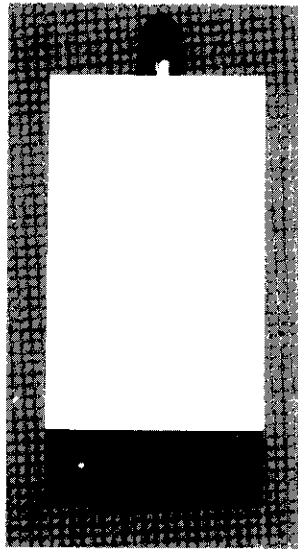


# 230 Combi RSF

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

## INSTALLATION AND SERVICING INSTRUCTIONS



GC No. 47 311 14

### BOILER OUTPUT

Automatic Modulating Control

To Domestic Hot Water

**Minimum 9.2 kW (31,400 Btu/h)**  
**Maximum 23.0 kW (78,500 Btu/h)**

To Central Heating

**Minimum 9.2 kW (31,400 Btu/h)**  
**Maximum 23.0 kW (78,500 Btu/h)**

**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

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## 1. Installation Regulations

### 1.1 Gas Safety (Installation and Use) Regulations 1984

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 Gas Safety (Installation and Use) Regulations 1984 as amended, current IEE Wiring Regulations BS 7671, local Building Regulations, Building Standards (Scotland)(Consolidation) and bylaws of the local Water Company. Health and Safety Document No. 635 (Electricity at Work Regulations). It should be in accordance with the relevant recommendations of the following British Standards.

BS 6798:1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60 kW.

BS 5449:1990 Central Heating for Domestic Premises.

BS 5546:1990 Installation of gas hot water supplies for domestic purposes.

BS 5440:1:1990 Flues and Ventilation for gas appliances of rated input not exceeding 60 kW: Flues.

BS 5440:2:1989 Flues and Ventilation for gas appliances of rated input not exceeding 60kW: Air Supply.

BS 6891:1988 Installation of low pressure gas pipework installations up to 28 mm (R1).

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.

## 2. General Information

2.1 This appliance is not suitable for external installation.

2.2 The appliance controls are set to provide a maximum output of 23 kW for the domestic hot water and a central heating load of up to 16.1 kW.

2.3 The control circuit provides automatic ignition. A permanent pilot is not used.

2.4 **PRINCIPLE APPLIANCE COMPONENTS** See Fig. 1.

A low thermal capacity Gas to Water heat exchanger.

A Water to Water heat exchanger to provide domestic hot water. Fully modulating controls in the central heating and domestic hot water modes of operation.

An expansion vessel, pressure gauge and pressure relief valve.

A by-pass for the central heating system.

Temperature safety cut-out controls.

A water flow regulator.

A standard horizontal flue assembly giving flue lengths from 100 mm to 500 mm.

An optional extra extension flue kit to provide for flue lengths up to 1500 mm long.

An optional fascia mounted programmer instead of the standard Operating Switch.

### 2.5 ELECTRICAL SUPPLY

Mains supply: 240V ~, 50 Hz, 270 watts. External fuse 3A. Internal fuses: T2A (F1) and T315mA (F2).

### 2.6 GAS SUPPLY

The boiler requires 2.69 m<sup>3</sup>/h (95.2 ft<sup>3</sup>/hr) of gas. The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demand from any other appliances being served. The table below gives an indication of limiting gas pipe lengths and the allowance to be made for fittings. Refer to BS6891 for further information.

The meter governor should deliver a dynamic pressure of 20 mbar (8in wg.) at the appliance, equivalent to a pressure of about 18.5-19 mbar at the gas valve.

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

TOTAL LENGTH OF GAS SUPPLY PIPE (metres)			Pipe Diameter (mm)
3	6	9	
Gas Discharge Rate (m <sup>3</sup> /h)			
2.9	-	-	15
8.7	5.8	4.6	22
18.0	12.0	9.4	28

#### Note:

Each fitting used in the gas line from the meter is equivalent to a length of straight pipe which must be added to the straight pipe length to give the total length.

ie: Elbow = 0.5 metres, Tee = 0.5 metres, 90° Bend = 0.3 metres.

### 2.7 PACKING

The appliance and flue components are packed in separate cartons.

### 2.8 GENERAL INSTALLATION

The appliance is only for connection to a sealed system.

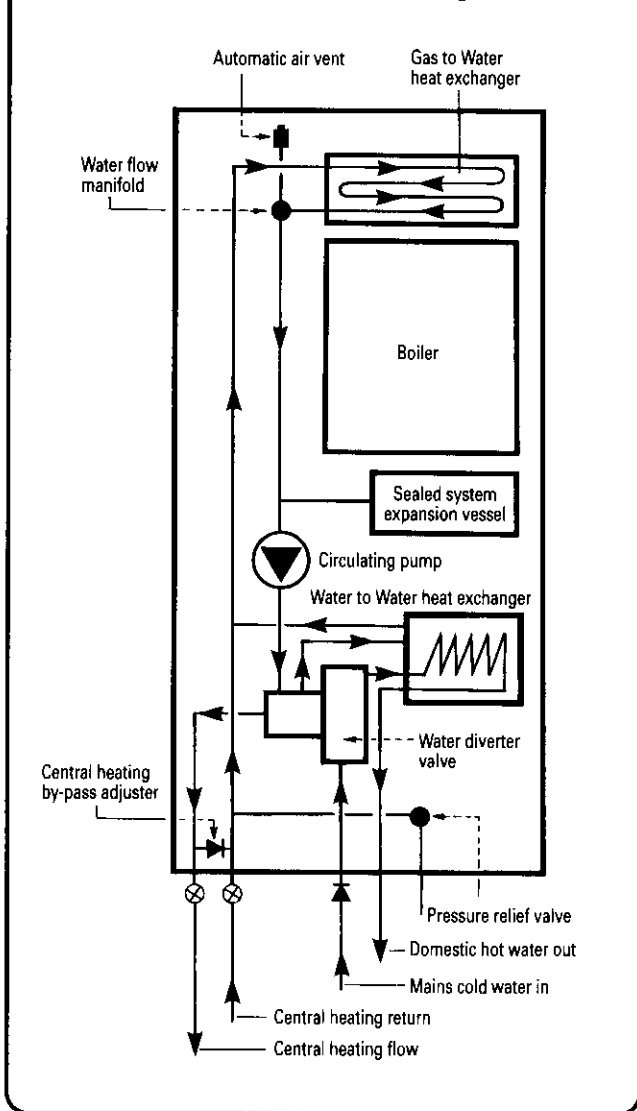
The specified ventilation openings made into a wall or compartment door must not be obstructed.

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

Do not place anything on top of the appliance.

The clearances specified for servicing must be maintained.

**Fig. 1. Appliance water flow diagram.**



## 2.9 FLUE

The appliance has a multi-directional horizontal fanned flue system—right, left or rear.

The standard flue assembly length is from 100 mm to 500 mm. An extension flue length from 501 mm to 1500 mm is available. A terminal guard, Type K2, GC 393 553, is available from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.

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

A kit for internal fixing of the flue is available separately.

## 2.10 CONTROLS

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

The Operating Switch provides for the selection of domestic hot water only (**WATER**) or central heating and domestic hot water (**HEATING & WATER**) or **OFF**.

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

The integral facia displays indicate the status of the appliance.

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

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

## 2.11 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 cold water mains supply. Purge the gas supply before finally connecting the appliance.**

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

Radiator valves must conform to the requirements of BS 2767 1991.

The relief valve discharge 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 3 relating to the available pump head.

## 2.12 SHOWERS, BIDETS, TAPS AND MIXING VALVES

Hot and cold taps and mixing valves used in the system must be suitable for operating at a mains pressure of up to 10 bar.

Thermostatically controlled or pressure equalising 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.

## 2.13 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 switched off.

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

## 2.14 OPERATION

**Domestic Hot Water:** With a demand for hot water the burner will light at its maximum setting and then automatically adjust its output to maintain the temperature of the delivered water. When hot water is no longer required, the burner will extinguish. The pump will continue to run for a short period to dissipate the residual heat from the appliance.

**Central Heating:** With a demand for heating the burner will light at its minimum setting and gradually increase to give the maximum output. The output of the appliance is then automatically adjusted to maintain the temperature of the system. The output can reduce down to a minimum of 9.2 kW. If the system no longer requires even the minimum output to maintain the desired room temperature the burner will extinguish. The pump will continue to run to dissipate the residual heat from the appliance. The appliance will remain off for a fixed period of two minutes before re-lighting to automatically meet the system requirements.

**Domestic Hot Water and Central Heating:** The appliance will supply heat to the central heating system as required. A demand for domestic hot water at a tap or shower will override the central heating requirement for the period of the domestic hot water demand. When hot water is no longer required the appliance will return to the central heating state and its normal mode of operation. The pump will continue to run to dissipate the residual heat from the appliance as necessary.

### 3. Technical Data

The Data Plate is fixed to the control box casing.

TABLE 1

NOMINAL BOILER RATINGS							
Output		Input		Burner Setting Pressure		Gas Rate	
kW	Btu/h	kW	Btu/h	m bar.	in. wg.	m <sup>3</sup> /h	ft <sup>3</sup> /h
9.2	31,400	13.0	44,300	2.5	1.0	1.22	43.0
16.1	54,900	21.0	71,600	6.8	2.7	1.97	69.5
23.0	78,500	28.8	98,200	13.5	5.4	2.69	95.2

TABLE 2 – Flue Details

Horizontal Flue	mm	inches
Wall Hole Diameter	110	4.25
Standard Flue – Minimum Length	100	4
Standard Flue – Maximum Length	500	19
Extended Flue – Maximum Length	1500	59

TABLE 3

AVAILABLE PUMP HEAD						
Boiler Output		Head		Min. Flow Rate		Temp. rise across heating flow and return
kW	Btu/h	metres	feet	litres/min	gal/min	
9.2	31,400	4.9	15.9	12.0	2.64	11°C (20°F)
16.1	54,900	2.54	8.25	21.0	4.63	
23.0	78,500	2.0	6.5	21.0	4.63	15°C (27°F)

TABLE 4

SPECIFICATIONS	
CENTRAL HEATING FLOW FITTING	22 mm Compression
CENTRAL HEATING RETURN FITTING	22 mm Compression
COLD WATER MAINS INLET FITTING	15 mm Compression
DOMESTIC HOT WATER OUTLET FITTING	15 mm Compression
GAS INLET FITTING	Rc <sup>1</sup> / <sub>2</sub>
PRESSURE RELIEF VALVE DISCHARGE FITTING	15 mm Compression
OVERALL HEIGHT (including flue elbow)	1100 mm (43.3 in.)
CASING HEIGHT	900 mm (35.4 in.)
CASING WIDTH	450 mm (17.7 in.)
CASING DEPTH	360 mm (14.2 in.)
WEIGHT (including water)	47.6 kg (105 lb.)
INSTALLATION WEIGHT	45.6 kg (100 lb.)
PACKAGED WEIGHT	48.5 kg (107 lb.)

TABLE 5

SPECIFICATIONS	
PRIMARY WATER CAPACITY	2.7 litres (0.6 galls.)
MAXIMUM COLD SUPPLY PRESSURE	10 Bar (150 psi)
MINIMUM COLD SUPPLY PRESSURE (WORKING) FOR MAXIMUM HOT WATER FLOW	1.6 Bar (23.5 psi)
MINIMUM COLD SUPPLY PRESSURE (WORKING) TO OPERATE THE APPLIANCE	0.6 Bar (9 psi)
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	Nominally 82°C (180°F)
OUTPUT TO DOMESTIC HOT WATER	Modulating 9.2–23 kW (31,400–78,500 Btu/h)
OUTPUT TO CENTRAL HEATING	Modulating 9.2–23 kW (31,400–78,500 Btu/h)
MAXIMUM DOMESTIC HOT WATER FLOW RATE FROM THE APPLIANCE	Nominally 8.0 litres/min (±15%) (1.75 gallons/min)
EQUIVALENT DOMESTIC HOT WATER FLOW RATE TO GIVE A TEMPERATURE RISE OF 35°C	Nominally 9.4 litres/min (2.07 gallons/min)

## 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 BS 7671 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 does not require any special wall protection.

4.4 The wall must be capable of supporting the weight of the appliance. See Table 4.

4.5 If the appliance is to be fitted in a timber framed building, refer to the British Gas publication DM2 "Guide for Gas Installations in Timber Framed Housing".

4.6 The following clearances must be available for installation

	Installation	Servicing
Above the flue elbow	30 mm	30 mm
In front	600 mm	600 mm
Below	230 mm	230 mm
Right hand side	20 mm	20 mm
Left hand side	5 mm	5 mm

and for servicing. See Fig. 2.

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

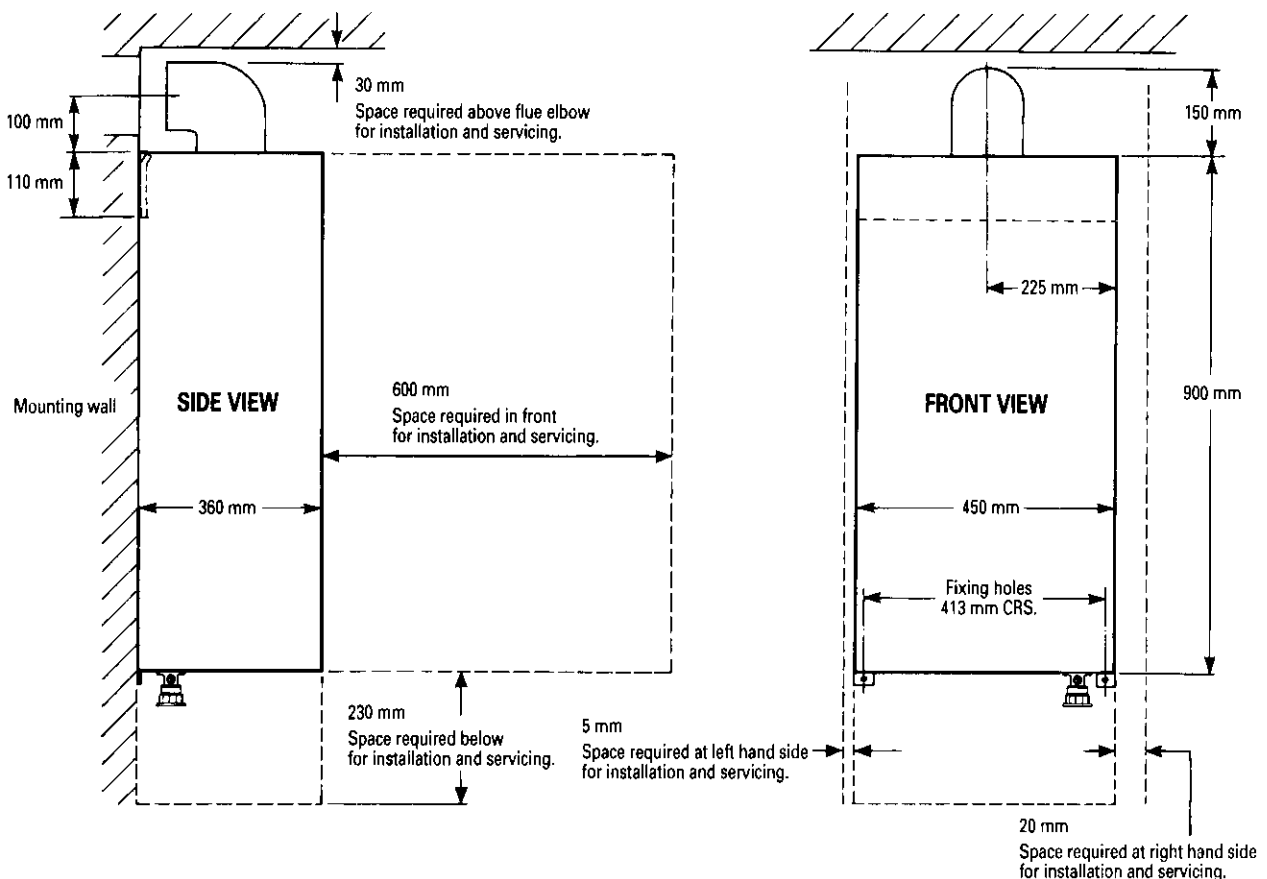
4.8 The airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh are acceptable provided that the major dimension is less than 13 mm. See BS 6798:1987.

4.9 No combustible surface must be within 75 mm of the casing. See BS476:4.

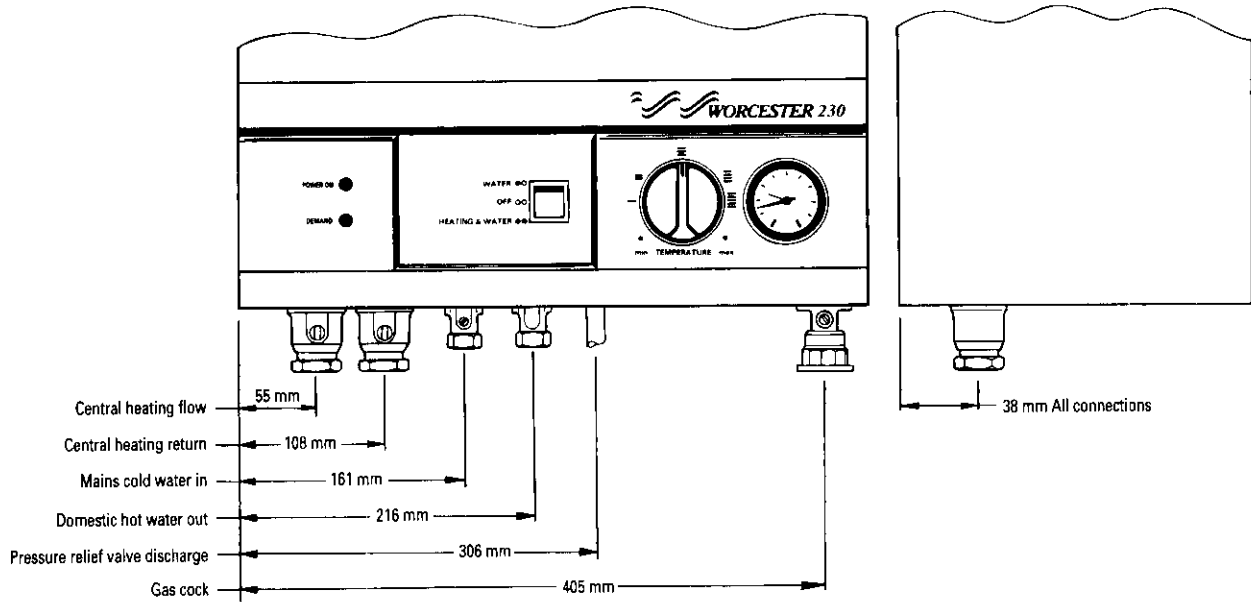
4.10 The distance between the inner face of a cupboard door and the cabinet front should not be less than 75 mm.

4.11 Always consider the possible need to disconnect the pipes from the appliance after installation.

Fig. 2. Appliance casing dimensions and required clearances.



**Fig. 3. Appliance pipework connections.**



## 5. Siting the Flue Terminal

See Fig. 4

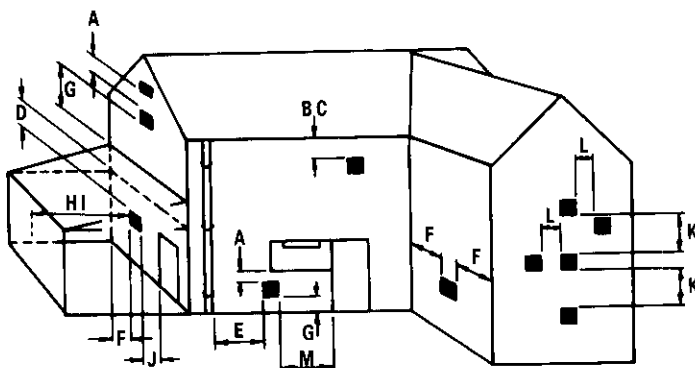
- 5.1 The flue must be installed as specified in BS 5440:Part 1.
- 5.2 The terminal must not cause an obstruction nor the discharge cause a nuisance.
- 5.3 If the terminal is fitted within 850 mm of a plastic or painted gutter or within 450 mm of painted eaves then an aluminium shield at least 750 mm long should be fitted to the underside of

the gutter or painted surface.

- 5.4 If a terminal is fitted less than 2 metres above a surface to which people have access then a guard must be fitted. See Section 2.9.
- 5.5 The terminal guard must be evenly spaced about the flue terminal and fixed to the wall using plated screws.
- 5.6 In certain weather conditions a terminal may steam and siting where this could cause a nuisance should be avoided.
- 5.7 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.	300 mm (12 in.)
B- Below gutters, soil pipes or drain pipes.	75 mm (3 in.)
C- Below eaves.	25 mm (1 in.)
D- Below balconies or car port roof.	25 mm (1 in.)
E- From vertical drain pipes and soil pipes.	25 mm (1 in.)
F- From internal or external corners.	25 mm (1 in.)
G- Above ground, roof or balcony level.	300 mm (12 in.)
H- From a surface facing a terminal.	600 mm (24 in.)
I- From a terminal facing a terminal	1200 mm (47 in.)
J- From an opening in a car port (e.g. door window) into dwelling.	1200 mm (47 in.)
K- Vertically from a terminal on the same wall.	150 mm (6 in.)
L- Horizontally from a terminal on the same wall.	300 mm (12 in.)
M- From door, window or air vent (achieve where possible).	150 mm (6 in.)

## 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. The clearances required for installation and Servicing will normally be adequate for venti-

lation. See Section 4.6.

**6.4** The minimum free areas required are given below.

Position of air vents	Air from the room	Air direct from outside
High Level	260 cm <sup>2</sup> . (40 in <sup>2</sup> .)	130 cm <sup>2</sup> . (20 in <sup>2</sup> )
Low Level	260 cm <sup>2</sup> . (40 in <sup>2</sup> .)	130 cm <sup>2</sup> . (20 in <sup>2</sup> )

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

## 7. Sealed System

See Figs. 5 and 6

- 7.1** The system must comply with the requirements of BS 6798 and BS 5449.
- 7.2** The appliance must not be operated without the system being full of water, properly vented and pressurised.
- 7.3** The pressure relief valve operates at 3 bar (45lb/in<sup>2</sup>). The discharge must be directed away from electrical components or where it might be a hazard to the user.
- 7.4** The pressure gauge indicates the system pressure which must be maintained.
- 7.5** The 8 litre expansion vessel is charged to 0.5 bar and is suitable for a static head of 5 metres (17.5ft). The pressure can be increased if the static head is greater than 5 metres (17.5ft).
- 7.6** With an initial system pressure of 0.5 bar, a system capacity of about 83 litres can be accommodated. Refer to BS 7074 Pt. 1 for more information. The charge pressure can be increased but with a decrease in system volume.

**7.7** The filling point must be at low level. See Figs. 5 and 6.

**7.8** Water loss must be replaced. See Fig 6. The connection should be made in the central heating return as close to the appliance as possible. See Figs. 5 and 6

**7.9** The make-up vessel must be fitted with a non-return valve.

**7.10** Repeated venting loses water from the system. It is essential that this water is replaced and the system pressure maintained.

**7.11** Connections to the mains water supply must not be made without the authority of the local Water Company.

**7.12** The pump is set at maximum and must not be adjusted.

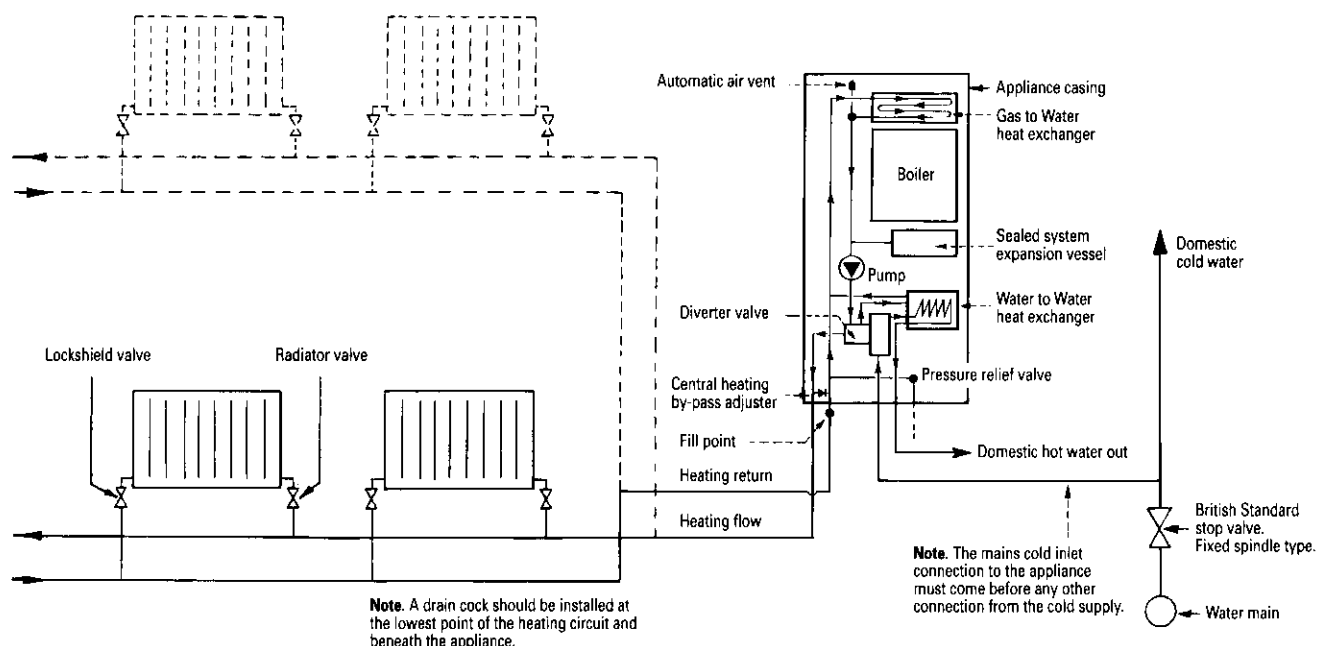
**7.13** Connections in the system must resist a pressure of up to 3 bar.

**7.14** Radiator valves must conform to BS 2767:1991.

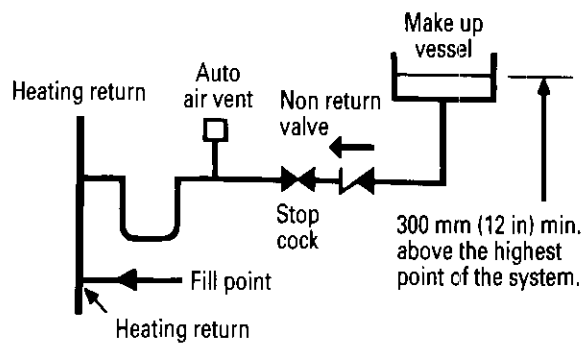
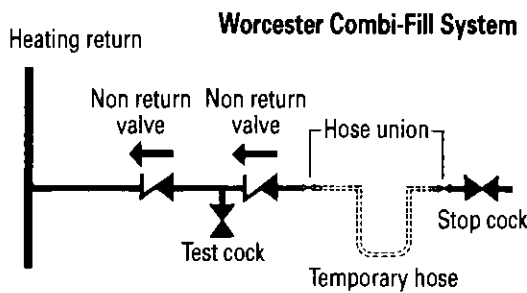
**7.15** Other valves used should conform to the requirements of BS 1010.

**7.16** To make use of the extra heating available from the appliance at the end of any demand, it is recommended that a single small radiator be left permanently open.

**Fig. 5. Sealed primary water system.**



**Fig. 6. System filling and make-up**



## 8. Domestic Hot Water

**8.1** The following are general requirements and, if necessary, reference should be made to the local Water Company before fitting the appliance.

**8.2 MAINS COLD WATER INLET.** Devices capable of preventing the flow of expansion water must not be fitted unless separate arrangements have been made. An expansion vessel connection point is provided within the appliance.

An Rc 1/2 connection is provided on the flow switch. See Fig. 36. A Zilmet Z160 is the preferred type. A thread sealant compatible with potable water must be used.

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

**8.4** The appliance is suitable for a mains pressure of up to 10 bar (150 lb/in<sup>2</sup>).

**8.5** The appliance is fitted with a mains supply isolating valve.

**8.6** The maximum domestic hot water flow rate is 8.0 litres/min ( $\pm 15\%$ ) (1.75 gallons/min).

**8.7** In winter (when the mains inlet water temperature is lower) a reduced flow rate at the taps will be required to achieve the maximum hot water delivery temperature available in warmer weather.

**8.8** It is suggested that long pipe runs to the taps or shower should be insulated to prevent the rapid cooling of domestic hot water after a tap or shower has been turned off.

**8.9** Hot and cold taps and mixing valves used with this appliance must be suitable for operating at a pressure of up to 10 bar (150 lb/in<sup>2</sup>).

**8.10** No anti-syphonage arrangements are necessary except for some loose head showers. See also Section 8.10 following.

**8.11** Thermostatically controlled or pressure equalising shower valves will guard against the flow of water at too high a temperature.

**8.12** The head of a loose head shower must not fall closer than 25 mm (1 in) 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.

**8.13** 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.

**8.14** As the maximum temperature of the Water to 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.

Installation of a scale inhibitor assembly should be in accordance with the requirements of the local Water Company. An isolating valve should be fitted to allow servicing. The water hardness can be determined using a standard test paper or by reference to the local Water Company.



## 9. Electrical

See Figs. 7, 8, 9, 10, and 11.

**9.1 MAINS SUPPLY.** 240 V ~, 50 Hz, 270 watts.  
External Fuse 3A. Internal Fuses: T2A (F1) and T315mA (F2).

**9.2** It must be possible to completely isolate the appliance.

**9.3** Connection to the mains supply should be via a double pole isolator with a contact separation of 3mm in all poles and supplying the appliance and controls only.

**9.4** The appliance must be earthed.

**9.5 Mains Cable.** 0.75 mm<sup>2</sup> (24 x 0.20 mm) to BS 6500 Table 16.  
The mains cable must be connected into the terminals marked L (Brown or Red lead), N (Blue or Black lead) and the earth stud and

be held securely in the cable clamp. For access refer to Section 13.

**9.6** The wiring between the appliance and the electrical supply shall comply with current IEE Wiring Regulations and any local regulations which apply.

**9.7** If a room and/or frost thermostat is to be fitted refer to Figs. 10 and 11. The thermostats must be suitable for use on mains voltage.

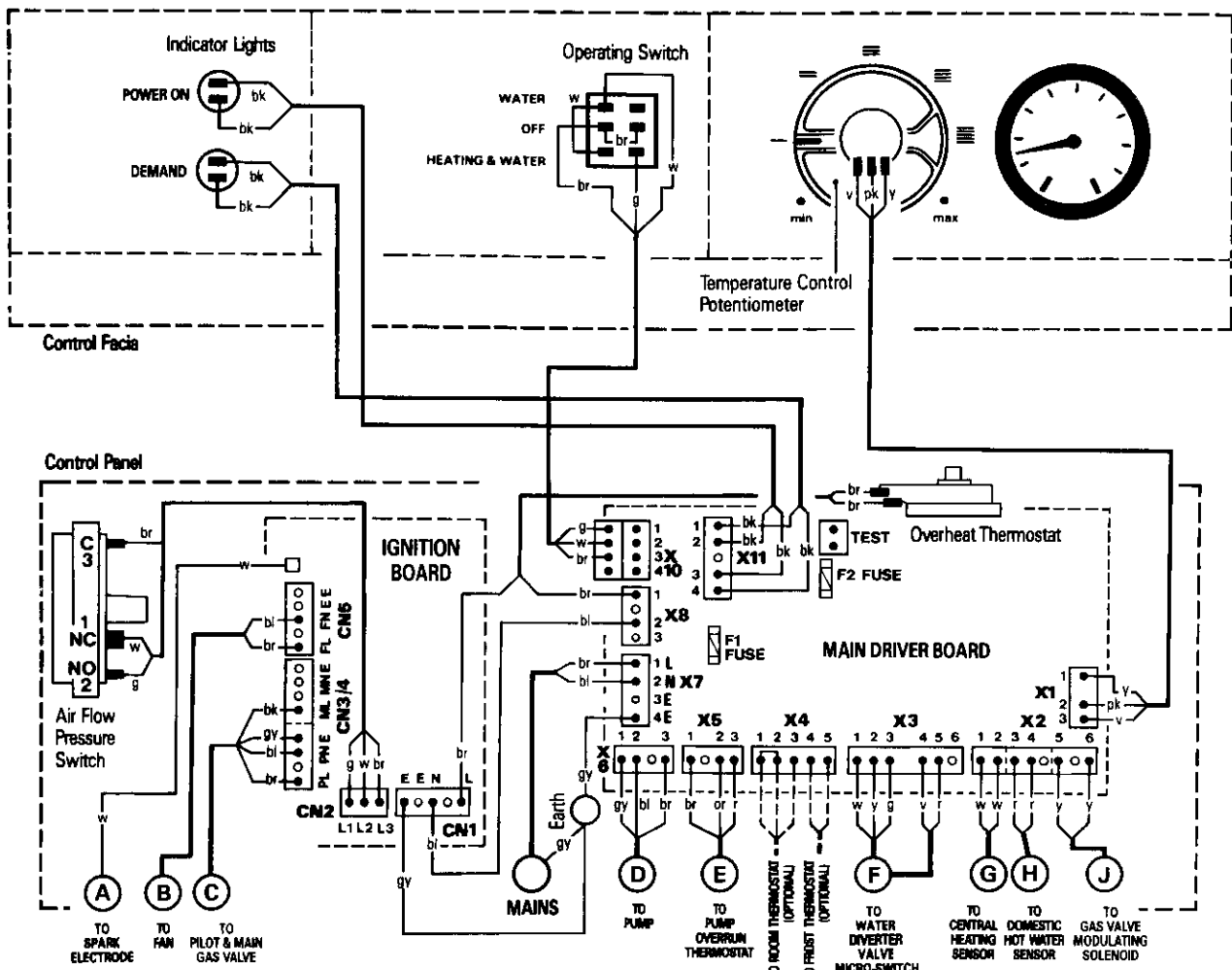
**9.8** A fascia mounted programmer is available as an extra. Instructions are supplied with the programmer kit.

**9.9** A time switch or programmer can be fitted externally to the appliance.

**9.10 SAFETY CHECK.** After installation or in the event 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. 7. Wiring Diagram – Control panel and fascia.**

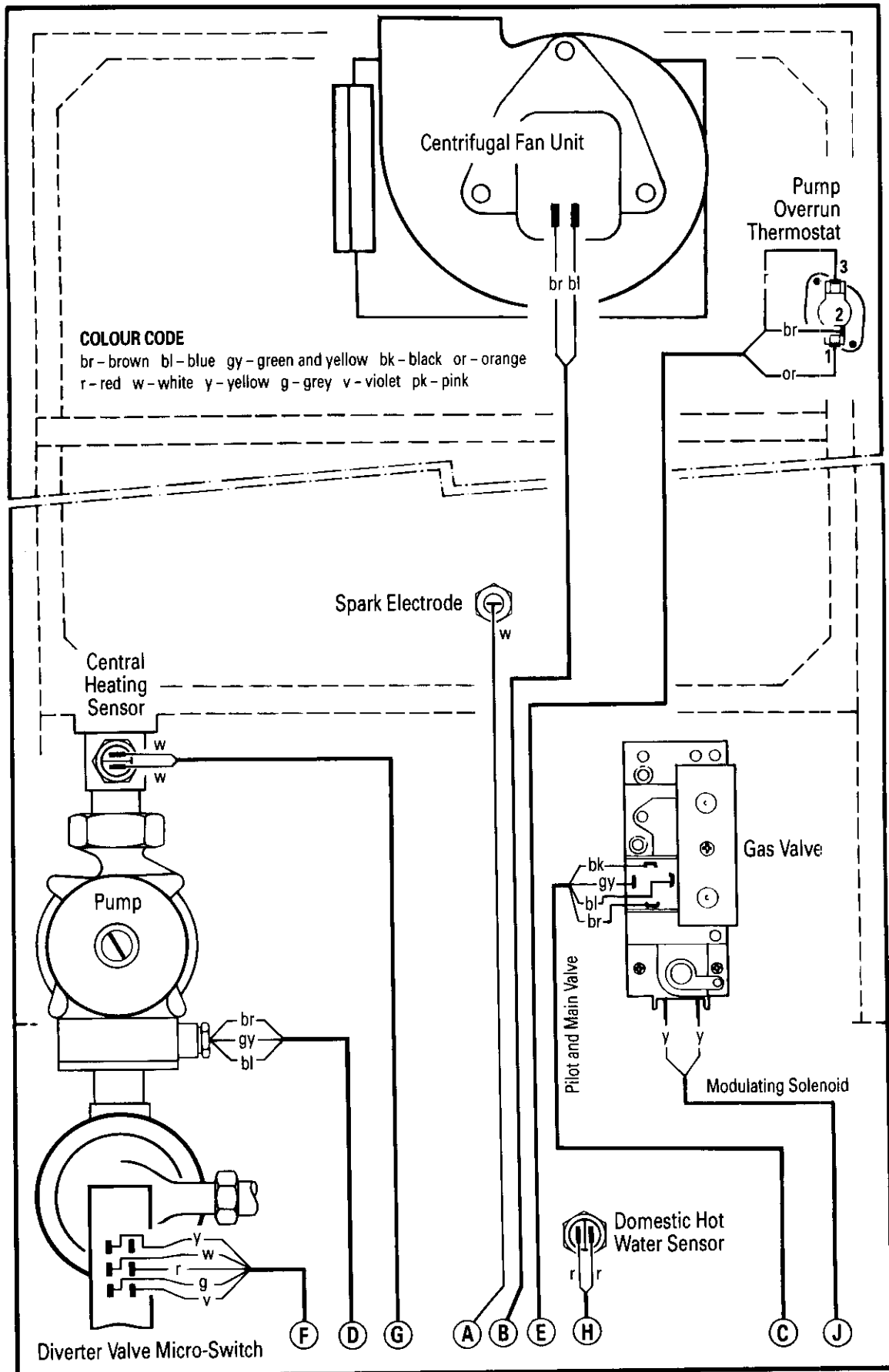
(All components shown viewed from front of appliance)

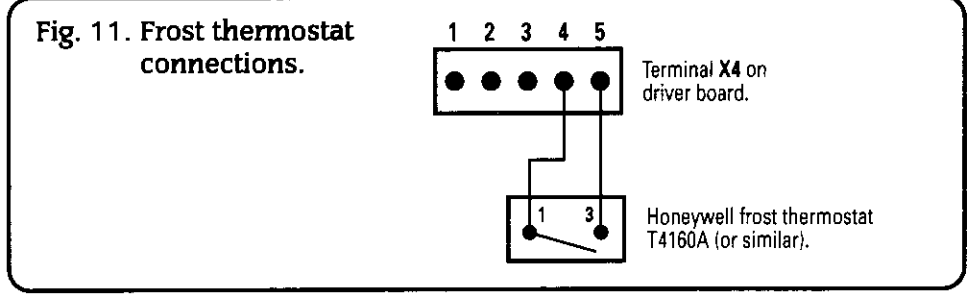
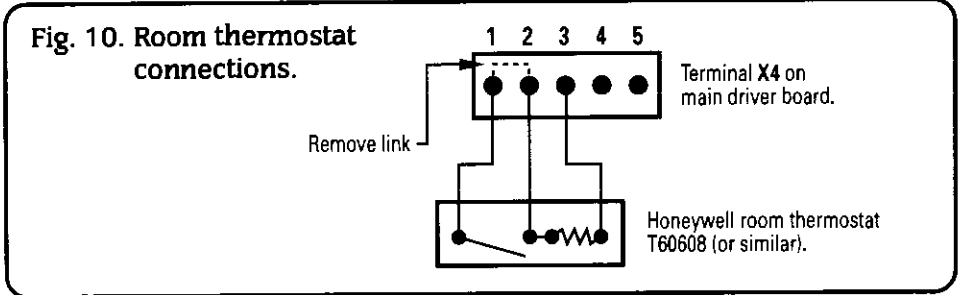
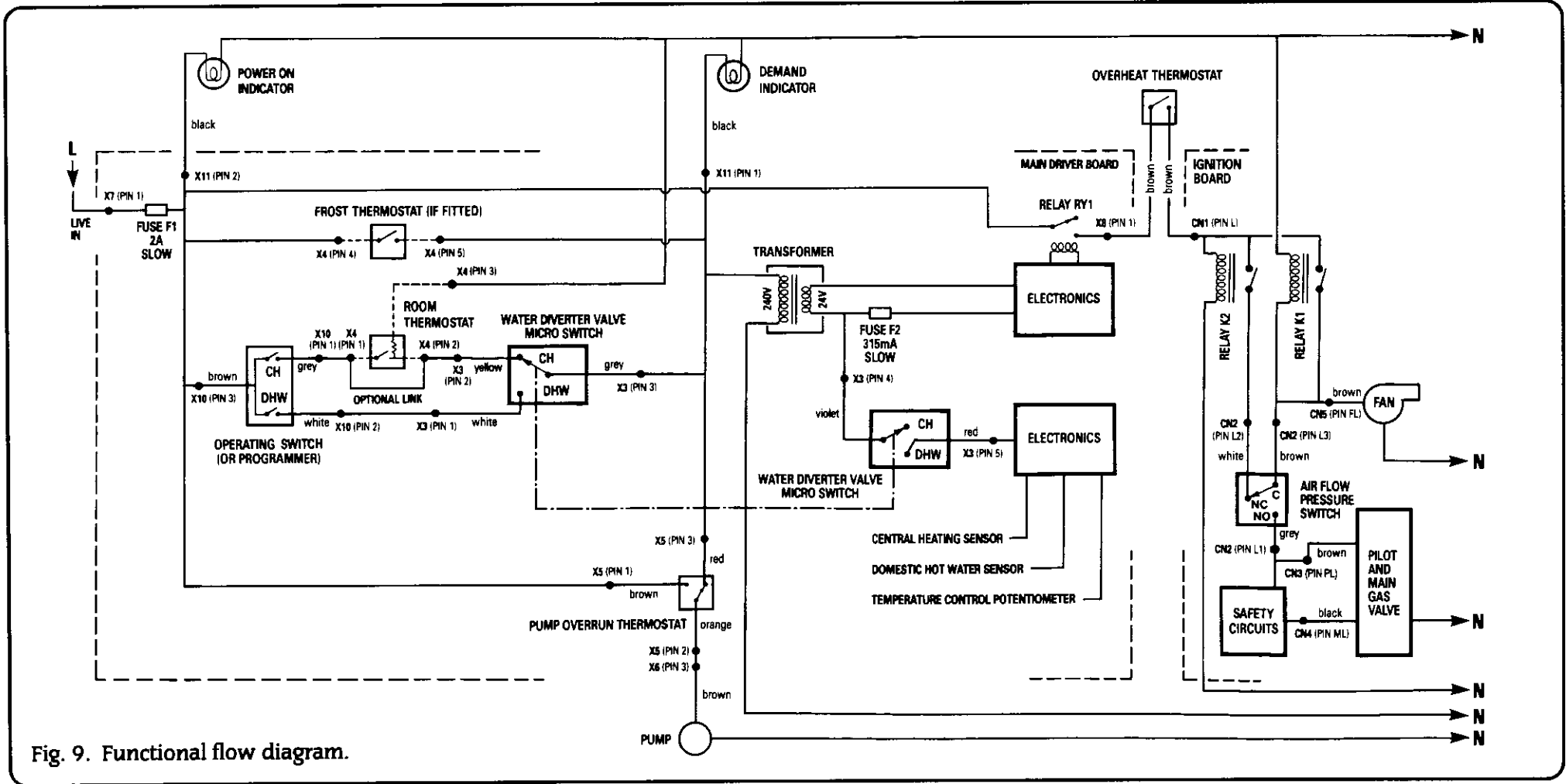


### COLOUR CODE

br - brown bl - blue gy - green and yellow bk - black or - orange  
r - red w - white y - yellow g - grey v - violet pk - pink

**Fig. 8. Wiring Diagram – Components outside control panel.**  
 (All components shown viewed from front of appliance)





## 10. Installation

The appliance is only suitable for fitting to a sealed system.

**10.1** The standard flue length is from 100 mm to 500 mm measured from the appliance casing to the outer wall.

The extended flue length is from 501 mm to 1500 mm. Only one extension may be used.

The flue must be installed as specified in BS 5440 Part 1.

**Note.** READ THIS SECTION FULLY BEFORE COMMENCING INSTALLATION

### 10.2 GENERAL FITTING.

Check that the appliance carton contains:- Appliance Installers Instruction Pack Appliance Mounting Plate Users Information Pack Installer Hardware Pack

Check that the position chosen for the appliance is in accor-

dance with the instructions given in Sections 4 and 5.

The distance from the bottom of the mounting plate to the top of the appliance casing is 106mm.

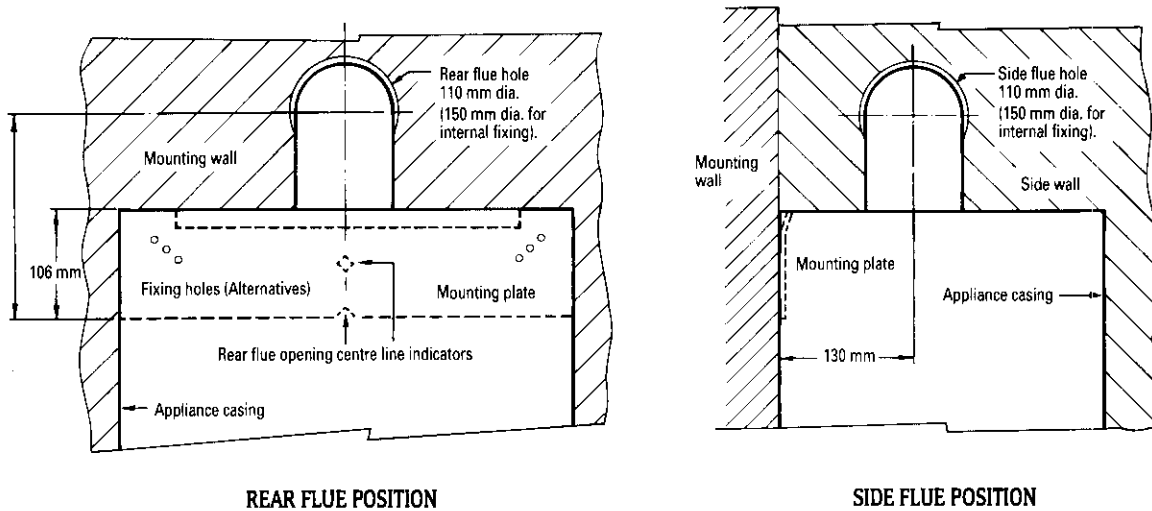
Hold the appliance mounting plate to the wall. Check that the plate is horizontal. See Fig 12.

Mark the position of the fixing holes and the position of the flue hole centre line onto the wall. Draw a horizontal line along the bottom of the mounting plate.

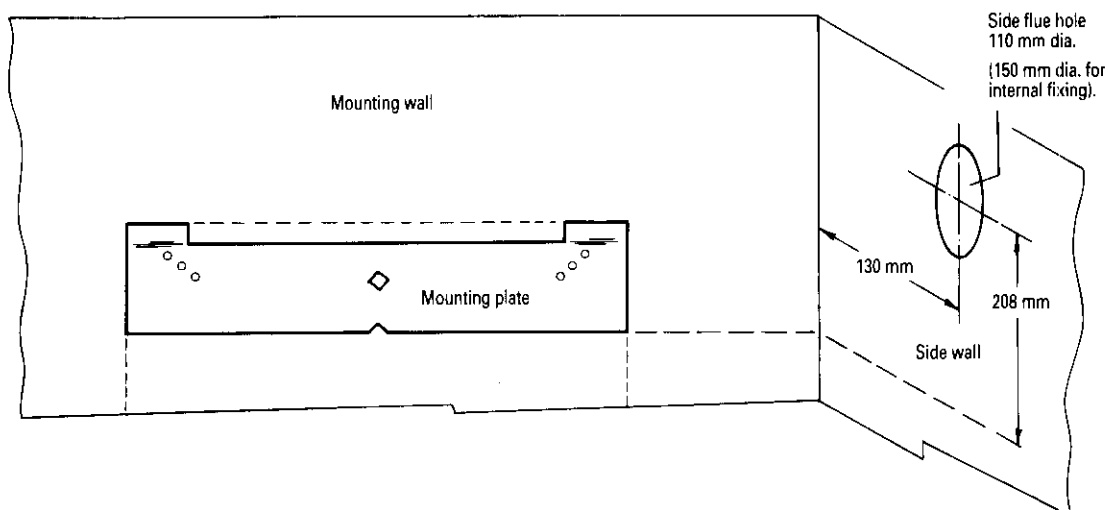
**Rear Flue** - Mark a vertical line through the flue hole centre point. Measure upwards 208 mm from the bottom of the mounting plate and mark the point. This is the centre point of the flue duct hole. See Fig 12.

**Side Flue** - Extend a horizontal line from the bottom of the mounting plate along the appropriate wall. Check that it remains horizontal and measure 208 mm upwards and mark a horizontal line. Measure 130 mm from the junction of the walls and mark a vertical line which will then give the position of the flue hole. See Fig 13.

**Fig. 12. Appliance mounting plate and flue position.**



**Fig. 13. Marking out the side flue position.**



Drill the two fixing holes 60 mm deep for No. 12 size plugs. Cut the flue duct hole at 110 mm diameter (150 mm dia. for internal fitting). Ensure that the hole is horizontal through the wall.

Fix the appliance mounting plate, and check that it is horizontal before tightening the two screws.

The gas and water pipes can be led towards the appliance at this stage. See Fig 3. The primary system should be flushed and treated in accordance with the recommendations of BS 7593:1992. Also flush the primary cold water supply pipe before the appliance is fitted to the wall.

Hang the appliance onto the wall. Drill (at a slight rising angle) through the two appliance fixing holes at the bottom of the casing. Plug and fix the casing bottom. Connect the gas, water and pressure relief valve connections to the appliance. A 15 mm shut-off valve (supplied with the Installer Pack) must be fitted to the cold water supply connection. See Fig 3.

Remove the cabinet front panel and the inner casing cover. Refer to Section 13.3 (a and b).

Unscrew and discard the automatic air vent cap. See Fig 14.

If the air and flue duct assembly is to be fitted from inside the room then the ducts must be cut to length, assembled and inserted through the wall at this stage before fitting the flue elbow to the appliance. Refer to Section 10.4 following for the assembly of the air and flue ducts.

Remove the fan. See Section 13.3(e).

### 10.3 AIR AND FLUE DUCT PREPARATION AND ASSEMBLY

Check the contents of the standard flue duct kit against the packing list. Similarly check the extension duct kit if applicable.

**Remove all the packing from the ducts and terminal assembly.**

The standard flue kit accommodates a flue assembly up to 500 mm long measured from the appliance casing to the outer wall face. See dimension L Figs.16 and 17. When dimension L is greater than 500 mm the extension flue assembly will be required.

Measure and cut the air and flue ducts to length ensuring that the cuts are square and free from burrs. Always check the dimensions before cutting the ducts.

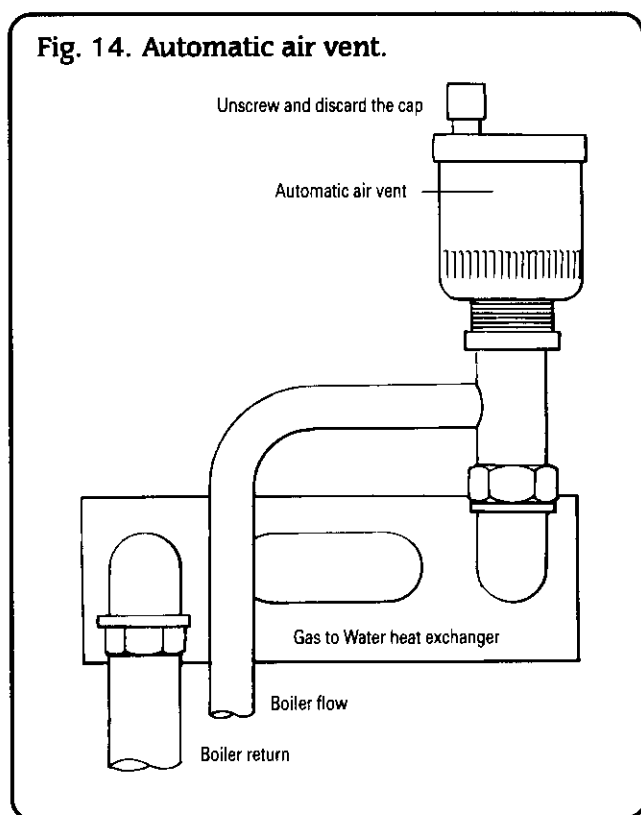


Fig. 14. Automatic air vent.

### EXTERNAL FITTING OF THE DUCT ASSEMBLY

#### Rear Flue Assembly

Measure distance L. See Fig 16

Air duct length =  $L + 73$  mm.

Flue duct length =  $L + 128$  mm.

Do not cut the drilled end of either duct.

Assemble the air and flue ducts to the terminal. Drill through the holes in the terminal into the air duct and fix using the screws provided. See Fig. 18. Join the extension ducts to the standard ducts as indicated in Fig. 19 applying a smear of silicone sealant to the end of the flue duct. Drill and screw together the air ducts. Push the assembly through the wall from outside the premises.

Fix the assembly to the flue elbow.

Drill through the holes in the elbow into the flue duct and fix with the screws provided. Access is gained by slightly withdrawing the flue duct. Spread a smear of silicone sealant around the elbow and push the air duct into position. Drill and fix the air duct to the elbow. See Figs. 18 and 20.

Align the flue elbow with the spigot on the appliance. See Fig. 15.

Align the clamp with the top of the spigot and tighten. Seal any small gaps in the spigot beneath the clamp with a small quantity of sealant.

Make good the internal and external brickwork or rendering.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

#### Side Flue Assembly

Measure distance L. See Fig 17

Air duct length =  $L + 170$  mm.

Flue duct length =  $L + 225$  mm.

Do not cut the drilled end of either duct.

Assemble the air and flue ducts to the terminal. Drill through the holes in the terminal into the air duct and fix using the screws provided. See Fig. 18. Join the extension ducts to the standard ducts as indicated in Fig. 19 applying a smear of silicone sealant to the end of the flue duct. Drill and screw together the air ducts. From outside, push the assembly through the wall and enter the ducts into the flue outlet elbow.

Pull back the air duct slightly to allow access to the flue duct. Drill through the holes in the elbow into the flue duct and fix with the screws provided. Spread a smear of silicone sealant around the elbow and push the air duct into position. Drill and fix the air duct to the elbow. See Figs. 18 and 20.

Align the flue elbow with the spigot on the appliance using silicone sealant. See Fig. 15.

Align the clamp with the top of the spigot. Seal any small gaps in the spigot beneath the clamp with a small quantity of sealant.

Make good the internal and external brickwork or rendering.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

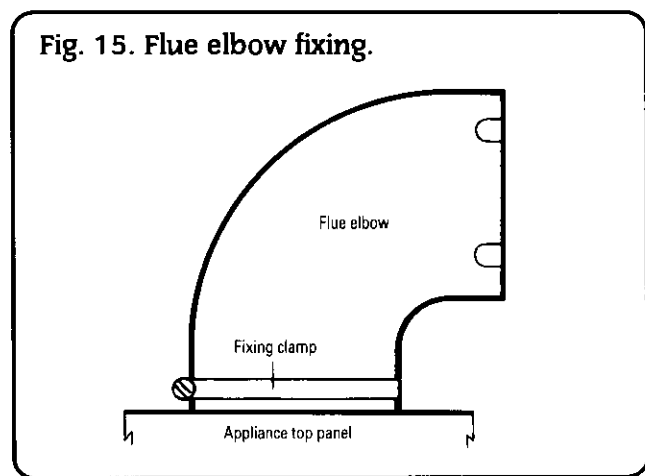


Fig. 15. Flue elbow fixing.

#### 10.4 INTERNAL FITTING OF THE DUCT ASSEMBLY

The rubber sealing gasket and the clamping ring are available from Worcester Heat Systems.

Measure and cut the ducts as previously described for external fitting (Section 10.3). Fix the ducts to the terminal and fit the rubber sealing gasket and clamp to the terminal. Centralise the gasket and tighten the clamping ring. See Fig 21. Slide the flue centring ring onto the air duct and tighten the screw. See Fig. 22. Fix the ducts and terminal assembly to the flue outlet elbow as described in Section 10.3 preceding.

Push the assembly through the wall so that the gasket flange is against the outside face of the wall. See Fig 22.

Align the flue elbow with the spigot on the appliance. Align the clamp with the top of the spigot. Seal any small gaps in the spigot beneath the clamp with a small quantity of sealant. See Fig. 15.

Refit the fan. Do not use any sealant on the joint. Replace the inner casing cover.

Seal the gap around the duct with the flexible seal provided and make good. See Fig 22.

#### 10.5 FINAL INSTALLATION

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

If a fascia mounted programmer is to be fitted, unscrew the upper two screws holding the fascia panel in place and carefully lower the fascia. See Fig 23.

Unplug the Operating Switch from terminal X10 on the main driver board. See Fig.7. Unscrew the four screws holding the switch plate and remove the complete Operating Switch assembly. Fit the programmer and tighten the four screws. Plug the programmer into terminal X10 on the main driver board.

Lower the control box as described in Section 13.3(d).

Connect the mains electrical supply to the appliance at terminal X7. Ensure that the earth lead is longer than the live and neutral leads and securely fixed into the cup washer on the earthing stud. See Fig.7. Connect any room and/or frost thermostats. The electrical leads must pass through the appropriate holes in the control panel and be fixed with the cable clamps provided. See Fig. 24. Refit the fascia panel.

Fig. 16. Flue duct length (rear flue).

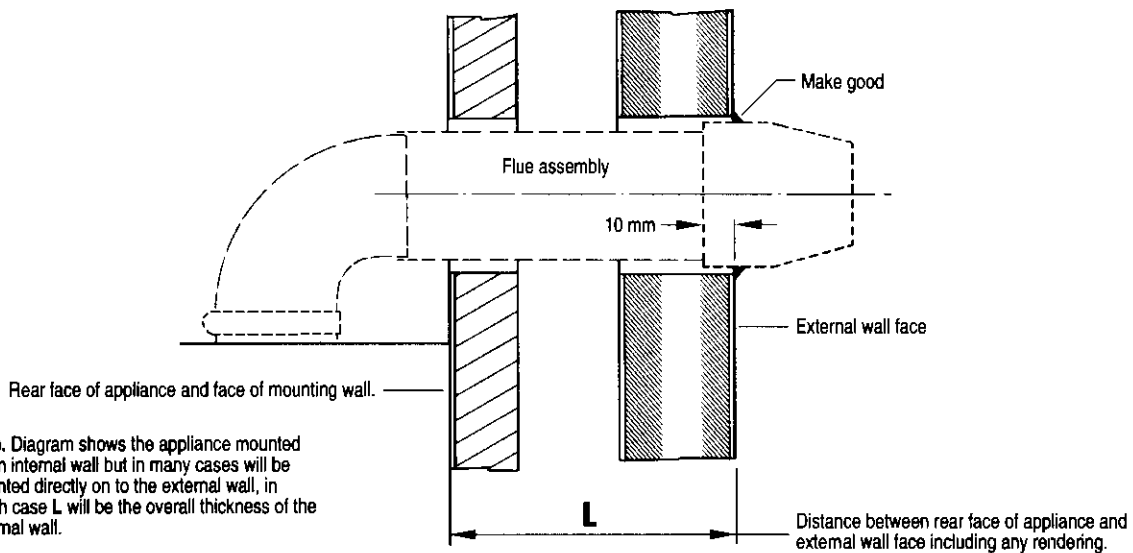
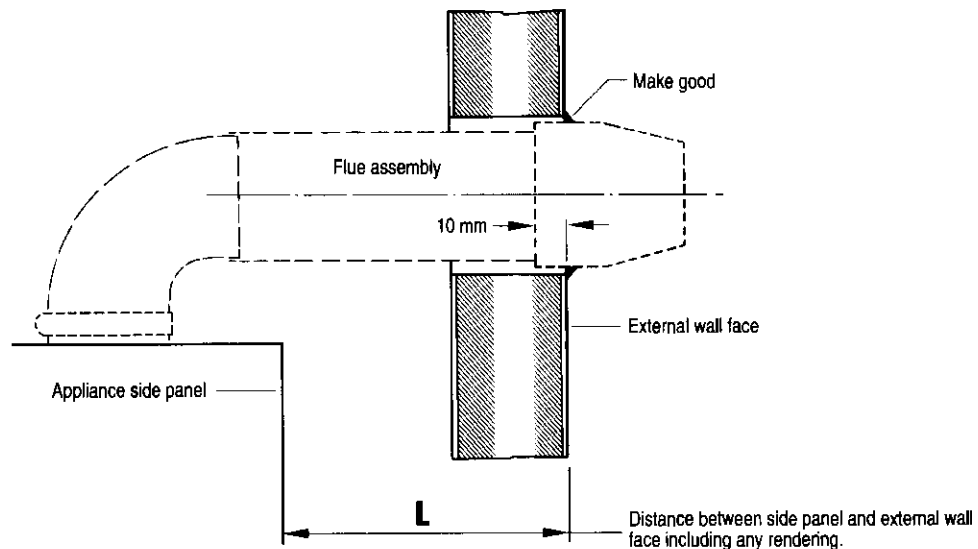
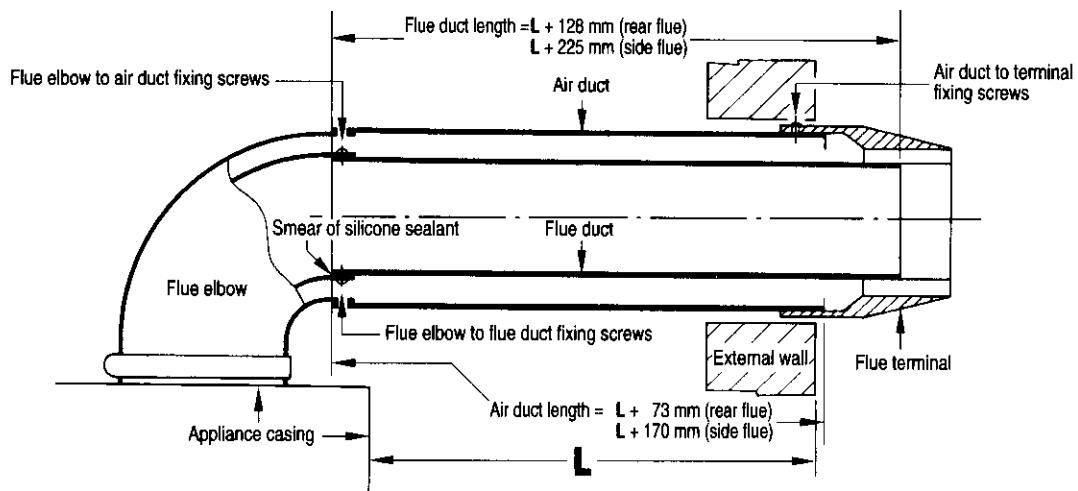


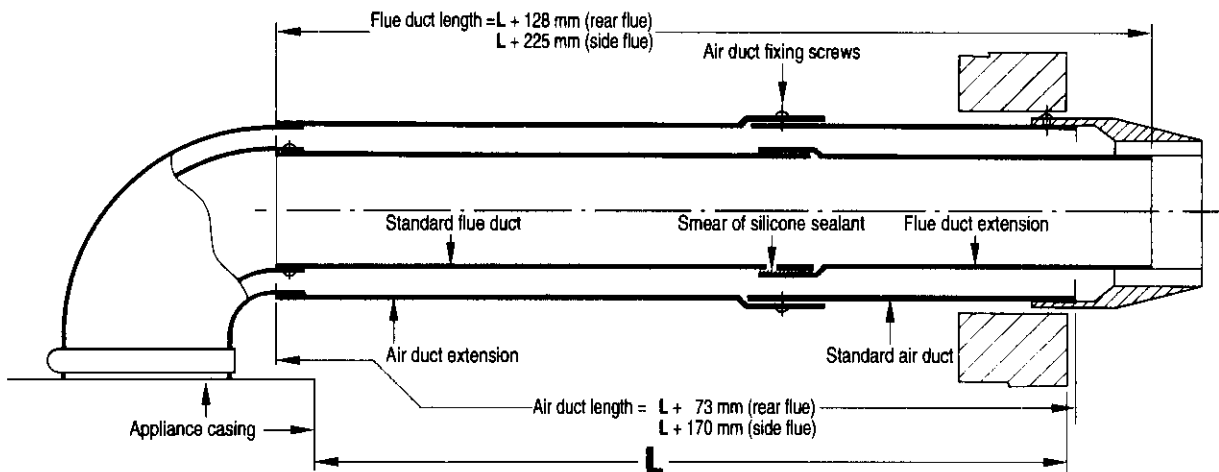
Fig. 17. Flue duct length (side flue).



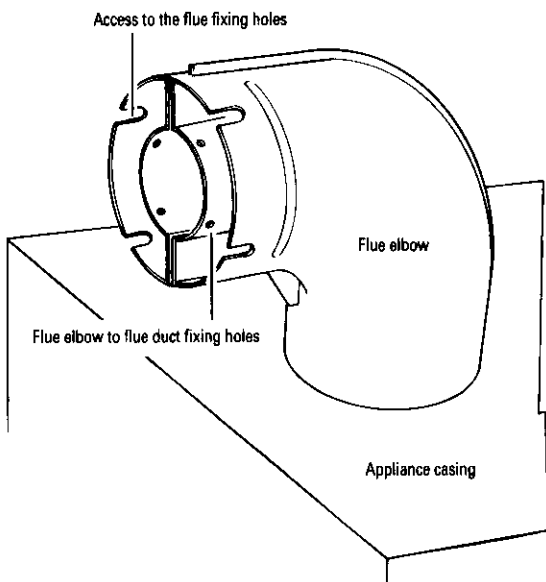
**Fig. 18. Flue elbow, ducts and terminal assembly.**



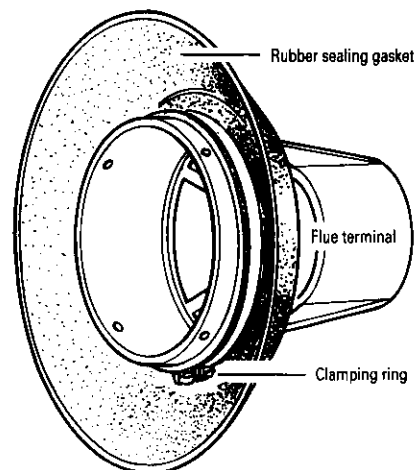
**Fig. 19. Flue assembly using the extension ducts.**



**Fig. 20. Flue elbow.**



**Fig. 21. Terminal assembly for internal fitting of the flue.**



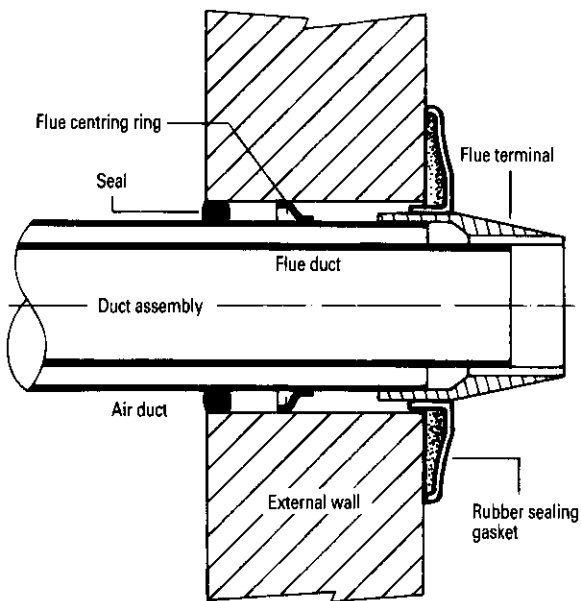
Test the gas supply pipework up to the appliance for soundness as indicated in BS 6891.

Refer to Section 11 for a full description of the filling, venting and the pressurising of the system.

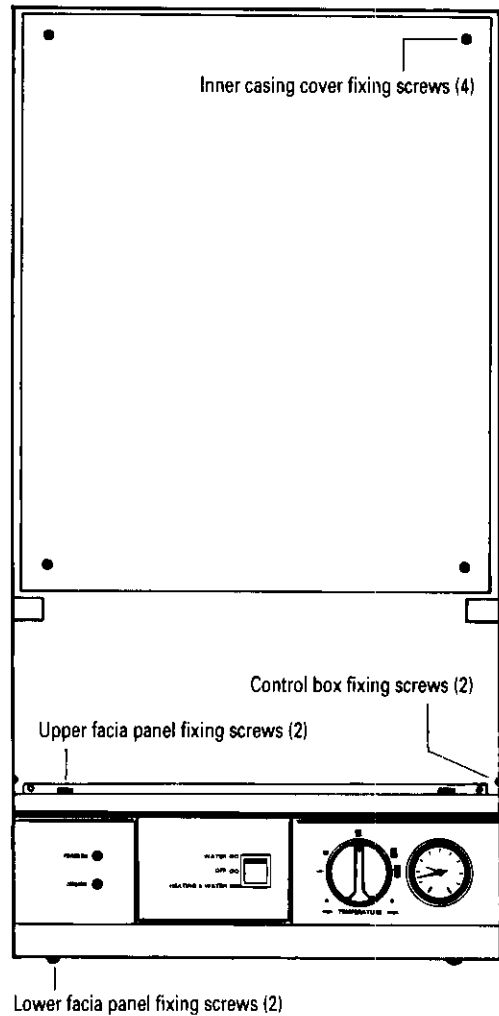
If the appliance is not to be commissioned immediately, replace the cabinet front panel. Check that the gas supply, the electrical supply and the water connections are all turned off.

If the premises are to be left unoccupied during frosty conditions, then commission the appliance as described in Section 11 and leave it under the control of the frost thermostat or leave operating continuously with the room thermostat set at 6°C or drain the appliance and system.

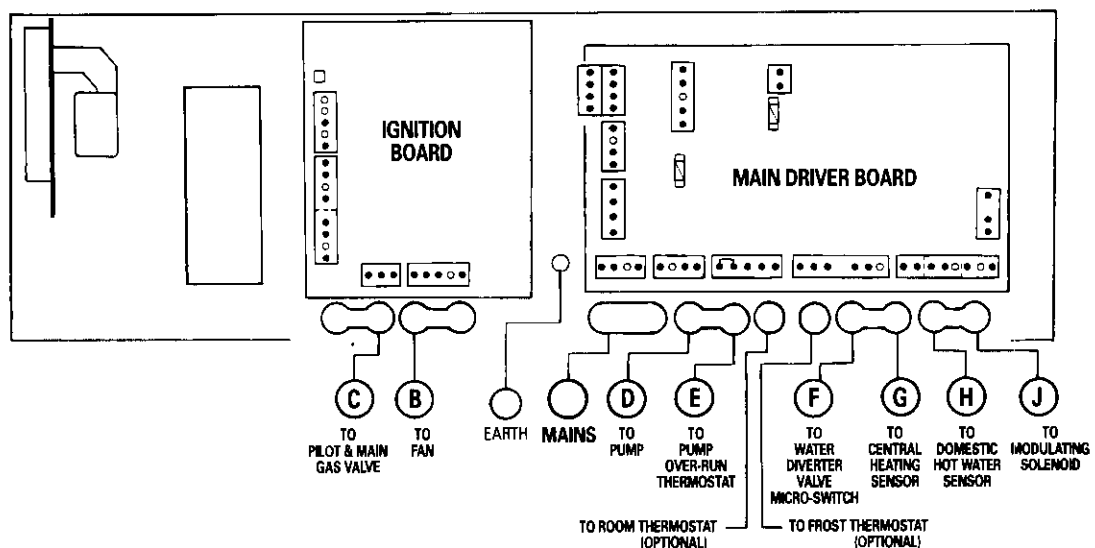
**Fig. 22. Duct and terminal assembly for internal fitting of the flue.**



**Fig. 23. Appliance casing and control equipment fixings.**



**Fig. 24. Electrical cable exits from control box.**





## 11. Commissioning

11.1 The appliance is dispatched with the controls set to provide a maximum output for domestic hot water of 23 kW (78,500 Btu/h) and satisfy a central heating load of 16.1 kW (54,900 Btu/h).

The controls can be reset to increase the heat load capability to 23 kW (78,500 Btu/h). Refer to Section 11.4 – Central Heating. It is not necessary to set the output below 16.1 kW (54,900 Btu/h) as it is automatically modulated to satisfy lower heat loads.

**Domestic Hot Water System.** Check that the mains water supply has been fully flushed out at installation.

**Central Heating System.** Check that the central heating system has been fully flushed out at installation.

**Gas Service.** The complete system, including the meter, must be inspected and tested for soundness and purged as indicated in BS 6891.

### 11.2 APPLIANCE AND CENTRAL HEATING SYSTEM PREPARATION

Remove the cabinet front panel.

Check that the electrical supply and the gas service to the appliance are off. See Fig 3.

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

Open the system valves at the appliance. See Fig 3. Open all the radiator valves, fill the system and vent each radiator in turn.

The automatic air vent (fixed to the flow manifold) will vent the appliance. Remove the boiler inner casing cover to check that the air vent cap has been removed. See Figs 14 and 23. Replace the cover immediately.

Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Water should be expelled from the discharge pipe. See Fig. 25. Lower the control box to gain access. Refer to Section 13.3(d).

#### Set the Expansion Vessel Pressure

The charge pressure of the expansion vessel as dispatched is 0.5 bar, which is equivalent to a static head of 5 metres (17 ft). The charge pressure must not be less than the static head at the point of connection. See Fig. 5. 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 (37 lb/ins<sup>2</sup>) and check for water soundness. Release water from the system using the 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 to 10.2 metres (33.5 ft) of water.

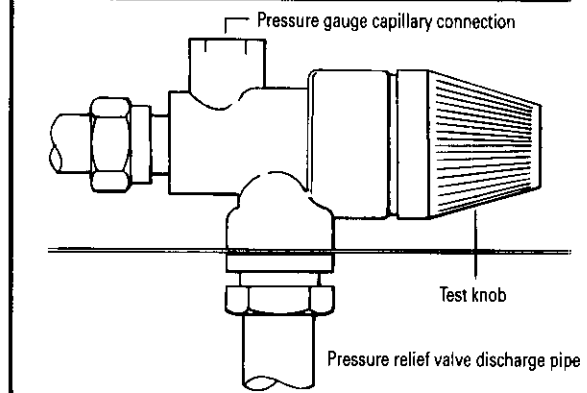
Set the movable pointer on the pressure gauge to coincide with the indicating pointer giving a permanent record of the set system pressure.

If the pressure indicated on the pressure gauge is greater than 2.6 bar when operating at the maximum central heating temperature, an extra expansion vessel must be fitted to the system as close as possible to the appliance central heating return connection.

The appliance (as dispatched) can accommodate a system volume of about 83 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.

Fig. 25. Pressure relief valve.



### 11.3 PROGRAMMER

Any programmer fitted on the appliance should be set up at this stage following the instructions sent with the programmer. The programmer will retain the setting for up to four weeks following an interruption in the electricity supply.

### 11.4 APPLIANCE OPERATION

Check that the electrical supply to the appliance is off.

Set the Operating Switch (or Programmer) to **OFF**.

Remove the inner casing cover. Refer to Section 13.3(b).

Disconnect the electrical connections from the modulating solenoid. Do not leave them unprotected. See Fig. 26. Turn on the gas supply and reconnect the electricity supply.

Set the Operating Switch (or Programmer) to **HEATING & WATER**. A continuous ignition spark will occur until the pilot is alight and sensed by the control circuit. The main burner will light and remain at its minimum setting. Test for gas soundness at the joint between the pilot pipe and the burner with leak detection fluid.

Observe the pilot flame. It should be about 18–20 mm long and envelope the spark electrode tip. If not, refer to Section 13.4. See Fig. 32. If the pilot still does not light, contact Worcester Heat Systems Service Department.

Set the Operating Switch (or Programmer) to **OFF** and disconnect the electrical supply at the mains.

#### Replace the inner casing cover.

Reconnect the electrical connections to the gas valve. Loosen the burner pressure test point screw and connect a pressure gauge. See Fig 26.

#### Domestic Hot Water.

Switch on the electricity supply.

Set the Operating Switch (or Programmer) to **WATER** and fully open a hot water tap.

The boiler should light at a burner pressure of between 12.5 and 13.5 mbar (5.0 and 5.4 in.wg.). If the burner pressure is low, check that the supply pressure at the gas valve inlet is at least 19 mbar (7.6 in. wg).

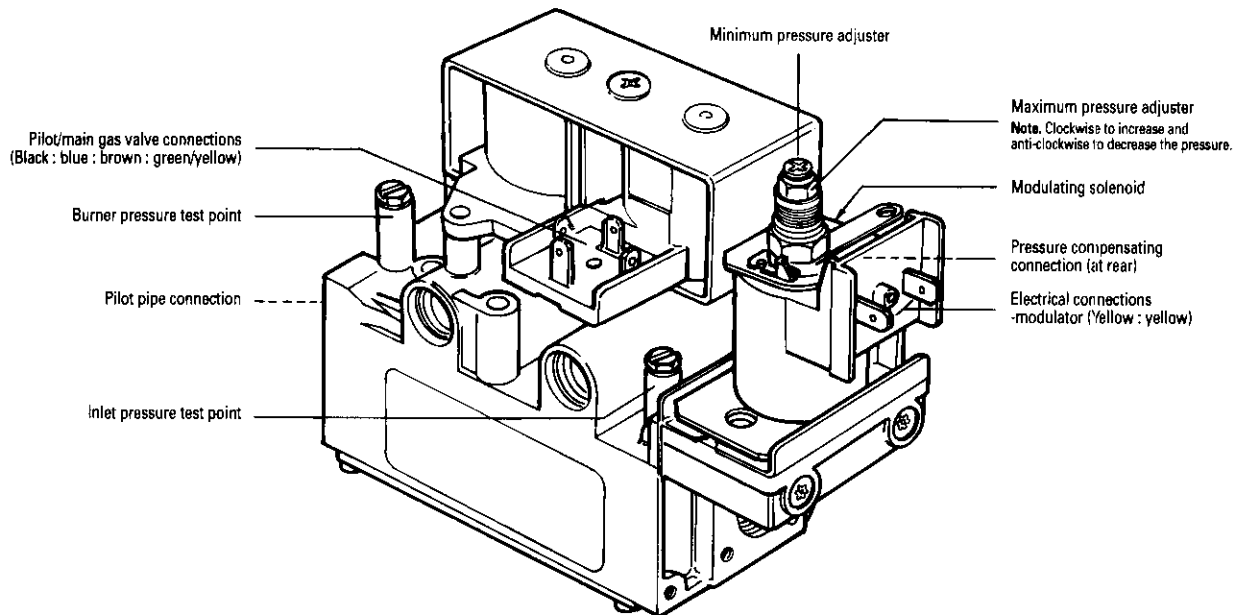
**Note:** The burner pressure is factory set and if (after checking that the supply pressure is sufficient) the correct pressure is not obtained then Worcester Heat Systems Service Department should be contacted.

If the appliance does not light, check that it is not in the over-heat 'lockout' state by pressing the thermostat reset button. See Fig. 27.

Gradually close the hot tap and check that the burner pressure drops. Fully open the tap and check that the burner pressure rises. Fully close the tap and check that the burner goes off. The pump will continue running until the appliance has cooled to a preset temperature.

Set the Operating Switch (or Programmer) to **OFF**.

**Fig. 26. Gas valve.**



### Central Heating

Check that all the radiator valves are open. Set the room thermostat and the Central Heating Temperature Control to maximum.

On sealed systems check that the system is pressurised and set to the required pressure as indicated on the gauge.

Set the Operating Switch (or Programmer) to **HEATING & WATER**.

The burner will light.

The appliance will modulate its output from 9.2 kW (31,400 Btu/h) to the set output of 16.1 kW (54,900 Btu/h) over a period of about two minutes.

Check the system to ensure that all the radiators are heating up evenly.

Shut down all but one of the radiators and observe the burner pressure fall. Open all of the radiator valves and check that the burner pressure rises.

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

Adjust the central heating by-pass valve until the same temperature difference is obtained. See Fig 28. This should be carried out with only a single radiator operating. If thermostatic radiator valves are fitted then one radiator should be left uncontrolled. The bypass valve should never be fully closed.

If the heat load is in excess of 16.1 kW (54,900 Btu/h) then reset the controls to the maximum of 23 kW (78,500 Btu/h) by carefully rotating the adjustment potentiometer to its maximum position. Access is gained to the adjustment point by lowering the electrical control box. Indicate the new setting pressure on the data plate.

Set the room thermostat to minimum and check that the burner goes out. Reset the room thermostat to maximum and the burner will relight and follow the normal operating procedure.

Check for proper ignition of the burner 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 relight and follow the normal sequence of operation.

Set the Operating Switch (or Programmer) to **OFF**.

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

Drain the system while the appliance is still hot.

Refill, vent and, with a sealed system, re-pressurise as described in Section 11.2.

### Domestic Hot Water and Central Heating

Turn on the electricity supply to the appliance and open the gas supply cock at the appliance.

Set the Operating Switch (or Programmer) to **HEATING & WATER**. If a programmer is fitted, set the domestic hot water to **Continuous** or **24Hrs** and the central heating to **ON**. The burner will light and heat will pass into the system. Turn on a hot water tap and check that fully heated hot water is discharged from the tap.

Close the tap and the burner will go off. The appliance will then return to the central heating mode and automatically balance with the system requirements.

Set the Operating Switch (or Programmer) to **OFF** and the burner will go out.

### 11.5 COMPLETION OF COMMISSIONING

Disconnect the pressure gauge and tighten the test point screw.

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

Refit the cabinet front panel.

If the appliance is being passed over to the user immediately, refer to Section 12 – Instructions to the User and set the controls to the user's requirements.

If the appliance is to be left inoperative, check that the Operating Switch is set to **OFF**. Turn off the gas service cock and switch off the electricity supply.

If there is any possibility of the appliance and system being left inoperative during frosty conditions, drain the appliance and system. For short inoperative periods leave the boiler under the control of a frost thermostat or operating continuously under the control of a room thermostat set at 6°C.

Fig. 27. Overheat thermostat reset button.

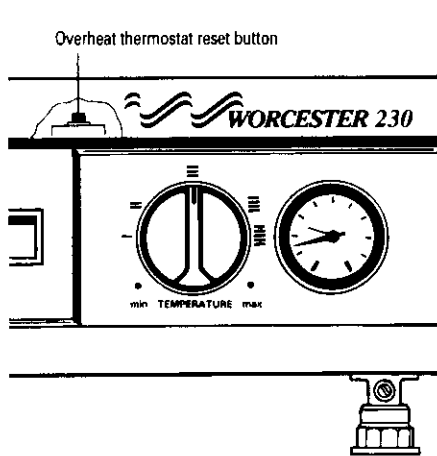
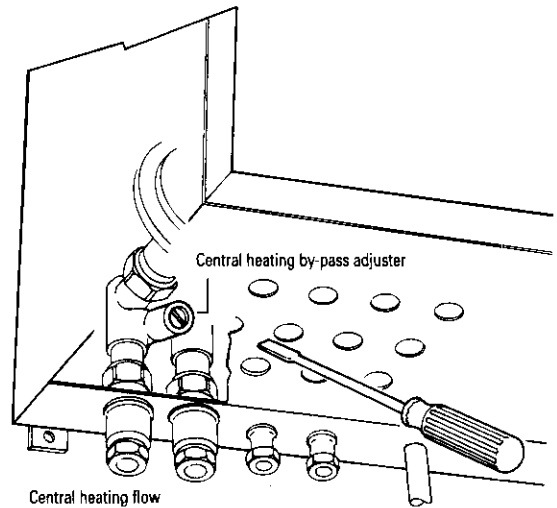


Fig. 28. Central heating by-pass adjuster.



## 12. Instructions To The User

12.1 Tell the user how to operate the appliance and hand over the Users Instructions leaflet.

12.2 Tell the user what to do if the the heating system is not to be used in frosty weather.

12.3 Tell the user the sealed system set pressure.

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

12.5 Set the system controls to the user's requirements.

12.6 If an external programmer has been fitted which has a programmable domestic hot water facility then it is suggested that this be set to **Continuous** or the equivalent.

## 13. Inspection and Servicing

13.1 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.

Any service work must be carried out by competent engineers such as British Gas or Corgi registered personnel.

### 13.2 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. See Section 6 – Air Supply.

Check the system and remake any joints or fittings which show signs of leakage.

Refill, vent and re-pressurise as described in Section 11. 2.

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

#### Warning

Disconnect the electrical supply at the mains and turn off the gas supply at the gas service cock on the appliance before servicing. See Fig. 3.

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

### 13.3 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.** Remove by lifting off the supports.

(b) **Inner Casing Cover.** Remove the cabinet front panel. Unscrew the four screws securing the cover to the casing and lift off. See Fig 23.

(c) **Facia Panel.** Check that the electricity supply to the appliance is turned off. Remove the cabinet front panel. Unscrew the two upper screws as shown in Fig 23 and lower the facia taking care not to damage the pressure gauge capillary tube or electrical connections.

(d) **Control Box.** Remove the cabinet front panel. Unscrew the two screws as shown in Fig. 23, Support the assembly and allow it to hinge down into the servicing position. Make sure no damage is done to the pressure gauge capillary tubes or electrical wires.

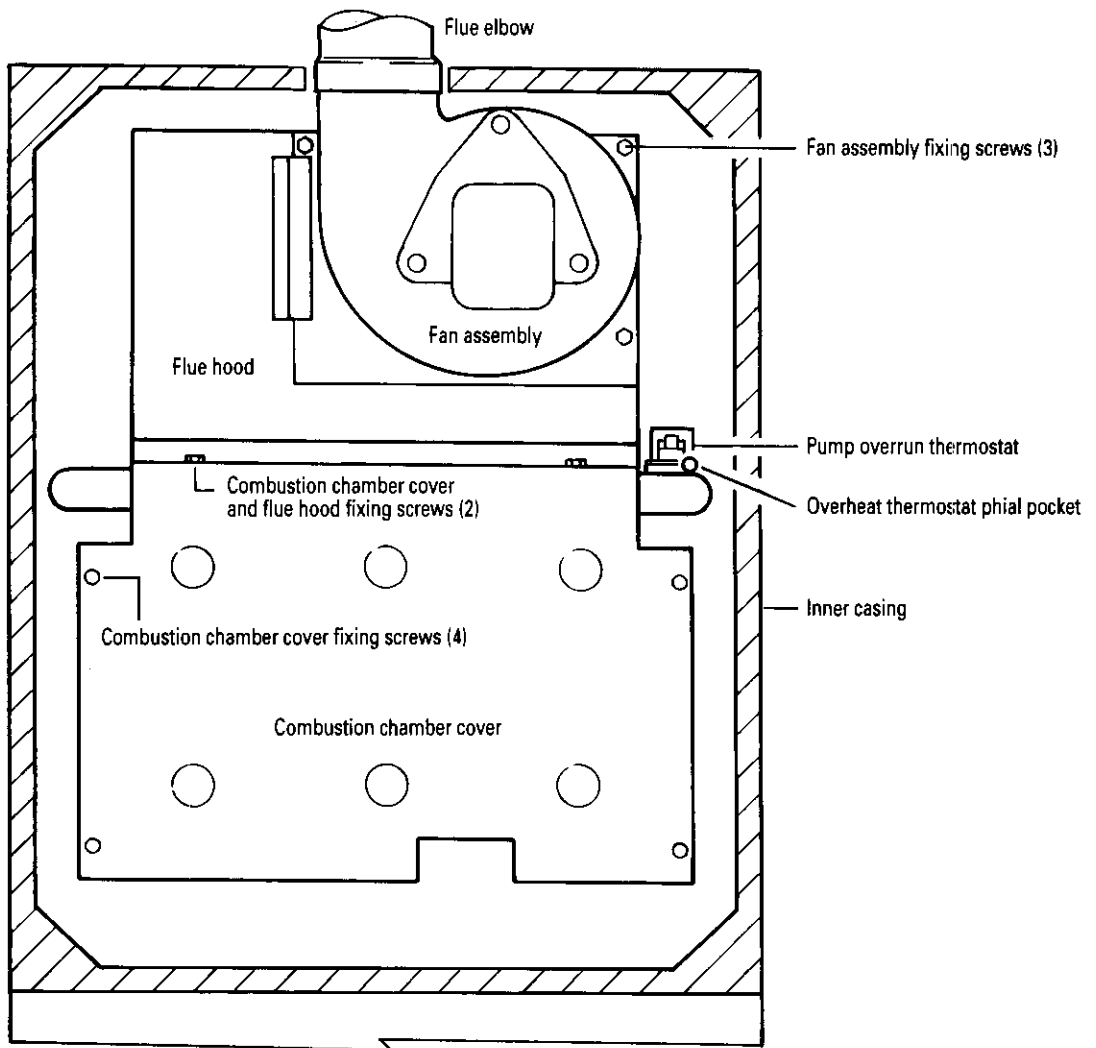
(e) **Fan.** Remove the inner casing cover. Unplug the electrical connections, pull off the sensing tube and unscrew the three fixing screws. Remove the fan assembly. See Fig 29.

(f) **Flue Hood Assembly.** Remove the the fan assembly. Unscrew the two screws fixing the flue hood and slide the flue hood assembly from the appliance. See Fig 29. When refitting the hood ensure that the rear return passes under the lip at the rear of the combustion chamber.

(g) **Combustion Chamber Cover.** Remove the the inner casing cover. Unscrew the six screws securing the cover and remove the cover. See Fig 29.

(h) **Main Burner Assembly.** Remove the combustion chamber cover. Unscrew the pilot fixing screws. Pull out the electrode. Undo the pilot pipe and remove the pilot burner. See Fig 30. Unscrew the two screws and remove the burner assembly by lifting the front of the burner and pulling forward. See Fig 31.

**Fig. 29. Appliance components and fixings (upper assembly).**



**Fig. 30. Pilot burner assembly.**

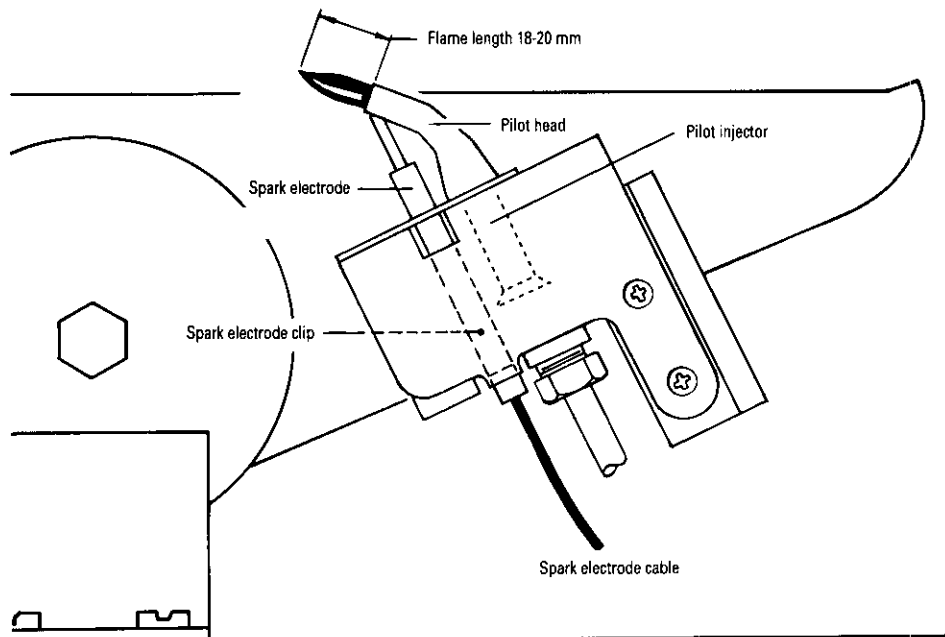


Fig. 31. Main burner fixings.

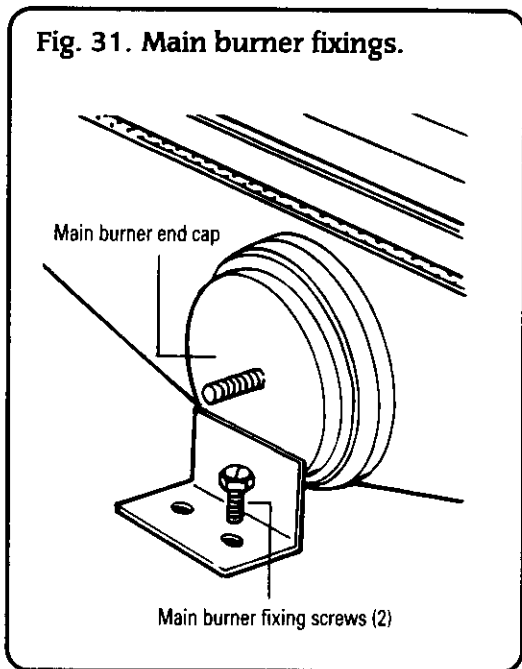
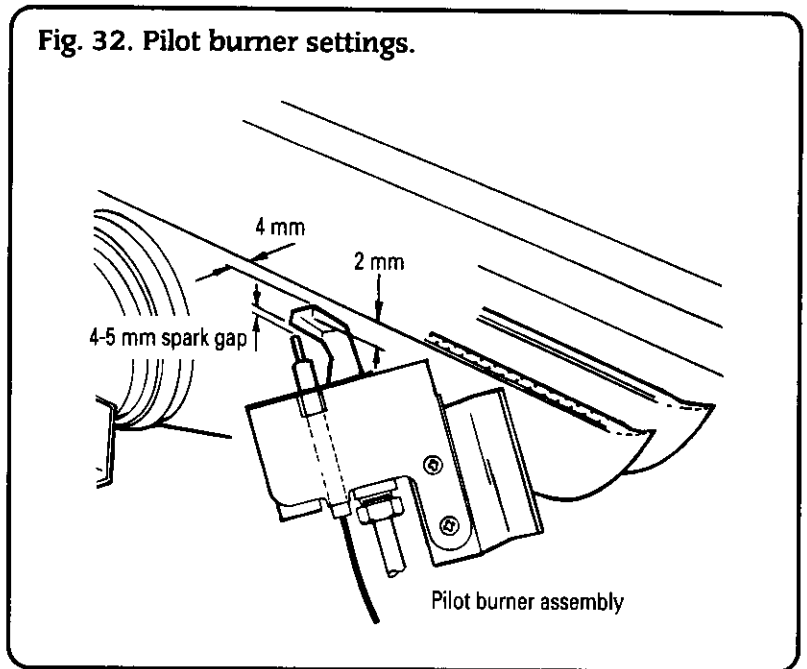


Fig. 32. Pilot burner settings.



### 13.4 SERVICE OF COMPONENTS

**Clean the Fan.** Any dust or fluff should be removed with a soft brush or by blowing. Take care not to distort the sensing tube.

**Clean the Main 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. Inspect the injector and clean with a soft brush. Replace the injector if it appears damaged. Do not use a wire brush or anything likely to cause damage.

**Clean the Pilot Burner Assembly.** Brush with a soft brush. Remove the pilot injector and clean by rinsing it in warm water. Replace the spark electrode if it appears damaged. When reassembling see Fig. 34 for correct positioning of the spark electrode.

**Clean the Gas to Water Heat Exchanger.** Cover the main burner manifold with a cloth. Clean the heat exchanger using a soft brush. Remove the deposits from the bottom of the combustion

chamber. Do not distort any of the blades.

**Combustion Chamber Insulation.** Examine and replace any pads that are damaged. See Section 14.4(7).

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

Reassemble the appliance in the reverse order.

Check that all components are in place and correctly fixed. Leave the cabinet front panel to be fitted after checking the operation of the appliance.

### 13.5 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 11 – Commissioning.

Refit the cabinet front panel and reset the controls to the users requirements.

## 14. Replacement of Parts

### 14.1 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 11 – Commissioning

### 14.2 COMPONENT ACCESS

To replace components it is necessary to remove one or more sections of the cabinet and cover plates within the appliance as described in Section 13.3. The fascia panel and control box may also need to be lowered as described in Section 13.3

### 14.3 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 removed from the appliance.

**(a) Central Heating Circuit.** Turn off the central heating flow and return valves at the appliance. See Fig 3. Fit a tube to the drain tap on the Water to Water heat exchanger and open the tap about one turn. See Fig 36. Close the drain tap when the flow has stopped. **Some water will remain in the expansion vessel, pump, diverter valve and Gas to Water heat exchanger and extra care must be taken when removing these components.**

**(b) Domestic Hot Water Circuit.** Turn off the mains cold supply valve at the appliance and open the lowest hot water tap. See Fig 3. **A quantity of water will remain in the Water to Water heat exchanger and the diverter valve and extra care must be taken when removing these components.**

### 14.4 COMPONENT REPLACEMENT

#### 1. Automatic Air Vent. See Fig 14.

Remove the inner casing cover as described in Section 13.3(b).

Drain the central heating circuit as described in Section 14.3(a). Unscrew the assembly.

Fit the replacement assembly.

Open the valves and fill and re-pressurise the system as described in Section 11.2.

#### 2. Air Flow Pressure Switch. See Fig 33

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

Lower the fascia panel as described in Section 13.3(c).

Carefully pull off the sensing tubes and the electrical connections from the switch.

Unscrew the two screws and remove the switch from the control box.

Fit the replacement switch in the reverse order ensuring that the electrical connections have been made to the correct terminals

on the switch. Check that the sensing tubes are fitted correctly.

**3. Fan.** See Fig 39

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

Remove the fan assembly as described in Section 13.3(e).

Fit the replacement fan in the reverse order.

**4. Overheat Thermostat.** See Figs 27 and 29

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

Remove the inner casing cover as described in Section 13.3(b).

Lower the facia panel as described in Section 13.3(c). Remove the clip and pull the phial from the pocket on the Gas to Water heat exchanger. Remove the cover plate and feed the phial and capillary through the hole in the cabinet. Unscrew the nut on the thermostat head and remove from the electrical control box.

Fit the replacement thermostat in the reverse order ensuring that some heat sink compound is in the pocket.

**5. Gas to Water Heat Exchanger.** See Figs 14, 34 and 35

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

Drain the central heating circuit as described in Section 14.3(a).

Remove the fan, flue hood assembly, pump overrun thermostat, overheat thermostat phial, and main burner as described in Sections 13.3(e, f, g and h), 14.4.(6) and 14.4.(8).

Unscrew the flow connectors at the connection and at the bottom left of the inner casing and move the heat exchanger to one side.

Unscrew the return connection at the bottom left of the inner casing and manoeuvre the heat exchanger from the casing. Carefully remove the left hand insulation pad and the exposed access plate.

Transfer the return pipe to the new heat exchanger leaving the connector nut loose.

Fit the replacement heat exchanger in the reverse order ensuring all the fibre washers are in place and a layer of heat sink compound is on both the thermostats. Align the return pipe and tighten the connection. Refit the access plate and the insulation pad.

Open the valves and fill and re-pressurise the system as described in Section 11.2.

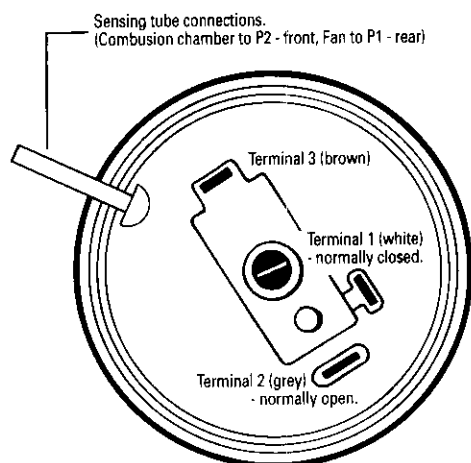
**6. Pump Overrun Thermostat.** See Figs 8 and 29

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

Remove the inner casing cover as described in Section 13.3(b).

Carefully remove the three wires from their connections and make note of their positions. Loosen the rear M4 screw securing the thermostat to its mounting plate on the Gas to Water heat exchanger. Remove the front screw and thermostat.

**Fig. 33. Air flow pressure switch.**



Fit the replacement thermostat ensuring a layer of heat sink compound is between the faces.

**7. Combustion Chamber Insulation.** See Fig 35

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

Drain the central heating circuit as described in Section 14.3(a).

Remove the inner casing cover, fan, flue hood assembly, and Gas to Water heat exchanger as described in Sections 13.3(b, e and f), and 14.4.(5). Remove the fibre insulation pads from the combustion chamber side, rear, and front sections.

Fit the replacement pads in the reverse order taking care not to damage them.

Open the valves and fill and re-pressurise the system as described in Section 11.2.

**8. Main Burner.** See Fig. 31

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

Remove the burner assembly as described in Section 13.3(h).

Fit the replacement burner in the reverse order taking care not to bend the pilot bracket on the main burner.

**9. Pilot Burner.** See Figs. 30 and 32

Unscrew the two screws and remove the pilot burner from the main burner.

Pull out the electrode. Undo the pilot pipe.

Fit the replacement burner in the reverse order. Check the pilot burner settings as shown in Fig. 32.

**10. Main Burner Injector.** See Fig. 31

Remove the main burner as described in Section 14.4(8).

Unscrew the brass injector at the back of the combustion chamber.

Fit the replacement injector in the reverse order.

**11. Spark Electrode.** See Figs. 30 and 32

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

Remove the pilot burner assembly as described in Sections 13.3(b) and 14.4(9). Lower the facia as described in Section 13.3(c).

Pull the spark electrode out of the clip. Pull the electrode lead from its tab on the ignition board.

Fit the replacement electrode in the reverse order, checking that the spark gap is 4 to 5 mm.

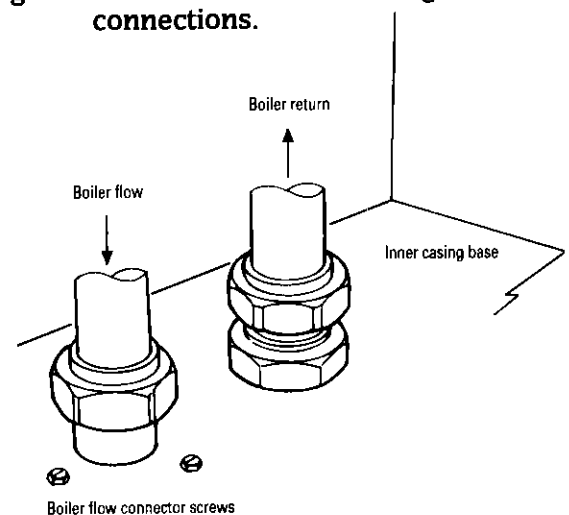
**12. Pilot Burner Injector.** See Fig 30

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

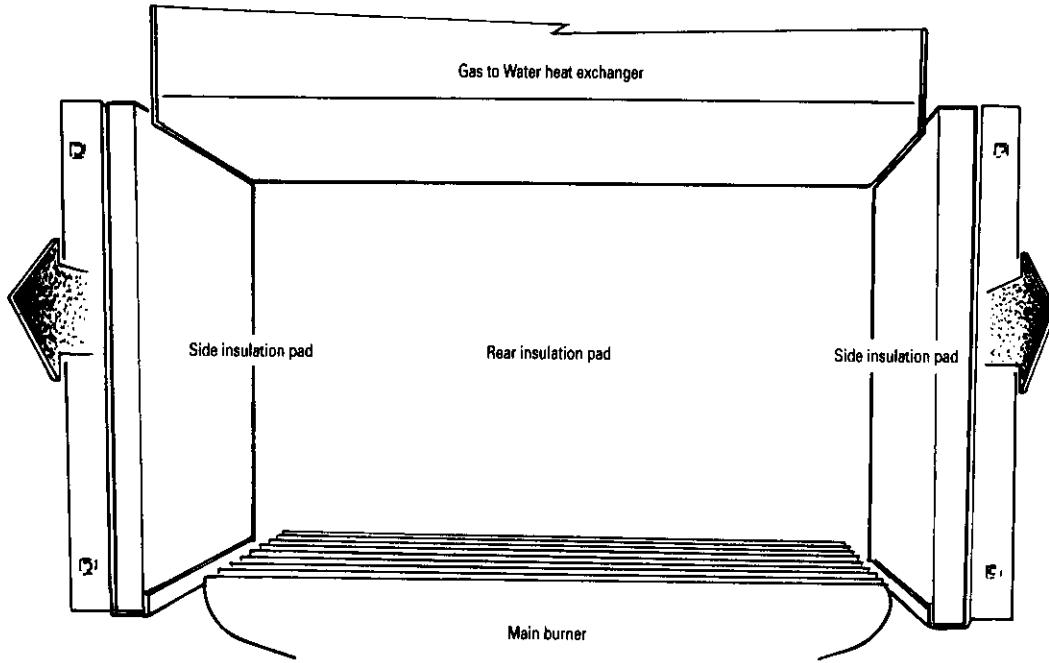
Remove the inner casing cover and pilot burner assembly as described in Sections 13.3(b) and 14.4(9). Remove the injector (a push fit inside the pilot assembly).

Fit the replacement injector in the reverse order.

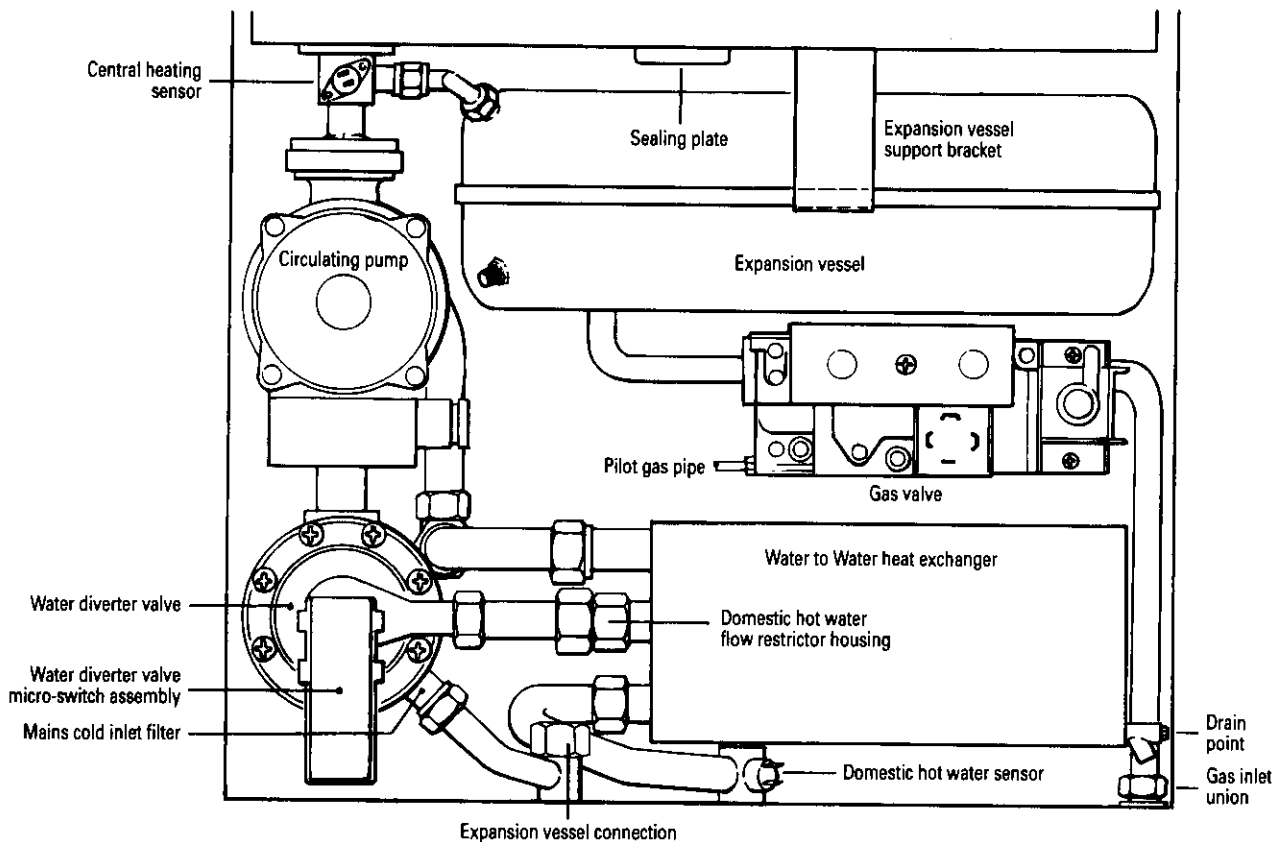
**Fig. 34. Gas to Water heat exchanger connections.**



**Fig. 35. Combustion chamber insulation.**



**Fig. 36. Appliance components (lower assembly).**



### 13. Gas Valve. See Fig. 26

Check that the electricity and gas supplies to the appliance are turned off.

Hang the control box assembly in the servicing position as described in Section 13.3(d).

Pull off the pressure compensating tube. Disconnect the pilot pipe. Unscrew and remove the main solenoid plug. Carefully pull off the two yellow wires from their terminals. Remove the four screws securing the valve to the outlet flange.

Undo the union at the inlet cock and remove the valve from the appliance

Fit the replacement gas valve in the reverse order ensuring the sealing washers are correctly fitted.

Turn on the gas supply and check for soundness.

#### To set the burner pressure. See Fig. 26

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

Follow the procedure described in Section 11.4 – Appliance Operation.

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

Remove the modulating solenoid cover.

The cover must be replaced immediately the adjustments have been made to ensure the proper operation of the gas control.

Start the appliance in the domestic hot water mode as described in Section 11.4 – Appliance Operation.

Adjust the maximum pressure adjustment nut to give a burner pressure of 12.9 mbar. See Fig. 26.

Switch off the appliance and turn off the electricity supply. Remove a lead from the modulating solenoid.

Switch on the electricity supply to the appliance and re-light in the domestic hot water mode.

Hold the maximum pressure adjustment nut firmly and turn the maximum pressure adjustment screw until the burner pressure is 2.0 mbar. See Fig. 26.

Switch off the appliance and turn off the electricity supply. Refit the lead to the modulating solenoid.

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

It should not be necessary to alter the central heating potentiometer setting when the gas control is replaced and the minimum and maximum burner pressures are set.

### 14. Central Heating Sensor. See Fig. 36

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

Carefully pull off the two leads from the sensor. Loosen the two M3 screws securing the sensor to the fitting and remove the sensor

Fit the replacement sensor with a layer of heat sink compound between the faces. Refit the leads.

### 15. Domestic Hot Water Sensor. See Fig. 36

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

Hang the control box assembly in the servicing position as described in Section 13.3(d).

Carefully pull off the two leads from the sensor. Loosen the two M3 screws holding the sensor to the fitting and remove the sensor.

Fit the replacement sensor in the reverse order ensuring a layer of heat sink compound is between the faces. Refit the leads.

### 16. Circulating Pump. See Fig 37

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

Drain the central heating circuit as described in Section 14.3(a).

Hang the control box assembly in the servicing position as described in Section 13.3(d).

Undo the two union nuts and remove the pump from the pipe-work. Support the pump and remove the electrical cover.

Disconnect the electrical wires taking note of their positions.

Fit the replacement pump in the reverse order using new sealing washers. Ease back the sleeved connector to allow the fitting of the bottom washer.

Alternatively replace the pump head only by removing the four Allen screws.

Open the valves and fill and re-pressurise the system as described in Section 11.2

**Note.** The direction of flow should be downwards. The speed should always be set to maximum.

Fig. 37. Circulating pump.

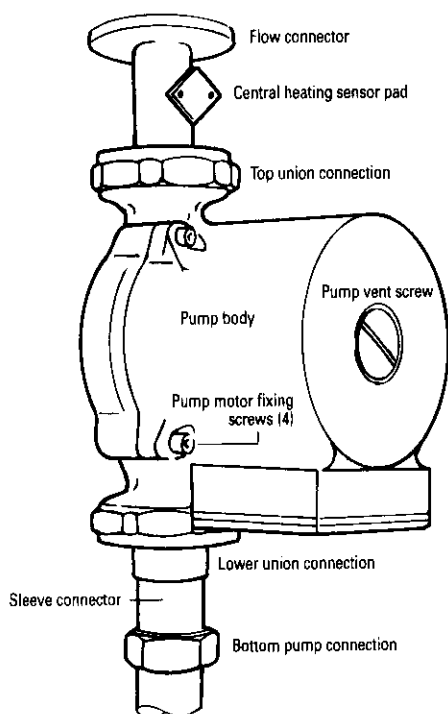
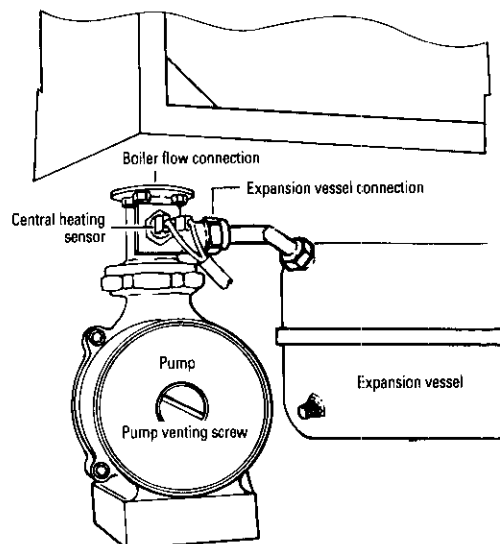


Fig. 38. Expansion vessel and pump assembly.





**17. Expansion Vessel.** See Fig 38

Drain the central heating circuit as described in Section 14.3(a).  
Hang the control box assembly in the servicing position as described in Section 13.3(d).  
Remove the inner casing cover as described in Section 13.3(b).  
Unscrew and remove the expansion vessel support bracket.  
Undo the expansion vessel connection at the boiler flow connection and remove the vessel.

Fit the replacement vessel in the reverse order.  
Open the valves and fill and re-pressurise the system as described in Section 11.2

**18. Pressure Relief Valve.** See Fig 25

Drain the central heating circuit as described in Section 14.3(a).  
Lower the control box assembly as described in Section 13.3(d)  
Undo the discharge pipe connection and unscrew the valve taking care not to distort the pipework.

Fit the replacement valve using a suitable thread sealing compound. Reconnect the discharge pipe.  
Open the valves and fill and re-pressurise the system as described in Section 11.2

**19. Water Diverting Valve Micro Switch Assembly.** See Fig 39.

Check that the electricity supply to the appliance is turned off.  
Lower the control box assembly as described in Section 13.3(d).

Using a pair of fine nosed pliers, pull the circlip off and remove the micro switch assembly from the valve. Lower the fascia as described in Section 13.3(c). Carefully pull off the Molex connection from terminal X3 on the main driver board. Remove the strain relief bush to withdraw the switch and lead assembly from the appliance.

Fit the replacement micro switch assembly in the reverse order.

**20. Water Diverting Valve.** See Fig 39

Check that the electricity supply to the appliance is turned off.  
Drain the central heating and domestic hot water circuits as described in Sections 14.3(a and b). Hang the control box assembly in the servicing position as described in Section 13.3.(d).

Remove the micro switch assembly as described in Section 14. 4. 20.

Undo all the water connections to the valve and remove from the appliance.

Fit the replacement valve in the reverse order ensuring that the filter and all fibre washers are in place.

Open the valves and fill and re-pressurise the system as described in Section 11.2

**21. Water to Water Heat Exchanger.** See Figs. 3, 36, 39 & 40.

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

Drain the central heating and domestic hot water circuits as described in Sections 14.3(a and b).

Loosen the mains cold water inlet connection and locknut at the appliance. See Fig.3.

Hang the control box assembly in the servicing position as described in Section 13.3(d).

Undo connection A and remove the coupling.

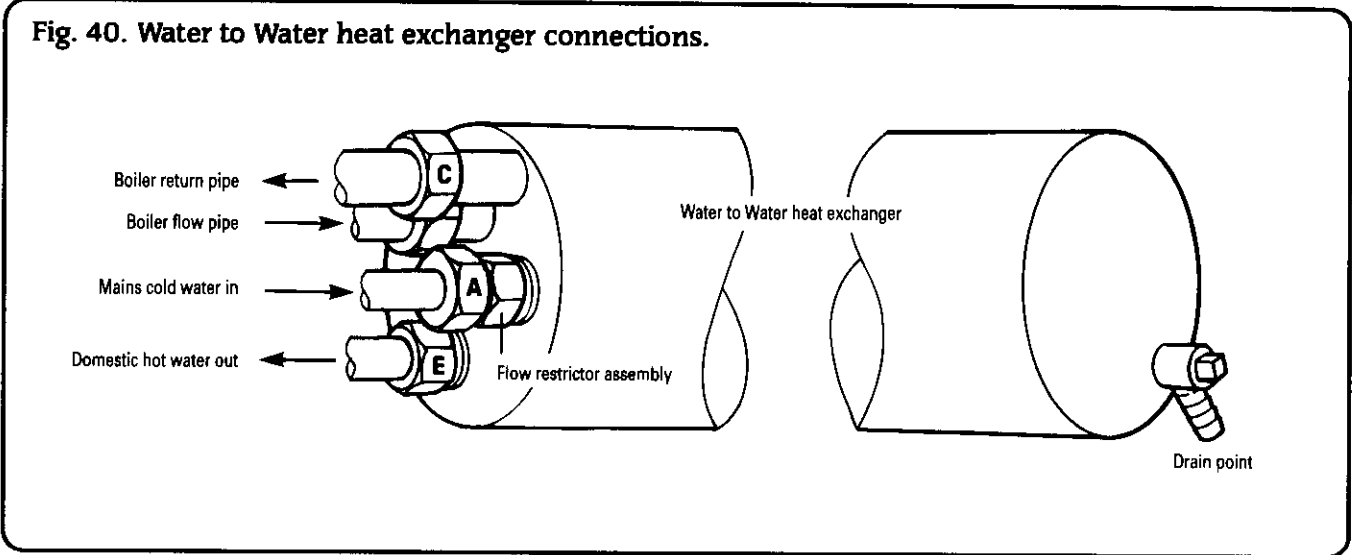
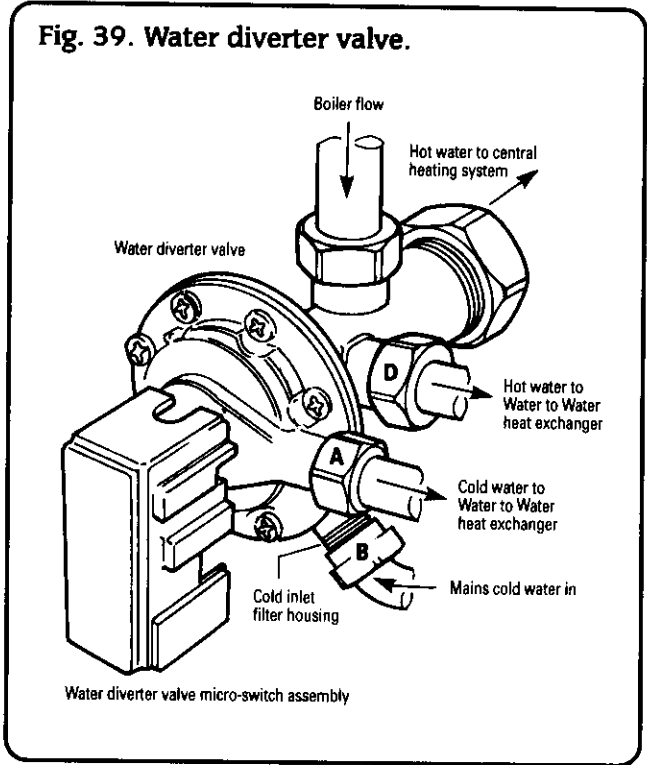
Undo connection B and move the pipe to one side. Undo connections C, D and E. Loosen the two screws at the right hand fixing bracket.

**Protect the control box and carefully remove the heat exchanger as some water remains.**

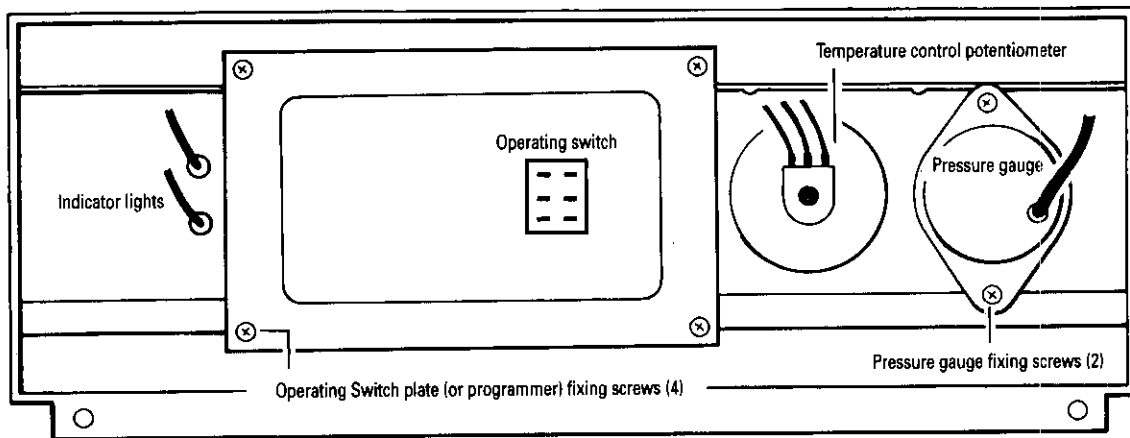
Transfer the boiler flow pipe (removed with the old heat exchanger) to the new heat exchanger using a new fibre washer.

Fit the replacement heat exchanger in the reverse order ensuring all the fibre washers are in place.

Open the valves and fill and re-pressurise the system as described in Section 11.2



**Fig. 41. Facia (rear view in lowered position).**



**22. Domestic Hot Water Flow Restrictor.** See Fig 36

Check that the electricity supply to the appliance is turned off.  
Drain the domestic hot water circuit as described in Section 14.3(b).

Hang the control box assembly in the servicing position as described in Section 13.3(d).

Undo the water connection **A** and remove the fitting. The plastic flow restrictor is located within the brass housing.

Fit the replacement flow restrictor and reassemble in the reverse order ensuring the fibre washers are in place.

**23. Pressure Gauge.** See Fig 41

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

Drain the central heating circuit as described in Section 14.3(a). Lower the facia panel as described in Section 13.3(c).

Remove the two screws securing the gauge to the facia panel. Hang the control box assembly in the servicing position as described in Section 13.3(d).

Disconnect the capillary at the pressure relief valve.

Fit the replacement gauge in the reverse order ensuring the fibre washer is in place.

Open the valves and fill and re-pressurise the system as described in Section 11.2

**24. Operating Switch.** See Fig 41

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

Lower the facia panel as described in Section 13.3(c).

Remove the leads from the rear of the switch making note of their positions.

Squeeze together the two plastic retaining lugs to remove the switch from the facia.

Snap in the replacement switch and reconnect the leads. Refer to the wiring diagram, Fig. 7

**25. Temperature Control Potentiometer.** See Fig 41

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

Lower the facia as described in Section 13.3(c).

Pull the knob off the spindle. Unscrew the locknut and remove the potentiometer from the facia panel. Remove the Molex plug from terminal **X1** on the main driver board.

Fit the replacement potentiometer in the reverse order.

**26. Main Driver Board.** See Fig 7

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

Lower the facia panel as described in Section 13.3(c)

Carefully pull off all the Molex connectors. Disconnect the room and frost thermostat connections (if fitted) from terminal **X4**. Remove the Operating Switch (or programmer) plug from terminal **X10**. Disconnect the mains supply leads at terminal **X7**. Release the plastic catch in each corner of the driver board and pull forward off the control panel.

Fit the replacement board in the reverse order ensuring it is pushed firmly onto the four posts and clicks into place.

Refit the facia panel and hang the control box assembly in the servicing position as described in Section 13.3 (d).

Set the central heating operating pressure to 6.3 mb (2.5 in.wg.) by adjusting (anticlockwise to increase the pressure and clockwise to decrease the pressure) the central heating potentiometer accessed through an opening in the rear of the control box. This must be done with the boiler operating in the central heating mode.

The adjustment is made using a thin flat-bladed screwdriver.

**27. Ignition Board.** See Fig 7

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

Lower the facia panel as described in Section 13.3(c).

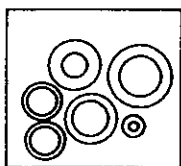
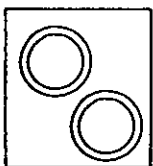
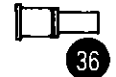
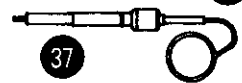
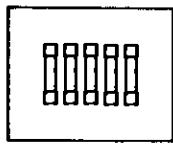
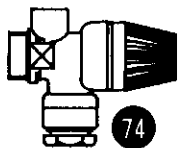
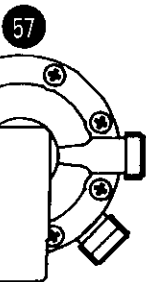
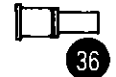
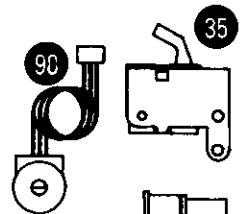
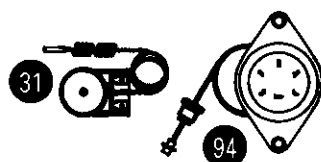
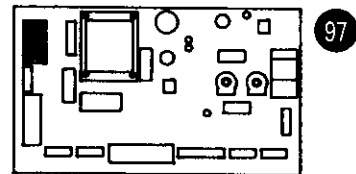
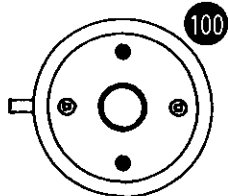
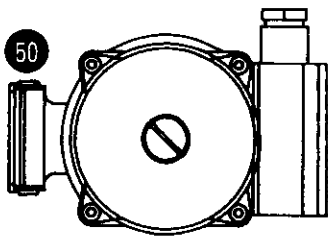
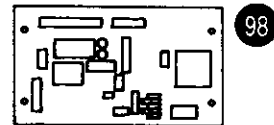
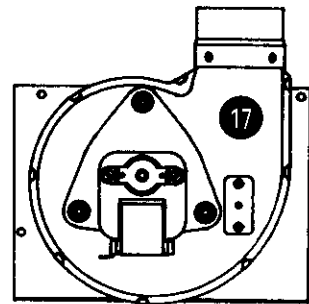
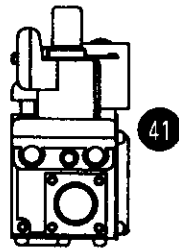
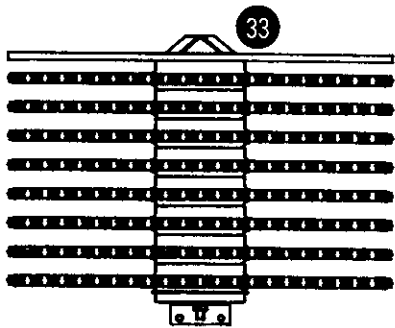
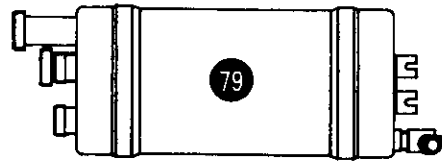
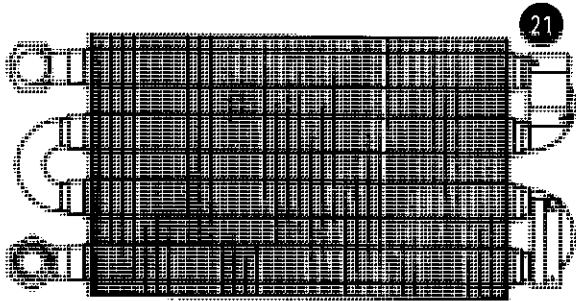
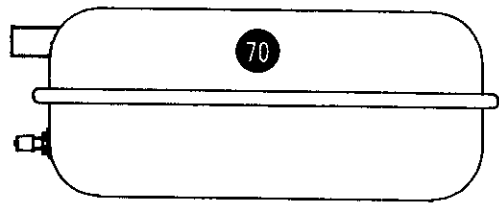
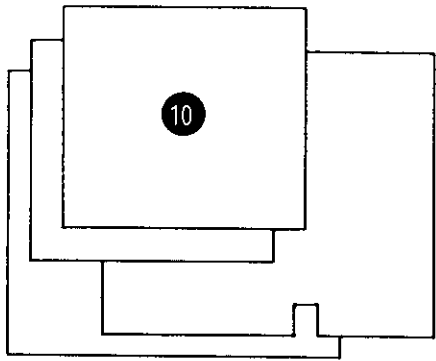
Carefully pull off all the Molex connectors, and disconnect the spark electrode cable. Release the plastic catch in each corner of the board and remove the board.

Fit the replacement board in the reverse order ensuring that it is pushed firmly onto the four posts and clicks into place.



## 15. Short Parts List

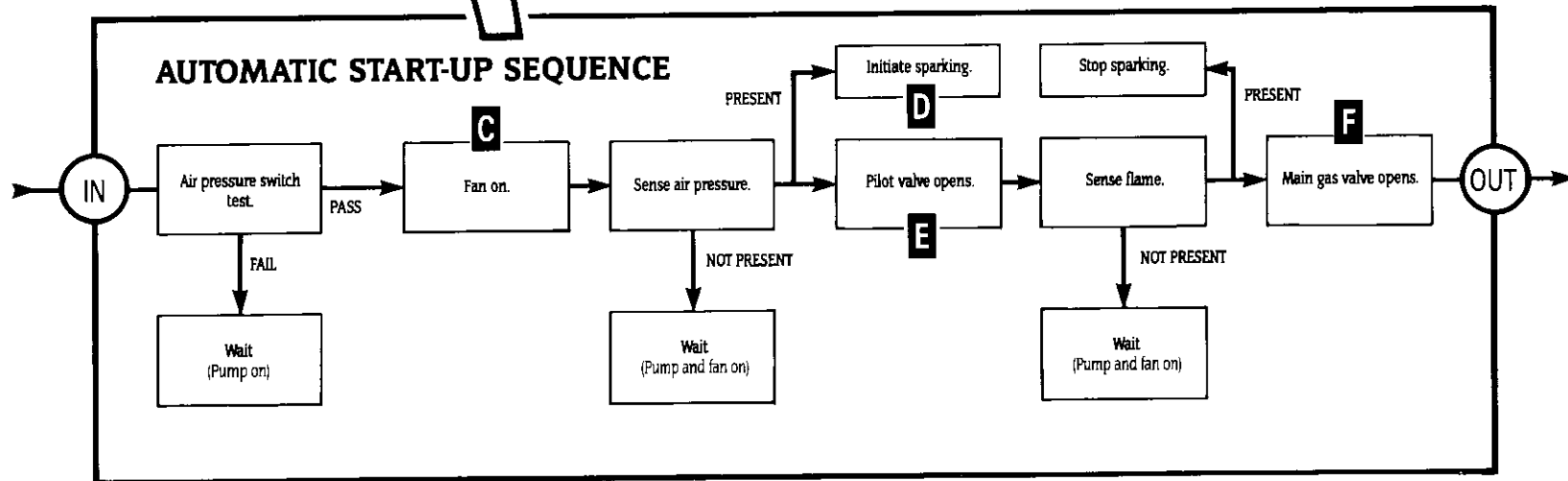
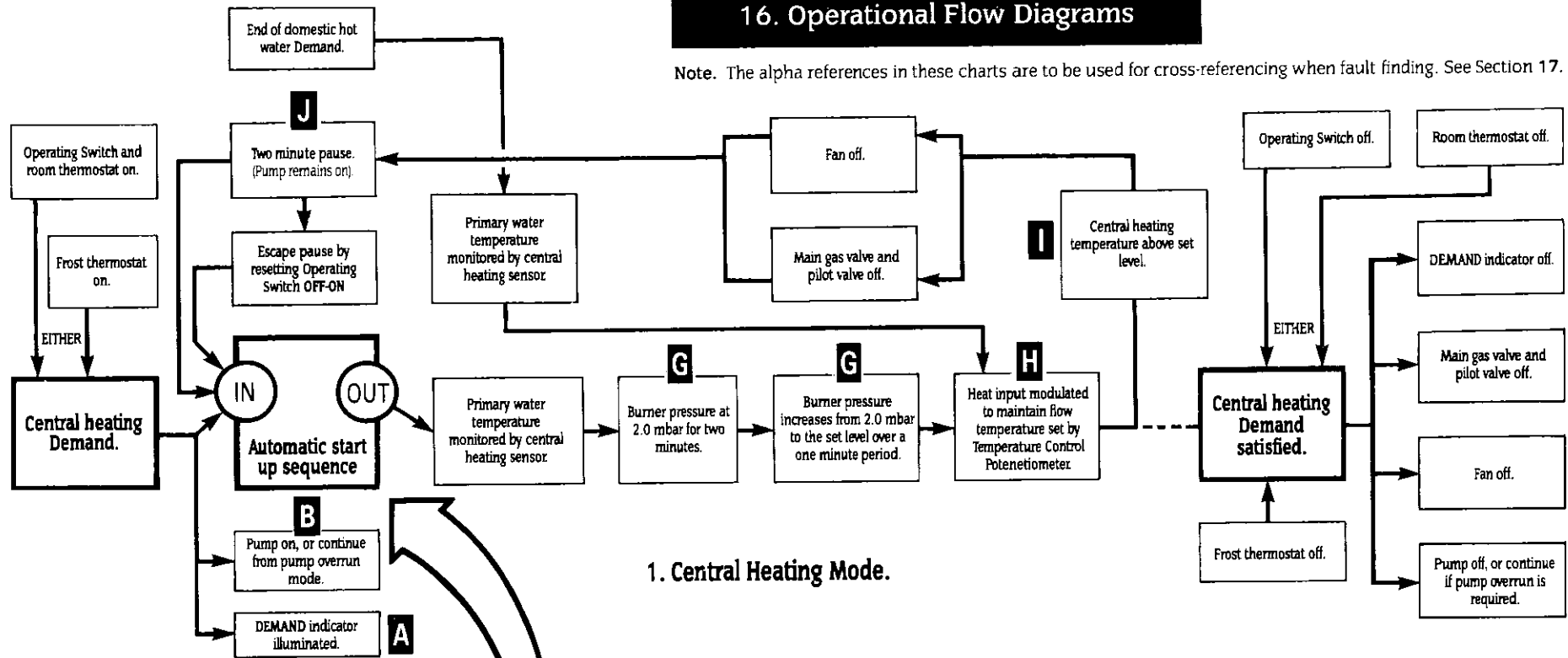
Key No.	GC. No.	Part	Manufacturer's Reference	No	WHS Part No.
41	379 557	Gas Valve	SIT837 Tandem Rp1/2 0.837	1	ZAGAS230
33	378 025	Main Burner	WHS 007223	1	SSA7223/1
34	379 040	Main Burner Injector	Stereomatic-Long 120°, 4.4mm Diameter	1	ZAGAS163
35	379 562	Pilot Burner	Honeywell-Q385A 2051	1	ZAGAS079
36	382 580	Pilot Burner Injector	Honeywell-45, 004, 108, 56/42A	1	ZBGAS045
37	379 561	Spark Electrode and Lead	Honeywell-45900413-008	1	ZBGAS078
21	371 542	Gas to Water Heat Exchanger	Giannoni-240 D673	1	ZAGAS153
24	379 419	Automatic Air Vent	Intermes-02, 50, 010	1	ZMMIS055
53	299 199	Thermister (with paste)	Elmwood-6655RN, 428-000-3	1	SPK0039
94	299 266	System Pressure Gauge (with Washer)	Cewal	1	SPK0090
74	386 789	Pressure Relief Valve	Caleffi-3141, 3bar	1	ZCVLV018
50	378 034	Circulating Pump	Grundfos-UPS 15-60, 120CL, 50526613	1	ZAMAJ198
70	379 558	Expansion Vessel	Zilmet-541.306008	1	ZMMIS094
79	371 537	Water to Water Heat Exchanger	WHS 006161	1	SSA6161/1
57	379 216	Diverter Valve	Inter Albion-D2040	1	ZAGAS166
97	379 556	Driver Board	Pektron-ASS-PRO 358	1	ZAGAS094
98	378 132	Ignition Board	Honeywell-S458 B1002 • Pactrol 415000	1	ZAGAS096
31	378 029	Overheat Thermostat	Ranco-LM7, P5050	1	ZAMAJ133
17	378 028	Fan Assembly	Sifan	1	SSA6072/9
100	379 560	Air Pressure Switch	Beck-911, 81	1	ZAGAS233
90	386 227	CH Temperature Control Potentiometer	Omeg-0W 208V 10KA with harness	1	SSAHAR002
93	379 559	Operating Switch	Arrow-200400 – E857 grey	1	ZDELE563
10	374 607	Combustion Chamber Insulation (Pack)		1	SPK0034
122	371 539	Programmer Kit (Optional)	WHS-Single Channel Grey	1	ZAMAJ164
42	299 258	Gasket Pack – Gas		1	SPK0089
61	371 541	Gasket Pack – Water		1	SPK0023
60	379 215	DHW Flow Restrictor	Type E, White 8 litres/min. (± 15%)	1	ZBUNC138
91	371 524	Indicator Light – DEMAND	Neon (Green) – complete with plug IMO Ref. N19RL 240G/S300-Green	1	SSAHAR081
92	371 525	Indicator Light – POWER ON	Neon (Amber) – complete with plug IMO Ref. N19RL 240A/S300-Amber	1	SSAHAR082
22	299 277	Pump Overrun Thermostat	Thermodisc 60T13500103	1	SPK0088
59	378 416	Filter	MPMV 3326 Stainless Steel	1	ZBUNC229
115	299 032	Fuse Pack		1	SPK0024

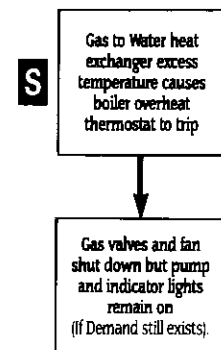
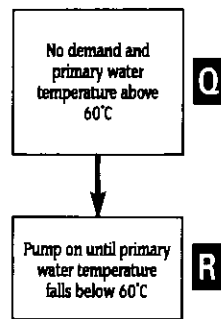
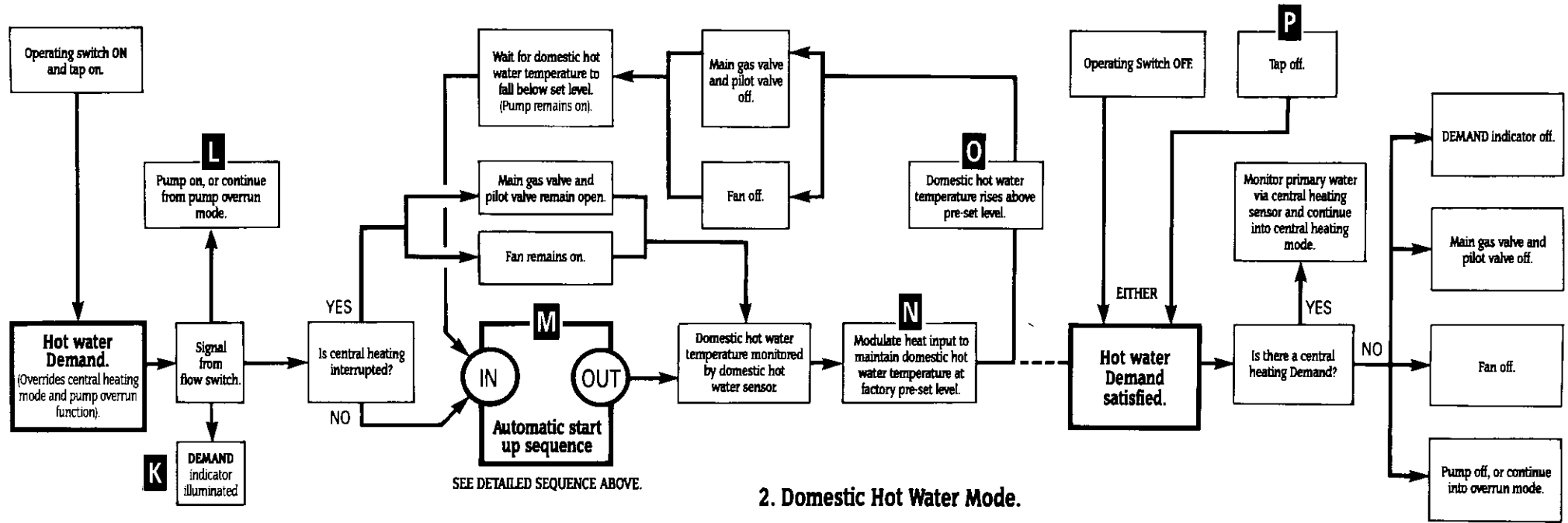


Parts key numbers

# 16. Operational Flow Diagrams

Note. The alpha references in these charts are to be used for cross-referencing when fault finding. See Section 17.

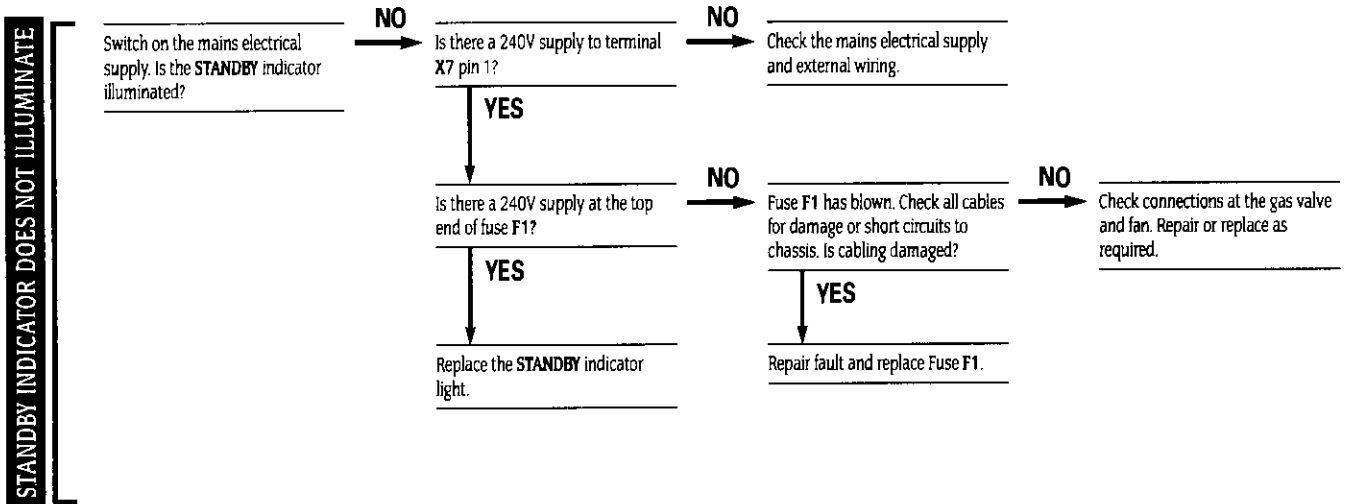




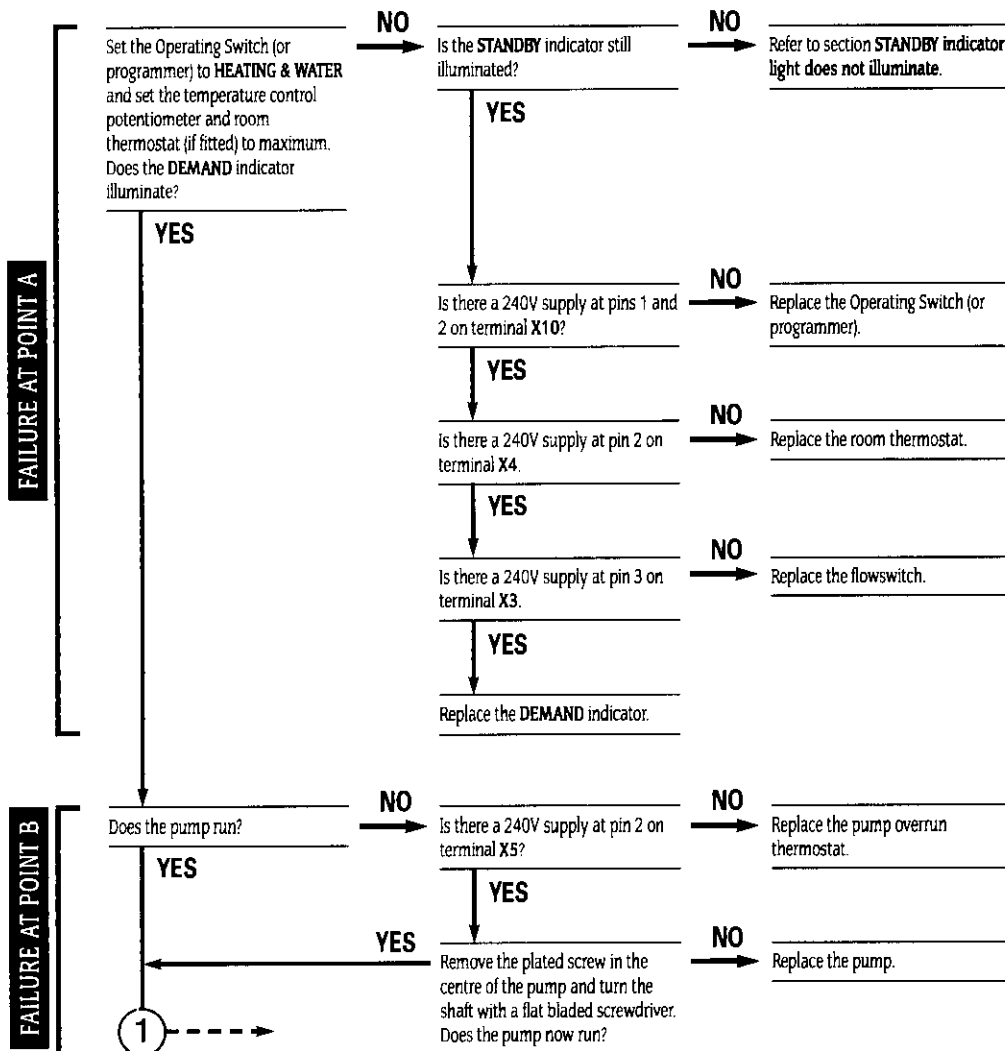
# 17. Fault Finding

This Fault Finding Chart is to be used in conjunction with the Operational Flow Diagrams in Section 16. To find the fault, locate the point on the flow diagram at which the appliance has failed, e.g. letter B. Then read the corresponding section in the fault finding chart, e.g. **Failure at point B**. **Note:** Each section assumes that the appliance operates correctly up to that point.

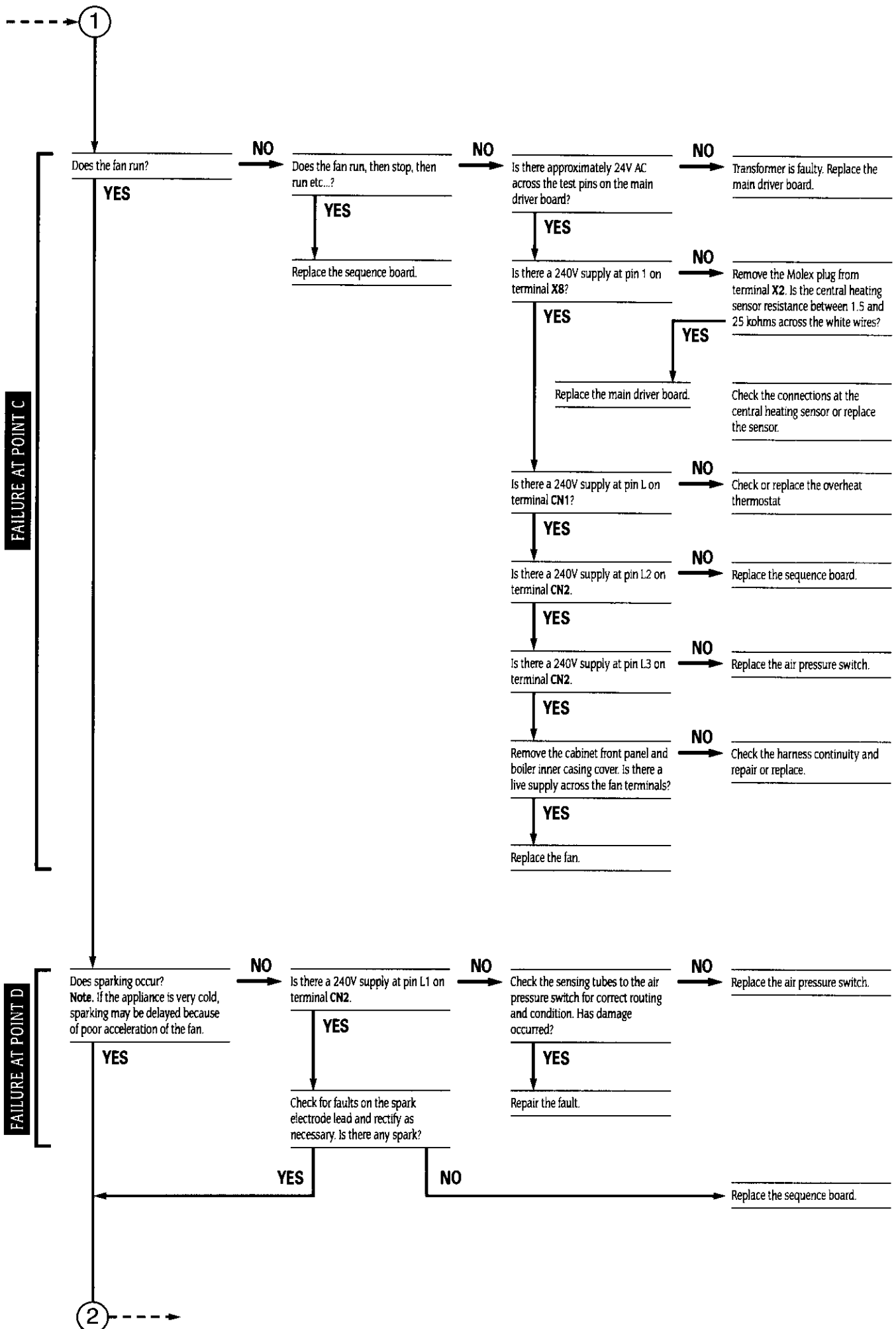
**Notes:** 1. All voltage measurements are with respect to neutral unless otherwise stated. 2. Before changing any component indicated in the chart, it is essential that the associated wiring is checked for continuity, condition and correct routing. 3. Preliminary electrical system checks are the first 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.

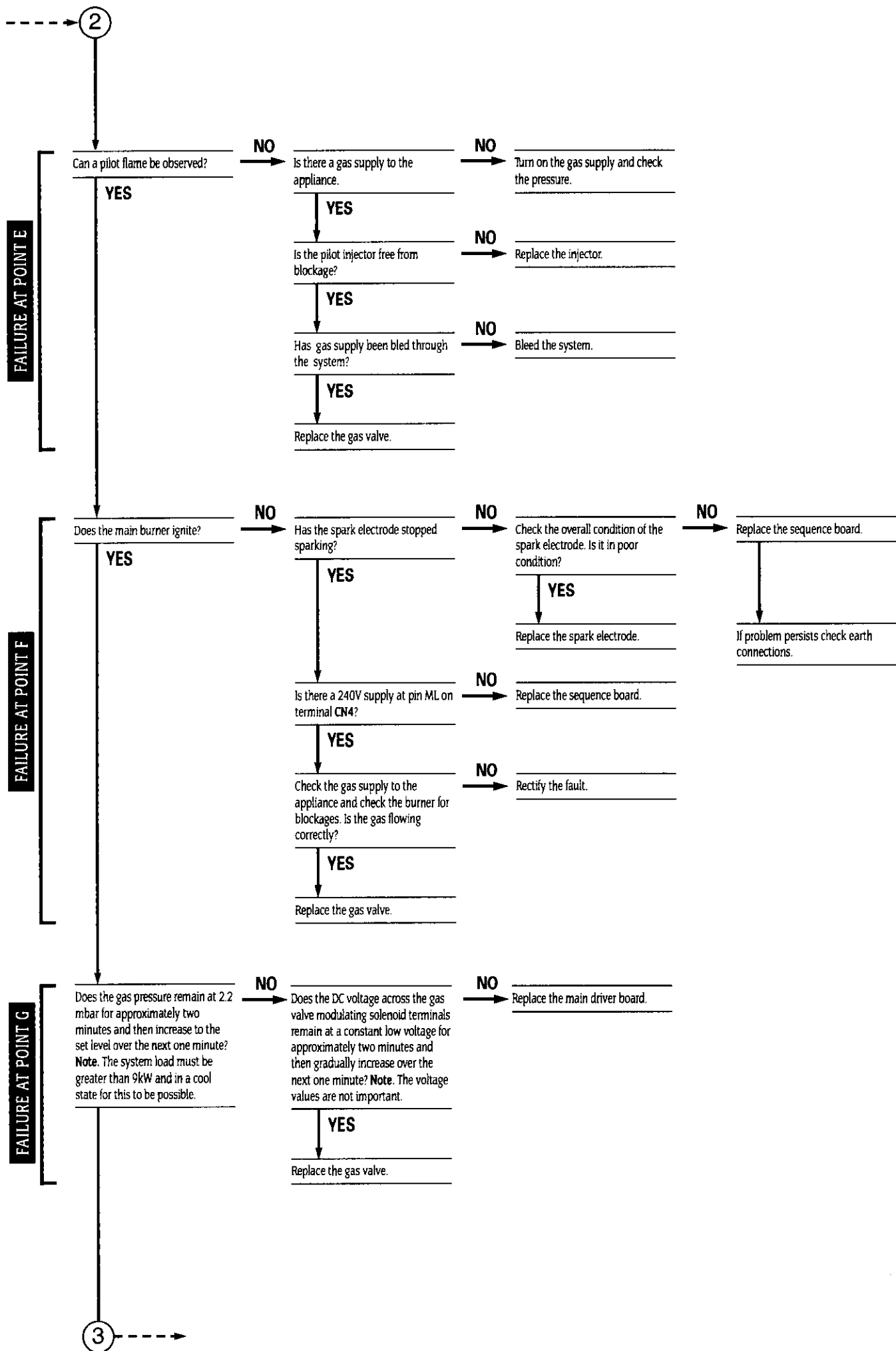


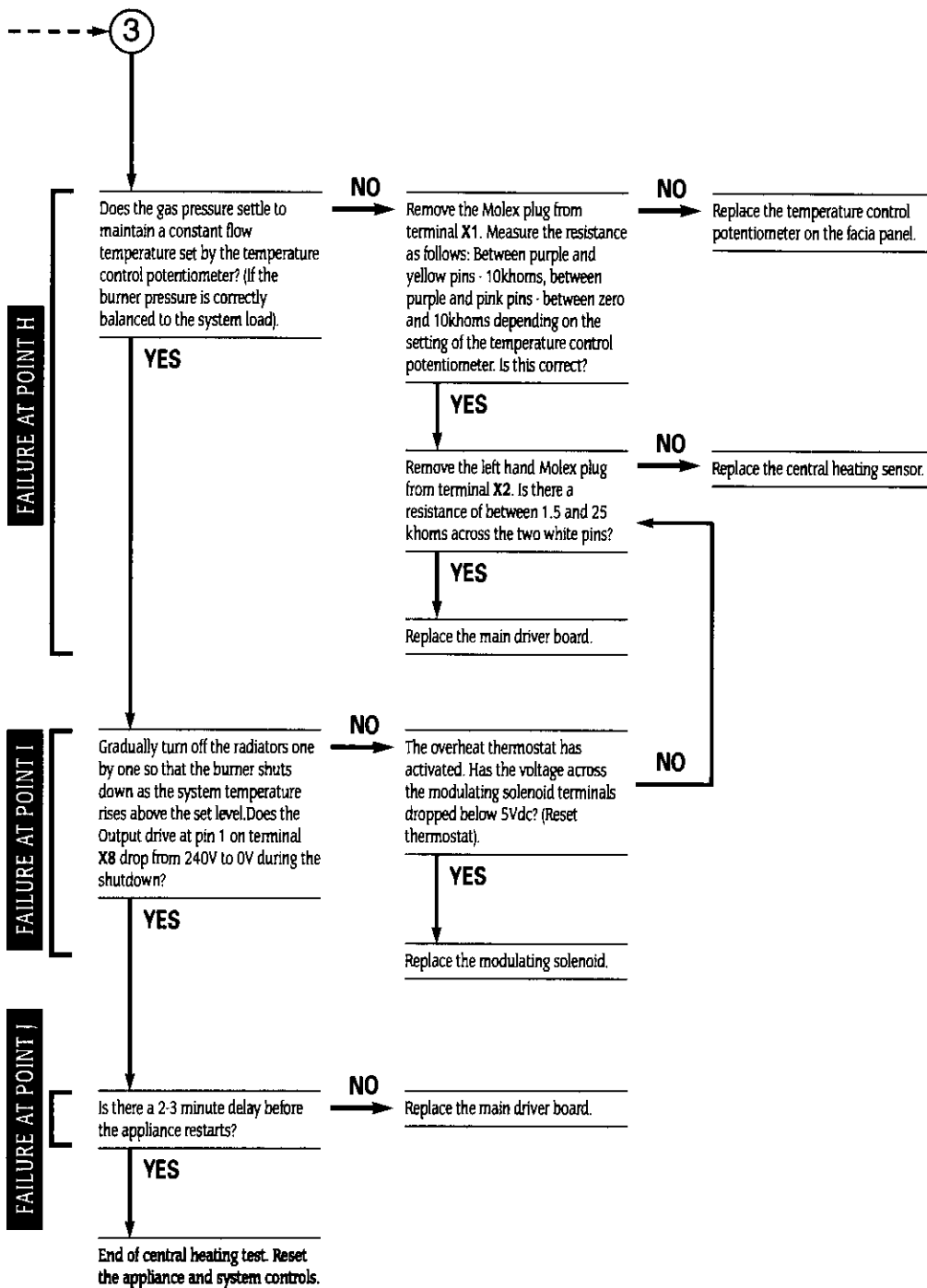
## START OF CENTRAL HEATING TEST





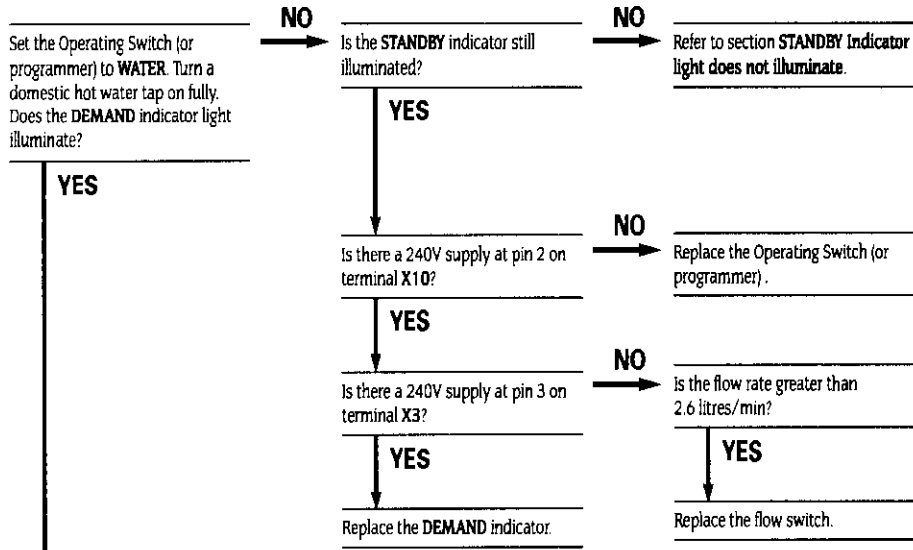




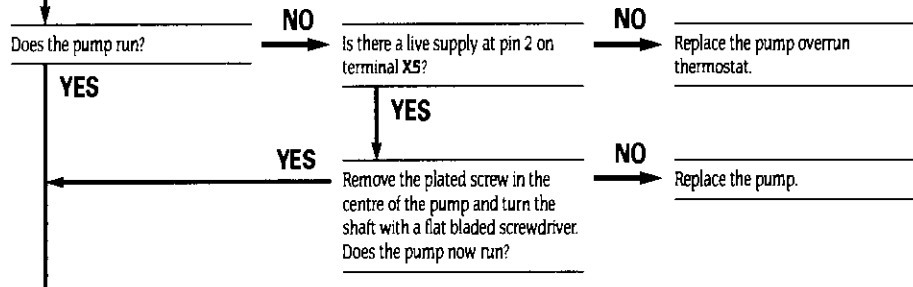


START OF DOMESTIC HOT WATER TEST

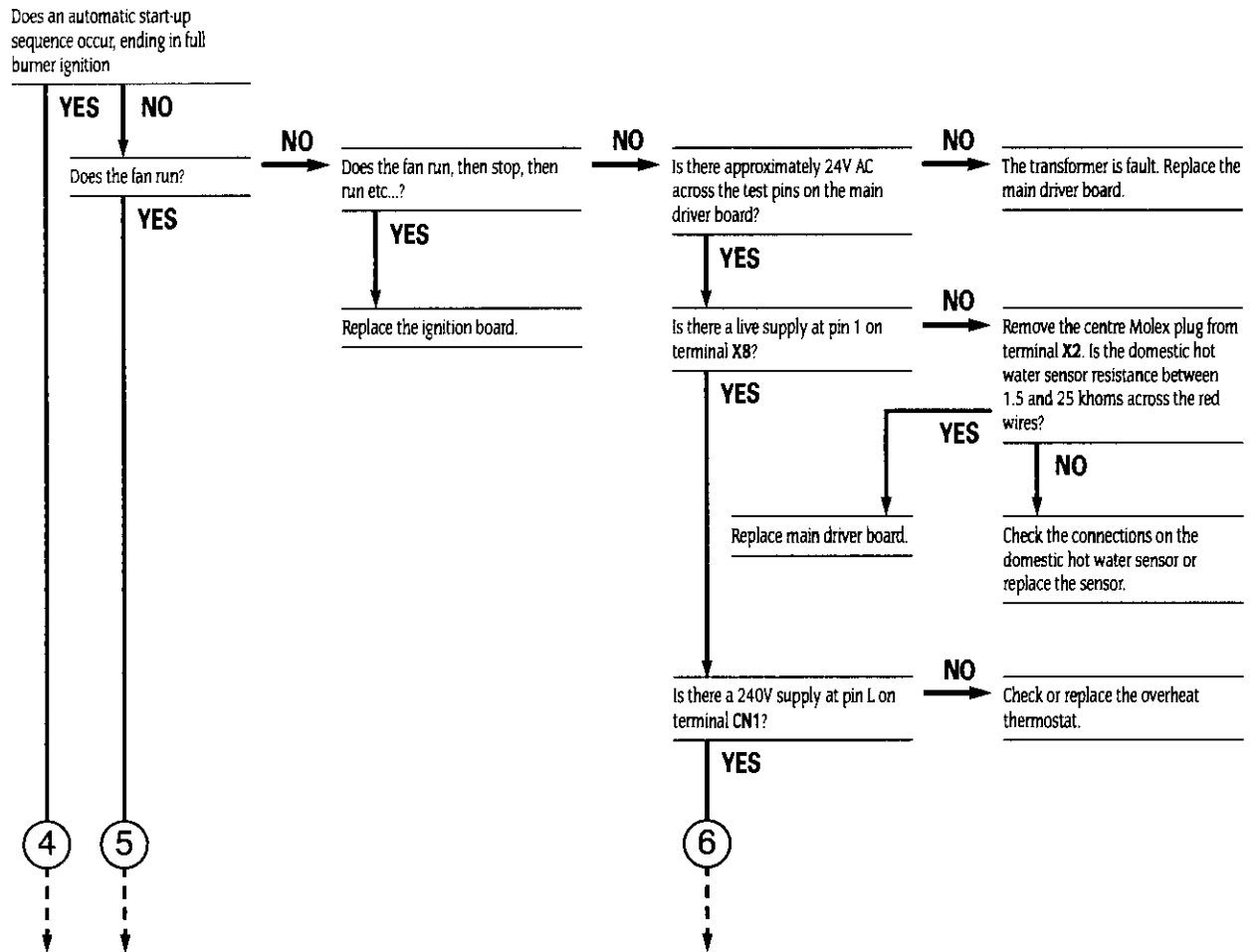
FAILURE AT POINT K

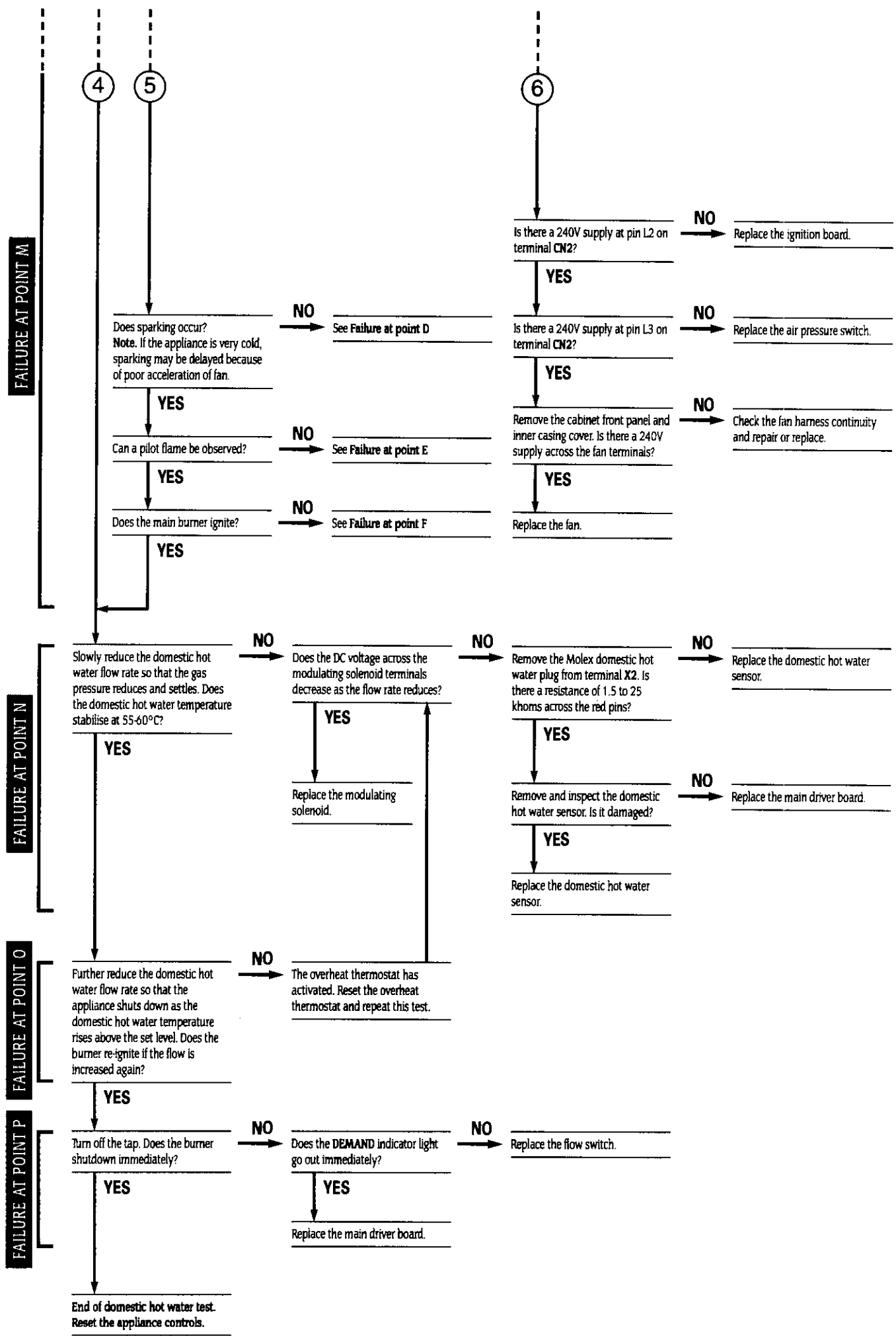


FAILURE AT POINT L

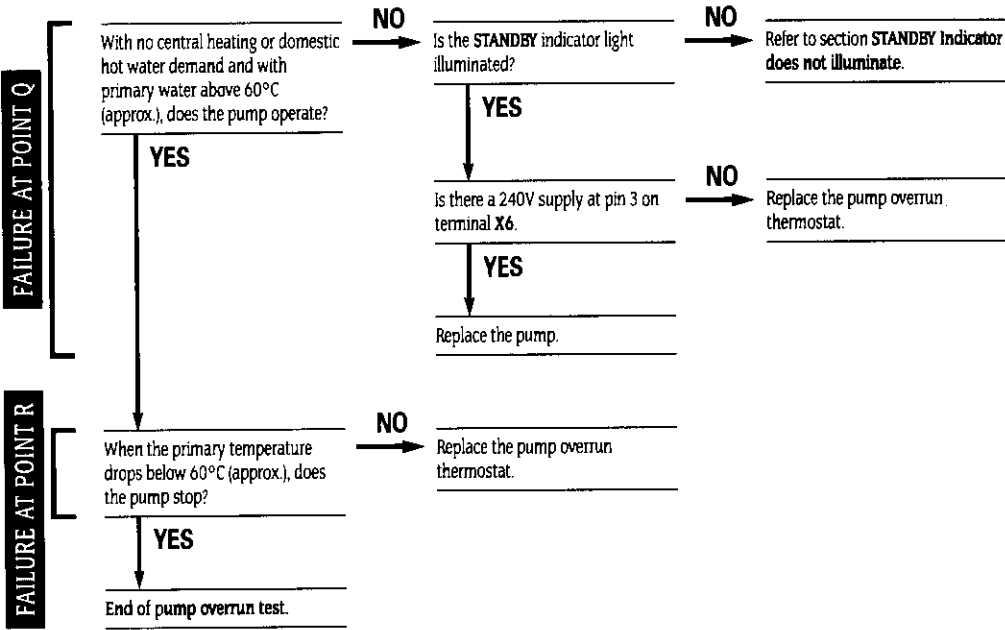


FAILURE AT POINT M

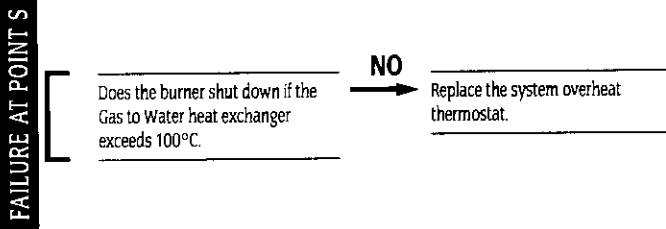




## START OF PUMP OVERRUN TEST



## OVERHEAT PROTECTION TEST







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

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