MARK 1

WESSEX 1 x 50
2 x 50
3 x 50

HOT WATER BOILERS FOR HEATING AND DOMESTIC HOT WATER

INSTALLATION AND COMMISSIONING INSTRUCTIONS
FOR USE WITH NATURAL GAS ONLY

CONTENTS

Figures

1.0 INTRODUCTION

These instructions are for use with natural gas only. The "Wessex" is a gas fired, fan assisted, open flued central heating/hot water boiler. Each burner/tube bank assembly is termed a module. Up to three boiler modules are arranged in a single casing, the multiple arrangements being termed batteries. Each battery has common flue, water and gas connections.

The technical data for the various arrangements is given in Section 2.

The burner fitted to each module is of the fan assisted pre-mix type complete with spark ignitor and sequence programmer.

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 (see Section 6.1).

The Wessex is floor mounted 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 module has a low thermal capacity and water flow rates must be maintained above the recommended levels shown in Section 8 and 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 1 x 50	59.5 kW (203,000 Btu/h)	50 kW (170,600 Btu/h)
Wessex 2 x 50	119.0 kW (406,000 Btu/h)	100 kW (341,200 Btu/h)
Wessex 3 x 50	178.5 kW (609,000 Btu/h)	150 kW (511,800 Btu/h)

2.3 Data Labels

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

2.4 Gas Supply

The units are for use with natural gas only. The nominal gas pressure at the single boiler/battery inlet manifold should be 20 m.bar (8 in. w.g.).

3.0 GENERAL REQUIREMENTS

3.1 Related Documents

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

"Technical notes on the design of flues for non domestic gas boilers", 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 "Technical Notes on the Design of Flues for Non Domestic Gas Boilers". 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.

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 is as shown below:

Boiler	Exhaust Volume at N.T.P.		Exhaust Temp.	
	m^3/h	ft^3/h	°C	°F
Wessex 1 x 50	85	3000	125	257
Wessex 2 x 50	170	6000	125	257
Wessex 3 x 50	255	9000	125	257

6.3 Flue Condensation

With the high thermal efficiency of the modules, the flue gas temperature is low (approx. 125°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 so that any condensation is continuously drained. All flues should have a minimum slope of 2.5° upwards in the direction of exhaust gas flow (no horizontal sections). All joints must be made so that any condensation is directed back down the slope. The drain fitted to the single boiler/battery casing will adequately cope with condensation from 6 m. (20 ft.) of twin-wall flue, any longer lengths of flue should have separate open drain connections. The drain pipe must be 20 mm. (¾ 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 must be made for disconnecting the flue pipe from each single boiler/battery 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 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.

Where the flue diameter is less than 200 mm. (8 in.) a terminal should be fitted, where the flue is of a larger size consideration should be given to the fitting of a terminal.

7.0 AIR SUPPLY

Boiler Installations up to 12 Modules — 600 KW Output

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

Boiler Installations in Excess of 12 Modules — 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 MODULES INSTALLED	POSITION OF AIR VENT(S)	AIR VENT AREAS (Air direct from outside)
Up to 12 modules (Up to 600 kW output)	High Level	270 cm^2 per module (42 in^2 per module)
	Low Level	540 cm^2 per module (84 in^2 per module)
12 to 22 modules (600 to 1100 kW output)	High Level	3300 cm^2 (500 in^2)
	Low Level	6600 cm^2 (1000 in^2)

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 must 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 Figure 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, must 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 must be fitted to the water system between the single boiler/battery and the first isolating valve in the water system. The size of this relief valve should be as shown below.

Boiler	Relief Valve Size	Free Area of Relief Valve
Wessex 1 x 50	20 mm. (¾ in)	284 mm.^{2} (0.44 in ^{2})
Wessex 2 x 50	20 mm. (¾ in)	284 mm.^{2} (0.44 in ^{2})
Wessex 3 x 50	20 mm. (¾ in)	284 mm.^{2} (0.44 in ^{2})

For further details see CP 332:3.

8.3 Open Vent Pipe and Cold Feed Pipe

A vent pipe and cold feed pipe must be fitted to the water system between the single boiler/battery and the first isolating valve in the water system. The sizes of these pipes are shown below.

Boiler	Open Vent Size	Cold Feed Size
Wessex 1 x 50	25 mm. (1 in)	20 mm. (¾ in)
Wessex 2 x 50	32 mm. (1¼ in.)	25 mm. (1 in.)
Wessex 3 x 50	38 mm. (1½ in.)	32 mm. (1¼ in.)

8.4 Altitude Gauge (Water Pressure Gauge)

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

8.7 Circulating Pump

One or more pumps will be required to circulate the water around the boiler and heating system. Fig. 3 shows the hydraulic resistance of the single boiler/battery. 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, consideration should be given to the fitting of a coarse filter 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 must be maintained through each single boiler/battery 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 must 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.

8.10 Control Schemes

8.10.1 Temperature Controls

An adjustable control thermostat graduated 1 to 6 (57–85°C) is fitted to each module and is scaled as follows:

1	2	3	4	5	6
57°C	63°C	68°C	74°C	80°C	85°C
135°F	145°F	154°F	165°F	176°F	185°F

A fixed limit thermostat (hand reset) is also fitted with a set point of 90°C (194°F).

Where three or more modules are employed connected to common flow and return mains, a Hamworthy step controller is recommended (see separate Hamworthy publication).

8.10.2 Water Flow Controls

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

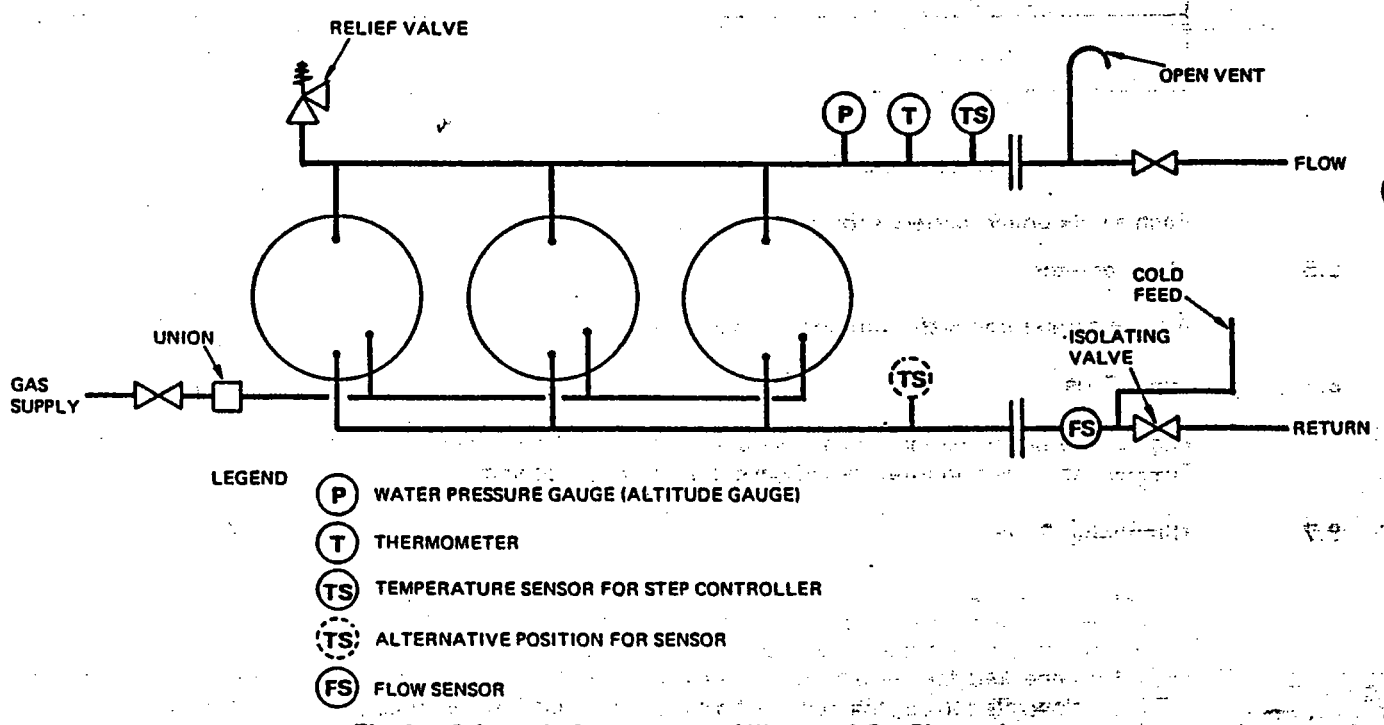


Fig. 1. Schematic Arrangement of Water and Gas Pipework

8.10.3 Frost Protection

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

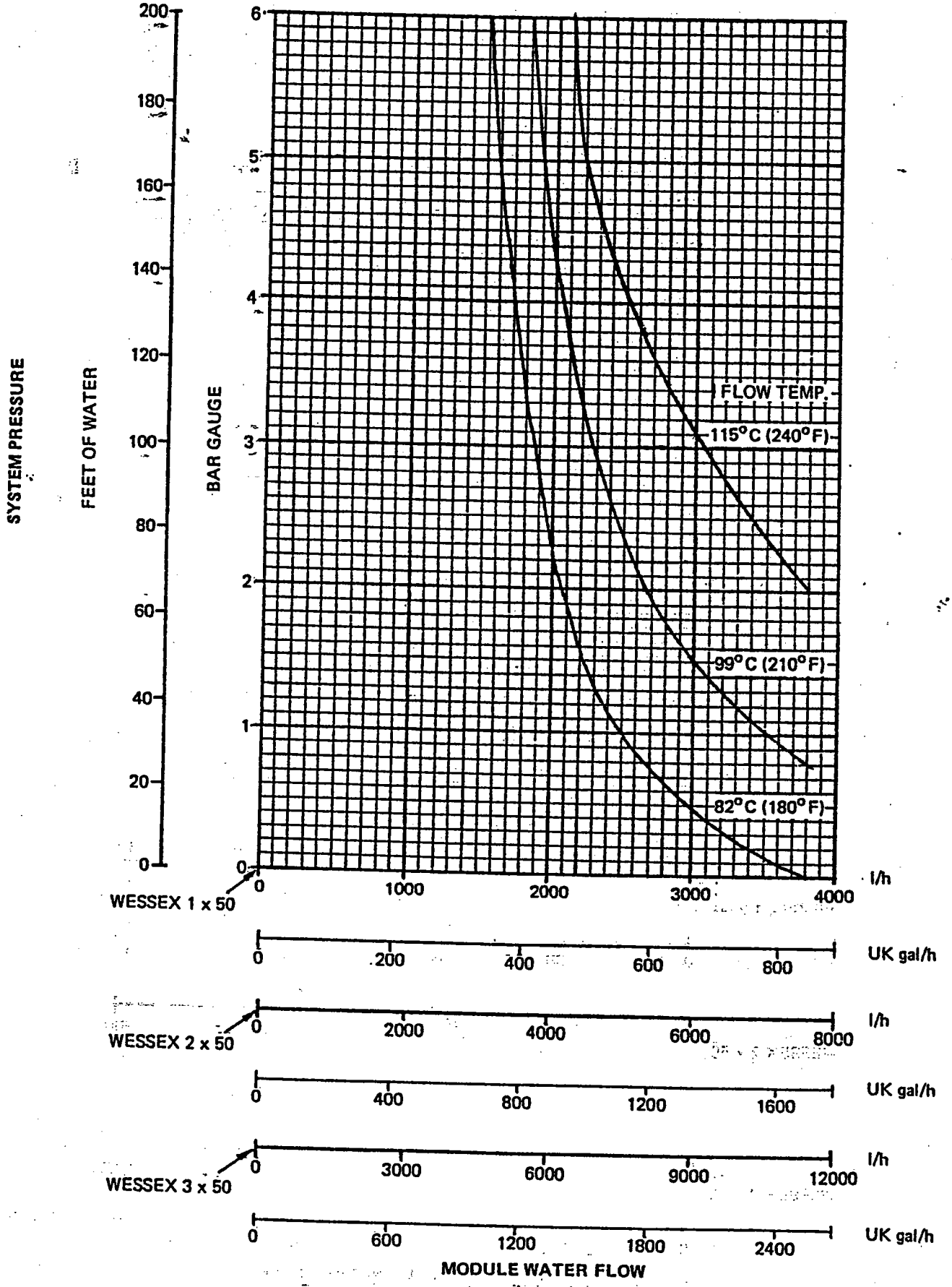


Fig. 2. Minimum Water Flow Rates

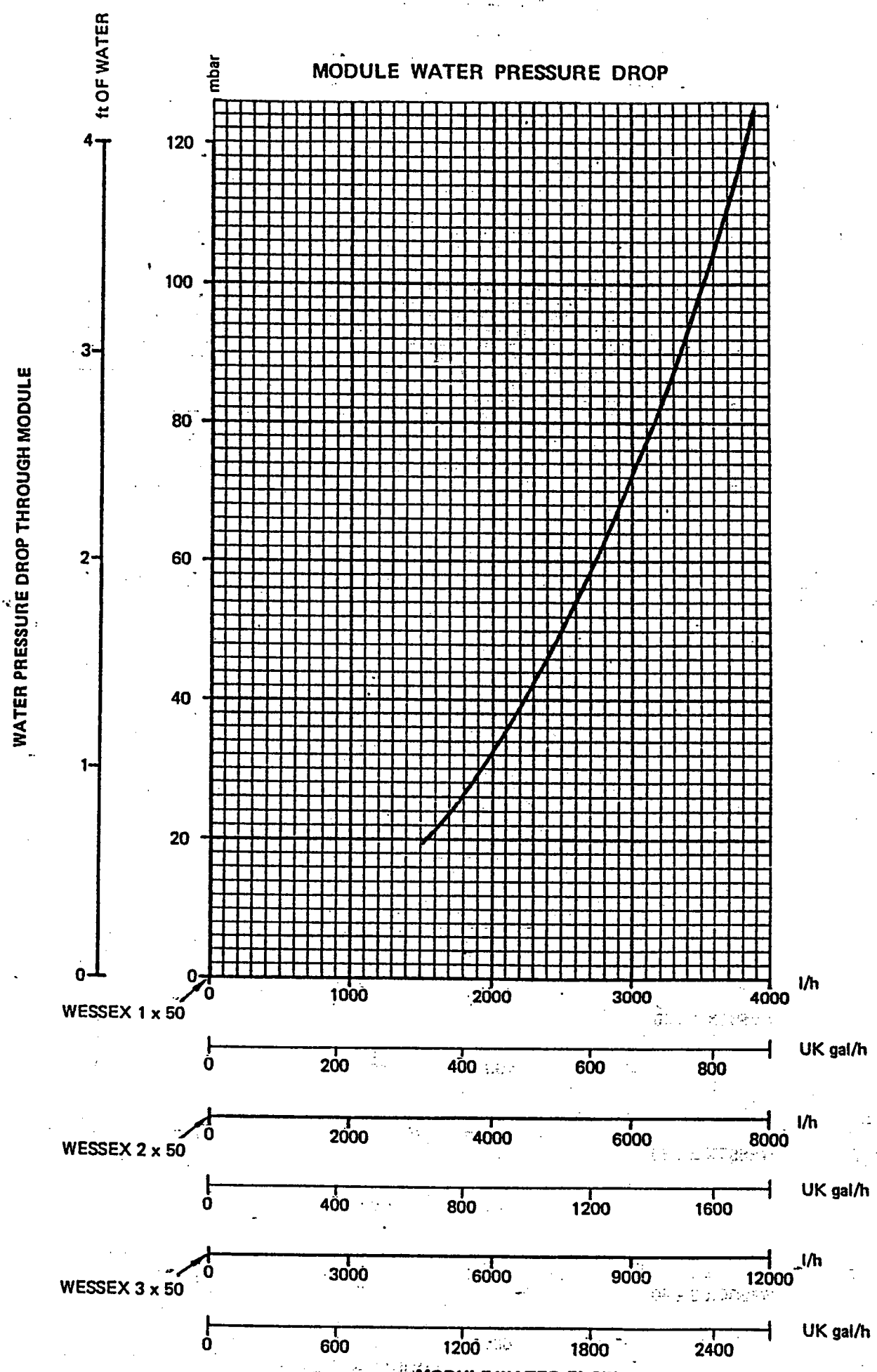


Fig. 3. — Water Pressure Drops

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 should facilitate complete electrical isolation of the single boiler/battery and 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. 4 - use heat resistant 3 core cable size 1.0 square mm. C.S.A.

NOTE: It may be convenient during connection of battery arrangements (i.e. 2 x 50 and 3 x 50 models) to remove the rear, and slacken the front fan motor plate/thermostat and lamp bracket screws. Wiring up can then be facilitated by swinging the bracket forwards. Refit when wiring connections are complete.

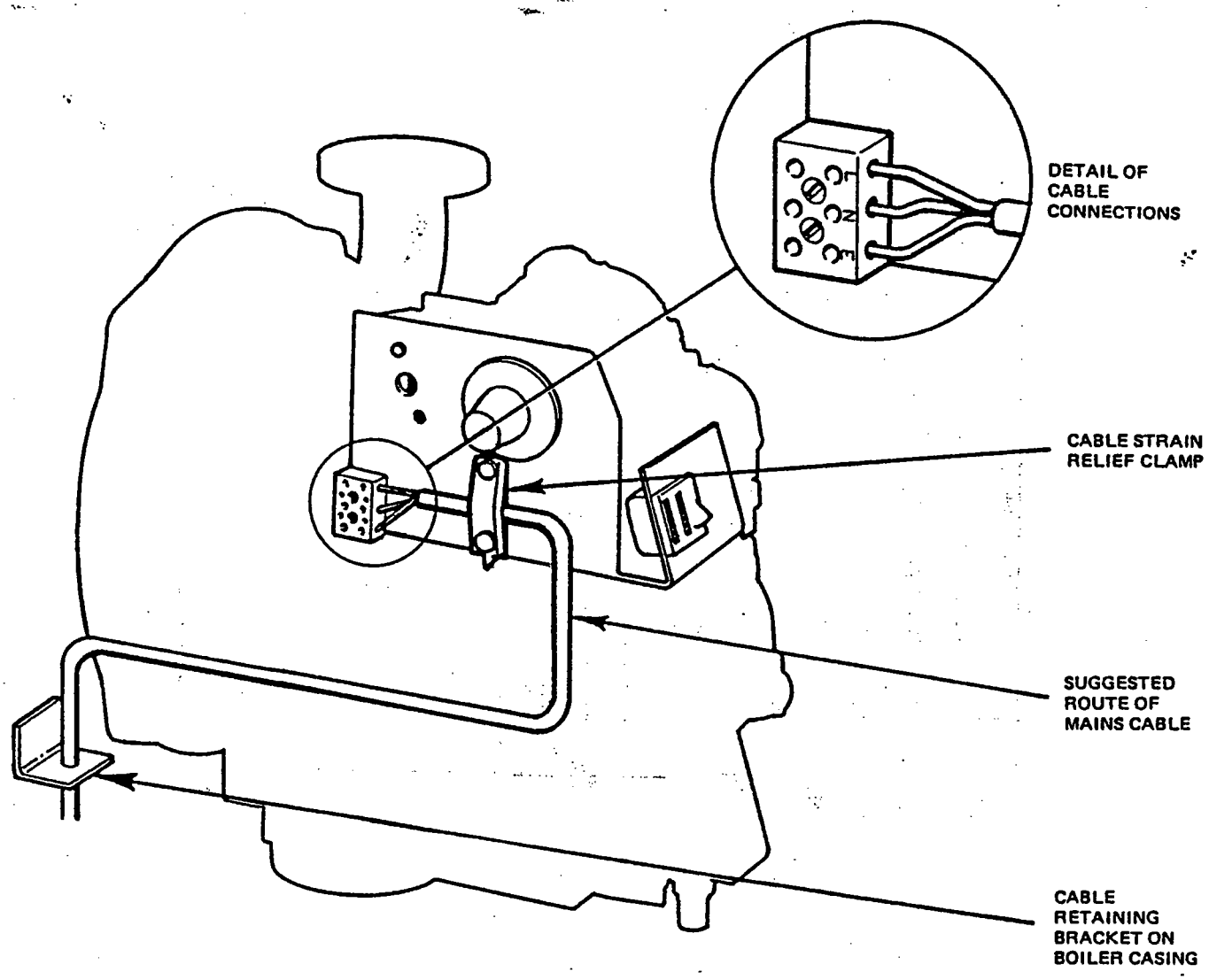
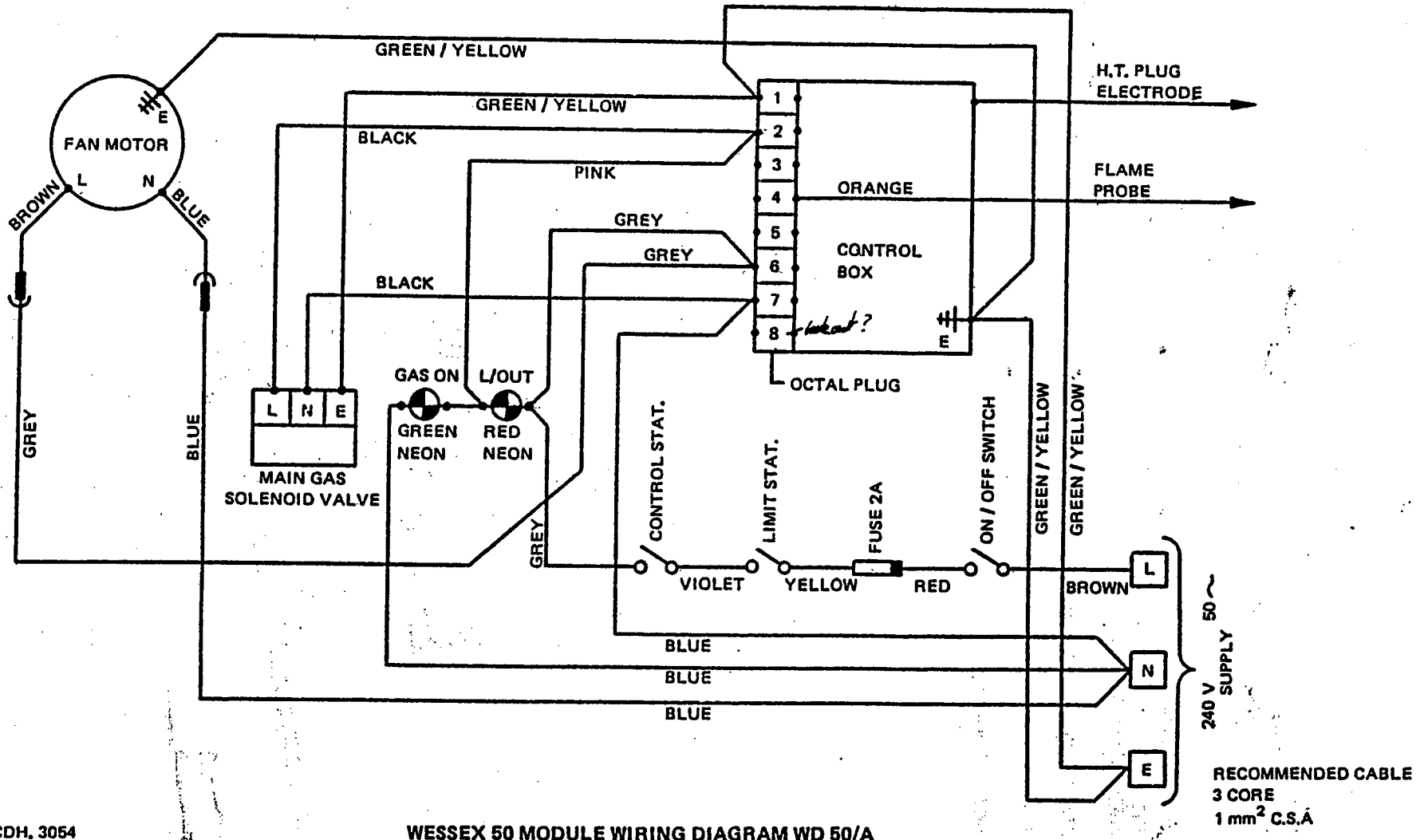


Fig. 4. Path of Mains Cable

9.2 Module Wiring Diagram

The module wiring diagram is shown in Fig. 5. This wiring diagram is also fitted inside each module cover.



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WESSEX 50 MODULE WIRING DIAGRAM WD 50/A

Fig. 5. Wiring Diagram

10.0 INSTALLATION OF BOILERS

10.1 General

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

The single boiler/battery should be positioned to allow a minimum of 150 mm. (six in.) 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.

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.

A flue socket is provided suitable for accepting a 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 the need to dismantle the whole flue system.

10.3 Gas Connections

For design see Section 5.

Size and position of gas connections are shown in Fig. 1. A filter mesh is fitted inside the gas cock at the union end. Each module has an individual gas cock fitted. The installer must fit a suitable isolation valve on the supply to each boiler battery as shown in Fig. 2. A union should be fitted between the isolation valve and the boiler battery manifold for ease of battery removal.

11.0 COMMISSIONING AND TESTING

11.1 Electrical Installation

For design see Section 9.

Checks to ensure electrical safety must 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.

The whole of the system must 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.

11.4 Lighting the Boiler (Initial Commissioning)

The first attempt to light the boiler must be made with the gas supply turned off, this will effectively check the programmer sequence. The following steps should be carried out:

a) Turn off gas supply at each module.

b) Establish water flow through the boiler modules.

c) Turn off "ON/OFF" switch at each module and set control thermostat at position 1.

d) Switch on electrical supply at external isolator.

e) Turn on module "ON/OFF" switch. The following automatic sequence should occur.

1) "LOCKOUT" lamp on and fan starts. Pre-purge period of approx. 22 seconds.

2) "GAS ON" lamp on, "LOCKOUT" lamp off, gas solenoid energises and spark on. Ignition period of approx. 2 seconds.

3) "GAS ON" lamp off, "LOCKOUT" lamp on, gas solenoid valve de-energises, fan continues to run for post purge until "ON/OFF" switch is switched off.

4) This lockout condition is reset by switching the module "ON/OFF" switch to off for 5 seconds.

If the sequence as described above fails, the following checks should be performed.

Step	Fault	Check
Step e1	"LOCKOUT" lamp does not come on and fan does not start.	i) Water temperature below thermostat setting, and limit thermostat is reset. ii) Electrical supply available at module terminal block. iii) Module fuse is intact. iv) Check that power is available at terminal 6 on programmer plug (using wiring diagram for intermediate components).
Step e1	"LOCKOUT" lamp on but fan does not start.	v) Check electrical power available at fan connections.
Step e1	Fan starts but "LOCKOUT" lamp does not come on.	vi) Check as iv) above. vii) Check neon indicator is not faulty. (Note: Neon is switched on neutral side, so test voltage across neon terminals).
Step e2	"LOCKOUT" lamp does not go off.	viii) If step e1 satisfactory, replace programmer.
Step e2	"GAS ON" lamp does not come on and solenoid valve does not energise.	ix) Check wiring in programmer plug. x) If checks up to ix) are satisfactory, replace programmer.
Step e2	"GAS ON" lamp on but solenoid does not energise.	xi) Check electrical power at programmer terminal 2. xii) Check neutral connection at programmer plug.
Step e2	Spark does not come on.	xiii) If checks up to xii) are satisfactory, replace programmer.
Step e3	Any malfunction of this step.	xiv) Replace programmer.

Provided all steps up to e3 have been completed successfully, the gas to the module can be turned on and the following actions taken:

f) Turn off "ON/OFF" switch at each module.

g) Establish water flow through the module.

h) Turn control thermostat to position marked 1.

i) Switch on electrical supply at external isolator.

j) Turn on module "ON/OFF" switch. The following sequence should then occur.

1) "LOCKOUT" lamp on and fan starts. Pre-purge period of approximately 22 seconds.

2) "GAS ON" lamp on, "LOCKOUT" lamp off, gas solenoid energises and spark on. Ignition period of approx. 2 seconds. If the burner ignites successfully it is good practice at this stage to proceed with a soundness check (soap test) on the gas pipework between the gas solenoid valve and proportionator outlet (include pressure tapping points and proportionator impulse pipe connections). Take great care not to allow soapy water on or near any electrical parts or connections.

3) Water heats up and satisfies control thermostat. Both lamps off, gas solenoid de-energises, fan stops.

4) Water cools and control thermostat cuts back in, module re-cycles from step j1.

If the above sequence fails after step j2 and the module locks out, attempt three re-starts from 'g'. If these fail, then fault find as follows:

Turn off gas, remove ignitor assembly from module, re-run sequence and observe spark. Replace ignitor assembly as required. Place micro-ammeter in series with flame probe, turn on gas supply and re-run sequence. Observe flame probe current during ignition, correct signal is 8 to 12 μA. Inspect and replace probe as required.

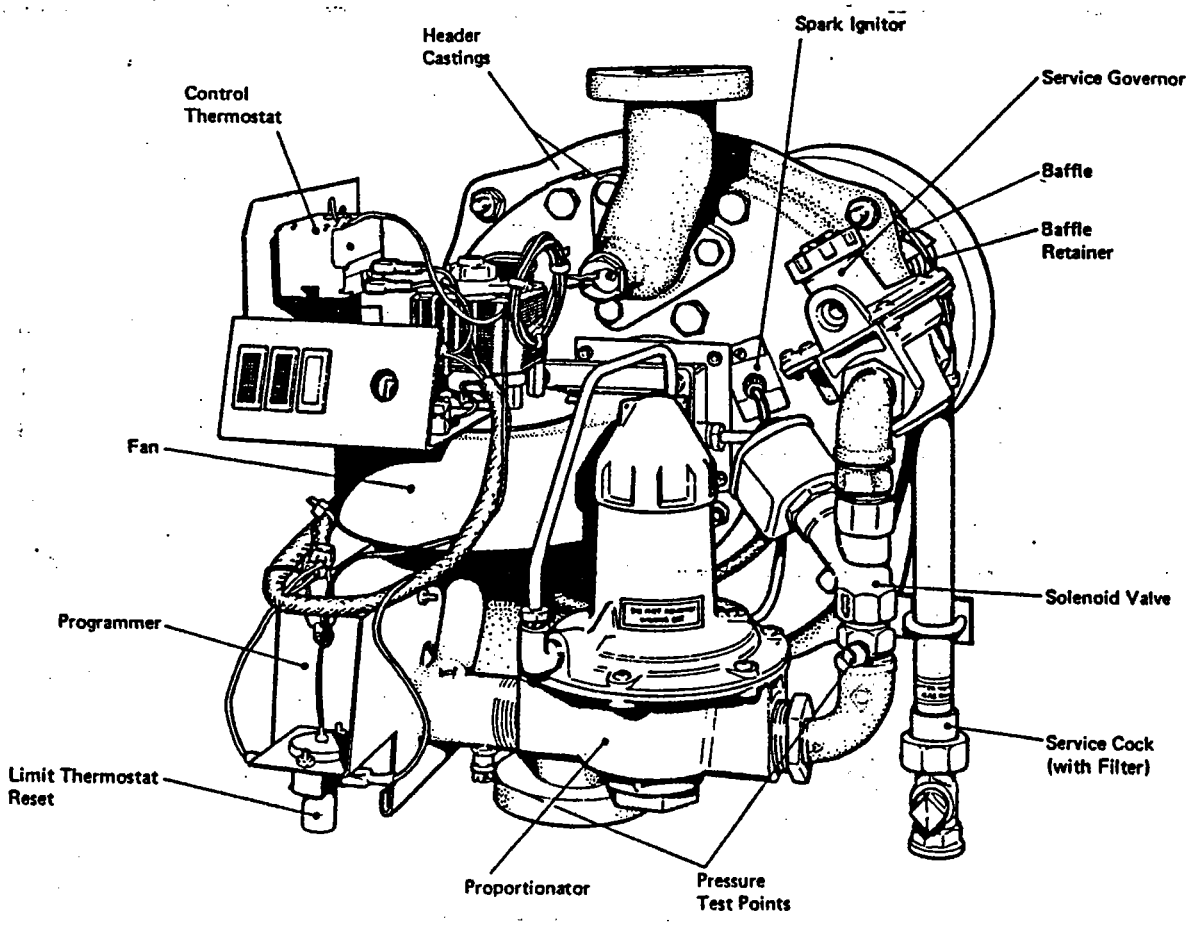


Fig. 6. Illustration of a Module

11.5 Gas Pressure Adjustment

The gas pressure can now be checked whilst the module is firing. The module should be allowed to fire for half an hour before measuring and setting pressures.

The proportionator is works set and sealed and should not be adjusted.

The appliance governor (first stage governor) is works set but may be adjusted to give optimum site conditions.

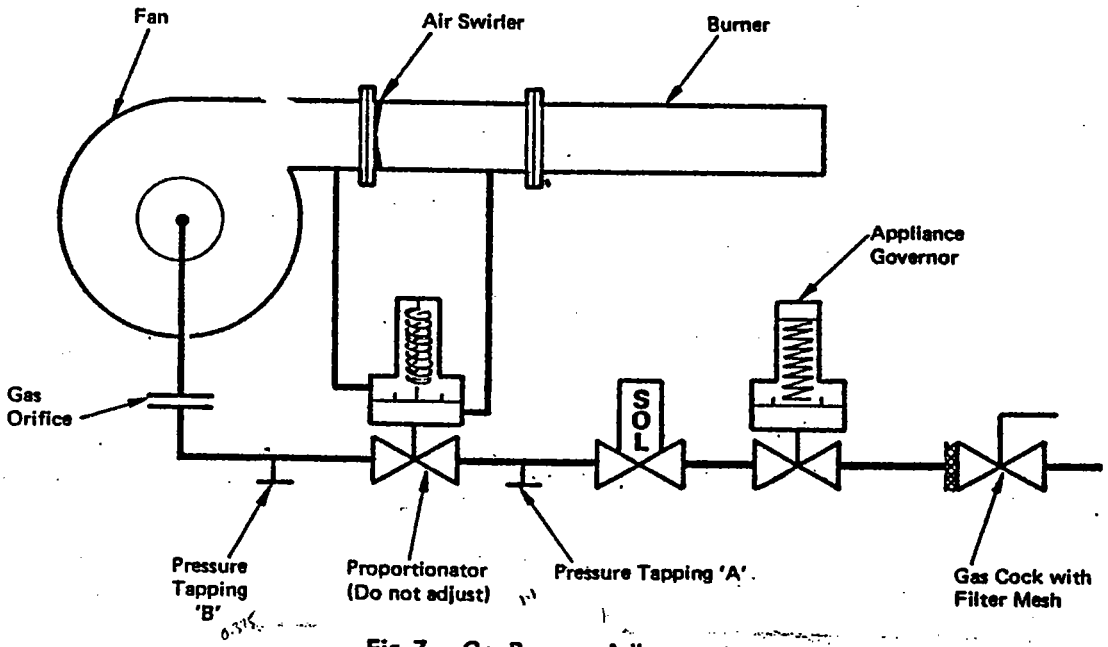


Fig. 7. Gas Pressure Adjustment

The gas pressure downstream of the proportionator (tapping 'B') should be set to 0.93 m.bar (0.375 in. w.g.) by adjustment of the appliance governor. A check reading of 2.74 m.bar (1.1 in. w.g.) should be observed upstream of the proportionator (tapping 'A'). The reading at point 'B' is the more important and should always be used when setting the pressure. If the check reading at point 'A' exceeds 3.50 m.bar (1.4 in. w.g.) or is less than 2.00 m.bar (0.8 in. w.g.), the module must be shut down and a Hamworthy Service person called.

NOTE: It is advisable to make a combustion check at initial commissioning and also if there are any reasons to suspect combustion performance or if any adjustment has been made to the appliance governors.

Flue gas sampling points are provided on the battery casing front above each module, these are sealed with a rubber bung for normal operation.

To check combustion take a flue gas sample from the sampling point above each module in turn.

For North Sea natural gas only:

For each module:

Normal CO_2 = 9 – 10% (By volume)
(or O_2 = 3.5 – 5% (By volume)

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

All for dry gas sample.

11.6 Limit Thermostat Check

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

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 module cover by unscrewing the central pozidrive retaining screw and withdrawing cover from the two corner locating pins.

13.2.2 Remove fan/mixing chamber and control 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 assembly by unscrewing the two M4 cheese head screws.

d) Remove flame probe by unscrewing the M3 screw securing it to the front header casting.

e) Release ½ in. union nut connecting gas service cock to module pipework.

f) Release gas pipe steadying 'U' bolt, located just above gas service cock, by slackening the two M6 nuts and undoing the M10 nut (module/casing stud). Swing pipe clamp off the stud.

g) Withdraw thermostat bulbs from pocket.

h) Unscrew the four M5 "Allen" socket screws securing the complete assembly to the front header casting, and withdraw assembly from the module.

i) The burner can now also be withdrawn from the module by first 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, and tap firmly, flange downwards, on a wooden block to eject particles of dust and debris. 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.

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

a) Disconnect fan motor leads at insulated "in line" spade connectors, and motor earth cable from terminal on control box end. Withdraw the 8 pin plug from rear of sequence control box and disconnect wiring loom from overheat stat (yellow and violet leads) located at the front of the sequence control box.

b) Remove red plastic cap securing solenoid enclosure of main electromagnetic gas valve and withdraw solenoid and enclosure etc.

c) Remove three 'posidrive' screws holding fan motor plate and thermostat/indication lamp bracket to fan casing, remove bracket and wiring loom complete with solenoid enclosure. Gently withdraw fan taking care not to damage rubber gasket. The fan motor bearings are sealed for life and do not require lubrication.

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

e) Gently brush both sides of the swirler - (located between fan discharge flange and extension duct) - to remove any dust accumulation.

NOTE: 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.

f) Remove both impulse lines - i.e. proportionator/fan and proportionator/extension duct. Blow through both to check clear. Blow through their respective connections each side of swirler. Do not blow through connections on proportionator.

g) Re-assemble fan/mixing chamber etc. by reversing the above procedure.

13.2.5 Gently lift filter gauze from gas cock and lightly brush off or blow away any dust and debris, replace immediately.

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

13.2.7 Check flame probe, for signs of oxidation or bending. Renew if required. Length of metal rod should be 51 mm. (2 in.) minimum.

13.2.8 Re-assemble fan/mixing chamber and controls assembly to module in reverse procedure to that given in paragraph 13.2.2. Check rectangular cork gasket for serviceability and renew if required. Use colour code given on wiring diagram (inside controls casing) to facilitate reconnection of electrical leads.

13.2.9 Replace module cover and tighten retaining screw.

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

13.3 Two Year Service

13.3.1 Repeat annual service as previously described in paragraphs 13.2.1 to 13.2.7 inclusive, but do not re-assemble any items to the boiler modules. If boiler is a 2 x 50 or 3 x 50 battery either (a) turn off main gas supply to boiler, undo 1 in. gas union and remove gas manifold, or (b) temporarily support gas manifold.

13.3.2 a) Isolate the single boiler/battery from the flow and return water pipes and drain down. Each module holds approximately 4 litres (0.9 gal.) of water.

b) Undo and remove the four M8 bolts and nuts securing the module flow and return flanges to respective headers and break the seal. If boiler is a 2 x 50 or 3 x 50 battery, undo flange bolts holding return and flow headers to respective pipework and remove headers.

c) Undo the four M10 nuts/studs securing the module to the battery casing and withdraw the module sliding it out on the internal runners.

NOTE: Each module weighs approximately 45 kg. (100 lb.).

d) Take module to bench and stretch off stainless coil spring baffle retainers.

e) The 16 stainless steel baffle plates will now come off easily and expose the finned tube bank. Wire brush both sides of baffles to remove any deposit.

f) Thoroughly wire brush finned tubes until clean.

13.3.3 Re-assemble module generally in reverse procedure to above, clean flanges and renew flange gaskets, renew ceramic rope seal - (module casing). To re-assemble baffles stretch coil spring retainer over tube bank then slip in baffles one at a time. Two baffles have pressed locating dimples. Ensure these baffles are positioned opposite one another around the tube bank to locate the retainers. When all baffles are in position stretch the second retainer over the assembly and locate between dimples.

When module is re-assembled in casing refit other items, i.e. ignition electrode assembly, flame probe, filter mesh, and fan/mixing chamber and controls etc., in accordance with procedure for annual service. Continue with final items of annual service, viz. 13.2.9 and 13.2.10.

13.4 **Four Year Service (and every subsequent four years)**

13.4.1 Repeat two year service procedure as described in paragraphs 13.3.1 and 13.3.2.

13.4.2 With module on bench:

a) Remove the 12 M10 bolts securing the inner cover plate to the inner tube plate and separate the plates.

b) Remove the 12 M10 bolts securing the front header plate to the outer 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 manufacturer's instructions for solution strength, method of application, safety and handling precautions.

13.4.3 Clean up mating surfaces and re-assemble covers to tube plates with new gaskets lightly greased before assembly. Torque M10 bolts down evenly to 5.5 kg.m. (40 lb.ft.).

13.4.4 It is good practice to dismantle and check the proportionator every four years. This is a job for an expert and should only be tackled by a Hamworthy appointed person or someone similarly experienced with the J 48 series governors. When due, this check is best done after step (e) in paragraph 13.2.4 (annual service).

a) Undo the three M4 pan head screws inside the fan volute securing the fan assembly to the gas feed pipe spider. Remove fan casing. This allows easy access to the proportionator which can be dismantled still assembled in the gas train.

NOTE: Recommissioning will be simplified if the adjuster locking nut positions are counted off in threads or turns before dismantling.

b) Examine the diaphragms for cracks or punctures and the valve 'bob' seals for deterioration or dirt. Clean and renew as necessary, also clean valve seat. Re-assemble ensuring the adjuster locking nuts are replaced to their original positions.

c) Replace fan casing and tighten 3 M4 screws.

d) Proceed with step (f) paragraph 13.2.4.

13.4.5 Continue with re-assembly according to paragraph 13.3.3 concluding with final items of annual service, viz. 13.2.9 and 13.2.10.

13.4.6 When the module is firing the gas pressure must be checked in accordance with paragraph 11.5 (Commissioning and Testing Section).

It may be necessary to adjust the proportionator, to do this remove sealing cap and slacken the two locking nuts on the slotted adjusting screw. **Do not attempt to turn the adjusting screw.** Hold the screw stationary with a screw driver and turn the nuts up or down the screw using a spanner.

Screwing the nuts down the adjuster reduces the gas pressure at pressure tapping 'B', and increases the gas pressure at pressure tapping 'A'. The gas flow to the module is reduced. Screwing the nuts up the adjuster increases the gas pressure at tapping 'B' and reduces the gas pressure at tapping 'A'. The gas flow to the module is increased. Adjust nuts to give correct pressure in conjunction with adjustment of service governor if necessary.

Tighten locknuts together at correct setting and replace proportionator sealing cap. Recheck pressures.

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:

WARNING: ISOLATE THE ELECTRICAL SUPPLY TO THE SINGLE BOILER/BATTERY AND TURN OFF THE GAS SUPPLY BEFORE REMOVING BURNER COVER AND COMMENCING ANY SERVICING OR COMPONENT EXCHANGE PROCEDURE.

1. Spark Electrode Renewal. (Hamworthy Part No: 363801500)

The electrode assembly is situated to the right of the fan extension duct. screwed to the front header casting.

Pull off the H.T. lead. remove the two M4 cheese head screws and withdraw complete spark assembly. The assembly may be renewed complete or as two separate items. i.e. (a) insulated electrode or (b) ground electrode/mounting flange. as required. Check spark gap is set at 4 mm. ($\frac{5}{32}$ in.) before fitting to boiler.

2. Flame Probe Renewal. (Hamworthy Part No: 333801192)

The flame proving probe is situated to the left of the fan extension duct on the front header casting. Pull off flame signal lead and undo M3 'Pozidrive' screw, withdraw the probe. Check metal rod of new probe for straightness and length (13.2.7) before fitting to boiler.

3. Fan Motor Renewal. (Hamworthy Part No: 339006689)

Disconnect motor earth lead from screw on front end of sequence control box, and disconnect motor leads at insulated "in-line" connectors. Remove the three 'pozidrive' screws holding the fan motor plate and thermostat/indicator lamp fascia etc., to the fan casing. Place the fascia to one side ensuring no excessive strain is put on any wiring connections or thermostat capillary. Withdraw the fan gently taking care not to damage rubber gasket. Slacken the impeller retaining grubscrew and remove the impeller from the motor shaft. Undo the three 'posidrive' screws exposed by the impeller removal and take off the motor mounting plate. This together with the impeller can now be fitted to the new motor, position the impeller to give a 6 mm. ($\frac{1}{4}$ in.) gap between motor plate and impeller backplate. Reverse the remainder of the above procedure for re-assembly.

4. Solenoid Valve Renewal. (Hamworthy Part No. 747441761) (Coil only).

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

Pull octal plug from its socket in the rear of the sequence controller. Remove the plug cover by undoing the two corner screws. slacken the cable clamp and release the solenoid leads: earth (green/yellow) terminal 1. (centre).. and black leads from terminals 2 and 7. Remove the solenoid leads and P.V.C. sleeving from the plug. Remove the red plastic cap securing the solenoid enclosure on the gas valve and withdraw solenoid and enclosure etc. Remove the coil/yoke assembly (noting the coil orientation) and withdraw the black leads from the P.V.C. sleeving. The earth (green/yellow) lead must remain in the sleeving.

Trim the flying leads on the new coil to length identical to the old coil (allow for stripping) and place the new coil into original yoke with original location bushes. Thread the two black leads into the enclosure grommet and through the sleeving. Orientate the coil/yoke assembly in the enclosure as the original.

Replace solenoid enclosure etc. on to the gas valve and replace the red cap. Reconnect the sleeving and coil leads into octal plug. the black leads are interchangeable but ensure one black accompanies blue wire in plug into terminal 7 and the other black accompanies pink in plug into terminal 2. Reconnect both earth (green/yellow) wires into centre terminal no: 1. Replace plug cover. Replace plug into sequence controller.

5. Control Thermostat Renewal. (Hamworthy Part No: 339006531)

Loosen the capillary retaining plate on the thermostat pocket. withdraw both capillaries and separate them. Remove the grey and violet coloured leads at the "push-on" terminals on the thermostat body. Pull off the control knob and undo bulkhead nut and washer.

Fit the new thermostat in reverse procedure ensuring that the capillary connection is at the top.

6. Limit Thermostat Renewal. (Hamworthy Part No: 339006549)

Loosen the capillary retaining plate on the thermostat pocket. withdraw both capillaries and separate them. Remove the violet and yellow coloured leads at the "push-on" terminals on the underside of the thermostat. Undo the two M4 pan head screws and remove thermostat. it may be necessary to "wind" the capillary through the bracket mounting hole. Reverse the above procedure for fitting the new thermostat.

7. Sequence Controller Renewal. (Hamworthy Part No: 339006572).

The sequence controller can be removed complete. Undo the nut on the earth screw on the front end of the sequence controller and remove both earth leads. Pull the octal plug from its socket in the rear of the controller also pull the H.T. connector from the spark electrode. Undo both M3 pan head screws holding upper flange of controller and lift the controller slightly to clear the folded slot. Unscrew the insulated body from the metal part of the H.T. connector to remove from cable. Refit the connector to the H.T. lead on the new controller.

Fit the new controller to boiler in reverse procedure to above.

8. Neons and On/Off Switch Renewal

Item	**Hamworthy Part Numbers**
Green neon lamp	339006606
Red neon lamp	339006592
On/off switch	339006648

Pull off the electrical leads to the appropriate item.

Release switch or lamp from mounting fascia by pressing in the plastic retaining lugs at the top and bottom. (Holes are provided in the underside of fascia bracket to facilitate releasing the lugs). Pull switch or lamp out frontwards. Push in new item until lugs lock in position and reconnect leads.

HAMWORTHY WESSEX 3 x 50

Battery Serial No.
Heat Input 178.5 kW (609 000 Btu/hr)
Heat Output 150 kW (511 800 Btu/hr)
For each Module
Gas Orifice Size 12 mm (0.472 in.)
Gas Nozzle Press. 0.96 m.b. (0.385 in. w.g.)
Gas Press. Before Proportionator 2.74 m.b. (1.10 in. w.g.)
Air Swirler Type AS50/B
Air Diff. Press. Across Swirler 1.86 m.b. (0.75 in. w.g.)
Max Working Head 60m (200 ft.)

Elect. Supply 240 volts 1 ph. 50 hz 600 watts max.
Fuse Externally at 5 amps.

British Gas Approved
G.C. No. 41/351/12 Cat. 1N

N

HAMWORTHY ENG. LTD. HEATING DEPT.,
FLEETS CORNER, POOLE, DORSET.

HAMWORTHY WESSEX 2 x 50

Battery Serial No.
Heat Input 119 kW (406 000 Btu/hr)
Heat Output 100 kW (341 200 Btu/hr)
For Each Module
Gas Orifice Size 12 mm (0.472 in.)
Gas Nozzle Press. 0.96 m.b. (0.385 in. w.g.)
Gas Press. Before Proportionator 2.74 m.b. (1.10 in. w.g.)
Air Swirler Type AS50/B
Air Diff. Press. Across Swirler 1.86 m.b. (0.75 in. w.g.)
Max Working Head 60m (200 ft.)

Elect. Supply 240 volts 1 ph. 50 hz 400 watts max.
Fuse Externally at 5 amps.

British Gas Approved
G.C. No. 41/351/11 Cat. 1N

N

HAMWORTHY ENG. LTD. HEATING DEPT.,
FLEETS CORNER, POOLE, DORSET.

HAMWORTHY WESSEX 1 x 50

Battery Serial No.
Heat Input 59.5 kW (203 000 Btu/hr)
Heat Output 50 kW (170 600 Btu/hr)

Gas Orifice Size 12 mm (0.472 in.)
Gas Nozzle Press. 0.96 m.b. (0.385 in. w.g.)
Gas Press. Before Proportionator 2.74 m.b. (1.10 in. w.g.)
Air Swirler Type AS50/B
Air Diff. Press. Across Swirler 1.86 m.b. (0.75 in. w.g.)
Max Working Head 60m (200 ft.)

Elect. Supply 240 volts 1 ph. 50 hz 200 watts max.
Fuse Externally at 5 amps.

British Gas Approved
G.C. No. 41/351/10 Cat. 1N

N

HAMWORTHY ENG. LTD. HEATING DEPT.,
FLEETS CORNER, POOLE, DORSET.

On top of boiler casing

On fan inside of cover

Module Ser. No.	N	Motor Type L9—24—130 Volts 240. 1 ph. 50 hz. 120 watts Class E Insulation ROTATION ⇨
Limit stat. type LM5 pre-set 90°C Control stat. type C26 range 57—85°C Programmer type C8855 Ignition time 2 secs. Pre-purge time 22 secs.	Gas orif. size — 12mm Air swirl. type AS50/B	
WIRING DIAGRAM REF: WD50/A INSIDE COVER		APPLIANCE MUST BE EARTHED

ISOLATE BEFORE REMOVING COVER

GAS ON | LOCKOUT | OFF — ON

Reset limit thermostat through bottom of cover with a finger. ⇩

TO RUN BOILER
Ensure water is circulating through the boiler
Ensure electricity supply and gas are turned on.
Put boiler switch to on.
Normal sequence:
1. Lock-out lamp on for 22 secs.
2. Gas-on lamp on, lock-out lamp off.
3. Internal control thermostat satisfied, both lamps off.
4. Internal control thermostat makes, revert to step 1.

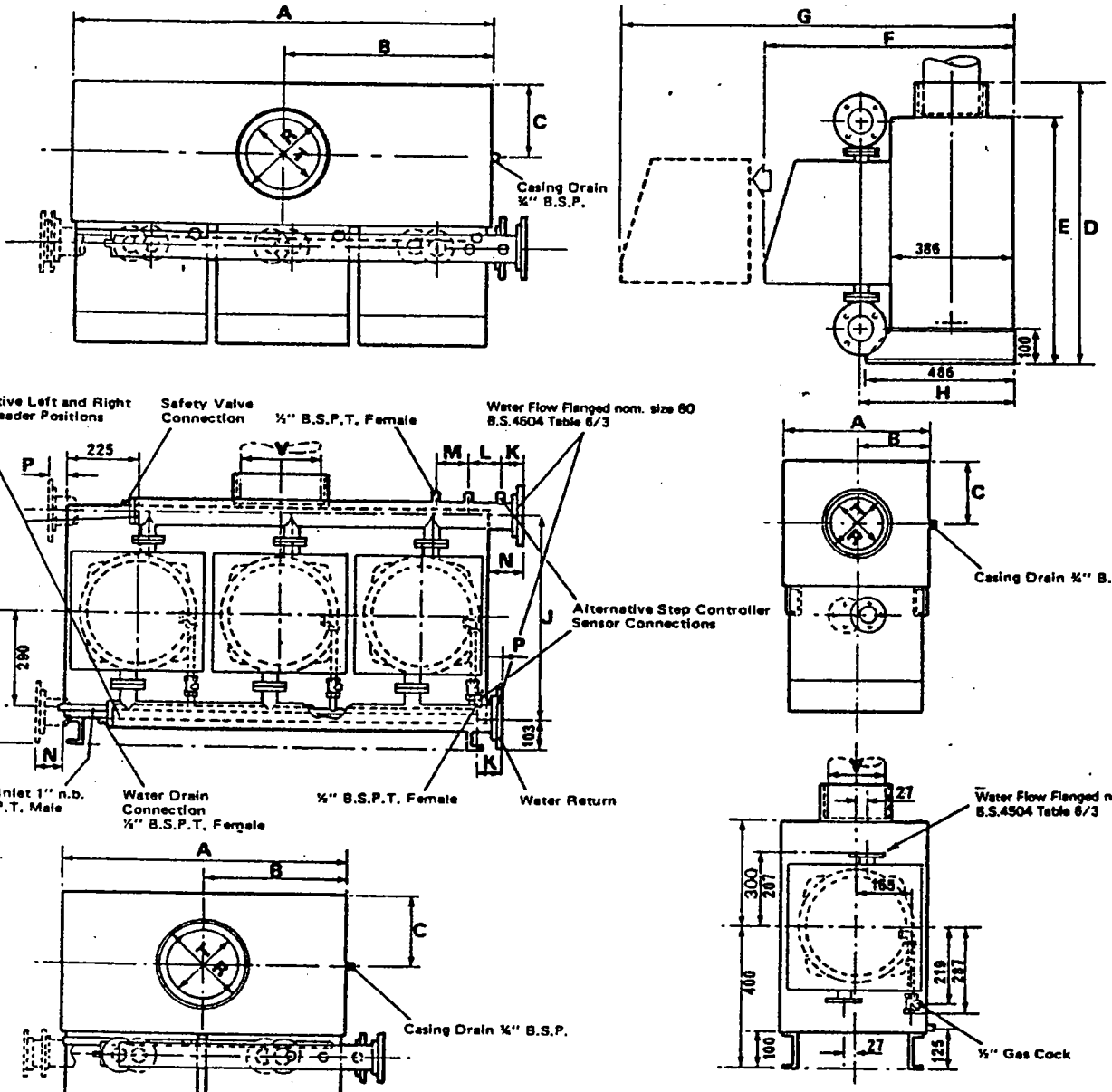
FAULTS
1. Water cold and lock-out lamp does not come on.
   Check electrical supply is on.
   Check water is circulating.
   Press limit thermostat re-set button.
2. Lock-out lamp on continuously.
   Put boiler switch to OFF, wait 5 secs., put switch to ON.

If faults repeat call competent service person.

Hamworthy
WESSEX

Front of cover

Fig. 8. Labels



Title: WESSEX BOILERS

All Dimensions in Millimetres

IDENT	DESCRIPTION	WESSEX 1x50	WESSEX 2x50	WESSEX 3x50
A	Overall length of Case	450	800	1200
B	Chimney c/line position	225	400	600
C	Chimney c/line position	178	178	178
D	Height of WESSEX Chimney from Base	789	802	802
E	Height of Top of Case from Base	700	700	700
F	Overall Dimension of Case (Front-Back)	716	716	716
G	Space required for removal of Front Case	1100	1100	1100
H	C/line dimension of Return/Flow Header	489	489	489
J	C/line dimension of Return/Flow Header	594	594	594
K	Dimension of Controller Gauge Connection		78	78
L	Position of Pressure Gauge Connection		100	100
M	Position of Temperature Connection		100	100
N	Dimension of Flange Face from Face of Case		107	107
P	Dimension of Flange Face from Face of Case		53	53
R	Inside dimension of Chimney Spigot	184	238	288
T	Inside dimension of Chimney Land	150	200	250
V	Outside dimension of Chimney	168	218	268
	Empty	85 kg	165 kg	240 kg
	Full	90 kg	175 kg	255 kg

Fig. 9. Arrangement Drawing