ICI CALDAIE UK LTD

INSTALLATION AND SERVICING MANUAL

RIO 140

Floor Standing Combination Boiler
providing
Central Heating and Mains Fed Domestic Hot Water

For use with Natural Gas (G20) - Natural Gas model only
or Propane (G31) - Propane model only

EC Certificated for Safety and Performance

CE

It is important that the boiler is installed and serviced
as described in these instructions

After installing the boiler leave these instructions with the User

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IMPORTANT

For information specific to Propane (G31) boilers refer to section 15 at the end of these instructions.

HEALTH AND SAFETY INFORMATION

Under the Consumer Protection Act 1987 and Section 6 of the Health & Safety at Work Act 1974, we are required to provide information on substances hazardous to health (COSHH Regulations 1988).
Sealants and paints used in the manufacture of the product are cured and present no known hazards when used in the manner for which they are intended.
The following material is also present in the product:

Insulation material
Material Type: Ceramic fibre board.
Description: Rigid board.
Known Hazards: May cause temporary irritation or rash to skin. High dust levels may irritate eyes and upper respiratory system.
Precautions: Avoid unnecessary or rough handling, or harsh abrasion of boards. Normal handling and use of material should not produce high dust levels.
Avoid inhalation, and contact with skin and eyes.
After handling always follow normal good hygiene practices.
Protection: Use disposable gloves, face mask and eye protection.
First Aid: Eyes - If irritation occurs, wash eyes with copious amounts of water. If symptoms persist, seek immediate medical advice.
Skin - If irritation occurs, wash under running water before washing with soap and water.
Inhalation - Remove to fresh air, drink water to clear throat and blow nose to remove dust/fibres.
Ingestion - Drink plenty of water.

1.1 TECHNICAL SPECIFICATIONS

CENTRAL HEATING

Maximum heating system water temperature	90°C + 0 - 5°C
Minimum heating system water temperature	30°C ± 2°C
Maximum heating system pressure	1.5 bar cold, 2.3 bar hot (set when cold)
Minimum heating system pressure (cold)	0.8 bar
Maximum heating system volume	90 litres (with expansion vessel provided)
Heating system expansion vessel size	10 litre pre-charged at 1.0 bar (max. 1.5 bar)
Safety valve setting	3.0 bar

DOMESTIC HOT WATER

Maximum hot water temperature	65°C ± 3°C
Maximum mains water inlet pressure (before pressure reducing valve)	6 bar
Minimum mains water inlet pressure	1.0 bar (remove flow restrictor if < 1.5 bar - section 9.25)
Minimum hot water flow rate	3.0 litre/min
Maximum pressure of hot water supplied to taps	3.5 bar
Dynamic hot water performance	13.6 litre/min raised 30°C
Amount of hot water at 30°C available in 10 minutes	260 litre
Time to raise stored water to maximum temperature	20 to 25 minutes (10°C inlet temp.)
Time to reheat 70% of stored water	3 to 4 minutes
Hot water expansion vessel size (two vessels)	4 litre and 2 litre, both pre-charged at 3.5 bar
Hot water storage capacity	140 litre
Temperature/pressure relief valve setting	90 - 95°C/7 bar
Expansion relief valve setting	6.0 bar
Mains water inlet pressure reducing valve setting	3.5 bar

GENERAL

Burner injector (Natural gas), marked 125 - No. off	15
Electrode gap	4 mm
Type of ignition	Direct burner ignition
Primary water content	9.0 litre
Weight (installed and including water)	307 kg
Lifting weight (installing)	158 kg
Case height (excludes flue elbow)	1 700 mm
Case width	600 mm
Case depth	600 mm
Clearances for installation and servicing	
Top (includes space for flue elbow)	300 mm
Front	600 mm
Sides	5 mm
Central heating flow and return connections	22 mm compression
Cold water mains inlet connection	15 mm compression
Safety valve discharge connection	½ in. BSP Female
Domestic hot water outlet connection	15 mm open pipe
Gas supply	15 mm compression
Flue terminal size	88 mm diameter x 125 mm deep
Flue restrictor diameter	49 mm co-axial, 45.5 mm twin pipe
Electricity supply	230 V ~ 50 Hz 150 W Fused at 3 A
Fuses on main driver board	2 A and 0.3 A (0.3 A for external controls)
Built in frost protection control on main driver board	Operates if primary water falls below 5°C

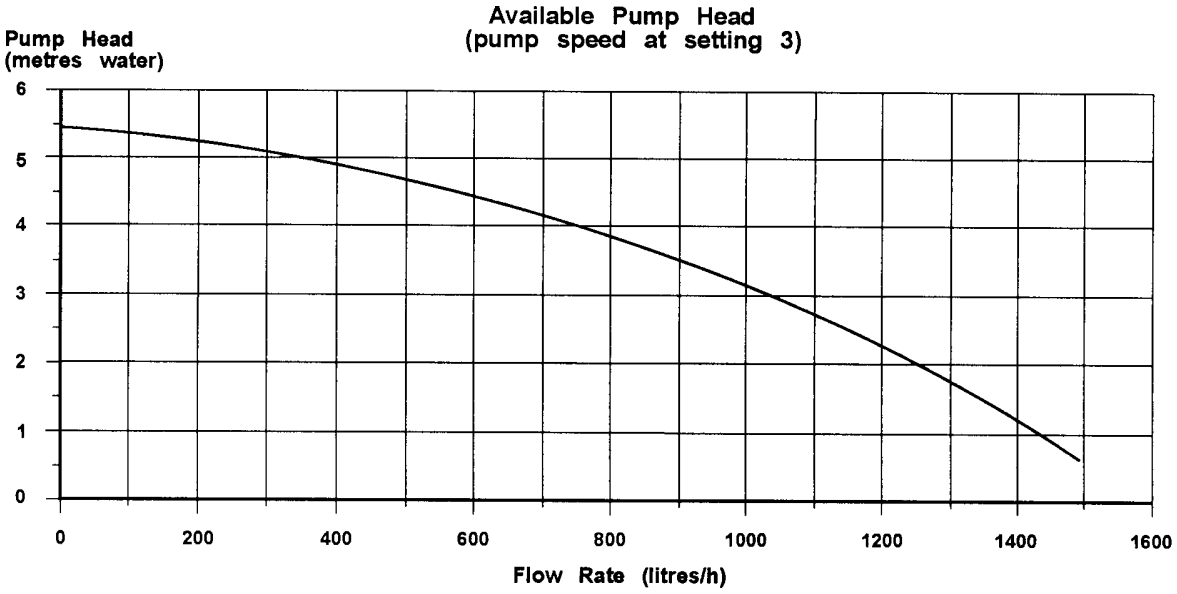
The boiler meets the requirements of IP20 for degree of protection against moisture.
The data label is positioned inside the upper front panel.

1.2 NOMINAL BOILER RATINGS - Natural gas (G20)

	Natural gas (G20) at 20 mbar						
	Heat Output		Heat Input (Gross)		Burner pressure		Gas rate
	kW	Btu/h	kW	Btu/h	mbar	in wg	m³/h
Min.	12.21	41 650	15.55	53 050	2.0	0.8	1.48
Factory set	18.09	61 700	23.04	77 830	4.9	2.0	2.20
Max.	28.40	96 900	34.32	117 100	11.9	4.6	3.27

Gas rate based on a gross calorific value of 37.78 MJ/m³ (G20) - EN437

1.3 PUMP PERFORMANCE



Output		Pump head		Flow rate		ΔT
kW	Btu/h	metres	feet	litres/h	gal/h	°C
12.21	41 650	3.30	10.82	955	204	11
18.09	61 700	2.60	8.53	1 111	244	14
28.40	96 900	2.00	6.56	1 221	269	20

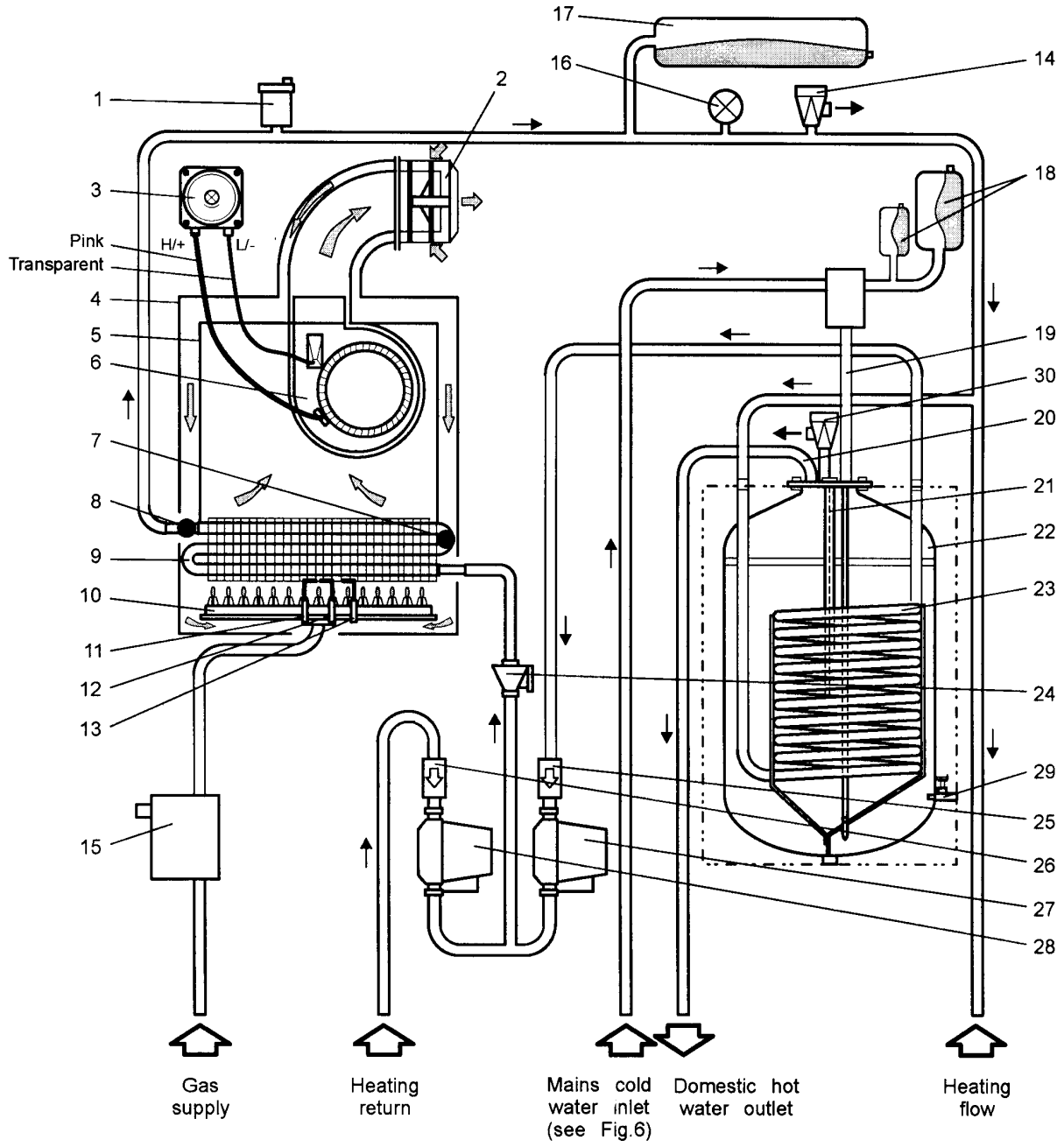
ΔT given above, is the temperature difference between the central heating flow and return connections.

The recommended range of ΔT across the boiler is between 11 and 20°C.
The pump head given above is the residual pump head available for the heating system.
Note: When designing the heating system, especially at the higher output (28.40 kW) the pump head, expansion vessel size, radiator mean temperature, etc. must all be taken into account.

1.4 FLUE LIMITATIONS

Co-axial flue size		100/60 mm
Twin pipe flue size		80/80 mm
Co-axial flue maximum length		4 m (3 m with one elbow)
Reduction per elbow		0.8 m (45° and 90°)
Twin pipe maximum length		20 m (total air + fumes)
Reduction per 90° elbow	(large radius)	0.6 m
	(small radius)	3.0 m
Minimum pipe length		0.5 m
Flow rate		68 kg/h

1.5 BOILER SCHEMATIC



1 Automatic air vent
2 Co-axial duct
3 Air pressure switch
4 Sealed chamber
5 Flue hood
6 Fan
7 Limit thermostat
8 Heating sensor
9 Heat exchanger
10 Burner
11 Ignition spark electrode
12 Ignition earth electrode
13 Flame detection electrode
14 Safety valve (3 bar)
15 Gas valve
16 Pressure gauge
17 Heating expansion vessel
18 Hot water expansion vessels
19 Cold water inlet to storage cylinder
20 Hot water outlet from storage cylinder
21 Anode
22 Storage cylinder
23 Heating coil
24 Flow switch
25 Hot water non return valve
26 Heating non return valve
27 Hot water pump
28 Heating pump
29 Storage cylinder drain cock
30 Temperature/pressure relief valve

2.1 BOILER DESCRIPTION

The Rio 140 is a room-sealed combination boiler using a small multi-directional fan-assisted balanced flue. The boiler, providing central heating and domestic hot water at mains pressure, has been designed for use with a sealed water central heating system. See section 2.11.

2Domestic hot water at mains pressure is supplied from an integral 140 litre unvented storage cylinder.
The pump, expansion vessel and safety devices are all fitted within the boiler.
The boiler will suit central heating systems requiring upto 28.40 kW (96 900 Btu/h).
The boiler is factory set to an output of 18.09 kW for central heating.
The maximum domestic hot water output is fixed at 28.40 kW (96 900 Btu/h) and is capable of providing 13.6 litres/min with a temperature rise of 30°C continuously, and 260 litres in the first 10 minutes (discharge of cylinder). See section 2.12.
The temperature of both the central heating water and domestic hot water are User controllable. Central heating from 30 to 90°C and hot water up to 65°C ± 3°C.
A built in timer allows the User to set the operating times for the central heating - domestic hot water is available continuously.
A 'Heating' switch is provided to allow the central heating to be turned off during the summer months, if required.
The boiler contains the following automatic safety features:-

An overheat safety thermostat which switches off the boiler if the heat exchanger exceeds 95°C.
A flow switch which switches the boiler off if the flow in the primary circuit is below 7.5 litres/min.
A safety valve which will automatically open at 3 bar to relieve excess pressure in the central heating system.
An overheat safety thermostat which switches off the boiler if the hot water store exceeds 65°C.
A temperature/pressure relief valve to vent the hot water store in the event of overheating (90 - 95°C/7 bar).
A built in frost protection control that will switch the boiler on if the primary water temperature falls below 5°C.

2.2 REGULATIONS TO COMPLY WITH

It is the law that all gas appliances are installed by competent persons such as British Gas or other CORGI registered personnel in accordance with the following recommendations:-

Gas Safety (Installation and Use) Regulations 1994 (as amended)
All relevant Building Regulations issued by the Department of the Environment
Building Standards (Scotland) (Consolidation) Regulations issued by the Scottish Development Department
Model and local Water Undertaking Byelaws
Current IEE Wiring Regulations and IEE Earthing Regulations
Health & Safety Document No. 635 'The Electricity At Work Regulations 1989'

The installation should also be in accordance with the following British Standard Codes of Practice:-

BS 5440:1:1990 Flues
BS 5440:2:1989 Air supply
BS 5449:1990 Forced circulation hot water systems
BS 5546:1990 Installation of hot water supplies for domestic purposes
BS 6700:1987 Design, installation, testing and maintenance of services supplying water
BS 6798:1987 Installation of gas fired hot water boilers
BS 6891:1989 Gas installation
BS 7593:1992 Code of Practice for treatment of water in heating systems
BS 7671:1992 Requirements for electrical installations, IEE Wiring Regulations

Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety to ensure that the law is complied with.

2.3 DELIVERY

The boiler is supplied in a two packs as following:-

Pack 1 Crated boiler
Literature pack with Flue restrictor and Boiler fittings accessories (see section 14 for contents)
Pack 2 Standard flue assembly
Flue accessories - See section 14 for contents

If the boiler is not to be installed immediately, ensure the packs are stored in a dry place where they will not be damaged.

2.4 NATURAL GAS (G20) SUPPLY - Refer to section 15 for Propane (G31)

The maximum natural gas requirement of the boiler is 3.27 m³/h.
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. A 22 mm supply pipe will be necessary for the majority of installations, but reference should be made to either BS 6891:1988 for detailed guidance on gas pipe sizing.
The meter and governor should ensure a dynamic pressure of 20 mbar (natural gas) at the inlet of the gas valve in the boiler.
The complete installation, including the meter, must be tested for gas soundness and purged as described in BS 6891.

2.5 ELECTRICITY SUPPLY

1 A 230 V ~ 50 Hz mains supply is required. **The boiler must be earthed.**
2 The supply must be fused at 3 A and there must only be one common isolator for the boiler and control system, and it must provide complete electrical isolation.
3 One of the following methods should be used for the connection. A fused double pole switch with a contact separation of at least 3 mm in both poles or a fused three pin plug and unswitched shuttered socket outlet (both complying with BS 1363).
4 The boiler is supplied with a pre-wired power supply cable with fitted 3 A fused plug.
5 All wiring external to the boiler must be in accordance with the current IEE Wiring Regulations.
6 Any room thermostat or frost thermostat used must have a 'volt free' control circuit.
7 The boiler requires a permanent mains supply, do not interrupt it with any external time control.
8 In the event of an electrical fault after installation of the boiler, the following electrical system checks must be carried out:- Short circuit, Polarity, Earth continuity and Resistance to earth.

2.6 AIR SUPPLY

1 As the boiler is room-sealed, it does not require any combustion air vents.
2 If installed in a cupboard or compartment, permanent ventilation vents are required - one at high level and one at low level. The vents may be either direct to the outside air or to a room. Both air vents must be into the same room or be on the same wall to the outside air.
The minimum free area for each vent is 306 cm², this may be halved if the ventilation is directly to the outside air.
3 If installed in a cupboard or compartment with a door, allow at least 75 mm clearance between the front of the boiler and the door for air movement. 5 mm should be allowed at each side of the boiler.

2.7 FLUE SYSTEM

1 The boiler is normally supplied with a 1 metre horizontal co-axial flue assembly with a 100 mm diameter outer pipe (air duct) and a 60 mm inner pipe (flue duct) and a 90° offtake elbow for the top of the boiler.
2 The assembly may be modified and extended using 1 metre extensions, 45°and 90° elbows and a vertical offtake to a maximum equivalent length of 4 metres.
Note: Each 45° and 90° bend has an equivalent flue length of 0.8 metres.
3 A vertical roof outlet kit is also available which may be combined with the components mentioned above to a maximum length of 4.3 metres (from the top of the boiler to the top of the roof outlet).
4 A flue restrictor is provided with the boiler and must be used if the flue length is less than 1.5 metres (see section 3.5).
5 It is possible to use a 'Two Pipe system' to increase the flue length. Refer to our seperate flue options brochure for further details. The diameter of the restrictor is different for this flue type (see section 1.1).
6 The flue must be installed in accordance with BS 5440:1.
7 During cold conditions there may be a tendency for steam to come from the terminal (this is quite normal for a high efficiency boiler). Do not position the terminal where this might cause a nuisance.
8 If the terminal is fitted within 850 mm of a plastic or painted gutter or within 450 mm of painted eaves, an aluminium shield at least 750 mm long should be fitted to the underside of the gutter or painted surface.
9 If the terminal is fitted less than 2 m above a surface to which people have access, the terminal must be protected by a guard. A suitable guard is available as an optional accessory.
The guard must be fitted centrally over the flue terminal and securely fixed to the wall.
10 The minimum dimensions for positioning the flue terminal are shown in Fig. 1.
11 Refer to section 1.4 for flue limitations.

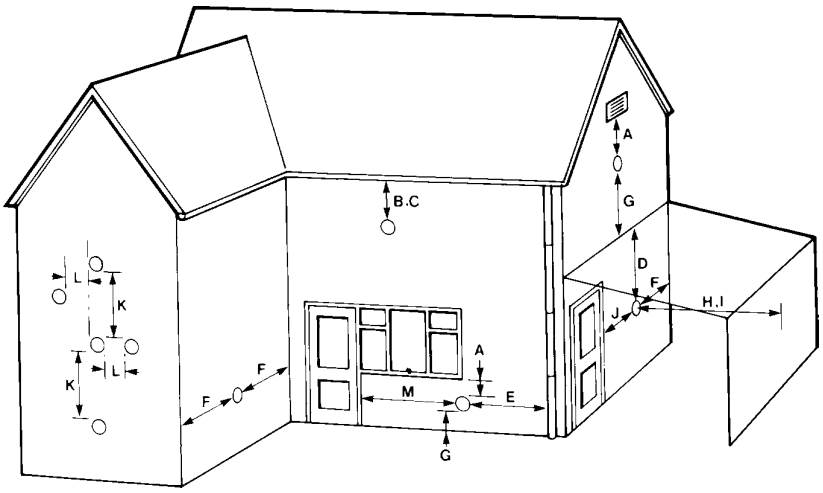


Fig. 1

Terminal position		Min. distance
A	Directly below an opening, air brick, window, 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
I	From a terminal facing the terminal	1200 mm
J	From an opening in the car port (e.g. door, window) into dwelling	1200 mm
K	Vertically from a terminal on the same wall	1500 mm
L	Horizontally from a terminal on the same wall	300 mm
M	Horizontally from a door, window or air vent	150 mm

2.8 BOILER LOCATION

1 The boiler is not suitable for external installation.
2 The boiler must stand firm and level on a sufficiently robust floor to take the weight of it- see Technical Information, page 3.
3 If the boiler is to be installed in a timber framed building, refer to the British Gas publication 'Guide for Gas Installation in Timber Framed Housing' reference DM2.
4 Installation may be in any room, although particular attention is drawn to the requirements of the current IEE Wiring Regulations and, in Scotland, the electrical provision of the Building Regulations applicable in Scotland, with respect to the installation of a boiler in a room containing a bath or shower.
Where a room sealed boiler is installed in a room containing a bath or shower, it must not be possible for a person entering or using the bath or shower to touch any electrical switch or boiler control using mains electricity.
5 The boiler may be installed in a cupboard or compartment to be used for airing clothes, provided it is correctly designed and ventilated for that purpose and that the requirements of BS 6798 and BS 5440:2 are complied with.
It is important that the boiler is separated from the airing space by a suitable non-combustible rigid mesh, refer to BS 6798:1987.
No combustible surface must be within 75 mm of the boiler case, this includes any cupboard door.
The clearances required for servicing, as given in the Technical Information section on page 3, also apply to a cupboard installation.

2.9 WATER AND GAS CONNECTIONS (See Fig. 2)

The fittings pack includes three isolating valves and a gas service cock, together with all the necessary pipework and fittings to connect them. A 15 mm pipe stub is also supplied for the hot water outlet connection. The isolating valves (22 mm for central heating flow/return, 15 mm for mains water inlet and 22 mm [15 mm outlet] for gas).
Also supplied are a pressure reducing valve, check valve, expansion relief valve and a tundish. See section 2.13.
All nuts and olives supplied with the fittings are suitable for use with copper tubing to BS 2871.
The water connections have been temporarily sealed with plastic caps to prevent any residual water (from factory testing) leaking from the boiler during transit. All the plastic caps must be removed before connecting any fittings. Take care when removing the caps as the boiler may still contain a small amount of water.

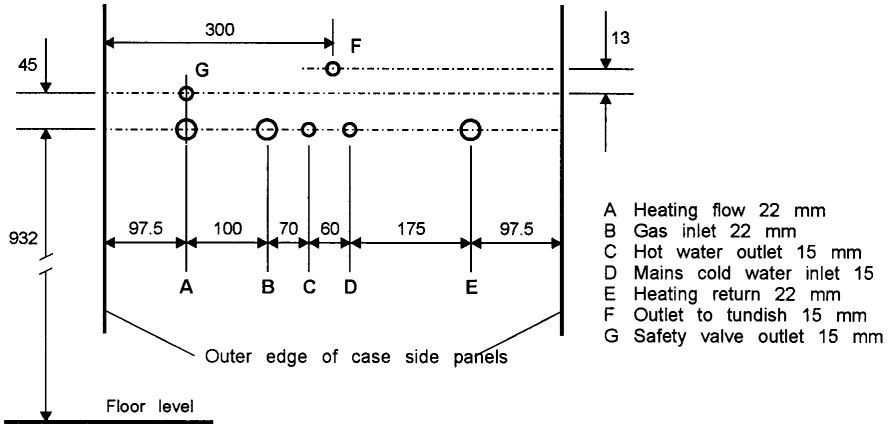


Fig. 2 - Connections as viewed from front of boiler

2.10 BOILER DIMENSIONS (See Fig. 3)

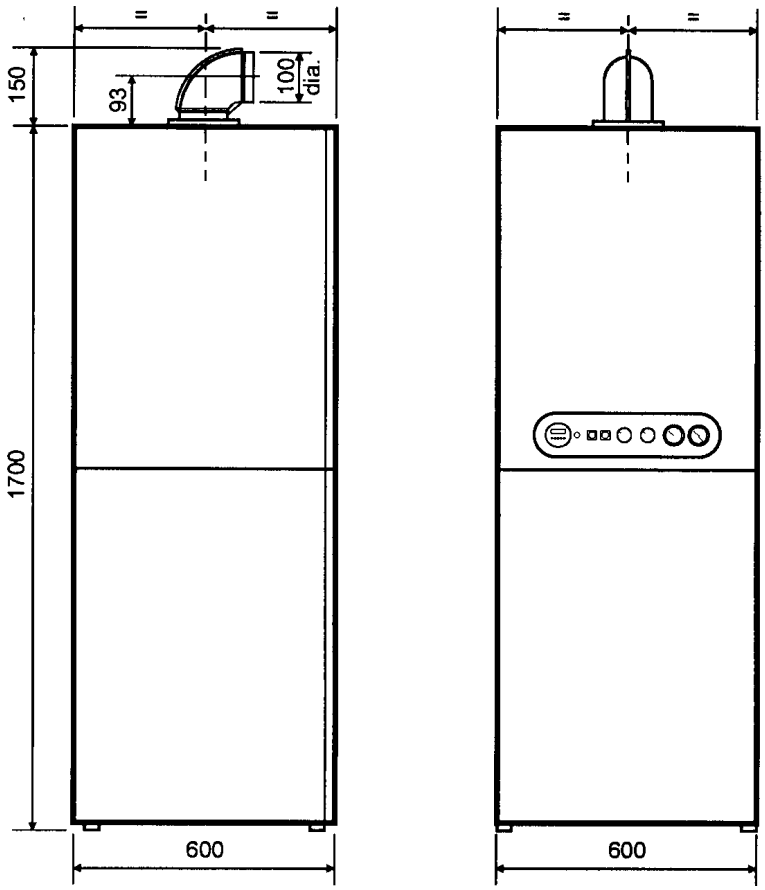


Fig. 3

2.11 CENTRAL HEATING SYSTEM - SEALED SYSTEMS ONLY (See Fig. 4)

1 The boiler is only suitable for use with a sealed system complying with the requirements of BS 5449 and BS 6798.
The maximum temperature of the central heating water is 90 +0 - 5°C.
Design notes - when designing the system, especially at the maximum output (28.40 kW) the pump head, expansion vessel size, radiator mean temperature, etc. must all be taken into account. Refer to the pump performance graph and the table in section 1.3 for guidelines.
2 The boiler is supplied with the following components built in:-
Safety valve - complying with BS 6759 and set to operate at 3 bar. The discharge pipe must be routed clear of the boiler to a drain, in such a manner that it can be seen, but cannot cause injury to persons or property.
Pressure gauge - to indicate the system pressure to be maintained.
Expansion vessel - conforming to BS 4814 with a capacity of 10 litres and pre-charged to a pressure of 1.0 bar.
By-pass - an automatic built-in by-pass ensures that the minimum necessary flow rate is always available, thereby protecting the heat exchanger. If the boiler is used on a small system (below 12.21 kW) and thermostatic radiator valves are used throughout, then an external by-pass is required.
Automatic air vent - an automatic air vent, fitted externally, allows the boiler to be installed and vented without disturbing the room-sealed inner case.
3 Using the expansion vessel as supplied and an initial system pressure (cold) of between 0.8 and 1.5 bar, a heating system volume of approximately 90 litres can be used. For further guidance refer to BS 7074:1. Refer to section 4.1 for further details of the expansion vessel.
4 The system design pressure (cold) should be between 0.8 and 1.5 bar. This pressure is equivalent to the maximum static head (see Fig. 4) in bar + 0.3 (1 bar = 10.2 metres of water).
5 Provision should be made to fill and replace water lost from the system. A double check valve assembly must be used, as shown in Fig. 5.
6 Filling of the system must be carried out in a manner approved by the local Water Undertaking. Where allowed, the system may be filled via a temporary connection as shown in Fig. 5.
7 All fittings used in the system must be able to withstand pressures up to 3 bar.
8 Radiator valves must comply with the requirements of BS 2767(10):1972.
9 One or more drain taps (to BS 2879) must be used to allow the system to be completely drained.

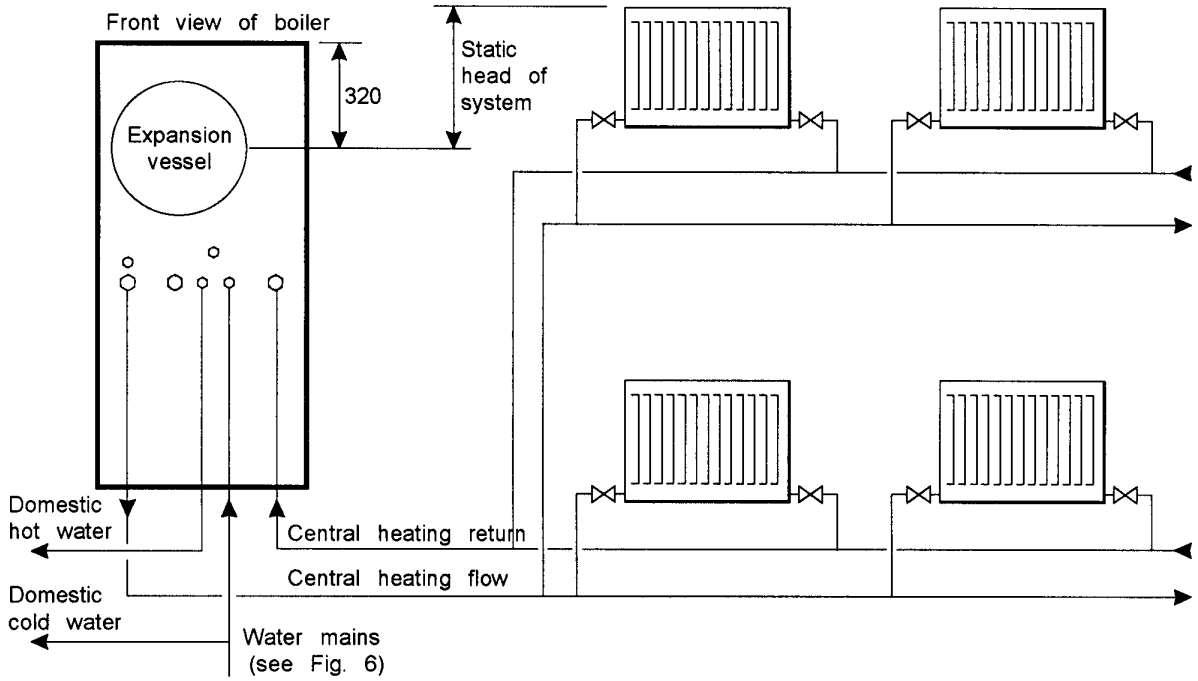
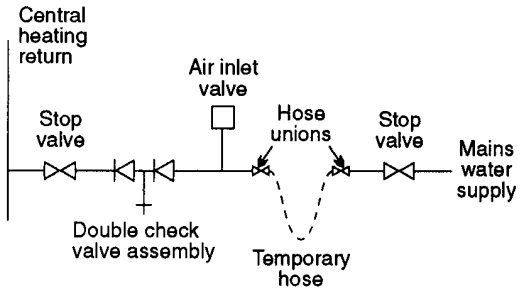


Fig. 4

10 To avoid the danger of dirt and foreign matter entering the boiler the complete heating system should be thoroughly cleaned in accordance with the procedure given in BS 7593. This involves the use of a cleanser, circulating it around the system for the required time before flushing out. It is important to select a cleanser appropriate to the situation, i.e. for new installations, or for an existing system when the boiler is being replaced. In the case of boiler replacement the system should be cleaned prior to the installation of the new boiler.
11 It is a condition of the manufacturers warranty that a suitable inhibitor is added to the system after the final (hot) flushing and is maintained in service. For further information concerning inhibitors contact ICI Caldaie (UK) Limited.



Manual filling and make-up

Fig. 5

2.12 DOMESTIC HOT WATER SYSTEM

Refer to section 2.13 for unvented domestic hot water storage system

1 The boiler is set to provide a nominal output of 28.40 kW for domestic hot water.
2 The design hot water flow rate is 13.6 litres/min giving a temperature rise of 30°C continuously, and 260 litres in the first 10 minutes (discharge of cylinder). Higher flow rates will not damage the boiler but may lower the water temperature below an acceptable level.
3 The mains water supply pressure may be between 1 and 6 bar.
4 A flow restrictor is fitted in the incoming mains fitting on top of the cylinder. This should be removed if the mains pressure is less than 1.5 bar (see section 9.26).
5 Incorporated within the boiler are two hot water expansion vessels (4 litre and 2 litre).
6 To ensure economic use, the pipe runs between the boiler and taps should be in 15 mm copper pipe and be as short as possible. Where possible the pipework should be insulated to reduce heat loss.
7 All taps and mixing valves used with the hot water system must be suitable for operating at a mains pressure of up to 8 bar.
8 A shower may be used with the boilers if required. It is recommended that thermostatically controlled shower valves are used to protect against a flow of water at too high a temperature.
If a fixed head type shower is used, no anti-syphonage devices are required.
If a loose or flexible head type shower is used it must be arranged so that the head cannot fall closer than 25 mm above the top of the bath, thereby preventing immersion in the bath water. If this is not practicable, an anti-syphonage device must be fitted at the point of the flexible hose connection.
9 The supply of hot and cold mains water direct to a bidet is allowed (subject to local Water Undertaking requirements) provided that the bidet is of the over-rim flushing type. The outlets should be shrouded and unable to have a temporary hand held spray attached. Arrangements for anti-syphonage are not necessary.
10 The boiler has been designed to overcome the formation of scale, however, in hard water areas the fitting of an in-line scale inhibitor is recommended. Consult the local Water Undertaking if in doubt.
11 Before the mains water supply pipe is connected to the boiler, it should be thoroughly flushed out to avoid the danger of dirt or foreign matter entering the boiler.
12 The boiler can be used to provide domestic hot water only, where the heating system is to be installed, or connected, at a later date.
As water must be present in the primary (heating) circuit of the boiler for it to produce domestic hot water:-
i Connect the heating flow and return together below the boiler, and incorporate a filling point in the connecting pipe.
ii Fill and vent the heating circuit of the boiler - refer to section 4.2.
iii Set and leave the 'Heating' switch to Hot Water Only.
iv Set the room thermostat (if fitted) to its minimum setting.

2.13 UNVENTED DOMESTIC HOT WATER STORAGE

The local Authority must be notified of the intention to install an unvented hot water storage system, as the installation is subject to Building Regulations approval.
To comply with the Building Regulations the pressure reducing valve, check valve and expansion relief valve, supplied in the water fittings pack, must be fitted before the mains water connection point of the boiler and there must be no isolating valves between these and the boiler. Refer to Fig. 6.

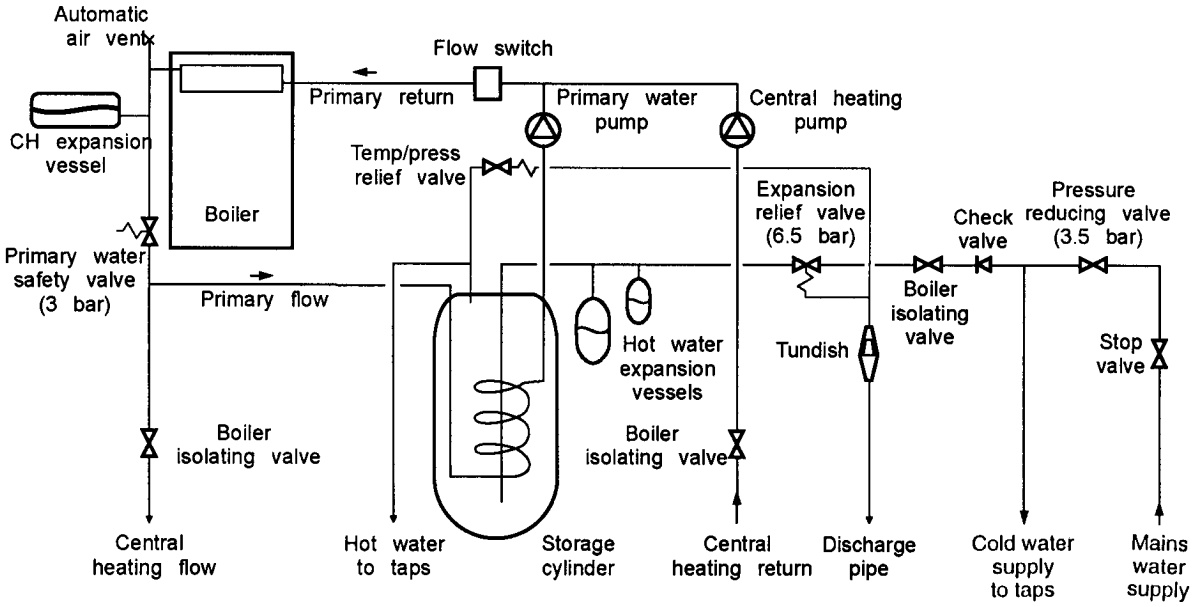


Fig. 6

The pipes discharging from both the expansion relief and temperature/pressure relief valves must be 15 mm diameter and must be connected to the tundish supplied. Both pipes should be connected together before joining to the tundish in 15 mm pipe. The discharge pipe from the tundish must be at least 22 mm pipe. Refer to the following table and Fig. 7.

The position of the tundish must be within 500 mm horizontally from the temperature/pressure relief valve and it must be away from any electrical connections and easily visible to the User.
The tundish discharge pipe should be of a heat resistant material (metal) and should comply with the following requirements:

i Terminate in a safe visible place where there is no risk to persons in the vicinity.
ii Have a vertical section of pipe at least 300 mm long, directly below the tundish before any bends or elbows in the pipe.
iii Be installed with a continuous fall.
iv Have no valves or taps.

Where a single pipe serves a number of discharges, such as in a block of flats, the number served should be limited to not more than six systems so that any installation can be traced reasonably easily. The single common discharge pipe should be at least one pipe size larger than the largest individual discharge pipe to be connected.
If the discharge from the safety devices may not be apparent i.e. in dwellings occupied by blind, infirm or disabled people, consideration should be given to the installation of an electronically operated device to warn when discharge takes place.
Ideally the discharge pipe should terminate below a fixed grating and above the water seal in a trapped gully. Alternatively it may discharge (up to 100 mm) above external surfaces such as car parks, hard standings, grassed areas etc. providing that where children may come into contact with discharges, a wire cage or similar guard must be positioned to prevent contact, whilst maintaining visibility. At a high level the discharge may be into a metal hopper and metal down pipe with the end of the discharge pipe clearly visible, or onto a roof capable of withstanding high temperature discharges of water and 3 m from any plastic guttering systems that would collect such discharges.
Note: The discharge will consist of scalding water and steam. Asphalt, roofing felt and non-metallic rainwater goods may be damaged by such discharges.

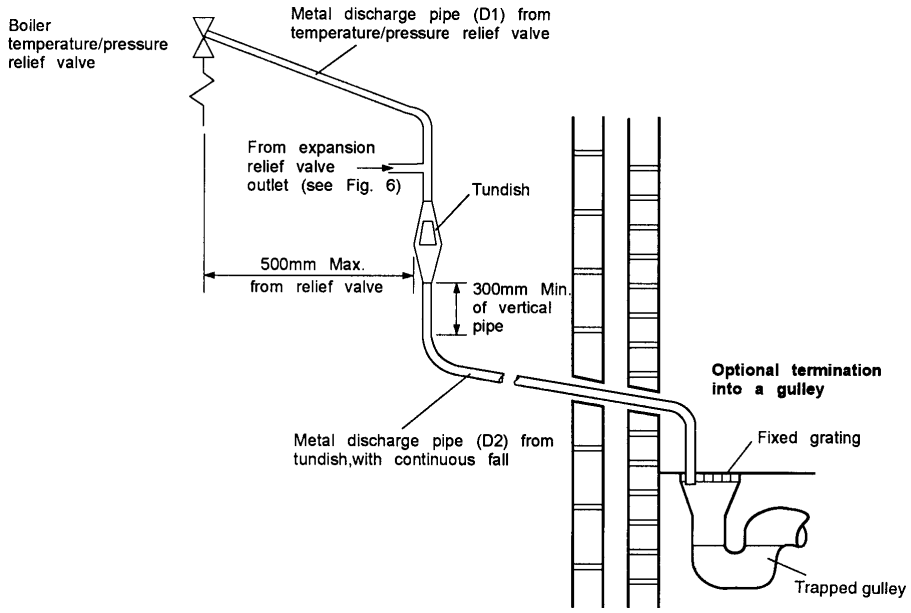


Fig. 7

2.14 METHOD OF OPERATION

The boiler operating mode is controlled by the 'Heating' switch on the control panel. When set to Hot Water Only, the boiler will only operate in the Domestic Hot Water mode. When set to Heating & Hot Water, it will operate in the Domestic Hot Water and Central Heating mode.

Note: The timer only controls the operating times of the central heating, not domestic hot water - this is available continuously.

Incorporated within the boiler case is an insulated unvented domestic hot storage cylinder containing 140 litres of domestic hot water maintained at the temperature set by the adjustable hot water temperature selector and (depending on incoming mains pressure) available to the User at a maximum pressure of 3.5 bar.

Domestic hot water supply always takes priority over central heating. If a demand for hot water occurs during a central heating period and reduces the store temperature to below that set by the hot water temperature selector, the boiler automatically switches to the hot water mode until the stored water is reheated to the temperature set by the hot water temperature selector. This interruption in the central heating should not be noticed by the User.

Central Heating Mode - If there is a call for heat, i.e. the timer and room thermostat (if fitted) are calling for heat, the pump will start to circulate the central heating water, activating the flow switch to start the ignition sequence. After a few seconds the burner will light, **remaining on minimum output for approximately 90 seconds** before gradually increasing to it's preset maximum.

The burner output is then automatically adjusted to match the system demand. When the temperature of the primary water is equal to the pre-set temperature minus 10°C, the burner output is automatically reduced. When the set water temperature is reached, the burner is turned off. The pump continues to run, circulating water around the system, for as long as both the timer and room thermostat (if fitted) are calling for heat. As the heating system water cools, the temperature drop is detected by the control system and the burner is automatically restarted for the cycle to continue until either the timer or room thermostat stops calling for heat. The burner is then turned off (if it is operating at the time) and the pump runs on for about 2½ minutes.

Domestic Hot Water Mode - When a demand for hot water reduces the temperature of the stored hot water below that set by the adjustable hot water selector, the pump starts and the burner lights, increasing to its maximum output. Water in the boiler is then diverted from the central heating system to reheat the stored hot water to the temperature set by the adjustable hot water temperature selector. The burner output gradually modulates down to its minimum output and remains at this output until the stored water reaches the selected temperature, when the burner is turned off and the pump stops. The boiler then returns to the central heating mode.

In both modes the fan (single speed) starts before the burner lights and stops after the burner is turned off. The temperature display (see Fig. 14) gives an indication of the temperature of the water in the primary circuit leaving the heat exchanger to either heat the store or the heating system. At temperatures upto 70°C the burner operates at maximum output, above this temperature the output automatically modulates down to suit the demand.

3.1 UNPACK THE BOILER (See Fig. 8)

1 Dismantle the transit crate from around the boiler and carefully remove the boiler from the pallet.
Note: Take care not to damage the casing when dismantling the crate and not to damage the corners of the case when removing the boiler from the pallet.
Ensure that the surface on which the boiler is standing is suitably protected so as not to be scratched or otherwise damaged when removing the boiler from the pallet.
2 The following loose items are supplied inside the boiler:-
Boiler fittings and accessories pack
Literature pack and Flue restrictor
Check the contents of the pack against the packing list (see section 14).

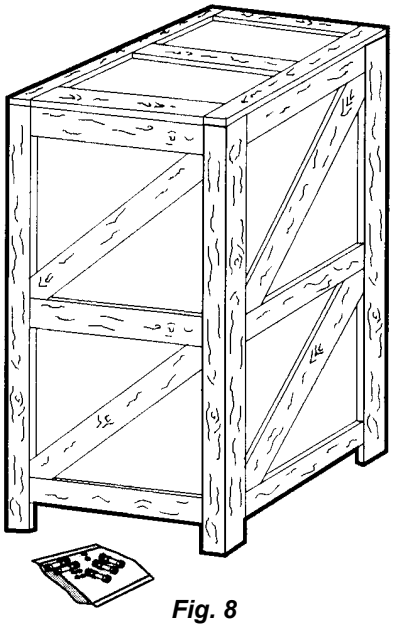


Fig. 8

3.2 PREPARE THE WALL (See Fig. 9)

1 Decide upon the position of the boiler and mark the position of the hole to be cut in the wall for the flue.
Note: Take into account the flue terminal position when deciding on the boiler position. Refer to section 2.7.
2 Mark the centre lines of the flue on the wall behind the boiler as shown in Fig. 9.
If side exit flue is to be used, continue the horizontal centre line of the flue across the wall to the side wall, then along the side wall 221 mm.
Note: This will give the position of the centre of the hole for the flue. The figure of 221 mm assumes the boiler is to be positioned against the wall with the pipework entering the boiler from the wall. If the boiler is to be positioned away from the wall, to allow pipework to run up the wall, that distance will have to be added to 221 mm.
3 Cut the 105 mm diameter hole in the wall for the flue - ensure it is horizontal.
4 If the boiler is to be positioned against the wall cut away a section of the skirting board (if fitted).

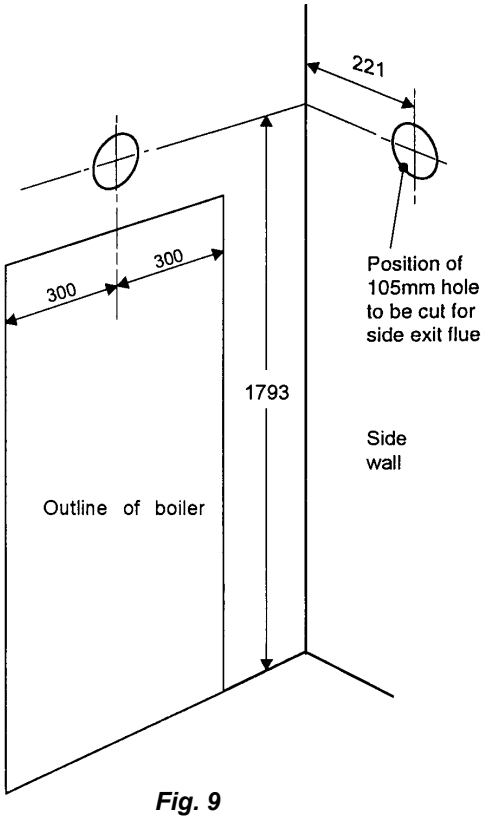


Fig. 9

3.3 POSITION THE BOILER

1 Carefully manoeuvre the boiler into position.
Take care not to damage the case corners or the floor.
2 Check that the boiler is standing firm and level.
Use the adjustable feet in each corner.
3 Open the upper front panel (hinges to the left) to gain access for making the pipework connections.

3.4 CONNECT THE PIPEWORK (See Fig. 2 and section 14)

Having ensured that all the water pipework has been thoroughly flushed and that the gas supply is clear, the pipework can now be connected to the boiler - ensure that all the plastic caps are removed from the boiler connections first. Take care when removing the plastic caps as the boiler may still contain a small amount of water.

Notes: **a** Ensure no parts of the pipework protrude more than 100 mm from the wall, as when the bottom cover assembly is refitted there is only a gap of 105 mm between the back of the bottom panel and the wall.0

b Connect the safety valve discharge pipe to the valve, remembering that the pipe must be routed clear of the boiler to a drain in such a manner that it may be seen, but cannot cause injury to persons or property.

1 Noting the pipe positions from the labels on the boiler, secure all the valves/fittings to the boiler with the operating spindles upward (accessible from within the boiler), then connect the pipework.
2 When tightening any fitting do not apply excessive force which might damage the pipework.
3 Connect the pressure reducing valve and expansion relief valve in the mains water supply to the boiler as described in section 2.13 and shown in Fig. 6. There must be no valves between the boiler and the expansion relief valve.
4 Connect the temperature/pressure relief valve and expansion relief valve discharge pipes to the tundish as described in section 2.13 and shown in Fig. 7.
5 Secure pipework to the wall as necessary.
6 Ensure that all the valves are closed and do not turn on the gas or water supplies at this stage. A valve is closed when the slot in the operating spindle is at right angles to the valve.

3.5 FIT THE STANDARD HORIZONTAL FLUE (See Figs. 10 and 11)

Alternative flue options are described in our seperate flue brochure.

Note: To avoid rain or possible condensation running into the boiler, the flue must not slope down towards the boiler.

The following procedure applies to both rear or side exit flue. The only difference being the lengths to which the ducts are cut.

Rear flue Outer air duct length is finished wall thickness plus 147 mm.
Inner flue duct length is finished wall thickness plus 277 mm.

Side flue Outer air duct length is finished wall thickness plus the distance from the inside wall to the outer edge of the case side panel plus 225 mm.
Inner flue duct length is finished wall thickness plus the distance from the inside wall to the outer edge of the flange on the back panel plus 355 mm.
If the overall length of the inner duct is greater than 1005 mm then a flue extension is required. To fit an extension refer to section 3.5.1.

1 Open the flue carton and check the contents of the pack against the packing list (see section 14).
2 Withdraw the inner flue duct from the outer air duct.
3 Mark the outer air duct to match the length given above, measure from the swaged 'outer' end of the tube. See Fig. 10.
4 Mark the inner flue duct to match the length given above, measure from the outermost edge of the terminal. See Fig. 10.
Push the spacing clip towards the terminal so that it will be about in the middle of the duct when it is cut to length. The clip can be removed on short flues, below 500 mm.
5 Double check the dimensions then cut both the inner and outer ducts to length. Ensure that they are cut square and are burr free.
6 Fit the outer sealing collar over the swaged end of the outer duct, ensuring it locates in the swage. See Fig. 10.

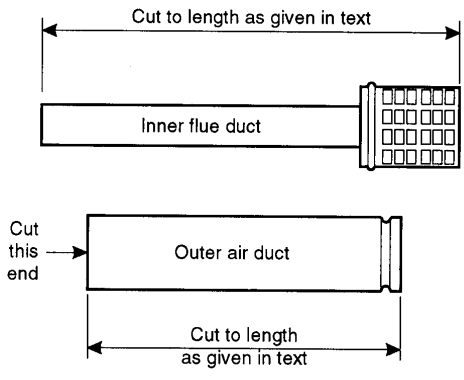


Fig. 10

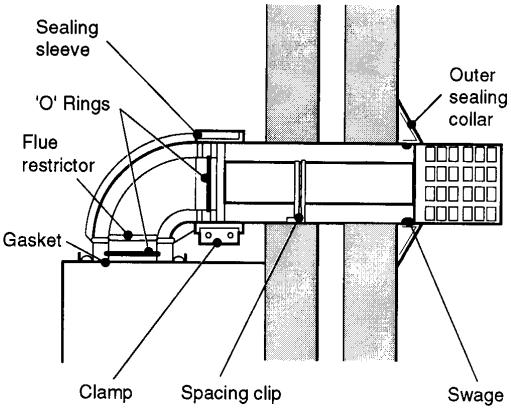


Fig. 11

7 Insert the terminal end of the inner duct into the end of the outer duct just cut and push it fully home. If there is sufficient space around the boiler to fit the inner duct from inside the building, then do this in paragraph 9.
8 From outside the building insert the assembly (or outer duct only) into the wall and carefully push it towards the boiler.
9 If the inner duct has already been positioned inside the outer duct, withdraw it into the building sufficiently to fit the flue elbow.
10 Locate the sealing collar over the outer duct with the larger internal diameter towards the wall.
11 Position the 'O' rings (supplied in the flue accessories pack) into the recesses at each end of the inner tube of the flue elbow.
Note: If the flue length is less than 1 m, fit the flue restrictor supplied into the inlet socket of the flue as shown in Fig. 11 - push the restrictor up into the socket as far as it will go.
12 Position the gasket (supplied in the flue accessories pack) over the fan spigot on top of the boiler, lining it up with the screw holes.
13 Lubricate the 'O' rings in the flue elbow with a soap solution to aid assembly, then insert the inner duct into the end of the elbow without the flange. If the spacing clip is fitted over the inner duct, ensure that the legs are facing downwards.
14 Push the elbow and inner duct assembly into the outer duct, raising the elbow above the fan spigot then lowering it into position over the spigot. Secure the elbow to the boiler with the four M4 screws supplied in the flue accessories pack.
15 Locate the sealing sleeve over the elbow as far as possible, then carefully withdraw the outer duct from the wall entering it into the sleeve as far as possible.
16 Open the clamp (supplied in the flue accessories pack) and locate it over the sealing sleeve. Fit the two No.8 self tapping screws (supplied in the flue accessories pack) to the clamp and tighten to secure the outer duct to the elbow.
17 Make good the inside wall and also the outside wall behind the outer sealing collar.
18 Fit a terminal guard if necessary. See section 2.7.

3.5.1 *FIT A FLUE EXTENSION TO A HORIZONTAL FLUE (See Fig. 12)*

1 Withdraw the inner flue duct from the outer air duct of the standard flue supplied with the boiler.
2 Position the flared end of the extension inner duct over the standard duct. Drill through the two pilot holes in the flared end of the extension into the standard duct using a 2.8 mm dia. drill. Secure the two ducts together using two of the screws supplied with the extension.
Leave the spacing clip in position on the standard duct.
3 Position the connecting sleeve (supplied with the extension) over the plain end of the standard outer duct, then slide in the outer duct of the extension. Secure the two together using the clamp and screws supplied with the extension.
4 Repeat with another extension if necessary.
5 Cut to length and fit the flue as described in the previous section (3.5). It is necessary to support the flue with a suitable bracket(s) when flue lengths approaching the maximum are used.

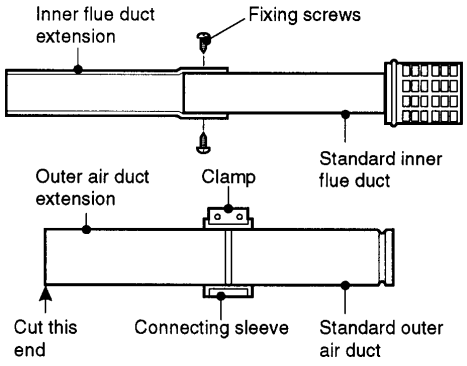


Fig. 12

3.6 CONNECT THE POWER SUPPLY (See Fig. 13)

The boiler is supplied with a factory fitted power supply cable and 3 A fused 3-pin plug. Connect the supply cable to a suitable power supply. Ensure correct polarity.
With the power supply OFF.
1 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
2 To connect a room thermostat proceed as follows:-
Pass the room thermostat leads through the cable support bush in the back of the control box (next to the power supply cable). Remove the yellow link between terminals 1 and 2 on the main terminal block and connect the thermostat in its place.
3 Carry out electrical system checks - Short circuit, Polarity, Earth continuity and Resistance to earth.
4 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
Do not switch on the electricity supply at this stage.

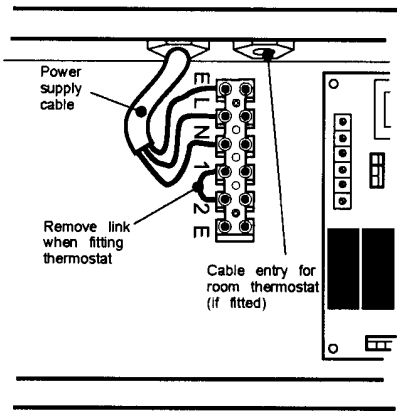


Fig. 13

4.1 CENTRAL HEATING EXPANSION VESSEL PRESSURE

The expansion vessel fitted is supplied with a charge pressure of 1.0 bar (equivalent to a static head of 10.2 metres). The charge pressure must not be less than the static head at the point of connection (see Fig. 4). Do not pressurise the vessel above 1.5 bar.
The central heating system volume, using the expansion vessel as supplied, must not exceed 90 litres. If the system volume is greater than 90 litres, an extra expansion vessel (complying with BS 4841) must be fitted as close as possible to the central heating return connection on the boiler. The charge pressure of the extra vessel must be the same as the vessel fitted in the boiler. Refer to BS 7074:1 for further guidance.
A simple test to check if the expansion vessel size is adequate, is to fully heat the system and if the pressure rises to no more than 2.3 bar the vessel is adequate. A higher figure indicates that an extra vessel is required.

4.2 FILL THE SYSTEM

1 Check the pressure in the CH (red) expansion vessel is 1 bar or as required.
2 The boiler is fitted with an automatic air vent (see Fig. 19) positioned at the top of the boiler on the left hand side. Check that the small cap on the top of the air vent is screwed on fully, then unscrew it one complete turn - the cap remains in this position from now on.
3 Open the central heating flow and return valves. See Fig. 2.
Using a suitable screwdriver, turn the operating spindles fully anticlockwise (¼ of a turn). A valve is open when the slot in the operating spindle is in line with the valve body.
It is important that these valves are open before pressurising the system, the system could be over-pressurised as the safety valve is within the boiler and would not protect the system if the valves were closed.
Gradually open the fill point valve in the heating system until water is heard to flow.
4 Vent each radiator in turn, starting with the lowest in the system, to remove the air.
5 It is important that the pumps are properly vented to avoid them running dry and damaging their bearings. Unscrew and remove the plug from the centre of the pump. Insert a flat bladed screwdriver into the exposed hole and rotate the pump spindle to and fro to ensure free movement (the pump may have dried out since factory testing), then replace the plug.
6 Check the operation of the pressure relief safety valve by turning the head anticlockwise until it clicks. The click is the safety valve lifting off its seat allowing excess primary water pressure to escape from the system - check that this is actually happening.
7 Continue to fill the system until the pressure gauge indicates between 0.8 and 1.5 bar. Close the fill point valve and check the system for water soundness, rectifying where necessary. Once soundness is confirmed, part drain the system and add the cleansing agent. Water may be released from the system by manually operating the safety valve until the system design pressure is obtained.
8 The system design pressure (cold) should be between 0.8 and 1.5 bar. This pressure is equivalent to the maximum permitted static head in bar + 0.3 (1 bar = 10.2 metres of water). See Fig. 4.
Set the adjustable pointer on the pressure gauge to the system design pressure.
9 Open the mains cold water supply valve to fill the storage cylinder. Open all the hot water taps until all the air is vented from the pipework, then close the taps.

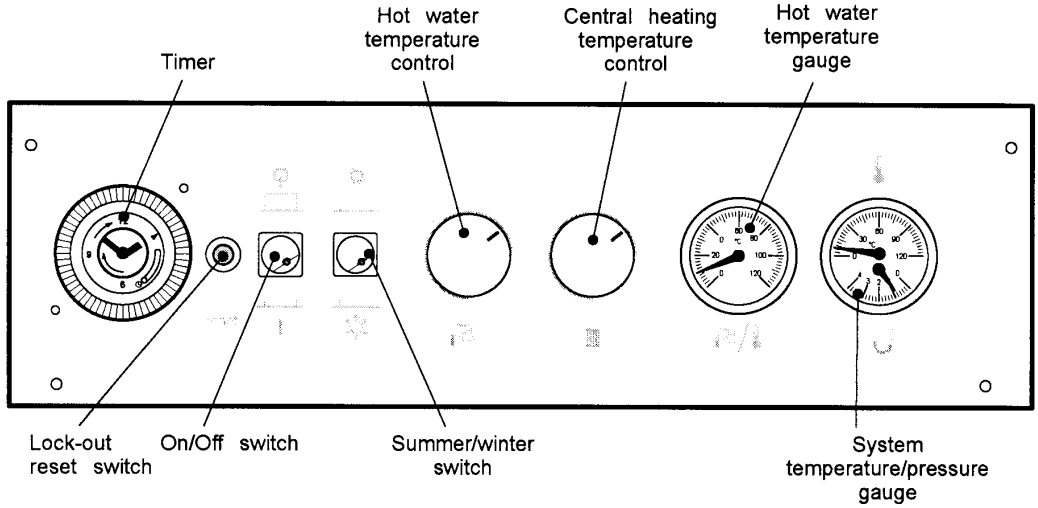


Fig.14 – Boiler controls

5.1 TEST FOR GAS SOUNDNESS AND PURGE THE SUPPLY

1 With the boiler gas service cock closed (slot in operating spindle at right angle to valve body), pressure test the gas supply and inlet pipework connection to the boiler service cock for soundness in accordance with BS 6891.
2 Unscrew the gas inlet pressure test point screw (see Fig. 19). Ensure the gas supply is on and open the boiler service cock (slot in operating spindle in line with valve body) to purge in accordance with BS 6891. Check that the static gas supply pressure is at least 20 mbar.
3 Tighten the test point screw and test for gas soundness. Close the boiler service cock.

5.2 FIRST LIGHTING (Refer to Fig. 14 for boiler controls)

Ensure that the gas and electricity supplies to the boiler are off and that the central heating flow and return valves are open.

1 Temporarily replace the control panel fascia, secure it with one of its fixing screws.
2 Switch on the electricity supply to the boiler and set the timer for continuous operation - see Users Operating manual.
3 Set the hot water temperature selector to maximum and central heating temperature selector to maximum, and if a room thermostat is fitted, set it to maximum.
4 Press in the boiler on/off switch, (the green light indicates the switch is set to on). Ensure the summer/winter switch is set to summer, i.e. hot water only, (the switch push button should be out and the green light out).
5 The boiler will attempt to heat the cold water in the storage cylinder, but as the gas supply is not yet turned on the boiler will 'lock-out' and the red button on the control panel will light.
The hot water pump will still be working. Allow the pump to continue to run for a few minutes to vent the internal primary circuit.
6 Turn on the gas supply at the boiler service cock and press the lock-out reset button (press and release the button quickly - do not keep it pressed in).
After a few seconds the boiler should light - the burner flames can be seen through the inspection window in the sealed chamber.
If the boiler does not light and goes to 'lock-out', press in the on/off switch to switch off the boiler and check that the gas supply has been purged (section 5.1). If the boiler does not light after several attempts, contact ICI Caldaie UK Ltd.
7 Allow the boiler to run until the water in the storage cylinder has reached the set temperature (20 to 25 minutes), when the boiler will turn off. Press in the summer/winter switch (the green light indicates the switch is set to winter, i.e. heating and hot water), the boiler will light and operate in the heating central mode. Allow the boiler to run for a few moments to circulate and vent air from the system.

5.3 CHECK THE BURNER PRESSURES

The maximum and minimum burner pressures can only be checked with a cold boiler/system. When checking the maximum pressure you will only have two minutes before it modulates down.

The minimum and maximum pressures in the hot water mode (see section 1) must be established first, before the pressure in the central heating can be checked or adjusted. With a cold store the boiler will automatically be in the hot water mode, so there is no need to set the summer/winter switch to any particular setting.

1 Press in the on/off switch to switch off the boiler. Isolated the gas supply at the service cock and press in the boiler on/off switch, (the green light indicates the switch is set to on). The boiler will attempt to start, but as the gas supply is not turned on the boiler will 'lock-out' and the red button on the control panel will light. The hot water pump will still be working. Allow the pump to continue to run for a **few minutes** to cool the internal primary circuit. Open a hot water tap to reduce the temperature of the stored water. Leave the tap running to remove heat from the primary circuit, thereby increasing the time available to check the maximum pressure.
2 Switch off the electricity supply. Loosen the burner setting pressure test point screw on the gas valve (see Fig. 19) and connect a pressure gauge. Disconnect one of the electrical leads to the modureg coil (see Fig. 19) and open the boiler gas service cock.
3 **Check minimum burner pressure**
Switch on the electricity supply and after a few moments the boiler will light at the minimum burner pressure.
The minimum pressure has been factory set and should not require adjusting. Check that the burner pressure is 2.0 ± 0.1 mbar.
Refer to section 9.7.1, if any adjustment has to be made.
Switch off the electricity supply and reconnect the lead to the modureg coil.
4 **Check maximum burner pressure**
Switch on the electricity supply and after a moment or two the boiler will light at the maximum burner pressure. Within two minutes the burner will reduce to the minimum pressure. Check that the burner pressure is 11.9 ± 0.1 mbar.
Refer to section 9.7.1, if any adjustment has to be made.
Close the hot water tap.

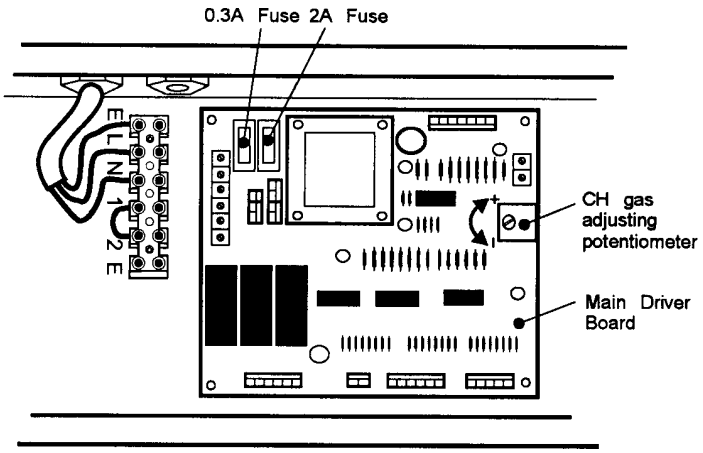


Fig. 15

5 **Maximum burner pressure in central heating mode**
Note: The maximum burner pressure in the central heating mode is adjusted by means of the potentiometer (see Fig. 15) on the main driver board, the pressures given in section 1.2 can only be achieved if the burner minimum and maximum pressures have been correctly set first on the gas valve.
To gain access to the main driver board - Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
Press in the summer/winter switch (the green light indicates the switch is set to winter, i.e. heating and hot water), the hot water temperature control to minimum and allow the boiler to run, to fully heat the store. When the store is satisfied the boiler will change to the central heating mode and burner pressure will increase to its maximum value as set by the potentiometer.
If the heating load is between the factory set output of 18.09 kW and the maximum of 28.40 kW the burner pressure should be set to maximum.
If the heating load is between 12.21 kW and 18.09 kW set the burner pressure to the factory set pressure.
If the heating load is below 12.21 kW the burner pressure should be set to minimum.

6 Press in the on/off switch (green light off) to turn off the boiler. Disconnect the pressure gauge and tighten the test point screw.
Press in the on/off switch (green light on) to light the boiler and test for gas soundness around the test point screw.

7 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.

5.4 FINAL COMMISSIONING

1 Allow the heating system to heat up, then balance the system to achieve the necessary temperature difference across the heating flow and return pipes at the boiler - see section 1.2.
2 Press in the on/off switch (green light off) and turn off the electricity supply to the boiler.
3 Drain the heating system, while it is still hot, as described in section 8 in order to complete the flushing process.
4 Refill, vent and re-pressurise the system as described in section 4.2, adding a suitable inhibitor.
For further information concerning inhibitors contact ICI Caldaie (UK) Limited.

5.5 FINAL ASSEMBLY

1 If the boiler is to be left in service with the User, set the controls, timer (see Users Operating manual) and room thermostat (if fitted) to the User's requirements then refer to section 6.
2 If the boiler is not to be handed over immediately, close the boiler gas service cock and switch off the electricity supply.
If there is any possibility of the boiler being left during frost conditions, then the boiler and system should be drained, refer to section 8.

The User must be advised (and demonstrated if necessary) of the following important points:-

1 How to light and turn off the boiler and how to operate the system controls.
2 The precautions necessary to prevent damage to the central heating system and to the building, in the event of the boiler not being used during frost conditions.
Explain that the boiler has a built-in frost protection control and that the boiler must be left switched on for this to operate.
3 The importance of annual servicing of the boiler to ensure safe and efficient operation.
4 That any servicing or replacement of parts must only be carried out by CORGI registered personnel.
5 Ensure that the boiler controls and room thermostat (if fitted) are set to the User's requirements.
6 Tell the User the sealed system pressure.
7 Show the User the position of the safety valve discharge pipe and tundish.
8 Explain to the User that if the boiler should ever 'lock-out' the reset button should be pressed in and released quickly and that if it cannot be reset a Service Engineer is required.
9 The importance of maintaining the strength of the anti corrosion solution in the sealed primary system.

Hand the Users Operating manual to the User.
Leave this Installation and Servicing manual with the User for use on future calls.

IMPORTANT: It is a condition of the manufacturers guarantee that:

1 The boiler is protected by a suitable anti corrosion inhibitor.
2 The installation is checked on completion by a CORGI registered installer.

7 BOILER SERVICING

To ensure efficient operation of the boiler it is recommended that it is checked and serviced as necessary at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but in general once per year should be adequate. It is the law that any service work must be carried out by CORGI registered personnel.

7.1 IMPORTANT NOTES PRIOR TO SERVICING

1 Check the flue terminal outside and ensure it is not blocked.
2 Run the boiler and check the operation of its controls.
3 Ensure that all system connections and fittings are sound. Remake any joints and check the tightness of any fittings that may be leaking. Refill, vent and re-pressurise the system as necessary. See section 4.2.
4 If the boiler is in a cupboard or compartment, ensure that the ventilation openings are adequate and are clear. See section 2.6.

Warning: Before servicing the boiler press in the on/off switch (see Fig. 14) to switch off the boiler (green light off), isolate the electricity supply and close the boiler gas service cock (see Fig. 2). Allow the boiler to cool.
The data label is positioned inside the upper front panel.
Always test for gas soundness after servicing any gas carrying components.

7.2 DISMANTLING PRIOR TO SERVICING (See Fig. 16)

1 Open the upper front panel (hinges to the left) to gain access.
2 Remove the eight screws securing the inner case front panel and remove the panel, take care not to damage the seal.
3 Remove the six screws securing the combustion chamber cover and remove the cover.
4 Remove the upper burner fixing screws and withdraw the air deflector plates. Remove the lower burner fixing screws, raise the front of the burner slightly so that the electrodes will clear the bottom of the inner case and withdraw the burner (it may require moving to the left slightly, to miss the water pipework, as it is withdrawn).
Take care not to damage the side insulation panels.
4 Disconnect the electrode leads.

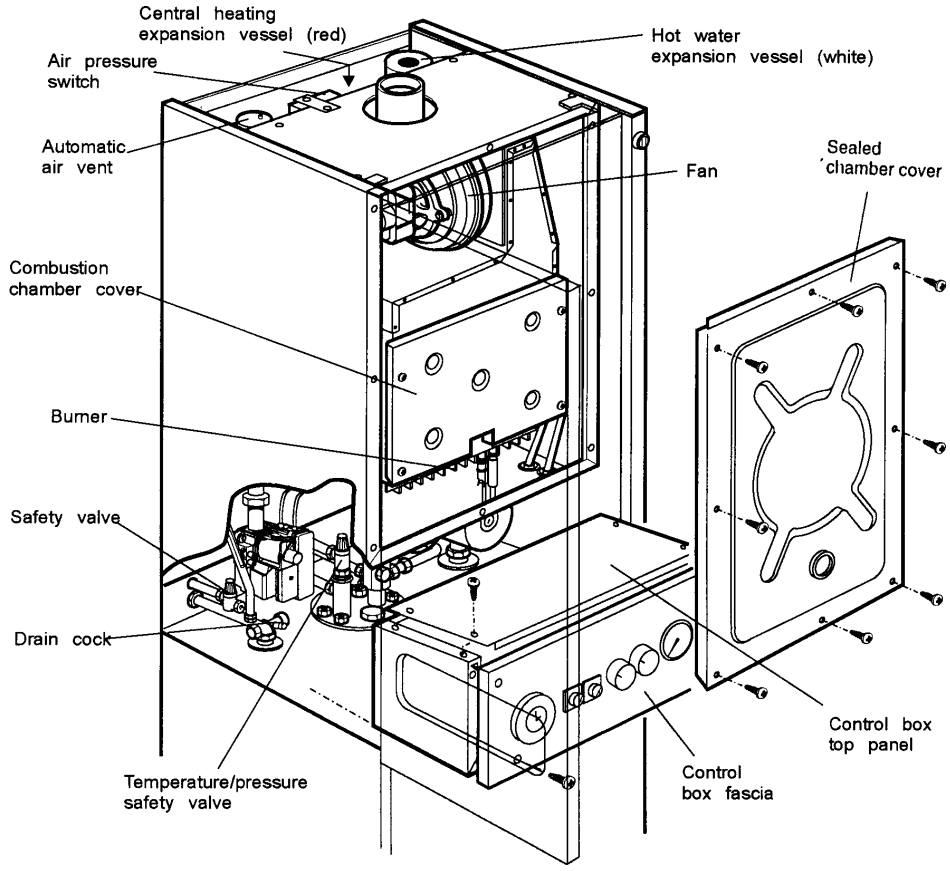


Fig.16

7.3 CLEANING THE BOILER

1 Check the condition of the bottom of the heat exchanger, if it requires cleaning the flue hood should be removed as described in section 9.28, paragraphs 2 to 9. If the flue hood is removed, the condition of the fan impeller should be checked (clean carefully with a soft brush).
If the heat exchanger requires cleaning, clean it from above and below using a suitable soft brush. Brush front to back NOT sideways.
2 Check the condition of the combustion chamber insulation panels (see Health and Safety Information on page 2), dampen the panels before carrying out any work on them. Any damaged panels must be replaced - refer to section 9.29. Remove any fallen deposits from the base of the sealed chamber.
3 Check the condition of the burner injectors on the manifold, carefully clean them with a soft brush if necessary.
Do not use a wire brush as this might damage the injectors.
Unscrew and replace (using a new sealing washer) any injector that appears damaged.
4 Brush the top of the burner with a soft brush and check that the flame ports are clear. Any blockage may be removed with a stiffer brush.
5 Check the condition of the electrodes, clean with a soft brush if necessary.
Replace any cracked or damaged electrodes - refer to section 9.4.
Check the electrode gaps and positions (see Fig. 17) ensuring that the ignition electrode tips are:-
i Directly over a flame port.
ii 4 mm apart.
iii 5 mm above the burner blade.
Check that the flame sensing electrode tip is 6 mm above the burner blade.
6 Check the condition of the various sealing grommets and replace if necessary.

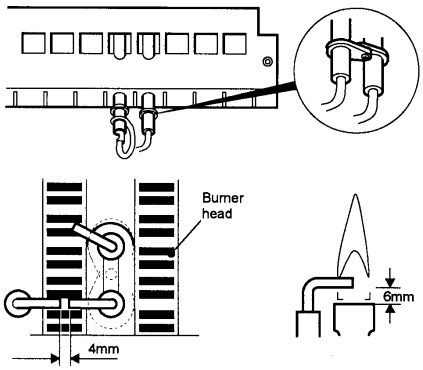


Fig. 17

7.4 RE-ASSEMBLE THE BOILER

1 Reconnect the electrode leads:-
2 Replace the burner, securing it in position with the four screws previously removed. Use the outer holes.
Note: Ensure the air deflector plates are fitted correctly using the upper burner fixing screws. See Fig. 18.
3 If the flue hood assembly was removed, replace it, the sealed chamber top, flue elbow and reconnect the flue.
Note: When reconnecting the air pressure switch sensing tubes to the fan connect the right (transparent) tube to the upper connector (nearest the fan outlet) and the left (pink) tube to the lower connector.
4 Replace the combustion chamber cover, securing it in position with the six screws previously removed.
Ensure that the top side returns are located over the heat exchanger.
White to the front ignition electrode Blue to the rear flame sensing electrode
Ensure that the insulation sleeves are in position over the connections.

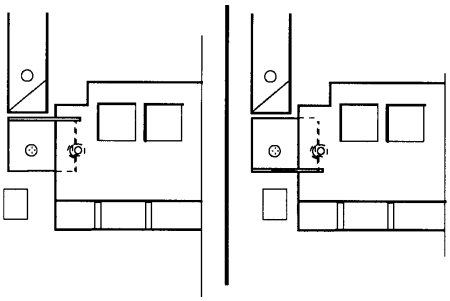


Fig. 18

5 Ensure that the inner case front panel seal is intact and in position, replace the panel (inspection window at the bottom) and secure it in position with the eight screws previously removed.

7.5 TEST THE BOILER

1 Perform Earth Continuity test and Resistance to Earth test.
2 Turn on electricity and gas supplies to the boiler.
3 Check the general operation of boiler and controls.
4 Lower the system pressure and check/reset the pressure in the primary water expansion vessel as necessary. Reset the system pressure.
5 Check and adjust gas settings (hot water minimum/maximum and heating maximum).
6 Carry out hot water performance test (flow rate and temperature rise).
7 Evaluate condition of primary water and presence of anti corrosion protection and inform boiler operator.
8 Re-assemble and clean boiler.

Refer to Figs. 2 and 19
Press in the on/off switch (see Fig. 14) to switch off the boiler (green light off) and isolate the electricity gas supplies.
Open the upper front panel (hinges to the left) to gain access.

Central heating circuit
1 Make a note of the system pressure, then close the central heating flow and return valves. See Fig. 2. Using a suitable screwdriver, turn the operating spindles fully clockwise (¼ of a turn).
2 Connect a suitable hose pipe to the drain cock in the central heating flow pipe (just to the left of the gas valve). Open the drain cock and drain the boiler.

Note: When refilling, ensure the system is adequately protected by a suitable anti-corrosion inhibitor.

Hot water circuit
1 Close the mains water supply valve and ensure all hot taps are closed.
2 Remove the lower front panel of the boiler (pulls off). Connect a suitable hose pipe to the drain cock at the bottom of the cylinder. Open the drain cock and drain the system. In most cases it will only be necessary to drain the circuit to just below the level of the top of the cylinder.

Note: Some water will remain in the boiler components and care must be taken when removing them.

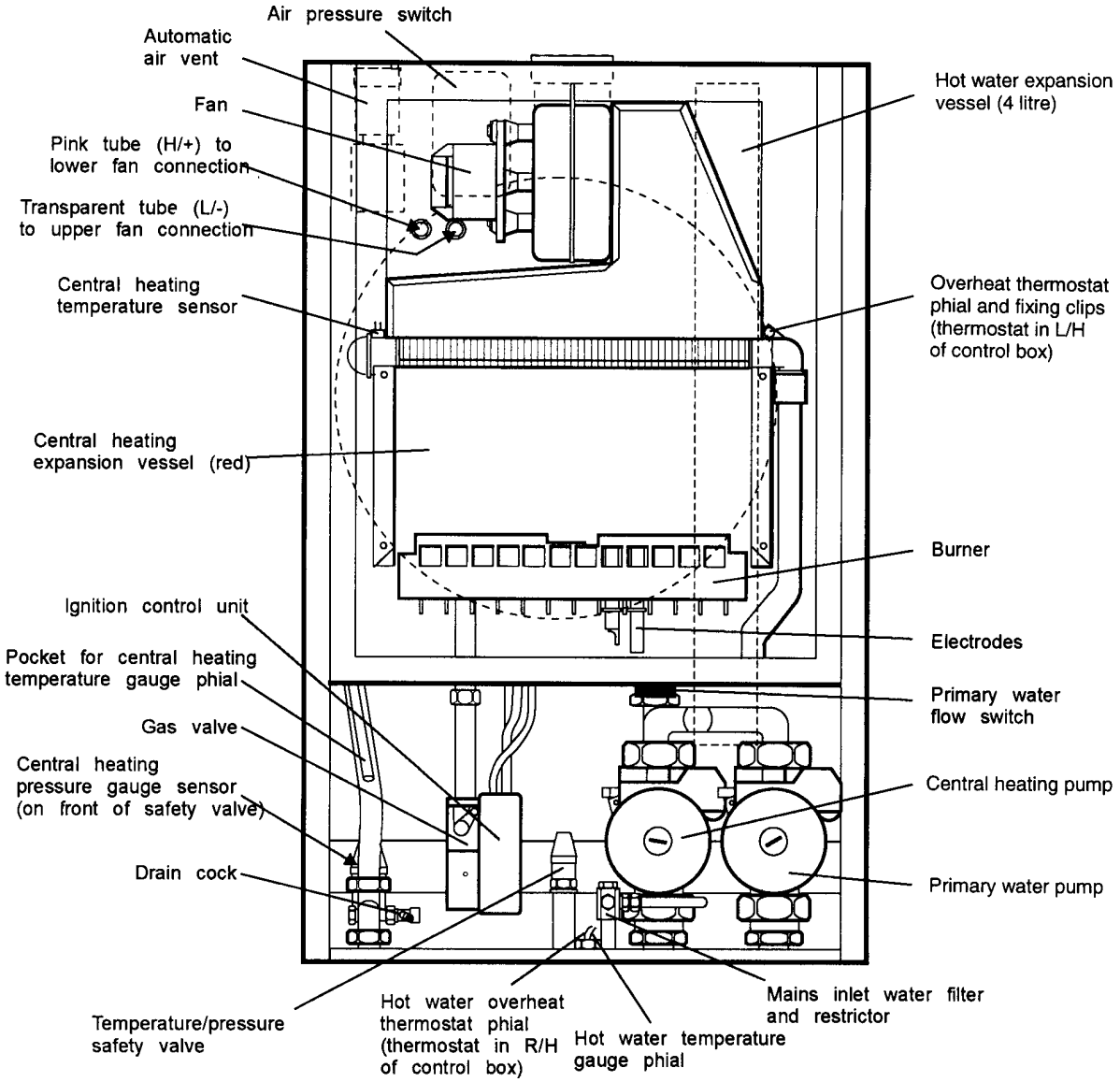


Fig. 19

9 REPLACEMENT OF COMPONENTS

It is the law that any service work must be carried out by CORGI registered personnel.
Warning: Before servicing the boiler press in the on/off switch (see Fig. 14) to switch off the boiler (green light off), isolate the electricity supply and close the boiler gas service cock (see Fig. 2). Allow the boiler to cool.
Important notes when removing or replacing components:-

1 Always test for gas soundness after replacing any gas carrying components or disturbing any gas connections.
2 Always check the condition of the sealed chamber seals when removing/replacing the top or front panels. Replace if necessary.
3 Always check the condition of sealing washers and 'O' rings. Replace if necessary.
4 Check the operation of the boiler, refer to section 2.14 if necessary.
5 Ensure that all the controls are returned to their original settings.

To replace any components in sections 9.1 to 9.17 does not require any draining of the boiler.
Refer to Figs. 16 and 18 for the position of the components.

9. 1 BURNER

1 Ensure that the electricity supply has been isolated.
2 Remove the burner as described in section 7.2, paragraphs 1 to 5.
3 From underneath the burner, remove the screws securing the electrodes and withdraw them. Transfer them to the new burner. Ensure that the earth lead is connected and that the ignition electrodes are positioned before fitting the flame sensing electrode. Check the electrode gaps. See Fig. 17.
5 Fit the burner, re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1, 2 and 3.

9.2 BURNER INJECTORS

1 Ensure that the electricity supply has been isolated.
2 Remove the burner as described in section 7.2, paragraphs 1 to 5.
3 Remove the four screws securing the burner blade assembly to the injector bar and remove the blade assembly.
4 Unscrew the damaged injector and screw in a replacement using a new sealing washer.
5 Refit the blade assembly to the injector bar and secure with the four screws previously removed. Use the outer set of holes.
6 Replace the burner, re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1, 2 and 3.

9.3 FAN

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Gain access to the fan as described in section 9.27, paragraphs 2 to 9.
4 Remove the four fixing screws securing the fan to the flue hood. Withdraw the assembly and disconnect the electrical leads from the fan motor, noting their position.
Note: It may be necessary to disconnect the electrical leads from the central heating sensor, when reconnecting the polarity is not important.
5 Connect the electrical leads to the new fan and secure it to the flue hood using the four screws previously removed.
Reconnect the sensor electrical leads if they were removed. Connect the sensing tubes to the fan - right (transparent) one to top connection, left (pink) one to bottom connection.
Note: Left and right refer to view when facing front of boiler.
7 Re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.4 ELECTRODES

1 Ensure that the electricity supply has been isolated.
2 Remove the burner as described in section 7.2, paragraphs 1 to 5.
3 From underneath the burner, remove the screws securing the electrodes and remove from the burner.
4 When refitting the electrodes, the earth electrode is at the left and the ignition electrode/flame sensing electrodes are at the right, secure in position with the screws previously removed. See Fig. 17.
Ensure the earth lead is connected by the L/H electrode fixing screw, the R/H ignition electrode bracket is positioned first (white lead) then the flame sensing electrode (blue lead) bracket is positioned on top before securing in position.
5 Check the electrode gaps and positions (see Fig. 17) ensuring that the ignition electrode tips are:-
a) Directly over a flame port, b) 4 mm apart, c) 5 mm above the burner blade.
Check that the flame sensing electrode tip is 6 mm above the burner blade.
6 Replace the burner, re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.5 ELECTRODE LEAD(S)

1 Ensure that the electricity supply has been isolated.
2 Gain access to the electrode leads as described in section 7.2, paragraphs 1 to 3.
3 Disconnect the electrode lead from the electrode (White ignition R/H, Blue flame sensing L/H) and the ignition control unit. Withdraw the old lead and replace with a new one. Check the condition of the grommet (replace if necessary) and ensure it is correctly fitted in the base of the sealed chamber.
4 Re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.6 PRIMARY WATER OVERHEAT THERMOSTAT

The overheat thermostat bulb is clipped on the right hand side to the rear of the main heat exchanger, with the thermostat body located inside the boiler control box on the left hand side.
1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the eight screws securing the inner case front panel and remove the panel, take care not to damage the gasket.
4 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box. From inside the control box remove the four screws securing the box to the boiler.
5 Unclip the thermostat bulb from the heat exchanger.
6 Carefully pull the control box forward slightly and remove the two screws securing the thermostat body. Disconnect the electrical leads from the thermostat.
7 Remove the thermostat from the control box withdrawing the capillary through the grommets in the back of the box and the bottom of the sealed chamber.
8 Carefully pass the new thermostat bulb through the grommet in the back of the control box, through the grommet in the bottom of the sealed chamber and secure it to the heat exchanger using the clip previously removed. Secure the new thermostat to the control box and reconnect the electrical leads to terminals C and 1 (the polarity is not important). Ensure the earth wire is also connected.
9 Re-assemble in reverse order, ensuring the front return edge of the control box top is located under the front panel return.
10 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.7 GAS VALVE (See Fig. 20)

Refer to section 9.7.1 after replacing the gas valve.
1 Ensure that the electricity and gas supplies have been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Disconnect the Modureg coil leads, then remove the screw securing the ignition control unit to the gas valve. Carefully prise open the wiring cover clips on the top and right hand side of the cover and remove the cover. Disconnect the wiring connector and withdraw the ignition control unit away from the gas valve.
4 Undo the unions above and below the gas valve, take care not to lose the sealing washers and remove the gas valve.
5 Remove the inlet and outlet manifolds and transfer them to the new valve, using new gaskets.

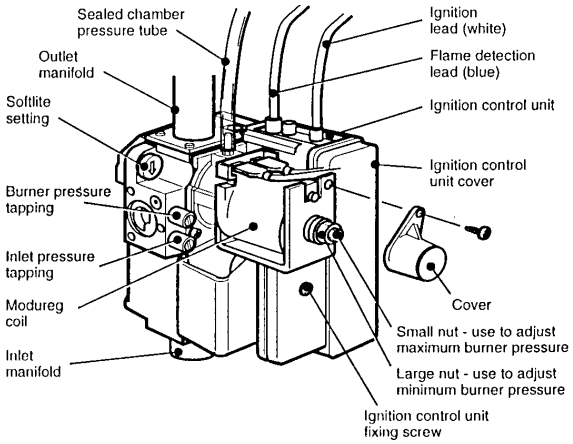


Fig. 20

6 Re-assemble in reverse order, the polarity of the modureg leads is not important. **Note**: The 'earth' tag is not used.
Check the Softlite setting (see Fig. 20) arrow up for Propane and Natural gas.
Note: Ensure the union sealing washers are in good condition, replace if necessary. Also ensure that the ignition control unit is located correctly on the gas valve.
7 Refer to section 9.7.1 to test for gas soundness and set the burner pressures.

9.7.1 SET THE BURNER PRESSURES

The minimum burner pressure is the same in both the central heating and hot water modes. The maximum burner pressure in the hot water mode is fixed, the maximum burner pressure in the central heating mode is adjustable to suit the heating load. Refer to section 5.3 for more detailed information.

Note: Always set the minimum pressure first.

1 **Check the minimum burner pressure** as described in section 5.3, paragraphs 1 to 3.
Wait until the pressure has stabilised.
Turn the minimum burner pressure adjustment nut (see Fig. 20) to obtain the required burner pressure (refer to section 1.2). Turn the nut clockwise to increase the pressure and then anticlockwise until the correct pressure is reached.

2 **Check the maximum burner pressure** as described in section 5.3, paragraph 4.
Wait until the pressure has stabilised.
Turn the maximum burner pressure adjustment nut (see Fig. 20) to obtain the required burner pressure (refer to section 1.2). Turn the nut clockwise to increase the pressure and then anticlockwise until required pressure is reached.
Note: Ensure that the minimum pressure adjustment nut does not turn when adjusting the maximum nut.

3 **Check the maximum burner pressure in the central heating mode** as described in section 5.3, paragraph 5.

4 Press in the on/off switch (green light off), disconnect the pressure gauge, retighten the test point screw and replace the Modureg head cover.

5 Press in the on/off switch (green light on) to light the boiler and test for gas soundness around the test point screw.

6 Test the boiler as described in section 7.5, paragraphs 1, 2 and 3.

9.8 IGNITION CONTROL UNIT

The ignition control unit is mounted on the right hand side of the gas valve (see Fig. 20) and is connected directly to the valve via a 5-way plug. There are no servicable parts inside the plastic enclosure.

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the screw securing the ignition control unit to the gas valve. Carefully prise open the wiring cover clips on the top and right hand side of the cover and remove the cover. Disconnect the wiring connector and withdraw the ignition control unit away from the gas valve.
4 Disconnect the ignition lead (white) and the flame detection lead (blue) from the ignition board.
5 Fit the replacement ignition board onto the gas valve and re-assemble in reverse order.
Note: Ensure that the ignition control unit is located correctly on the gas valve.
6 Test the boiler as described in section 7.5, paragraphs 1, 2 and 3.

9.9 TIMER

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Remove the two screws and nuts securing the timer to the control panel fascia.
5 Lift the timer out of the back of the fascia and disconnect the electrical leads, noting their position.
6 Re-assemble in reverse order using a new timer - refer to the wiring diagram, page 34, for electrical connections.
7 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
8 Test the boiler as described in section 7.5, paragraphs 1, 2 and 3.

9.10 INSPECTION WINDOW

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the eight screws securing the inner case front panel and remove the panel, take care not to damage the gasket.
4 Cut away the silicone mounting with a sharp tool and remove the damaged window. Fit a new window using a suitable heatproof silicone and allow to dry as per the manufacturers instructions.
5 Re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.11 LOCK-OUT RESET SWITCH

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Disconnect the electrical leads from the reset switch.
5 Squeeze together the locating tabs around the back and push it out of the fascia.
6 Push in a replacement switch from the front, ensuring it is located correctly in the fascia.
7 Connect the electrical leads to the new switch as follows:-
White to Terminal 1, Green to Terminal 2, Blue to Terminal 3
8 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
9 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.12 TEMPERATURE CONTROL POTENTIOMETER

The heating and hot water temperature control potentiometers (both the same) are located on the back of the control panel fascia.
1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Pull the control knob off the potentiometer spindle and disconnect the electrical leads, noting their position.
5 Note which way the potentiometer is fitted, then remove the nut securing it to the fascia. Fit a new potentiometer in the same orientation and secure in position. Reconnect the leads - refer to the wiring diagram, page 34, for electrical connections.
6 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
7 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.13 SWITCHES

The same procedure applies to both the on/off and summer/winter switches (the switches are not the same).
1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Disconnect the electrical leads from the back of the switch, noting their position.
5 Squeeze together the locating tabs on the back of the switch and push it out of the fascia.
5 Push in a replacement switch from the front, ensuring it is the correct way round (green light at bottom right) and connect the electrical leads - refer to the wiring diagram, page 34, for electrical connections.
6 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
7 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.14 MAIN DRIVER BOARD

The main driver board is positioned in the centre of the control box.
1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Carefully lift the board off its mounting pillars (one each corner).
2 Remove the leads from the terminal blocks (noting their position) and unplug all the wiring connections from the circuit board.

6 Re-assemble in reverse order using a new board - refer to the wiring diagram, page 34, for electrical connections.
Do not use excessive force when re-making the board connections and ensure all plugs and leads are correctly connected.
Note: The burner pressure (in the central heating mode) will have to be reset as described in section 5.2. Ensure the NG/LPG jumper on the main PCB is correctly set, that jumper JP2 is not fitted and that the other jumpers JP3 (2 - 3) and JP6 (1 - 2) are correctly fitted (see wiring diagram in section 10.2).
7 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.15 HOT WATER STORAGE OVERHEAT THERMOSTAT

This overheat thermostat is located inside the boiler control box on the right hand side, with the thermostat phial located in the top of the storage cylinder.
1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box. From inside the control box remove the four screws securing the box to the boiler.
4 Carefully pull the control box forward slightly and remove the two screws securing the thermostat body. Disconnect the electrical leads from the thermostat.
5 Carefully remove the circlip from the thermostat pocket in the top of the cylinder, retaining the thermostat capillaries, and withdraw the overheat thermostat phial.
6 Remove the thermostat, carefully withdrawing the phial through the back of the control box.
7 Re-assemble in reverse order ensuring the thermostat phial is inserted as far as it will go into the storage cylinder pocket. The polarity of the red leads is not important.
8 Replace the control box cover, ensuring the front return edge is located under the front panel return, and secure with four screws.
9 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.16 AIR PRESSURE SWITCH

The air pressure switch is positioned on the back of the boiler at the top and is accessible without opening the case.
1 Ensure that the electricity supply has been isolated.
2 Remove the screw securing the mounting bracket to the top of the boiler and lift up the pressure switch. Unscrew and remove the plastic cover and disconnect the electrical leads.
3 Disconnect the two sensing tubes and the electrical leads from the pressure switch. Check the condition of the grommets (replace if necessary).
4 Remove the mounting bracket from the switch and fit it to the new one in the same position.
5 Connect the electrical leads as follows:-
Blue to Terminal C, Black to Terminal Nc (1), Brown to Terminal No (2)
6 Connect the right (transparent) sensing tube to the connector marked - / L and the left (pink) tube to the other connector marked + / H.
Note: Left and right refer to view when facing front of boiler.
7 Fit the plastic cover and mounting bracket to the new switch and secure the mounting bracket to the top of the boiler.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.17 HOT WATER TEMPERATURE GAUGE

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Carefully remove the circlip from the thermostat pocket in the top of the cylinder, retaining the thermostat capillaries, and withdraw the temperature gauge phial.
5 Squeeze together the locating tabs on the back of the gauge and push the gauge out of the control panel fascia. Carefully withdraw the capillary through the grommet in the back of the control box.
6 Push in a replacement gauge, ensuring it is the correct way round and position the temperature phial in the pocket, ensuring it is inserted as far as it will go.

7 Re-assemble in reverse order, ensuring the front return edge of the control box top is located under the front panel return.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.18 SYSTEM TEMPERATURE/PRESSURE GAUGE

1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box.
4 Remove the union nut securing the pressure sensor to the front of the safety valve (to the left of the gas valve) and withdraw the sensor. Withdraw the temperature phial from the pocket on the central heating flow pipe (also to the left of the gas valve).
5 Squeeze together the locating tabs on the back of the gauge and push the gauge out of the control panel fascia. Carefully withdraw the capillaries through the grommet in the back of the control box.
6 Push in a replacement gauge, ensuring it is the correct way round, secure the sensor in place with union and position the temperature phial in the pocket.
7 Re-assemble in reverse order, ensuring the front return edge of the control box top is located under the front panel return.
8 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7. Set the adjustable pointer on the pressure gauge to the system design pressure.
9 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.19 SAFETY VALVE

The safety valve is positioned at the back of the boiler to the left of the gas valve.
1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Disconnect the discharge pipe from the safety valve.
4 Remove the union nut securing the pressure sensor to the front of the safety valve and withdraw the sensor.
5 Unscrew the safety valve from the central heating flow pipe.
6 Re-assemble in reverse order using a new valve.
7 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7. Turn the safety valve knob a couple of times to check that it re-seats properly without leaking. Re-pressurise the system if necessary.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.20 PUMP or NON RETURN VALVE

Both the primary water (R/H) and central heating (L/H) pumps are the same. **A replacement pump must be set at setting 3.**
A non return valve is fitted directly beneath each pump.
1 Ensure that the electricity supply has been isolated.
2 Drain the hot water or central heating circuit of the boiler as described in section 8.
3 Disconnect the pump wiring connector.
4 Undo the pipe unions from the pump and withdraw the pump. Remove the non return valve if it is to be replaced.
Note: To gain access to the lower pump union it may be necessary to raise the control box as follows:- Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box. From inside the control box remove the four screws securing the box to the boiler.
5 Re-assemble in reverse order using a new pump with new seals or new non return valve. Ensure the pump is fitted the correct way up - the direction of flow is upwards.
6 Open the mains water supply valve to refill the storage tank and vent the circuit by opening the hot taps, or fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
7 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.21 AUTOMATIC AIR VENT

The air vent is positioned at the back of the boiler on the upper left hand side and is accessible without opening the case.

1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Unscrew the automatic air vent from the fitting and replace with a new one using a new 'O' ring.
Check that the small cap in the top of the air vent is screwed in fully, then unscrew it one complete turn - the cap remains in this position from now on.
4 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
5 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.22 CENTRAL HEATING EXPANSION VESSEL (red)

The expansion vessel is positioned on the back of the boiler and is accessible from the top.

1 Ensure that the electricity supply has been isolated.
2 If rear exit flue is used, disconnect the flue elbow from the flue and remove it from the top of the boiler.
3 Drain the central heating circuit of the boiler as described in section 8.
4 Remove the one screw (L/H side) securing the expansion vessel retaining channel and withdraw the channel.
5 Undo the union at the bottom of the vessel and remove by lifting the vessel up and out of the boiler.
6 Re-assemble in reverse order, using a new sealing washer on the expansion vessel connection. The bottom connection of the expansion vessel should be towards the front of the boiler when fitting it.
Note: Ensure the expansion vessel is correctly located in the bottom fitting and that it is secured by the fixing channel.
7 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.23 HOT WATER EXPANSION VESSELS (4 litre - white, 2 litre - silver)

The boiler is fitted with two hot water expansion vessels, see Fig. 19. The 4 litre expansion vessel is positioned on the back of the boiler at the right hand side and is accessible from the top. The 2 litre vessel is positioned behind the upper front panel.

1 Ensure that the electricity supply has been isolated.
2 Drain the hot water circuit of the boiler as described in section 8.
3 4 litre vessel - Remove the one screw (L/H side) securing the central heating expansion vessel retaining channel and withdraw the channel.
Undo the union at the bottom of the vessel, remove the two screws at the top securing the vessel to the mounting bracket and remove by lifting the vessel up and out of the boiler.
4 2 litre vessel - Undo the union at the bottom of the vessel, remove the screws securing the locating bracket and remove the vessel.
5 Re-assemble in reverse order, using a new sealing washer on the expansion vessel connection.
6 Open the mains water supply valve to refill the storage tank and vent the circuit by opening the hot taps.
7 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.24 PRIMARY WATER FLOW SWITCH

The primary water flow switch assembly is positioned above the pumps.
The microswitch can be replaced without draining the boiler.
Microswitch

1 Ensure that the electricity supply has been isolated.
2 Open the upper front panel (hinges to the left) to gain access.
3 Remove the plastic cover from the primary water flow switch and slide the microswitch from its housing pins.
Disconnect the electrical leads and connect to the new switch (polarity is not important, but use only the two outer terminals).
4 Carefully move the operating lever away to allow the microswitch to locate on its housing pins.
5 Re-assemble in reverse order and test the boiler as described in section 7.5, paragraphs 1,2 and 3.

Water Flow Switch

1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Remove the microswitch as described above.
4 Undo the unions and withdraw the flow switch.
5 Re-assemble in reverse order using new sealing washers.
6 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
7 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.25 MAINS WATER INLET FILTER & FLOW RESTRICTOR (see Fig. 21)

The mains water supply to the boiler has two filters, one is positioned in the right hand connection point on top of the hot water storage cylinder, the other is in the pressure reducing valve in the supply external to the boiler (see Fig. 6). A flow restrictor is also fitted in the top connection point to the cylinder.

To replace or clean the filter in the boiler.

1 Ensure that the electricity supply has been isolated.
2 Drain the hot water circuit as described in section 8.
3 Undo and remove the two unions from the fitting. Take care not to lose any sealing washers.
4 Remove the water inlet nut from the top of the fitting and withdraw the filter. Unscrew the fitting from the top of the hot water storage tank.
Note: To gain access to the fitting it may be necessary to raise the control box as follows:-
Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box. From inside the control box remove the four screws securing box to the boiler.

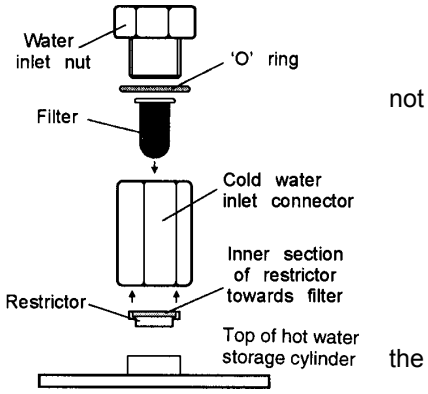


Fig. 21

9.26 DOMESTIC HOT WATER TEMPERATURE/PRESSURE RELIEF VALVE

The DHW temperature/pressure relief valve is positioned in the left hand connection point on top of the hot water storage cylinder.

1 Ensure that the electricity supply has been isolated.
2 Drain the hot water circuit as described in section 8.
3 Disconnect the valve outlet union and unscrew the valve from the hot water storage cylinder.
Note: To gain access to the valve it may be necessary to raise the control box as follows:-
Remove the four screws securing the control box top cover. Slide the cover back and up to remove it from the control box. From inside the control box remove the four screws securing the box to the boiler.
4 Re-assemble in reverse order using a new valve.
5 Open the mains water supply valve to refill the storage tank and vent the circuit by opening the hot taps.
6 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

9.27 CENTRAL HEATING TEMPERATURE SENSOR

The central heating temperature sensor is positioned on the rear of the heat exchanger at the left hand side. See Fig. 19.

1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Remove the eight screws securing the sealed chamber front panel and remove the panel, take care not to damage the gasket.
4 Disconnect the electrical leads from the sensor and unscrew the sensor.

5 Fit a replacement sensor, using a small amount of thread sealant.
6 Reconnect the electrical leads (polarity is not important) and re-assemble in reverse order.
7 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

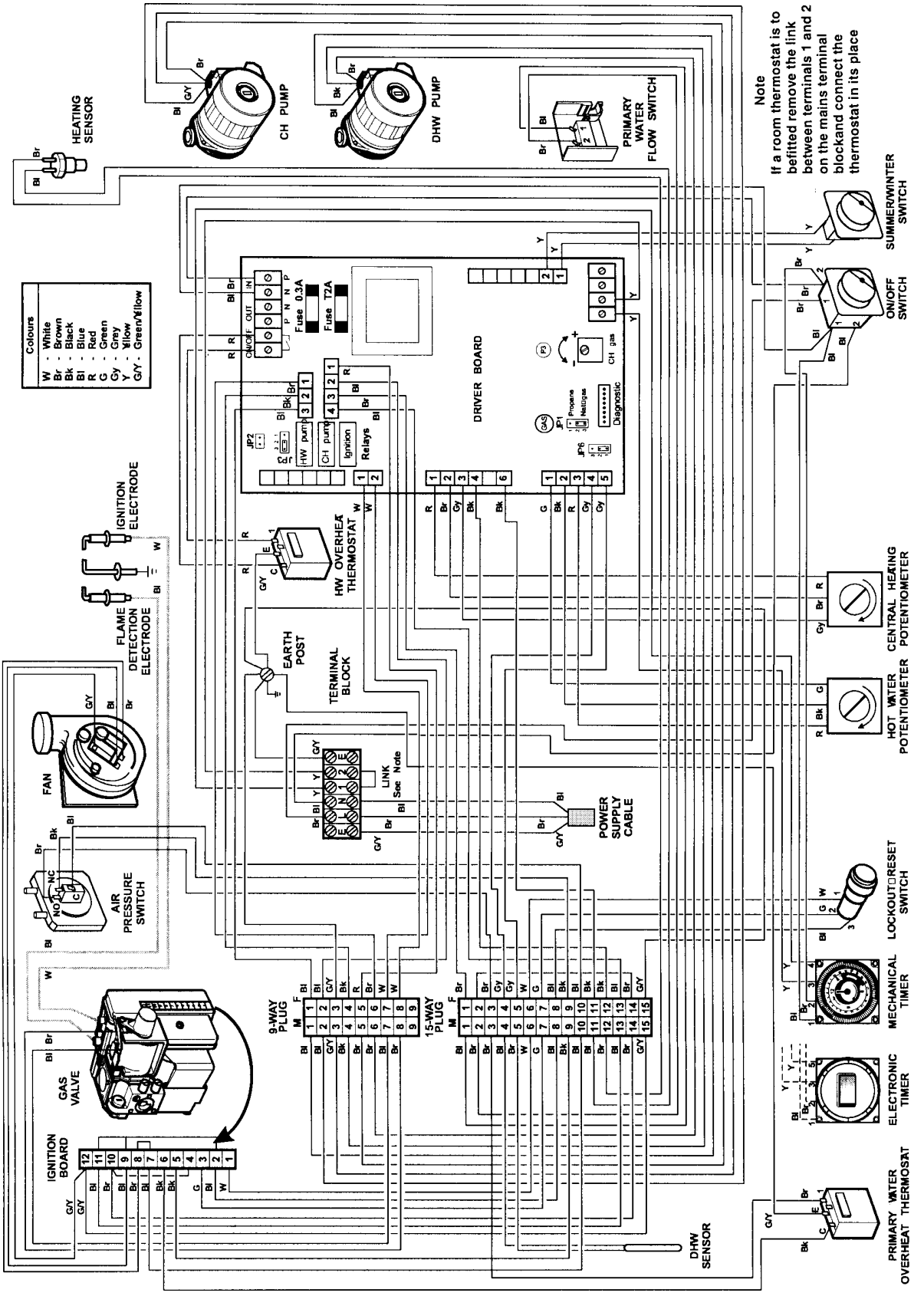
9.28 MAIN HEAT EXCHANGER

Take care when handling the new heat exchanger not to damage the fins.
1 Ensure that the electricity supply has been isolated.
2 Drain the central heating circuit of the boiler as described in section 8.
3 Remove the eight screws securing the inner case front panel and remove the panel, take care not to damage the seal.
4 Remove the six screws securing the combustion chamber front cover and remove the cover.
5 Disconnect the flue elbow from the flue and remove it from the top of the boiler
6 Remove the six screws securing the top of the sealed chamber and remove, take care not to damage the seal.
7 Disconnect the air pressure switch sensing tubes from the fan noting their position.
8 Disconnect the electrical leads from the fan motor, noting their position.
9 Remove the remaining two screws (behind the flue hood) securing the flue hood to the combustion chamber. Lift up the fan and flue hood assembly to clear the heat exchanger and remove from the boiler.
10 Disconnect the electrical leads from the central heating thermostat (left hand side of the heat exchanger) and unclip the overheat thermostat bulb (on the right hand side of the heat exchanger).
11 Undo the small socket head grub screws, securing the heat exchanger to the inlet/outlet pipes, by about 3 turns.
12 Lift the right hand side of the heat exchanger up to clear the inlet pipe then withdraw it from the outlet pipe.
13 Transfer the central heating sensor and overheat thermostat bulb clip from the old heat exchanger to the new one.
14 Re-assemble in reverse order using new 'O' rings on the heat exchanger connections, ensuring the grub screws are correctly located and not over tightened. Also replace the flue seals and the seals to the boiler top cover if necessary.
Note: When reconnecting the air pressure switch sensing tubes to the fan connect the right (transparent) tube to the upper connector (nearest the fan outlet) and the left (pink) tube to the lower connector.
15 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
16 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

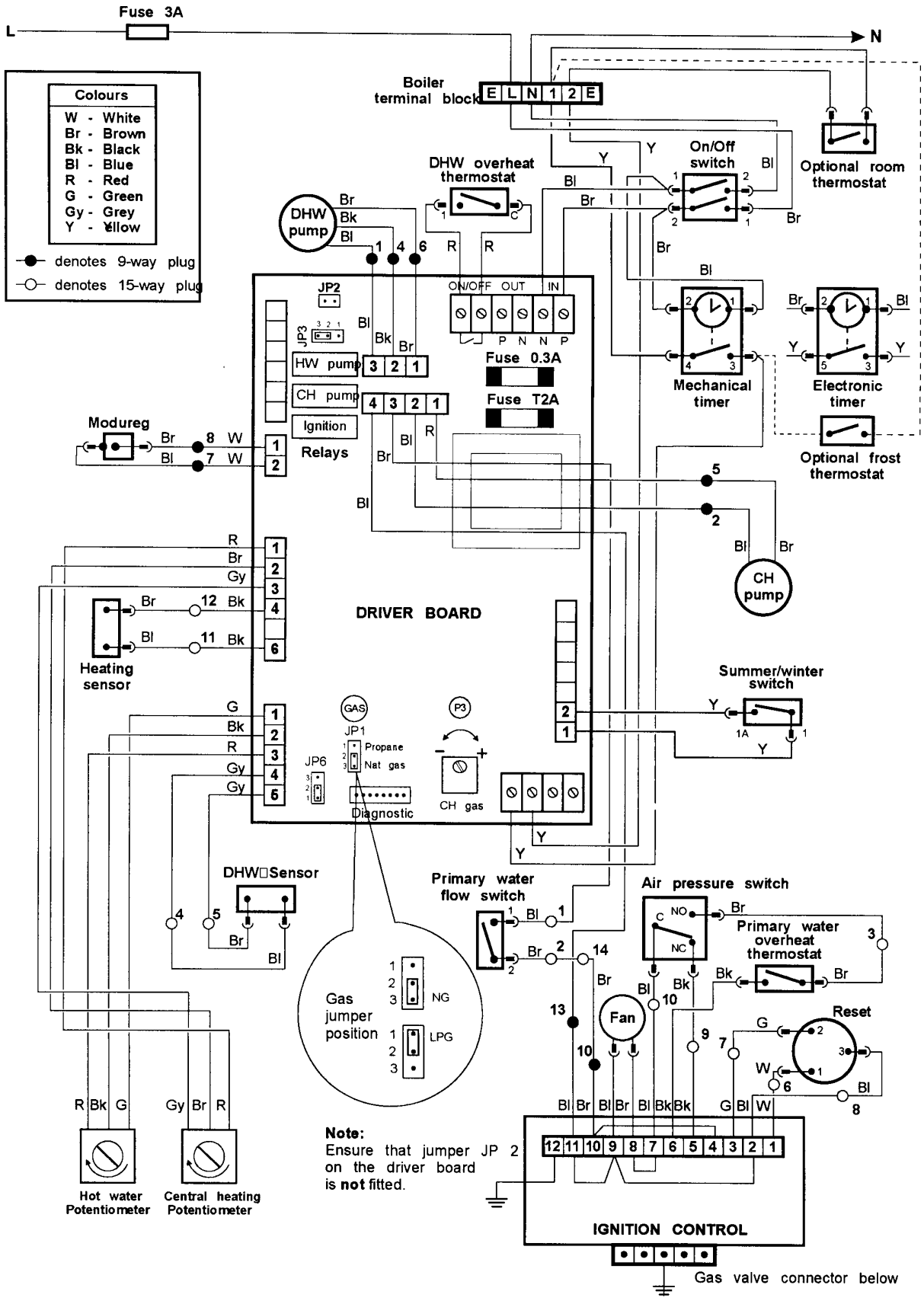
9.29 COMBUSTION CHAMBER INSULATION PANELS

Refer to Health and Safety Information on page 2 and dampen the panels before carrying out any work on them.
1 Ensure that the electricity supply has been isolated.
2 Remove the main heat exchanger as described in section 9.28, paragraphs 2 to 9.
3 Remove the rear panel by carefully pulling it forward at the top and lifting out.
Remove the front and side panels in a similar way.
4 Insert the new panels bottom first then push back into position.
5 Re-assemble in reverse order, ensuring the heat exchanger retaining screws are correctly located and not over tightened.
Note: Ensure the seals on the sealed chamber top and front panels are intact and in position, and when reconnecting the air pressure switch sensing tubes to the fan connect the right (transparent) tube to the upper connector (nearest the fan outlet) and the left (pink) tube to the lower connector.
6 Fill the boiler and re-pressurise the system to between 0.8 and 1.5 bar (to match the original system pressure) as described in section 4.2, paragraphs 2 to 7.
8 Test the boiler as described in section 7.5, paragraphs 1,2 and 3.

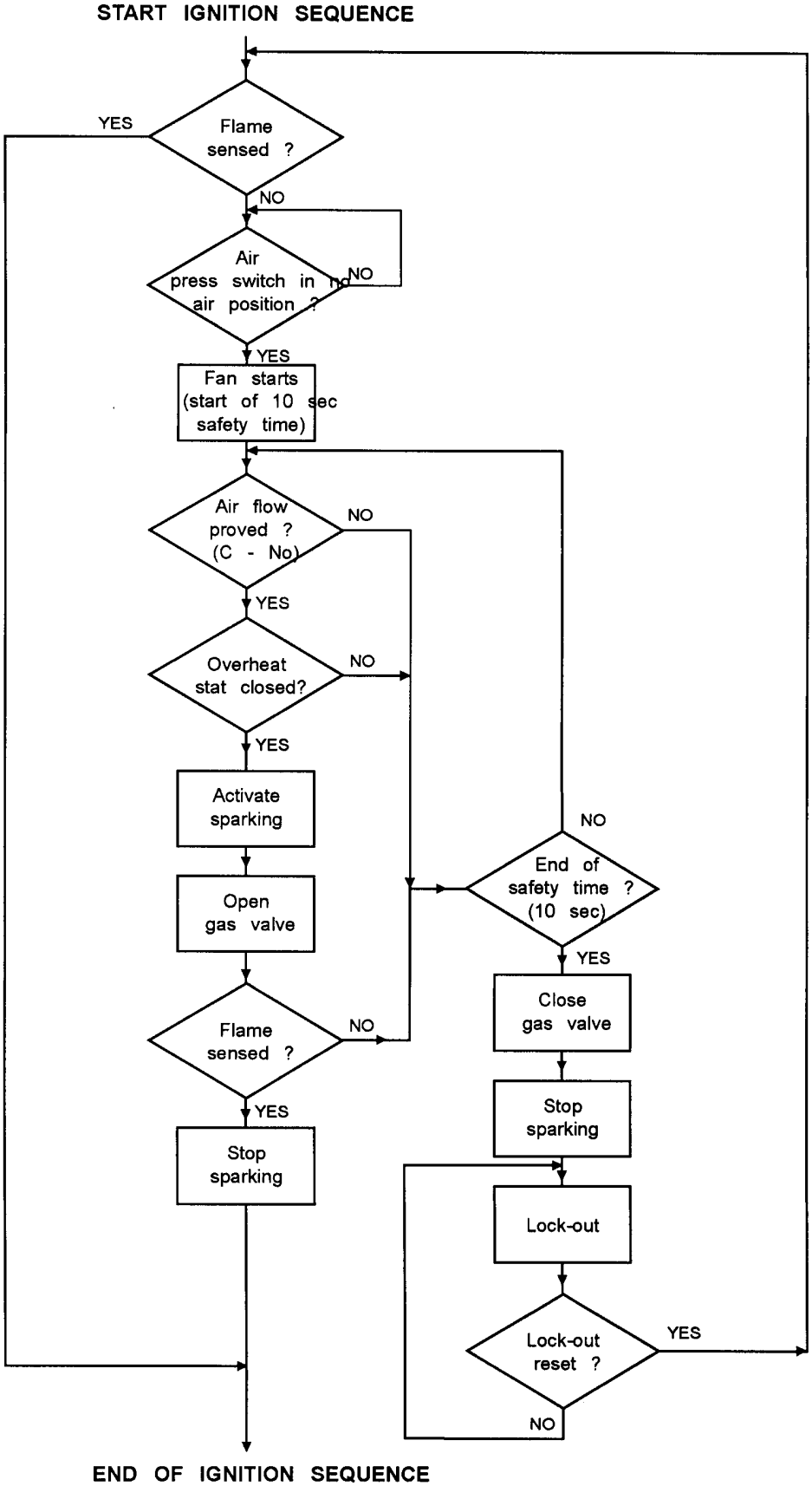
10.1 ILLUSTRATED WIRING DIAGRAM



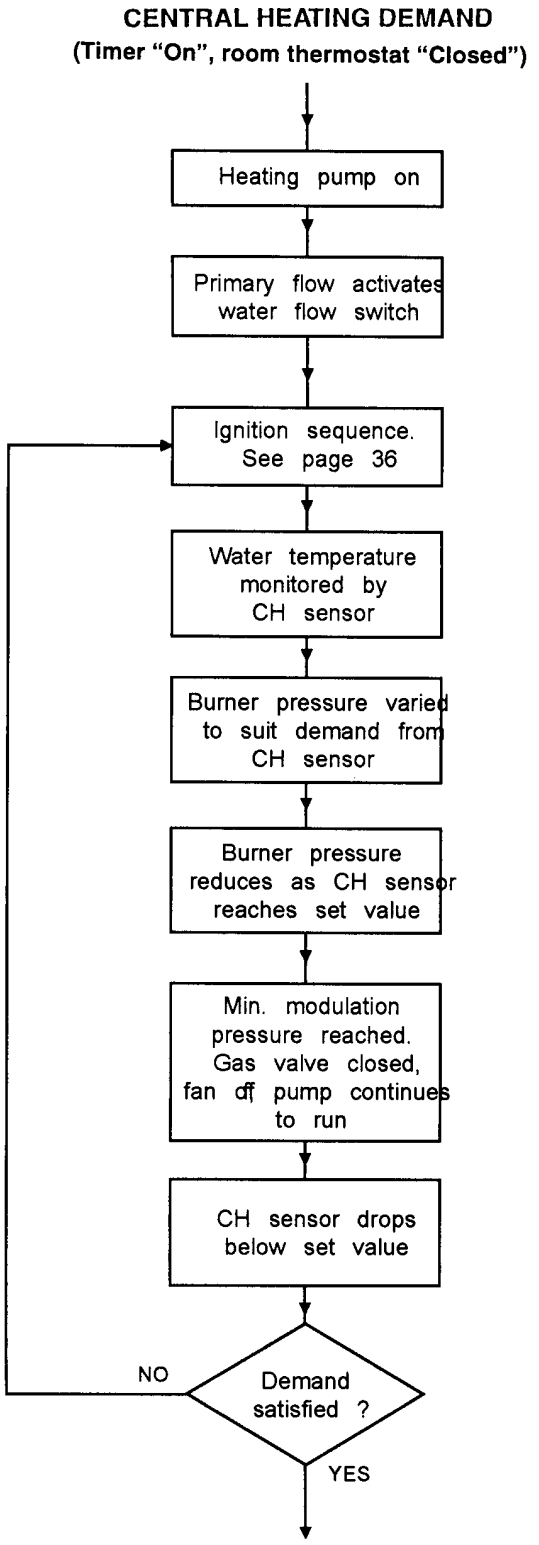
10.2 FUNCTIONAL FLOW WIRING DIAGRAM



11.1 AUTOMATIC IGNITION SEQUENCE

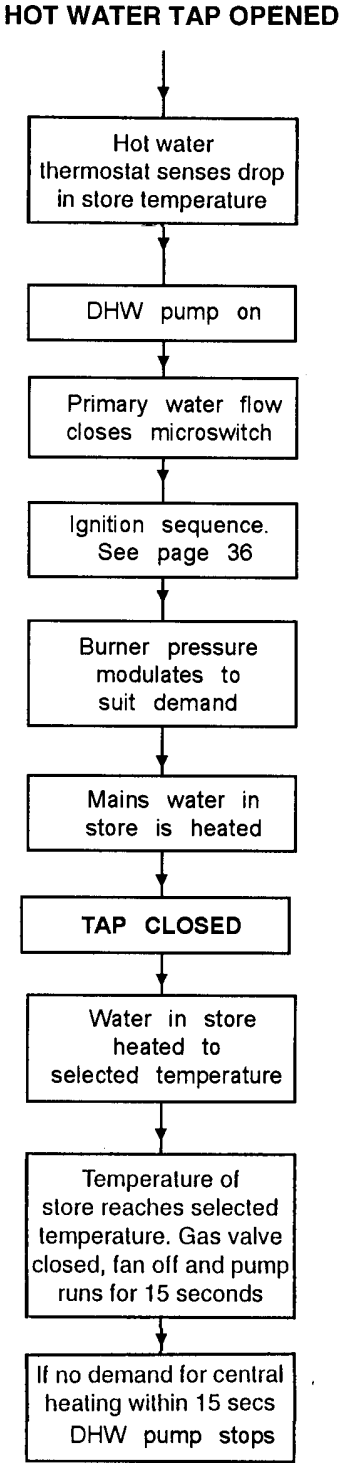


11.2 OPERATION IN CENTRAL HEATING MODE



Note: Pump overrun is 2.5 mins when heat demand is satisfied.

11.3 OPERATION IN DOMESTIC HOT WATER MODE



During the fault finding procedure the first electrical checks to be carried out are:- Short circuit, Polarity, Earth continuity and Resistance to earth. After completing a service or fault finding task which has required the breaking and remaking of electrical connections, the electrical checks must be repeated.

Preliminary check of mains voltage and switches – ensure timer is in an 'on' position and room thermostat (it fitted) is calling for heat.

BURNER WILL NOT LIGHT

Pump and fan not operating (but no lock-out)

Possible cause	Remedy
Blown fuse on driver board	Check fuse, replace if necessary
Seized pump	Check pump, free rotor or replace if necessary
Airlock in pump/boiler	Vent pump and boiler
No power to pump	Check electrical connections
Faulty pump	Check 230V at pump, replace if necessary
Faulty driver board	Check 230V at board, replace if necessary

Pump operating, fan not operating (but no lock-out)

Possible cause	Remedy
No power to ignition control unit	Check 230V output from driver board (pins 3 & 4 to left of fuse)
Primary water flow switch not activated	Check connections from driver board
Primary water flow switch faulty	Check operation of primary flow switch
No power to fan	Check switch continuity, replace if necessary Check 230V output from ignition board (pins 8 & 9 on ignition PCB) Check electrical connections to fan Check continuity of wiring to fan
Fan faulty	Check 230V at fan, replace fan if necessary
Air pressure switch faulty	Check electrical connections to switch Check continuity (N/C contact), replace if necessary
Ignition control PCB faulty	Check control, replace if necessary

Pump and fan operating followed by boiler lock-out

Possible cause	Remedy
Air pressure switch faulty	Check electrical connections to switch Check continuity (N/O contact), replace if necessary
Blocked air pressure switch tubes	Check and rectify as necessary
Air switch tubes incorrectly connected	Check and rectify as necessary
Flue system blocked or obstructed	Check and rectify as necessary
Fan venturi blocked	Check and rectify as necessary
Overheat thermostat contacts open	If boiler is hot, allow to cool and re-check Check switch continuity, replace if necessary
No gas at burner	Check gas service cock is open Check cock at meter is open Check for gas pressure at burner test point
No electrical supply to gas valve	Check ignition control is correctly fitted on gas valve
Gas valve faulty	Check valve, replace if necessary
No spark at electrode (but gas valve heard to operate)	Check ignition lead connections, rectify as necessary Check ignition lead continuity, replace if necessary Check electrode setting and rectify as necessary Check earthing electrode and rectify as necessary
Ignition control PCB faulty	Check control, replace if necessary

BURNER LIGHTS AND THEN GOES TO LOCK-OUT

Possible cause	Remedy
Flame not detected	Check position of electrode and adjust as necessary
	Check sensing lead connections, rectify as necessary
	Check sensing lead continuity, replace if necessary
	Ignition module faulty - replace
Polarity of electrical supply reversed	Check and rectify as necessary

BURNER WILL NOT LIGHT FOR HOT WATER

Possible cause	Remedy
Summer/winter switch faulty	Check continuity (summer position), replace if necessary
Hot water sensor faulty	Check electrical connections, replace if necessary
Driver board faulty	Check board, replace if necessary

BURNER WILL NOT LIGHT FOR HEATING

Possible cause	Remedy
Summer/winter switch set to Summer	Check switch and reset as necessary
Summer/winter switch faulty	Check electrical connections, rectify as necessary
	Check continuity, replace if necessary
Heating timer not set to 'On'	Check timer setting and reset as necessary
Heating timer faulty	Check electrical connections, rectify as necessary
	Check switch continuity, replace if necessary
Room thermostat not set to 'On'	Check setting of thermostat and reset as necessary
Room thermostat faulty	Check wiring and connections, rectify as necessary
	Check switch continuity, replace if necessary
Link 1-2 not fitted (when no stat fitted)	Check and rectify as necessary
Heating sensor faulty	Check electrical connections, rectify as necessary
	Check sensor (see note below), replace if necessary
Driver board faulty	Check board, replace if necessary

NOTE: Temperature sensor resistance - 10 kohms at 20°C

NO DOMESTIC HOT WATER OR HOT WATER NOT HOT ENOUGH

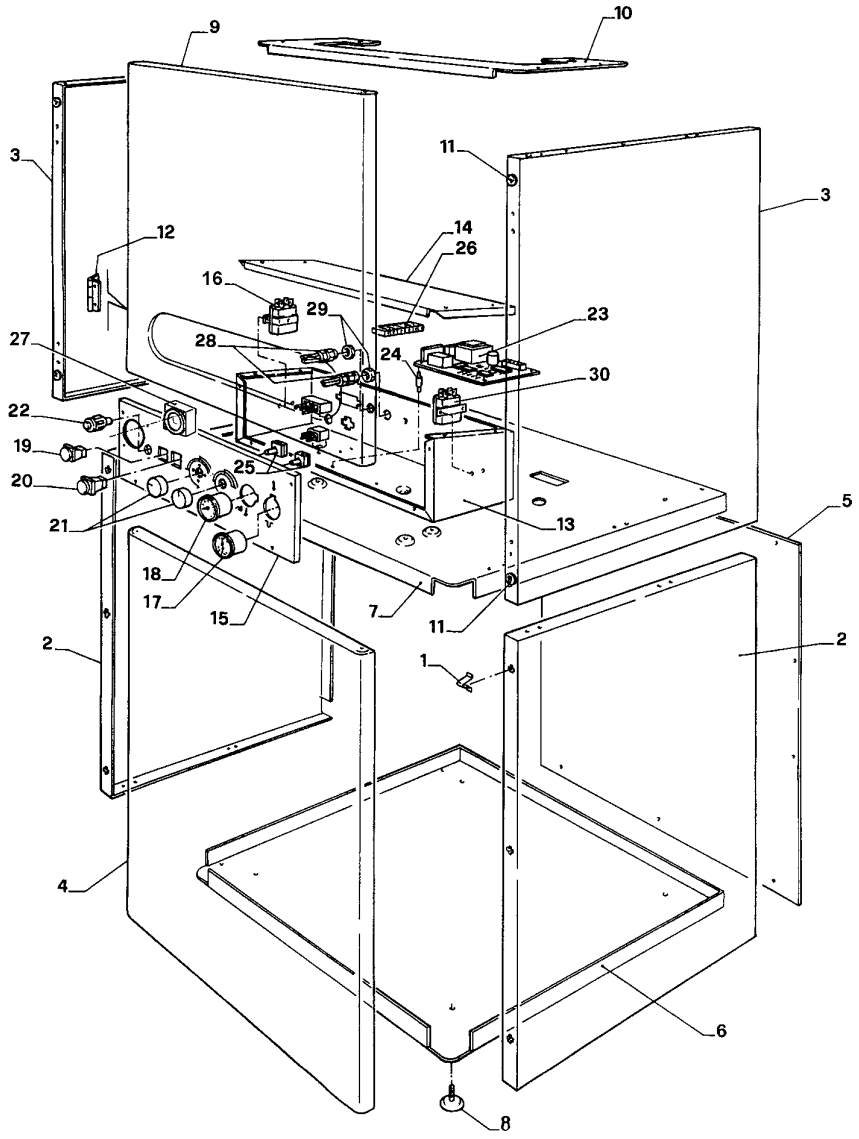
Possible cause	Remedy
Hot water sensor faulty	Check electrical connections, replace if necessary
DHW pump faulty or jammed	Check pump, rectify or replace as necessary
Cold inlet filter block	Remove filter to check and clean as necessary
Hot water temperature control set too low	Check control setting and adjust as necessary
Insufficient gas supply	Check inlet/outlet gas pressure with boiler running
	NB: Refer to section 1 for gas rates and pressures
	Check gas pipe size/length, rectify as necessary
	Check meter outlet pressure, rectify as necessary

WHEN BOILER SET TO HOT WATER ONLY, RADIATORS HEAT UP

Possible cause	Remedy
Non return valve (below DHW pump) faulty or jammed	Check valve, rectify or replace as necessary

13 EXPLODED VIEWS AND PARTS LISTS

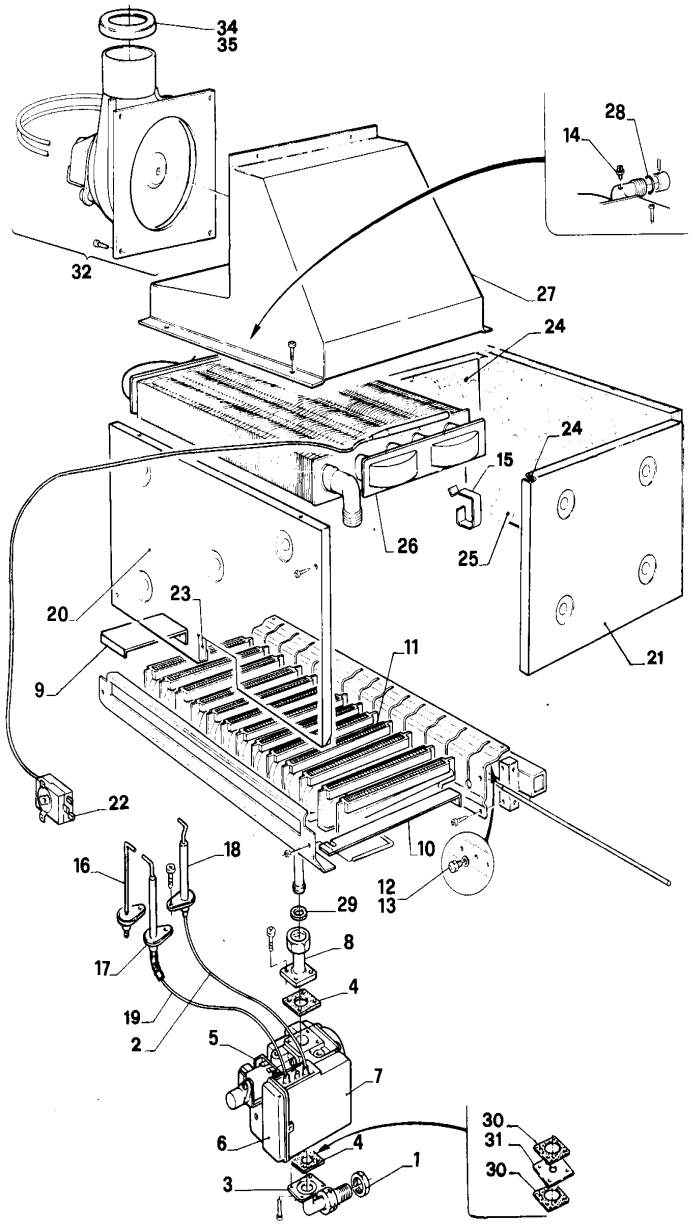
13.1 CASING AND ELECTRICS



N.	P. No.	Q.	Description
1	18010150	6	Panel clip
2	60000400	2	Lower side panel
3	60000410	2	Upper side panel
4	60000420	1	Lower front panel
5	60000430	1	Lower back panel
6	60000440	1	Lower base plate
7	60000570	1	Lower top plate
8	10050020	4	Adjustable foot
9	60000465	1	Upper front panel
10	60000480	1	Upper case support plate
11	50000270	2	Magnetic catch
12	50000400	2	Hinge
13	60000690	1	Control box body
14	60000360	1	Control box top panel
15	60000375	1	Control box fascia panel

N.	P. No.	Q.	Description
16	50000895	1	Primary water overheat thermostat
17	18040021	1	Temperature/pressure gauge (CH)
18	16080050	1	Temperature gauge (DHW)
19	14000504	1	On/off switch
20	14000505	1	Summer/winter
21	60000380	2	Control knob
22	60000530	1	Reset switch
23	40000790	1	Main driver board
24	40000455	4	PCB mounting pillar
25	50000165	2	Potentiometer
26	50000930	1	Terminal block
27	50000520	1	Timer (mechanical)
27	50000525	1	Timer (electronic)
28	50000330	2	Cable gland
29	50000340	2	Nut for cable gland
30	41000215	1	Hot water overheat thermostat

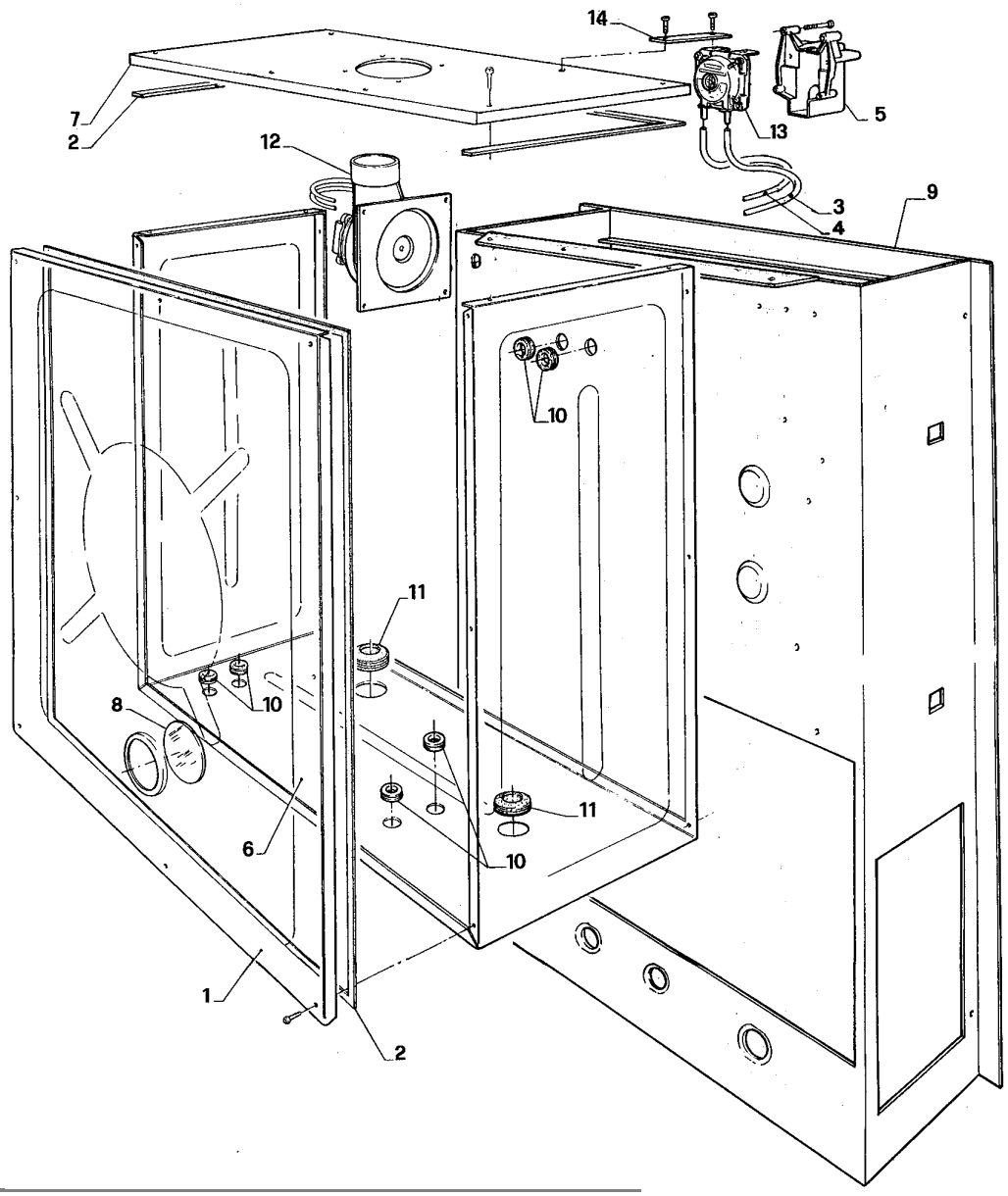
13.2 GAS COMPONENTS



N.	P. No.	Q.	Description
1	18030310	1	Locking nut 3/4" BSP
2	18022084	1	Flame detection electrode lead (blue)
3	50000613	1	Gas valve inlet manifold
4	50000630	2	Gas valve manifold gasket (NG)
5	50000730	1	Gas valve (NG/LPG)
6	50000940	1	Ignition control unit cover
7	50000870	1	Ignition control unit
8	60000600	1	Gas valve outlet manifold
9	51000446	1	Burner closure panel LH
10	50000670	1	Burner closure panel RH
11	51000578	1	Burner
12	18011216	15	Burner injector (NG) 125
13	18011112	15	Burner injector (LPG) 75
14	50000160	1	CH temperature sensor
15	50000705	1	Thermostat phial retaining clip
16	18011515	1	Ignition earth electrode
17	18011511	1	Ignition spark electrode

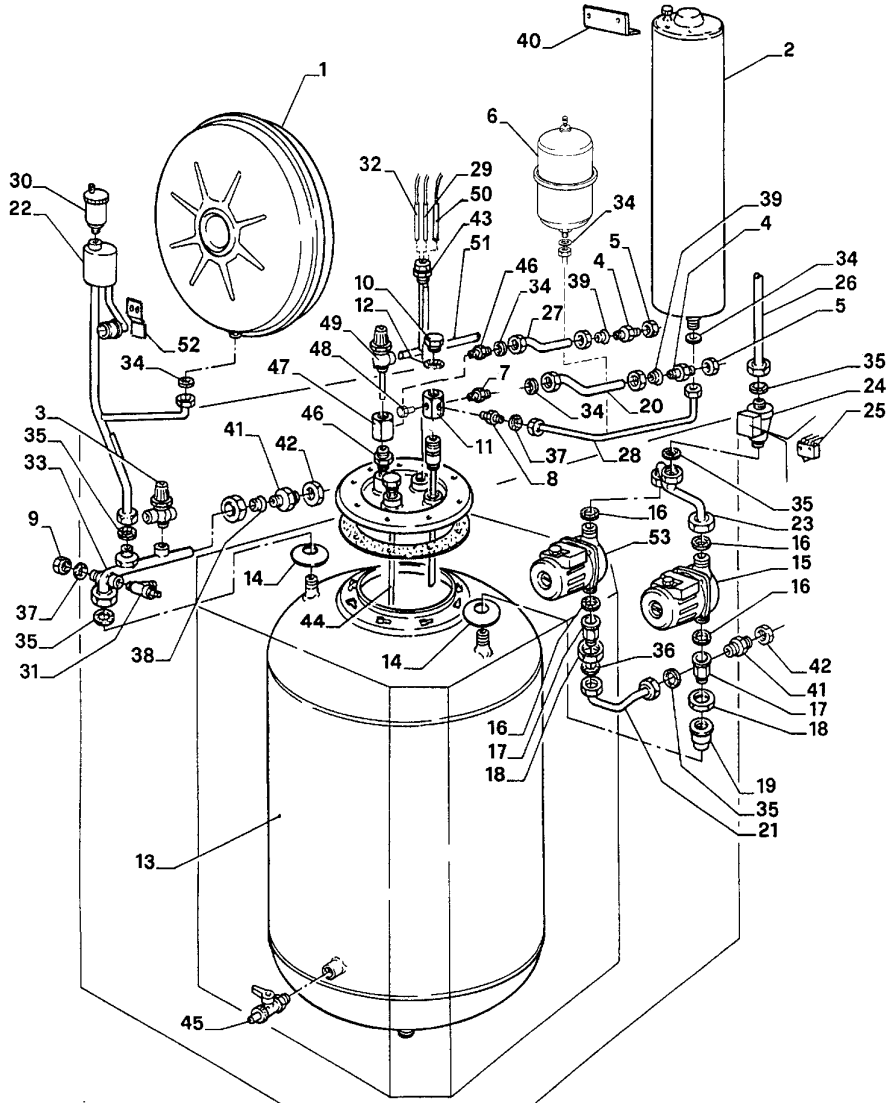
N.	P. No.	Q.	Description
18	18011510	1	Flame detection electrode
19	18022083	1	Ignition electrode lead (white)
20	51000704	1	Combustion chamber panel - front
21	51000536	1	Combustion chamber panel - side/rear
22	50000895	1	Primary water overheat thermostat
23	51000172	1	Insulation panel - front
24	51000181	2	Insulation panel - side
25	51000177	1	Insulation panel - rear
26	51000106	1	Main heat exchanger
27	51000028	1	Flue hood
28	40000095	2	'O' ring (3081)
29	18050045	1	Gasket 18.5 x 11.5 x 2
30	40000980	2	Gas valve inlet manifold gasket (LPG)
31	40000965	1	Diaphragm 7.0 mm (LPG)
32	41000921	1	Fan assembly 55W
34	51000756	1	Restrictor (49 mm) - coaxial flue
35	51000760	1	Restrictor (45.5 mm) - two pipe flue

13.3 SEALED COMBUSTION CHAMBER



N.	P. No.	Q.	Description
1	51000046	1	Sealed chamber front cover
2	50000377	mtr.	Sealed chamber seal
3	40000960	1	Pressure switch sensing tube (right/clear)
4	40000963	1	Pressure switch sensing tube (left/pink)
5	40000923	1	Pressure switch cover
6	51000031	1	Sealed chamber base/sides
7	51000036	1	Sealed chamber top panel
8	18010712	1	Viewing window
9	60000560	1	Chassis
10	18052115	6	Grommet (small)
11	18052119	2	Grommet (large)
12	41000921	1	Fan assembly
13	41000926	1	Pressure switch - 2.68 mbar
14	50000518	1	Pressure switch mounting bracket

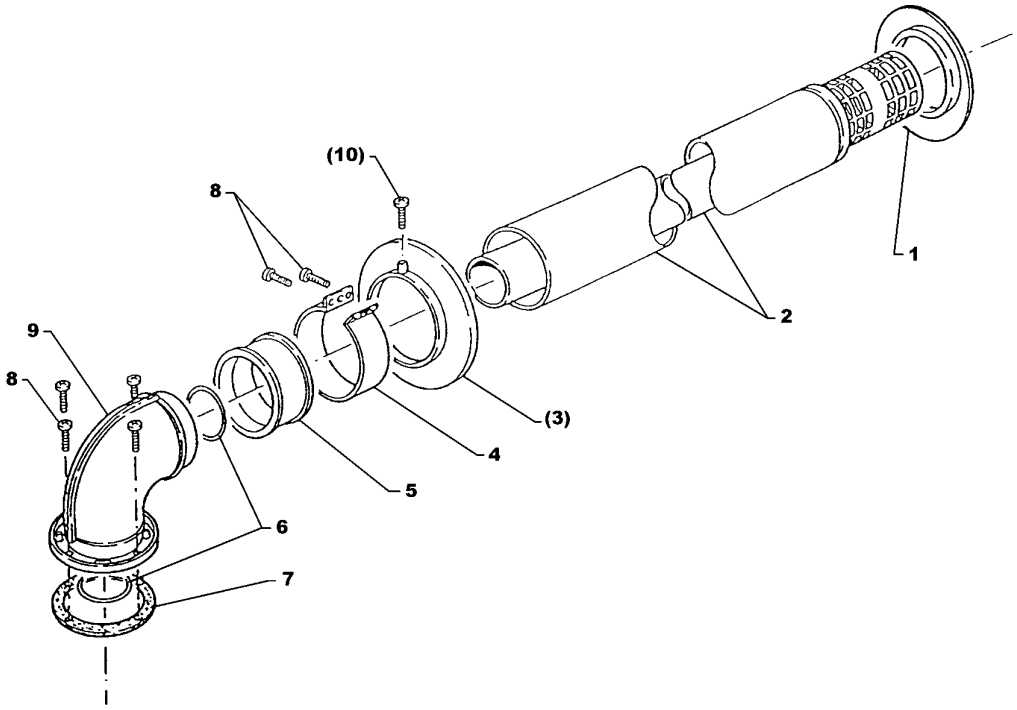
13.4 WATER COMPONENTS



N.	P. No.	Q	Description
1	60000150	1	CH expansion vessel (10 ltr)
2	60000510	1	DHW expansion vessel (4 ltr)
3	18020190	1	Safety valve (3 bar)
4	18030050	2	Connector 1/2"
5	18030320	2	Locknut 1/2"
6	41000225	1	DHW expansion vessel (2ltr)
7	40000405	1	Adaptor 1/2" x 3/8"
8	60000170	1	Adaptor 3/8" x 1/8"
9	50000365	1	Blanking cap 3/8"
10	40000065	1	Water inlet nut
11	40000060	1	Water inlet fitting
12	40000100	1	'O' ring
13	MG-140-UK	1	Cylinder
14	16041016	2	Washer
15	18040299	1	DHW Pump
16	18050125	4	Pump sealing washer
17	13080033	2	Non return valve
18	60000210	2	Nut
19	60000220	1	Connector
20	60000625	1	Cold water outlet pipe
21	60000630	1	Heating return pipe
22	60000640	1	Air separator
23	60000650	1	Pump to flow switch pipe
24	18040010	1	Primary water flow switch
25	18021033	1	Primary water flow switch microswitch
26	60000655	1	Primary water flow switch to boiler pipe

N.	P. No.	Q	Description
27	60000615	1	Hot water inlet pipe
28	60000670	1	Hot water expansion vessel pipe
29	40000215	1	Hot water overheat thermostat sensor
30	18020150	1	Automatic air vent
31	60000540	1	Drain cock 1/4"
32	40000917	1	Hot water sensor
33	60000590	1	Flow connection pipe
34	18050045	5	Sealing washer Ø 1/2"
35	18050020	5	Sealing washer Ø 3/4"
36	18050130	1	Sealing washer Ø 1"
37	50000465	2	Sealing washer Ø 3/8"
38	18050090	1	Olive 3/4"
39	18050080	2	Olive 1/2"
40	60000140	1	CH expansion vessel mounting bracket
41	40000320	2	Connector 3/4"
42	18030310	2	Locknut 3/4"
43	60000605	1	Sensor pocket
44	16010010	1	Anode
45	18022810	1	Drain cock 1/2"
46	07020151	2	Connector 1/2"
47	07040003	1	Tee 1/2"
48	40000415	1	Blanking plug 3/8"
49	60000730	1	Temperature/pressure relief valve
50	16080050	1	Temperature gauge sensor
51	60000635	1	Temperature/pressure relief valve pipe
52	60000750	1	Air separator bracket
53	18040300	1	CH Pump

13.5 HORIZONTAL FLUE (CO-AXIAL)



N.	P.No.	Q	Description
1	FH004	1	Outer wall seal
2	FH002	1	Concentric flue pipe 100/80 mm
3	FHV005	1	Inner wall seal (optional)
4	FHV008	1	Flue clamp - Elbow to pipe
5	FHV009	1	Stepped flue seal - elbow to pipe
6	FHV007	2	'O' ring 80 mm - inner flue seal
7	FHV006	1	Gasket - flue elbow to boiler
8	FHV010	6	Screw pan hd pozi No.8 x 11
9	FH003	1	90° flue elbow
10	FHV031	1	Screw pan hd pozi M3 x 10 (optional)

14 PACKING LISTS

14.1 BOILER PACK

Containing:	Qty.	Part No.
Rio 140 boiler complete with timer (NG)	1	80090145
Rio 140 boiler complete with timer (LPG)	1	80090155
Installation and Servicing manual	1	18000170
Users Operating manual	1	18000180
Guarantee card	1	18000110
Flue restrictor (standard co-axial flue)	1	51000756

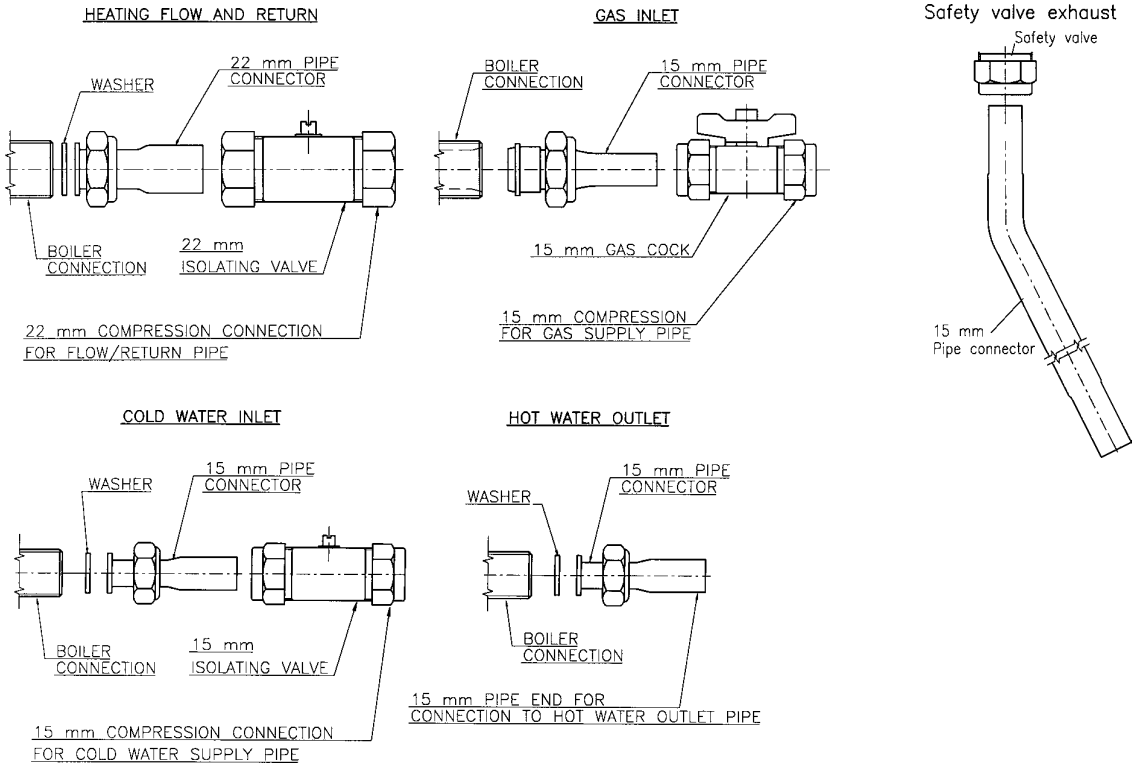
14.2 BOILER FITTINGS PACK

Containing:-	Qty.	Part No.
Gas cock	1	50000955
Flow/return valve	2	50000935
Cold water inlet valve	1	50000945
22 mm pipe connector flow/return (see below)	2	90020092
15 mm pipe connector for cold and hot water (see below)	2	90020093
15 mm pipe connector for gas (see below)	1	90020094
3/4 in. fibre washer (flow/return connections)	2	18050020
1/2 in. fibre washer (hot/cold water connections)	2	18050045
Tundish	1	41000275
Check valve	1	41000245
Pressure reducing valve	1	41000235
Expansion relief valve	1	41000240

14.3 STANDARD FLUE KIT

Containing:	Qty.	Part No.
1 metre horizontal flue pipe assembly	1	FH002
90° flue elbow	1	FHV003
Gasket (elbow to boiler)	1	FHV006
Inner 'O' ring (red)	2	FHV007
Flue clamp	1	FHV008
Sealing sleeve (elbow to pipe)	1	FHV009
Outer wall sleeve	1	FH004
No.8 x 1/2 in. pan hd pozi screw	6	FHV010

GAS AND WATER PIPE CONNECTIONS



The following instructions, specific to Propane boilers, must be read in conjunction with the standard Installation and Servicing instructions in this manual.

15.1 NOMINAL BOILER RATINGS - Propane (G31)

Heat Output		Propane (G31) at 37 mbar				
		Heat Input		Burner pressure		Gas rate
kW	Btu/h	kW	Btu/h	mbar	in wg	m^3/h
12.21	41 650	15.22	51 900	7.7	3.1	0.57
18.09	61 700	23.55	76 950	15.5	6.2	0.85
28.40	96 900	33.59	114 000	35.6	14.3	1.26

15.2 REGULATIONS TO COMPLY WITH

As section 2.2 with the following addition:-

BS 5482:1:1994 Domestic propane gas burning installations at permanent dwellings

15.3 GAS SUPPLY

The maximum propane requirement of the boiler is 1.26 m^3/h.
The gas storage vessel and supply pipes must be capable of delivering this quantity of gas in addition to the demand from any other appliances in the house. A 22 mm supply pipe will be necessary for the majority of installations, but reference should be made to BS 5482:1994 for detailed guidance on gas pipe sizing.
The regulator should ensure a dynamic pressure of 37 mbar at the inlet of the gas valve in the boiler.
The complete installation must be tested for gas soundness and purged as described in BS 5482.
All screwed gas fittings must be made using an approved propane sealant.

15.4 BOILER LOCATION

Boilers using propane must not be installed in basements or cellars.

15.5 REPLACEMENT OF PARTS

When replacing the main driver board set the gas jumper (JP1) to position 1 and 2, see wiring diagram section 10.2.
The burner injectors are size 75, (15 off), part no.18011102.

ICI Caldaie UK Ltd
Unit 23, Whaddon Business Park, Whaddon Salisbury, Wiltshire, SP5 3HF
Telephone (01722) 711077 Fax (01722) 711120

18000170 Ed. 2-07/01 3 - St. 200 - 12/01

CALDAIE UK LTD

USERS OPERATING MANUAL

RIO 140

Floor Standing Combination Boiler
providing
Central Heating and Mains Fed Domestic Hot Water

For use with Natural Gas (G20) - Natural Gas model only
or Propane (G31) - Propane model only

EC Certificated for Safety and Performance

CE

The boiler must be installed by a competent person in accordance with the Gas Safety (Installation and Use) Regulations.

Servicing and replacement of parts must only be carried out by competent persons such as British Gas or other CORGI registered personnel.

ABOUT YOUR BOILER

The Rio 140 is a combination boiler with an integral unvented hot water storage tank. It will supply domestic hot water at mains pressure and provide central heating.
As all the basic components required for the central heating system and for providing domestic hot water are fitted within the boiler, the need for external hot and cold water storage is eliminated. Therefore the system normally has no tanks in the loft or a hot water storage cylinder.
The boiler will suit central heating systems requiring upto 28.40 kW (96 900 Btu/h), your Installer will have adjusted the boiler output to suit the system.
The boiler is fully automatic once switched on, and will supply hot water whenever a hot tap is opened and central heating during the periods set on the timer.

METHOD OF OPERATION (see Fig. 1 for boiler controls)

The boiler operating mode is controlled by the 'Summer/Winter' switch on the control panel. When set to Summer, the boiler will only operate in the Domestic Hot Water mode. When set to Winter, it will operate in the Domestic Hot Water and Central Heating mode.
Note: The timer only controls the operating times of the central heating, not domestic hot water - this is available continuously.
Incorporated within the boiler case is an insulated unvented domestic hot storage cylinder containing 140 litres of domestic hot water maintained at the temperature set by the adjustable hot water temperature selector and (depending on incoming mains pressure) available at a maximum pressure of 3.5 bar.
Domestic hot water supply always takes priority over central heating. If a demand for hot water occurs during a central heating period and reduces the store temperature to below that set by the hot water temperature selector, the boiler automatically switches to the hot water mode until the stored water is reheated to the temperature set by the hot water temperature selector. This interruption in the central heating should not be noticed.

Central Heating Mode - If there is a call for heat the pump will start to circulate the central heating water and after a few seconds the burner will light. The burner output is automatically adjusted to match the system demand. As the temperature of the water in the boiler approaches that set by the adjustable temperature selector, the burner is turned off and the pump continues to run. As the heating system water cools, the temperature drop is detected by the control system and the burner is automatically restarted for the cycle to continue until either the timer or room thermostat stops calling for heat. The burner is then turned off (if it is operating at the time) and the pump runs on for about 2½ minutes.

Domestic Hot Water Mode - When a demand for hot water reduces the temperature of the stored hot water below that set by the adjustable hot water selector, the pump starts and the burner lights, increasing to its maximum output. Water in the boiler is then diverted from the central heating system to reheat the stored hot water to the temperature set by the adjustable hot water temperature selector. When the stored water reaches the selected temperature the burner is turned off and the pump stops. The boiler then returns to the central heating mode.
In both modes the fan starts before the burner lights and stops after the burner is turned off.

CENTRAL HEATING SYSTEM

The boiler operates on a sealed central heating system which will have been pressurised by your Installer. He will have set the red pointer on the pressure gauge (see Fig. 1), to indicate the system pressure (when cold). Do not adjust this pointer. The grey pointer indicates the actual system pressure (between 0.8 and 1.5 bar) which will increase slightly when the boiler is operating.
If the grey pointer falls below the red pointer (when the boiler is switched off and cold), you should contact your Service Engineer to re-pressurise the system. If the system requires re-pressurising more than once a year, ask your Service Engineer to check the heating system for leaks.
The boiler is fitted with an automatic air vent which removes air from the system as it leaves the boiler. Any air trapped in the radiators needs removing by venting the radiators using the vent screw at the top of the radiators. Only vent a radiator if the top is cool and the bottom is hot. Excessive venting will reduce the system pressure, so only vent when necessary and check the system pressure as mentioned above.
The temperature of the water leaving the boiler to the radiators can be increased by turning the heating temperature control knob (see Fig. 1) clockwise.
The boiler will provide central heating whenever the timer is in an 'ON' period and the room thermostat (if fitted) is calling for heat.
For summer time operation, when central heating is not required, set the 'Summer/Winter' switch (see Fig. 1) to Summer.

DOMESTIC HOT WATER SYSTEM

The boiler will supply domestic hot water whenever a hot tap is opened.
The flow of water from the taps (hot or cold) depends upon the mains water pressure, and in some homes it may not be possible to use a number of taps at the same time.
The temperature of water leaving a hot tap depends on a lot of variables, such as mains pressure, distance of the tap from the boiler and the flow rate of the water leaving the tap. It may take some time and experimenting with the hot water temperature control (see below) and how far you open a tap to achieve the results you require. Remember, if you open a hot tap fully it may not supply water at such a high temperature as when you only open it half way.
The temperature of the hot water leaving the boiler for the hot taps can be increased by turning the hot water temperature control knob (see Fig. 1) clockwise.

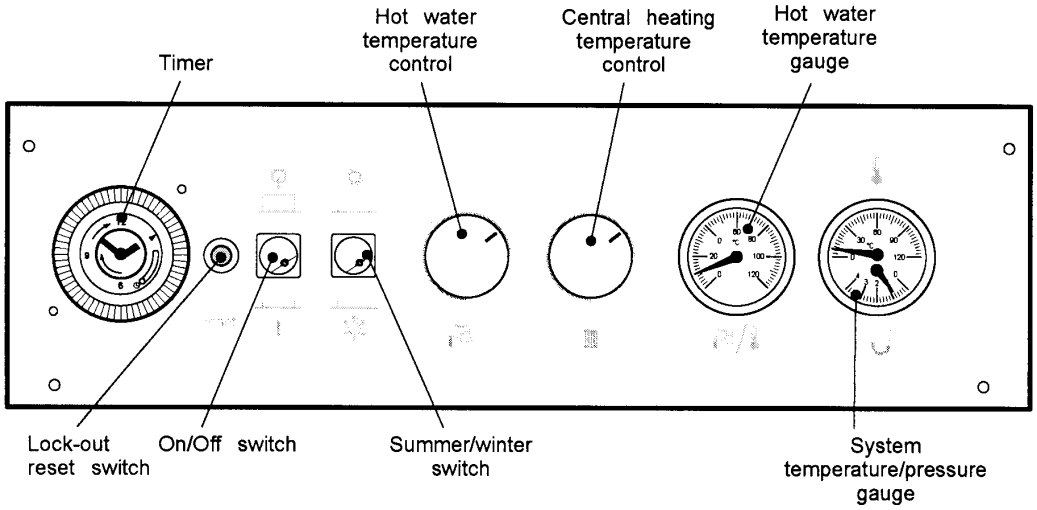


Fig. 1

LIGHTING YOUR BOILER (see Fig. 1)

1 Ensure that - the gas and water supplies are turned on, the electricity supply to the boiler is off, the On/Off switch is set to OFF (switch push button is out), the timer is correctly set (refer to the Timer section), the Summer/Winter switch is set to Winter (the switch push button should be in), the grey pointer on the pressure gauge is not below the red pointer, the room thermostat (if fitted) is set at the desired setting and the timer is correctly set (refer to the relevant Timer section).
2 Turn both the Hot Water and Heating temperature selectors fully clockwise to their maximum setting.
3 Switch on the electricity supply to the boiler.
4 Press in the On/Off switch (the green light on the switch indicates the switch is set to on).
5 The boiler is now ready to light automatically.
If the stored domestic hot water in the cylinder is cold, the boiler will heat this first.
If the timer is set to an 'on' period the boiler will light (see note below) and provide central heating.
If a hot water tap is opened the boiler will supply hot water.
6 Reset the controls to the desired settings.

TURNING OFF YOUR BOILER (see Fig. 1)

For short periods - Set the On/Off switch to off (the switch push button should be out, and the green light on the switch off).
To restart, simply press in the On/Off switch to on (the switch push button should be in, and the green light on the switch on).
For long periods: Set the On/Off switch to off (the switch push button should be out, and the green light on the switch off), and switch off the electricity supply to the boiler. If required, the gas, water and electricity supplies may be turned off at the mains.
To restart, refer to the full lighting instructions above.
Note: After switching the boiler off, it will be necessary to re-set the mechanical (24 hr) timer to the correct time. The digital electronic timer has a built-in battery to retain the time, date and programmes.

GENERAL NOTES AND CARE OF YOUR SYSTEM

1 **On/Off switch** - This switch (switch push button in for on, out for off) turns the boiler and the timer on and off. The green light on the switch indicates it is in the on position.

2 **'Summer/Winter' switch** - This switch (switch push button in for winter, out for summer) allows you to switch off the central heating in the summer. It does not effect the supply of hot water for the taps. The green light on the switch indicates it is in the winter position.
Winter - Heating and Hot Water
Summer- Hot Water Only

3 **Heating temperature control** - This control allows the temperature of the water leaving the boiler for the heating system to be adjusted. Turning it clockwise increases the temperature.

4 **Hot water temperature control** - This control allows the temperature of the water leaving the boiler for the hot taps to be adjusted. Turning it clockwise increases the temperature.

5 **Temperature/pressure gauge** - This indicates the central heating system water temperature and pressure. The grey pointer indicates the actual pressure, which will increase as the system warms up. The red pointer indicates the system pressure (boiler off and system cold) set by your installer.
Do not operate the boiler if the grey pointer falls below the red pointer. Contact your Service Engineer to have the system re-pressurised.

6 **Lockout reset button** - If there is a burner control malfunction, a built-in safety circuit switches the boiler off and the lockout reset button will light. Usually such malfunctions are short lived, and pressing the reset button (press in and release quickly) will restore normal operation.
If the boiler continually goes to 'lockout' a fault exists and you will need to call your Service Engineer.

7 **Safety valves** - The boiler is fitted with safety valves to release excess pressure from the central heating or hot water system if it overheats. If water or steam is discharged from the end of theses pipes, switch off the boiler and contact your Service Engineer. Your installer should have informed you where these pipes terminate.

8 Clearances and ventilation - Always ensure that the boiler has the following minimum clearances for safety and servicing:-
Top: 300 mm, Front: 600 mm, Sides: 5 mm
If the boiler is installed in a compartment, your Installer will have provided ventilation openings in the wall or door. Do not obstruct these openings, periodically check that they are clear.
Do not place any combustible material around or on the boiler or flue pipe.

9 **Flue terminal** - The flue terminal on the outside wall must not be obstructed or damaged.
In cold weather steam might appear from the terminal - this is quite normal for a high efficiency boiler.
In severe conditions check that the terminal does not become blocked by snow.

10 **Frost protection** - The boiler is fitted with built-in frost protection. This will automatically start the boiler if the water temperature falls below 5°C, providing the electrical supply to the boiler is on, the On/Off switch is set to on and the Summer/Winter switch is set to winter.

11 **Cleaning and servicing** - Lightly wipe over the case with a damp cloth and a little detergent. Do not use abrasive pads or cleaners.
You should have your boiler serviced at least once a year to ensure safe and efficient operation.
Contact your Service Engineer for further details.

12 **Failure of mains services** - If the electricity supply fails, the boiler will not operate. Once it is restored the boiler will resume its normal operation.
Note: The timer has a built-in battery to retain the time, date and programmes.
If the mains water supply is ever cut off, the boiler will not supply domestic hot water. It will however, still provide central heating.

13 **Gas leak** - If a gas leak is suspected, turn off the gas supply and contact your local Gas Region or Service Engineer.
Remember - do not operate electrical switches, smoke or light matches.

ELECTRICITY SUPPLY

The boiler requires a 230V ~ 50Hz supply. It must be protected by a 3A fuse.
Warning: This appliance must be earthed.

TIMER

The timer (mechanical or electronic) fitted to your boiler allows you to control the times of your central heating periods only. Domestic hot water will always be available, provided the boiler is switched on.
The mechanical timer has a 24 hr. clock setting together with a 12 hr. clock hands display.
The digital electronic display (24 hr. clock) provides a permanent display of the time of day and day of the week. If the boiler is switched off or its power supply interrupted, a built in battery will operate the display and protect the programme of operating times etc.
When setting the times for the heating periods it is useful to remember that it might take up to an hour for the house to become warm, especially in colder weather. Also the effect of the central heating will remain for a time when the central heating is turned off.

MECHANICAL TIMER - Description and setting (see Fig. 2)

The 24 hr. timer dial has a number of tappets around its edge, each corresponding to 15 minutes. When tappets (or groups) are set towards the outside of the dial, the timer will be in an 'on' position during that period and the boiler will provide central heating.
A typical timer setting for a working family could be as follows:-
The groups of tappets between 6.00 and 8.00, and 16.00 and 22.00 set outwards as shown in Fig. 2. This would provide two 'on' periods for central heating from 6 am to 8 am, then again from 4 pm to 10 pm.
To set the timer to the correct time of day, turn the dial (outer tappet ring) clockwise until the time of day is against the time indicator arrow head. Fig. 2 shows the timer at midnight (24.00). The timer also has a conventional 12 hr clock hands display in the centre (do not move the pointer, as it will damage the clock).
IMPORTANT: Do not turn the dial anticlockwise.
The timer has a manual override switch which allows you to override the tappet settings on the timer as follows:-

1 Set the switch to I and the timer is permanently on, this provides a continuous central heating 'on' period, ignoring any tappet positions. This setting is useful if you come home late in the evening and the central heating is 'off'. Do not forget to reset the switch to the ◷ (central) position when going to bed or the house has warmed up.
2 Set the switch to 0 and the timer is permanently 'off' - no central heating.
3 Set the switch to ◷ (central) position and your central heating will operate during your pre-set periods.

The manual override switch, shown in Fig. 2, is in the ◷ position.

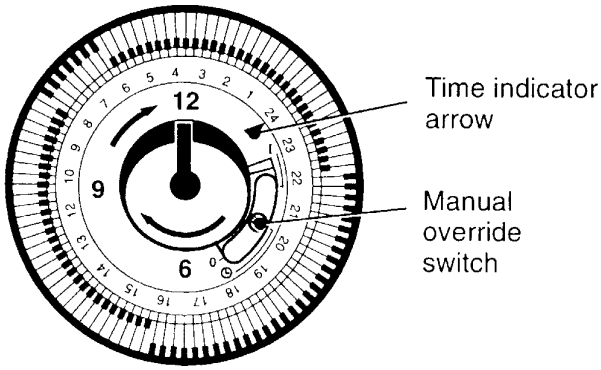


Fig. 2

ELECTRONIC TIMER – Description of controls (see Figs. 3 and 4)

Switch operation

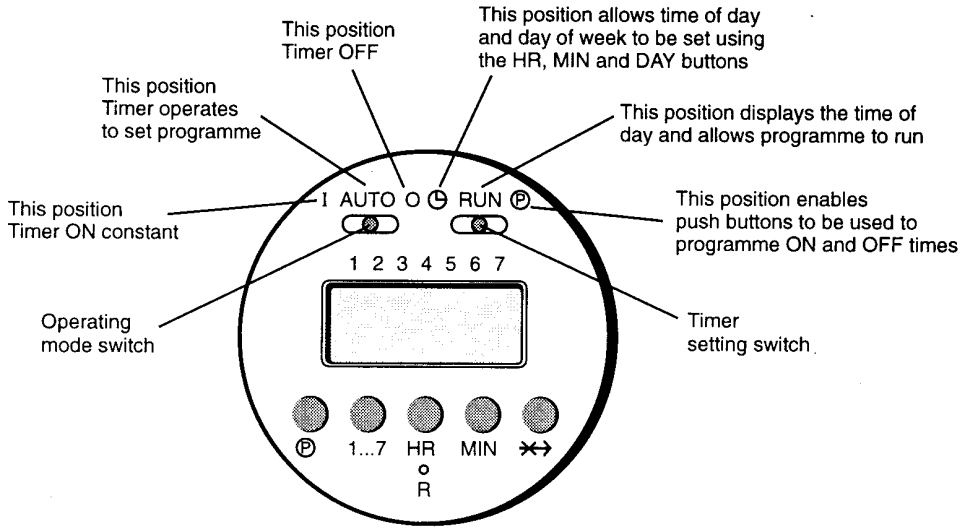


Fig. 3

Button operation

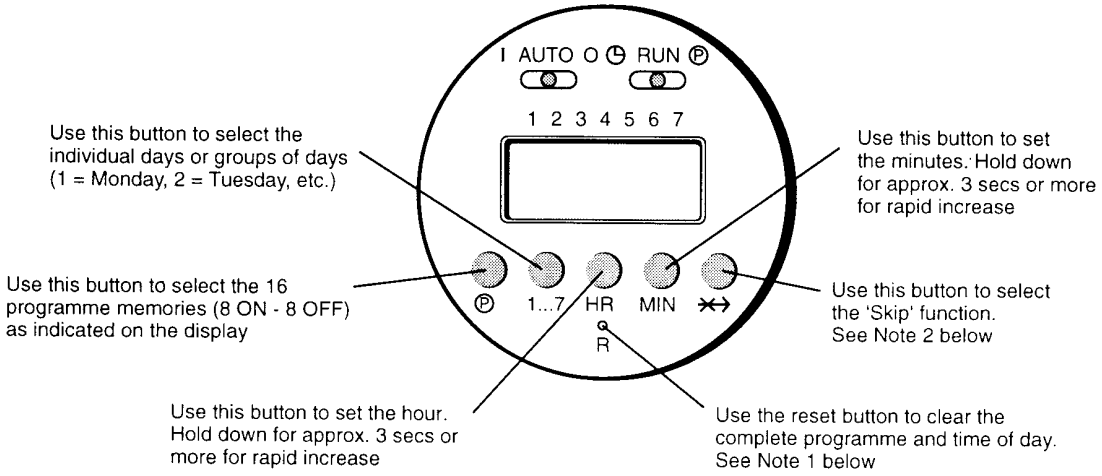


Fig. 4

Note 1: After pressing the reset button: The display will reset to 0.00 and 7 (Sunday) will be selected. The display will flash until the timer setting switch is set to RUN to set the timer.

Note 2: Pressing turns the timer OFF (↔ appears in the display) for 24 hours from midnight that day to the following midnight, when it will revert back to the normal programme and the ↔ disappears.
If required, a second 24 hr skip period can be selected during the skip day by pressing the ↔ button again.

PROGRAMMING THE ELECTRONIC TIMER

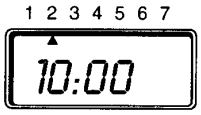
1 Press R (reset) to clear any previous inputs.

2 Set the timer setting switch to RUN Ⓟ

3 Set the timer using HR and MIN

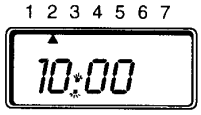
4 Set the actual day using 1...7

An arrow will be displayed under the actual day.



Set the timer setting switch to RUN Ⓟ

The actual time of day will be displayed (flashing colon).

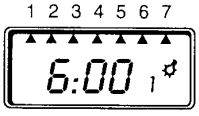


5 Set the time setting switch to RUN Ⓟ

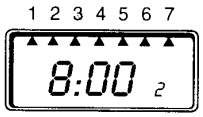
6 Select the required day (or group of days) for the first ON setting by pressing 1...7

7 Select ON/OFF time selection (8 ON and 8 OFF are available) by pressing Ⓟ

(Number and symbol in the display indicates the selection) ON -



and OFF -



8 Select the first required ON time by pressing HR and MIN and then press Ⓟ

9 Repeat steps 6, 7 and 8 to set the first required OFF time. Adopt the same procedure for all other required ON/OFF times.

10 When all the switching selections are completed, set the timer setting switch to RUN Ⓟ

11 Ensure that the operating mode switch is set to AUTO I AUTO O

The timer is now set to run automatically on the times programmed.

12 To use the 'skip' function press ⋈

Pressing ⋈ turns the timer OFF (⋈ appears in the display) for 24 hours from midnight that day.

If the timer is 'OFF' (with ⋈ in the display), to override the skip function set the operating mode switch to I (constant) I AUTO O

TERMS OF GUARANTEE

1 The Company shall mean ICI CALDAIE UK LTD.
2 The boiler is guaranteed for a period of 12 months from the date of installation providing that any work undertaken is authorised by the Company and carried out by an approved service agent.
3 The boiler is to be checked on installation by a CORGI registered installer.
4 The heating circuit is to be treated and maintained against corrosion in accordance with BS 7593:1972 and is at all times to be inhibited with an approved anti corrosion solution.
5 The Guarantee does not cover breakdowns caused by incorrect installation, neglect, misuse, accident or failure to operate the boiler in accordance with the manufacturers instructions.
6 The Company will endeavour to provide prompt service in the unlikely event of a problem occurring, but cannot be held responsible for any consequence of delay however caused.
7 We strongly recommend that you complete and return the Guarantee Registration Card, but failure to do so does not affect your statutory rights.

DO NOT NEGLECT YOUR GAS COMBINATION BOILER
THE COMPANY RECOMMENDS YOU TAKE OUT AN ANNUAL SERVICE CONTRACT WITH AN APPROVED CORGI REGISTERED INSTALLER.

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