WESSEX 200

HOT WATER BOILERS FOR HEATING AND
DOMESTIC HOT WATER

MARK 3 PROVISIONAL.

INSTALLATION AND COMMISSIONING
INSTRUCTIONS
FOR USE WITH NATURAL GAS ONLY

CONTENTS

FIGURES

1.0 INTRODUCTION

This appliance is for use with natural gas only. The "Wessex" is a gas fired, fan assisted, open flued central heating/hot water boiler which has an output rating of 200 kW (682.000 Btu/h).

The technical data for the boiler is given in Section 2. The burner fitted to the boiler is of the fan assisted pre-mix type complete with gas ignitor and sequence programmer.

The boiler is arranged for direct connection to the flue system. The flue outlets from more than one boiler may be connected to a single chimney, providing the relevant requirements of the current Building Regulations are adhered to. No draught diverter is fitted to the boiler nor is a fixed diverter required in the flue system. However, a draught stabiliser is recommended for some installations (see Section 6.1). The Wessex is floor mounting and is intended for the heating of commercial and industrial premises. It may also be used to supply hot water for those premises via an indirect cylinder.

The boiler has a low thermal capacity and water flow rates should be maintained above the minimum levels shown in Fig. 2.

2.0 TECHNICAL DATA

2.1 Overall Dimensions

Shown in Fig. 9

2.2 Heat Input/Output

Unit	Heat Input	Heat Output
Wessex 200	238 kW (812.000 Btu/h)	200 kW (682.000 Btu/h)

2.3 Data Labels

Copies of the data labels applicable to the boiler are shown in Fig. 8

2.4 Gas Supply

The nominal natural gas pressure at the boiler inlet manifold should be 20 mbar (8 in w.g.).

3.0 GENERAL REQUIREMENTS

3.1 Related Documents

Gas Safety Regulations 1972.
It is Law that all gas appliances are installed by competent persons in accordance with the above regulations.Failure to install appliances correctly could lead to prosecution.It is in your own interest,and that of safety to ensure that this law is complied with.(This paragraph is brought to your notice at the request of British Gas).

The installation of the boiler must be in accordance with the relevant requirements of the Gas Safety Regulations, building regulations, I.E.E. Regulations and the byelaws of the local water undertaking.

It should also be in accordance with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents:

British Standard Codes of Practice

CP 331: Installation of pipes and meters for town gas.
Part 3: Low pressure installation pipes.

CP 332: Selection and installation of town gas space heating.
Part 3: Boilers of more than 150.000 Btu/h (44 kW) and up to 2.000.000 Btu/h (586 kW) output.

CP 341, 300 - 307: Central heating by low pressure hot water.

CP 342: Centralised hot water supply.
Part 1: Individual dwellings.
Part 2: Buildings other than individual dwellings.

British Gas Publications

Flues for Commercial and Industrial gas fired boilers and air heaters, and

"Combustion and ventilation air - guidance notes for boiler installations in excess of 2.000.000 Btu/h (586 kW) output".

4.0 LOCATION

The location chosen for the boiler must permit the provision of a satisfactory flue system and an adequate air supply. The location must also provide adequate space for servicing and air circulation around each unit.

The boiler must be installed on a level non-combustible surface that is capable of adequately supporting its weight (when filled with water) and any ancillary equipment.

Any combustible material adjacent to the boiler and the flue system must be so placed or shielded as to ensure that its temperature does not exceed 65°C (150°F).

Further details regarding boiler location are given in CP 332:3.

5.0 GAS SUPPLY

5.1 Service Pipes

The local gas region must be consulted at the installation planning stage in order to establish the availability of an adequate supply of gas.

An existing service pipe must not be used without prior consultation with the local gas region.

5.2 Meters

A new gas meter will be connected to the service pipe by the local gas region, or a local gas region contractor.

An existing meter should be checked, preferably by the gas region, to ensure that it is adequate to deal with the rate of gas supply required.

5.3 Gas Supply Pipes

Supply pipes must be fitted in accordance with CP 331:3. Pipework from the meter to the boiler must be of adequate size. Do not use pipes of a smaller size than the boiler gas connection. The complete installation must be tested for soundness as described in the above Code.

5.4 Boosted Supplies

Where it is necessary to employ a gas pressure booster, the controls must include a low pressure cut-off switch at the booster inlet. The local gas region must be consulted before a gas pressure booster is fitted.

6.0 FLUE SYSTEM

Detailed recommendations for flue systems are given in the British Gas Publication "Flues for Commercial and Industrial gas fired boilers and air heaters." Reference should also be made to CP 332:3, where applicable.

The following notes are intended to give general guidance only.

6.1 Suction

Each single boiler/battery is arranged for direct connection to the flue system. The flue outlets from more than one battery may be connected to a single chimney. No draught diverter is fitted to the single boiler/battery nor is a fixed diverter required in the flue system. However, a draught stabiliser is recommended for some installations.

The flue system should be designed to maintain atmospheric pressure or a slight suction at the single boiler/battery flue connection at all times. Where the suction is likely to exceed 0.1 m.bar (0.04 in. w.g.) at any time, a draught stabiliser is recommended to be fitted to the flue system.

It is recommended that a draught stabiliser is fitted to the flue system where the suction is likely to exceed 0.1 mbar (0.04 in w.g.) or the height of the flue exceeds 4 m (13ft). No fixed draught diverter is fitted to the boiler nor is it recommended that any is fitted to the flue system.

6.2 Design Waste Gas Volume and Temperature

It is recommended that the volume and temperature of the waste gases used for design of the flue system are as shown below:

Boiler	Exhaust Volume at N.T.P.		Exhaust Temp.	
	m^3/h	ft^3/hr	°C	°F
Wessex 200	340	12000	130	266

6.3 Flue Condensation

With the high thermal efficiency of the boiler, the flue gas temperature is low (approx. 130°C). Condensation in the flue is thus more likely than with lower efficiency units. It is strongly recommended that twin-wall or insulated flue pipe is used on all installations. Care should be taken to ensure that the flue is installed such that any condensation is continuously drained. All flues should have a minimum slope of 2½° upwards in the direction of exhaust gas flow (no horizontal sections). All joints should be such that any condensation is directed back down the slope. The drain fitted to the boiler casing will adequately cope with condensation from 6 m (20ft) of twin-wall flue, any longer lengths of flue should have separate open drain connections. The drain pipe must be 12.7 mm ($\frac{1}{2}$ in) dia. minimum, of non-corrodible material and preferably led to a gulley.

6.4 Materials

Materials used for the flue system must be mechanically robust, resistant to internal and external corrosion, non-combustible and durable under the conditions to which they are likely to be subjected.

6.5 Disconnection

Facilities should be made for disconnecting the flue pipe from the boiler for inspection and servicing purposes. Bends with removable covers should be fitted for inspection and cleaning purposes where considered appropriate.

6.6 Flue Discharge

The flue system must ensure safe and efficient operation of the boiler to which it is attached, protect the combustion process from wind effects and disperse the products of combustion to the external air.

The flue must terminate in a freely exposed position and must be so situated as to prevent the products of combustion entering any opening in a building in such concentration as to be prejudicial to health or a nuisance.

Consideration should be given to the fitting of a flue discharge terminal.

7.0 AIR SUPPLY

Installations up to 3 Boilers — 600 kW Output

Detailed recommendations for air supply are given in CP 332:3.

Installations in Excess of 3 Boilers — 600 kW Output

Detailed recommendations for air supply are given in the British Gas Publication "Guidance Notes for Boiler Installations in Excess of 2.000.000 Btu/h (586 kW) Output".

The following notes are intended to give general guidance. In all cases there must be provision for an adequate supply of air for both combustion and general ventilation.

7.1 Air Supply by Natural Ventilation

The purpose provided space, housing the boiler must have, or be provided with, permanent air vents communicating directly with the outside air, at high level and at low level. Where communication with the outside air is only possible by means of high level air vents, ducting down to floor level for the lower vents should be used. For an exposed boiler house, air vents should be fitted preferably on all four sides, but at least on two sides. Air vents should have negligible resistance and must not be sited in any position where they are likely to be easily blocked or flooded or in any position adjacent to an extraction system which is carrying flammable vapour. Grilles or louvres must be so designed that high velocity air streams do not occur within the space housing the boiler.

The air supply requirements stated below are equivalent to those specified in CP 332.3 and the British Gas Guidance Notes as mentioned above.

NUMBER OF BOILERS INSTALLED	POSITION OF AIR VENT(S)	AIR VENT AREAS (Air direct from outside)
Up to 3	High Level	1071 cm^2 (162 in^2) per boiler
	Low Level	2142 cm^2 (324 in^2) per boiler
4 or 5	High Level	3300 cm^2 (500 in^2) in Total
	Low Level	6600 cm^2 (1000 in^2) in Total
6 and above	High Level	595 cm^2 (90 in^2) per boiler
	Low Level	1190 cm^2 (180 in^2) per boiler

7.2 Air Supply by Mechanical Ventilation

The supply of air to a space housing the boiler by mechanical means should be by mechanical inlet with natural or mechanical extraction. Mechanical extract ventilation with natural inlet must not be used. Where a mechanical inlet and a mechanical extract system is applied, the design extraction rate should not exceed one third of the design inlet rate.

The requirements for air supply by mechanical ventilation are given in CP 332:3 and the British Gas Guidance Notes mentioned above.

NOTE: For mechanical ventilation systems an automatic control should be provided to cut off the gas supply to the boiler, in the event of failure of air flow in either inlet or extract fans.

8.0 WATER CIRCULATION SYSTEM

8.1 General

The boiler has a low water content and the requirements of minimum water flow are given in Section 8 8 and Fig. 2. Recommendations for the water circulation system are given in CP 332:3 and CP 342.

The following notes are of particular importance.

In a combined central heating and hot water system, the hot water storage vessel must be of the indirect cylinder or calorifier type. The hot water storage vessel should be insulated, preferably, with not less than 75 mm. (3 in) thick mineral fibre, or its thermal equivalent.

Circulating pipework not forming part of the useful heating surface should be insulated to help prevent heat loss and possible freezing, particularly where pipes are run through roof spaces and ventilated cavities. Cisterns situated in areas which may be exposed to freezing conditions, should also be insulated.

Insulation exposed to the weather should be rendered waterproof.

Draining taps must be located in accessible positions which permit the draining of the whole system, including the boiler and hot water storage vessel.

8.2 Pressure Relief Valve

A pressure relief valve should be fitted to the water system between the boiler and the first isolating valve in the water system. The size of this relief valve, per boiler, should be 20 mm (¾ in) having a free area of 284 mm² (0.44 in²).

For further details see CP 332:3.

8.3 Open Vent Pipe and Cold Feed Pipe

Every boiler or group of boilers should have an open vent pipe and cold feed pipe installed between the boiler and the first water isolating valve. The sizes of these pipes per boiler is:

Open vent - 38 mm (1½ in)
Cold feed - 32 mm (1¼ in)

8.4 Altitude Gauge (Water Pressure Gauge)

Every boiler or group of boilers should be provided with a gauge complete with isolating cock.

8.5 Thermometer

A thermometer complete with pocket should be fitted in the pipework to indicate water flow temperature.

8.6 Drain Taps

Each boiler must have a ½ in n.b. drain tap fitted to drain the boiler only. The heating system in total should have drain taps as recommended by CP 332:3.

8.7 Circulating Pump

One or more circulating pumps will be required to circulate the boilers and heating system. Fig. 3 shows the hydraulic resistance of the boiler. The pump should be sited to facilitate servicing.

It is important to note that when Wessex boilers are used to replace boilers on an existing system, the pumps should be checked for performance against the new boiler waterside pressure drop to ensure that the minimum flow rate can be obtained. It is also important that the existing system be flushed through to remove any loose matter which may have accumulated. If in any doubt regarding the cleanliness of the system, a coarse filter should be fitted in the return pipework to the boilers.

8.8 Minimum Water Flow Rates

The minimum water flow rates are shown in Fig. 2. These flow rates should be maintained through each boiler at all times when the burner is firing. If the water flow rate is allowed to fall below the minimum then the waterways of the boiler might be subject to premature failure due to scale formation. Particular attention should be paid to the restriction of external flow circuits during periods of low heat demand.

8.9 Waterside Pressure Drop

The water side pressure drop is shown in Fig. 3.

NOTE: If boilers are run off time clock control, a pump overrun (not H.E.L. supply) should be fitted which must run for a minimum of 1 minute on shut-down of the boiler.

8.10 Control Schemes

8.10.1 Temperature Controls

An adjustable control thermostat is supplied fitted to each module, being set to operate within the range 50-90° C as standard. However, the thermostat scale is graduated from 50-110° C and therefore if a higher water temperature is required (and providing sufficient head on the water system is available) the thermostat may be adjusted to operate anywhere within the range 50-110° C.
For thermostat adjustment procedure see Section 11.70.

An adjustable overheat cut off device (hand reset limit thermostat) is also fitted to the module and can be set at either 95 or 110° C depending upon the water temperature requirement. (screw driver slot adjustment) The thermostat will be delivered fitted to the module set in the 95° C position.

8.10.2 Water Flow Controls

Any external mixing valves or similar controls should always ensure that the minimum water flow rate shown in Fig. 2 is maintained. It is recommended that a water flow switch is fitted to the system. The switch should be connected such that the boiler cannot fire unless the water flow is proved.

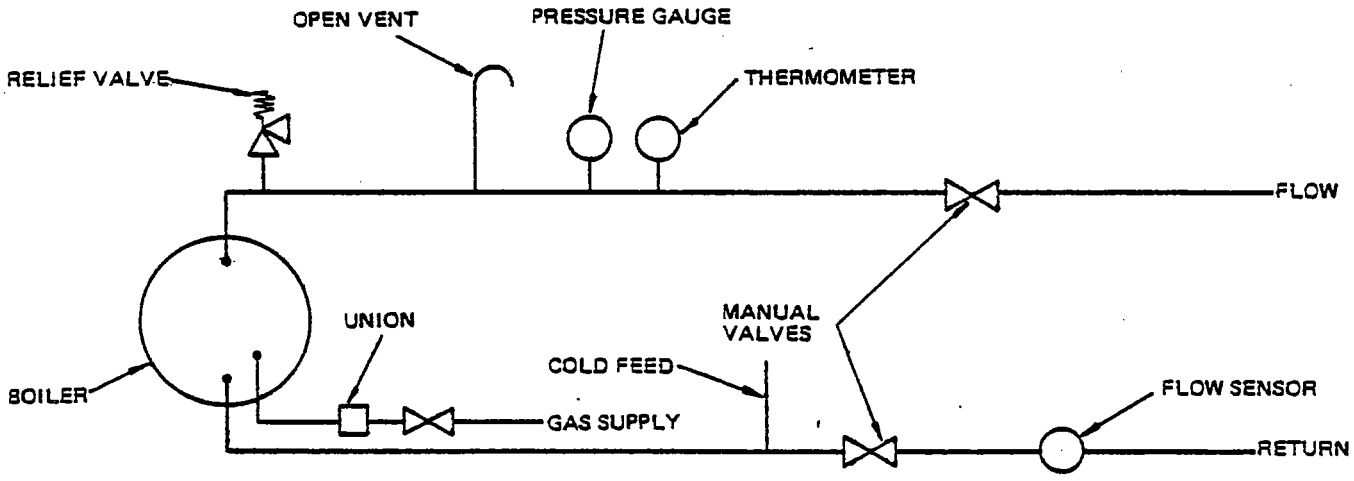
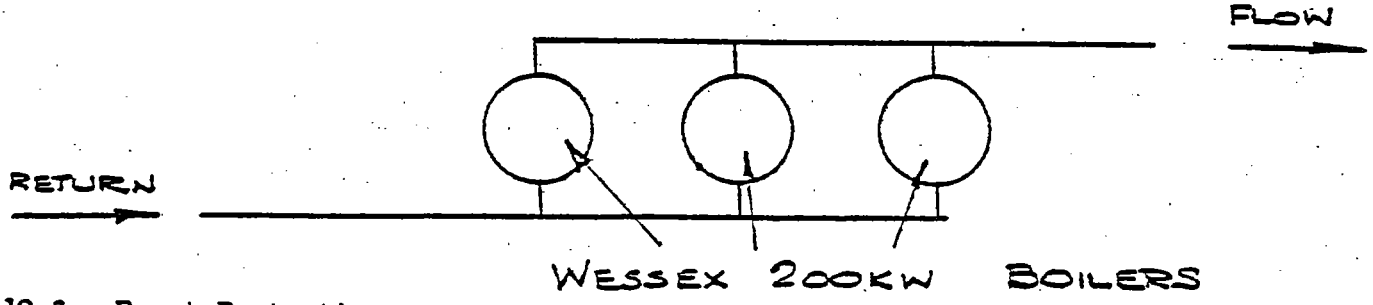


Fig. 1. Schematic Arrangement of Water and Gas Pipework

When multiple boilers are installed it is recommended that the water pipework is connected using the reverse flow principle to ensure equal flows through all boilers.



8.10.3 Frost Protection

Consideration should be given to fitting a frost thermostat set at approximately 4° C (39° F).

9.0 ELECTRICAL SUPPLY

WARNING: THIS APPLIANCE MUST BE EARTHED.

Wiring external to the boiler must be installed in accordance with the I.E.E. Regulations and any local regulations which apply. Wiring must be completed in heat resistant 3 core cable. (Size 1.0 square mm. C.S.A.). Boilers are normally supplied for 230/250 volts. 50 Hz. internal fuse rating of each module is 2 amp. External fuses should be 5 amp. for all single boiler/battery sizes.

The method of connection to the mains electricity supply must facilitate complete electrical isolation of the single boiler/battery with a contact separation of at least 3mm in all poles. The mains isolator should be provided adjacent to the boiler in a readily accessible position. The supply should only serve the boiler. Further details regarding connection to the electricity supply are given in CP 323:3.

9.1 Mains Cable Connection

The path of the mains cable is shown in Fig. 3 - use heat resistant 3 core cable size 1.0 square mm. C.S.A.

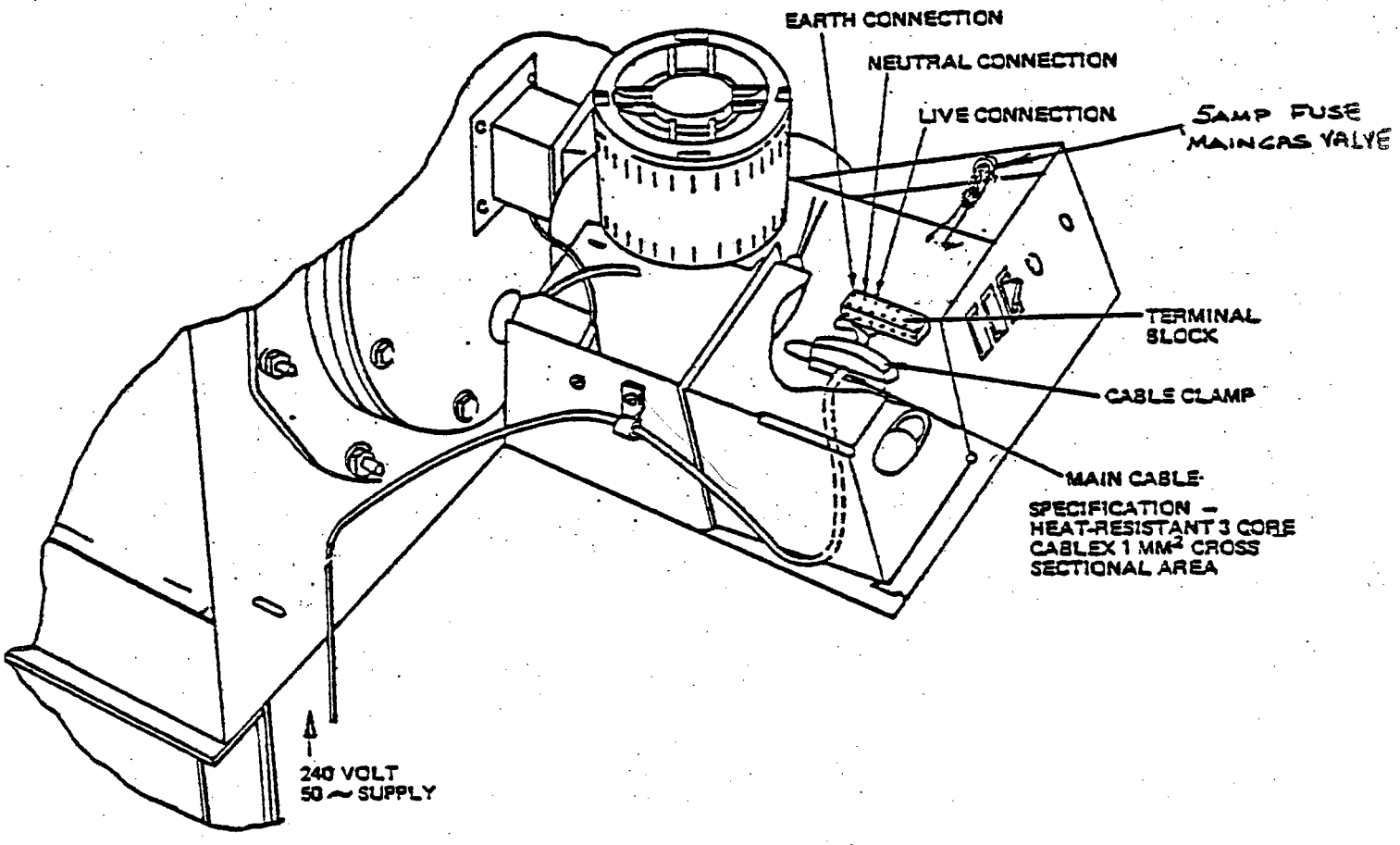


Fig. 3. Path of Mains Cable

9.2 Boiler Wiring Diagram

The boiler wiring diagram is shown in Fig. 4 This wiring diagram is also fitted inside each boiler cover.

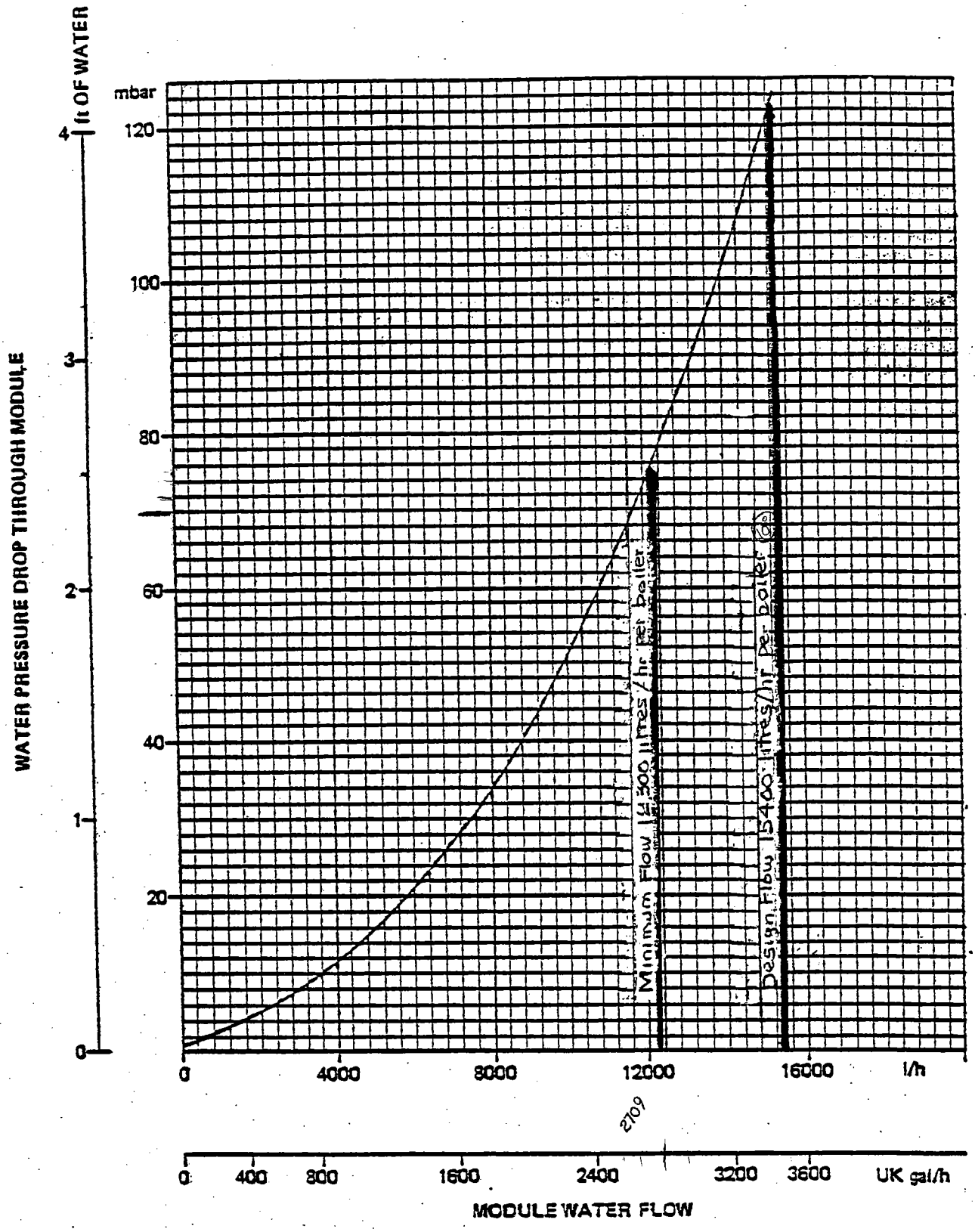


Fig. 2 Water Pressure Drop and Minimum Flow Rate

10.0 INSTALLATION OF BOILERS

10.1 General

Each boiler is normally despatched to site as a pre-assembled unit for floor mounting. The boilers should be stored in a weatherproof place before installation.

The boilers should be positioned to allow minimum clearances of 150 mm (6 in) to the rear, 400 mm (16 in) to each side, and 800 mm (32 in) to the front from adjacent walls or equipment to facilitate occasional inspection. Other installation dimensions are given in Fig. 9

10.2 Connection of Boilers to the Flue System

Notes on the recommendation for design of the flue system are given in Section 6.

No fixed draught diverter is fitted to the boiler nor is one required to be fitted to the system.

A flue socket is provided suitable for accepting standard twin-wall flue pipe. Sealing of the flue to the socket should be made using a suitable caulking string and cold caulking compound.

Suitable means should be incorporated in the flue system adjacent to the boiler for removal of the boiler casing without dismantling the whole flue system.

10.3 Gas Connections

For design see Section 5.

Size and position of gas connections are shown in Fig. 9

A filter mesh is fitted inside each main gas solenoid valve.

11.0 COMMISSIONING AND TESTING

11.1 Electrical Installation

For design see Section 9.

Checks to ensure electrical safety should be carried out by a competent person.

11.2 Gas Installation

For design see Section 5.

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

11.3 Water Circulation System

For design see Section 8.

NOTE: If a boiler is to be fitted onto an old or existing pipework system it is adviseable to chemically clean and thoroughly flush the system through prior to installation.

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

With the pump fitted, the system should be filled and air locks cleared. Vent the radiators and check for water soundness. Light the boiler as detailed in 11.4.

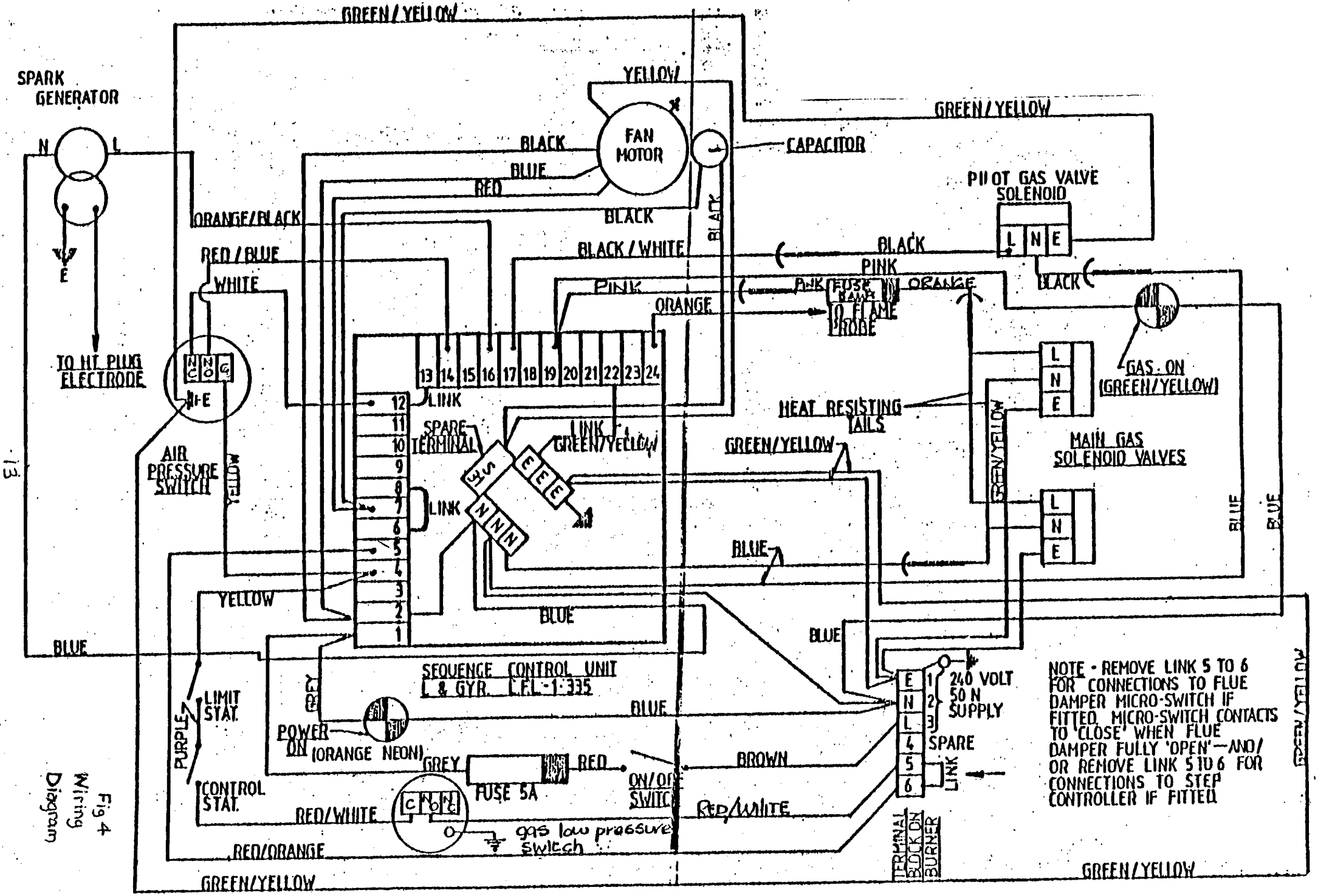


Fig 4 Wiring Diagram

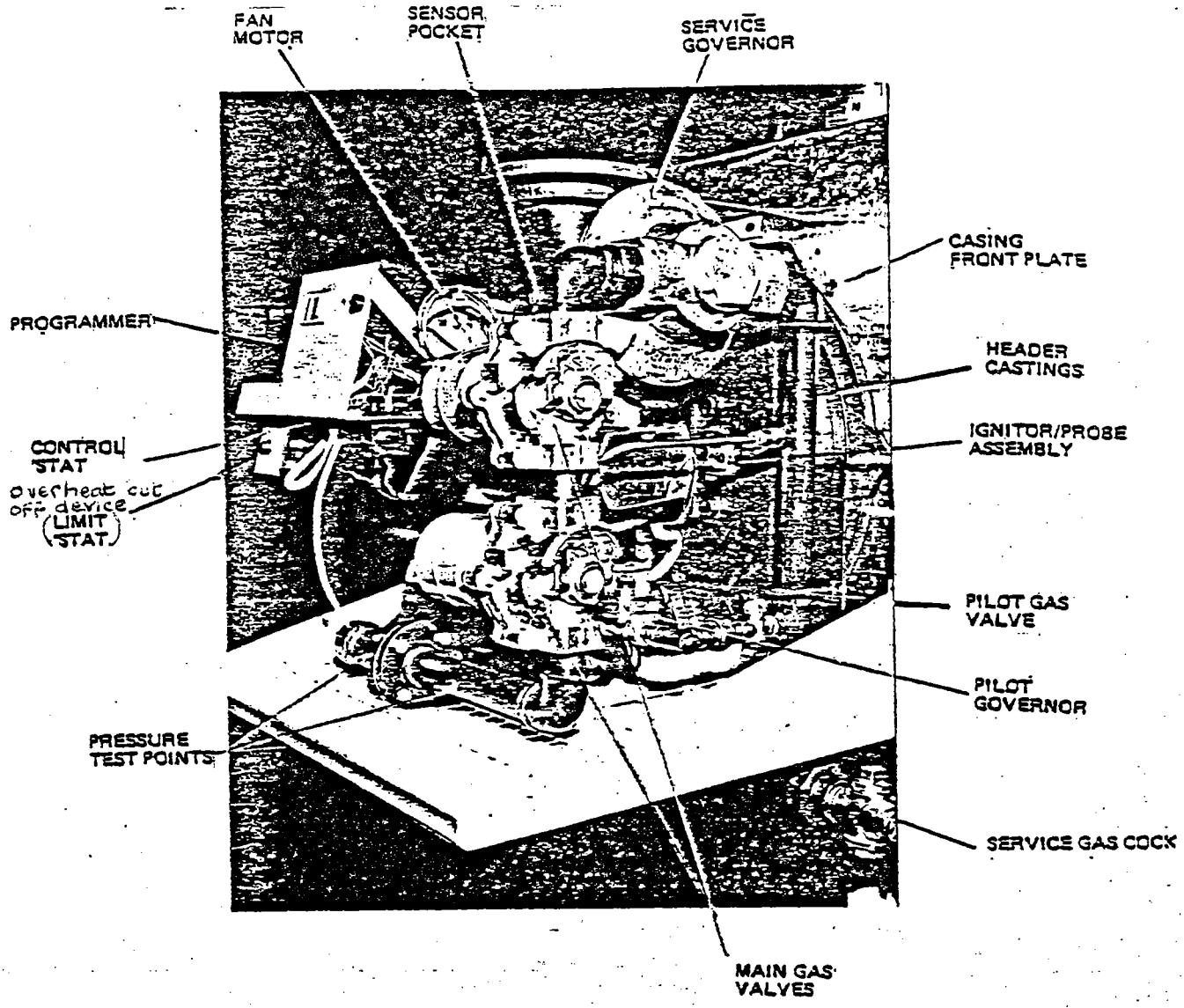


Fig. 6. Illustration of a Module

11.4 Lighting the Boiler (Initial Commissioning)

WARNING:-

Before attempting to light the boiler ensure that any personnel involved are aware of what action is about to be taken and begin by making the following checks:-

a) Flueway passages to chimney are clear.

b) Adequate ventilation exists in the boilerhouse, reference Section 7.10.

c) The system is fully charged with water, ready to receive heat, all necessary valves are open and the pump is running and circulating the water.

d) The pipework and valve arrangement is installed to Hamworthy recommendation in such a way that adequate water flow rates will be present in accordance with Fig. 2.

e) The gas supply pipework is clear of any loose matter, tested for soundness and purged to CP:331/3.

Turn off the electrical supply to the boiler at the mains external isolator.

Remove and retain the "Main Gas Valves" 5 amp fuse (situated on controls bracket, Reference Fig. 3.).

Ensure main gas supply is turned off at the boiler service cock (Reference Fig. 5.).

11.4 Lighting the Boiler (Initial Commissioning) - Continued...

Set the control thermostat to the minimum setting (50° C) and switch on electrical supply to boiler at external isolator, ensuring that all external controls are calling for heat (e.g. time clocks etc.).

Turn boiler switch to "ON".

The boiler will then follow the automatic sequence detailed in Section 11.5 but will stop at Step  on the programmer, illuminating the orange "lockout" neon on the programmer viewing glass. This "lockout" signifies a pilot flame failure.

Open the main gas supply at the boiler service cock, and check to ensure pilot gas cock is open.

Clear the "lockout" condition by depressing the viewing glass on the front of the programmer. The boiler will then repeat the automatic sequence as in (5), but this time the pilot flame will ignite, prove, and the boiler will "lockout" at Step  on the programmer. This lockout signifies a main flame failure at 67½ seconds from start due to the absence of gas.

Replace the "Main Gas Valves" 5 amp isolating fuse and clear lockout by depressing viewing glass on programmer.

The boiler will then follow automatic sequence detailed in 11.5, fire and assume normal run position 1/. . on the programmer after 97½ seconds from start.

11.5 NORMAL OPERATING SEQUENCE

Controller Symbols at Indicator	Event(s) in Programme	Approx. Time (secs) into Start Cycle
	Orange "power on" lamp on. air pressure switch check for no air pressure.	0
	Fan starts - commence of pre-purge.	2½
P	Air flow proven by pressure switch.	10
	Pre-purge complete. ignition spark energises.	45
	Pilot gas valve energises.	47½
	Spark de-energises and pilot flame proves on probe.	52½
	Main gas valves energise and green "gas on" lamp on.	62½
	Pilot gas valve de-energises and main flame proves on probe.	67½
	Idle steps of programmer - main flame continues to be proven.	+
	Normal running position - start cycle completed.	97½
	Water up to temperature - control stat opens. main gas valves de-energise and green "gas on" lamp off.	-
	Fan runs on for 15 seconds post purge.	
	Fan stops. orange "power on" lamp remains on - boiler at standby.	-

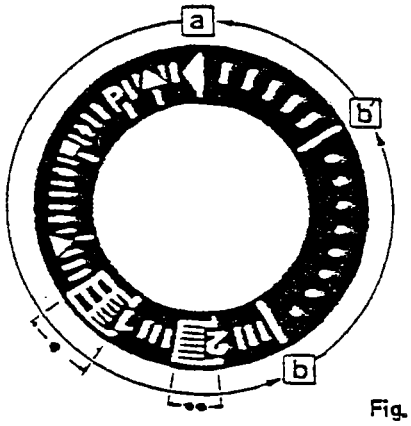


Fig. 6 Controller Symbols

a - b	Start-up sequence.
b - b	Idle steps of the sequence switch up to the self shut-down after burner start-up (b' = running position of the sequence switch).
b - a	Post-purge sequence after controlled shut-down. In start position 'a' the sequence switch switches itself off automatically or initiates immediately another burner start-up (e.g. after a fault has been corrected).
•	Duration of safety time (pilot flame).
••	Duration of safety time (main flame).

Notes:

If lockout occurs at any other point between start and pre-ignition, which is not marked by a symbol, there is normally a premature, i.e. faulty flame signal.

When lockout occurs, the control can be reset immediately. After the resetting (and also after the correction of a fault which resulted in a controlled shut-down, or after each mains failure) the sequence switch always runs through to its start position, whereby only terminals 7, 9, 10 and 11 receive voltage in accordance with the control programme. It is only then that the control unit programmes a fresh burner start-up.

CONTROL PROGRAMME UNDER FAULT CONDITIONS AND LOCKOUT INDICATION

In the event of fault conditions the fuel supply is always interrupted immediately and, simultaneously, the sequence switch stops and thus the lockout indicator. The symbol appearing above the reading mark indicates the kind of fault:

⊣	No start because a contact has not been closed between terminals 12 and 4, (pressure switch "no air" signal) or between terminals 4 and 5 (control thermostat limit thermostat, gas pressure switch and external flue damper switch if fitted.
▲	Not applicable to any fault condition for 'Wessex' Boilers.
P	Lockout because the air differential pressure signal has not been received at the start of the air pressure check. Any air differential pressure failure after this point in time also causes the control to go to lockout.
■	Lockout due to fault in the flame supervision circuit.
▼	Not applicable to any fault condition for 'Wessex' Boilers.
1	Lockout because no flame signal has been received on completion of the 1st safety time. (pilot flame). Any flame signal failure after completion of the first safety time also causes the control to go to lockout.
2	Lockout because no flame signal has been received on completion of the 2nd safety time. (main flame).
⏐	Lockout because the flame signal has been lost during burner operation or air pressure failure has occurred.

11.7 Gas Pressure Adjustment

The boiler pilot and appliance governors are works set to give the correct gas pressure drop across each individual orifice, reference tapping points B/C and E/F, Fig. 7. They can, however, be adjusted to give optimum boiler performance for various site conditions. The minimum gas mains pressure at the inlet to the boiler (firing at rate) is 17.5 mbar (7" wg) and a check facility is available in the boiler gas service cock reference tapping point G.

The gas pressure drop across the pilot orifice (tappings E/F) is 5 mbar (2" wg) and can be checked and, if necessary, adjusted on the pilot governor during the boiler ignition period. During commissioning of the pilot, it is advisable to isolate the main gas valves by removing the "5 Amp Main Gas Valve Fuse", as detailed in commissioning instructions section 11.4.

The gas pressure drop across the "Main Flame" gas orifice (tappings B and C) is 6 mbar (2.4" wg) and can be checked and, if necessary, adjusted on the service governor after the main valves have opened and the boiler has assumed normal run.

On completion of checking/adjusting gas pressure drops, replace all pressure test point sealing caps.

NOTE: It is advisable to make a combustion check following initial commissioning as described in Clause 11.7.1.

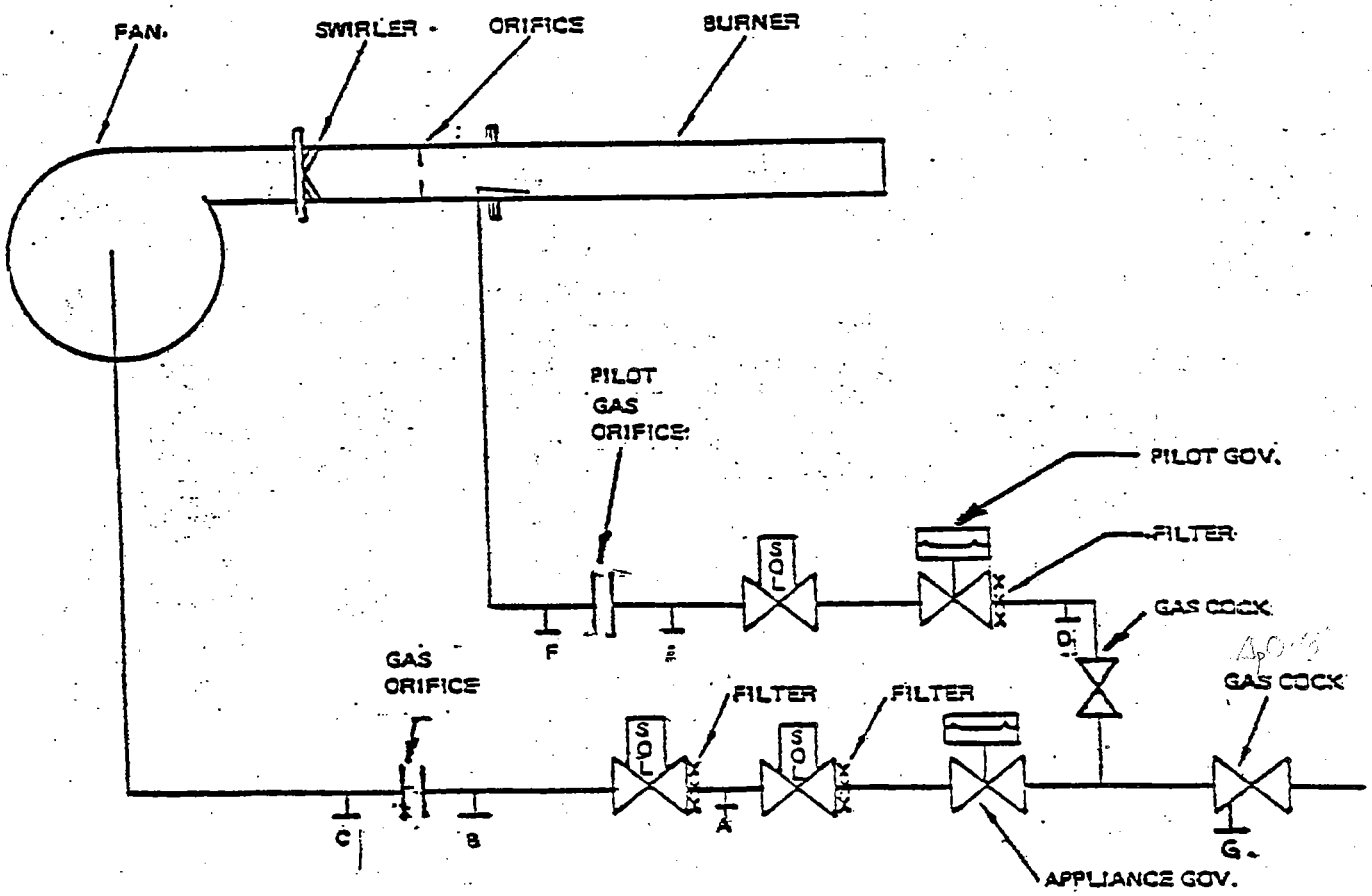


Fig. 7 Schematic Arrangement of Gas Controls

11.7 A flue gas sampling point is provided on the boiler casing front above the boiler, this is sealed with a rubber bung for normal operation.

For North Sea natural gas only:

For each boiler:

Normal CO_2 = 9 - 10% (by volume)

(or O_2 = 3.5 - 5% (by volume)

Normal CO level should not exceed 200 ppm (0.02%) by volume.

All for dry gas sample.

11.8 Over heat cut off device(limit thermostat) check.

The functioning of the device must be checked by withdrawing the control stat element from the pocket leaving the device in place. The water flow to the module should be throttled slowly until the device cuts out the firing cycle. If any audible boiler noises are observed before the device cuts out, the device is faulty, and must be replaced.

11.9 Air Differential Pressure Switch Adjustment

The air differential pressure switch is works set and should require no further adjustment, unless it is thought to be mal-functioning or it has been replaced.

Switch off boiler, isolate the external electrical supply and remove cover of pressure switch by unscrewing the single captive 'posidrive' screw.

Pressure adjustment is via the single slotted screw. Turn the screw clockwise to decrease the differential pressure and anti-clockwise to increase the differential pressure. For normal operation, set the switch within the range 1-1.5 mbar (0.4-0.6" wg).

Replace the cover, tighten the posidrive screw and turn on external electrical supply to boiler.

11.10 Low Gas Pressure Switch Adjustment

The low gas pressure switch is mounted on the left-hand side of the gas feed pipe support bracket.

The switch is works set and should require no further adjustment, unless it is thought to be mal-functioning or it has been replaced.

Switch off boiler, isolate external electrical supply and remove cover of pressure switch by unscrewing the single captive posidrive screw.

Pressure adjustment is via the single slotted screw, turn the screw clockwise to decrease the pressure setting and anti-clockwise to increase the pressure setting.

For normal operation set the switch at 12.5 mbar (5" wg).

Replace the pressure switch cover, tighten the posidrive screw, then turn on electrical supply to boiler.

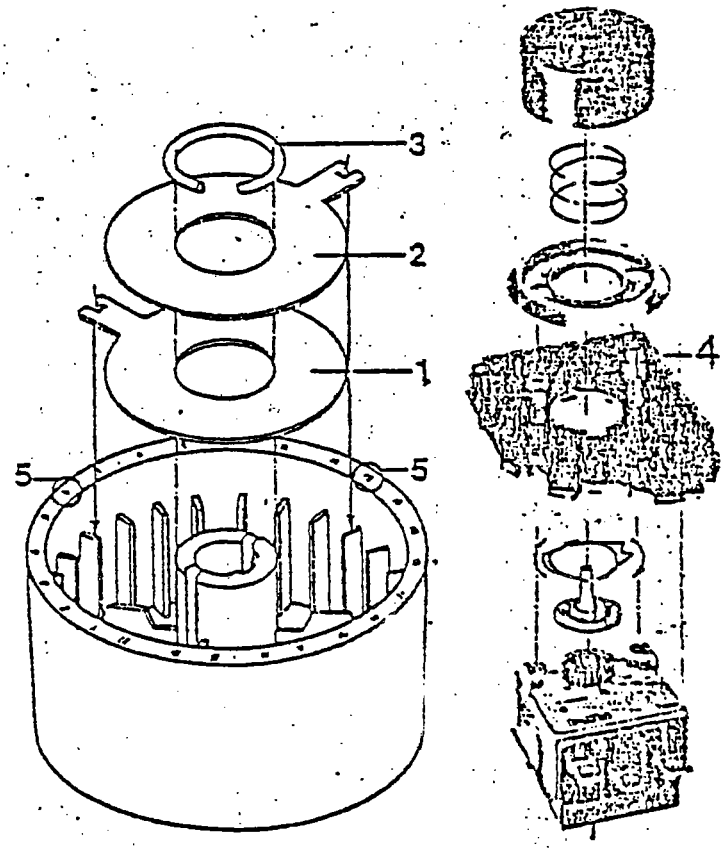
CONTROL THERMOSTAT SETTING PROCEDURE.

NOTE: Control thermostats are to set to operate within the range 50 to 90°C unless requested otherwise by contract requirements.

Adjusting the limitation of angle of rotation only for thermostats with drum type setting knobs.

1. Pull the setting knob off the thermostat spindle.
2. Remove the spring clip (3) and limit stop discs (1) and (2) from inside the setting knob.
3. Insert limit stop disc (1) in to the setting knob so that its stop arm locks on to that rib having the guide number (5) which corresponds to the start value of the desired setting range.
4. Insert limit stop disc (2) in the same manner, but this time choosing the rib and guide number which corresponds to the end value of the desired setting range.
5. Replace spring clip (3), thus securing the limit stop discs.
6. Push the setting knob back on to the thermostat spindle so that the stop screw (4) is located within the selected setting range.
7. Rotate the setting knob to the limit stops of both ends of the scale to check the adjusted range against the setting scale.

TYPICAL ALTERNATIVE THERMOSTAT RANGES		
RANGE	DISC 1 POSITION	DISC 2 POSITION
50 - 90	1	19
50 - 95	1	21
50 - 100	1	23
50 - 105	1	25



12.0 USER'S INSTRUCTIONS

Upon satisfactory completion of commissioning and testing, hand the User's Instructions to the user or purchaser and explain the method of economic and efficient operation of the system. Ensure that the user or purchaser is fully conversant with the lighting, shut-down and general operational procedure. Advise of the precautions necessary to prevent damage to the system and to the building in the event of the system remaining inoperative during frost conditions.

13.0 SERVICING INSTRUCTIONS

13.1 General

Regular periodic servicing is recommended, preferably by a Hamworthy appointed person.

The following procedures are to be applied by those persons less familiar with the appliance.

NOTE:

WARNING: ISOLATE THE ELECTRICAL SUPPLY TO THE SINGLE BOILER/BATTERY BEFORE ANY SERVICING OR COMPONENT EXCHANGE PROCEDURE, AND TURN OFF THE GAS SERVICE COCK TO THE MODULE BEING SERVICED.

13.2 Annual Service

13.2.1 Remove controls cover by releasing the two chrome latches and unscrewing the central 'pozidrive' retaining screw. Withdraw cover from the two corner locating pins.

13.2.2 Remove fan/mixing chamber and controller assembly complete using the following steps:

a) Disconnect mains supply cable at terminal block. loosen cable clamp and withdraw cable from assembly.

b) Disconnect leads to spark electrode and flame probe.

c) Remove spark electrode and probe assembly by unscrewing the two M6 cheese head screws.

d) Remove the low gas pressure switch cover and disconnect the two red/white leads from the "Normally Open" and "Common" contacts within the switch body. Release and remove the single green/yellow earthing cable then slacken the conduit gland nut and withdraw the protecting sleeve and wires from the body

e) Remove pressure switch cover and disconnect pilot solenoid earth lead and power leads at the "in line" connectors situated inside the pressure switch casing.

f) Disconnect the earth leads to the main gas solenoid valves at the boiler terminal block and main gas valve power leads at the "in line" connectors.

g) Withdraw thermostat bulbs from pocket.

h) Unscrew the four M6 nuts securing the complete assembly to the front header casting studs and withdraw assembly from the module.

i) Remove the stainless steel orifice plate and its cork gasket.

j) The burner can now also be withdrawn from the module by first removing M3 screw and then tapping lightly on the flange to loosen. The centre cone can be gripped with pliers to facilitate withdrawal.

13.2.3 Clean the burner by gently brushing inner and outer surfaces. tap burner flange firmly downwards on a wooden block to eject particles of dust and debris. Blow through pilot pipe to check clear. Check circular cork gasket for soundness and renew if necessary. Replace burner in module. (Closed end of burner must locate in recess in module rear tube plate. this will be indicated when the flanged end of the burner is flush and square with the front header casting). Ensure pilot gas pipe is positioned on the right hand side.

13.2.4 The fan/mixing chamber and controller assembly may be removed to bench for cleaning:

a) Remove four 'posidrive' screws holding fan motor plate and controls bracket to fan casing. remove bracket and wiring loom complete with fan motor taking care not to damage rubber gasket. and without putting any strain on cable connections or wiring loom. Disconnect the impulse pipe at the pressure switch and ease the pipe clear of the switch body.

b) Remove (unscrew) pressure switch from fan casing (if care is exercised it is possible to remove switch without disconnecting it from loom).

c) Gently brush fan blades if necessary to remove any dust accumulation.

d) Gently brush both sides of the swirler - (located between fan discharge flange and extension duct) - to remove any dust accumulation. Exercise extreme caution at this stage as the swirler must not be damaged or altered in any way. Do not attempt to remove swirler from its location.

e) Blow through the pressure switch impulse pipe to check clear.

f) Re-assemble fan/mixing chamber etc. by reverse of above procedure. renewing gaskets as required.

13.2.5 Check spark electrode assembly. If either electrode shows signs of oxidation or is bent it should be renewed. Check spark gap is set at 4 mm ($\frac{5}{32}$ in).

13.2.6 Check flame probe for signs of oxidation or bending. Renew if required. Length of metal rod should be 85 mm ($3\frac{3}{8}$ in) minimum.

13.2.7 Re-assemble fan/mixing chamber and controller assembly to boiler in reverse procedure to that given in paragraph 13.2.2. Check rectangular foam gaskets for soundness and renew if required. Use colour code given on wiring diagram (inside controls casing) to facilitate reconnection of electrical leads.

13.2.8 With module service gas cock still turned off check the programmed sequence as described in paragraph 11.4/11.5 on initial commissioning in commissioning and testing section.

13.2.9 Check gas pressures and reset if necessary in accordance with the values given in paragraph 11.7 (Commissioning and Testing Section).

13.2.10 Replace module controls cover and tighten retaining screw.

13.2.11 Carry out a combustion check by testing the flue gas CO_2 and CO levels. typical values are given in paragraph 11.7.a

13.3 **Two Year Service**

NOTE: It is advisable to have at hand a tube of silicon rubber sealant in addition to other usual gasket materials.

13.3.1 Repeat annual service as described in paragraphs 13.2.1 to 13.2.6 inclusive. but do not re-assemble any items to the boiler.

13.3.2 (a) Remove and retain the 6 M5 posidrive screws retaining the boiler insulation panels, taking care to note the order of re-assembly. Lift the top insulation panel clear of the boiler and then remove each of the four individual side panels.

b) Undo all the M5 screws retaining both casing side panels and remove panels by pulling out at the top and then lifting. taking care not to damage the insulation fixed to their inside surface. If caution is exercised the silicon rubber seal will come away intact on each side panel and can be re-used.

c) Unhook both stainless coil spring baffle retainers and remove. Also remove the 16 stainless steel baffle plates. Wire brush both sides of the baffles to remove any deposits.

d) Thoroughly wire brush the exposed finned copper tubes until clean. (The tube bank may be gently hosed down with clean water to remove debris providing the burner is removed). Blow off dry.

e) De-sludge the floor of the casing and ensure the ¾ in drain is clear.

13.3.3 If necessary repair the silicon rubber seal around edges of side panels with new liquid sealant. Allow 20 minutes for partial cure.

13.3.4 Replace one coil spring baffle retainer around tube bank and slip in baffles one at a time. When all the baffles are repositioned replace the second retainer and locate between tabs on baffles. ensure first retainer is similarly located. Now lightly smear grease over side sealing faces of casing.

13.3.5 Replace side panels carefully to avoid damaging repaired seal etc. and tighten screws. Clean off any excess liquid rubber that may squeeze out.

13.3.6 Continue with re-assembly in accordance with procedure for annual service viz: paragraphs 13.2.7 to 13.2.11.

13.4 **Four Year Service**

13.4.1 Either the heat exchange module may be descaled in situ:

Repeat two year service as described in paragraphs 13.3.1 to 13.3.5 inclusive then:

13.4.2 Isolate the boiler from the main system flow and return pipes and circulate a chemical descaling solution through the heat exchanger. preferably using a pumped recirculating system. This job is best carried out by experts. Recommended solutions include "Gamlen" XD blended with "Gamlen" CUO inhibitor. Follow the chemical manufacturers recommendations and instructions regarding method. solution strength and safety and handling precautions.

Reconnect boiler to pipework system after cleaning up flanges and renewing gaskets.

NOTE: Fit flange bolts so that nuts are uppermost on flow connection, and underneath on return connection. This is important to avoid controls cover fouling bolts.

Now proceed to paragraphs 13.4.12 and 13.4.13.

Or alternatively the heat exchanger module may be removed for descaling:

13.4.3 Carry out annual service as previously described in paragraphs 13.2.1 to 13.2.6 inclusive. do not re-assemble any items to boiler.

13.4.4 a) Release 1 in gas union connecting service cock to boiler pipework.

b) Undo both nuts on M8 'U' bolt clamping the vertical gas feed pipe. Undo both M8 set screws retaining gas controls assembly to 3 in n.b. water return elbow. Remove gas control assembly.

13.4.5 a) Isolate the boiler from the main system flow and return pipes and drain boiler. (It contains approximately 20 litres (4.5 gallons) of water).

13.4.6 Either:

a) Undo the six M10 nuts/studs holding the heat exchanger module to the casing, and carefullywithdraw the module from its casing by sliding it out on its internal runners. The module is heavy (137 kg or 300 lb) and will require frontal support as soon as the front flange clears the studs. Otherwise tube bank damage will result. Also support the rear of the module as it emerges from the casing.

Alternatively to a) above if space permits:

b) Disconnect boiler casing from flue duct and remove water flow and return pipework local to boiler front including elbows. up to front header casting. Undo four of the six M10 nuts/studs (front header to casing) leaving the two outer nuts in place (those on horizontal centre line of module). Tip casing forward onto front header casting using timber or similar to protect studs etc. and to shore up.

Undo the remaining two M10 nuts/studs and gently lift casing from the module.

Return casing to normal position for cleaning.

13.4.7 Remove module baffles by unhooking the stainless steel retaining springs. Wire brush the baffles and tube bank assembly and continue service in accordance with paragraphs 13.3.2 (c), (d), and (e). (Two Year Service).

13.4.8 a) Remove the 12 M12 bolts securing the front header plate to the front tube plate and separate the plates.

b) Remove the 18 M12 bolts securing the rear cover plate to the rear tube plate and separate the plates.

c) Clean and descale the tubes through and also the waterways in the tube plates and covers. Chemical descaling is preferred for the tube bank assembly. recommended solutions include "Gamlen" XD blended with Gamlen CUO inhibitor.

Follow chemical manufacturers instructions for solution strength, method of application, safety and handling precautions.

13.4.9 Clean up mating surfaces and re-assemble covers to tube plates with new gaskets lightly greased before assembly. Torque M12 bolts down evenly to 60 lb/ft.

13.4.10 a) Re-assemble baffles to module etc. in accordance with procedure in paragraph 13.3.4.

b) Renew ceramic rope seal and replace module in casing by reverse of either method a) or b) described in paragraph 13.4.6.

c) If necessary replace boiler "in line" with its associated pipework and reconnect flow and return connections and flue duct clean up flanges and renew gaskets.

NOTE: Fit flange bolts to flow and return elbows so that nuts are uppermost on flow connection, and underneath on return connection. This is important to avoid controls cover fouling bolts.

13.4.11 a) Replace gas controls assembly, tighten 'U' bolt and two M8 bolts locating assembly to return elbow.

b) Reconnect 1 in gas main union to service cock.

13.4.12 Continue with re-assembly in accordance with procedure for annual service viz:

paragraphs 13.2.7 to 13.2.11.

13.4.13 When the module is firing the gas pressure must now be checked in accordance with paragraph 11.7 (Commissioning and Testing Section).

14.0 Replacement of Failed Components

There are a number of components listed below which can be replaced simply and quickly by following the given procedure:

NOTE:

ISOLATE THE ELECTRICAL SUPPLY TO THE BOILER AND TURN OFF THE GAS SUPPLY BEFORE REMOVING CONTROLS COVER AND COMMENCING ANY SERVICING OR COMPONENT EXCHANGE PROCEDURE.

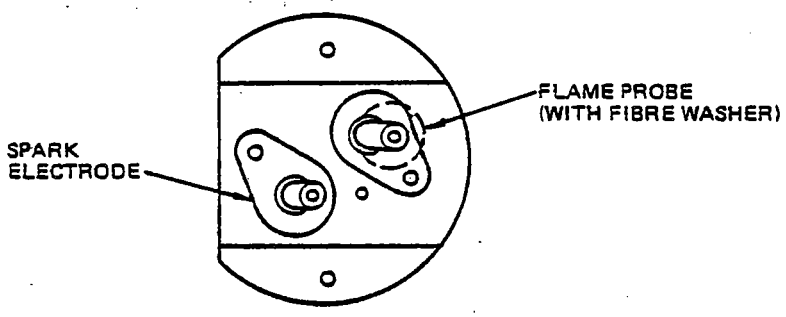
14.1 Spark Electrode and Flame Probe Renewal

Item	Hamworthy Pt. No.
Spark electrode	333801192
Flame probe	333801192
Earth rod/mounting block	333801275/333801267

The ignitor/probe assembly is situated on the horizontal centre line to the right of the fan extension duct screwed to the front header casting.

Pull off the H.T. and flame probe caps, remove the two M5 cap head screws and withdraw assembly.

Renew insulated spark and probe electrodes as required. The spark earthing rod is part assembled to the ignitor block and can only be renewed complete with same.



Ensure the right hand insulated electrode - see sketch - is fitted with the large fibre and steel washers. This is an important safeguard to prevent interchanging the H.T. and probe leads. Ensure the spark gap is set at 3.5-4.0 mm (approx. $\frac{5}{32}$ in) before refitting assembly to boiler.

14.2 Fan Motor Renewal — H.E.L. Pt. No. 339007083

Remove sequence controller by first unscrewing the two 'posidrive' retaining screws located at opposite corners of controller base. Pull-controller firmly from base. Disconnect motor leads from base terminals, viz. yellow from spare terminal in middle of base, also black and blue from terminal 2 and red from terminal 7. Loosen cable gland nut and pull disconnected leads with protective sleeve from base.

Remove motor capacitor from spring clip. Remove the four M5 'posidrive' screws holding the controls bracket and fan motor plate to the fan casing. Place the controls bracket to one side taking care not to stretch or pull any cables or capillaries etc.

Withdraw the fan gently taking care not to damage the rubber gasket. Slacken the impeller retaining grubscrew and remove the impeller from the motor shaft.

Undo the four 'posidrive' screws exposed by the impeller removal and take off the motor mounting plate noting the position of all spacers, rubber bushes and earth strap etc.

Replace these items (together with mounting plate and impeller) on the new motor, position the impeller to give a 6 mm ($\frac{1}{4}$ in) gap between motor plate and impeller backplate at the rim of the latter. Tighten the retaining grubscrew onto the flat surface provided on the motor shaft.

Cut the flying leads of the new motor to lengths identical to the old, re-use the old lead protection sleeve if undamaged otherwise renew same.

Re-build the assembly in reverse order to remainder of removal procedure, use the wiring diagram inside the controls to cover to assist with wiring connections.

14.3 Pilot Solenoid Valve Renewal (Coil Only) — H.E.L. Pt. No. 339007034

It is likely that the main cause of gas valve failure will be due to coil winding failure either open or short circuit. In such event it is possible to replace the coil only:

Remove the plastic cover from the air pressure switch by unscrewing the two captive 'posidrive' screws. Unplug the 'in line' connectors to the pilot gas valve flying leads, i.e. black/white and blue wires, also undo the earth screw inside the pressure switch body and release the earth (green yellow) lead to the pilot valve.

Remove the red plastic cap securing the solenoid cover and withdraw solenoid assembly from valve.

Cut the 'in line' connectors from the solenoid 'flying' leads and remove solenoid from its housing pulling the flying leads through the protective sleeve, the earth lead must remain in the sleeve. Remove the yoke from the old coil and replace on the new coil, together with the original location bushes. Trim the flying leads to length identical to original (allow for stripping and spade connectors).

Thread the flying leads through the sleeve from the housing end and drop solenoid assembly into the housing. Crimp new "Hellerman" inline spade connections to flying leads.

Re-assemble the solenoid to valve and reconnect the solenoid leads (including the earth) inside the air pressure switch body, replace air switch cover.

14.4 Main Solenoid Valves (Coil Only) — H.E.L. Pt. No. 339007034

Remove the solenoid coil retaining nut, spring washer flux nut and cover of the failed valve. Slide the coil assembly up the solenoid base assembly until the cover of the insulating barrier can be opened to gain access to the terminal block. Disconnect the A.C. supply leads (orange) after noting the positions of each connection, and withdraw the coil assembly completely from the valve. The solenoid housing is best left in position at this stage.

Disconnect the flying leads (orange) from the new coil assembly and discard them, take care not to displace any of the rectifier components connected into the coil terminal block. Slip the new coil assembly onto the solenoid valve assembly and connect the orange supply leads to their respective terminals. Close and lock in place the cover of the insulating barrier and replace the coil, cover, flux nut, spring washer and locking nut. Torque the flux nut to approximately 35 inch pounds and the retaining nut to approximately 140 inch pounds.

14.5 Control Thermostat Renewal. (Hamworthy Part No. 339009345

Withdraw the control thermostat bulb from the pocket in the flow header. Remove the spaded purple and Red/White leads at the "push on" terminals on the thermostat body. Pull off the thermostat control knob and remove the spring and silver bezel. The thermostat is retained to the support bracket by two M3 screws, one of which is a pillar type and forms the thermostat stop. Take care to note the relative positions of the two screws before removing them, together with the thermostat body.

Re-assemble thenew thermostat in reverse procedure ensuring that the purple and red/white leads connect the thermostat in the normally closed position. (Identified as contacts 1 and 2 on the thermostat body).

NOTE: for adjustment of thermostat operating range reference to Section 11.11.

14.6 Limit Thermostat Renewall - Hamworthy Part No. 339008388

Withdraw the limit thermostat bulb from the pocket in the flow header. Remove the spaded purple and yellow coloured leads at the "push-on" terminals on the thermostat body, undo the bulkhead nut, then withdraw the thermostat.

Fit the new thermostat in reverse procedure ensuring that the purple and yellow leads connect the thermostat in the normally closed position. (Identified as contacts 1 and 2 on the thermostat body.)

NOTE: For adjustment of the thermostat operating range refer to Section 11.11.

14.7 Sequence Controller Renewal — H.E.L. Pt. No. 339006572

The sequence controller can be removed complete. Unscrew the two captive 'posidrive' screws (located at opposite corners) retaining the controller to its terminal wiring base. Pull the controller firmly from its base. there will be some resistance due to the "push in" terminal connections. Locate new controller, correctly to base and push firmly home. tighten 'posidrive' screws.

14.8 Neons and On/Off Switch Renewal

Item	H.E.L. Pt. No.
Green neon lamp	339006606
Orange neon lamp	339006598
On/off rocker switch	339006648

Pull off the electrical leads to the appropriate item at spade connectors. Release switch or lamp from mounting fascia by pressing in the plastic retaining lugs at the top and bottom. Pull component out frontwards. Push in new component until lugs lock in position and reconnect leads. Consult wiring diagram inside controls cover if in doubt regarding reconnection.

14.9 Ignition Spark Generator — H.E.L. Pt. No. 339007042

The ignition spark generator is located at the rear of the controls bracket behind the sequence controller.

Pull the H.T. cap from the ignition electrode. Twist the H.T. cable anti-clockwise at the spark generator end to unscrew it from same. also disconnect the orange/black and blue leads from the spark generator at the spade terminals. Undo the long 2BA retaining bolt, nut and shakeproof washer and remove the spark generator from the controls bracket.

Reverse the above procedure for fitting the new spark generator.

14.10 Air Differential Pressure Switch Renewal - Hamworthy Part No. 747146295

The air pressure switch is located on the right hand side of the fan casing.

Remove the cover by unscrewing the single captive "posidrive" screw. Unplug the inline connectors to the pilot gas valve flying leads, ie. black/white and blue wires, also undo the earth screw in the pressure switch body and release both green/yellow leads.

Remove solenoid valve leads from the switch body. Pull the flame probe cap from the probe electrode and remove the cap from the orange wire by unscrewing metal sleeve of cap assembly.

Disconnect yellow, white and red/blue wires from switch at screw terminals, slacken conduit gland nut and withdraw protecting sleeve and all wires from pressure switch.

Disconnect capacitor from spring clip and remove the four M5 posidrive screws holding the controls bracket and fan motor plate to the fan casing. Place the controls bracket to one side taking care not to damage any cables or capillaries etc. Release the Enots tubing nut securing the impulse pipe to the choke adaptor in the air pressure switch, then ease the pipe clear from the assembly. While holding the locknut inside the fan casing unscrew and remove the pressure switch together with the Hobbs straight connector as an assembly from the fancase unit, taking care to note the order of seals etc. Remove the Hobbs straight connector (complete with locknut and washer) and the choke fitting from the 1/4" BSP and 1/8" BSP tapping points in the existing pressure switch and then fit them into the replacement switch.

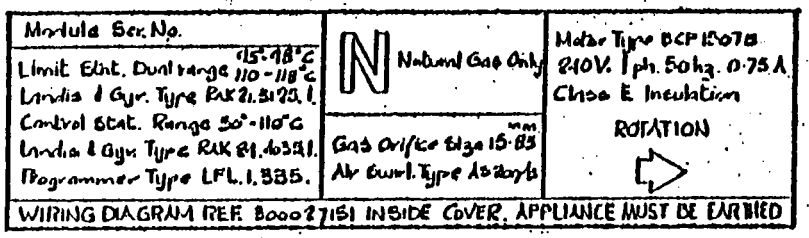
NOTE: The 1/8" BSP tapping point in the replacement switch will be sealed with a protective plug which must be removed with a screwdriver before assembling the choke fitting.

14.11 Low Gas Pressure Switch Renewal - Hamworthy Part No. 747146287

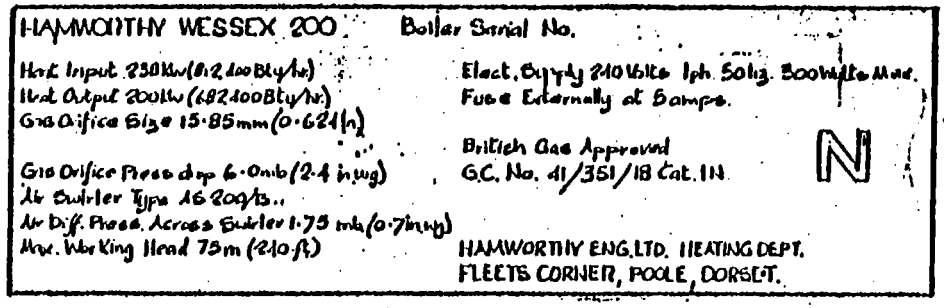
The low gas pressure switch is mounted on the left-hand side of the gas feed pipe support bracket.

Remove the cover by unscrewing the single captive posidrive screw then disconnect the two red/white leads from the switch at the terminals identified as "common" and "normally open". Release the earth screw in the switch body and remove the single green/yellow earthing cable, then slacken the conduit gland nut and withdraw protecting sleeve and wires from the body. Unscrew and remove the pressure switch from the 1/4" BSP parallel Hobbs connector, taking care to note the position of the copper sealing washer. Lightly grease the threads of the 1/4" connectors then screw "fully home" the replacement pressure switch, such that the copper sealing washer is compressed to form a gas tight seal against the Hobbs nut. Re-fit the conduit gland nut and connect the two red/white and single earthing cable in accordance with wiring diagram inside control cover. Reference Fig. 4.

Adjust the pressure switch setting as detailed in Section 11.9 then replace the cover and tighten the posidrive screw.



ON FAN INSIDE OF COVER



ON BOILER CASING

FRONT OF COVER

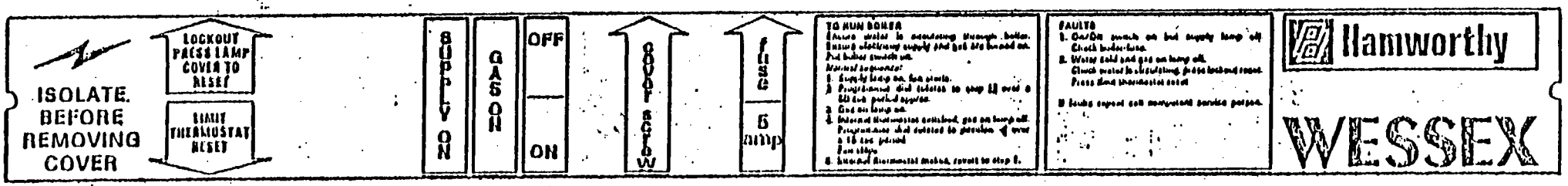
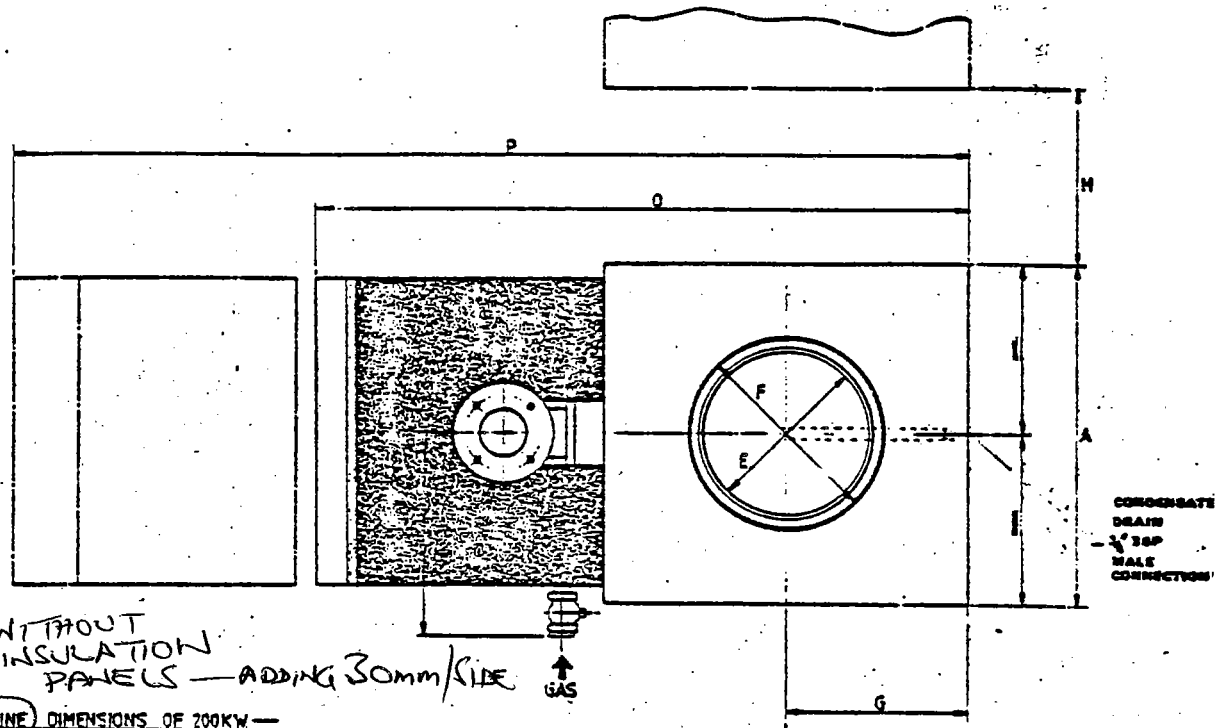
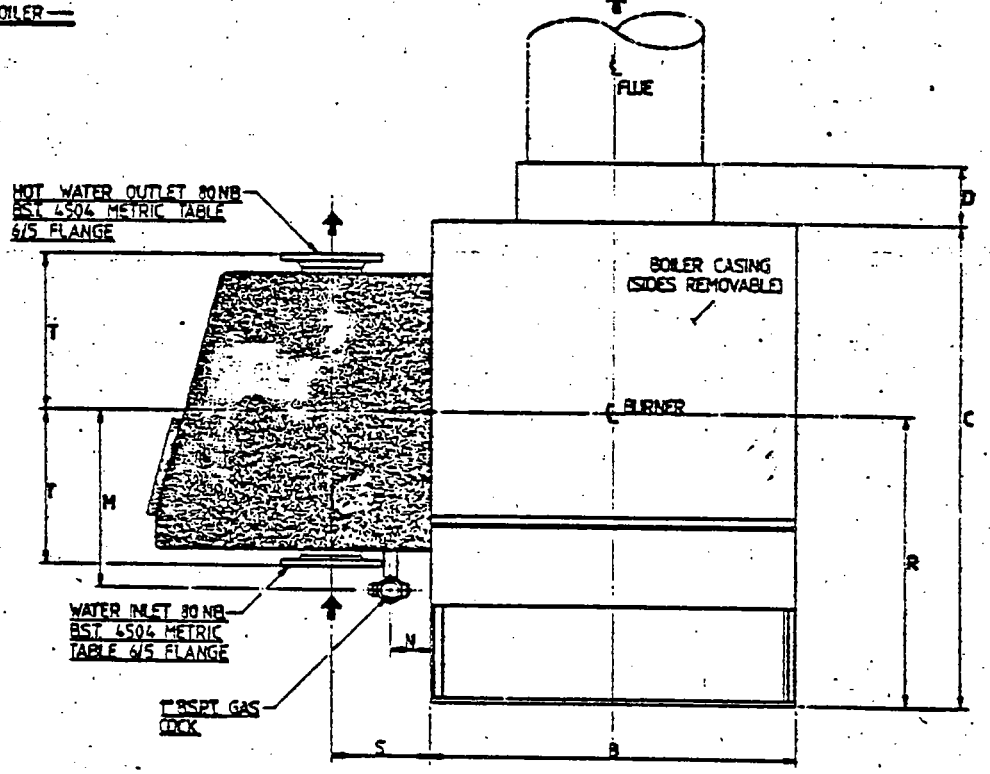


FIG. 8 - Labels



WITHOUT INSULATION PANELS — ADDING 30mm/SIDE

OUTLINE DIMENSIONS OF 200KW — WESSEX HOT-WATER BOILER —



IDENT	DESCRIPTION	DIM.
A	OVERALL WIDTH OF CASING —	600
B	" LENGTH " " —	640
C	HEIGHT OF CASING TOP —	880
D	DIMENSION OF FLUE CONNECTION	102
E	DIA. FLUE HOLE IN CASING TOP	300
F	DIA. INSIDE FLUE SOCKET CONN.	344
G	DIM. CASING BACK TO FLUE	335
H	MIN. CLEARANCE EACH SIDE	600
K	" " SIDE " "	22
L	DIM. FOR GAS CONNECTION	377
M	" " " "	340
WEIGHT — EMPTY		257 kg.
FULL		kg.

IDENT	DESCRIPTION	DIM.
N	DIM. FOR GAS CONNECTION —	85
O	OVERALL DIM. CASING FRONT-BACK	1180
P	SPACE REQUIRED FOR REMOVAL OF	
	FRONT COVER	1755
		230
R	" " " BURNER ℄	541
S	" TO WATER CONNECTION FROM EDGE	
	OF CASING	180
T	DIM. ON WATER FLANGES FROM BURNER ℄	292