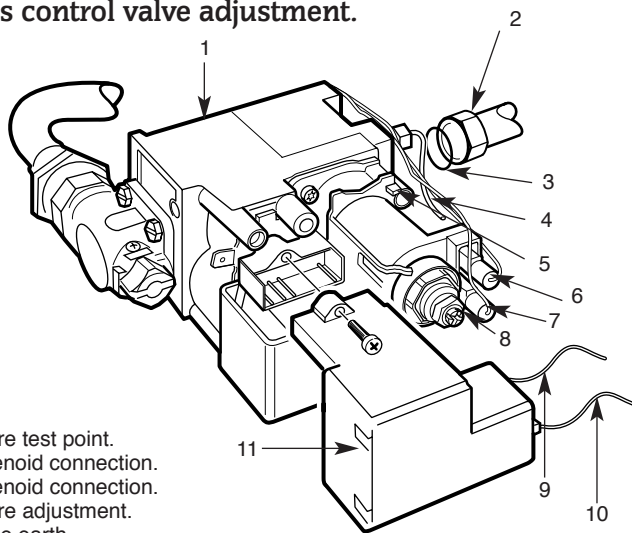


Fig. 20. Pilot burner assembly.

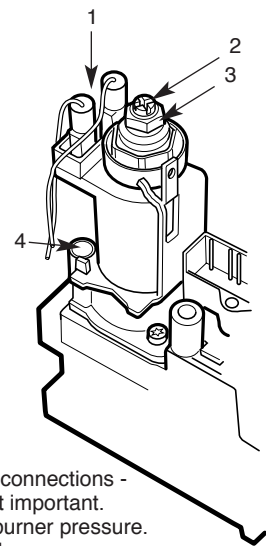


1. Pilot assembly
2. Pilot head
3. Pilot assembly fixing screws (2)
4. Pilot gas pipe fixing nut
5. Pilot gas pipe
6. Spark electrode (secured by clip)
7. Flame sense electrode
8. Flame sense electrode fixing nut
9. Spark electrode earth lead

Fig. 21. Gas control valve adjustment.



1. Gas valve.
2. Outlet union.
3. O-ring.
4. Pilot gas pipe.
5. Burner pressure test point.
6. Gas valve solenoid connection.
7. Gas valve solenoid connection.
8. Burner pressure adjustment.
9. Spark electrode earth.
10. Spark electrode lead.
11. Gas valve connector and fixing screw.



1. Modulator connections - polarity not important.
2. Minimum burner pressure.
3. Maximum burner pressure.
4. Burner pressure test point.

NOTE: Remove the adjustment cover.

12. Commissioning The Appliance



Benchmark Water Treatment: For optimum performance after installation, this boiler and its associated central heating system should be flushed in accordance with the guidelines given in BS7593:1992 - Treatment of water in domestic hot water systems. Full instructions are supplied with proprietary cleansers sold for this purpose. If an inhibitor is to be used after flushing, it should be used in accordance with the inhibitor manufacturers instructions.

Suitable flushing agents and inhibitors are available from Betz Dearborn Tel: 0151 4245351 and Fernox Tel: 01799 521133. Instructions for use are supplied with these products.

IMPORTANT: Any system cleanser must be fully flushed from the system before any inhibitor is added.

12.1 SUMMARY

The appliance is dispatched with the controls set to provide a maximum output for domestic hot water and central heating load of 24 kW.

The appliance automatically modulates to satisfy lower heat loads.

Domestic Hot Water Circuit

Confirm that the mains water supply has been flushed out at installation. If not it will be necessary to disconnect the cold water inlet pipe from the appliance and thoroughly flush.

Central Heating System

Flush the system before starting to commission the appliance and, at the end of the commissioning procedure, drain whilst hot. Immediately refill and re-pressurise adding an inhibitor as necessary.

Gas Service.

The complete system, including the meter, must be inspected and tested for soundness and purged as indicated in BS 6891. In the event of a leak, or suspected leak, at the 'O' ring joint on the main appliance manifold, connect a manometer to the test point on the inlet of the multifunctional gas valve. A soundness test carried out after turning off the appliance gas cock will test the section between the gas cock and the gas valve, thus enabling the leak to be traced to the 'O' ring.

12.2 APPLIANCE AND CENTRAL HEATING SYSTEM PREPARATION.

12.2.1 VENT THE APPLIANCE.

Remove the cabinet front panel before starting the commissioning procedure. See Fig. 14.

Check that the gas service and the electrical supply to the appliance are turned off.

Raise the fascia and control box into the Service Position. Refer to Fig. 14.

Lower the expansion vessel into the Service Position and remove the inner casing cover. See Fig. 16.

Check that all the water connections throughout the system are tight.

Open the system valves at the appliance. See Figs. 3 and 17.

Open all the radiator valves, fill the system and vent each radiator in turn.

Vent the heatbank from the manual air vent. See Figs. 16 and 17. The automatic air vent (fixed to the flow manifold) will vent the boiler section for sealed systems. Do not replace the inner casing cover until instructed in Section 12.4 Appliance Operation.

In order to thoroughly vent the appliance and system the appliance may be operated without gas turned on as follows:

Switch on the electricity supply.

Set the heating temperature control (or, if fitted, Programmer to Heating and Water) to maximum.

The pump and fan will run for five minutes, a continuous spark will occur two minutes before lock-out occurs. Reset by turning the heating temperature control OFF and ON.

Primary water will circulate around the appliance.

Allow the appliance to operate in this condition for a few minutes.

Set the room thermostat (if fitted) to maximum. The water diverter will open to central heating and the appliance will operate. See Fig. 16.

Primary water will now circulate around the central heating system. Allow the appliance to operate in this condition for a few minutes. Vent all radiators again during this period until air is cleared from the system.

When the system has been fully vented set the heating temperature control to the Off position.

Note: The water diverter valve, in the de-energised condition, is always open to provide hot water. The controls give priority to reheating the heatbank following a demand for hot water. If the valve fails to open when energised to the central heating system, hot water will still be available.

The valve does not have a manually open position.

Set the temperature controls (or Programmer) to **OFF**.

Switch off the electrical supply.

The appliance and central heating system should have been successfully vented. **It is important that it is fully vented.**

Check the pressure relief valve operates by turning the knob anti-clockwise until it releases. Water should be expelled from the discharge pipe. See Fig. 15.

12.2.2 SEALED SYSTEMS ONLY.

SET THE EXPANSION VESSEL PRESSURE

The charge pressure of the expansion vessel (as supplied) is 0.5 bar, which is equivalent to a static head of 5 metres. The charge pressure must not be less than the static head at the point of connection. See Fig 6. A Schraider type tyre valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary.

SET THE SYSTEM PRESSURE

Fill the system until the pressure gauge shows 2.5 bar and check for water soundness. Release water from the system using the pressure relief valve test knob until the System Design Pressure is obtained up to a maximum of 1.5 bar.

System Design Pressure in bar = Static Head of the System in bar + 0.3

Note: 1 bar is equivalent 10.2 metres of water

Set the movable pointer on the pressure gauge to coincide with the indicating pointer, giving a permanent record of the set system pressure. See Fig. 16.

If the pressure indicated on the pressure gauge is greater than

2.5 bar when operating at the maximum central heating temperature, an extra expansion vessel must be fitted to the system as close to the appliance central heating return connection as possible.

The appliance (as despatched) can accommodate a system volume of about 104 litres. Refer to BS 7074 Part 1. If the system volume is in excess of that accommodated by the expansion vessel fitted to the appliance then an extra vessel must be fitted as close as possible to the central heating return connection of the appliance.

Any extra vessel fitted must be pressurised to the same figure as the integral vessel. If the expansion vessel fails then the specified replacement must be fitted.

12.3 PROGRAMMER.

Any programmer fitted to the appliance should be set up at this stage following the instructions sent with the programmer.

12.4 APPLIANCE OPERATION.

12.4.1 Check that the electrical supply to the appliance is off.

Turn the room thermostat (if fitted) to maximum.

Set the temperature controls (or Programmer) to **OFF**.

12.4.2 Pilot operation.

Disconnect the flame sense electrode lead at the control board.

Turn on the gas supply and reconnect the electricity supply.

Put the heating control to **MAX** (or Programmer to heating and water).

A continuous spark will occur for up to two minutes until the pilot is alight. The fan and pump will run but the main burner will not light. Test for gas soundness at the joint between the pilot pipe and the burner with leak detection fluid. See Fig. 34.

Observe the pilot flame. It should be about 20mm long and envelope the spark electrode tip. See Fig. 34.

Put the temperature control (or Programmer) to **OFF** and disconnect the electrical supply at the mains.

IMPORTANT: Replace the inner casing cover and reposition the pressure vessel. See Fig. 16.

Reconnect the flame sense electrode lead at the control board.

Turn off the gas supply at the appliance.

Loosen the burner pressure test point screw and connect a pressure gauge. See Fig. 33.

12.4.3 Check the maximum burner pressure.

NOTE: The maximum burner pressure is the same for central heating and domestic hot water.

Turn the hot water temperature control to **MAX** and set the programmer (if fitted) to **HW ON**.

Turn on the gas supply to the appliance.

Turn on the electricity supply to the appliance.

The burner will light at minimum pressure and increase over a few seconds to the maximum burner pressure to satisfy the heat bank.

If the required maximum burner pressure is not achieved and the inlet pressure to the appliance is correct i.e. 20 mbar for natural gas or 37 mbar for propane which is equivalent to 18.5 or 35.5 mbar at the gas valve inlet, then the burner pressure must be reset. Refer to Fig.33.

If the heatbank is satisfied then it may be necessary to fully open one or two hot water taps to ensure the maximum heat requirement.

12.4.4 Check the minimum burner pressure.

NOTE: The minimum burner pressures are different for central heating and domestic hot water.

The minimum burner pressure to be set is the domestic hot water pressure.

The central heating minimum burner pressure is a control function and is not adjustable.

Repeat the procedure for checking the maximum burner pressure but, carefully, pull-off one of the blue leads from the modulating control on the gas valve. **Ensure that the connector does not touch any metal.** Refer to Fig.33.

If the minimum burner pressure is not achieved then the burner pressure must be reset.

NOTE: The maximum burner pressure must be set first as this can affect the minimum burner pressure setting. Refer to Fig. 33.

Turn all the temperature controls to **OFF** (or **MIN**) and the programmer (if fitted) to **OFF**.

Turn off the gas and electricity supplies to the appliance.

12.4.5 Check the operation of the appliance.

Refer to the Operational Flow Diagrams, Section 16, for the sequence of events.

The appliance control system gives priority to the satisfying of the heatbank and the delivery of domestic hot water.

Check that all the system and radiator valves are open.

Set the hot water temperature control **MAX**. set the programmer (if fitted) to **DHW ON** or **CONTINUOUS**.

Turn on the gas and electricity supplies to the appliance.

The boiler will light and follow the Tank Mode of operation until the heatbank is satisfied (upto twelve minutes from cold) when the burner will go off.

Fully open a hot tap to put the appliance into the DHW draw-off mode. The burner will light to maintain the heatbank which is supplying the hot water to the tap.

Shut the tap and the burner will go out, possibly after a short period of time filling the heatbank.

Set the programmer, if fitted, to central heating **ON**, the hot water temperature control to **MIN**, the heating temperature control to **MAX** and the room thermostat to **MAX**. Check that the system is pressurised, the burner will light and, after a possible short period topping-up the heatbank, will supply heat to the radiators.

Check that the radiators heat up evenly.

Balance the system so that the required temperature difference across the heating flow and return pipes is obtained. See Section 3, Table 3.

Adjust the by-pass valve until the same temperature difference is obtained. See Fig. 12. This should be carried out with only a single radiator operating.

If thermostatic radiator valves are fitted then, ideally, one radiator should be left uncontrolled. **The bypass valve should never be fully closed.**

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

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

12.4.6 Check ignition after a break in the gas supply.

Turn off the gas service cock and wait for 60 seconds. The main burner and pilot will go out but sparking from the electrode will continue. Carefully open the gas service cock and observe the burner re-light and follow the normal sequence of operation.

Put the temperature controls (or Programmer) to **OFF**. Switch off the gas service cock and the electrical supply to the appliance.

12.4.7 Drain and reset system.

Drain the heating system whilst the appliance is still hot. Refer to Fig. 1. for the position of the appliance drain point.

Refill, vent and re-pressurise (sealed systems) as described previously.

Set the temperature controls to **MAX**. If a programmer is fitted set to Continuous or 24 Hrs and the Heating to **ON**. The boiler will fire and, when the heatbank is satisfied, commence to heat up the radiators. Allow to operate for 45 minutes, venting as necessary. Check for water soundness.

Note: From cold it will take about 12 minutes for the heatbank to be satisfied before the central heating system will receive heat.

IMPORTANT: The complete system must be checked for water leaks. Should any leaks be found they must be rectified before proceeding further.

Set the temperature controls to **OFF**, or if a programmer is fitted, switch to **OFF**. Switch electrical supply off at the mains.

Check for the correct operation of User's Controls including the room thermostat (if fitted).

12.5 COMPLETION OF COMMISSIONING.

Disconnect the pressure gauge and tighten the test point screw. Re-start the appliance and check for gas soundness around the test point screw.

Replace the burner pressure adjustment cover. Fix with the screw and seal with suitable marking e.g. red paint.

Refit the expansion vessel and cabinet front panel. See Fig. 12.

If the appliance is being passed over to the User immediately refer to Section 13, Users Instructions and set the controls to the user's requirements.

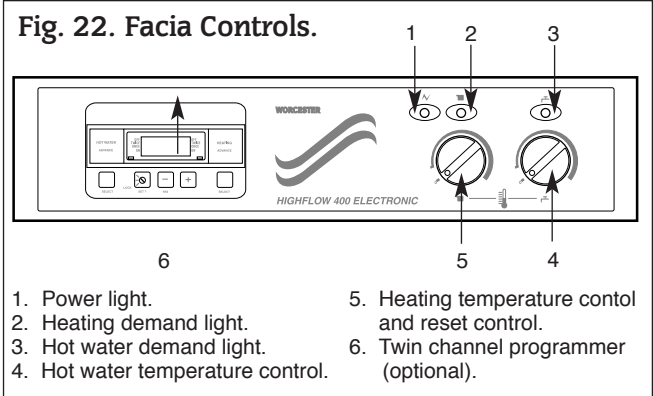
If the appliance is to be left inoperative check that the programmer and the controls are set to **OFF**. Turn the gas service cock to off and switch off the electricity supply.

For short inoperative periods leave the appliance under the control of a frost thermostat, if fitted, or operating continuously under the control of a room thermostat set at 6°C.

If there is any possibility of the appliance and system being left inoperative during frosty conditions then drain the appliance and system.

13. Instructions To The User

Fig. 22. Facia Controls.



13.1 Tell the user how to operate the appliance and hand over the Users Instructions leaflet and the completed **Benchmark** log book.

13.2 Tell the user what to do if the heating system is not to be used in frosty weather. Also tell the user that if the appliance is not to be used for long periods during frosty weather, the system must be drained and the gas and electricity supplies turned off.

13.3 Tell the user the Sealed System set pressure if applicable.

13.4 Tell the user of the importance of regular servicing. Worcester Heat Systems Ltd offer a comprehensive maintenance contract.

13.5 Set the system controls to the users requirements.

13.6 If an external programmer has been fitted instruct the user how to set the programmes.

13.7 Tell the user about the safety devices and any hazard notices.

14. Inspection And Servicing

To ensure continued efficient operation of the appliance it must be checked and serviced as necessary at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but once per year should generally be adequate. The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers.

It is the law that any service work must be carried out by competent engineers such as British Gas or Corgi registered personnel.

14.1 PRE-SERVICE INSPECTION

Check that the flue terminal and the terminal guard, if fitted, are clear. If the appliance is in a compartment check that the ventilation

openings in the compartment door or walls are clear. Refer to Section 6, Air Supply.

Check the operation of the pressure relief valve. Reset the system pressure if necessary.

Check the expansion vessel pressure and reset as necessary.

Check the system and remake any joints or fittings which show signs of leakage. Refill, vent and re-pressurise sealed systems as described in Section 12, Commissioning.

Operate the appliance and the system taking note of any faults.

Measurement of flue gases

For consistency of flue gas measurements it is necessary to have a constant maximum output and the appliance to be at equilibrium.

Insert the probe into the secondary flue.

Expected readings should be approximately:

CO 0.003—0.008%

CO₂ 7.0—8.0%

SAFETY: Disconnect the electrical supply at the mains and turn off the gas supply at the gas service cock on the appliance before servicing the appliance. See Fig. 12.

After completing the service always test for gas soundness as indicated in BS 6891.

14.2 DISMANTLE THE APPLIANCE

To carry out a full and comprehensive service of the appliance remove the following parts to gain access to the components which need to be checked or serviced.

(a) Cabinet Front Panel

Lift the panel to clear the top locator and kick strip.

(b) Facia and Control Box

Remove the cabinet front panel. Unscrew the two screws securing the facia to the outer edges of the cabinet, accessible under the facia. Ease the facia forwards on the slide rails until fully extended. Lift the facia and control box upwards through 90° into the Service Position. Lodge in the Service Position on the outer locations. See Fig. 12.

(c) Expansion Vessel

Remove the cabinet front panel

Unscrew the screw securing the expansion vessel support bracket to the right hand side panel. Lower the vessel gently until resting on the floor. See Figs. 16 and 37.

(d) Inner Casing Cover

Repeat operations a,b and c. Unscrew the four screws securing the cover to the inner casing and lift off. See Figs. 16 and 23.

(e) Flue Hood

Repeat operations a, b, c and d. Unscrew the two screws locating the front of the flue hood to the combustion chamber cover. Ease the flue hood forwards about 15mm to clear the rear locator. Remove the flue hood from the heat exchanger and clear of the inner casing. See Figs. 16 and 23.

(f) Combustion Chamber Cover

Repeat operations a, b, c, d, and e. Unscrew the four screws securing the combustion chamber cover and remove the cover. See Figs. 16 and 23.

(g) Burner

Repeat operations a, b, c, d, e and f. Unscrew the two screws securing the pilot bracket to the burner. Unscrew the two screws securing the front of the burner and the spark electrode lead to the burner bracket located inside the inner casing. Remove the burner by easing forwards and upwards off the main burner injector and clear of the pilot bracket. See Figs. 16 and 23.

(h) Pilot

Repeat operations a,b,c,d,e,f and g. Unscrew the two screws securing the pilot bracket to the burner bracket. Unscrew and remove the flame sense electrode. Unclip the spark igniter and remove.

Support the pilot bracket with a suitable tool. Unscrew the pilot pipe union nut and ease the pipe clear of the bracket. Remove the pilot injector from the pilot bracket. See Figs. 16 and 23.

14.3 SERVICING OF COMPONENTS

Clean the Burner

Brush the blade tops and mixing tube with a soft brush and check that all the flame ports are clear. Remove any blockages with a non-metallic brush.

Clean the Main Burner Injector

Inspect the main burner injector located at the rear of the inner casing. Clean with a soft brush. Do not use a wire brush or anything likely to cause damage.

Clean the Pilot Bracket

Brush with a soft brush. Clean the pilot injector by rinsing it in warm water. Check the condition of the electrode.

Clean the Gas to Water Heat Exchanger

Cover the main burner injector and pilot bracket with a cloth. Clean the heat exchanger using a soft brush. Remove the deposits from the bottom of the combustion chamber. The heat exchanger is manufactured from copper take care not distort any of the fins.

Combustion Chamber Insulation

Examine and replace any pads that are damaged. Refer to Section 15.3.3.

Controls

Remove any dust or deposits using a soft brush. Take care not to mishandle any component connections.

Note: Should any of the components be damaged they must be replaced before the service is completed. Refer to the appropriate item in Section 15, Replacement of Parts.

After servicing, reassemble the appliance in the reverse order. Check that all components are in place and correctly fixed. See Fig. 16 and 23. Leave the cabinet front panel to be fitted after checking the operation of the appliance.

14.4 TEST THE APPLIANCE

On completion of the service and reassembly of the appliance, check for gas soundness and the correct operation of the appliance as described in Section 12, Commissioning. Refit the cabinet front panel and reset the controls to the users requirements.

15. Replacement of Parts

WARNING: Switch off the electricity and gas supplies before replacing any components. After the replacement of any components check for gas soundness (where relevant) and carry out functional checks as described in Section 12.

15.1 COMPONENT ACCESS

To replace components

It is necessary to remove one or more sections of the cabinet and cover plates within the appliance. Refer to Section 14.2 a, b, c and d.

To access the control box

Place the facia and control box in the Service Position. Refer to Section 14.2, (b) and Fig. 12. Unscrew two fixing screws at the top and two on the underside securing the facia to the control box. Ease the facia clear of the control box. Take care not to strain the wiring. Ensure the facia is supported when out of the control box. See Fig. 12.

IMPORTANT: Comprehensive gasket/O-ring packs are available for the gas and water connections on the appliance. Refer to Section 18, Short Parts List.

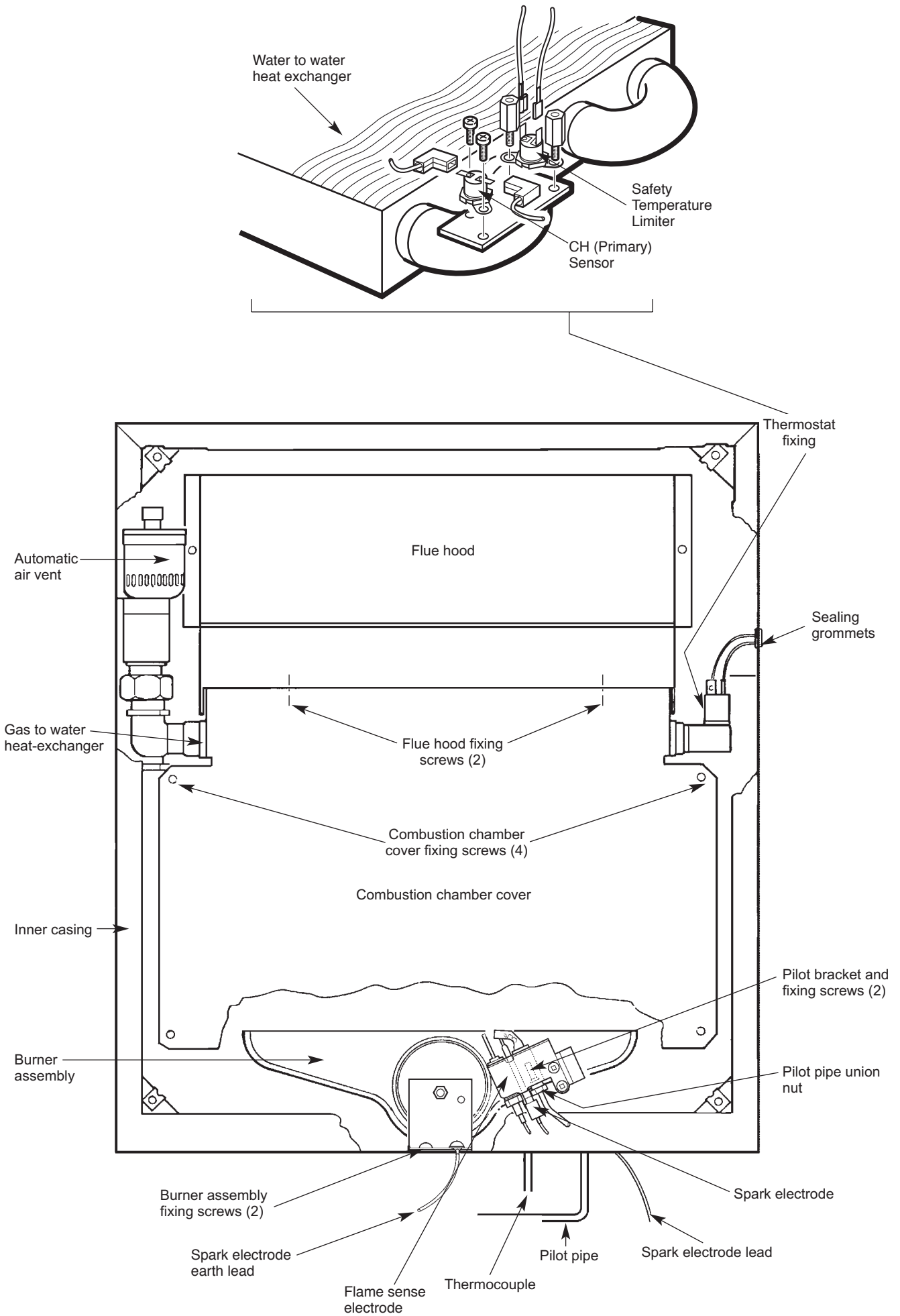
When replacing components that use clip fixings, the connections must be fully entered so that the clips can pass completely into the locating groove. The clips must not be forced into place.

Any "O" ring which shows sign of damage must be replaced. The "O" rings can be lubricated with a suitable lubricant (i.e. silicon based grease or glycerin) which is non-reactive with the ethylene-propylene nitrile "O" rings.

15.2 DRAINING THE APPLIANCE

Check that the electricity supply to the appliance is turned off. Before removing any component holding water it is important that as much water as possible is drained from the appliance.

Fig. 23. Inner casing assembly.



CAUTION: Some water will remain in the expansion vessel, pump, water diverter valve, water to water heat exchanger and gas to water heat exchanger. Extra care must be taken when removing these components.

Place a towel or cloth beneath the component to absorb the excess system water.

The water will be contaminated and any absorbent material used must be destroyed or washed thoroughly after any component has been replaced.

Any inhibitor in the primary water must be replenished.

(a) Appliance Heatbank and Heating Circuit

Turn off the central heating flow and return valves at the appliance using a flat blade screwdriver. See Fig. 16. Remove the kick strip secured to the cabinet side panels and base plate with five screws. See Fig. 12. Fit a tube to the drain tap located on the right hand side, front, of the heatbank and open the tap. See Figs. 1 and 12.

Note: The heatbank contains about 60 litres of primary water sufficient time must be allowed to drain the heatbank. Close the drain tap when the flow has stopped.

(b) Appliance Hot Water Circuit

Turn off the mains water supply valve at the appliance using a flat blade screwdriver. See Fig. 16. Fit a tube to the drain tap located on the left hand side of the gas valve. See Fig. 16. Open the tap and drain the hot water circuit.

A quantity of water will remain in the water to water heat exchanger, extra care must be taken when removing this component.

15.3 COMPONENT REPLACEMENT

1. Automatic Air Vent. See Fig. 23.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel into the Service Position and remove the inner casing cover, as described in Section 14.2 a, b, c and d.

Drain the heating circuit as described in Section 15.2(a).

Unscrew the automatic air vent and discard. Fit the replacement assembly. Ensure the plastic cap is removed and discarded.

Open the valves, fill and re-pressurise the system as described in Section 12.2.

Ensure the joint is water tight. Reassemble the appliance in the reverse order.

2. Gas to Water Heat Exchanger. See Figs. 23 and 24.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel into the Service Position and remove the inner casing cover, as described in Section 14.2 a, b, c and d.

Drain the heating circuit as described in Section 15.2 (a).

Remove the flue hood and combustion chamber cover as described in Sections 14.2 e and f. Unscrew the retaining screws and remove the Safety Temperature Limiter and CH primary sensor from the thermostat pad as described in Section 15.3 - 12.

Remove the left hand fibre insulation pad from the combustion chamber. Remove the access cover in the left hand side of the combustion chamber held in position with one screw.

Unscrew the front and rear heat exchanger union connections.

Lift the heat exchanger off the right hand side of the combustion chamber support and clear of the union connections. Remove the heat exchanger clear of the inner casing.

CAUTION: There will be a small quantity of water remaining in the heat exchanger. Follow the procedure as described in Section 15.2.

Discard the heat exchanger.

Fit the replacement heat exchanger in the reverse order using new fibre sealing washers. Ensure the washers are in place and the heat exchanger correctly aligned.

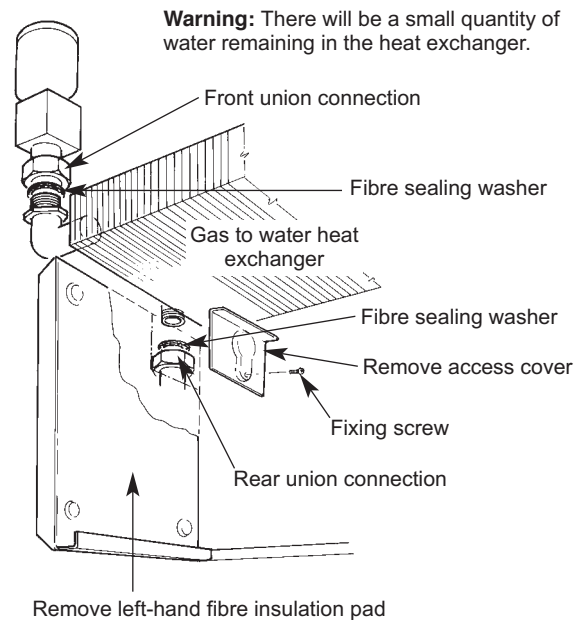
Tighten the union connections. Refit the access cover to the left hand side of the combustion chamber and replace the fibre insulation pad. Refit the combustion chamber cover. Refit the sensor and thermostat with a layer of heat sink compound.

Refer to the wiring diagram Fig. 7.

Reassemble the appliance in the reverse order.

Open the valves, fill and re-pressurise the system as described in Section 12.2.

Fig. 24. Gas to water heat exchanger.



3. Combustion Chamber Insulation. See Figs. 23 and 25.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel into the Service Position and remove the inner casing cover, as described in Section 14.2 a, b, c and d.

Drain the heating circuit as described in Section 15.2 (a).

Remove the combustion chamber cover as described in Section 14.2 (f).

Remove the gas to water heat exchanger as described in Section 15.3.2.

Remove the fibre insulation pads from the combustion chamber side, rear and front sections and discard.

Fit replacement fibre insulation pads in the reverse order.

Note: The fibre is fragile take care it is not damaged.

Ensure the insulation pad fitted to the combustion chamber cover has the pilot observation hole correctly aligned.

Reassemble the appliance in the reverse order.

Open the valves, fill and re-pressurise the system as described in Section 12.2.

4. Main Burner. See Figs. 20 and 23.

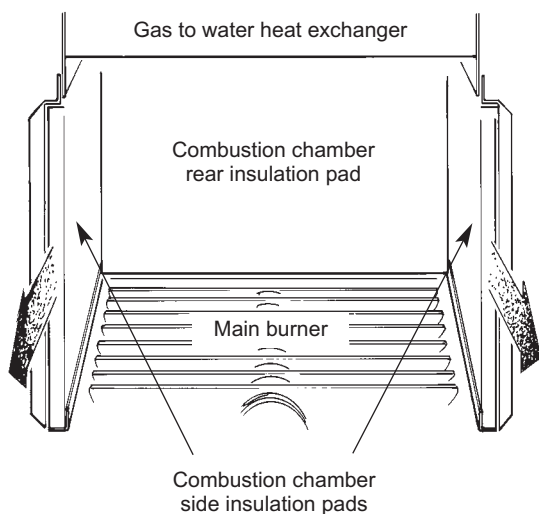
Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d.

Remove the combustion chamber cover and main burner assembly as described in Sections 14.2 f and g. Discard the burner.

Fit a replacement main burner in the reverse order. Ensure the main burner is fitted correctly on the main burner injector located at the back of the inner casing. Reassemble the appliance in the reverse order.

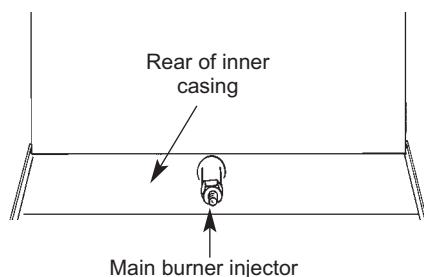
Fig. 25. Combustion chamber insulation.



5. Main Burner Injector. See Fig. 26.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d. Remove the combustion chamber cover and main burner assembly as described in Sections 14.2 f and g. Unscrew the brass injector at the rear of the inner casing and discard. Fit the replacement injector in the reverse order. Thread sealing compound is not required. Reassemble the appliance in the reverse order.

Fig. 26. Main burner injector.



6. Pilot Burner. See Figs. 20, 23 and 27.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d. Remove the combustion chamber cover as described in Section 14.2 f. Unscrew and withdraw the flame sense electrode. Unscrew the two screws securing the pilot burner to the main burner. Ease the pilot burner forwards sufficiently to allow a suitable tool to support it. The spark electrode is held in position with a clip. Ease the clip backwards and remove the spark electrode and retain. Disconnect the thermocouple nut from the pilot bracket and ease the thermocouple from the assembly. Unscrew the union nut securing the pilot pipe and ease the pipe clear. Remove the pilot injector which is a push fit inside the pilot burner and retain.

Discard the pilot burner.

Fit a replacement pilot burner in the reverse order. Check the pilot burner settings and spark electrode gap are as shown in Fig. 23 and Section 12.4.

Reassemble the appliance in the reverse order.

7. Pilot Injector. See Figs. 20 and 23.

Remove the pilot burner as described in Section 15.3.7 preceding. Remove the pilot injector which is a push fit inside the pilot burner and discard. Fit a replacement pilot injector in the reverse order. Check the pilot burner settings and spark gap is as shown in Fig. 23.

Reassemble the appliance in the reverse order.

8. Flame Sense Electrode. See Figs. 20 and 23.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d. Remove the combustion chamber cover as described in Sections 14.2 g. Unscrew the two screws securing the pilot burner to the main burner. Ease the pilot burner forwards sufficiently to allow access.

Unscrew and withdraw the flame sense electrode.

Remove the fascia as described in Section 15.1.

Carefully pull the lead from the tag on the control board. Remove the electrode assembly from the appliance and discard.

Fit replacement assembly in reverse order.

Check the pilot burner settings and spark electrode gap is 4 to 5mm, as shown in Fig. 23. Reassemble the appliance in the reverse order.

9. Spark Electrode. See Figs. 20 and 23.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d. Remove the combustion chamber cover as described in Sections 14.2 g. Unscrew the two screws securing the pilot burner to the main burner. Ease the pilot burner forwards sufficiently to allow access.

The spark electrode is held in position with a clip. Ease the clip backwards and remove the spark electrode. Pull off the spark electrode cable at the gas valve and discard the spark electrode assembly.

Fit a replacement spark electrode in the reverse order. Check the pilot burner settings and spark electrode gap is 4 to 5mm, as shown in Fig. 23. Reassemble the appliance in the reverse order.

10. Safety Temperature Limiter. See Fig. 23.

Surface thermostat with vertical 4.8mm tabs.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d.

Remove the fascia as described in Section 15.1.

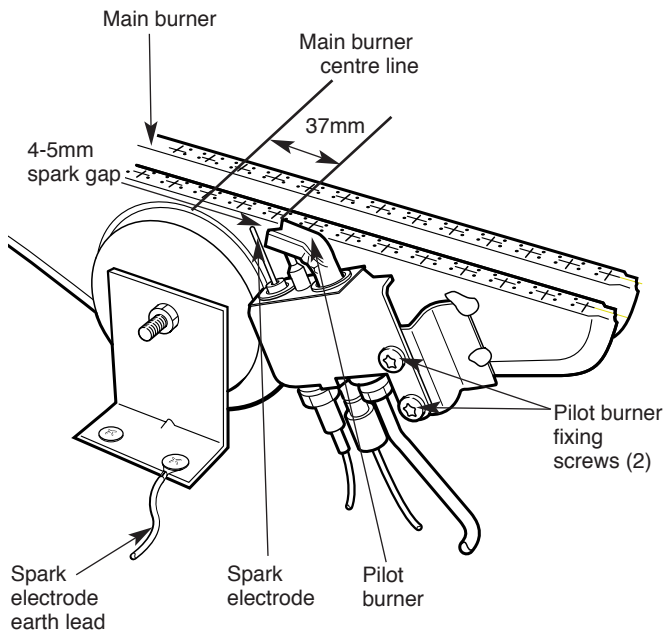
Pull off the two electrical connections to the safety temperature limiter thermostat.

Unscrew and discard the thermostat.

Fit a new safety temperature limiter thermostat in the reverse order. The polarity of the connections is not important. Apply a smear of heat sink compound to the thermostat face.

Reassemble the appliance in the reverse order.

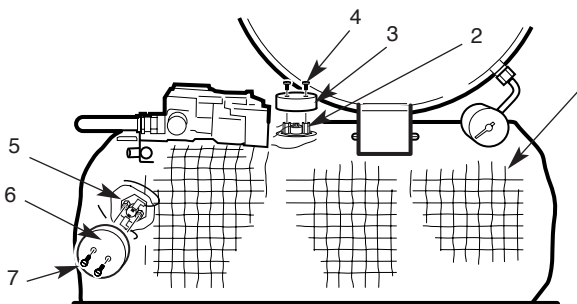
Fig. 27. Pilot burner setting.



11. Hot Water Sensor. See Fig. 30.

Surface sensor with vertical 6.3mm tabs. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel as described in Section 14.2 a. Carefully pull-off the leads to the sensor. Release the clip and remove the sensor. Fit a new sensor and re-assemble in the reverse order. Apply a smear of heat sink compound to the sensor face. Reassemble the appliance in the reverse order.

Fig. 28. Tank Sensor and heatbank overheater thermostat.



1. Heat bank
2. Unvented tank thermostat (G3)
3. Thermostat cover
4. Thermostat cover thermostat fixing screws (2)
5. Tank sensor
6. Sensor cover
7. Sensor cover fixing screws (2)

12. Heating (Primary) Sensor. See Fig. 23.

Surface sensor with angled 6.3mm tabs. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, lower the expansion vessel and remove the inner casing cover, as described in Section 14.2 a, b, c and d. Pull off the two electrical connections to the sensor. Unscrew the two screws securing the sensor and discard the sensor.

Fit a new sensor in the reverse order. The polarity of the connections is not important. Apply a smear of heat sink compound to the thermostat face.

Reassemble the appliance in the reverse order

13. Water Filter Primary System. See Figs. 29 and 34.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position, as described in Section 15.2.a.

NOTE: It is not necessary to drain the complete appliance. Fit a 5mm dia. plastic pipe to the manual air vent and drain the top manifold. See Fig. 34.

Remove the heating thermostat phial as described in Section 15.14.

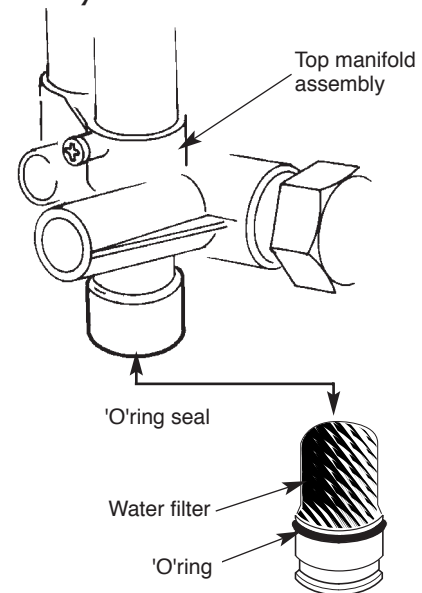
Loosen the top and bottom pipe fixing screws. Push the pipe into the slip joint. See Fig. 25.

Ease the heating thermostat pocket out of the top manifold and clear of the appliance.

The water filter is located inside the top manifold. Remove the filter and clean or replace.

Reassemble the appliance in the reverse order using a new 'O' ring seal. Ensure that the screws are correctly located and tightened.

Fig. 25. Primary Water Filter



14. Tank Sensor. See Fig. 28.

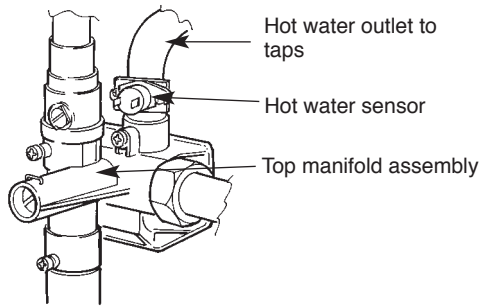
Surface sensor with horizontal 6.3mm tabs. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel as described in Section 14.2 a. Unscrew the two screws and remove the cover. Carefully pull-off the leads at the sensor. Unscrew the two screws and remove the sensor. Fit a new sensor in the reverse order. Apply a smear of heat sink compound to the contact surface. The polarity of the connections is not important. Reassemble the appliance in the reverse order.

15. Heat Bank Overheat Thermostat. See Fig. 28.

Surface thermostat with horizontal 4.8mm tabs. Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel as described in Section 14.2 a. Unscrew the two screws and remove the cover. Carefully pull-off the leads at the thermostat. Unscrew the two screws and remove the thermostat.

Fit a new sensor in the reverse order. Apply a smear of heat sink compound to the contact surface. The polarity of the connections is not important. Reassemble the appliance in the reverse order.

Fig. 30. Hot water sensor.



16. Gas Valve. See Figs. 16 and 31.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel and lower the expansion vessel as described in Section 14.2 a, b and c.

Turn off the gas supply at the service cock.

Disconnect the pilot pipe at the gas valve and carefully move to one side.

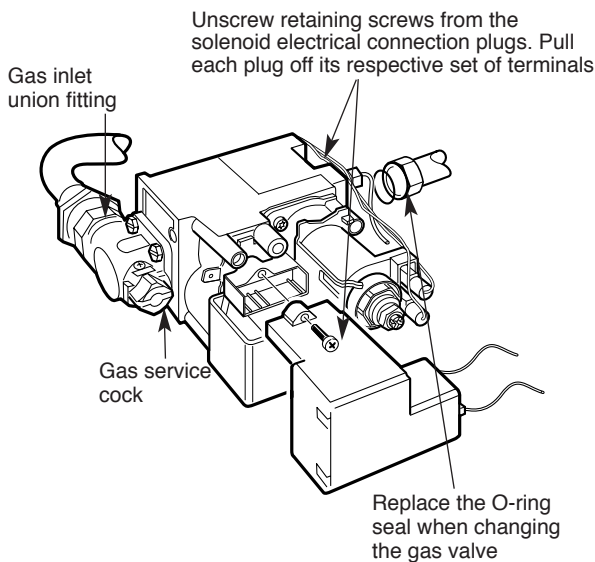
Unscrew the union securing the outlet flange connection to the side of the of the gas valve. Unscrew the four slotted hex head screws at the gas service cock at the valve. Support the valve and unscrew the retaining screw from the igniter unit and remove. Carefully pull off the leads from the valve.

Fit the replacement gas valve in the reverse order ensure the 'O' rings are renewed. Reconnect the electrical connections and the igniter unit. Reassemble the appliance in reverse order.

Turn on the gas supply at the service cock and check for gas soundness.

Re-commission the appliance and set the burner setting pressures. Refer to Section 12: Commissioning and Fig. 31.

Fig. 31. Gas valve.



17. Pilot Filter

If problems are experienced with the pilot filter fit a replacement gas valve as described in Section 15.3.- 18.

18. Circulating Pump. See Figs. 16 and 23.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the facia and control box in the Service Position and lower the expansion vessel, as described in Section 14.2 a, b and c. Drain the heating circuit as described in Section 15.2 a.

Remove the pump electrical cover and disconnect the electrical connections. Release the cable clamp and remove the cable.

Withdraw the two securing clips from the pump body. Ease the pump forwards about 10mm off the "O" ring seals and remove from the appliance.

CAUTION: There will be a small quantity of water remaining in the pump and pipework.

Follow the procedure as described in Section 15.2.

Discard the pump and "O" ring seals.

Fit new "O" ring seals. Fit a replacement pump in the reverse order taking care to ensure the securing clips are properly entered into the slots and not scoring the O-rings on entry. A smear of lubricant on each O-ring will ease the re-assembly. Check the pump head is set to maximum.

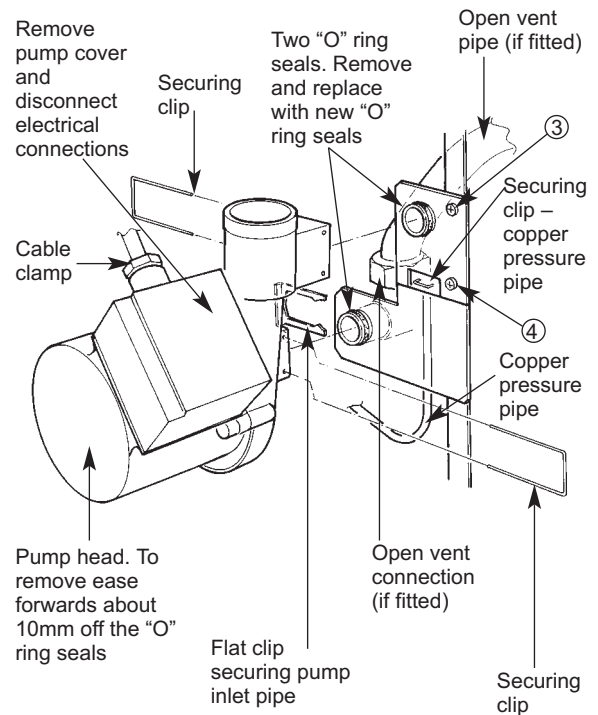
The pump head is a Grundfos 15-60. A replacement head may be transferred to the special body. Take care not to mark the mating surfaces.

Reconnect the cable and refit the cable clamp.

Open the valves, fill and repressurise the system as described in Section 12.2. Reassemble the appliance in the reverse order.

Fig. 32. Circulating pump.

Warning: There will be a small quantity of water remaining in the pump and pipework



19. Water Diverter Valve and Coil. See Figs. 32 and 33.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel and lower the expansion vessel as described in Section 14.2 a. Remove the facia as described in Section 15.1 .

19.1 Diverter Valve Coil.

Carefully remove the clip securing the locking bar and withdraw the coil.

Unplug the connector from the coil.

Fit the new coil ensuring that the clip is correctly fixed.

19.2 Diverter Valve

Note: It is not necessary to disconnect the electrical cable. The cable length is sufficient to allow the pump head to rest on top of the appliance. Do not allow the pump head to be suspended by the cable. Secure the pump head.

Unplug the connector at the diverter valve.

Using a pair of long nose pliers, remove the two clips securing the 6 mm copper pressure pipe, to the top left hand corner of the valve and pump connection. Retain the clips. Ease the pressure pipe out of the connections and clear of the appliance.

Retain the pressure pipe.

Unscrew the four fixing screws securing the water diverter valve to the bottom manifold. The bottom right hand screw is accessible using a "chubby" type screwdriver. Remove the water diverter valve clear of the appliance. Discard the valve and "O" ring seals. Retain the fixing screws.

CAUTION. There will be a small quantity of water remaining in the valve and lower manifold. Follow the procedure as described in Section 15.2.

NOTE: Three new "O" ring seals are provided with the replacement valve. Two of the "O" rings are identical in diameter and cross - section and are required for the outer ports. The third "O" ring is smaller in diameter and cross-section and will seal the centre port.

IMPORTANT: Fit the two larger diameter "O" rings into the outer locations on the replacement valve. Fit the smaller diameter "O" ring over the centre spigot on the bottom manifold. Ensure the "O" ring is located correctly against the shoulder on the centre spigot.

Fit the replacement valve in reverse order ensure the four fixing screws are correctly engaged. Replace the "O" ring seals and refit the pressure pipe. Ensure the securing clips are fully engaged in the locating holes.

Reconnect the electric cable to the control board and replace the strain relief bush. Replace the circulating pump as described in Section 15.3-20.

Open the valves, fill and repressurise the system as described in Section 12.2. Reassemble the appliance in the reverse order.

22. Water to Water Heat Exchanger.

See Figs. 34, 35, and 36.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position and lower the expansion vessel into the Service Position, as described in Section 14.2 a, b and c. Drain the heating and hot water circuit as described in Section 15.2

CAUTION: The weight of the water to water heat exchanger is 2 kg. approx. A quantity of water will remain in the heat exchanger and pipework. Follow the procedure as described in Section 15.2.

Remove the circulating pump as described in Section 15.3 - 18.

Remove the water diverter valve as described in Section 15.3 - 19.

Note:

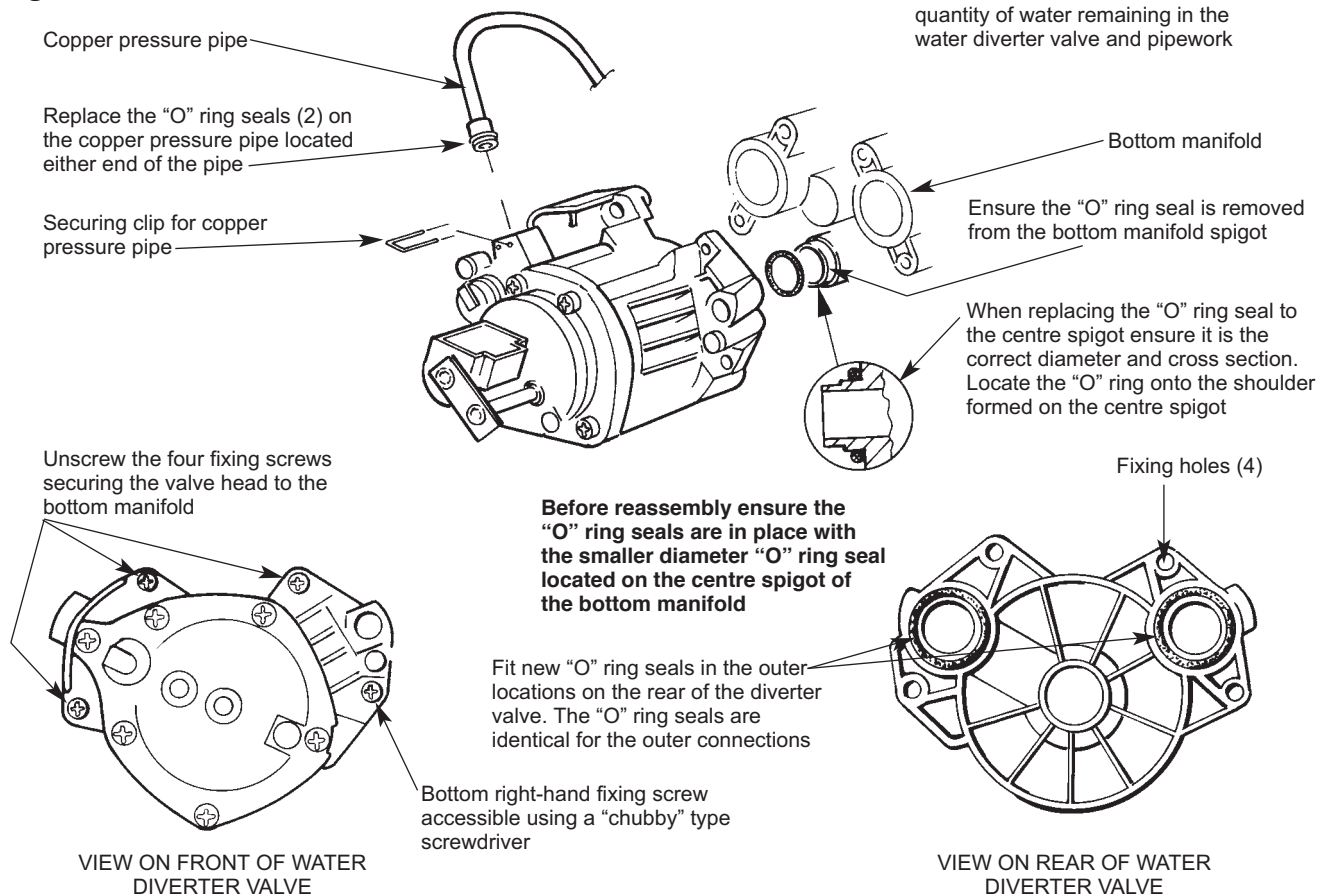
- (i) It is not necessary to disconnect the electrical cable from these components. The length of cable is sufficient to allow them to rest on top of the appliance cabinet. Do not allow them to be suspended by the cable. Secure the pump head and diverter valve.
- (ii) Unless otherwise stated all water joints are sealed with "O" rings. To disconnect twist the pipe and/or ease the joint apart. When re-connecting the joint a new "O" ring must be fitted. Silicone grease must be applied to the "O" ring.

Remove the pressure relief valve and manual air vent as described in Section 15.3- 25, 26 and retain.

Unscrew locating screw No.1 in the bottom manifold two full turns.

Unscrew the flat faced union fitting below the flow turbine and remove the sealing washer and discard. Move the cold water inlet pipe to the left to clear the flow turbine. Ease the pipe upwards, 10mm approx. and remove from the bottom manifold. Retain the pipe.

Fig. 33. Water diverter valve.



Unscrew the union fitting below the cold water inlet valve and remove the flow switch and water filter assembly.

Place the flow switch and water filter assembly on top of the appliance cabinet and secure.

Unscrew locating screw No.2 in the top manifold two full turns. Ease the heating return pipe downwards 10mm approx. into the slip joint in the bottom manifold.

Move the pipe to the left to clear the top manifold. Ease the pipe upwards 10mm approx. and remove the pipe from the bottom manifold. Retain the pipe.

If the appliance is fitted to an open vent system unscrew the open vent union connection and remove the washer.

Remove the flat clip securing the pump inlet pipe to pump support plate. Retain the clip.

Remove the two screws Nos. 3 and 4 securing the pump inlet pipe support plate and remove the plate. Unscrew locating screw No. 5 two full turns. Ease the pump inlet pipe upwards 10mm approx. and remove from the bottom manifold. Retain the pipe, plate and screws.

To access the water to water heat exchanger the top manifold must first be removed:

Unscrew locating screws Nos. 6, 7 and 8 two full turns. Unscrew and remove screws Nos. 9 and 10 securing the manifold to the water to water heat exchanger support bracket. Retain the screws.

Unscrew the flat faced union securing the manifold to the inner casing pipework. Remove the sealing washer and discard.

Ease the manifold assembly downwards, 10mm approx., until clear of the heating flow and return pipes and hot water outlet pipe.

Remove the manifold clear of the appliance and retain.

Unscrew locating screws Nos. 11 and 12 two full turns. Unscrew and remove screws Nos. 13 and 14 securing the bottom manifold to the water to water heat exchanger support bracket. Retain the screws.

Unscrew the bracket supporting the domestic drain from the left hand side of the gas valve. Using long nose pliers remove the clip securing the drain pipe to the bottom manifold. Ease the drain pipe downwards out of the manifold and remove. Retain the clip, screw, bracket and drain pipe.

Ease the bottom manifold and water to water heat exchanger upwards 10mm approx. until clear of the heat bank flow and return pipes.

Note: It may be necessary to push down on the flow and return pipes to release the "O" ring fittings. Before entering the heat bank the flow and return pipes are fitted into slip joints. The joints are sealed with "O" rings and allow some movement forwards or backwards when removing the bottom manifold and water to water heat exchanger.

Ease the water to water heat exchanger and bottom manifold from the support bracket and clear of the appliance.

Release screw No. 15 and remove the bottom manifold off the locations on the water to water heat exchanger. Discard the heat exchanger and retain the fixing screw.

Remove the two "O" ring seals from the rear of each manifold and discard.

IMPORTANT: Two new "O" ring seals must be fitted to the rear of each manifold.

If the flow and return pipes to the heat bank have been disturbed when removing the water to water heat exchanger the "O" ring seals must be replaced :

Ease the heat bank flow pipe out of the front slip joint and return pipe out of the rear slip joint and clear of the push in elbows.

Remove and discard the "O" ring seals from each pipe. Replace with new "O" ring seals.

Pull out the flat clip from the front push in elbow and remove the elbow. Retain the clip and push in elbow.

To release the rear elbow reach under the water to water heat exchanger bracket and push in fully the flat plate clamp mechanism. Remove the rear push in elbow and retain. Remove and discard the elbow "O" ring seals. Replace with new "O" ring seals.

Re-assemble the rear and front push in elbows. Ensure the rear clamp mechanism is engaged and fully pulled into the location. Engage the front flat clip into the slot correctly.

Re-assemble the flow and return pipes into the slip joints. The pipe lengths are not identical, the longest pipe is rear/return pipe.

Re-assemble the bottom manifold to the replacement water to water heat exchanger. Ensure the heat exchanger is located correctly with the internally threaded boss fitting through the fixing hole in the manifold and the raised section on the manifold port fitting into the bottom right hand port on the heat exchanger.

Replace screw No. 15 and tighten.

Fit the replacement water to water heat exchanger and bottom manifold assembly into the support bracket. Ensure the heat bank flow and return connections are fully engaged. Secure the assembly to the support bracket with screw Nos. 13 and 14. Fully tighten the screws fixing the "O" rings Nos. 11 and 12.

Re-assemble the top manifold in the reverse order.

Ensure the heating flow and heating return and hot water pipes are fully engaged.

Ensure a new sealing washer and "O" ring is fitted when re-connecting the union securing the top manifold to the inner casing pipework. Replace the manifold top fixing screws Nos. 9 and 10. Tighten screws Nos. 6, 7 and 8 and manifold union fitting.

Re-assemble the pump outlet pipe and re-fit the pump support plate. Ensure the flat clip is re-located. Re-connect the open vent pipe (if applicable).

Ensure a new sealing washer is fitted.

Replace the heating thermostat phial and wire clip.

Re-assemble the heating return pipe using the slip joint in the bottom manifold to manoeuvre the pipe into position.

Re-assemble the cold water inlet pipe and flow switch ensure the sealing washer is renewed. Re-connect the union fitting to the cold water inlet valve.

Re-assemble the pressure relief valve ensuring the securing clip is replaced.

Re-assemble the domestic drain pipe re-locate the securing clip and bracket.

Before continuing ensure screws 1, 2, 5, 6, 7, 8, 11 and 12 are tightened.

The "O" ring seals must be pushed fully into the housing.

Re-assemble the water diverter valve. Re-assemble the 6mm diameter pressure pipe to the pump inlet pipe and diverter valve. Ensure the securing clips are replaced.

Re-assemble the circulating pump ensure the securing clips are re-placed.

Open the valves, fill and repressurise the system as described in Section 12.2. Reassemble the appliance in the reverse order.

21. Water to Water Heat Exchanger Top Manifold.

See Figs. 34, 35 and 36.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the facia and control box in the Service Position and lower the expansion vessel into the Service Position, as described in Section 14.2 a, b and c.

Drain the heating and hot water circuit as described in Section 15.2.

Refer to Section 15.3 - 20 and remove the Top Manifold commencing from the instruction:

CAUTION: The weight of the water to water heat exchanger is 2kg. approx. A quantity of water will remain in the heat exchanger and pipework. Follow the procedure as described in Section 15.2.

Remove the manifold clear of the appliance

Fig. 34. Water to water heat exchanger.

Note: Screw Nos. ① ②, ⑤ ⑥ ⑦ ⑧, ⑪ ⑫ unscrew two full turns – **Do not remove.**
 Screw Nos. ③ ④ (Refer to Fig. 31) ⑨ ⑩, ⑬ ⑭ ⑮ remove and retain.

Warning: There will be a small quantity of water remaining in the pipework and water-to-water heat exchanger.

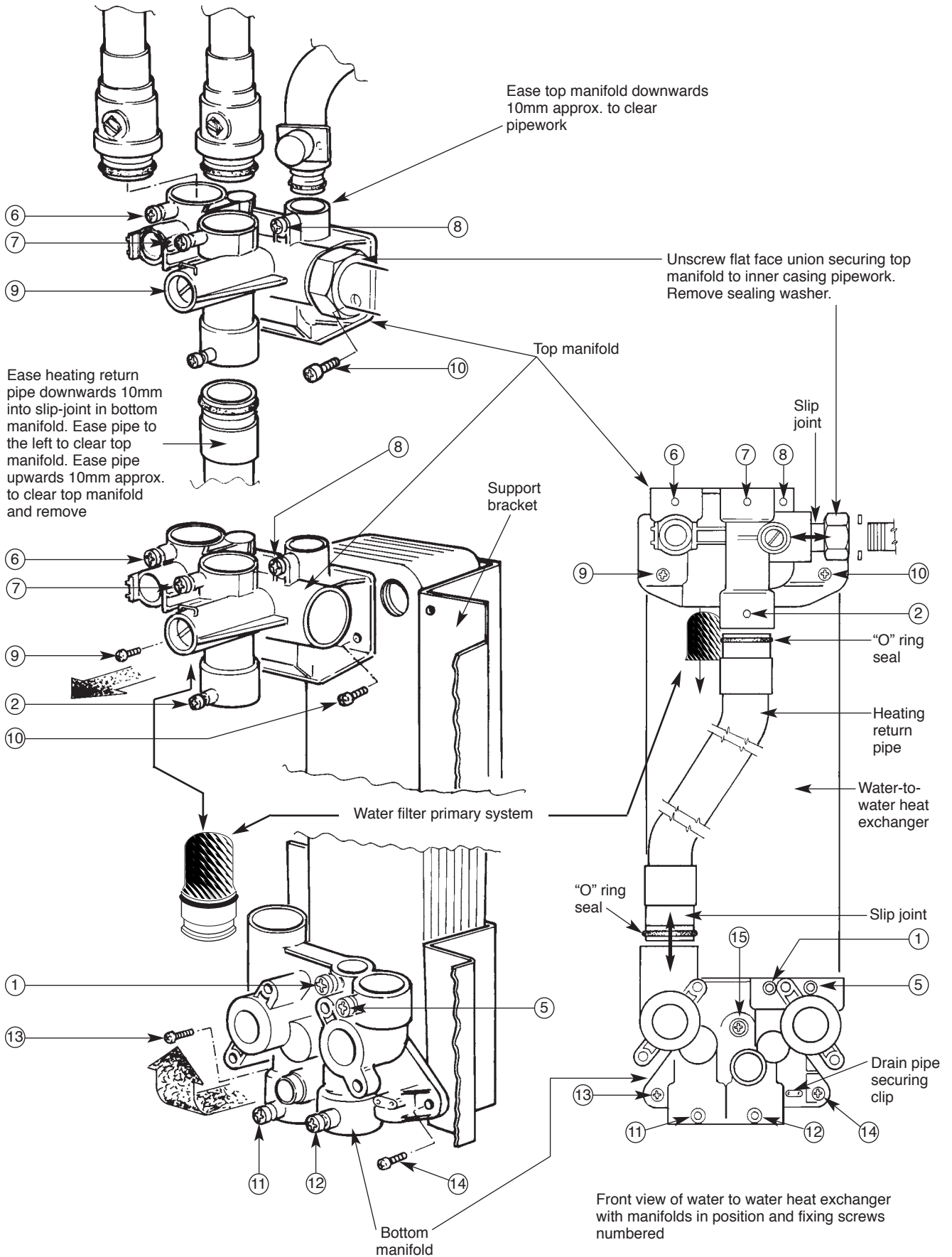


Fig. 35. Water to water heat exchanger.

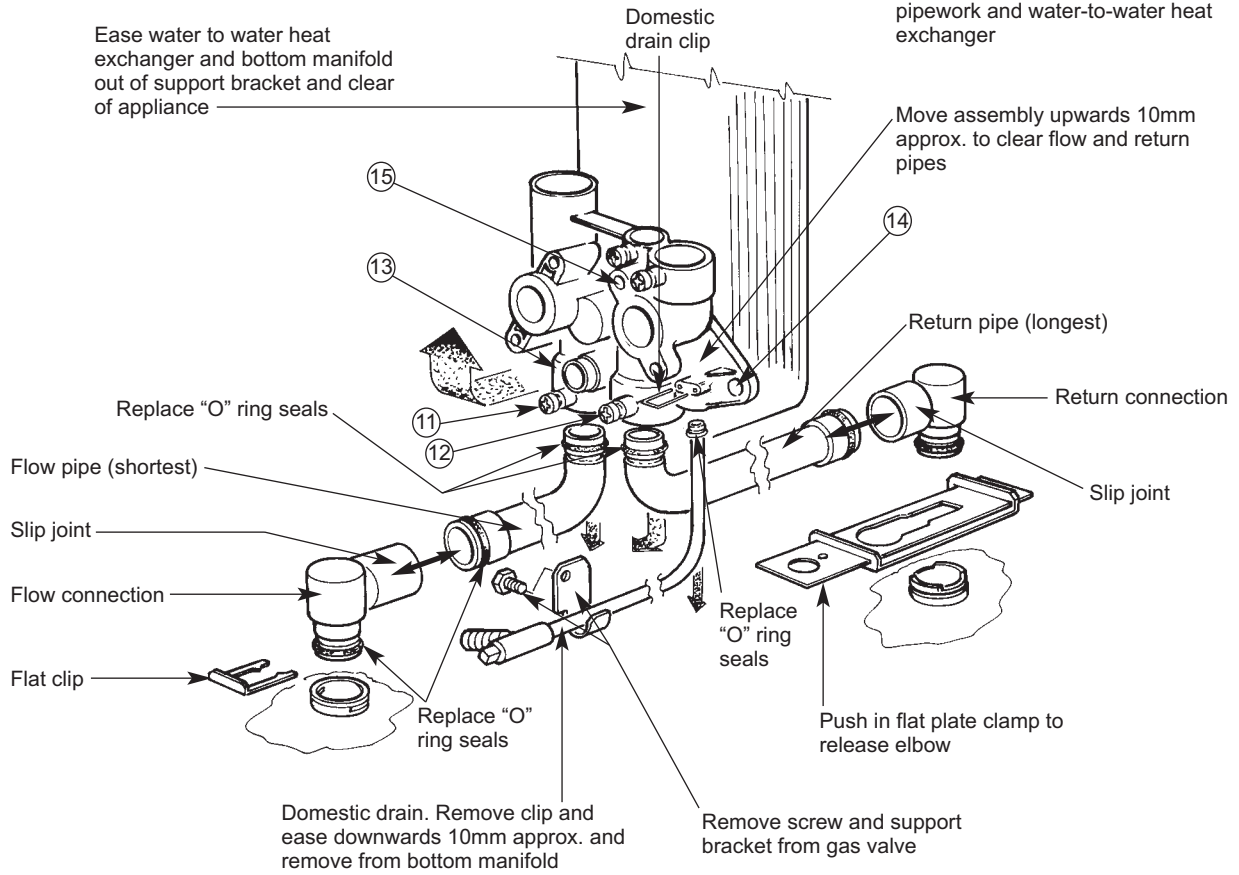
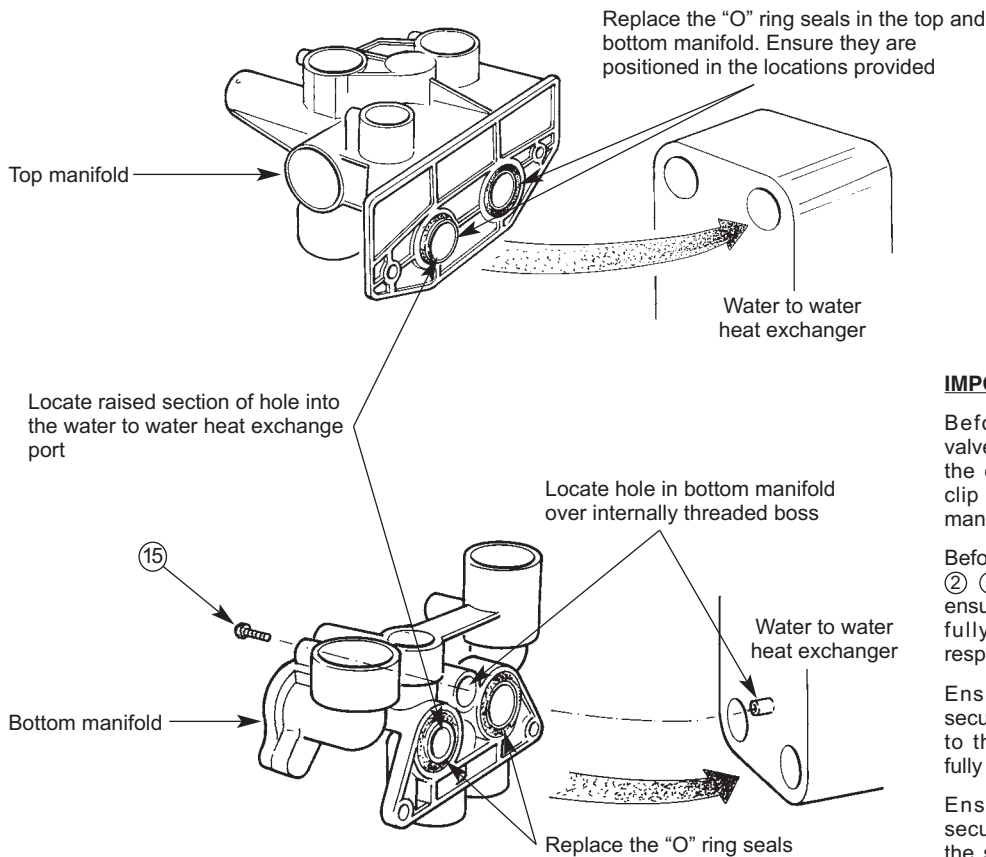


Fig. 36. Replacing the "O" ring seals in top and bottom manifolds.



IMPORTANT:

Before the water diverter valve is re-assembled ensure the domestic drain pipe and clip are fitted to the bottom manifold. Refer to Fig. 30.

Before tightening screws ① ② ⑤ ⑥ ⑦ ⑧ ⑪ ⑫ ensure the "O" ring seals are fully pushed into their respective housing.

Ensure screws ⑬ and ⑭, securing the bottom manifold to the support bracket, are fully tightened.

Ensure screws ⑨ and ⑩, securing the top manifold to the support bracket, are fully tightened.

Remove and retain the brass stub connection and nut from the manifold.

Withdraw the by-pass adjuster retaining clip and unscrew the adjuster from the manifold retaining both items.

Undo and remove the phial pocket securing clip screw and clip. Retain both the clip and screw. Extract the phial pocket and retain.

Unscrew and retain all locating screws.

Before reassembling the appliance refit the by-pass adjuster and phial pocket in the reverse order using new "O" rings.

Screw all locating screws fully home then unscrew each of them two full turns. Check that none of the screws protrude into their relevant bores.

Reassemble the manifold in the reverse order using new "O" rings to replace any "O" rings which have been disturbed. Use new sealing washers where appropriate.

Ensure that all clips and screws are correctly refitted.

Open the valves, fill and repressurise the system as described in Section 12.2. Reassemble the appliance in the reverse order.

22. Water to Water Heat Exchanger Bottom Manifold.

See Figs. 34, 35 and 36.

See Section 15.3 - 22 Water to Water Heat Exchanger.

Follow this procedure replacing the bottom manifold after the bottom manifold/ water to water heat exchanger assembly has been removed from the appliance. Retain the original water to water heat exchanger and fit the new manifold using new "O" rings. Reassemble the appliance as described in section 15.3 - 20.

23. Expansion Vessel. See Fig. 37.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position and lower the expansion vessel into the Service Position, as described in Section 14.2 a, b and c.

Drain the heating circuit as described in Section 15.2 a.

Unscrew the union fitting on the right hand side of the expansion vessel and remove the sealing washer. Ease the expansion vessel assembly upwards to clear the support bracket and remove from the appliance. Take care when removing as a small quantity of water remains inside the vessel. Follow the procedure as described in Section 15.2.

Unscrew the fixing screw and remove the securing clip from the expansion vessel. Note the position of securing clip. Discard the expansion and sealing washer.

Fix the securing clip to the replacement expansion vessel. Replace the expansion vessel assembly into the support bracket and reconnect the union fitting using a new sealing washer.

Open the valves, fill and repressurise the system as described in Section 12.2.

Reassemble the appliance in the reverse order.

24. Expansion Vessel Flexible Hose. See Fig. 37.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position and lower the expansion vessel into the Service Position, as described in Section 14.2 a, b and c.

Drain the heating circuit as described in Section 15.2 a.

Unscrew the union fitting on the right hand side of the expansion vessel. Remove and dispose of the sealing washer. Ease the expansion vessel assembly upwards to clear the support bracket and remove from the appliance. Take care when removing as a small quantity of water remains inside the vessel. Follow the procedure as described in Section 15.2.

Unscrew the union fitting from behind the pump.

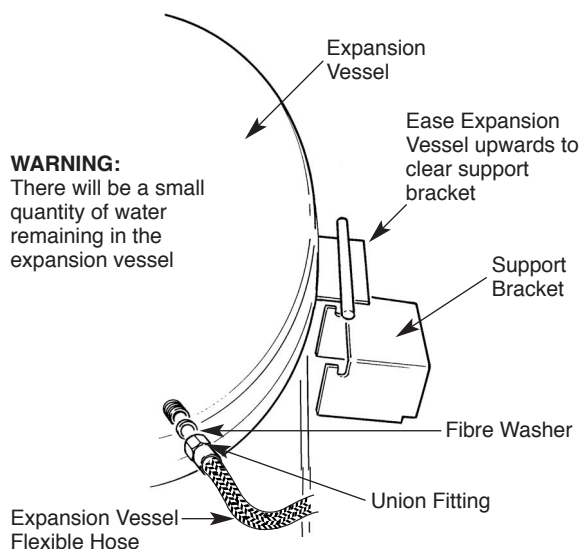
Remove and dispose of the sealing washer.

Reconnect the hose in the reverse order using new sealing washers. Ensure the orientation of the hose fittings does not cause twisting or crimping of the hose when the expansion vessel is repositioned in the boiler.

Open the valves, fill and repressurise the system as described in Section 12.2.

Reassemble the appliance in the reverse order.

Fig. 37. Expansion vessel and flexible hose.



25. Pressure Relief Valve. See Fig. 38.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position as described in Section 14.2 a, b and c.

Drain the heating circuit as described in Section 15.2 a.

Slacken the two screws in the slotted holes securing the discharge pipe support bracket. Disconnect the discharge pipe and withdraw it from the valve.

Withdraw the securing clip from the top manifold and ease the pressure relief valve assembly forwards until clear of the appliance. Unscrew the manual air vent. Discard the valve and "O" ring.

Reconnect the overflow pipe and manual air vent to the replacement valve. Fit a new "O" ring seal to the valve.

Reconnect the assembly to the appliance and replace the securing clip.

Open the valves, fill and re-pressurise the system as described in Section 12.2. Reassemble the appliance in the reverse order.

26. Manual Air Vent. See Fig. 38.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position as described in Section 14.2 a, b and c.

Drain the heating circuit as described in Section 15.2 a.

Remove the Pressure Relief Valve as described in Section 15.3-27.

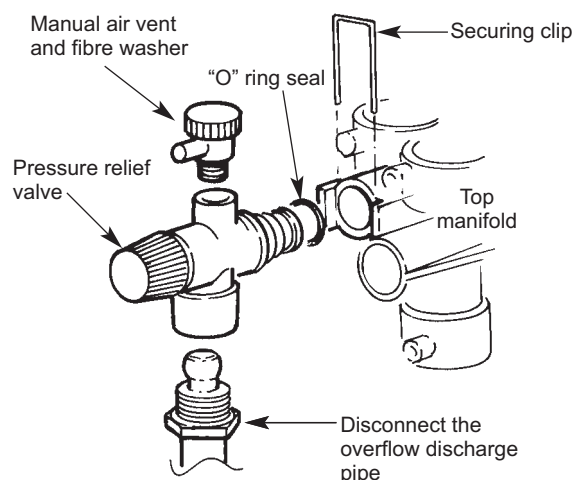
Unscrew the Manual Air Vent and discard along with its washer.

Replace with a new Manual Air Vent and washer.

Reconnect in the reverse order using new "O" rings where appropriate.

Reassemble the appliance in the reverse order.

Fig. 38. Pressure relief valve and manual



27. Pressure Gauge. See Fig. 16.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the fascia and control box in the Service Position and lower the expansion vessel into the Service Position, as described in Section 14.2 a, b and c.

Drain the heating circuit as described in Section 15.2 a.

Unscrew the pressure gauge out of the heat bank. Fit the replacement pressure gauge using suitable thread sealing compound. Open the valves, fill and re-pressurise the system as described in Section 12.2.

Reassemble the appliance in the reverse order.

28. Flow Turbine. See Fig. 39.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position as described in Section 14.2 a and b.

Drain the hot water circuit as described in Section 15.2 b.

Separate the in-line connector.

Carefully unscrew the union connection.

Fit a replacement flow turbine in the reverse order. Ensure the arrow on the end of the black plastic body points **downwards** and new sealing washers are fitted.

Reconnect the in-line connector.

Open the valve and fill the hot water circuit.

Reassemble the appliance in the reverse order.

29. Hot Water Filter. See Fig. 39.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, as described in Section 14.2 a, b and c.

Drain the hot water circuit as described in Section 15.2 b.

Undo the flat faced union above the flow switch. Ease the flow switch and pipework sideways sufficiently to clear the union. Remove the sealing washer and discard.

Undo the union below the mains water supply valve and remove the filter housing clear of the appliance. The water filter is located in the top of the housing. Remove the filter clean or replace.

Reassemble in the reverse order and replace the sealing washer. No sealing compound is required. Open the mains water valve and fill the hot water circuit.

Reassemble the appliance in the reverse order.

30. Hot Water Flow Regulator. See Fig. 39.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel, place the fascia and control box in the Service Position, as described in Section 14.2 a, b and c.

Drain the hot water circuit as described in Section 15.2 b.

Undo the flat faced union below the flow switch. Ease the pipework sideways sufficiently to clear the flow switch. Remove the sealing washer and discard.

The water flow regulator is located in the union fitting. It may be necessary to prise the regulator from its housing. Remove and discard.

Fit a new flow regulator, small diameter section first. Reassemble in the reverse order and replace the sealing washer. No sealing compound is required.

Open the mains water valve and fill the hot water circuit.

Reassemble the appliance in the reverse order.

31. Control Board. See Figs. 8 and 40.

Check that the electricity supply to the appliance is turned off.

Remove the cabinet front panel as described in Section 14.2 a.

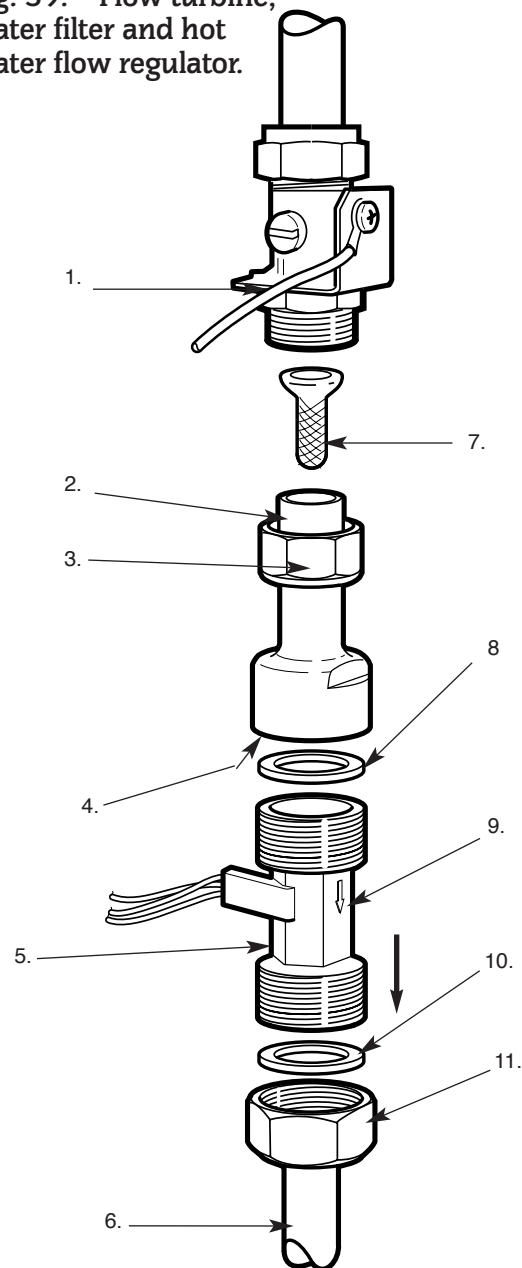
Unscrew the four fixing screws - two at the top and two at the bottom and withdraw the fascia assembly.

Rest the assembly in the channel and cut-out supports provided.

Unscrew the L and N mains connection and carefully unplug all the other connections from the board not forgetting the earth tag.

Unscrew the 6 fixing screws and lift out the board.

Fig. 39. Flow turbine, water filter and hot water flow regulator.



1. Mains cold water inlet valve
2. Water filter housing
3. Flat face union fitting
4. Water flow regulator
5. Flow turbine
6. Pipework to bottom manifold
7. Water filter
8. Fibre washer
9. Ensure arrow points downwards
10. Fibre washer
11. Flat face union fitting

Re-assemble the fascia assembly in the reverse order ensuring that the control knobs are correctly aligned.

32. Facia Mounted Programmer. See Figs. 8 and 12.

Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel, place the facia and control box in the Service Position as described in Section 14.2 a and b. Remove the facia as described in Section 15.1.

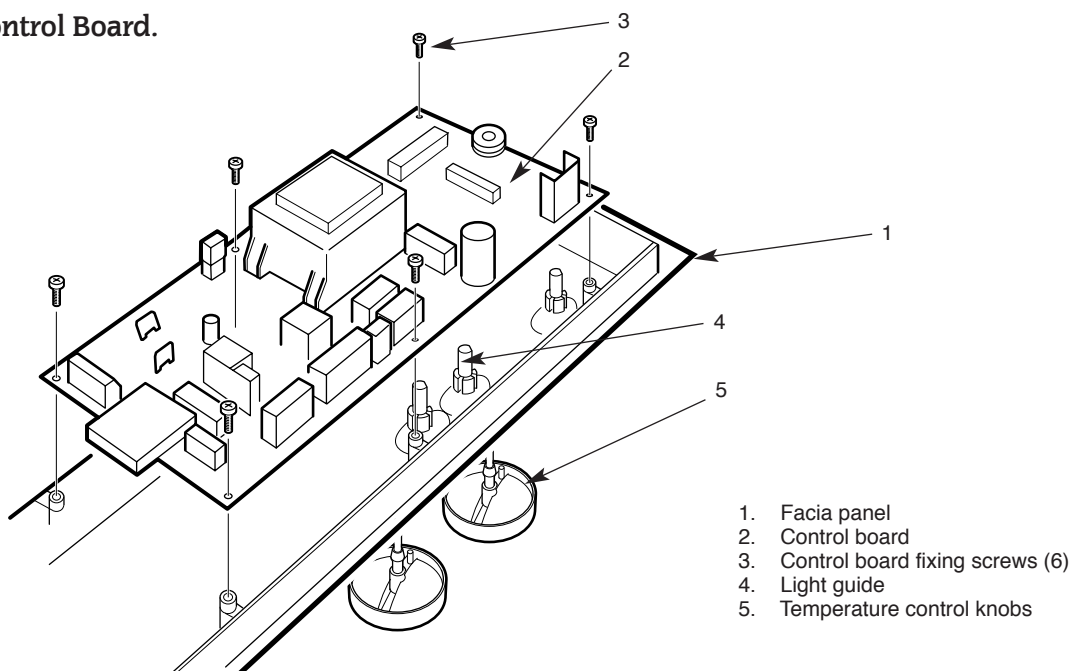
Unplug the programmer from the control board from terminals marked **X2** "Programmer/Switch". Undo the four nuts securing the programmer to the facia and remove. Fit a new programmer in the reverse order and connect the plug at the driver board. Reassemble the facia in the reverse order.

33. Remote Mounted Programmer. See Fig. 11.

Check that the electricity has been turned off and isolate the programmer.

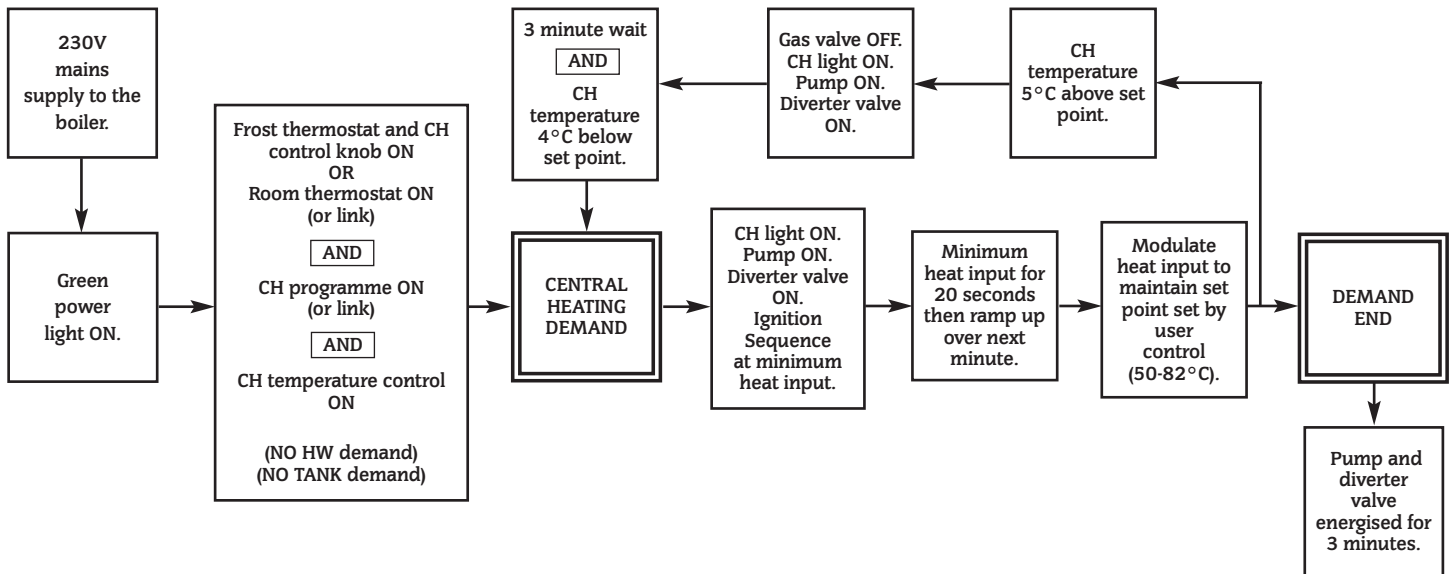
Disconnect the leads from the programmer noting the alignment. Fit the replacement programmer and reconnect the leads checking that they are correctly positioned.

Fig. 40. Control Board.

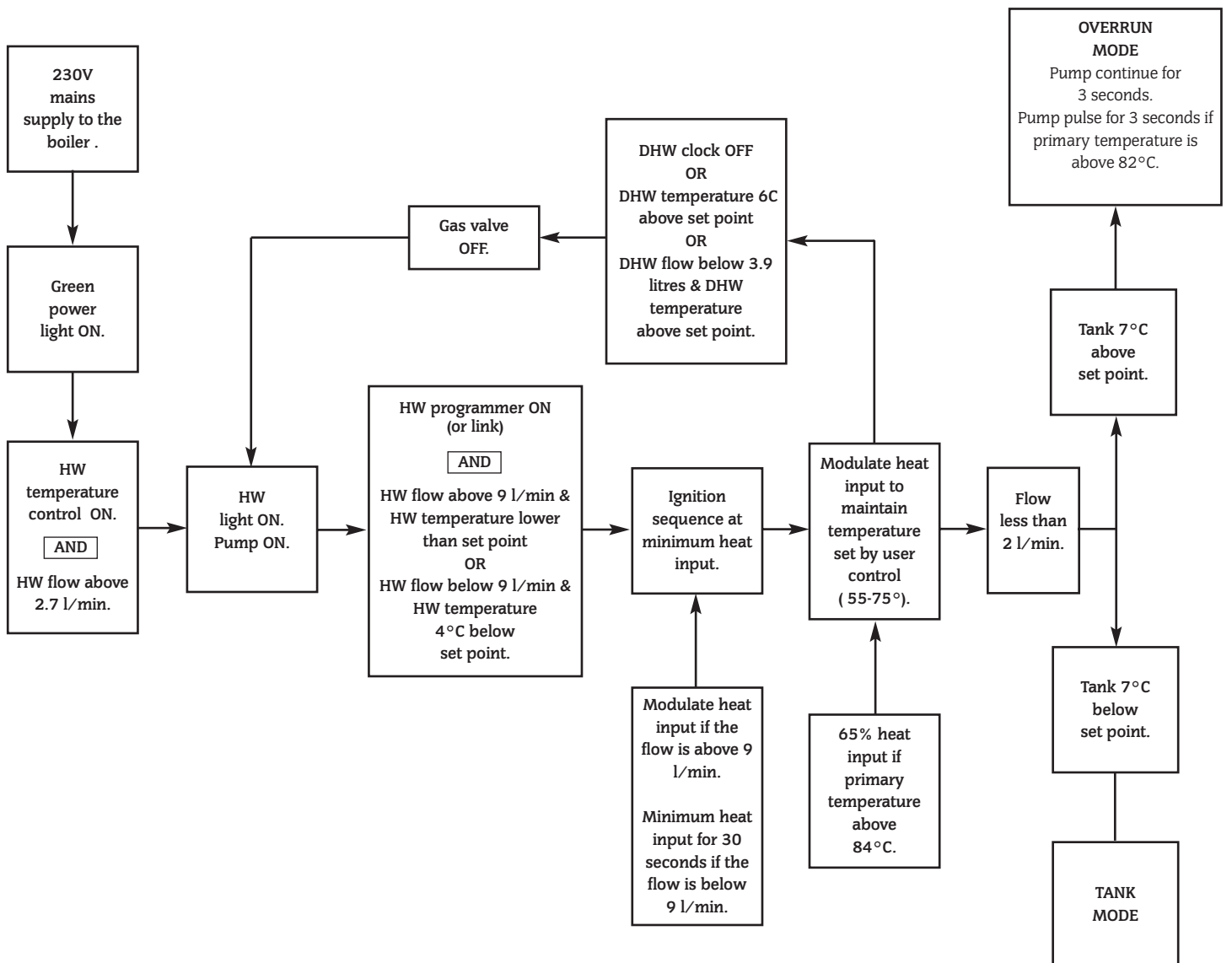


16. Operational Flow Diagrams

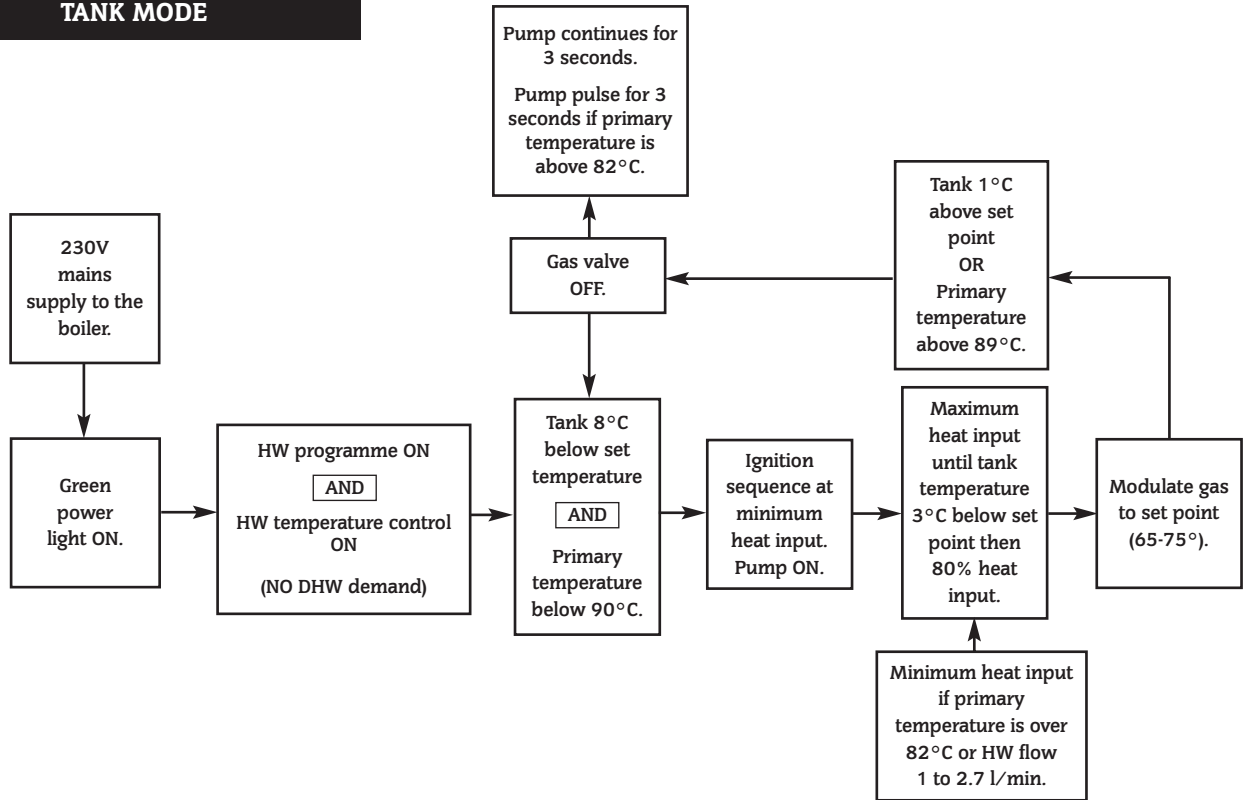
CENTRAL HEATING MODE



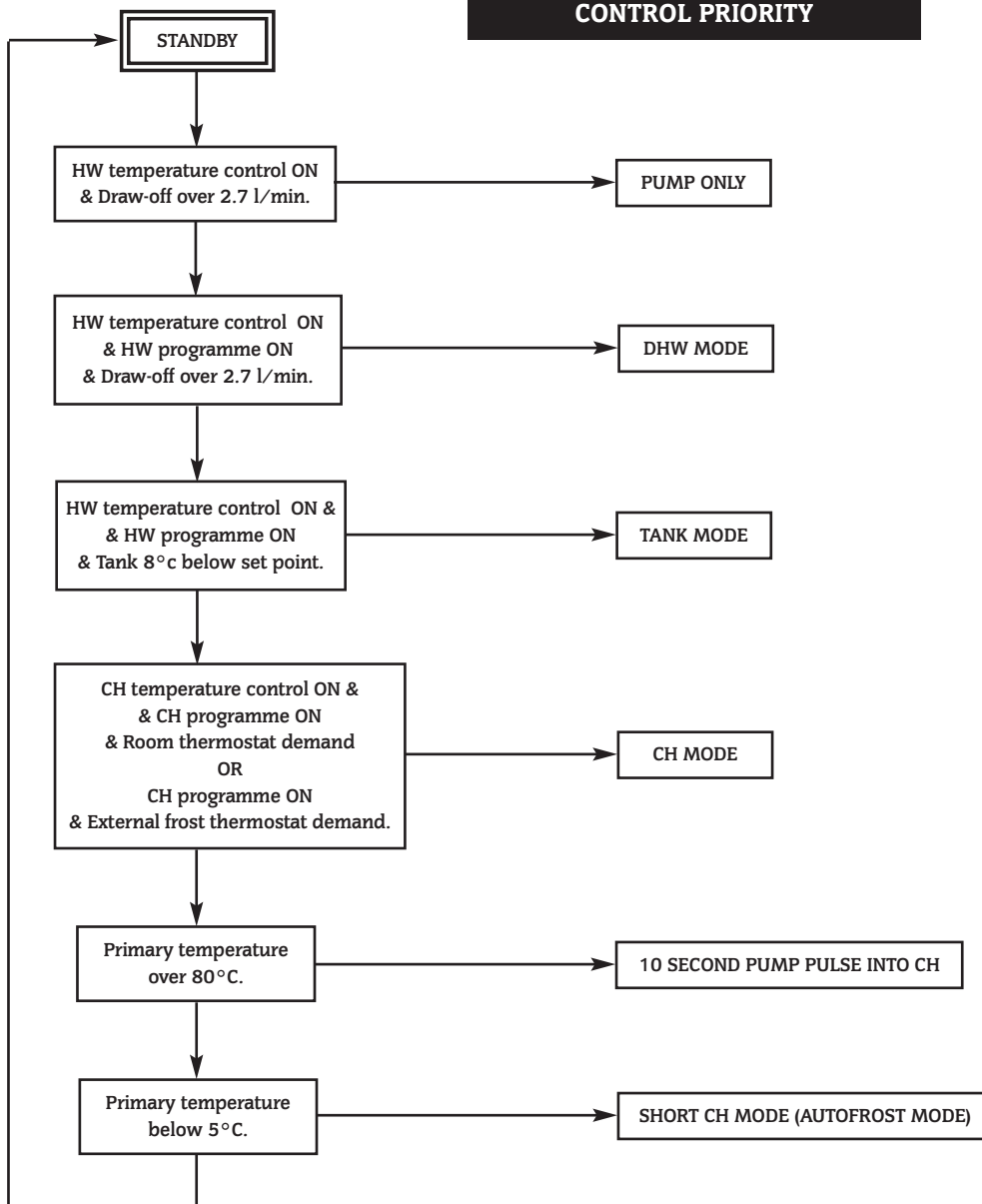
DOMESTIC HOT WATER MODE



TANK MODE



CONTROL PRIORITY



17. 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.

The electronic control system for this boiler incorporates three lights on the fascia. These are used to show normal operating status. But as a secondary function, by flashing, they can also be used to help provide fault diagnostics. Therefore, with individual or groups of lights being permanently off, on or flashing, every normal fault can be identified.

To use the fault finding system, select a box below which represents the light situation during your fault. Then refer to the appropriate fail point. This fault-finding system assumes that the appliance has been operating correctly until the time of failure and not an installation error.

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.

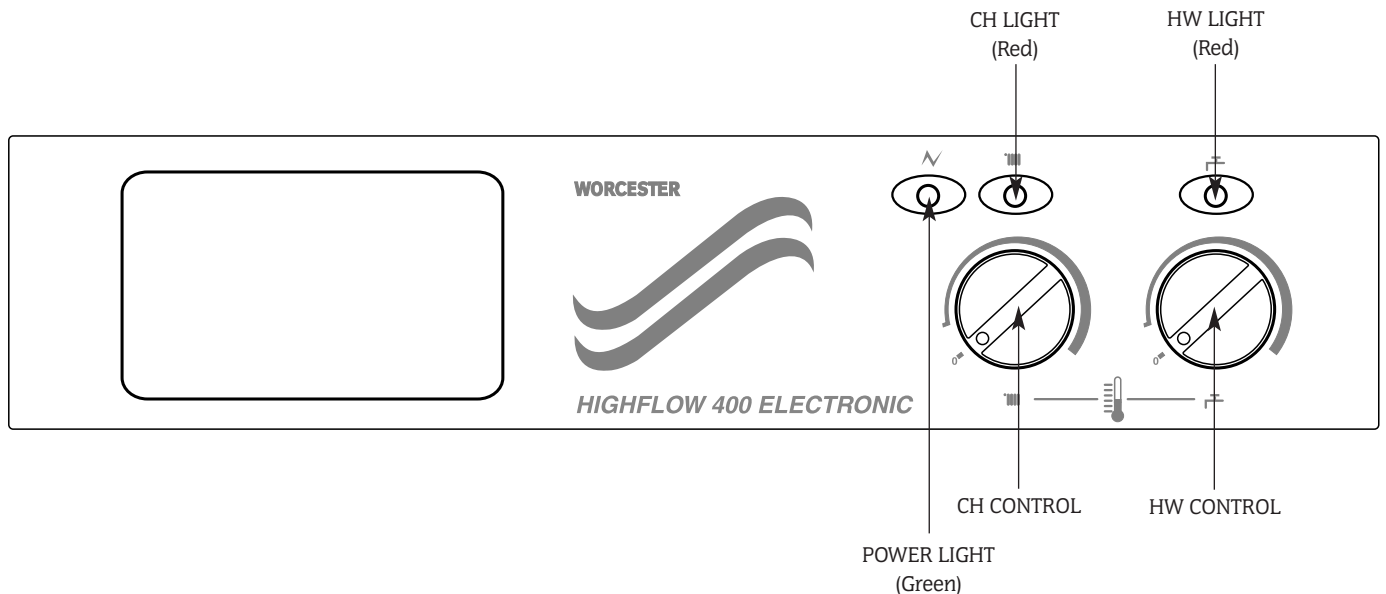
Light Situation During Fault

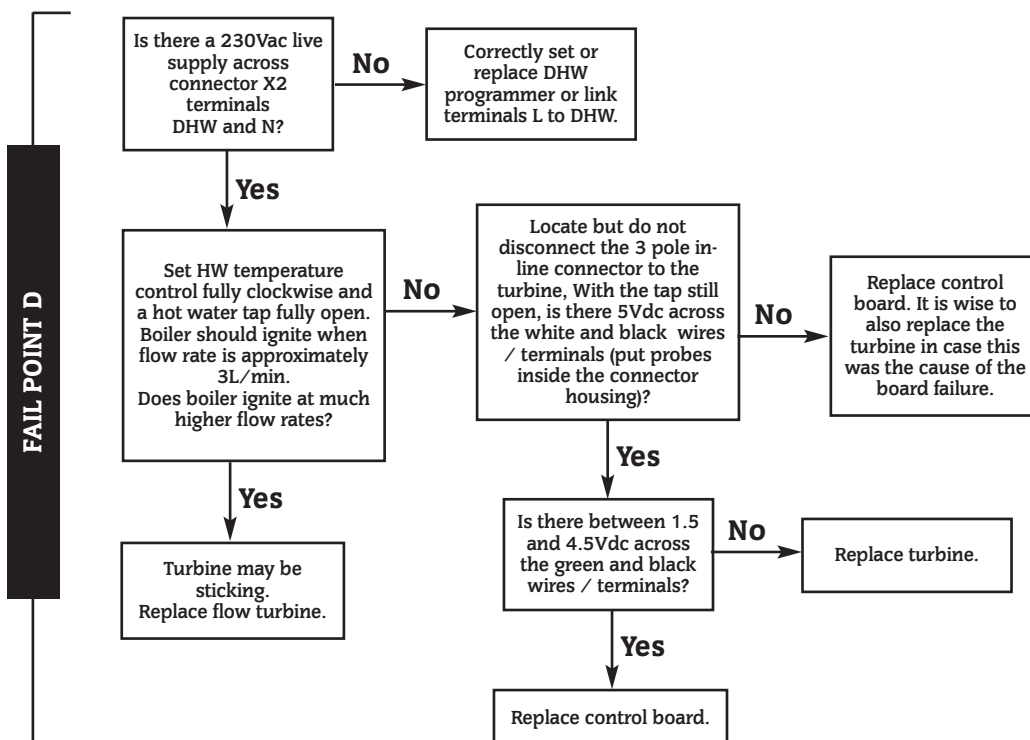
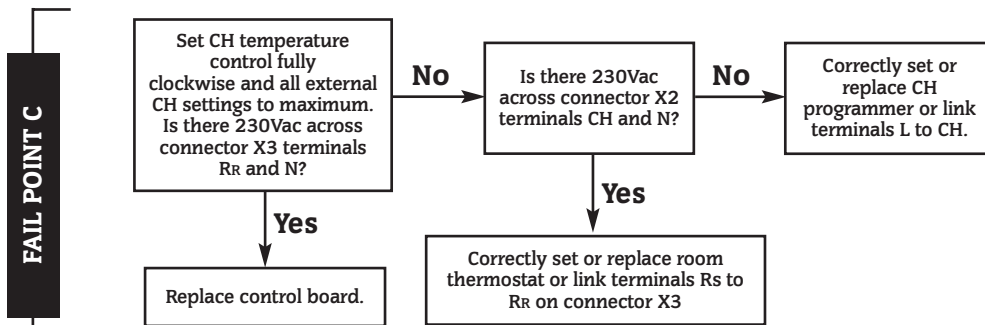
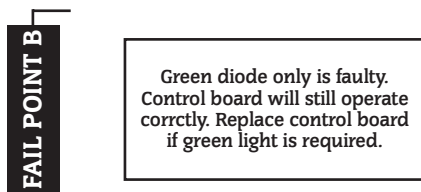
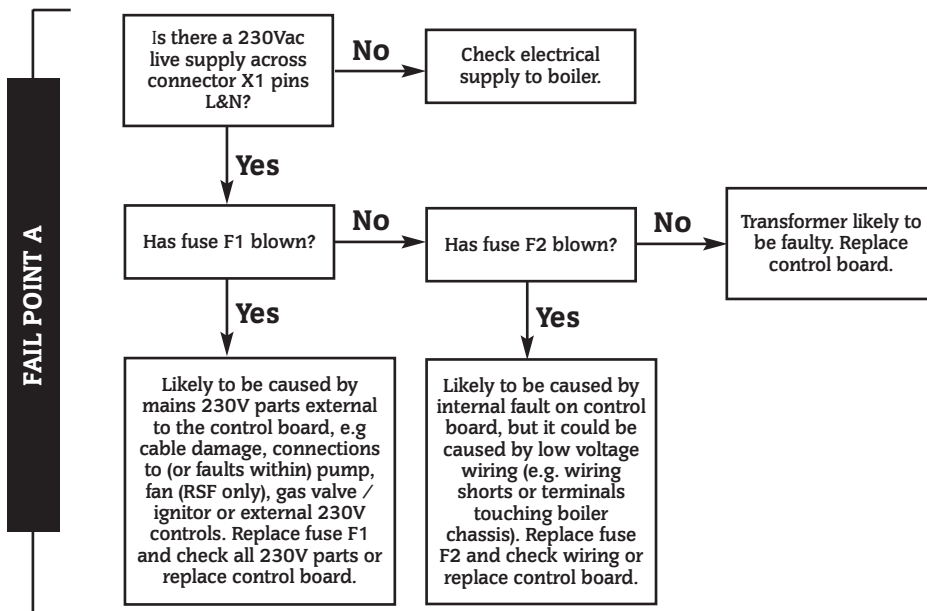
GREEN LIGHT	RED CH LIGHT	RED HW LIGHT	FAILURE DESCRIPTION	FAIL POINT
OFF	OFF	OFF	No lights and no functions	A
OFF			No green light. All functions o.k and red lights o.k.	B
ON	OFF		No CH light and no CH function. HW function o.k.	C
ON		OFF	No HW light and no HW function. CH function o.k.	D
ON			Serious temperature fault in CH or HW mode.	E
ON	SLOW FLASH		Ignition sequence failure lockout. Pilot gas not detected after 2 minutes (reset using CH temperature control).	F
ON	FAST FLASH		Sensor failure.	G
ON	SLOW FLASH	SLOW FLASH	Safety Temperature Limiter lockout (reset using CH temperature control).	H
ON	ALTERNATE FLASH		Tank overheat lockout (call Service Engineer).	I
ON	FAST FLASH	FAST FLASH	Diverter spillage trip (OF only)	J
			Other faults	K

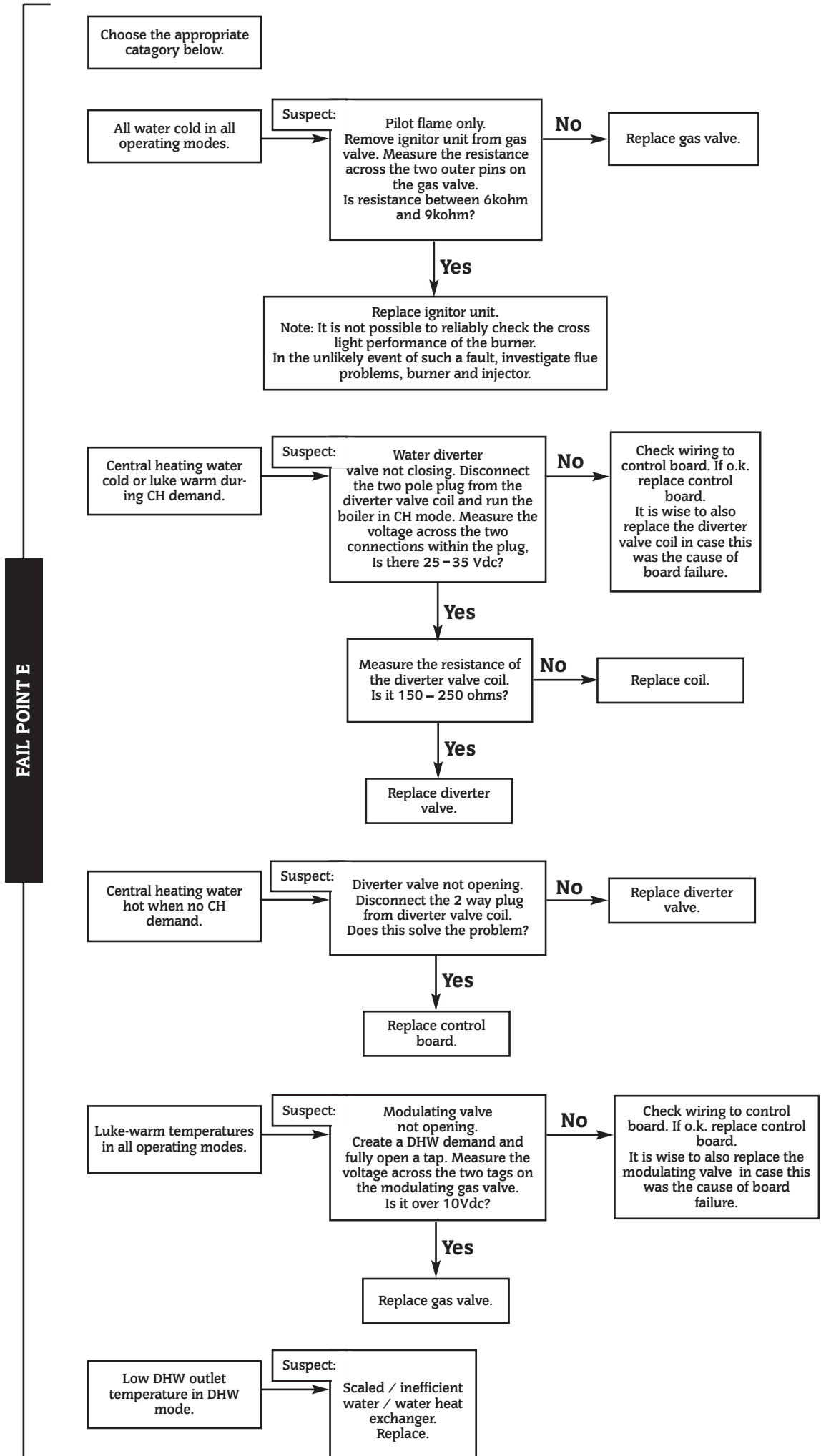
SLOW FLASH is once per second

FAST FLASH is five times per second

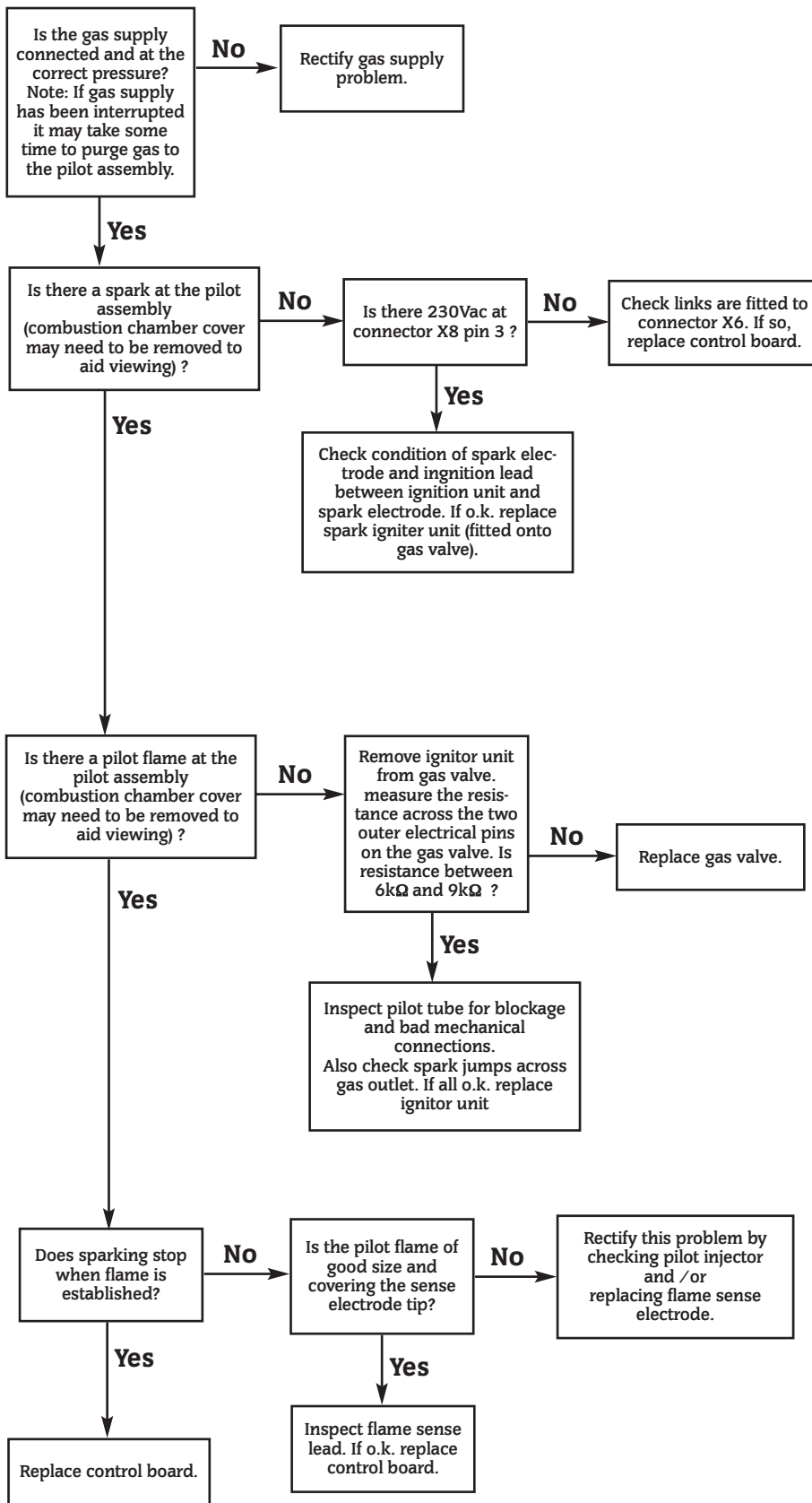
NOTE: There is no mains supply isolating switch on the appliance

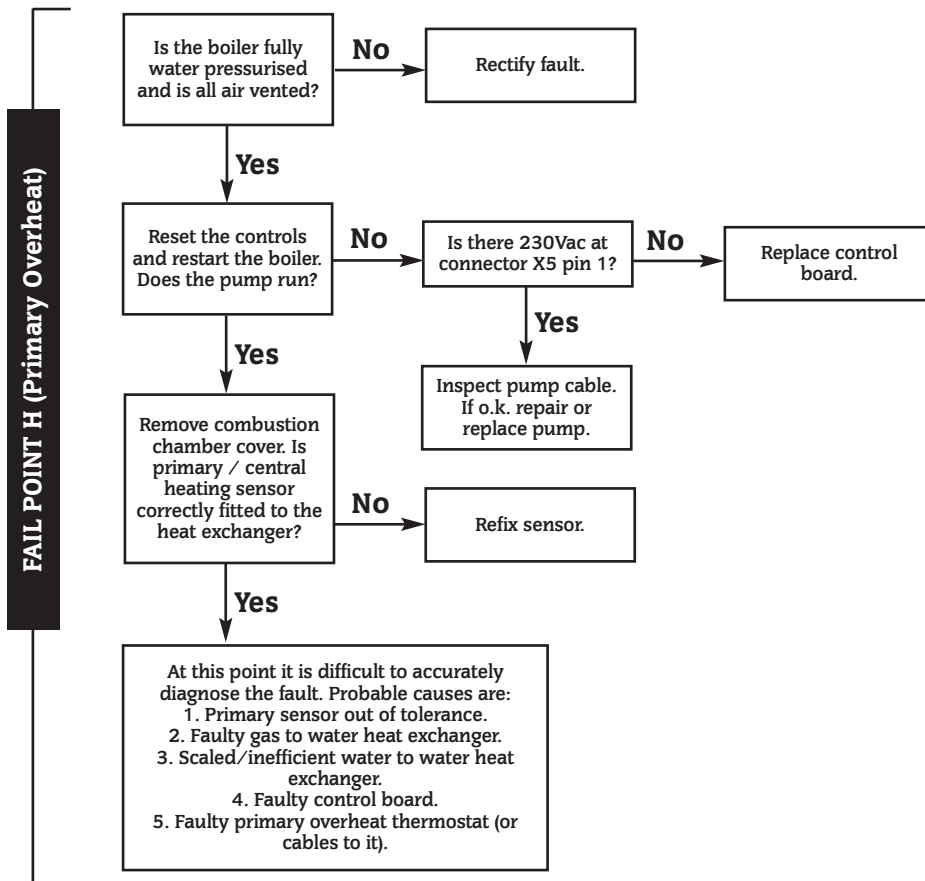
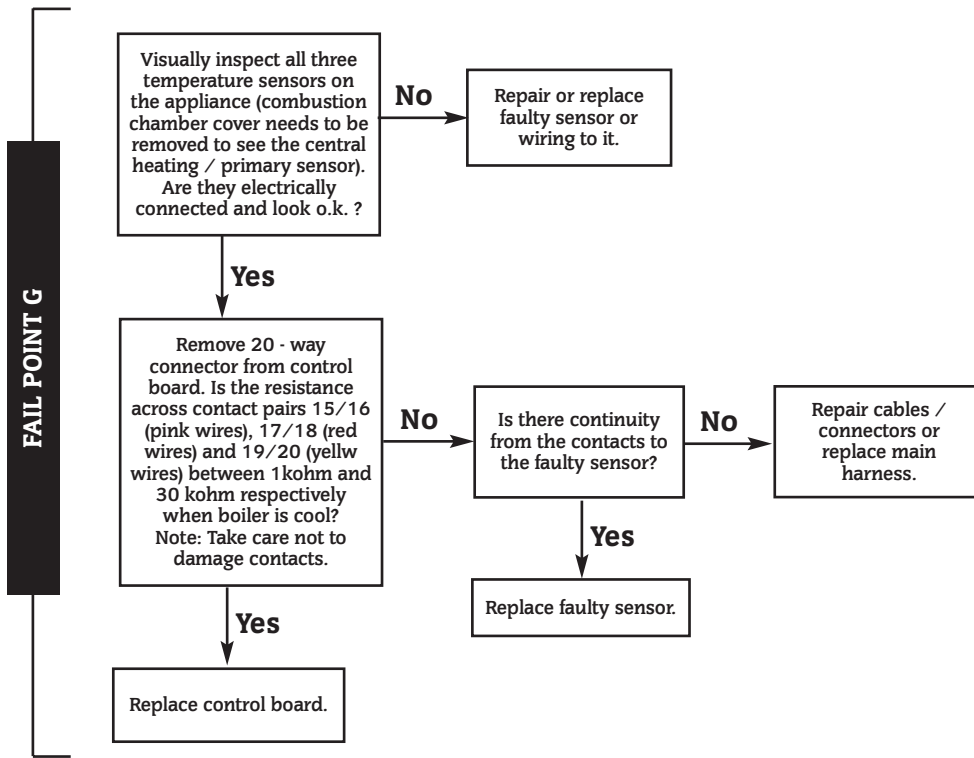






FAIL POINT F (Ignition Sequence Lockout)





FAIL POINT I

Storage tank has overheated.
This is a serious fault.
Call Service Engineer.

FAIL POINT J

Flue gas detected inside boiler.
Note 1:
It is possible that during extreme weather conditions this fault may occur intermittently.
Note 2:
Lights will flash until detector thermostat self resets.

Is flue correctly installed and free of blockages?

No

Unblock/rectify fault.

Yes

Check air/gas channels in gas/water heat exchanger. Are they free of restrictions?

No

Clean or replace heat exchanger.

Yes

Replace flue gas safety device (TTB) OF ONLY. If this fails to solve the problem then replace control board.

FAIL POINT K

If the boiler has developed erratic or poor performance and the above information has not satisfactorily located the fault, the following information may be useful:

Temperature sensors:
These are critical to provide temperature information for the control system.
Check they are fitted securely with conductive paste. May be out of tolerance.

Control board:
May have component failure.

Gas Valve:
Modulating valve may be sticking.

Burner:
May not be cross-lighting effectively.

18. Component Parts List

Key No.	GC No.	Description	Manufacturer's Reference	Qty	WHS Part No.
1	378 025	Burner NG	Aeromatic AC23/053567	1	8 716 142 607 0
2	379 040	Burner Injector	Injector 4.4mm diameter	1	8 716 156 337 0
3		Gas Valve	SIT Sigma	1	8 716 102 995 0
4	379 562	Pilot Burner	Honeywell Q38A2051	1	8 716 142 612 0
5	382 850	Pilot Injector	Honeywell 45.004.108.001B	1	8 716 156 300 0
6	386 575	Spark Electrode	Honeywell 45900413-004	1	8 716 142 104 0
7		Spark Electrode Lead		1	8 716 104 553 0
8		Flame Sense Electrode		1	8 716 104 511 0
9		Flame Sense Electrode Lead		1	8 716 104 554 0
10		Gas to Water Heat Exchanger	c/w washers	1	8 716 102 310 0
11	374 607	Combustion Chamber Insulation		1	7 716 192 227 0
12	E00 717	Auto Air Vent	Caleffi Minical 503020	1	8 716 140 500 0
13	386 244	Pressure Gauge	c/w washers	1	8 716 142 325 0
14	378 810	Pressure Relief Valve	c/w 'O' rings Caleffi 314439	1	8 716 142 422 0
15	325 269	Pump	Grundfos 59876516	1	8 716 102 257 0
16	299 341	Expansion Vessel	12 litres c/w washers	1	8 716 142 507 0
17	299 323	DHW Heat Exchanger	SWEP E8-18 c/w "O" Rings	1	8 716 142 904 0
18		Water Diverter Valve	Bosch c/w "O" Rings	1	8 716 104 569 0
19		Heatbank Overheat Thermostat	Elmwood	1	8 716 103 217 0
20		Safety Temperature Limiter	Elmwood	1	8 716 103 216 0
21		CH/ Primary Sensor	Elmwood 6655-9488-4	1	8 716 142 319 0
22		Tank Sensor	Elmwood	1	8 716 770 425 0
23		HW Sensor Kit	Elmwood 6655-9003-5	1	8 716 142 302 0
24		Programmer Kit (Optional)	Twin Channel	1	7 716 192 007 0
25	324 822	Gauze Filter (HW)		1	8 716 148 401 0
26	378 809	Manual Air Vent	1/4 BSP	1	8 716 140 516 0
27	E57 945	Turbine Assembly	c/w washer and harness	1	8 716 146 160 0
28		Flow Regulator	Type A 18 L/min \pm 15%, Purple with sleeve	1	8 716 104 479 0
29	299 337	Flexible Hose	c/w washers	1	8 716 140 557 0
30		Control Board	Pactrol 423800	1	8 716 102 339 0
31	299 093	Inner Casing Seal		1	8 716 140 747 0
32	299 342	Top Manifold Block	c/w with "O" Rings	1	8 716 143 017 0
33	299 343	Bottom Manifold Block	c/w with "O" Rings	1	8 716 143 016 0
34	299 346	Gasket/ "O" Ring Pack		1	7 716 192 228 0
35		Water Filter Primary System		1	8 716 148 411 0
36		Diverter Valve Coil	c/w clip	1	



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PUBLICATION 8 716 115 019a (02/08)