



WORCESTER

Bosch Thermotechnik

350 Combi

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

INSTALLATION AND SERVICING INSTRUCTIONS



GC No. 47 311 13

BOILER OUTPUT

Automatic Modulating Control

To Domestic Hot Water

Minimum 9.0 kW (30,700 Btu/h)

Maximum 35.17 kW (120,000 Btu/h)

To Central Heating

Minimum 9.0 kW (30,700 Btu/h)

Maximum 25.0 kW (85,300 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, local Building Regulations, Building Standards (Scotland) (Consolidation), bye-laws 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 6798:1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60kW

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 60kW: 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 section contains a summary of essential information. Refer to the appropriate main sections for more information.

2.2 This appliance is not suitable for external installation.

2.3 The appliance controls are set to provide a maximum output of 35.17kW for the domestic hot water and can be reset to satisfy a central heating load of up to 25kW. The appliance leaves the factory set to satisfy a central heating load of 15kW.

2.4 PRINCIPLE APPLIANCE COMPONENTS.

The appliance comprises the following:

A low thermal capacity gas to water heat exchanger.

A Water to Water heat exchanger to provide domestic hot water.

Separate circulating pumps for domestic hot water and for central heating.

A drain point.

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 heating system.

Temperature and water pressure safety cut-out controls.

A variable speed fan.

A water flow regulator.

An optional extra flue kit to provide for flue lengths up to 2 metres.

A fascia mounted programmer is available as an optional extra.

2.5 ELECTRICAL SUPPLY.

Mains supply: 240V ~ 50Hz, 340 watts. External Fuse 3A. Internal Fuses F2A (20 mm).

A supply failure will stop the appliance operating. The appliance will automatically return to normal operation upon the resumption of the supply.

2.6 DELIVERY.

The main appliance is packed in one carton. The flue components are packed separately.

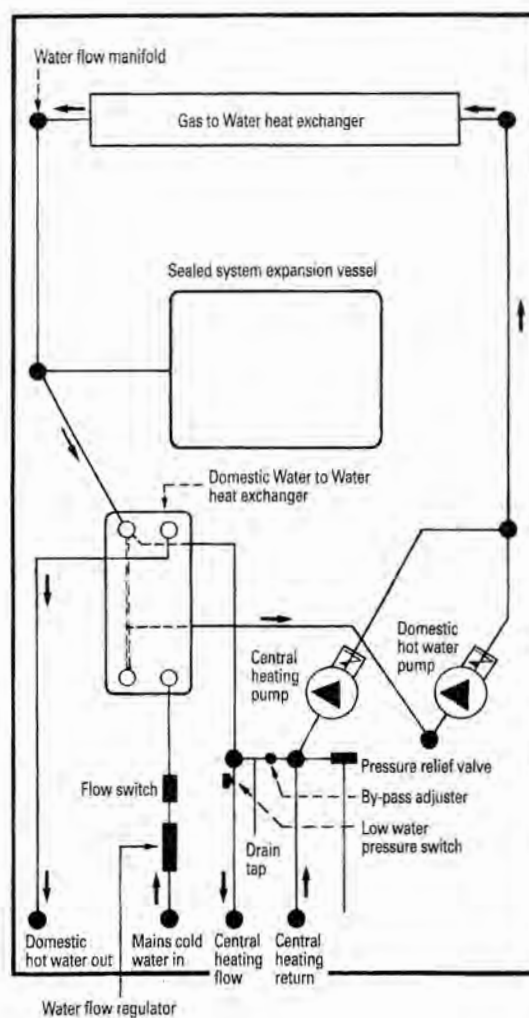
2.7 INSTALLATION.

The appliance is supplied for connection to a sealed system and is not suitable for use with an open system.

The appliance is not suitable for external installation.

It is a room sealed appliance. The specified ventilation openings in a wall or compartment door must not be obstructed.

Fig. 1. Appliance water flow diagram.



A separate combustion air opening in any room or compartment is not required.

Do not place anything on top of the appliance.

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

The clearances specified for servicing must be maintained.

There is space for the gas and water pipes to pass up the back of the appliance and to come out at the top. See Section 10.2.

2.8 FLUE.

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

The standard flue assembly length is from 100 mm (4 in.) to 1000 mm (39.3 in.).

An extended flue length from 1001 mm (39.4 in.) to 2000 mm (78.7 in.) is available.

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

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

An internal flue fixing kit is available from Worcester Heat Systems. The Instructions for fitting the flue are in this booklet. See Section 10.3.

2.9 CONTROLS.

Separate circulating pumps control the central heating and domestic hot water flow systems.

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

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

The Operating Switch provides for the selection of **Domestic Hot Water only** or **Central Heating and Domestic Hot Water** or **Off**.

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

The integral fascia 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.

The water system low pressure cut-off switch is set to operate at 0.5 bar (7.4 psi).

2.10 SYSTEM NOTES.

IMPORTANT: Check that no foreign matter is left in either the gas or water pipework as this could cause damage to the appliance. The primary system should be flushed and treated in accordance with the recommendations of BS 7593:1992.

The appliance is **NOT** suitable for fitting to an open vented system.

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

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

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.

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

2.11 SHOWERS, BIDETS, TAPS AND MIXING VALVES.

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

Thermostatically controlled shower valves will give extra comfort and 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 but is 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.

2.12 GAS SUPPLY.

The boiler requires 4.12 m³/h (144.5 ft³/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. Table 7 gives an indication of limiting gas pipe lengths and the allowance to be made for fittings. Refer to BS 6891 for further information.

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

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

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 turned 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 Mode: With a demand for hot water the burner will light at its minimum setting and immediately increase to the maximum output. The temperature of the water at the tap rapidly rises to its maximum set level. The output of the appliance is then automatically adjusted to maintain the temperature rise of the delivered water.

When hot water is no longer required the burner goes out. The fan will overrun for a few seconds to dissipate the residual heat from the appliance.

In winter, when the mains inlet temperature is low, it will be necessary to reduce the flow of water from the tap to maintain the delivery temperature.

Central heating Mode: With a demand for heating the burner will light at its minimum setting and gradually increase to the maximum output of between 15kW and 25kW depending upon the setting. 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 9.0kW. If the system no longer requires even the minimum output to maintain the desired room temperature then the burner will extinguish. The fan will overrun for a few seconds to dissipate the residual heat from the appliance. The appliance will remain off for a fixed period of about three minutes before re-lighting and will automatically meet the system requirement.

Domestic 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 requirement for the period of hot water demand. When hot water is no longer required the burner will extinguish and a waiting period of about three minutes will prevail before returning to the central heating state and its normal mode of operation. The fan overrun function will only come into operation if neither pump is operating.

3. Technical Data

The Data Plate is fixed to the control box casing.

TABLE 1

NOMINAL BOILER RATINGS (10 minutes after lighting)							
Output		Input		Burner Setting Pressure		Gas Rate	
kW	Btu/h	kW	Btu/h	m bar.	in. wg.	m ³ /h	ft ³ /h
9.0	30,700	12.68	43,200	1.3	0.52	1.19	41.98
25.0	85,300	31.65	108,000	7.8	3.12	2.97	104.8
35.17	120,000	43.96	150,000	14.2	5.68	4.12	145.5

TABLE 2

FLUE DETAILS		
Horizontal Flue (Side or Rear)	mm	inches
Wall Hole Diameter	125	5.0
Wall Hole Diameter (using internal fitting kit)	150	6.0
Standard Flue – Minimum Length	100	4.0
Standard Flue – Maximum Length	1000	39.3
Extended Flue – Maximum Length	2000	78.7

TABLE 3

AVAILABLE PUMP HEAD						
Boiler Output		Head		Min. Flow Rate		Temp. rise across central heating flow and return
kW	Btu/h	metres	feet	litres/min	gal/min	
9.0	30,700	4.70	15.23	11.73	2.58	11°C (20°F)
15.0	51,200	2.65	8.61	19.54	4.30	
25.0	85,300	2.08	6.76	21.57	4.75	16°C (29°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 CONNECTION	Rc ³ / ₄
PRESSURE RELIEF VALVE DISCHARGE FITTING	15 mm Compression
OVERALL APPLIANCE HEIGHT (including flue bend)	925 mm (36.4 in.)
CASING HEIGHT	900 mm (35.4 in.)
CASING WIDTH	500 mm (19.7 in.)
CASING DEPTH	310 mm (12.2 in.)
DRY WEIGHT	67 kg (148 lb.)
MAXIMUM INSTALLATION WEIGHT	60 kg (132 lb.)
PACKAGED WEIGHT	72 kg (159 lb.)

TABLE 5

SPECIFICATIONS	
PRIMARY WATER CAPACITY	3 litres (0.66 galls.)
MAXIMUM COLD SUPPLY PRESSURE	10 bar (150 psi)
MINIMUM COLD SUPPLY PRESSURE (WORKING) FOR MAXIMUM HOT WATER FLOW	1.3 bar (20.0 psi)
MINIMUM COLD SUPPLY PRESSURE (WORKING) TO OPERATE THE APPLIANCE	0.8 bar (12 psi)
MAXIMUM CENTRAL HEATING FLOW TEMPERATURE	Nominally 82°C (180°F)
MAXIMUM HEATING SYSTEM PRESSURE	1.5 bar (22 p.s.i.)
MINIMUM HEATING SYSTEM PRESSURE	0.55 bar (8 p.s.i.)
OUTPUT TO DOMESTIC HOT WATER	Modulating 9.0–35.17 kW (30,700–120,000 Btu/h)
OUTPUT TO CENTRAL HEATING	Modulating 9.0–25.0 kW (30,700–85,300 Btu/h)
MAXIMUM DOMESTIC HOT WATER FLOW RATE FROM THE APPLIANCE	Nominally 12.5 litres/min (± 15%) (2.8 gallons/min)
EQUIVALENT DOMESTIC HOT WATER FLOW RATE TO GIVE A TEMPERATURE RISE OF 35°C	Nominally 14.4 litres/min (± 15%) (3.22 gallons/min)

TABLE 6

NOMINAL RATE OF DISCHARGE OF DOMESTIC HOT WATER				
litres/minute	13	12	11	10
gallons/minute	2.86	2.75	2.42	2.20
Nominal temperature rise °C	38.5	41.5	45.5	50.0

Table 6 is given as a guide and assumes a Water to Water heat exchanger efficiency of 100% and a constant heat output of 35.2kW (120,000 Btu/h). The control sensors will ensure that the heat output from the boiler will reduce as necessary to maintain the temperature rise and prevent overheating.

TABLE 7

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

Each fitting used in the gas line from the meter is equivalent to a specific length of straight pipe which must be added to the straight pipe length to give the total length.
i.e. Elbow = 0.5 metres, Tee = 0.5 metres, 90° Bend = 0.3 metres.

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 does not require any special wall protection. The wall must be capable of supporting the weight of the appliance. See Table. 4.

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

4.4 The following clearances must be available for installation and for servicing. See Fig. 2.

	Installation	Servicing
Above the flue bend	35 mm	35 mm
In front	600 mm	600 mm
Below	200 mm	200 mm
Right and left hand side	25 mm	5 mm*

*If a side flue connection is made then 25 mm must be left at that side for possible service access.

4.5 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.

It is essential that an airing space is 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.

The requirements regarding the servicing space must be followed when the appliance is in a compartment used for airing clothes.

No combustible surface must be within 75 mm of the casing.

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

If a cupboard is to be built around the appliance after installation then the requirements specified in BS 6798: 1987 and BS 5440:2 must be strictly followed.

4.6 The position of the pipes are shown in Fig. 3 so that the piping of the system can take place before the fitting of the appliance.

4.7 Always consider the possible need to separate the pipes from the appliance after installation.

Fig. 2. Appliance casing dimensions and required clearances.

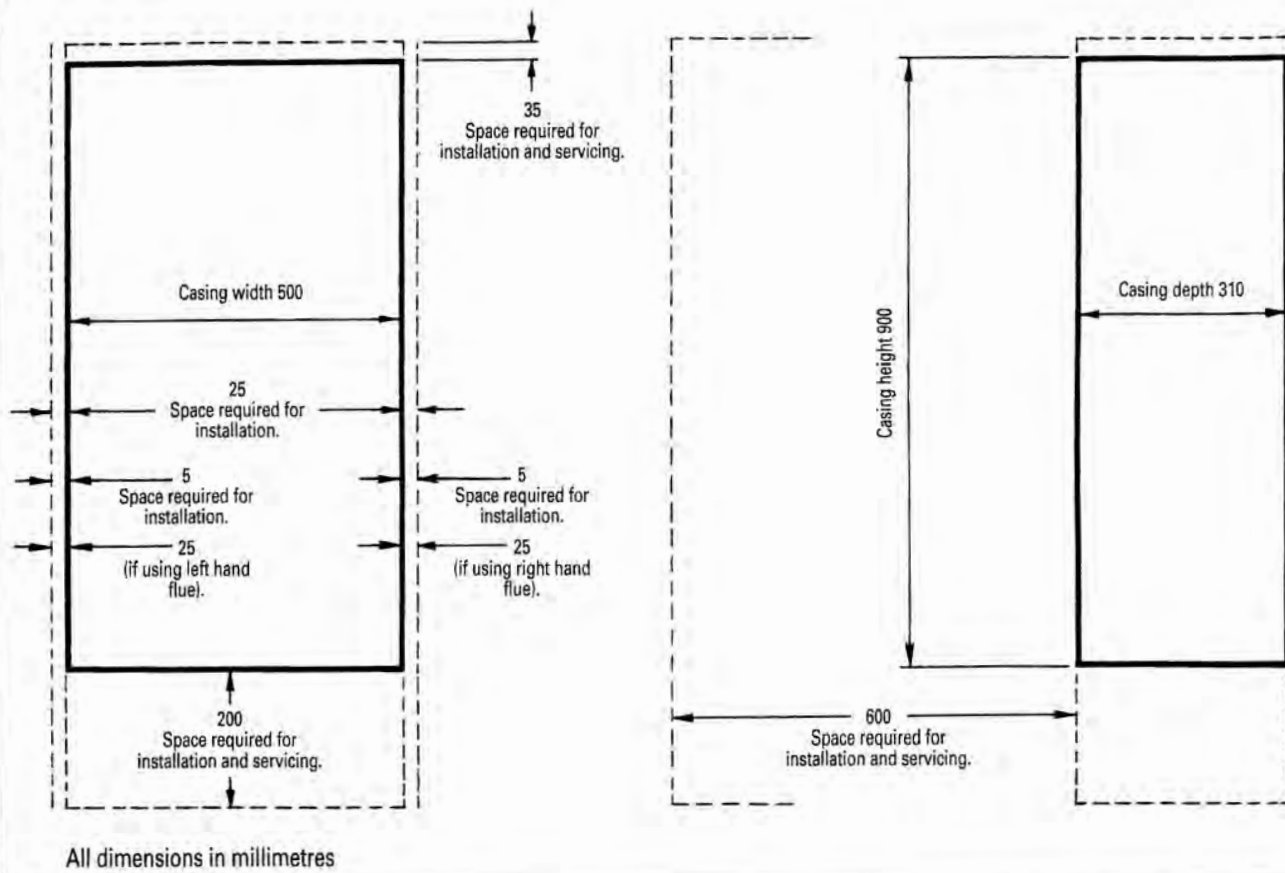
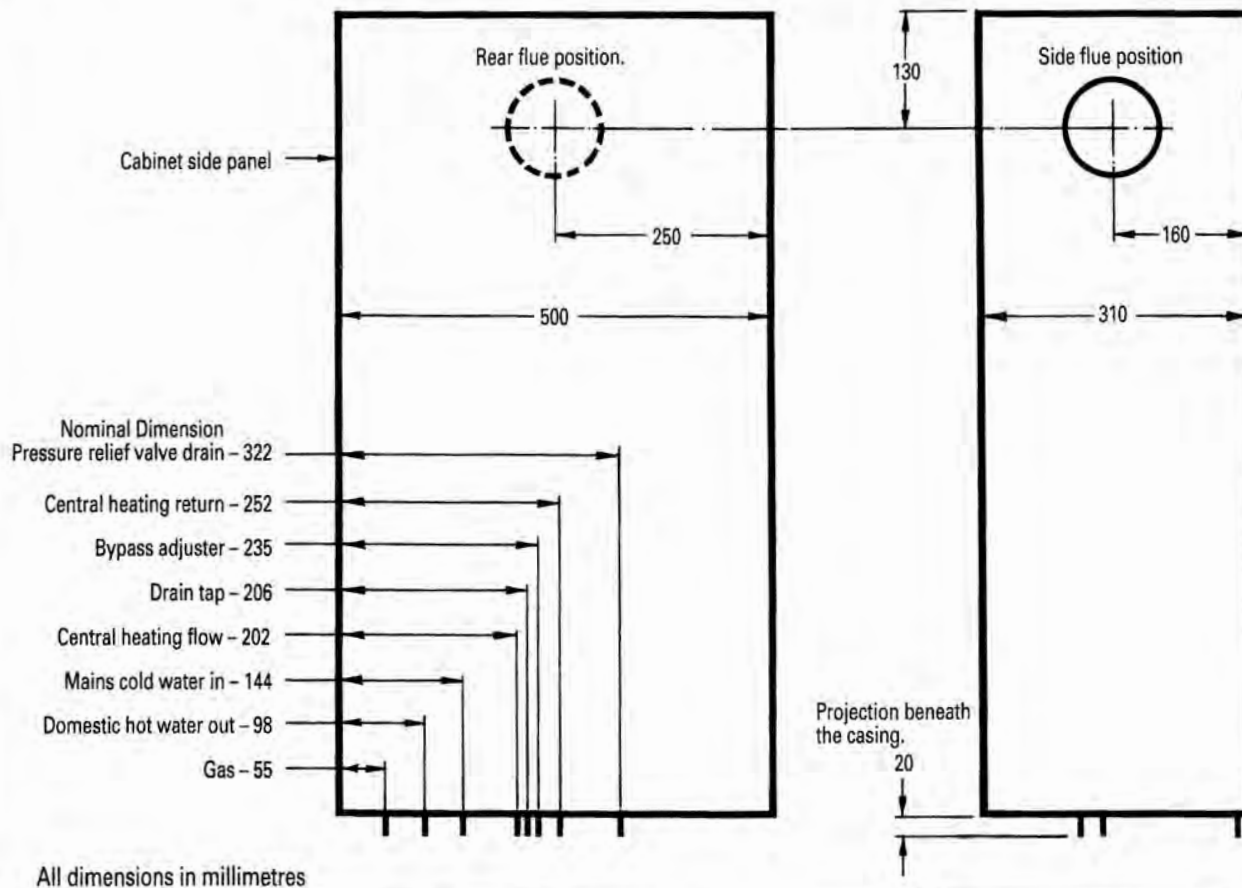


Fig. 3. Appliance pipework connections and flue positions.



5. Flue Terminal Position

See Fig. 4.

- 5.1 The flue must be installed as specified by BS 5440: Part 1.
- 5.2 The standard flue length is 100 mm (4 in.) up to 1000 mm (39.3 in.). The extended flue length is 1001 mm (39.4 in.) up to 2000 mm (78.7 in.).
- 5.3 The air duct should be supported at the joint of the extended duct and the brackets rigidly fixed to the wall.
- 5.4 The terminal must be positioned so as not to cause an obstruction and so that the combustion products do not cause a nuisance.

Under some climatic conditions there may be a tendency for steam to come from the terminal. Terminal positions where this may cause a nuisance should be avoided.

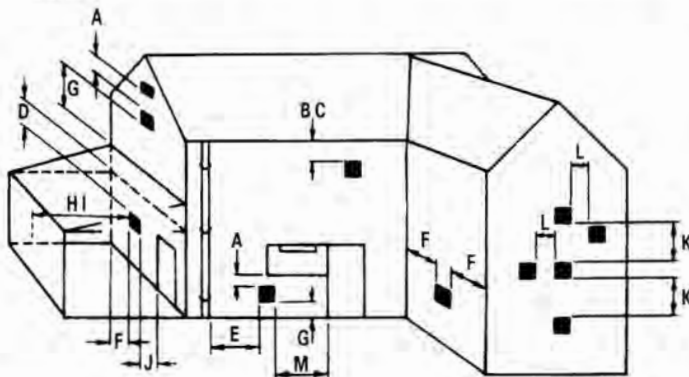
If the terminal is fitted within 850 mm of a plastic or painted gutter or within 450 mm of painted eaves then an aluminium shield at least 750 mm long should be fitted to the underside of the gutter or painted surface.

If a terminal is fitted less than 2 metres above a surface to which people have access, then a guard Reference GC 393 553 Type K2, available from Tower Flue Components Ltd, Vale Rise, Tonbridge TN9 1TB, must be fitted.

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

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.	200 mm (8 in.)
D- Below balconies or car port roof.	200 mm (8 in.)
E- From vertical drain pipes and soil pipes.	75 mm (3 in.)
F- From internal or external corners.	300 mm (12 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.	1500 mm (59 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 combustion air vent.
 - 6.2 If the appliance is installed in a cupboard or compartment, permanent air vents are required for cooling purposes, one at high level and one at low level, either direct to outside air or to a room. Both air vents must pass to the same room or be on the same wall to the outside air.
- There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. See Section 4, Para. 4.5.
- The ventilation openings in the cupboard or compartment must

not be effectively reduced by the close proximity of the appliance. See Section 4.5.

The minimum free areas required are given below.

Position of air vents	Air from the room	Air direct from outside
High Level	396 cm ² . (60 in ² .)	198 cm ² . (30 in ²)
Low Level	396 cm ² . (60 in ² .)	198 cm ² . (30 in ²)

Refer also to BS 6798: 1987 and BS 5440: Part 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.
- The appliance must not be operated without the system being full of water, properly vented and pressurised.
- 7.2 **Pressure Relief Valve.** The valve complies with BS 6759 and will operate at 3 bar (45 lb./in.²). The discharge pipe must be directed away from electrical items or wiring and from where it might be a hazard to the user.
 - 7.3 **Pressure Gauge.** The gauge indicates the system pressure which must be maintained.
 - 7.4 **Expansion Vessel.** The vessel conforms to BS 4814, has a capacity of 10 litres charged to 0.5 bar and is suitable for a static

head of 5 metres (17.5 ft.). A Schraider type valve allows the pressure to be increased if the static head is greater than 5 metres (17.5 ft.).

7.5 **System Volume.** With an initial system pressure of 1 bar, a system capacity of about 72 litres can be accommodated. Refer to BS 7074 Part 1 and BS 5449 to calculate the system volume accommodated by the expansion vessel at the set pressure.

This volume must not be exceeded.

TABLE 8

Initial Pressure Pressure (bar)	TOTAL SYSTEM VOLUME (litres)		
	Initial Charge Pressure (bar)		
	0.5	1.0	1.5
1.0	72	92	-
1.5	39	53	64

7.6 System Design Pressure. The maximum system design pressure is 1.5 bar (21.5 lb./in.²).

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

If the expansion vessel within the appliance fails it must be replaced with the designated spare part. See Section 14.4 and Section 15.

7.7 Filling. See Fig. 6. The filling point must be at low level.

7.8 Make-Up. See Fig. 6. Water lost from the system must be replaced. Refer to BS 7074, Part 1. The connection must be made in the central heating return as close as possible to the appliance.

7.9 Venting. The system and the appliance must be properly vented. Repeated venting reduces the amount of water in the system. It is essential that this water is replaced and the system pressure maintained. The reason for the need to repeatedly vent

the system (usually a leak) must be rectified.

7.10 Water Mains Connection. There must be no connection to the mains without the authority of the local Water Company.

7.11 By-Pass. An adjustable system by-pass is fitted to the appliance.

7.12 Pump. The pump on the central heating system is set at maximum and must not be adjusted.

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

7.14 Valves. Radiator valves must conform to BS 2767(10): 1972. Other valves used should conform to the requirements of BS 1010.

7.15 Low Water Pressure Switch. The switch will stop the appliance if the system pressure falls below 0.5 bar (7.5 lb./in.²). This will be indicated by a red light on the fascia. The cause of the drop in pressure (such as a leak in the system) must be investigated and rectified.

Fig. 5. Sealed primary water system.

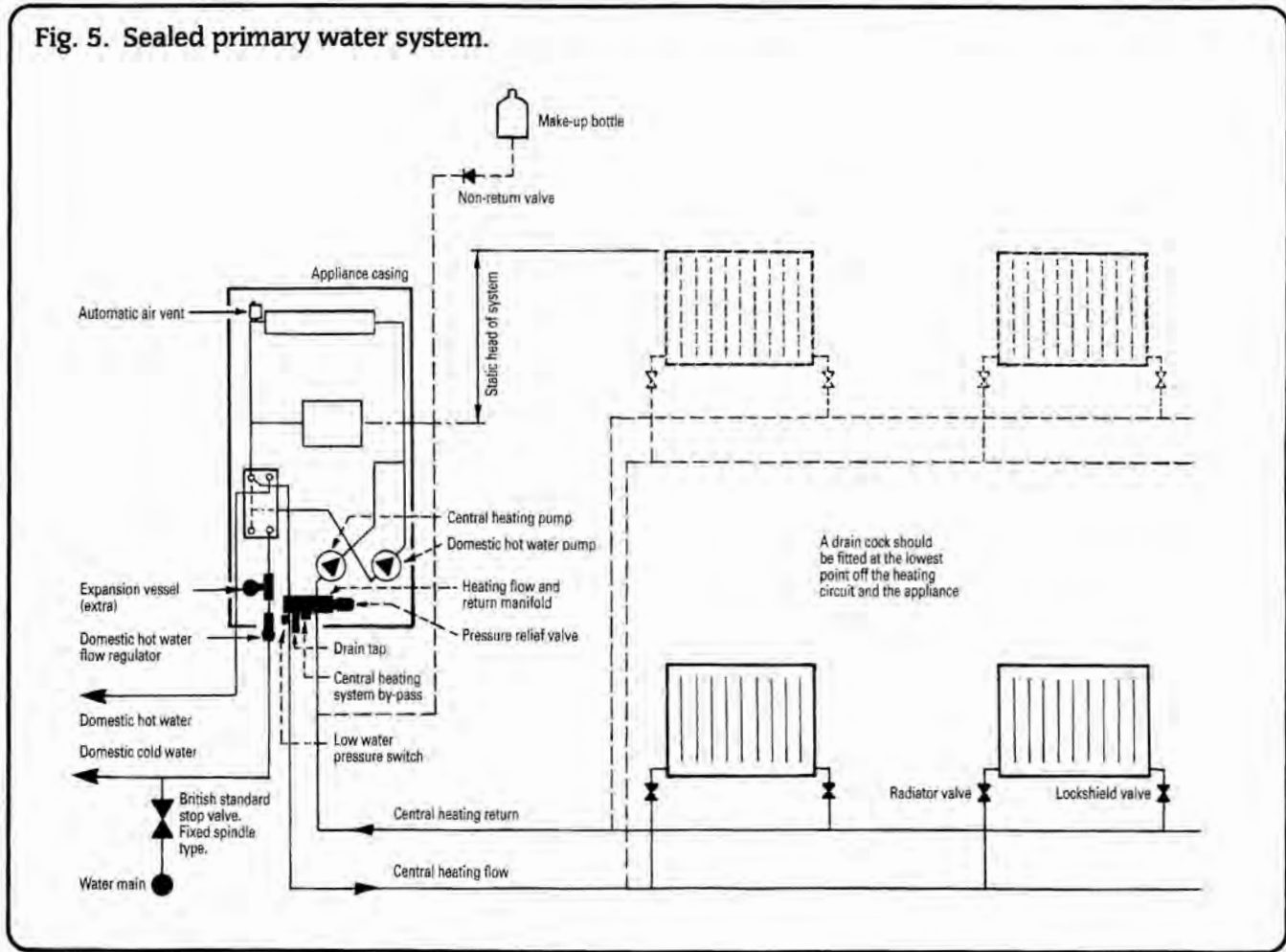
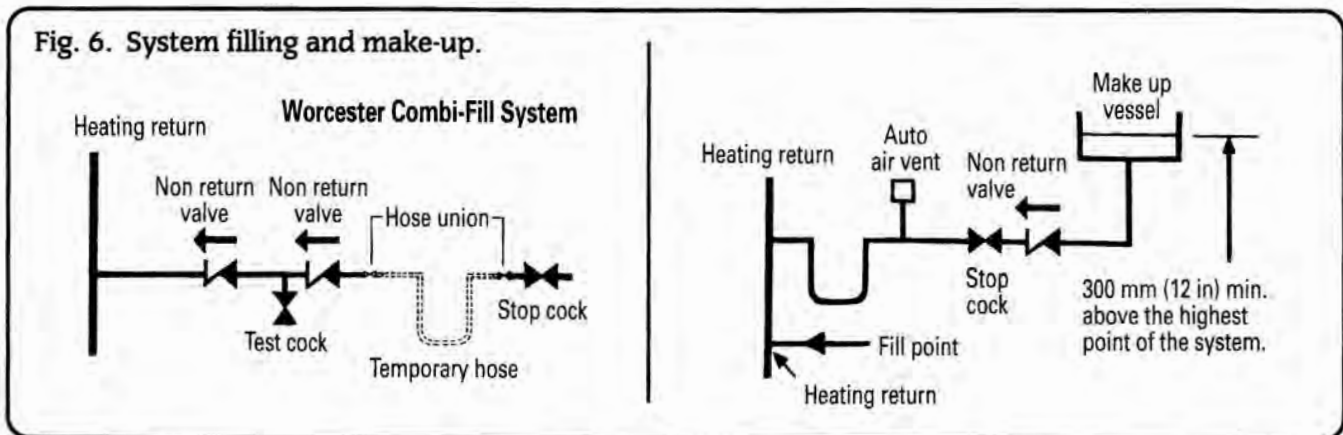


Fig. 6. System filling and make-up.



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 can be fitted within the casing of the appliance if necessary.

An RC $\frac{1}{2}$ connection is provided on the flow switch assembly. See Fig. 38. A Zilmet Z160 is the preferred type. A thread sealant compatible with potable water must be used.

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

The appliance is suitable for a mains supply having a maximum pressure of up to 10 bar (145 lb./in.²). A pressure reducing valve must be fitted, if necessary.

The appliance is fitted with an isolating valve.

The pump, which circulates water to the domestic hot water heat exchanger, is set at maximum and must not be adjusted.

8.3 HOT WATER SUPPLY AND FLOW REGULATION.

The minimum supply pressure for the maximum flow of hot water is 1.3 bar (20 lb./in.²). The maximum hot water flow rate is 12.5 litres/min. ($\pm 15\%$) (2.8 gallons/min.) giving a temperature rise of nominally 41°C.

The temperature rise of the domestic hot water is maintained by the automatic modulation of the heat input to the boiler.

The temperature of the incoming water is raised by a fixed amount. In winter, when the mains inlet temperature is lower, the water flow at the taps must be reduced to maintain the required delivery temperature.

If there are long pipe runs to the taps or shower then it is suggested they be insulated to prevent the rapid cooling of residual hot water in the pipes after the tap or shower has been turned off.

8.4 TAPS AND VALVES.

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

8.5 SHOWERS (FIXED HEAD TYPE).

No anti-siphonage arrangements are necessary. Thermostatically controlled shower valves will give extra comfort and guard against the flow of water at too high a temperature.

8.6 SHOWERS (LOOSE OR FLEXIBLE HEAD TYPE).

A loose head shower hose must be fixed so that the head cannot 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 incorporate or be fitted with an anti-siphonage device at the point of the flexible hose connections.

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

8.7 BIDETS.

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-siphonage arrangements are necessary.

8.8 USE IN HARD WATER AREAS.

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

Installation of a scale inhibitor assembly should be strictly in accordance with the requirements of the local Water Company. An isolating valve to facilitate servicing should be incorporated.

The water hardness may be determined using a standard test paper or by reference to the local Water Company. Further information may be obtained from Worcester Heat Systems Ltd.

9. Electrical

See Figs. 7, 8, 9a, 9b and 10.

9.1 MAINS SUPPLY.

Supply: 240V ~ 50 Hz, 340 watts. External Fuse 3A. Internal Fuses F2A (20 mm). It must be possible to completely isolate the appliance.

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.

The appliance must be earthed.

Mains Cable. 0.75 mm² (24 x 0.20 mm) to BS 6500 Table 16. Temperature rated at 100°C.

If a new cable is needed it must be connected into the terminals marked L (Brown or Red lead), N (Blue or Black lead) and \oplus (Green/Yellow or Green lead) and be held securely in the cable clamp. When fixing the mains lead or external control leads check that sufficient has been left within the casing to allow the control box to be brought forward and lowered.

9.2 MAINS CONNECTION.

To gain access to the mains connection point on the main driver board remove the facia assembly.

9.3 EXTERNAL THERMOSTATS.

If a room and/or frost thermostat is to be fitted refer to Figs. 7 and 8. The thermostats must be suitable for use on mains voltage. Secure the leads with the strain relief bushes provided.

9.4 FACIA MOUNTED PROGRAMMER.

A programmer offering time controlled Central Heating and Domestic Hot Water or one which provides controlled Central Heating and switched Domestic Hot Water is acceptable. For further information contact Worcester Heat Systems Ltd.

9.6 SAFETY CHECK.

In the event of an electrical fault after the installation of the appliance, the electrical system shall be checked for short circuits, fuse failure, incorrect polarity of connections, earth continuity or resistance to earth.

Fig. 7. Room thermostat connections.

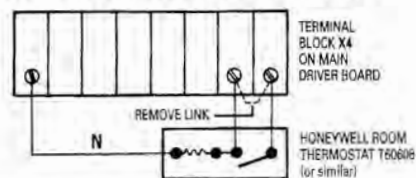


Fig. 8. Frost thermostat connections.

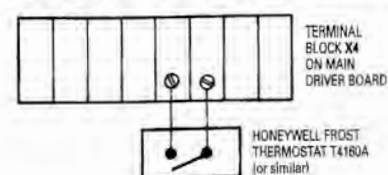


Fig. 9a. Wiring diagram—Components outside control panel.
 (All components shown viewed from front of appliance)

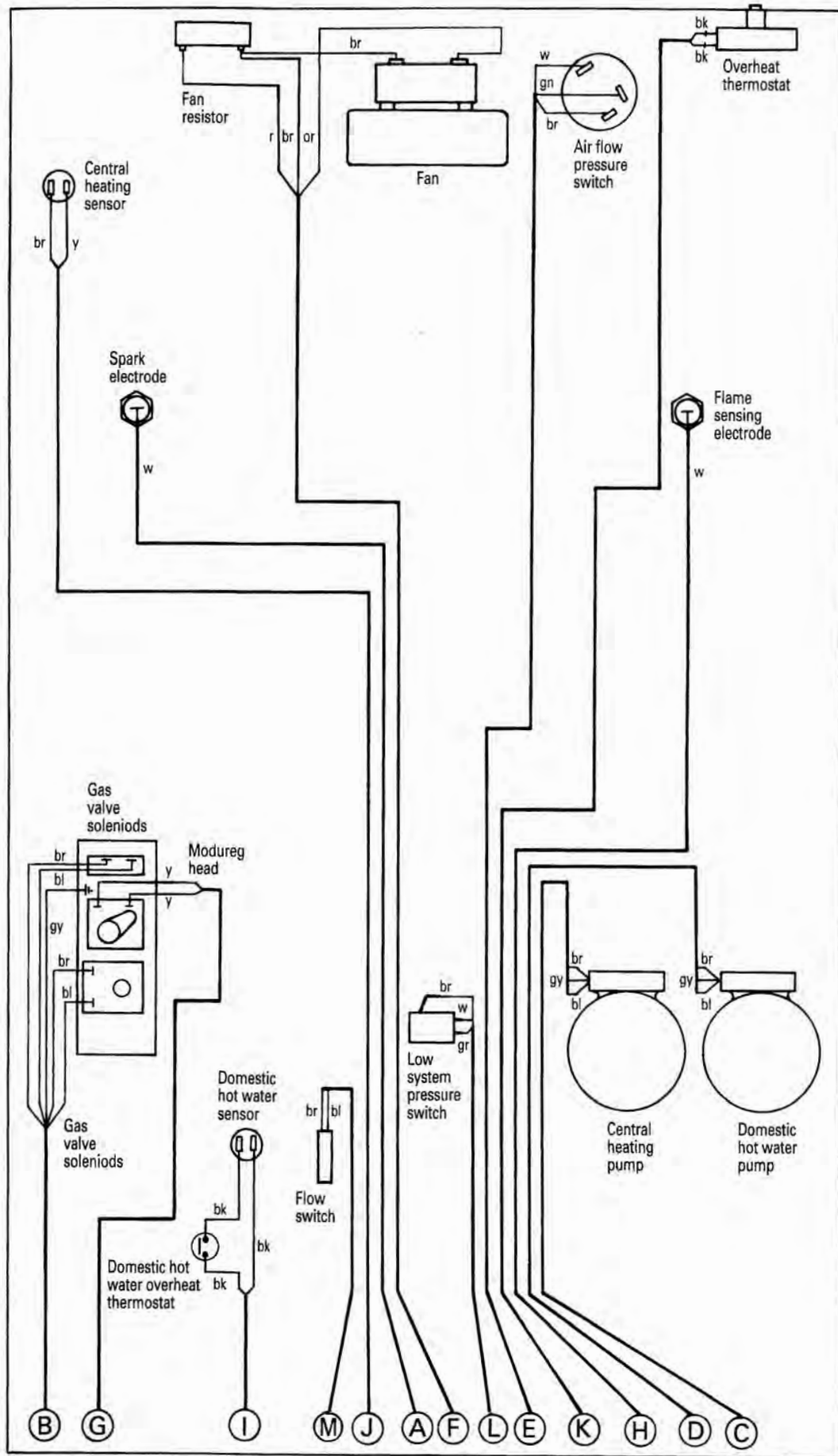


Fig. 9b. Wiring diagram—Control panel and facia.
 (All components shown viewed from front of appliance)

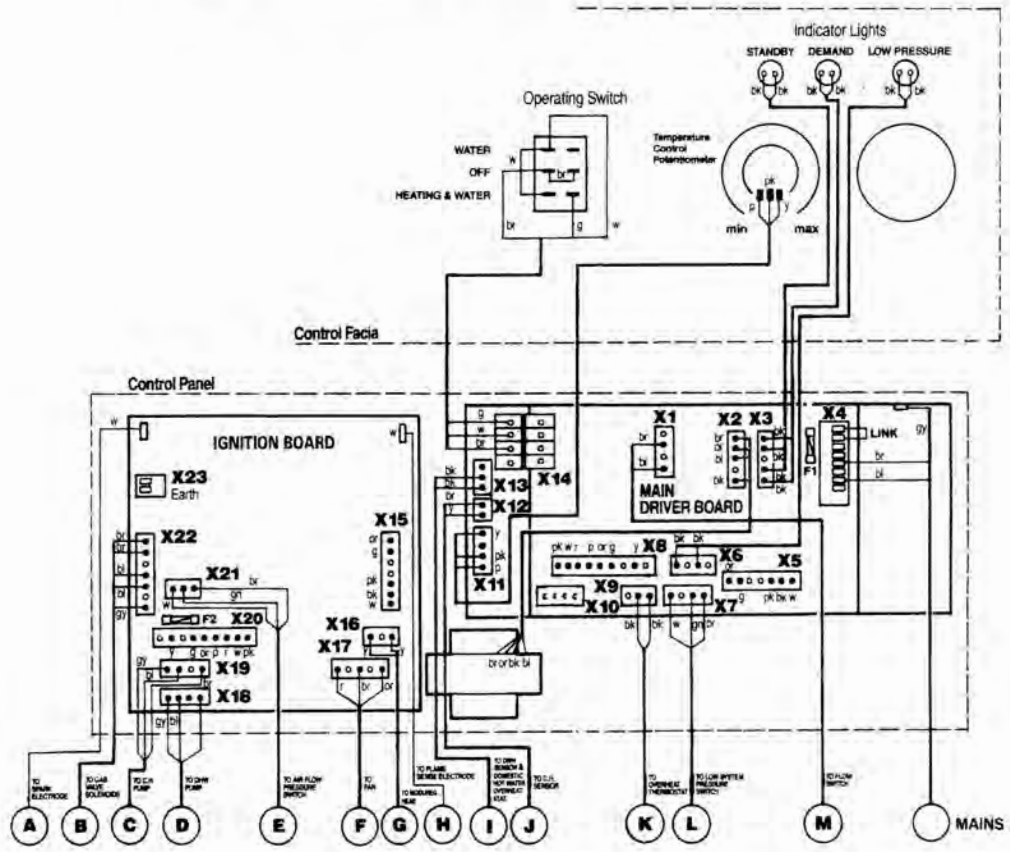
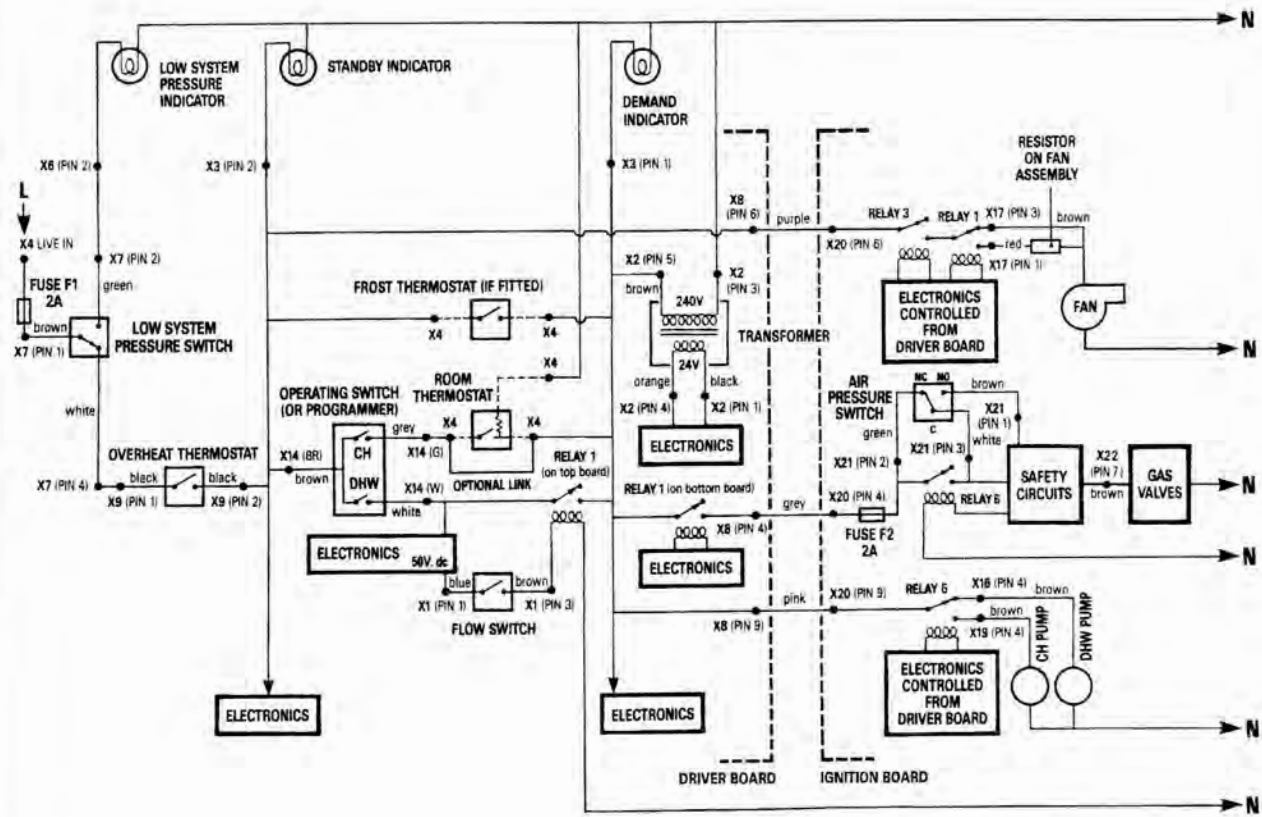


Fig. 10. Functional flow diagram.



10. Installation

10.1. The standard flue length is 100mm – 1000mm. The extended flue length is 1001 – 2000mm. One extension only may be used.

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

Note: Components and instructions are supplied with the standard flue kit to allow the flue assembly to be fitted from inside the building.

10.2. GENERAL PREPARATION

Check that the appliance carton contains:-

Installers instruction pack

Users information pack

Side flue template

Appliance with mounting plate and manifold assembly

Appliance casing bottom panel

Carefully remove the appliance from the package and lay it on its back.

Unscrew the gas and water connections joining the appliance to the wall mounting plate and manifold assembly at the bottom of the appliance.

Raise the bottom of the appliance and pull out the wall mounting plate and manifold assembly from the appliance.

Check that the gas and water valves are closed. See Fig. 21.

Check that the position chosen for the appliance is in accordance with the instructions given in Sections 4 and 5.

Hold the wall mounting plate to the wall onto which the appliance is to be fitted. Check that the plate is horizontal and vertical where indicated. See Fig. 11.

Mark the position of the six appliance fixing holes and the position of the flue on the wall(s).

Rear Flue – Mark from the wall mounting plate. See Fig. 11.

Side Flue – Mark the horizontal line of the top of the casing and extend along the wall and mark the position of the flue hole using the side template. See Fig. 11.

Drill the six appliance fixing holes 60mm deep for the No. 12 plugs supplied.

Drill the flue hole at 125mm diameter (150mm dia. for internal fitting) ensuring that it is horizontal through the wall.

Fix the sealing gasket, (supplied with the appliance), evenly around the flue opening in the mounting plate at the side facing the wall.

Plug the holes and fix the appliance mounting plate and manifold assembly checking that the assembly is horizontal before tightening the screws.

Notches on the manifold assembly indicate the centre lines of the valves.

Transfer these marks to the wall to aid the alignment of the pipework.

Remove the gas cock and fit the appropriate connector fitting. Refit the cock.

If pre-plumbing the pipework, then loosen the valve locknuts and arrange the pipework so that there can be some slight vertical movement of the valves when connected to the pipework. Suitably restrain the pipework after connecting the appliance.

Pre-plumbing is not advised if movement is not available.

Pipework running up the back of the appliance must be arranged to pass to one side of the air/flue duct when a rear flue connection is made. See Fig. 11.

Pipework can only run horizontally outside the limits of the appliance casing. It is important that the pipes are not fixed using clips which space them away from the wall.

The gas and water pipes may now be connected to the manifold. Before the appliance is fitted to the wall, thoroughly flush the central heating system and the mains water supply pipe. Lift the appliance onto the mounting plate. Remove the two appliance support brackets. Tighten the connections at the manifold.

10.3. FIXING THE APPLIANCE

Remove the cabinet front panel from the appliance by pulling it away from the clips at the bottom of the casing and lifting it off the top supports.

Remove the inner casing cover and the inner cover panel by removing the eight screws. See Fig. 22.

Fix the air duct clamp assembly (packed in the installer pack) to the appropriate opening as follows. See Fig. 17.

Pull off the fan suction tubes and unplug the electrical connection from the fan at the 3-pin connector block. See Fig. 15. Unscrew and remove the fan fixing screw. Slide the fan out of the appliance.

To fit the air duct assembly to the rear opening, carefully slide the outer part of the clamp assembly down behind the appliance and hold it in position while placing the inner flanged section on the inside of the inner casing. Align the screw holes and loosely fix the screws. See Fig. 17.

If a side flue connection is to be made, remove the appropriate sealing plate assembly. See Fig. 16. Fit the air duct clamp assembly as described with the outer section fixed against the white cabinet casing.

Fit the sealing plate assembly (previously moved from the side flue opening) to the rear flue opening and tighten the screws.

Carefully flex the silicon rubber sealing ring to achieve an undistorted ring.

Fit the ring into the groove in the air duct clamp assembly. Tighten the screws so that the ring is held evenly but not distorted or compressed. Do not fully tighten the screws at this stage. See Fig. 17.

If it is necessary, (because of accessibility problems) to fit the flue duct assembly from inside the building, then it should be done now.

Internal fitting of the flue

Cut and assemble the ducts and the terminal. Section 10.4. Fit the sealing gasket to the terminal and set in the channel. Slide the flue centring ring, available from Worcester Heat Systems, onto the air duct and tighten the clamp. See Fig. 14a. Loop a strong cord around the terminal from inside the flue duct leaving enough exposed to grip.

Lubricate the gasket and push the assembly through the wall.

Lift the appliance onto the wallplate ensuring that it is properly entered onto the top supports. Remove the transit brackets.

Hold the bottom of the appliance a little off the wall so that the connections can be aligned and entered. Ensure that the valve cocks face downwards. Fully tighten the gas and water connections and the valve locknuts. Always support the appliance pipework when tightening. Pass a 15mm pipe through the manifold plate and connect it to the relief valve discharge compression fitting. Ensure that any discharge does not fall onto electrical components or where it might be a hazard to the user. See Fig. 28.

Carefully pull back the assembly, using the cord, so that the air duct is drawn into the clamping ring and fix. See Section 10.4. Remove the cord

Fit the casing bottom panel using the screws supplied. The panel and screws are packed separately. See Fig. 23.

10.4. AIR AND FLUE DUCT ASSEMBLY

Open the package/s containing the ductwork and check the contents against the packing list/s. Remove all the packing from the ducts and terminal assembly.

The standard flue kit accommodates a flue assembly of up to 1 metre in length.

See Fig. 14 for the assembly arrangements.

Overall Duct Lengths, 1.0 – 1.2 metres

The air and flue ducts must be shortened before assembly and final cutting to length.

REAR FLUE ASSEMBLY

Measure and cut the air and flue ducts to length. Always check the dimensions before cutting. Measure the equivalent wall thickness **W** from the mounting wall to the external wall. See Fig 12.

Air duct length = $W + 65\text{mm}$. Cut the air duct to length leaving the cut square and smooth. Do not cut the drilled end of the air duct assembly.

Flue duct length = $W + 105\text{mm}$. Cut the flue duct to length.

Assemble the air and flue ducts and the terminal assembly. Do not forget to fit the internal support spider to an extended flue system. See Fig. 14.

Join any extended air ducts together applying a thin smear of silicone sealant around the end of the penetrating duct before pushing fully home into the expanded end of the other duct. See Fig. 14.

Drill through the guide holes using the 3mm drill supplied and fix the ducts and the terminal assembly using the self-tapping screws provided.

From outside, ease the complete assembly through the hole in the wall. The air duct fits more easily if it is lubricated with soap solution. Fully engage the air duct into the air duct clamp assembly and tighten the three screws. Make sure that the silicone seal is not distorted when entering the air duct.

REAR FLUE CONNECTION

Pull the inner flue duct forward to protrude 50mm into the inner casing. Do not exceed this figure. Slide the flue duct clamp over the fan outlet. Replace the fan assembly ensuring that the flue duct enters the fan outlet to a depth of 20mm.

Rotate the flue duct clamp around until the screw head is accessible and tighten. Push the fan fully home and tighten the fan fixing screw. See Fig. 18.

Make good the external brickwork or rendering. The inside edge of the rolled channel on the terminal assembly will be 10mm from the wall face.

Reconnect the electricity supply plug and suction tubes to the fan.

SIDE FLUE ASSEMBLY

Measure and cut the air and flue ducts to length. Always check the dimensions before cutting.

Measure the length **L**. See Fig. 13.

Air duct length = $L + 15\text{mm}$. Cut the flue duct to length, leaving the cut end smooth and square. Do not cut the drilled end.

Flue duct length = $L + 142\text{mm}$. Cut the flue duct to length.

Assemble the air and flue ducts and the terminal assembly. Do not forget to fit the internal support spider to an extended flue system. See Fig. 14.

Join any extended air ducts together applying a thin smear of silicone sealant around the end of the penetrating duct before pushing fully home into the expanded end of the other duct. See Fig 14.

Drill through the guide holes using the 3mm drill supplied and fix the ducts and the terminal assembly using the self tapping screws provided.

From outside, ease the complete assembly through the hole in the wall. The air duct fits more easily if it is lubricated with soap solution. Fully engage the air duct into the air duct clamp assembly and tighten the three screws. Make sure that the silicone seal is not distorted when entering the air duct.

SIDE FLUE CONNECTION

Slide the flue duct clamp over the fan outlet. Replace the fan assembly in the appropriate position and push into place. Refit the fan fixing screw and partially tighten. It will be necessary to remove a flue hood fixing wing nut and hook to allow the fan to be fitted. Replace these fittings immediately.

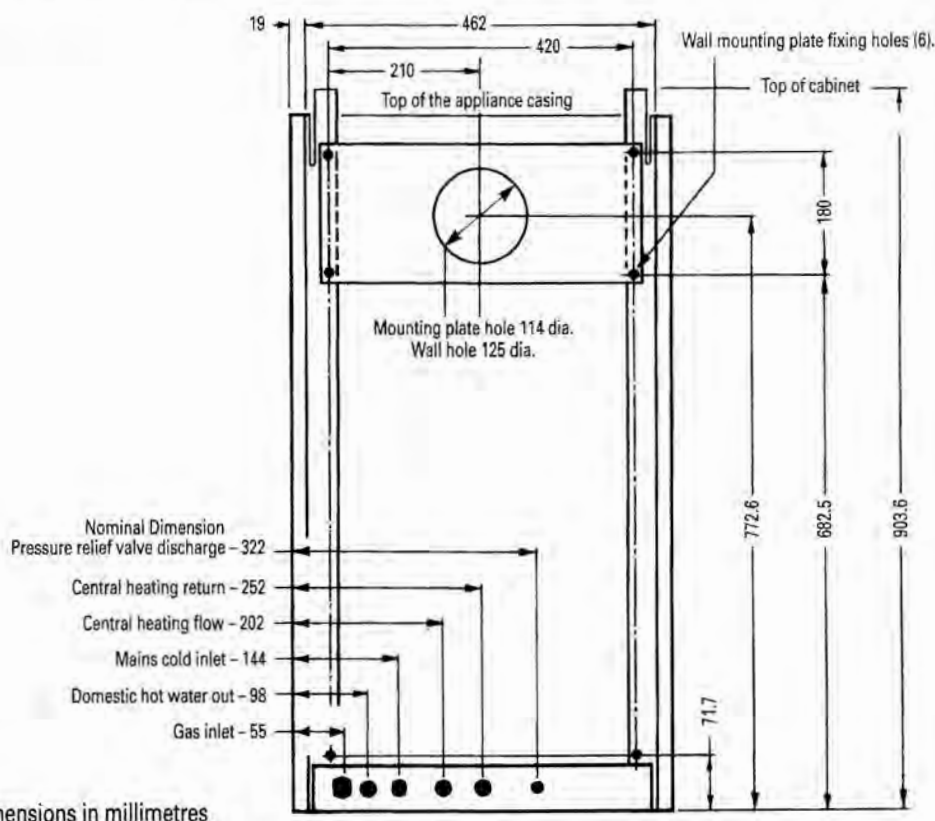
Push the flue duct into the fan outlet ensuring that 20mm of it enters the fan outlet. See Fig. 18.

Twist the flue duct clamp around until the screw head is accessible and tighten. Tighten the fan fixing screw.

Make good the external brickwork or rendering. The inside edge of the rolled channel on the terminal assembly will be 10mm from the wall face.

Reconnect the electricity supply plus and suction tubes to the fan.

Fig. 11. Wall mounting plate and manifold assembly.



Air Duct. Reduce the length of the extension air duct to 900mm. Do not cut from the expanded end. Loosely assemble the standard and extension ducts and cut to the required overall length. Do not cut the drilled end.

Flue Duct. Reduce the length of the extension air duct to 900mm.

Loosely assemble the standard and extension ducts and cut to the required overall length.

Overall Duct Lengths, 1.2 – 2.0 metres. Separately assemble the standard and extended air and flue ducts. Do not permanently fix together. Cut the ducts to the required overall length.

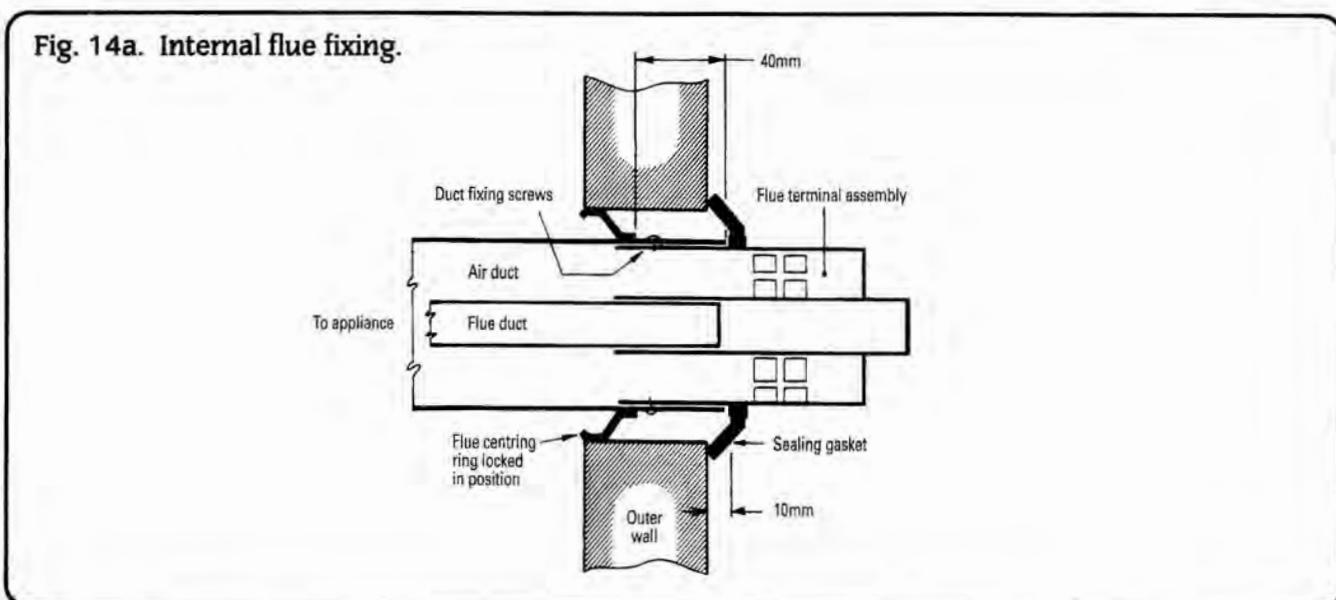
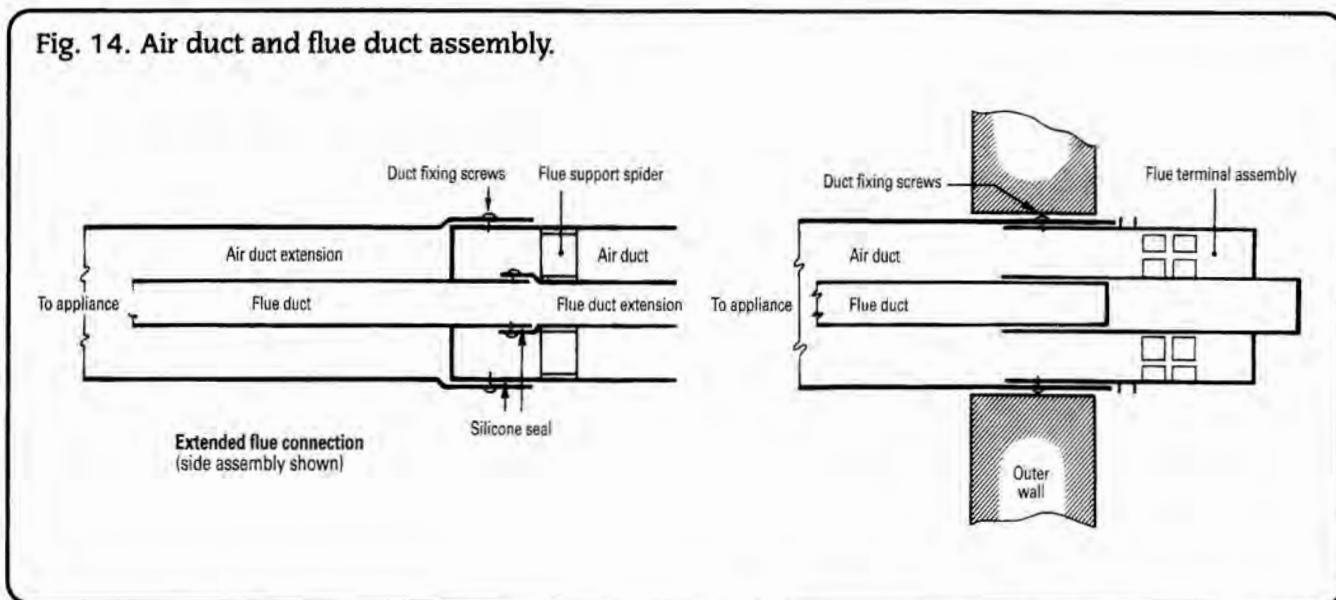
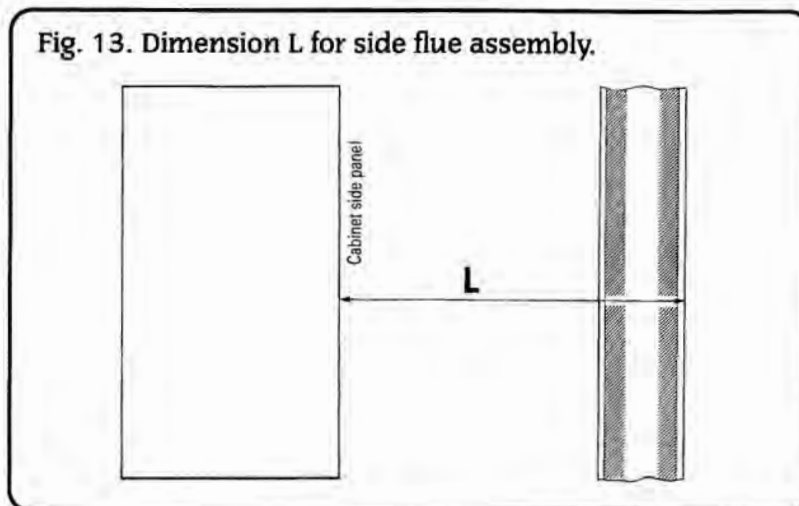
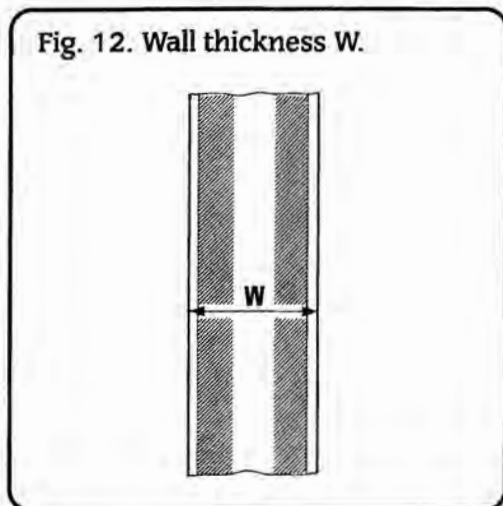


Fig. 15. Suction tube connections between the fan and the air flow pressure switch.

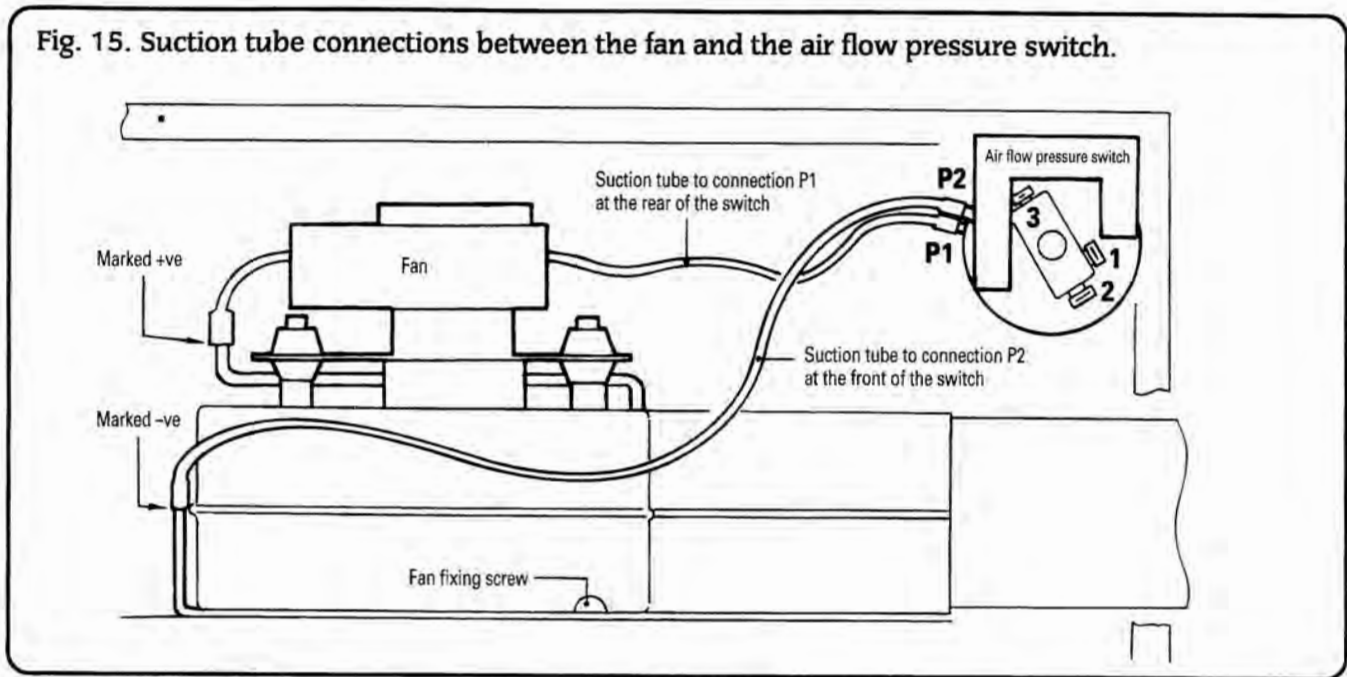


Fig. 16. Blanking off the flue openings not used.

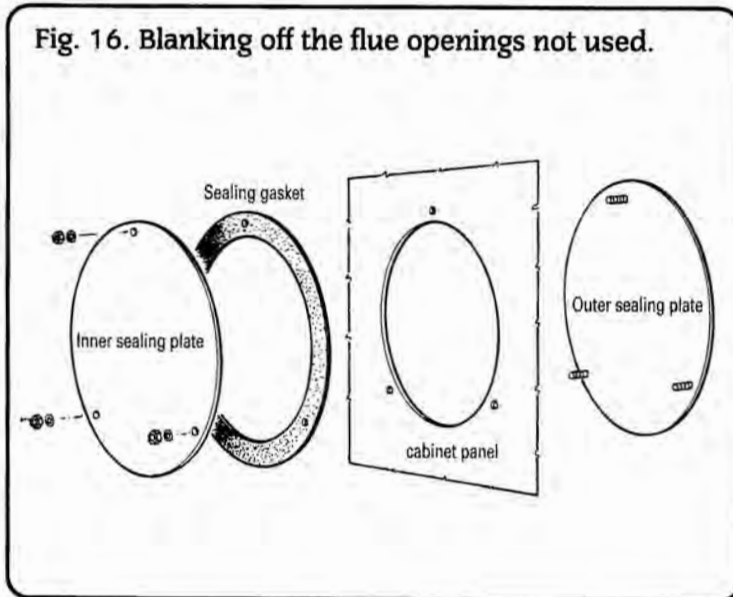


Fig. 17. Air duct clamp assembly.

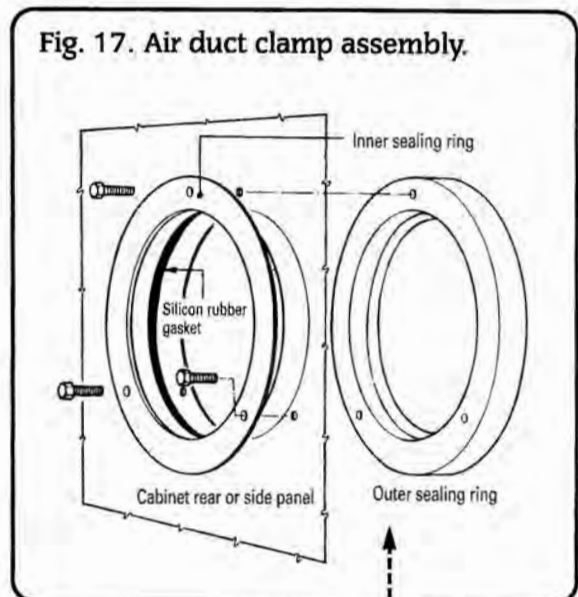
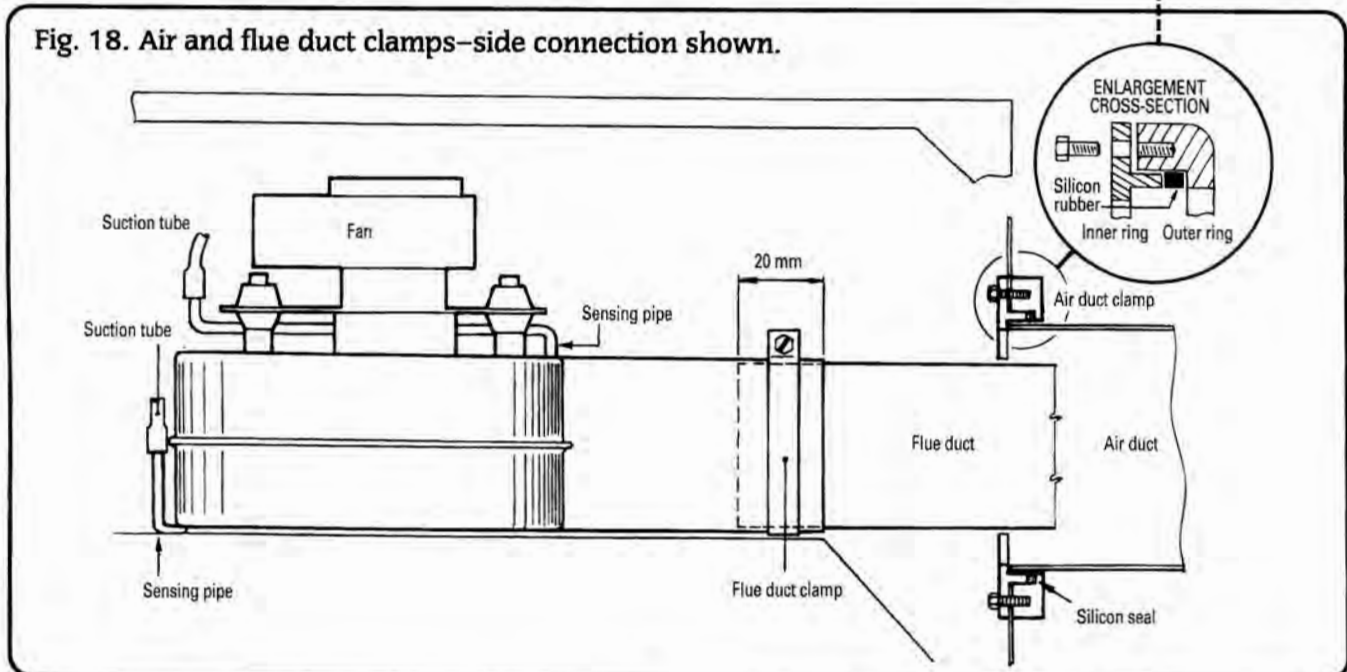


Fig. 18. Air and flue duct clamps—side connection shown.



10.5. FINAL INSTALLATION

Remove the automatic air vent cap. See Fig. 19. Replace the inner casing cover. See Fig. 22.

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

Remove the fascia panel as described in Section 14.2 (a).

Facia Mounted Programmer

Unplug the Operating Switch connection at the control board. Unscrew and retain the four nuts and washers securing the switch mounting plate to the fascia. See Fig. 40. Remove the plate. Fit the programmer to the fascia and fix using the four nuts and washers. Plug the lead into the connection X14 on the main driver board. See Fig. 9b. The programmer can be set when the electricity supply has been turned on at the commissioning stage.

Connect the mains electricity supply to the appliance and connect any room and/or frost thermostats. Refer to Section 9, Figs. 7 and 8. The leads from the thermostats must pass through the holes provided in the control box at the right hand side and be clamped using the strain relief bushes provided in the pack. Check that the control box can be withdrawn and lowered before fixing any leads outside the appliance. To remove the control box refer to Section 14.2 (b).

Refit the control box and fascia.

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

If the appliance is not to be commissioned immediately, replace the inner cover panel and the cabinet front panel. See Fig. 22. Check that the gas supply, the electrical supply and the water connections are all turned off.

11. Commissioning

11.1 The appliance is despatched with the controls set to provide a maximum output for domestic hot water of 35.2kW (120,000 Btu/h) and satisfy a central heating load up to 15kW (51,200 Btu/h). The controls can be reset to increase the central heating load capability up to 25kW (85,300 Btu/h). It is not necessary to set an output between these figures.

Domestic Hot Water System

Confirm that the mains water supply has been fully 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

Confirm that the central heating system has been fully flushed out at installation using a flushing agent. If not, after the addition of a suitable flushing agent, drain whilst hot and immediately refill and re-pressurise. A suitable proprietary inhibitor should be added when refilling.

Further information can be obtained from Worcester Heat Systems.

11.2 APPLIANCE AND SYSTEM PREPARATION.

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

Check that the Operating Switch (or programmer) is set to OFF. See Fig. 20.

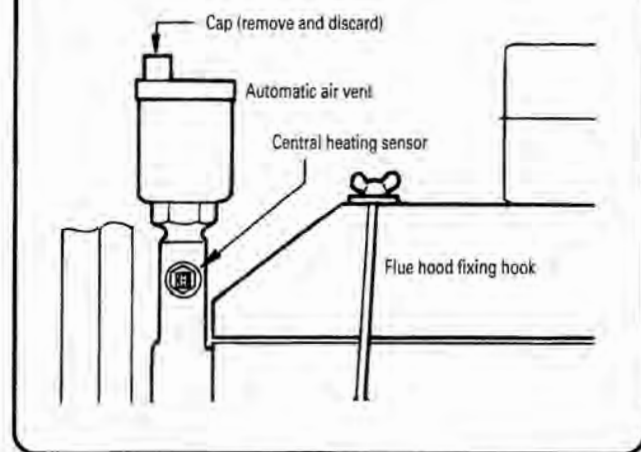
Check that all the water connections throughout the system are tight. Remove the cabinet front panel by pulling forward at the bottom and lifting it off the top supports.

Remove the inner cover panel by unscrewing the four screws. See Fig. 22.

Unscrew the two screws at each end of the control box. Pull forward and lower the control box assembly. See Fig. 22.

Open the central heating system valves on the manifold. See Fig. 21. Open all the radiator valves and fill the system. The automatic air vent (fixed to the flow manifold) will vent the appliance. See Fig. 19. Remove the boiler inner casing cover to check that the air vent

Fig. 19. Automatic air vent.



cap has been removed. Replace the cover immediately. See Fig. 22. Vent each radiator in turn to remove the air from the system.

Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Water should be expelled from the discharge pip. See Fig. 28.

Remove the plated cap at the front of each pump. Turn the exposed shaft about half a turn using a flat bladed screw driver. Replace the plated caps. See Fig. 25.

Set the System Pressure

Fill the system until the pressure shows 1.5 bar and check for water soundness.

Release water from the system (through the pressure relief valve) until the Initial System Design Pressure is obtained.

System Design Pressure in bar = Static Head in bar + 0.3.

Note. 1 bar is equivalent to 10.2 metres (33.5 ft.) of water.

The minimum system design pressure should be 1.0 bar.

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

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 (17 feet). The charge pressure must not be less than the static head at the point of connection i.e. the height of the top point of the system above the expansion vessel. See Fig. 5. A Schraider type tyre valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary.

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.

The appliance, as despatched, can accommodate a system volume of about 72 litres. Refer to BS 7074 Part 1, BS 5449 and Table 8. This volume must not be exceeded.

If the expansion vessel fails it must be replaced with the designated spare part. See Section 14.4 and Section 15.

11.3 PROGRAMMER.

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

11.4 APPLIANCE START-UP.

Set the room thermostat (if fitted) to maximum. Set the Central Heating Temperature Control Knob on the fascia to maximum. See Fig. 20.

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

Turn the gas on at the service cock. Access is from beneath the appliance. See Fig. 28.

Fig. 20. Facia panel with cover lowered.

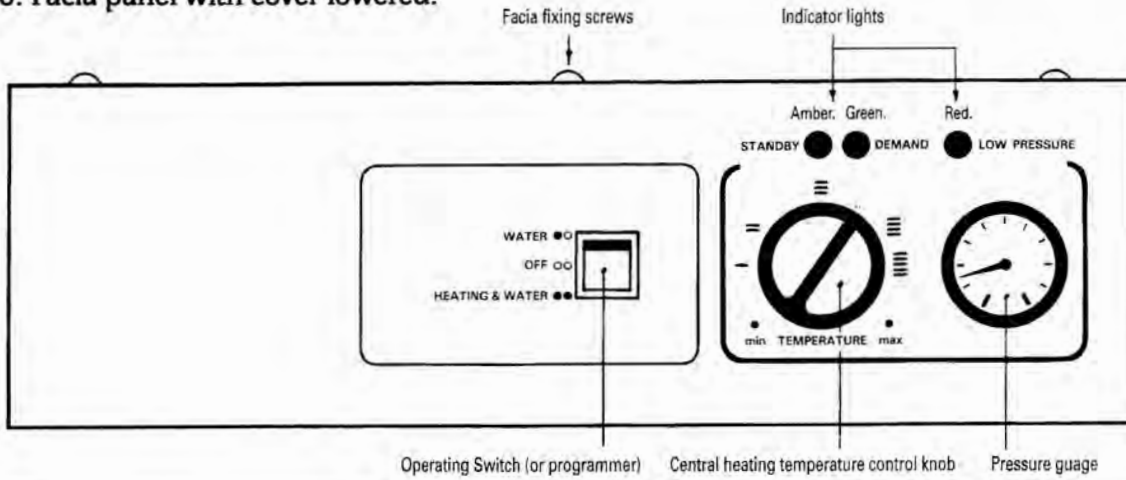


Fig. 21. Valve operation.

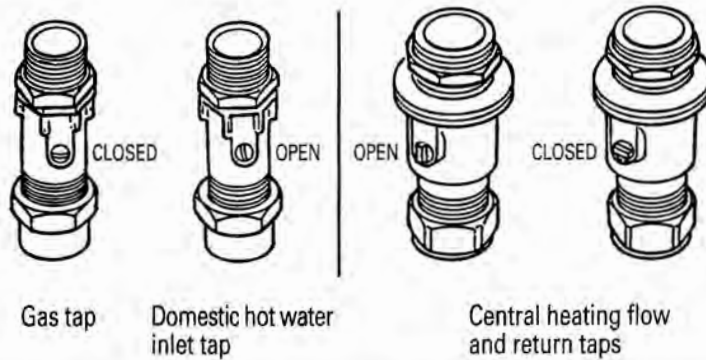


Fig. 22. Cover and electrical panel fixings.

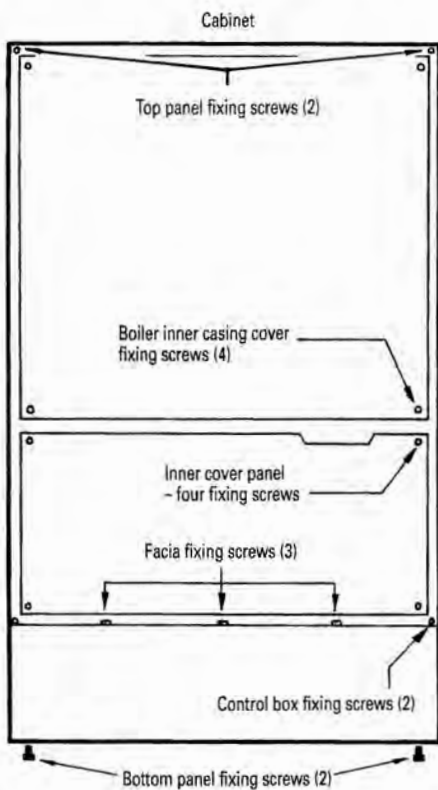


Fig. 23. Casing bottom panel assembly.

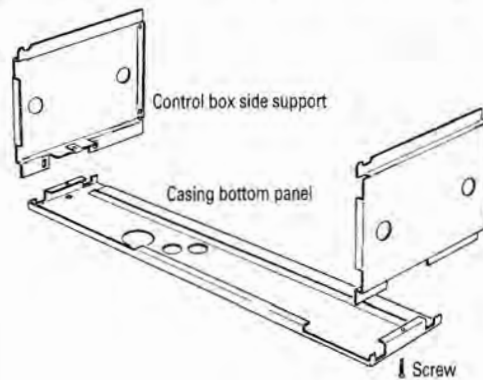


Fig. 24. Pressure relief valve.

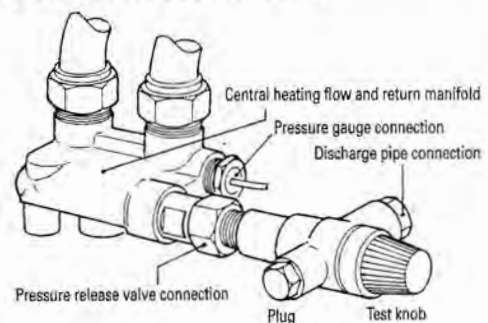
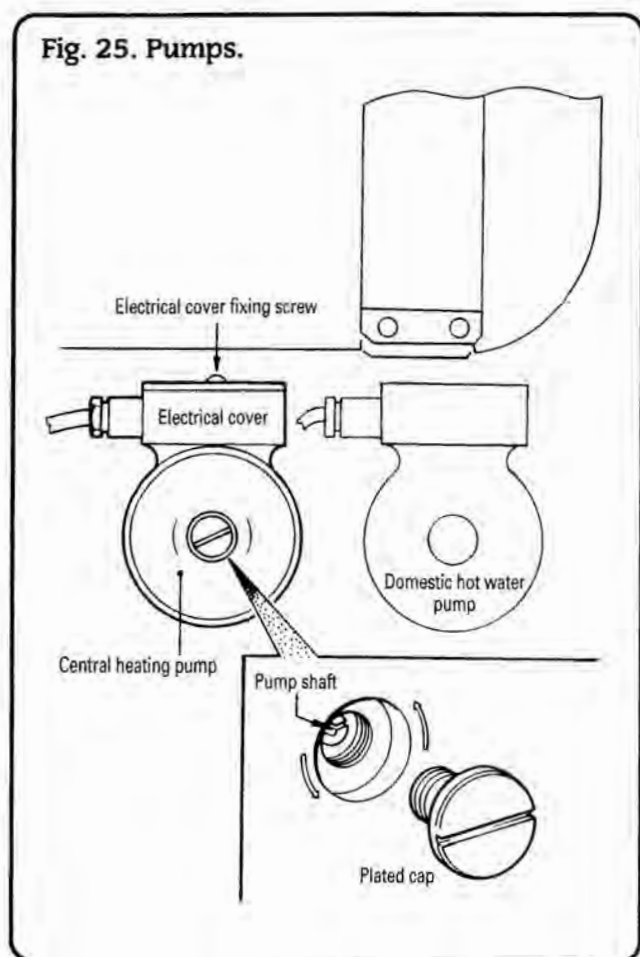


Fig. 25. Pumps.



11.5 APPLIANCE OPERATION.

Turn on the electricity supply to the appliance.

Domestic Hot Water Mode

Open the domestic hot water inlet valve. See Figs. 21 and 28.

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

The boiler should light in a few seconds at the minimum burner pressure (1.3 mbar) and immediately increase to maximum (14.2 mbar). The burner pressure limits have been set at the factory and no adjustment of the gas valve should be necessary. Refer to Section 14.8 if adjustment has to be made.

If the appliance does not light, check that it is not in the overheat lock-out state by pressing the re-set button. See Fig. 34. If it still does not light, set the Operating Switch or Programmer to **OFF** and then back to **WATER** as the gas line will need to be fully purged of air. If ignition still does not take place after several attempts contact Worcester Heat Systems Ltd., Technical Information Department.

With the boiler lit, hot water at a flow of 12.5 litres/min. ($\pm 15\%$) (2.8 gallons/min.) is delivered at a full temperature within a few seconds.

Gradually close the tap and check that the burner pressure drops. Fully open the tap and check that the burner pressure rises.

Shut the tap and check that the burner goes off—the fan may continue to run for a short period of time.

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

Central Heating Mode

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

The appliance should light in a few seconds at a burner pressure of 1.3 mbar. The burner pressure will remain at this figure for about two minutes and then increase over one minute to its factory set figure of about 2.8 mbar which is equivalent to a heating load of 15kW (51,200 Btu/h). If a greater heat output up to a maximum of 25kW (85,300 Btu/h) is required, then the burner pressure must be adjusted at the potentiometer located at the rear of the control

box. See Fig. 27. Adjust the potentiometer to give a burner pressure of 7.8 mbar. This figure can only be achieved if the burner pressures are correctly set in the domestic hot water mode.

It is not necessary to set an output between these figures because of the modulating effect of the controls.

Reposition and fix the control box.

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

Shut down all the radiators but one 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 heating flow and return pipes is obtained relevant to the heating load. See Table 3.

Shut all the radiators and adjust the by-pass until the same temperature difference is obtained. See Fig. 28.

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

Reset the room thermostat to maximum. After a fixed off period of about three minutes the burner will re-light and follow the normal operating procedure.

Turn off the electricity supply to the appliance. Drain the heating system as described in Section 14.3 (a). Refill and repressurise as described in Section 11.2 adding a suitable proprietary inhibitor. Further information can be obtained from Worcester Heat Systems.

Domestic Hot Water and Central Heating Mode

Turn on the electricity supply to the appliance.

Set the Operating Switch to **HEATING & WATER**. If a programmer is fitted set the central heating to **24 Hours** and the domestic hot water to **ON**.

Check the operation of the domestic hot water supply by opening a hot tap.

Shut the hot tap and the burner will go off.

The appliance will return to the central heating mode after a fixed off period of about three minutes and will then automatically balance with the system requirements.

Set the Operating Switch (or Programmer) to **OFF** and the burner will go out and the fan will overrun for a few seconds.

11.6 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 inner cover panel and the cabinet front panel.

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

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

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

If there is any possibility of frosty conditions then the appliance should be left under the control of a frost thermostat or with the system operating continuously with the room thermostat set at 6°C.

12. Instructions to the User

- 12.1 Instruct the user in the efficient and safe operation of the appliance and hand over the User's Instructions pamphlet.
- 12.2 Describe the operation and function of the controls.
- 12.3 Tell the user of the action necessary in the event of the central heating system not being used during frost conditions.
- 12.4 Tell the user the sealed system pressure.

12.5 Tell the user that it is important for servicing to be carried out at the intervals recommended by the Local Gas Region. Worcester Heat Systems Ltd. will be pleased to discuss and offer a comprehensive maintenance contract.

12.6 Set the system controls to the user's requirements. Refer to Section 11.

12.7 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 24 Hours or the equivalent.

Fig. 26. Gas valve pressure adjustments.

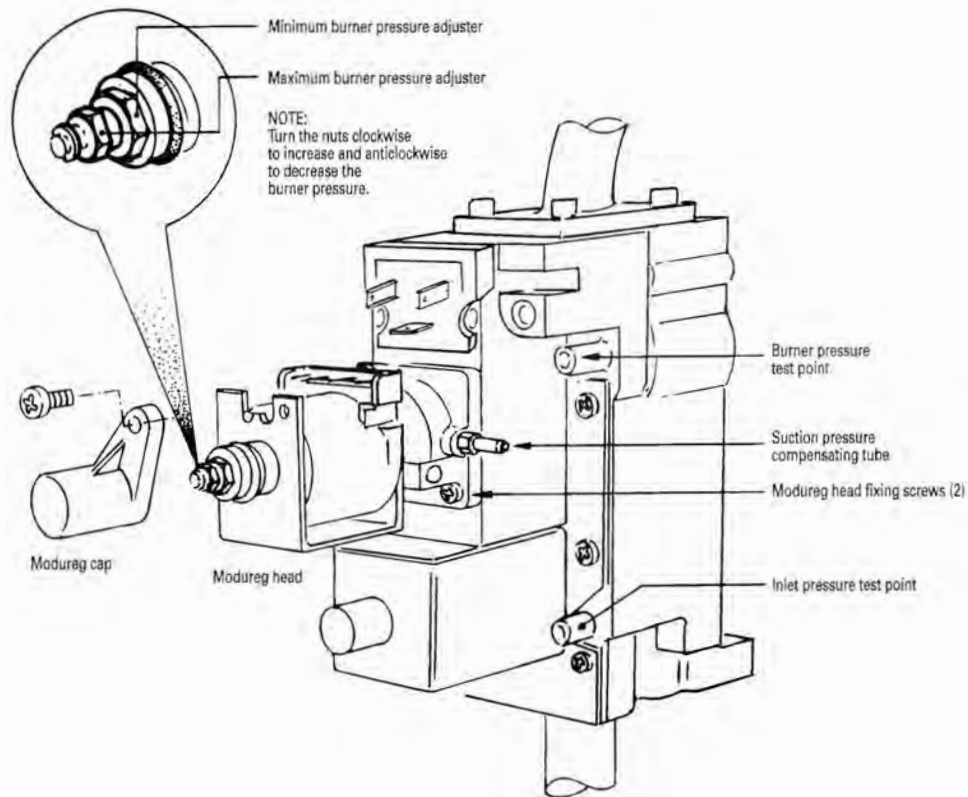


Fig. 27. Central heating burner pressure adjusting screw.

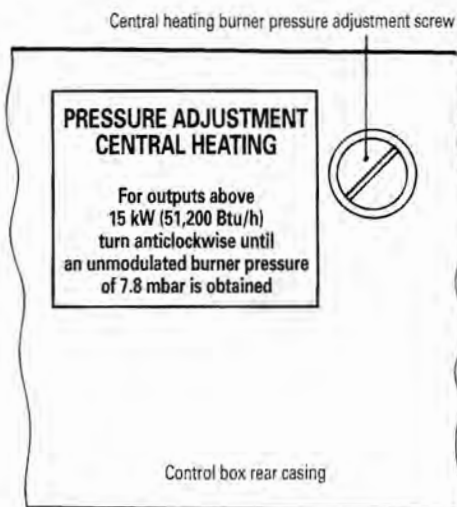
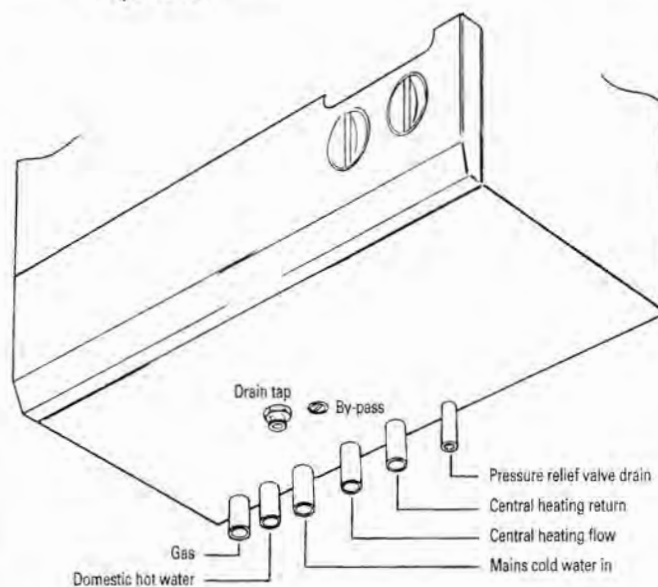


Fig. 28. Location of pipework connections and adjusters.



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.

It is the law that 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. Check the connections in the system and remake any joints or fittings which show signs of leakage. Refill, vent and re-pressurise as described in Section 11.

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

IMPORTANT. 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. 21.

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 Cover. Pull forward at the bottom and lift off the top supports. See Fig. 22.

(b) Inner Cover Panel. Remove the cabinet front panel. Unscrew the four screws and remove the panel. See Fig. 22.

(c) Inner Casing Cover. Remove the cabinet front cover. Unscrew the four screws and remove the casing cover. See Fig. 22.

(d) Combustion Chamber Cover. Remove the inner casing cover. Loosen the two wing nuts securing the flue hood and remove the hooks from the combustion chamber cover. Unscrew the four screws and remove the cover. See Fig. 29.

(e) Fan. Remove the inner casing cover. Remove by unplugging the electrical connections at the terminal block, pulling off the suction pipes and unscrewing the single fixing screw. Unscrew the flue duct fixing clamp. See Fig. 18.

(a) Appliance with Rear Flue. Carefully slide the fan out of the appliance ensuring that the flue duct remains undisturbed.

(b) Appliance with Side Flue. Carefully slide the flue duct out of the fan outlet, to the left or right as appropriate. Unscrew and remove the flue hood fixing hook at the same side as the flue connection.

(f) Flue Hood Assembly. Remove the inner casing cover. Loosen the two wing nuts securing the flue hood and remove the hooks from the combustion chamber cover. Withdraw the clamping bars from their rear bracket and lift the flue hood assembly from the appliance. If the fan is not to be removed separately, then disconnect the electrical supply, the suction tubes and the flue duct as described in the preceding note. See Fig. 15.

(g) Burner Blade Assembly. Remove the combustion chamber cover. Remove the spark and sensing electrode assemblies by unscrewing and removing the mounting brackets complete. See Fig. 30.

Loosen the two bottom fixing screws and unscrew and remove the two extended screws securing the burner blade assembly. See Fig. 31. Lift the blade assembly off the bottom support screws, raise the front of the assembly to about 45° and carefully withdraw it from the combustion chamber. Take care not to damage the insulation pads.

13.4 SERVICING OF COMPONENTS.

Clean the fan. Any dust or fluff should be removed with a soft brush or by blowing. Sharp instruments must not be used. Take care not to distort the sensing tubes.

Clean the burner. Brush the blade tops with a soft brush and check that all the flame ports are clear. Remove any blockages with a non-metallic brush. Clean any deposits from the venturis using a soft brush.

Clean the electrodes. Brush any deposits from the electrodes using a soft brush. Replace any electrode that show signs of damage or erosion.

Clean the burner manifold. Inspect the injectors and carefully clean with a soft brush. Do not use a wire brush or anything likely to cause damage. Replace any injector which appears damaged. Don't forget the spacing washers.

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

Check the combustion chamber insulation. Examine the insulation pads and replace if necessary. See Section 14, Para. 14.4.

Clean the controls. Remove any dust or deposits which may have built up on the controls. Take care not to mishandle any component connections.

Reassemble the appliance.

Refit the burner blade assembly, the electrodes, the flue hood and the fan if it has been removed separately. Check that the electrodes and suction tubes are connected and positioned correctly. See Fig. 30.

Refit the combustion chamber cover. Carefully reconnect the flue duct to the fan outlet as described in Section 11, Para. 5.

Check that all the connections have been made correctly before refitting the boiler inner casing cover. See Fig. 22.

Check that the flue terminal is clean and unobstructed.

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.

Refit the inner cover panel and the cabinet front panel and reset the controls to the user's requirements.

Fig. 29. Combustion chamber cover and flue hood.

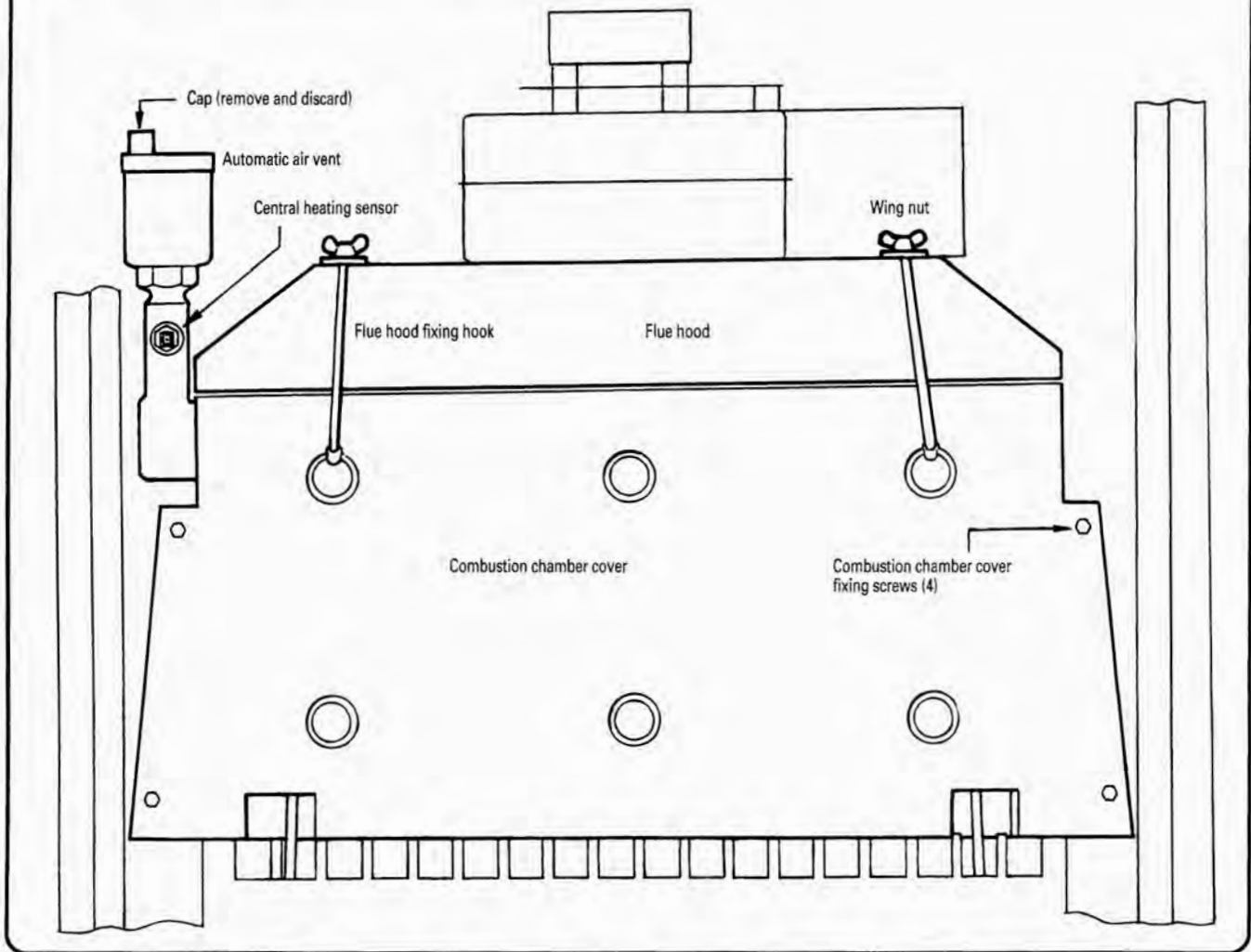


Fig. 30. Spark electrode and flame sensing electrode.

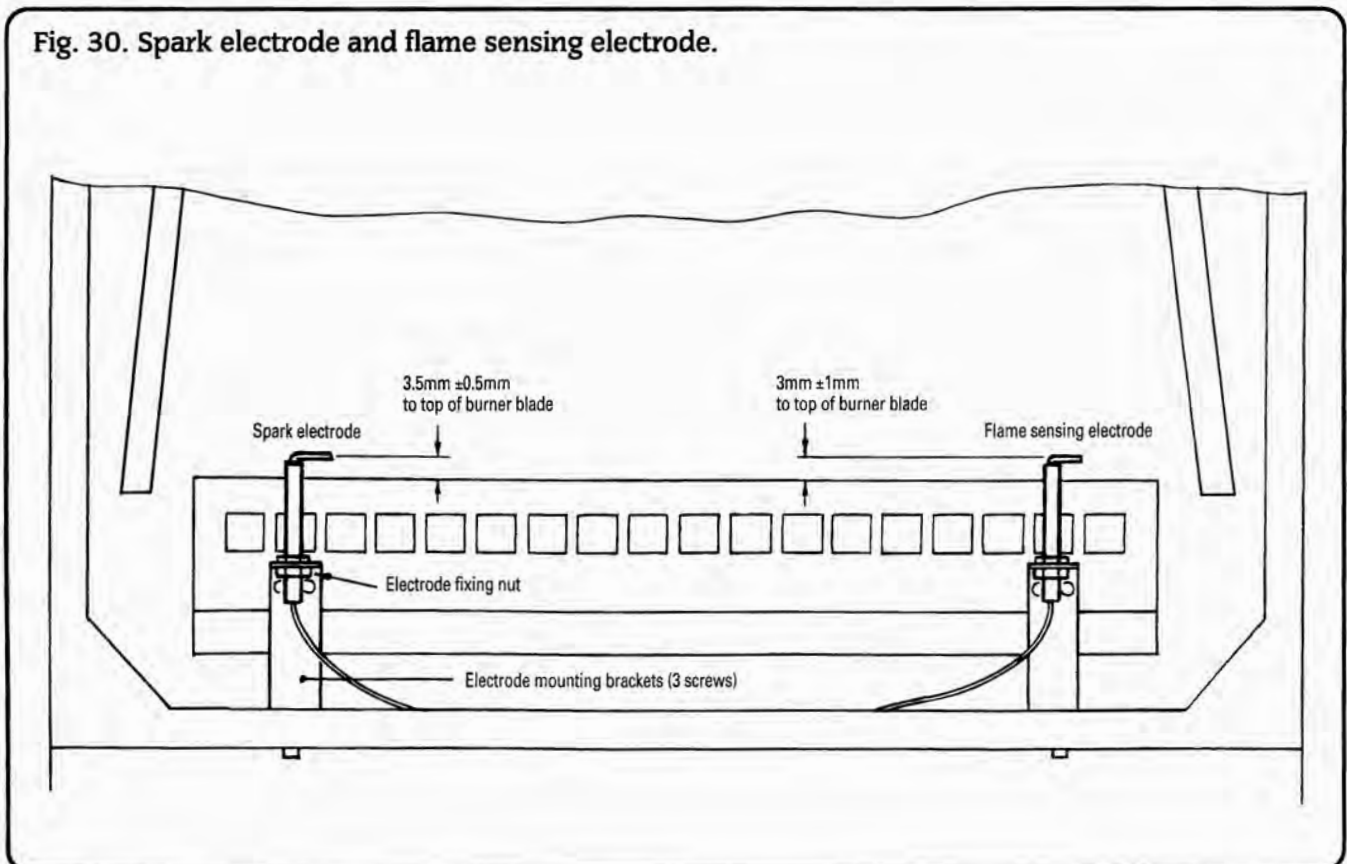
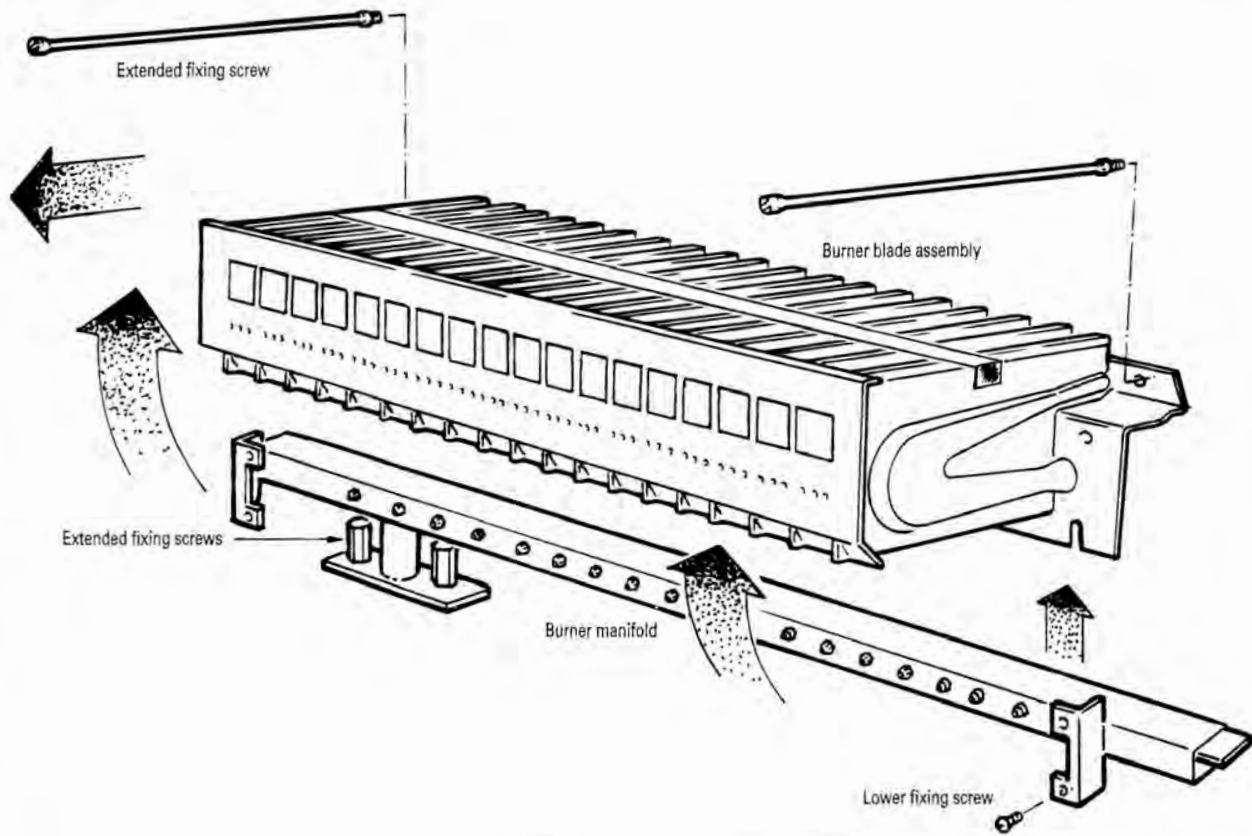


Fig. 31. Burner assembly.



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.

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 together with the fascia and control box as described in the notes following.

- (a) **Fascia.** Remove the inner cover panel as described in Section 13.3 (b). Remove the three screws which hold the fascia assembly in position. Lower the fascia assembly. The assembly can be unhooked from its supports. Do not allow it to hang unsupported. See Fig. 20.
- (b) **Control Box.** Remove the inner cover panel as described in Section 13.3 (b). Unscrew the two fixing screws at each end of the control box. Pull the complete assembly forward and lower if necessary. The assembly can be unhooked from its supports. Do not allow it to hang unsupported. See Fig. 22.

Important: The following components are secured to the appliance with clips. See Figs. 37, 38 and 39.

- 12: Expansion Vessel
- 13: Central Heating Pump
- 14: Domestic Hot Water Pump
- 15: Water to Water Heat Exchanger
- 27: Gas to Water Heat Exchanger

Important: Comprehensive gasket/O-ring packs are available for the gas and water connections on the appliance. See Section 15.

When replacing these components 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.

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) Appliance Central Heating Circuit

Turn off the central heating flow and return valves at the appliance. See Figs. 21 and 28. These are operated using an adjustable spanner or a screwdriver.

Fit a tube to the drain tap and open the tap about one turn. See Fig. 28. Press in the non-return valve test button on the central heating pump (left hand) to remove more water. See Fig. 39. Close the drain tap when the flow has stopped.

Some water will remain in the expansion vessel, pumps and Gas to Water heat exchanger and extra care must be taken when removing these components.

(b) Appliance Hot Water Circuit

Turn off the mains water supply valve at the appliance. See Figs. 21 and 28. This is operated using a flat blade screwdriver. Later versions of the water flow regulator have a drain screw which must be loosened to remove more water. See Fig. 41.

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

14.4. COMPONENT REPLACEMENT.

1. Central Heating Sensor. See Fig 32.

Check that the electrical supply has been turned off.

Remove the inner casing cover. See Section 13.3 (c)

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

Carefully pull off the two leads from the sensor and unscrew the sensor from the heat exchanger.

Fit the replacement sensor with the washer. Refit the leads.

Open the valves. Fill and repressurise the system as described in Section 11.2.

2. Automatic Air Vent. See Fig. 32.

Remove the inner casing cover. See Section 13.3 (c).

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

Remove the central heating sensor connector.

Unscrew the assembly. Fit the replacement assembly in the reverse order. Refit the sensor connection.

Open the valves, fill and repressurise the system as described in Section 11.2.

3. Fan. See Figs. 15 and 18.

Check that the electrical supply has been turned off.

Remove the fan as described in Section 13.3 (e). Fit the replacement fan assembly in the reverse order.

4. Air Flow Pressure Switch. See Figs. 15 and 33.

Check that the electrical supply has been turned off.

Remove the inner casing cover. See Section 13.3. (c).

Pull off the suction tubes from the switch. See Fig. 15. Carefully pull off the electrical connections from the switch. Unscrew the screws and remove the switch from the bracket.

Fit the replacement switch in the reverse order.

Check that the electrical connections have been made to the correct terminals on the switch. See Fig. 33.

5. Overheat Thermostat. See Figs. 22 and 34

Check that the electrical supply has been turned off.

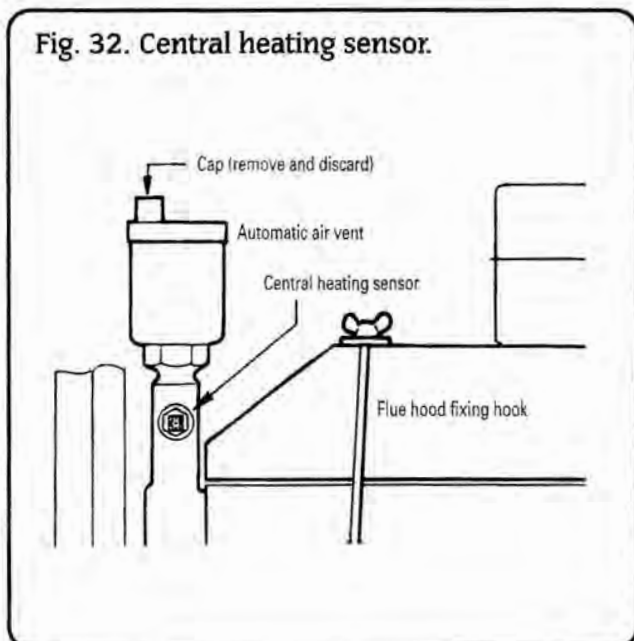
Remove the inner casing cover. See Section 13.3. (c).

Unscrew the two screws fixing the top panel. Lift the panel and push backwards to release the lugs. Remove the panel. See Fig. 22.

Remove the clip and pull the thermostat phial from the pocket. See Fig. 34. Carefully pull off the leads from the terminals on the thermostat head. Unscrew the nut fixing the thermostat head. Remove the thermostat from the inner casing.

Fit a new thermostat in the reverse order.

Fig. 32. Central heating sensor.



6. Spark Electrode. See Figs. 9b and 35.

Check that the electrical supply has been turned off.

Remove the inner casing cover and fascia. See Section 13.3. (c) and 14.2 (a).

Pull off the lead from its tab on the ignition board. See Fig. 9b.

Unscrew the securing nut holding the electrode to its mounting bracket and withdraw the electrode and lead. See Fig. 35.

Fit a new electrode assembly in the reverse order. Check that the electrode tip is the correct height above the burner blade. See Fig. 35.

7. Flame Sensing Electrode. See Figs. 9b and 35.

Check that the electrical supply has been turned off.

Replace the electrode as described in Section 14.4.6 preceding.

8. Gas Valve. See Figs. 9b and 26.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b). Remove the cabinet bottom panel by unscrewing the two screws. See Fig. 22.

Pull off the suction pressure compensating tube. See Fig. 26.

Unscrew and move aside the main solenoid cover on the gas valve. Carefully disconnect the leads from the two solenoids and the Modureg head on the gas valve and unscrew the earth lead. Unscrew the four screws securing the flange at the top of the gas valve. Unscrew the union connection at the mounting manifold and remove the gas valve.

Transfer the inlet pipe and gaskets to the new valve.

Fit the new valve ensuring that the two gaskets are seated in their housings.

Fit a new valve in the reverse order. See Fig. 9a.

To replace the Modureg head only

Pull off the suction pressure compensating tube and the electrical connections. Unscrew the two screws securing the Modureg head to the main body and remove.

Fit the new Modureg head (Honeywell 2032) in the reverse order ensuring that the gasket is in the correct position. Transfer the compensating tube connection.

Test for gas soundness at all joints as described in Section 11.2.

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 Start-Up.

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

Remove the fixing screw and remove the Modureg head cover.

Remove the compensating tube from the gas valve. See Fig. 26. The tube and the Modureg cap, must be replaced immediately the adjustments have been made to ensure the proper operation of the gas control.

Remove a lead from the Modureg control and start the appliance in the domestic hot water mode as described in Section 11.5 – Appliance Operation. Adjust the minimum pressure adjustment nut to give a burner pressure of 1.3 mbar. See Fig. 26.

Switch off the appliance and turn off the electricity supply. Refit the lead to the Modureg head.

Switch on the electricity supply to the appliance and re-light in the domestic hot water mode. The burner pressure will immediately increase to the maximum.

Turn the maximum pressure adjustment screw until the burner pressure is 14.5 mbar. See Fig. 26. The operating pressure of 14.2 mbar is obtained when the compensating tube is refitted to the gas valve.

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.

Fig. 33. Air flow pressure switch.

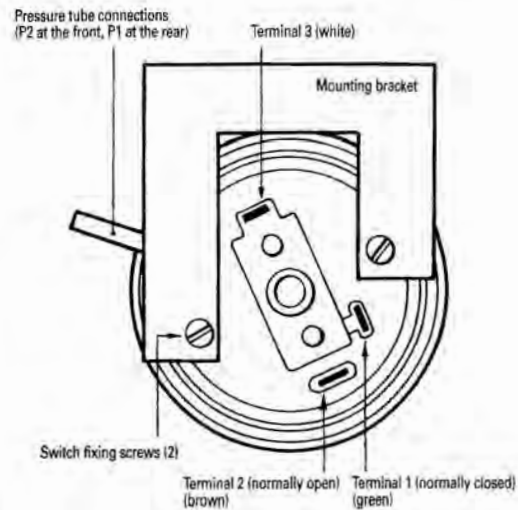


Fig. 34. Overheat thermostat.

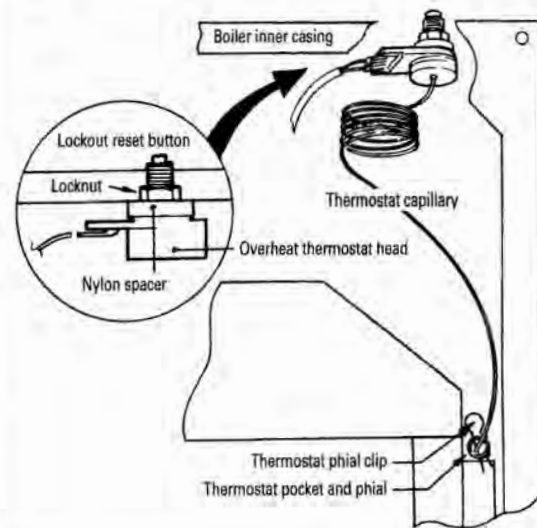


Fig. 35. Electrode fixing and gap setting.
(SPARK ELECTRODE SHOWN)

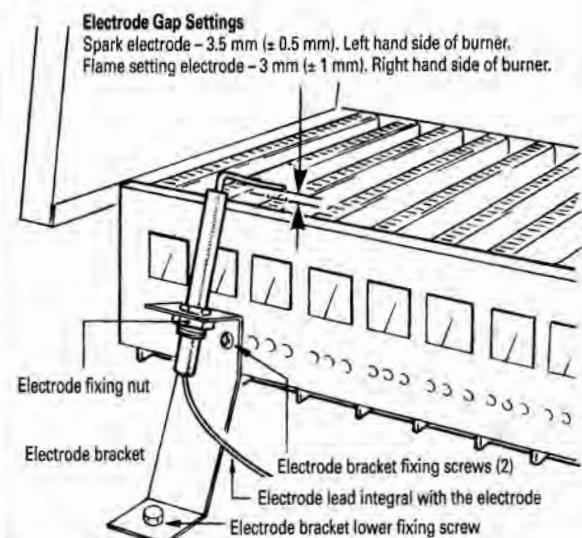
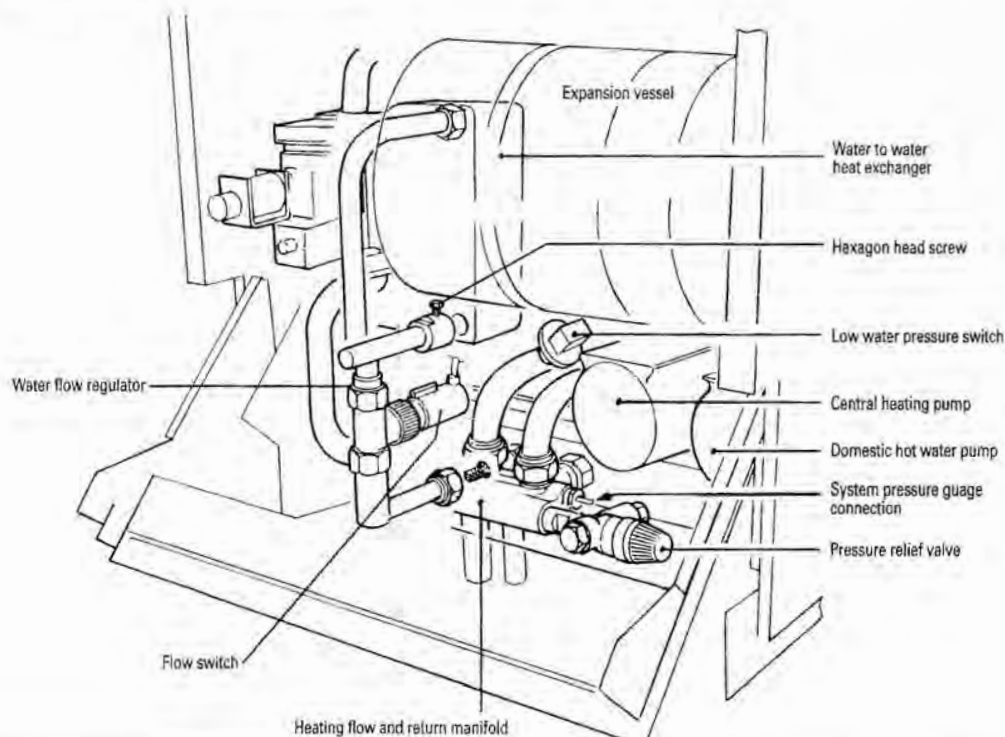


Fig. 36. Water flow control components.



9. Domestic Hot Water Sensor. See Fig. 36.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b). Drain the hot water circuit as described in Section 14.3 (b).

Carefully pull off the two leads from the sensor. See Fig. 36. Unscrew the sensor from the pipe.

Fit the replacement sensor with a new washer and refit the leads.

The polarity is not important.

Open the mains water supply valve.

10. Domestic Hot Water Overheat Thermostat. See Fig. 36.

Check that the electrical supply has been turned off. Lower the control box. See Section 14.2 (b). Pull off the two leads from the thermostat and unscrew the two screws to remove the thermostat.

Fit a new thermostat in the reverse order. The heat transfer paste must be retained or re-applied.

11. Pressure Relief Valve. See Fig. 36.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b). Drain the hot water circuit as described in Section 14.3 (a).

Unscrew the pressure relief valve drain pipe union and the relief valve union and carefully remove the valve from the appliance.

Fit the new valve in the reverse order.

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

12. Expansion Vessel. See Fig. 38.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b).

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

Unscrew the expansion vessel securing screw and support the vessel.

Push up the securing clip at the rear of the vessel to release the connection. Remove the vessel. Take care when removing the vessel as a small quantity of water remains inside the vessel.

Set the clip in its open position and fit the new vessel in the reverse

order using a new 'O' ring. The assembly is aided if the 'O' ring is lubricated with soap solution.

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

13. Central Heating Pump. See Figs. 24 and 39.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.4 (b).

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

Remove the expansion vessel. See Paragraph 12 preceding.

Remove the pump cover and disconnect the electrical connections. See Fig. 24.

Withdraw the two securing clips from the pump body. See Fig. 39.

Remove the pump. There will be a small quantity of water remaining in the pump. Fit a new 'O' ring.

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

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

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

14. Hot Water Pump. See Figs. 24 and 39.

Check that the electrical supply has been turned off.

Replace the hot water pump as described in Section 14.4.13 preceding.

15. Water to Water Heat Exchanger. Figs. 36 and 37.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b).

Drain the appliance as described in Section 14.3 (a) and (b).

Unscrew the two screws and remove the bottom panel. See Fig. 22.

Turn off the inlet gas cock. Remove the gas valve as described in Paragraph 8 preceding.

Remove the leads from the hot water sensor and hot water thermostat.

Unscrew the flow switch head and carefully lay to one side. It is not necessary to unplug the switch.

Undo the outlet union connection at the heat exchanger. Release the locking screw at the heat exchanger and the union connections at the mounting manifold. Lay the inlet and outlet assemblies to one side.

Pull out the securing clips from the rear of the heat exchanger. See Fig. 37.

Remove the heat exchanger. There will be a quantity of water remaining in the heat exchanger and pipework.

Fit the new heat exchanger in the reverse order using new 'O'-rings taking care that the securing clips are properly entered. Refit the pipe and control assembly and reconnect the leads. Refit the flow switch assembly.

Open the mains water supply valve.

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

Fit the gas valve in the reverse order.

16. Water Flow Regulator and Gauze Filter. See Fig. 41.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b).

Drain the hot water circuit as described in Section 14.3 (b).

Remove the cabinet bottom panel by unscrewing the two fixing screws.

Unscrew the flow switch and lay to one side. Replace the flow regulator. See Fig. 41.

Undo the mains water inlet union and unscrew the screw fixing the assembly to the Water to Water heat exchanger. Remove the complete assembly.

The inlet gauze filter can now be replaced if necessary.

Fit the inlet pipe assembly. Fit the flow switch in the reverse order. Check that the arrow on the flow switch points upwards.

Open the mains water supply valve.

17 Flow Switch. See Figs. 9b and 41.

Check that the electrical supply has been turned off.

Remove components as described in Section 14.2(a) and (b).

Drain the hot water circuit as described in Section 14.3 (b)

Unscrew the flow switch. Unplug the switch connection at the main driver board, connection X1.

Release the cord strain relief bush at the rear of the control box and remove the switch.

Fit the new flow switch in the reverse order ensuring that the O-ring is in place.

Check that the arrow on the switch points upwards.

Open the mains water supply valve.

18. Low Water Pressure Switch. See Fig. 36.

Check that the electrical supply has been turned off.

Lower the control box. See Section 14.2 (b).

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

Carefully pull off the electrical leads and note the polarity. See Fig. 36. Unscrew and remove the switch.

Fit a new switch in the reverse order using a suitable non-setting thread sealant. Check that the leads are correctly connected. See Fig. 9b.

Fit a new switch in the reverse order.

19. Main Driver Board. See Fig. 9b.

Check that the electrical supply has been turned off.

Remove the fascia. See Section 14.2 (a).

Carefully unplug or unscrew all the connections to the board.

Remove the transformer as described in Paragraph 21 following.

Release the complete board from the clips securing it to the control box.

Fig. 37. Water to Water heat exchanger clips.

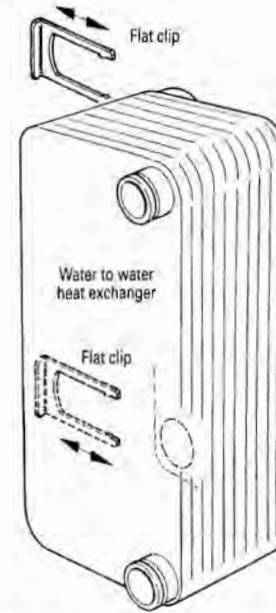


Fig. 38. Expansion vessel.

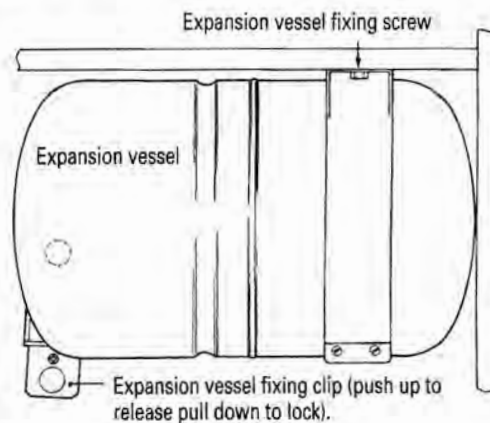


Fig. 39. Pump fixing clip (rear view).

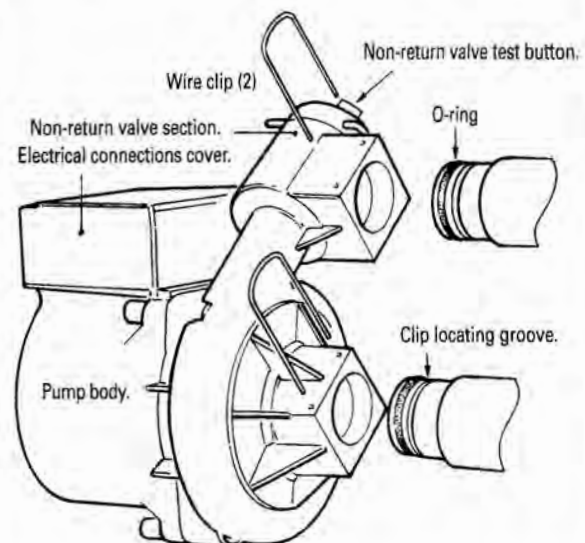
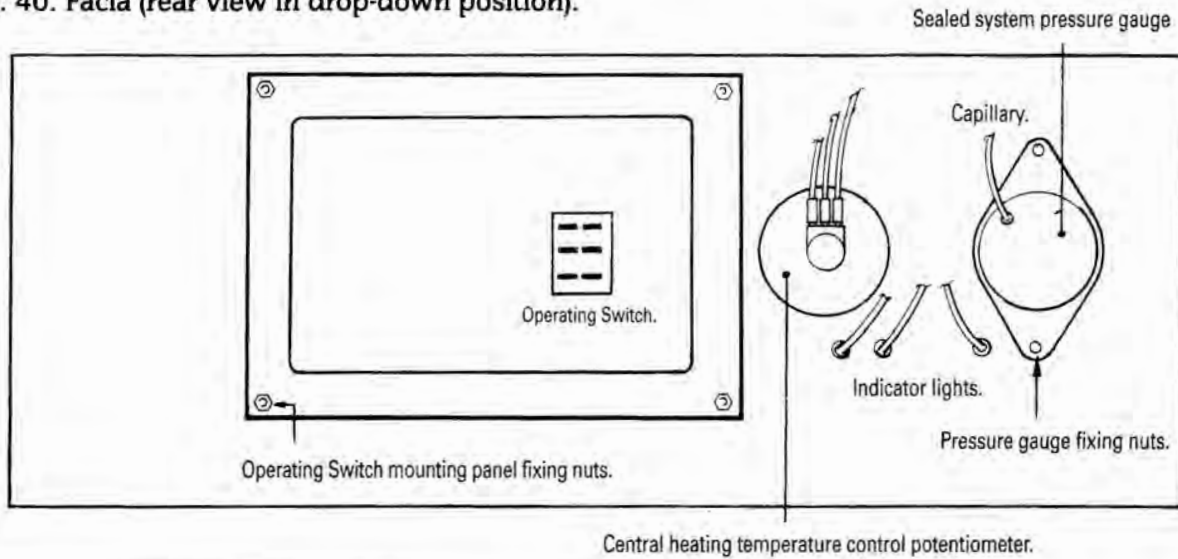


Fig. 40. Facia (rear view in drop-down position).



Fit a new board in the reverse order. The plugs are individually matched and connections must not be forced. See Fig. 9b.

Set the central heating pressure as described in Section 11.5.

20. Ignition Board. See Fig. 9b.

Check that the electrical supply has been turned off.

Remove the facia. See Section 14.2 (a).

Carefully unplug or unscrew all the connections to the board.

Release the board from the clips securing it to the control box.

Fit a new board in the reverse order. The plugs are individually matched and connections must not be forced. See Fig. 9b.

21. Transformer. See Fig. 9b.

Check that the electrical supply has been turned off.

Remove the facia and lower the control box. See Section 14.2 (a) and 14.2 (b).

Unplug the connection to the main driver board. See Fig. 9b.

Unscrew the screws securing the transformer to the control box.

Remove the transformer.

Fit a new transformer ensuring that the insulation pad is refitted beneath the transformer.

22. System Pressure Gauge. See Figs. 24 and 40.

Remove the facia and lower the control box. See Section 14.2 (a) and (b).

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

Remove the pressure relief valve as described in Paragraph 11 preceding. Unscrew the capillary from the manifold.

Unscrew the nuts and remove the pressure gauge and capillary from the facia. See Fig. 40.

Fit a new gauge and capillary in the reverse order.

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

23. Central Heating Temperature Control Potentiometer.

See Figs. 20 and 40.

Check that the electrical supply has been turned off.

Remove the facia. See Section 14.2 (a).

Remove the control knob by grasping it firmly and pulling it off the spindle. See Fig. 20. Disconnect the plug from the main driver board. See Fig. 9b.

Unscrew the locknut securing the potentiometer at the spindle and withdraw. Fit the new potentiometer in the reverse order.

Reconnect the plug to the driver board.

24. Operating Switch. See Fig. 20.

Check that the electrical supply has been turned off.

Remove the facia. See Section 14.2 (a).

Remove the leads from the rear of the switch, taking note of their positions. See Fig. 20. Squeeze together the two plastic retaining lugs and remove the switch from the front of the facia.

Snap in the replacement switch and reconnect the leads. See Fig. 9b.

25. Neon Indicator Lights. See Figs. 9b, 40, 42, and 43

Check that the electrical supply has been turned off.

Remove the facia. See Section 14.2 (a).

Unplug the appropriate neon connection at the driver board. Connection X3 or X6. See Fig. 9b.

Use an electrical screwdriver to carefully push down through the locking clip slot to depress the locking clips and withdraw the leads of the failed neon. See Fig. 42. Remove the neon from the facia.

Push the replacement neon into the facia opening. See Fig. 9b.

Fig. 41. Domestic hot water control assembly.

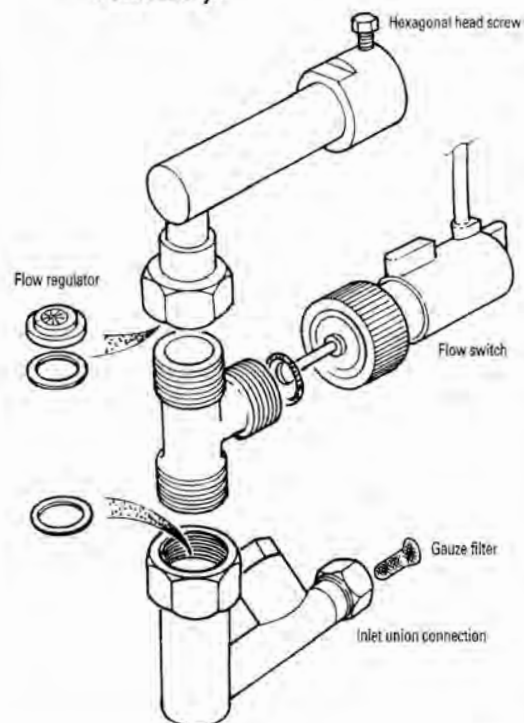


Fig. 42. Neon indicator light plugs.

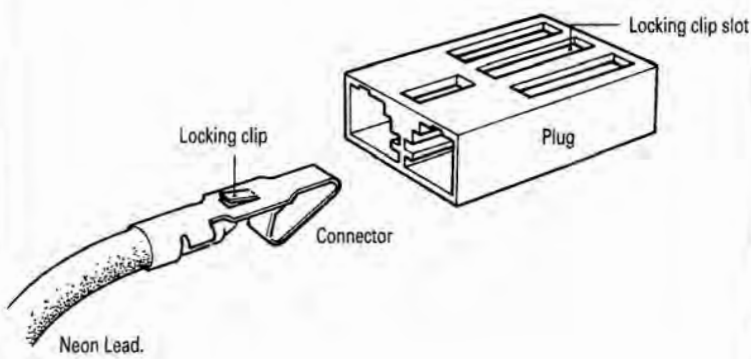


Fig. 43. Neon indicator light connections.

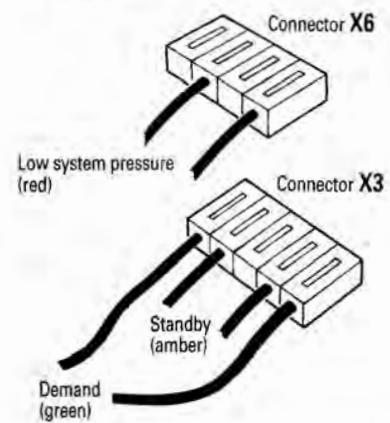


Fig. 44. Burner manifold assembly.

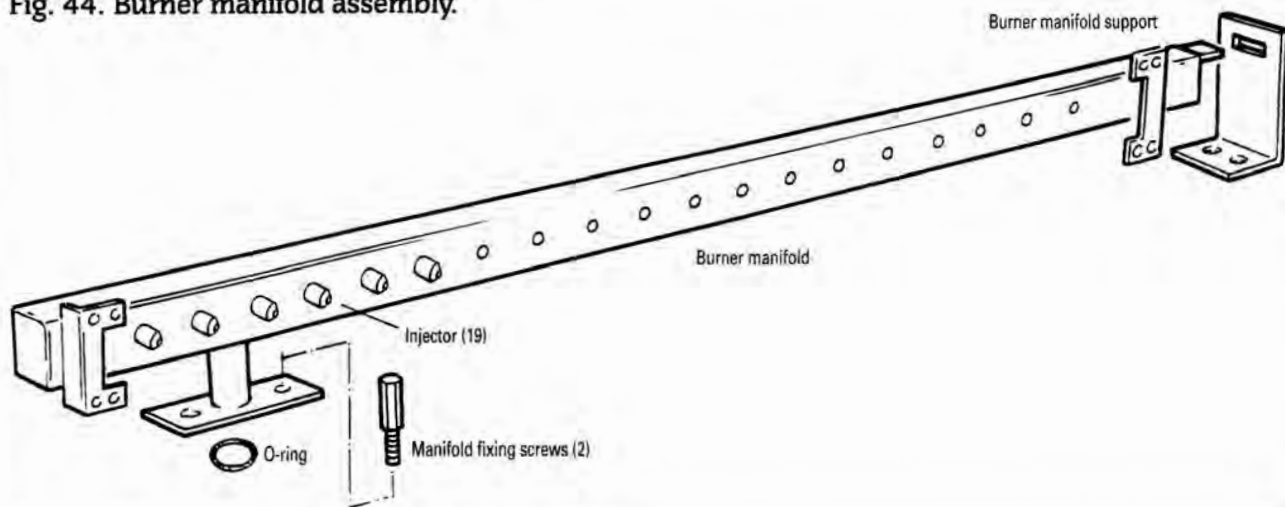
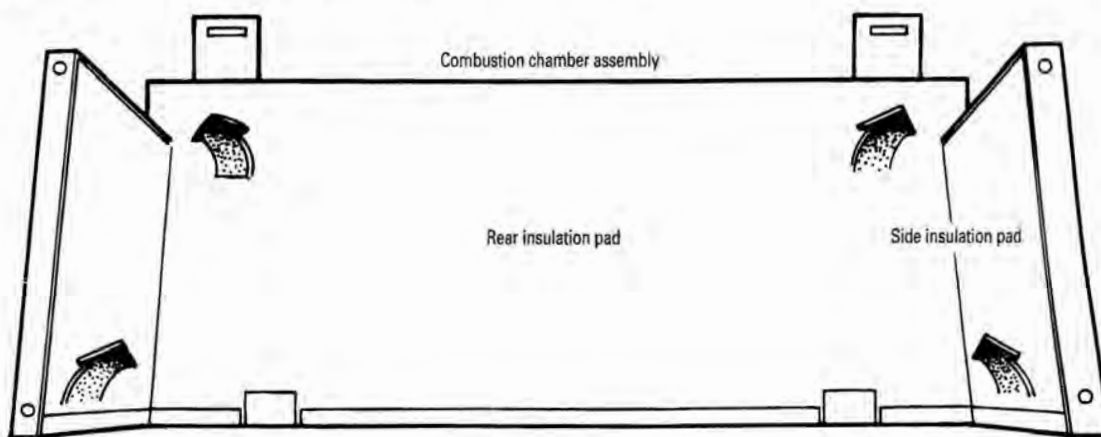


Fig. 45. Combustion chamber insulation.



Insert the lead connectors into the plug with the locking clip in the correct position. See Figs. 42 and 43.

Reconnect the plug to the driver board and re-assemble the appliance.

26(a) Facia Mounted Programmer. See Fig. 40. Check that the electrical supply has been turned off. Remove the facia. See Section 14.2 (a).

Unplug the programmer from the main driver board. Undo the four nuts securing the programmer to the facia and remove.

Fit the new programmer in the reverse order and connect the plug at the driver board.

26(b) Remote Mounted Programmer. See Fig. 9b. Turn off the electrical supply and isolate the programmer.

Disconnect the leads from the programmer noting their alignment.

Fit the replacement programmer and reconnect the leads checking that they are correctly positioned.

27. Gas to Water Heat Exchanger. See Fig. 46.

Check that the electrical supply has been turned off.

Remove the combustion chamber cover. See Section 13.3(d).

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

Remove the fan as described in Section 13.3 (e). Withdraw the overheat thermostat phial.

Disconnect the central heating sensor.

Remove the flue hood as described in Section 13.3(f). Pull out the securing clips from the rear of the heat exchanger. See Fig. 46. Remove the heat exchanger. There will be a small quantity of water remaining in the heat exchanger.

Transfer components as necessary to the new heat exchanger and fit in the reverse order using new 'O' rings taking care to ensure that the securing clips are properly entered.

Reassembly the appliance in the reverse order.

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

28. Burner and Manifold. See Fig. 44.

Check that the electrical supply has been turned off.

Remove the combustion chamber cover. See Section 13.3 (d).

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

Unscrew the two extended screws securing the burner manifold to the bottom of the casing. Pull the manifold to the left to withdraw it from the right hand support bracket and remove from the casing. See Fig. 44.

Fit a new burner in the reverse order. Examine the 'O' ring and replace if it appears damaged. Tighten the screws evenly to ensure that the flange remains square with the base of the casing.

Test for gas soundness at all joints as described in Section 11.2.

29. Combustion Chamber Insulation. See Fig. 45.

Check that the electrical supply has been turned off.

Remove the combustion chamber cover. See Section 13.3(d).

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

Remove the Gas to Water heat exchanger as described in Paragraph 27 preceding.

Cover the burner and manifold.

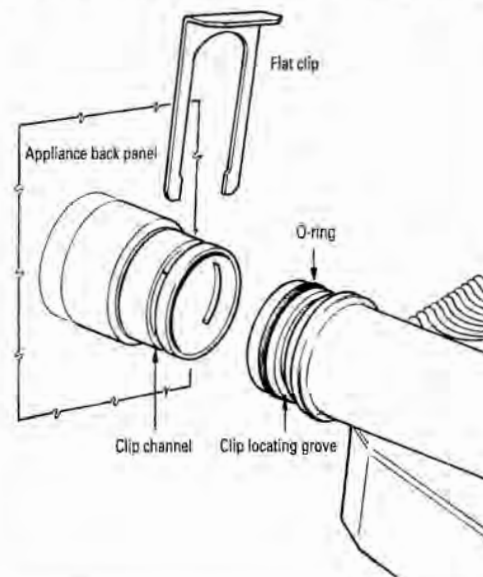
Remove the fibre insulation pads from the rear of the combustion chamber and then from the sides. See Fig. 45. Remove the pad from the combustion chamber cover.

Fit the new pads in the reverse order and reassemble the appliance in the reverse order.

Test for gas soundness at all joints as described in Section 11.2.

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

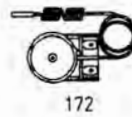
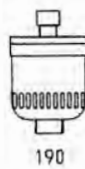
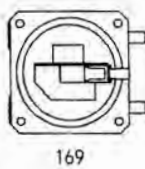
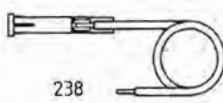
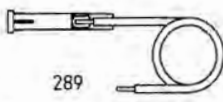
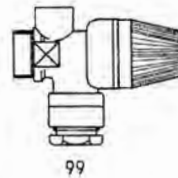
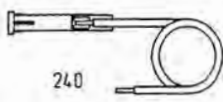
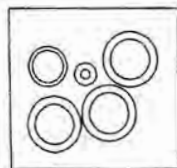
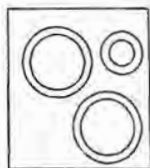
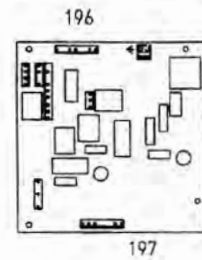
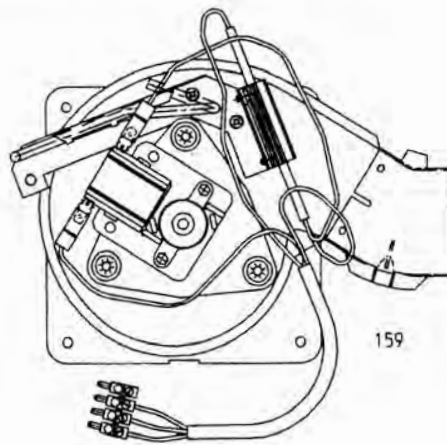
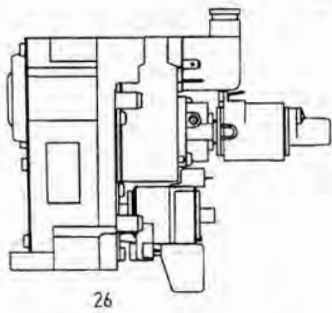
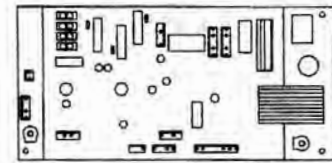
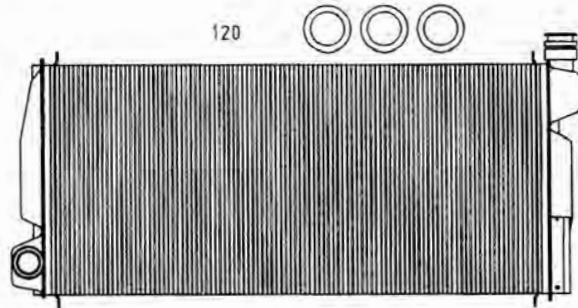
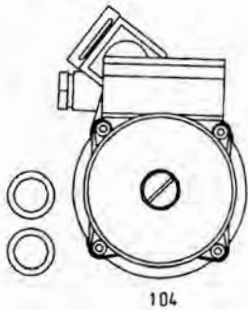
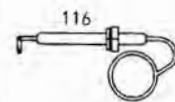
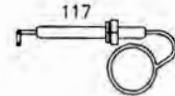
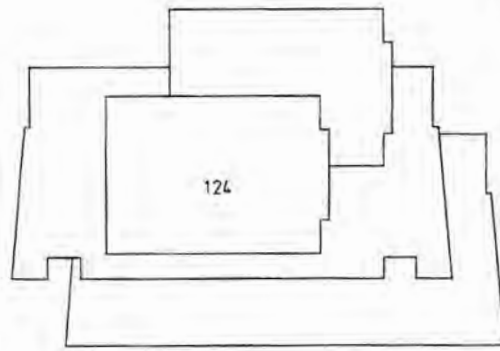
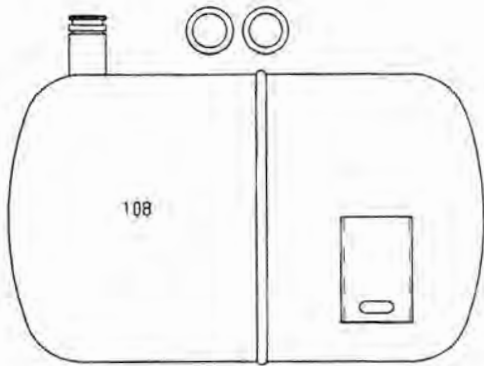
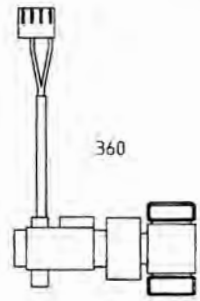
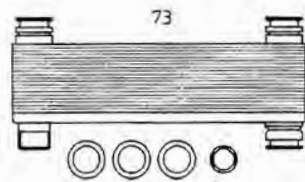
Fig. 46. Gas to Water heat exchanger clips.



15. Short Parts List

Also see parts drawing with key numbers on page 31

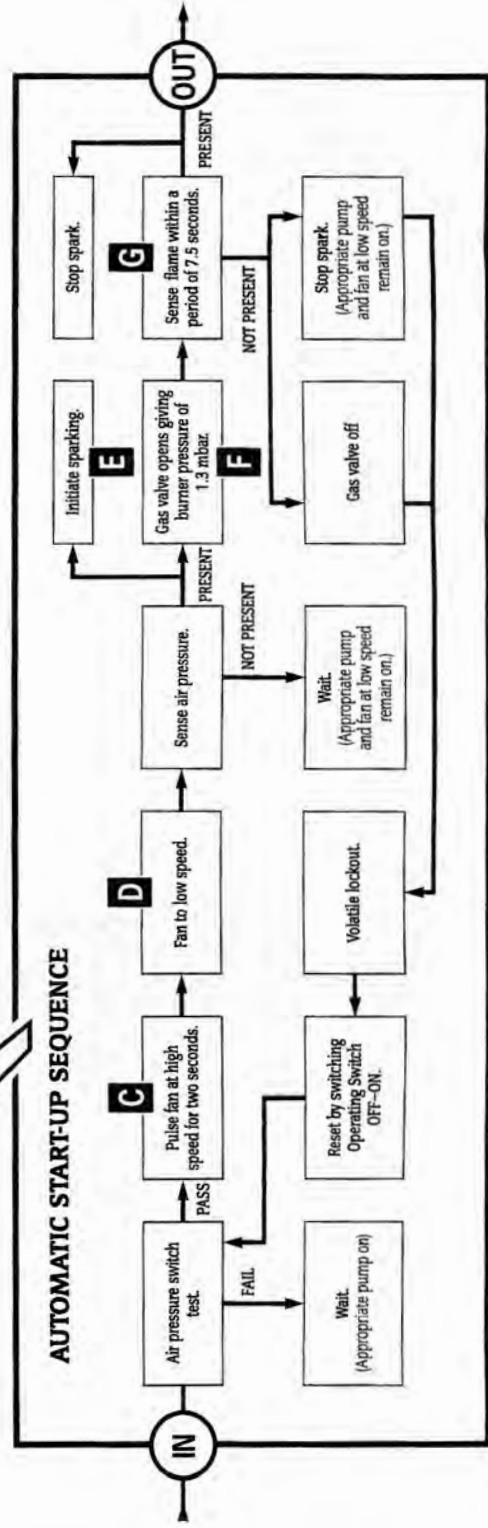
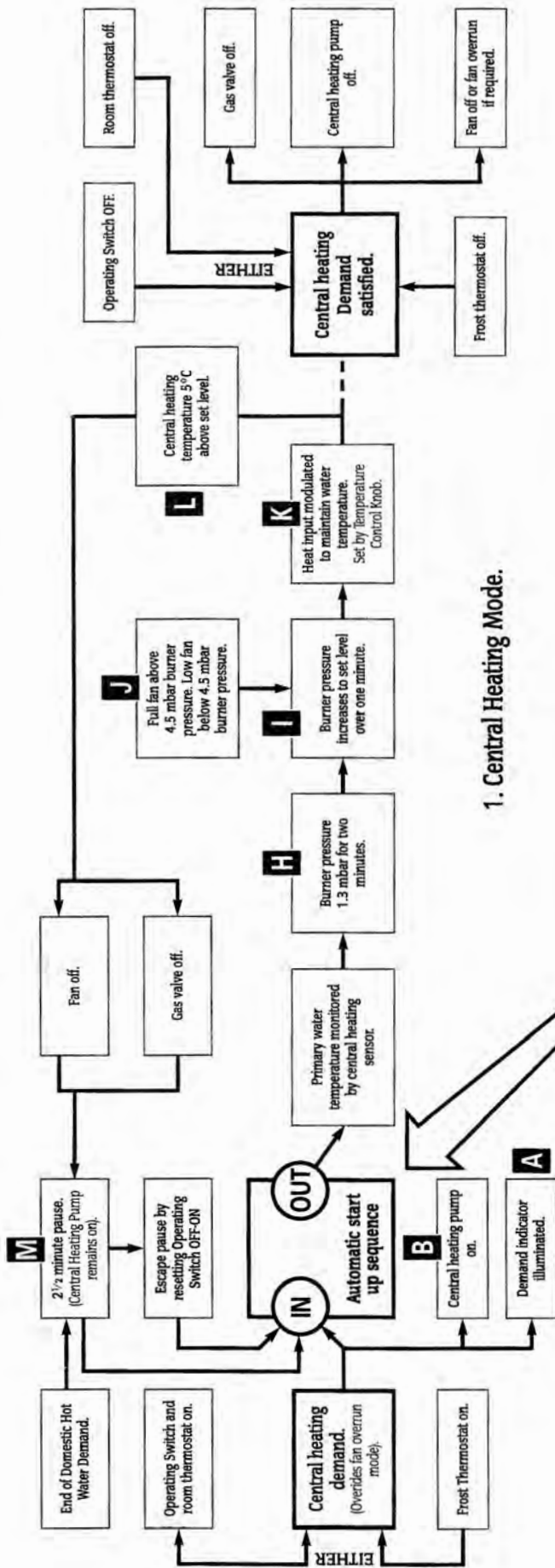
Key No.	GC. No.	Part	Manufacturer's Reference	Quantity	WHS Part No.
76/166	386 241	Sensor – complete with washer	Secisud 101A20	2	SPK0001
190	324 917	Auto Air Vent	Intermes 02,50,010	1	ZMMIS055
159	386 237	Fan Assembly – complete	Sifan FFB 0226-002	1	SSA5727/1
169	299 246	Air Pressure Switch	Honeywell	1	SPK0082
172	382 482	Overheat Thermostat – with heat transfer paste	Ranco LM7 P5040	1	SPK0002
116	382 751	Spark Electrode with Lead	Vernitron 60999/000	1	ZBGAS063
117	386 240	Flame Sensing Electrode with Lead	Vernitron 60999/001	1	ZBGAS064
26	378 745	Gas Valve	Honeywell VR4605 MA2032 Rc ^{1/2}	1	ZAGAS135
30	397 581	Gas Valve Adjuster (Modureg)	Honeywell 3032 24V.dc	1	ZAGAS119
79	386 222	Domestic Hot Water Overheat Thermostat – with heat transfer paste	Elmwood 2455–82 L70C	1	SPK0003
99	386 789	Pressure Relief Valve	CALEFFI 3141	1	ZCVLV018
108	371 521	Expansion Vessel – with 'O' ring	FB1/5485	1	SPK0005
104	386 224	Pump with 'O' rings	Grundfos 15-60 Special	2	SPK0006
73	299 321	Domestic Hot Water Heat Exchanger with 'O' rings and washers	Alfa-Laval CB14-14/18	1	SPK0105
59	395 761	Flow Regulator	12 litres/minute Type E Red	1	ZBUNC122
360	374 628	Flow Switch – with plug	SIKA VK315M	1	SSA010090
63	324 822	Gauze Filter	3/3613 Worcester	1	ZBUNC230
106	386 226	Water Pressure Switch	Novomec FPS37414A	1	ZAGAS112
196	386 238	Main Driver Board	Pactrol 413000	1	ZAGAS125
197	386 239	Ignition Board	Pactrol 413100	1	ZAGAS126
199	386 243	Transformer – with plug	TT495 Transtronic 240-24V 16VA	1	SSAHAR086
241	386 244	Pressure Gauge – with washer	Cewal	1	SPK0011
236	386 227	Central Heating Temperature Control Potentiometer – with plug	Omeg OW 20BV 10KA	1	SSAHAR002
233	386 778	Operating Switch	Arrow 2004E	1	ZDELE237
315		Programmer Kit	Worcester single channel – grey	1	ZAMAJ164
120	371 528	Heat Exchanger – with 'O' rings	Giannoni 1/5521	1	SPK0013
23	299 247	Burner Assembly – complete with brackets	Worgas MO51-19-9042	1	SPK0084
124	371 527	Combustion Chamber Insulation – complete		1	SPK0014
238	371 524	Neon (Green) – complete with plug	IMO Ref. NI9L240 R/S – Green	1	SSAHAR081
289	371 525	Neon (Amber) – complete with connector	IMO Ref. NI9L 240 R/S – Amber	1	SSAHAR082
240	371 526	Neon (Red) – complete with connector	IMO Ref. NI9L 240 R/S – Red	1	SSAHAR083
317	371 535	Gasket Pack – water	Worcester	1	SPK0019
318	371 536	Gasket Pack – gas	Worcester	1	SPK0020

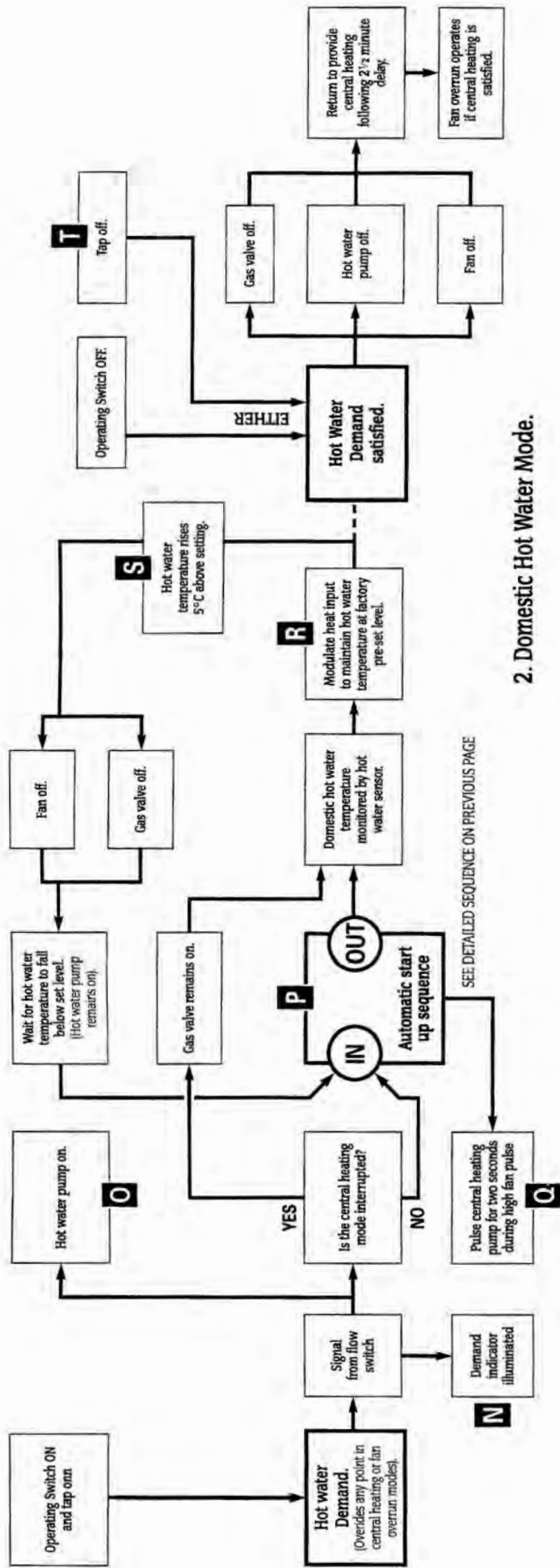


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16. Operational Flow Diagrams

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

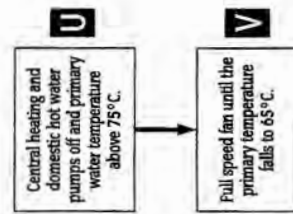




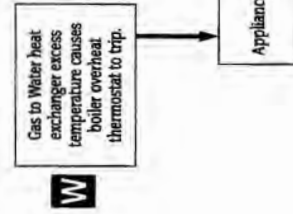
2. Domestic Hot Water Mode.

SEE DETAILED SEQUENCE ON PREVIOUS PAGE

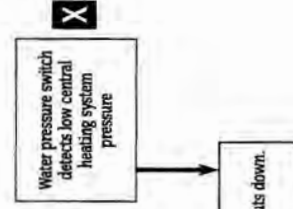
3. Fan Overrun Function.



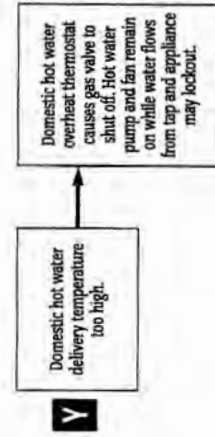
4. Overheat Protection.



5. Low System Pressure Protection.



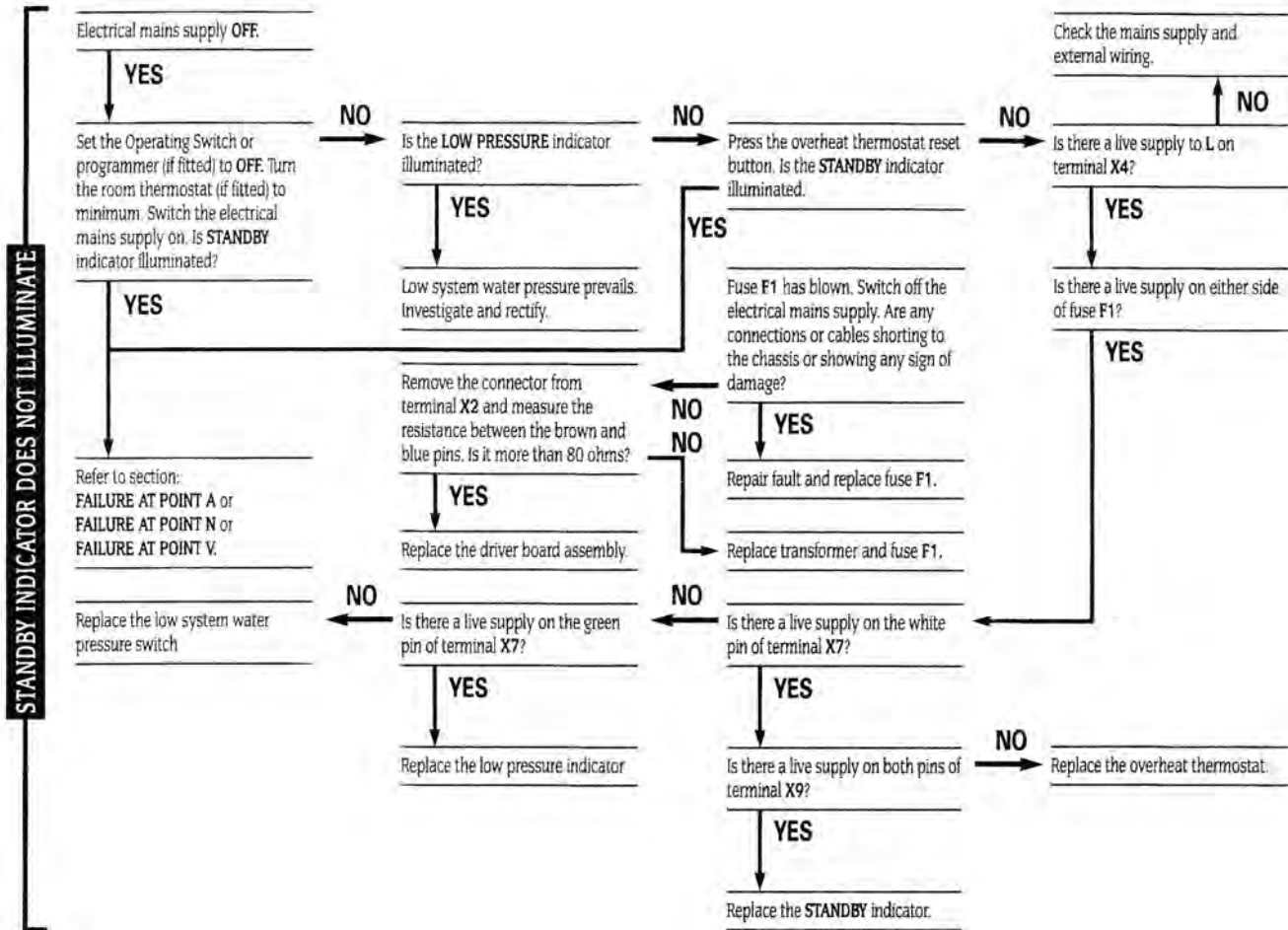
6. Domestic Hot Water Overheat Protection.



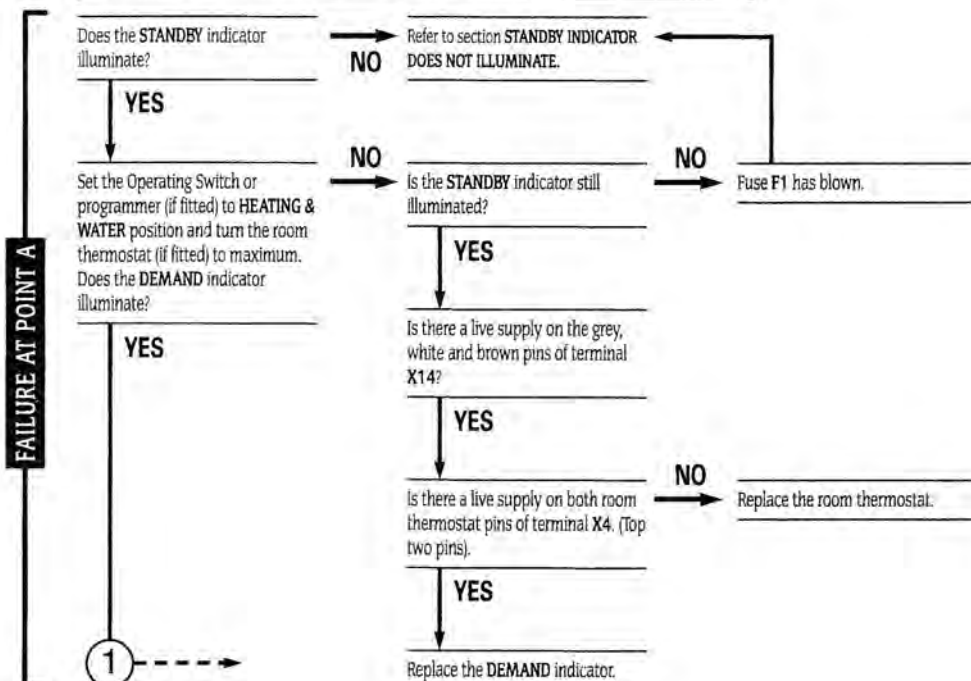
17. Fault Finding

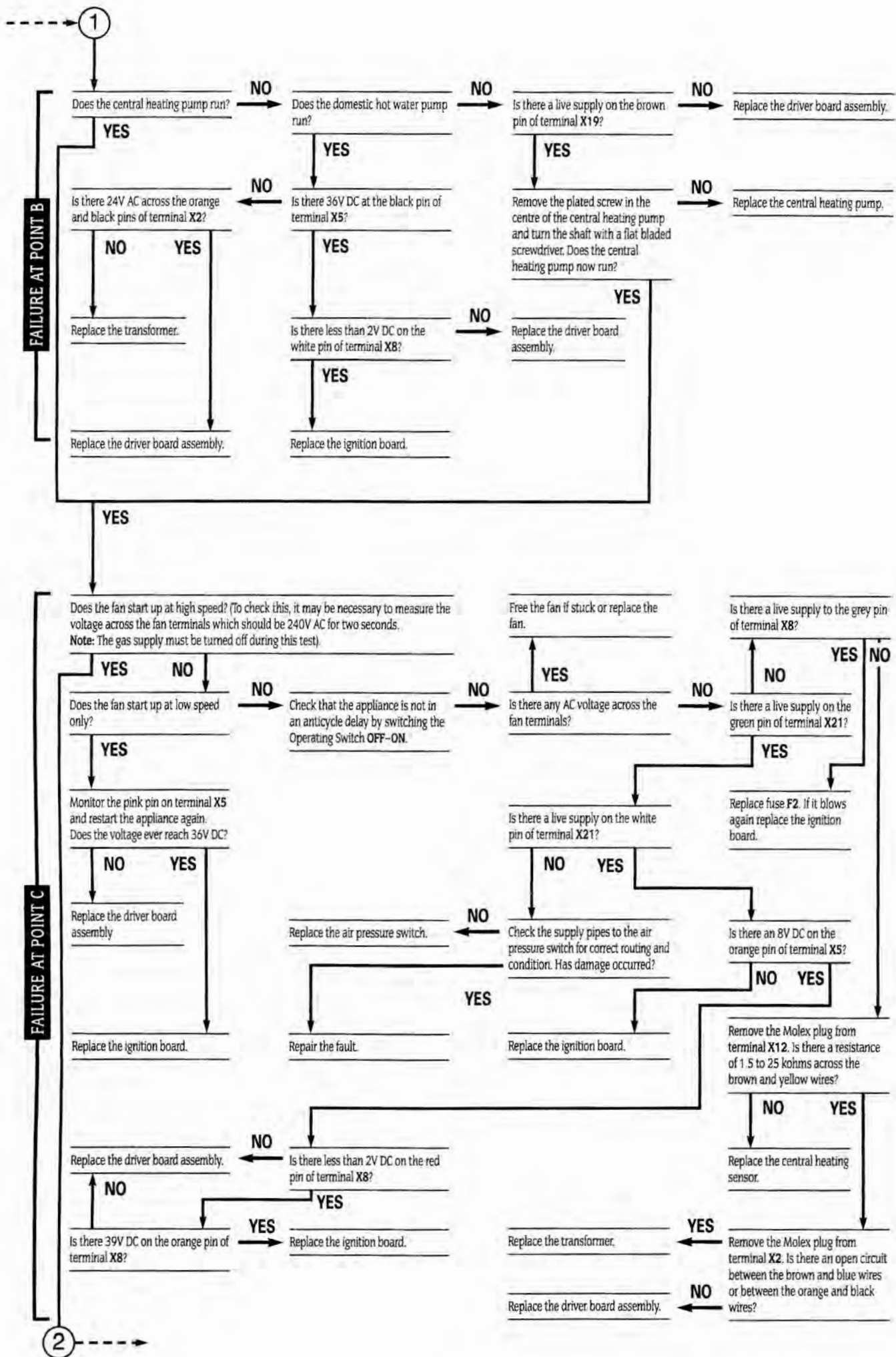
This Fault Finding Chart is to be used in conjunction with the Operational Flow Diagrams in Section 16. To find the fault, locate the point on the flow diagram at which the appliance has failed, e.g. letter B. Then read the corresponding section in the fault finding chart, e.g. **Failure at point B**.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

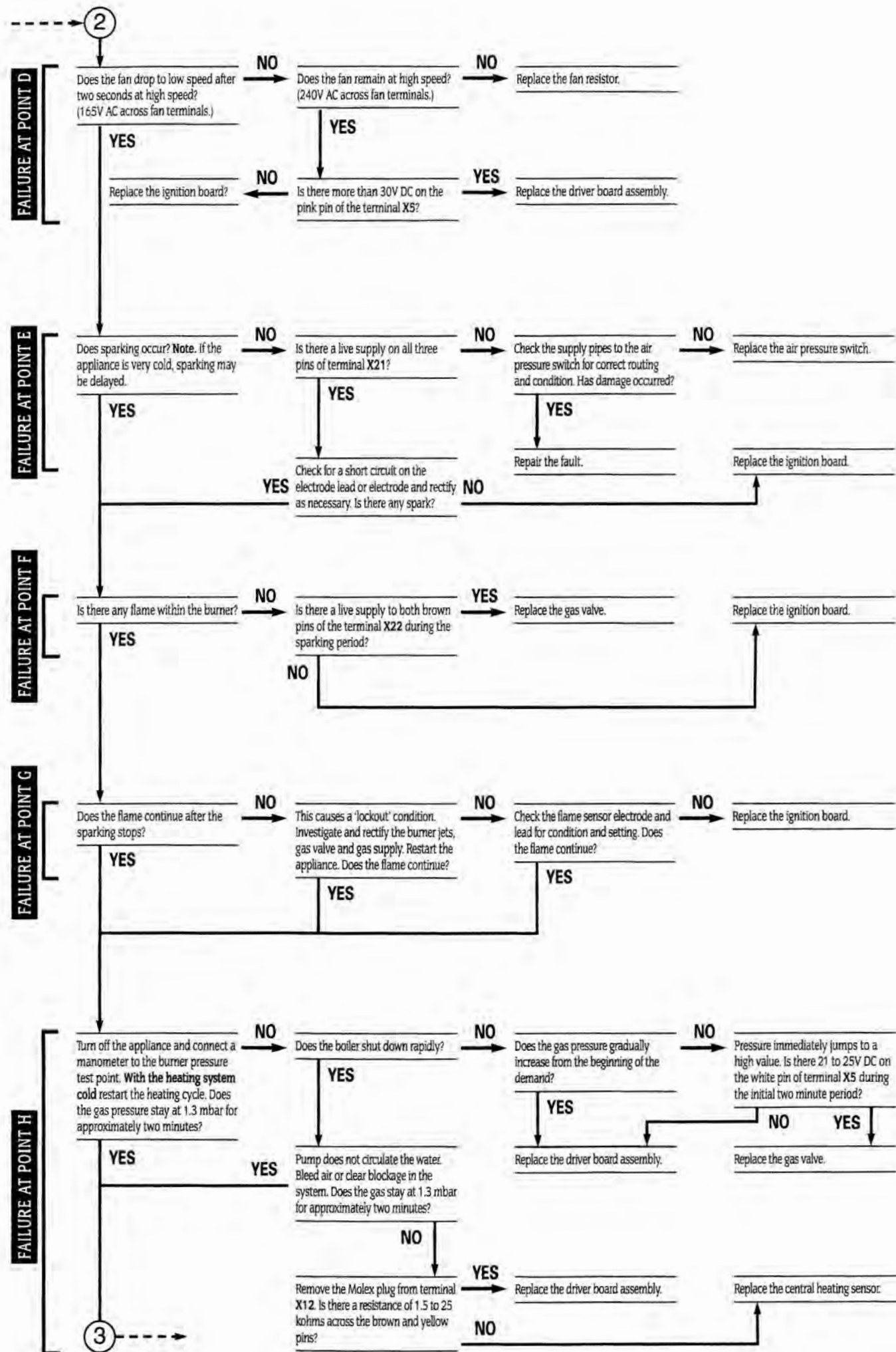
Notes: 1. All voltage measurements are with respect to neutral unless otherwise stated. 2. Before changing any component indicated in the chart, it is essential that the associated wiring is checked for continuity, condition and correct routing. 3. Preliminary electrical system checks are the first electrical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

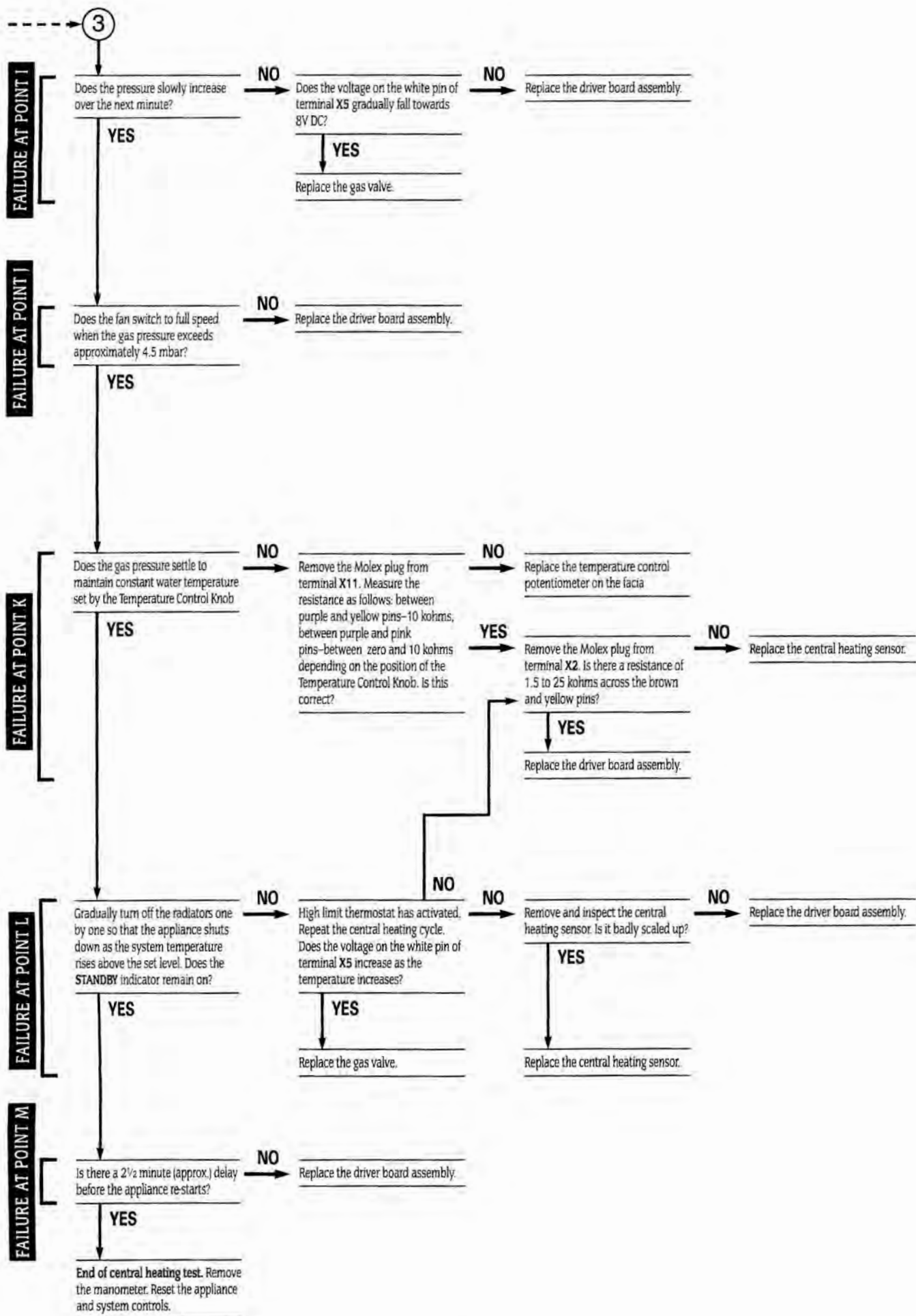


START OF CENTRAL HEATING TEST

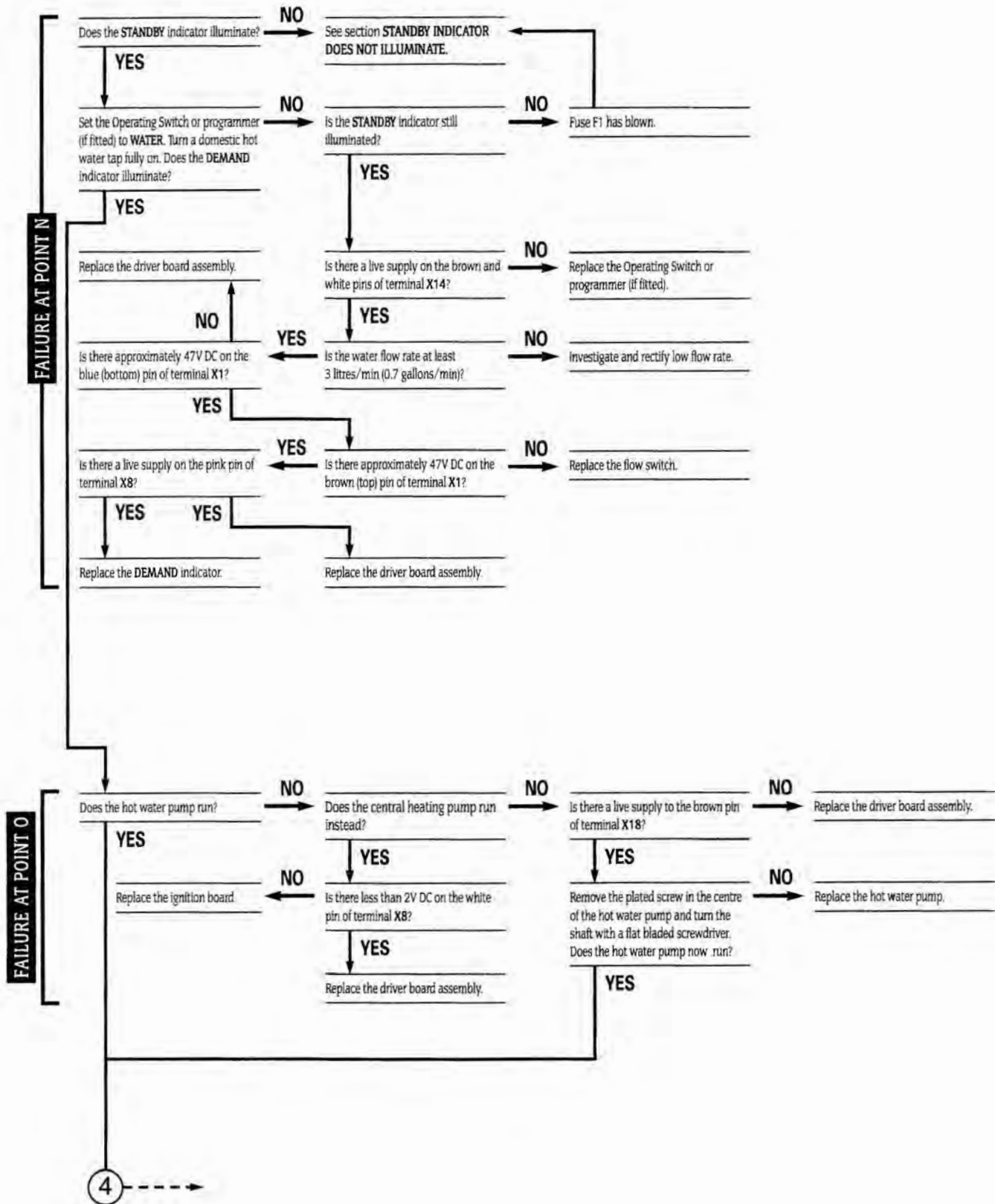


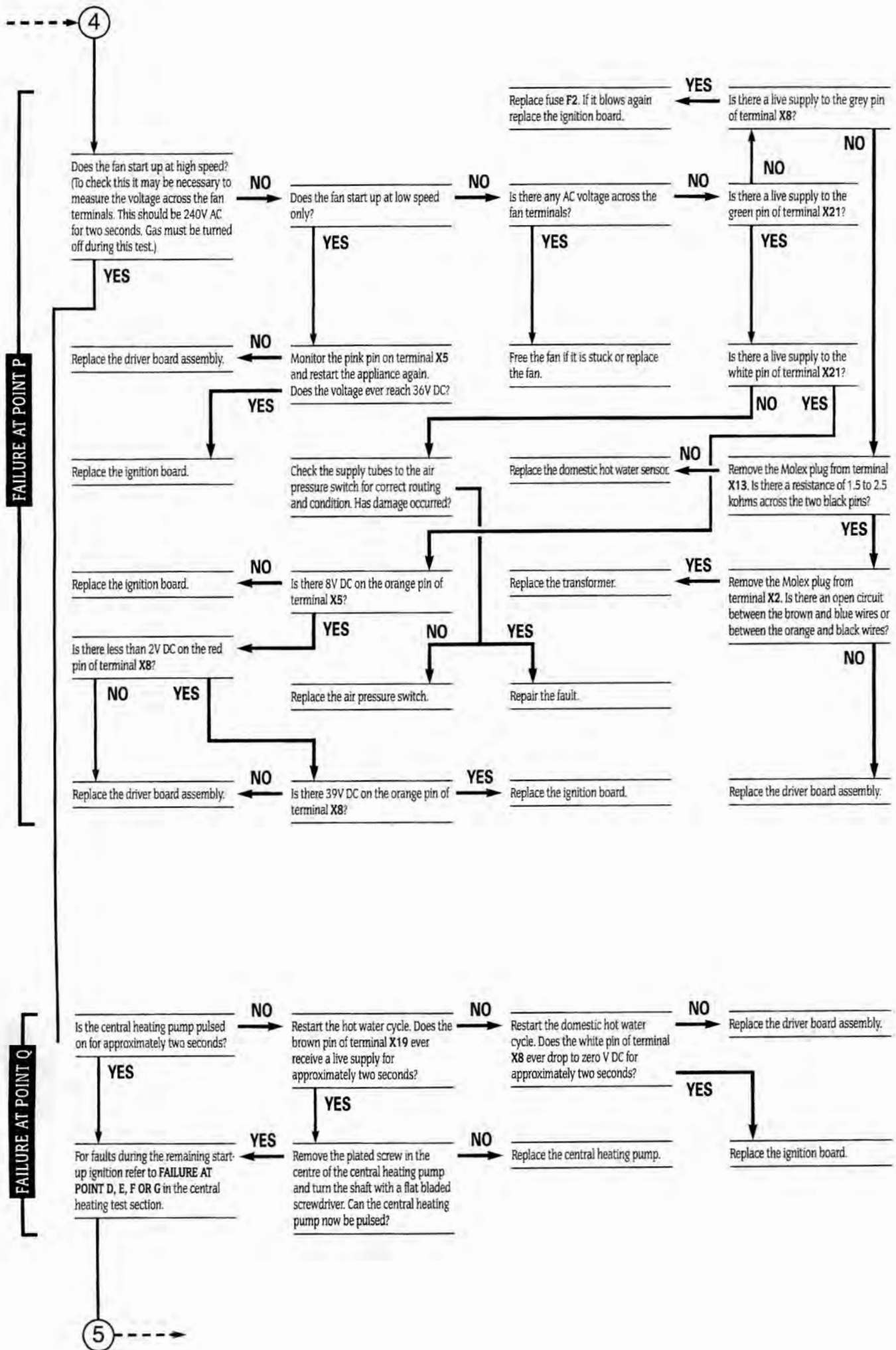


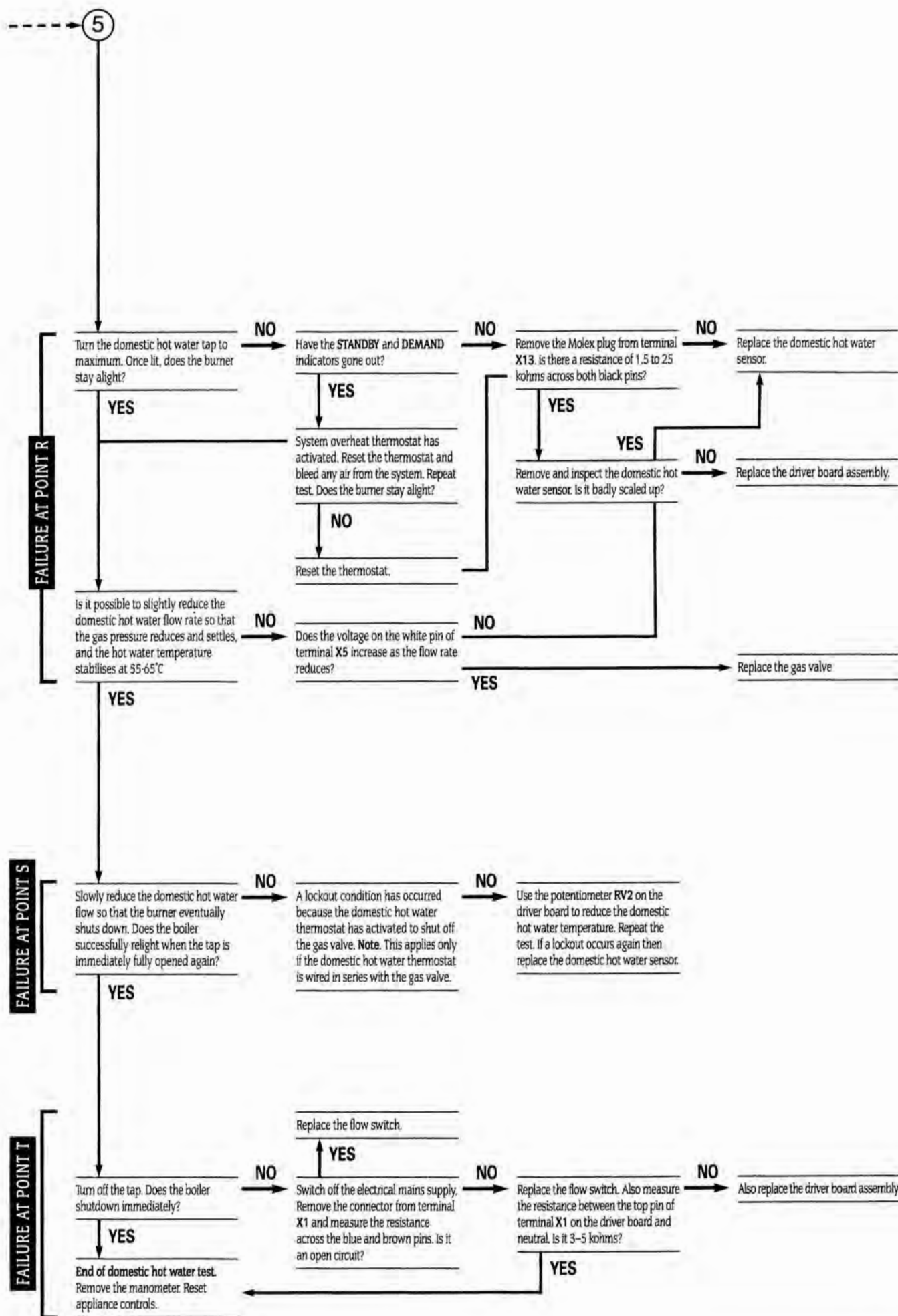




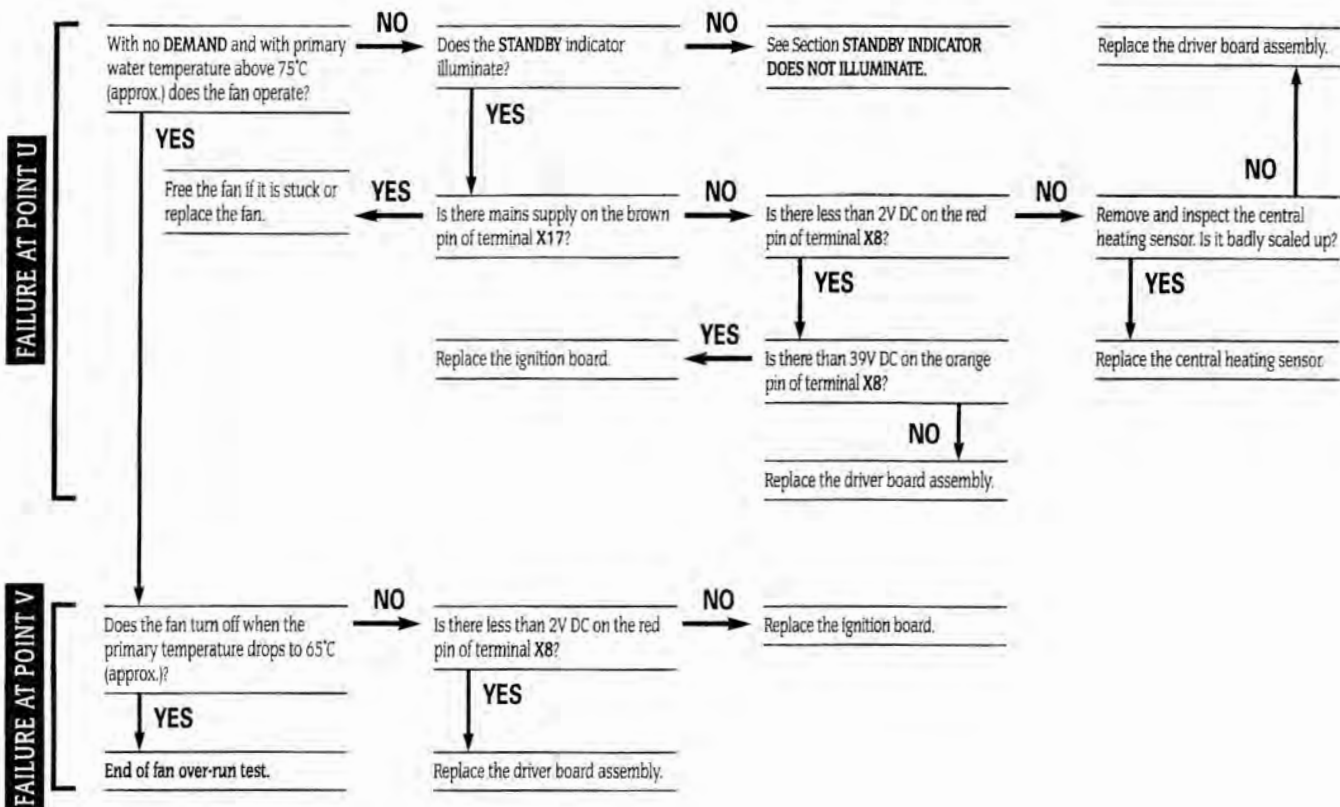
START OF DOMESTIC HOT WATER TEST



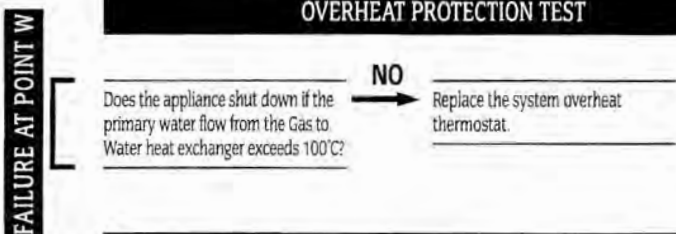




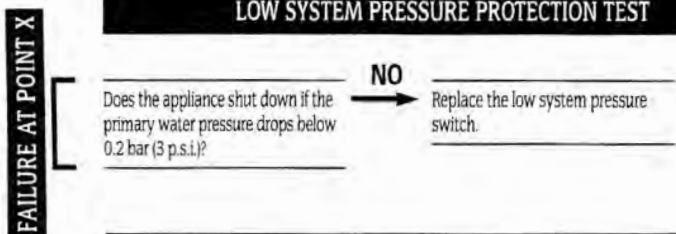
START OF PUMP OVERRUN TEST



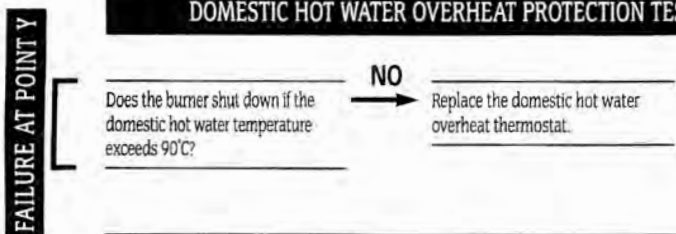
OVERHEAT PROTECTION TEST



LOW SYSTEM PRESSURE PROTECTION TEST



DOMESTIC HOT WATER OVERHEAT PROTECTION TEST





Cotswold Way Warndon Worcester WR4 9SW
Tel: (01905) 754624. Fax: (01905) 754619.

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