



# Highflow 3.5 OF

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## OPEN FLUED MODEL

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

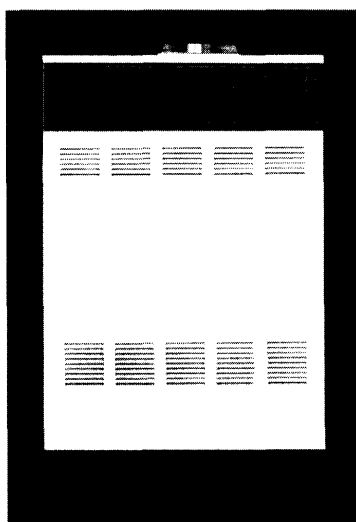
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### INSTALLATION AND

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### SERVICING INSTRUCTIONS

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GC NUMBER 41 311 38

#### BOILER OUTPUT

To Hot Water

**Maximum 22.9 kW (78,000 Btu/h)**

To Central Heating

**Minimum 8.8 kW (30,000 Btu/h)**

**Maximum 22.9 kW (78,000 Btu/h)**

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**IMPORTANT: THIS APPLIANCE IS FOR USE WITH NATURAL GAS ONLY**

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**THESE INSTRUCTIONS APPLY IN THE UK ONLY**

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

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Bosch Group

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## INSTALLATION REGULATIONS

The installation of this appliance must be in accordance with the relevant requirements of the Gas Safety (Installation and Use) Regulations, local Building Regulations, Building Standards (Scotland) (Consolidation), current IEE wiring regulations and bye laws of the local water undertaking. It should be in accordance with the relevant recommendations of the following British Standards and Codes of Practice: BS 6798:1987, BS 5449:1:1990, BS 5546:1:1990, BS 5440:1:1990, BS 5440:2:1989 and BS 6891.

**Gas Safety (Installation and Use) Regulations 1984:** It is the law that all gas appliances are installed by a competent person, in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest, and that of safety to ensure compliance with the law.

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

## TECHNICAL DATA

NOTE: THE DATA PLATE IS POSITIONED BENEATH THE TOP PANEL ON TOP OF THE ELECTRICAL COVER

Table 1

| NOMINAL BOILER RATINGS (10 minutes after lighting) |        |          |       |          |                         |          |                   |                      |
|--|--------|----------|-------|----------|-------------------------|----------|-------------------|----------------------|
| MODE   | OUTPUT |          | INPUT |          | BURNER SETTING PRESSURE |          | GAS RATE          |                      |
| HEATING RANGE                                      | kW     | (Btu/h)  | kW    | (Btu/h)  | m bar                   | (in. wg) | m <sup>3</sup> /h | (ft <sup>3</sup> /h) |
|  | 8.8    | (30,000) | 12.1  | (41,300) | 2.5                     | (1.0)    | (1.15)            | (40.7)               |
|  | 11     | (37,000) | 14.9  | (50,800) | 3.7                     | (1.5)    | (1.42)            | (50.0)               |
|  | 13     | (44,350) | 17.5  | (59,700) | 5.2                     | (2.1)    | (1.67)            | (58.8)               |
|  | 15     | (51,200) | 19.9  | (67,900) | 6.7                     | (2.7)    | (1.90)            | (66.9)               |
|  | 17     | (58,000) | 22.5  | (76,800) | 8.5                     | (3.4)    | (2.15)            | (75.7)               |
|  | 19     | (64,800) | 24.8  | (84,600) | 10.4                    | (4.2)    | (2.37)            | (83.3)               |
|  | 22.9   | (78,000) | 29.1  | (99,500) | 14.3                    | (5.7)    | (2.80)            | (98.5)               |

Note: The Pressure test point is located on the gas valve (See Fig. 9).

Table 2

| SPECIFICATIONS                       |   |
|--------------------------------------|---|
| CENTRAL HEATING FLOW                 | 28 mm COPPER TUBE                                 |
| CENTRAL HEATING RETURN               | 28 mm COPPER TUBE                                 |
| COLD WATER MAINS IN                  | R ½ (½ in. B.S.P.)                                |
| DOMESTIC HOT WATER OUT               | 22 mm COPPER TUBE                                 |
| GAS INLET                            | 22 mm COPPER TUBE                                 |
| HEIGHT                               | 860 mm (33.9 in.)                                 |
| WIDTH                                | 550 mm (21.8 in.)                                 |
| DEPTH                                | 600 mm (23.6 in.)                                 |
| WEIGHT (empty)                       | 95 kg (210 lbs.)                                  |
| PRIMARY CAPACITY                     | 48 Litres (10.6 galls.)                           |
| * MAXIMUM STATIC HEAD                | 25 m (81 ft.)                                     |
| * MINIMUM STATIC HEAD                | 1 m (39 in.)                                      |
| CIRCULATING PUMP                     | Grundfos UPS 15-60                                |
| OUTPUT TO HEATING MAXIMUM            | 22.9 kW (78,000 Btu/h)                            |
| OUTPUT TO DOMESTIC HOT WATER         | 22.9 kW (78,000 Btu/h)                            |
| MAXIMUM DOMESTIC HOT WATER FLOW RATE | Nominally 15 l/min ± 15% (3.3 gal./m.)            |
| GAS RATE (after 10 min.)             | 2.8 dm <sup>3</sup> /h (98.52 ft <sup>3</sup> /h) |

\* Appliance static heads are measured from the top of the casing to the highest point of the system.

Table 3

| AVAILABLE PUMP HEADS |          |      |        |                   |          |  |
|----------------------|----------|------|--------|-------------------|----------|--|
| HEATING OUTPUT       |          | HEAD |        | MINIMUM FLOW RATE |          | TEMPERATURE RISE                               |
| kW                   | Btu/h    | m    | (ft)   | l/m.              | (gal/m.) |  |
| 8.8                  | (30,000) | 5.1  | (16.6) | 11.5              | (2.5)    | 11 °C (20 °F) between heating flow and return. |
| 11                   | (37,500) | 4.7  | (15.5) | 14.5              | (3.2)    |  |
| 13                   | (44,350) | 4.3  | (14.1) | 17.0              | (3.8)    |  |
| 15                   | (51,200) | 3.8  | (12.6) | 19.5              | (4.3)    |  |
| 17                   | (58,000) | 3.3  | (10.9) | 22.5              | (4.9)    |  |
| 19                   | (64,800) | 2.2  | (7.2)  | 24.8              | (5.4)    |  |
| 22.9                 | (78,000) | 1.7  | (5.5)  | 30.0              | (6.6)    |  |

## 1. GENERAL INFORMATION

### 1. HIGHFLOW 3.5 OF INCORPORATES

- An open flued low thermal capacity boiler having a maximum heat output of 22.9 kW (78,000 Btu/h).
- A heatbank having a nominal capacity of 45 litres (10 gallons) of circulating primary hot water positioned at the side of the appliance. A copper finned water to water heat-exchanger is fitted into the heatbank. Secondary mains supply domestic hot water passes through the heat exchanger.
- A diverter valve to direct the boiler output either to domestic hot water or central heating as required.
- An integral circulating pump.
- Multifunctional gas valve and electrical control system to individually control the domestic hot water and central heating.
- Boiler and hot water temperature control thermostats providing control for central heating and domestic hot water.
- A User's Operating Switch for selection of water only or heating and water. A programmer kit is available as an optional extra.
- An electronic pump delay control board which enables the pump to run on for a period of about 5 minutes after each operating cycle.
- An expansion vessel, pressure gauge, pressure release valve and auto air vent to enable the appliance to be connected to a sealed water system.

### 2. INSTALLATION WARNING:

GREAT CARE MUST BE TAKEN TO ENSURE THAT NO FOREIGN MATTER IS LEFT IN THE WATER SYSTEM. THIS COULD CAUSE DAMAGE TO THE APPLIANCE.

### 3. NATURAL GAS SUPPLY

The boiler requires 2.8m<sup>3</sup>/h (98.5 ft<sup>3</sup>/h) of gas. Meter and supply pipes must be capable of delivering this quantity of gas in addition to the demand from any other appliances in the house. The meter outlet governor must ensure a nominal pressure of 20m bar (8 in.wg.) at the appliance. The complete installation, including the meter, should be inspected and tested for soundness and purged in accordance with the recommendations of BS 6891.

### 4. ELECTRICAL SUPPLY

Mains supply 240 V, 50 Hz, 135 watts.

### 5. OPEN VENTED SYSTEM

The appliance is supplied ready for connection to a sealed water system. A conventional open vented system can be used by carefully removing the automatic safety valve and sealing its connection. See Section 10. Care should be taken not to distort the pipe.

### 6. CONTROLS

All controls included with the appliance are specified in the 'Short List of Parts' included in this leaflet. There is

provision for a room thermostat and frost thermostat to be fitted to the appliance. See Section 11.

Thermostatic radiator valves can be used in the system; however, a suitable by-pass is recommended with this type of control.

### 7. DRAINAGE

A drain cock is fitted at the base of the heat bank to drain water from the appliance.

### 8. PACKAGING

The appliance is despatched in one package.

## 2. SITING THE APPLIANCE

(Refer also to sections 5, 6 and 7).

- The appliance is floor standing and the floor must be firm and level.
- The following clearances must be left to allow for servicing and ventilation:
  - Above the appliance: Servicing 450 mm (18 in.)  
Ventilation 5 mm (0.2 in.)
  - In front of the appliance: Servicing 600 mm (24 in.)  
Ventilation 150 mm (6 in.)
  - Left-hand side: Servicing 5 mm (0.2 in.)  
(Viewed from front) Ventilation 5 mm (0.2 in.)
  - Right-hand side: Servicing 70 mm (2.8 in.)  
(Viewed from front) Ventilation 70 mm (2.8 in.)  
If a standard work surface is fitted then the gap should be 100 mm (4 in.)

**NOTE:** Care must be taken to ensure adequate space is available at either side for installing the boiler. See Section 8 Installation.

**NOTE:** If the appliance is to be fitted in a timber framed building it should be fitted in accordance with the British Gas publication "Guide for Gas—Installation in Timber Framed Housing" Ref DM2. If in doubt advice must be sought from the local Gas Region of British Gas.

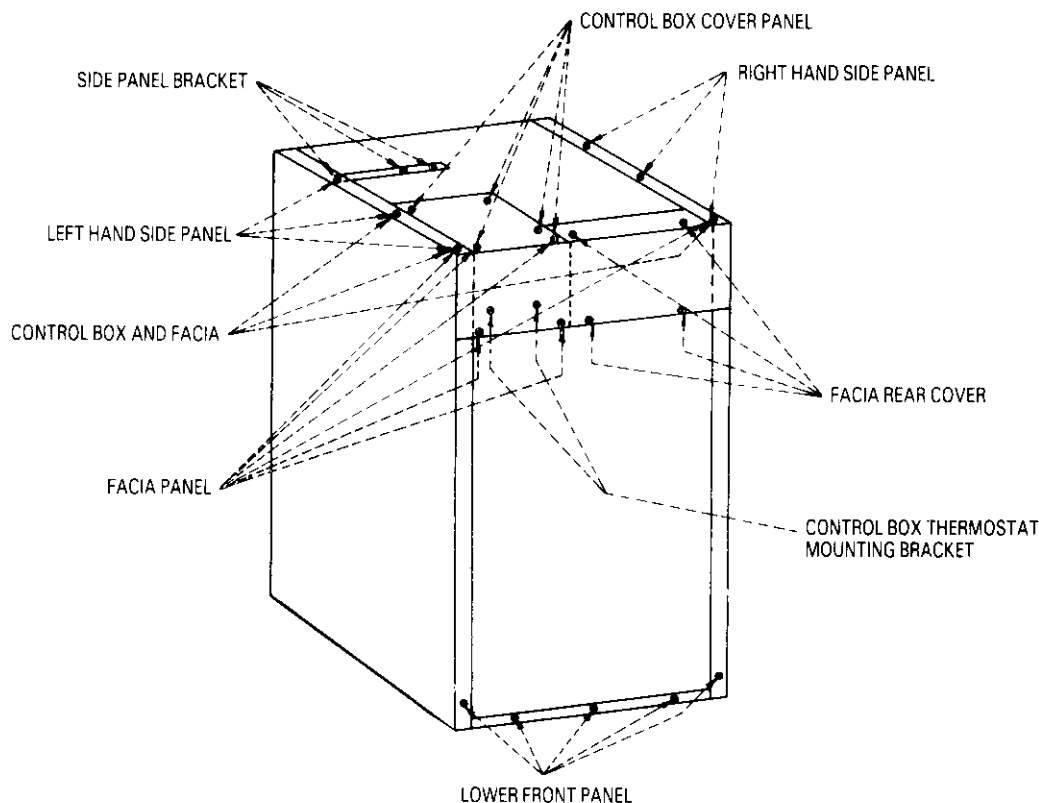
## 3. REMOVAL OF CABINET

See Fig. 2.

**NOTE:** It is necessary to remove the cabinet top panel, front panel, left and right hand side panels and lower grille to aid installation.

- Remove the cabinet top panel by snatching squarely upwards to release the clips.

**Fig. 2. Cabinet and Control Panel Fixing Screws.**



- (b) Remove the cabinet front panel by pulling firmly at the base and lifting upwards and outwards.
- (c) Undo the five pozi-drive screws holding the lower front grille kick strip to the side panels and base frame.
- (d) Remove the two thermostat knobs and release the three pozi-drive screws securing the control box and facia panel to the side panels. Lift the control box and facia and rest the assembly on top of the boiler. Take care not to stretch any electrical cables or thermostat capillaries.
- (e) Remove the three screws remaining at the top of each of the panels one in the left hand and two in the right hand panel. Draw the side panels slightly forward and release them from the securing lugs in the base plate.

## 4. SYSTEM CONSIDERATIONS

- (a) The appliance includes a pump and no other circulating pump is required. When fitting a room or frost thermostat, refer to Section 11 Electrical. The appliance will operate satisfactorily on a two pipe small bore or micro-bore system.
- (b) The heatbank contains a finned copper heat exchanger which provides domestic hot water. A control system is incorporated that gives priority to the domestic hot water and the central heating will be turned off when a demand for hot water is made. For large quantities of hot water the control thermostat should be set at maximum and after use, a few minutes may be required to re-heat the heatbank, the central heating will remain off during this period.

**IT IS GENERALLY ADVISABLE TO FIT A BYPASS TO ALL SYSTEMS.**

## 5. INSTALLATION—IMPORTANT

THE APPLIANCE MUST NOT BE INSTALLED IN A BEDROOM OR BED-SITTING ROOM NOR IN A ROOM CONTAINING A BATH OR SHOWER.

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 THE APPLIANCE IN A ROOM CONTAINING A BATH OR SHOWER.

## 6. AIR SUPPLY

The appliance must have a clearance at the right hand side for air movement of at least 70 mm (2.8 in.) or 100 mm (4 in.) if a work surface has been fitted above the boiler. See Section 2.

The appliance must not be boxed in tightly with kitchen cupboards etc. Air supply must be provided in accordance with B.S. 5440:2.

1. If the appliance is installed in a room, then the room must have a permanent air vent direct to outside air, or to an adjacent room which itself has a permanent air vent direct to outside air. The minimum effective area of the air vent(s) required is 100 cm<sup>2</sup> (15 in.<sup>2</sup>).
2. If the appliance is installed in a cupboard or compartment, permanent air vents are required in the cupboard or compartment, one at high level and one at low level, either direct to outside air or to a room. Both high and low level air vents must communicate with the same room or must

both be on the same wall to the outside air. The minimum effective areas are given in Table 4. Where the cupboard or compartment is ventilated to a room, the room itself must have an air vent direct to the outside air of a minimum effective area 100 cm<sup>2</sup> (15 in.<sup>2</sup>). Details of essential features of cupboard/compartment design, including airing cupboard installation, are given in B.S. 6798:1987.

3. If there is any type of extractor fan fitted in the premises, spillage of the products from the boiler flue could occur when the fan is operating, unless an adequate air inlet area from outside is provided.
4. A spillage test as detailed in B.S. 5440:1 must be carried out and any remedial action taken to ensure the installation meets these standards.

Table 4

| Position of Air Vents | Air from room                                | Air direct from outside                        |
|-----------------------|--|--|
| High Level            | 264 cm <sup>2</sup><br>(41 in <sup>2</sup> ) | 132 cm <sup>2</sup><br>(20.5 in <sup>2</sup> ) |
| Low Level             | 528 cm <sup>2</sup><br>(82 in <sup>2</sup> ) | 264 cm <sup>2</sup><br>(41 in <sup>2</sup> )   |

## 7. FLUE

The boiler must be connected to a flue conforming to B.S. 715 using a suitable adapter.

The boiler flue outlet has an internal diameter of 144 mm. The flue pipe fitted to the boiler must have an internal diameter of 125 mm (5 in.). If the outside diameter of the flue pipe is greater than 144 mm then an adapter must be fitted.

An acceptable means of disconnection must be incorporated in the installation immediately above the draught diverter e.g. a slip or split socket.

The boiler must be connected to a suitable flue which will provide a consistent up-draught without undue cooling of the flue gases. The requirements of B.S. 5440:1 should be followed.

Horizontal flue runs should be avoided and the flue should terminate in accordance with the relevant recommendations given in B.S. 5440:1. The flue must be fitted with a terminal which has been tested and found satisfactory by British Gas. The terminal must not be installed within 600 mm (24 in.) of an openable window, air vent or any other ventilation opening.

Existing chimneys may be suitable but must be swept first and usually require an approved liner to be fitted. If in doubt regarding the suitability of a flue, consult the local Gas Region for advice.

If the flue is required to be taken through the wall behind the boiler then adequate space should be allowed for a suitable flue bend to be fitted.

### Right-angle bends must not be used.

When the flue is taken through the ceiling and into the roof space, or room above, it must be provided with a sleeve of non-combustible material sufficient to allow an air space between the sleeve and the flue of 25mm (1in) minimum. A suitable non-combustible sleeve or plate must be fitted to centre the flue and maintain the 25mm (1in) air gap. The space between the plate/sleeve and the flue pipe should be filled with mineral wool or similar non-combustible, non conducting material.

### IMPORTANT

IT IS ABSOLUTELY ESSENTIAL to ensure, in practice, products of combustion discharging from the flue terminal cannot re-enter the building or any other adjacent building through ventilators, windows, doors, other sources of natural air infiltration, or forced ventilation /air conditioning. If this eventuality should occur, the appliance **MUST** be turned off immediately and the local Gas Region called in to investigate.

## 8. INSTALLING THE APPLIANCE

See Figs. 1 and 3.

**NOTE:** ADDITIONAL SPACE IS REQUIRED FOR INSTALLATION OVER AND ABOVE THE DISTANCES SPECIFIED IN SECTION 2 FOR SERVICING.

The space required for installation is 25 mm (1 in.) at the left hand side and 70 mm (2.8 in.) at the right hand side.

The description following covers one method of installation. If connections are made in a different way then the space required for installation may be greater.

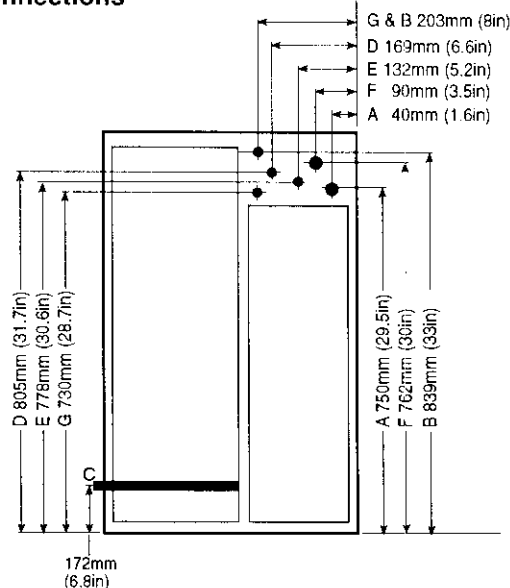
A knock-out panel is provided in the cabinet top panel to facilitate vertical pipe connections.

Compression fittings may be used on all water connections to allow for the fitting of the boiler and servicing. An additional compression fitting is not, however, necessary on the domestic hot water inlet as the specially designed fitting already incorporates a union connection.

It is most important that the pipework is routed so as not to obstruct access to the circulating pump, diverter valve or heat exchanger (heat bank).

1. Check that the proposed position of the boiler is firm and level. No special floor protection is required. **DO NOT PLACE THE BOILER IN ITS FINAL POSITION AT THIS STAGE.**
  2. Remove the cabinet top, front, lower front right hand and left hand side panels. See section 3.
- NOTE:** Rest the control box and fascia on the top right of the appliance.
3. Remove the cabinet left hand side panel support strap by removing the two M5 screws securing it to the boiler inner casing.
  4. Remove the central heating flow pipe (See Fig. 29) by disconnecting the assembly at the pump union and its entry to the heat bank. Do not mislay the pump union washer.

Fig 3. Rear View of Boiler Pipework Connections



**NOTE:** ALL DIMENSIONS ARE NOMINAL

- A CENTRAL HEATING RETURN (28mm)
- B VENT AND FEED (22mm)
- C GAS INLET (22mm)
- D DOMESTIC COLD WATER IN - R<sub>1/2</sub>
- E DOMESTIC HOT WATER OUT (22mm)
- F CENTRAL HEATING FLOW (28mm)
- G SAFETY VALVE (22mm)

5. Make the gas connection to the end of the gas supply pipe at the right hand side of the boiler.
6. Attach a 22 mm elbow to the primary feed pipe so that its outlet will face upwards through the cabinet top panel cut-out.
7. Fit and tighten a ½ in. x 15 mm soldering connection cupling to the domestic hot water inlet assembly. To this may be fitted a 15 mm pipe formed to pass upward through the cabinet top panel cut-out.  
**NOTE:** The distance from the face of the R ½ connection on the DHW fitting to the wall is nominally 75 mm (3 in.)
8. Attach a 22 mm elbow to the domestic hot water flow pipe with the outlet facing upwards through the cabinet top panel cut-out.
9. Fit a 28 mm x 28 mm compression fitting elbow to the central heating return pipe. The outlet may face upwards through the cabinet top panel cut-out or towards the left hand side of the boiler.
10. To the loose central heating flow pipe assembly (see Paragraph 4 preceding) attach a 28 mm elbow with the outlet positioned to face upwards through the cut-out in the cabinet top panel or towards the left hand side of the boiler. Refit the assembly to the appliance and re-connect the pump. Do not forget to fit the washer.

#### 11. Sealed Systems Only

On open vent systems the safety valve may be removed and the connection capped. Take care not to damage the pipe. Fit a 22mm pipe to the outlet of the Tundish pipe to lead any possible discharge from the safety valve away from the boiler.

**Safety Valve Discharge Pipe:** The discharge pipe from the tundish must be continued in 22 mm copper pipe, and laid to a continuous fall to avoid the retention of any discharge water within the pipework. A fall in excess of 1 in 200 will be satisfactory.

The pipework should have a resistance to flow of water not greater than that of a straight pipe 9 metres long.

The termination of the discharge pipe must be visible, but in a location not readily accessible to persons.

Discharges at low level are acceptable providing that a wire cage or similar is positioned to prevent contact, while maintaining visibility.

12. Move the boiler into its correct position with the rear of the boiler base plate parallel with the wall or skirting board.
13. Connect the gas pipe to the gas inlet on the boiler at the left hand side. The connection must be close to the side of the appliance. See Paragraph 5.
14. Check the gas pipework up to the appliance gas service cock for gas soundness in accordance with CP 331, Pt. 3.
15. Connect the water system pipes at the rear of the appliance.

16. Thoroughly flush the whole of the water system with cold water. Fill the system venting the boiler and check for water soundness.
17. Connect the first section of the flue to the socket on top of the boiler. See Section 7 – Flue. Properly seal the flue pipe into the socket. Complete the installation of the flue. **Do not operate the boiler without the flue fully connected.**
18. Connect the mains lead as described in Section 12 – Electrical. For frost and room thermostat connections refer also to Section 12.
19. Re-assemble the appliance leaving off the cabinet front panel until the commissioning has taken place. See Section 13

## 9. SEALED PRIMARY SYSTEM

See Figs. 5 and 6.

THE INSTALLATION MUST COMPLY WITH THE REQUIREMENTS OF BS 6798:1987 and BS 5449:1.

The open end of the combined feed and vent pipe must be sealed.

1. For sizes of flow and return pipework refer to Technical Data and Fig. 3.

#### 2. THE EXPANSION VESSEL CHARGE PRESSURE

The expansion vessel is charged to 0.5 bar (7 p.s.i.). The charge pressure must not be less than the static head of the system measured from the top of the appliance to the highest point of the system. See Fig. 6. The vessel as supplied is therefore suitable for systems with a static head of 0.5 bar, 5m (17 ft.). Greater static heads will require the expansion vessel pressure to be increased.

The expansion vessel is charged with air and fitted with a schraider tyre type valve. The charge pressure is therefore adjustable by using a tyre pump and pressure gauge, and should be increased if required.

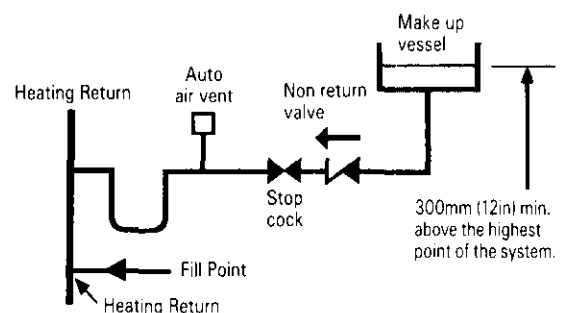
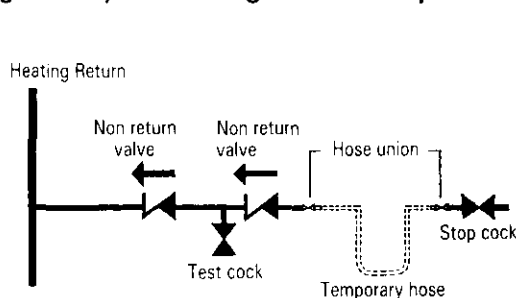
#### 3. SYSTEM FILLING AND MAKE-UP

A system should be incorporated for filling a sealed system that is acceptable to the local water undertaking and connected as close to the central heating return connection as possible. When filling the system the diverter valve should be in the manually open position, return it to its normal position when filling is complete.

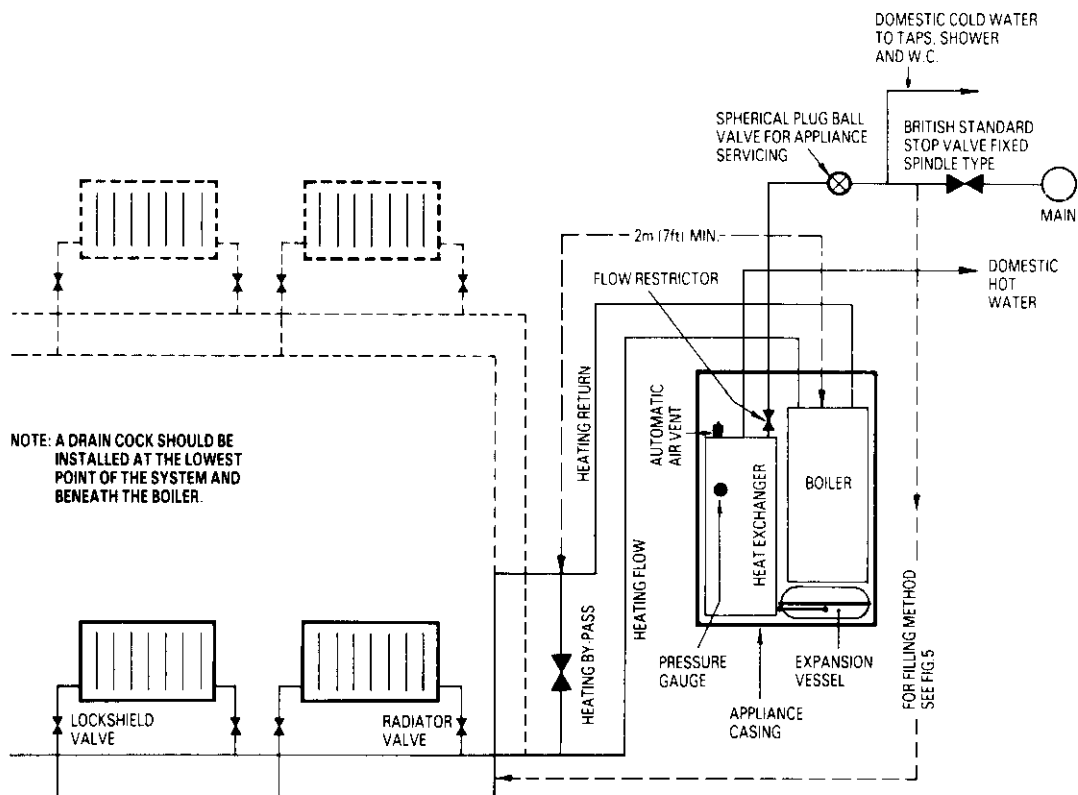
A system in common use is as follows:-

- (a) A temporary hose connection is made from a distribution pipe or from a service pipe under mains pressure. The connection should incorporate a stop cock to BS 1010, a test cock, an approved type vacuum breaker and an approved non-return valve. See Fig. 5a.

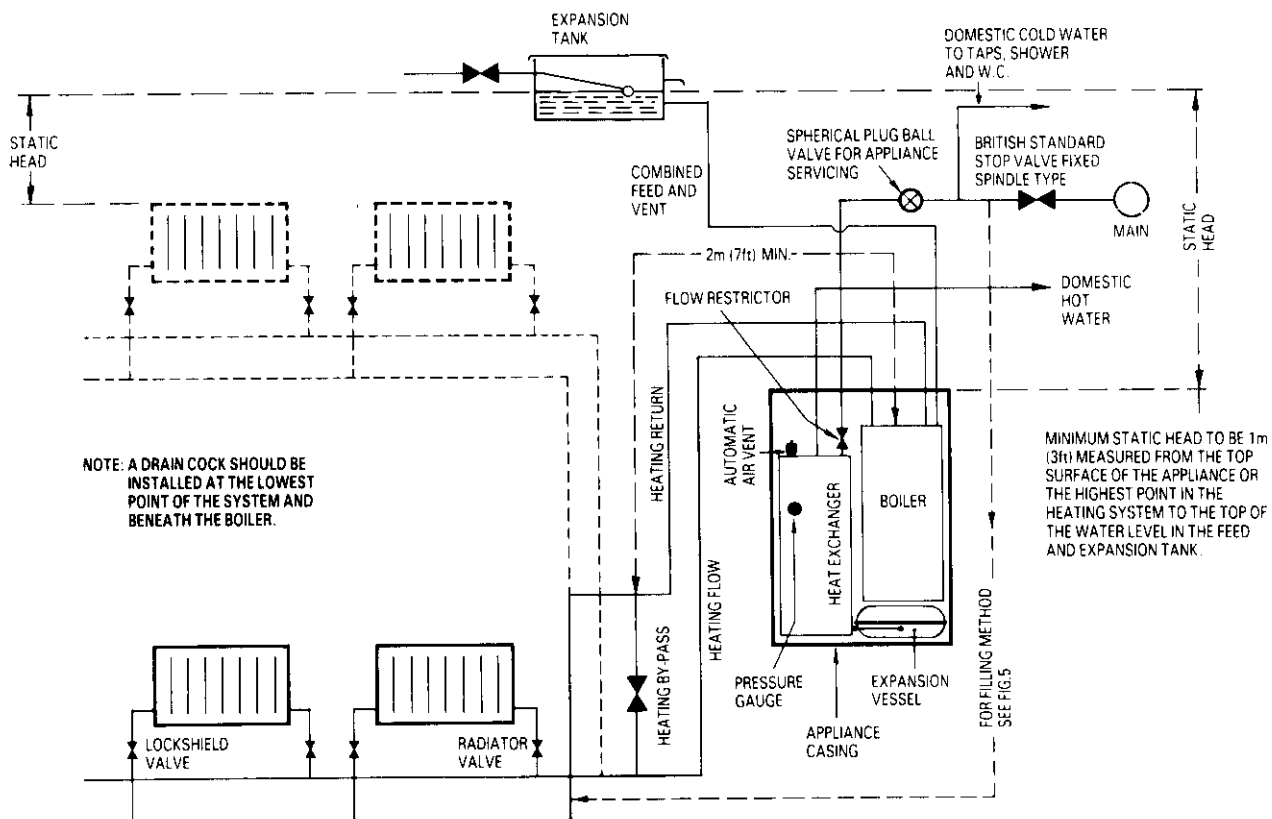
**Fig. 5. System Filling and Make-up.**



**Fig. 6. Sealed Primary Water System**



**Fig. 7. Open Vented Water System**



With this method, water make-up is achieved by pre-pressurisation of the system to a cold pressure above that of the expansion vessel charge pressure, (0.5 bar as supplied). An increase of 0.5 bar would be suitable, alternatively a make-up vessel can be connected as described below. See Fig. 5b.

- (b) **CONNECTION OF A MAKE UP VESSEL** (See Fig. 5)  
In systems where the initial system design pressure is equal to the static head a manually filled container should be used. Positioned at least 1 m (39 in.) above the highest point of the system and containing not more than 3 litres (5.3 pints) of water. The connection should be made as close to the central heating return as possible and include a non-return valve, stop cock and automatic air vent.

#### 4. SYSTEM VOLUME

The expansion vessel fitted to the appliance will accommodate differing system volumes depending upon the initial charge pressure and pre-pressurisation pressure of the system if any. Reference should be made to Table 5 to establish the system volume that can be accommodated under different conditions with the standard expansion vessel.

If it is found that the system volume is in excess of that catered for by the expansion vessel provided, then an extra vessel can be added as close to the return connection of the appliance as possible so that the total expansion vessel volume is adequate. Refer to BS 5449:1 and BS 6798:1987 for further information.

Table 5

| Total System Volume — Litres (gallons) |                              |                |              |
|--|------------------------------|----------------|--------------|
| Initial system pressure — Bar          | Vessel charge pressure — Bar |                |              |
|  | 0.5                          | 1.0            | 1.5          |
| 0.5                                    | 156<br>(35)                  | —              | —            |
| 1.0                                    | 96<br>(21)                   | 122.5<br>(27)  | —            |
| 1.5                                    | 51.5<br>(11.5)               | 69.5<br>(15.5) | 85<br>(18.5) |
| 2.0                                    | 24<br>(5.5)                  | 32.5<br>(7)    | 39.5<br>(9)  |

**NOTE:** If the pressure indicated on the pressure gauge fitted to the appliance exceeds 2.6 bar when operating on maximum temperature, an extra expansion vessel should be fitted to the system.

#### 5. VENTING

The automatic air vent fitted to the appliance (See Fig. 27) is fitted with a protective black plastic screw cap this should be removed and discarded, air will now automatically be vented from this point during filling.

The heating system should be fitted with manual air vents at all high points.

#### 6. SYSTEM BY-PASS

A suitable by-pass designed to give the minimum flow rate indicated in Table 3 corresponding to the heating output used must be fitted.

A suitable position for the by-pass is shown in Fig. 6. The by-pass should be connected in 22 mm diameter pipe at least 2 m (7 ft.) from the appliance and fitted with a suitable valve to provide adjustment.

To adjust the by-pass, the boiler should be operated on central heating with the system by-pass and radiator valves set fully open for at least 45 minutes. With the aid of a contact thermometer, balance the heating system and restrict the by-pass by the minimum amount necessary to give a temperature rise across the flow and return pipe of 11 °C (20 °F).

#### 7. PUMP

The pump has been set at MAXIMUM and must not be reduced.

#### 8. PRESSURE RELIEF VALVE

A spring loaded pressure relief valve set to operate at 3 bar (45 lbs./in<sup>2</sup>) is fitted within the boiler. A discharge pipe should be fitted to the Tundish pipe which terminates in a position such that if water or steam is discharged it would not cause a hazard to the occupants of the premises or damage to electrical components and wiring.

## 10. OPEN VENT PRIMARY SYSTEM

(See Fig. 7.)

1. For sizes of flow and return pipework refer to Technical Data and Fig. 3.

#### 2. FEED AND EXPANSION CISTERN

The feed and vent pipe should be 22 mm diameter rising continuously from the appliance to the feed and expansion cistern. The use of long horizontal runs must be avoided.

The feed and expansion cistern should be arranged so that it provides a minimum static head of 1 m (39 in.) above the top of the appliance or above the highest point in the heating circuit, whichever is the highest.

#### 3. PRESSURE RELIEF VALVE

A pressure relief valve is not required on an open vented system. If preferred it may be removed from the appliance and the tapping blanked off. If the relief valve is left in position a discharge pipe must be fitted which terminates in a position such that if water or steam is discharged it would not cause a hazard to the occupants of the premises or damage to electrical components and wiring. See Fig 4.

#### 4. FILLING AND VENTING

An auto air vent, which initially requires the top to be loosened, is fitted to the top of the insulated heat exchanger adjacent to the boiler. See Fig 27. Air should be released as necessary from this point during filling. Any other air within the appliance will be expelled via the feed and vent connection or dissipated into the rest of the system. The heating system should be fitted with manual air vents at any high point.

#### 5. BY-PASS

A suitable by-pass designed to give the minimum flow rate indicated in Table 3 corresponding to the heating output used, must be fitted. A suitable position for the by-pass is shown in Fig. 7. The by-pass should be connected in 22 mm diameter pipe at least 2m (7 ft.) from the appliance and fitted with a suitable valve to provide adjustment.

To adjust the by-pass, the boiler should be operated on central heating with the by-pass and radiator valves set fully open for at least 45 minutes. With the aid of a contact thermometer, balance the heating system and restrict the by-pass by the minimum amount necessary to give a temperature rise across the flow and return pipes of 11 °C (20 °F).

#### 6. PUMP

The pump has been set at maximum and must not be reduced.

## 11. DOMESTIC WATER SUPPLY

**NOTE:** The following instructions are general installation recommendations and reference should be made to the local water undertaking before fitting any of these appliances.

In the event of difficulty please contact the manufacturer.

#### 1. COLD SUPPLY

There should be no device capable of preventing the flow of expansion water unless separate arrangements for expansion water are made. The final 600mm mains cold water connection to the unit should be made in copper only.



## 2. HOT SUPPLY AND FLOW REGULATING

The appliance is fitted with a water flow regulator.

The maximum flow of domestic hot water available through the appliance is limited to 15 litres/min. (3.3 gall./min.).

**NOTE:** The flow regulator contained within the flow regulator housing is plastic. Do not heat the housing during soldering operations on adjacent joints, e.g. remove and replace after soldering.

## 3. TAPS AND VALVES

Hot and cold taps and mixing valves used with this appliance must be suitable for operating at mains pressure.

## 4. SHOWERS (FIXED HEAD TYPE)

No anti-siphonage arrangements are necessary.

## 5. SHOWERS (LOOSE OR FLEXIBLE HEAD TYPE)

If a loose head shower with flexible hose is to be used over a bath, the hose must be fixed so that the head cannot fall

closer than 13 mm (0.5 in.) above the top edge of the bath in order that the head is prevented from being immersed in bath water, or the shower must incorporate or be fitted with an anti-siphonage device at the point of flexible hose connection.

## 6. BIDETS

The supply of hot and cold mains water direct to a bidet is permitted 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.

## 7. USE IN HARD WATER AREAS

If the appliance is used in any area where the temporary hardness exceeds 200 ppm a 'Worcester In-Line' scale inhibitor (available from Worcester Engineering Co. Ltd.) should be fitted into the cold supply to the appliance.

Installation should be strictly in accordance with the requirements of the local water undertaking. An isolating valve to facilitate servicing may be incorporated.

# 12. ELECTRICAL

See Figs. 9, 10 and 11

**NOTE:** Switch off the mains supply before removing the control box cover in order to gain access to the electrical terminal strip.

- Remove the cabinet top panel by snatching squarely upwards.
- Release the five pozi-drive screws securing the cover of the electrical control box and remove.

## ROOM AND FROST THERMOSTATS

If a room or frost thermostat is to be fitted, it should be wired into the appliance terminal strip as shown in Fig. 8. One or both of the blanking plugs should be removed from the electrical cover and the cable passed through the hole. A Heyco cord strain relief bush, packed separately with these instructions, should be used to retain the cables at this point. The cables should then be clipped into the cable retaining clip fixed to the left hand side panel. Care should be taken that the cables are clipped neatly into place.

## MAINS WIRING

The method of connection to the appliance must facilitate the complete isolation of the appliance, preferably via a 3 amp fused three-pin plug and unswitched shuttered socket outlet, both complying with the requirements of BS 1363. Alternatively connection may be made via a double pole isolator with a contact separation of 3 mm in all poles and supplying the boiler and system controls only.

Mains Cable: 0.75 mm<sup>2</sup> (24 x 0.20 mm). Should the factory fitted mains cable need to be replaced then the new cable must be connected into the terminals marked **Live**, **Neutral** and **Earth** at the left hand side of the appliance terminal strip. The cable should then be passed through the cable clamp located in the

left hand side of the electrical cover and clipped into the two cable retaining clips fixed to the left hand side panel. Care should be taken that the cable is clipped neatly into place. All the external wiring shall comply with current IEE wiring regulations, and any local regulations which apply. **The appliance must be earthed.**

## SAFETY CHECK

In the event of an electrical fault after installation of the appliance, preliminary electrical system checks shall be carried out (i.e. earth continuity, polarity and resistance to earth, etc.) as described in the British Gas Multimeter Handbook.

**Fig. 8. Room Thermostat and Frost Thermostat Connections.**

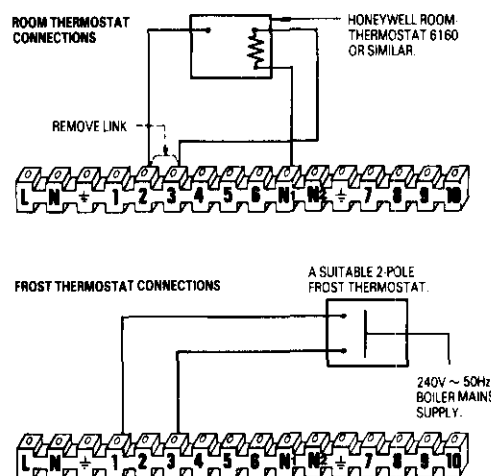
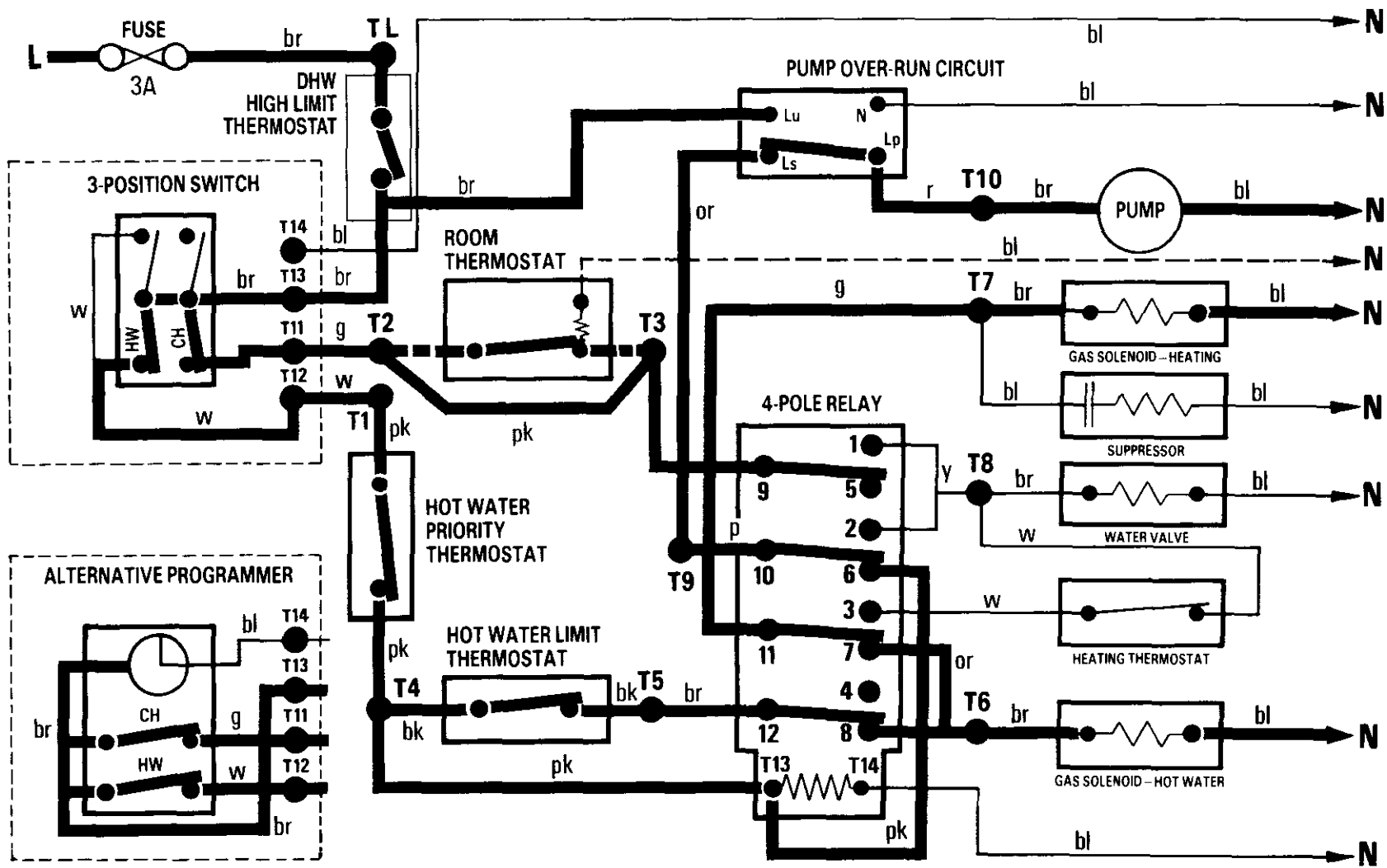


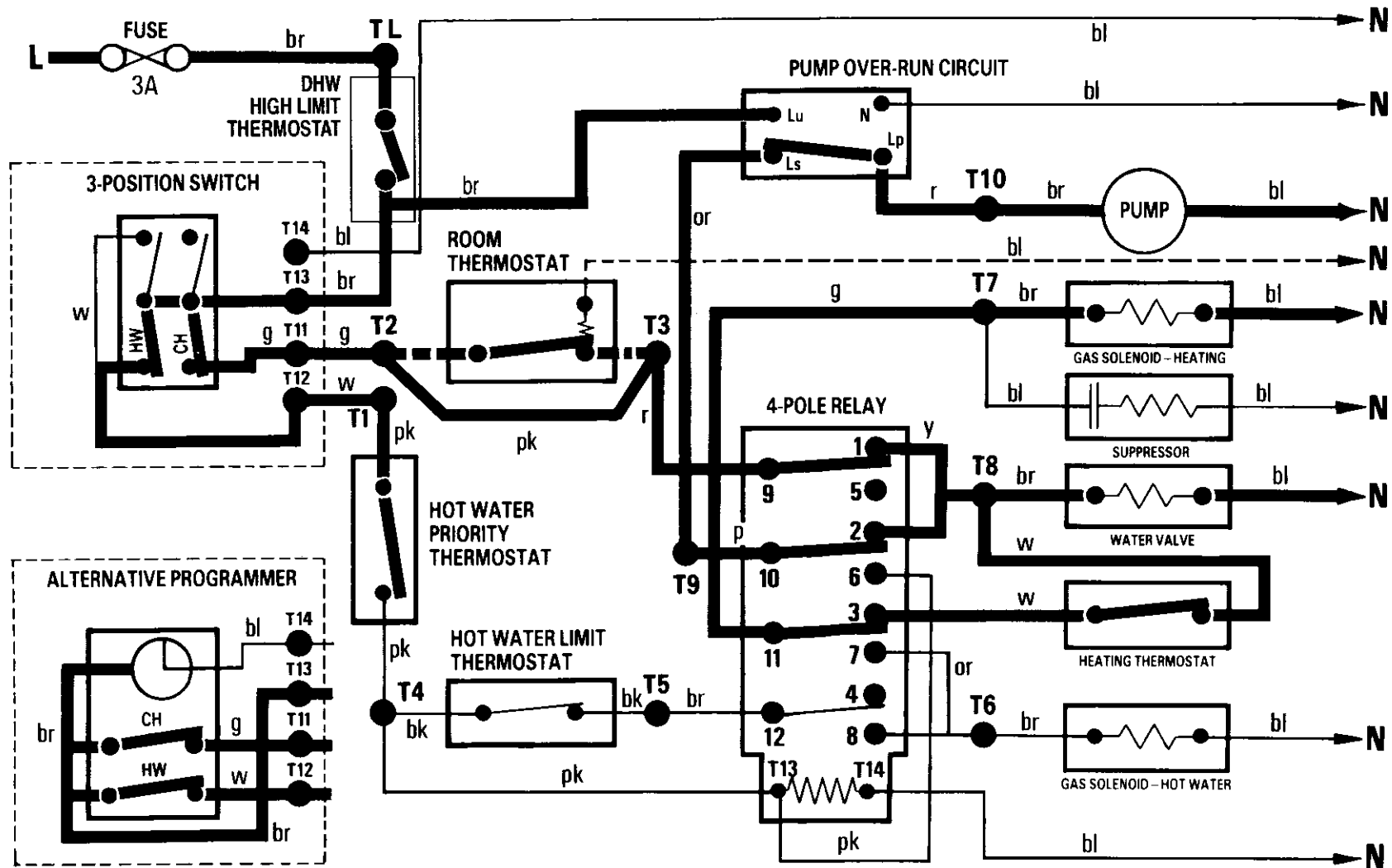
Fig. 9. Function Flow Diagram HOT WATER MODE.



**COLOUR CODE**

|          |          |           |          |                  |          |
|----------|----------|-----------|----------|------------------|----------|
| bl BLUE  | bk BLACK | pk PINK   | v VIOLET | r RED            | g GREY   |
| br BROWN | y YELLOW | or ORANGE | w WHITE  | g/y GREEN/YELLOW | p PURPLE |

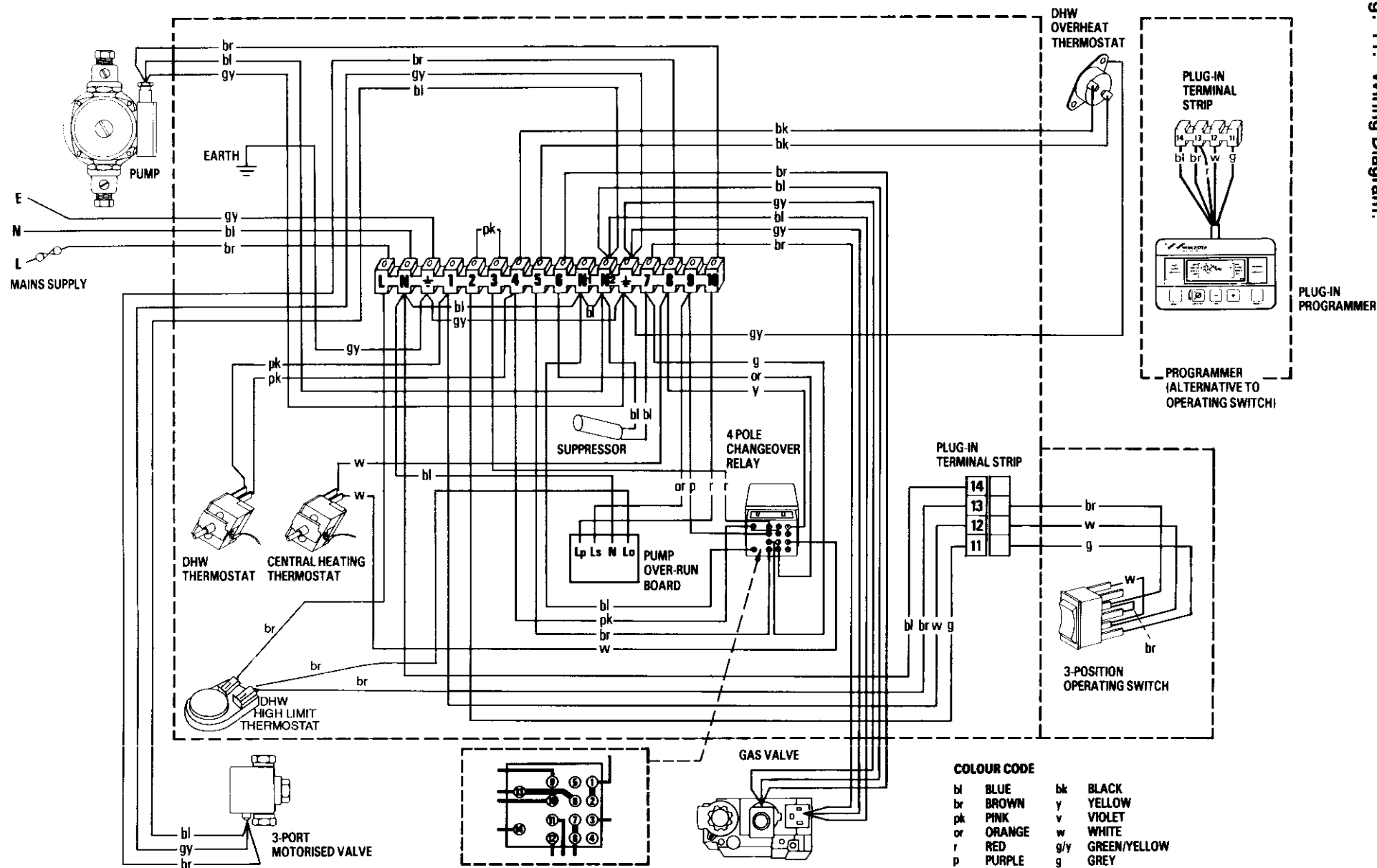
Fig. 10. Functional Flow Diagram CENTRAL HEATING MODE.



**COLOUR CODE**

|          |          |           |          |                  |          |
|----------|----------|-----------|----------|------------------|----------|
| bl BLUE  | bk BLACK | pk PINK   | v VIOLET | r RED            | g GREY   |
| br BROWN | y YELLOW | or ORANGE | w WHITE  | g/y GREEN/YELLOW | p PURPLE |

Fig. 11. Wiring Diagram.



## 13. COMMISSION THE APPLIANCE

After the appliance has been finally connected and the heating system flushed out (See Section 1 Paragraph 2 Installation Warning), check that the electricity supply is off, gas service cock is off and the appliance thermostat knobs are turned to maximum and the system controls are calling for heat..

1. Open all radiators and lockshield valves and fill the system. Vent as necessary. See Section 9.3. Check for water soundness.
2. Switch electrical supply on at mains socket.

**NOTE:** Immediately mains electricity is applied to the boiler the pump delay timer is energised causing the pump to run for about 5 minutes, this occurs whether or not the controls are calling for heat. The pump will subsequently only run in the course of the normal operation of the boiler.

3. Position the User's Operating Switch to **HEATING AND WATER**. If a programmer is fitted, set the **HW** and **CH** select buttons to **OFF**. Leave the system to work in a cold state for about 20 minutes, venting as necessary. Position the User's Operating Switch or programmer to **OFF**.
4. Turn the gas on at the gas service cock.

5. Push hard on the gas valve button and keep it pressed in. At the same time, separately push in the red igniter button. When it clicks, the pilot—seen through the inspection window—should light. If the pilot does not light immediately, press the igniter button repeatedly until it does. When the pilot lights, continue to hold the gas valve button in for a further 15 seconds, then release it slowly.

**CAUTION:** If the pilot does not stay alight, twist the gas valve button in the direction of the arrow. Wait for three minutes and repeat operation 5 until the pilot is lit. Continue to hold the gas valve button in for a longer period, then release it slowly. Check the pilot flame length is as indicated in Fig. 17. If it is not, then adjust using the pilot throttle (see Fig. 12), clockwise to reduce the size or anti-clockwise to increase the size of the pilot flame.

**NOTE:** Minimum recommended thermocouple output is 8mV closed circuit.

6. Loosen the burner pressure test point screw one turn and connect a pressure gauge. See Fig. 12.
7. Position the Users Operating Switch to **HEATING AND WATER**, or if a programmer is fitted set the **CH** and **HW** select buttons to **ON**. Check the main burner ignites smoothly.
8. Test for gas soundness around the boiler gas components using leak detection fluid. Refer to Section 16, Paragraph 6(c) for details on the method of checking the burner manifold joint for gas soundness.

Turn off the boiler and replace the boiler inner casing immediately after checking the gas soundness. Check the main burner through the viewing window.

Check the burner setting pressures. See Technical Data.

### ADJUSTING DHW (HIGH) GAS PRESSURE

Refer to Fig. 12.

- (a) Allow the boiler to fire for at least 10 minutes before making any adjustments.
- (b) Turn the DHW thermostat to maximum. Turn the **HEATING** thermostat **OFF**.
- (c) If DHW service gas pressure needs adjustment refer to **TECHNICAL DATA**. Using a 10 mm blade width screwdriver, turn the screw 'A' clockwise to increase and counter-clockwise to decrease pressure until the desired setting is achieved.
- (d) Check several times if main burner ignites smoothly, by operating the DHW thermostat, before proceeding to check the **HEATING (LOW)** gas pressure.

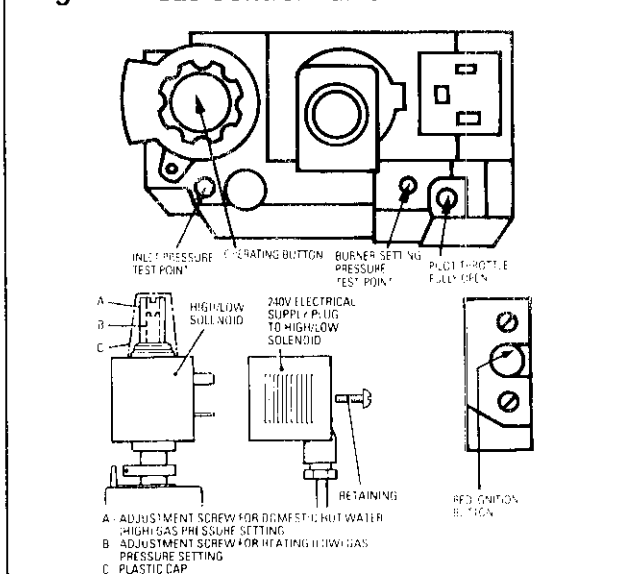
### ADJUSTMENT OF HEATING (LOW) GAS PRESSURE

Refer to Fig. 12.

- (e) Turn the DHW thermostat to **OFF**. Set the **HEATING** thermostat to maximum.

- (f) If the **HEATING** gas pressure requires adjustment, refer to **TECHNICAL DATA**.
  - (g) Using a small screwdriver turn the screw 'B' clockwise to increase and counter-clockwise to decrease pressure until the desired setting is achieved.
  - (h) Operate the **HEATING** thermostat several times to ensure the main burner ignites smoothly before checking that gas valve switches from **HIGH** to **LOW** correctly.
  - (i) Using the DHW and **HEATING** control thermostats switch the boiler from **HIGH** to **LOW** and back several times to ensure correct gas pressures. Replace the plastic cap 'C'.
9. Position the Users Operating Switch to **OFF**, or, if a programmer is fitted set **CH** and **HW** select buttons to **OFF**. Disconnect the pressure gauge and retighten the test point screw. Test for soundness around the screw.
  10. Check the operation of the flame failure device to ensure that it will shut off the gas to the main burner within 60 seconds, by switching off the electricity supply at the mains and turning off the gas supply at the gas cock. After 60 seconds, check for the correct operation of the flame failure device by turning the gas back on at the gas cock and attempting to re-light the pilot without depressing the gas valve button. If the pilot can be lit in this way, turn off the gas supply and contact Worcester Heat Systems Service Dept.
  11. Position the Users Operating Switch to **HEATING AND WATER**, or, if a programmer is fitted, set select buttons to **ON**. Re-light the appliance and allow it to operate, venting as necessary.
- NOTE:** It will take about 12 minutes for the heat bank to be satisfied before the central heating system will receive heat.
- Check for water soundness.
- Important:** The complete appliance must be checked for water leaks. Should any leaks be found they must be rectified before proceeding further.
- Check for spillage from the diverter outlet at the right hand side of the appliance as specified in B.S. 5446:Part 2, 1978.
12. Position the Users Operating Switch to **OFF**, or, if a programmer is fitted set select buttons to **OFF**. Switch the electrical supply off at the mains. Turn the pilot gas off at the gas valve as stated in paragraph 5. Drain the water from the appliance and the system from the drain points while the water is still hot.
  13. Refill the appliance and system (see Instruction 1) and repeat Instructions 2 and 3.
  14. Light the pilot (see Instruction 5) and repeat Instruction 7.
  15. Check for correct operation of the user controls including the room thermostat (if fitted) and leave set to the customers requirements.

Fig. 12. Gas Control Valve



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## 14. SYSTEM GUIDANCE AND BY-PASS ADJUSTMENT

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When thermostatic radiator valves are used throughout a system it is possible that on some occasions, flow through the central heating circulating pump will stop. In these cases it is advisable to fit a system by-pass.

A suitable position for the by-pass is shown in Figs. 6 & 7. by-pass should be connected in 22mm diameter pipe and fitted with a suitable valve to provide adjustment.

To adjust the by-pass the boiler should be operated on hot water and central heating with the thermostatic radiator valves and system by-pass set fully open for at least 45 minutes. With the aid of a contact thermometer, balance the heating system and restrict the by-pass by the minimum amount necessary to give a temperature rise across the flow and return pipes of 11°C (20°F).

Alternatively the heating system **must** include one uncontrolled radiator having a minimum heat loss of 0.9 kW (3000 Btu/h) under design conditions. The radiators **must** be fitted with two lockshield valves both of which **must** be at least partly open at all times.

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## 15. USER'S INSTRUCTIONS

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Hand the users instructions to the user or purchaser for retention and instruct in the efficient and satisfactory operation of the boiler and heating/hot water system.

Advise the user or purchaser of the precautions necessary to prevent damage to the heating/hot water system and to the building in the event of the heating system remaining inoperative during frost conditions.

Finally advise the user or purchaser that for continued efficient and safe operation of the boiler it is important that adequate servicing is carried out at intervals recommended by the Local Gas Region.

**Worcester Heat Systems Ltd. will be pleased to discuss and offer a comprehensive maintenance contract.**

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## 16. ROUTINE CLEANING AND INSPECTION

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**THE FOLLOWING SHOULD BE CARRIED OUT AT PERIODS NOT EXCEEDING ONE YEAR.**

Operate the appliance and system noting any faults which may need to be rectified during the service.

**WARNING:** Disconnect the electrical supply before commencing any servicing. Turn off the gas at the gas service cock.

### ACCESS

- Remove the cabinet panels and facia as described in Section 3 but leaving the side panels in place. See Fig. 2.
- Remove the boiler inner casing by releasing the six M5 screws and washers. See Fig. 23.
- Remove the combustion chamber front plate by releasing the six M5 screws.

### 1. REMOVE THE BURNER AND PILOT ASSEMBLY (See Fig. 13.)

- Disconnect the thermocouple nut at the pilot burner assembly and ease the thermocouple from the assembly.
- Carefully pull the electrode lead off the connector tab at the electrode.
- Disconnect the pilot tube within the combustion chamber at the adaptor.

- Release the two M5 screws securing the burner manifold block at the front.
- Carefully remove the burner and pilot assembly.

### 2. REMOVE THE FLUE HOOD

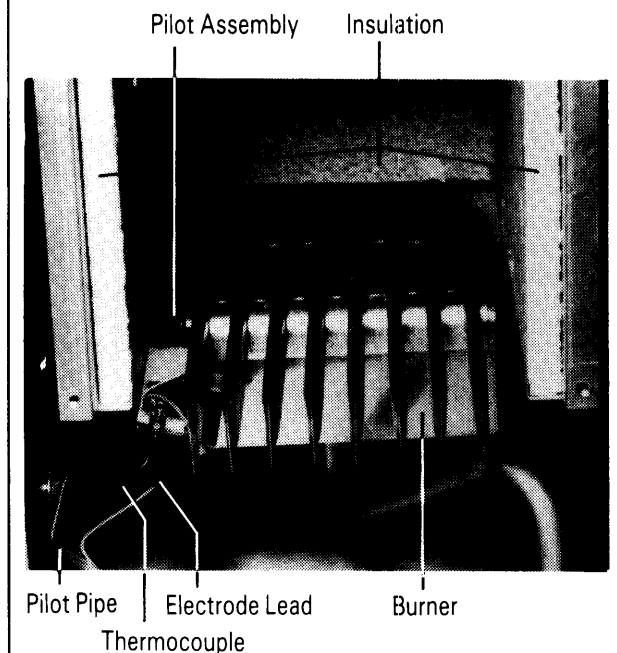
(See Fig. 14.)

- Slacken the wing nuts securing the 'J' Bolts until the 'J' sections can be manipulated to pass upwards through their location brackets.
- Lift the flue hood clear of the heat exchanger and remove from the casing. Gently prise upwards at the front sides to disengage if necessary. Take care not to disturb the limit thermostat connections.

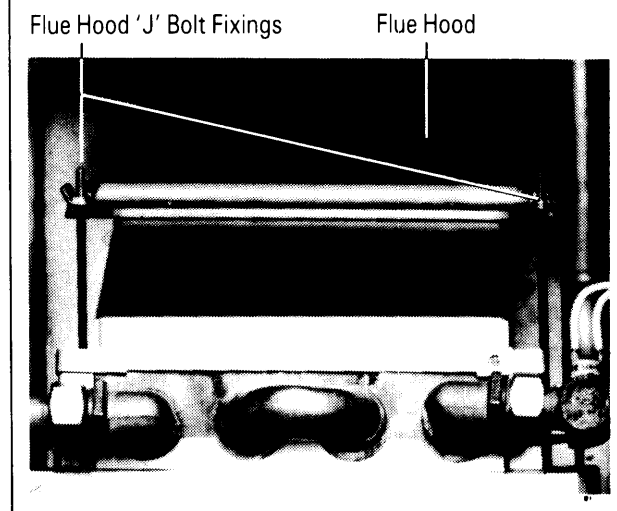
### 3. SERVICING THE BURNER

- Disconnect the pilot pipe from the pilot burner and remove the pilot injector which fits loosely between the pipe and the burner.
- Carefully remove the main injector from the burner. Check that there is no blockage or damage.
- Brush the burner blades and check that the flame ports are clear, do not use a brush with metallic bristles.

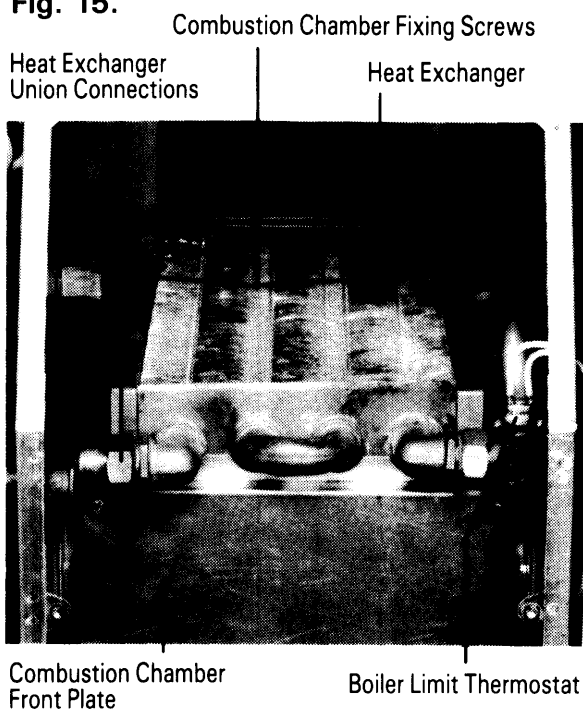
**Fig. 13.**



**Fig. 14.**



**Fig. 15.**



- (d) Inspect the pilot burner and ignition electrode. Ensure that they are clean and in good condition. Check that the spark is 3–4mm (0.14 in.). See Fig. 17.
- (e) Check that the thermocouple tip is not burned or cracked. If it shows any sign of damage a new thermocouple must be fitted.
- (f) Re-assemble the burner components in the reverse order, not forgetting the pilot and main burner injectors. Do not fully tighten the pilot pipe at this stage.

#### **4. CLEANING THE HEAT EXCHANGER** (See Fig. 13.)

- (a) Cover the pilot gas inlet adaptor and the main gas inlet within the combustion chamber.
- (b) Using a suitable brush, clean the inside surface of the heat exchanger and the fins.
- (c) Clean the flue duct.
- (d) Remove any deposits which fall to the bottom of the boiler casing.
- (e) Check the condition of the rear, sides and front combustion chamber insulation pieces. Renew if necessary. See Section 17, Replacement of Parts—Section 6.

#### **5. RE-ASSEMBLY**

Re-assemble the boiler in the reverse order to the dismantling procedure.

- (a) Replace the flue hood on to the heat exchanger ensuring that the hood is properly located on the heat exchanger.
- (b) Locate the 'J' bolts in the side brackets, ensuring that they are hooked into the bracket, and hand tighten. Do not over tighten.
- (c) Replace the burner and pilot assembly locating the positioning bracket into the bracket in the combustion chamber.
- (d) Secure the burner manifold with the extended M5 screws checking that the O-ring is in position.
- (e) Connect and tighten the pilot feed pipe at the adaptor. Fully tighten the connection at the pilot assembly.
- (f) Reconnect the thermocouple.
- (g) Reconnect the Piezo-electric igniter lead to the electrode.
- (h) Check that all joints are tight.
- (i) Replace the combustion chamber front plate.

- (j) Brush any dust or deposits from the gas control and associated pipework.
- (k) Re-assemble the cabinet in the reverse order to its removal. Do not fit the inner casing or the cabinet front panel at this stage.

#### **6. TEST APPLIANCE AND INSTALLATION**

- (a) Turn on the gas at the gas service cock and re-connect the electrical supply.
- (b) Refer to the lighting instructions on the jacket front panel.
- (c) **Carefully** light the boiler and check for gas soundness including the burner manifold connection within the combustion chamber in accordance with BS 6891. It is necessary to operate the boiler for a short period with the boiler inner casing removed. **The action must be undertaken with great care.** Turn off the boiler and replace the boiler inner casing immediately after checking the gas soundness. Check the main burner through the viewing window.
- (d) With the central heating **OFF**, check that the domestic hot water operates correctly. When the priority thermostat is satisfied, switch the central heating on and check that the diverter valve operates and supplies hot water to the central heating circuit.
- (e) Set the 3-position switch (or programmer) to **OFF**.
- (f) Loosen the burner pressure test point one turn and connect a pressure gauge. See Fig. 20. Set the 3-position switch (or programmer) to **HOT WATER and CENTRAL HEATING (24 hrs)** setting. Set the hot water thermostat to **OFF** and the central heating thermostat to **MAXIMUM**. If necessary adjust the gas pressure at the governor on the gas valve. See Section 13.
- (g) Set the 3-position switch (or programmer) to **HOT WATER**. Turn the central heating thermostat to **OFF** and the hot water thermostat to **MAXIMUM**. If necessary adjust the gas pressure at the governor on the gas valve. See Section 13.
- (h) Set the controls to **OFF**. Disconnect the pressure gauge and retighten the test point screw. Re-light and test for gas soundness around the test point screw.
- (i) Before leaving the site the service engineer should check that no flammable material is left inside the appliance casing and that the ventilation requirements remain at the required standard. See Section 6.
- (j) If the appliance is fitted in a cupboard check that the cupboard ventilation remains adequate. See Section 6.
- (k) Refit the facia, cabinet front panel and top panel.

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## **17. REPLACEMENT OF PARTS**

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**WARNING:** Disconnect the electrical supply at the mains and turn off the gas service cock before commencing any work.

To replace appliance parts it is necessary to remove one or more sections of the cabinet and cover plates within the boiler as described below.

- (a) **Cabinet Top Panel:** Snatch squarely upwards to release the clips.
- (b) **Cabinet Front Panel:** Pull firmly at the base to release the clips and lift upwards and out.
- (c) **Facia Panel:** Remove the six pozi-drive screws and the plug-in terminal strip connection. See Fig. 2. Remove the remaining screw in the right hand side panel to allow the removal of the facia.
- (d) **Control Box and Facia:** Remove the cabinet top and front panels. Release the three pozi-drive screws, and rest the assembly on the appliance. See Fig. 2. Release the remaining screw in the right hand side panel to allow the removal of the control box and facia.
- (e) **Inner Casing:** Remove the six slotted hexagon head screws and washers. (See Fig. 23.)
- (f) **Combustion Chamber Panel:** Remove the six slotted hexagon head screws.

- (g) **Cabinet Lower Front Panel:** Remove the five pozi-drive screws securing the panel. See Fig. 2.
- (h) **Control Box Cover:** Remove the five pozi-drive screws. See Fig. 2.
- (i) **Control Box:** Remove the fascia panel. Remove the single pozi-drive screw in the top of the left hand side panel. See Fig. 2. Support the box so that undue strain is not placed upon the electrical cable and thermostat capillaries.
- (j) **Left Hand and Right Hand Cabinet Side Panels:** Remove the cabinet top, front and lower front panels and the control box and fascia. Remove the three screws remaining at the top of each of the panels, one in the left hand and two in the right hand panel. See Fig. 2. Draw the panels slightly forward to release them from the securing lugs in the base plate and lift away from the appliance.

The following components can be replaced if the cabinet top panel, cabinet front panel, inner casing and combustion chamber cover are removed. See 17 (a), (b), (e) and (f) preceding.

### 1. THE MAIN BURNER

(See Fig. 13.)

- (a) Disconnect the thermocouple nut at the pilot burner assembly and ease it from the assembly.
- (b) Carefully pull the electrode lead off the connector tab at the electrode.
- (c) Disconnect the pilot tube within the combustion chamber at the adaptor.
- (d) Release the two extended M5 screws securing the burner manifold block at the front of the chamber.
- (e) Carefully remove the burner and pilot assembly from the combustion chamber by lifting and pulling.
- (f) Remove the pilot assembly by removing the two screws and nuts. Remove the main injector.
- (g) Re-assemble in the reverse order, ensure that the O-ring is located in the end of the burner manifold.
- (i) Check the gas soundness of the connection between the burner manifold and the gas line. See Section 15. Routine Cleaning.

### 2. THE MAIN INJECTOR and LINT ARRESTER ASSEMBLY

(See Figs. 16 and 16a.)

#### (a) The Lint Arrester Assembly

- 1. Remove the M5 screw securing the lint arrester assembly and lift the rear frame away from the burner.
- 2. Remove the clip beneath the arrester assembly and lift away the side frames to left and right.

- 3. Lift the front frame up and away from the burner mixing tube.
- 4. Clean the gauze by shaking and washing in soapy water or brushing with a non-metallic brush. Care must be taken not to damage the gauze or its assembly housing.

#### (b) The Main Injector

- 1. Remove the burner.
- 2. Remove the lint arrester assembly.
- 3. Remove the main injector from the burner.
- 4. Fit the new main injector and re-assemble the main burner assembly in the reverse order.

### 3. THE PILOT INJECTOR, SPARK ELECTRODE, PILOT SHIELD AND PILOT BURNER

(See Figs. 18 and 19.)

#### (a) The Pilot Injector

Remove the main burner assembly, See Instruction 1 above.

- (1) Disconnect the thermocouple nut at the pilot burner assembly and ease it from the assembly.
- (2) Disconnect the pilot pipe from the pilot burner. Slacken the pilot tube connection at the adaptor within the combustion chamber and move the pilot pipe away from the pilot assembly.
- (3) The pilot injector may now be removed. It may be necessary to carefully ease the injector free.
- (4) Fit a new pilot injector and re-assemble in the reverse order.

Fig. 16a. Lint Arrester Assembly

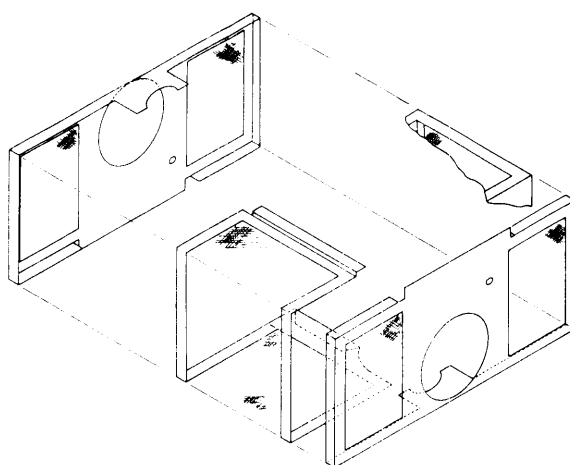


Fig. 16. Lint Arrester Assembly

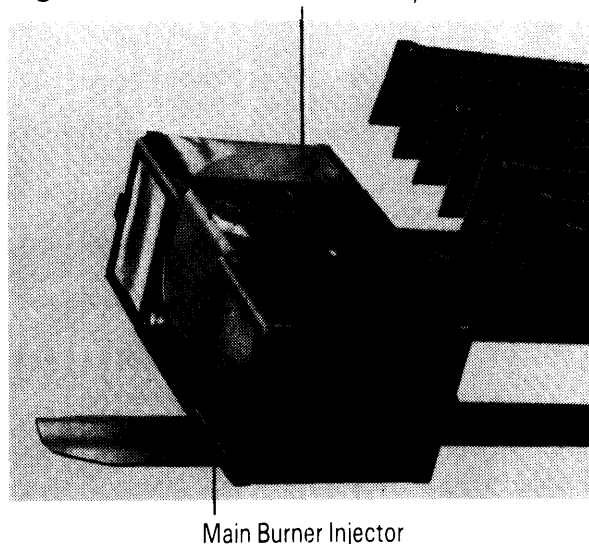
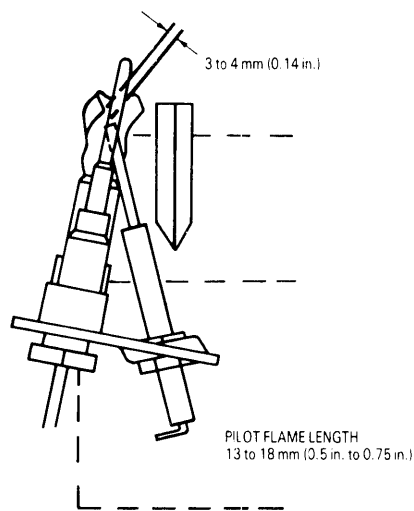


Fig. 17. Pilot Head/Electrode Position.





**(b) The Spark Electrode**

Remove the main burner assembly, See Instruction 1 above.

- (1) Release the hexagon nut securing the spark electrode to the pilot assembly and remove.
- (2) Fit a new spark electrode. Check that the spark gap is 3 to 4 mm (0.14 in.). See Fig. 17.

**(c) The Pilot Shield**

Remove the main burner assembly, See Instruction 1 above.

- (1) Remove the two M4 screws and nuts securing the pilot shield to the pilot bracket.
- (2) Fit a new pilot shield and re-assemble in the reverse order.

**(d) The Pilot Burner**

Remove the main burner assembly. See Instruction 1.

- (1) Remove the spark electrode, pilot shield and injector as described above.
- (2) Remove the remaining M4 screw from the pilot bracket and remove the pilot burner.
- (3) Fit a new pilot burner and re-assemble in the reverse order. Check that the pilot assembly is fitted above the mounting bracket on the main burner.

**4. THE THERMOCOUPLE**

(See Figs. 13 and 21.)

- (a) Disconnect the thermocouple nut at the pilot bracket and ease the thermocouple from the assembly.
- (b) Release the thermocouple from its connection at the right hand side of the gas valve.
- (c) Remove the thermocouple from the boiler. To prevent the risk of damage, remove the electrode lead before removing the thermocouple.
- (d) Re-assemble in the reverse order using a new thermocouple. Avoid sharp bends in the thermocouple lead, ensuring that it follows the same route as the original.

**5. THE ELECTRODE LEAD**

(See Fig. 21.)

- (a) Carefully pull the lead off the connector tab at the electrode and at the piezo unit.
- (b) Remove the lead and fit a replacement.

**6. THE COMBUSTION CHAMBER INSULATION**

(See Figs. 13 and 15.)

- (a) Cover the burner and pilot with a clean cloth to prevent any loose matter falling onto the assembly.

- (b) Remove the collector hood as described in Section 16, Routine Cleaning.

- (c) Drain the boiler.

- (d) Loosen but do not completely remove, the two M5 screws at the top of each side of the combustion chamber securing it to the inner casing.

- (e) Release the union connections at the heat exchanger and carefully manoeuvre the heat exchanger out of the inner casing taking care not to mislay the fibre washers.

- (f) Remove and discard the insulation and fit the replacement pads, not forgetting the pad fitted to the combustion chamber front cover.

- (g) Refit the heat exchanger, not forgetting the union washers, ensuring that it is correctly positioned.

**NOTE:** Do not forget to remove the cloth from the burner/pilot assembly.

- (h) Refit the combustion chamber cover.

- (i) Tighten combustion chamber fixing screws.

- (j) Re-assemble the appliance in the reverse order checking that all the components have been fitted correctly.

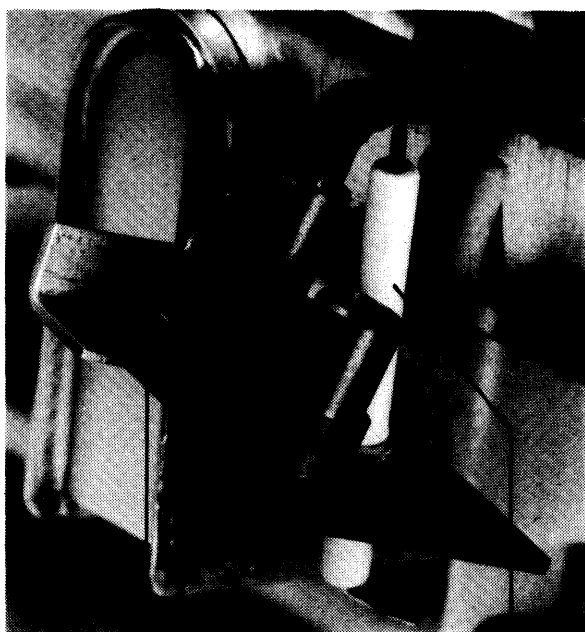
**The following components can be replaced if the cabinet front panel is removed. See 17(b) preceding.**

**7. THE PIEZO GENERATOR**

(See Fig. 21.)

- (a) Carefully pull the lead off the connector tab at the piezo generator.
- (b) Remove the two M5 fixing screws and remove the piezo generator.
- (c) Fit a new generator and re-assemble in the reverse order checking that the limit thermostat leads are not trapped by the bracket.

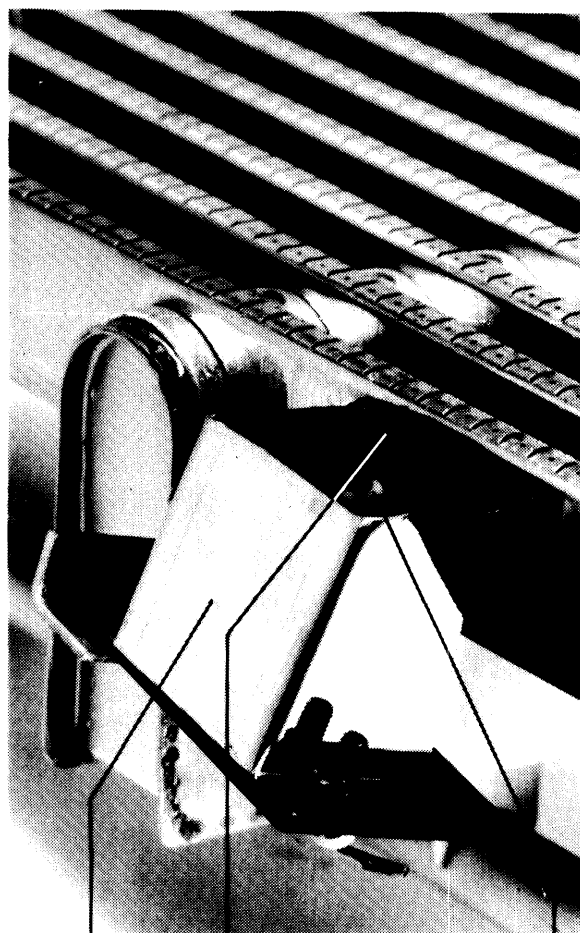
**Fig. 18.**



Pilot Assembly

Spark Electrode

**Fig. 19.**

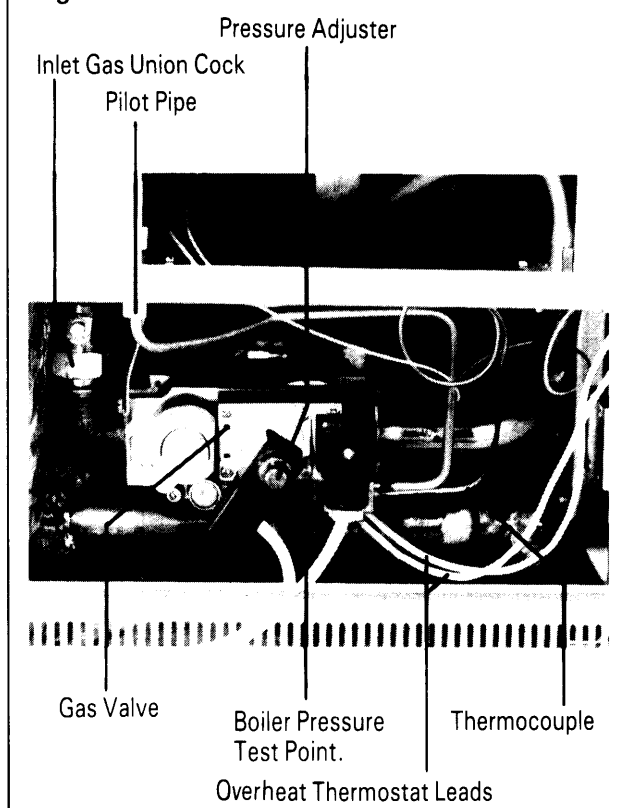


Pilot Shield

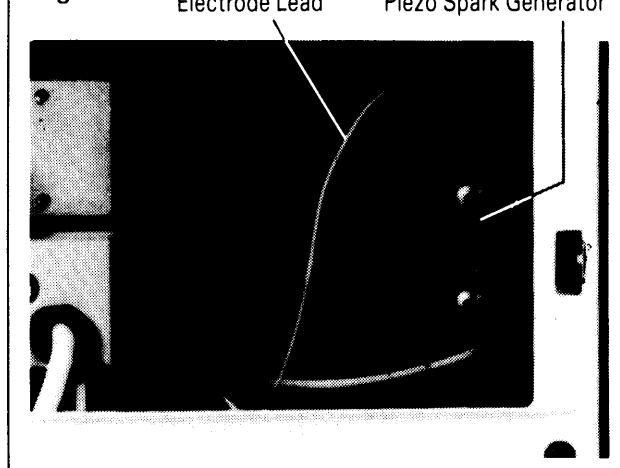
Pilot

Spark Electrode

**Fig. 20.**



**Fig. 21.**



## 8. THE PRESSURE GAUGE

(See Fig 28.)

- Isolate the boiler and drain off the heating and domestic hot water systems
- Unscrew the pressure gauge from the heat bank.
- Fit a new pressure gauge.
- Open all the radiator valves and re-fill the system venting as necessary. The appliance is fitted with an automatic air vent on the heat bank.

**The following components can be replaced if the cabinet front panel, lower front panel and the inner casing are removed. See 17(b), (e) and (g) preceding.**

Check that the electrical supply and the gas service cock are shut off.

## 9. THE GAS VALVE

(See Fig. 20.)

- Disconnect the thermocouple from its connection at the right hand side of the gas valve. Disconnect the pilot pipe at its entry to the combustion chamber and at the gas valve. Remove the pipe.

- Unscrew the retaining screws from the solenoid electrical connection plugs. Then pull each plug off of its respective set of terminals.

**NOTE:** The plugs are dissimilar and therefore not inter-connectable.

- Remove the four M5 screws securing the right hand gas line flange connection to the gas valve.
- Remove the screw securing the gas valve support bracket located within the combustion chamber.
- Release the gas line union connection and carefully withdraw the valve assembly.
- Unscrew the limit thermostat lead from the rear of the gas valve.
- Remove the inlet elbow and transfer all the ancillary components to the new gas valve, using sealing compound where necessary.
- Re-assemble in the reverse order, taking care to replace the sealing washer. Ensure that the limit thermostat lead is correctly positioned in the thermocouple interrupter before tightening the thermocouple nut.
- Turn on the gas supply at the gas service cock. Refer to the lighting instructions and light the pilot.
- Check connections for gas soundness.
- Turn on the electrical supply. Test for the correct operation of the gas valve and check for soundness.

## 10. THE PILOT FILTER.

Check that the electrical supply and the gas service cock are shut off.

- Release the cover from the CH solenoid, there is no need to remove the electrical connections.
- Remove the governor and solenoid assembly by removing the four pozi-drive screws and put the assembly to one side. Do not strain the electrical leads. Do not disturb the sealing gasket.
- Remove the single pozi-drive screw securing the cover plate exposed above and carefully lift away the plate.
- Replace the pilot filter.
- Re-assemble in the reverse order taking great care to ensure that the gaskets are properly fitted and that the screws are tight. Replace the gaskets if any damage is apparent.
- Turn on the gas supply.
- Turn on the electrical supply. Refer to the lighting instructions and light the pilot, check for gas soundness.
- Test for the correct operation of the gas valve and check for gas soundness.

## 11. THE SEALED SYSTEM EXPANSION VESSEL

(See Figs. 13 and 30)

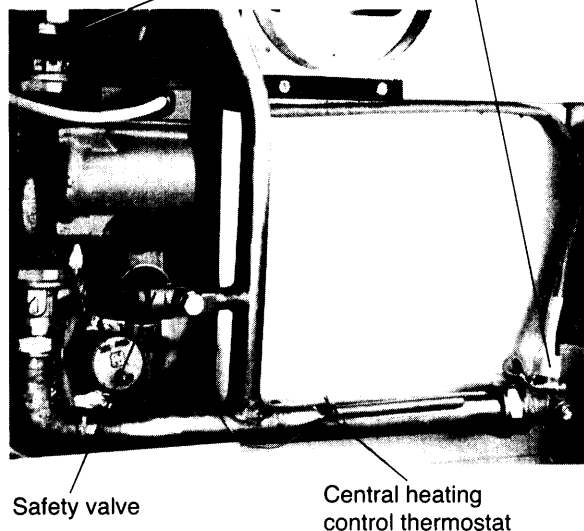
- Drain off the heating and domestic hot water systems.
- Remove the gas valve as described in Instruction 9 preceding.

**NOTE:** Lay the assembly to one side. It is not necessary to disconnect the main central heating and domestic hot water solenoid leads.

- Disconnect the main burner by removing the two extended M5 screws at the combustion chamber. Do not mislay the O-ring.
- Remove the four M5 screws and remove the gas line from the boiler.
- Remove the piezo generator as described in Instruction 7 preceding. The piezo generator bracket must be removed by releasing the two M5 screws securing it to the vertical member.
- Undo the union connection joining the expansion vessel to the heat bank.

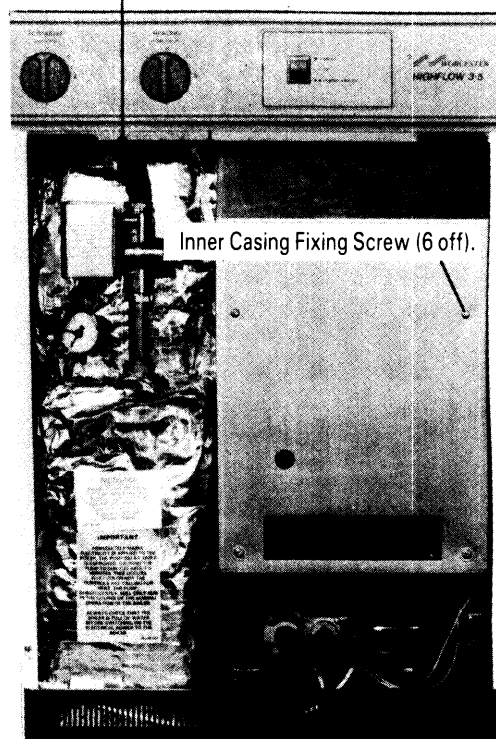
**NOTE:** There will be a small quantity of water remaining in the heat bank.

**Fig. 22.** Domestic hot water high limit thermostat Domestic hot water overheat thermostat



**Fig. 23.**

DHW High Limit Thermostat Reset Button



- (g) Remove the complete union fittings from the heat bank. Withdraw the expansion vessel. It will be necessary to slightly displace the gas line. Protect the threads of the gas line union.
- (h) Refit the new expansion vessel after transferring the short connector pipe assembly. Re-assemble the appliance in the reverse order.
- (j) Refill the system and check for the correct operation of the controls and for the gas soundness of all relevant joints.

**The following components can be replaced if the cabinet top panel, front panel and inner casing are removed. See 17(a), (b) and (e) preceding.**

## 12. THE BOILER LIMIT THERMOSTAT

(See Fig. 15.)

- (a) Remove the two M5 taptite screws holding the limit thermostat to the flow pipe.
- (b) Unscrew the limit thermostat leads from the gas valve. One is located at the rear of the gas valve. It will be necessary to remove the pilot pipe to gain access to the rear connection. The connection is a hexagon nut and an M10 open ended spanner will be required to release the nut to allow it to be unscrewed.
- (c) Push the grommet situated in the side of the inner casing inwards into the casing.
- (d) Thread the limit thermostat leads through into the inner casing and remove the thermostat.
- (e) Fit the new limit thermostat connecting the lead and grommet assembly in the reverse order. Take care not to overtighten the rear connection. Finger tight plus a quarter of a turn is sufficient.

**NOTE:** When fitting replacement thermostat it is important to ensure that no foreign matter is present on the contact surfaces of both the thermostat and the mounting bracket. During manufacture thermal grease is smeared on the surfaces and may be left.

**The following components can be replaced if the cabinet top panel, cabinet front panel, fascia and the control box cover are removed. See 17(a), (b), (c) and (h) preceding.**

Check that the electrical supply has been disconnected.

## 13. THE DWH TANK OVERHEAT THERMOSTAT

(See Fig. 22.)

- (a) Disconnect the thermostat leads at the terminal strip. Refer to the wiring diagram (Fig. 11) to ensure that the correct leads are disconnected. Do not leave any leads loose in the control box.

- (b) Release the strain relief bush by compressing the loose section of the bush and carefully withdraw the leads from the control box.
- (e) Remove the two M3 taptite screws holding the overheat thermostat to the flow pipe.
- (f) Fit a new thermostat and reconnect ensuring that the strain relief bush has been replaced. Refer to the electrical wiring diagram (Fig 11) to ensure the correct connections are made.

**NOTE:** When fitting a replacement thermostat it is important to ensure that no foreign matter is present on the contact surfaces of both the thermostat and the mounting bracket. During manufacture thermal grease is smeared on the surfaces and may be left.

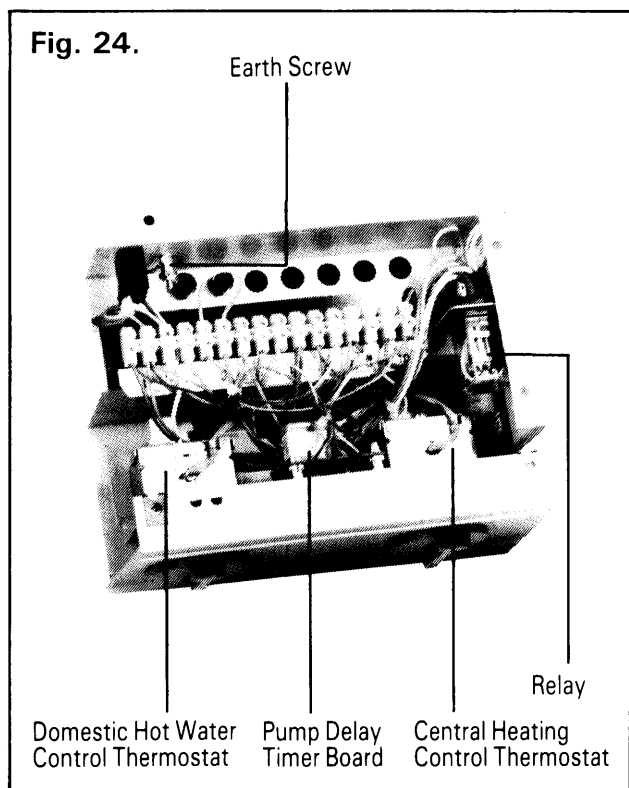
- (g) Re-assemble the appliance in the reverse order.

## 14. THE CENTRAL HEATING CONTROL THERMOSTAT

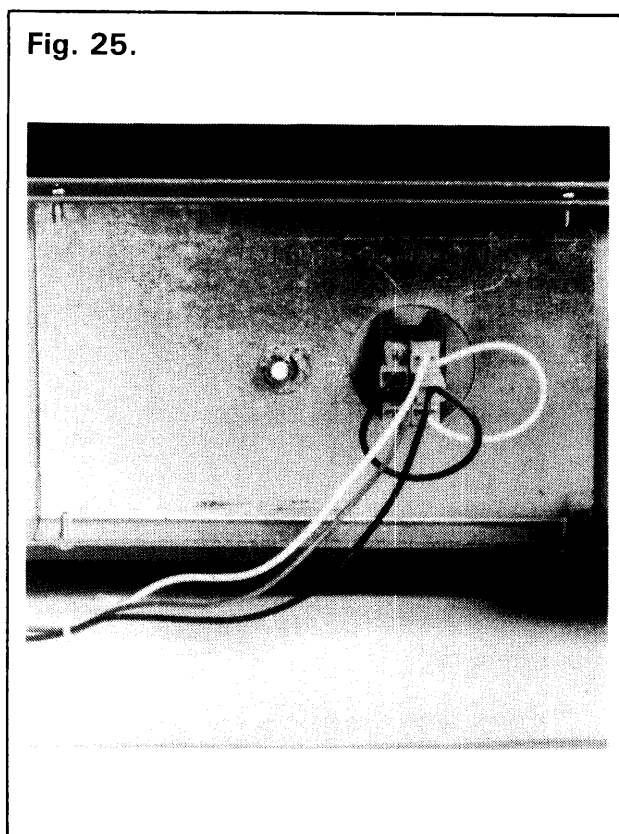
(See Figs. 22 and 24.)

- (a) Unscrew the two slotted M5 screws located beneath the control box and ease away the thermostat and pump delay timer mounting bracket.
- (b) Using a pair of long nose pliers pull the retaining clip from the thermostat pocket situated in the flow pipe and remove the thermostat phial.
- (c) Remove the thermostat central clamping nut and washer.
- (d) Pull off the two electrical connections from the rear of the thermostat.
- (e) Push the thermostat body back to disengage the spindle from the mounting bracket.
- (f) Withdraw the thermostat threading the capillary through the slot in the rear of the electrical control box.
- (g) Fit the new thermostat and re-assemble in the reverse order. The capillary of the replacement thermostat must be uncoiled to assist its passage through the control box opening. With the thermostat in position the excess capillary must be recoiled, without tight bends, and positioned so that it is beneath the combined feed and vent pipe but not in contact with any hot surface. Ensure that the retaining clip is replaced into the thermostat pocket.

**Fig. 24.**



**Fig. 25.**



## 15. THE DWH TANK THERMOSTAT

(See Figs. 22 and 24.)

- Unscrew the two slotted M5 screws located beneath the control box and ease away the thermostat and pump delay timer mounting bracket.
- Using a pair of long nose pliers pull the retaining clip from the thermostat pocket situated in the DHW inlet pipe on the top of the heat bank at the rear and remove the thermostat phial.
- Remove the central clamping nut and washer.
- Pull off the two electrical connections from the rear of the thermostat.
- Push the thermostat body back to disengage the spindle from the mounting bracket.
- Withdraw the thermostat threading the capillary through the slot in the rear of the electrical control box.
- Fit the new thermostat and re-assemble in the reverse order. The capillary of the replacement thermostat must be uncoiled to assist its passage through the control box opening. With the thermostat in position the excess capillary must be recoiled, without tight bends, and positioned so that it is beneath the combined feed and vent pipe but not in contact with any hot surface. Ensure the retaining clip is replaced into the thermostat pocket.

## 16. THE RELAY

(See Fig. 24.)

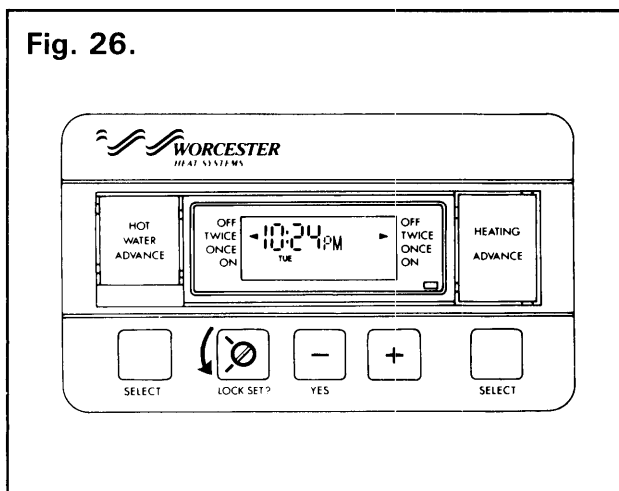
- Ease the relay from the base by pulling horizontally.
- The new relay will fit in one direction only. Push the relay into the base until fully located.

## 17. THE 3-POSITION SWITCH

(See Fig. 25.)

- Disengage the rear cover of the fascia panel by releasing the four M5 screws, two at the top and two at the bottom.
- Remove the push-on connections from the rear of the switch taking note of their positions.
- Squeeze together the two plastic retaining lugs and remove the switch from the front of the fascia.
- Snap in the replacement switch and with the aid of the wiring diagram (Fig. 11) reconnect the push-on connections.

**Fig. 26.**



## 18. THE SUPPRESSOR

(See Fig. 24.)

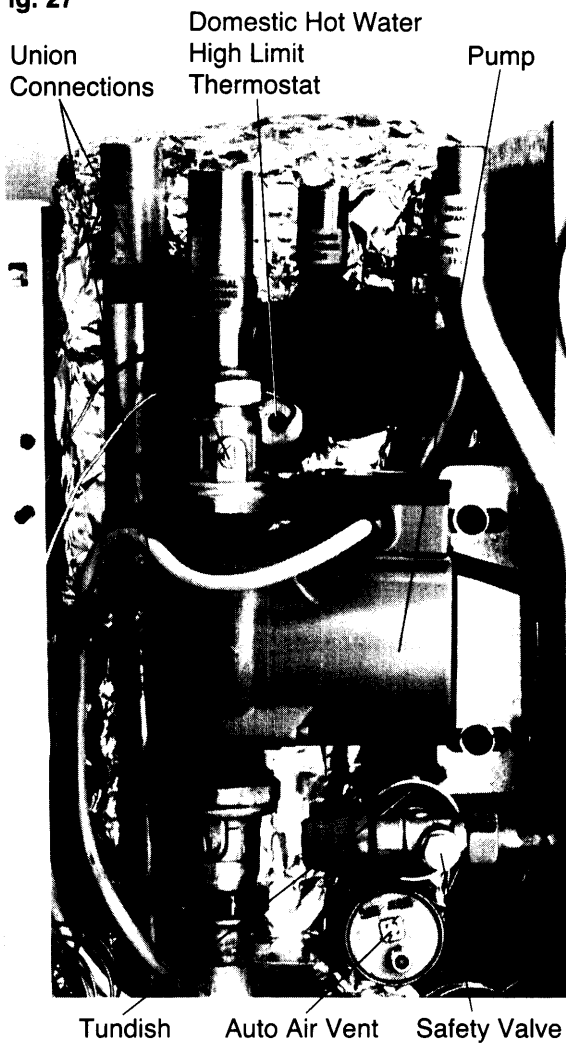
- Unscrew the two slotted M5 screws located beneath the control box and ease away the thermostat and pump delay timer mounting bracket.
- The suppressor is located below the terminal strips and is held by a 'P' clip secured by a screw. Loosen the screw and ease the suppressor clear of the bracket.
- Disconnect the suppressor leads from the terminal strip and remove.
- Fit a new suppressor and re-assemble in the reverse order. Refer to the electrical wiring diagram (Fig. 11) to ensure the correct connections are made.

## 19. TO REPLACE THE PROGRAMMER

(See Fig. 26.)

- Remove the rear cover of the fascia panel by releasing the four M5 screws, two at the top and two at the bottom.
- To remove programmer unscrew the four screws securing it to the fascia, two at the top, two at the bottom.
- Fit the replacement programmer and re-assemble in the reverse order. Use only the specified programmer. Do not attempt to fit any other model or make.

**Fig. 27**



## 20. THE PUMP DELAY TIMER BOARD

(see Fig. 24.)

- Unscrew the two slotted M5 screws located beneath the control box and ease away the thermostat and pump delay timer mounting bracket.
- Release the plastic catch on the end of each mounting post pulling the printed circuit board forward approximately 3mm each time to prevent the plastic catch from returning. It may be necessary to use an electrical screw driver to assist in releasing the catches. Pull the board off the mounting posts until it is free.
- Disconnect the electrical connections at the terminal strip.
- Locate the replacement board, with the leads at the top, over the four mounting posts and push back squarely until the plastic catch on the end of each post clicks into place.
- Reconnect the leads with the aid of the wiring diagram (Fig 11). **It is important to reconnect the leads correctly.**

### 20a. THE DHW HIGH LIMIT THERMOSTAT

See Fig 23.

- Remove the clip from the end of the overheat thermostat phial pocket.
- Remove the thermostat phial from its pocket and feed it out of the exposed hole at the left hand side of the electrical box.
- Pull off the two electrical connectors at the thermostat. Polarity is not important.
- Remove the thermostat centre post fixing nut situated under the control panel. Ease the thermostat out of its hole.
- Replace with a new thermostat in reverse order, ensuring:-
  - The split pin is replaced.
  - Any surplus capillary tube is coiled neatly, **OUTSIDE** the control panel, in the space below the control panel.

**The following components can be replaced if the cabinet top panel is removed. See 17(a) preceding.**

Check that the electrical supply has been disconnected.

## 21. THE CIRCULATING PUMP

(See Fig. 27.)

- Turn off the isolating valves mounted on the inlet and outlet pump.
- Remove the left hand side panel support strap.
- Undo the two union nuts and remove the pump ensuring that the sealing washers are not mislaid. If the connections are found to be excessively tight then the left hand cabinet side panel may be removed to give increased access.
- Remove the two screws holding the electrical cover on the pump and disconnect the electrical leads noting the wire positions.
- Fit the replacement circulating pump using new sealing washers.

**NOTE:** The direction flow indicator on the circulating pump should point towards the rear of the boiler. The replacement pump, if fitted with a speed adjustment, should be set at maximum speed.

- Open the isolating valves.
- Re-assemble the appliance in the reverse order.

## 22. THE FLOW REGULATOR

(See Fig. 29.)

- Turn off the mains cold water supply.

**NOTE:** A residue of the water will remain in the pipe

- Unscrew the flow regulator housing union nut and ease the cold water connection aside. It may be necessary to unclip the supply pipe.
- Remove the sealing washer, wire filter and plastic flow regulator. It may be necessary to prise the regulator from its housing.
- Fit a new flow regulator, small diameter section first, and re-assemble in the reverse order, replacing the fibre sealing washer. No sealing compound should be used.

## 23. THE SAFETY VALVE

(See. Fig 22.)

- Drain off the heating and domestic hot water systems.
- Unscrew the safety valve from the feed/vent pipe taking care not to distort the pipe.
- Fit a new safety valve using an approved jointing compound.
- Open all the radiators and fill the system, venting as necessary. The appliance is fitted with an automatic air vent on the heat bank.

**The following components can be replaced if the cabinet top panel, cabinet front panel, control box cover, inner casing, control box and fascia and combustion chamber cover are removed. See 17(a), (b), (d), (e), (f) and (h) preceding.**

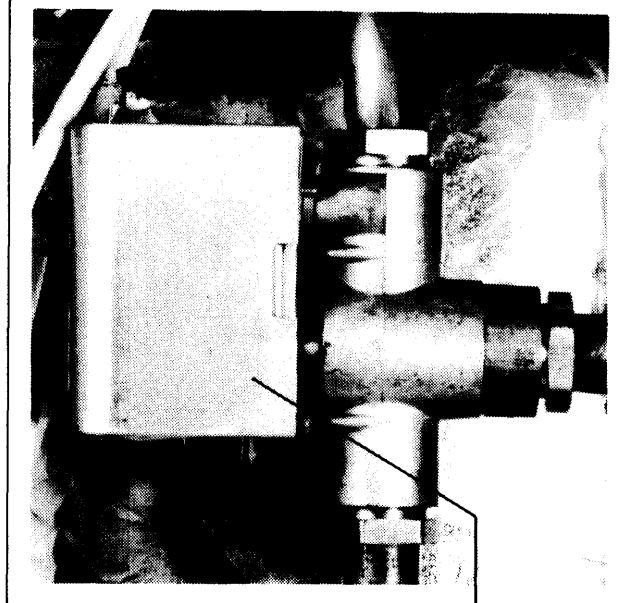
Check that the electrical supply has been disconnected.

## 24. THE DIVERTER VALVE

(See Figs. 15 and 28.)

- Drain down the heating and domestic hot water systems.
- Disconnect the diverter valve leads at the terminal strip. See Fig 11. Release the strain relief bush and carefully withdraw the leads from the control box.
- Loosen the top connection on the diverter valve and disconnect the other end of the elbow. Take care not to mislay the washer.
- Release completely the left hand heat exchanger union connection taking care not to mislay the washer.
- Release the remaining two union connections on the valve.
- Lift the valve upwards and to the left to separate it from the pipes.
- Fit the replacement diverter valve with the manual override lever facing downwards.
- Reconnect the leads ensuring that the strain relief bush is replaced. Refer to the electrical wiring diagram (Fig. 11) to ensure the correct connections have been made.

**Fig. 28.**



Diverter Valve

- (i) Open all radiator valves and re-fill the system venting as necessary. The appliance is fitted with an automatic air vent on the heat bank.
- (j) Check that the system operates satisfactorily.

**NOTE:** It is possible with some diverter valves to replace the operating mechanism only, leaving the valve body in-situ. Consult the diverter valve manufacturers instructions for further information.

**The following components can be replaced if the cabinet top panel, cabinet front panel, and control box and fascia are removed. See 16(a), (b) and (d) preceding.**

## 25. THE AUTOMATIC AIR VENT

(See Fig. 27.)

- (a) Drain down the heating and domestic hot water systems.
- (b) Unscrew the automatic air vent.
- (c) Fit the replacement air vent using an approved jointing compound.
- (d) Open all radiator valves and re-fill the system, venting as necessary.
- (e) Check that the system operates satisfactorily.

**The following components can be replaced if the cabinet top panel, cabinet front panel, lower front panel, inner casing, combustion chamber cover and control box and fascia are removed. See 16(a), (b), (d), (e), (f) and (g) preceding.**

## 26. THE HEAT BANK

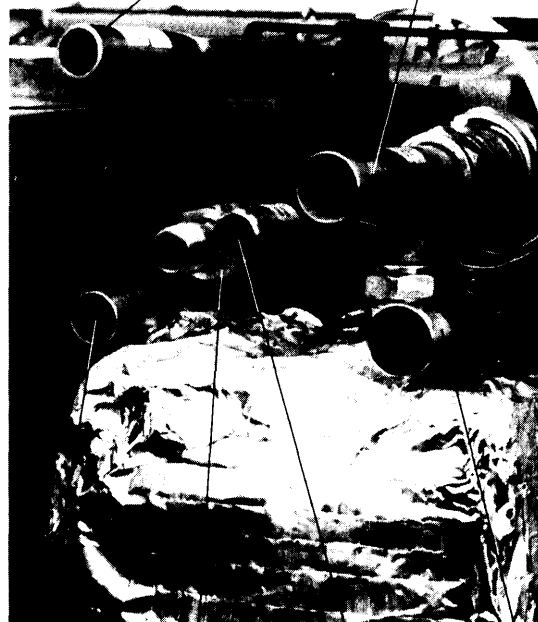
Should the heat bank fail or the domestic hot water heat exchanger within it become scaled up due to its use in a hard water area without suitable water treatment, then Worcester Heat Systems Ltd. Service Department should be contacted who will advise on suitable remedial action.

## 27. THE HEAT EXCHANGER

(See Figs. 14, 15 and 28.)

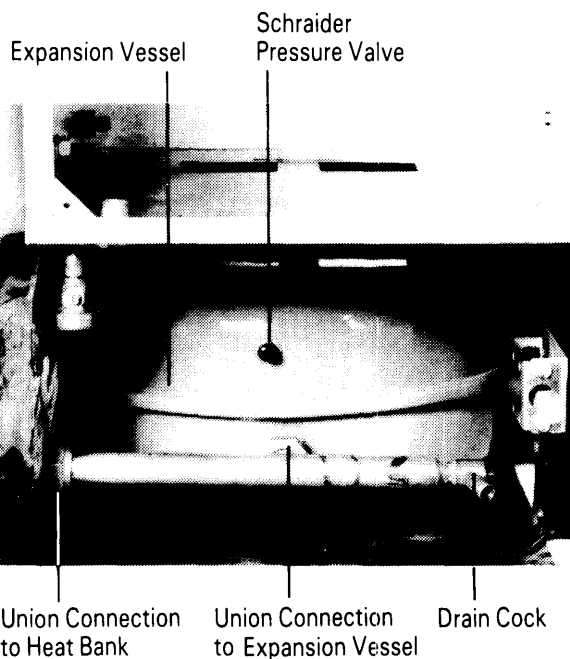
- (a) Drain down the heating system.
- (b) Slacken the wing nuts securing the 'J' bolts holding the flue hood until the 'J' sections can be manipulated to pass upwards through their location brackets.
- (c) Lift the flue hood clear of the heat exchanger and remove from the casing. Gently prise upwards at the front sides to disengage if necessary. Take care not to disturb the limit thermostat connections.
- (d) Slacken the two M5 screws securing the combustion chamber to the inner casing. See Fig. 12.

**Fig. 29** Combined Feed and Vent Pipe Central Heating Flow



Tundish Discharge Pipe Cold Water Inlet Flow Regulator D.H.W. Flow Central Heating Return

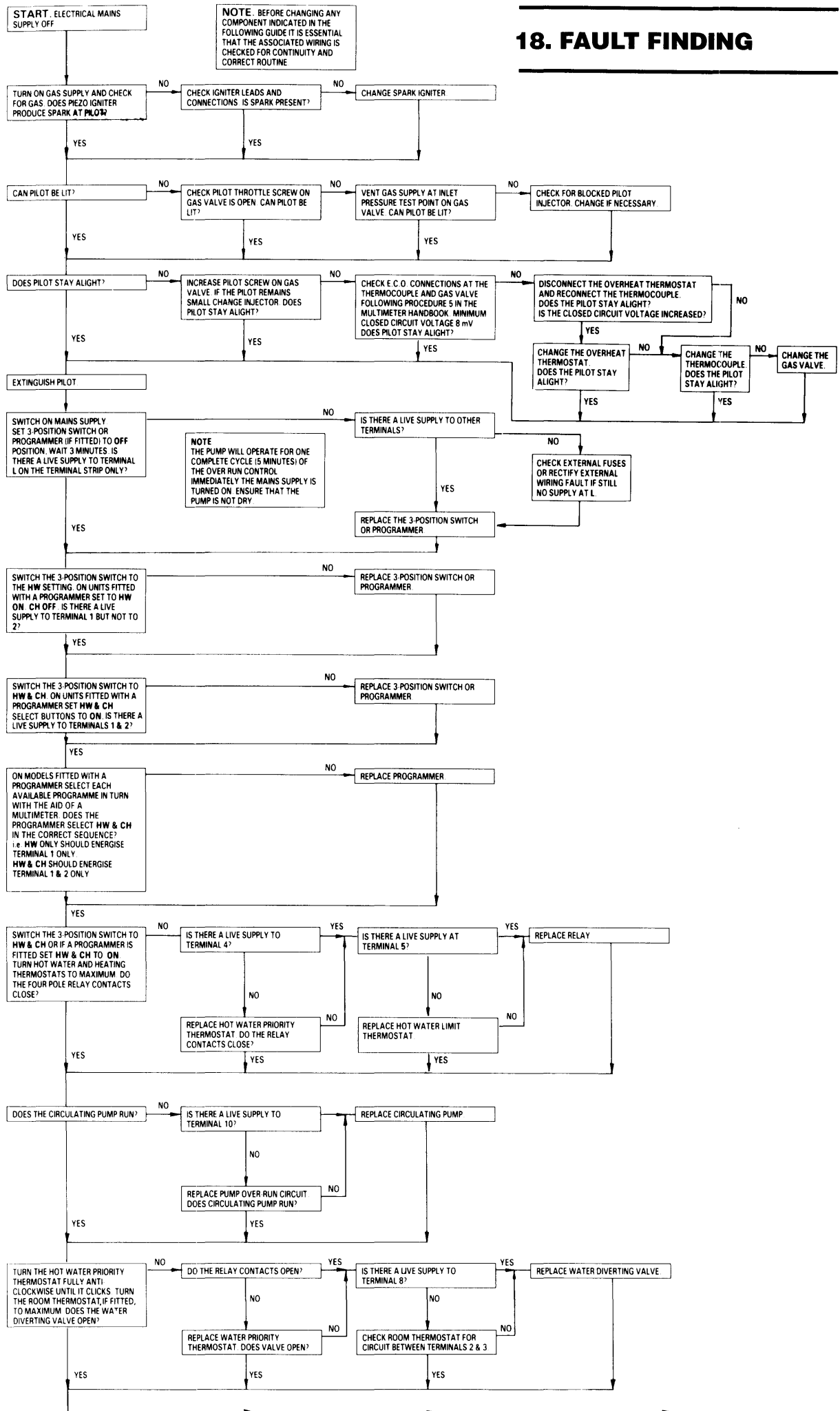
**Fig. 30**



- (e) Release the two heat exchanger union connections. Ease back the pipe work and remove the heat exchanger by lifting it slightly to release it from the rear mountings.
- (f) Fit a new heat exchanger and re-assemble in the reverse order ensuring that it is correctly seated in its mountings. Do not forget to fit new washers.
- (g) Open all radiator valves and re-fill the system, venting as necessary. The appliance is fitted with an automatic air vent on the heat bank. See Fig 27.
- (h) Re-assemble the appliance
- (i) Check that the appliance and system operates satisfactorily.



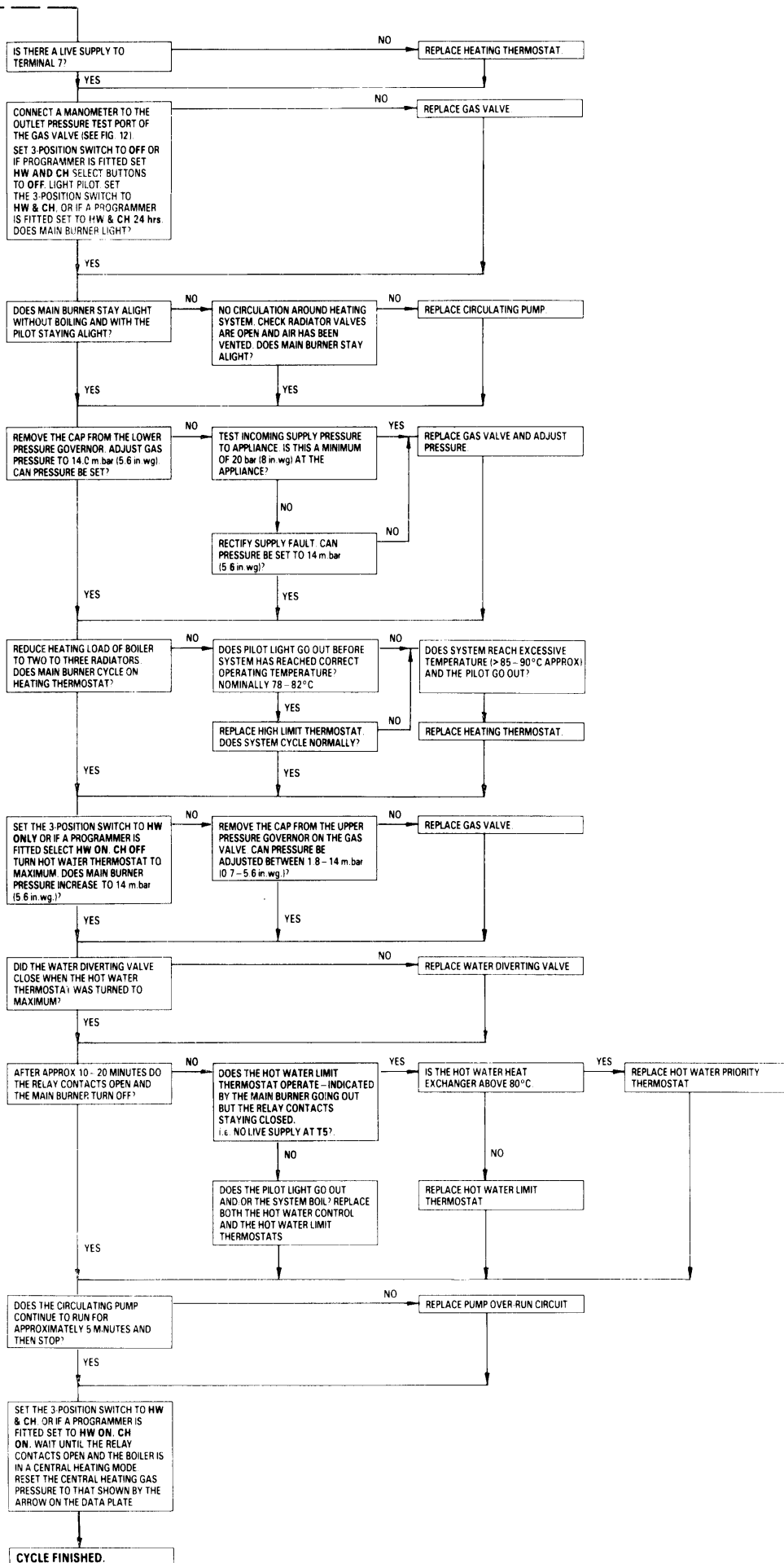
## 18. FAULT FINDING





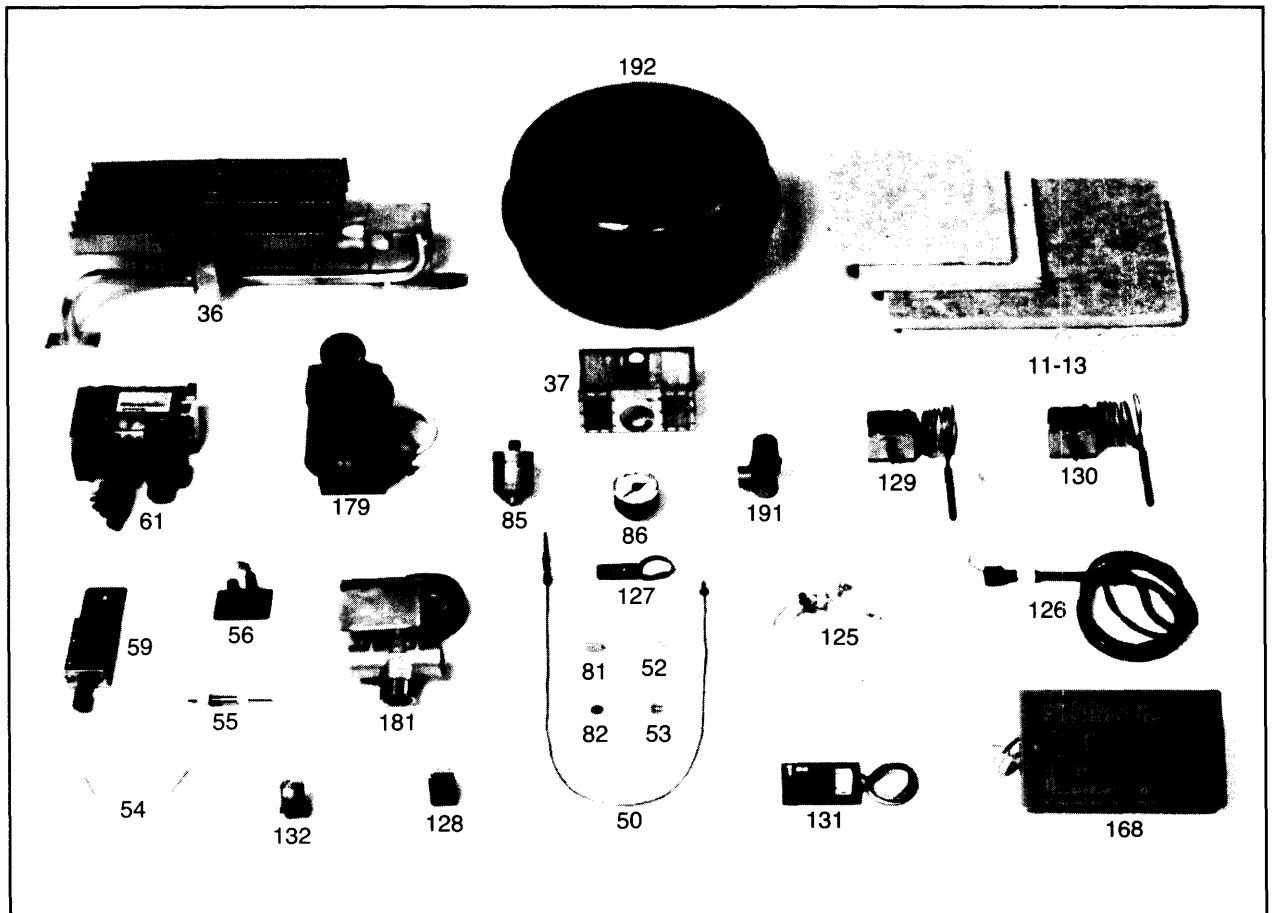
**NOTE:**

Preliminary electrical system checks as contained in the BGC Multimeter Instructions Book 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, then the checks—A. EARTH CONTINUITY, C. POLARITY and D. RESISTANCE TO EARTH—MUST be repeated.



## 19. SHORT PARTS LIST

| Key No. | GC No.   | Description                        | Manufacturer's Reference  | Qty | WHS Part No. |
|---------|----------|------------------------------------|---------------------------|-----|--------------|
| 36      | 382849   | Main Burner                        | Furigas 156.500.003       | 1   | ZAGAS069     |
| 53      | 382851   | Main Burner Injector               | Furigas 515.001.000.4.5   | 1   | ZAGAS076     |
| 61      | 378743   | Gas Valve                          | Honeywell V4600 Q2083     | 1   | ZAGAS132     |
| 56      | 391664   | Pilot Burner                       | Honeywell Q359            | 1   | ZBGAS017     |
| 52      | 382850   | Pilot Injector                     | Honeywell 45.004.108.001B | 1   | ZBGAS016     |
| 50      | 390210   | Thermocouple                       | Honeywell Q309 A2747      | 1   | ZBGAS035     |
| 59      | 393652   | Igniter                            | Vernitron 0207            | 1   | ZBGAS010     |
| 55      |          | Electrode                          | Drg. No. 3/5382           | 1   | ZBGAS062     |
| 54      | 324887   | Electrode Lead                     | Kigas 7774.700lg          | 1   | ZBGAS025     |
| 179     | 378034   | Pump                               | Grundfos UPS 15-60        | 1   | ZAMAJ198     |
| 181     | 382854   | Diverter Valve                     | ACL 6798                  | 1   | ZAMAJ116     |
| 129     | 395958   | Heating Control Thermostat         | Ranco CL6P0128            | 1   | ZAGAS008     |
| 130     |          | Hot Water Control Thermostat       | Ranco CL6P0147            | 1   | ZAGAS207     |
| 126     |          | Overheat Thermostat                | Elmwood 2455RBV           | 1   | ZAMAJ223     |
| 125     | 382897   | Limit Thermostat                   | Elmwood 2455RC            | 1   | ZAMAJ096     |
| 127     | 384542   | Suppressor                         | ITT TS 121P               | 1   | ZDELE061     |
| 128     | 386778   | 3 Position Switch                  | Arrow 2004E               | 1   | ZDELE237     |
| 168     | 371531   | Programmer (Optional) Twin Channel | Worcester Heat Systems    | 1   | ZAMAJ163     |
| 131     | 371402   | Pump Delay Timer Board             | Pactrol 408401            | 1   | ZAGAS080     |
| 132     | 368289   | Relay                              | Omron MY4                 | 1   | ZDELE183     |
| 82      | 368467   | Flow Regulator Type E, Lime        | Drg. No. 3/5211           | 1   | ZBUNC125     |
| 81      | 324822   | Flow Filter                        |                           | 1   | ZBUNC230     |
| 85      | 324917   | Auto Air Vent                      |                           | 1   | ZMMIS055     |
| 86      | 371376   | Pressure Gauge                     | Wila 0-4 bar 0-60 psi     | 1   | ZBUNC145     |
| 191     | 386789   | Safety Valve                       | Caleffi 3141              | 1   | ZCVLV018     |
| 192     | 382883   | Expansion Vessel                   | Zilmet Type 541           | 1   | ZMMIS084     |
| 11-13   | 371350-2 | Insulation Combustion Chamber      | Drg. Nos. 3/3381-3/3383   | 4   | ZEINS055-7   |
| 37      | 371357   | Gauze Filter Box Assembly          |                           | 1   | ZAGAS068     |
|         |          | DHW High Limit Thermostat          | Ranco LM7 P5065           | 1   | ZAMAJ134     |







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This booklet is accurate at the date of printing but will be superseded and should be disregarded if specifications and/or appearances are changed in the interests of continued improvement.

All goods sold are subject to our official Conditions of Sale, a copy of which may be obtained on application.

**PUBLICATION ZKLIT822, ISSUE 2 – MAY 1994**