

CHALLENGER

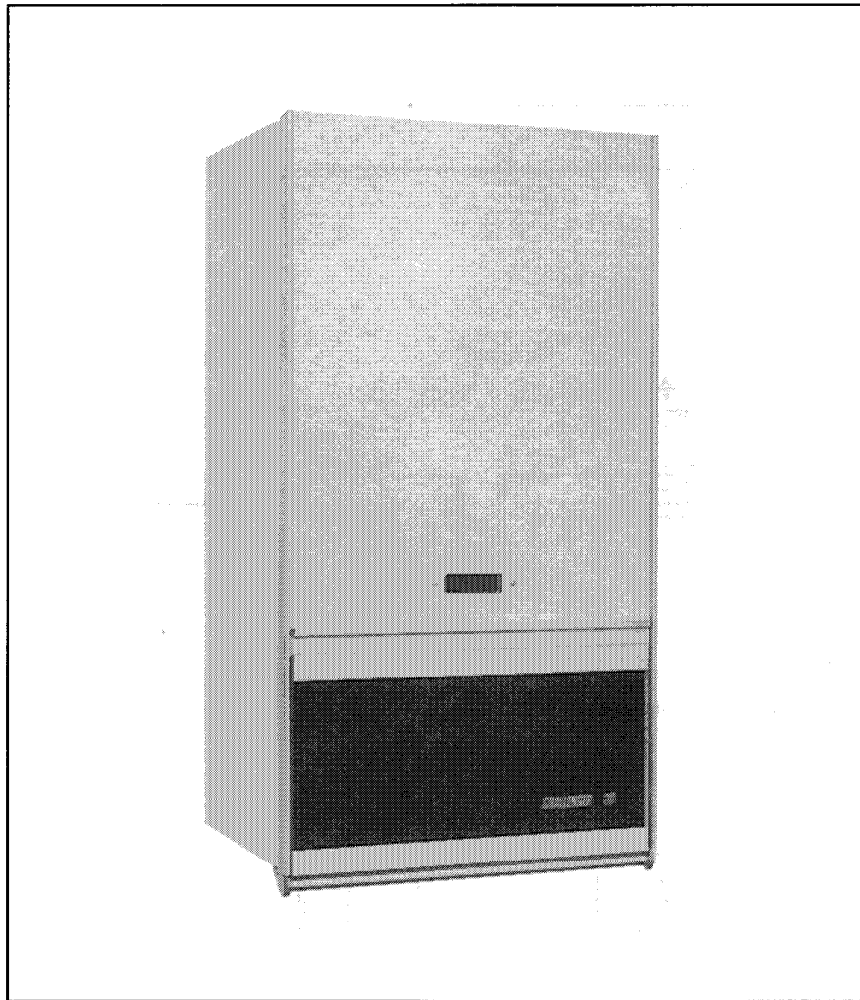
Balanced Flue Boilers

30 BF

(GCN° 41.980.71)

40 BF

(GCN° 41.980.75)



installation and servicing instructions

(leave these instructions adjacent to the gas meter)

CHALLENGER BF are low water content gas fired boilers.

CHALLENGER 30 is rated between 4.35 kW (15,000 Btu/h) and 8.7 kW (30,000 Btu/h).

CHALLENGER 40 is rated between 5.8 kW (20,000 Btu/h) and 11.6 kW (40,000 Btu/h).

The boiler is designed for use on Natural Gas, unless otherwise stated. It is suitable for open systems and sealed systems.

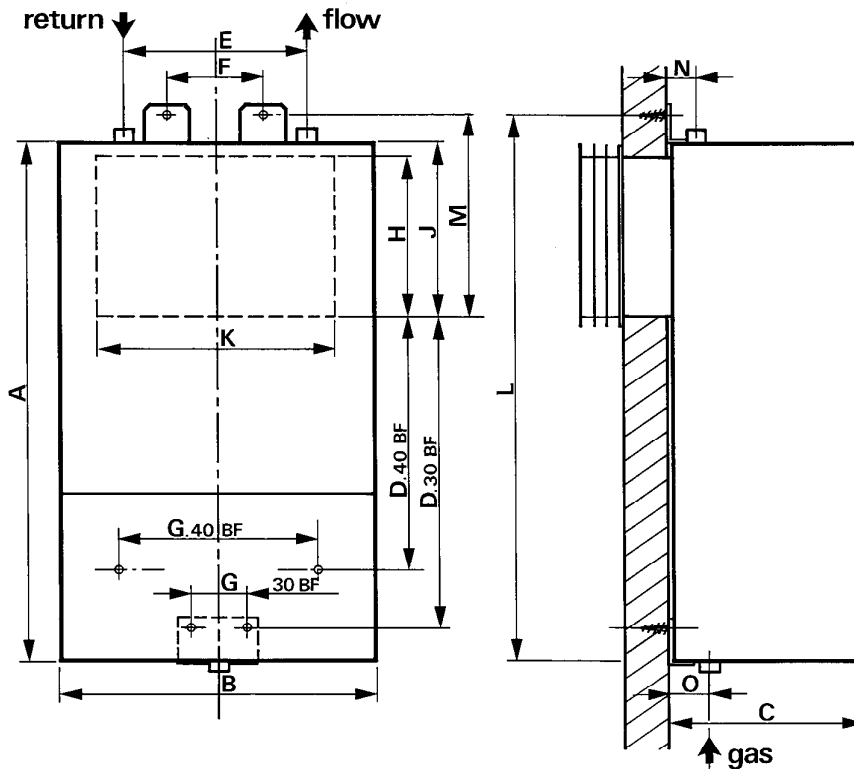
The boiler is designed for fully pumped systems only with a number features incorporated.

- Fully adjustable electronic temperature regulation between 60 °C and 82 °C.
- Automatic alternation high flame/low flame.
- Pump overrun.
- Low resistance.
- High limit thermostat.

Guarantee

The manufacturer's guarantee on the appliance is for 24 months from the date of installation. The guarantee is voidable if it is not installed in accordance with the recommendations made herein or in a manner approved by the manufacturer.

1.1 TECHNICAL DATA



CHALLENGER 30 BF

	mm	ins
A	610	24
B	330	13
C	270	10.6
D	350	13.77
E	224	8.8
F	120	5.0
G	80	3.1
H	200	7.8
J	215	8.5
K	300	12
L	660	26
M	260	10.25
N	30	1.2
O	45	1.7

CHALLENGER 40 BF

	mm	ins
A	655	25.78
B	395	15.55
C	260	10.25
D	320	12.6
E	225	8.9
F	120	5.00
G	250	9.8
H	200	7.87
J	210	8.26
K	300	12.00
L	700	27.5
M	260	10.23
N	35	1.37
O	50	1.96

1.2

30 BF	OUTPUT		INPUT			BURNER PRESSURE (HOT)		GAS RATE	
	kW	Btu/h		kW	Btu/h	mbar	ins.w.g.	m ³ /h	ft ³ /h
Max	8.7	30,000	Max	10.9	37,500	6.4	2.56	1.02	36.26
Min	4.35	15,000	Min	5.66	19,480	1.15	0.45	0.53	18.83

40 BF	OUTPUT		INPUT			BURNER PRESSURE (HOT)		GAS RATE	
	kW	Btu/h		kW	Btu/h	mbar	ins.w.g.	m ³ /h	ft ³ /h
Max	11.6	40,000	Max	14.5	50,000	12.0	4.72	1.37	48.54
Min	5.8	20,000	Min	7.55	26,000	3.5	1.37	0.71	25.24

NB : For intermediate settings see graph page 13

DIMENSIONS (Casing ex connections)				
	30 BF		40 BF	
	mm	ins	mm	ins
High	610	24	655	26
Wide	330	13	395	15.5
Deep	270	10.6	245	9.64

CLEARANCES		
	mm	ins
Sides	5	0.25
Top	76	3
Bottom	127	5
Front	500	20

1.3

Balance Flue	Flue set requires a hole in the wall 205 mm highx305 mm wide (8 inx12 in)
Gas connection	15 mm compression fitting
Water connection	22 mm compression fittings
Minimum flow rate	see 1.4
Maximum static head	30 m (98 ft)
Minimum static head	150 mm (6 ins) – See page 7.
Electrical connection	240 V single phase 50 Hz supply fused 3 amp
Weight	30 BF - 18.18 kg (40 lbs) 40 BF - 20 kg (44 lbs).
Water capacity	0.5 lit. (0.11 gals.)
Manifold Injector Size	30 BF 1.18 mm (0.046 ins.) 40 BF 1.08 mm 0.042 ins
Pilot injector	0.3 mm (0.011 ins.)
Ignition	Continuous spark – spark generator ANSTOSS
Electrode	Chaffoteaux – spark gap 5.0 mm
Boiler thermostat	Electronic – Chaffoteaux Ltd
High Limit thermostat	Ranco LM5
Thermocouple and thermoelectric valve	Chaffoteaux Ltd

1.4

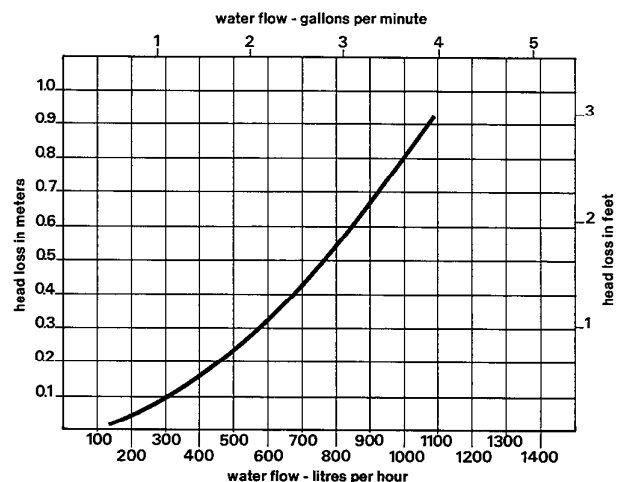
HYDRAULIC RESISTANCE

The hydraulic resistance of the boiler varies with the water flow. The graph (Fig. 2) indicates resistance at various flow rates.

The minimum flow rate is equivalent to a temperature rise of 15° C :

30 BF		40 BF	
504 l/h	1.85 gpm	673 l/h	2.47 gpm

Minimum water flow rate



1.5 Description of Operation

Pressing the ignitor (on) button disconnects the supply to the pump, opens the thermo electric valve and causes a continuous pilot ignition spark to be generated and the pilot is lit.

If there is a demand the pump will start when the « ON » button is released. The burner will commence after a 30 second delay when the 50 % fixed gas valve opens. After 3 seconds the 2nd (variable output) valve opens.

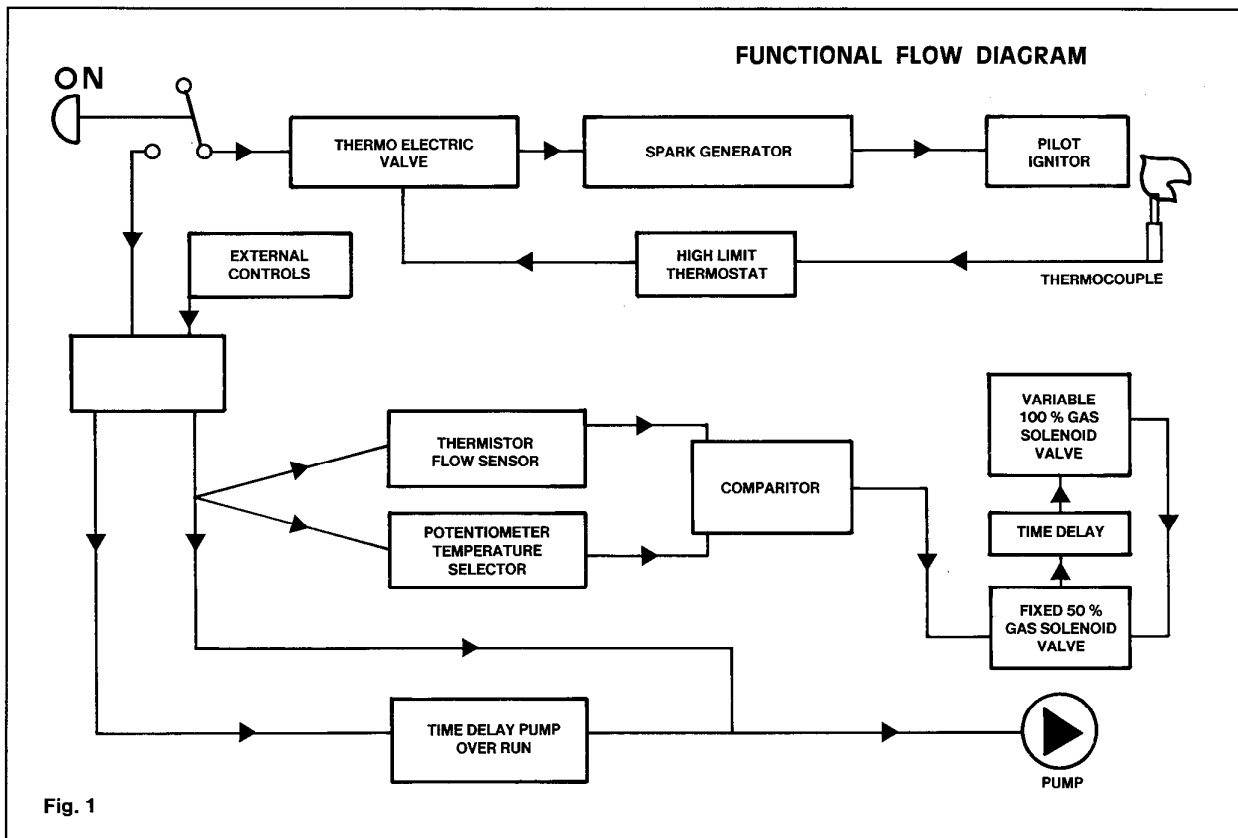
Temperature control is by means of a temperature sensing thermistor and potentiometer. These signals are fed to a comparator.

When the flow temperature approaches the set temperature the main gas valve is closed and the boiler

continues to fire on 50 % fixed gas valve. When the set temperature is reached the boiler switches off. If flow temperature reduces the 50 % fixed gas valve opens followed by the variable valve.

At the end of an 'on' cycle under the control of a time clock or programmer or when the cylinder and room thermostat are satisfied the boiler switches off but the pump continues to run for 15 seconds.

The high temperature cut out breaks the thermocouple circuit which extinguishes the pilot and closes the gas supply to the burner. Manual re-setting is required. (See section 4.11).



2. INSTALLATION REQUIREMENTS

2.1 General

The installation of the boiler must be in accordance with the Gas Safety Regulations, Building Regulations, I.E.E. Regulations and the Byelaws of the local Water Undertaking. It should be in accordance also with 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. Detailed recommendations are stated in the following British Standard Codes of Practice : CP 331:3, BS 5376:2, BS 5546, BS 5440:1 and 2, BS 5449:1.

Note : Gas safety (Installation and Use) regulations 1984 : It is the law that all gas appliances are installed by competent 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 position chosen for the boiler should permit the provision of a satisfactory flue termination. The position should also provide adequate space for servicing and air circulation around the boiler. (See Section 4).

Where installation will be in an unusual position, special procedures may be necessary, and BS 5376:2 gives detailed guidance on this aspect.

A cupboard or compartment used to enclose the boiler 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 5376:2.

2.3 Water Circulation Systems

Open or sealed type central heating systems (see Section 5) should be in accordance with the relevant recommendations given in BS 5376:2, BS 5449:1 (for smallbore or microbore systems) and the British Gas Specifications for Domestic Wet Central Heating Systems.

Hot water systems should be in accordance with the relevant recommendations given in CP 342:1 and the above mentioned British Gas publication and BS 5546.

2.4 Air supply – Balanced Flue Boiler

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 and 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 room or must both be on the same wall to outside air.

This free area may be halved if the ventilation is provided directly from outside.

30 BF cupboard or compartment air supply

Position of air vents	Air from room	Air direct from outside
High level	98.1 cm ² 15.0 ins ²	49.0 cm ² 7.5 ins ²
Low level	98.1 cm ² 15.0 ins ²	49.0 cm ² 7.5 ins ²

40 BF

Position of air vents	Air from room	Air direct from outside
High level	130.5 cm ² 20.22 ins ²	65.25 cm ² 10.1 ins ²
Low level	130.5 cm ² 20.22 ins ²	65.25 cm ² 10.1 ins ²

2.5 Electrical Supply

This appliance must be earthed. All wiring must conform to the I.E.E. Regulations. The CHALLENGER 30 requires a 240 V, single phase, 50 Hz supply. A means of isolation must be provided adjacent to the boiler, this should preferably be an unswitched plug and socket. Alternatively, a double pole isolator having a contact separation of at least 3 mm at both poles must be used. The fuse rating should be 3 amp. The supply cord must be 0.75 mm² three core heat resisting cable.

2.6 Gas Supply

The CHALLENGER 30 requires 1.1 m³/h (37 ft³/h). CHALLENGER 40 requires 1.4 m³/h (49 ft³/h) of natural gas. The meter and supply pipes must be capable of delivering this quantity of gas in addition to the demand from any other appliances in the house.

The complete installation must be tested for soundness as described in CP 351:3

2.7 Flueing

Detailed recommendations for flueing are given in BS 5440:1. The following notes are for general guidance only.

The boiler must be installed so that the flue terminal discharges directly into the external air.

Termination should be on a clear expanse of wall; the terminal being preferably not less than 600 mm (2 ft) from a corner or recess.

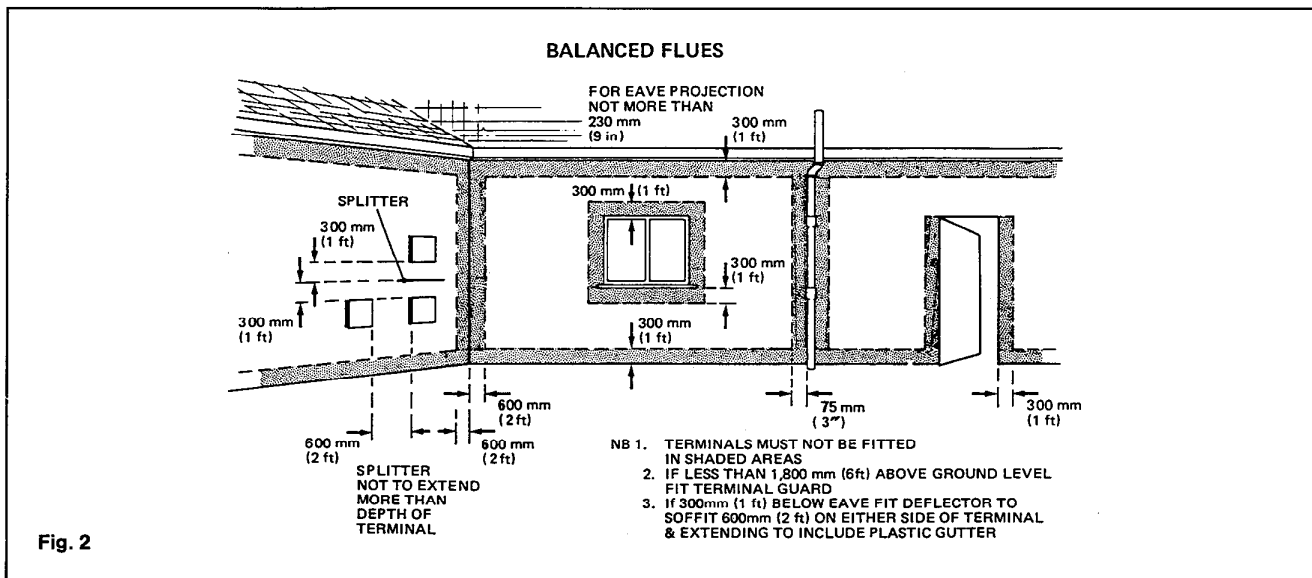
Where the terminal is less than 2 m (6.6 ft) above the level of any ground, balcony, flat roof or place to which people have access, the terminal must be protected by a guard of suitable material.

Where a terminal guard has not been supplied (optional extra) with the boiler, one may be obtained from Chafoteaux Limited or from Tower Flue Components Ltd. Tonbridge 351555.

The air inlet/products outlet duct and the terminal should be no closer than 25 mm (1 in) to combustible material. Detailed recommendations on protection of combustible material are given in BS 5440:1.

The distance of any surface facing the terminal should be greater than 600 mm (24 ins).

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



3. SYSTEM GUIDANCE

(Chaffoteaux Ltd. recommendations).

3.1 General

The CHALLENGER is a low water content boiler designed ONLY for use with fully pumped systems. It may be used with open or sealed systems, all safety controls excluding the pressure relief valve being incorporated in the boiler. The thermostat is adjustable and, on its maximum setting, gives a nominal 82°C (180°F) $\pm 4^{\circ}\text{C}$ (7°F).

Detailed recommendations for the water circulation are given in BS 5376.2 1976, BS 5449.1 1977 and BS 5546:1979.

Thermostatic control should be fitted to the cylinder and heating circuits.

3.2 Strainers

Where the CHALLENGER is used as a replacement for a boiler on an existing system, ideally the system should be flushed and cleaned using a suitable chemical cleaner following the manufacturer's recommendations and fitted with a strainer similar to that manufactured by Honeywell.

3.3 Control Schemes

The boiler is electrically controlled. See section 3.11.

Most normal pumped primary control schemes can be used including thermostatic radiator and cylinder valves. When using motorised valves the controls should be so arranged to switch off the boiler when circuits are satisfied.

Chaffoteaux can be consulted where technical assistance is required.

3.4 Circulation Pump

The system circulating pump should be sized relative to the resistance of the connected load and the system design selected. The water flow rate through the boiler should not be less than shown in section 1.4. The pump must be installed between isolating valves. Most pump manufacturers require a minimum static head on the pump inlet to prevent cavitation. For boiler resistance see graph on page 3.

3.5 Cold feeds and open vents

The cold feed and open vent should be so positioned that pumping over and sub-atmospheric pressures are avoided see recommendations for various layouts on page 7.

3.6 Automatic Air Separator

Chaffoteaux Limited strongly recommend the inclusion of a British Gas accepted automatic air separator in the system as shown in fig. 9.

The open vent pipe should rise continuously from the system pipework.

It should not be entered horizontally into the system pipework. The use of an enlarged T to create a low velocity point is recommended. The preferred arrangement is shown in fig. 9.

3.7 Cylinder

The domestic hot water cylinder used with the CHALLENGER must be of the indirect and high recovery type to BS 1566 Pt. 1. Single feed cylinders are not suitable for use with the appliance. Flow and return pipework to the cylinder should be in 22 mm pipe.

3.8 Feed and Expansion Tank

The feed and expansion tank should be adequately sized to accept the system water expansion, it should not be mounted closer than 9 in. to a ceiling to allow access to the ball valve.

3.9 Inhibitors

Chaffoteaux Limited do not generally recommend the inclusion of an inhibitor with heating and hot water systems, utilising CHAFFOTEAUX boilers. It is, however, appreciated that the use of a corrosion and limescale inhibitor may be desirable or specified.

The following are the appliance manufacturer recommendations :

- 1) Use only a British Gas or similar approved inhibitor from the Fernox range manufactured by Industrial (Anti-Corrosion) Services, Britannica Works, Arkesdon Road, Clabering, Nr Saffron Waldron.
- 2) Use only the quantities specified by the inhibitor manufacturer.
- 3) Cleanse the system as may be required by the inhibitor manufacturer.
- 4) Add inhibitor only after flushing when finally refilling the system.

3.10 Add on devices

This appliance is approved by British Gas for safety and performance. It is important that no external control devices – eg. flue dampers, economisers etc. – be directly connected to this appliance unless covered by these Installation instructions or agreed by the Manufacturer in writing.

Any direct connection of a control device not approved by the manufacturer could invalidate British Gas approval and also infringe the Gas Safety Regulations.

ALTERNATIVE SYSTEM LAYOUTS

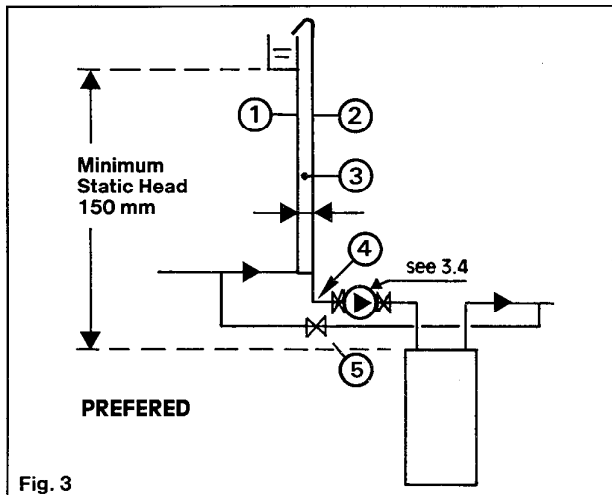


Fig. 3

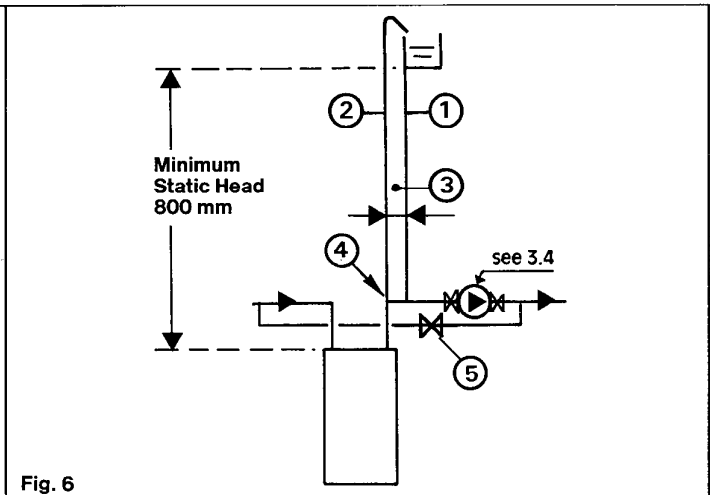


Fig. 6

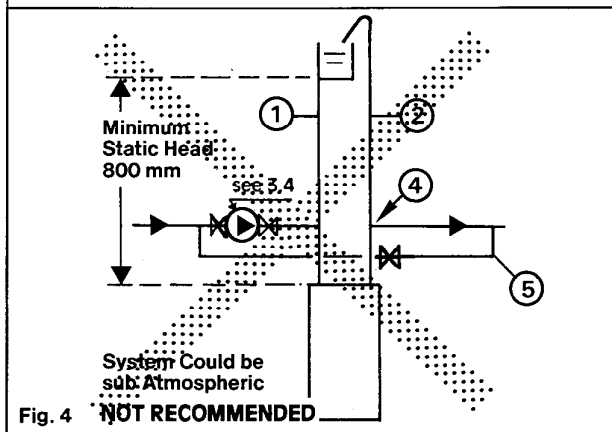


Fig. 4

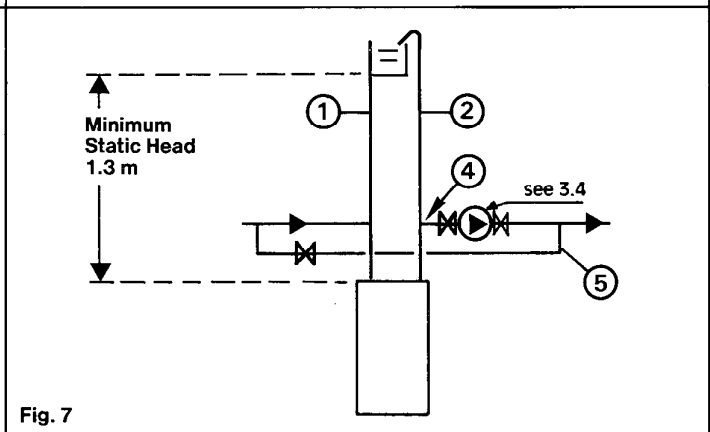


Fig. 7

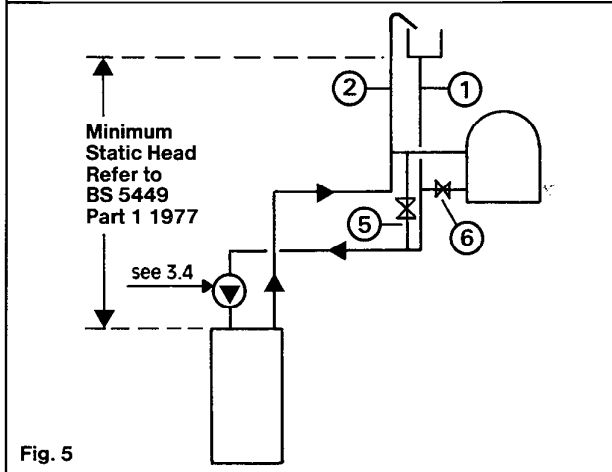


Fig. 5

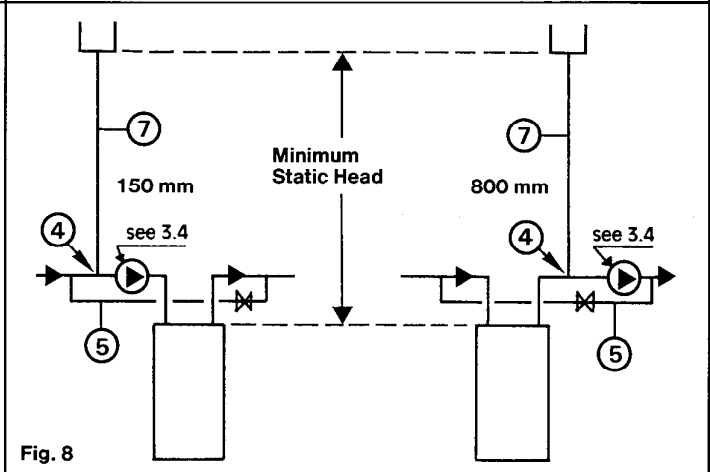


Fig. 8

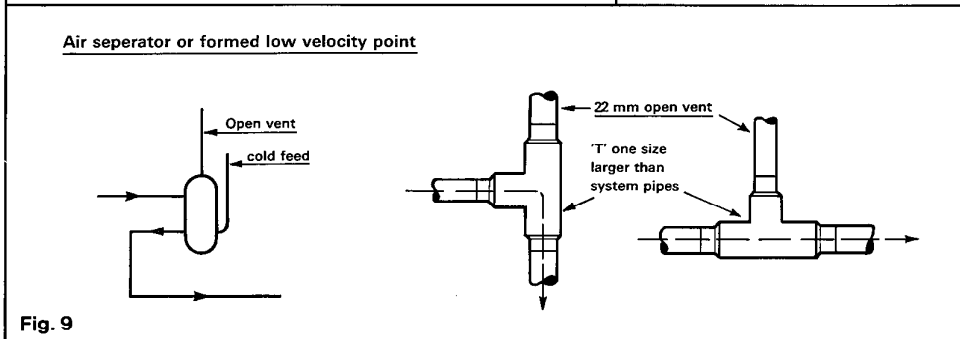


Fig. 9

1. Cold feed 15 mm
2. Open vent 22 mm
3. 6 in. maximum
4. See fig. 9
5. By pass 15 mm
6. Regulating valve
7. Combined cold feed and open vent

3.11 Electrical Controls

(Chaffoteaux recommendations)

CHALLENGER can be used with most normal pumped primary schemes including non-electrical heating and hot water controls.

It is not normally possible to use full programming facilities when using a mixture of electrical and non-electrical controls. However, some non-electrical controls are now available with an external microswitch and these controls are preferred.

Where the thermostatic radiator valves are used a system by pass will be necessary to maintain the minimum flow rate – See section 1.4.

Important: All external wiring to and from the boiler must be in accordance with the current edition of the I.E.E. wiring regulations.

1. Fully pumped system independent control of central heating and hot water using two spring return motorised valves.

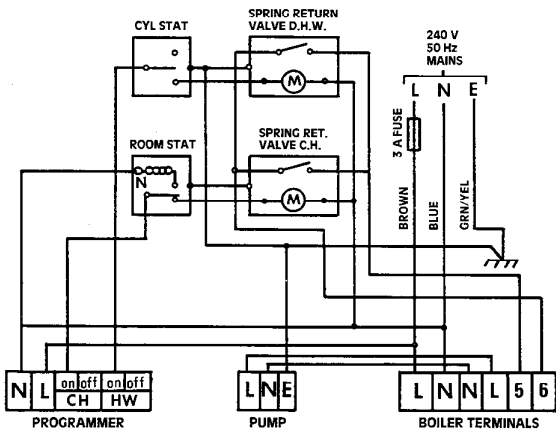


Fig. 10

2. Fully pumped systems independent control of central heating and hot water using two motorised valves.

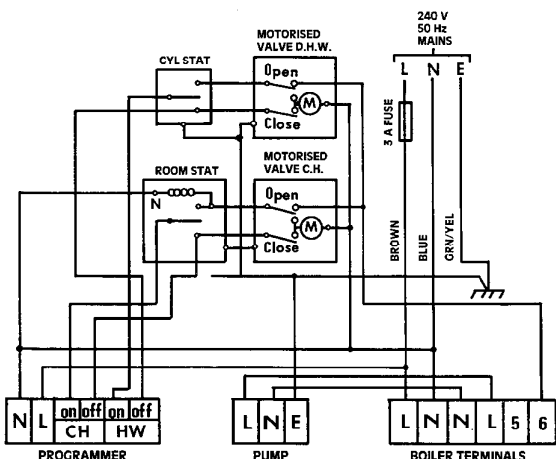


Fig. 11

3. Drayton flow share valve system.

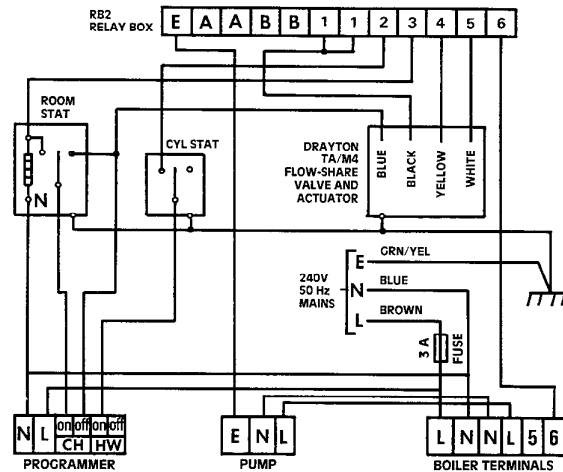


Fig. 12

4. Honeywell Sundial 'Y' plan.

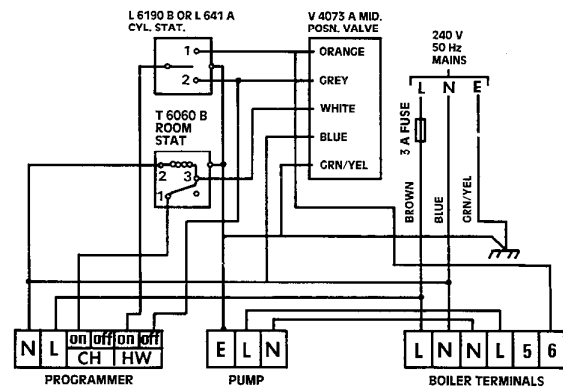


Fig. 13

5. Satchwell Duoflow system.

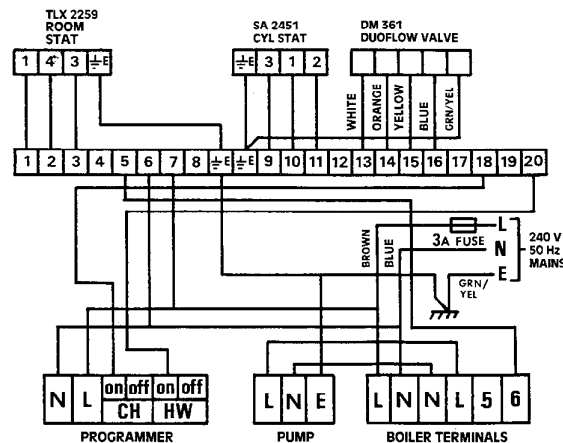


Fig. 14

4. INSTALLING THE BOILER

A vertical flat area is required for the boiler as follows :

CHALLENGER 30 BF 340 mm wide × 813 mm high (13.4 ins × 32.0 ins)

CHALLENGER 40 BF 405 mm wide × 858 mm high (16.0 ins × 33.7 ins)

The above dimensions include the necessary clearances around the boilers for case removal and for air movement.

The standard flue set supplied with the boiler is suitable for walls having a thickness of 75 mm to 355 mm (3 ins to 14 ins). Extension sets are available for walls up to 610 mm (24 ins). This can be extended to 610 mm (24 ins) using an extension kit or alternatively a 610 mm (24 ins) complete assembly is available.

4.1

Preparing the wall (traditional constructions)

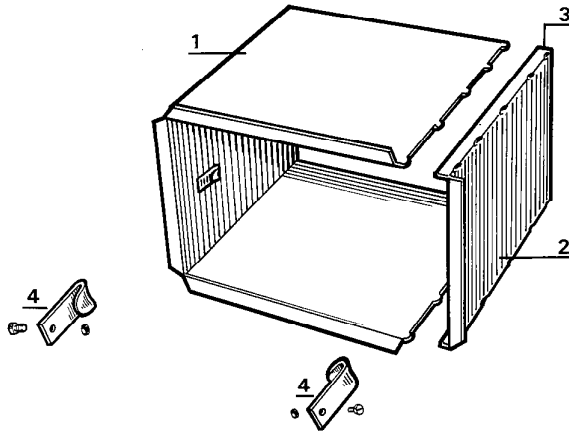
- Using dimension on page 2, or using boiler as template, cut hole for air duct.
- If the hole is cut accurately, there will be no necessity to line the hole since the air duct will make a satisfactory seal.

4.2

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 Gas Region of British Gas.

4.3.1

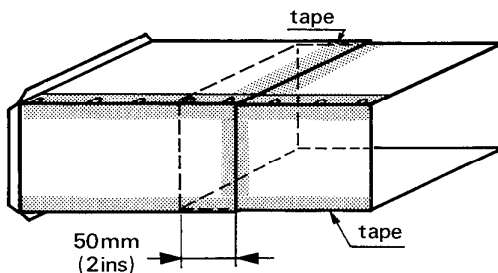


Assembling the balanced flue set

NB : For walls 355 mm (14") or less use the air duct body and cover supplied with the appliance. For walls over 355 mm (14 ins) up to 600 mm (24 ins) a 24" flue assembly is available alternatively the flue extension kit may be used (See 4.3.2).

- Remove air duct body (1) and cover (2) from carton.
- Measure and cut plain ends of air duct body and cover to the wall thickness plus 5 mm (1/4 ins).
- Place cover over body and engage tags.
- Turn down tags in direction of flange (3).
- Tape along length of joints with tape provided.
- Using nut and bolt provided fit hooks (4) to air duct.

4.3.2

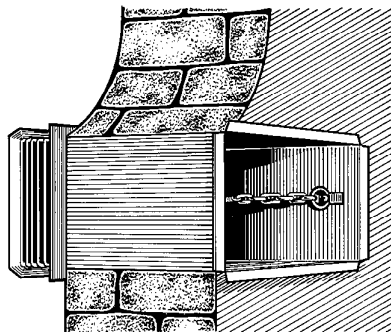


For walls in excess of 355 mm (14 ins)

NB : Use either 600 mm (24 ins) assembly or flue extension kit.

- Proceed as a-f – 4.3.1.
- Assemble air duct extension.
- Insert extension piece inside flanged section and extend to the wall thickness + 5 mm (1/4) leaving a minimum of 50 mm (2 ins) overlap.
- Trim extension piece to length as necessary.
- Mark around inside of joint.
- Remove from wall and reassemble to mark in (e) and tape around outside of joint with tape provided.

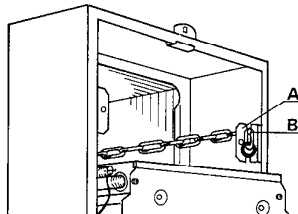
4.4.1



Fitting the balanced flue set walls in excess of 100 mm (4 ins)

- a) Fit air duct into hole with the flanged end flush with the internal wall surface.
 - b) Make good and seal air duct into hole internally and externally.
 - c) Pass terminal through hole and secure with springs and chains on the hooks on the air duct.
- NB** : It is recommended that a length of card or string is fixed to the terminal to prevent any risk of damage or danger to persons in or about the building.

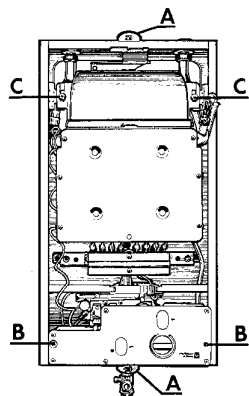
4.4.2



Fitting the balanced flue terminal walls 75 mm (3 ins) to 100 mm (4 ins)

- a) Proceed as 4.4.1 a and b.
- b) Mount boiler see 4.5 and 4.6.
- c) Transfer chains from the hooks to the slots in the flue bend mounting bracket A.
- d) Secure chain with nut and bolt B provided.

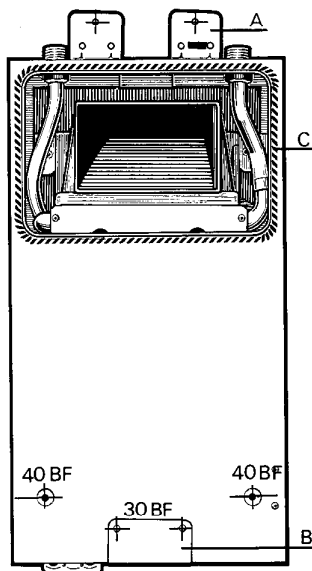
4.5



Preparing the boiler for fitting

- a) Remove front casing by removing two screws (A) at top and bottom and two screws (B) front lower part of boiler.
 - b) Remove the aluminium flue bend by removing screws (C) on either side of bend.
 - c) Fit two brackets to top of boiler using screws provided A - 4.6.1.
 - d) Fit cable clamp bracket below boiler (A - 4.8) using screws and paint cutting washers provided.
- NB** : Paint cutting washers must be used to maintain the earth bond.

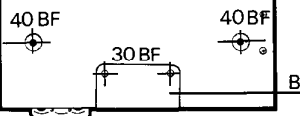
4.6.1



Fitting the boiler 30 BF

- a) Measure down from base of the air duct (page 1) for bottom fixing. Mark, drill, rawplug and fix bottom bracket.
- b) Offer boiler to wall resting on bottom bracket and locating with air duct.
- c) Mark, drill and rawplug wall.
- d) Attach foam gasket around the air inlet spigot (c) (pull off protective paper whilst sticking down gasket).
- e) Lift boiler into position with the air inlet spigot locating into the air duct.
- f) Secure boiler to the wall with the screws and washers provided.
- g) Secure boiler screwing through bottom bracket.

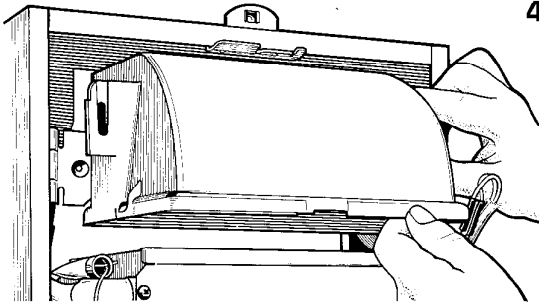
4.6.2



Fitting the boiler 40 BF

- a) Offer boiler to the wall and mark top fixing bracket and bottom fixing holes.
- b) Drill and rawplug wall.
- c) Attach foam gasket around the air inlet spigot (pull off protective paper whilst sticking down gasket).
- d) Lift boiler into position with the air inlet spigot locating into the air duct.
- e) Secure boiler to the wall with the screws and washers provided.

4.7



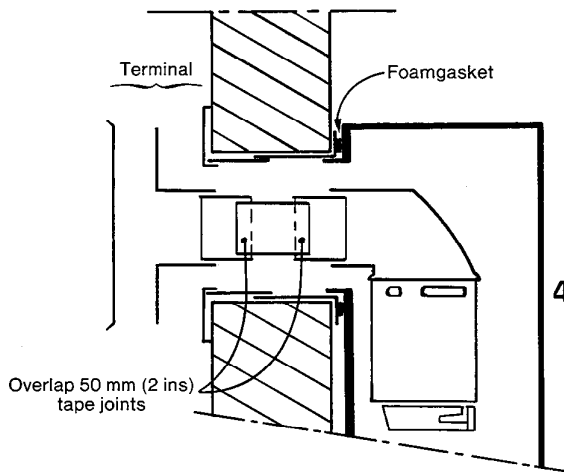
4.7.1 Assembling the flue duct and bend (Walls 75 mm (3 ins) to 100 mm (4 ins))

- Cut flue duct to length, wall thickness plus 100 mm (4").
- Slide flue duct through the air duct and fully engage it in the terminal.
- Replace flue bend engaging the flue duct.
- Ensure that the flue bend sits evenly and securely on the heat exchanger secure flue bend with the two screws previously removed.

NB : It is advisable to reduce the tension from the terminal securing chains before locating flue bend. Retension after fixing bend securing chain with the nut and bolt provided. See 4.4.2.

4.7.2 Assembling the flue duct and bend (walls 100 mm to 350 mm (4 ins to 14 ins))

- The flue duct is telescopic and should be extended to a length equal to the wall thickness plus 100 mm (4 ins) including an overlap of not less than 50 mm (2 ins).
- Tape around the joint in flue duct.
- Slide flue duct through the air duct and fully engage in the terminal.
- Replace the flue bend engaging the flue duct.
- Ensure that the flue bend sits evenly and securely on the heat exchanger, secure flue bend with the two screws previously removed.

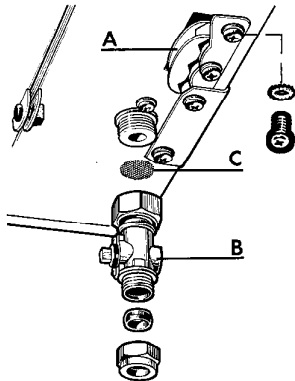


4.7.3 Assembling the flue duct and bend (walls 355 mm to 600 mm 14 to 24 ins) - 14 ins flue assembly plus extension kit.

- The flue duct is telescopic and comprises 3 pieces it should be extended to a length equal to the wall thickness plus 100 mm (4") including two overlaps of not less than 50 mm (2 ins).
- Proceed as 4.7.2 b to e.

NB : When a 24 ins flue assembly is supplied the flue duct comprises 2 telescopic sections.

4.8

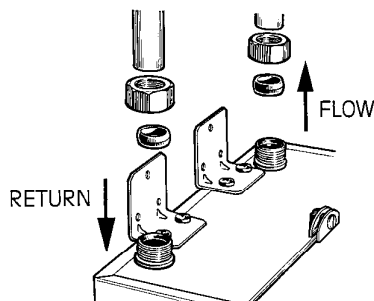


Making the gas connection

- Fit the gas service tap (B) together with the filter washer (C).
- The gas supply pipe size should be sufficient to ensure that there is 20 mbar (8 in.w.g.) pressure at the service tap, with the appliance working.

NB : The gas supply pipe size should not be less than the gas inlet to the appliance.

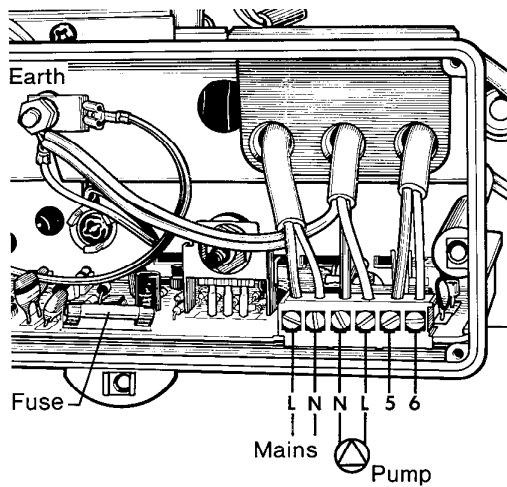
4.9



Making the water connections

- Remove sealing plugs.
- Fit the nuts and olives supplied in the accessory box.
- Enter the FLOW pipe into the RIGHT hand connection and the RETURN goes to the LEFT hand connections.
- Tighten compression fitting holding connection on inside of boiler.

4.10

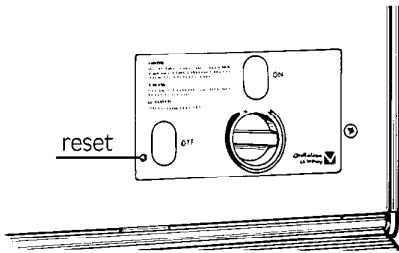


Making Electrical Connections (See section 2 for electrical supply requirements.)

- Remove control box cover (see 8.10).
- Three core heat resisting supply cable is passed through clamp and through slot in casing, and into rear of electrical box and connected to terminals on connection block and the earth connection made to earth terminal.
- Connect pump cable to terminals (L) and the earth on earth terminal.
- Connect ancillary controls across terminals marked 5 and 6. See controls diagrams. Pages 8 and 12.
- Clamp wires with cable clamp.
- Replace control box cover.

NOTE : The length of the earth wire between the cord anchorage and the terminal must be such that the live and neutral wires become taut before the earth wire if the supply cord is pulled.

4.11

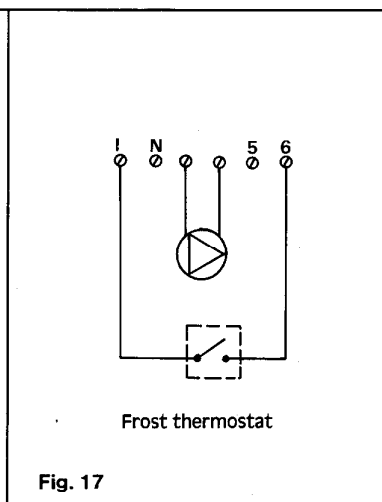
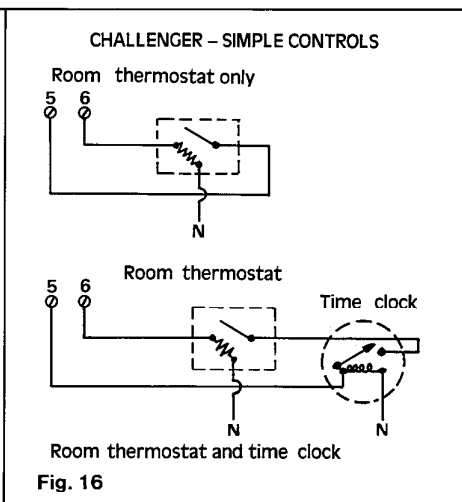
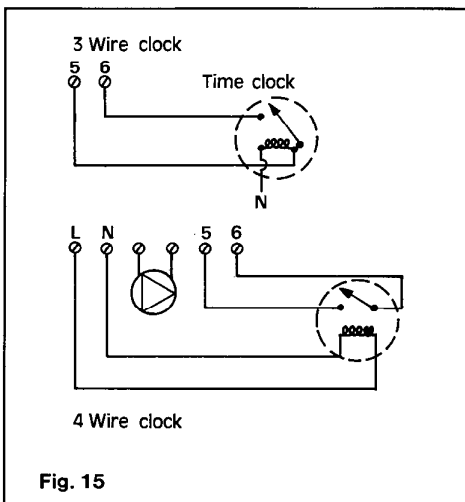


Resetting high limit thermostat

- If for any reason the high limit thermostat operates the pilot will go off and the boiler will require manual re-setting.
- Re-establish the appliance by re-setting the high limit thermostat by pressing the red button in hole on electrical panel.
- Establish cause and rectify – see fault finding chart, page 21.

In the event of an electrical fault after installation preliminary electrical system checks as described in the Multimeter Instruction book should 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.



5. COMMISSIONING – OPEN VENTED SYSTEMS

5.1 Gas Installation

The whole of the gas installation, including the meter should be inspected and tested for soundness and purged in accordance with the recommendations of CP 331:3.

5.2 Water circulation system – Open vented system only

The whole of the system should be filled and thoroughly flushed out with cold water without the pump in position. Ensure that all valves are open.

With the pump fitted the system should be filled and air locks cleared. Vent all radiators and check for water soundness.

Light the boiler as detailed in 5.3.

The water system should be heated to maximum working temperature and examined for water soundness. Both gas and water should then be turned off and the water system rapidly drained while still hot.

The system should again be filled, cleared of air locks and examined for water soundness and inhibitor added to the system if required in the specification (See section 3.9).

5.3 Lighting the boiler

- Check that the gas service tap is open.
- Switch controls to a demand mode, ensuring that pump is running.
- Push the button marked 'on' fully in and hold for 10 seconds.
- Check that pilot is alight and release button slowly.
- If the pilot extinguishes press red button and repeat from (b). (The pilot should be about 13 mm (1/2") long and impinge on the tip of the thermocouple).
- If the pilot extinguishes, wait 3 minutes and repeat b) above.
- After 30 seconds the main burner will light.
- Check for gas soundness around the boiler gas components using sense of smell and leak detection fluid.
- Check and adjust gas rate as detailed in 5.4.

5.4 Gas rate adjustment (To be carried out before adjusting by-pass.)

NB: The boiler is supplied rated at the highest output. The boiler is fitted with a gas rate adjuster.

- Switch boiler to off by pressing OFF button.
- Remove the pressure test point screw C (8.5) and connect a suitable pressure gauge.
- Remove the hexagonal cap from gas volume adjuster, D (7.5) exposing the adjustment screw.
- Turn boiler on by pressing ON button (see lighting boiler 5.3).
- Adjust pressure after boiler has been running for 10 minutes and then check the gas rate. Setting pressures are given in graph relative to required output. The pressure will be reduced by clockwise movement of screw, increased by anti-clockwise movement.
- Turn boiler to OFF and refit pressure test point screw and volume regulator cap. Test for gas leakage around pressure test point.
- Mark the data badge to indicate output to which boiler has been set.
- Replace case. Particular attention must be given to ensuring that the case seal is sound when the casing is replaced.

5.5 Adjusting the by-pass

NB: The by-pass valve should be of the lock shield pattern.

- Set the pump to achieve the system requirements but ensure that the minimum flow rate through the boiler is achieved (See 1.4 - page 3). This is equivalent to a temperature rise across the boiler of 15° C. Set boiler thermostat to maximum.
- Fit the boiler with the by-pass fully closed and the system on full load, i.e. central heating and domestic hot water (indicator valve fully open).
- Adjust the system to minimum load. This will normally be central heating only with one radiator operating.
- Open the by-pass gradually until the boiler operates quietly at all flow temperatures and the boiler thermostat turns off the gas.

6 SEALED SYSTEMS

6.1 Safety valve

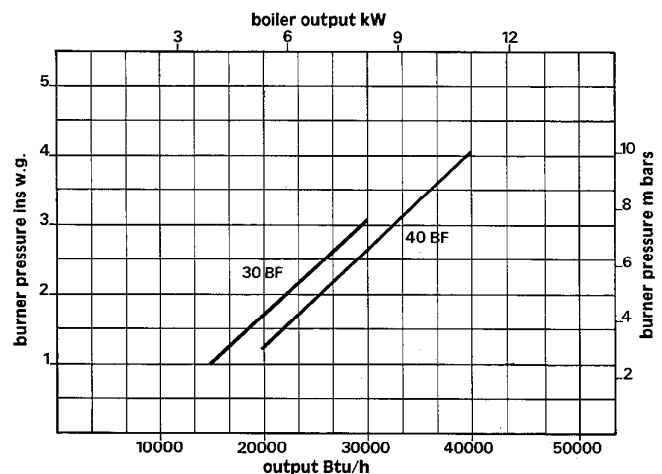
A safety valve shall be fitted close to the appliance on the flow pipe. Only safety valves set to operate at 3 bar shall be used; they shall be so positioned or any discharge pipe so arranged, that discharge of water or steam from the valve cannot create a hazard to occupants of the premises or cause damage to electrical components and wiring.

6.2 Pressure Gauge

A pressure gauge covering the range 0-4 bar (0-60 lb/in²) shall be fitted to the system adjacent to, and visible from, the filling point.

6.3 Expansion vessel

- A diaphragm type expansion vessel shall be fitted by a connection to the inlet side of the circulating pump, in a manner laid down in the vessel makers' instructions (see page 14 for illustration of recommended system layouts). The expansion vessel shall be capable of accepting water up to at least 62.5 % of its volume without damage.
- The nitrogen or air charge pressure of the expansion vessel shall not be less than the hydro-static head (height of the top point of the system above the expansion vessel).
- The expansion vessel shall be sized in accordance with the Table on page 14.



Safety valve setting (bar)	3.0									
Vessel charge pressure (bar)	0.5					1.0			1.5	
Initial system pressure (bar)	0.5	1.0	1.5	2.0	1.0	1.5	2.0	1.5	2.0	
Total water content of system	Expansion Vessel Volume (litres)									
litres										
25	2.1	3.5	6.5	13.7	2.7	4.7	10.3	3.9	8.3	
50	4.2	7.0	12.9	27.5	5.4	9.5	20.6	7.8	16.5	
75	6.3	10.5	19.4	41.3	8.2	14.2	30.9	11.7	24.8	
100	8.3	14.0	25.9	55.1	10.9	19.0	41.2	15.6	33.1	
125	10.4	17.5	32.4	68.9	13.6	23.7	51.5	19.5	41.3	
150	12.5	21.0	38.8	82.6	16.3	28.5	61.8	23.4	49.6	
175	14.6	24.5	45.3	96.4	19.1	33.2	72.1	27.3	57.9	
200	16.7	28.0	51.8	110.2	21.8	38.0	82.4	31.2	66.2	
250	20.8	35.0	64.7	137.7	27.2	47.5	105.0	39.0	82.7	
300	25.0	42.0	77.7	165.3	32.7	57.0	123.6	46.8	99.3	
350	29.1	49.0	90.6	192.8	38.1	66.5	144.2	54.6	115.8	
400	33.3	56.0	103.6	220.4	43.6	76.0	164.8	62.4	132.4	
450	37.5	63.0	116.5	247.9	49.0	85.5	185.4	70.2	148.9	
500	41.6	70.0	129.5	275.5	54.5	95.0	206.0	78.0	165.5	
For systems volumes other than those given above, multiply the system volume by the factor across	0.0833	0.140	0.259	0.551	0.109	0.190	0.412	0.156	0.331	

For the Challenger boilers the volume found from the above table shall be multiplied by 0.80

rary hose connection is only permissible if acceptable to the local Water Authority.

6.4 Hot Water storage Cylinder

The hot water cylinder shall be the indirect coil type which is suitable for the system pressure.

6.5 Make-up system

Provision shall be made for replacing water lost from the system either :

- (i) From a make-up vessel or tank mounted in a position higher than the top point of the system and connected through a non-return valve to the system on the return side of the hot water cylinder or the return side of all heat emitters, or –
- (ii) Where access to make up vessel would be difficult, by pressurisation of the system.

6.6 Mains Connection

There shall be no connection to the mains supply or to the water storage tank supplying domestic water, even through a non-return valve, without the approval of the local Water Authority.

6.7 Filling Point

For filling system see BS 5376 Pt2 appendix A. A tempo-

6.8 Pipework

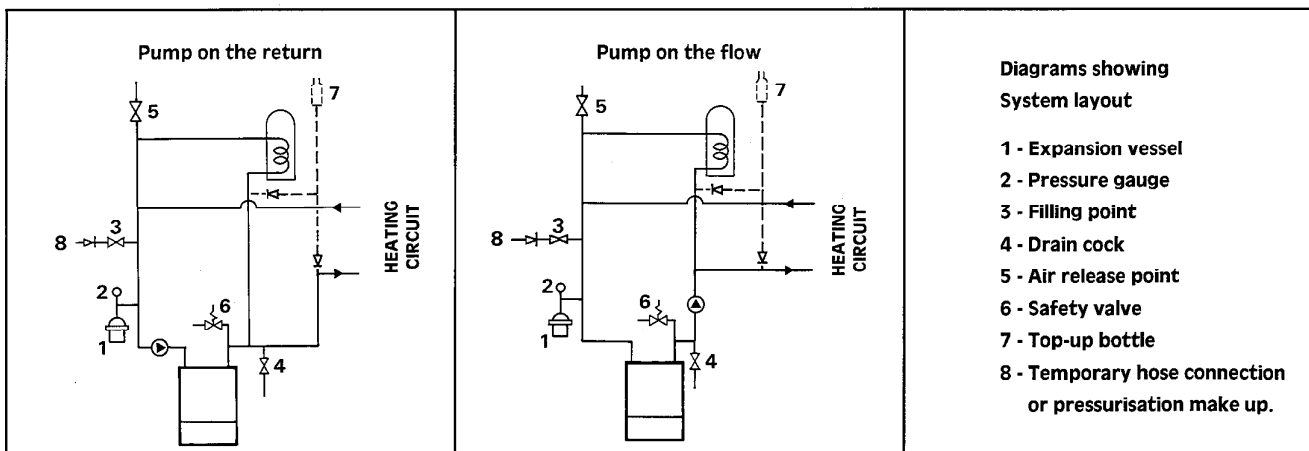
Pipework should be of copper ; small bore or microbore with capillary or compression jointing to a high standard. Leak sealant shall not be used in the system.

Where a vessel of the calculated size is not obtainable, the next available larger size should be used.

For the purpose of the above calculation, the volume of the system shall be determined as accurately as possible using manufacturers' data as appropriate. Alternatively the volumes given below may be used to give a conservative estimate of the system volume :

- Boiler 0.5 litres (0.11 gallons)
- Small bore pipework 0.3 litres (0.07 gallons)
per 0.292 kW (1000 Btu/h) of system output
- Microbore pipework 7 litres (1.5 gallons)
- Steel panel radiators 2.3 litres (0.5 gallons)
per 0.292 kW (1000 Btu/h) of system output
- Hot water cylinder 2 litres (0.44 gallons)

If a system is extended, an expansion vessel of increased volume may be required unless previous provision has been made for the extension.



5.9 Commissioning Sealed System Only

The whole of the system should be filled and thoroughly flushed out with cold water without the circulating pump in position. Ensure that all valves are open. (The system must be filled with water either from a sealed system filler pump with a break tank, or by any other method approved by the Local Water Undertaking).

With the circulating pump fitted the system should be filled and airlocks cleared until the pressure gauge registers 1.5 bar (21.5 lbf/in²).

Vent all radiators and check for water soundness.

Manually raise the water pressure to ensure that the safety valve lifts. This should occur within ± 0.3 bar (± 4.3 lbf/in²) of the preset lift pressure, ie. 3 bar (43.5 lbf/in²).

Release water from the system until the initial system design pressure is attained, taking into account any dif-

ference in height between the pressure gauge and the point at which the pressure vessel is connected.

Light the boiler as detailed in 5.3.

The water system should be heated to maximum working temperature and examined for water soundness.

Both gas and water should then be turned off and the water system rapidly drained whilst still hot.

The system should again be filled, and inhibitor added to the system, if required in the specification (see 3.9), cleared of air locks and adjusted to the initial design pressure. Any set pointer on the pressure gauge should be set to coincide with the indicating pointer. Examine for water soundness. Now adjust the gas rate and the system by-pass (See 5.4 and 5.5).

n.b. The boiler is supplied rated at highest output. The boiler is fitted with a gas rate adjuster.

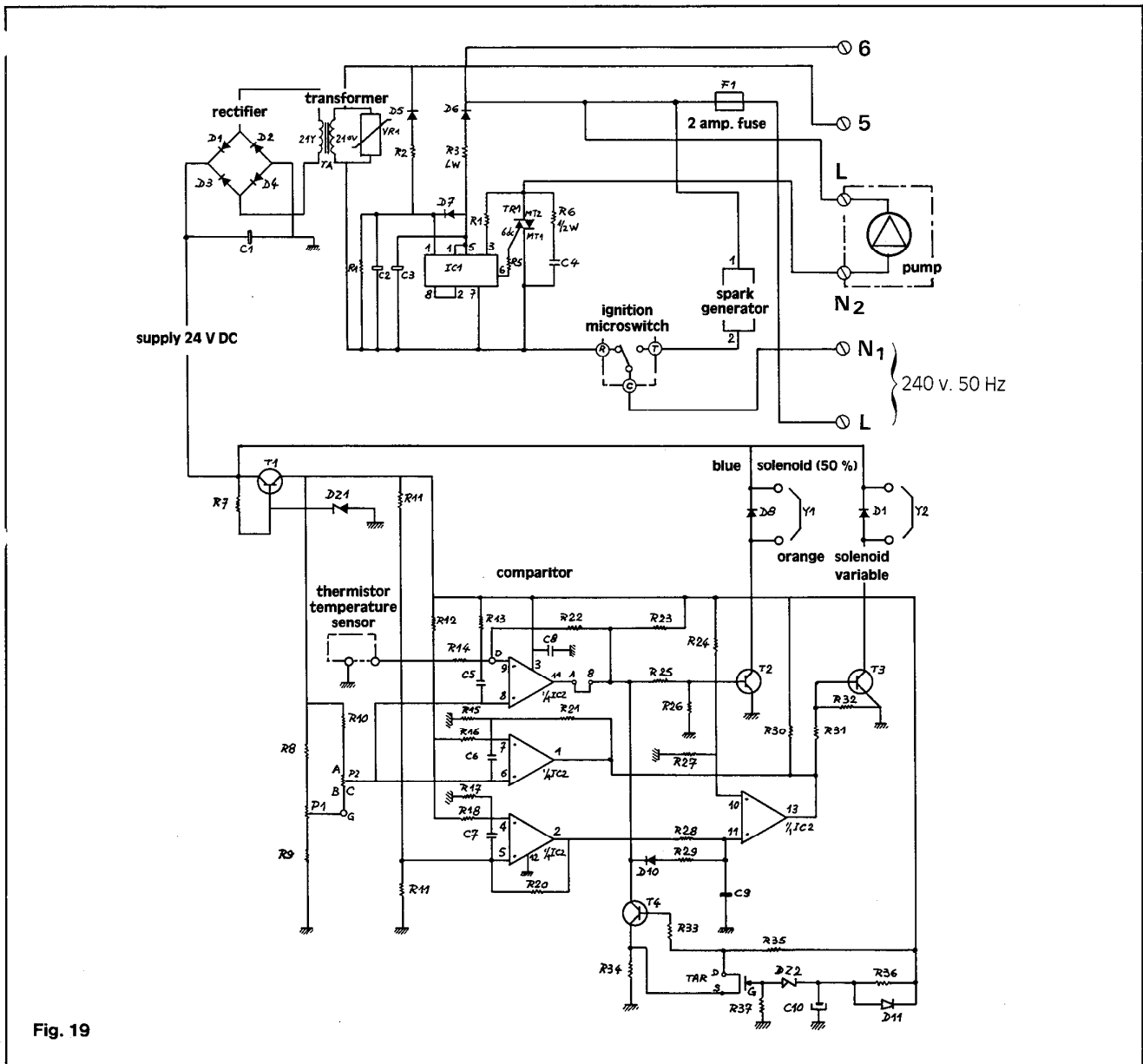


Fig. 19

CHALLENGER TEST POINTS

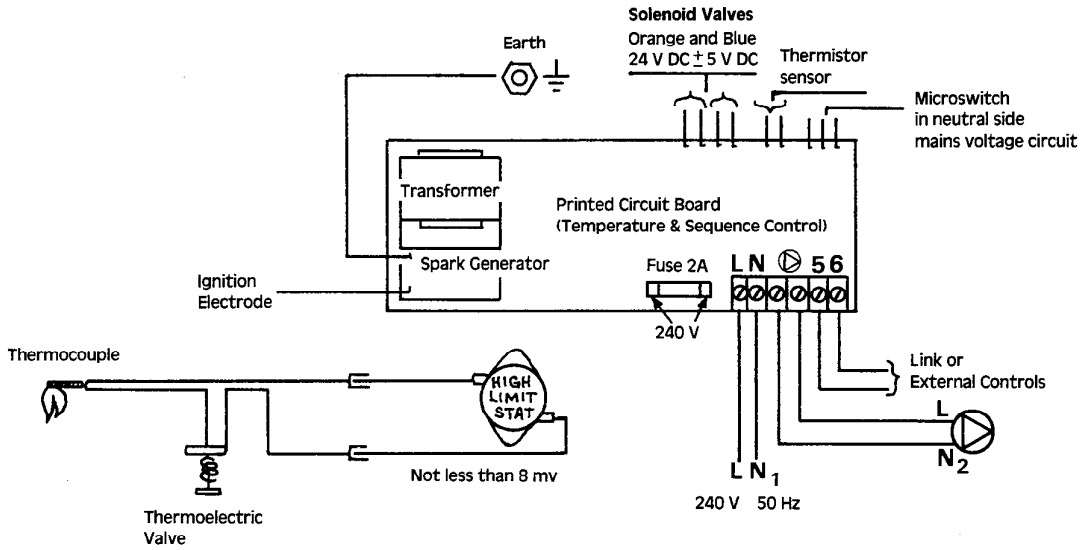


Fig. 20

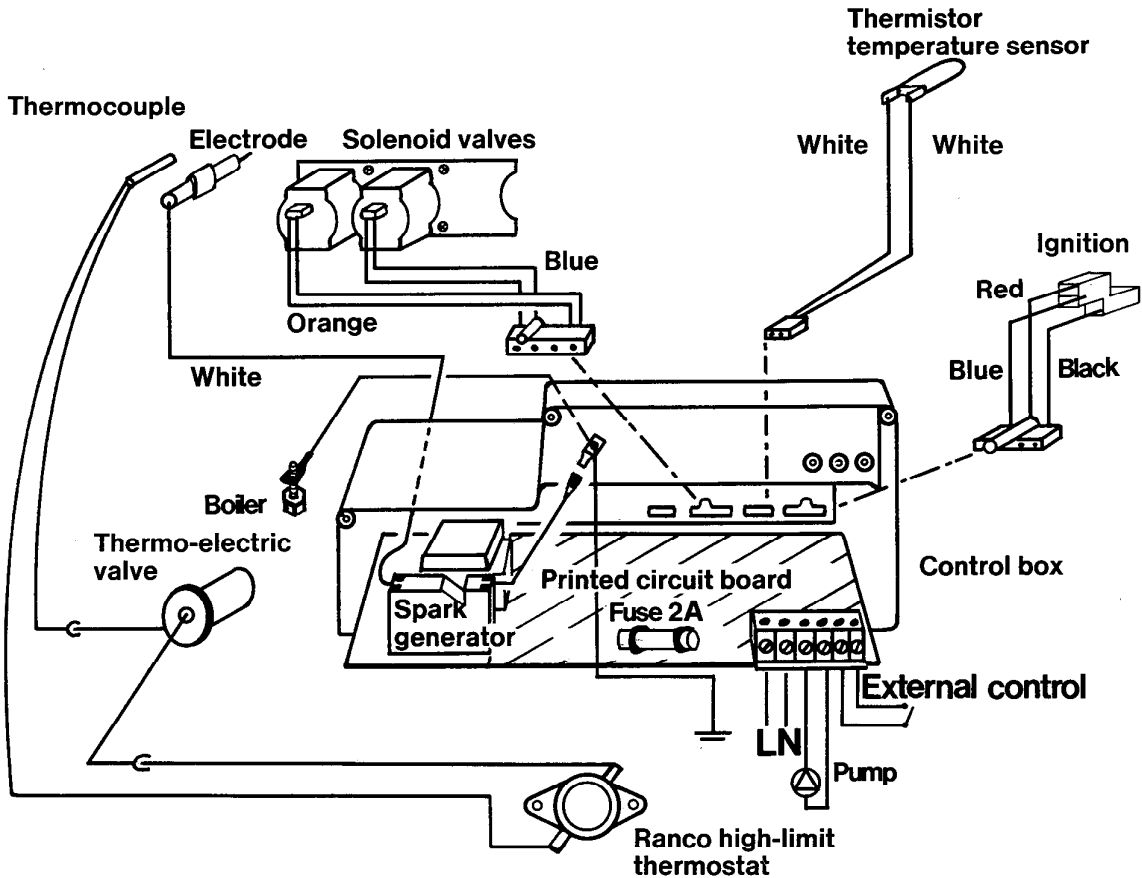


Fig. 21

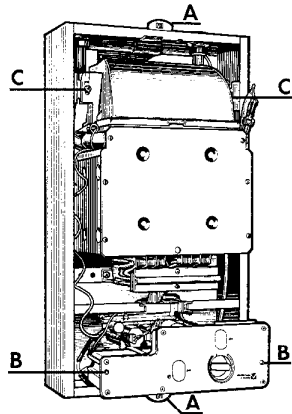
7. SERVICING

For efficient and trouble free operation it is important that the CHALLENGER receives regular maintenance. The following schedules are recommended.

Before commencing any work turn off the gas at the gas inlet service 4.8 tap (Page 4). Ensure that the electricity supply is disconnected.

NB : Always test for a gas soundness after completing any servicing or exchange of gas carrying components.

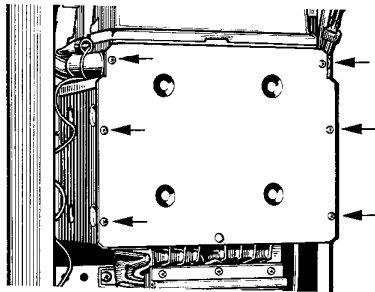
7.1



Remove front casing

- Remove screws (A) at top and bottom of boiler.
- Remove two screws from lower front of case (B).
- Remove case by pulling forward easing out bottom first.
- Replace in reverse order.

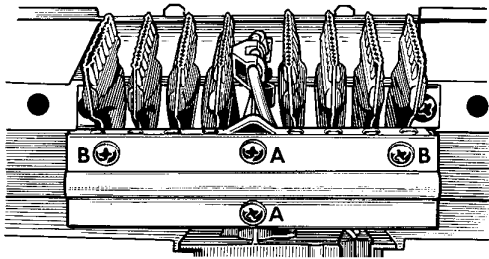
7.2



Remove combustion chamber front panel

- Remove six screws securing front panel of combustion chamber.
- Remove panel by easing forward at bottom and disengage from flue hood by pulling downwards.

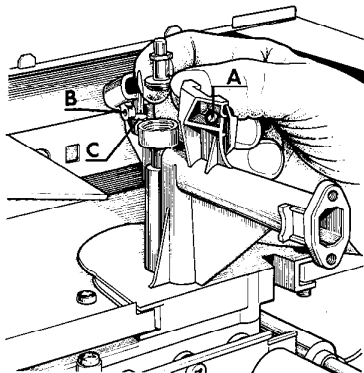
7.3



Remove burner assembly

- Remove screws securing burner manifold to gas section (A). 30 BF and screws A and B (end of manifold in the 40 BF).
- Remove manifold and gasket and retain in a safe place.
- Burner can now be removed.

7.4



To remove pilot

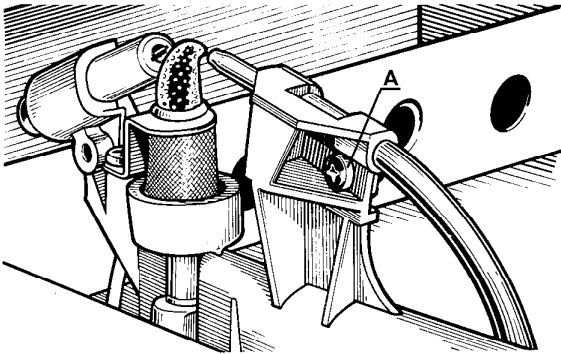
- Release thermocouple from bracket retaining screw and securing clamp (A). Move thermocouple to the side.
- Release the electrode by loosening screw (B) on right hand side of assembly and rotating retaining clip.
- Remove pilot gauze and filter by removing screw (C) securing gauze to assembly.
- Remove pilot by unscrewing (nut size 8 mm AF) using set or adjustable spanner.
- The pilot injector can be cleaned and should be replaced bright side uppermost.
- Replace in reverse order.

Cleaning the parts

- a) The burner can be cleaned by inverting and brushing with a soft brush.
- b) The heat exchanger matrix can be cleaned by brushing. It may be an advantage to remove flue hood see 4.7. If deposits are too hard to remove by brushing, the matrix can be removed – see section 8.7 page 19 and washed with hot water and detergent.
- c) The gas filter (see C 4.8) can be cleaned using water and detergent - **DO NOT USE SOLVENTS**.
- d) Replace all components in reverse order. **NB** : particular attention must be given to ensuring that the case seal is sound when the casing is replaced.

8. REPLACEMENT OF PARTS

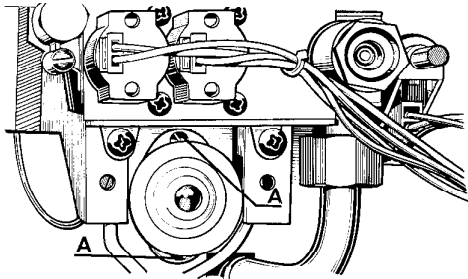
8.1



Replacing thermocouple

- a) Remove front case 7.1
- b) Remove combustion chamber front panel 7.2
- c) Remove burner 7.3
- d) Release thermocouple from bracket securing clamp (A).
- e) Release at thermoelectric valve by unscrewing nut 10 mm.
- f) Disconnect from overheat thermostat by pulling connections apart.
- g) Replace in reverse order (taking care to replace rubber seating BF only).

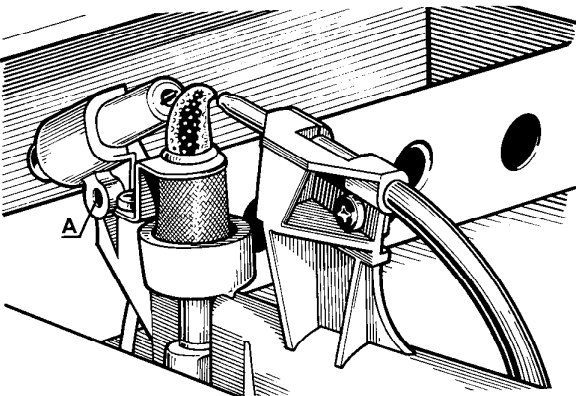
8.2



Replace high limit thermostat

- a) Remove front case 7.1 and electrical control box 8.10.
- b) Remove two screws (A) securing overheat assembly.
- c) Disconnect at pin connectors by pulling apart.
- d) Remove sensor from dry pocket first removing split pin.
- e) Replace in reverse order using a heat sink grease on the sensing phial.

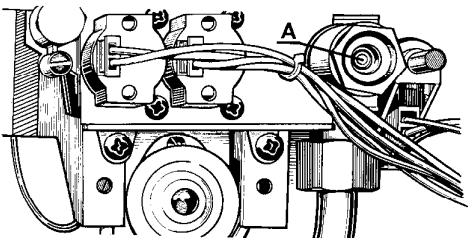
8.3



Replace spark electrode and lead

- a) Remove front case 7.1.
- b) Remove combustion chamber front panel 7.2.
- c) Remove burner 7.3.
- d) Remove thermostat knob and six screws from front of electrical control box.
- e) Remove plugs from rear of electrical controls box.
- f) Slide PCB forward and remove spark terminal.
- g) Feed lead out through rear of control box.
- h) Loosen screw securing clip – retain electrode and turn clip through 90°.
- i) Withdraw electrode by sliding forward.
- j) Replace in reverse order taking care to locate electrode in locating groove and to replace plugs in rear of control box.

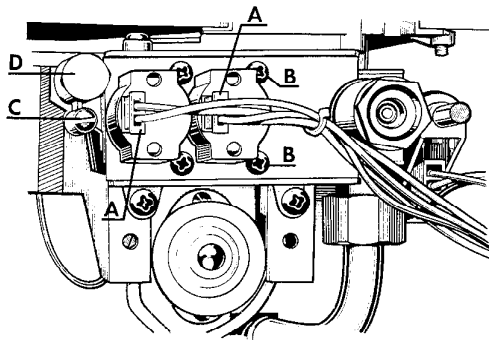
8.4



To replace thermoelectric valve

- a) Remove front cover.
- b) Remove thermocouple connection.
- c) Remove nut securing thermoelectric valve (25 mm).
- d) Withdraw thermoelectric valve.
- e) Replace in reverse order.

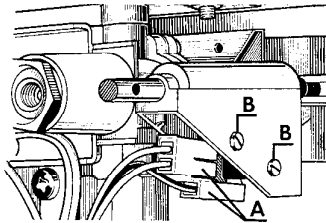
8.5



To replace solenoid valves

- a) Remove front casing 7.1.
- b) Remove electrical control box 8.10.
- c) Withdraw plug connections (A) (colour coded from solenoid valves).
- d) Remove four screws (B) securing solenoid valve mounting plate.
- e) Remove mounting plate and solenoids – **take care not to misplace springs.**
- f) Replace in reverse order.

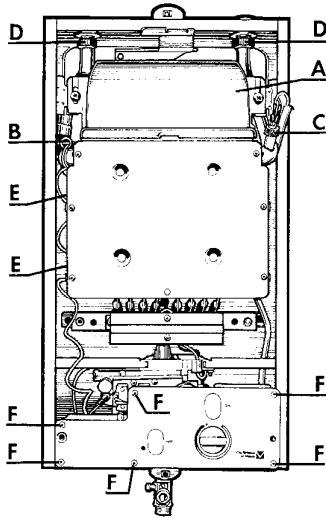
8.6



To replace microswitch

- a) Remove front casing 7.1.
- b) Remove electrical control box 8.10.
- c) Remove plugs (A) from microswitch.
- d) Remove two screws (B) retaining microswitch.
- e) Replace in reverse order.

8.7



To replace heat exchanger

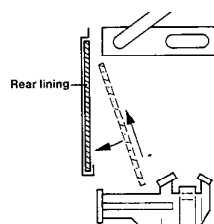
- a) Drain system.
- b) Remove front casing 7.1.
- c) Remove combustion chamber front panel 7.2.
- d) Remove burner manifold and burner 7.3.
- e) Remove flue bend (A).
- f) Remove overheat thermostat phial – left hand side (B).
- g) Withdraw thermostat temperature sensor – right hand side (C).
- h) Unscrew nuts on flow and return connections.
- i) Slacken four screws securing combustion to rear chassis.
- j) Drop assembly and withdraw forwards.
- k) Remove two screws from rear of assembly retaining heat exchanger to combustion chamber.
- l) Replace in reverse order.

8.8

To replace pilot injector

- a) Proceed as 7.4.
- b) Replace injector ensuring it is fitted bright side uppermost.

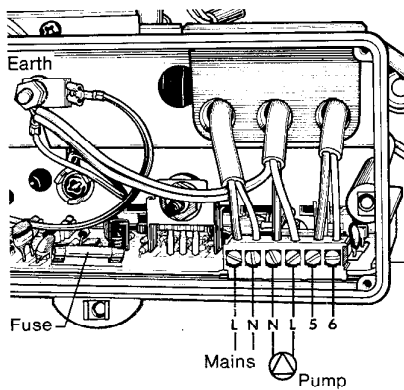
8.9



To replace combustion chamber linings

- a) Remove front casing 7.1.
- b) Remove combustion chamber front panel 7.2.
- c) Remove burner 7.3. Slide outside linings first followed by rear lining which is removed by easing upwards and sliding out from bottom. Replace in reverse order taking care that front lining is correctly positioned.

8.10

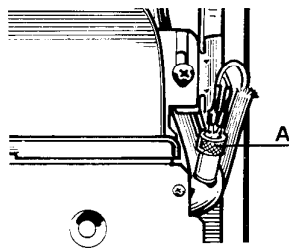


To replace electrical control box

- a) Isolate electrical supply.
- b) Remove front casing 7.1.
- c) Remove six screws retaining electrical control box cover 8.7 - F.
- d) Withdraw plugs from rear of box.
- e) Disconnect to terminal strip.
- f) Slide PCB forward and disconnect spark electrode and earth leads.
- g) Remove 2 screws securing control box to chassis.
- h) Replace in reverse order taking care to replace plugs in rear of control box.

NB : Care should be taken to ensure correct location of the ON, OFF and reset buttons.

8.11



To replace thermostat

- a) Isolate electrical supply.
- b) Remove front casing.
- c) Undo knurled ring (A) retaining thermostat phial and remove phial.
- d) Unplug from rear of control box.
- e) Replace in reverse order using heat sink grease on the sensing phial.

8.12

To replace fuse

- a) Isolate electrical supply.
- b) Remove front casing 7.1.
- c) Remove cover on electrical control box (8.10 c)
- d) Remove and replace fuse.
- e) Reassemble in reverse order.

8.13

To replace PCB

- a) Isolate electrical supply.
- b) Remove front casing 7.1.
- c) Remove electrical control box cover (see 8.10 c).
- d) Remove plugs from rear of electrical control box.
- e) Ease forward PCB and remove spark electrode wire and earth wire from spark generator.
- f) Slide board forward and remove.
- g) Replace in reverse order.

8.14

Testing of FFD Circuit

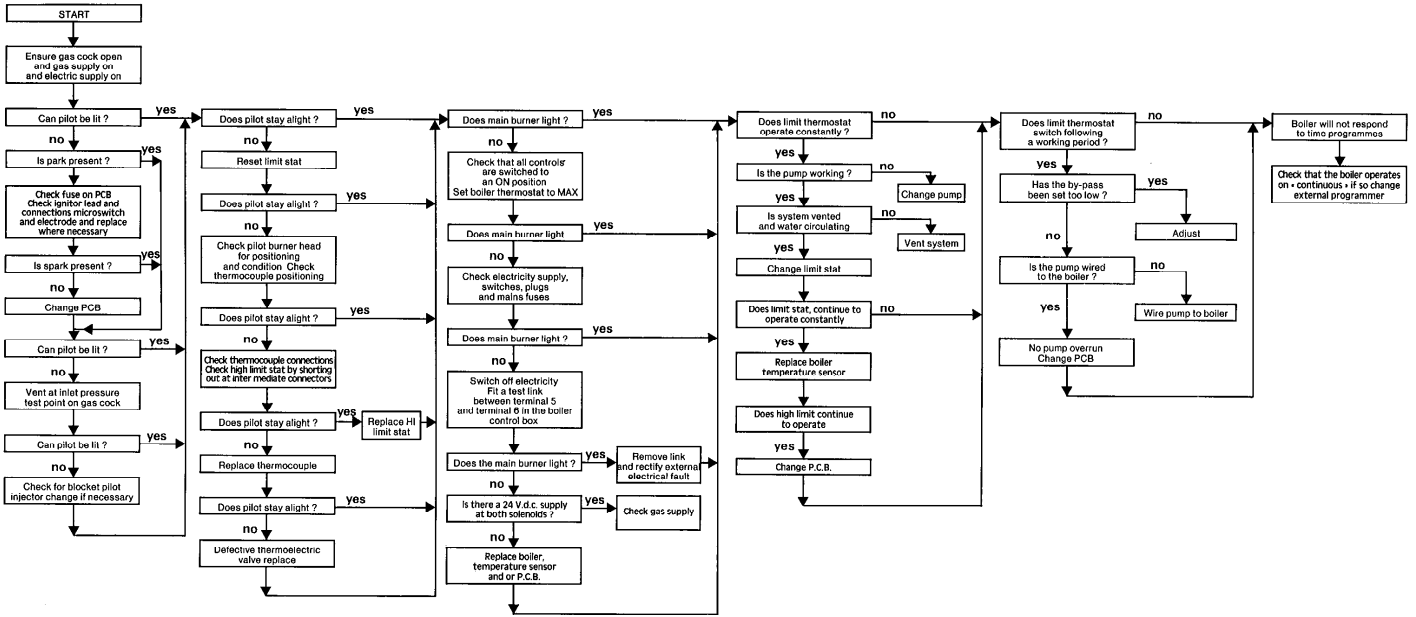
Closed circuit

- Slide back insulation at plug in connection and attach millivolt meter using crocodile clip connectors.
- Output should not be less than 3 mv.

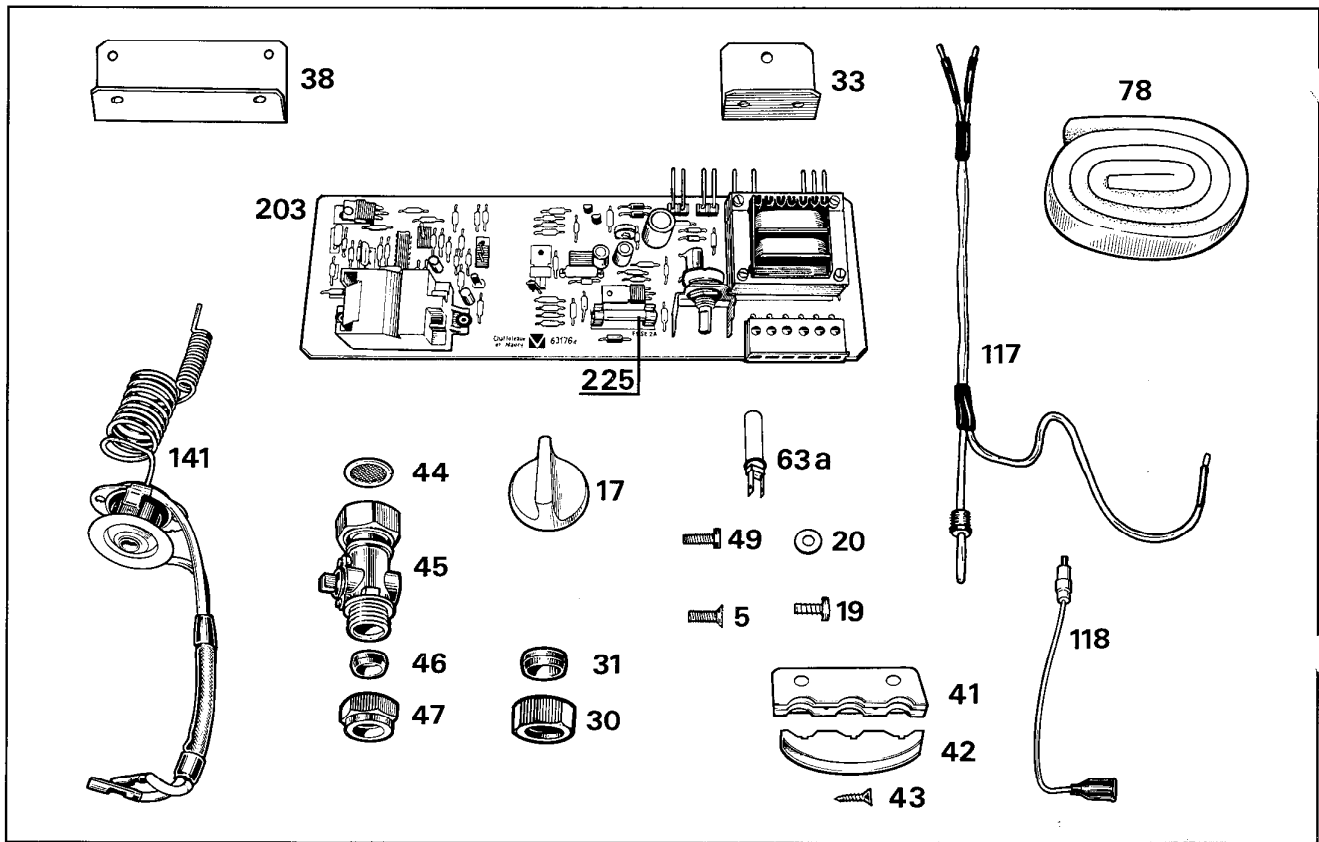
Open circuit

- Disconnect round pin connectors.
- Attach millivolt meter using crocodile clips to the thermocouple side - male connectors.
- Press and hold ignitor button.
- Output with pilot on should not be less than 14 mv.

NB : If closed circuit output is high and approaching the open circuit voltage obtained, then suspect faulty thermoelectric valve.



SHORT LIST



Key No	Description	GC Number	Part Number
5	Screw M6 front cover/control box securing	366 713	65622/01
7a	Door assembly (30 BF)	366 688	64143
7b	Door assembly (40 BF)	366 649	64150
17	Temperature selector knob	366 553	64051
19	Screw front case/rear case securing	402 327	45817
20	Plastic washer	407 715	34377
21	Serrated washer	366 035	13183
30	Nut 3/4" BSP	366 558	47509
31	Olive (22 mm)	366 559	47508
33	Top fixing bracket	366 250	40169/06
38	Bottom bracket 30 BF only	366 691	65485/06
41	Cable clamp bracket	366 564	65519/06
42	Cable clamp	366 565	27834
43	Screws cable clamp/bracket	366 714	45654
44	Gas filter washer	263 545	37309
45	Gas service cock	366 566	65960
46	Olive (15 mm)	263 800	56489
47	Nut 1/2" BSP	366 642	56490/01
49	Fixing screw - Bracket to case	366 546	66207/03
63a	Thermistor temperature sensor	366 570	64154
78	Foam gasket - rear case/air inlet duct	366 662	56511
117	Thermocouple assembly	366 667	65974
118	Electrode and lead assembly	366 593	63404
141	High limit thermostat assembly	366 636	65962
203	Printed circuit board	366 614	63176
225	Fuse (2 amp)	264 446	44790

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**Chaffoteaux
et Maury**

