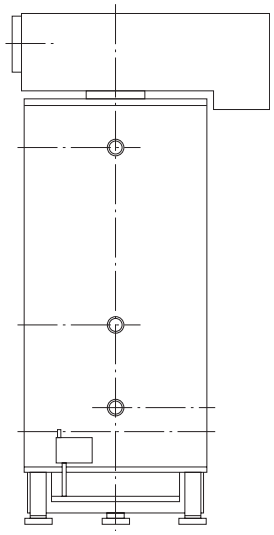

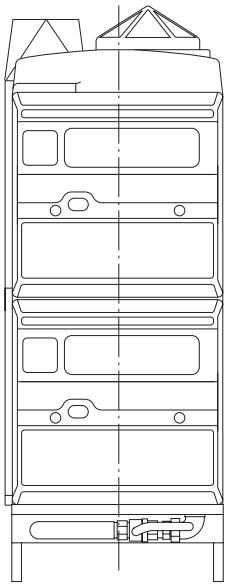

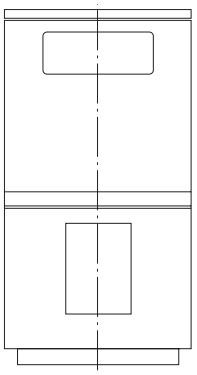

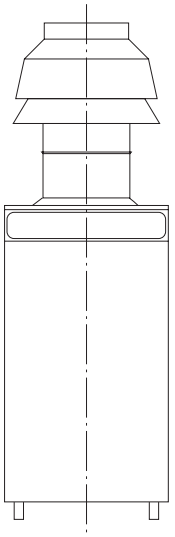

Purewell Series Boilers

Cast Iron, Atmospheric, Modular Boilers with Automatic Ignition for Heating and Domestic Hot Water Installations

Installation, Commissioning and Servicing Instructions

CLASSIC MODELS
40, 50, 60, 70, 80, 95, 105, 120 kW
INTEGRA MODELS
40, 70 & 100 kW

NATURAL GAS I_{2H}
LPG-PROPANE I_{3P}

IMPORTANT NOTE

THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT

Hamworthy
HEATING & HOT WATER PRODUCTS

Customer Services

Technical Enquiries **01202 662527/662528**

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

Site Assembly **01202 662555**

Hamworthy offer a service of site assembly for many of our products in instances where plant room area is restricted. Using our trained staff we offer a higher quality of build and assurance of a boiler built and tested by the manufacturer.

Commissioning **01202 662555**

Commissioning of equipment by our own engineers, accredited agents or specialist sub – contractors will ensure the equipment is operating safely and efficiently.

Maintenance Agreements **01202 662555**

Regular routine servicing of equipment by Hamworthy service engineers inspects the safety and integrity of the plant, reducing the risk of failure and improving performance and efficiency. Maintenance agreements enable our customers to plan and budget more efficiently.

Breakdown service, repair, replacement **01202 662555**

Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents throughout the UK.

Spare Parts **01202 662525**

A comprehensive spare parts service is operated from our factory in Poole, providing replacement parts for both current and discontinued products. Delivery of parts and components is normally from stock within seven days. However, a next day delivery service is available for breakdowns and emergencies.

Purewell Series Boilers

Cast Iron, Atmospheric, Modular Boilers with Automatic Ignition for Heating and Domestic Hot Water Installations

Installation, Commissioning and Servicing Instructions

CLASSIC MODELS
40, 50, 60, 70, 80, 95, 105, 120 kW
INTEGRA MODELS
40, 70 & 100 kW

NATURAL GAS I_{2H}
LPG-PROPANE I_{3P}

NOTE: THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE INSTALLING, COMMISSIONING, OPERATING OR SERVICING EQUIPMENT.

THE PUREWELL BOILER IS INTENDED FOR USE AS A COMMERCIAL APPLIANCE AND IS NOT CERTIFIED FOR USE IN DOMESTIC APPLICATIONS OR HABITABLE AREAS.

THIS BOILER IS FOR USE ON GROUP H NATURAL GAS (2ND FAMILY) I_{2H} OR LPG-PROPANE (3RD FAMILY) I_{3P}. PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT IS FOUND RELATING TO SPECIFIC GAS TO BE FIRED BEFORE FIRING BOILER.

THIS BOILER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.
EC TYPE CERTIFICATE Nos. (GAD) BG/EC-87/93/20, (BED) BE-87/97/34.
PRODUCT IDENTIFICATION No. 87AO20.

PUBLICATION NO. 500001089
ISSUE 'F'
March 2005

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1.0 INTRODUCTION

1.1 A competent person holding 'CORGI' registration or equivalent must install this boiler. All installations **MUST** conform to the relevant Gas Safety and Building Regulations. Health & Safety requirements must also be taken into account when installing any equipment. Failure to comply with the above may lead to Prosecution.

1.2 These instructions are for Group H Natural Gas (2nd Family) and LPG-Propane (3rd Family). The information relative to propane firing is to be found in Appendix 'A' (p37). Boilers **MUST NOT** use gas other than that for which they were designed and made.

1.3 The Purewell is an atmospheric, gas fired boiler manufactured from horizontal cast iron sections, nippled at alternate ends. These sections are mounted on a fabricated mild steel basket assembly, which houses the burner bar and igniter assemblies. A unique radiant baffle is fitted beneath the burner bars, protecting the floor below by reducing heat lost from the boiler.

The **'Classic'** version of the Purewell boiler is designed to be connected to the flue via a specifically designed draught diverter which incorporates a High / Low Damper in the primary flue duct. This damper **MUST** be fitted into the spigot on top of the heat exchanger as supplied. **NO** modification or variance is permitted as this may change operational characteristics. Flue outlets from more than one boiler may be connected together to form a header.

'**Integra'** versions have an in-built draught diverter and can therefore be connected direct to a header assembly via a suitable flue pipe.

1.4 If the boiler is to be connected to an un-vented (pressurised) heating system, care must be taken to ensure all extra safety requirements are met and that the relevant interlocks will shut down the boiler (s) should a high or low pressure fault occur.

The pressurisation unit must also incorporate a low level water switch, which protects the water pumps, and will directly or indirectly shut down the boiler plant should a low water condition occur.

Consideration should also be given to the maximum working pressure of the boiler as given in **Section 2:TECHNICAL DATA** (p5). Consult Hamworthy Heating Technical Department for help or assistance if in doubt.

1.5 The Purewell boiler is not suitable for direct connection to domestic hot water supplies or gravity fed heating systems.

1.6 The Purewell boiler can be installed with either reverse return water flow layout (optional kits available) or with single pipe header layout (non HHL supply). See Figure 1.1 (p2) for typical schematic layout.

1.7 It is good practice in all heating installations to use some form of water treatment to reduce formation of lime scale and black iron oxide sludge. The high efficiencies produced by the Purewell Boiler can easily be reduced by lime scale formation. If a pressurised unit is used, it is prudent to include an hours run meter to give an indication of pump running time and hence raw water make-up. Any leaks should be attended to as soon as possible to avoid calcium salt build up within the boiler's waterways.

1.8 Options

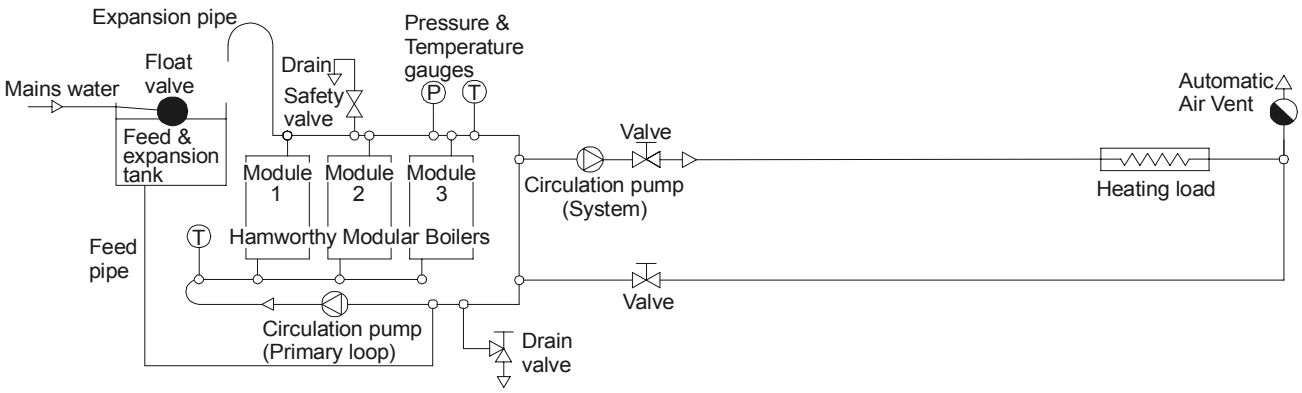
1.8.1 Optional reverse return header kits, comprising a pre-designed arrangement of components, are available for modular installations of all Purewell boiler models. Please contact Hamworthy Heating for information.

1.8.2 Milton boiler sequence control system for timed remote control of single and multiple on/off and high/low boilers, with outside temperature compensation and optimum start.

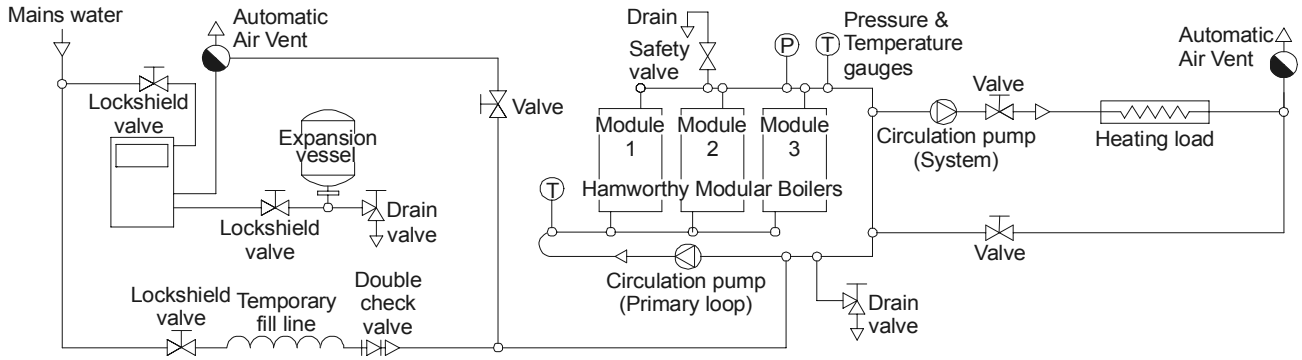
Note: Optional Hamworthy Heating Ltd Sequencing Interface Modules will be required, to be installed within the control panel of each boiler, to enable sequence control of the boilers by the Milton boiler sequence control.

Refer to Milton and Sequence Interface Module kit instructions for details.

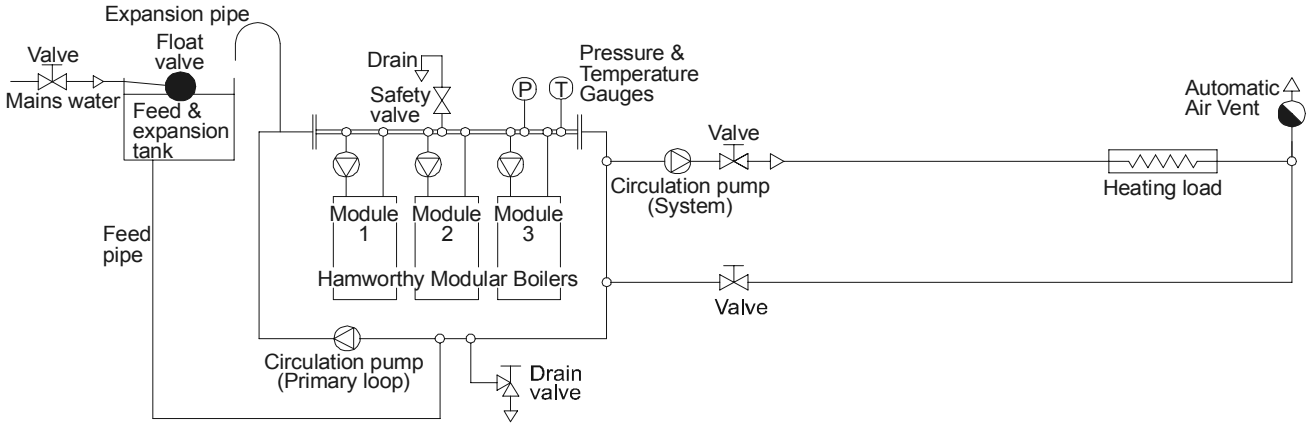
Figure 1.1 Boiler Installation (Typical)



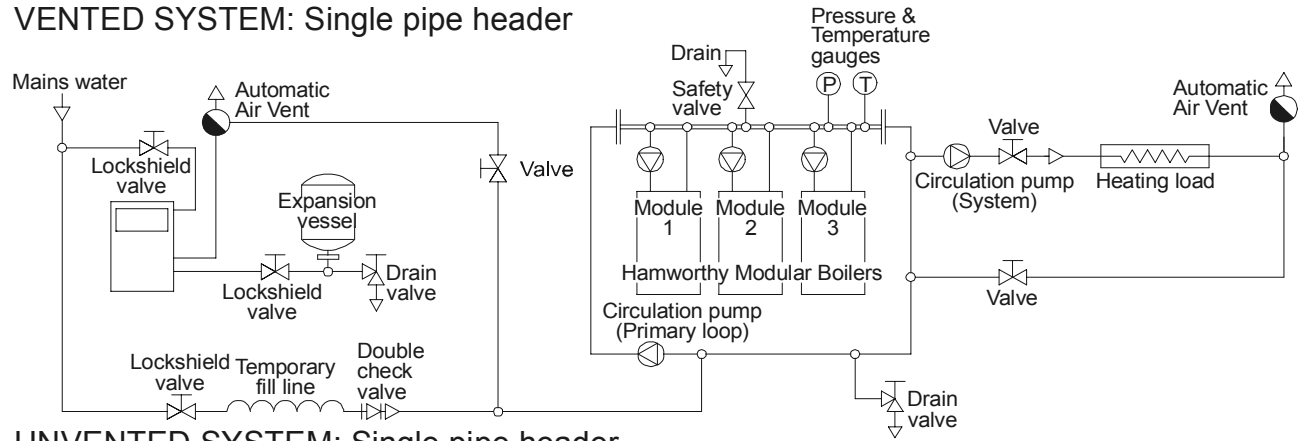
VENTED SYSTEM: Primary loop, Hamworthy recommended system.



UNVENTED SYSTEM: Primary loop, Hamworthy recommended system.



VENTED SYSTEM: Single pipe header



UNVENTED SYSTEM: Single pipe header

Figure 2.1 Boiler Dimensions / Clearances

Note! C = Classic model	40/50	40	60/70/80	70	95/105	100	120
I = Integra model	C	I	C	I	C	I	C
Approx. Dry Weight kg.	235	240	285	290	345	350	400
A - Boiler Height (Casing) mm.	870	1007	870	1195	1060	1195	1060
B - Flue height from floor mm.	1383	1035	1475	1126	1577	1201	1671
C - Flow Connection Height mm.	580	580	667	667	761	761	855
D - Gas Connection Height mm.	769	769	769	769	957	957	957
E - Gas Connection - (BSP.T Male)	R¾	R¾	R¾	R¾	R1	R1	R1
F - Flue Outlet Dia. mm. (Nominal)	206	206	206	206	256	256	256

NOTE! The 533 centres relate to boilers close coupled in modular form. For stand-alone applications a minimum of 150mm should be allowed between casings. (Space baskets 200mm apart).

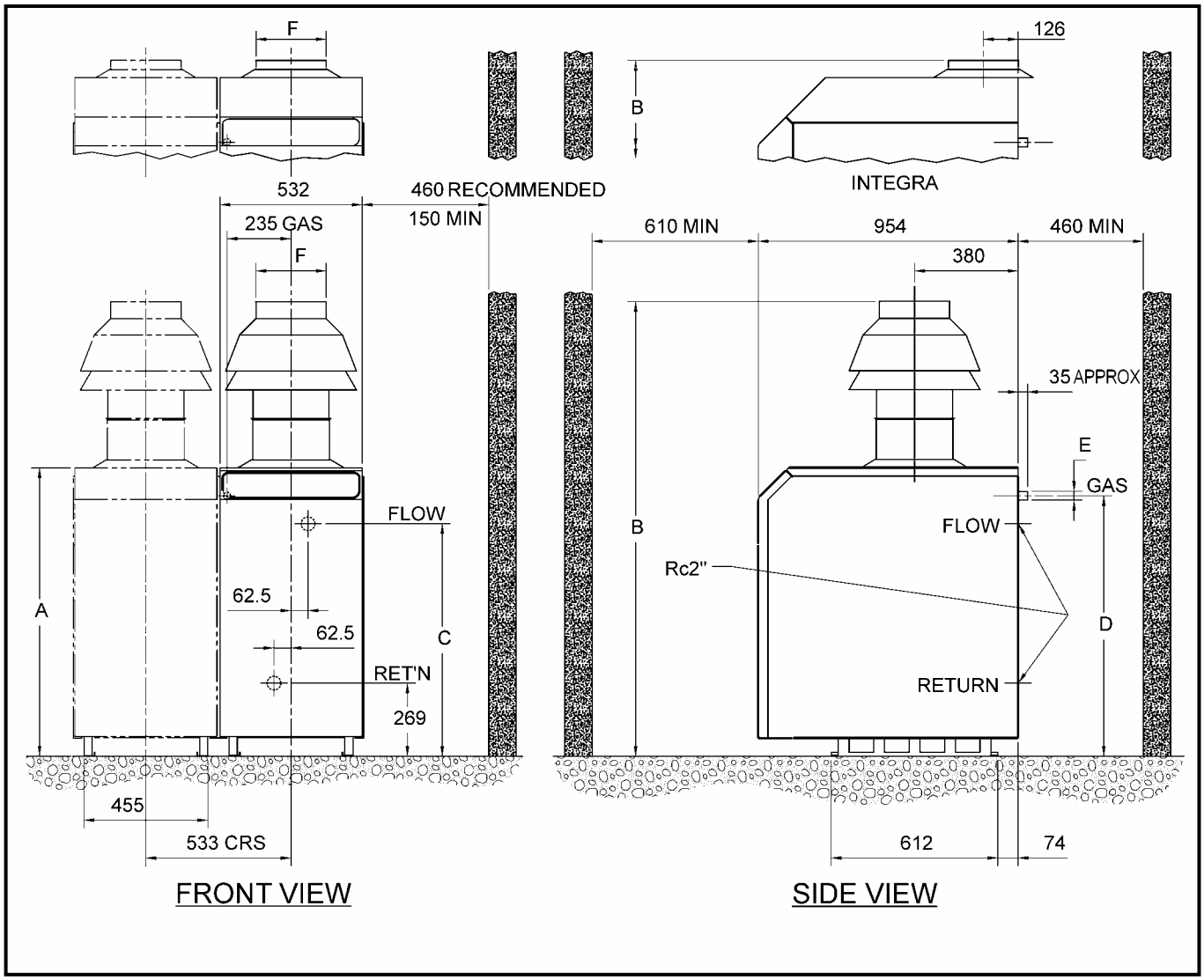


Figure 2.2 Performance and General Data Information

GENERAL DATA	**40**	**50**	**60**	**70**	**80**	**95**	**100**	**105**	**120**
Boiler Input High Fire - kW (Gross)	49.3	63.4	74.5	88.4	101.0	120.0	126.0	132.0	150.0
Boiler Input High Fire - kW (Nett)	44.4	57.1	67.1	79.6	90.9	108.5	113.6	118.8	135.0
Boiler Input Low Fire - kW (Gross)	41.5	39.9	40.5	36.0	39.0	43.0	N/A	47.6	48.0
Boiler Input Low Fire - kW (Nett)	37.4	35.9	36.5	32.4	35.1	38.7	N/A	42.9	43.2
Boiler Output High Fire - kW	40	50	60	70	80	95	100	105	120
Boiler Output Low Fire - kW	32.5	31.4	31.6	29.2	31.6	34.4	N/A	38.0	38.7
FLUE DATA									
Nominal Flue Dia. **Classic** - mm	206	206	206	206	206	256	-	256	256
Nominal Flue Dia. **Integra** - mm	206	-	-	206	-	-	256	-	-
Approx. Flue Gas Temp. - °C	190	200	190	220	230	200	205	215	205
Approx. Flue Gas Volume @ 9.0% CO_2 & 100°C - m^3/h*	73.8	92.4	110.8	129.1	147.3	174.6	184.1	192.9	220.0
GAS DATA									
Gas Inlet Connection	R¾					R1			
Nominal Gas Inlet Pressure - mbar	20								
Maximum Gas Inlet Pressure - mbar	25								
Gas Manifold Pressure High Fire - mbar	13.4	12.5	11.9	11.0	9.5	11.5	10.2	11.2	11.0
Gas Manifold Pressure Low Fire - mbar	9.0	5.0	3.5	2.0	1.5	1.5	1.5	1.5	1.2
Gas Flow Rate High Fire - m^3/h	4.73	5.92	7.10	8.27	9.44	11.19	11.80	12.36	14.10
Injector Marking / Dia. - mm	2.7	3.1	3.4	3.75	4.2	3.9	4.1	4.1	4.4
No. Burner Bars / Injectors	4					5			
WATER DATA									
Water Connections	Flow - Rc2 Return - Rc2								
Maximum Water Pressure - bar g	6								
Water Content - litres	30.0	30.0	37.1	37.1	37.1	44.2	44.2	44.2	51.3
Maximum Flow Rate @ 11°C ΔT Rise - litre/s	0.87	1.08	1.30	1.52	1.74	2.06	2.17	2.28	2.60
Waterside Pressure Loss @ 11°C ΔT Rise - mbar	5.10	7.84	15.69	20.59	26.47	37.25	41.12	50.00	84.31
Design Flow Rate @ 15°C ΔT Rise - litre/s	0.64	0.80	0.95	1.12	1.27	1.51	1.59	1.67	1.91
Waterside Pressure Loss @ 15°C ΔT Rise - mbar	2.75	4.31	8.63	11.57	14.90	22.55	25.00	27.45	47.06
Minimum Flow Rate @ 22°C ΔT Rise - litre/s	0.43	0.54	0.65	0.76	0.87	1.03	1.08	1.14	1.30
Waterside Pressure Loss @ 22°C ΔT Rise - mbar	1.27	2.06	4.12	5.49	7.06	11.76	12.94	13.23	22.55
ELECTRICAL DATA									
Normal Supply Voltage	230V ~ 50Hz								
Power Consumption (maximum) - W	90								
Shunt Pump Output (optional)	230V ~ 50Hz fused @ 2A								

*** NOTE!** Flue gas volumes are based on a gross flue gas temperature of 100°C at 1013mbar. This is considered to be the predicted temperature of the products in the secondary flue downstream of the draught diverter.

2.0 TECHNICAL DATA

2.1 Overall dimensions are shown in Figure 2.1 (p3). Both single and multiple boiler arrangements are shown.

The Purewell boiler can be installed as a single unit or in modular form where a 'multi' casing reduces required floor area. Each boiler has an independent door for access to the controls and other working components.

It is recommended that a maximum of 6 boilers can be positioned on 533mm (21") centres if required. Larger numbers should be split into two or more banks with 150mm (6") between each bank. **NOTE!** When installing modular units on 533mm (21") centres, the casing support rail or spacing plates should be fitted between each boiler before bolting together. See **Section 10.1: General Installation of Boilers** (p15) Ref: - spacing plates for further information.

2.2 General Information and Technical Data relating to Natural Gas is shown in Figure 2.2.

Technical data relating to propane firing can be found in Appendix 'A' (p37).

2.3 Screw threads: All screw threads used in the Purewell boiler conform to the following: -

ISO 7/1 or **ISO 228/1** for pipe threads where applicable.

ISO 262 for all general screw threads.

3.0 GENERAL REQUIREMENTS

3.1 Related Documents.

Gas Safety Installations and Use Regulations 1994, (As amended).

It is law that competent persons in accordance with the above regulations install all gas appliances. 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.

The installation of the boiler **MUST** be in accordance with the relevant requirements of the IEE Regulations and the byelaws of the local water undertaking.

The installation 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 Standards

BS 7074: Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Part 2: Code of practice for low and medium hot water systems.

BS 6891: Installation of low-pressure gas pipework of up to 28mm in domestic premises. (For larger installations see **IGE/UP/1**, **IGE/UP/1A** and **IGE/UP/2**)

BS 6644: Installation of Gas Fired Hot Water Boilers - 60kW to 2MW.

BS 6700: Design, installation, testing and maintenance of services supplying water for domestic use.
BS 6880: Part 1, 2 & 3: Code of practice for low temperature hot water heating systems of output greater than 45kW.

BS EN 60335, Part 1. Safety of Household & Similar Electrical Appliances. **BS 3456, Part 201:** Electrical Standards.

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

I. Gas E. Publications

IGE/UP/1 Soundness testing and purging of industrial and commercial gas installations.

IGE/UP/1A Soundness testing and direct purging of small low pressure industrial and commercial natural gas installations.

IGE/UP/2 Gas installation pipework, boosters and compressors in industrial and commercial premises.

IGE/UP/10 Installation of gas appliances in industrial and commercial premises. Pt. 1 flued appliances.

Health and Safety Executive:-

Guidance note PM5 - Automatically controlled steam and hot water boilers.

CIBSE Publications: - "CIBSE Guide"

It is impractical in this document to specify all relevant information, but the following extracts from the above references are emphasized since failure to comply with these requirements will almost certainly result in an unsatisfactory installation.

3.2 Feed water Quality

If the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in the boiler water passageways. Details of additives can be obtained from any reliable manufacturer of water treatment products or the local water authority. It should be noted however, that even if the boiler water is of average hardness, not

requiring treatment, subsequent draining of the system for repair or constant make-up water due to an undetected leak will cause additional deposits and gradual build-up of scale. It is essential, therefore that leaks are attended to promptly and draining is kept to an absolute minimum.

It is recommended that the system is flushed out at least twice with hot water before any treatment is added. If any doubt exists regarding the internal cleanliness of an old system, consideration should be given to the fitting of a coarse filter in the return pipework to the boilers.

3.3 Adequate Water Flow

The Hamworthy Purewell boiler is designed as a quick response, low water content unit, to run continuously with maximum reliability. Care should be taken in the initial design and layout having due regard for adequate water flow through the boilers and the influence of the system controls.

NOTE! The Standards Authority recommend a minimum return temperature of 50°C in all heating systems other than condensing boilers.

Figure 2.2 (p4) shows recommended and minimum water flows required. The control system and valves, where fitted, should be regulated to avoid lower flows occurring.

The flow corresponding to 22°C temperature rise across the boiler is the minimum recommended flow at any time. For boiler hydraulic resistance see Figure 2.2 (p4).

3.4 Time Clock Control

In order to avoid local overheating and progressive calcium deposition at zero flow conditions where boilers are operated from time clocks, provision should be made for a 5 minute circulating pump over-run after the last boiler has ceased firing.

NOTE! Time clocks should not interrupt live, neutral or earth connections, see **Section 9.0: ELECTRICAL SUPPLY** (p12) for details. See Figure 9.1 (p14) for wiring details.

3.5 Minimum System Pressure

To comply with guidance note **PM5 (Health and Safety Executive)**, the minimum pressure requirements at the boiler are given below as examples: -

1) Single installed boiler running at 82°C flow temperature. Minimum head required is not less than 2 metres or 0.2 bar.
2) Single installed boiler running at 95°C flow temperature. Minimum head required = 5.1 metres or 0.5 bar.
3) Modular boiler installation running at 82°C flow temperature and 11°C rise across system. Minimum head required = 4.3 metres or 0.42 bar.
4) Modular boiler installation running at 82°C flow temperature and 22°C rise across system. Minimum head required = 10.5 metres or 1.03 bar.

See **Section 8.11** (p11) for Pressurised Water Systems.

4.0 LOCATION

4.1 Refer to Figure 2.1 (p3) for dimensions, weights and clearances. 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. This includes any electrical trunking laid along the floor.

Allow adequate space, this should not normally be less than 460mm at the rear, for flow and return connections. Also allow at least 460mm on one side, the other side must be no less than 150mm. Allow 610mm (minimum) in front of the boiler for servicing.

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 to ensure that its temperature does not exceed 65°C.

Further details regarding boiler location are given in **BS 6644**.

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 **BS 6891** or **IGE/UP/2** as appropriate. 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 purged and tested for soundness as described in **BS 6891** or **IGE/UP/1** and **IGE/UP/1A** as appropriate.

See Figure 5.3 (p8) for recommended gas flows in pipes.

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.

5.5 Boiler House Control Valve

A manual valve for boiler house isolation shall be fitted in the gas supply line. It shall be clearly identified and readily accessible for operation, preferably by an exit.

5.6 Boiler Gas System Leak Check

Although the boiler receives a gas leak check and gas train component integrity check prior to leaving the factory, transport and installation may cause disturbance to unions, fittings and gas valve assemblies' etc. During commissioning a further test for soundness should be carried out on the boiler gas pipework and components. A procedure guide is given below. Care must be taken not to allow leak detection fluid on or near any electrical parts or connections (If used). See Figure 5.6 - Gas valve/ pipework leak check test procedure.

Note: - Main gas supply pressure - G20 - 20mbar
- G31 - 37mbar

To Check Valve B

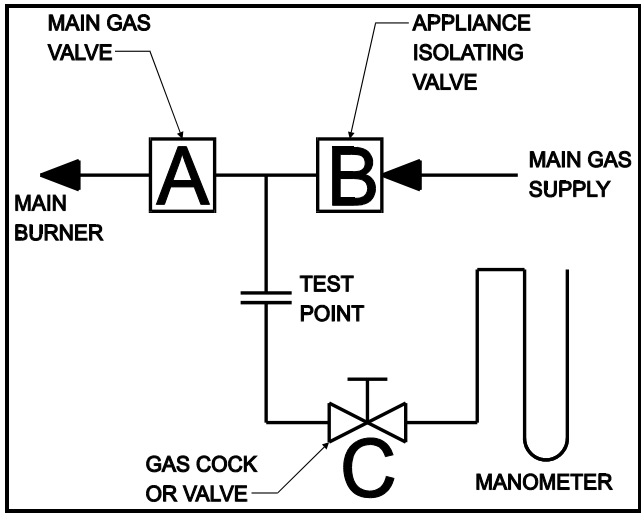
1) Turn off the electrical power and gas to the appliance.
2) Connect the manometer to gas valve test point.
3) With A, B closed open C and monitor manometer over a 2 minute period, a rise indicates a leak on valve B.

To Check Valve A

1) Open C.
2) Open B to produce the main gas supply pressure between A and B.
3) Close B
4) System may be considered sound if over a period of 2 minutes any drop in pressure is less than 0.5 mbar (0.2" wg.).

NOTE: Allow a manometer stabilisation period of approximately 1-minute before each 2 minute check period. Following soundness tests close valve B and remove manometer connections and tighten test points.

Figure 5.6 Gas valve/pipework leak test procedure.



6.0 FLUE SYSTEM

Detailed recommendations for flue systems are given in **BS 6644**, I. Gas E. Publication **IGE/UP/10** "Installation of gas appliances in industrial and commercial premises Pt 1 flued appliances".
The following notes are intended to give general guidance only.

6.1 General Requirements

The Hamworthy Purewell series of boilers are designed to be used with natural draught flues. Flue systems should be designed in accordance with current regulations and with reference to the I. Gas E. publication **IGE/UP/10** "Installation of gas appliances in industrial and commercial premises Pt 1 flued appliances". The following points should be noted: -

1)'Classic' boilers **MUST** have the correct draught diverter and primary flue damper fitted in an unmodified condition before connection to the flue system.

'Integra' boilers **MUST** have the flue hood incorporating the draught diverter, fitted in an unmodified condition before connection to the flue system.

2) The bottom of the flue header should be at least 500 mm above the draught diverter skirt bottom.

3) The flue system must be self-supporting in the correct position to avoid compression of the draught diverter and enable its removal for boiler cleaning.

4) Boilers should be located as near the chimney as possible the nearest being not more than 2m (6ft) away.

5) The flue system should be designed to achieve a negative suction at all times at the draught diverter outlet on all modules in a bank. For optimum performance, draught conditions should be between -0.05 to -0.125 mbar. In the case of a single boiler installation the minimum vertical flue height is 2m above the draught diverter skirt. For multiple boiler installations consult Hamworthy Heating Technical Department. In some instances, mechanical

Figure 5.3 Gas Flow in Pipes

Purewell Boiler Output	Maximum length of gas pipe (Metres)						
NB	20mm	25mm	40mm	50mm	65mm	80mm	100mm
40kW	10	42	-	-	-	-	-
50kW	-	25	180	820	-	-	-
60kW	-	16	120	540	-	-	-
70kW	-	11	85	380	-	-	-
80kW	-	-	62	280	900	-	-
95kW	-	-	42	185	580	-	-
105kW	-	-	33	145	470	-	-
120kW	-	-	25	110	345	-	-
160 (2 x 80kW)	-	-	12	56	180	-	-
190 (2 x 95kW)	-	-	-	38	120	750	-
210 (2 x 105kW)	-	-	-	30	96	600	-
240 (2 x 120kW)	-	-	-	22	72	440	-
285 (3 x 95kW)	-	-	-	15	47	290	-
315 (3 x 105kW)	-	-	-	11	37	235	-
360 (3 x 120kW)	-	-	-	-	27	170	810
380 (4 x 95kW)	-	-	-	-	24	150	730
420 (4 x 105kW)	-	-	-	-	19	115	570
480 (4 x 120kW)	-	-	-	-	14	86	430
525 (5 x 105kW)	-	-	-	-	11	71	340
600 (5 x 120kW)	-	-	-	-	-	51	245
630 (6 x 105kW)	-	-	-	-	-	46	220
720 (6 x 120kW)	-	-	-	-	-	34	165

The above table expresses pipe lengths from gas meter to appliance which will produce approx. 1mbar pressure loss. This table must be used in conjunction with losses of various fittings fitted in the gas line shown below.

Fitting Type(NB)	20mm	25mm	40mm	50mm	65mm	80mm	100mm
Per elbow	0.5m	0.5m	1.0m	1.5m	2.0m	2.5m	3.5m
Per Tee	0.5m	0.5m	1.0m	1.5m	2.0m	2.5m	3.5m
Per 90°Bend	0.3m	0.3m	0.3m	0.5m	0.5m	1.0m	1.5m

For example: - 2 Purewell 120kW Boilers being fed by 65mm NB pipe with 6 elbows between gas meter and boiler header can have a maximum length of 72m - (6 x 2m) = 60 metres run to achieve a 1mbar loss.
Note! Information above is based on IM/16.

assistance may be necessary. The boilers are suitable for connection to a fan diluted flue system, refer to I. Gas E. publication **IGE/UP/10** "Installation of gas appliances in industrial and commercial premises Pt 1 flued appliances".
6) Purewell boilers are suitable for installation in a balanced compartment in accordance with the requirements of **BS 6644.** Consult Hamworthy Heating Technical Department for help or assistance if in doubt.

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 be as shown in Figure 2.2 (p4).

6.3 Flue Condensation

Care should be taken to ensure that the flue is installed in such a way that any condensation produced on start up will drain away naturally.

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

On **'Classic'** models, the draught diverter is designed to enable separation from the primary flue damper such that it can be lifted clear of the boiler to ease disconnection. The flue must be correctly reconnected when servicing is complete ensuring locating bolts are securely fitted. See **Section 13: SERVICING** (p27) for further information.

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.

Where the flue diameter is less than 200mm (8") a terminal must be fitted. Where the flue is of a larger size consideration should be given to the fitting of a flue discharge terminal or grill to stop ingress of birds, etc.

6.7 Surface Temperatures

Combustible materials in the vicinity of the boiler and flue shall not exceed 65°C during boiler operation. The flue shall not be closer than 50mm to any combustible material, except where it passes through such material with a non-combustible sleeve when the air gap may not be less than 25mm.

6.8 Flue System Location

The flue system must not be placed or fitted where there is undue risk of accidental damage to the flue pipe or undue danger to persons in the vicinity.

NOTE! The flue **MUST** be self-supporting. Check that the flue and chimney are clear from any obstruction.

7.0 AIR SUPPLY

Detailed recommendations for air supply are given in **BS 6644**. 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, in addition to that required for any other appliance.

7.1 Air Supply by Natural Ventilation

The boiler room must have, or be provided with, permanent air vents directly to the outside air, at high level and at low level. 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 supplied for boiler house ventilation shall be such that the maximum temperatures within the boiler house shall be as follows:

1) At floor level (or 100mm above) = 25°C.
2) At mid-level (1.5m above floor level) = 32°C.
3) At ceiling level (or 100mm below) = 40°C.

Where both low and high level openings are used, the grilles shall have a total minimum free area of: -

Low Level (inlet): 540cm² plus 4.5cm² per Kilowatt in excess of 60kW total rated input.

High Level (outlet): 270cm² plus 2.25cm² per Kilowatt in excess of 60kW total rated input.

7.2 Air Supply by Mechanical Ventilation

Air supplied to the boiler room by Mechanical means should be as follows: -

1) Mechanical inlet and mechanical extract can be utilised providing design extraction rate does not exceed one third of the design inlet rate.

2) Mechanical extract ventilation with natural inlet ventilation **MUST NOT** be used.

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.

Figure 7.2 Mechanical Ventilation Flow Rates

	Flow rate per 1000kW total rated heat input (Gross)	
Atmospheric Boilers	Inlet air (Combustion ventilation)	Extract air (ventilation)
	m^3/s.	m^3/s.
Volume	1.10	0.45

8.0 WATER CIRCULATION SYSTEM

8.1 General

The Purewell Cast Iron Boiler has a low water content and the requirements of minimum water flow are given in **Section 8.8: Minimum Water Flow Rates** (p11) and Figure 2.2 (p4). Recommendations for the water circulation system are given in **BS 6644** and **CP 342**. The following notes are of particular importance: -

1) 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 75mm (3 in) thick mineral fibre, or its thermal equivalent.

2) 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.

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

4) Each boiler has one Rc2 BS21 flow and one Rc2 BS21 return tapping. Flow and return headers should connect boilers but sufficient length of connecting pipe should be allowed to clear the casing before connecting into the headers. The headers should be connected to the system in a "reverse return" arrangement (the water flow in each header is in the same direction) to ensure equal flow in each module. Figure 1.1 (p2) shows typical layout.

8.2 Pressure Relief Valve (Safety Valve)

Each boiler, or in the case of a modular installations, each bank of boilers, must be fitted with a pressure relief valve to **BS 6759** Part 1 and sized as shown in **BS 6644**.

BS 6644 provides comprehensive information for the selection and location of safety valves and attention is drawn to the higher capacity requirements of safety valves for pressurised hot water systems.

8.3 Open Vent and Cold Feed Pipe

(See **BS 6644** for further information.)

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 minimum bore (mm) of these pipes per installation is as follows: -

The vent pipe must rise continually, it must not be valved except by a design which when closed for maintenance ensures the boiler is open to atmosphere. The pipe shall be protected against freezing where this might occur.

Figure 8.3. Cold Feed and Vent Pipe Sizes

Boiler Output	Feed	Vent
< 60 kW	19	25
60 kW - 150 kW	25	32
150 kW - 300 kW	32	38
300 kW - 600 kW	38	50

8.4 Altitude Gauge (Water Pressure Gauge)

Every boiler or group of boilers should be provided with a gauge complete with isolating cock. See Figure 1.1 (p2) for typical position.

8.5 Thermometer

See Figure 1.1 (p2) for typical position. A thermometer complete with pocket should be fitted in the pipework to indicate water flow temperature.

8.6 Drain Valves

Each boiler should have a 15mm NB drain valve (not H.H.L. supply) fitted to drain the boiler only. The heating system in total should have drain valves as recommended by **BS 6644**. See Figure 1.1 (p2) for recommended positions.

8.7 Circulating Pump

One or more circulating pumps will be required to circulate water around the boilers and heating system. Figure 2.2 (p4) shows the hydraulic resistance of the boiler. The pump should be sited to facilitate servicing. It is important to note that when Purewell 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 twice 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

Minimum water flow rates are shown in Figure 2.2 (p4). These flow rates should be maintained through the boiler at all times whilst the boiler is firing. If the water flow rate is allowed to fall below the minimum, the boiler heat exchanger could fail due to the resultant scale formation. Particular attention should be paid to the restriction of external flow circuits during periods of low heat demand.

8.9 Water Pressure Drop

The waterside hydraulic resistance (Pressure drop) is shown in Figure 2.2 (p4).
NOTE: If boilers are run off time clock control, a pump overrun (not HHL supply) should be fitted which must run for a minimum of 5 minutes on shut-down of the last boiler.

8.10 Control Schemes

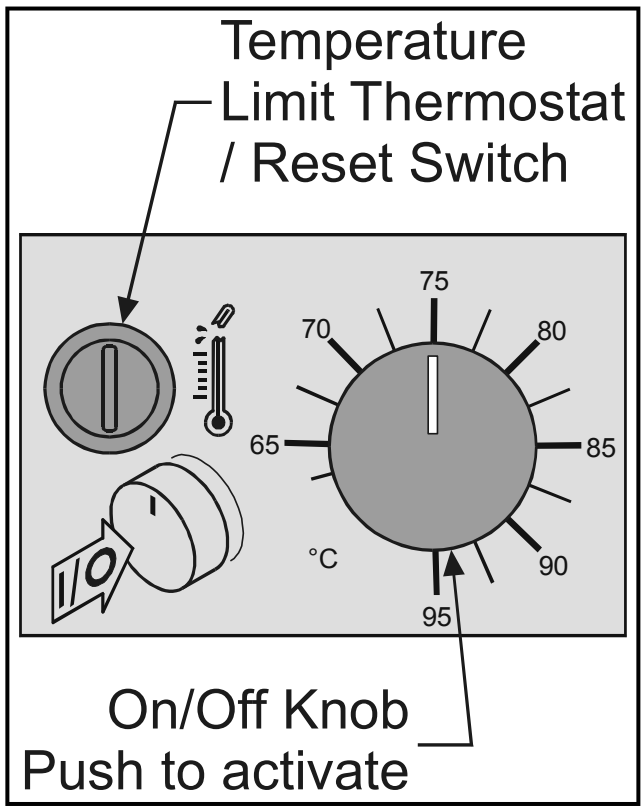
8.10.1 Temperature Controls

An electronic control thermostat using a 10kΩ NTC thermistor temperature sensor is incorporated within the boiler controls. A potentiometer is used to adjust the control thermostat set point between the range 65 to 95°C. The potentiometer also acts as the boiler on/off switch via a push and release action. An additional potentiometer (fitted to the boiler main control PCB) provides a temperature offset below the main control set point for high/low control switching (Classic models with high/low flue damper only), which can be adjusted up to 10°C below the main set point (5°C recommended).

If a higher water temperature is required, and providing sufficient head on the water system is available, the thermostat may be adjusted to operate up to 120°C – **see Note**.

A standard electro-mechanical temperature limiter, (hand reset limit thermostat) is also fitted to the boiler and must be set at 100°C, with a maximum setting of

Figure 8.10.1 Temperature Controls and Boiler On/Off Switch



110°C. The minimum difference between control thermostat and temperature limiter **MUST NOT** be less than 10°C.

Note! A high temperature control kit is available incorporating a new temperature limiter, label and instructions. For further information contact Hamworthy Heating for details.

8.10.2 Water Flow Controls

Any external mixing valves or similar controls should **ALWAYS** ensure that the minimum water flow rate shown in Figure 2.2 (p4) is maintained.

8.10.3 Frost Protection

Consideration should be given to fitting a frost thermostat set at approximately 4°C

8.11 Unvented Pressurised Systems

See Figure 1.1 (p2) for typical layout of a pressurised (Un-vented) Hot Water System.

In order to correctly size a pressurisation unit for any heating system certain parameters are required. These are: -
1) Static height of highest component in system.
2) System volume - if not known a general rule of thumb of 10 litres/kW installed boiler power can be used.
3) Maximum flow temperature, i.e. most systems run at 82°C.

4) Maximum system hot working pressure, generally given in barg.
From the above information Hamworthy Heating can size the pressure unit and also the expansion vessel required.

Care must be taken in sizing expansion vessels to ensure maximum acceptance factors are not exceeded. Normally manufacturers of vessels impose a limit of 0.5. This value must not be exceeded at any time during the operation of the boiler: this includes the over pressure condition should a safety valve lift.
Consideration should also be given to sizing of the safety valve(s) in the system. See **BS 6759**: Part 1 for information.
See also **BS 6880**: Part 1 for design considerations.

8.12 Modular Boiler Control Schemes

For modular installations of the Purewell automatic ignition range of boilers, Hamworthy Heating can supply an optional Milton boiler sequence control system.

This system comprises a wall mounted 'Boiler Sequence Control' unit, and a 'Sequencing Interface Module' unit mounted to the fascia of each boiler's control panel, which provides on/off or high/low switching of the boiler. The Boiler Sequence Control communicates with the 'Sequencing Interface Modules' via a 2 wire data BUS. PT1000 type water flow temperature, optional room temperature and optional outside air temperature sensors are available, which are wired to the Boiler Sequence Control. Refer to Figure 8.12 and the Milton boiler sequence control and sequencing interface module instructions for further details.

Alternatively, the Purewell boilers can be controlled on/off or high/low via the remote on/off and high/low control loops, by a non-HHL control system - see Figure 8.12.

9.0 ELECTRICAL SUPPLY

WARNING: THIS APPLIANCE MUST BE EARTHED.

Wiring external to the boiler must be installed in accordance with the IEE Regulations and any local regulations, which apply. Wiring must be completed in heat resistant 3-core cable. (Size 1.0mm² csa). Boilers are normally supplied suitable for 230 volts, 50Hz. Internal fuse rating is 6.3A (T rated). External fuses should be 10A for all single boiler 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.

This appliance must be isolated from the mains electricity supply in the event of electric arc welding being carried out on any connecting pipework.

A mains isolator must be provided adjacent to the boiler in a readily accessible position. The supply should only serve the boiler.

NOTE! Volt free contact electrical supplies must also be isolated when fitted (see note on fascia). Further details regarding connection to the electricity supply are given in **BS EN 60335, Part 1 or BS 3456, Part 201**.

The mains power supply MUST NOT be switched by a time clock, especially if a single header pump kit is utilised. The Purewell boiler has a remote stop/ start loop which can be used to operate the boiler(s) under a timed regime. The boiler control provides a 230V ~ signal that can be fed through a volt free contact for operation. Refer to Figures 8.12 and 9.1 (p14) for typical site wiring connections. See **BS 6644** for further information. **DO NOT feed mains voltage onto these terminals.**

9.1 Site Wiring

Access to the controls is achieved by rotating the ¼ turn latch and removing the door. A 20mm dia. knockout is provided in each side panel if required for electrical connections. Any other routing of site cables should ensure that cables do not pass close to the boiler flue hood or that any cable trunking does not interfere with normal air circulation and supply ducts.

A removable bracket is supplied with every Purewell boiler having three 20mm dia. holes for electrical cable anchorage. A plug and socket arrangement is utilised for the site terminal connections, the plug terminals being attached to the removable bracket.

NOTE! Rigid conduit **MUST NOT** be connected to the bracket as this will prevent removal. Care must be taken to ensure correct connections are made to the relevant terminals before applying power.
Refer to Figures 8.12 and 9.1 (p14) for typical wiring diagram.

NOTE! On/off (without flue damper) boilers only -
The boiler control panel is supplied with 1off 6way and 1off 7way link connector, supplied loose inside the control panel. These connectors MUST be fitted to sockets CN1 (6way) and CN2 (7way) located on the top left corner of the control panel main PCB.
Failure to correctly fit the link connectors will prevent operation of on/off boilers.
The link connectors are not required for high/low (with flue damper) boilers.

Figure 8.12 Site Wiring Diagram

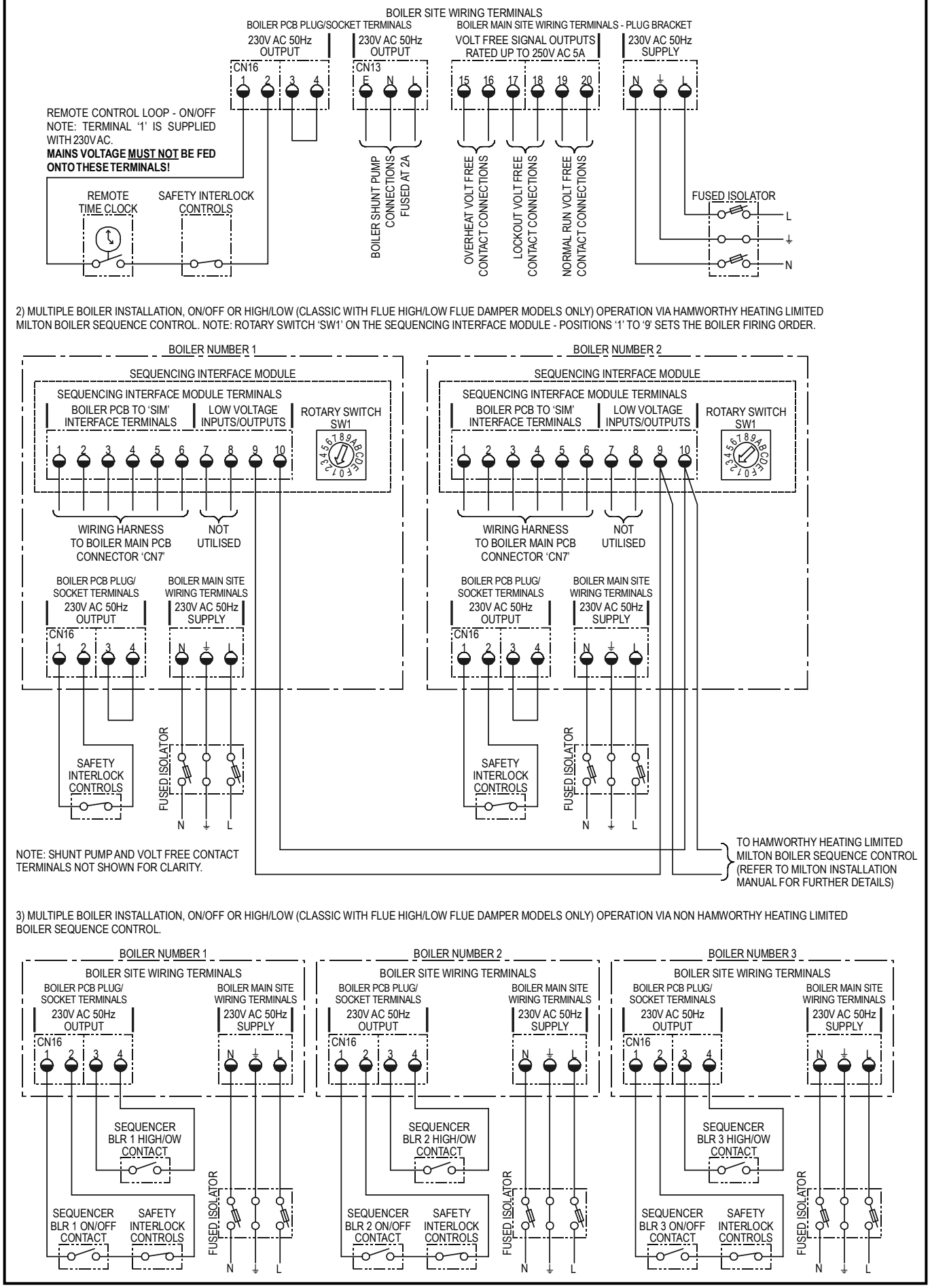
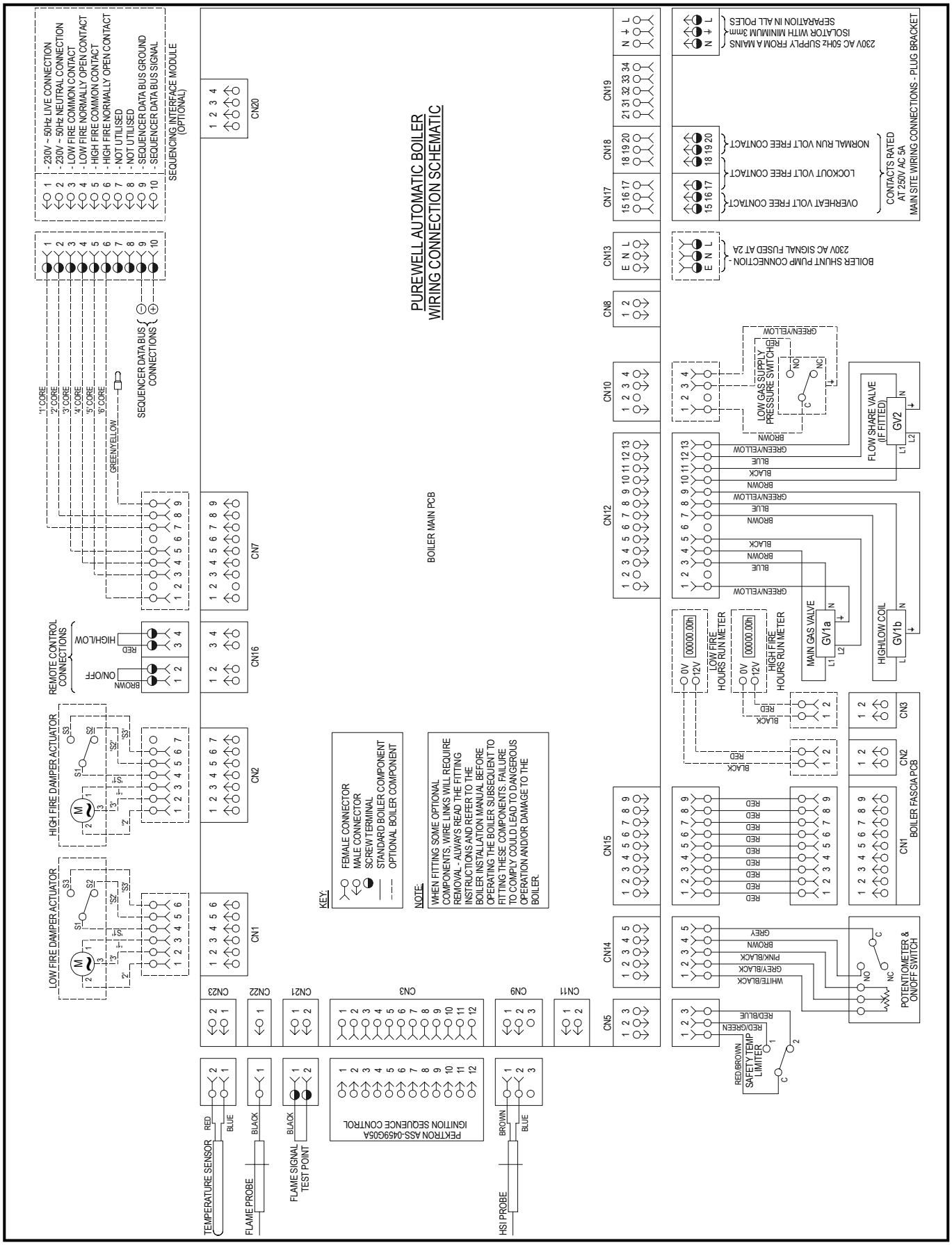


Figure 9.1 Wiring Schematic



NOTE! Maximum rating of volt free contact(s) is 3 Amperes Resistive

WARNING! External voltage MUST NOT be applied to remote stop/start terminals CN16 or high/low control loop terminals CN16 or any terminals on the fascia. **NOTE! *** Volt free contacts may have separate supply. Ensure all power supplies are completely isolated prior to working on the electrical circuits of this appliance.

9.2 Indication Signals and Volt Free Contacts

Volt free contacts are provided to enable external indicator lights or alarms to derive signals for normal run, overheat and lockout.

Note:- These external circuits **MUST** be isolated before obtaining access to the controls for any service or maintenance procedures to be carried out.

9.3 Milton Boiler Sequence Control and Sequencing Interface Module (Optional)

Refer to the Milton boiler sequence control manuals for details of its installation.

The sequencing interface module is supplied as a kit for site assembly to the boiler control panel(s). Refer to the installation instructions supplied with the kit for assembly details.

The sequencing interface module incorporates a 10way plug/socket screw terminal block to make the site wiring connections. Refer to Figure 8.12 and the Milton boiler sequence control installation manual for wiring connection details.

Note: For correct operation of the sequencing interface module a number of wire links **MUST** be removed from the boiler main PCB - refer to **Section 11.5** clause 8) (p22) for details.

10.0 BOILER ASSEMBLY AND INSTALLATION

10.1 General

Each boiler is despatched to site as follows: -

i) Heat exchanger & basket including burners and gas valve(s) etc. on a pallet.
ii) Casing complete with assembly instructions.
iii) Control panel assembly.
iv) Primary flue (incl. High / Low Damper) & draught diverter. ('**Classic'** models only)

Further details of each individual assembly are given below: -

1) Factory tested heat exchanger casting assembly complete, including insulation wrap, gas valve assembly including pre-wired plug assembly. The gas connection pipe should be fitted to the boiler flue hood once the heat exchanger is in place. **NOTE!** Care must be taken to ensure no damage occurs to either insulation wrap or gas connecting pipe. **THIS PIPE MUST NOT BE USED TO MANOEUVRE OR POSITION THE BOILER. NOTE!** Consideration must be given to the weight of the boiler (See Figure 2.1 p3), before lifting. It is recommended that the boiler is moved complete with pallet and positioned correctly. The pallet can then be dismantled and the boiler slid into position.

2) Casing including all screws, fasteners etc. to permit site assembly. Instructions are included in each box to show method of assembly. Two sizes are manufactured these are: - Small casing for boilers up to 80kW (**NOTE!** P70 **'Integra'** utilises larger casing), large casing for boilers from 95kW to 120kW. **NOTE!** When installing a multi-casing set the spacing plates must be used to correctly space the boilers approx. 3mm apart prior to fitting the casing. (See label attached to the basket fixing.)
It is recommended that all mechanical work is carried out prior to fitting the casing assembly, this will reduce possible damage to the panels.
The casing assembly includes a component list, which is also shown in Figure 10.7 (p18/19). You should check to ensure that all parts are supplied prior to assembly.

3) Controls assembly including fascia bezel. This assembly will be suited to the desired controls and can accommodate the fitting of any optional extras. Refer to Figure 10.7 for fitting instructions. Ensure all thermostat capillaries are inserted and correctly located into the top of the boiler. The controls assembly also incorporates a socket which matches the gas valve wiring plug. Care must be taken to ensure both plug and gland plate are correctly located and fixed in position by the screws provided.

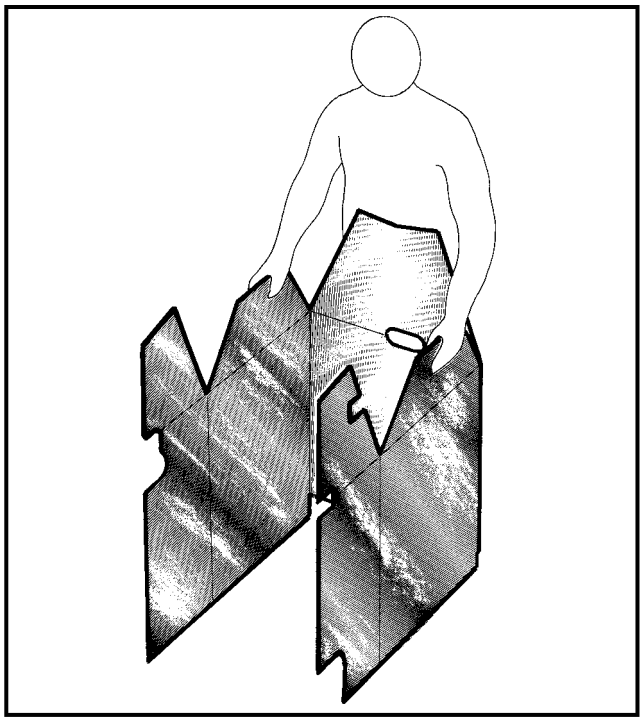
4) (Classic models only) Primary flue damper and draught diverter complete with flue bezel. Instructions are supplied with the primary flue damper on how to assemble the damper and draught diverter. These instructions **MUST** be followed correctly and fully complied with to ensure correct operation.

NOTE! Prior to fitting the damper, ensure the baffle (Not fitted to 120kW boiler) is positioned correctly and laying flat on the heat exchanger. It is recommended that the heat exchanger insulation be fitted prior to fitting the damper.

10.2 Heat Exchanger Insulation Fitting Instructions

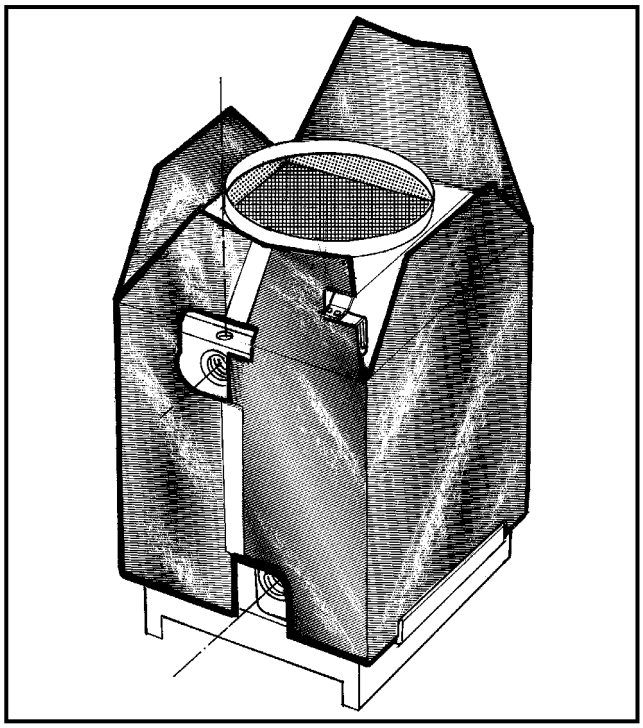
With reference to Figure 10.2a - Unfold blanket and offer up to the boiler as shown. Ensure gas pipe cutout is positioned to the left and that the 'petals' are uppermost. Sit the insulation blanket onto the basket ensuring a snug fit.

Figure 10.2a



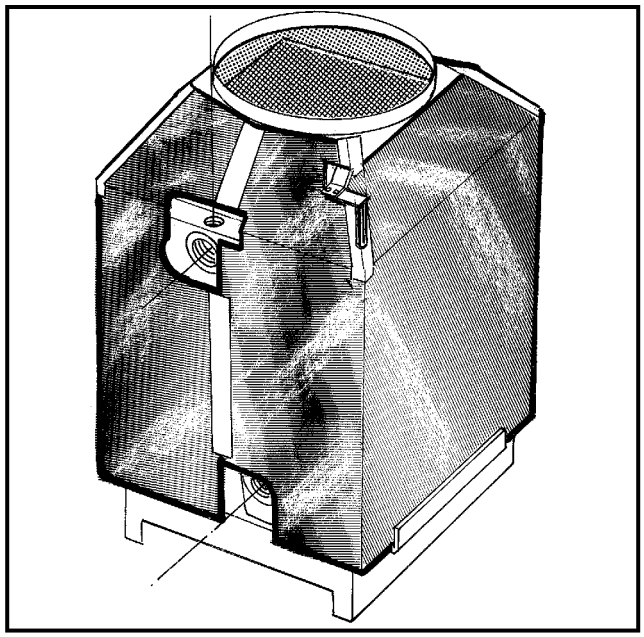
Reference to Figure 10.2b - Insulation should be folded around boiler such that its rear edges meet in the centre. Ensure flow and return connections are clear and unobstructed. Apply foil tape down join.

Figure 10.2b



Reference to Figure 10.2c - Fold down petals as shown. Use foil tape to affix edges. Fold as required. Ensure gas pipe bracket is clear and unobstructed.

Figure 10.2c



Ensure combustion air passages are unobstructed when fully fitted.

10.3 Gas Pipe Fitting Instructions

With reference to Figure No. 10.3a - Remove half union and gas valve from gas train. Ensure gas valve/manifold bracket does not suffer undue stress/ movement. Affix half union and gas valve assembly to gas pipe as shown using proprietary sealing compound. Ensure gas valve lever is correctly orientated. Offer gas pipe to boiler as shown. Bracket should be mounted as shown. Bracket's position will be dependent on boiler size.

Figure 10.3a

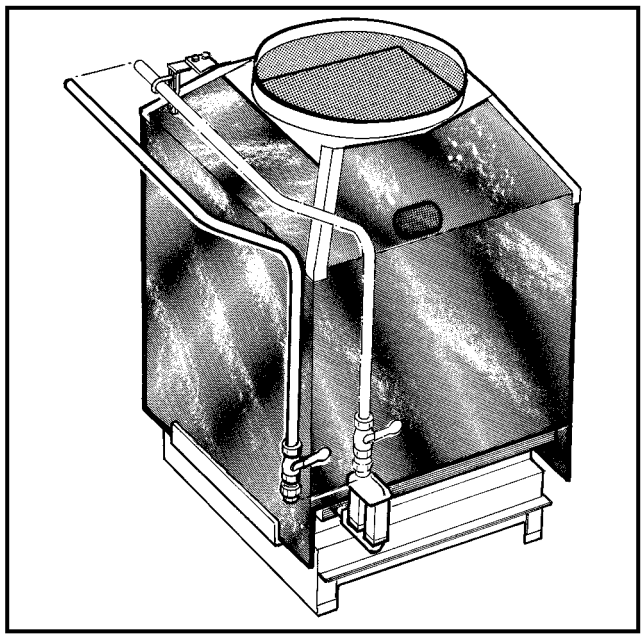


Figure No. 10.3b shows the pipe clamp fitted to Purewell 60, 70, 80 and 120 kW boilers.

Figure 10.3b

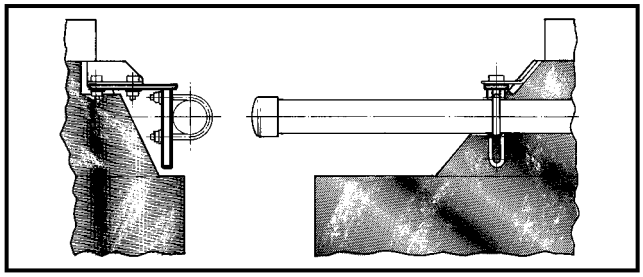
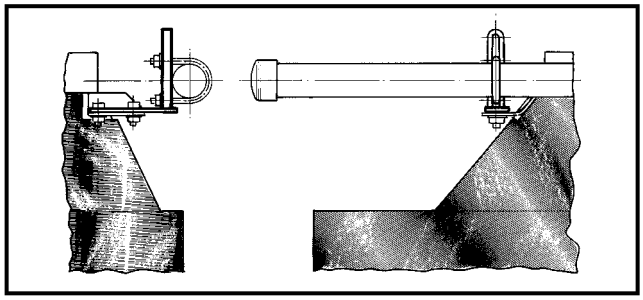


Figure No. 10.3c shows the pipe clamp fitted to Purewell 40, 50, 95 and 105 kW boilers.

Figure 10.3c



Tighten screws ensuring 'U' clamp threads do not damage insulation. It may be necessary to remove the bottom thread of the 'U' clamp with the bracket in lower position as it may foul the draught hood. Ensure no undue stress is placed on the gas pipe/manifold and ensure pipe is vertical/horizontal before clamping in position.

10.4 Connection of Boilers to the Flue System.

Notes on the recommendation for design of the flue system are given in **Section 6:FLUE SYSTEM.**

10.4.1 'Classic' models: -

The draught diverter and primary flue damper supplied with the boiler must be fitted to the boiler in accordance with the fitting instructions, **NO** modifications are permitted on site. **Prior to fitting the assembly to the boiler, read the primary flue damper instructions.** Care should be taken to ensure the seals between primary flue damper, draught diverter and boiler spigot are sound as a leak may affect the boilers' operation.
Note:- take care in routing the damper electrical cables over the boiler flue hood and into the control panel.
The top panel can be fitted after having made the damper electrical connections to the control panel.

10.4.2 'Integra' models: -

The **'Integra'** model incorporates its own draught diverter and care must taken to ensure the seal between the outlet spigot and flue pipe is sound to avoid the escape of flue gas.

10.4.3 The top panel will require protecting to ensure no damage occurs to the plastic coating during subsequent site assembly of other components. It is important, for service requirements, that the flue system is fully self-supporting. Check the flue and chimney are clear from obstruction.

10.5 Gas Connection

The Purewell boiler is supplied with a gas pipe which when assembled exits the casing at the rear, see Figure 2.1 (p3) for position. The incoming mains gas supply must be capable of supplying gas to the boiler at the required pressure, under all firing conditions. For sizing information see Figure 5.3 (p8). An approved isolating valve & union should be installed for each boiler in a convenient and safe position and be clearly marked.

10.6 Water Connections

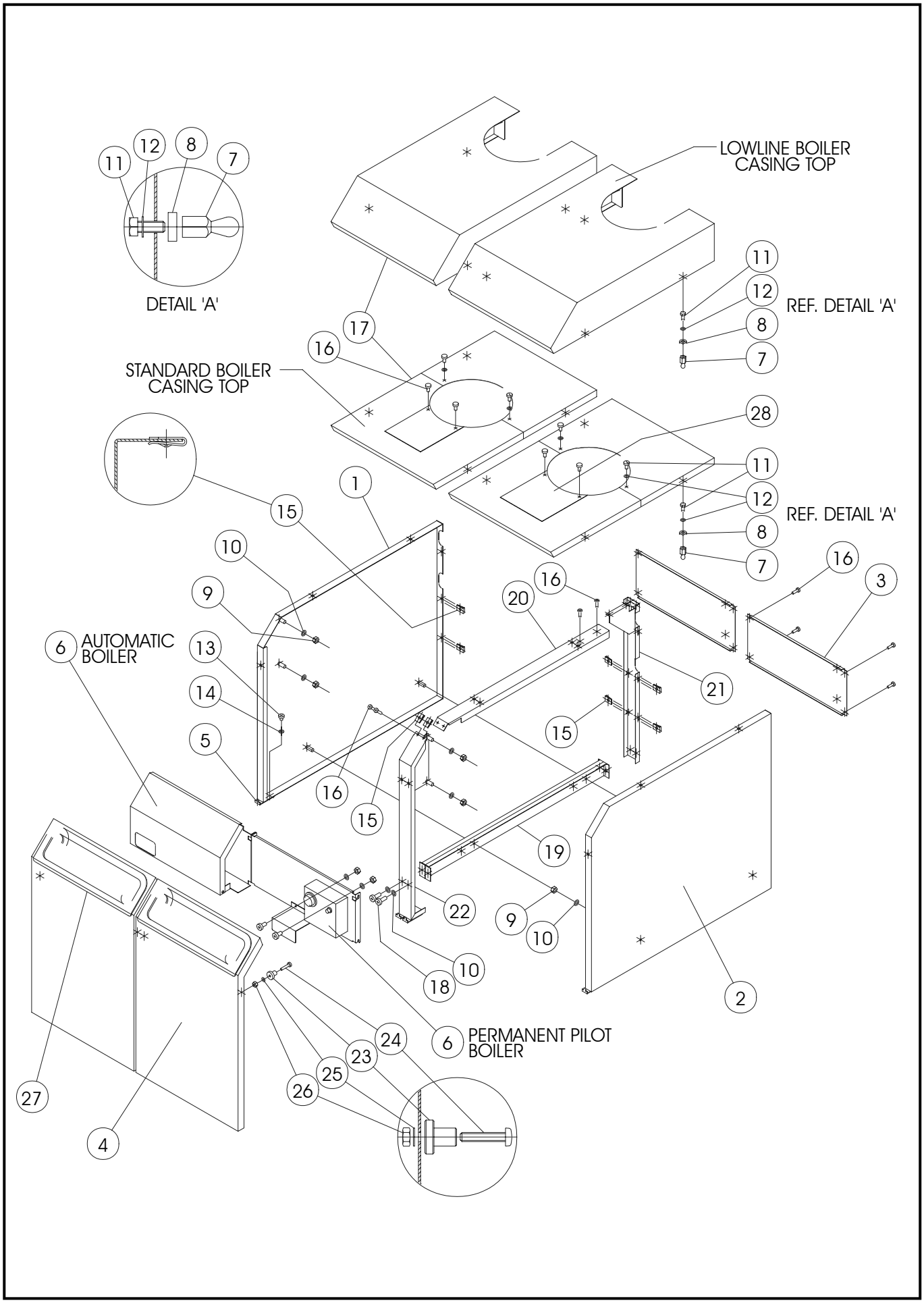
See Figure 2.1 (p3) for position of water connections (flow and return). A R½ BS21 plug is fitted local to the return connection for the fitting of a drain cock, NOTE! (Not HHL supply). Care must be taken when installing water system pipework that undue stress is avoided on the boiler flow and return connections. It is recommended that unions are fitted local to the boiler to permit future servicing requirements.

Fully closing valves must not be connected to both flow and return pipes unless the boiler is fitted with an individual, correctly sized safety valve. It is recommended that a 3-way 'L' port valve is fitted in the flow connection to allow an open vent situation should the boiler need to be fully isolated from the system.

10.7 Casing and Controls Assembly

For assembly of casing components and controls unit see Figure 10.7 (p18/19).
Multi casings
Note: Where boilers are in Modular form, i.e. MPC360 (3 x 120kW), a multi-casing pack is provided for each additional boiler. For example: a triple boiler module will require: - 1 off single casing pack plus 2 off multi-casing packs. If the bottom support rail (item 19) has not been pre-assembled, the following procedure must be taken: -
1) Loosen the nuts that clamp the basket assemblies of the 2 boilers together, (1 front and 1 rear). Remove the bolt, spacer and nut assembly.
2) Position the bottom support rail (item 19) between the boiler baskets. Assemble to boiler baskets using 2off M6 screws, nuts and shake proof washers (items 18, 9 & 10).
3) Select the rear support rail (item 21) and fit 6off 'U' nuts (item 15), 4off in the 2 lower pairs of holes and 2off in the angle bracket at the top. Fix the rear support rail to the bottom support rail, using 2off M6 screws and washers (items 18 and 10).

Figure 10.7 Assembling the Casing / Multi-Casing Set



Parts List of Figure 10.7 - Assembling the Casing/Multi-Casing Set.

Item	Description	Quantity (Single Casing Kit)	Quantity (Multi Casing Kit)
1	Left hand side panel	1	-
2	Right hand side panel	1	-
3	Back panel	1	1
4	Door panel	1	1
5	Door location bracket	2	2
6	Control panel	1	1
7	Ball stud fastener	4	4
8	Spacer for ball stud fastener	4	4
9	M6 hexagon nut	8	6
10	M6 internally serrated shake proof washer	8	4
11	M5 x 12mm hexagon head screw	4	4
12	M5 internally serrated shake proof washer	4	4
13	M5 x 6mm pozi-drive pan head screw	4	4
14	M5 spring washer	4	4
15	'U' nut for no.8 self tapping screw	4	10
16	No.8 x ½" self tapping screw	6	12
17	Top panel	1	1
18	M6 x 16mm pozi-drive pan head screw	-	6
19	Bottom support rail	-	1
20	Top support rail	-	1
21	Rear support rail	-	1
22	Front support rail	-	1
23	Door location pin	2	2
24	M4 x 20 pozi-drive pan head screw	2	2
25	M4 internally serrated shake proof washer	2	2
26	M4 hexagon nut	2	2
27	Fascia bezel	1	1
28	Boiler top panel insert	1 (Classic only)	1 (Classic only)

4) Select the front support rail (item 22) and fit the 2off door location brackets (item 5) using 4off M6 screws and spring washers (items 13 and 14). Fit 2off 'U' nuts (item 15) to the top 45° return. Fix the front support rail to the bottom support rail, using 2off M6 screws and washers (items 18 and 10).

5) Select the top support rail (item 20) and fit 2off 'U' nuts (item 15) to the pair of holes at the rear end. Fix the top support rail to the front and rear support rails using 6off No.8 self tapping screws (item 16).

Single and multi-casings.

6) Select the side panels (items 1 and 2) and fit the 2off door location brackets (item 5) using 4off M6 screws and spring washers (items 13 and 14). Fit 'U' nuts (item 15) to the 2 holes at the rear of each panel as shown. Fix the side panels to the boiler basket using M6 nuts and shake proof washers (items 9 and 10).

7) Fit the back panel (item 3) using 4off No.8 self tapping screws (item 16). **DO NOT FULLY TIGHTEN THE SCREWS.**

8) Select the control panel (item 6). Permanent pilot boilers only, fit the door catch bracket to the control panel using the 2off M6 screws, nuts and washers supplied with the panel as shown. Loosely fit 4off M6 nuts and washers (items 9 & 10) to the pressed-in studs at the top front end of the side panels (or multi-casing frame set) as shown. Fit the control panel by passing the right hand side behind the pressed-in studs and pulling the panel forwards to engage the studs into the slots in the right hand side of the panel. Push the left of the control panel backwards to engage the studs on that side into the slots in the panel. Tighten the 4off M6 nuts.

9) Select the top panel (item17) and fit 4off ball studs, spacers, M5 screws and shake proof washers (items 7, 8, 11 and 12). Should the flue already be fitted to the boiler, the top panel can be split by removing screws and washers (items 11 & 12).

Place the top panel in position and press the ball studs into the matching latches in the top edge of the side panels (or multi casing frame set). Classic boilers only, if a damper is fitted, remove the screws (item 16) and discard the top panel insert (item 28) if required. Should the damper motor assembly sit above the top panel, discard the blanking plug from the top panel insert. Fit the edging strip to the hole and route the damper cable assembly through the hole into the control panel, securing the cables to the casing side panel using the self-adhesive clips supplied.

Note: The damper must be fitted with the motor assembly at the front of the boiler.

10) The 4off screws fixing the back panel to the side panels can now be tightened.

11) Select the door panel (item 4) and fit the 2off location pins, M4 screws, nuts and shake proof washers (items 23, 24, 25 & 26), to the 2 holes in the rear return. Select the fascia bezel (item 27) supplied with the control panel. Remove the paper liner from the self-adhesive foam tape affixed to the rear of the bezel, and fit to the door aperture as shown ensuring correct orientation and a strong bond to the surface of the door panel. To fit the door, locate the slotted holes in the bottom onto the location brackets (item 5). Pivot the door backwards until the location pins engage fully into the mating holes in the front edge of the side panels (or multi-casing frame set). Turn the quarter turn latch in the centre of the door panel to lock it in place.

11.0 COMMISSIONING AND TESTING

11.1 Electrical Installation

A suitably competent person MUST check wiring. Normal supply required is 230 volts AC, single phase, 50 Hz. An isolator correctly fused at 10A should be sited close to the boiler.

Access to the controls is achieved by rotating the ¼ turn latch and removing the door. Connections to the boiler should pass through the 3 x 20mm wiring gland plate. If a single header pump kit is used then this power source must be constant and not switched by any time clock. The boiler is supplied with a remote stop/start circuit for time clock operation. **Any other interlocks, i.e. Pressurisation unit, BEM System should be wired in series with the remote stop/start loop.**

The site wiring terminal rail is marked with Live, Neutral and Earth connections. See Figure 9.1 for details. **IMPORTANT READ THE WARNING NOTE REGARDING EXTERNAL VOLTAGES.**

This rail is of the plug/socket type and can be unplugged for wiring if required.
The main PCB is provided with four T rated fuses to protect the following circuits – see Figure 11.1.

Main PCB	F1 – T6.3A
Boiler controls	F2 – T2A
Shunt Pump	F3 – T2A
Sequencing Interface Module	F4 – T2A

A schematic of the electrical control circuit(s) is shown in Figure 9.1 (p14).

11.2 Gas Installation

For design see **Section 5:GAS SUPPLY** (p6).
The whole of the gas installation including the meter must be inspected and tested for soundness and purged in accordance with the recommendations of **BS 6891** or **IGE/UP/1**, **IGE/UP/1A** and **IGE/UP/2** as appropriate.

11.3 Water Circulation System

For design see **Section 8:WATER SYSTEM** (p10).
The system should be thoroughly flushed out with cold water without the pump in position. Ensure all the valves are open.

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

If the system is unvented the pressurisation unit should not be utilised for the initial filling. This should be carried out using a WRC approved double check valve and temporary-filling loop.

In order to comply with local Water Authority Regulations, this loop must be disconnected when filling is complete. Water treatments should not be fed through the pressurisation unit unless permitted by the manufacturer.
Check the expansion vessel cushion pressure as detailed by the manufacturer's Installer's Guide.

11.4 Commissioning the Boiler

A competent person holding 'CORGI' registration MUST be responsible for the commissioning of this boiler. Before attempting to commission any boiler, ensure that personnel involved are aware of what action is about to be taken and begin by making the following checks: -

1) Flueway passages to chimney are clear.

2a) 'Classic' models: - If necessary, remove the primary flue damper and draught diverter assembly, flue hood and baffle (not fitted to the 120kW boiler) to ensure the boiler flueways are clear. Reposition the gas baffle ensuring that it is laying flat on the top section. Re-fit the flue hood, damper and draught diverter assembly. Ensure primary flue damper and draught diverter passages are clear and clean.

2b) '**Integra' models: -** The **'Integra'** draught diverter incorporates an integral inspection cover. To gain access, remove insulation and M6 bolts on the sloping front of the hood assembly. This will reveal the inner part of the boiler, if further access is required, remove primary flue pipe (ensure it is correctly supported), and remove complete top of the draught diverter assembly. After cleaning the boiler re-assemble draught diverter in reverse order. Ensure all joints are correctly sealed.

3) Adequate ventilation as per **Section 7: Air Supply** exists in the boiler house.

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

5) The pipework and valve arrangement is installed to Hamworthy Heating recommendations in such a way that water flow rates will be in accordance with Figure 2.2 (p4).

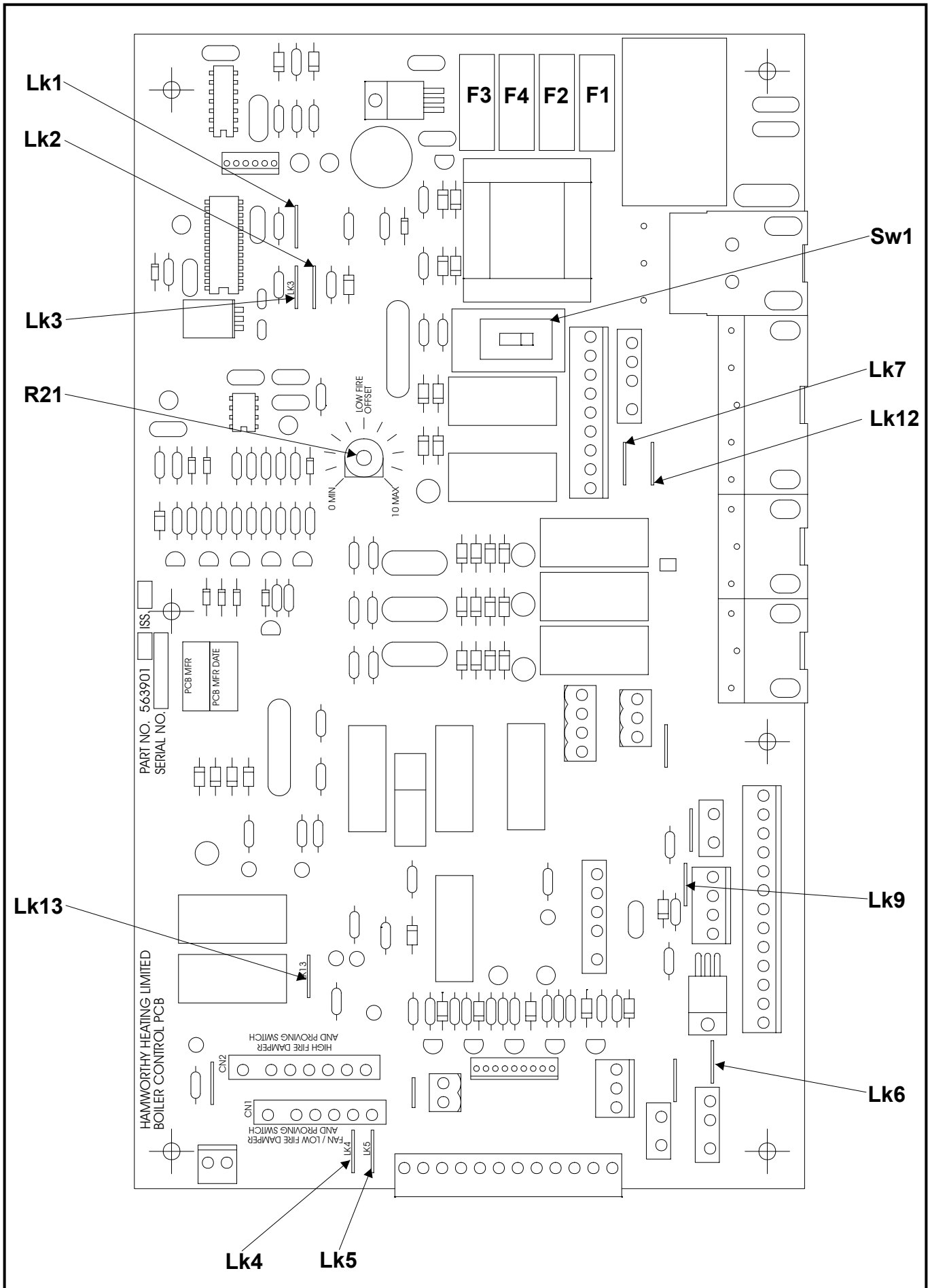
6) The gas supply pipework is clear of any loose matter, tested for soundness and purged.

11.5 Boiler Checks Prior To Lighting

NOTE! Refer to Figure 2.2 (p4) for maximum gas inlet pressure for normal operation. Information relating to propane firing can be found in Appendix 'A' (p37).

NOTE! - All propane boilers are fitted with a low gas pressure switch (set at 20mbar). Should the gas supply pressure fall below this level, the boiler **will not** operate.

Figure 11.1 Main PCB Layout



1) Gas supply is connected but turned to the "off" position. Any unions or fittings are correctly tightened, test points are closed, burners correctly positioned, injectors are in place (of correct size) and tight and that the ignition and probe leads are connected correctly. Ensure Hot Surface igniter and sensing probe assembly are not cracked or broken.

2) Ensure electricity is connected, the gas valve PCB connection is correctly located and that the sensor and thermostat bulbs are fully inserted into the boiler pocket. Reset temperature limiter by firmly pressing pin (in controls housing.)

3) If a sequencing interface module is fitted to the boiler control panel, locate and the hand auto switch 'SW1' on the boiler main PCB (refer to Figure 11.1 p21), and set it to the 'hand' position to override operation of the sequencing interface module for the purposes of commissioning.

4) Check setting of both temperature limiter and control thermostat. The temperature limiter is generally set at 100°C from the factory unless otherwise instructed. Set thermostat to required temperature (normally 82°C).

NOTE! Minimum temperature setting should not be less than 72°C to avoid condensation in the flue if a 22°C system temperature rise is used.

NOTE! It is generally recommended that the minimum return temperature to a non-condensing boiler is 50°C.

5) Drop down fascia on the controls housing to reveal access to the main PCB. Figure 9.1 (p14) shows the correct location of incoming wires. Remove the plug connection CN21 from the main PCB and replace the link by inserting a multi-meter set to read DC µA. Carefully remove high/low plug connection CN16 from the main PCB, this will ensure burner stays at start rate (low fire) when fired.

6) The Purewell fully automatic boiler utilises a low fire start gas rate ignited by hot surface igniter (HSI), see Figure 14.1 (p32). To ascertain which type of gas valve is fitted and the method of low fire and high fire adjustment, refer to Figure 11.7a (p23). You should familiarise yourself with this procedure for use later when required.

7) If a single header pipe kit is fitted, ensure that the shunt pump is connected to the plug connection CN13 on the main PCB. The run on timer is preset to 5 minutes. Check that the fuse on the main PCB is fitted and sound.

8) IMPORTANT:- PRIOR TO LIGHTING UP THE BOILER, THE SAFETY LINKS ON THE MAIN PCB MUST BE REMOVED AS DETAILED, TO ENSURE SAFE OPERATION OF THE BOILER – REFER TO FIGURE 11.1 (p21). THE LINKS MUST BE CAREFULLY CUT USING A SMALL PAIR OF ELECTRICAL SIDE CUTTERS AND THE RESULTANT LOOSE LINKS MUST BE REMOVED FROM THE PCB SO AS NOT TO CAUSE AN ELECTRICAL SHORT.

8.1 All models, check that LK1 & LK6 have been factory removed.
8.2 For optional high flow temperature (120°C), cut LK1 & LK2.
8.3 'Classic' high/low (with flue damper) models, cut LK3, check that LK4, LK5 & LK13 have been factory removed.
8.4 '**Classic**' and **'Integra'** on/off (without flue damper) models, fit 6way and 7way link connectors supplied loose with control panel, to sockets CN1 (6way) and CN2 (7way). The link connectors **MUST** be fitted to enable correct boiler operation.
8.5 For optional sequencing interface module control cut LK7 & LK12.
8.6 For low gas pressure switch (Propane boilers) cut LK9.

11.6 Procedure for Initial Lighting

Ensure gas service cock is in the "off" position. Press the control thermostat knob to switch 'on' the boiler. Press lockout button on fascia to re-set timer (wait at least 15 seconds before pressing again if lockout neon does not go out. After a delay the HSI neon should illuminate on the fascia and the igniter should be visible through the viewing port on the burner front plate. As the gas service cock is closed, the controls should go to lockout after approximately 3 seconds (amber neon on fascia lit). If the above occurs correctly, open service cock and press reset button on fascia.

After a delay, the ignition should be visible and the main gas valve should energise, lighting the main burner. Turn the control thermostat to the required flow temperature. **NOTE!** The multi-meter should be reading at least 1µA.

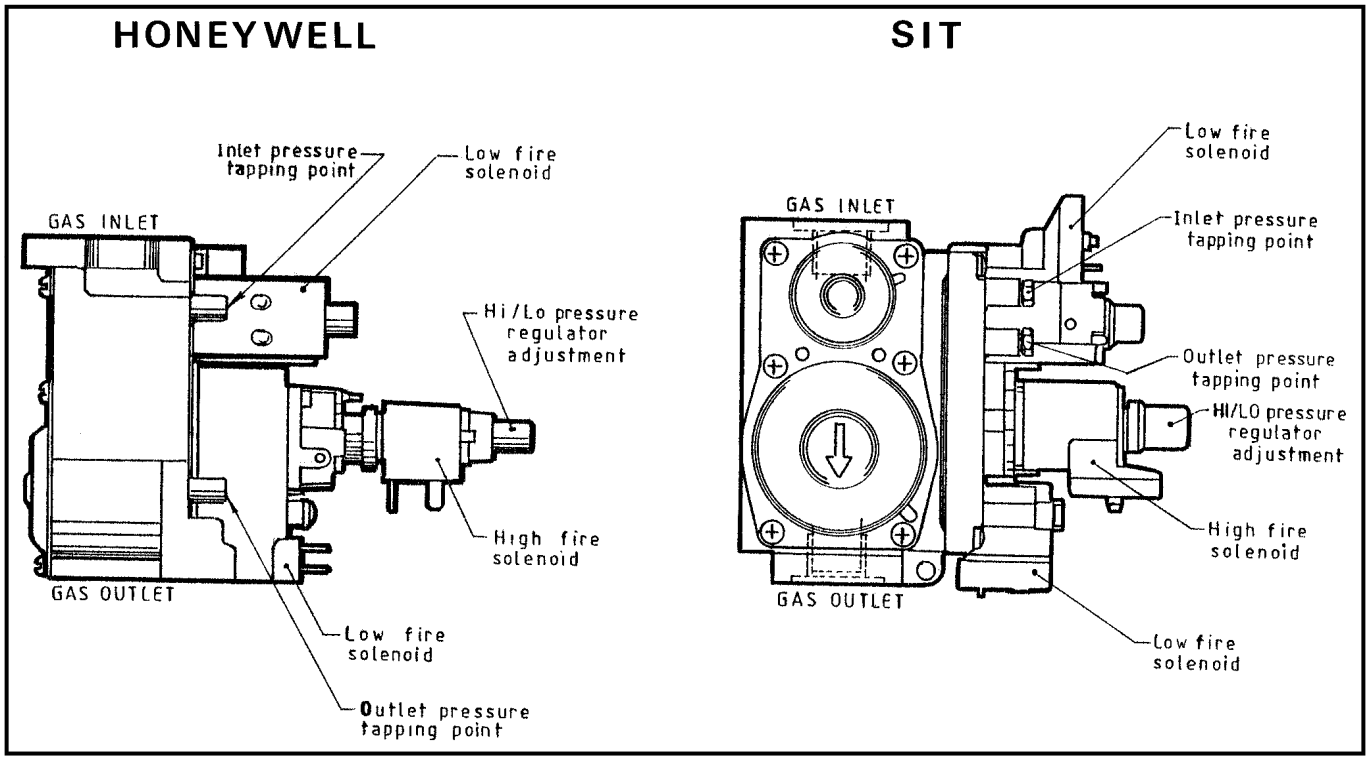
11.7 Gas Pressure Adjustment and Combustion Checks

After the boiler has operated for approximately 10 minutes, press the control thermostat knob to switch 'off' the boiler. Open the pressure test point screw on the burner manifold and fit a manometer (suitable for 30mbar - Natural Gas or 50mbar - Propane). Check low fire (start rate) against pressure shown in Figure 2.2 (p4) or Appendix 'A' (p37). If necessary adjust low fire pressure (refer to Figure 11.7a p23 for relevant gas valve fitted).

Having checked the low fire pressure, **carefully** adjust the differential (low fire offset) R21 (see Figure. 11.1 p21) between high and low fire (0 to 10°C) on the main PCB. A recommended setting is 5°C.

Carefully replace high fire plug (CN16) on the main PCB to energise the damper **('Classic' only)** and

Figure 11.7a Diagram of Automatic Gas Valves



ADJUSTMENT PROCEDURE.

Refer to Figure 2.2 to find the low fire/start and high fire gas pressures for the boiler being fired.

Fit a manometer (suitable for 30mbar) onto manifold test point.

Light the boiler, then remove the protective cover from the Hi/Lo pressure regulator.

To adjust the high fire gas pressure, turn the outer nut on the hi/lo pressure regulator.

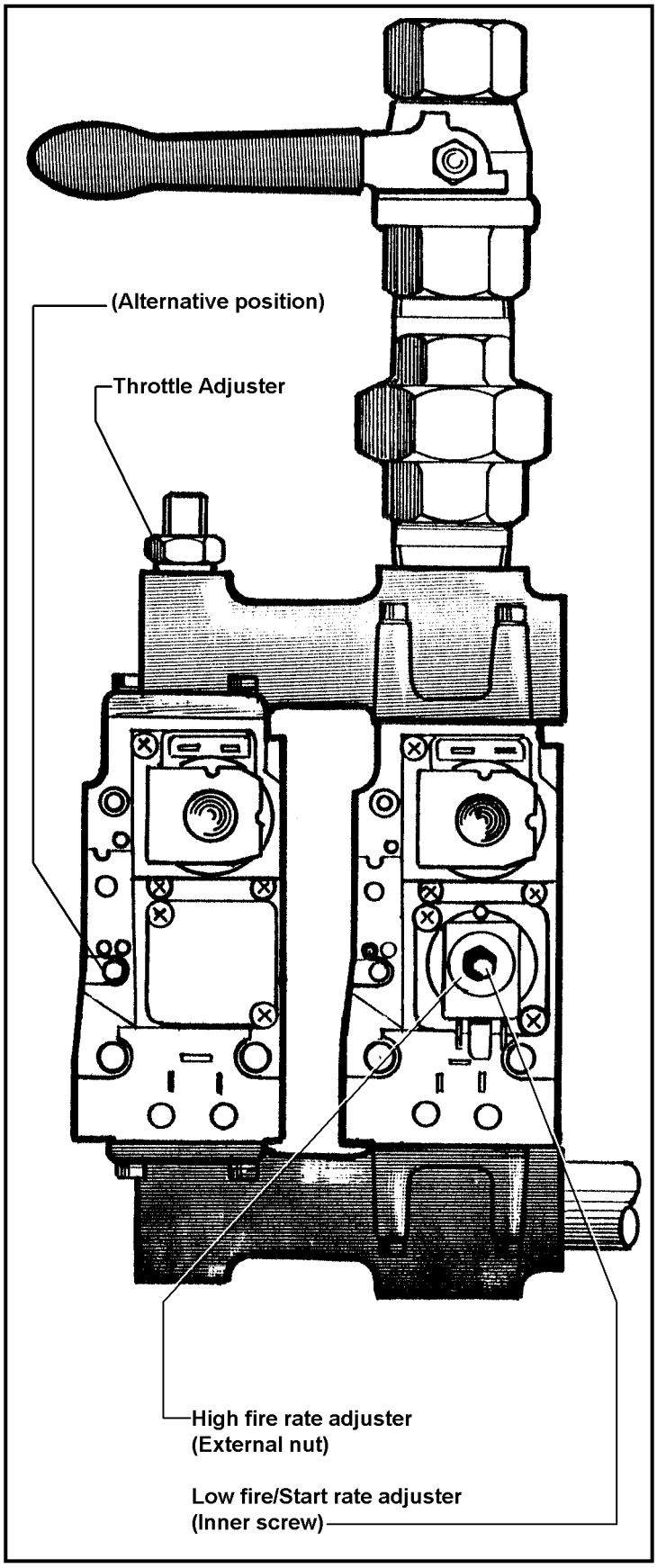
To adjust low fire/start gas pressure, remove the link between terminals C3 and C4 (CN16); nominally set the low fire/start gas pressure by rotating the inner cross-head screw, whilst keeping the outer nut from rotating. Turn the boiler off then on again and fine trim the pressure.

Insert or make high fire link on terminals C3 and C4 (CN16); the boiler should now drive to high fire. Replace protective cap on Hi/Lo gas valve.

Note! The low fire setting must always be set last of all. The valves operation may be incorrect if this omitted.

Note! It is also advisable to carry out this procedure with all the boilers firing. The long-term reliability of the ignition system may well be reduced unless this procedure is carried out correctly.

Figure 11.7b Diagram of 'Hi' Flow Gas Valve Assembly (Natural Gas Only)



PUREWELL 95, 100 (Integra), 105 & 120kW Automatic

The 'Flowshare' gas valve assembly is designed to pass the correct quantity of gas at the nominal inlet pressure of 20mbar and a maximum inlet pressure of 25mbar.

Refer to Figure 2.2 to find low fire/start and high fire gas pressures for the boiler being fired.

Fit a manometer (suitable for 30mbar) onto gas manifold pressure tapping point.

Light the boiler. Remove protective cap from the Hi/ Lo pressure regulator.

Turn the Hi/Lo valve high fire pressure regulator (outer nut) clockwise until the pressure stops increasing. Loosen Throttle locking nut (if fitted) and rotate the throttle valve adjuster screw until the manifold pressure is a approx. 0.5mbar greater than the required high fire gas pressure.

Tighten the locking nut (if fitted) on the throttle adjuster screw.

Turn the Hi/Lo valve high fire rate adjuster anti-clockwise to fine trim the high fire pressure.

Refer to Figure 11.6a for procedure on how to adjust valves for correct low fire/start gas pressures.

NOTE! Honeywell valves shown in diagram.

valve system up to high fire. Check gas pressure against that shown in Figure 2.2 (p4) or Appendix 'A' (p37). If necessary adjust high fire governor to suit. Occasionally this high fire adjustment can influence the low fire (start rate), therefore remove link and check low fire pressure again. Adjust if required. Repeat until low and high fire pressures are as shown in Figure 2.2 (p4) or Appendix 'A' (p37).

The Purewell boiler has been designed to conform with the requirements of the Gas Appliance (Safety) Regulations (1992). For Natural Gas the gas pressure governor control system is configured for a nominal gas inlet pressure of 20mbar with a maximum inlet pressure of 25mbar. Larger Purewell Automatic boilers (95, 105 and 120kW) are fitted with a unique flow share gas valve arrangement. Refer to Figure 11.7b (p24) to establish method of adjustment of the by-pass throttle arrangement. **NOTE!** The by-pass valve throttle **MUST** be used as a coarse adjuster, the main control **MUST** always be accomplished by the high/low control valve.

For Propane firing boilers, the nominal gas inlet pressure is 37mbar, with a maximum inlet pressure of 47mbar. All Propane firing boilers are fitted with a low gas pressure switch (set at 20mbar). Should the gas supply pressure fall below this level, the boiler **will not** operate. All Propane firing boilers are fitted with a single gas valve providing high and low control. Refer to Figure 11.7a (p23).

Remove manometer and close pressure test point. Record all readings for future reference on relevant commissioning sheet.

Check no flue gas spillage occurs from the diverter: Ref. **BS 5440**: Part 1 will give guidance if required. Allow system to warm up sufficiently to check operation of control thermostat.

A combustion check must be taken when first commissioning the boiler. A sampling point is provided in the flue on **'Classic'** models or inspection door on **'Integra'** models, which is covered by a small push in plug which can be removed. **NOTE!** Care should be exercised if the boiler is firing as the flue can achieve temperatures, which will produce injury if touched.

Combustion figures for Natural Gas should be as follows: -
CO_2 = 8.5 - 9% volume in dry flue gas
CO = 0-50ppm: however figure should not exceed 200ppm under normal operating conditions.

Details of flue gas composition relating to propane firing can be found in Appendix 'A' (p37).

11.8 Temperature Limiter (Limit Thermostat)

Reset and test the operation of the temperature limiter by firmly pressing the button (in the controls fascia.), removing the clip and bulb from the pocket and carefully applying a heat source to the bulb. The reset button should operate. If satisfactory, refit the bulb in the pocket and secure with the clip.

Check temperature limiter setting. Removing plastic cover (unscrewing) can achieve this if fitted. Undo holding nut and withdraw into the controls housing. Adjust if required and replace in reverse order to above.

11.9 Safety Checks

To check for correct operation of the controller, break the multi-meter µA circuit (remove plug connection CN21 from the main PCB), the boiler should lockout after approximately one second. Check that the flame has been extinguished. Remove multi-meter and replace wire link to the plug CN21. If a sequencing interface module is fitted set the hand/auto switch 'SW1' on the boiler main PCB (refer to Figure 11.1 p21) to the 'auto' position. Wait at least 15 seconds before pressing re-set button on fascia to re-set controller. After a waiting period the boiler will light and run normally.

11.10 User's Instructions

When the above is complete, the boiler owner or their representative should be made aware of the lighting and operating instructions fitted to the inside of the boiler door. A practical demonstration should be given describing each functional step. This Installer's Guide and User's Instructions should then be handed over and be kept in a safe place for easy reference.

12.0 FAULT FINDING

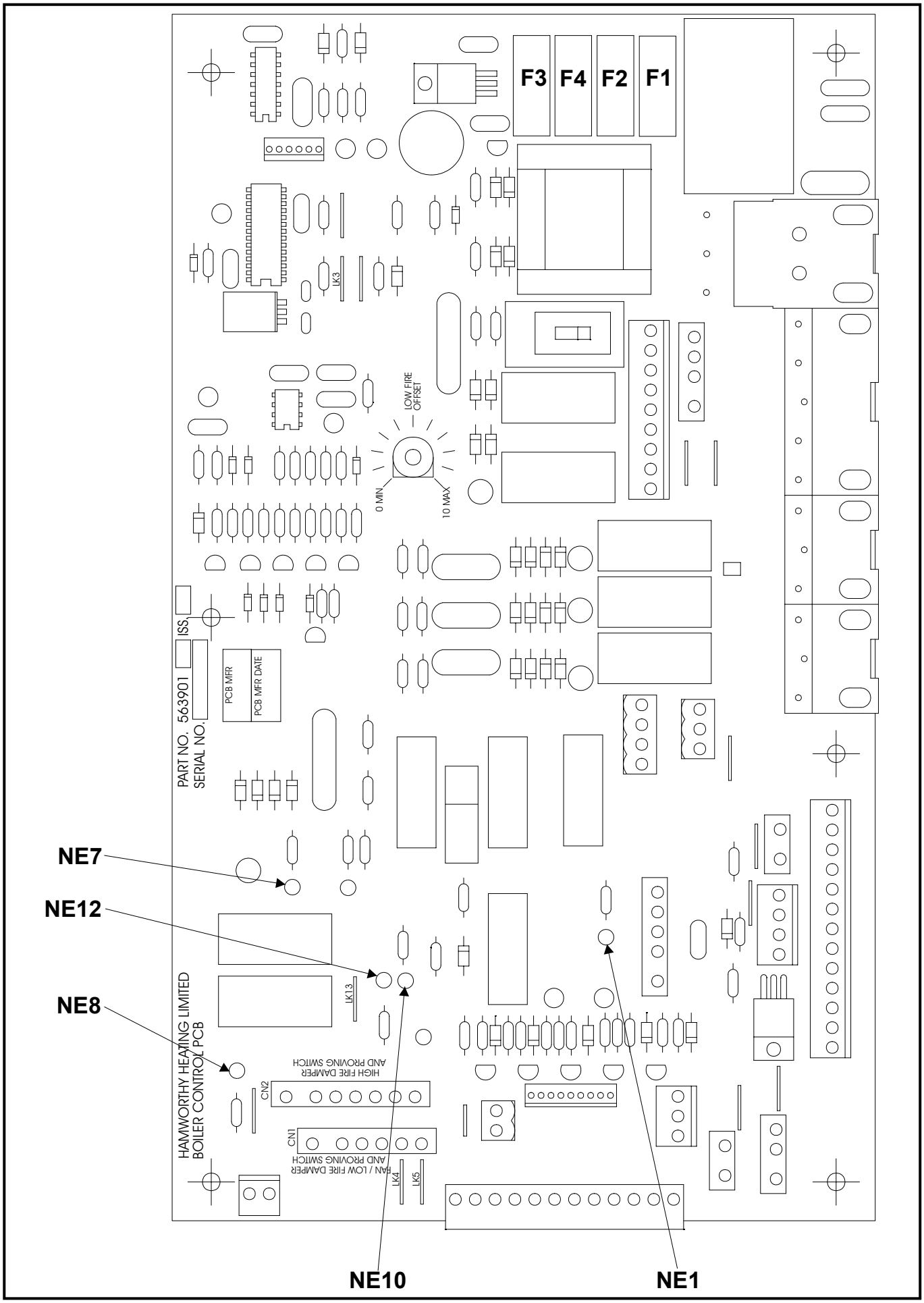
12.1 Safety Features Summary

The main PCB is fitted with neons to indicate correct operation of the boiler functions – refer to Figure 12.1 (p26).

Should the control thermostat fail, causing an overheat condition, the temperature limiter will trip thus creating an immediate shutdown regardless of firing mode. An overheat neon on the **controls fascia** will indicate that this condition has occurred. The door will have to be removed to permit access to the temperature limiter re-set pin. If, after pushing the pin in, the light on the fascia does not go out and the boiler does not light up, it could be that the boiler is still too hot, i.e. the control thermostat has not re-set. An investigation should be carried out to ascertain the reason for the overheating. An obvious reason would be too low a water flow rate through the boiler.

The flame is under constant supervision by the burner logic controller. This is accomplished by measuring the flame's ability to rectify an AC current. If the flame diminishes for whatever reason and the rectified current

Figure 12.1 Boiler Function Neons



drops below the controllers minimum (0.7µA DC), the controller will induce a non-volatile lockout which will require a manual re-set (situated on the controls fascia) to re-start the control sequence.

'Classic' models only. Prior to the ignition sequence starting, the damper mechanism has to operate and prove position. With the thermostat calling for heat, neon NE7 on the main PCB will be illuminated – indicating power to the Low Fire damper.

After approximately 20 seconds, neon NE10 on the main PCB will be illuminated – indicating that the low fire damper is open and the ignition sequence can commence. Simultaneously, the green HSi LED on the control panel fascia will illuminate. Once ignition has occurred, the green Low Fire LED on the control panel fascia will illuminate.

Should there be a demand for hire fire, neon NE8 on the main PCB will be illuminated – indicating power to the High Fire damper.

After approximately 20 seconds, neon NE12 on the main PCB will be illuminated – indicating that the High Fire damper is open. Simultaneously, the green High Fire LED on the control panel fascia will illuminate. The boiler should now be operating at High Fire.

If the boiler continues to lockout, then an investigation must be made to ascertain the cause. See Figure 12.2 (p28/29) for possible corrective scenarios.

All Propane firing boilers are fitted with a low gas pressure switch (set at 20mbar). Should the gas supply pressure fall below this level, the boiler **will not** operate.

12.2 Fault Finding Procedures

General fault finding is shown in Figure 12.2 (p28/29). If the boiler still cannot be operated satisfactorily after following the chart, consult your local office of Hamworthy Heating for assistance.

12.3 Possible Causes of Boiler Lockout

1) Ignition failure due to faulty igniter.
2) Ignition failure due to faulty gas valve.
3) No or low gas supply pressure.
4) No ignition due to faulty controller.
5) Ignition failure due to faulty damper mechanism.

13.0 SERVICING

13.1 Regular annual servicing is recommended to ensure trouble free operation. Although cleaning of flueways may not be necessary on a yearly basis, it is important that all controls and safety features are checked for correct operation. **NOTE!** Measuring flue gas CO_2 and gas temperatures will give an indication of the state of the boiler flueways and waterways. Results should be compared with previously measured values to establish possible loss of efficiency.

13.2 Before servicing the boiler, the following procedure must be carried out: - **WARNING: Isolate the electrical supply and turn off the gas service cock to the boiler module being serviced.**

1) Remove the front casing door by using a screwdriver to rotate the ¼ turn latch.

2) Turn off gas service cock, (fitted upstream of gas control valve) and carefully drop down the fascia of the controls housing.
3) Undo both screws on gas valve gland plate, situated under controls assembly, and carefully disconnect the plug from the PCB. Withdraw the cable and plug assembly.

4) Disconnect igniter and probe leads carefully. A protective boot will require pulling back to reveal the sensing probe connector.

5) Slacken union below gas service cock and release. Slacken and remove nuts/washers holding gas valve and manifold assembly. Remove manifold assembly taking care not to damage high/ low gas solenoid.

6) Carefully remove burner assembly by pulling burner front plate. Check condition of igniter assembly and probe for damage. Clean as required. Check burner bars and clean using a soft brush if required (if possible use compressed air to blow out the dust inside the bar). Damaged or cracked burner bars should be replaced. To replace an individual bar will require drilling out the rivets holding it on to the front plate. A replacement burner bar will be supplied with clinch nuts and screws to fix onto the front plate.

13.3 The boiler flueways can now be cleaned as follows:-

13.3.1 'Classic' models: -

1) Check the flue above the draught diverter is self-supporting before removing the two bolts on the draught diverter clamp and sliding the primary flue up inside the double cone assembly. The complete assembly can be removed and stored safely. Disconnect the damper electrical connections (CN1 & CN2) from the control panel PCB and carefully lift the damper assembly from the flue hood. Remove the top-casing panel and bezel. The panel is secured by spring latches. Lift off and store in a safe place to avoid damage or scratching.

2) Undo the screws supporting the gas pipe clamp. **NOTE!** The boiler gas pipe may require supporting in order not to place undue stress on the main gas header pipe.

3) Carefully prise away the silver insulation jacket

Figure 12.2a Fault Finding Procedures

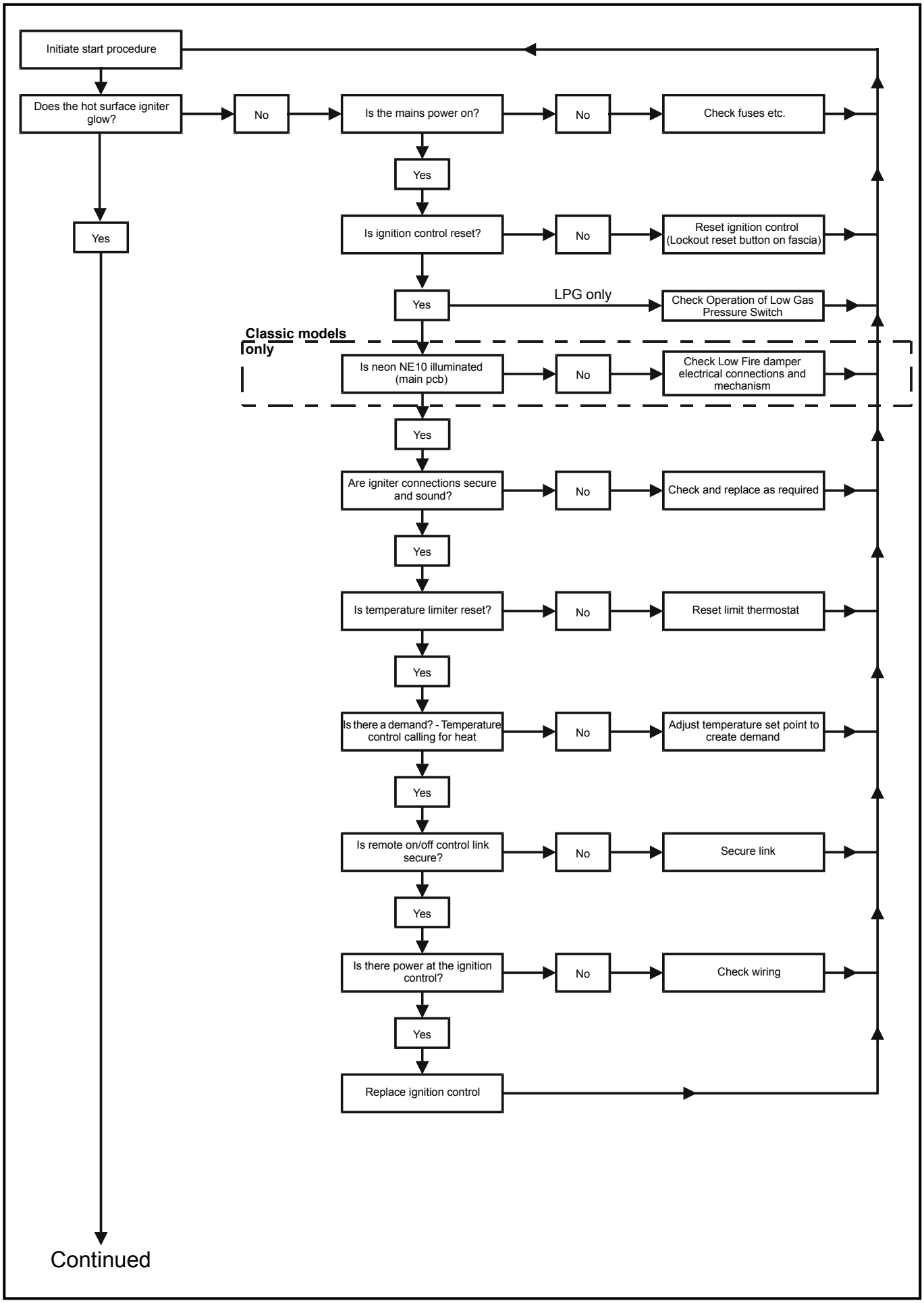
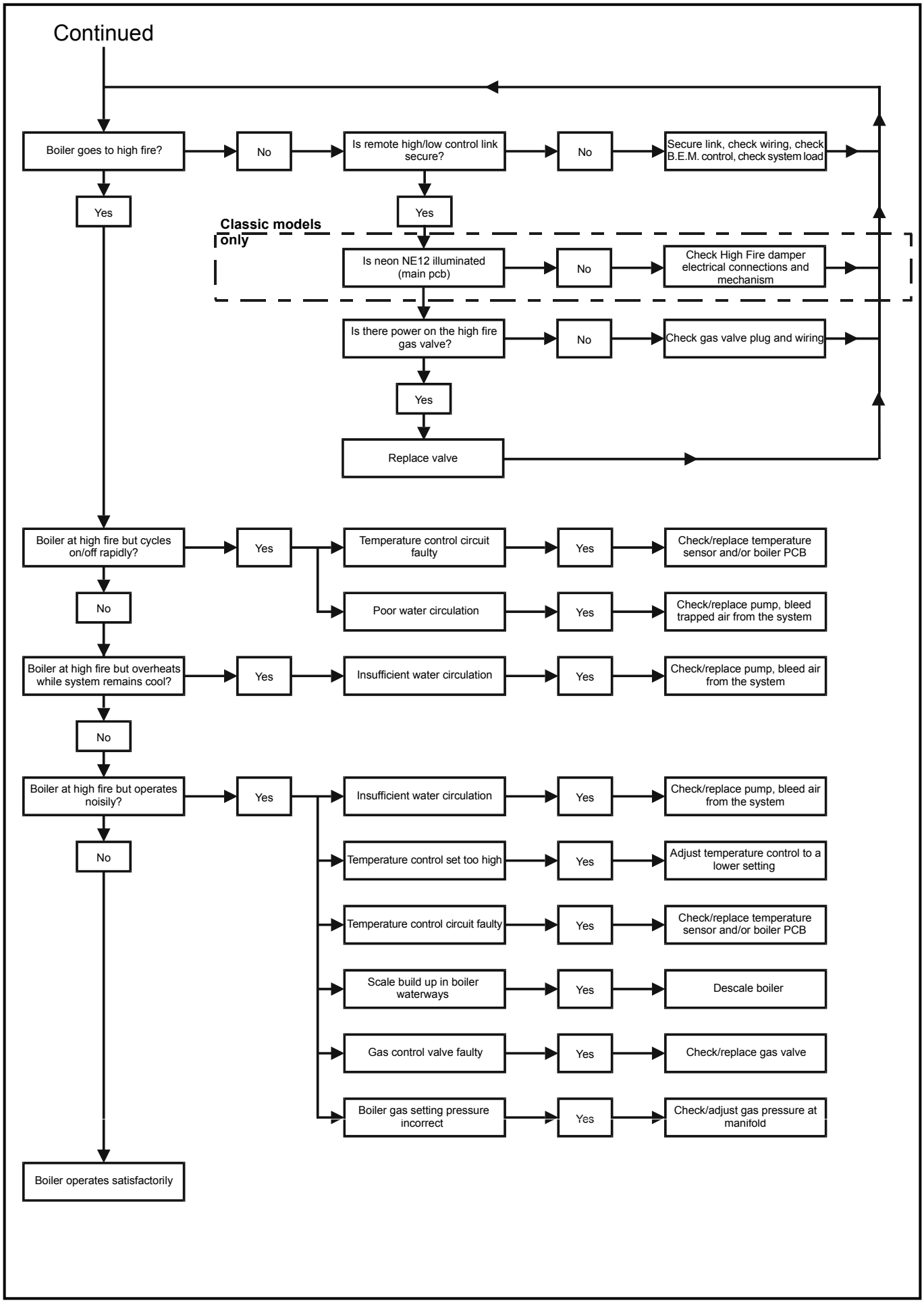


Figure 12.2b Fault Finding Procedures (Cont.)



from the flue hood. Undo and remove the nuts holding the flue hood to the boiler. Take care not to move the locking nuts which locate the hood's position. Remove the gas baffle, (not fitted to 120kW boiler).

13.3.2 'Integra' models: -

1) Check the flue above the flue pipe is self-supporting. Remove the top panel to gain access to the draught diverter. Remove the insulation and inspection cover (M6) bolts on sloping front.

2) If further access is required remove M6 bolts along top of draught diverter. The top section should now drop down to free the flue pipe. Undo M6 bolts from baffle and swing away.

3) NOTE! This baffl**e MU**ST be relocated in the correct position when re-assembling the draught diverter.

13.3.3 All models: -

4) The boiler flueways are now exposed and can be brushed through diagonally in both directions to remove deposits from the cast iron finned surfaces.

5) Re-assemble the boiler in the reverse order to that shown above. Ensure a new rope seal is fitted to the flue hood to maintain a gas tight seal, (see spares list). Ensure primary flue damper is sealed into flue hood spigot and draught diverter is sealed to damper. The boiler's operation may be affected if these seals are not completely fitted.

6) Before replacing the burner bar assembly, lift out both halves of the radiant reflector and brush off any dust and fallen deposits accumulated on it. Also clean the area under the reflector before re-placing it in its correct location. Re-assemble the burner bar assembly, ensuring correct location on the rear support bracket. Refit the gas manifold taking care not to damage any fragile components. Check all gas connections are tightened securely before opening the gas service cock. Re-connect electrical connections. Switch on the electricity supply and re-light the boiler following the correct procedure on the inside of the door.

7) Take gas pressure readings and exhaust gas readings and compare with Figure 2.2 (p4), or for propane firing refer to Appendix 'A' (p37), adjust as required. Ensure no gas leaks are evident from the gas connections, see Figure 5.6 (p7) for procedure. Check thermostat settings and adjust if required.

8) Re-fit door and tidy floor around boiler as necessary.

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. In each case carrying out the appropriate part of the commissioning procedure must check the operation of each replaced component. See **Section 11.0:Commissioning and Testing**

NOTE: Isolate 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 Igniter Assembly

Reference to Figure 14.0 (p31) shows position of igniter assembly. To remove assembly disconnect the plug/socket on the supply lead and remove the screw securing the igniter to the burner front panel. Figure 14.1 (p32) shows diagram of igniter assembly and relevant components and part numbers. Renew components as required and generally remove any loose sooty deposits and clean as required. Ensure positions of components are as recommended in Figure 14.1 (p32).

14.2 Control Thermostat Renewal.

The thermostat consists of a potentiometer and remote sensor. Part Nos. 563901258 & 533901350

NOTE! Record existing temperature setting of thermostat for reference before removal.

Prise the top panel from the side panels (secured by spring latches) and lift boiler top panel to reveal thermostat pocket. **NOTE!** on **'Classic'** models, remove the infill panel prior to lifting the top panel. Carefully remove thermostat phials. Drop down fascia to reveal controls section. Disconnect the sensor cable plug (CN23) from the PCB and remove the sensor. Prise out the indicator disc from the centre of the control knob and loosen the collet nut securing the knob to the shaft. Pull off the control knob and undo the securing nut on the central spindle. Disconnect the potentiometer cable plug (CN14) from the PCB and remove the potentiometer. Replace components in reverse order ensuring that the sensor is correctly located within the pocket. Do not force the bulb into the pocket. When replacing the potentiometer knob, rotate the shaft fully anti-clockwise and fit the knob with the locating pip aligned with the 60°C graduation. Fit the indicator disc aligning the mark with the graduation. Close fascia and re-fit top panel correctly.

Run the boiler and turn the thermostat up and down and 'on' and 'off' to check for correct operation. Set thermostat to previously noted setting.

Figure 14.0 General Layout (Front View)

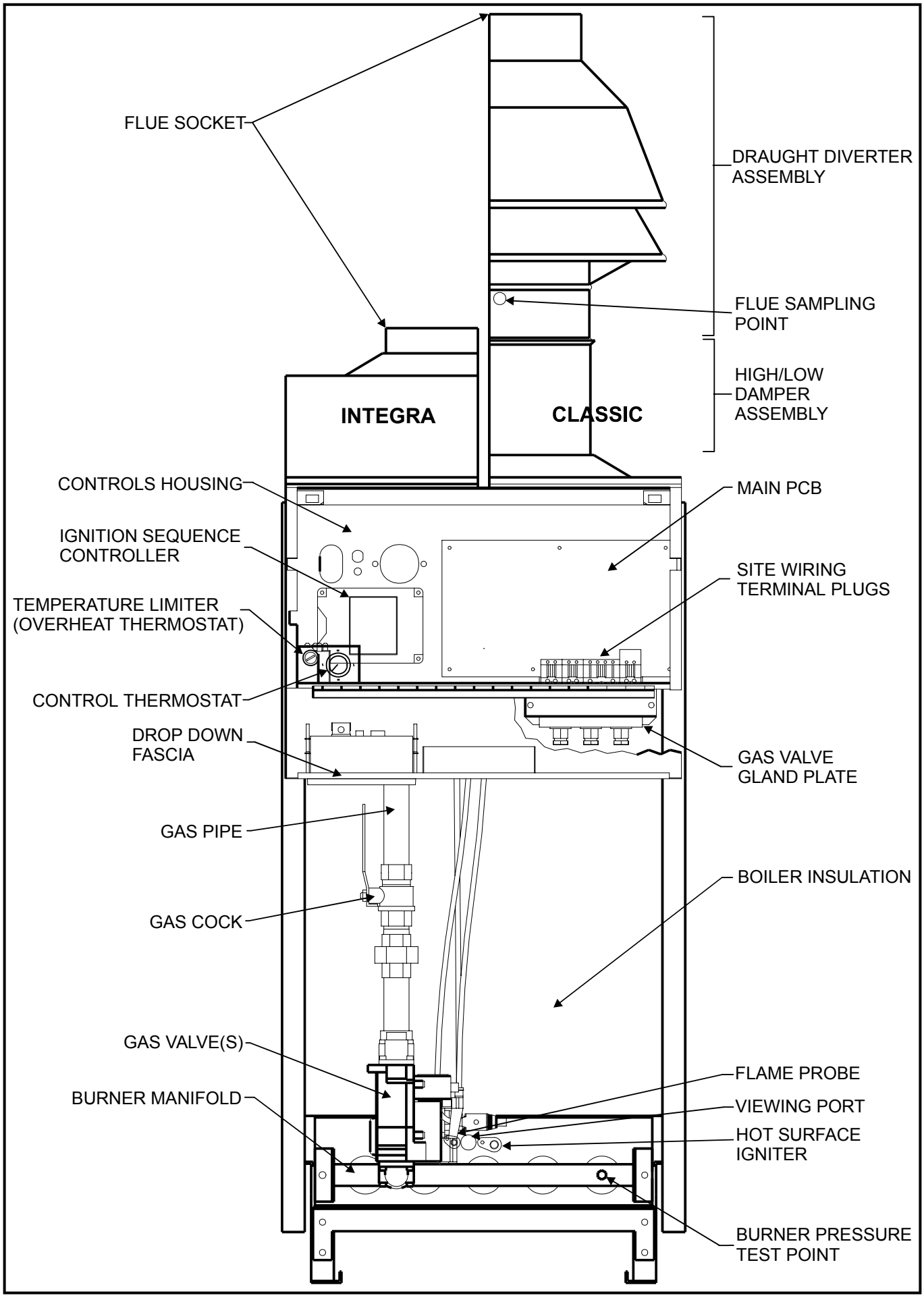
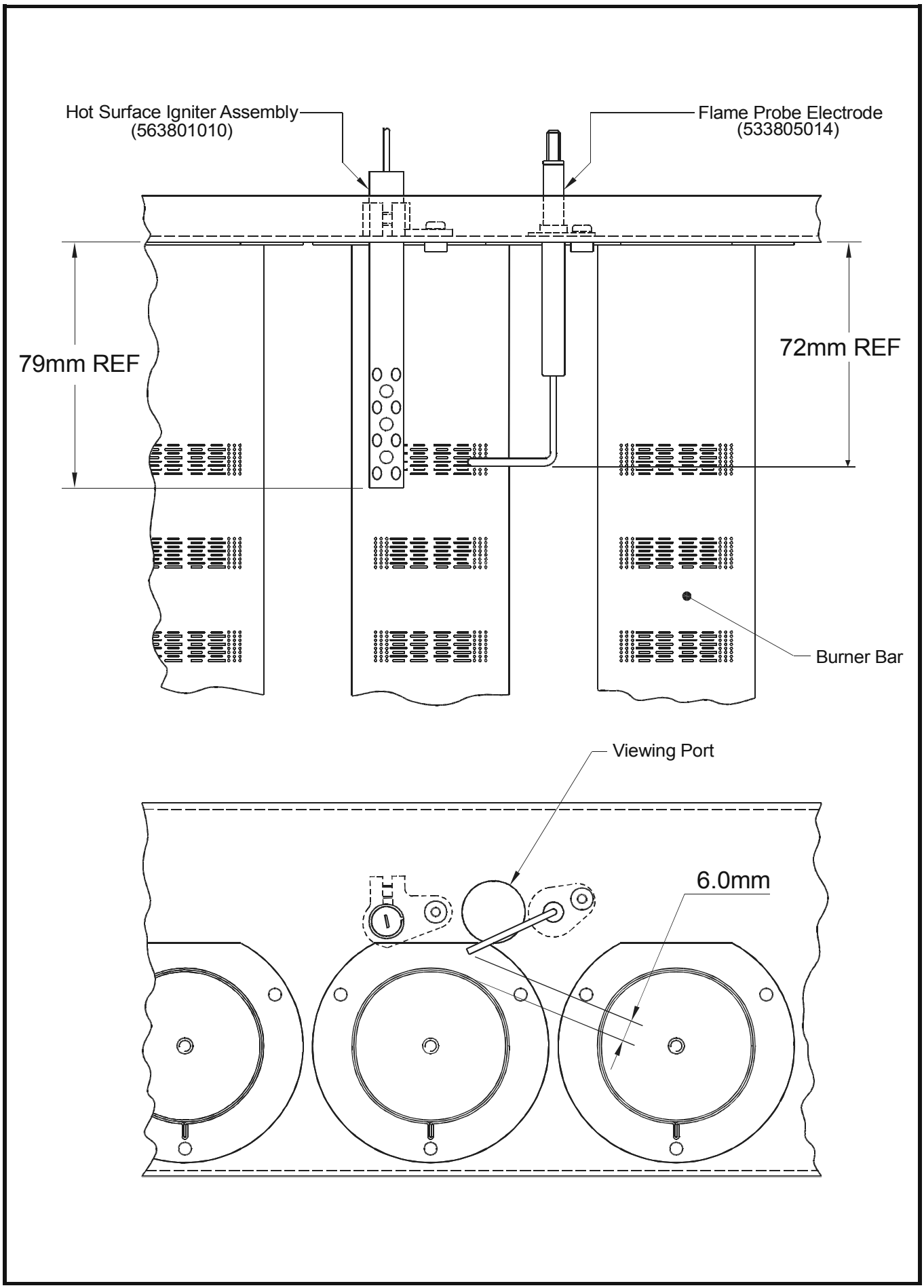


Figure 14.1 Diagram of Hot Surface Igniter and Sensing Probe Assembly



14.3 Temperature Limiter (Limit Stat) Renewal Part No. 339011044 or 533901179

The temperature limiter renewal procedure follows that of the control thermostat with some minor differences. These are as below: -

Remove the 'push on' spade connections from the temperature limiter body noting position of coloured cables. Remove plastic cover (if fitted) and unscrew holding nut to detach temperature limiter from housing. Gently feed the capillary back through the controls bulkhead. Re-set temperature limiter to 100°C. Check the operation of the device by carefully applying a heat source to the bulb. Re-assemble temperature limiter into controls housing ensuring correct cable notation. Refer to the thermostat diagram if terminal identification differs from those given in Figure 9.1 (p14).

14.4 Main Gas Valve.

NOTE! Some gas valve components can be replaced without completely removing the whole assembly from the boiler. However, Hamworthy Heating strongly recommend that a new gas valve assembly is fitted to ensure safe, reliable operation of the boiler. Please refer to Hamworthy Heating Technical Department before attempting to remove components from the gas valve.

NOTE! Only gas valves with an identical Type No. may be used for replacement. Please contact Hamworthy Heating spares Dept. for further information.

Various types and manufacturers of gas valves are used. Refer to Figure 11.7 (p23/24) for particular valve(s) fitted.

1) Ensure power and gas supplies are isolated.

2) Remove the gas valve wiring plugs from the gas valve(s) – secured by M3 screws through the plug body. **NOTE!** The position of the relevant electrical cables should be noted, especially on the 95-120kW boilers. Undo the union connection and 8mm nuts holding the gas valve/manifold assembly to front plate, this will allow the whole assembly to be removed from the boiler.

3) Remove the gas valve by unscrewing cap head screws holding valve to pipework. When replacing the gas valve, it is advisable to renew the `O` ring seals sealing both ends. See **SECTION 15.0 Recommended Spares** (p36) for Part Nos. Note that the `O` ring fitted to the 40-80kW (Natural Gas) and all propane models, is different to that used on the 95-120kW (Natural Gas) models. Do not over tighten cap head screws in gas valve body. Ensure electrical plugs are firmly and correctly located and holding screws are tightened.

4) Replace assembly ensuring correct orientation of the gas valve. Ensure that the gas flow is in the same direction as the arrow on the bottom of the valve. Refit all external components. Switch on gas and power supply and check for integrity of all joints using a proprietary leak detector. Ensure gas valve (s) operation is correct and safe before continuing. Refer to **Section 5.6** (p7). if necessary for valve integrity check procedure.

5) Re-light the boiler using instructions on the inside of the door. Check and adjust, the low fire/ start gas and high fire gas pressures, refer to Figure 2.2 (p4) for Natural Gas or Appendix 'A' (p37) - propane firing, for correct settings. Re-set throttle valve position, if replaced, see Figure No. 11.7b (p24) for procedure. If necessary, refer to **Section 11.4 Commissioning the Boiler** (p20), for correct procedures.

14.5 Damper Actuator Motor

1) Remove the 2 screws securing the split top casing panel and remove the two halves of the top panel from the ballstuds. Should the damper cables be routed through the top panel insert, refer to 2).

2) Drop down the control panel fascia and unplug the damper motor electrical connections CN1 & CN2, from the PCB. Remove the cable gland from the rear of the control panel and withdraw the damper cables, unclipping them from the boiler side panels.

3) Remove the clamp band and collapse the draught diverter onto the primary flue. Remove the screw securing the primary flue to the boiler flue hood and carefully remove the complete assembly and flue bezel. **Alternatively**, remove the clamp band and 2 screws securing the draught diverter to the primary duct. Collapse the short primary duct into the draught diverter and remove the damper assembly and flue bezel, leaving the draught diverter assembly connected to the flue system. Temporarily support the draught diverter.

4) Identify the motor cables and carefully remove the terminations from the PCB connector using a small terminal screw driver – See Figure 14.5a (p34). Remove the cables from the strain relief bushes in the gland plate. **NOTE!** The Low Fire motor MUST be removed to gain access to the High Fire motor.

5.1) Low Fire Motor

5.1.1) Remove the motor cover secured by four screws.

5.1.2) Remove the two screws securing the actuator location bracket to the mounting plate. Slacken the 'U' clamp and remove the M4 button head screw securing the torque sleeve to the Low Fire damper shaft. Withdraw the motor and shaft.

Figure 14.5a Damper Actuator Wiring Details

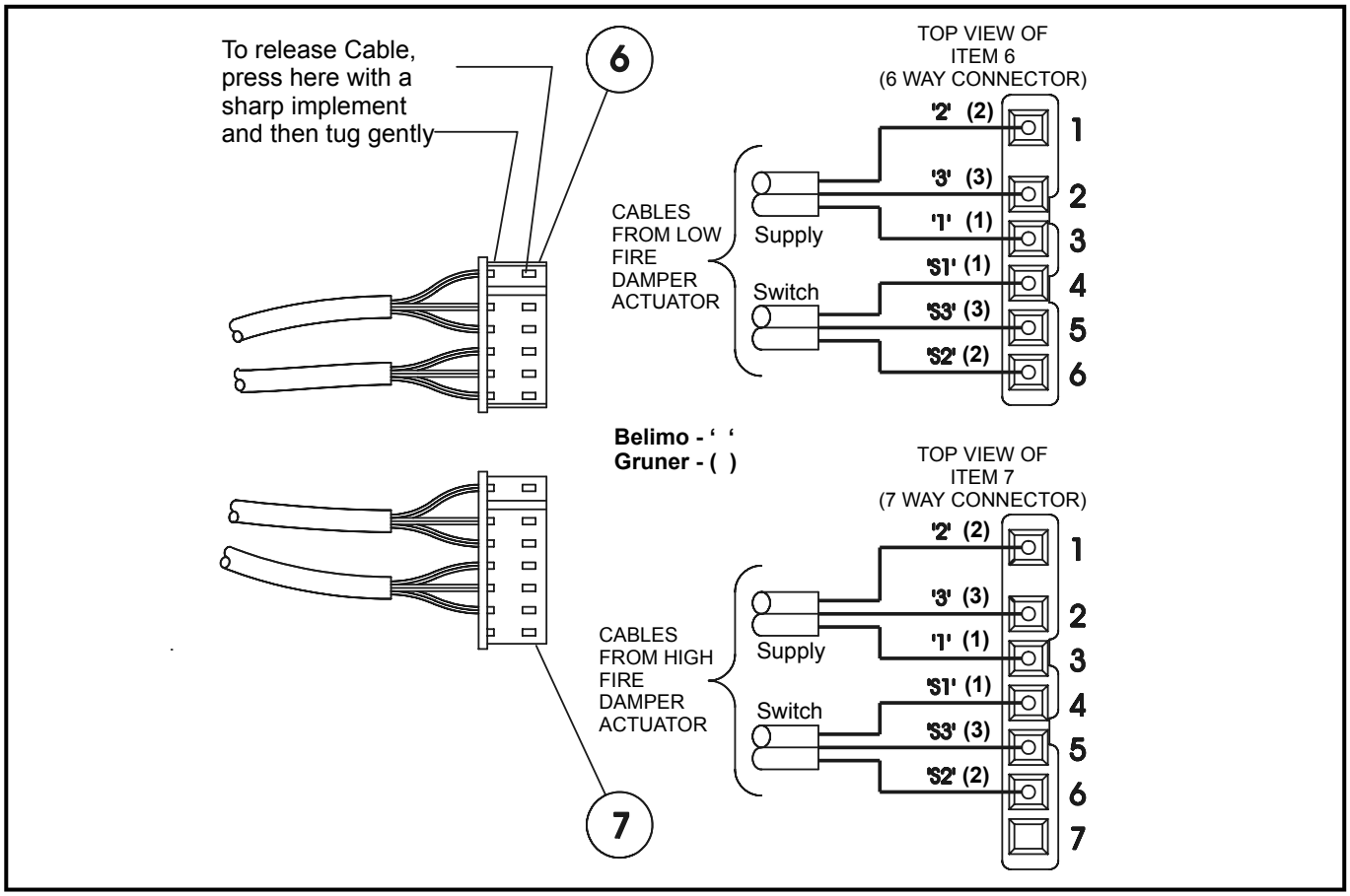
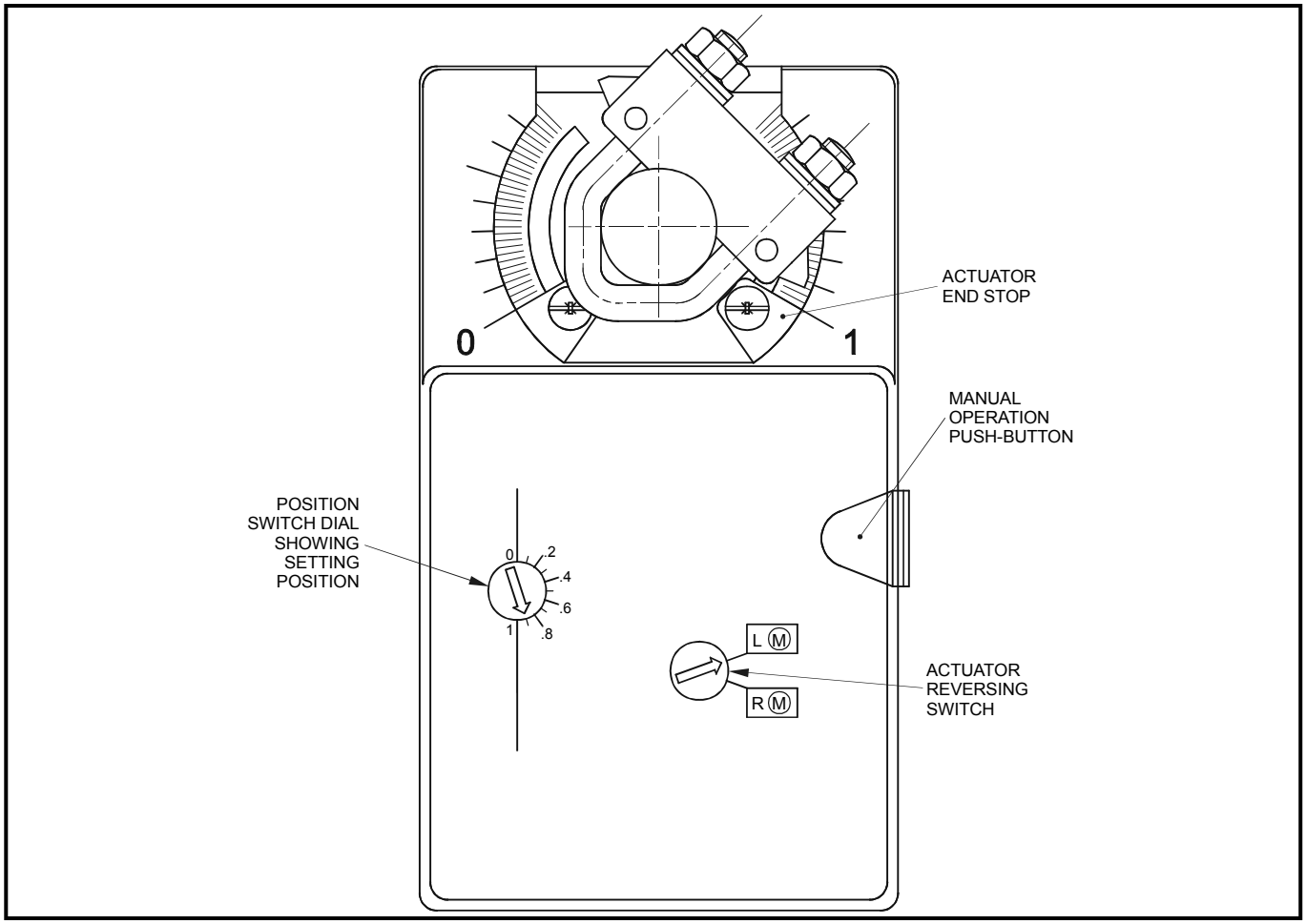


Figure 14.5b Damper Actuator Motor



5.2) High Fire Motor

5.2.1) Remove the motor cover secured by four **screws.**

5.2.2) Slacken the 'U' clamp and slide the motor off the High Fire shaft. **NOTE!** The bush supporting the High Fire shaft is a light press fit onto the Low Fire shaft and may need released to remove the High Fire motor.

6) Refit the replacement parts in reverse order noting the following:

Discard the pointer and M5 nuts supplied with the new motor and replace with the nuts and washers from the failed unit ensuring that the serrated faces of the washers interlock.

6.1) High Fire Motor

6.1.1) Depress the manual operating button on the side of the motor body and rotate the clamp arrangement fully counter-clockwise. See Figure 14.5b (p34). Rotate the High Fire damper blade into the horizontal position, refit the motor and tighten the 'U' clamp. The anti-vibration washers should be locked. Check the position of the damper blade and that it is central in the duct. Manually operate the actuator fully clockwise to check the open position of the damper blade. Should adjustment be necessary in either open or closed positions, reposition the end stops, and secure the fixing screws.

6.1.2) Set the actuator reversing switch to the 'L' position and with the High Fire damper in the open position, adjust the position switch dial as shown in Figure 14.5b (p34). Check the operation of the position switch by rotating the actuator about the open position listening for the switch operation. Adjust as necessary.

6.2) Low Fire Motor

6.2.1) Pass the Low Fire torque sleeve over the Low Fire shaft. Replace the actuator location bracket, refit the motor and fix the torque sleeve to the Low Fire shaft. Depress the manual operating button on the side of the motor body and rotate the clamp arrangement fully counter-clockwise. See Figure 14.5b (p34). Rotate the Low Fire damper blade into the horizontal position, and tighten the 'U' clamp The anti-vibration washers should be locked. Check the position of the damper blade and that it is central in the duct. Manually operate the actuator fully clockwise to check the open position of the damper blade. Should adjustment be necessary in either open or closed positions, reposition the end stops, and secure the fixing screws. Both High and Low Fire damper blades should align in the open and closed positions.

6.2.2) Set the actuator reversing switch to the 'L' position and with the Low Fire damper in the open position, adjust the position switch dial as shown in Figure 14.5b (p34). Check the operation of the position switch by rotating the actuator about the open position listening for the switch operation. Adjust as necessary.

6.3) Reassemble the cables to the gland plate and refit the terminations to the PCB connectors (push in). See Figure 14.5a (p34). **NOTE!** The cables have identification numbers printed onto the insulation. Fit the flue bezel over the primary duct, refit and secure the damper to the flue hood. Secure the connectors to the PCB, the gland plate to the rear of the control panel and carefully route and secure the cables.

6.4) Prior to refitting the draught diverter, check for correct operation of the damper by briefly firing the boiler. Upon satisfactory operation, refit the motor cover and draught diverter assembly. Support the flue bezel and fit the top panel and infill.

6.5) Re-light the boiler using instructions on the inside of the door and check for correct operation.

15.0 RECOMMENDED SPARES

Please Note! To ensure the correct spare parts are despatched by our spares department, it is imperative that the complete Boiler/Control Panel Serial numbers are given. The Boiler Serial Number is located on the gas manifold inside the door. The Control Panel Serial Number is located inside the Control panel on the maximum power-rating label. These numbers **MUST** be quoted when ordering spare parts.

SPARES ITEM	PART NO.
Electrical Items	
2 Amperes Control Fuse	747225834
Main fuse (F1) on PCB. – T6.3A	533901221
PCB fuses (F2, F3 & F4) – T2A	533922002
Sequencing Interface Module PCB Fuse - T250mA	533922008
Flame sensing probe lead	533901259
Main PCB	563901293
Fascia PCB	563901237
Thermostat sensor (incl. 600mm long leads)	533901350
Potentiometer (incl. PCB harness)	563901258
Ignition Sequence Controller	533901344
Primary Flue Damper Motor incl. Leads	563901281
Hours Run Meter	563901273
Sequencing Interface Module	533901421
Mechanical Items	
Single Burner Bar	533301003
Heat Exchanger Nipple	330502033
Flue hood thermoseal Yarn (10mm Dia.)	331299233
Injector Copper Washer	339008347
Gas Valve 'O' Ring Joint (40 - 80kW only)	742111245
Gas Valve 'O' Ring Joint (95 - 120kW only)	742122069
HSi Igniter	563801010
Flame Probe	533805014
Temperature Limiter (Imit)	533901179
Temperature Limiter (L & G)	339011044

NOTE! For any service/replacement parts (Especially Gas Valves) the boiler Serial No. (on Data Plate inside boiler) MUST be quoted.

For service or spares please contact: -

Hamworthy Heating Limited
Fleets Corner
Poole
Dorset
BH17 0HH

Phone Number 01202 662500
Fax Number 01202 665111
Service 01202 662555
Spares 01202 662525
Technical ..... 01202 662527 / 662528

Appendix A Purewell Automatic Ignition

INFORMATION RELATING TO PROPANE FIRING

NOTE:-
LPG FUELS - IT IS STRONGLY RECOMMENDED THAT, ON LPG INSTALLATIONS, GAS DETECTION EQUIPMENT IS FITTED. THIS EQUIPMENT SHOULD BE POSITIONED NEAR THE BOILER AND AT LOW LEVEL. IT IS ALSO IMPORTANT THAT THE SPACE HOUSING THE BOILER IS ADEQUATELY VENTILATED AT HIGH AND LOW LEVEL. REFER TO MAIN INSTALLER'S GUIDE.

1.0 INTRODUCTION

The operation of the Purewell range of boilers on LPG-Propane (3rd family) I_{3P} is similar to that on Natural Gas (2nd family) I_{2H} and the design and installation details described in the main body of the installer's guide should be followed. There are however, differences in the construction and setting of the propane fired boiler which are as follows: -

a) The main gas injectors (located in the gas manifold) are replaced with those detailed the Performance and General Data Information table below.
b) The nominal gas inlet pressure for propane should be 37mbar.
c) Relevant labels are replaced to indicate the appropriate gas for which the boiler is set up to fire.

The following tables and paragraphs, using the same numbering system as the main installer's guide, highlight the different values and procedures to be used when firing propane, and should be used in conjunction with the Main Installer's Guide.

Figure 2.2 Performance and General Data Information

GENERAL DATA	**40**	**50**	**60**	**70**	**80**	**95**	**100**	**105**	**120**
Boiler Input High Fire - kW (Gross)	49.3	63.4	74.5	88.4	101.0	120.0	126.0	132.0	150.0
Boiler Input High Fire - kW (Nett)	45.4	58.4	68.6	81.4	93.0	110.5	116.0	121.6	138.1
Boiler Input Low Fire - kW (Gross)	24.7	29.2	33.0	38.0	40.7	32.0	N/A	41.4	47.2
Boiler Input Low Fire - kW (Nett)	22.7	26.9	30.4	35.0	37.5	29.5	N/A	38.1	43.5
Boiler Output High Fire - kW	40	50	60	70	80	95	100	105	120
Boiler Output Low Fire - kW	23.4	25.3	25.8	30.8	33.0	25.6	N/A	33.0	38.0
FLUE DATA									
Nominal Flue Dia. **Classic** - mm	206	206	206	206	206	256	-	256	256
Nominal Flue Dia. **Integra** - mm	206	-	-	206	-	-	256	-	-
Approx. Flue Gas Temp. - °C	180	190	190	200	210	200	200	210	190
Approx. Flue Gas Volume @ 9.0% CO_2 & 100°C - m^3/h*	68	83	91	97	110	132	147	147	175
GAS DATA									
Nominal Gas Inlet Pressure - mbar	37								
Maximum Gas Inlet Pressure - mbar	45								
Gas Manifold Pressure High Fire - mbar	15.0	15.0	15.0	15.0	17.0	29.0	23.0	25.0	24.0
Gas Manifold Pressure Low Fire - mbar	10	4.0	3.0	3.0	3.0	2.6	2.5	2.6	2.6
Gas Flow Rate High Fire - m^3/h	1.9	2.4	2.8	3.3	3.8	4.5	4.7	5.0	5.7
- kg/h	3.5	4.6	5.3	6.3	7.2	8.6	9.0	9.5	10.7
Injector Marking / Dia. - mm	2.1	2.3	2.6	2.8	2.9	2.4	2.7	2.7	2.9

*** NOTE!** Flue gas volumes are based on a gross flue gas temperature of 100°C at 1013mbar. This is considered to be the predicted temperature of the products in the secondary flue downstream of the draught diverter.

11.5 BOILER CHECKS PRIOR TO LIGHTING

Ensure that the gas supply is connected but turned to the 'OFF' position. Remove the cover on the low gas pressure switch and connect a multi-meter across terminals 'C & NO' - to measure circuit continuity.

Connect a manometer suitable for 50mbar to the pressure tapping on the switch body and gradually turn 'ON' the gas supply. The switch should operate at approximately 20mbar - noted on the multi-meter.

Turn 'OFF' the gas supply and undo the pressure test point on the gas valve inlet and allow the gas pressure to fall. The switch should operate at approximately 20mbar - noted on the multi-meter.

11.5.1 Gas Pressure Adjustment

After approximately 30 minutes of normal firing, connecting a manometer to test point on the manifold should check the manifold gas pressure. Minor adjustments to the appliance governor may be necessary to correct for site gas pressure conditions.

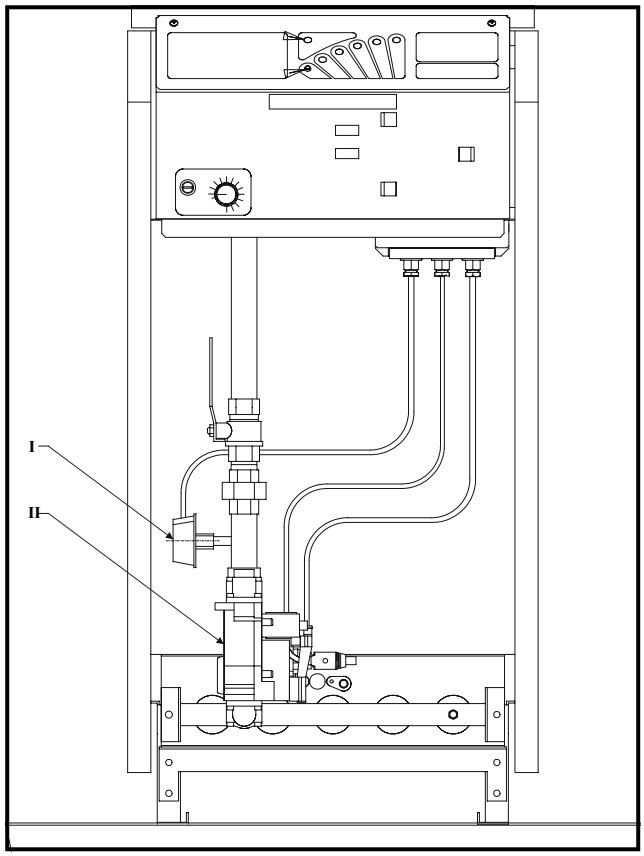
NOTE: The above is a first order check. Final setting must be made using a gas meter.

11.5.2 Combustion Checks

A flue gas sampling point is provided in the front boiler casing (see Figure 14.0 p31). To check combustion take a flue gas sample from each module test point and for reference CO_2 measurements should be between 8.0% and 11.5% or 9.0 to 4.0% O_2 (dependant upon model). Normal CO levels should not exceed 200ppm.

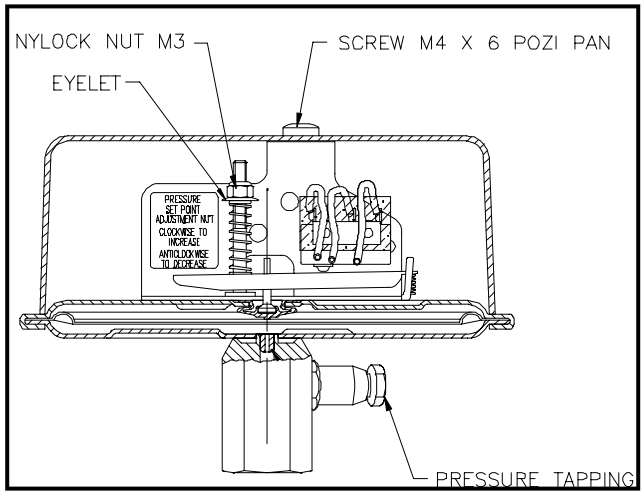
NOTE: All the above measurements refer to **dry flue gas** samples.

Gas Pressure Switch Location



Key: I - Gas Pressure Switch
II - Main Gas Valve

Gas Pressure Switch Adjustment



With the cover removed, turn the M3 nut clockwise to increase the set point and vice-versa. Seal the adjuster after setting.

15.0 RECOMMENDED SPARES

MECHANICAL ITEMS	PART No.
Low Gas Pressure Switch.....	339009477

USEFUL USER INFORMATION

INSTALLER	SITE ADDRESS

DATE OF COMMISSIONING:

BOILER TYPE	BOILER SIZE(S)	UNIT NO(S).	SERIAL NO(S).	FLUE

NOTES:

NOTES:

Notes

Connect direct

Direct Dial Telephone and Fax Numbers

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- water heaters
- pressurisation sets

Poole Office

Hamworthy Heating Limited
Fleets Corner, Poole, Dorset BH17 0HH England
Main switchboard tel: **01202 662500**

Technical enquiries	**01202 662527/662528**	**01202 665111**
Spare parts	**01202 662525**	**01202 665111**
Service department	**01202 662555**	**01202 662522**

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Birmingham Office

Hamworthy Heating Limited
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Main switchboard tel: **0121 360 7000** fax: **0121 325 2309**

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Northern Ireland
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tel: **02890 849826** fax: **02890 847443**

Website

www.hamworthy-heating.com

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