This manual must be kept with the appliance

iHE

Indirect High Efficiency Boiler & Water Heater

Installation and Servicing Instructions

Models
100/300
150/300

Working towards a cleaner future

POTTERTON COMMERCIAL
heating specialists

M6500

TECHNICAL DATA

Category gas types	II_{2H} G20 @ 20 mbar
Permitted flue systems	B23, C13, C33 & C53

GENERAL PERFORMANCE DATA		iHE 100/300	iHE 150/300
Nominal Heat Input net (gross)	kW	94.0 (102.2)	140.0 (152.1)
Minimum Heat Input net (gross)	kW	9.8 (11.1)	9.8 (11.1)
Nominal Heat Output Max (Pcond)	kW	99.0	147.4
Nominal Heat Output Min (Pcond)	kW	10.0	10.0
Gas Consumption (G20)	m^3/h	9.9	14.8
Gas Consumption (G25)	m^3/h	11.1	16.4
Flue gas temperature max (min)	°C	79 (50)	79 (50)
CO_2 at max output (min output)	%	9.3 (8.7)	9.3 (8.7)
CO at max output (min output)	ppm	128 (3)	128 (3)
NOx Value	ppm (mg/kWh)	36.8 (56.7)	36.8 (56.7)
NOx Class		5	5
HEATING			
Efficiency max heat output 50/30°C	net %	105.3	105.3
Efficiency min heat output 50/30°C	net %	102.5	102.5
Efficiency max heat output 80/60°C	net %	96.6	96.6
Efficiency min heat output 80/60°C	net %	95.2	95.2
Efficiency 30% heat output	net %	108.5	108.5
Seasonal Efficiency	gross %	95.6	95.6
Operating pressure max (min)	bar	3.0 (0.5)	3.0 (0.5)
Max permitted operating temperature	°C	82	82
Flow / Return connections	BSP	F 2”	F 2”
Fill/drain connection	BSP	M ½”	M ½”
HOT WATER			
Tank capacity	litres	300	300
Recovery rate through 50°C	l/h	1,520	2,240
Time to recover tank through 50°C	mins	12	9
Operating pressure max (min)	bar	6.0 (0.2)	6.0 (0.2)
In/Out connections	BSP	M 1½”	M 1½”
Water return connection	BSP	M 1”	M 1”
ELECTRICAL			
Electrical supply voltage	V	230	230
Electrical supply frequency	Hz	50	50
Minimum power consumption	A	0.2	0.2
Maximum power consumption	A (W)	3.3 (760)	3.82 (880)
Fuse rating on mains supply	A	5	5
Insulation protection rating	IP	20	20
FLUE			
Flue connection single flue	mm	130	130
Flue connection concentric	mm	130/200	130/200
Max flue equivalent length twin	m	30	30
Max flue equivalent length concentric	m	14	14
OTHER CONNECTIONS			
Gas connection	BSP	F 1”	F 1”
Condensate connection	mm	40	40
Tank drain connection	mm	28	28
DIMENSIONS & WEIGHTS			
Weight, empty (estimate)	kg	290	320
Weight, full (estimate)	kg	608	641
Height	mm	1,970	1,970
Width	mm	1,450	1,450
Depth	mm	685	685
Service clearance, rear	mm	0	0
Service clearance, right & top	mm	300	300
Service clearance, left & front	mm	800	800

C O N T E N T S

SYMBOLS USED IN THIS GUIDE

DANGER!

INDICATES SERIOUS DANGER TO PERSONAL SAFETY AND LIFE

WARNING!

INDICATES A POTENTALLY DANGEROUS SITUATION FOR THE APPLIANCE AND THE ENVIRONMENT

NOTE!

SUGGESTIONS TO ASSIST THE USER IN IMPLEMENTING INSTRUCTIONS IN THIS GUIDE

SMELL OF GAS

If you smell gas - follow these safety instructions:
- Do NOT turn off or on any electrical switches (including light switches)
- Do NOT smoke
- Do NOT use the telephone
- DO evacuate persons away from the source of the gas smell
- DO close the main gas shutoff valve
- DO open all the windows and doors where the gas leakage has occurred
- DO inform the gas authority or a competent specialist as soon as possible

CORRECT USE OF APPLIANCE

This Potterton comnmercial heating product has been designed and manufactured to comply with current International standards of safety. However, following an improper use, dangers could arise concerning the safety and life of the user or of other people, or damage could be caused to the appliance or other object. The appliance is designed to be used in a pumped hot water central heating system and potable hot water supply and storage. Any other use of this appliance will be considered improper. Potterton Commercial declines any responsibility for any damage or injuries caused by an improper use. In order to use the appliance according to its designed scope, it is essential to carefully follow the instructions given in this guide.

BEWARE

The installation, adjustment & servicing of this appliance must be carried out by a competent person (In the UK by a Gas Safe Registered Engineer and in IE by a (RGII) Registered Gas Installer) and installed in accordance with current standards and regulations. Failure to correctly install or maintain this appliance could cause injury to persons or damage to property. The manufacturer shall not be held liable for any such injury and/or damage.

FLAMMABLE SUBSTANCES

Do not store or use explosive or easily inflammable material (such as petrol, paint or paper) in the same room where the appliance has been installed.

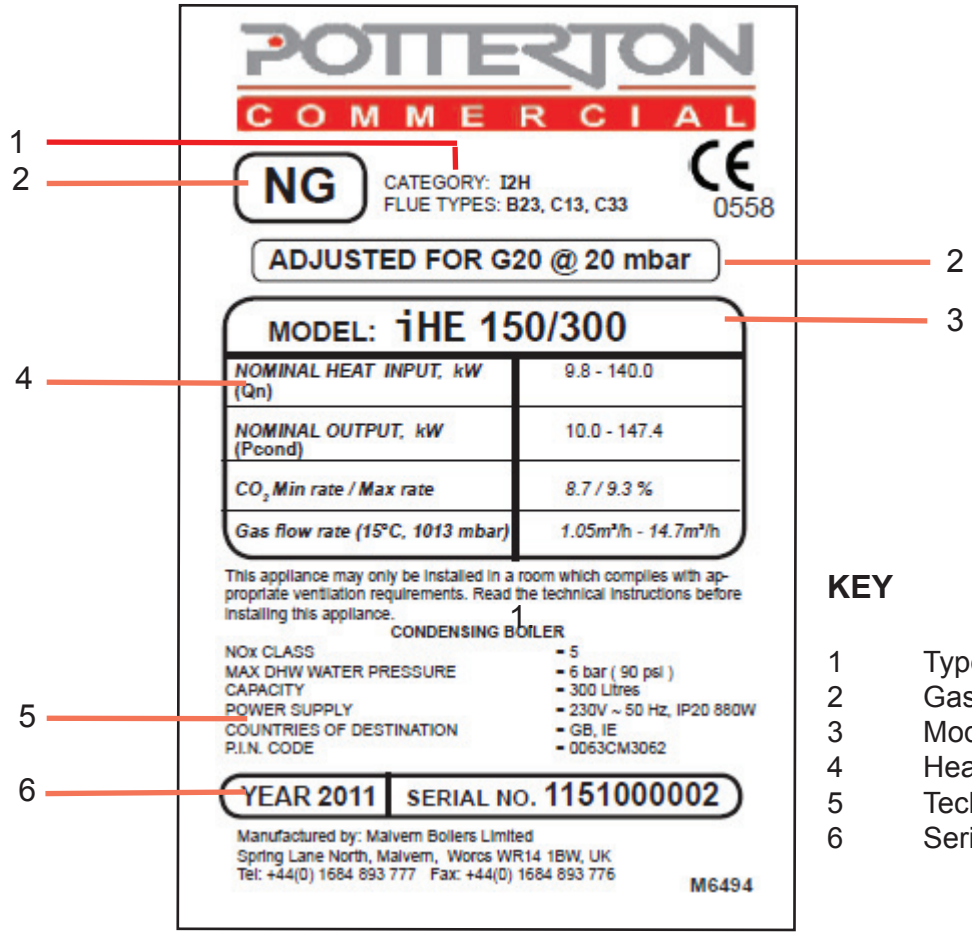
OPERATOR COMPETENCY

This boiler is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are given supervision or instruction concerning the use of it by a person responsible for their safety. Children should be supervised to ensure they do not play with the appliance.

Potterton Commercial's policy is one of continuous improvement, and therefore the information in this manual, whilst correct at the time of publication, may be subject to revision without prior notice.

DATA PLATE

There are two data plates located on the appliance . One is mounted on the inside of the electrical assembly (which becomes visible when the left hand door is opened) and the other is on the outside casing just below the electrical installation panel.



KEY

1 Type approval designation
2 Gas type and pressure
3 Model Name
4 Heat, gas flow & CO ² data
5 Technical data
6 Serial number

CE MARKING

The CE marking documents that the appliance complies with the essential requirements of the following directives:
- Gas appliance directive (90/396/EEC)
- Electromagnetic compatibility directive (89/336/CEE)
- Low voltage directive (2006/95/EEC)
- Efficiency requirements directive (Council Directive 92/42/EEC) for condensing boilers

This manual is an integral and indispensable part of the appliance and it is suggested that this manual is kept in a safe place for future reference.

GENERAL WARNINGS

The appliance has been designed for use with G20 gas and is manufactured to give an efficient, reliable and long service life.

To ensure continued trouble-free operation of the appliance at maximum efficiency, it is essential that correct installation, commissioning, operation and annual service procedures are carried out strictly in accordance with the instructions given in this manual.

Only original parts and accessories from the manufacturer must be used on all appliances. Using non-approved parts may compromise the safety of the appliance and invalidate any warranty.

The installation, commissioning and repair of this appliance must be carried out by a competent person, in accordance with the manufacturers instructions and complying with the National Laws in force at the time. (In the UK a competent person must be a Gas Safe registered Engineer or in IE by a Registered Gas Installer (RGII)).

In the event of failure and/or suspected faulty functioning of the appliance. Switch off the appliance and contact suitable qualified technicians. Do not attempt to make any repairs unless you are suitably qualified and competent to do so.

SAFETY

This appliance must be installed in accordance with local building regulations, national standards and bye laws in force. Attention should be given to the following standards and guidance notes:

GAS SAFETY (INSTALLATION AND USE) REGULATIONS

BUILDING REGULATIONS

THE WATER SUPPLY (WATER FITTINGS) REGULATIONS

Detailed recommendations are contained in the following codes of practice:

BS 6880: Low temperature hot water heating systems of output greater than 45kW.
Part 1 Fundamental Design
Part 2 Selection of equipment
Part 3 Installation, commissioning and maintenance

BS 6644: Specification for installation of gas-fired hot water boilers of rated inputs of between 70kW (net) and 1.8MW (net) (2nd & 3rd family gases)

BS EN 12897 Specification for indirectly heated unvented (closed) storage water heaters.

The following could be relevant dependant upon the installation:

IGE/UP/1 - 1A -1B Strength & tightness testing of industrial and commercial gas installations.

IGEM/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.

IGEM/UP/4 Commissioning of gas fired plant on industrial and commercial premises.

IGE/UP/7 Gas installations in timber frame buildings.

IGE/UP/10 Gas Installations in industrial and commercial premises.

IEE Wiring Regulations for electrical installations (BS7671)

NOTE: Consideration should be given to amendments or updates to the above standards.

HEALTH

It is the duty of manufacturers and suppliers of products to ensure, so far as is practicable, that such products are safe and without risk to health when properly used and to make available to users, adequate information about their safe and proper operation.

This appliance should only be used in the manner and purpose for which it was intended and in accordance with the instructions in this manual. Although the boiler has been manufactured with paramount consideration to safety, certain basic precautions specified in this manual must be taken by the user. It is imperative that all users of it must be provided with all the information and instruction necessary to ensure correct and safe operation.

Combatting Legionella

Water systems in buildings have been associated with outbreaks of Legionnaires' Disease, particularly in health care facilities where occupants are significantly more susceptible to infection.

In recognition of the risks in hospitals, a Code of Practice for the Control of Legionella in Health Care premises has been issued by the Department of Health.

Codes of Practice applicable to other premises have been published by other organisations, principally the Health and Safety Executive (HS) (G70) and the Chartered Institute of Building Services Engineers (CIBSE, TM13).
All Codes of Practice draw attention to the design and operation of water systems with reference to avoidance of factors that favour colonisation by Legionella bacteria. These factors include stagnation, lukewarm conditions (20ºC to 45ºC) and the accumulation of debris, scale and corrosion in the base of tanks and calorifiers.

An independent evaluation of our products was commissioned to investigate their resistance to the build-up of Legionella bacteria. Experiments were conducted to determine whether, following a substantial challenge by Legionella Pneumophilia, after overnight and stagnation conditions, the system was rendered free from viable recoverable Legionella. It was found that at 61ºC, following a challenge of approximately 107 organisms per litre, within one hour, more than 99.999% of organisms had been killed. After a subsequent stagnation period, sampling did not reveal any residual contamination. The design of the base of the integral water tank precludes Legionella colonisation, even after build-up of debris. The heating process ensures that the water at the bottom of the tank reaches the same temperature as in the rest.

In addition the controls of the appliance provide anti-legionella routines to provide additional protection.

Based on data obtained through experiment, this appliance can be described as Legionella resistant as it is considered unlikely that, at the temperature tested, the organism would colonise the water heater and present a possible health risk.

DESCRIPTION OF APPLIANCE

The iHE is a gas fired, low No×, multi-heat engine cascading boiler system, with an integrated 5" Low Loss Header for the supply of a low temperature hot water heating system. The iHE range of boilers also features an integrated stainless steel tank and plate heat exchanger for the supply of hot water.

Fully automatic electronic controls are integrated into the appliance, with a wide range of control and sensor options available. The controls also provides voltage free outputs for Enable, Burner On and Fault, for remote BMS use.

Each heat engine module consists of a stainless steel combustion chamber, premix burner, modulating fan, gas valve, ignition and flame detection electrodes and an NTC sensor for management control.

Each heat engine module is equipped with NTC sensors for precise temperature control on flow and return manifolds. Fully premixed, radiating, modulating burner, integrated with gas valve to deliver precise gas/air mixture throughout the full modulation range.

Common combustion air intake manifold, takes air from boiler room (type B23 flue) or directly from outside via a combined flue system (C13 & C33). An air non-return valve is integrated into the air supply of each heat engine, to ensure that flue products cannot contaminate the air supply, when the heat engine is not in use.

The safety and operation functions of each heat engine are managed by micro processor controlled circuit boards, one for each heat engine. The upper controller also acts as the cascade controller, switching/modulating the heat engines according to the demand and readings from the systems sensors. Control is performed using comparison parameters between the requested temperature and the global flow temperature.

Control Logic:

At full demand, each heat engine is ignited one at a time, until all heat engines are operating at full output.

As flow and return temperatures increase, all heat engines will begin to modulate down together, until all are operating at minimum input rate. As flow temperatures begin to approach the calculated set point, one of the heat engines will stop, leaving the others operating at minimum input rate. This will continue until all heat engines have stopped and temperature flow requirements have been fully satisfied.

GENERAL DIMENSIONS

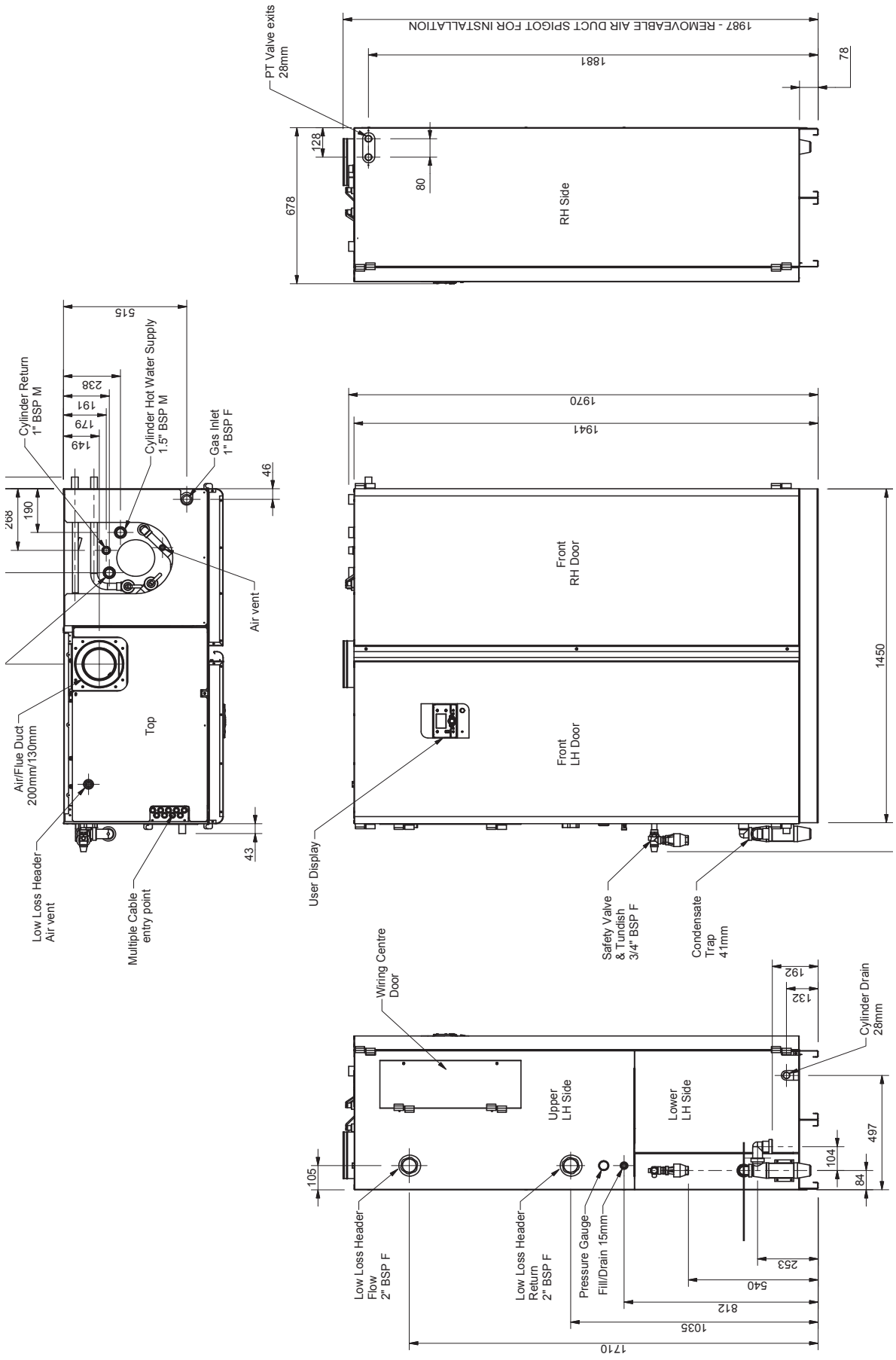


Fig 1.1

UNPACKING

The appliance is delivered assembled and protected by a plastic bag, inside a strong wooden crate. The packaging is designed to be handled by a forklift or pallet truck. The complete crated appliance can go through a door of 2,320mm high. Without packaging it can go through a door 1,970mm high.

Remove nails fixing crate sides to the base. Remove nails from one end of the crate. Remove end of crate and slide the main body of the crate off the opposite end.

Remove plastic wrapping once the appliance has reached its intended installation area.

Dispose of plastic packaging carefully. Keep out of the reach of children and animals.

APPLIANCE LOCATION

The location selected for installation of the appliance must allow the provision of a satisfactory flue, an adequate air supply (for type B_{23}), a drain and be well illuminated. A purpose built plant room or compartment is strongly recommended.

If a purpose built plant room is not available, measures should be taken to protect the appliance from damage and prevent any extraneous matter from being stored on or around the Heater. See BS 6644 Clauses 4, 5 and 6 for details. Any combustible material adjacent to the appliance must be so placed and shielded as to ensure that it's temperature does not exceed 66ºC (150ºF).

There must be easy access to the plant room and boiler at all times. The appliance must be located in an area where leakage from the tank, water connections or the combined temperature and pressure safety valve will not result in damage to the area adjacent to it. When such locations cannot be avoided, a suitable drain tray must be installed under the Heater. The drain tray must be no deeper than 38mm and must be 100mm wider and longer than the boiler. It should be piped to an adequate drain using 20mm (0.75in) diameter pipe, angled for proper drainage.

Access must be provided to the front of the boiler with adequate clearance for servicing and operation. (*Fig 1.1*)

The floor on which the boiler is installed must be flat, level and of sufficient strength to withstand the weight of it when filled with water, and should satisfy the requirements of the Local Authority & Building Regulations.

Whether connecting to an existing or a new heating system, a filter/strainer (with two isolation valves) must be fitted in the return pipe. When necessary it can be removed and cleaned, which will help protect the appliance from contaminants, from within the heating system.

Appliance floor fixing kit

This appliance has been supplied with plates to fasten the appliance securely to the floor.

There are four floor fixing plates (M6644) included with this unit. Two have been packed separately with the Air Duct kit that includes these instructions and another two plates have been used to fasten the appliance to the pallet.

Central Floor fixing method (two plates required)

Once the appliance has been located on a level surface, fix the appliance to the floor using the following method.

1) Slide plate into position so that it interlocks onto the LH central base support . Mark floor with hole position and remove plate (*Fig 2.1)*.
2) Drill marked position on floor to allow installers preferred method of fixing.
3) Refit plate and fasten through using preferred fixing method.
4) Repeat method at the RH end of the central base support.

Fig 2.1

Central Floor fixing method (two plates required)

If the central fixing positions are unsuitable for the installation, alternative positions can be utilised in the corners. (*Fig 2.2*) This method can only be used if the installer has kept the pallet fixing plates and has four plates in total.

Follow points 1 - 4 above for fixing instructions.

Fig 2.2

Installation into existing heating systems

Before replacement of an existing boiler, it is necessary to thoroughly clean out the old system first. This is best achieved intro ducing a basic cleaning solution 4 weeks before the substitution.

When the appliance is installed on existing systems, please ensure you have considered the following before commissioning:

- If you intend to use the existing flue on a B23 category system, check that flue outlet is suitable for condensing boilers, is the correct size, is correct for the temperature of the products of combustion and is manufactured according to current regulations. It must be tested for soundness and must not have any restrictions or defects. Also ensure that the flue outlet pipe has a connection for the discharge of condensate. For all other flue types, it is recommended that a completely new flue system is installed.
- The boiler room has a suitable outlet for the discharge of condensate produced.
- The electrical connections comply with the current electrical standards and the work has been carried out by a suitably qualified person.
- The gas supply pipework is constructed to the current regulations in force.
- The expansion vessels and associated fittings are correctly sized to absorb the total expansion of the system and in tested working order.
- The circulation pump' s output, the head and flow direction are suitable.
- The complete system has been cleaned of impurities and lime scale.

Installation into new heating systems

It is recommended to thoroughly clean out the new system with a system flush product, before commissioning the appliance.

System Inhibitors & pH levels

After cleaning and flushing of the system, it should be filled with an appropriate inhibitor/antifreeze treatment to maintain pH levels of between 7.5 & 9.5pH.

The following system treatments have been tested and are recommended for use in this appliance:

	FERNOX	**SENTINEL**
Inhibitors	Protector/Alphi 11	X100, X500
Noise reducer		X200
Universal cleaner	Restorer	X300
Sludge remover	Protector, Restorer	X400
Antifreeze	Alphi 11	X500

WATER CONNECTIONS

General
The cold water inlet and hot water outlet connection nipples are identified on top of the appliance. Connect the cold water feed and hot water outlet to these nipples with union adaptors for ease of servicing. Connect the supplied isolating valve to the drain connection and pipe to a suitable discharge point.
(See fig 1.1 for connection locations)

Do not apply excessive torque to these nipples when making connections. The use of an appropriate pipe sealing compound s recommended

Cold Water Supply - System
The appliance may be connected to an open vent or sealed system supply. When connected to a sealed system an unvented water kit must be installed with a minimum water pressure of one bar. The appliances are factory fitted with temperature and pressure relief valves. An unvented system must be fitted by an approved installer.

Cold Water Supply - Quality and Treatment
In hard water areas scale formation can occur in all hot water systems and the higher the volume and hotter the water used, the greater and more problematic the scale build-up can be. Water treatment is usually recommended when the hardness levels measures greater than 150 ppm. For this reason, base exchange water treatment is strongly recommended in hard water areas.

Open Vented Design (*Fig 2.3*)
The tank must be supplied from a cold water feed cistern and the hot water supply pipe must be fitted with an open vent pipe in accordance with BS 5546 and BS 6644. The Water Supply (Water Fittings) Regulations must be observed when installing the system.
The cold water feed cistern must have an actual capacity greater than the hourly recovery rate of the heater or heaters to which it is fitted, the minimum actual capacity allowed for a feed cistern being 227 litres (50 gallons).
The actual cistern capacity is the capacity to the normal water level of the cistern. All cisterns should be manufactured to the relevant Standard.

The distance from the normal water level to the top of the cistern should comply with that specified by the Water Authorities.

Secondary Return (*Fig 2.5*)
A Secondary Return may be fitted to the 1” nipple at the top of the appliance. In all cases, for serviceability, the recirculation pipe must be fitted with a stop valve immediately before the connection point.

De-Stratification
By virtue of its design a de-stratification pump is not required.

iHE OPEN VENT EXAMPLE

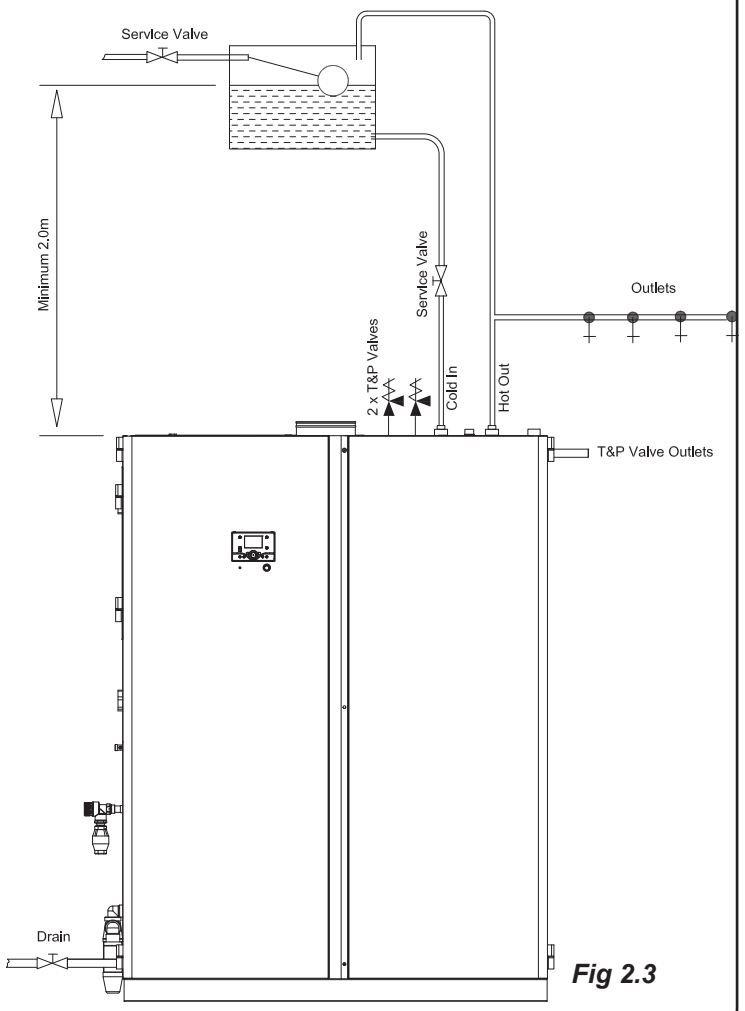


Fig 2.3

Unvented Water Supply

Unvented Systems should only be fitted by an Approved Installer

When using the Heater on an unvented hot water storage system, the Unvented System Kit, part number B314, available from the manufacturer **must** be fitted. See Parts List Page 30.

When used in an unvented system, the Heater will supply hot water at a maximum of 3 bar or at the pressure available at the mains feed if this is lower. During conditions of no-flow, system pressure may rise to a maximum of 6 bar, whilst the burner is operating. When testing the system, it is recommended that a maximum test pressure of 7 bar is used.

For the hot water supply, a 25 litre expansion vessel is suitable for the stored volume of all models of the Heater and an average pipework system. For systems with larger pipe volumes or additional storage, expansion vessels with greater capacity are availaible.
Assemble the components of the unvented system kit as shown in Fig 2.4

For the Central Heating supply the expansion vesel must comply with BS4814 and must be sized on the basis of total system volume and initial charge pressure. Initial minimum charge should not be less than 0.5 bar and must take into account static head and specification of any pressurising equipment.

When assembling the Pressure Reducing Valve and Double Non-Return Valve, ensure that the flow arrows marked on the components are pointing in the direction of flow, that is towards the Heater.

The relief valves fitted to this appliance must not be used for any other purpose. No fitting should be installed between the expansion valve and the cylinder.

The cold water for services may be drawn from the 22mm compression port on Pressure Reducing Valve. The water pressure at this point will be similar to that available at the hot water outlet of the water heater. If this port is not used, it should be sealed with the blanking plug supplied.
If higher flow rates are required for the cold water services, a suitable tee fitting should be fitted to the pipework, upstream of the Pressure Reducing Valve.

The pipework fitted to the tundish outlet should be at least 28mm diameter, made of metal and should be terminated at a suitable drain (see Building Regulations Approved Document G3).
All fittings and materials supplying water to the storage vessel must be suitable for use with drinking water and listed in the current Water Research Centre “Materials and Fittings Directory”.
Installation of unvented hot storage water systems must comply with Part G of Schedule 1 of the Building Regulations.

iHE UNVENTED SYSTEM DESIGN

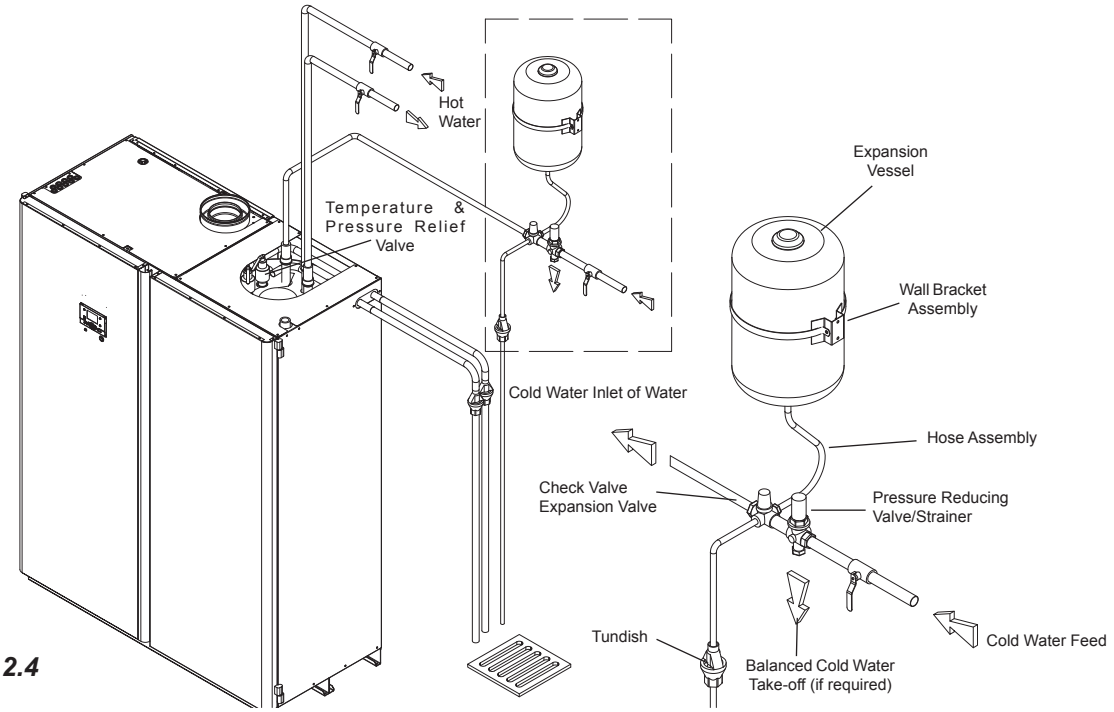


Fig 2.4

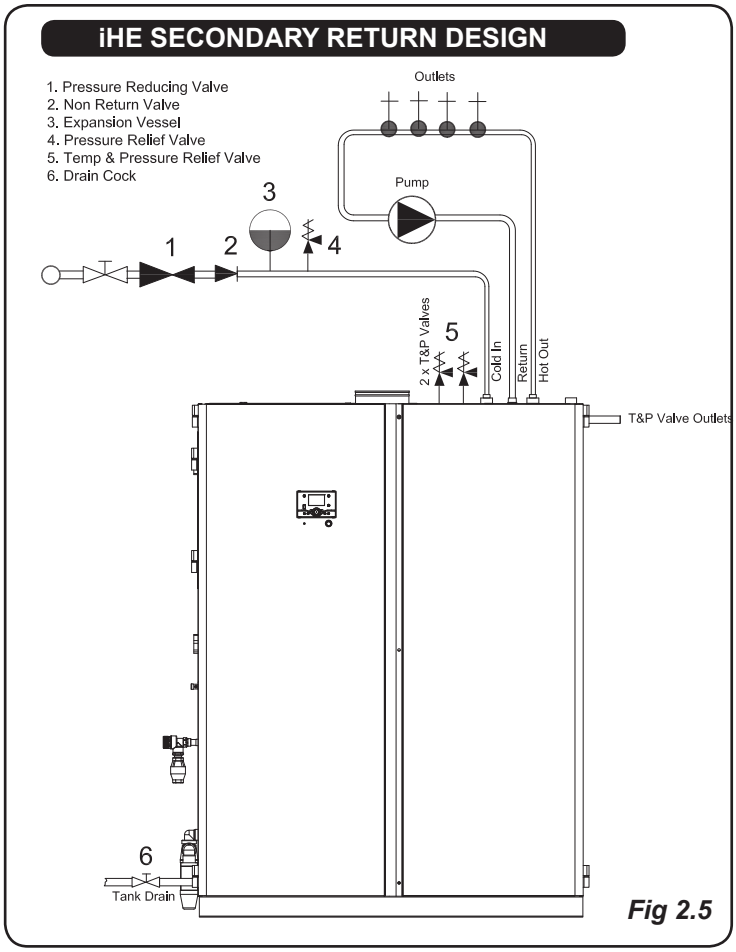


Fig 2.5

Condensate Removal

Condensation is formed in the normal operation of the appliance and this must be continuously discharged into a drain. Given the acidity level of condense discharge (pH 3.5 - 4.5) only plastic material can be used for the discharge pipe work.

40mm pipe with a drop of at least 30 mm for every metre of pipework should be used. A trap is supplied which should be connected into a drain via a tundish or air break.

External pipework and that passing through a wall to the outside should be run in a minimum of 40mm diameter. External pipework should be insulated to protect against frost and freezing temperatures.

The condensate trap must be filled with water before operating the appliance.

It is important that the condensate flow must be maintained, even in freezing conditions. In the event that the condensate becomes blocked, the appliance will shutdown completely, and will not operate again until the flow has been restored.

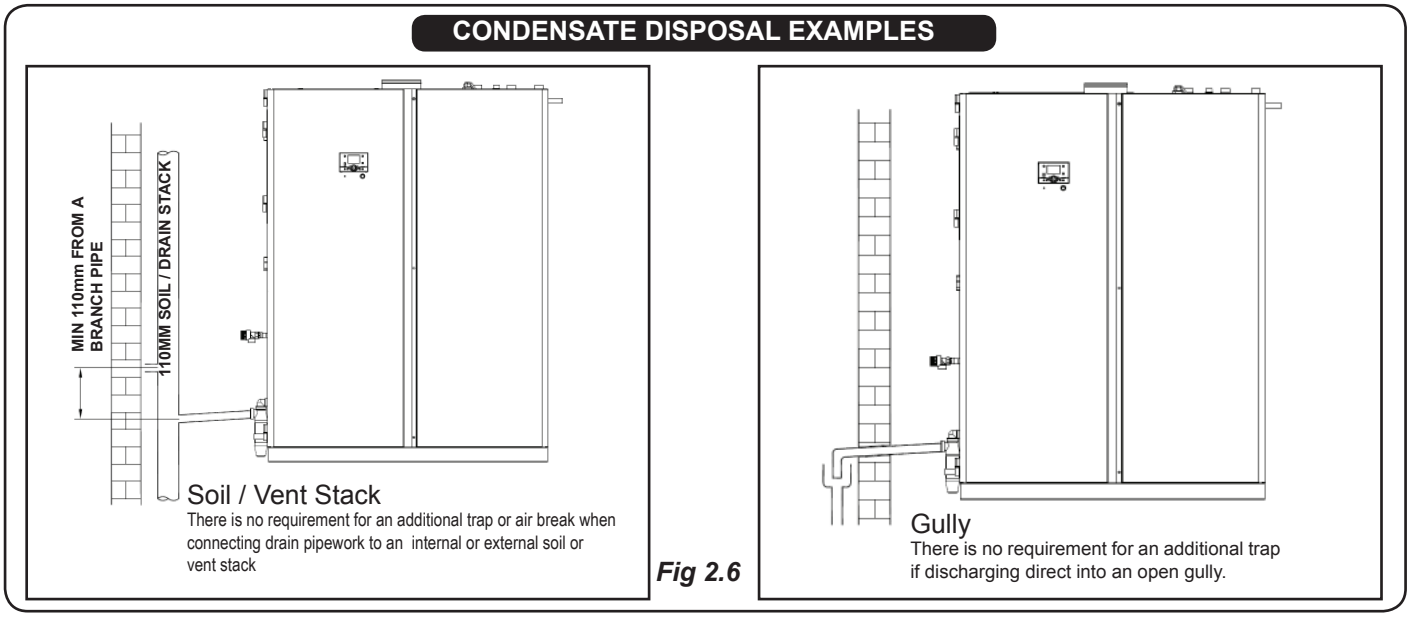


Fig 2.6

FLUE SYSTEM & VENTILATION

In order to minimise the height of this appliance, the flue spigot plate assembly is supplied separately and will have to be installed before fitting the flue system:

- Fully insert (approx 50mm) plastic flue pipe section (supplied) into flue socket (*fig 3.1*).

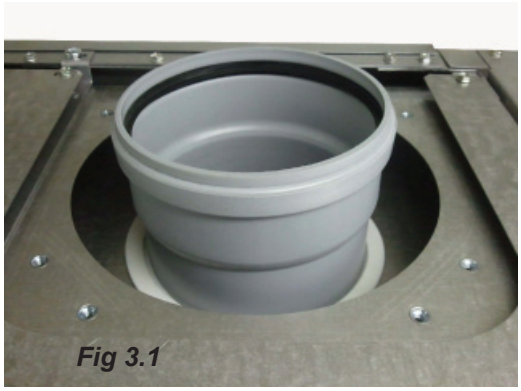


Fig 3.1

- Screw metal air colar onto the top of the flue socket with the 8 screws (supplied) *(fig 3.2*)

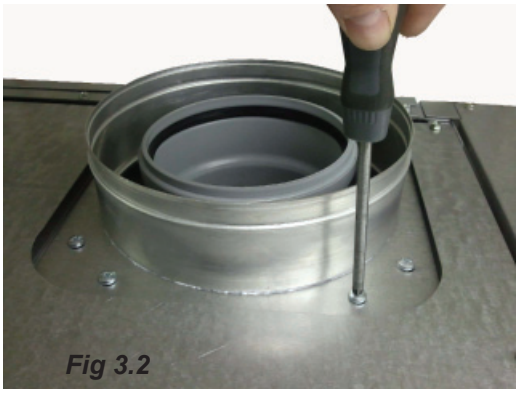


Fig 3.2

The appliance can be installed using a number of alternative arrangements depending upon the installation requirements It is delivered with a 130/200mm concentric outlet in the centre. Flue components are ordered separately as required.

Open Flue (Type B_{23})

This is an open flued arrangement where the air for combustion is drawn from the room and because of this the room must be ventilated. If the Heater is installed in a compartment then it will require both a high level and a low level vent.

The flue products are discharged either horizontally or vertically using any of the supplied separate duct components.

Ventilation Requirements for type B (open flue systems)

Refer to BS 6644 clause 19 and BS 5440 part 2 for detailed recommendations.

The room in which an appliance is installed must have a permanent air vent to outside air or to a room which itself has direct access to outside air.

Installations in boiler rooms require permanent vents for air supply purposes, one at high level and one at low level, direct to outside air. The minimum free areas required are as follows:-

Low level (inlet)	iHE 100 = 376 cm^2 iHE 150 = 560 cm^2
High level (outlet)	iHE 100 = 188 cm^2 iHE 150 = 280 cm^2

Where the appliance is to installed in a compartment, permanent air vents are required at high and low level. These air vents must either connected with a room or internal space, or be direct to outside air. The minimum free air requirements in the compartment are as follows:-

Position of Air Vents	Air from room or internal space	Air direct from outside
High Level	iHE100 = 940 cm^2 iHE150 = 1,400 cm^2	iHE100 = 470 cm^2 iHE150 = 700 cm^2
Low Level	iHE100 = 1,880 cm^2 iHE150 = 2,800 cm^2	iHE100 = 940 cm^2 iHE150 = 1,400 cm^2

A compartment containing an open-flued appliance shall be labelled as follows:

IMPORTANT: **Do not block the vents. Do not use the compartment for storage**.

Where an installation is to operate in summer months, the above allowance should be sufficient, provided it does not operate for more than 50% of the time. If the installation is to be operated at 75% then an additional 1cm^2 will be required per kW at low and high level. If this appliance is to be operated 100% of the time during the summer, an additional 2cm^2 free-area per kW will be required at low and high level.

There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. The clearances required for Installation and Servicing will normally be adequate. *(See Fig. 1.1)*

The effect of any type of extract fan in the plant room must be considered and an additional air inlet may be needed from outside to counter the effect of any such fans.

Room Sealed Flue (Type C_{xy})

There are three approved room sealed arrangements where both the air inlet and flue discharge terminate outside the building.

Type C_{13} & C_{33} Flue and air ducts terminate either horizontally or vertically in the same position

Flue and air ducts are supplied to a concentric design (130/200mm). See Fig 3.5 for component choices. Flues should slope back to the Heater by 3 degrees.

Terminal positions must comply with the requirements detailed in Fig. 3.4, page 13.

Ventilation Requirements (Type $C_{13,}$ C_{33} & C_{53})

Where the appliance is installed in a **ROOM** or **COMPARTMENT** no additional ventilation is required.

MAXIMUM FLUE LENGTHS

The combustion fan fitted to the appliance moves the air and flue products through the system and can provide sufficient capacity for a **Flue Equivalent Length** (**FEL**) of 18 metres for type C_{13} and C_{33} systems and 30 metres for type B_{23} system.

Each flue accessory such as bends and straight lengths restrict the flue system and have a **FEL** which must be added together to determine the total.

Referring to the diagrams (*Fig 3.5 & 3.6)* select a suitable flue system for the particular installation requirement and then calculate the **FEL** of the system, this must not be greater than that stated above.

C_{13} AND C_{33} FLUE TERMINAL ARRANGEMENTS

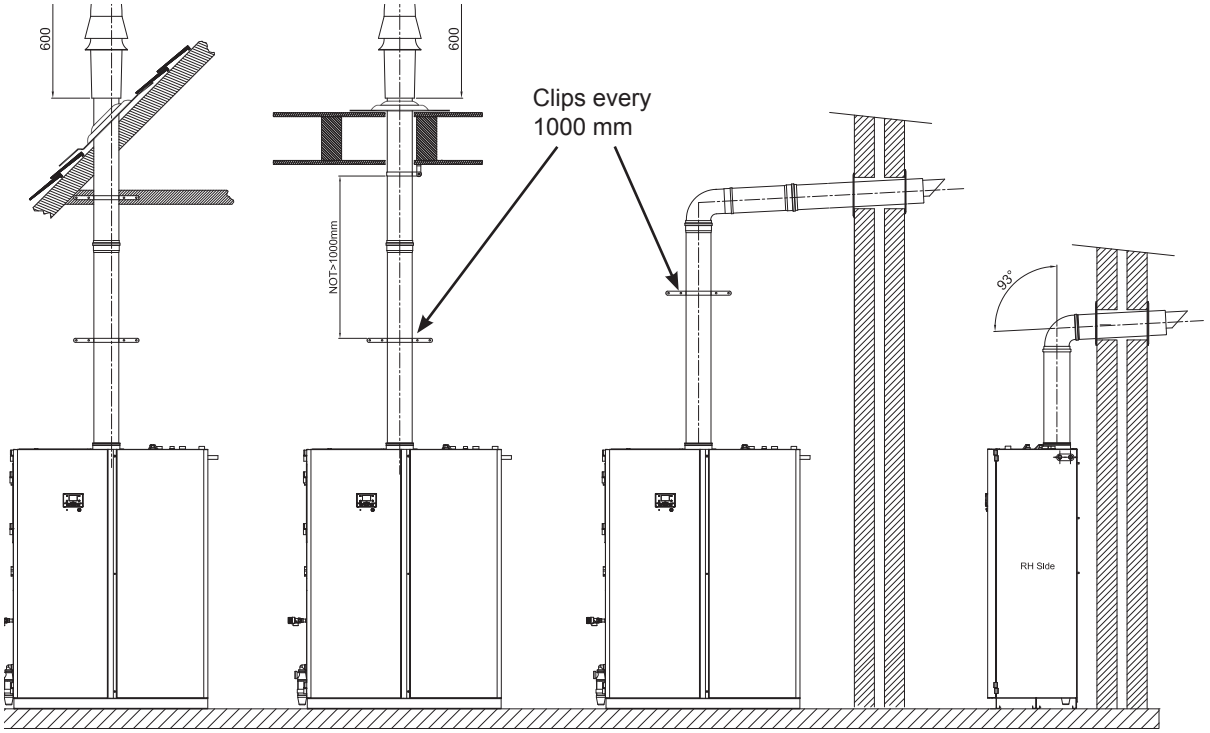
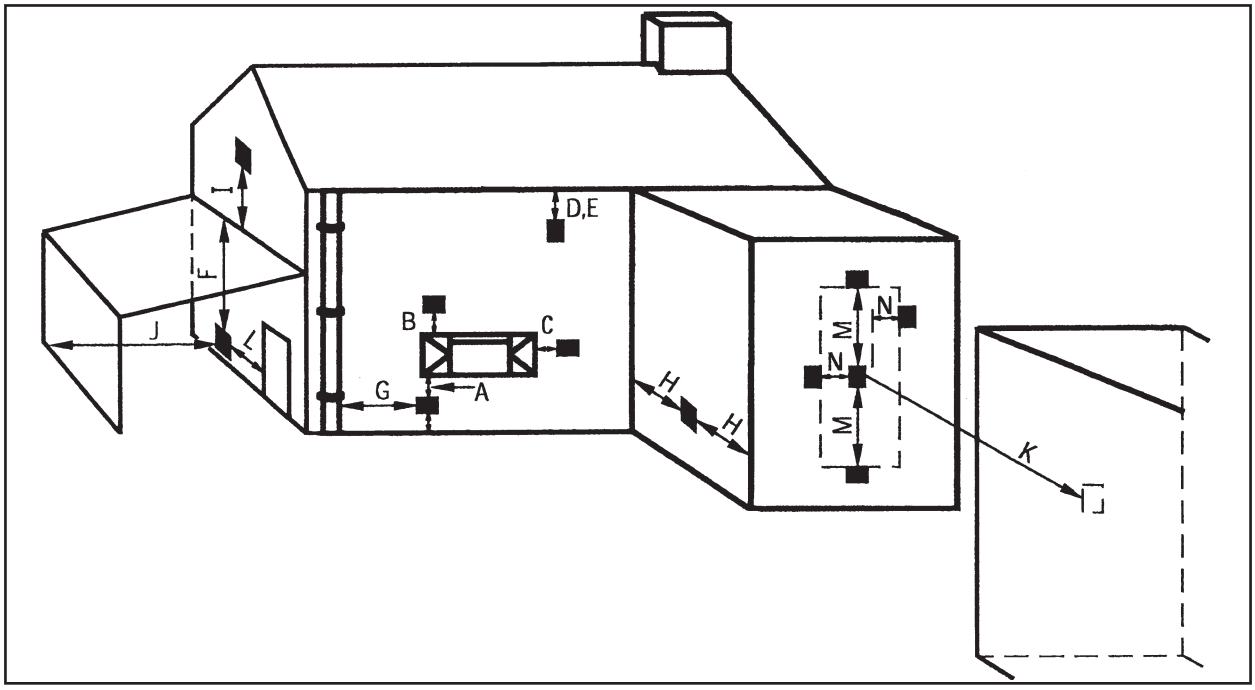


Fig 3.3

FLUE TERMINAL POSITIONS

The flue discharge position for any flue type must conform to the following requirements



Minimum Distance	mm
A Directly below an opening, air brick, opening window etc.	300
B Above an opening, air brick, opening window etc.	300
C Horizontally to an opening, air brick, opening window etc.	300
D Below a gutter or sanitary pipework	75
E Below the eaves	200
F Below a balcony or carport roof	200
G From vertical drain/soil pipework	150
H From an internal or external corner	300
I Above ground, roof or balcony level	300
J From a surface facing terminal	600
K From a terminal facing the terminal	1200
L From a opening in a carport (e.g. door, windows) into the building	1200
M Vertically from a terminal on the same wall	1500
N Horizontally from a terminal on the same wall	300

Fig 3.4

Examples:

Concentric Flue Type C_{13}
A flue system that uses ten straight lengths, three 90° bends, two 45° bends and a horizontal terminal.

10 x 1m straight length	10.0
3 x 90° bends	3.0
2 x 45° bends	1.0
1 x Horizontal Terminal	1.0
Total (within 18m limit)	**15.0**

Concentric Flue Type C_{33}
A system that rises from the Heater and uses seven straight lengths, four 45° bends and a vertical terminal.

7 x 1m straight lengths	7.0
4 x 45° bends	2.0
Vertical Terminal	1.6
Total (within 18m limit)	**10.6**

Open Flue Type B_{23}
The maximum **FEL** of flue in this configuration is 25 metres.

The air inlet connection to the appliance must be fitted with a Debris Guard. Air is drawn from the room or compartment in which the heater is installed and therefore the room or compartment **must be ventilated.** See Page 11.

The flue duct can discharge either vertically or horizontally by selection of the correct flue terminal. The flue pipe can be fitted with 90 and 45 degree bends as well as extensions.

Example:
A **B_{23}** system with air collected from the plant room and the flue exiting via twelve straight lengths and four 45° bends to a roof terminal.

4 x 1 m straight lengths of FLUE.	12.0
4 x 45° bends of FLUE	2.0
1 x Roof Terminal	1.6
Total (within 30m limit)	**15.6**

Concentric Flue

Item	**F.E.L.**
1m length	1.0
45° bend	0.5
90° bend	1.0
Horizontal Terminal	1.0
Vertical Terminal	1.6

Flue Parts	**Part Number**
1.0 m Concentric Length	E212
0.5m Concentric Length	E214
Concentric 90° Bend	E215
Concentric 45° Bend	E216
Flue Condense Trap	E220
Horizontal Terminal kit	E240
Terminal Guard	E630
Vertical Terminal kit	E670
Wall Clamp 200mm	E219

Conventional Flue

Item	**F.E.L.**
NB Do not include the Twin Adapter	
1m length	1.0
45° bend	0.5
90° bend	1.0
Horizontal Terminal	1.0
Vertical Terminal	1.6

Flue Parts	**Part Number**
Flue Clamp, 130 mm	TBC
Angle Roof Plate	TBC
Flat Roof Plate	TBC
1m x 130mm Flue Length	TBC
130mm 90° Elbow	TBC
130mm 45° Elbow	TBC
Debris Guard	TBC

CONCENTRIC FLUE PARTS

90° Bend
1.0 FEL
(P/N: E215)

45° Bend
0.5 FEL
(P/N: E216)

Horizontal Terminal kit
1.0 FEL (P/N: E240)

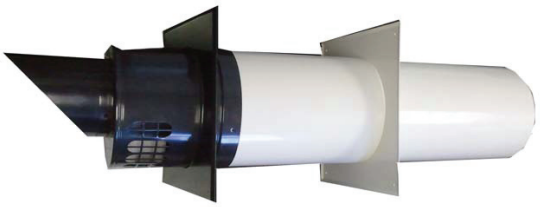


Fig 3.5

CONVENTIONAL SINGLE FLUE PARTS

90° Bend
1.0 FEL

45° Bend
0.5 FEL

Debris Guard
0.0 FEL

Horizontal Terminal
1.0 FEL

Fig 3.6

GAS CONNECTIONS

Gas Supply
A manual valve for isolation of the gas supply to the boiler should be installed nearby and it should be clearly identified and readily accessible for use at all times.

The installation of the gas supply must conform, to the British Standards and Codes of Practice listed in Section 1 of this manual.

The appliance should be fitted with a gas isolating cock, a supply pipe of 1” Steel pipework and can be supplied from any direction.

The gas supply pipework must be fitted with suitable unions so the Heater can be safely removed for major service or repair.

Natural Gas
The gas meter, regulator and supply pipework must be sized so as to provide an adequate supply to the Heater in addition to any other appliances connected to the supply. (See Technical Data on the inside cover for Pressure and Flow Rate requirements.)

Where the Boiler is installed in a plant room or purpose built compartment, a manually operated valve must be fitted in accordance with the Gas Safety (Installation and Use) Regulations. The valve must be easily identified and readily accessible.

Gas Connection
The 1” Galvanised steel gas connection is provided at the top of the Heater. A minimum of 20mb (G20) running pressure, must be available at the appliance inlet, with the Heater and other connected appliances firing.

This will require a test point on the supply to the appliance, the gas valve inlet pressure tapping should not be used, whilst the appliance is being operated, as this will give a false reading.

Check for gas tightness (BS. 6891) in pipework to the appliance by connecting a manometer to the inlet pressure tapping point.(*See Fig. 4.1*) Gas and combustion soundness within the Heater should be checked using sense of smell and leak detection fluid. Ensure gas tightness before moving onto to commissioning the aplliance.

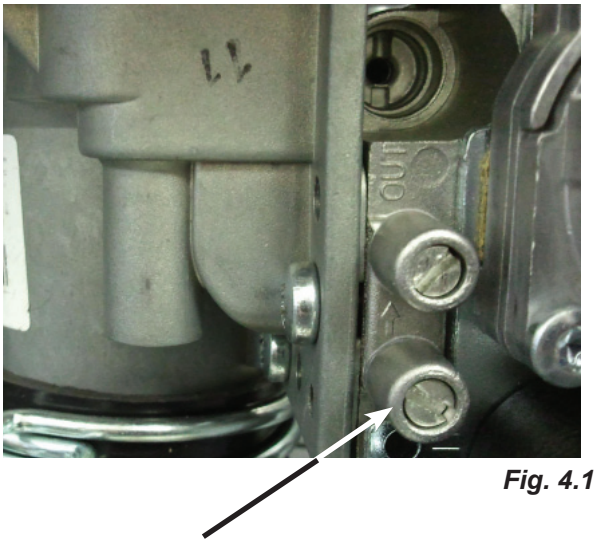


Fig. 4.1

ELECTRICAL CONNECTIONS

This appliance must be earthed

Isolate the mains electrical supply before starting any work and observe all relevant safety precautions

External wiring to the Heater must be installed in accordance with current I.E.E. Regulations for the wiring of buildings and to any Local Regulations that may apply.

The appliance is designed to operate from a 230V, single phase supply fused at 5 amps. Mains input cable should be at least 0.75mm^2, 3 core

The method of connection to the mains electricity supply should facilitate complete electrical isolation of the appliance. A fused double pole switch or fused spur box serving only the heater may be used.

The point of connection to the mains electricity supply should be readily accessible and adjacent to the appliance, and should be connected to the mains supply as detailed above.

Access to the terminal connections

Remove the Side Access Panel (See Fig 1.1) to expose the electrical connections.

A permanent live supply must be connected to the appliance. Automatic timed or remote operation of the appliance can be achieved by connecting to the volt free "**Remote Enable**" terminals after removing the link wire. (Fig. *4.2)*

Remote Indicators:

The appliance has a volt free (or can be used with voltages up to 230v) output, which can be connected to a Building Management System or a remote indicator panel. This input is connected to the "BMS COMMON INPUT" terminal.

Fault

Five minutes after any fault occurs within the appliance an internal relay will activate and connect "BMS COMMON INPUT" to "BMS FAULT OUTPUT".

Burner On

When the appliance heat engine/s are in operation an internal relay will activate and connect "BMS COMMON INPUT" to "BMS BURNER ON OUTPUT".

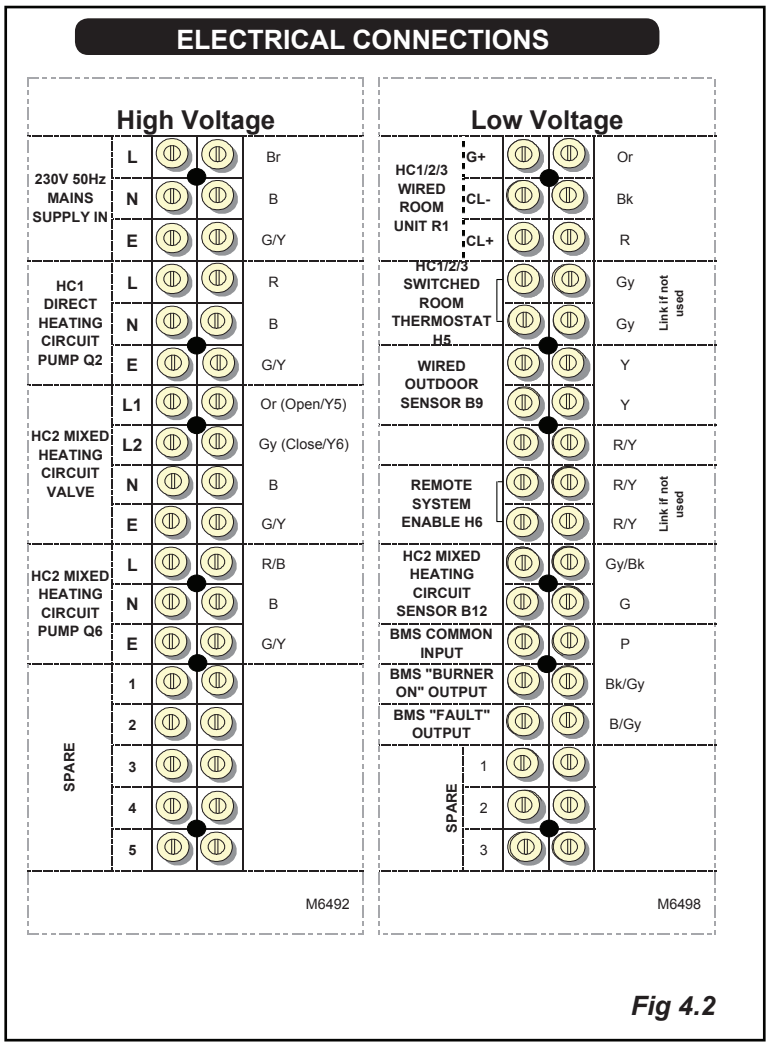


Fig 4.2

WIRING DIAGRAM, PCB 1

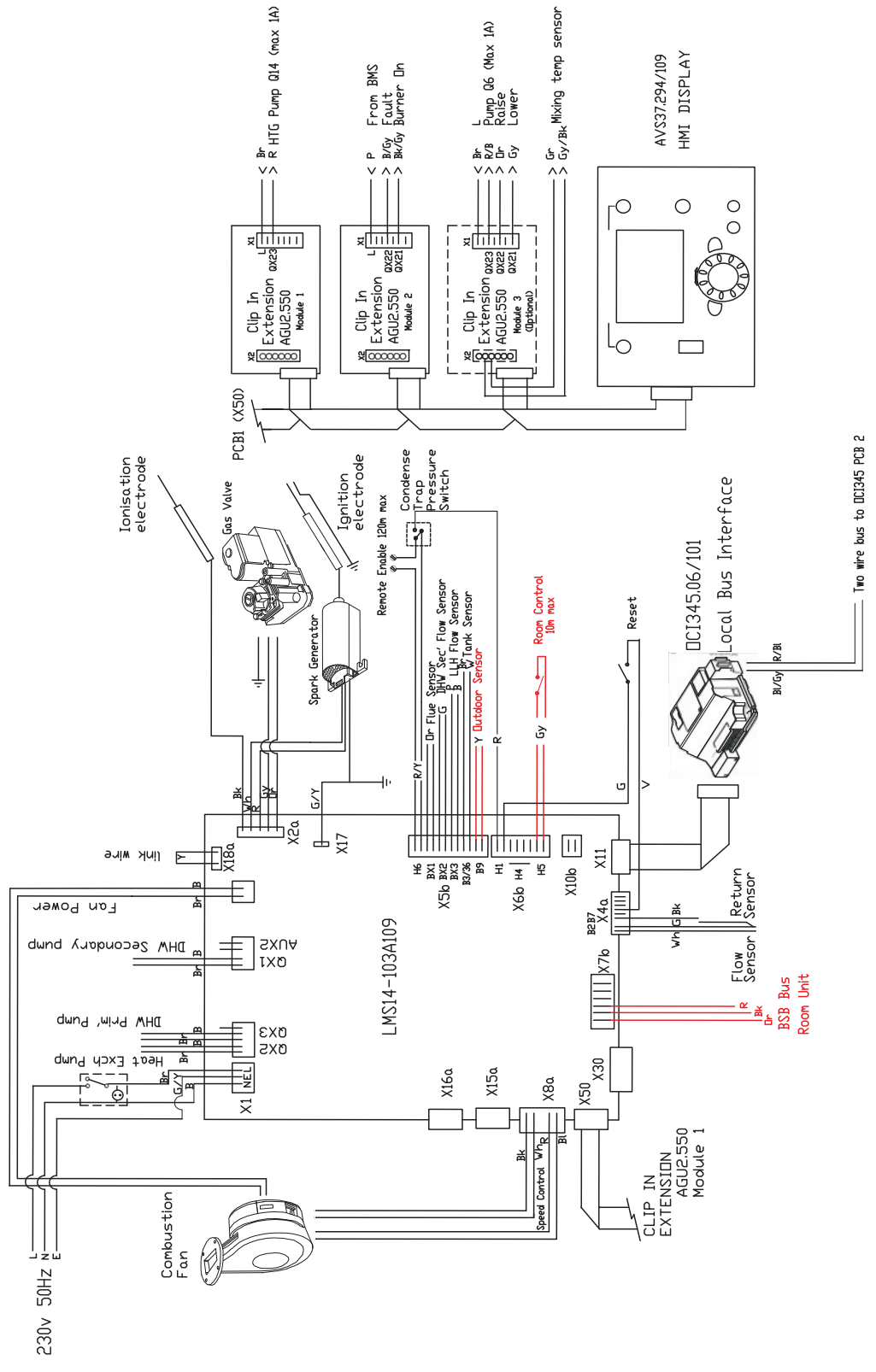


Fig 4.3

WIRING DIAGRAM, PCB 2 & 3

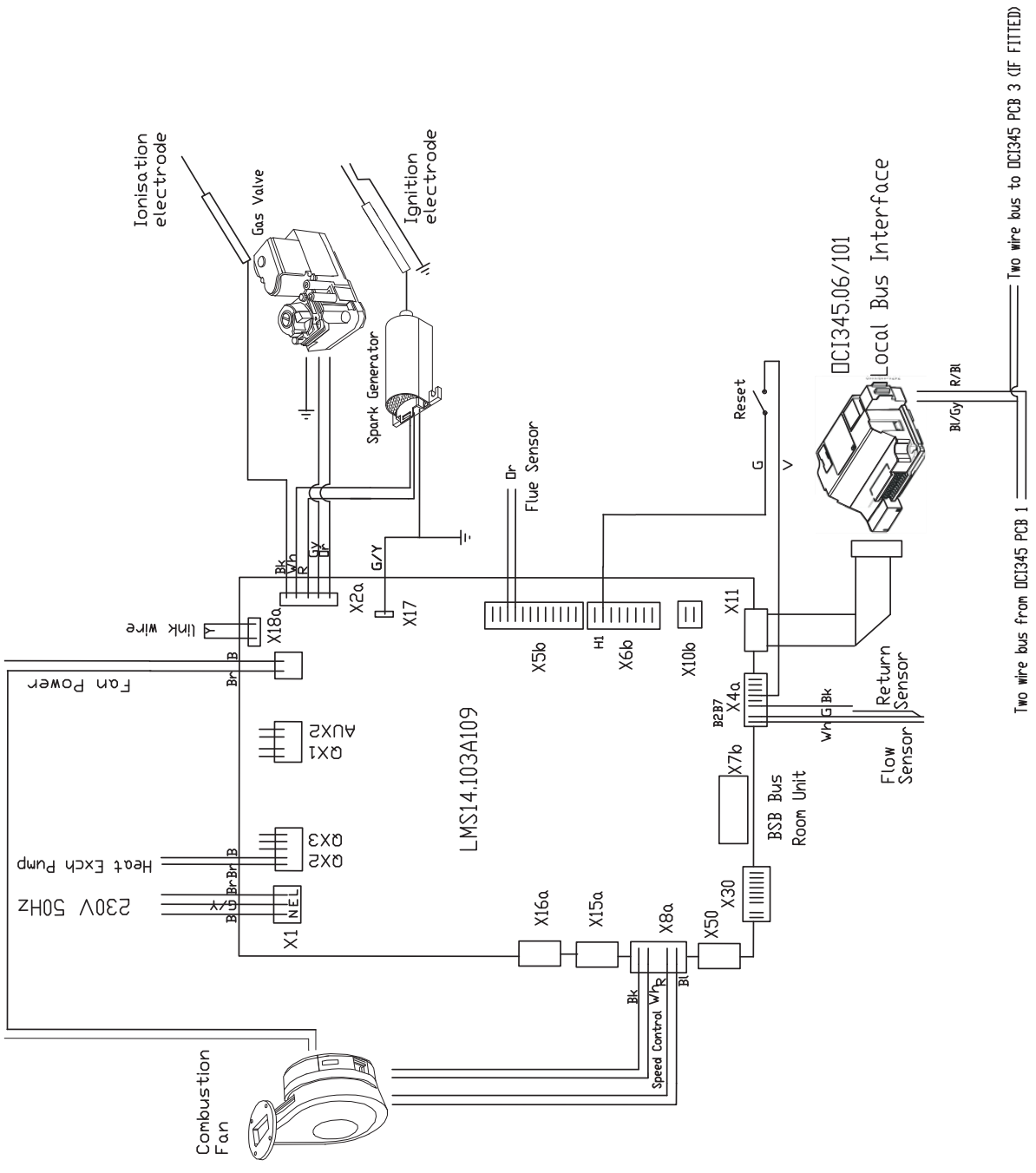
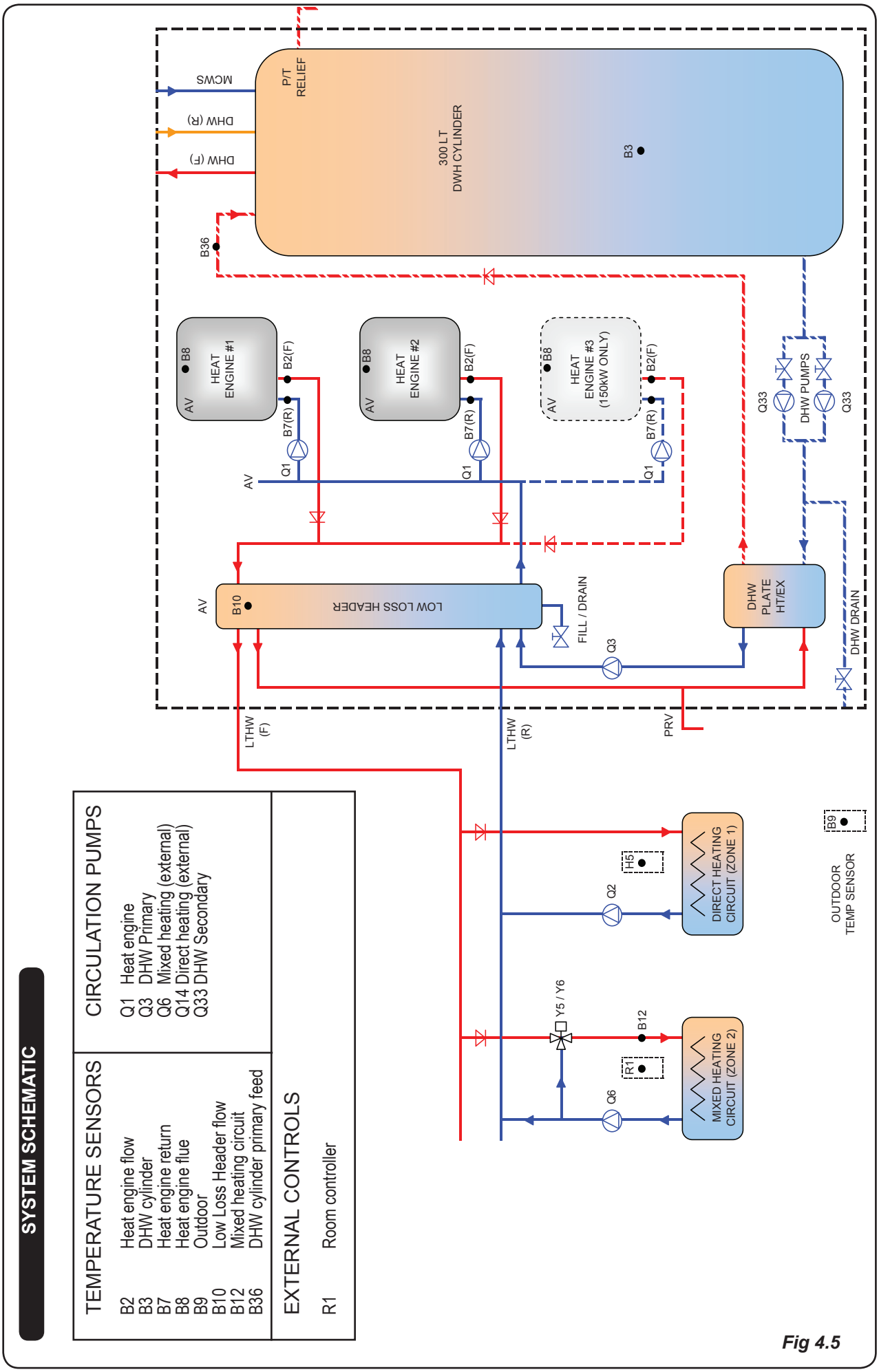


Fig 4.4

SYSTEM SCHEMATIC



TEMPERATURE SENSORS

B2	Heat engine flow
B3	DHW cylinder
B7	Heat engine return
B8	Heat engine flue
B9	Outdoor
B10	Low Loss Header flow
B12	Mixed heating circuit
B36	DHW cylinder primary feed

EXTERNAL CONTROLS

R1	Room controller

CIRCULATION PUMPS

Q1	Heat engine
Q3	DHW Primary
Q6	Mixed heating (external)
Q14	Direct heating (external)
Q33	DHW Secondary

Fig 4.5

COMMISSIONING GENERAL

After installation of the pipework and fittings, open the main water supply valve, flush the system and fill the heater. The appliance can be commissioned utilising the heating system or using the built-in hot water store.

Filling the system with water

The heat engines and Low Loss Header (LLH) must be completely full of water and without air. Failure to remove air from the heat exchangers can lead to permanent damage and failure of the appliance.

1. Connect a water supply to the fill point of the appliance and fill with water. Do not exceed 3 bar as this will open the automatic pressure relief valve.
2. Open the vents at the top of the main LLH and smaller flow manifold. Close vents when all the air has been expelled.
3. Starting from heat engine 1 (PCB1) and working downwards, run the flow pump (QX2) for each heat engine. (See sections below - ***Running the circulation pumps***). Stop pump only when all sound of air has ceased and the pump is running quietly.
4. When all heat engines pumps (QX2) have been run to expel air, open the vent at the top of the main LLH manifold only. Close vent when all the air has been expelled.
5. Run the Primary pump (QX3) for the plate heat exchanger, to remove all trapped air. (See section below regarding running the appliance pumps)
6. Reopen the LLH and Flow manifold vents to remove remaining air.
7. Recommended fill pressures: Min 0.5mbar, Max 2.5mbar.
8. Check for leaks

Filling the tank with water

1. Check that the tank drain connection is fitted and closed.
2. If the appliance is connected to a hot water recirculation system, open the isolation valve immediately before the connection point to the tank.
3. Turn on the entire hot water draw off taps.
4. Turn on the cold water supply and fill the heater.
5. Close each hot water draw off tap when water is discharged.
6. Run the Secondary pump (QX1) for the plate heat exchanger, to remove all trapped air. (See section below regarding running the appliance pumps)
7. Open the vent at the top of the hot water outlet until all air has been expelled.
8. After initial filling, open each hot water draw off tap in succession and check that all the air is vented from the system.
9. Check for leaks.

Starting the appliance

Turn on the switched spur supplying electricity to the appliance.

Turn on the appliance. A green light within the switch should illuminate to indicate that power is now available to the appliance and the display should then proceed with system start up checks. When the appliance has finished these checks, it should be displaying the default screen “Cascade flow temperature”. If this is not the case, press the escape key until this message is displayed.

Running the circulation pumps (manual method)

Each of the appliance pumps can be run without a heating or hot water demand by performing the following actions from the default screen:

1. Press “OK” button
2. Hold the Info button for more than 3 seconds
3. Select “commissioning” using scroll wheel, press “OK”
4. Select “input/output test” using scroll wheel, Press “OK”
5. Screen should be displaying “Relay test” and “line 7700”, Press “OK” and “no test” should now be flashing.
6. Using the scroll wheel select the following:-
   - QX1 – To run the two secondary pumps on the tank side.
   - QX2 – To run heat engine 1 flow pump <u>only</u> (see point 9. for running QX2 on heat engines 2 or 3).
   - QX3 – To run the primary pump on the LLH side
7. To stop the test function press “OK” until the current test flashes, using the scroll wheel select “no test” and press “OK”. (if the display has returned to the default screen follows steps 1 – 6 before selecting “no test” and pressing “OK”)
8. Press “Esc” twice to return to default screen
9. In order to run QX2 on heat engines 2 or 3 it is necessary to carry out the following:

- Switch off the appliance.
- Remove the two screws securing the metal cover over the electronic control boards. Remove covering plate by lifting it upwards and away.
- Remove the ribbon cable connectors from each of the AGU2.5 modules *(fig 5.2)* and finally unplug the end of the ribbon on PCB1 connection X50 (*fig 5.3*)

Fig 5.2

- Take the free end of the ribbon cable and plug it into X50 on PCB2.
- Power up the appliance. ***Avoid contact with any of the control boards as the appliance is now live.***
- To operate QX2 on heat engine three. Switch off appliance, move connector from X50 on PCB2 to X50 on PCB3 and power up the appliance. *(Fig 5.3)*

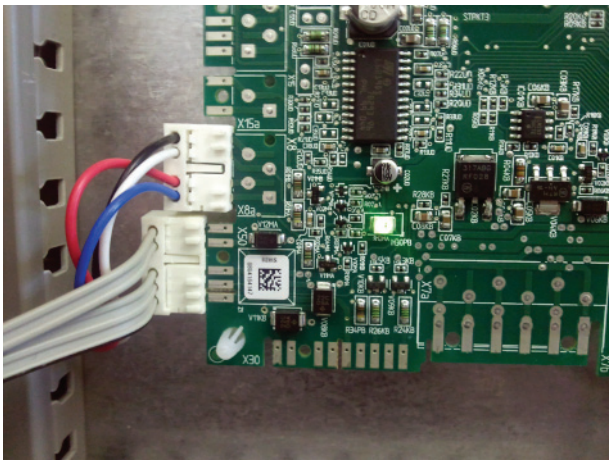


Fig 5.3

- After completion of pump operations, replace ribbon connector onto X50 of PCB1 and all connections on to AGU2.5 modules.

Running the circulation pumps (OCI700 software)

1. Remove the front panel screws; open the hinged front cover to access the electrical control panel.
2. Connect the OCI700 using the LPB lead to the OCI345. Located on the bottom right hand side of the electrical control panel. NB It may be necessary to remove the small plastic cover to gain access to this connection. (Fig 5.5)
3. Start the ACS service software and if necessary create a new plant name for this appliance.
4. Open “Popcard” within “Applications”
5. Select device 1 and open
6. Select “IO” Test
7. Left click on “Relay test” line 7700 and change actual value to:
   - “QX1” – To run the secondary pump on the tank side
   - “QX2” – To run heat exchanger flow pump (change device to select other heat engines)
   - “QX3” – To run the primary pump on the LLH side
8. Change back to “No test” once complete

Setting the domestic hot water (tank) temperature

The DHW set point can be altered by performing the following actions from the default screen:

1. Press the “OK” button
2. Using the scroll wheel select “Domestic Hot Water”, press “OK”.
3. Press “OK”, the temperature should now be flashing. Use the scroll wheel to set desired temperature, press “OK”
4. Press “ESC” twice to return to default display

(See seperate User Guide for more detail on setting both heating and hot water temperatures and times)

COMMISSIONING THE HEAT ENGINES

The gas mixture and heater gas rate is factory set. Please do not attempt to change the settings of the governor behind the sealed cover. However, it is an important part of commissioning to check the gas rate of the appliance and that the combustion emission levels are correct.

As this appliance contains several heat engines, the manufacturer recommends that commissioning is done using Siemens OCI700 service tool, available from the manufacture. If this service tool is not available to the commissioning agent, then the following manual procedure can be used:

Commissioning Procedure - Manual Method

Please follow the following procedure if you are not using Siemens OCI700 service tool.

1. Remove the front panel screws; open the hinged front left cover and the inner control panel.
2. Hinge back inner control panel and pull off the electrical connector to all the gas valves except the one to the heat engine that is to be checked. NB this will put the other heat engines into lockout, but this can be ignored during commissioning.
3. Power up the appliance.

4. Remove the plug in the flue outlet elbow of the heat engine being commissioned and push the probe of a combustion analyser approx 65mm inside flue.
5. If commissioning heat engine 1, please move straight onto step 6. If commissioning heat engine 2 or 3, the following steps will need to be followed before proceeding to step 6:
   - Switch off the appliance.
   - Remove the two screws securing the metal cover over the electronic control boards. Remove covering plate by lifting it upwards and away.
   - Remove the ribbon cable connectors from each of the AGU2.5 modules *(fig 5.2)* and finally unplug the end of the ribbon on the control board no 1 (*fig 5.3*)
   - Take the free end of the ribbon cable and plug it into X50 on control board no 2.
   - Power up the appliance. Warning. Avoid contact with any of the control boards as the appliance is now live.
   - If commissioning heat engine no 3. Switch off appliance, move connector from X50 on control board 2 to X50 on control board no 3 and power up the appliance. *(Fig 5.3)*
6. Request a DHW demand by pressing the DHW button on the user controls (top left button).
7. Press and hold the heating demand button (top right) for more than 3 seconds, to switch *Controller Stop Function* on
8. Press the “i” info button to bring up 0-100% display. Press OK and this display should flash.
9. Rotate the knob (if required) to indicate 100% and press OK. This is the rate that the heat engine will run at once it has ignited.
10. Once the heat engine has ignited a “flame” symbol should be visible on the user display and the flame should be visible through the heat engine sight window.
11. Allow five minutes for the heat engine to warm up before checking the combustion.
12. The CO2 figure should be within the range 9.1% to 9.3%. If adjustment is required, pull off the black rubber cover from the Throttle Screw and adjust. Screw clockwise to reduce CO2, anti-clockwise to increase the CO2. *Fig. 5.4*
13. When the correct combustion readings are achieved, replace the cover plug over the Throttle Screw.
14. Press and hold the heating demand button for more than 3 seconds to turn off the “controller stop function”
15. Press the DHW demand button to turn off the appliance and when the burner has stopped firing remove the Gas Valve electrical connector of the heat engine and then replace the connector on the next to be tested.

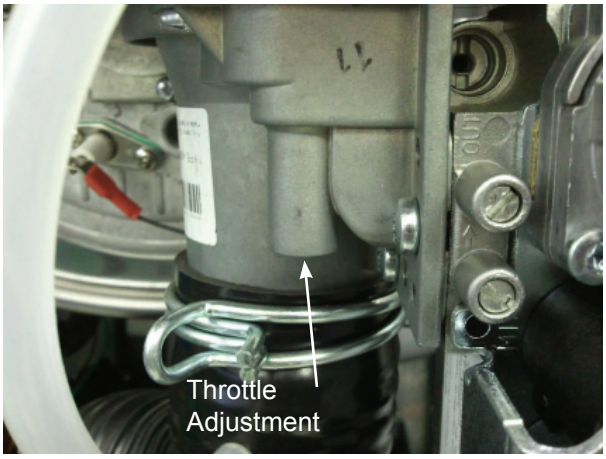


Fig 5.4

16. Remove the gas analyser probe from the flue elbow and replace the sample point plug.
17. Press the RESET button on the front of the control panel.
18. Repeat the procedures 4 - 15 until all heat engines have been tested.
19. Finally: Switch off appliance. Refit the ribbon cable to control board no 1 and all AGU2.5s. Refit electrical connectors onto each gas valve. Ensure all sample point plugs have been replaced. Refit metal cover plate and secure hinged covers.

Commissioning Procedure (OCI700 Software)

1. Remove the front panel screws; open the hinged front cover and the inner control panel. Connect the OCI700 using the LPB lead to the OCI345 located on the bottom right hand side of the electrical control panel (*fig 5.5*). NB It may be necessary to remove the small plastic cover to gain access to this connection.
2. Pull off the electrical connector to all the gas valves except the one to the heat engine that is to be checked. NB this will put the other heat engines into lockout, but this can be ignored during commissioning.
3. Power up the appliance.
4. Start the ACS service software and if necessary create a new plant name for this appliance.
5. Using the ACS service software Open “Popcard” within “Applications”

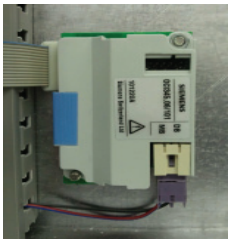


Fig 5.5

6. Remove the flue sample point plug in the flue outlet elbow and push the probe of a combustion analyser fully in.
7. Request a DHW demand by pressing the DHW button on the appliance controls (top left button).
8. Using software, Select device 1 and open “Service / Special operation” (Select devices 2 & 3 as you begin to commission further heat engines).
9. Using software, select line 7145 “Controller stop set point” and set it to 100%
10. Using software, select line 7143 “Controller stop function” and set to “on”. The heat engine will now run at 100% loading.
11. Once the heat engine has ignited a “flame” symbol should be visible on the user display and / or a flame should be visible through the heat engine sight window.
12. Allow five minutes for the Heat engine to warm up before checking the combustion.
13. The CO_2 figure should be within the range 9.1% to 9.3%. If adjustment is required, pull off the black rubber cover from the Throttle Screw and adjust. Screw clockwise to reduce CO_2, anti-clockwise to increase the CO_2. Fig. 5.4
14. When the correct combustion readings are achieved, replace the cover over the Throttle Screw.
15. Press the DHW demand button to turn off the appliance and when the burner has stopped firing remove the Gas Valve electrical connector of the heat engine and then replace the connector on the next to be tested.
16. Remove the gas analyser probe from the flue elbow and replace the sample point plug.
17. Press the RESET button on the front of the control panel.
18. Repeat procedures 6 – 17 until all heat engines have been tested.
19. Finally: Switch off appliance power. Refit all gas valve electrical connectors and ensure all sample point plugs have been replaced into each flue elbow.

NB. This appliance is optimised to provide Space Heating and DHW in equal quantities. However, if this appliance is used primarily for the supply of DHW and has very little or no Space heating demand, there is a small efficiency benefit if the circulation pump on each heat engine (see fig 7.3) is moved from speed 3 to speed 2

FINAL CHECKS

Check the individual heat engines maximum rate and combustion are to specification.

See Table 1.0 and Datatable Inside Cover.

Rating Table (1040 Btu/ft³) (38.8 MJ/m³)

kW	***gross** Btu/h*	*ft³ per min*	*m³/2 mins*
102	348,271	5.6	0.32
152	518,992	8.4	0.48

Table 1.0

User Handover

When commissioning is satisfactorily completed the user must be instructed on the use and operation of the appliance and in particular detail:

- Hand over to the user the “User’s Instruction Guide” as well as all other lterature relating to the appliance.

- Explain the importance of air vents and the flue outlet system, and that they should not be altered or interferred with in any way.

- Explain to the user the importance of internal water pressure and how to restore it to the correct value.

- Explain and demonstate to the user the correct function and adjustment of the temperature, thermostats and radiators for the economic use of the system.

- Remind the user that in order to comply to the regulations in force the appliance has to be inspected and serviced regularly as indicated by the manufacturer.

Finally these instructions should be handed over to the user.

Frost Protection

The Heater is fitted with automatic Frost Protection. Provided there is Mains and Gas, if the LLH sensor reads less than 8°C a Heat Engine will fire to bring the temperature up to 16°C. NB *Other Frost protection levels can be set according to customer requirements.*

Anti-Legionella

The Heater is provided with an Anti-Legionella programme. It set by default to be off but can be set to be started manually or periodically. Lines 1640 to 1647 control how, and when this function will operate.

FAULT FINDING

Operation Sequence

The appliance requires Mains on both the Live (L) and Remote Enable connection to be able to run. It is delivered with a link between them which can be removed if a Timer or Remote Switch is used.
To run the Heater you must have a Mains supply, Gas, and a Tank or Central Heating temperature below their set point.
If all the above are correct then the Gas Ignition Control starts the Ignition sequence:

1. The Fan runs as a pre-purge of the Heat Exchanger
2. After a few seconds a spark is created at the electrode and the burner is lit.
3. The burner flame is sensed and the spark is removed.
4. The Fan speed is then changed by the control to suit the working conditions.
5. If it fails to light the burner the spark will stop and the Fan will run on as a post-purge of the Heat Exchanger.
6. The ignition sequence will be repeated up to five times, then the control will lockout and will require a manual reset to start again.

Lockouts

If the Heat Engine is unable to light or detects a safety condition, the control will lockout and that Heat Engine will stop firing. The display will show the 🔔 symbol and the green LED on the appropriate Control Board will flash. The fault will have to be cleared before that Heat Engine will function. Pressing the Info button will provide the fault detail, see the Table 2.0 for the most common lockouts. Press the RESET button and provided the condition has been corrected the Heat Engine will try to light.

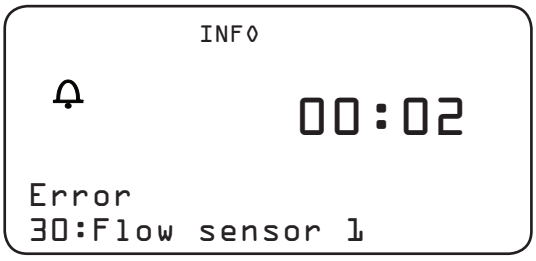
10	Outside Sensor error (where fitted)
20	Flow Sensor error.
28	Flue Gas Temperature Sensor error.
30	Flow Sensor error
40	Return Sensor error
50	DHW Temperature Sensor error
128	Loss of Flame during operation
133	Unsuccessful Ignition

Table 2.0

A Lockout condition should not be repeatedly reset. If the condition persists then a qualified repair engineer should be called.

Lockout Display (*Table 2.0*)

The Display will show a 🔔 if the appliance has locked out. More information can be obtained by pressing the Info button on the HMI display screen. Example screen:

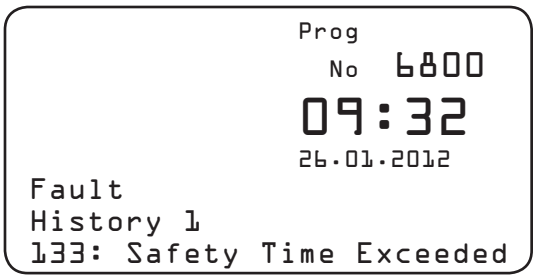


The number on the display indicates the number of the PCB that the fault has occurred on (See fig 7.1 for help in identifying PCB). In this example a flow sensor error has occurred on the second heat engine (PCB 2).

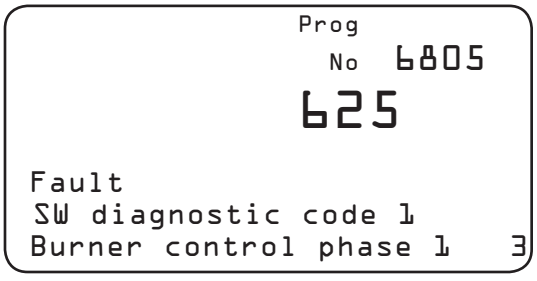
Diagnostics

The HMI can provide additional information in Engineer Mode.
To enter Engineer Mode:

- Press OK then hold down the Info button for more than 3 seconds.
- Select Engineer from the list using the Wheel, then press OK.
- Use the Wheel to scroll down to 'Fault' and press OK.
- Step through the lines 6800 to 6995 to list the last 20 faults. The first screen gives the general fault and the time and date of its occurrence. Example screen:
-



- Page two of fault history records specific details about what the software and controls were doing at the precise moment the fault occurred. Example screen:



A complete listing of displayed fault codes, and possible areas of resolution is given in table 3.0 on page 34. Please also refer to the "iHE users operating and programming guide" for details not covered by this manual.

SERVICING

Health and Safety Statement :
This Boiler contains no asbestos.

In all cases, before work commences turn off the Mains Electricity and Gas Supply.

Routine Service

To ensure continued efficient operation of the Boiler it is recommended that it is checked and serviced at regular intervals.
The frequency of servicing will depend upon the particular installation and usage but in every case a maximum of twelve months should be allowed between service inspections.

It is law that any service work should be carried out by Registered personnel.

1. Clean the burner and check the combustion chamber.
2. Check condition of ignition spark and sensing electrodes.
3. Check the air duct and flue seals.
4. Check condensate syphon and pipework for leaks.
5. Check the combustion CO, CO_2 and gas rate.

Follow the procedures given in Changing Components for parts removal in addition to the following notes.

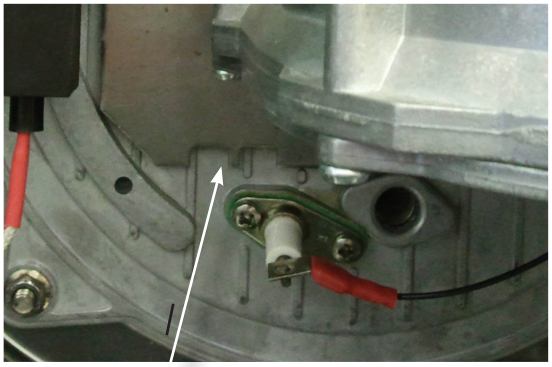
Burner & Combustion Chamber

To view the burner and the inside of the heat exchanger it is suggested you remove the front of the heat exchanger complete with the fan and gas valve:

- Remove door and swing aside the controls Panel.
- Disconnect the gas cock flange from the gas valve.
- Unplug fan electrical connectors.
- Remove Air tube from the main air stack or by removing the spring clip (Fig 6.1) and pulling off the flexible hose. Do not remove the two black screws holding the air valve in place.
- Remove the connection plug and earth lead to the spark generator.
- Pull off the earth lead connection on the gas valve and heat exchanger.
- Undo the four nuts holding the heat exchanger front and pull the whole assembly forwards.
- Replace silicone door seal if there are any signs of damage and in any case every 2 years.
- Heat exchanger deposits can be removed using a non-metalic brush and vacuum cleaner.
- Assembly is the reverse.

Spark Electrode or Sense Electrode

- Turn off the Boiler.
- Pull off the Lead(s).
- Undo the two screws retaining the electrode assembly and carefully withdraw.
- The spark gap should be 3.0 mm ± 0.5. There is a useful guage built into the burner door (Fig 6.1)
- Assembly is the reverse, ensure the gasket is correctly placed.



Spark gap guage ***Fig 6.1***

Air Duct & Flue Seals

A visual inspection should establish there are no leaks around any of the seals, including the flexible Air Duct to the Venturi. Replace if there is any doubt as to the integrity of the seals.

Condensate Pipework

Inspect all joints in the pipework for leaks, repair/replace parts if any defects found.

Condensate Syphon

The lower bowl of the Syphon can be unscrewed, examined and cleaned. Check its connection to the Heat Exchanger and pipework for leaks.

Gas Rate & Combustion

See the Datatable on the inside of the cover for the correct values. A Combustion sample point is provided on the individual flue outlet elbows.
To check, re-establish gas and electricity and then run the Boiler for at least 5 minutes. If adjustment is required remove the cover over the Throttle screw and turn anti-clockwise to increase CO_2, clockwise to decrease.(*Fig. 6.2*) Allow at least a minute between adjustments to obtain stable readings. The Gas Rate will be correct when the CO and CO_2 figures are to specification.

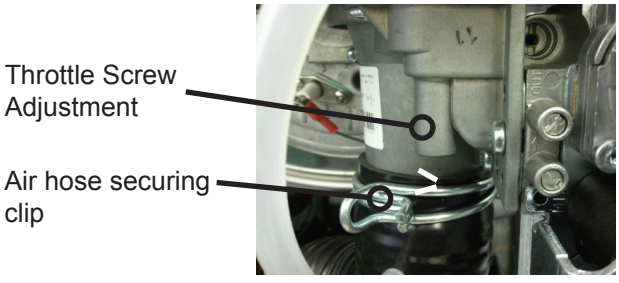


Fig 6.2

CHANGING COMPONENTS

NONE OF THE CONTROLS ARE REPAIRABLE IF THEY ARE NOT WORKING THEY MUST BE REPLACED

In all cases, before work commences turn off the Mains Electricity and Gas Supply.
The following items can be replaced:

- Pressure Temperature Relief Valves.
- Flow, Return and DHW Flow Sensors
- LLH and Tank Sensor.
- Flue Sensor.
- The HMI Display.
- Master and Slave PCBs
- Spark Generator.
- Spark and Sense Electrodes.
- Gas Valve.
- Fan.
- Venturi.
- Heat Exchanger.
- Pumps.
- Plate Heat Exchanger.
- Expansion Vessel.

Pressure Temperature Relief Valve

The removal of this valve will require either the draining or the valving off of the system that is above tank level. Once Isolated the connecting pipework can be removed and the Valve unscrewed from the Tank.

Return, Flow and DHW Flow Sensors

The Flow and Return Sensors are clipped on to the copper pipework beneath the Heat Exchangers. The DHW Flow sensor is clipped to the DHW Flow pipe at the top of the Tank.

- Pull off the two leads and unclip the sensor
- Replacement is the reverse.

LLH and Tank Sensors

These sensors are fitted in to pockets at the top of the LLH and the Tank, they have in-line connectors within 500 mm from their pockets.

- Pull the connector apart and withdraw the sensor.
- Replacement is the reverse.

Flue Sensor

This is located at the Flue outlet of the Heat Exchanger.

- They are removed by turning anti-clockwise a quarter turn and withdrawing.
- Replacement is the reverse.

AVS 37 HMI Display

- Use a small flat edged screwdriver to release the HMI from its mounting bracket, by springing off its four plastic edge clips.
- Remove the cable from the HMI Display.
- Replacement is reverse.

LMS14 PCB 1 to 3

These are located on Control Panel. It is important that the correct PCB replacement is used in the right place. They are named from top to bottom
PCB1, PCB2 and PCB3.

- Pull off all the connectors on the PCB.
- Release all 7 PCB supports and withdraw the board.
- Replacement is the reverse.

Spark Generator

This is located at the front of the Heat Exchanger on the Fan Mounting bracket.

- Pull off the grey connector to the Generator.
- Release the nut holding the Generator to the bracket, and remove generator.
- Replacement is the reverse.

Spark and Sense Electrodes

These are located on the front of the Heat Exchanger.

- Pull off the electrical connectors.
- Undo the two screws retaining the bracket and withdraw.
- Replacement is the reverse.

Plate Heat Exchanger

- Remove the lower left hand side cover to gain access to the heat exchanger
- Remove the condense pipework from behind the heat exchanger.
- Remove the two crosshead screws, located either side of the heat exchanger.
- Drain as much of the primary and secondary systems water as possible.
- Release all four heat exchanger connections and slide the heat exchanger toward the rear of the appliance
- Replacement is the reverse.

The Air tube connecting the Venturi to the flue system contains a one-way valve at the end of the flexible tube. It is essential that the two screws holding it in position are not removed and are positioned upright (12 o'clock). This alignment should be checked if the hose or air system joints are moved or altered in any way (see fig 6.3).

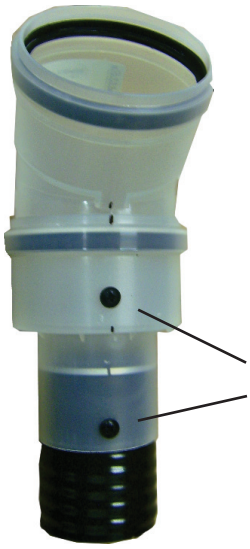


Fig 6.3

Gas Valve

NB Coil resistances are 2.8k and 1.6k ohms.

- Remove the electrical connector.
- Release the Gascock by undoing the four shoulder bolts holding it to the Gas Valve.
- Remove the Offset tube from the Gas Valve and unscrew the Offset Connector and transfer to the new Gas Valve.
- Release the Gas Valve from the Venturi by undoing three screws.
- Transfer the rubber gasket and, if fitted, Orifice to the new Gas Valve.
- Replacement is the reverse.
- Fire the boiler and check for gas leaks.
- After five minutes check the rate and combustion is correct to the Datatable. (inside cover). Adjust using the throttle on the Gas Valve.

Combustion Fan

- Remove the two electrical connectors on the Fan.
- Remove the two screws holding the Venturi to the Fan, retain the gasket between them.
- Undo the four nuts and washers holding the Fan to the Heat Exchanger and withdraw.
- Transfer the Venturi gasket to the new fan.
- Replacement is the reverse.

Venturi

- Remove the Gas Valve, see above.
- Pull off the Air Tube (***Fig 4.1***)
- Undo the two screws holding the Venturi to the Fan and remove.
- Ensure the gasket is transferred to the new Venturi or positioned on the Fan before positioning the replacement.
- Replacement is the reverse.
- Fire the Boiler and check for gas leaks.
- After five minutes check the rate and combustion is correct to the Datatable. (inside cover). Adjust using the Throttle Screw on the Gas Valve clockwise to decrease CO_2, anticlockwise to increase CO_2 if required. (*Fig. 6.2*)

The following components require the draining of the primary or secondary. It is essential that all the air is removed from the Heat Exchanger before the appliance is fired. Running the appliance with air still inside will damage the heat exchanger and invalidate the warranty.

Heat Exchanger

- Drain as much of the primary water as is necessary to ensure the heat exchanger is empty.
- Release both the heat exchanger demountable connections of the flow and return pipes.
- Lower the pipework away from the heat exchanger.
- Disconnect the gas valve from the supply pipe using the compression fitting.
- Disconnect all electrical connections to the flue sensor, spark generator, both fan connections and gas valve.

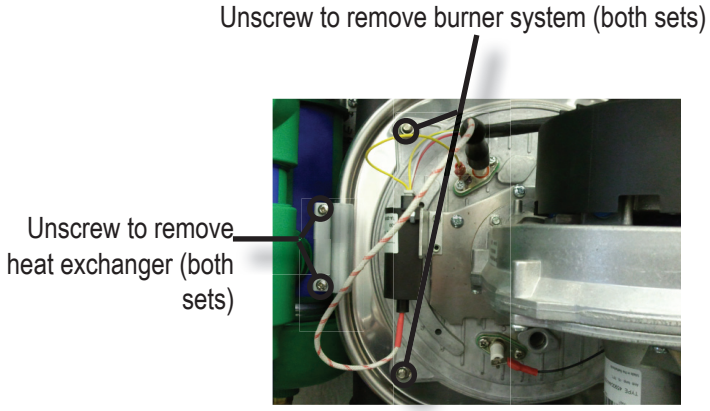


Fig 6.4

- Remove the whole burner system using the four retaining nuts holding the heat exchanger door to the body. (fig 6.4).
- Remove the flue elbow by lifting it up and away from the heat exchanger.
- The heat exchanger is now only retained by the two side brackets and releasing the four front screws will enable it to be pulled forward. Before releasing ensure there is support available.
- Replacement is the reverse.

Heat Engine Circulation Pump

These are located on the return pipes of the Heat Engines (see Fig 7.3).

- Drain as much of the primary water as is necessary to ensure the Pump is empty.
- Remove the lid of the pump wiring box and disconnect the supply lead.
- Undo the two water connections and remove the pump.
- Transfer the supply lead to the new Pump.
- Replacement is the reverse.
- Refill and check for leaks.

Primary DHW Pump

This single pump is located between the Low Loss Header and the plate heat exchanger(see Fig 7.2)

- Drain as much of the primary water as is necessary to ensure the Pump is empty.
- Remove the lid of the pump wiring box and disconnect the supply lead.
- Undo the two water connections and remove the pump.
- Transfer the supply lead to the new Pump.
- Replacement is the reverse.
- Refill and check for leaks.

Secondary DHW Pumps

These are located on the pipes from the Plate Heat Exchanger going to the Tank (see Fig 7.2).

- Turn off the two valves fitted between the Tank and Pumps.
- Drain as much of the secondary as is necessary to ensure the Pump is empty.
- Remove the lid of the Pump wiring box and disconnect the supply lead.
- Undo the two water connections and remove the Pump.
- Transfer the supply lead to the new Pump.
- Replacement is the reverse.
- Refill and check for leaks.

Expansion Vessel (Otional)

- Drain as much of the primary as is necessary.
- Remove the single screw holding the retaining strap.
- Release the flexible hose connection to the Vessel and remove it.
- Replacement is the reverse.

Cleaning

The casing is finished with a polyester coating and will mark if abrasive cleaners are used. It should be cleaned using standard non abrasive cleaning products.

Refer to pages 31-33 for item location reference

Item	Description	Part Number
1	Flue Sensor	5139798
2	Primary Heat Exchanger	5139773
3	Heat Exchanger Silicone Door Seal	5139774
4	Burner Door Nut Set	5139783
5	Spark Electrode c/w Gasket & Screws	5139785
6	Fan	5139777
7	Burner Gasket	5139782
8	Fan Gasket	5139778
9	Flow or Return Sensor	5139794
10	Ionisation Electrode c/w Gasket & Screws	5139787
11	Burner	5139781
12	Spark Generator	5139784
13	Venturi	5139780
14	Gas Valve	5139779
15	HT Lead	5139786
16	Pressure Gauge (0-4Bar)	5139806
17	Tundish 1 inch	5139811
18	Tank Access Hatch c/w O-Ring & Dip Tube	5139809
19	Tank Dip Tube Sensor	E664
20	Low Loss Header Sensor	G077
21	DHW Pressure & Temperature Relief Valve	5139805
22	300ltr Tank	E652
23	Tank DHW Flow Sensor	5139797
24	Pressure Relief Valve (3 bar)	5139807
25	Condensate Trap	E211
26	Plate Heat Exchanger c/w Fittings	5139775
27	DHW Primary Pump	5139803
28	Heat Exchanger Pump	5139802
29	DHW Secondary Pump	5139804
30	AGU2.5 Clip In Extension	5139793
31	AVS37 HMI Display	5139788
32	On / Off Switch	5139801
33	Reset PCB	5139800
34	LMS14 PCB 1	5139789
35	LMS14 PCB 2	5139790
36	LMS14 PCB 3	5139791
37	OC1345 Communication Device (c/w cable)	5139792

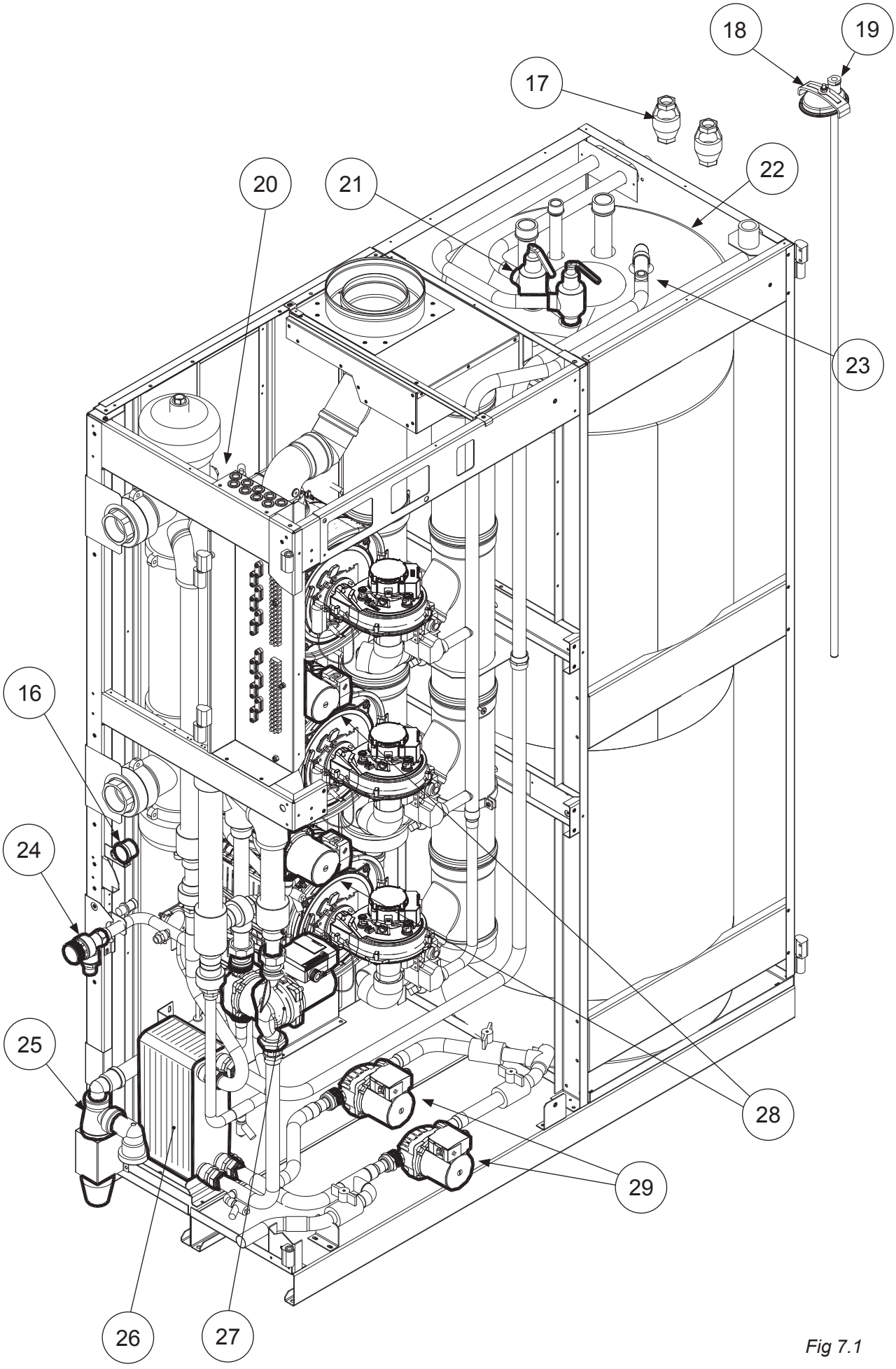
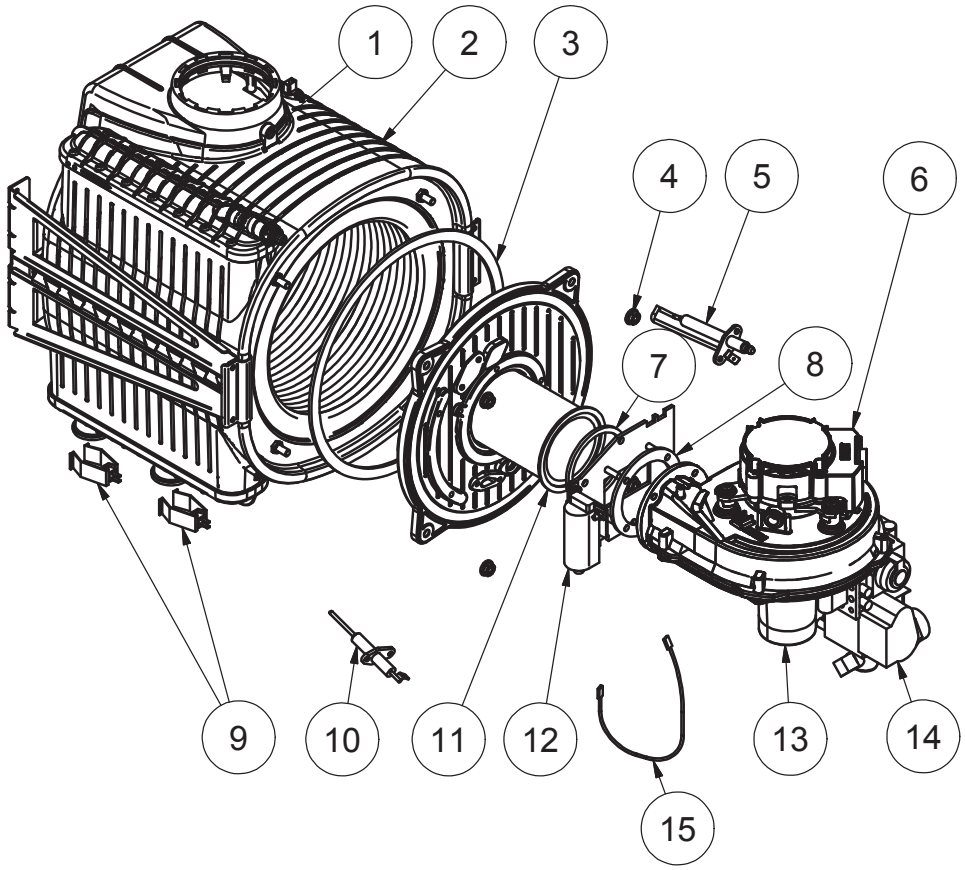


Fig 7.1



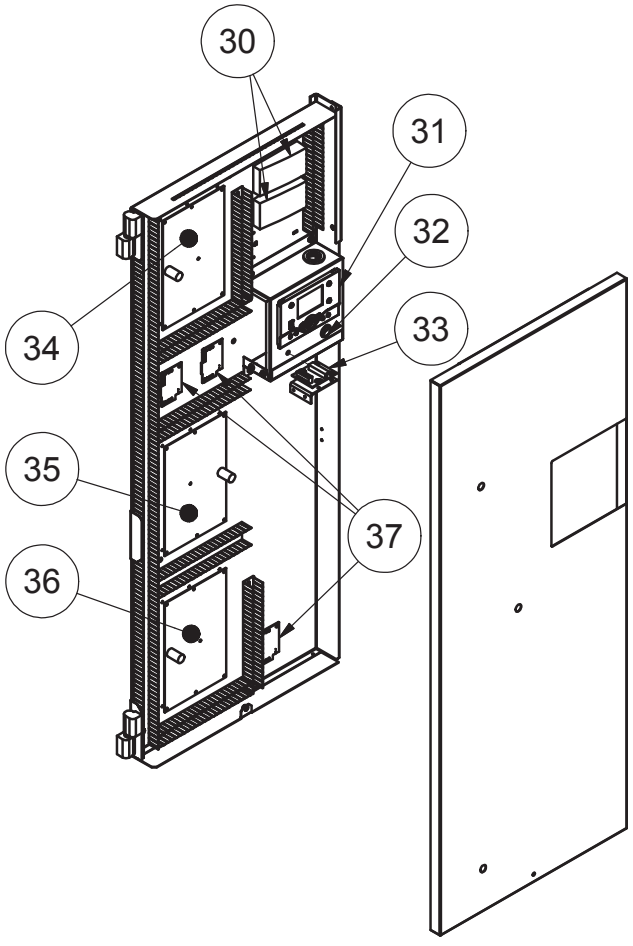


Fig 7.2

APPLIANCE COMPONENTS INTERNAL

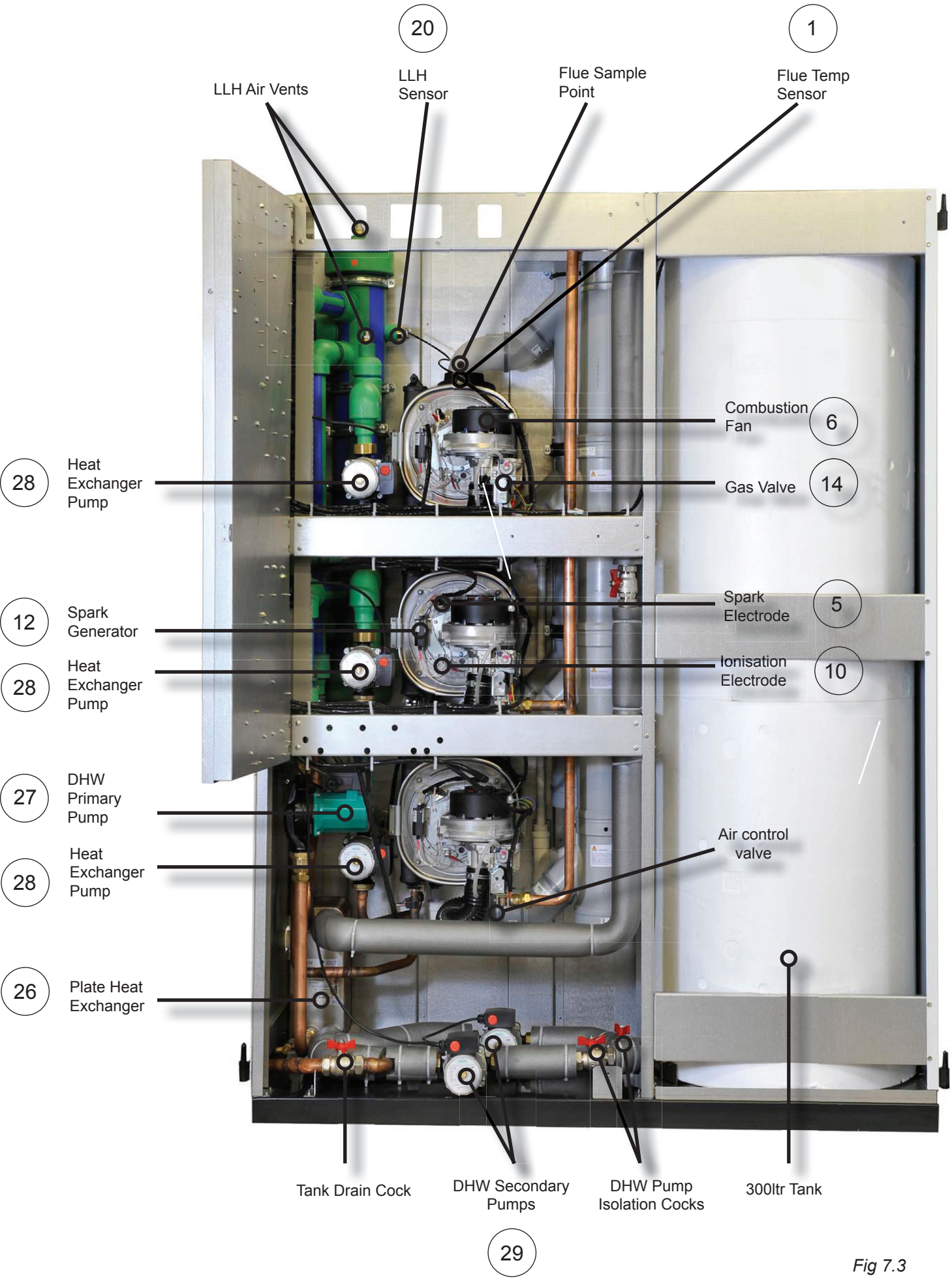


Fig 7.3

FAULT CODES

Code	Fault Description	Notes
10	Outside sensor, error	Check connections and / or replace faulty sensor (B9)
20	Boiler temperature 1, sensor error	Check connections and / or replace faulty sensor (B2)
26	Common flow temperature, sensor error	Check connections and / or replace faulty sensor (B10)
28	Flue gas temperature, sensor error	Check connections and / or replace faulty sensor (B8)
30	Flow temperature 1, sensor error	Check connections and / or replace faulty sensor (B1)
32	Flow temperature 2, sensor error	Check connections and / or replace faulty sensor (B12)
40	Return temperature 1, sensor error	Check connections and / or replace faulty sensor (B7)
50	DHW temperature 1, sensor error	Check connections and / or replace faulty sensor (B3)
60	Room temperature 1, sensor error	Check connections and / or replace faulty sensor (R1)
65	Room temperature 2, sensor error	Check connections and / or replace faulty sensor (R2)
68	Room temperature 3, sensor error	Check connections and / or replace faulty sensor (R3)
70	Stoarge tank temperature 1, sensor error	Check connections and / or replace faulty sensor (B4)
83	LPB collision	Duplicate LPB address - Check all PCBs function 6600
84	BSB address collision	Room unit incorrectly configured - see function 40
98	Extension module 1, error	Module 1 configuration error - Check parameters
99	Extension module 2, error	Module 2 configuration error - Check parameters
100	2 Clock time masters	Only PCB no 1 is set as time master - see Function 6640
110	STB lockout	Check connector X18a and all flow & return sensors
111	Shutdown limit thermostat	Heat exchanger temperatures have been exceeded
121	Flow temperature heating circuit 1 not reached	Htg Circuit 1, time temp parameter not reached
122	Flow temperature heating circuit 2 not reached	Htg Circuit 2, time temp parameter not reached
126	DHW charging temperature not reached	Check operation and heat up times for DHW
127	DHW legionella temperature not reached	Check operation of appliance
128	Loss of flame during operation	Ionisation current lost after successful ignition
130	Flue gas temp too high	Heat Engine is overheating. Check causes of high temps
133	Safety time exceeded	Ignition unsuccessful after 5 attempts
151	BMU Internal error	Check polarity is not reversed to the appliance
152	Parameterization error	Incorrect / Conflicting parameters input.

Table 3.0

FAULT CODES (CONTINUED)

Code	Fault Description	Notes
153	Unit manually locked	Reset button stuck in
160	Fan speed threshold not reached	Required fan speed not reached - Faulty fan unit
171	Alarm contact 1 active	Condensate blockage
172	Alarm contact 2 active	Alarm 2 activated (not configured)
173	Alarm contact 3 active	Alarm 3 activated (not configured)
174	Alarm contact 4 active	Alarm 4 activated (not configured)
217	Sensor error	Ionisation current fault.
317	Mains frequency outside permissable range	Check electrical installaiton
320	DHW Charging temperature, sensor error	Check connections and / or replace faulty sensor (B36)
324	Input BX, same sensors	BX sensor duplicated - check parameters
325	Input BX/extension module, same sensors	BX extension module sensor duplicated - check parameters
326	Input BX/mixing group, same sensors	Bx Mixing Circuit sensor duplicated - check parameters
327	Extension module, same function	Extension Modules duplicated - check parameters
330	Sensor input BX1 without function	BX1 connected but not defined - check parameters
331	Sensor input BX2 without function	BX2 connected but not defined - check parameters
332	Sensor input BX3 without function	BX3 connected but not defined - check parameters
333	Sensor input BX4 without function	BX4 connected but not defined - check parameters
335	Sensor input BX21 without function	BX21 connected but not defined - check parameters
336	Sensor input BX22 without function	BX22 connected but not defined - check parameters
351	Primary controller/system pump, address error	Htg Pump (Q14) not configured on PCB1
353	Cascade flow sensor B10 missing	Check connections and configuration of sensor (B10)
384	Extraneous Light	Ionisation current detected before ignition
385	Mains under voltage	Mains voltage below 185v - check installation
386	Fan speed tolerance	Fan outside allowed speed tolerance level - replace fan
388	DHW sensor no function	Tank temperature sensor not configured (B3)
432	Function earth not connected	No Ignition earth, X1 / X17 not connected or earth fault
NA	Operating mode button locked - Cannot operate in DHW or Heating mode (No fault code displayed)	Remote system enable operating. Check Link terminals

Table 3.0

NOTES

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