

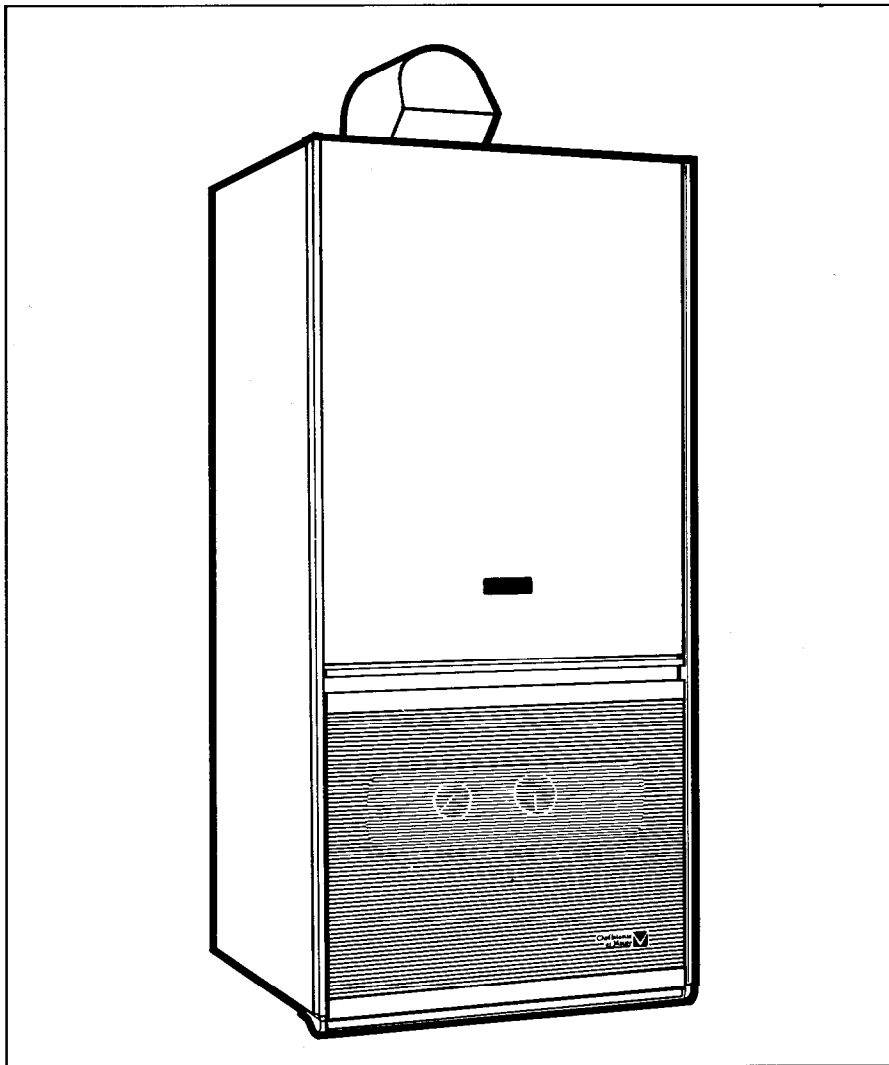
# Celtic FF

ROOM SEALED FANNED BALANCED FLUE  
COMBINATION BOILER

G.C. No. 47 980 01

FROM SERIAL N° 391061863

This appliance has been tested and certificated by British Gas  
(For use on natural gas only)



## Installation and Servicing Instructions

(leave these instructions with the user)

**Chaffoteaux  
et Maury**



Looking Good. Heating Better

The **CELTIC FF** is a wall mounted, low water content fan balanced flue appliance suitable for central heating and hot water via a non storage water to water heat exchanger. The maximum output is 24.0 kW (81,900 Btu/h).

The boiler is designed for sealed systems only and included in the appliance is the expansion vessel, circulating pump, temperature and pressure gauges, safety valve and electric connection box.

The flue which is 100 mm (4 in) dia pipe, can be directed to the rear or to the left or right and can be extended to a maximum length of 3 m, or 1,6 metres horizontally using the available 90° bend (see sections 1.4.1, 1.4.2 and 1.4.3 figures 2, 3, 3a, 3b, 3c).

**Special features include :**

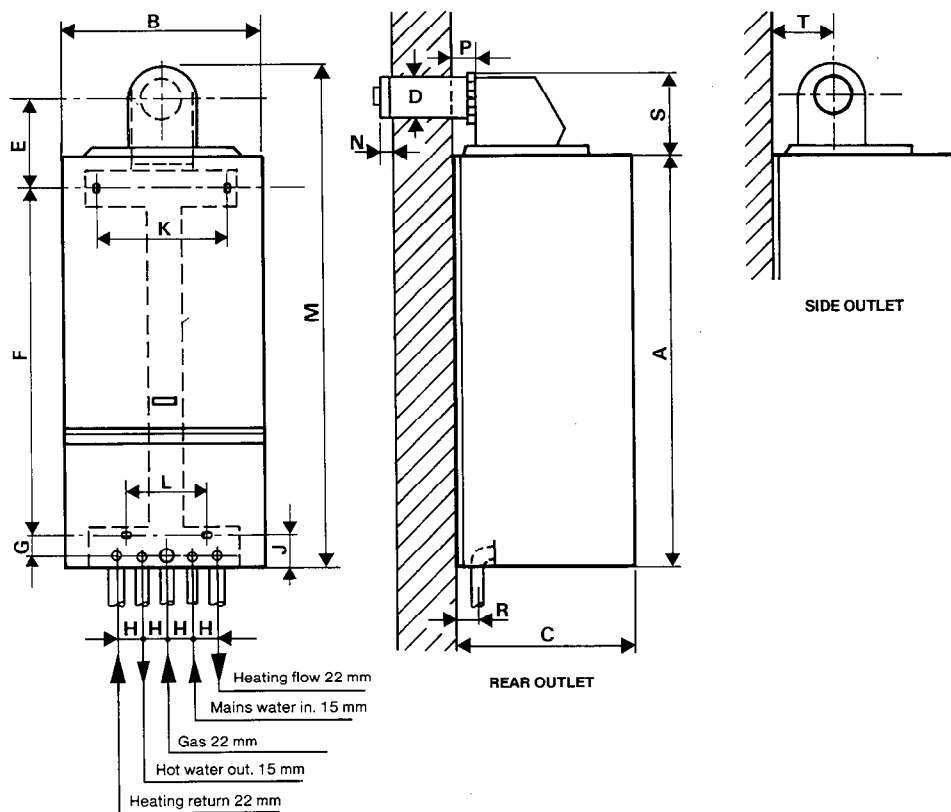
- Output to central heating fully range rated between 1/3 and full output.

- High efficiency.
- Special jig plate enabling all pipework to be installed before installing appliance.
- Independent control over central heating flow temperature and hot water.
- Fully adjustable central heating flow temperature.
- regulation between 50° C and 82° C.
- High limit thermostat for both boiler and hot water.
- Integral frost thermostats to protect appliance.
- Water flow switch to protect appliance.
- Suitable for showers with mixer valves which are compatible with water heaters.

**Guarantee**

The manufacturer's guarantee on this appliance is for 12 months from the date of installation. The guarantee is void ; if the appliance is not installed in accordance with the recommendations made herein.

**1.1 DIMENSIONS**



	mm	in
<b>A</b>	820.5	32.3
<b>B</b>	391.0	15.4
<b>C</b>	365.0	14.4
<b>D</b>	100.0	4.0
<b>E</b>	169.5	6.7
<b>F</b>	654.5	25.7
<b>G</b>	43.0	1.7
<b>H</b>	50.0	2.0
<b>J</b>	75.0	3.0
<b>K</b>	260.0	10.2
<b>L</b>	150.0	6.0
<b>M</b>	972.5	38.3
<b>N</b>	13.0	0.5
<b>P</b>	61.0	2.4
<b>R</b>	30.0	1.2
<b>S</b>	152.0	6.0
<b>T</b>	112.0	4.4

## 1.2 Technical Data

<b>Hot water</b> Input ..... 28.41 kW 96.940 Btu/h Output ..... 24.0 kW 81.900 Btu/h Water flow rate raised 45° C (81° F) ..... 7.6 L/min 1.7 gal/min Water flow rate raised 30° C (54° F) ..... 11.4 L/min 2.5 gal/min Maximum temperature ..... 60° C 140° F Maximum pressure ..... 10 bar 150 psi Minimum working pressure ..... 1 bar 15 psi Gas rate ..... 2.7 m <sup>3</sup> /h 95.35 ft <sup>3</sup> /h Burner pressure ..... 12.5 mbar 5.0 in wg	<b>Connections</b> Gas ..... 22 mm copper Heating flow ..... 22 mm copper Heating return ..... 22 mm copper Mains cold water inlet ..... 15 mm copper Hot water outlet ..... 15 mm copper Electrical supply 240 V ~ 50 Hz, fused at 3A. Electrical input ..... 195 watts Internally fused, two at F2A (BS 4265) Weight ..... 42 kg   92.4 lb Water capacity ..... 7 pints   4 litres
<b>Central heating</b> Maximum input ..... 28.41 kW 96.940 Btu/h Maximum output ..... 24.0 kW 81.900 Btu/h Gas rate (maximum) ..... 2.7 m <sup>3</sup> /h 95.35 ft <sup>3</sup> /h Burner pressure ..... 12.5 mbar 5.0 in wg Minimum input ..... 11.6 kW 39.580 Btu/h Minimum output ..... 8.0 kW 27.300 Btu/h Gas rate (minimum) ..... 1.0 m <sup>3</sup> /h 35.31 ft <sup>3</sup> /h Burner pressure ..... 1.5 mbar 0.6 in wg Minimum flow rate ..... 300 L/h 1.1 gal/min Maximum pressure ..... 3.0 bar 44 psi	<b>Ignition</b> - Anstoss continuous spark generator <b>Electrode</b> - Chaffoteaux Ltd, spark gap 5 mm <b>Boiler thermostat</b> - EGO (82° C) <b>Boiler limit thermostat</b> - Sopac (85° C) <b>Hot water limit thermostat</b> - Sopac (57° C + 3° C) <b>Safety overheat thermostat Tokoswitch</b> - (105° C) <b>Frost thermostats Elmwood</b> - (3° C and 11° C) <b>Gas valve</b> - AEMF <b>Fan motor</b> - SEL <b>Pressure switch</b> - Dungs <b>Pump head</b> - Grundfos UP 15/60 <b>Expansion vessel initial charge pressure</b> - 0.65 bar (9.6 PSI)
<p style="text-align: center;"><b>Natural gas</b></p> Manifold injectors 14 off ..... 1.28 mm 0.05 in Pilot injector ..... 0.3 mm 0.01 in Manifold restrictors 2/3 valve .. 4.5 mm 0.18 in 1/3 valve .. 2.3 mm 0.09 in	

## 1.3 Minimum clearances around Boiler

Top above air duct .....	50 mm (2 in)
Bottom below case .....	200 mm (8 in)
Sides .....	100 mm (4 in)
Front .....	600 mm (24 in)

## 1.4 Wall Thicknesses

The standard flue assembly can accommodate the following thicknesses.

Rear : from 55 mm to 576 mm

Side : from 55 mm to 392 mm

(This allows for a minimum clearance of 100 mm between the appliance and the side wall. As this dimension increases, so the maximum side wall thickness available decreases).

Extension flue assemblies are available to accommodate wall thicknesses of :

Rear : from 577 mm to 2876 mm

Side : from 393 mm to 2692 mm

See figs. 2 and 3 for details of number of extensions required.

**IMPORTANT NOTE :** The extension ducts supplied, up to a maximum of 3, will in fact permit a greater length than indicated to be covered. The ducts **MUST** be cut so that the maximum length from the centre line of the flue turret to the outermost point of the air duct **DOES NOT EXCEED 3 metres**. Greater length must not be used.

### 1.4.1 Rear Flue Outlet

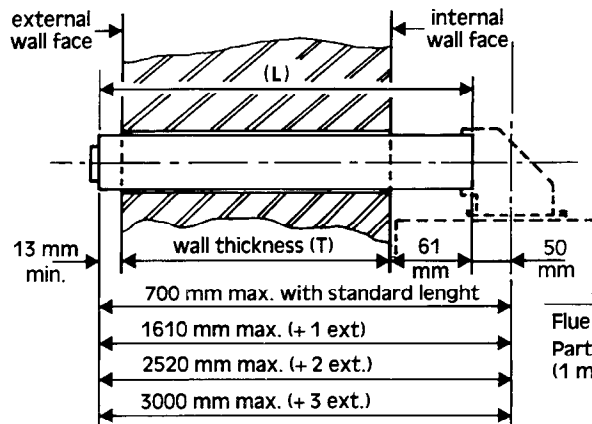


Fig. 2

REAR OUTLET ASSEMBLY

#### To cut flue assembly to length

- Measure wall thickness (T).
- Add 74 mm, this will give required length (L).
- Mark plastic air duct for length (L) and cut off surplus (from plain end).

**N.B.** If extension sections are used ensure these are firmly pushed together, see figs. 3b and 3c.

- Cut off same amount from aluminium flue duct (plain end).

Flue extension accessory  
Part No. 61061  
(1 metre length)

### 1.4.2 Side Flue Outlet

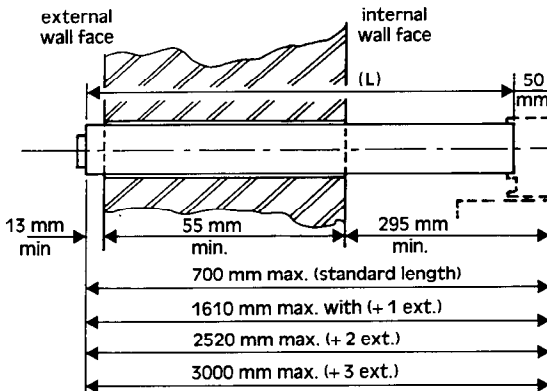


Fig. 3

SIDE OUTLET ASSEMBLY

#### To cut flue assembly to length

- Measure from external wall face to centre line of Celtic and subtract 37 mm (this will give required length "L").
- Cut off surplus from plastic air duct (plain end).

**N.B.** If extension sections are used ensure these are firmly pushed together.

- Cut same amount off aluminium flue duct (plain end).

Flue extension accessory  
Part No. 61061  
(1 metre length)

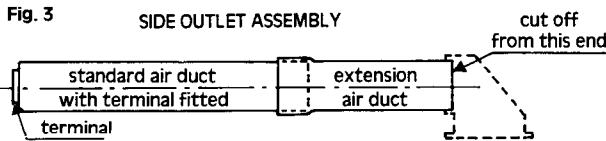


Fig. 3a PLASTIC AIR DUCT

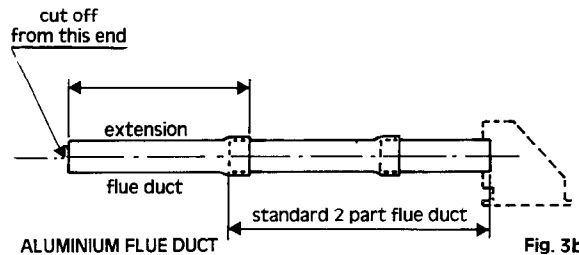


Fig. 3b

### 1.4.3 Other flue arrangements

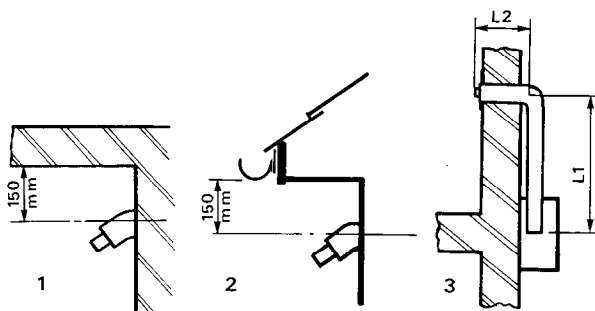


Fig. 3c

1. Distance from internal corner 300 mm without kit, 150 mm with kit no. 76216 (GC No. 264 833).
2. Distance below balconies or eaves 200 mm without kit, 150 mm with kit no. 76216 (GC No 264 833).
3. Appliance is normally supplied packed with standard 650 mm straight flue section. Additional straight extension lengths of 1 metre, Part No. 62823 (GC No 264 459), can be used up to a total straight length of 3 metres. It is also possible to incorporate one bend in the flue using Part No. 65572 (GC No. 264 835). In this case the length L1 + L2 should not exceed 1.6 metres horizontally.

## 1.5 Description

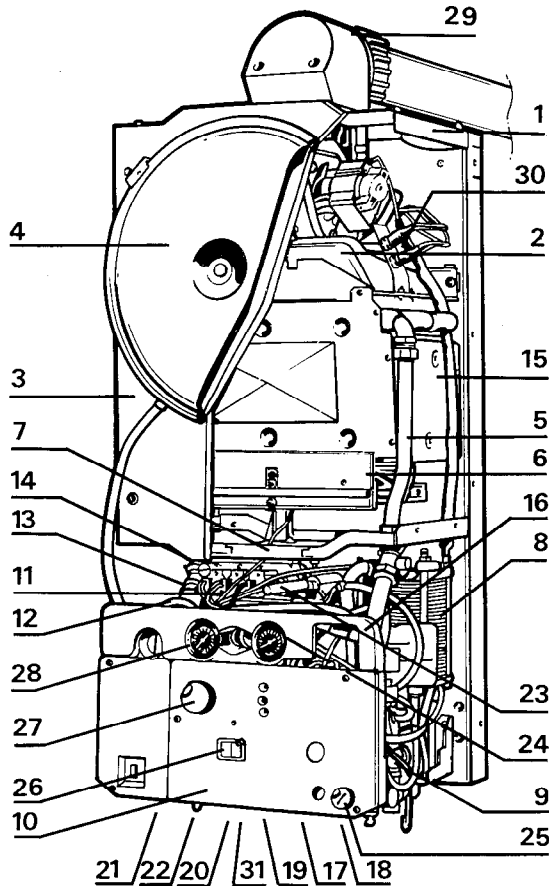


Fig. 4

The appliance is mounted in a steel case which has a white epoxy resin paint finish.

### 1. Chassis :

The chassis is a rigid plated mild steel pressing on which all components are mounted.

### 2. Flue hood :

Is an aluminium alloy casting onto which the two speed fan is mounted.

### 3. Combustion chamber :

This is assembled from a number of components mounted onto the chassis. The front panel is simply removed for servicing complete with the expansion vessel, hooks are fitted below the appliance to accept and retain the panel during servicing.

### 4. Expansion vessel :

The expansion vessel has a capacity of 5,4 litres (1.19 gal) and is sized for a normal system water content where the load is equivalent to the maximum output of the boiler. The charge pressure is 0.65 bar.

### 5. Pilot security is by thermocouple flame failure :

**6. Multigas burner comprising :** stainless steel blades (14) and a manifold with injectors (14).

**7. Gas section** including thermoelectric valve and two stage valves.

### 8. Secondary heat exchanger :

The secondary heat exchanger is a plate type heat exchanger. A thermostat is fitted on the pipework limiting the domestic hot water temperature to a maximum of  $57 \pm 3^\circ \text{C}$ .

### 9. Change over valve :

The valve is activated by a demand for domestic hot water, closes the heating circuits, and directs water to the secondary heat exchanger.

### 10. Electrical box containing :

Mains connection  
Fuses  
Printed circuit board  
Connections for external controls  
Connections for fan, pressure switch and Flow Switch  
Connections for pump

### 11. Solenoid valve :

Block on which 3 valves are mounted :  
1/3 valve - 1st stage valve-heating and hot water (blue)  
2/3 valve - full output to hot water (black)  
2/3 valve - (variable valve) central heating (orange).

### 12. Grundfos pump motor

**13. Air separator and vent** directly connected to the pump inlet (not illustrated).

**14. Regulation screw** to adjust output to heating (2/3 valve).

### 15. Heating body comprising :

Copper finned tube heat exchanger protected with silicone resin paint.  
Combustion chamber in aluminium coated steel.  
Combustion chamber lining - ceramic fibre panels.

### 16. High limit thermostat.

**17. Water service tap** (not illustrated).

**18. Flow isolating valve** - heating (not illustrated).

**19. Gas service tap** (not illustrated).

**20. Domestic hot water outlet** (not illustrated).

**21. Safety valve with drain tap** (not illustrated).

**22. Heating return isolating valve** with filter (not illustrated).

**23. Ignition button.**

**24. Thermometer** indicating boiler flow temperature.

**25. Temperature selector** for domestic hot water.

**26. Selector switch** - hot water only/OFF/heating and hot water.

**27. Thermostat to regulate heating** flow temperature.

**28. Pressure gauge.**

**29. Pressure switch.**

**30. Integral frost thermostats.**

**31. Water flow switch.**

## 1.6 Description of Operation

**1.6.1** The Celtic FF is a dual purpose or combination boiler providing central heating and hot water. Hot water is provided on a demand basis. For the duration of the demand for hot water the central heating is interrupted.

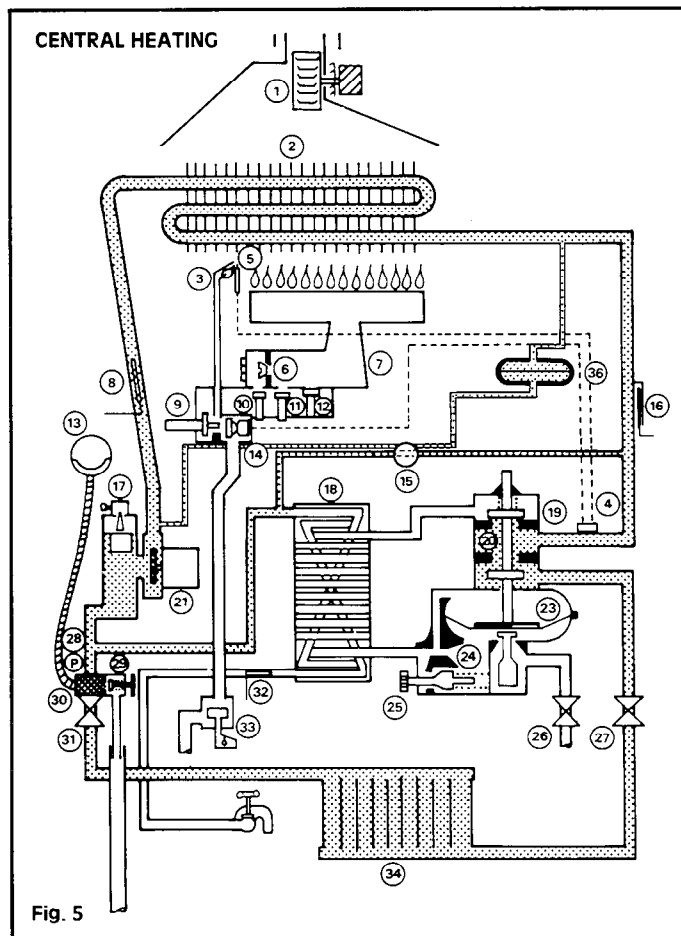
The appliance operates in two modes. A hot water only setting where it operates only on hot water demand and a hot water + central heating setting providing central heating and switching to hot water on demand.

### 1.6.2 Central Heating (see fig. 5)

The pump (21) circulates water which returns to the boiler via the return valve (31) which incorporates a filter (30). Before reaching the pump it passes through an air separator and air purger (17). The return water passes through the heat exchanger (2) where it is heated. It then passes through the change over valve (19) which in heating mode is in its rest position (fig. 3) and out via the flow valve (27) to the radiator circuits (34). The boiler thermostat (8) controls the temperature of the circulation water between a minimum of 50° C approx and a nominal maximum of 82° C. The boiler thermostat also controls the opening of the 1/3 (11) and variable solenoid valve (10).

The limit thermostat (16) set to 85° C closes both solenoids valves in the event of its set temperature being reached as could occur under the low flow conditions.

The boiler is protected by a high limit thermostat (4) the operation of which interrupts the thermocouple and extinguishes the pilot. If the high limit thermostat operates it is necessary to manually re-establish the pilot.



### 1.6.3 Hot Water (see fig. 6)

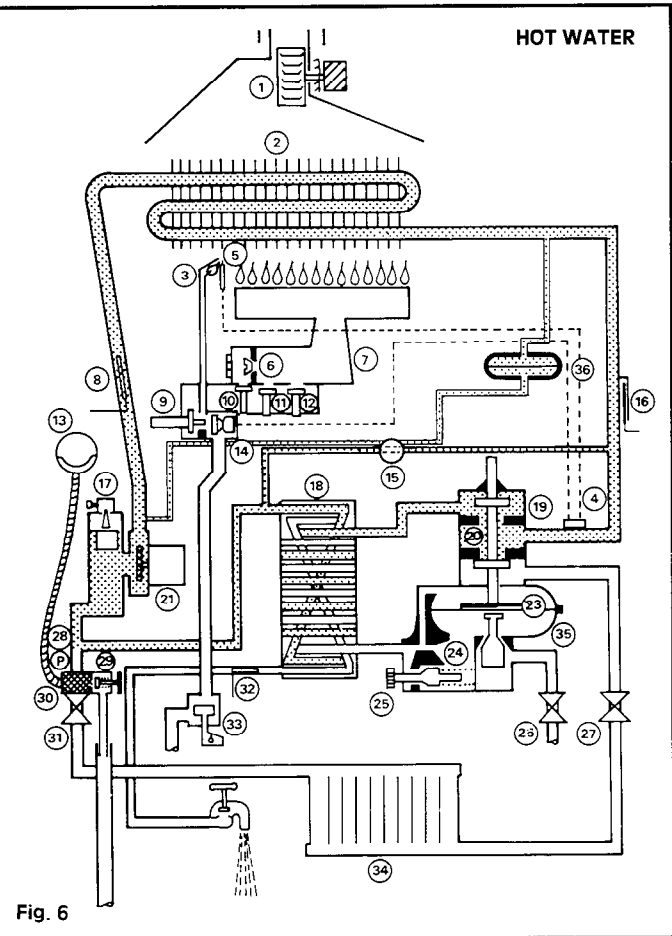
When there is a demand water flows through the water section part (35) of the change over valve (19). The inclusion of a venturi (24) produces high pressure under the diaphragm (23) causing it to rise. This movement is transmitted to the change over valve closing the heating port and opening the hot water port, as shown (20). The primary water heated by the boiler now passes through the water to water heat exchanger (18) where it flows through alternate plates indirectly heating the DHW.

The rising of the change over valve spindle causes :

1. The opening of a microswitch stopping the pump. This circuit is remade by a second microswitch making when the hot water port is fully open.
2. The by-passing of the boiler thermostat brings the boiler under control of a fixed temperature thermostat (32) which operates on the 2/3 fixed solenoid (12).
3. The selection of the 1/3 valve and the fixed 2/3 valve.

The water temperature is under control of the user and the opening of the regulator (25) increases the flow of the water and thus reduces the temperature.

When the regulator is closed – hottest setting, lowest flow – a limiting thermostat (32) prevents the secondary hot water temperature exceeding 60° C by cycling the solenoid valve without interrupting the flow of water.



### 1.6.4 Gas (see figs. 5 and 6)

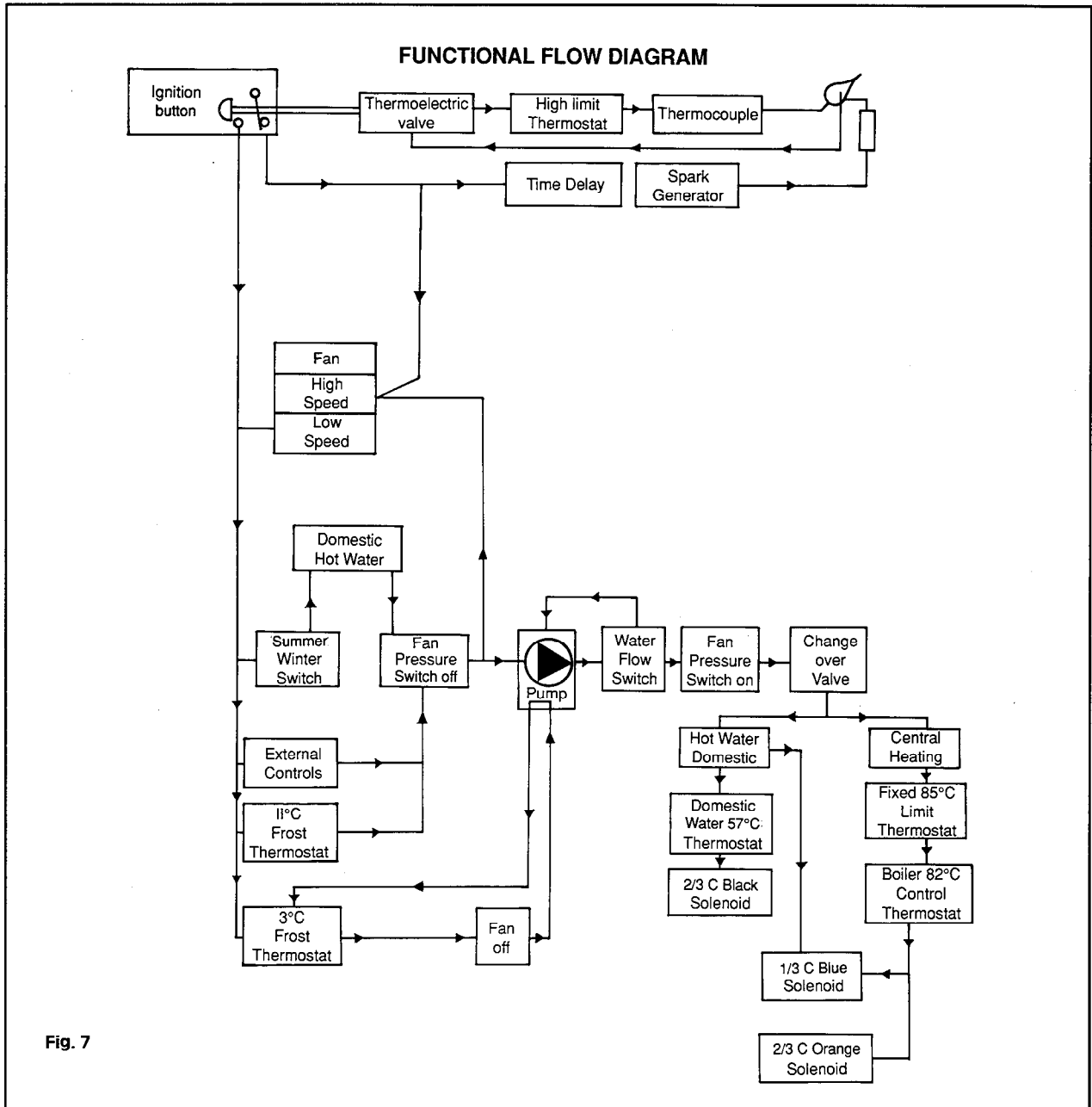
When the main gas tap (33) is turned to the on position gas is admitted to the gas section (7). Pressing the ignitor button (9) operates a microswitch causing the commencement of a firing cycle. The fan changes from low to high speed and after a purge period of approx 14 seconds a continuous stream of sparks are delivered lighting the pilot gas (3). Simultaneously, the thermoelectric valve (14) is opened and after a further 5 seconds, sufficient energy is being produced by the thermocouple (5) for the thermoelectric valve to be retained in the open position.

When the ignitor button is slowly released gas is admitted to the underside of the solenoid valves (10, 11 and 12).

There are 3 solenoid valves (1) the centre (blue) valve (11) fixed at 1/3 of max rated output, (2) the right hand hot water (black) valve (12) fixed at 2/3 of maximum rated output, (3) the left hand central heating (orange) valve (10) which is variable up to 2/3 maximum rated output.

The gas admitted by the orange valve is varied by adjuster (6).

### 1.6.5



### 1.6.6 Safety Controls

In addition to the normal safety controls the CELTIC FF incorporates the following features.

Should the central heating water flow reduce to below 300 L/h (1,1 gal/min) the gas supply to the burner is turned off, see figs 3 & 4 (36).

Built in boiler protection is provided by turning the burner and pump on if there is any risk of frost damage.





## 2 INSTALLATION REQUIREMENTS

### 2.1 General

The installation of the boiler must be in accordance with Gas Safety (Installation and Use) Regulations 1984, Building Regulations, current I.E.E. Wiring Regulations and the Byelaws of the Local Water Undertaking. It should be in accordance also with the BS Codes of Practice and the British Gas Specifications for Domestic Wet Central Heating Systems and any relevant requirements of the local Gas Region and Local Authority Building Standards (Scotland) Regulations.

Detailed recommendations are stated in the following British Standard Codes of Practice : BS 6891 : 1988, BS 6798 1987, BS 5440 1979, BS 5440 : 1 1990 and 2 : 1989, BS 5449 : 1 1990.

**Note :** Gas Safety Installation and Use Reg 1984. It is the law that all gas appliances are installed by C.O.R.G.I. Registered persons in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your own interest and that of safety to ensure compliance with the law.

### 2.2 Location

The boiler is not suitable for external installation. The position chosen for the boiler must permit the provision of a satisfactory flue termination. The location must also permit adequate space for servicing and air circulation around the boiler. The surface on which the boiler is mounted must be of non combustible material.

The boiler may be installed in any room or internal space 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 to Scotland, with respect to the installation of a heater utilising mains electricity in a room or internal space containing a bath or shower.

Where the installation of the boiler will be in an unusual location special procedures may be necessary and BS 5546 gives detailed guidance on this aspect.

A compartment used to enclose the heater must be designed and constructed specifically for this purpose. An existing cupboard or compartment may be used provided that it is modified for the purpose.

Details of essential features of cupboard/compartment design are given in BS 6798: 1987.

## 2.3 Water Circulation System

The Celtic FF is suitable for SEALED SYSTEMS only and should be in accordance with the relevant recommendations given in BS 6798: 1987, BS 5449:1 (for the smallbore or/and microbore systems) and the British Gas Specifications for Central Heating Systems.

## 2.4 Siting the Flue Terminal

Refer to section 1.4 for details of wall thicknesses which can be covered.

Detailed recommendations for flueing are given in BS 5440 Pt 1. The following notes are intended to give general guidance.

The boiler must be installed so that the flue terminal is exposed to external air. The boiler must NOT be installed so that the terminal discharges into another room or space as an outhouse or lean-to. It is important that the position of the terminal allows a free passage of air across at all times. The minimum acceptable spacings from the terminal to obstructions and ventilation openings are specified below (fig. 10).

Terminal positions	Min spacings
A - Directly below an opening, windows etc. ....	300 mm
B - Below gutters soil pipes or drain pipes	75 mm
C - Below eaves .....	200 mm
D - Below balconies or car port roof ....	200 mm
E - From a vertical drain pipe or soil pipe	75 mm
F - From an internal or external corner .	300 mm
G - Above ground roof or balcony level .	300 mm
H - From a surface facing the terminal .	600 mm
J - From a terminal on the same wall ...	1200 mm
K - Vertically from a terminal on the same wall .....	1500 mm
L - Horizontally from a terminal on the same wall .....	300 mm

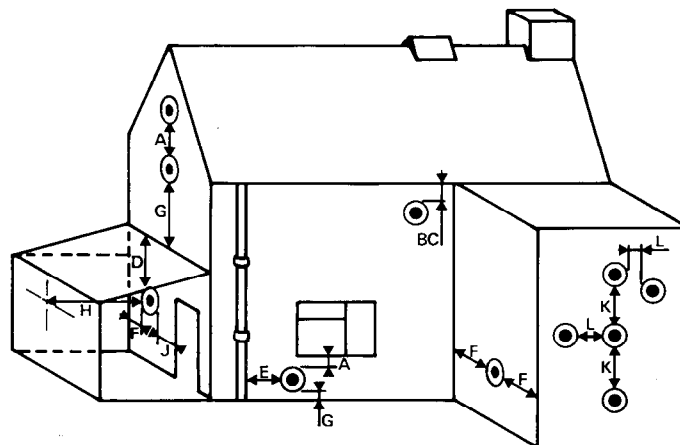


Fig. 10

**Note :** The flue can be extended to clear a projection. BUILDING REGULATIONS 1985 excerpt. Approved document J Part B 1.4 (C) (D).

**C)** Protect with a terminal guard if it could come in contact with people near the building or be subjected to damage.

**D)** Designed so as to prevent the entry of any matter which might restrict the flue. (A terminal guard G.C. No 381 782 is available from).

Quinnel Barret & Quinnel Wireworks  
Old Kent Road  
London SE15 1NL Tel. 081-639-1357

The air inlet/outlet duct and the terminal of the appliance must not be closer than 25 mm (1 in) to any combustible material. Detailed recommendations on the protection of combustible material are given in BS 5440 Pt 1 : 1990.

**IMPORTANT NOTICE : TIMBER FRAMED HOUSES**

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 INSTALLATIONS IN TIMBER FRAMED HOUSING" reference DM2. IF IN DOUBT, ADVICE MUST BE SOUGHT FROM THE LOCAL REGION OF BRITISH GAS.

**2.5 Air Supply**

The room in which the boiler is installed does not require a purpose provided air vent.

If the boiler 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 the outside air or to a room. Both high and low level air vents must communicate with the same space.

Position of vents	Air from room	Air direct from outside
High level	264 cm <sup>2</sup> (40 in <sup>2</sup> )	132 cm <sup>2</sup> (20 in <sup>2</sup> )
Low level	264 cm <sup>2</sup> (40 in <sup>2</sup> )	132 cm <sup>2</sup> (20 in <sup>2</sup> )

**2.6 Electrical Supply**

- This appliance must be earthed.
- All wiring external to the appliance must conform to the current I.E.E. Regulations.
- The Celtic FF requires a 240 V ~ 50 Hz supply.
- Connection of the appliance and any system controls to the mains supply must be through a common isolator and must be fused at 3A maximum. This should preferably be an unswitched shuttered socket outlet and 3 pin plug to BS 1363. Alternatively, a double pole isolating switch may be used, provided it has a minimum contact separation of 3 mm in both poles. The isolator should be clearly marked showing its purpose, preferably positioned close to the appliance.
- Fuse the supply at 3A.
- The supply cord must be 0.75 mm<sup>2</sup> (24 x 0.2 mm) three core to BS 6500 Table 16.

**2.7 Gas Supply**

The Celtic FF requires :

2.7 m<sup>3</sup>/h (95.35 ft<sup>3</sup>/h) gas flow.

The meter and supply pipes should be capable of delivering this quantity of gas in addition to the demand from any other appliances in the house.

The complete installation must be tested for soundness as described in BS 6891 : 1988

**3. SYSTEM GUIDANCE**

**3.1 General**

The low water content CELTIC FF dual purpose boiler includes the expansion vessel, safety overheat thermostat, temperature and pressure gauges, and safety valve.

The thermostat is adjustable and on its maximum setting gives a nominal 82° C (180° F) flow temperature. Detailed recommendations for water circulation are given in BS 5546 : 1990. Whilst the boiler provides hot water, there may be occasions when a cylinder will be used, for instance, if the property has two bathrooms. Detailed recommendations of this application are given in sections 3.13 to 3.16 Thermostatic control should be used in the heating circuits and the cylinder if one is fitted.

It must be remembered that a combination appliance has a limited volume of hot water that can be supplied at any one time for a given temperature. Indeed in most respects it is equivalent to a multipoint water heater and many of the constraints associated with multipoints apply equally to combination boilers.

The appliance has two separate functions, to provide heating and hot water on demand. It can have a third which is to supply hot water high demand through the use of an indirect cylinder.

Such a course could recommend itself if, for instance, there is more than one bathroom or if the standard and appointments of the property, such as basins in all bedrooms and a large kitchen indicate a high usage of hot water.

Hot water produced indirectly through a cylinder can be used to satisfy high simultaneous demand outlets - bathrooms etc, whilst the benefits of high efficiency in generally small quantities of hot water, can be fully utilised in kitchens, cloakrooms and so on.

Figs. 14, 15, 16 and 17 indicate various layouts for the production of hot water. It is recommended that only a high recovery cylinder is used and circumstances may from time to time dictate that a special saturated heat exchanger in an indirect cylinder may be desirable.

Separate time and temperature control over hot water generated in this way can be achieved by the use either of two port valves or three port valves of a flow share or priority pattern (see notes on drawing).

It is also possible, where the occupation of the house is variable, to provide either for a small or large load. This is best achieved with a tall, small diameter cylinder. See section 5 for possible wiring arrangements.

When using the hot water side of the appliance the use of non-return valves and/or loose jumpered stop cocks is just as critical as with the conventional multipoint and should be avoided. If a non-return valve is fitted in the incoming water supply then an expansion vessel MUST be fitted in the domestic hot water circuit with a capacity of at least 0.16 litres.

If the mains cold water supply is in excess of 10 bar (150 psi) a pressure limiter must be fitted to avoid excessive pressure being applied to the boiler.

When replacing an existing cylinder storage system with CELTIC FF it is essential that all redundant pipework is removed and dead legs eliminated.

In properties where there are multiple draw-off points on different levels consideration should be given to the use of non-return valves in the secondary hot water system to avoid "active dead legs". No non return valve should be less than 3 ft (1 m) above the top of the appliance and ideally should be as close as possible to the terminal fitting.

### 3.2 System controls

The boiler is electrically controlled and is suitable for most control schemes currently available including thermostatic radiator valve and motorised valves. When using motorised valves the controls should be arranged to switch off the boiler when circuits are satisfied. The boiler requires a minimum flow rate of 300 L/h (1.1 gal/min) and consequently, if thermostatic radiator valves are fitted to all radiators, a by pass will be necessary. This will ensure that the boiler will operate correctly when all TRVs are closed.

### 3.3 Pump

The boiler is fitted with a Grundfos UP. 15/60 pump head. The graph (fig. 11) indicates the residual head available for the system.

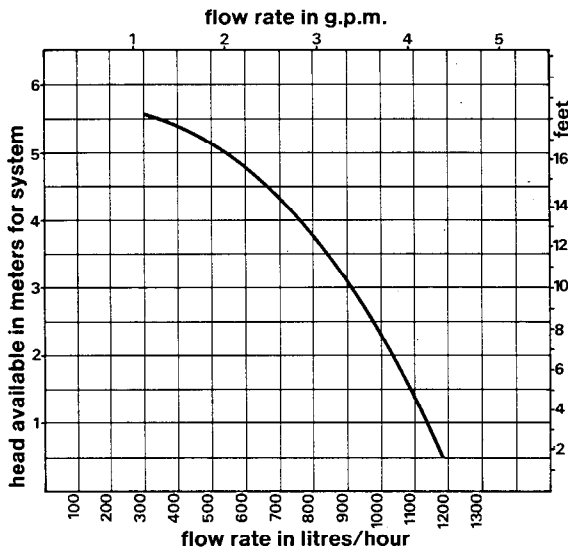


Fig. 11

### 3.4 Expansion vessel

The expansion vessel which is fitted on the front of the combustion chamber maintains pressure and accommodates system water expansion. The vessel has a capacity of 5.4 litres (1.19 gals) and is charged to a pressure of 0.65 bar.

**The connection in the centre of the expansion vessel is not a vent point.**

At the design flow temperature and the initial system pressures quoted the maximum allowable system volume is 75 litres.

If the water volume is not known and cannot be accurately assessed from manufacturers data the following volumes may be used to give a conservative estimate of the system volume.

Boiler .....	4 litres (0.8 gals)
Small bore pipework .....	0.3 litres (0.07 gals)
	per 0.292 kW
Microbore pipework .....	7 litres (1.5 gals)
Steel panel radiators .....	2.3 litres (0.5 gals)
	per 0.292 kW (1000 Btu/h) of system output
Hot water cylinder .....	(0.44 gals)

If the volume exceeds 75 litres an additional vessel will be required fitted in the flow from the appliances. Refer to BS 7074 Pt. 1 or BS 5449 for details of sizing.

### 3.5 Mains Water Connection

There shall be no permanent connection to the Heating System Pipework for filling or replenishing without the approval of the Local Water Authority.

### 3.6 Filling point (see BS 6798: 1987 Appendix A)

Filling and recharging can be done :

- 1) Through a temporary hose connection from a draw off tap supplied from a service pipe under mains pressure provided that this is acceptable to the Local Water Authority, see fig. 12).
- 2) Through a self contained unit comprising a cistern, pressure pump if required and if necessary a pressure reducing valve or flow restrictor, fig. 13.
- 3) Through a cistern, used for no other purpose, permanently connected to a service pipe. The static head available must be sufficient to provide the designed initial system pressure.

### 3.7 Make up system

Provision must be made for replacing water lost from the system indicated by a reduction in pressure shown on the pressure gauge. Recharge through the filling point (see section 3.6).

### 3.8

Pipework should be of copper, small bore or microbore with capillary or compression jointing to a high standard, leak sealant must not be used in the system.

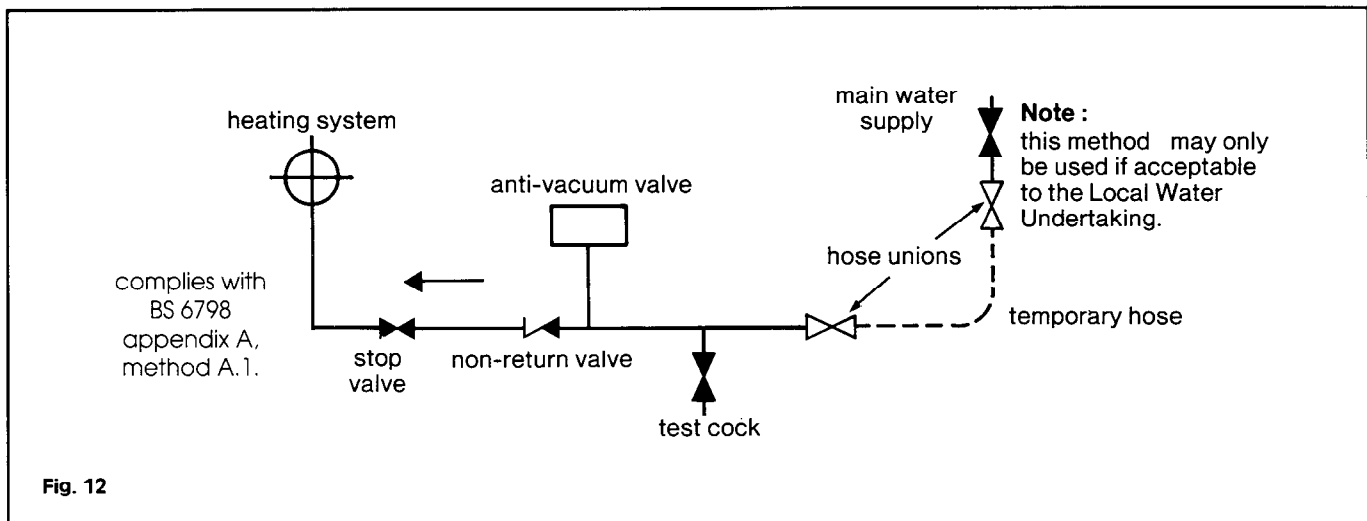


Fig. 12

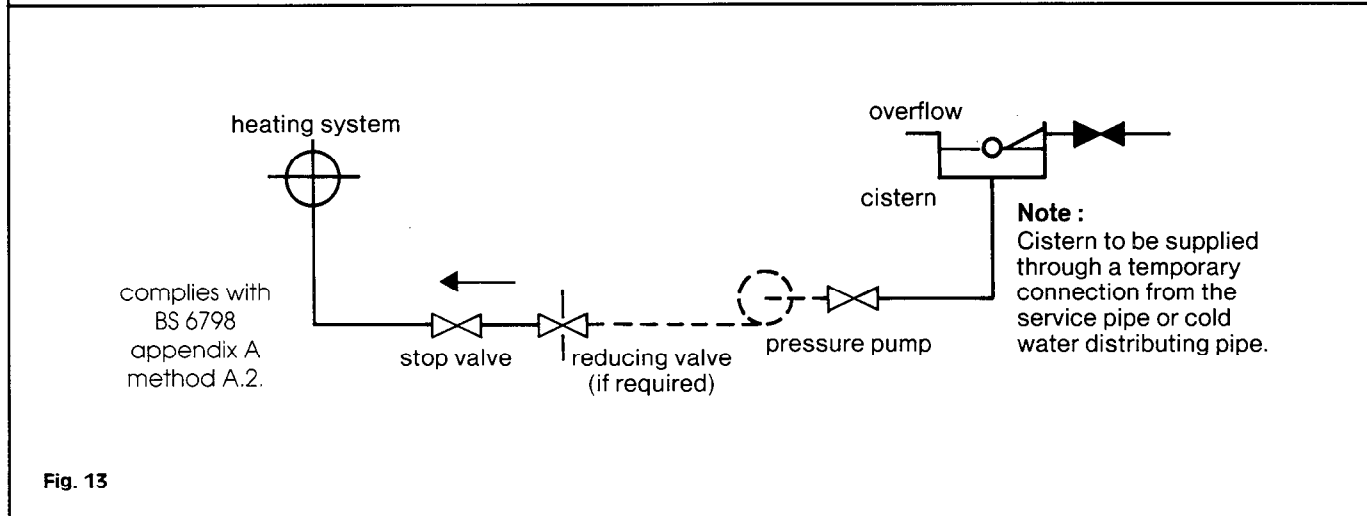


Fig. 13

### 3.9.1 Boiler replacement (retrofit)

In an old system where the boiler is being replaced, we recommend the use of a strainer, fitted with a drain tap on the heating return, designed to retain scale particles and other solid debris. It is good practice to use a chemical cleaner with a flocculating agent, used as recommended by the cleanser manufacturer, to clean the system before the old boiler is removed.

### 3.9.2 Existing systems

Valves and joints should be carefully checked for leaks and the appropriate action should be taken either as a repair or replacement. The old open system has probably only been subjected to a pressure of 0.4 bar or less. When you change to a sealed system where the charge pressure will be 1.0 bar and the running pressure exceeding 1.5 bar, consideration should be given to the replacement of radiator valves with a pattern capable of sealing at the higher pressures.

### 3.10 Cylinder

Where a domestic hot water cylinder is used with the Celtic FF it MUST be of the indirect and high recovery type to BS 1566:Pt 1. Single feed cylinders are not suitable for use with this appliance. Flow and return pipework to the cylinder should be in 22 mm copper pipe.

### 3.11 Inhibitors

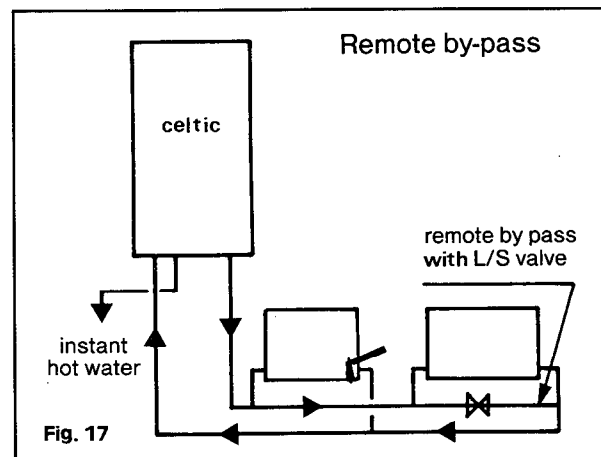
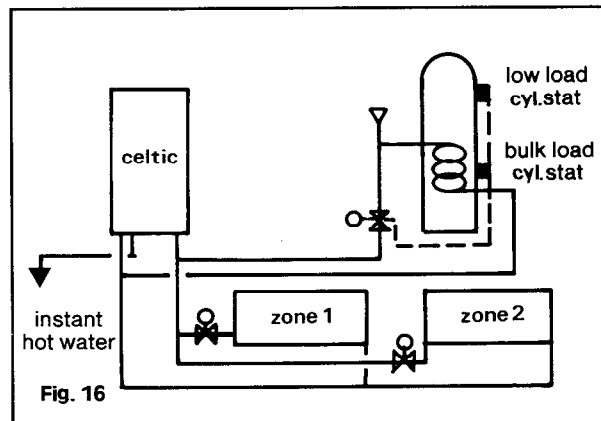
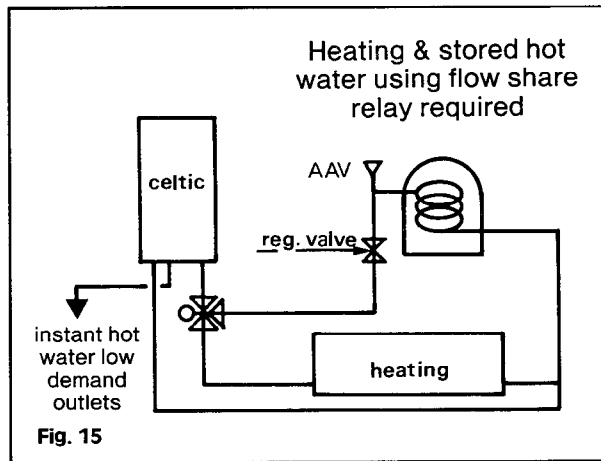
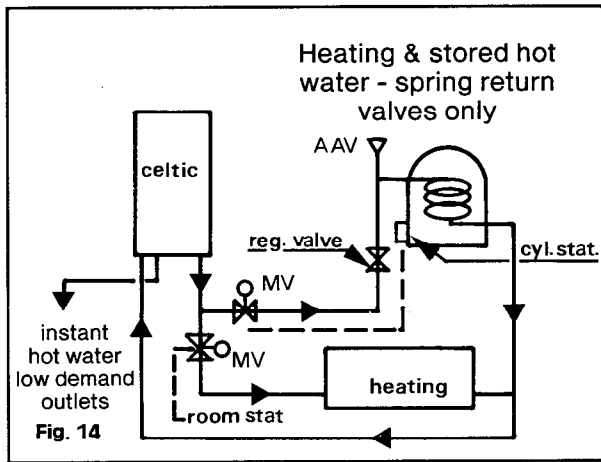
Chaffoteaux Ltd do not generally recommend the use of inhibitors in systems using the Celtic FF boiler. It is however, appreciated that the use of a corrosion and limescale inhibitor may be desirable or specified.

The following are the appliance manufacturer's recommendations :

- 1) Use only a British Gas or similar approved inhibitor from the Fernox Manufacturing Company Limited Britannica Works, Clavering, Essex CB11 4QZ - Tel : 0799 085811 ; Grace Service Chemical, Grace Dearbon Ltd - Widness - Cheshire WA8 8 UD Tel : 051 424 5351 - Telex : 627 341 - Fax : 051 423 2722
- 2) Use only the quantities specified by the inhibitor manufacturer.
- 3) Cleanse the system as required by the inhibitor manufacturer.
- 4) Add inhibitor only after flushing when finally re-filling the system.

### 3.12 Add-on devices

It is important that no external control devices eg. economisers be directly fitted to this appliance unless covered by these installation instructions or agreed with the manufacturer in writing. Any direct connection of a control device not approved by the manufacturer could make the guarantee void and also infringe the Gas Safety (Installation & Use) Regulations 1984.



### 3.13 Heating and hot water systems

It must be remembered that a combination appliance has a limited volume of hot water that can be supplied at any one time for a given temperature. Indeed in most respects it is equivalent to a multipoint water heater and many of constraints associated with multipoints apply equally to the combination boilers.

The appliance has two separate functions, to provide heating and hot water on demand. It can have a third, which is to supply hot water high demand through the use of an indirect cylinder.

Such a course would recommend itself if for instance there is more than one bathroom. If the standard and appointments of the property such as basins in all bedrooms and a large kitchen indicate a high usage of hot water.

**3.14** Hot water produced indirectly through a cylinder can be used to satisfy high simultaneous demand outlets - bathrooms etc. Whilst the benefits of the high efficiency in generally small quantities of hot water, can be fully utilised in kitchens, cloakrooms and so on.

Figs. 14, 15, 16 and 17 indicate various layouts for the production of hot water. It is recommended that only a high recovery cylinder is used and circumstances may from time to time dictate that a special saturated heat exchanger in an indirect cylinder may be desirable.

Separate time and temperature control over hot water generated in this way can be achieved by the use either of two port valves or three port valves of a flow share or priority pattern (see notes on drawing).

It is also possible, where the occupation of the house is variable, to provide either for a small or large load. This is best achieved with a tall, small diameter cylinder (fig. 16, see sections 5 for possible wiring arrangements).

**3.15** When using the instantaneous side of the appliance the use of non-return valves and/or loose jumpered stop cocks is just as critical as with the conventional multipoint and should be avoided. If a non-return valve is fitted in the incoming water supply then an expansion vessel **MUST** be fitted in the domestic hot water circuit with a capacity of at least 0.16 litres

When replacing an existing cylinder storage system with an instantaneous type system it is essential that all redundant pipework is removed and dead legs eliminated.

In properties where there are multiple draw off points on different level consideration should be given to the use of non-return valves in the secondary hot water system to avoid "active dead legs". No non-return valve should be less than 3 ft (1 m) above the top of the appliance and ideally should be as close as possible to the terminal fitting.

**3.16** The consideration of heating systems using thermostatic valves should ensure that the minimum flow rate through the appliance is maintained and in this connection the remote by-pass is preferred (see fig. 17).

## 4. INSTALLING THE BOILER

A vertical flat area is required for the boiler : 1122 mm high x 591 mm wide (44 in x 23.25 in). The surface on which the boiler is mounted must be of a non reverberating and of a non combustible material.

The appliance is supplied in a single carton which contains :

- 1) The **chassis** with all functional parts attached.
- 2) **Casing comprising** : 2 side panels  
1 front panel  
1 controls fascia cover  
1 glass door complete with hinges
- 3) **Mounting bracket comprising** : flue guide  
top support plate  
spacing strip  
bottom support plate  
plastic jig plate connection
- 4) **Plastic bag containing** : gas filter/washer
- 5) **Box containing** : gas and water connections inc.4 above.
- 6) **Box containing** : control knobs  
safety valve  
wall plugs  
screws and fixings.
- 7) **Flue assembly** : flue turret with pressure differential switch and 1st flue duct section  
plastic wall liner with terminal  
flue duct  
plastic turret cover  
2nd flue section
- 8) **Plastic bag containing** : flue locking ring  
'O' ring  
2 gaskets - one cork and one rubber  
4 mounting screws with washers for flue turret

**N.B. (i)** Extension flue assemblies are not supplied as standard, and must be ordered to suit (see section 1.4)

### 4.1

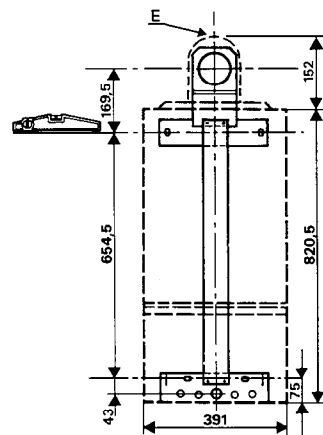


Fig. 18

#### Positioning the boiler

- a) Select the location for the boiler referring to the dimensions shown in 1.1 and 1.3 terminal location positions (2.4 - fig. 10).
- b) Check flue length (see 1.4 - figs. 2 and 3).
- c) Check clearance on external wall for flue terminal position (see table 2.4 - fig. 10)
- d) Assemble the mounting bracket made up from 4 pieces (fig. 18) using 4 thread forming screws.
- e) If for rear flue installation, remember to include the flue guide plate E, using 2 thread forming screws.

### 4.2

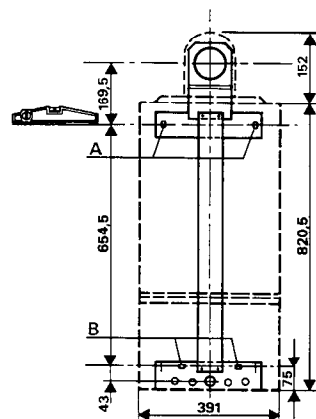


Fig. 19

#### Rear outlet flue

- a) Mark vertical centre line for boiler on wall.
- b) Mark horizontal centre line for 107 mm (4.2 in) dia wall opening and one for upper bracket fixing screws (A).
- c) Using bracket as template mark 4 fixing points (A) and (B).
- d) Mark wall for flue opening using flue guide plate.
- e) Drill the wall for the flue opening using a 107 mm (4.2 in) core drill.
- f) Drill 4 fixing holes (A) and (B) 7.9 mm (5/16 in) and plug.
- g) Fix bracket to wall using 6 mm x 50 mm wood screws provided.

**N.B.** Ensure bracket is square and plumb to vertical centre line before tightening.

### 4.3

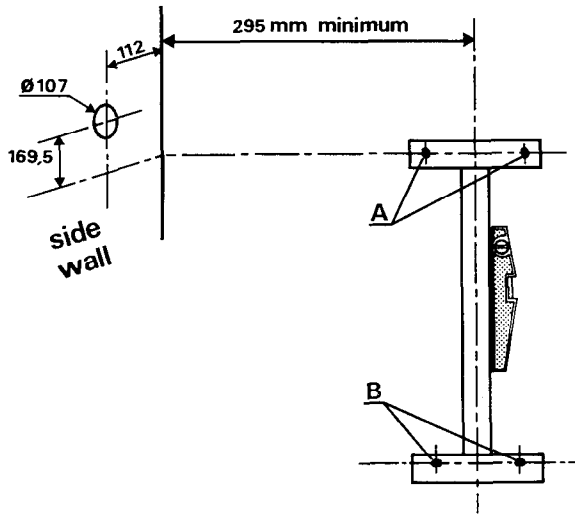


Fig. 20

#### Side outlet flue

- Mark vertical centre line for boiler on wall (see fig. 20).
  - Using bracket as template mark 4 fixing slots (A) and (B).
  - Mark horizontal line through the fixing slots (A) and project to side wall.
  - Mark vertical axis of flue opening 112 mm (4.4 in) from corner of wall.
  - Mark wall for centre of flue opening 169.5 mm above the horizontal on side wall.
  - Drill the wall for the flue opening using a 107 mm (4.2 in) core drill.
  - Drill 4 fixing holes (for (A) top of slot) and (for (B) center of slot).
  - Fix bracket to wall using 6 mm x 50 mm wood screws provided.
- N.B.** Ensure bracket is square and plumb to vertical centre line before tightening.

### 4.4

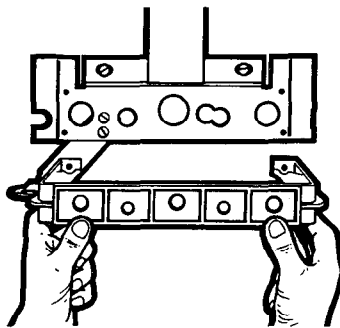


Fig. 21

#### Jig plate

- N.B.** By using the plastic jig plate the piping system can be completed before the boiler is mounted.
- Attach plastic jig plate to bottom bracket using 4.6 mm x 10 hexagonal screws provided (fig. 21).
  - Fit copper tails and washers to jig plate, the mains water inlet tail (M) is the shorter of the two 15 mm tails (fig. 22).
  - The water can either come from above or below using the standard tails provided. The gas must enter from below.

### 4.5

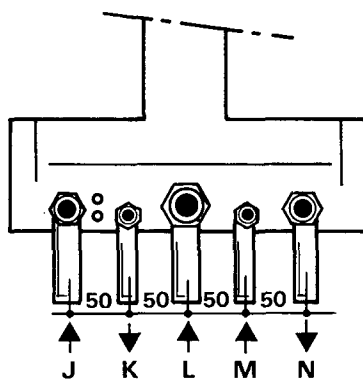


Fig. 22

#### Gas and water connections

	Tube diameter	Thread size
<b>J)</b> Heating return	22 mm	3/4 in
<b>K)</b> Hot water outlet domestic	15 mm	1/2 in
<b>L)</b> Gas inlet	22 mm	3/4 in
<b>M)</b> Mains water inlet domestic	15 mm	1/2 in
<b>N)</b> Heating flow	22 mm	3/4 in

#### Pipework

- Fit or cut pipework to connect with copper tails on jig plate.

### 4.6

#### Water connections

- Make connections to copper tails using either solder capillary fittings or compression type.

### 4.7

#### Gas connection

- The gas connection is 22 mm diameter.
  - Make the gas connection.
- N.B.** The gas supply pipe must not be less than 22 mm diameter.

#### IMPORTANT NOTE :

At this stage the pipework can be completed and tested before the boiler is positioned. Having completed a satisfactory test on the pipework the boiler can now be fitted or retained for fitting at a later date.

## 4.8

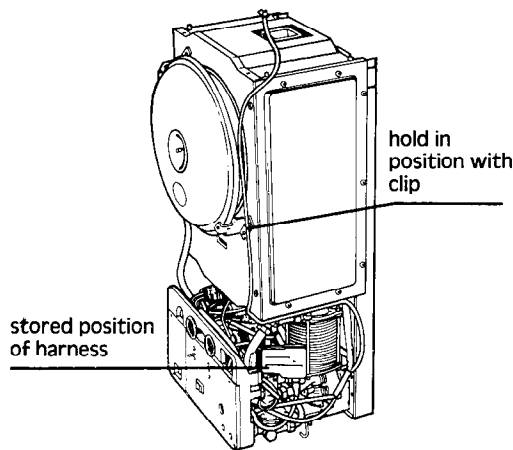


Fig. 23

### Fitting the boiler

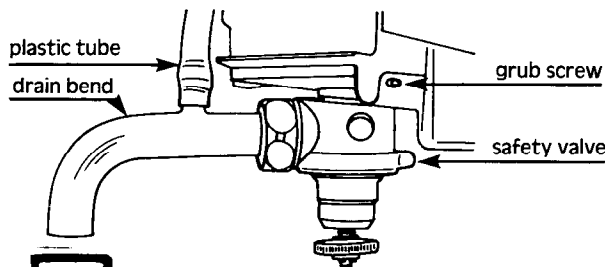
- Before hanging the boiler, uncoil wiring harness (connections to pressure switch) stored by changeover valve, route through lower part of chassis and up back of boiler, place into clips.
- Remove plastic jig plate from bracket and retain screws.
- Hang boiler on mounting bracket, ensure that it is properly located.

**N.B.** Insert washer into union nut and offer assembly to boiler. Use the plain black 3/4 and 1/2 diameter graphited fibre washers for water unions, and the white 3/4 filter/washer for the gas union.

- Connect water union using plain washers, working from left to right.
- Connect the gas union using the filter/washer packed separately either way round.

**N.B.** As an alternative to using the plastic jig plate the tails can be fitted to the boiler before mounting, then connected to the services.

## 4.9



### Fit safety valve

The safety valve is mounted below the heating return (J) (fig. 22) isolating valve.

- Ensure 'O' ring is in position within the socket from heating return isolating valve.
- Fit safety valve and secure with grub screw provides.

- Fit 14 mm tail drain bend using washer provided.
- Fit plastic tube from air separator to nipple on 14 mm tail.

**N.B.** The drain must be 22 mm and the 14 mm drain bend from the safety valve must be installed so that discharge of water is readily visible. A tundish arrangement is acceptable. The connection must **NOT** be made by a capillary or compression fitting directly between the 14 mm drain bend and the 22 mm discharge pipe without an air gap. see fig. 24.

The 22 mm discharge pipe must discharge to the outside of the building where possible over a drain. The discharge must be such that it will not be hazardous to occupants or cause damage to external electrical components or wiring. The pipe should be directed downwards. It must not discharge above an entrance or window or any type of public access as the temperature of the water being discharged may reach 100° C.

## 4.10

Fig. 24

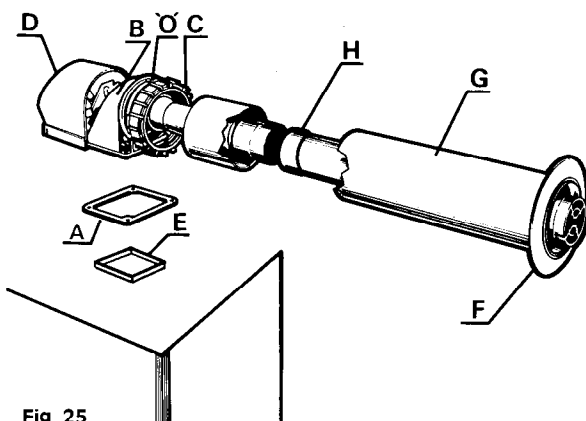


Fig. 25

### Fitting the flue up to 700 mm long

- Cut plastic duct (G) to length required, see fig. 2 or 3 dimension (L).

- Cut same amount from aluminium flue duct (H).

**N.B.** In very cold weather the plastic air duct becomes brittle, warm before cutting.

- Remove plastic turret cover (D) from flue turret (B) held by two screws.

- Peel off protective paper from adhesive side of cork gasket (A) place on mating side of flue turret (B) lining up with four clearance holes, press together.

- Assemble second part of flue duct (H), push fit.

- Slide locking ring (C) and 'O' ring over plastic air duct.

- Slide air duct over flue duct, engage end of flue duct into terminal and locate air duct into turret (B).

- Slide 'O' ring along air duct (G), to contact with the face of the turret (B). Locate lugs on locking ring (C) between lugs on flue turret (B). Push together and turn to lock.

- Position square channelled rubber gasket (E) on the flue hood outlet of the boiler, channel facing downwards.

- Pass the flue assembly through the wall and seat turret (B), onto the flue outlet, secure with 4 screws provided.

**N.B.** The terminal must extend 13 mm (0.5 in) past the surface of the external wall.

- Fit wall plate (F) provided with mastic sealing ring over air duct to structure.

- Make good internal wall face where the air/flue duct assemblies exit the room.

- Do not fit plastic turret cover 'D' until electrical connections have been made.



## 4.11

### Fitting the flue over 700 mm long

- Assembly is precisely as detailed in section 4.10 using the requisite number of extension flue and air ducts. In particular note the following.
- The standard flue duct is always used (both sections) at the appliance end (uncut).
- The standard air duct is always used at the terminal end (uncut).
- When cutting, always cut one extension flue duct and the same amount from one extension air duct. Always cut the plain end **NOT** the socket end.
- Full details of dimensions and assembly are given in figs. 2 or 3 as applicable.
- If internal fixtures prevent the assembled ducts being passed through the wall from the inside, the ducts may be pushed through from outside (remove the locking ring (C) and O ring first).

## 4.12

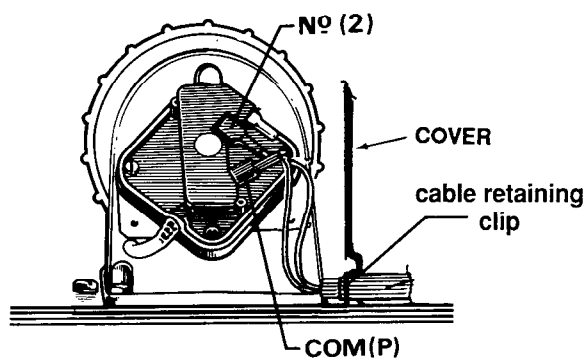


Fig. 26

### Connection to the pressure switch

- The two wires on the harness must be connected.
  - Push spade terminals onto tags COM (P) and No (2) – the common and normally open contacts – polarity immaterial.
  - Fit turret cover (D) (fig. 25) ensuring that both the air tube and cables are not trapped, with the **cable retaining clip** positioned as shown, see fig. 26, within the cover.
- N.B.** NC (1) Terminal is not used.

## 4.13

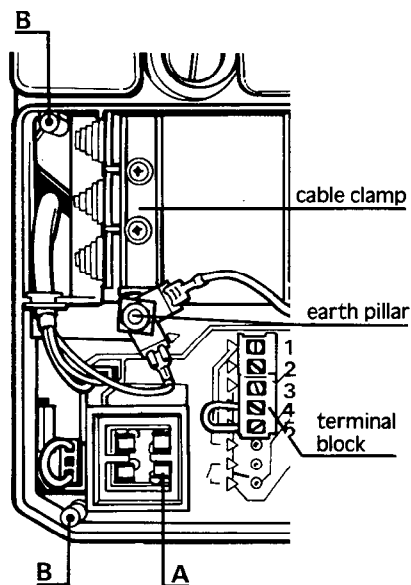


Fig. 27

### Making the electrical connection

**N.B.** See Section 2.6 for electrical supply requirements  
THIS APPLIANCE MUST BE EARTHED.

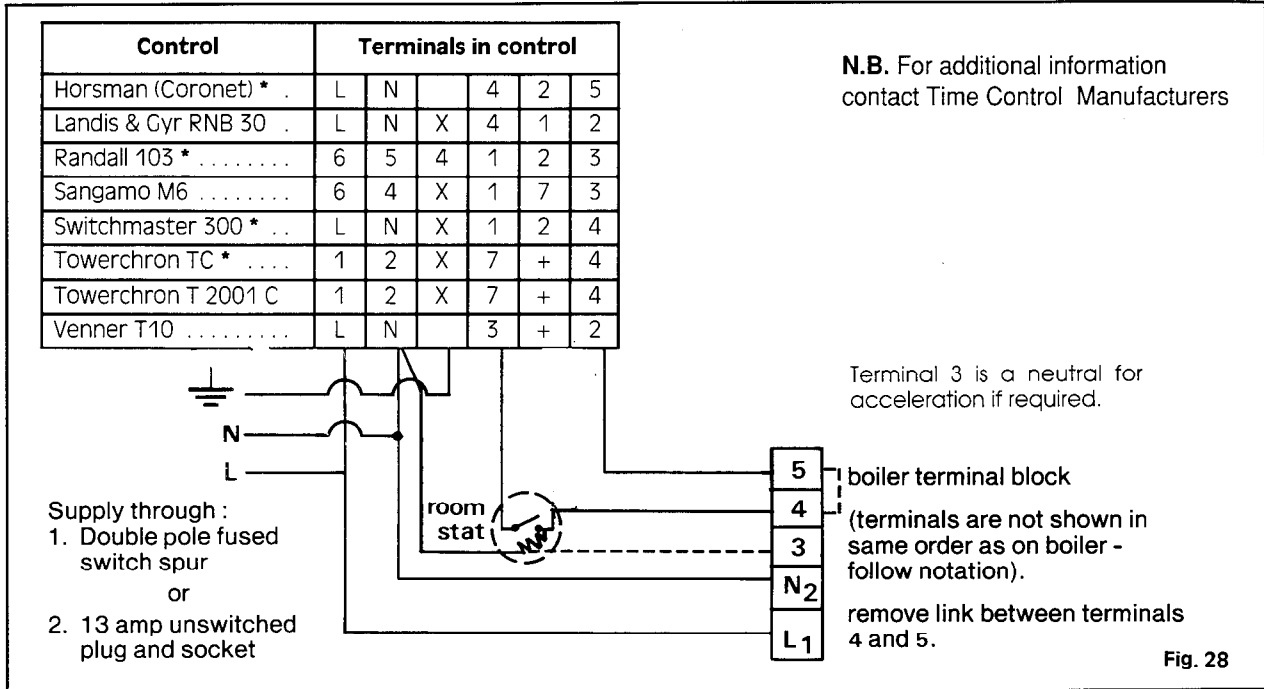
- Pull out fuses (A).
- Remove two screws (B).
- Open door to left hand side of electrical box.
- Cut the cable entries to the size of the cable being used which should not be less than 0.75 mm<sup>2</sup>.
- Remove cable clamp.
- Connect permanent live to (L) (Ph) and neutral to N.
- Connect earth to earth pillar (⏏).
- Connect external controls - time clock room thermostat etc. across terminal 4 and 5, (sections 5.1-5.5).
- Secure cables with cable clamp and locate flex into clip on boiler chassis.
- Close door and secure with two screws.
- Replace fuses.

**N.B.** The length of the earth wire between the cable clamp and the terminal must be such that the live and neutral wires become taut before the earth wire if the supply cord is pulled.

In the event of an electrical fault after installation preliminary electrical system checks must be carried out. Checks to ensure electrical safety should be carried out by a competent person i.e earth continuity, polarity and resistance to earth.

Use only voltage free external control switching. No supply voltage should be connected to terminals 3, 4 or 5.

## 5. EXTERNAL CONTROLS



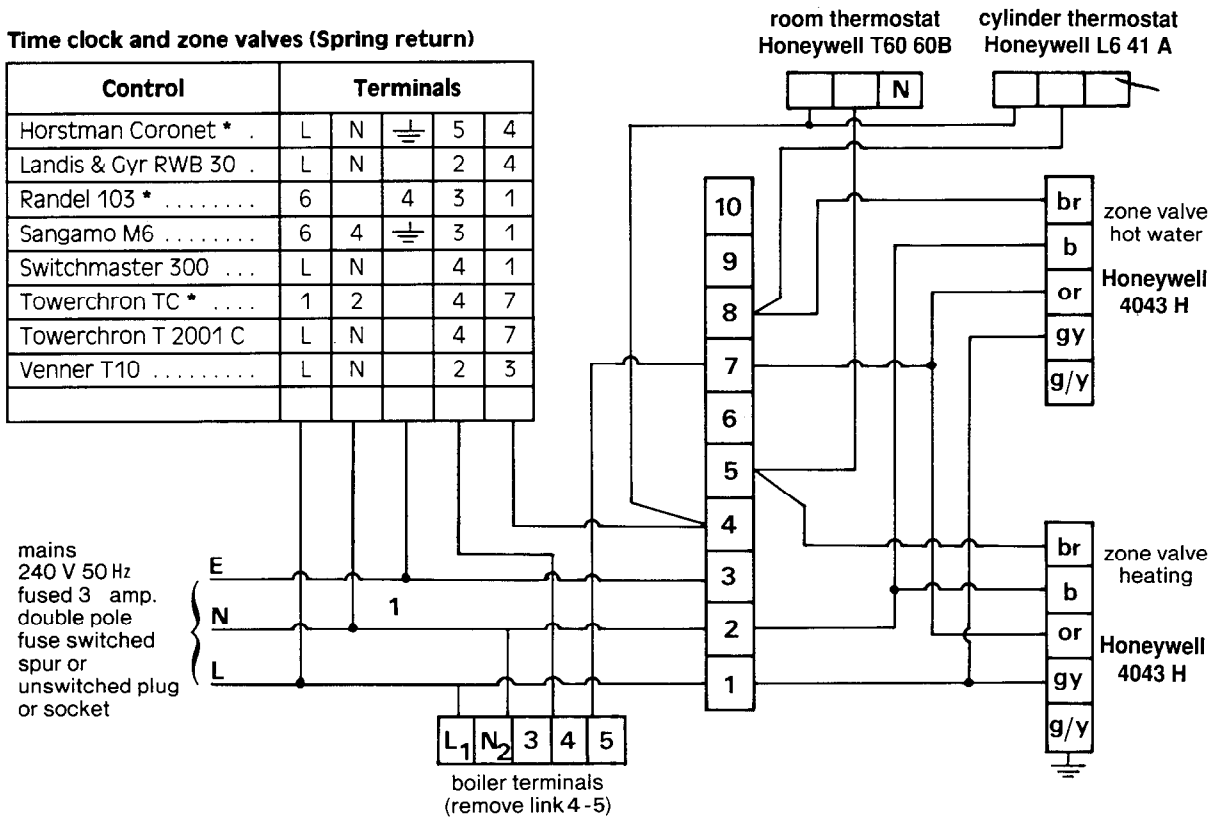
### 5.1 Time clock - Time clock and room stat

- The time clock contacts **must** be voltage free (remove external links).
- The room stat accelerator should be connected if fitted.
- Supply fuse valve 3 amp.

- NB.** 1) X in table indicates no earth connection in time clock.  
2) \* in table indicates that external links on time clock must be removed.  
3) + in table indicates no 'spare' connection in time clock so a connector will be required.

### 5.2 Time clock and zone valves (Spring return)

Control	Terminals				
Horsman Coronet *	L	N	⊕	5	4
Landis & Gyr RWB 30	L	N		2	4
Randel 103 *	6		4	3	1
Sangamo M6	6	4	⊕	3	1
Switchmaster 300	L	N		4	1
Towerchron TC *	1	2		4	7
Towerchron T 2001 C	L	N		4	7
Venner T10	L	N		2	3



### 5.3

#### Programmer and zone valves

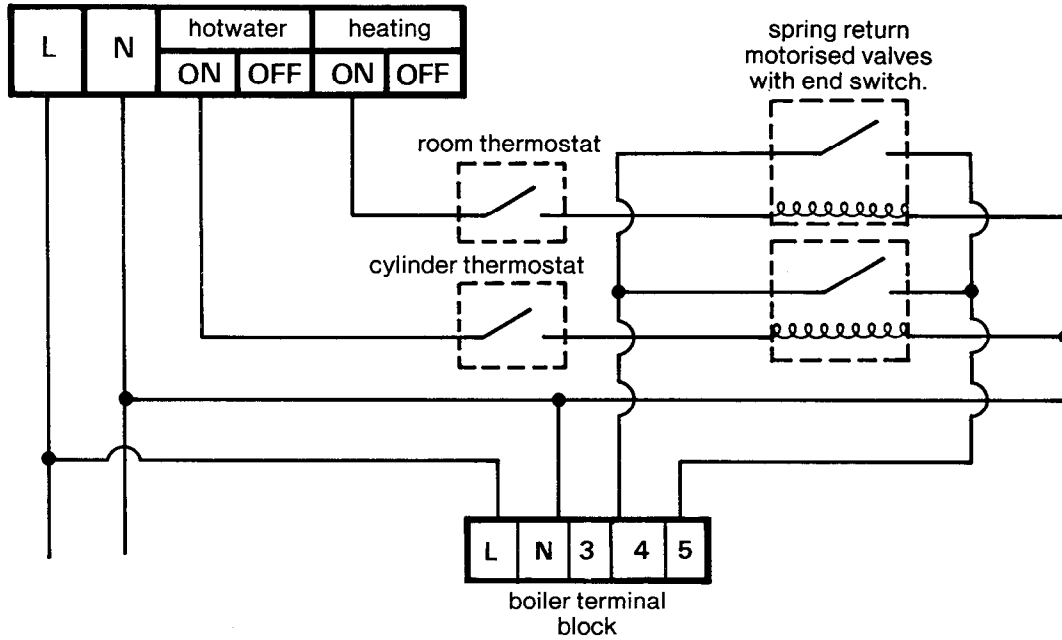


Fig. 30

### 5.4

#### Honeywell Y plan, Satchwell flow share or Satchwell mini valves to control zones.

Refer to controls manufacturers literature. Live to relay coil is the wire in their literature which carries the signal to the boiler.

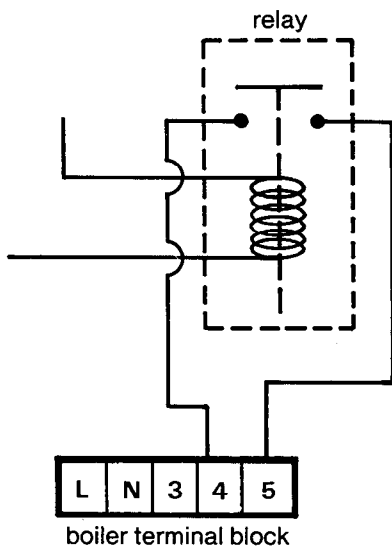


Fig. 31

### 5.5 Frost thermostat.

The appliance is protected by integral frost thermostats.

It is advisable to protect the system from frost damage by fitting an additional remote frost thermostat which will over ride the controls whilst the selector switch is set to hot water + central heating (H).

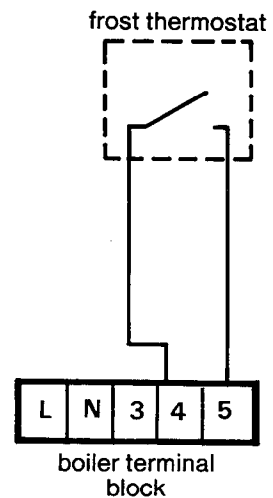


Fig. 32

## 6. COMMISSIONING

### 6.1

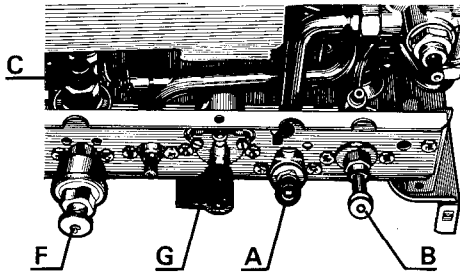


Fig. 33

#### Hot water circuits - filling

- 1) Check that stop cocks up stream of appliance are of a fixed jumper type.
- 2) Open mains cold water inlet valve (fig. 33) (A)
- 3) Vent installation by opening taps and closing.
- 4) Check that "dead legs" have been eliminated
- 5) Check for water soundness and rectify if necessary.

### 6.2

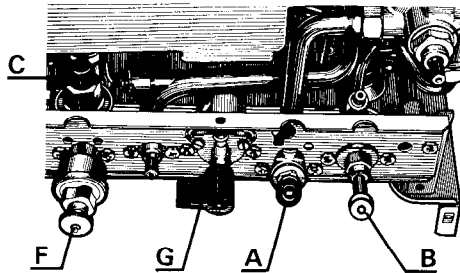


Fig. 34

#### Central heating circuits - filling

- 1) Ensure that the isolating valves are open (fig. 34 B and C). **N.B.** Valve (C) must be turned anti-clockwise by the knurled nut until it dislocates from the thread and then pulled out horizontally to its extremity (approximately 30 mm (1 1/4 ins)).
- 2) Fill system to charge condition, see section 3.
- 3) Vent radiators and any high points.
- 4) Vent automatic air separator/air purger by loosening screw (fig. 35) (E) two complete turns from closed position.  
**N.B.** Leave screw (E) in open position.

- 5) Set system charge pressure to design cold pressure. For a new installation we suggest 1.0 bar. For an old system see section (3, 9, 2) set to system static head or 0.8 bar which ever is the greater.
- 6) Check for water soundness and rectify any leaks.
- 7) Switch on electrical supply.
- 8) Manually check pump is free to rotate. Remove cap (fig. 35 D).
- 9) Switch to HOT WATER + CENTRAL HEATING on selector switch (A) (fig. 35) switch position (II).
- 10) Allow pump to run for further 10-15 minutes. Switch OFF.
- 11) Isolate water supply and drain boiler by disconnecting fill system and opening the drain valve (F). This is incorporated in the safety valve and is achieved by screwing down the head until the valve lifts. Open all low level drain cocks.
- 12) Remove filter in the return isolating valve (C) and inspect for any installation debris, see section (7.6) to clean and replace.
- 13) Refill system as above.

### 6.3

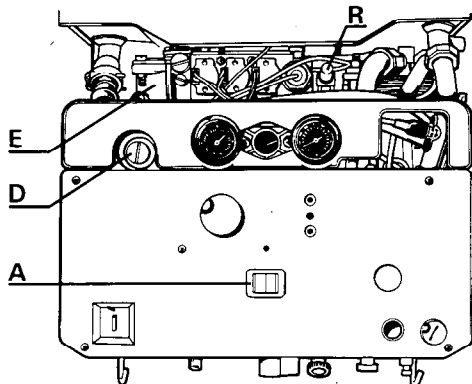


Fig. 35

#### **ATTENTION : COMMISSIONING IN COLD WEATHER**

This boiler is protected by two in-built frost thermostats. During cold weather the boiler may operate under the control of these thermostats.

This can happen under two conditions :

1. If the boiler temperature is less than 3° C (e.g. the boiler has been stored under very cold conditions) the fan will not run, the pump will operate continuously, it will still be possible to light the pilot but not the main burner.

Wait for a few minutes to allow the heat of the pilot to reset the safety controls permitting the main burner to fire.

2. If the boiler temperature is between 3° C and 11° C the frost thermostat will override the external controls. This will cause the main burner to fire for a few minutes and then turn off. This applies if the switch is in position I or II and is quite normal.

#### Lighting the boiler

- 1) Purge gas supply. Switch on electrical supply.
  - 2) Turn the lever on the gas service tap (fig. 34) (G) to the left. In the open position the flame sign is to the front.
  - 3) Temporarily locate the three blue control 'knobs' - one thermostat knob, one ignition button extension and one temperature control knob.
  - 4) Switch to HOT WATER + CENTRAL HEATING (II) on the selector switch (A). The fan will run at low speed.
  - 5) Press the ignition button (R) and hold in.
    - a) The fan will change to high speed to purge the combustion chamber. Gas is admitted to the pilot.
    - b) After approx 14 seconds the spark generator passes a continuous stream of sparks to light the pilot.
    - c) When the pilot is alight - viewed through the sight glass, wait for a further 5 seconds before slowly releasing the button.
  - 6) When the button is released, while the boiler is set to heating and any ancillary controls are in demand position, the boiler will fire.
  - 7) Check for gas soundness using leak detection fluid.
  - 8) Check and adjust gas pressure/gas rate, see Section 6.4
- N.B.** The thermocouple output should be checked at this stage, should be greater than 12 mv.

## 6.4

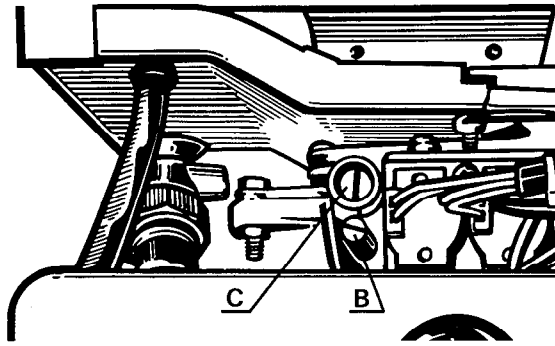


Fig. 36

### Gas rate adjustment

**N.B.** Before adjustment check gas pressure on the inlet to the appliance, with the appliance working - this should be 20 m bar (8 in wg) for natural gas.

The maximum gas rate on hot water is fixed and is a function of the restrictor size. The central heating variable adjuster is factory set at 100 % i.e for an output of approx 24.0 kW (81.900 Btu/h).

- 1) Switch boiler to the off (O) central position, see section 6.3 (fig. 35).
- 2) Remove the pressure test point screw - (B) and connect a suitable pressure gauge.
- 3) Remove the hexagonal cap from gas rate adjuster exposing the adjusting screw (C).
- 4) Switch the boiler to hot water and central heating (II) and check that any fitted external controls are calling for heat.
- 5) Adjust. Setting pressures are given in graph figs. 37 and 38. The pressure will be reduced by clockwise movement of screw, increased by anticlockwise movement. Now select hot water only, adjust temperature knob, see fig. 4 (25), to minimum and open the largest volume draw-off tap. The gas pressure should now be the maximum as indicated in Technical Data. Now reduce the water flow to minimum and check that the burner reduces its output, this will take a short period of time.
- 6) Switch boiler off (O). Remove pressure gauge and replace test point screw and gas rate adjuster hexagon cap. Check for gas soundness around screw.
- 7) Mark the data badge, located on the front of the combustion chamber below the sight glass to indicate output to heating system.

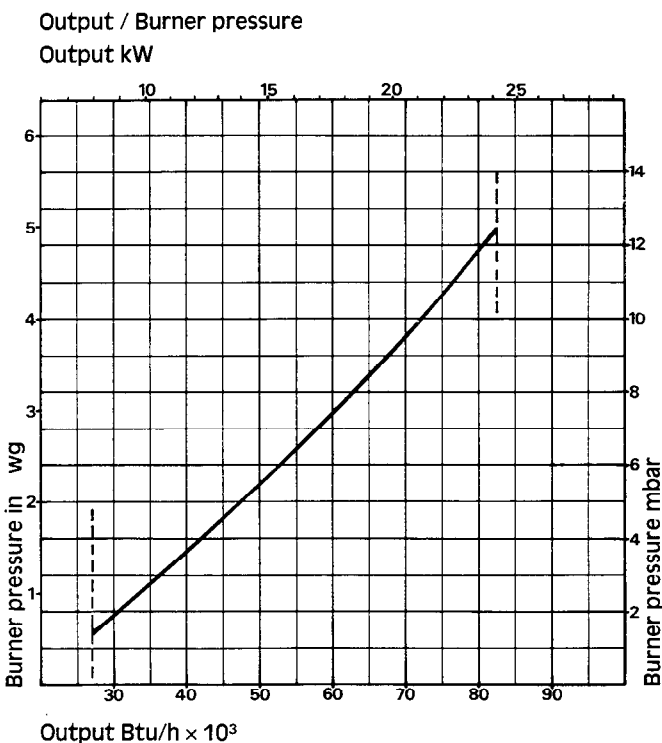


Fig. 37

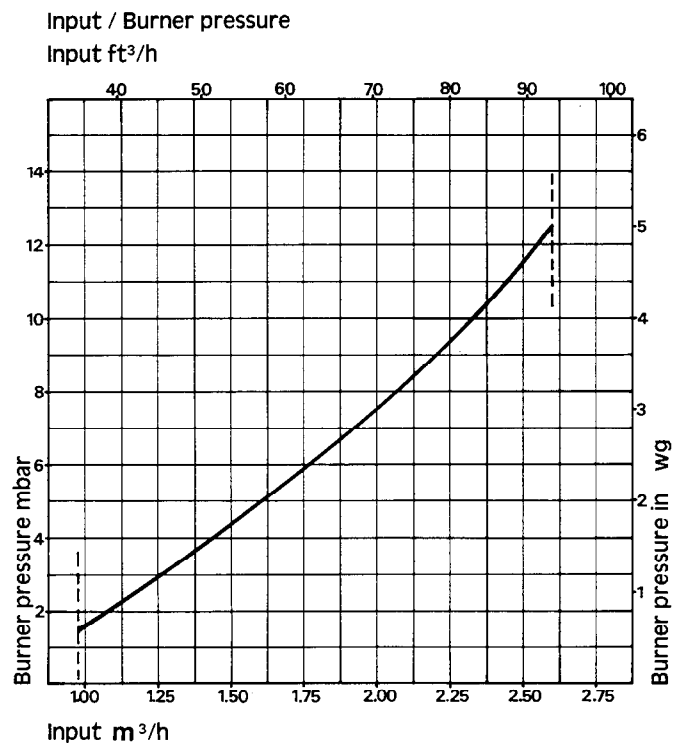


Fig. 38

## 6.5

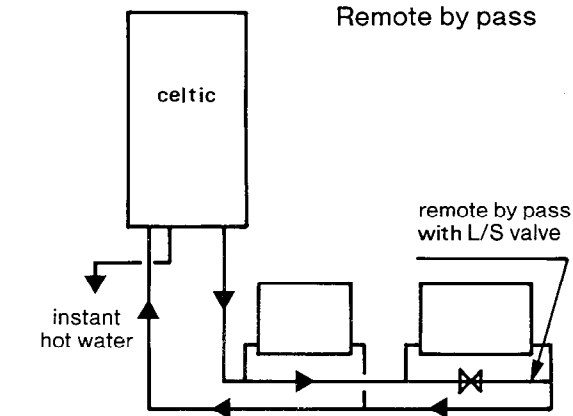


Fig. 39

### Adjusting the heating system by-pass

Where a by-pass is fitted, see section 3.2, it is necessary to adjust to obtain the boiler minimum flow requirement of 300 l/h (1.1 gal/min).

- 1) Set boiler thermostat to maximum, switch boiler to HOT WATER + CENTRAL HEATING (11).
- 2) Open all radiators and close the by-pass. Check the temperature rise across the boiler which should not be greater than 20° C (36° F).
- 3) Adjust system to minimum load. This is normally done by closing valves on all but two radiators.
- 4) Open by-pass gradually until the boiler operates quietly and the temperature rise is maintained.

**N.B.** The by-pass valve should be of the lock shield pattern. The flow switch operates at approx 300 l/h (1.1 gal/min).

## 6.6

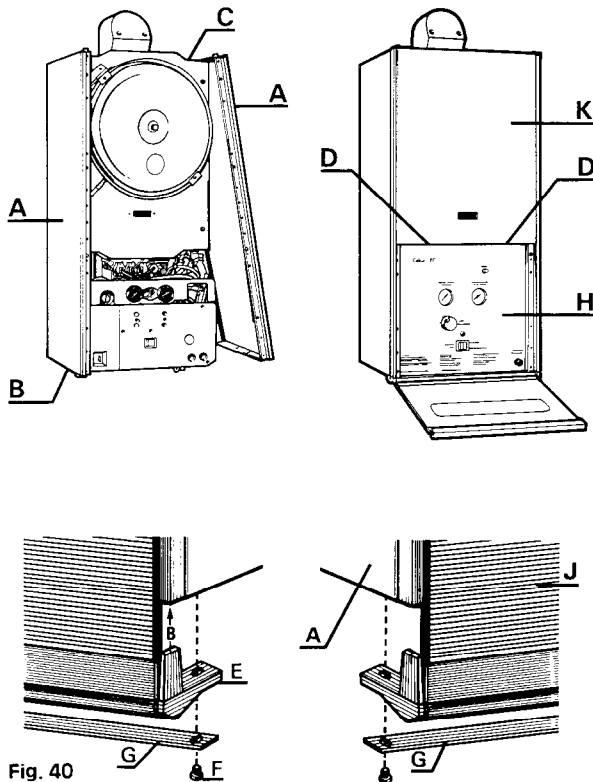


Fig. 40

### Fitting the casing

- 1) Take from the carton the controls cover (H), the glass door (J) the top front panel (K) and the side panels (A).
- 2) Remove control knobs used during testing and commissioning.
- 3) Fit side panels (A) and secure with screws at bottom rear (B).
- 4) Put the control cover (H) in position and secure with five screws.
- 5) Fit the front top panel over the pins at the top of the boiler (C) and secure with two screws at the bottom (D).
- 6) Fit the various control knobs, gas push button, and domestic hot water temperature selector.
- 7) To fit the glass door proceed as follows :

**N.B.** THE TIE ROD (G) MUST BE USED

- a) Remove the nuts from the machine screws securing the tie rod to the hinges.
- b) Offer the door up vertically. Engage part (E) in the profile of the right hand side panel. Fix assembly with screw from beneath (F).
- c) Pivot the left hand hinge and engage into profile of the left hand side panel. Fix assembly with screw from beneath.

## 6.7

HAND OVER THE USERS INSTRUCTIONS AND EXPLAIN THE BASIC FUNCTIONS OF OPERATING THE APPLIANCE. LEAVE THE INSTALLATION AND SERVICING INSTRUCTIONS ADJACENT TO THE GAS SERVICE METER. IF THE ELECTRICITY SUPPLY IS INTERRUPTED THE PILOT MAY HAVE EXTINGUISHED. WHEN THE SUPPLY IS RESTORED RELIGHT THE PILOT SEE SECTION 6.3

## 7. ROUTINE SERVICING

To ensure continued efficient and safe operation of the appliance it is recommended that it is checked and serviced annually. It is the law that any service work must be carried out by a C.O.R.G.I. Registered person. This routine service will normally be confined to :

- 1) Cleaning the burner.
- 2) Cleaning the heat exchanger.
- 3) Checking the gas controls.
- 4) Cleaning water filters and hoses.

The following schedules are recommended :

- a) Check the function of appliance, burner pressure and gas flow rate.
- b) Observe flame picture.
- c) Check, clean or replace components as necessary.

**N.B.** Before commencing any work turn off gas at the gas inlet tap (fig. 34) item (G) and ensure that the electricity supply is disconnected. Isolate water supply and drain Appliance if required.

### 7.1

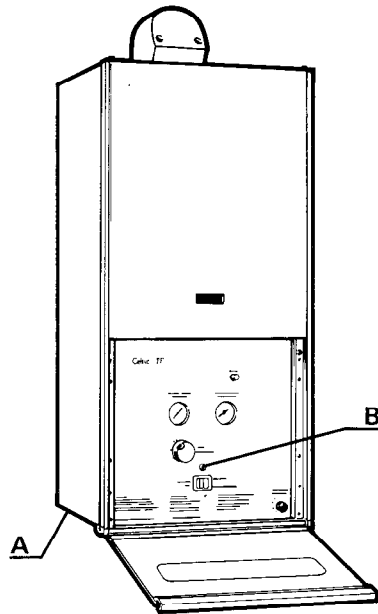


Fig. 41

#### Remove front casing

- a) Remove two screws (A) bottom rear of boiler.
- b) Remove screw (B) centre of lower front panel.
- c) Remove control knobs.
- d) Remove case by easing forward at bottom and lifting off lugs at top.

If necessary, remove the lower control cover (4 screws) and lift off the upper front panel before removing case.

### 7.2

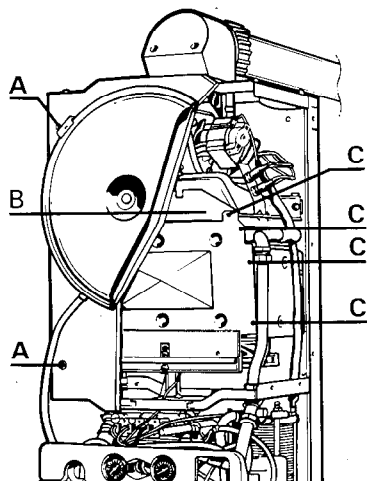


Fig. 42

#### To remove combustion chamber front panel and heating body panels to expose heat exchanger (primary)

- a) Remove four screws (A) securing the combustion chamber front panel.
- b) Lift off front panel complete with expansion vessel and hang on hooks provided below boiler through matching holes on top folded edge.

**N.B.** Alternatively support on worktop or floor to avoid damage to flexible tube.

- c) Remove eight screws (C) and lift off heating body front panel with access panel (B).
- d) Clean the heat exchanger after removing the burner and pilot, see section 7.7.

### 7.3

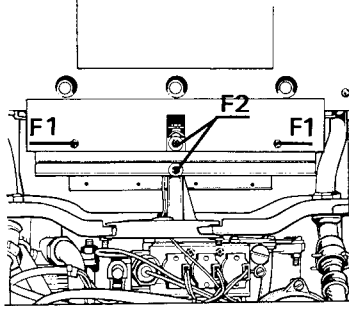


Fig. 43

#### Remove burner assembly

- Remove two screws (F1) and remove closure plate by withdrawing forward.
- Remove four screws (F2) and remove burner by withdrawing forwards, taking care not to trap ignition electrode lead.
- Remove gasket and retain in safe place, or if adhered to one surface, leave alone as removal may damage the gasket.
- To clean burner see action 7.7.

### 7.4

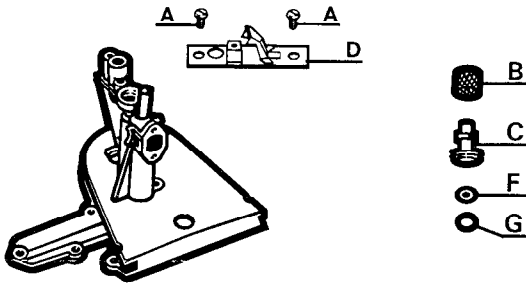


Fig. 44

#### To remove pilot

- Remove two screws (A) securing deflector plate and pilot head. Lift off deflector plate (D) taking care not to damage the electrode tip.
  - Remove pilot air filter (B).
  - Using a 7 mm spanner, remove pilot body (C) from pilot burner base.
  - Check injector and clean the filter.
- N.B.** The pilot injector (F) is retained in the base of the body with an 'O' ring (G). If the injector is replaced it is fitted bright side uppermost.
- Ensure deflector plate (D) is correctly located on the pilot.

### 7.5

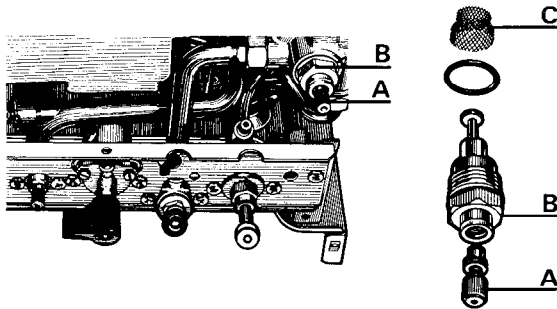


Fig. 45

#### To clean mains water inlet filter

- Isolate from mains water and drain from valve (A) beneath the change over valve.
  - Remove governor and filter (B) and (C).
  - Clean filter (C) grease governor spindle, using a high temperature silicone grease.
- N.B.** Take care upon removal of governor and filter, a spring is situated between the spindle and the screwed section. Ensure this is correctly replaced.

### 7.6

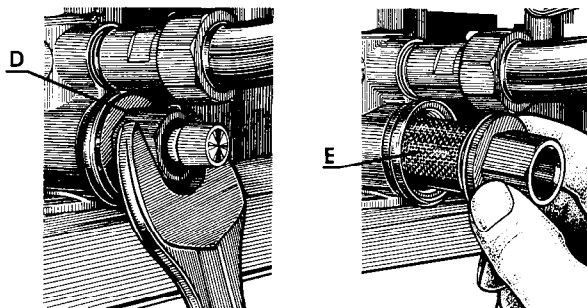


Fig. 46

#### To clean heating return filter

- Close heating flow and return valves (B and C) and drain through safety valve (F) »section 6.2).
  - Using spanner remove return valve spindle guide assembly (D).
- N.B.** Take care not to damage the capillary tube right hand side.
- Lift filter (E) off assembly.
  - Clean in warm water.
  - Replace in reverse order.
- Replace all components removed in reverse order.



## 7.7

### Cleaning and replacement of parts

- a) The burner can be cleaned by inverting and brushing with a soft brush. Inspect injectors, ensure they are clear.
- b) The heat exchanger flueways can be cleaned by thoroughly brushing the finned surface. After brushing inspect to ensure that the flueways are completely clear.
- c) The thermocouple can be wiped with a lint free cloth to remove any deposits. If the thermocouple tip appears burnt or cracked, exchange to avoid a possible break at a later date - see section 8.1
- d) Electrode : examine and clean, the tip, if the tip appears damaged replace electrode and lead assembly - see section 8.2
- e) Replace all components in reverse order noting particularly that the deflector plate - see section 7.4 D is correctly located on the pilot jet. The gasket between the gas section and the manifold must be correctly positioned upon reassembly.
- f) Open all isolation valves and repressurise system if necessary.
- g) Recommission and check controls.
- h) After the boiler is lit, check all gas connections for soundness.
- j) Allow the boiler to warm up thoroughly, then check the burner pressure and adjust as necessary to that given in the table for required output - see section 6.4
- k) Restore any sytem controls and clocks to their original setting.

## 8. REPLACEMENT OF PARTS

**N.B.** Before commencing ensure gas and electricity supplies are isolated.

### 8.1

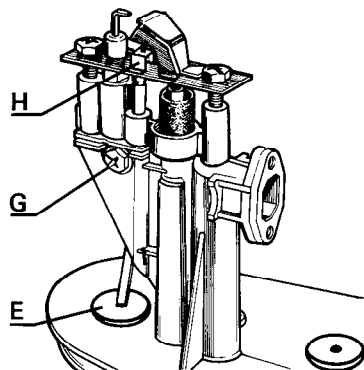


Fig. 47

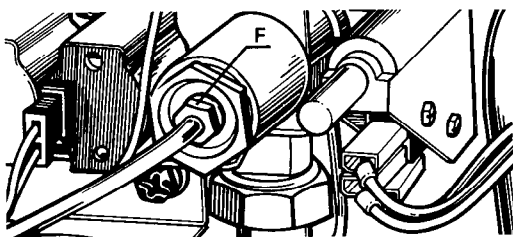


Fig. 48

### The remove thermocouple

- a) Remove front case, see section 7.1.
- b) Remove outer front panel, see section 7.2.
- c) Remove burner, see section 7.3.
- d) Disconnect high limit stat see section 8.3.
- e) Remove thermocouple from thermoelectric valve connection (F).
- f) Loosen securing screw (G) two full turns to relieve tension from locking spring.
- g) Remove thermocouple by sliding down through gas section.
- h) Remove grommet (E) from base of combustion chamber.
- j) Carefully form a 4 inch radius to thermocouple and insert thermocouple into combustion chamber (pathx).
- k) Slide grommet (E) over the thermocouple.
- i) Continue feeding the thermocouple into its location until it is hard against the thermocouple stop H in the pilot head.
- m) Tighten fixing screw (G), previously loosened.
- n) Reposition grommet in base of combustion chamber.
- o) Form the new thermocouple and connect to thermoelectric valve (F).
- p) Reconnect high limit thermostat.

**NOTE :** When replacing the thermocouple the conductor may need manipulating - avoiding bending at acute angles.

## 8.2

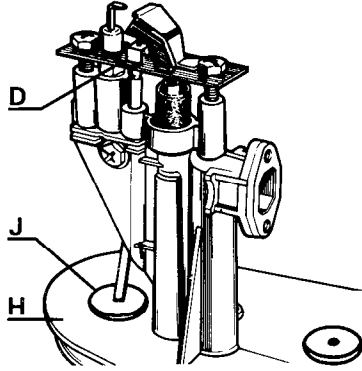


Fig. 49

### To replace electrode and lead assembly

- a) Remove front case, see section 7.1
- b) Remove outer front panel and combustion chamber front panel, see section 7.2
- c) Remove burner, see section 7.3
- d) Remove deflector plate (D), see section 7.4
- e) Disconnect from electrical box by pulling off electrode lead at lower left hand rear.
- f) Feed cable up through gas section (H) removing grommet (J).
- g) Remove electrode by pulling upward from location groove.
- h) Replace in reverse order locating electrode in deflector plate (D), spark gap 5 mm.

## 8.3

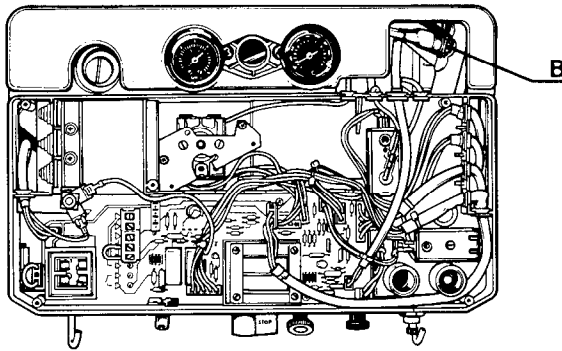


Fig. 50

### To replace safety overheat thermostat

- a) Remove front case, see section 7.1
- b) Remove two screws securing high limit thermostat to bracket (B).
- c) Remove high limit stat and thermocouple see 8.1.
- d) Withdraw noting route
- e) Replace in reverse order. Use heat sink grease between high limit stat and bracket (B)

## 8.4

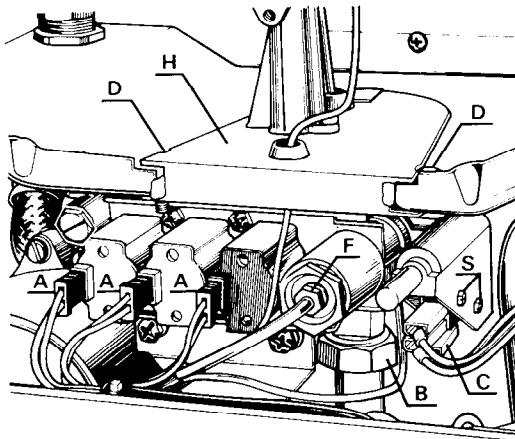


Fig. 51

### To replace ignition microswitch

- a) Remove front case, see section 7.1
  - b) Remove outer front panel and combustion chamber front cover, see section 7.2
  - c) Remove burner see section 7.3
  - d) Remove electrical control box, see section 8.9
  - e) Remove plugs from solenoid valves (A), noting colours.
  - f) Pull off three tab connectors (C) from microswitch noting their position (blue top, red centre, black bottom).
- Note :** Microswitch connections must be made in accordance with wiring diagram. (fig. 9)
- g) Release gas union (B).
  - h) Remove the two screws (D) retaining gas section.
  - i) Slide out gas section (H) by pulling forwards (comprises solenoid valves, gas valve, pilot assembly electrode, etc).
  - k) Remove two screws (S) retaining microswitch.
  - m) Remove microswitch.
  - n) Replace in reverse order.

## 8.5

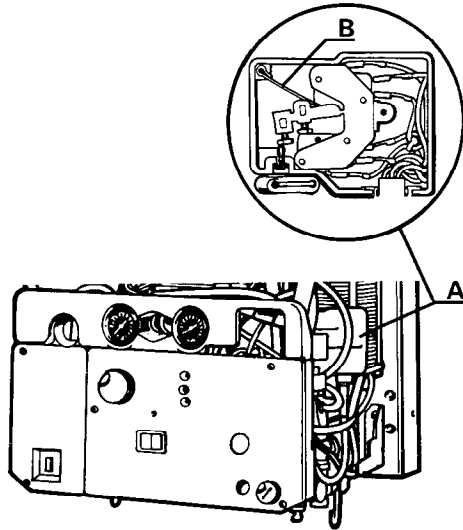


Fig. 52

### To replace change over valve microswitch

- a) Remove front case, see section 7.1
- b) Undo screw (A) and remove microswitch box cover.  
**N.B.** Upper microswitch operates for D, H, W mode. Lower microswitch operates for C, H mode.
- c) Lift spring (B) and pull operating lever off mounting pins.
- d) Remove respective microswitch from mounting pins.
- e) Note colour code and pull off electrical tags.
- f) Replace in reverse order.

When replacing box cover, ensure that the lugs on the connector block are clamped **inside** the box.

**N.B.** Refer to fig. 9 for colour codes.

## 8.6

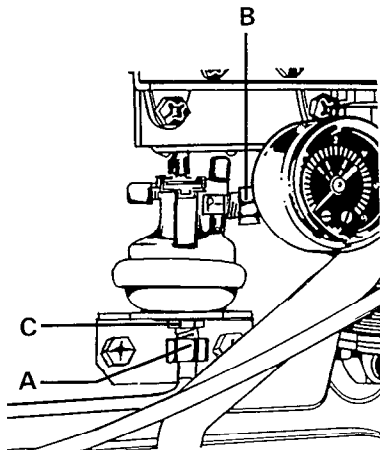


Fig. 53

### To replace the flow switch assy

- a) Remove air separator see section 8.13
- b) Disconnect high pressure tube at union A.
- c) Disconnect low pressure tube at union B.
- d) Undo retaining nut C.
- e) Remove assembly by lifting up and forward.
- f) Replace reverse order.

## 8.7

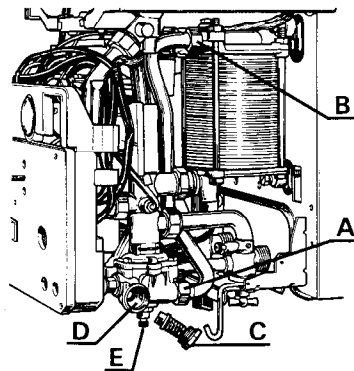


Fig. 54

### To replace venturi

- a) Remove front case, see section 7.1
  - b) Isolate from mains water and drain down from valve (E).
  - c) Undo union (A) at rear of change over valve.
  - d) Loosen union (B) on secondary heat exchanger and move pipe to one side.
  - e) Remove plug, spring and plastic valve (C) from right hand side of change over valve.
  - f) Use small screw driver to gently push out venturi ensure screw driver does not enter throat of venturi.
- N.B.** The venturi is contained within the union (A) and can be removed using access at (D).
- g) Replace in reverse order.

## 8.8

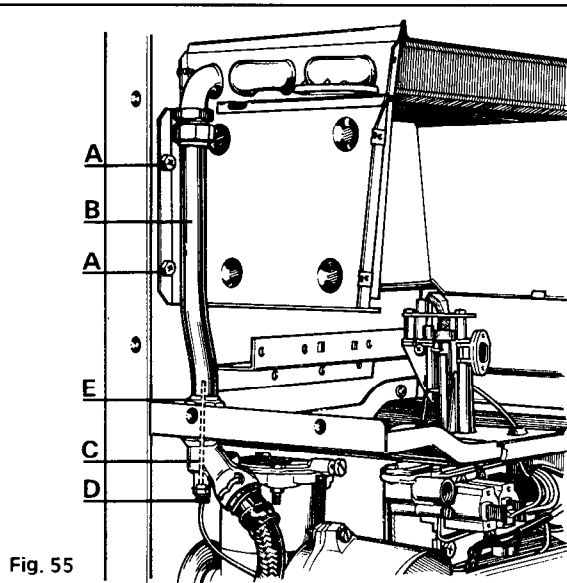


Fig. 55

### To replace primary heat exchanger

- a) Remove front case, see section 7.1
  - b) Isolate appliance from system by closing heating flow and return valves (B and C), see fig. 34.
  - c) Drain boiler (primary side) through safety valve (F) (fig. 34).
  - d) Remove combustion chamber panels, see section 7.2
  - e) Remove burner, see section 7.3
  - f) Remove 14 screws holding left and right hand side combustion chamber panels.
  - g) Pull out lower split pin (D) and remove boiler thermostat sensing phial (C).
  - h) Remove four screws (A) securing combustion chamber to chassis.
  - i) Undo bottom flow and return pipe unions (E) and slide primary heat exchanger forwards with flow pipes and heating body (three sides) to remove.
- N.B.** To replace, the flow pipe unions need to be made on to the heat exchanger before refitting. Check that bottom unions align correctly before continuing.

## 8.9

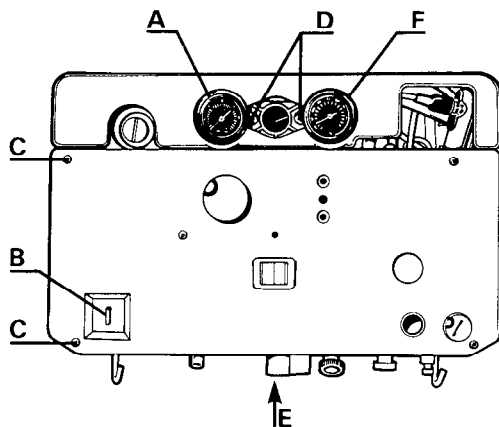


Fig. 56

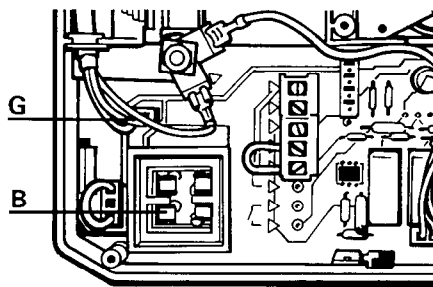


Fig. 56a

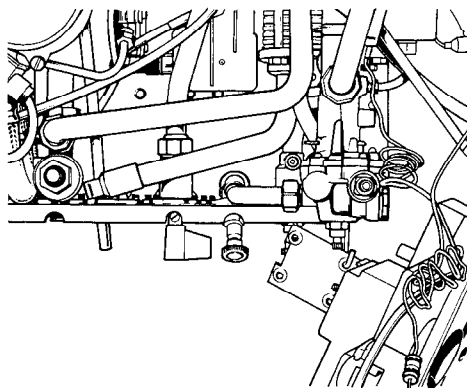


Fig. 56b

### To remove electrical control box

- a) Remove front casing, see section 7.1
- b) Remove fuses by pulling fuse carrier (B) from electrical box.
- c) Remove five screws (C) lift electrical box cover away and unplug from PCB.
- d) Remove temperature gauge by easing off from by pass tube see section 8.33
- e) Pull off plug from solenoid valves (note cable colours match solenoid case colours).
- f) Unplug pump connector and earth wire from PCB.
- g) Unplug connector to change over valve.
- h) Unplug three leads from ignition microswitch.
- i) Unplug connector of frost thermostat from PCB.
- k) Unplug connector from fan leads at PCB.
- l) Remove one screw (D) and two screws (E). (Electrical box support bracket to lower chassis).
- m) Carefully ease electrical box forward to allow access to flow switch lead, also to electrode at bottom rear of box.
- n) Disconnect lead from flow switch.
- o) Disconnect electrode from rear of electrical box.
- p) Carefully move the electrical box away from the appliance and to the right whilst straightening the capillary tube from boiler control thermostat and domestic hot water thermostat.
- q) Continue moving electrical box until bottom support bracket can be positioned on hook at bottom of appliance, see fig. 56 B.

To remove the electrical box completely, continue in the following manner :

- r) Isolate appliance from the system by closing valves A, B and C, see Section 6.2 (Fig. 34).
- s) Drain secondary side by opening drain plug (H) (fig. 34).
- t) Drain primary side through safety valve (F) (fig. 34).
- u) Remove clip and phial from boiler thermostat pocket.
- v) Remove clip and phial from DHW thermostat pocket.
- w) Remove split pin and phial from limit thermostat pocket.
- x) Remove box completely.

To replace electrical box in reverse order note :

- a) Hang box on hook.
- b) Capillaries must be routed behind any pipework except the boiler control thermostat capillary which must be routed behind the expansion vessel pipe.
- c) Connect three leads to ignition microswitch prior to locating the electrical box.

## 8.10

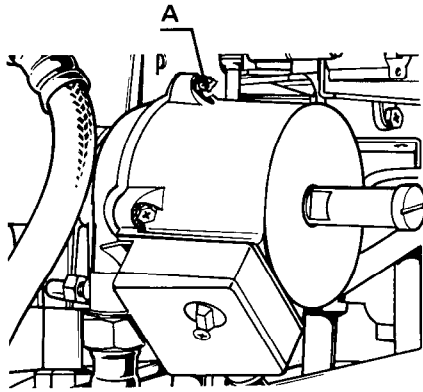


Fig. 57

### To replace pump head

- a) Remove front case, see section 7.1
- b) Remove electrical box see section 8.9
- c) Isolate boiler from system by closing flow and return valves see section 6.2 (B and C).
- d) Drain boiler (primary side) through safety valve see section 6.2 (F).
- e) Remove four screws (A)
- f) Remove pump head noting orientation.
- g) Take off electrical connection cover by removing screw.
- h) Remove lead and transfer to new pump head.
- j) Replace in reverse order.
- k) Open flow and return valves. Top up system if necessary.

## 8.11

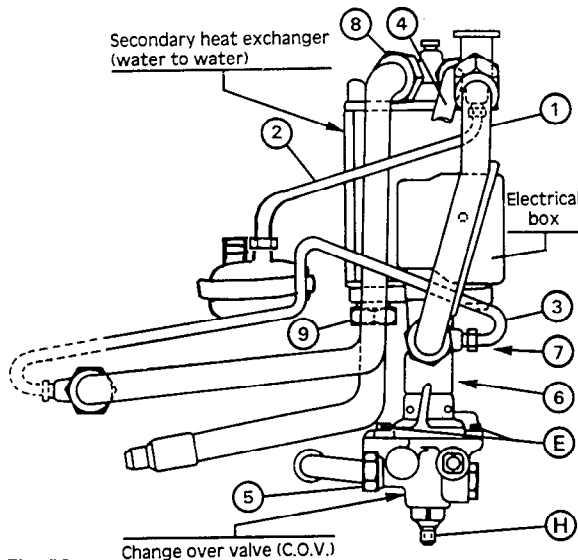


Fig. 58

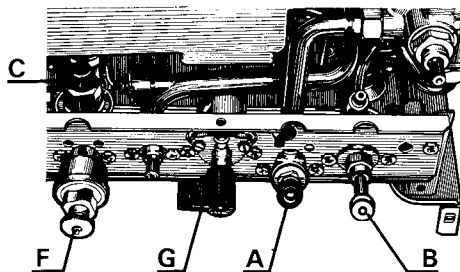


Fig. 58a

### To replace change over valve (C, O, V)

- a) Remove front case, see section 7.1
- b) Disconnect and remove electrical box, see section 8.9
- c) Turn off main water at valve see section 6.2 (A).
- d) Turn off central heating flow and return valves see section 6 (B)
- e) Drain secondary side by opening drain plug on bottom of change over valve (H).
- f) Unplug thermocouple connectors in cables to safety overheat thermostat.
- g) Remove front tube (1) from change over valve complete with safety overheat thermostat.
- h) Remove flow pressure tube (2) from heat exchanger to flow switch.
- i) Remove tube (3) from C, O, V, to return valve.
- N.B.** Swing microswitch box to give access to union nuts.
- j) Remove rear tube (4) from C, O, V, to secondary heat exchanger.
- k) Unscrew union nut (5) of mains water inlet to C, O, V.
- l) Unscrew heating return tube nut (6) from C, O, V.
- m) Unscrew union nut (7) of C, O, V, to secondary heat exchanger.
- n) Remove C, O, V.
- o) To inspect diaphragm remove four screws (E) securing valve to water section.
- N.B.** Do not remove spring clips.
- p) Clean or replace diaphragm.
- q) Flush out water section.
- r) Replace in reverse order.
- s) Open flow and return valves. Top up system if necessary.

## 8.12

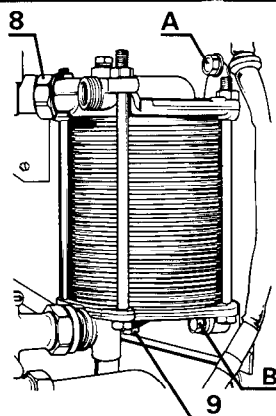


Fig. 59

### To replace secondary heat exchanger

- a) Remove front case, see section 7.1.
- b) Disconnect and remove electrical box, see section 8.9
- c) Remove change over valve, see section 8.11.
- d) Unscrew union nut (8) at top of secondary heat exchanger.
- e) Unscrew bottom left hand union nut (9) of secondary heat exchanger.
- f) Slacken top screw (A) of heat exchanger to chassis.
- g) Remove bottom screw (B) and spacer.
- h) Remove secondary heat exchanger.
- i) Replace in reverse order.
- N.B.** Do not unscrew the four tie rods in the secondary heat exchanger.

## 8.13

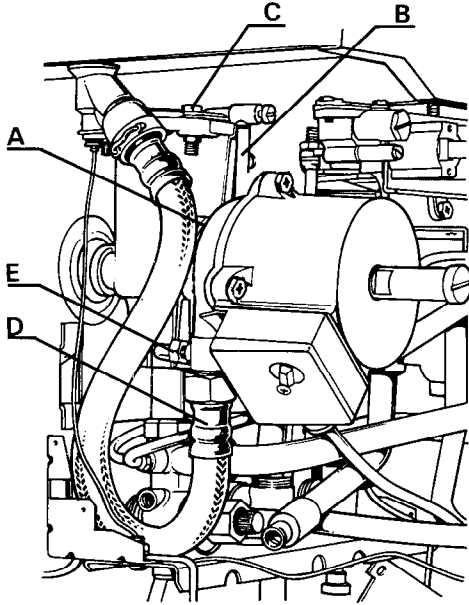


Fig. 59a

### To replace air separator

- a) Remove front case, see section 7.1
- b) Remove electrical box see section 8.9
- c) Close heating flow and return valves (B & C), see section 8.11 (fig. 58 A).
- d) Drain boiler down through safety valve (F), see section 8.11 (fig. 56).
- e) Disconnect bleed pipe union from pump volute (E).
- f) Pull off plastic drain tube (B).
- g) Pull out spring clip (A) with pliers.
- h) Disconnect flexible pipe union (D) at pump outlet.
- j) Pull pump complete with volute forwards and remove.
- k) Disconnect union nut at base of air separator.
- m) Ease air separator forward and disengage integral peg from chassis.
- n) Remove four screws (C) retaining cap.
- o) Lift out float.
- p) Clean float and inspect valve.
- q) Replace in reverse order. Ensure that washer is replaced in lower union of separator.
- r) Open flow and return valves. Re-pressurise system if necessary.

## 8.14

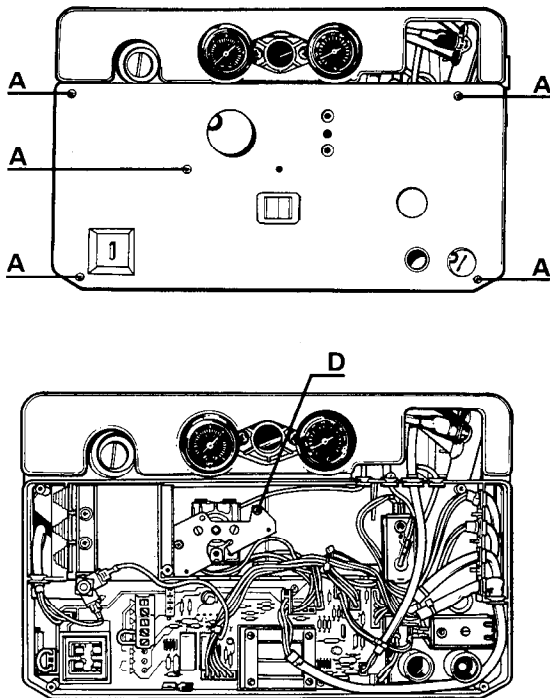


Fig. 60

### To replace boiler thermostat

- a) Remove front case see section 7.1.
- b) Remove five screws (A) and remove electrical box cover. Unplug from the PCB the single connector for the switch.
- c) Remove clip retaining thermostat phial see section 8.8 fig. 55 (D) in pocket - remove phial section 8.8 fig. 55 (C) **N.B.** Primary water must be drained from appliance
- d) Remove two screws (D) which secure boiler thermostat onto moulded pegs in electrical box.
- e) Remove the spade connectors noting position, see illustrated wiring diagram fig. 9.
- f) Feed out capillary through electrical box having removed the split grommet.
- g) Replace in reverse order.

## 8.15

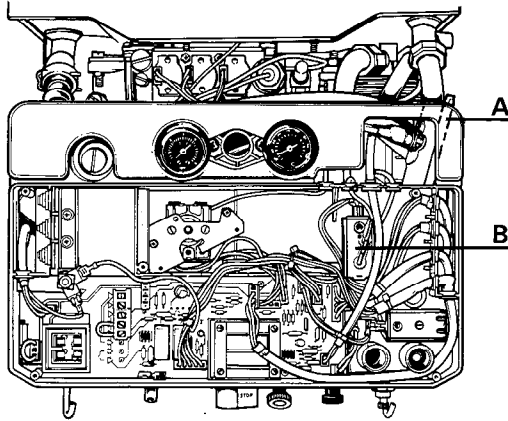


Fig. 61

### To replace boiler limit thermostat

- a) Remove front case, see section 7.1
  - b) Remove electrical box, see section 8.9
- N.B.** Thermostat is situated to right top of electrical box, sensor in pocket on flow pipe on right hand lower side.
- c) Remove split pin from dry pocket on flow pipe (A).
  - d) This thermostat is located on moulded pins - ease forward and remove spade connectors.
  - e) Feed capillary through the control box having removed the split grommet.
  - f) Replace in reverse order (polarity immaterial).

## 8.16

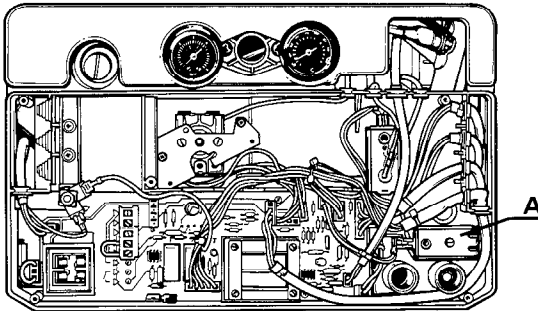


Fig. 62

### To replace domestic hot water thermostat

- a) Remove front case see section 7.1
- b) Remove electrical box front cover see section 8.9 (c).
- c) Isolate mains water supply - drain from valve beneath the change over valve, see section 8.11 fig. 58 (H).
- d) Remove clip which retains phial in wet pocket.
- e) Remove phial from pocket.
- f) Ease thermostat off moulded pegs and pull off of spade connections.
- g) Feed capillary through the control box, having removed the split grommet.
- h) Replace in reverse order. Polarity immaterial.

## 8.17

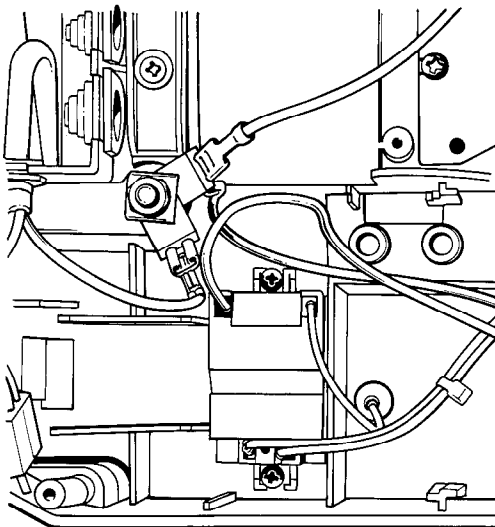


Fig. 63

### To replace spark generator

- a) Remove front case see section 7.1
  - b) Remove electrical box cover see section 8.9 (C).
  - c) Remove PCB see section 8.18.
  - d) Remove insulating separator board (behind PCB).
  - e) Pull tab connections from spark generator noting position.
  - f) Slacken bottom fixing screw and remove top screw from generator.
  - g) Lift up off bottom screw and pull forwards.
  - h) Replace in reverse order. (Connect leads before locating generator).
- N.B.** Ensure earth is connected and when re-positioning insulated separator board, wires must pass through cut outs.

## 8.18

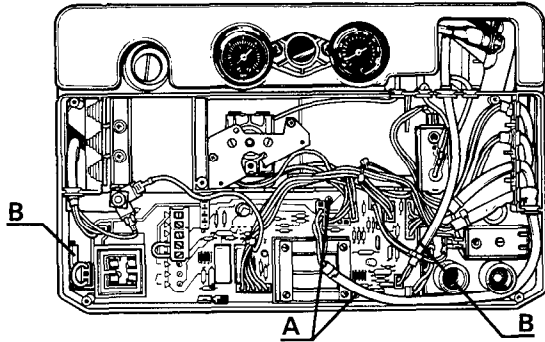
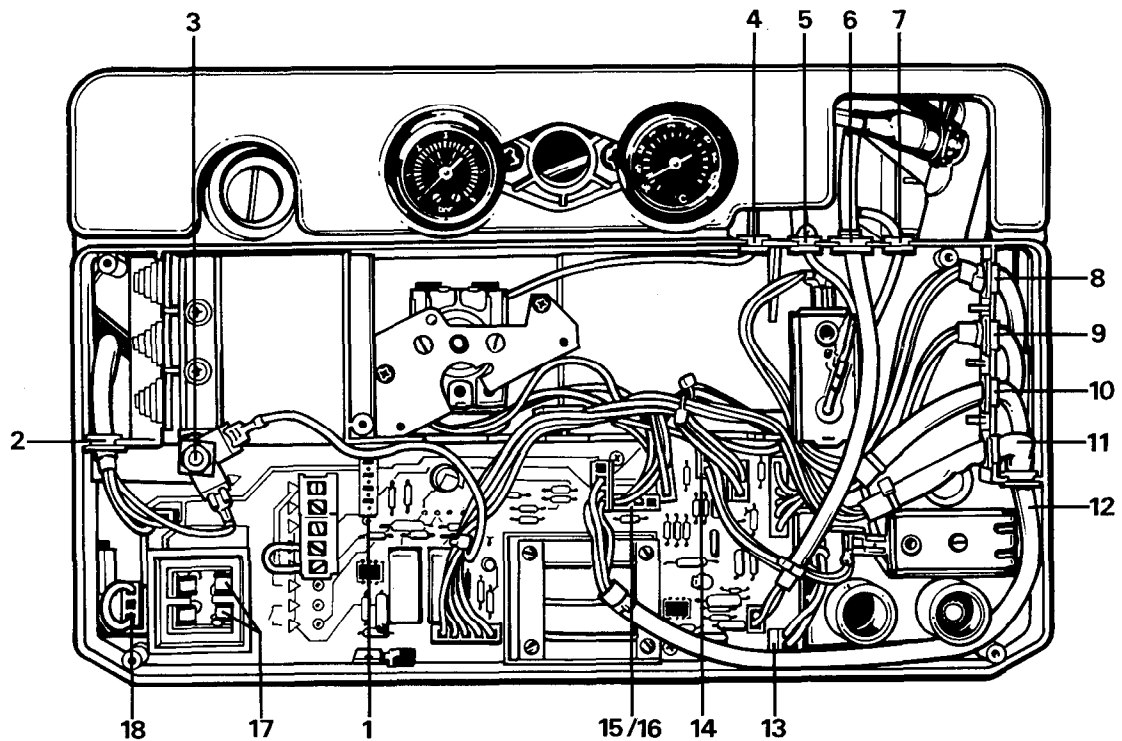


Fig. 64

### To replace printed circuit board (PCB)

- a) Remove front case, see section 7.1
- b) Remove electrical box front cover see section 8.9 (C).
- c) Remove all plug-in connections (10).
- d) Disconnect mains input cable at terminals 1 and 2 but not the earth.
- e) Disconnect external controls, if fitted, from terminals 4 and 5.
- f) Remove two screws (A).
- g) Ease back plastic catches (B) at left and right side of PCB.
- h) Remove by pulling to the left and forward, disengage from guide - centre bottom and top.
- j) Pull PCB forward.
- k) Replace in reverse order.



- |                               |                               |                      |
|-------------------------------|-------------------------------|----------------------|
| 1 Summer/Winter Switch        | 7 D.H.W. Thermostat Capillary | 13 Igniter           |
| 2 Pump                        | 8 Change Over Valve           | 14 D.H.W. Thermostat |
| 3 Earth                       | 9 Push Button Ignition        | 15 Boiler Thermostat |
| 4 Boiler Thermostat Capillary | 10 Solenoid Gas Valves        | 16 Limit Thermostat  |
| 5 C.H. Limit Thermostat       | 11 Fan                        | 17 Fuse              |
| 6 Water Flow Switch           | 12 Frost Thermostat           | 18 Not Used          |

### ELECTRICAL BOX SHOWING POSITION OF COMPONENTS WITH LAYOUT OF PLUGS AND WIRING.

Fig. 65



## 8.19

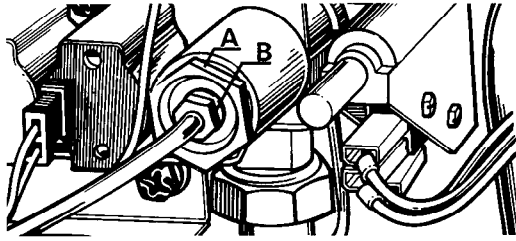


Fig. 66

### To replace thermoelectric valve

- a) Remove front case, see section 7.1
- b) Remove thermocouple connection (B).
- c) Remove nut (A) securing thermoelectric valve.
- d) Withdraw thermoelectric valve.
- e) Replace in reverse order.

**N.B.** Care should be taken when replacing the nut securing the thermoelectric valve - fine threads.

## 8.20

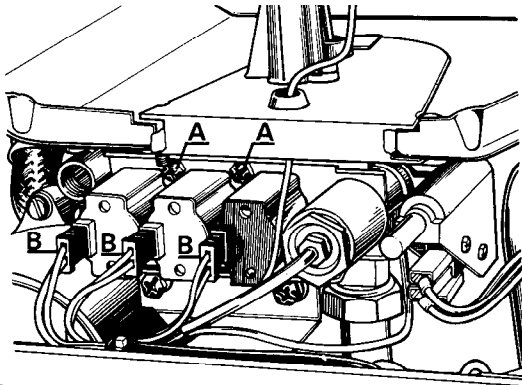


Fig. 67

### To replace solenoid valves

- a) Remove front case see section 7.1
- b) Withdraw plugs - colour coded - from solenoids (B).
- c) Remove four screws (A) securing valve mounting plate.
- d) Remove mounting plate and solenoids - take care not to misplace valve springs and plungers.
- e) Replace in reverse order using a NEW GASKET.

## 8.21

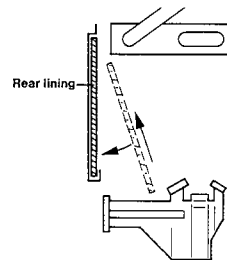


Fig. 68

### To replace heating body linings

- a) Remove case, see section 7.1
- b) Remove combustion chamber front panel with expansion vessel, see section 7.2 (A, B, C and D).
- c) Remove burner, see section 7.3
- d) First slide out side linings followed by rear which is removed by easing upwards and sliding out from bottom.
- e) Replace in reverse order.

## 8.22

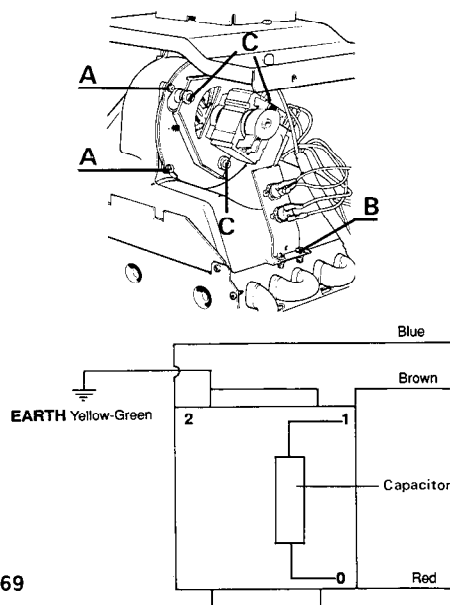


Fig. 69

### To replace fan

- a) Remove case see section 7.1
- b) Remove outer front panel see section 7.2
- c) Remove 7 screws right hand side of combustion chamber and lift off side panel.
- d) Pull off 4 spade connections from frost thermostats.
- e) Pull off 4 spade connections from fan.
- f) Remove four screws - two on flue hood (A) and two on support bracket (B).
- g) Turn anti-clockwise 10° to disengage lug from rear and withdraw assembly.
- h) Remove three screws securing motor to bracket (C) leaving grommet in bracket.
- j) Replace in reverse order using new gasket.

**N.B.** Ensure frost stat leads are paired i.e mauve on top white on bottom. Ensure correct location of fan connectors and that the lug at the rear is located correctly.

## 8.23

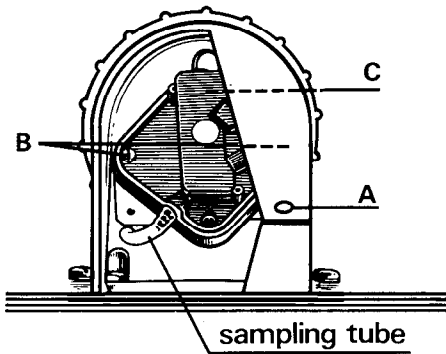


Fig. 70

### To replace pressure switch

- Remove two screws (A) retaining plastic turret cover and remove terminal cover.
- Note position of spade connectors and remove (COM-P and No 2).
- Disconnect pressure sampling tube by pulling off nipple.
- Remove two screws retaining pressure switch. **B**
- Replace in reverse order.

**N.B.** Ensure 'O' ring is position on rear of pressure switch to seal pressure switch - high pressure sample joint. Transfer 4 mm support screw (C) and nut onto the new switch.

## 8.24

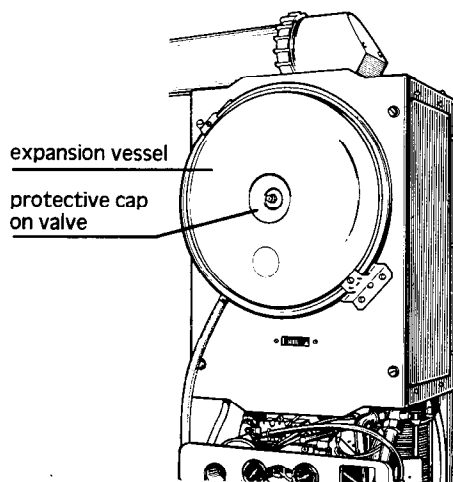


Fig. 71

### To re-pressurise expansion vessel

- Remove case see section 7.1
  - Close heating flow and return valves and drain boiler through safety valve, see section 6.2 fig. 34 (F).
  - Remove protective cap and check pressure on schroeder valve with gauge.
- N.B.** The setting pressure is 0.65 bar (9.5 psi)
- To re-pressurise use car foot pump or bicycle pump with adaptor.
  - Refill and commission boiler.

## 8.25

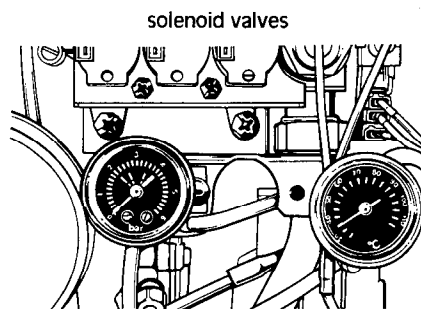


Fig. 72

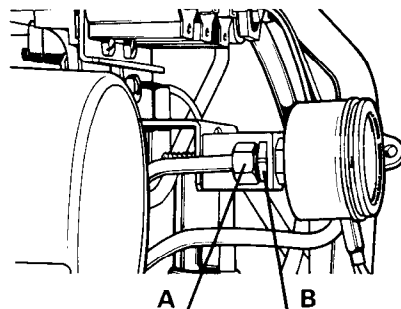


Fig. 73

### To replace pressure gauge

- Remove case see section 7.1
- Close heating flow and return valves and drain boiler through safety valve, see section 6.2 fig. 34 (F).
- Pull off connectors noting colour on solenoid valves to improve access.
- Undo union nut (A) on pressure tube at rear of gauge.
- Undo locknut (B) and withdraw gauge, taking care not to misplace washer.
- Replace in reverse order.
- Open flow and return valves. Re-pressurise system if necessary.

## 8.26

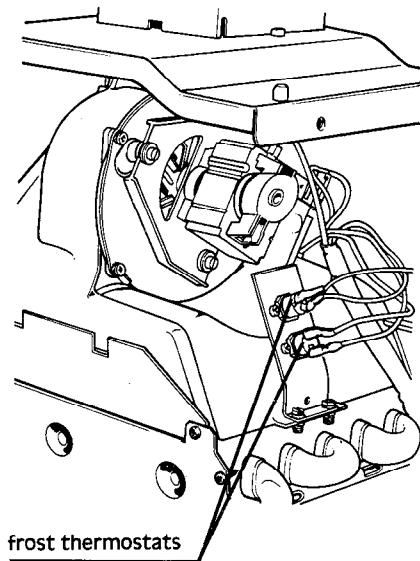


Fig. 74

### To replace frost thermostats

- a) Remove case, see section 7.1
- b) Remove outer front panel, see section 7.2
- c) Remove 7 screws securing right hand side panel.
- d) Remove leads from each thermostat.
- e) Remove 2 screws securing each thermostat.
- f) Replace in reverse order.

## 8.27

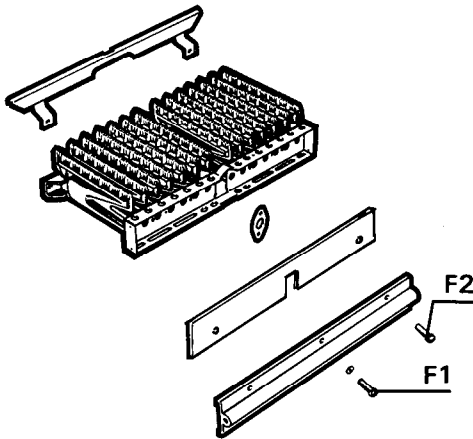


Fig. 75

### To replace main burner

- a) Remove case, see section 7.1
- b) Remove outer front panel, see section 7.2
- c) Remove burner, see section 7.3
- d) Replace in reverse order ensuring that the gasket is correctly positioned between the injector cover plate and the manifold.

## 8.28

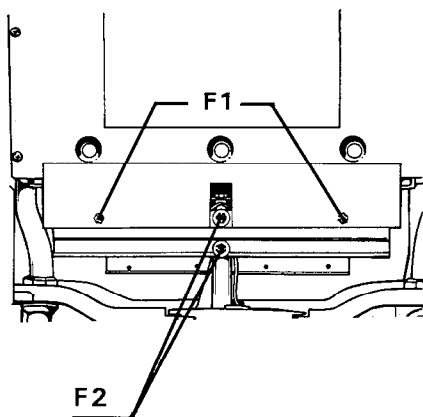


Fig. 76

### To replace the burner manifold assembly

- a) Remove the front case, see section 7.1
- b) Remove the combustion chamber front panel to expose the burner manifold see section 7.2 (a to c.)
- c) Remove the two screws F1 and remove the closure plate.
- N.B.** When replacing the manifold it is advisable to replace the gasket at the same time.
- d) Remove the two screws F2 and lift off from Burner base.
- e) Replace in reverse order.

8.29

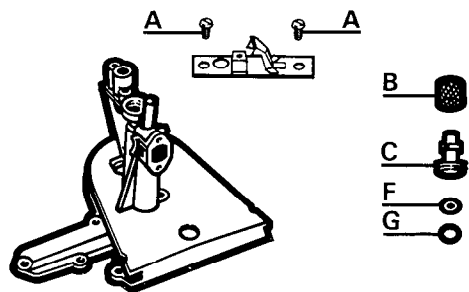


Fig. 77

**To replace pilot injector, air filter, deflector plate/ burner head**

- a) Remove as detailed in section 7.4
- b) Replace in reverse order.

8.30

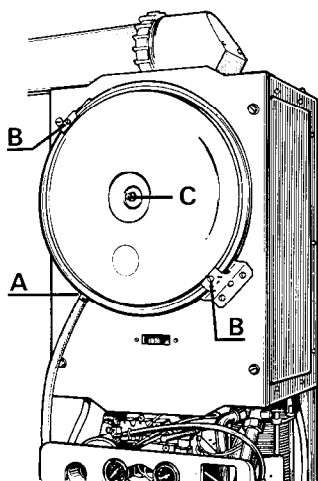


Fig. 78

**To replace expansion vessel**

- a) Remove front case, see section 7.1
- b) Isolate appliance from system by closing flow and return valves see section 6.2 fig. 34 (B et C).
- c) Drain boiler (primary side) through safety valve fig. 34 (F) and vent expansion vessel at (C).
- d) Remove flexible pipe from expansion vessel, AT (A).
- e) Loosen upper securing screw, (B) support and loosen lower screw. Slide out expansion vessel.
- f) Replace in reverse order, engaging the thread of the flexible pipe before screwing fully home screws (B). The vessel **must** be central on the front panel.
- g) Re-pressurise expansion vessel see section 8.24.
- h) Open flow and return valves. If necessary, re-pressurise system.

8.31

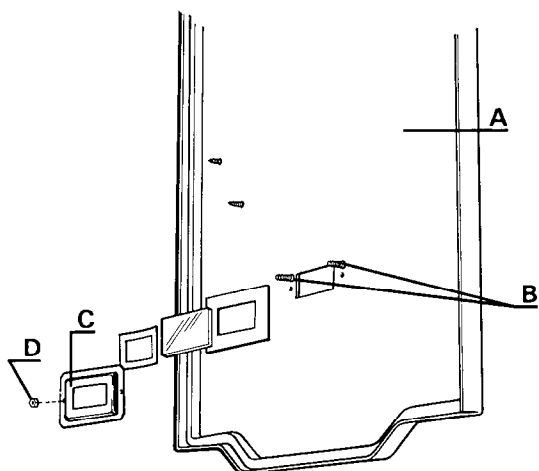


Fig. 79

**To replace viewing window**

- a) Remove front case, see section 7.1
- b) Remove combustion chamber front panel (A), see section 7.2
- c) Remove the screws (B) securing the sight glass bracket (C). Take care not to loose the two nuts (D).
- d) Replace in reverse order referring to diagram opposite.

### 8.32

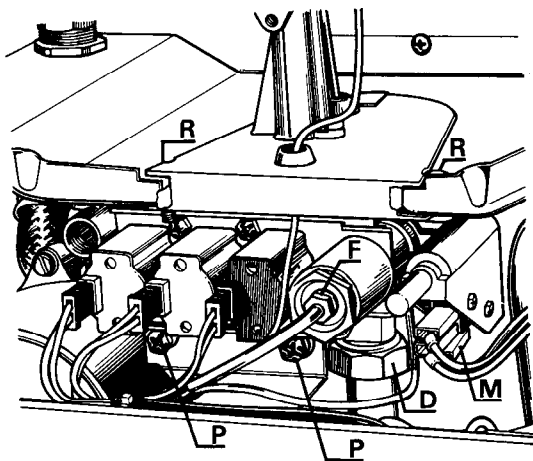


Fig. 80

#### To replace the main gas valve body

- a) Remove front case, see section 7.1
- b) Remove combustion chamber front panel, see section 7.2
- c) Remove burner assembly, see section 7.3
- d) Remove electrical control box, see section 8.9
- e) Part thermocouple connections to high limit thermostat.
- f) Pull connectors off microswitch (M) noting colours.
- g) Remove two screws (P) retaining bracket to gas section and ease bracket down to clear gas section.
- h) Slacken and undo the gas supply union (D) beneath gas section.
- i) Remove two screws (R) retaining gas section to combustion chamber base.
- k) Remove gas section by pulling forward.
- m) Reassemble in reverse order and check for gas soundness.

### 8.33

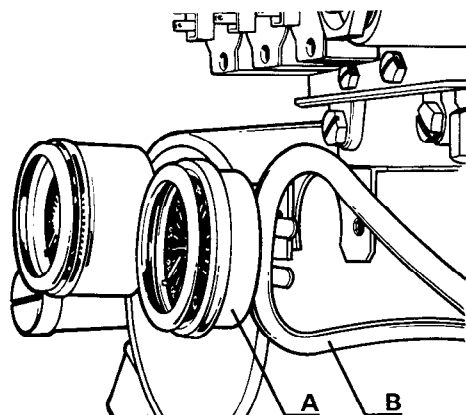


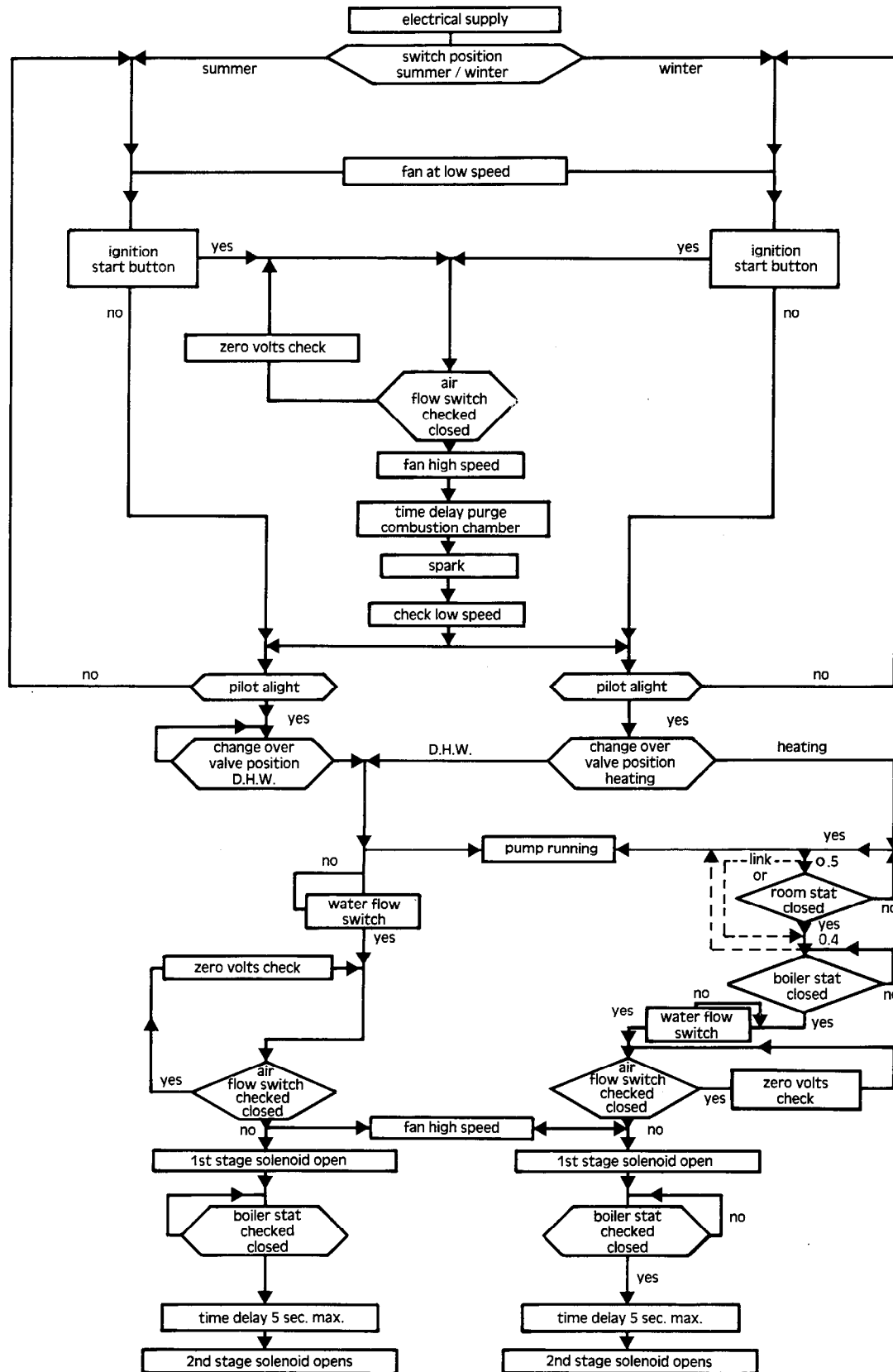
Fig. 81

#### To replace the temperature gauge

- a) Remove the front case, see section 7.1
- b) The temperature gauge (A) is retained on the by pass tube with a spring clip. Carefully lever the gauge from the by pass tube using a suitable tool (B) whilst supporting from the front to prevent damage.

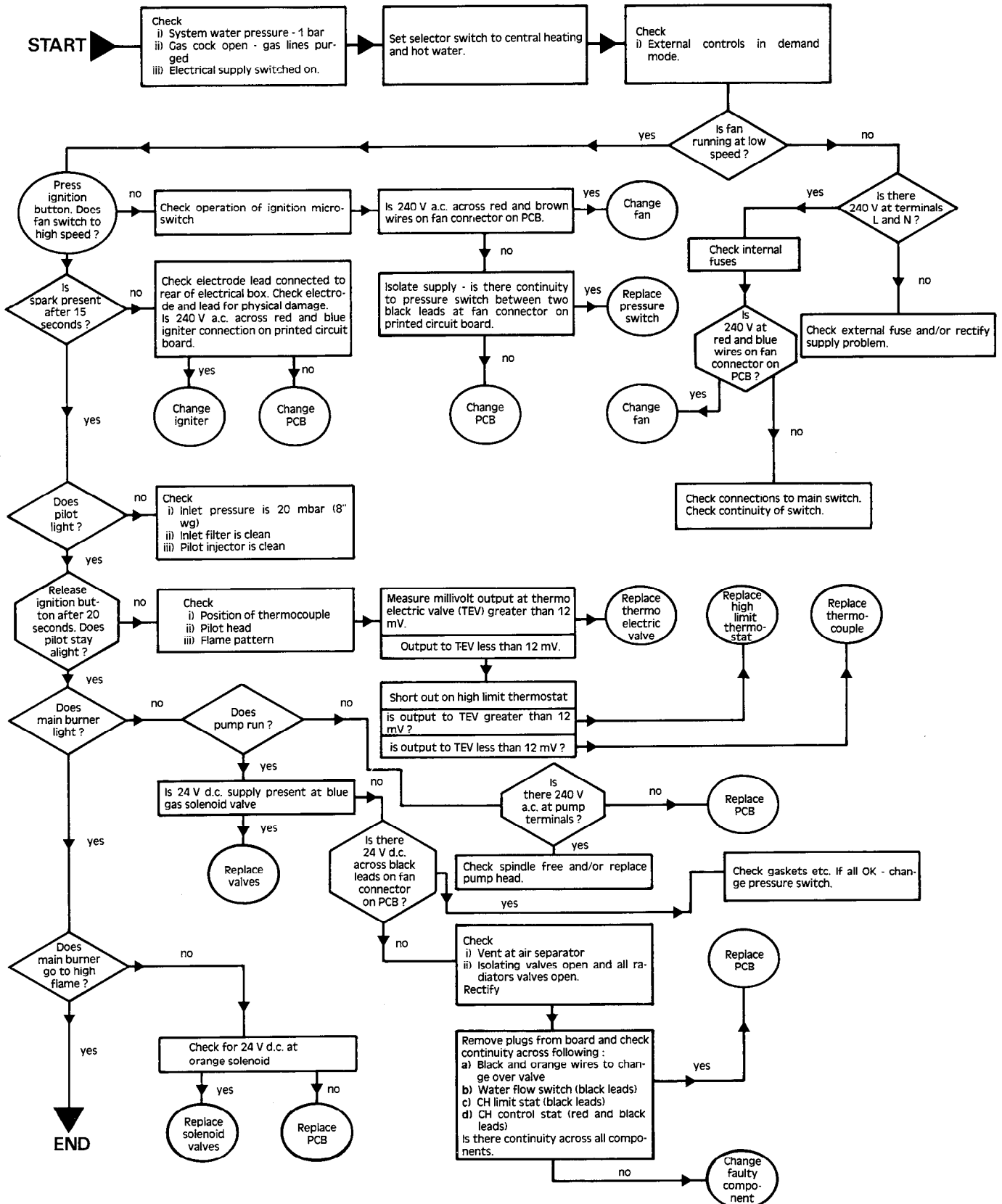
# 9. FAULT FINDING

## 9.1 Logic sequence



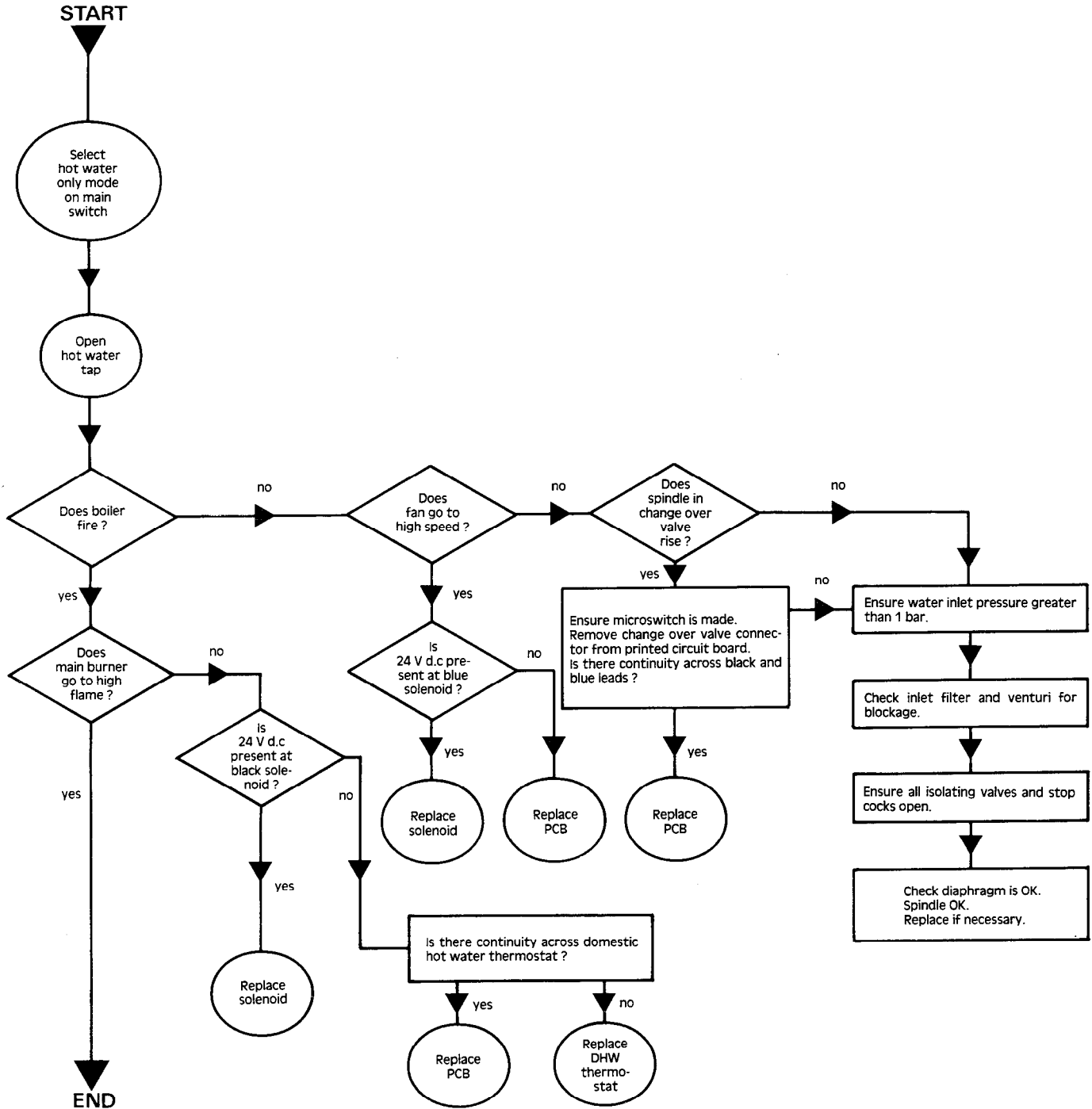
# FAULT FINDING CENTRAL HEATING OPERATION SEQUENTIAL FLOW CHART 1

READ IN CONJUNCTION WITH SECTIONS (9.1 & 9.3)



9.3

**FAULT FINDING  
DOMESTIC WATER OPERATION  
SEQUENTIAL FLOW CHART 2  
READ IN CONJUNCTION WITH SECTIONS (9.1 & 9.2)**





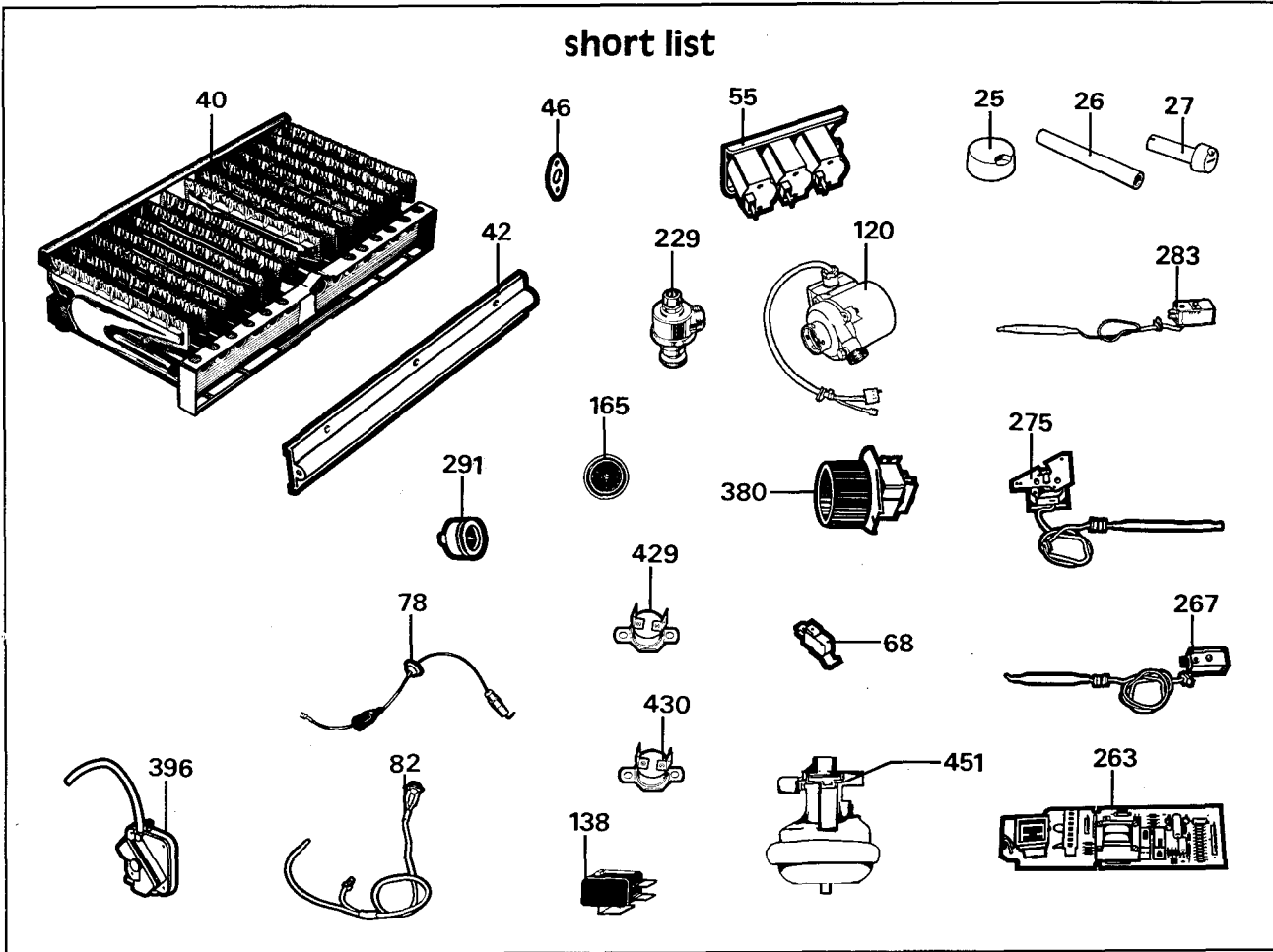
## 9.4 FAULT FINDING TABULAR CHART

PROBLEM	CAUSE	REMEDY
<p><b>1) Explosive ignition</b></p>	<p><b>i) Poor pilot flame</b></p> <ul style="list-style-type: none"> <li><b>a) Inlet pressure low - should be 8" wg (20 mbar) working pressure</b></li> <li><b>b) Blocked gas filter</b></li> <li><b>c) Pilot injector dirty</b></li> </ul> <p><b>ii) 1/3 valve not operating</b></p> <ul style="list-style-type: none"> <li><b>a) 24 volt supply to valve</b></li> <li><b>b) No voltage at solenoid</b></li> </ul> <p><b>iii) Crosslighting strip - missing/incorrectly positioned.</b></p>	<ul style="list-style-type: none"> <li><b>1a) Check meter and pipe sizing, see sections 2.7 and 4.7.</b></li> <li><b>1b) Clean</b></li> <li><b>1c) Replace, see section 8.29</b></li> <li><b>2a) Replace solenoids, see section 8.20</b></li> <li><b>2b) Check plugs on printed circuit board</b></li> <li><b>2c) Replace printed circuit board, see section 8.18</b></li> <li><b>3a) Replace or reposition.</b></li> </ul>
<p><b>2) Unstable burner</b></p>	<ul style="list-style-type: none"> <li><b>i) Incorrect injectors</b></li> <li><b>ii) Gas pressure at manifold</b> <ul style="list-style-type: none"> <li><b>a) Too high</b></li> <li><b>b) Too low</b></li> </ul> </li> <li><b>iii) Terminal incorrectly positioned</b></li> <li><b>iv) Incorrectly assembled flue duct</b></li> <li><b>v) Fan incorrectly located</b></li> <li><b>vi) Combustion chamber front cover not sealing</b></li> <li><b>vii) Heat exchanger fins blocked</b></li> <li><b>viii) Neoprene gasket in turret not correctly fitted or missing</b></li> </ul>	<ul style="list-style-type: none"> <li><b>1) Replace manifold 1.28 mm injectors for natural gas, see section 8.28</b></li> <li><b>2a) Adjust, see section 6.4</b></li> <li><b>2b) Check restrictors and inlet pressure, see section 1.2</b></li> <li><b>3) See section 2.4</b></li> <li><b>4) Check and reassemble, see section 4.10</b></li> <li><b>5) Remove and refit correctly, see section 8.22</b></li> <li><b>6a) Tighten</b></li> <li><b>5b) Replace sealing strip</b></li> <li><b>7) Clean, see section 7.2 et 7.7</b></li> <li><b>8) Fit or refit, see section 4.10.</b></li> </ul>
<p><b>3) Central heating - low flow temperature</b></p>	<ul style="list-style-type: none"> <li><b>i) Boiler thermostat out of calibration</b></li> <li><b>ii) Limit stat out of calibration</b></li> <li><b>iii) Insufficient gas pressure</b></li> <li><b>iv) 1/3 blue or 2/3 orange gas valve not opening</b> <ul style="list-style-type: none"> <li><b>a) 24 volts at solenoid.</b></li> <li><b>b) No voltage at solenoid</b></li> </ul> </li> <li><b>v) Hot water valve in change over valve assembly sticking</b> <ul style="list-style-type: none"> <li><b>a) Dead leg on hot water system</b></li> <li><b>b) Bent spindle in valve</b></li> </ul> </li> <li><b>vi) By-pass, if fitted, incorrectly adjusted</b></li> <li><b>vii) Pressure switch hunting</b></li> </ul>	<ul style="list-style-type: none"> <li><b>1) Replace, see section 8.14</b></li> <li><b>2) Replace, see section 8.15</b></li> <li><b>3) Check pressure at meter and pipe sizing, see sections 2.7 and 4.7</b></li> <li><b>4a) Replace solenoid, see section 8.20</b></li> <li><b>4b) Replace printed circuit board, see section 8.18</b></li> <li><b>5a) Eliminate</b></li> <li><b>5b) Replace, see section 8.11</b></li> <li><b>6) Adjust, see section 3.16</b></li> <li><b>7) Replace, see section 8.23</b></li> </ul>

PROBLEM	CAUSE	REMEDY
<b>4)</b> Boiler noisy	<ul style="list-style-type: none"> <li><b>i)</b> On heating only             <ul style="list-style-type: none"> <li><b>a)</b> Low flow rate as result of system resistance</li> <li><b>b)</b> Air in system</li> </ul> </li> <li><b>ii)</b> On hot water and central heating             <ul style="list-style-type: none"> <li><b>a)</b> Low pressure in sealed system</li> <li><b>b)</b> Pump not running</li> </ul> </li> <li><b>iii)</b> Blocked filter on heating return</li> <li><b>iv)</b> Gas filter fitted to heating flow or return pipes</li> <li><b>v)</b> Heat exchanger scaled</li> <li><b>vi)</b> Overgassed</li> </ul> <p>(VII) Isolating valves not fully open</p>	<ul style="list-style-type: none"> <li><b>1a)</b> Check and if omitted fit by-pass see section 3.16</li> <li><b>1b)</b> Purge by venting radiators</li> <li><b>2a)</b> Repressurise to 1 bar cold, see section 6.2 (5)</li> <li><b>2b)</b> Replace pump head, see section 8.10</li> <li><b>3)</b> Clean and replace, see section 7.6</li> <li><b>4)</b> Remove and reposition, see section 4.5</li> <li><b>5a)</b> Descale</li> <li><b>5b)</b> Replace, see section 8.8</li> <li><b>6a)</b> Check gas pressure and adjust, see section 6.4</li> <li><b>6b)</b> Check restrictors, see section 1.2</li> <li><b>7)</b> Open fully see section 6.2</li> </ul>
<b>5)</b> Hot water does not operate over temperature range	<ul style="list-style-type: none"> <li><b>i)</b> Water governor sticking</li> <li><b>ii)</b> Low inlet water pressure</li> <li><b>iii)</b> Inlet water filter blocked</li> <li><b>iv)</b> Incorrect venturi fitted</li> <li><b>v)</b> Hot water limit stat out of calibration</li> <li><b>vi)</b> Solenoids not operating</li> <li><b>vii)</b> Pressure switch hunting</li> <li><b>viii)</b> Low inlet gas pressure</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Lubricate and replace, see section 7.5</li> <li><b>2)</b> Ensure all down stream stop cocks open</li> <li><b>3)</b> Clean and replace, see section 7.5</li> <li><b>4)</b> Replace with 5.4 mm diameter, see section 8.7</li> <li><b>5)</b> Replace, see section 8.16</li> <li><b>6)</b> See section 9.2. Flow chart 1</li> <li><b>7)</b> Replace, see section 8.23</li> <li><b>8)</b> See section 6.4</li> </ul>
<b>6)</b> No main burner	<ul style="list-style-type: none"> <li><b>i)</b> Lack of water flow</li> <li><b>ii)</b> Pump jammed</li> <li><b>iii)</b> No water</li> <li><b>iv)</b> Flow switch not operating</li> <li><b>v)</b> Heating thermostat faulty (CH only)</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Checks valves are open, see sections 6.1 and 6.2</li> <li><b>2)</b> Manually check, see section 6.2 (8)</li> <li><b>3)</b> Fill system, see section 6.2</li> <li><b>4)</b> Replace switch, see section 8.34</li> <li><b>5)</b> Replace see section 8.14</li> </ul>
<b>7)</b> Safety valve discharges	<ul style="list-style-type: none"> <li><b>i)</b> System pressure too high</li> <li><b>ii)</b> Not isolated from mains</li> <li><b>iii)</b> Vessel lost air charge</li> <li><b>iv)</b> Secondary heat exchanger (water to water). Internal water leak.</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Adjust to 1 bar cold</li> <li><b>2)</b> Remove filling loop</li> <li><b>3)</b> Recharge to 0.65 bar, see section 8.24</li> <li><b>4)</b> Replace, see section 8.12</li> </ul>
<b>8)</b> Pump noisy	<ul style="list-style-type: none"> <li><b>i)</b> Air in system</li> <li><b>ii)</b> Air separator not venting             <ul style="list-style-type: none"> <li><b>a)</b> Needle stuck</li> <li><b>b)</b> Float stuck</li> </ul> </li> <li><b>iii)</b> Debris in pump</li> <li><b>iv)</b> Water filter blocked.</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Vent radiators</li> <li><b>2)</b> Open vent on air separator, see section 6.2 (4)</li> <li><b>2a)</b> Release and lubricate</li> <li><b>2b)</b> Release and lubricate</li> <li><b>3)</b> Clean and replace, see section 8.10</li> <li><b>4)</b> Clean and replace, see section 7.6</li> </ul>

PROBLEM	CAUSE	REMEDY
<b>9)</b> Excessive temperature rise across boiler	<ul style="list-style-type: none"> <li><b>i)</b> Return filter blocked</li> <li><b>ii)</b> Low water flow rate             <ul style="list-style-type: none"> <li><b>a)</b> Pump defective</li> <li><b>b)</b> High system resistance</li> <li><b>c)</b> Gas filter inadvertently fitted in flow or return connection</li> </ul> </li> <li><b>iii)</b> Gas rate too high</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Clean and replace, see section 7.6</li> <li><b>2a)</b> Replace, see section 8.10</li> <li><b>2b)</b> Fit by-pass, see section 3.16</li> <li><b>2c)</b> Remove and refit, see section 4.5</li> <li><b>3)</b> Adjust, see section 6.4</li> </ul>
<b>10)</b> Rapid cycling high/low or high/low/off	<ul style="list-style-type: none"> <li><b>i)</b> Low water flow rate</li> <li><b>ii)</b> Limit stat out of calibration</li> <li><b>iii)</b> By-pass if fitted not regulated</li> <li><b>iv)</b> Blocked heat exchanger</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> See 'System guidance' section 3.3</li> <li><b>2)</b> Replace, see section 8.15</li> <li><b>3)</b> Adjust, see section 6.5</li> <li><b>4)</b> Clean or replace, see section 8.8</li> </ul>
<b>11)</b> Fan on high speed continuously	<ul style="list-style-type: none"> <li><b>i)</b> Defective printed circuit board</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Replace, see section 8.18</li> </ul>
<b>12)</b> Loss of pressure shown on gauge	<ul style="list-style-type: none"> <li><b>i)</b> Leak on system</li> <li><b>ii)</b> Leak on appliance</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Locate and rectify</li> <li><b>2)</b> Locate and rectify</li> </ul>
<b>13)</b> Gain in pressure shown on gauge	<ul style="list-style-type: none"> <li><b>i)</b> Filling loop still fitted and letting by</li> <li><b>ii)</b> Blockage in expansion chamber flexible hose</li> <li><b>iii)</b> Secondary heat exchanger (water to water). Internal water leak</li> </ul>	<ul style="list-style-type: none"> <li><b>1)</b> Close stop cocks and remove</li> <li><b>2)</b> Clear blockage</li> <li><b>3)</b> Replace, see section 8.12</li> </ul>

## short list



Key N <sup>o</sup>	Description	GC number	Maker's part number
25	Boiler thermostat knob .....	366 421	44269.00
26	Ignitor push button .....	366 846	59600.00
27	Water temperature control knob .....	264 591	44267.00
40	Burner head assembly .....	264 592	69106.00
42	Manifold assembly with injectors .....	264 593	81011.00
46	Manifold gasket .....	264 477	71226.00
55	Solenoid valve assembly .....	366 865	81030.00
68	Ignition micro-switch .....	264 793	78989.00
78	Electrode and lead assembly .....	264 828	70308.00
82	Thermocouple and Safety overheat thermostat assembly .....	264 602	74723.00
120	Pump motor Grundfos 15/60 .....	383 722	1000772.00
138	Change over valve micro-switch .....	366 897	1001156.00
165	Thermometer .....	366 933	44333.00
229	Pressure relief valve .....	264 630	1001898.00
263	Printed circuit board .....	264 637	78867.00
267	Domestic hot water thermostat 57°C .....	264 547	100606.30
275	Heating thermostat 50° C - 82° C .....	264 552	81420.00
283	Limit thermostat 85°C .....	264 649	56974.00
291	Pressure gauge kit .....	264 556	81180.00
380	Fan assembly .....	265 121	56401.00
396	Pressure switch kit .....	264 882	81054.00
429	Frost thermostat (11° C) .....	264 663	71897.00
430	Frost thermostat (3° C) .....	264 664	71896.00
451	Flow switch .....	264 666	1000658.00

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