



tentwenty & twentytwentysix *Condensing Boilers*



Installation & Service Instructions

GC No. 41 555 17
41 555 18, 41 555 19

Serial Number:

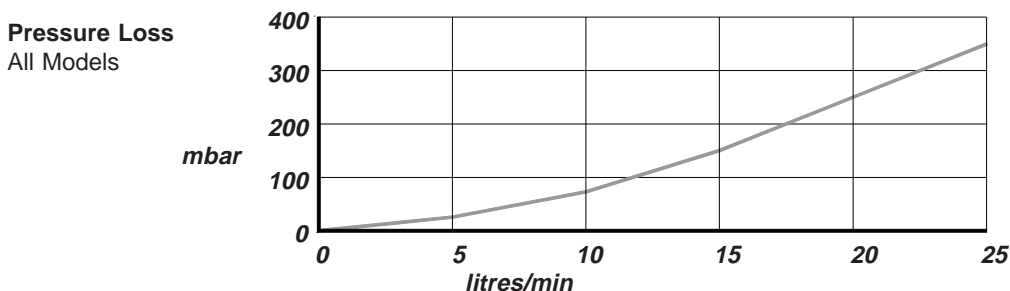


Note to the Installer: **Natural and Propane Gas**
Please leave these Instructions adjacent to the meter.



Technical Data

Boiler Model	tentwenty (min/max)	twentytwentysix (min/max)
Flue, Gas Type & Destination	C ₁₂ C ₃₂ C ₅₂ , CAT II 2H, U.K. & I.E.	C ₁₂ C ₃₂ C ₅₂ , CAT II 2H3P, U.K. & I.E.
SEDBUK Rating	B	B
Heat Input, NET	10.1-16.8 kW (34,410-57,360 Btu/h)	20.0-23.0 kW (68,250-78,400 Btu/h)
Heat Input, GROSS	11.2-18.7 kW (38,200-63,730 Btu/h)	22.2-25.5 kW (75,750-87,000 Btu/h)
Heat Output 80-60°C	9.76-16.14 kW (33,290-55,000Btu/h)	19.1-22.0 kW (65,200-74,800Btu/h)
Heat Output 50-30°C	10.25-17.0 kW (35,000-58,000Btu/h)	20.6-23.5 kW (70,000-80,000Btu/h)
Setting Pressure, NG (Propane)	5.0 - 14.0 mb	10.4 - 14.0 mb (28.4 - 35.8 mb)
Gas Consumption for CV	1.02 - 1.69 m ³ /h	2.08 - 2.4 m ³ /h
39.0 MJ/m³ after 10 minutes	(36.0 - 59.7 ft ³ /h)	(75.3 - 85.7 ft ³ /h)
Main Burner (Aeromatic)	Aeromatic AC13/ 122555	Aeromatic AC13/ 122557
Gas Control	SIT. 840.026	SIT. 840.026
Burner Injector, NG (Propane)	Dia. 3.4	Dia. 4.1(2.6 Propane)
Pilot Injector, NG (Propane)	SIT 0.997.142/33	SIT0.997.142/33 (0.977.150/23 Propane)
Gas Connection	½" B.S.P.	½" B.S.P.
Installation Lift Weight	20 kg.	23.5 kg.
Total Dry Weight	28 kg.	34 kg.
Water Content	1.4 litres	1.6 litres
MAXIMUM Water Pressure	3 bar	3 bar
MINIMUM Static Water Head	1 m	1 m
Boiler Thermostat range	30 - 82°C	30 - 82°C
Recommended Water Flow	10 - 12 litres/m	14 - 16 litres/m
MINIMUM Water Flow	5 litres/m	7.5 litres/m
Flow & Return Connections	22mm Copper	28mm Copper
Electrical Supply	230V~50Hz 40W	230V~50Hz 40W
Internal Fuse Rating	1 Amp (20mm)	1 Amp (20mm)
External Fuse Rating	3 Amp	3 Amp
Dimensions mm	790 High, 400 Wide, 330 Deep	790 High, 500 Wide, 340 Deep
Service Clearances mm	450 Front, 30 Above, 25 Below 30 Left & Right	450 Front, 30 Above, 25 Below 30 Left & Right
Terminal Dimensions mm	Concentric 160 High 160 Wide & 55 Deep, Twin 260 High 150 Wide 100 Deep	Concentric 160 High 160 Wide & 55 Deep, Twin 260 High 150 Wide 100 Deep
Flue Dimensions mm	Concentric 110, Twin 80	Concentric 110, Twin 80
Flue Length, min-max, mm (overall = there and back)	Concentric 100 - 2000, Twin (overall) 200 - 30000	Concentric 100 - 2000, Twin (overall) 200 - 30000



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Introduction

These Instructions cover a range of lightweight, wall hung, gas fired, condensing boilers which are room sealed and fan assisted on the flue side. The flue systems available are Concentric, left, right, or rear, up to 2 metres and, Twin Pipe, horizontal total combined length of 22 metres or vertical, up to a total length of 30 metres. The ignition system is fully automatic.

There are two models with different output ranges - see the **Technical Data on page 1** for details.

The boiler casing is of white enamelled mild steel. They are suitable for connection to open vented or

sealed systems. These systems may be pumped central heating or pumped central heating combined with a pumped indirect domestic hot water circuit. Gravity circuits must NOT be used.

The boilers include a pump overrun device so it is essential that there is an open circuit for water to flow between the flow and return. In some system designs this may require the addition of a bypass, an automatic bypass is preferred.

The boilers also contain integral frost protection, the boiler will fire if the temperature within it approaches 4 to 5 degrees Centigrade. It will do this even when turned to Off, and can only be inhibited by removing the Permanent Live supply to the boiler.

Adequate arrangements for completely draining the system, by provision of drain cocks MUST be provided.

Gas Safety (Installation and Use) Regulations, (as amended).

It is the law that all gas appliances are installed by a competent person (e.g. a CORGI registered operative) in accordance with the above Regulations. Failure to install appliances correctly could lead to prosecution.

It is in your own interest, and that of safety, to ensure that the law is complied with. The installation of the boiler MUST also be in accordance with the current I.E.E.. Wiring Regulations, the Local Building Regulations, Building Standards (Scotland), the Bye Laws of the Local Water Undertaking, any relevant requirements of the Local Authority, and Health and Safety document No 635, "Electricity at Work Regulations".

Detailed recommendations are contained in the following British Standard Codes of Practice.

Codes of Practice.

BS.6798 Installation of gas fired hot water boilers of rated input not exceeding 70kW.

BS.5449:1 Forced circulation hot water systems (small bore and microbore domestic central heating systems).

BS.5546 Installation of gas hot water supplies for domestic purpose (2nd Family Gases).

BS.5440: Part1. Flues (for gas appliances of rated input not exceeding 60kW).

BS 6891 Specification for installation of low pressure gas pipework.

BS 7074:1 Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems.

BS5482:1 Code of practice for domestic butane & propane gas burning installations.

Building Regulations Part J 1

IMPORTANT. It is important that no external control devices are directly connected to this appliance - unless covered by these 'Installation and Servicing Instructions' or otherwise recommended by the manufacturer. If in doubt, please enquire.

Any direct connection of a control device not recommended by the manufacturer could infringe the Gas Safety (Installation & Use) Regulations, the above regulations and the normal appliance warranty.

Manufacturer's notes must NOT be taken, in any way, as overriding statutory obligations.

Location of Boiler

The boiler MUST be installed on a flat and vertical non-combustible wall, capable of adequately supporting the weight of the boiler and any ancillary equipment.

THE BOILER IS NOT SUITABLE FOR EXTERNAL INSTALLATION.

IMPORTANT NOTICE.

If the boiler is to be fitted in a timber framed building it should be fitted in accordance with the British Gas publication 'Guide for Gas Installations in Timber Frame Housing', reference DM2. If in doubt, advice must be sought from the Local Gas Region of British Gas.

The boiler may be installed in any room or internal space. Particular attention is drawn to the requirements of the current I.E.E Wiring regulations and, in Scotland, the electrical provisions of the Building Regulations applicable to Scotland with respect to the installation of the boiler in a room or internal space containing a bath or shower.

Where a room sealed appliance is installed in a room containing a bath or shower then the appliance and any electrical switch or appliance control, utilising mains electricity should be so situated that it cannot be touched by a person using the bath or shower.

Where installation will be in an unusual location then special procedures may be necessary and BS.6798 gives detailed guidance on this aspect.

A compartment used to enclose the boiler MUST be designed and constructed specially for this purpose. An existing cupboard, or compartment, may be used provided it is modified for the purpose. Details of essential features of cupboard compartment design, including airing cupboard installations are given in BS.6798.

In siting the boiler, the following limitations MUST be observed:

1. The position selected for installation MUST allow adequate space for servicing in front of the boiler and for air circulation around the boiler.
2. This position MUST also permit the provision of a satisfactory balanced flue termination.
3. This position MUST also permit the provision of a satisfactory connection to the condensate drain.

Gas Supply

An existing meter (NG) and pipework should be checked, preferably by the Gas region, to ensure that they are adequate to deal with the rate of gas supply required.

Supply pipes should be sized to suit installation and obtain a working pressure of 20 mbar (NG) and 37 mbar (Propane). Installation pipes should be fitted in accordance with BS.6891.

A Natural Gas appliance must be connected to a governed meter.

Conversion

The appliance can be converted from NG to LPG or vice versa by change of the Burner, Main and Pilot Injectors and re-setting the Gas Valve. Contact your supplier for the necessary parts.

Flueing

Only flue components provided by the Manufacturer should be used with these appliances. Detailed recommendations for flueing are given in BS.5440:

1. The following notes are intended for general guidance.

1. Be aware of the plume from the flue and the wetting effect it has to adjacent property.
2. The flue can be taken upwards, left, right or to the rear of the appliance.
3. The boiler is supplied separate to the chosen flue set. It can be supplied with Twin or Concentric flues. The flue components for the Twin application must be chosen from the separate Flue Application Guide. There are two lengths of Concentric Flue. Standard, that will reach 500mm, and Extended that will reach up to 2000mm. (Part No. M3838).
4. The boiler MUST be installed so that the terminal is exposed to external air.
5. It is important that the terminal allows the free passage of air across it at all times.
6. The acceptable spacing from the terminal to obstructions and ventilation openings are specified in Table 1.

7. Because the flue gases and terminal are at very low temperature it is not necessary to fit a Terminal guard to protect against burns. If a guard is required for any other reason the following is recommended.

For the **Concentric** Terminal:
Model K3 6.5 x 11 (plastic coated) (GC No 393554)

For the **Twin Flue** Terminal:
Model B (black plastic coated).

For the **Single Flue** Terminal:
Model H (black plastic coated).

All are available from:

Tower Flue Components Ltd.

*Tower House.
Vale Rise.
Tonbridge
KENT
TN9 1TB
01732 351555*

Terminal Position	Minimum
Below window or vent	300 mm
Below gutter or pipes	75 mm
Below eaves	200 mm
Below balcony or roof	200 mm
From a window	200 mm
From vertical pipe	75 mm
From corners	300 mm
Above ground, roof or balcony	300 mm
From facing surface	600 mm
From facing terminal	1200 mm
From opening under a car port	1200 mm
Vertically from a terminal	1500 mm
Horizontally from a terminal	300 mm

Table 1.

IMPORTANT.

It is absolutely ESSENTIAL to ensure, in practice, that products of combustion discharging from the terminal cannot re-enter the building, or any other adjacent building, through ventilators, windows, doors, other sources of natural air infiltration or forced ventilation/air conditioning.

If this should occur, the appliance MUST be turned OFF IMMEDIATELY and the Local Gas Region consulted.

Air Supply

It is NOT necessary to have a purpose provided air vent in the room or internal space in which the boiler is installed.

Where the boiler is installed in a cupboard or compartment no air vents are required. However the User may wish to ensure that is ventilated to provide air circulation.

Water Supply

The central heating system should be in accordance with the relevant recommendations given in BS.6798, BS 7593:1992 and, in addition, for smallbore and microbore systems - BS.5449:1.

The domestic hot water system, if applicable, should be in accordance with the relevant recommendations of BS.5546.

Copper tubing to BS 2871:1 is recommended for water carrying pipework.

The hot water storage cylinder MUST be of the indirect type and should preferably be manufactured of copper.

The hot water cylinder, & ancillary pipework, not forming part of the useful heating surface should be lagged, to prevent heat loss and any possible freezing, particularly where pipes run through roof spaces and ventilated underfloor spaces.

Draining taps MUST be located in accessible positions, which permit the draining of the whole system, including boiler and hot water storage vessel. Draining taps should be at least ½ in. nominal size and be in accordance with BS.2879.

Condensate Drain

Refer to Fig. 2, and 12.

A condensate drain is provided on the boiler, this drain must be connected to the household drainage point, or soakaway on site. All pipework and fittings in the condensate drainage system MUST be made of plastic. Refer to British Gas publication "Guidance notes for installation of domestic condensing boilers"

No other materials may be used.

The drain outlet on the boiler is :

Polypipe, 21.5mm pushfit overflow pipe.

Sealed Systems

A sealed system should follow the guidelines given in the Code of Practice BS 7074 :1. It should include a safety valve to BS 6750 Pt 1, fitted close to the boiler, without an intermediate valve to the system and in a position where it can be tested. It should be preset to operate at 3 bar (45 lb/in²) and sited to discharge through a pipe to a safe outlet.

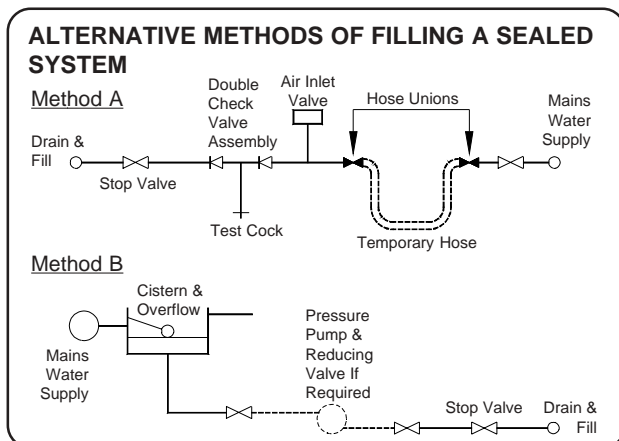
An expansion vessel complying with BS 4814 must be fitted to the system close to the return side of the pump. The connection should be not less than 15mm and without a valve or restriction. Size the vessel by using the table below.

1. Choose a vessel pressure by taking the static head of the system, adding 0.3 bar, and taking the nearest larger size.
2. Select the Vessel Volume from the table below by finding the system volume and vessel pressure.
3. Choose that size or larger from the manufacturers' range.

Vessel Pressure Bar	System Volume Litres				
	50	60	70	100	150
0.5	4	4	8	8	12
1.0	8	8	8	12	18
1.5	8	12	12	18	24

A pressure gauge with a fill pressure indicator and a range of 0-4 bar should be fitted close to the expansion vessel in a visible position.

A design as detailed below should be used for the filling connection, it utilises a BS 1010 stop valve, a double non-return valve and filling loop fitted at low level and should be installed with the approval of the local Water Undertaking.



Electricity Supply

Refer to Figs. 3 and 4.

Wiring external to the appliance **MUST** be in accordance with the current I.E.E. Wiring Regulations and any Local Regulations that apply.

The boiler is supplied for 230V ~ 50Hz. Single phase. Fuse rating is 3A.

The method of connection to the mains electricity supply **MUST** facilitate complete electrical isolation of the boiler, preferably by the use of a fused double pole switch having a 3mm (1/8in.) contact separation in both poles and servicing only the boiler and system controls.

The point of connection to the mains should be readily accessible and adjacent to the boiler, except that, for bathroom installations, the point of connection to the mains **MUST** be situated outside the bathroom.

Note. Where a room sealed appliance is installed in a room containing a bath or shower, the appliance, any electrical switch or appliance control utilising mains electricity should be so situated that it cannot be touched by a person using the bath or shower.

Installation Of Boiler

Suggested procedure:

1. Site to suit system and terminal limitations.
2. Mark Boiler Mounting Box fixing position. (**Fig. 5**).
3. Mark & Drill Flue hole(s).
(see **Fig. 7** for Concentric, **Fig. 8** for Twin Pipe).
4. Fix Boiler Mounting Box to the wall.
5. Remove the Electrical tray and the Case from boiler module.
6. Plumb module for water and gas OFF the wall (access is much better).
7. Fix the Boiler to its Mounting Box.
8. Plumb tails to system and gas.
9. Test for leaks.
10. Replace the Case and Electrical tray.

Space Required for Installation and Service.

Right or Left	30 mm	1¼ in.
Above	30mm	1¼ in.
Below	25mm	1 in.
In Front	450mm	18 in.

Removal of the Case

Refer to Fig. 6

1. Lower the electrical cover. This is detached by pulling the cover towards you and carefully lowering. Care should be taken to prevent strain on the cables and connections.
2. Remove the case by unscrewing the two pozidrive screws located at the bottom and rear of the case, and lifting and pulling forward off the two pegs which are located at the top. The case should be kept vertical as it is removed. Examine the sealing strip for damage and replace if necessary.

IMPORTANT: FAILURE TO CORRECTLY LOCATE THE APPLIANCE CASE COULD RESULT IN LEAKAGE OF COMBUSTION PRODUCTS INTO THE ROOM.

Boiler Mounting Box

1. Site to suit system and terminal limitations.
2. For the Concentric Flue. Prepare the Boiler Mounting Box for the flue direction required by swapping one of the blanking discs for the flue grommet.
3. Using the template, ensure the Boiler Mounting Box is at the desired height for the top of the boiler. **See Fig. 5**
4. Mark the wall or ceiling for the flue exit points and core drill the wall to give a 0 to 3 degree slope down towards the boiler. The recommended core drill for the Concentric Flue is 128mm and 90mm for the Twin Pipe.
5. Then screw the Boiler Mounting Box to the wall using a top hole on each side, and then any other two, using the four screws, washers and wallplugs supplied.

Assembly Of Flue Pipe & Air Duct Pipe To Boiler Mounting Box (Concentric Flue Only)

The following is based on the flue tube being supplied with the straight and elbow connectors being pre-assembled, the one NOT required to be cut off during installation.

Right or Left Outlet

1. Secure the 50mm flue tube with ELBOW connector on the saddle using the Velcro strap. **See Fig. 7**

2. Measure carefully and saw off the 50mm tube to give required projection from wall. **See Fig. 7**
3. Measure carefully and saw off the 110mm Air duct tube to give required projection from wall. The flue pipe must project more than the outer air duct when assembled. **See Fig. 8**

Note:

It is acceptable to obtain this dimension by pulling the air duct away from the air duct stop, provided there is a minimum of 10mm (1/2 in.) insertion into the Boiler Mounting Box and that a satisfactory seal is achieved.

4. For extended flues, position the air duct support clips provided every 700mm.

Rear Outlet (Concentric Flue Only)

Install as above but using the STRAIGHT connector in the Boiler Mounting Box. Follow the instructions under Right or Left Outlet, points 1,2,3 and 4.

Terminals

Concentric

Fix to the outside wall with the 'T' cutout towards the top face which contains no holes. If a guard is fitted, the terminal should be at its centre.

Twin Pipe

The terminal can be fixed vertical or horizontal. The flue pipe must always be connected to the extended outlet of the terminal. The spacing is 120mm and a core drill of 90mm is recommended. See Fig. 2.

Single Pipe

A core drill of 90mm is recommended. See Fig. 2.

Twin Pipe Assembly

All the Twin Pipe components for this appliance are lightweight plastic and utilise a push-fit system. Very few fasteners are required and their use is detailed on the instructions provided with the components.

Important:

All Twin Pipe Installations must comply with the following.

1. The Flue pipe must slope back to the boiler by three degrees (1 in 20) on all horizontal runs. The air pipe can be above or below horizontal.

2. Pipes must be clipped every 1000mm, minimum.
3. The condensate connection from the Boiler Mounting Box must be connected to the Boiler Condensate Drain Trap. (see Fig. 12)
4. All connections should be made with the Socket end furthest from the boiler.
5. Only CentraCerin or Silicone Grease should be used to ease the fitting of sections.
6. The combined length of Air and Flue should not exceed 22m horizontal, or 30m vertical and includes any terminal parts.
7. The straight equivalent lengths of bends in a horizontal design are as follows:
 - 45 degrees, 1.3m.
 - 90 degrees, 4m.

For more complex designs please see the details provided with the components
8. The Roof Terminal must not be altered and there should be at least 300mm from the terminal to any part of the building.

It is recommended that:

1. The Installation of the flues are completed before the boiler is hung on the Mounting Box. This will ensure that any debris that gets into the flues can be cleared.
2. That 45 degree bends are always used with vertical flues and where possible used in preference to 90 degree bends in horizontal installations.
3. Straight/square Flue pieces may be reduced in length by cutting. It will ease assembly if the cut edge is cleaned, chamfered and greased before insertion.

Plumbing

Prepare the flow and return pipe work on the rear of the boiler. Note: It is important that the joints on this pipework are leakproof as access is very limited after fitting the boiler module. Facing the boiler the FLOW connection is at the bottom left and the RETURN at the top right.

SECURING THE BOILER ON TO THE MOUNTING BOX

1. Remove the two M5 screws from the Mounting Box, and retain.
2. Remove the boiler top trim by undoing the two

screws, and retain. For Twin Pipe Installations, also remove the Left Hand Side Trim.

3. With the bottom of the boiler away from the wall, hang the top of the back panel onto the Mounting Box. Now, by gently lowering the bottom of the boiler against the wall the fan spigot should engage in the flue connector. Observe the correct engagement of the fan spigot into the flue.
 4. For Twin Pipe Installations, Remove the cap from the spare inlet on the condensate trap. Offer up the silicone drain tube from the Mounting Box and shorten if necessary. If there is very little clearance on the left of the appliance it will be easier to connect the flue drain to the syphon by swinging the bottom of the boiler away from the wall to give more room.
- IMPORTANT:** Neither of the drain tubes should be kinked, they must run smoothly to the Condensate Trap.
5. Replace the two M5 screws around the fan that hold the Mounting Box to the back panel.
 6. Replace the Left Hand Side Trim and decorative top trim, if required.

Lower Boiler Fixing

The boiler is finally attached to the wall by two screws, washers and wallplugs. See Fig. 5

Gas Connection

The ½" BSP. gas connection point is shown in Fig.2. A minimum of 20mb. (NG), 37mb (LPG) must be available at the boiler inlet, with the boiler and other connected appliances firing. Check for gas soundness (B.S. 6891: 1988) in pipework to boiler using a manometer. Open the gas cock. Gas soundness within the boiler should be checked using sense of smell and/or leak detection fluid. Check the burner bar pressure with a manometer connected to the control and adjust if required, with the pressure regulator on the Gas Valve.

Condensate Connection

The position of the plastic condensate drain pipe is shown in Fig 2.

Where possible an internal termination of the Condensate discharge pipework should be used.

Installation pipework must be in plastic to a suitable drain location with a gradient of 2.5° (45mm/ meter run) minimum. If connected to another drainage trap, an air break is required between the boiler drain and that trap. (see Fig.11). Internal runs must

minimum of 19mm pipe. External runs **MUST** be made in a minimum of 32mm pipe, starting inside the building, and if possible insulated to defer problems from freezing.

Whichever method is used it should be checked during commissioning to prove there is a leakfree working connection from the boiler to the drain. The simplest way to do this is to carefully pour some water into the boiler flue and check it emerges at the drain.

The British Gas booklet "Guidance for the installation of Domestic Condensing Boilers" should also be referred to.

System Design

General principals

The system should be designed to conform with the latest requirements of the Building Regulations.

Condensing Boilers give their best performance when the system water temperature is as low as possible and still achieve the desired room temperatures. Oversized radiators make this easier to achieve but are not essential as, even in a standard designed installation, most of the boilers' working hours are spent with the system producing much less than the designed output. This is because the outside temperature is often higher than the figure used for the design, typically -1 to -2° C.

A design using 3-port flow-share valve, room thermostat and cylinder thermostat, is a perfectly suitable minimum. The boilers include a pump overrun device so it is essential that there is an open circuit for water to flow between the flow and return. In some system designs this may require the addition of a bypass, an automatic bypass is preferred.

They also contain integral frost protection, the boiler will fire if the temperature within it approaches freezing. It will do this even when turned to Off, and can only be inhibited by removing the Permanent Live supply to the boiler.

Thermostatic radiator valves can be used but it is essential to fit a bypass to maintain minimum flow conditions. An automatic bypass is preferred.

The boiler waterside is completely copper so all good corrosion inhibitors are suitable.

Designs

The following designs are all acceptable:

1. Sealed system to BS.6798 and BS.5449:1

2. Combined Feed and Vent systems.

3. Separate Cold Feed and Vent systems.

The pump may be on the flow or return, but careful note of its position relative to the feed and vent **MUST** be made to avoid pumping over, or sucking in air. It should always be installed with isolating valves as close as possible on both its flow and return. The design temperature difference across the boiler for optimum operating efficiency is 20°C. If thermostatic valves or zone valves are used ensure the minimum flow shown in the **Technical Data on page 1** is possible.

Electrical Connections

WARNING: The appliance MUST be earthed.


All wiring for the boiler and system controls **MUST** conform to I.E.E. Wiring Regulations, and work should be tested using a suitable meter, for Earth Continuity, Polarity, Short Circuit and Resistance to Earth.

The supply must be through a common isolator, a double pole 3A fused isolating switch with a contact separation of 3mm minimum on both poles. The cable used should be no less than 0.75mm² to BS.6500 PVC, 3 core, and fixed ensuring the earth connection is longer than the Live and Neutral.

Access to the boiler connections is made by withdrawing the Electrical Tray then releasing the single screw retaining the cover over the push fit screw terminals. The boiler internal wiring is shown in **Fig.3** and **Fig.4**.

Connections are as follows :-

4 Way Terminal Supply Connection

	Earth
N	Mains Neutral
Ls	Switched Live
L	Permanent Live

3 Way Terminal Pump Connection

	Earth
N	Pump Neutral
L	Pump Live

The boiler includes a pump overrun and an external pump **MUST** be powered from the Pump push-fit connector.

For systems using an external programmer, the electrical wiring should follow the relevant control manufacturer's recommendations, with the switched live from the controls returning to Ls in the 4 way push-fit connector.

Commissioning

General

The elimination of air from systems is essential to minimise the occurrence of heat exchanger and general system noise. It is particularly important for lightweight boilers.

Metal swarf and flux chemicals make a very aggressive mixture, the destructive nature of which can be drastically reduced by flushing. Consequently this is a mandatory step in the commissioning procedure.

Low water content, fabricated boilers are vulnerable to damage by air, particularly when the system water is 'hard'. (Contains a lot of dissolved calcium salts). The result of this damage is evident in noisy boilers and reduced service life.

Removal of air from a system mainly takes place when the water is stopping, starting or not moving at all. It is removed most easily when it is in large bubbles, but the action of the pump is to chop it up so that it becomes a foam, which is extremely difficult to remove.

Two or three second bursts on the pump at the initial stage will reduce the risk of foam formation.

Sloping the pipe runs towards the vent points will greatly aid air removal. Sloping pipes are not just a feature of gravity systems but can greatly aid the pumped system because air can move towards a vent when the pump stops.

Air is dissolved in water but is released when heated. Always run a system at maximum temperature for at least 15 minutes to enable this potential problem to be removed during commissioning.

Commissioning Procedure

The boiler is fitted with automatic ignition and will start when the gas cock is open, mains is connected to the boiler and the controls calling for heat.

NOTE: If the boiler has just been filled with very cold water, the built in Frost Thermostat will attempt to fire it if it has a permanent live and no switched live, this is completely normal. It is recommended that the gas cock is turned off during this early stage. Because of a built in delay, the boiler is always held off for a minimum of 120 seconds. However, for commissioning purposes, switch off using the System Isolating Switch will avoid the delay.

It is strongly suggested that the following stages of commissioning are followed, and not an immediate connection of all services. This procedure prevents

substantial amounts of air being dispersed through the system as small bubbles.

Carry out electrical tests as stated in Electrical Connections if not already done so.

With all radiator valves fully open, fill the system but do not start pump.

Sealed Systems only :

With the temporary hose connected, fill from the mains supply, then follow the procedure below.

Check for water soundness and rectify where necessary.

DO NOT TURN ON GAS

Drain the system by opening all draincocks. This will flush the system of flux and swarf.

Pour 3/4 of the inhibitor in and fill the system with clean water and vent air from radiators and pipework.

Sealed Systems only: *Pour in all the inhibitor, and fill to required pressure plus 0.3 bar to allow for venting.*

Switch on the electrical supply to the boiler and switch the programmer to DHW.

Switch off after about five seconds and vent all points again.

Repeat this for 5 minutes.

Sealed Systems only: *re-pressurise if required.*

Turn on pump (do not turn on gas) and run for at least 30 minutes with 3 port valve in DHW position most of the time.

Stop pump at five minute intervals and vent until no more air can be removed and air noises are no longer produced at the boiler. While the system is venting check again for water soundness.

TURN ON THE GAS

Check for gas soundness (BS 6891: 1988) in pipework to boiler using a manometer.

Open the gas cock and after purging the system, the boiler will light automatically.

Run system at maximum thermostat setting.

Gas soundness within the boiler should be checked using sense of smell and/or leak detection fluid.

Continue running for 15 minutes, venting every 5 minutes.

The Pilot is factory set.

The Main gas valve, GV2, gradually raises the pressure to the set point. Allow at least 60 seconds for the final pressure to stabilise.

IMPORTANT. It is essential when setting the burner pressure that the inlet pressure is at least 20 mbar (NG), 37 mbar (LPG) with the boiler and any other connected appliances running.

Set the burner pressure to the correct pressure by using a manometer connected to the control and adjusting the regulator to the desired input. (see the charts below and Fig.1)

Where a bypass is fitted check its operation with the system hot, the minimum flow rate through the boiler should be as shown in the **Technical Data on Page1.**

Set the pump speed to the highest setting that does not provoke unreasonable operational noise within the system.

Sealed Systems only: re-pressurise to required pressure and set the gauge indicator

With the system hot, check again for water soundness. Refit the case to the boiler. Add remainder of corrosion inhibitor. Balance the system in the normal way to obtain even heating of all radiators.

If fitted set the cylinder thermostat to 60°C, or lower if preferred.

Complete the Logbook and pass to the user when explaining and demonstrating the operation of the system. Their instructions are located under the Electrical Tray.

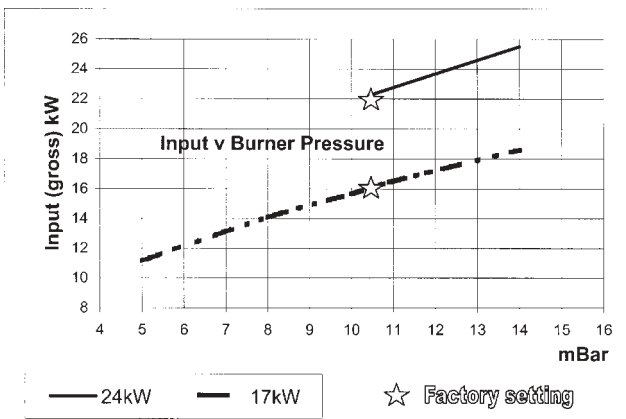
Note: The boiler is fitted with a syphon trap that includes a blocked drain device. This is to safeguard the boiler and help defer the effects from the possible freezing of the condensate pipework in extreme weather.

The user should be made aware of this feature and, that in the event of blocked condensate pipework, for example frozen condensate pipework, the boiler will automatically stop functioning. It will start again as soon as the blockage has cleared.

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

kW	Btu/h	sec/ft ³	m ³ /2 mins
10	34120	109.7	0.0309
12	40944	91.4	0.0371
14	47768	78.4	0.0433
16	54592	68.6	0.0495
18	61416	61.0	0.0557
20	68240	54.9	0.0619
22	75064	49.9	0.0680
24	81888	45.7	0.0742
26	88712	42.2	0.0804

For Commission check list see next page.



Commission Check List (hydraulic)

The key points which must be observed closely, are shown below.

- ✓ With radiator valves and vents open fill the system.
- ✓ **Do not use pump. Do not light gas**
- ✓ Check for and rectify leaks.
- ✓ Drain to flush system.
- ✓ Refill system, adding 3/4 of the inhibitor.
- ✓ **Do not light boiler.**
- ✓ Vent all radiator and air release points.
- ✓ Run pump for 5-10 second bursts and revent.
- ✓ **Do not light boiler.**
- ✓ Run pump for at least 30 minutes.
- ✓ Stop at 5 minute intervals to vent.
- ✓ Continue venting until no more air noise can be heard.
- ✓ Light boiler and run at max thermostat setting. Continue for 15 minutes, venting every 5 minutes.
- ✓ Add remainder of inhibitor.

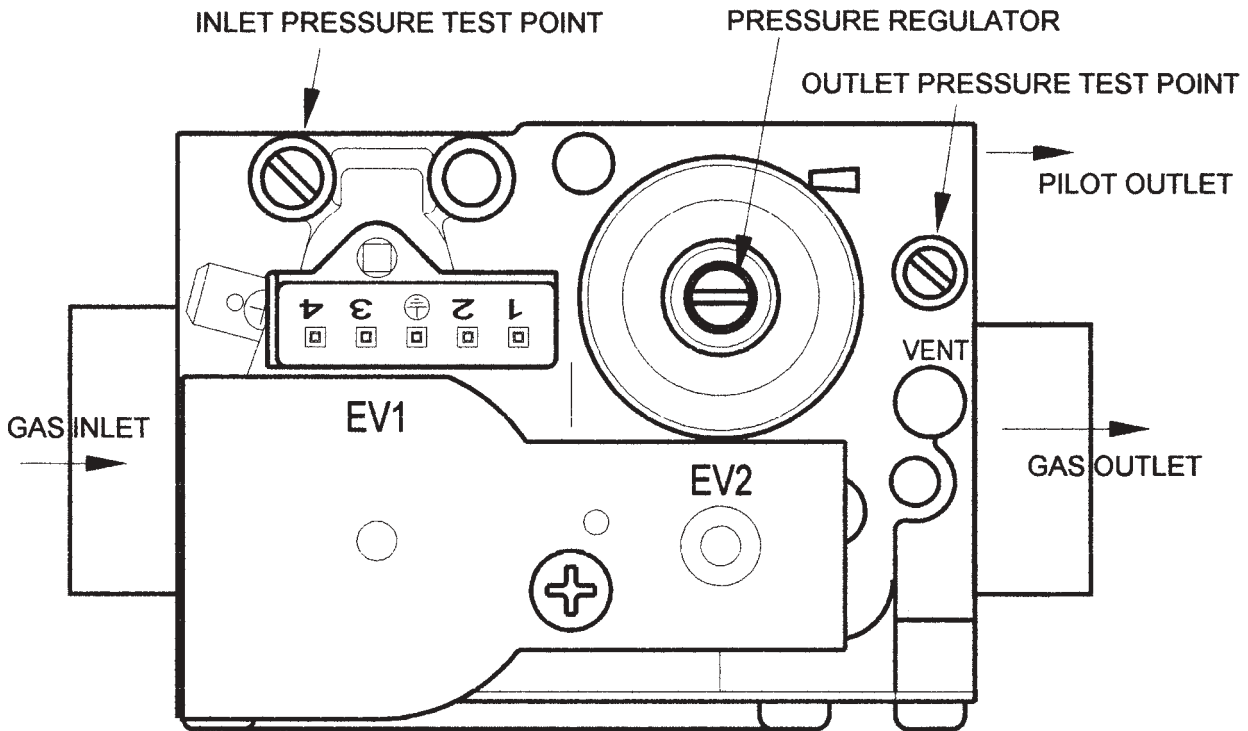
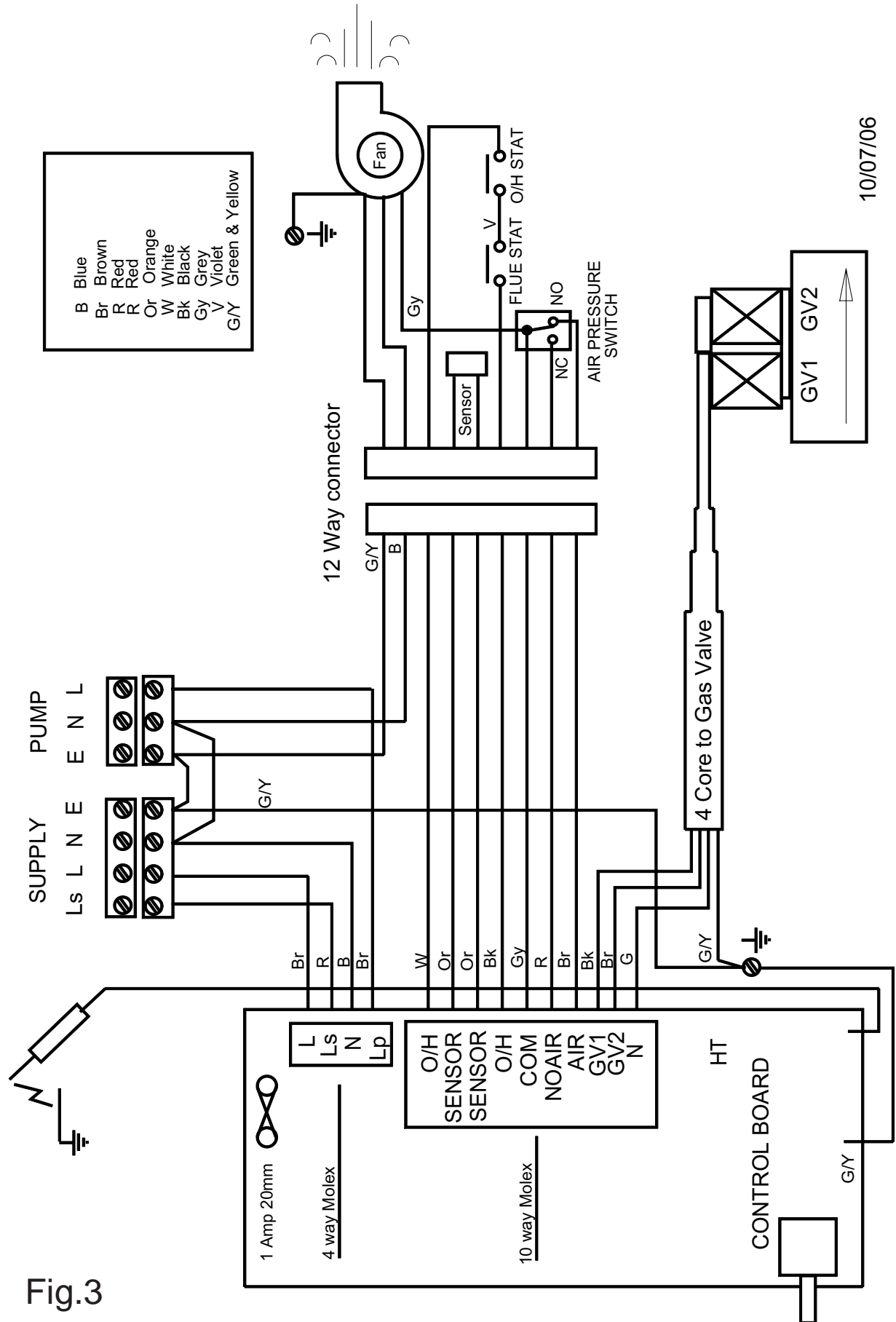


Fig.1

Schematic Wiring



10/07/06

Fig.3

Physical Wiring Diagram

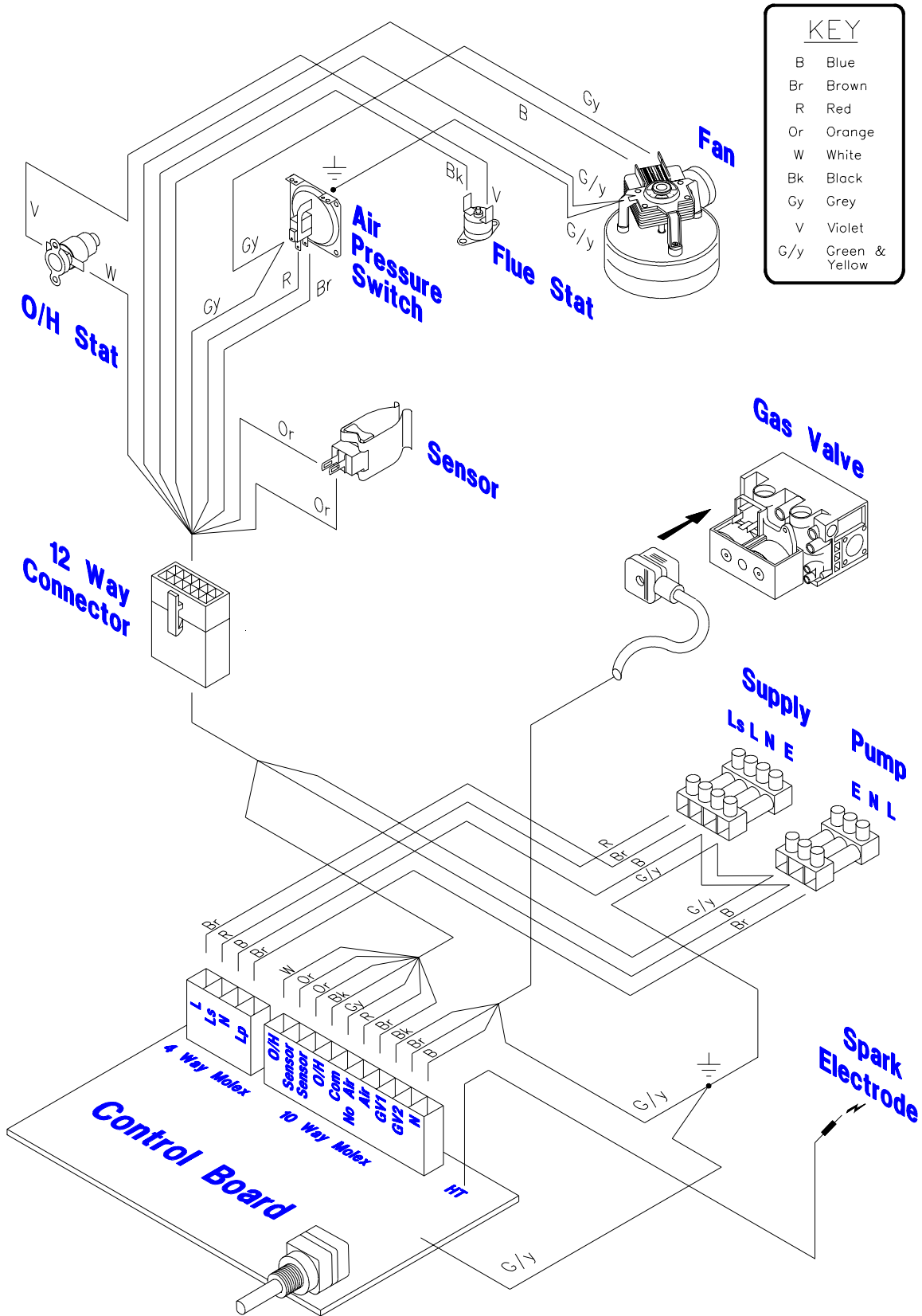


Fig.4

Fixing Positions

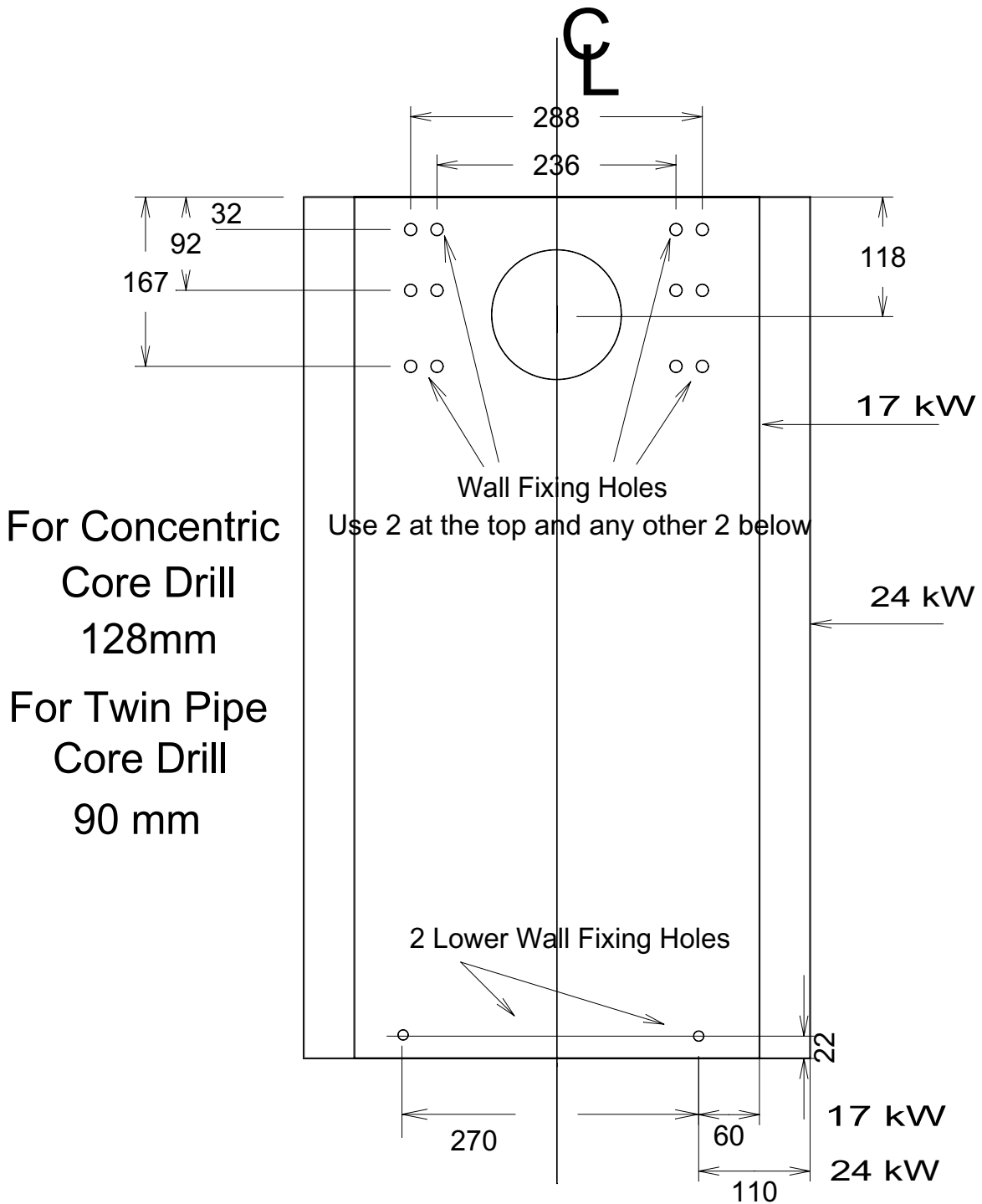


Fig.5

Boiler Panel Assembly

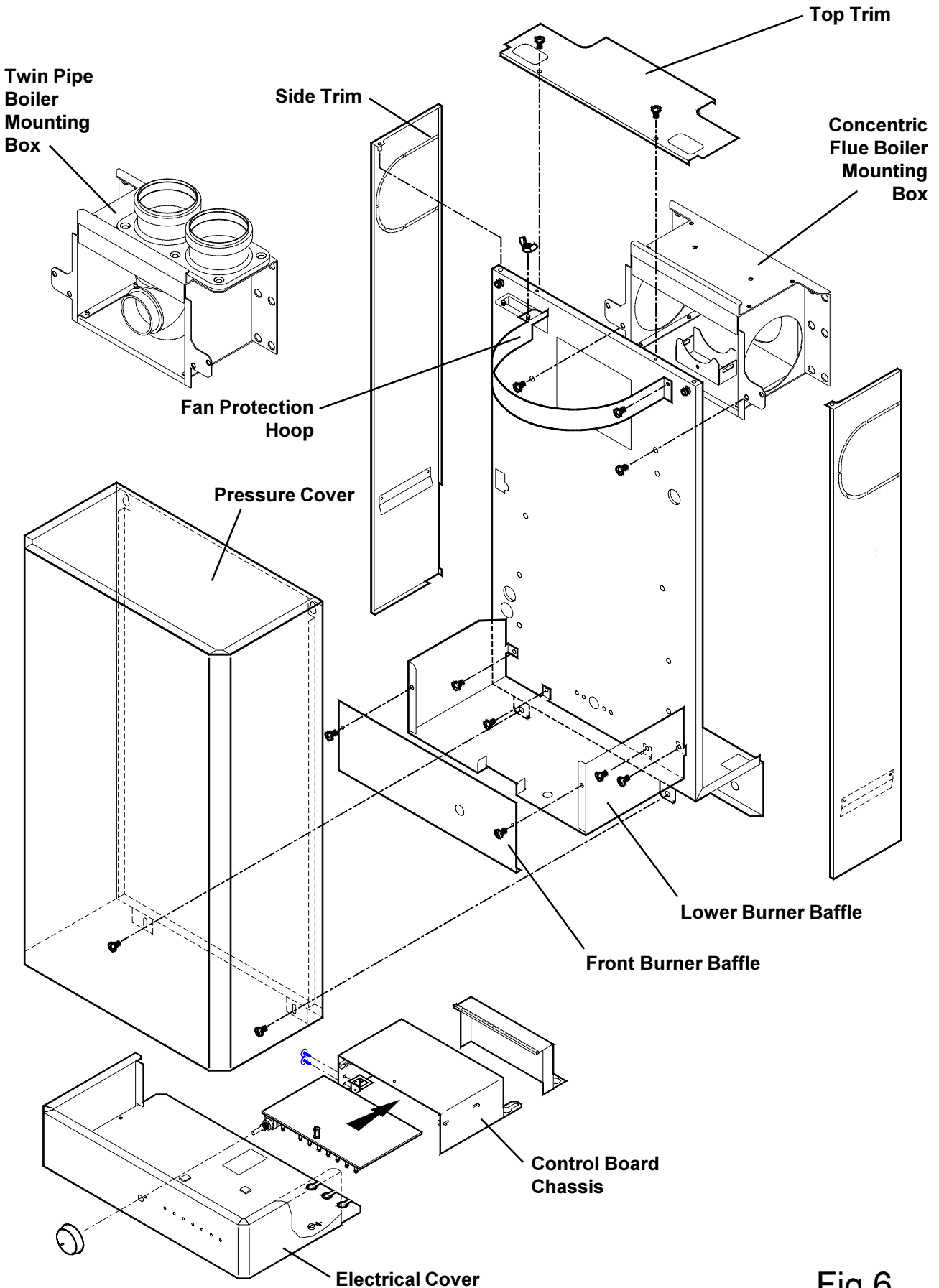


Fig.6

Concentric Flue, positions

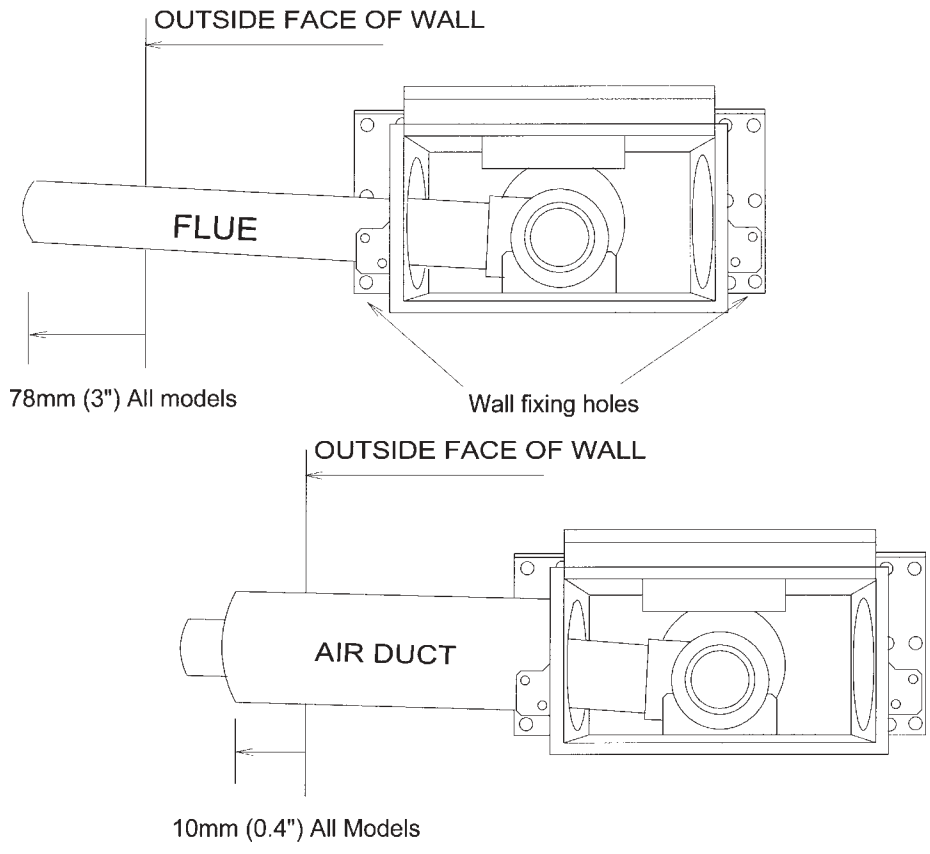


Fig.7

Twin Flue Positions

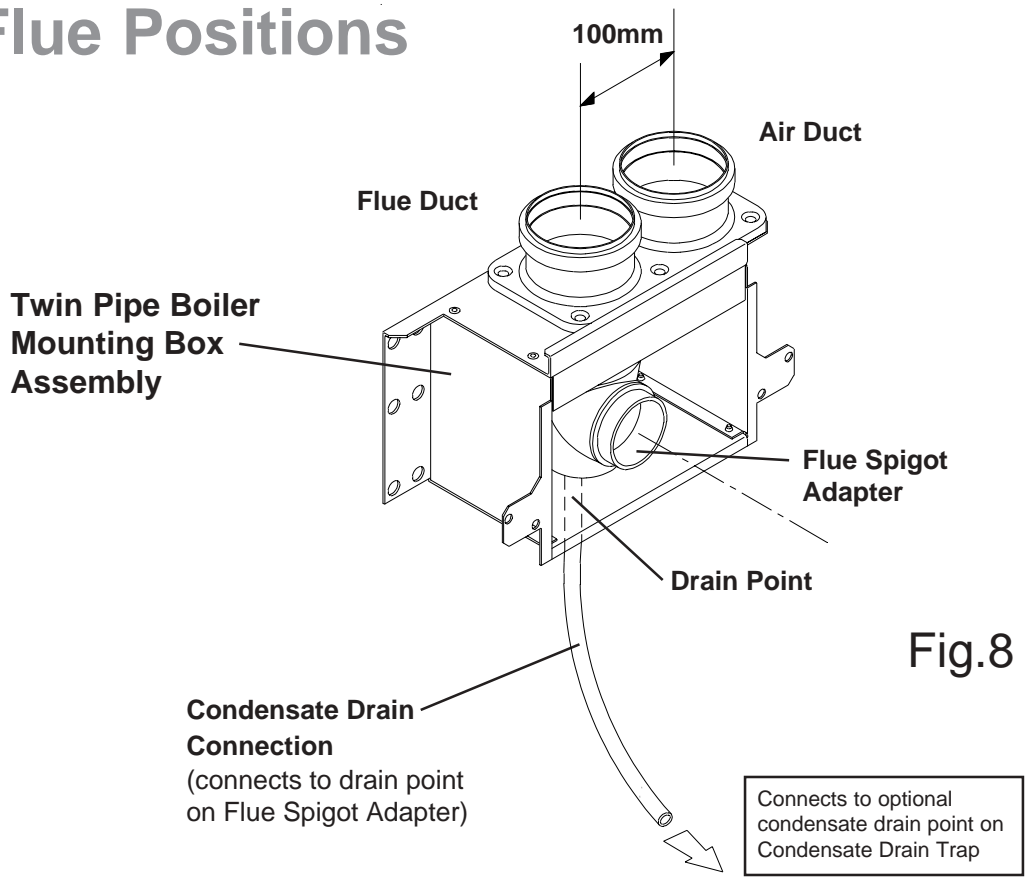


Fig.8

Fault Finding

The electrical sequence in the boiler is very straightforward and faults can easily be tracked down if this simple sequence is followed.

System Controls - - - - Flue Stat - - - - Overheat Stat - - - - Pressure Switch - - - - Control Board - - - - Ignition

The lamps on the front panel indicate several of the stages in the ignition sequence.

Firstly a Permanent live has to be connected to the L terminal then the *power* (~) lamp lights.

When the system controls and the programmer are calling for heat, power is fed to the boiler initiating the following sequence.

A call for heat powers the Ls terminal and the *running* (⚡) and *pump* (Ⓢ) lamps light. Provided the Flue Stat, Overheat Stat and boiler are cold, the fan starts up. The pressure switch detects the correct airflow and that the condensate drain is not blocked then, switches over. This is indicated by the *fan* (⚙) lamp illuminating.

The *pilot* (🔥) lamp illuminates, the pilot gas valve opens and the Control Board provides a spark at the pilot electrode. (If the L and N supply are reversed the boiler will not progress beyond pilot ignition. This is indicated by the *phase reversed* neon behind the knob lighting.) The pilot flame is detected and the control board stops sparking and then energises the main gas valve and the *burner* (🔥) lamp is illuminated.

The pilot flame lights the burner, and it stays alight until turned off by the control thermostat, system controls, or in the case of a fault condition a safety thermostat.

The flue thermostat will trip if the flue exceeds a pre-set temperature. The overheat thermostat will trip if the water flow rate is insufficient, both are indicated by the *lockout* lamp (⚠) illuminating.

NOTE: The boiler has a built-in delay timer. It is indicated by the *running* (⚡) lamp flashing. For testing, switching the Mains Supply off for a few seconds, then back on again will reset the delay.

WARNING: BEFORE COMMENCING OR COMPLETING ANY ELECTRICAL WORK ON THE APPLIANCE, IT IS RECOMMENDED THAT THE BASIC SAFETY CHECKS FOR EARTH CONTINUITY, SHORT CIRCUIT, POLARITY AND RESISTANCE TO EARTH ARE MADE. ALL WORK CARRIED OUT SHOULD FOLLOW GUIDELINES LAID DOWN BY THE I.E.E.

Fault Diagnosis

The fault Diagnosis chart shows the normal and fault sequences for the boiler indicator lamps. To diagnose a fault, use the following procedure.

- Turn off the system Mains supply.
- Set all thermostats and timers to a call for heat position.
- Turn on the system Mains supply and watch the boiler indicator lamps.

Compare the lamps with the diagnosis chart opposite to determine the fault and cause.

Fault Diagnosis

		Fascia Indicators					Hidden phase reversed
power	running	pump	fan	pilot	burner	lockout	
*	*	*	*	*	*		
*	*	*					
*		*					
*		*					
*							*
*	*						
*	(*)	*				*	
*							
*	*						
*	*	*					
*	*	*	*	*			
*	*	*	*	*	*		*
*	*	*	*	*	*		*

Working conditions	Explanation	Cause
Normal operation, boiler firing		
Normal operation, <i>running</i> flashing, boiler upto temperature and in delay mode (120 seconds)		
Normal operation, system satisfied, pump running on (120 seconds)		
Normal operation, no demand		
Fault conditions	Explanation	Cause
Live and Neutral reversed		
Boiler not firing, controls calling	No permanent Live	Fuse on Control board blown
Safety thermostat tripped.	Reset Overheat by turning boiler stat to off then on	Insufficient water flow OR Faulty Overheat Stat
NB: Pump runs continuously	OR Reset Flue Stat on flue hood.	Blocked flue OR Faulty Fan OR Faulty Flue Stat.
		OR Flow & return reversed.
No switched Live (Ls)		Switched live from controls absent.
No power to pump		Faulty Control board.
Air Pressure Switch not satisfied	APS stuck or not pressurised	Condensate trap blocked.
Boiler cold but not firing	Sensor failed low resistance	Flue blocked OR Faulty Fan OR APS.
Stuck in delay mode if more than 120s	Reset by turning Mains off then on.	Indicating hot when not.
Pilot valve not energised	Mains not applied to GV1	If reoccurs, replace Control board
Pilot not established.	No gas	Control board failed.
	OR No spark OR No flame sense	Faulty Control board OR HT lead.
Pilot not established		Live and Neutral reversed.

NOTE: There are other combinations of lamps that can take place during a failure.

03/07/2003

Servicing

Health and Safety Statement :

This product contains no asbestos.

Routine

To ensure continued efficient operation of the appliance 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 general once per year should be adequate. It is law that any service work should be carried out by Corgi registered personnel.

1. Clean burner and combustion chamber.
2. Check pilot and burner gas supply.
3. Check condition of ignition sensing probe.
4. Check boiler pipework joints for leaks.
5. Check the case seals.
6. Check condensate pipework for leaks.
7. Check heat exchangers, and the flue and air duct are clear of any obstruction, and not leaking.
8. Check the Fan and its seal.
9. Check and clear the condensate exit on the secondary heat exchanger by removing the Condensate Outlet and the Inspection Cover (**Fig. 10**).
10. Check and clear the condensate syphon.

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

1.Heat Exchangers

Remove the panel in front of the secondary heat exchanger to gain access to inner inspection panels on the secondary and to view the primary (the lowest inspection panel also gives a view of the primary). Also view from beneath the primary. Clean as required. If in doubt, drain the system and remove for inspection.

2.Condensate Syphon

With a suitable bowl to catch the water, unscrew the drain-cap(s) on the underside of the Syphon trap and drain the water. Remove any solids and replace cap(s). (**Fig 12**)

CHANGING COMPONENTS

THERE ARE NO REPAIRABLE ITEMS, IF NOT WORKING AN ITEM MUST BE REPLACED.

The boiler is in two major sections, the Case, and the Electrical Tray, The Major Components Diagram shows where the items are to be found. (pages 23-24)

Behind the Electrical Tray

1. Control Board.
2. Gas Valve.

Behind the Case

3. Fan.
4. Air Pressure Switch.
5. Flue Thermostat.
6. Control Sensor.
7. Overheat Cut-off Device.
8. HT Lead.
9. Pilot Assembly.
10. Burner.
11. Main Injector.
12. Combustion Chamber Insulation.
13. Primary Heat Exchanger.
14. Secondary Heat Exchanger.

Servicing behind the Electrical Tray

To Remove the Electrical tray

- Disconnect the electrical supply from the boiler and system.
- Slide the Electrical Tray forward a short way, then lower. Remove the cover over the components.

DO NOT STRAIN THE CABLES, USE THE SUPPORT PROVIDED.

1. Control board

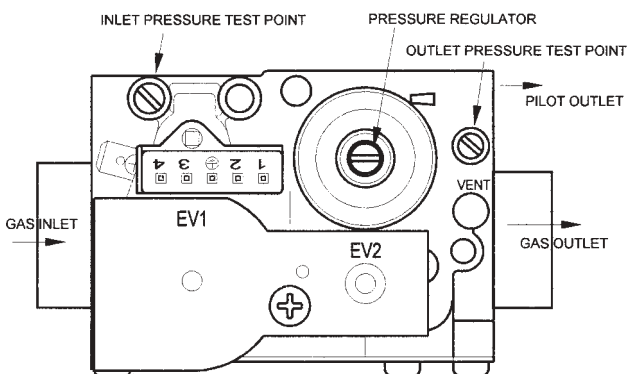
- Remove the Control knob.
- Lower the Electrical Tray.
- Remove the single screw that retains the inner cover.
- Pull off the HT Lead, Multipole plug, and the Gas Valve lead, at the Valve.
- Slide back the Electrical Chassis and remove.
- Undo the Earthing screw and then pull off the 4 and 10 way Molex connectors.
- Remove the bracket for the potentiometer.
- Slide the Control Board out of the chassis.
- Transfer the pcb support to the new board.
- Replace the Control board.
- Re-assembly is the reverse.

2. Gas Valve

- Lower the Electrical Tray.
- Turn the Gas Cock off.
- Pull off the electrical connector from the Gas Valve.
- Release the pilot feed tube.
- Undo the four shoulder bolts at each end of the valve.

TAKE CARE TO SUPPORT THE VALVE AS IT IS RELEASED.

- Replacement is the reverse.
- When secure, attach a manometer to the burner pressure tapping on the right hand side of the valve.
- The Pilot Adjuster is factory set.
- Turn on gas and electrical supply.
- The gas valve slowly opens to its setting ensure it has fully opened before adjusting.
- Set burner gas pressure with the governor. (see **Technical Data on page 1 for figure**)



Removing the Case

- Lower the Electrical Tray.
- Undo the two M5 screws at the base of the Case.
- Lift the Case straight up about half an inch (12mm).
- Gently pull the Case straight forward off the hidden studs at the top of the boiler. (The cover hangs on two studs in keyhole slots)
- Examine the sealing strip for damage and replace if necessary.
- Place the Case somewhere safe from damage

IMPORTANT: FAILURE TO CORRECTLY LOCATE THE APPLIANCE CASE COULD RESULT IN LEAKAGE OF COMBUSTION PRODUCTS INTO THE ROOM.

3. Fan Assembly

- Lower the Electrical Tray.
- Remove the Case.
- Undo the wing nut holding the Fan Protection Hoop.
- Pull the electrical connectors off the Fan.
- Gently pull the pressure tubing off the tappings on the Flue Hood.
- Undo the two screws holding the Flue Hood and slide forward and away.
- Re-assembly is the reverse.

4. Air Pressure Switch

- Lower the Electrical Tray.
- Remove the Case.
- Pull the electrical connectors off the Air Pressure Switch.
- Gently pull the pressure tubing off the both tappings on the switch.
- Undo the M4 nut and wing nut holding the Air Pressure Switch to its bracket on to the Back Panel
- Lift off its studs and rotate out of its bracket.
- Re-assembly is the reverse.

5. Flue Thermostat

- Lower the Electrical Tray.
- Remove the Case.
- Pull the electrical connectors off the Flue Thermostat.
- Re-assembly is the reverse.

6. Control Sensor

- Lower the Electrical Tray.
- Remove the Case.
- Unclip the sensor.
- Pull the electrical connectors off the Control sensor.
- Re-assembly is the reverse.

7. Overheat Cut-off Device

- Lower the Electrical Tray.
- Remove the Case.
- Pull the electrical connectors off the Overheat Cut-off device.
- Unscrew from its mounting.
- Re-assembly is the reverse.
- Lower the Electrical Tray.

8. Electrode and HT Lead

- Lower the Electrical Tray.
- Remove the Case
- Pull off the HT lead from the Control board.
- Undo the left and right screws holding the Front Burner Baffle.
- Remove the front baffle.
- Release the tube nut holding the electrode to the Pilot Burner.
- Carefully withdraw the Electrode and HT Lead.
- Re-assembly is the reverse.

9. Pilot Assembly

- Lower the Electrical Tray.
- Remove the Case.
- Undo the left and right screws holding the Front Burner Baffle and remove. If access is restricted also remove the lower baffle.
- Release the tube nut holding the electrode to the Pilot Burner.
- Undo the Pilot tube from the Pilot Assembly and gently lever downwards away from the Pilot. It has to be removed and replaced with the injector clipped into position.
- Undo the two screws retaining the Pilot Assembly.
- Re-assembly is the reverse

NB The pilot is **not** adjustable.

10. Burner

- Lower the Electrical Tray.
- Remove the Case.
- Remove the Front Baffle.
- Remove the Combustion Chamber front by releasing the four screws.
- Undo the Pilot tube from the Pilot Assembly and gently lever downwards away from the Pilot. It has to be removed and replaced with the injector clipped into position.
- Pull off the HT lead.
- Pull the Burner forward off the two studs at the rear.
- Remove the Pilot Assembly.
- Re-assembly is the reverse.

11. Main Injector

- Lower the Electrical Tray.
- Remove the Case.
- Remove the Burner.
- Undo the Main Injector from the manifold.
- Re-assembly is the reverse.

12. Combustion Chamber Insulation

- Lower the Electrical Tray.
- Remove the Case.
- Remove the Front Baffle, then undo the four M5 screws holding the lower baffle onto the Back Panel
- Remove the Burner, as in 10.
- Undo the four screws holding the Chamber to the Back Panel and lower downwards and away.
- Replace the Insulation Panels in the Chamber.
- Re-assembly is the reverse.

13. Primary Heat Exchanger

- Lower the Electrical Tray.
- Remove the Case.
- Remove the front baffle.
- Remove or cover the Burner.
- Remove the Combustion Chamber.
- Unclip the Control sensor.
- Pull off the wires to the Overheat Cut Out device.
- Drain the Boiler of water.
- Undo the flow and return connections to the Heat Exchanger and lower away.
- Re-assembly is the reverse.

14. Secondary Heat Exchanger

- Lower the Electrical Tray.
- Remove the Case.
- Remove the Flue Thermostat.
- Remove the Fan Assembly.
- Drain the Boiler of water.
- Undo the flow and return connections to the secondary Heat Exchanger.
- Release the Condensate connection clamping plate.
- Undo the four screws holding the Secondary Heat Exchanger to the Back Panel and lift away.
- Re-assembly is the reverse.

Spares

1st Line Spares:

Item	Part Number	GC Number
Primary Heat Exchanger (17 kW)	M0142	
Primary Heat Exchanger (24 kW)	M0593	
Secondary Heat Exchanger (17 kW)	M0502	
Secondary Heat Exchanger (24 kW)	M0797	
Burner (17 kW)	M3726	
Burner (24 kW) NG	M3727	
Burner (24 kW) Propane	M5148	
Ceramic Board Set (17 kW)	0524	106 403
Ceramic Board Set (24 kW)	M1089	106 404
Fan Assembly (17 kW)	M1095	
Fan Assembly (24 kW)	M0910	106 435
Control Board	M3752	
Control Assembly	M3915	
Gas Valve, Sigma 840	M3783	
Air Pressure Switch (Concentric Flues)	7712	379 091
Air Pressure Switch (Twin Pipe Flues)	M4176	
Main Injector (3.4mm) (17 kW)	M3806	
Main Injector (4.1mm) (24 kW, NG)	M0919	106 386
Main Injector (2.6 mm) (24 kW, Propane)	M5110	
Overheat Thermostat	M3781	379 314
Pilot Injector	7709	386 673
Pilot Injector (Propane)	M5149	
Electrode	7710	386 744
Pilot Assembly	7716	381 865
Flue Thermostat	7717	379 308
HT Lead Assembly	M3895	
Clip-on Sensor (22mm)	M3338	
Condensate Trap	M3805	

Electrical Components

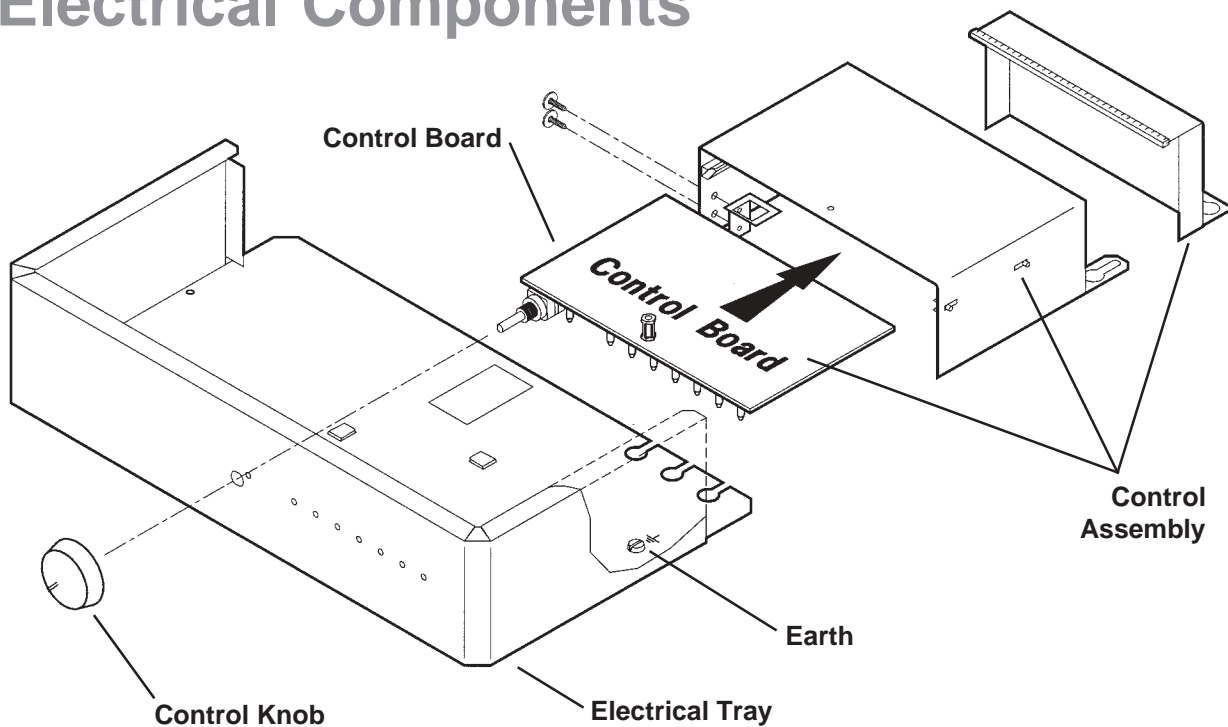


Fig.9

Major Components

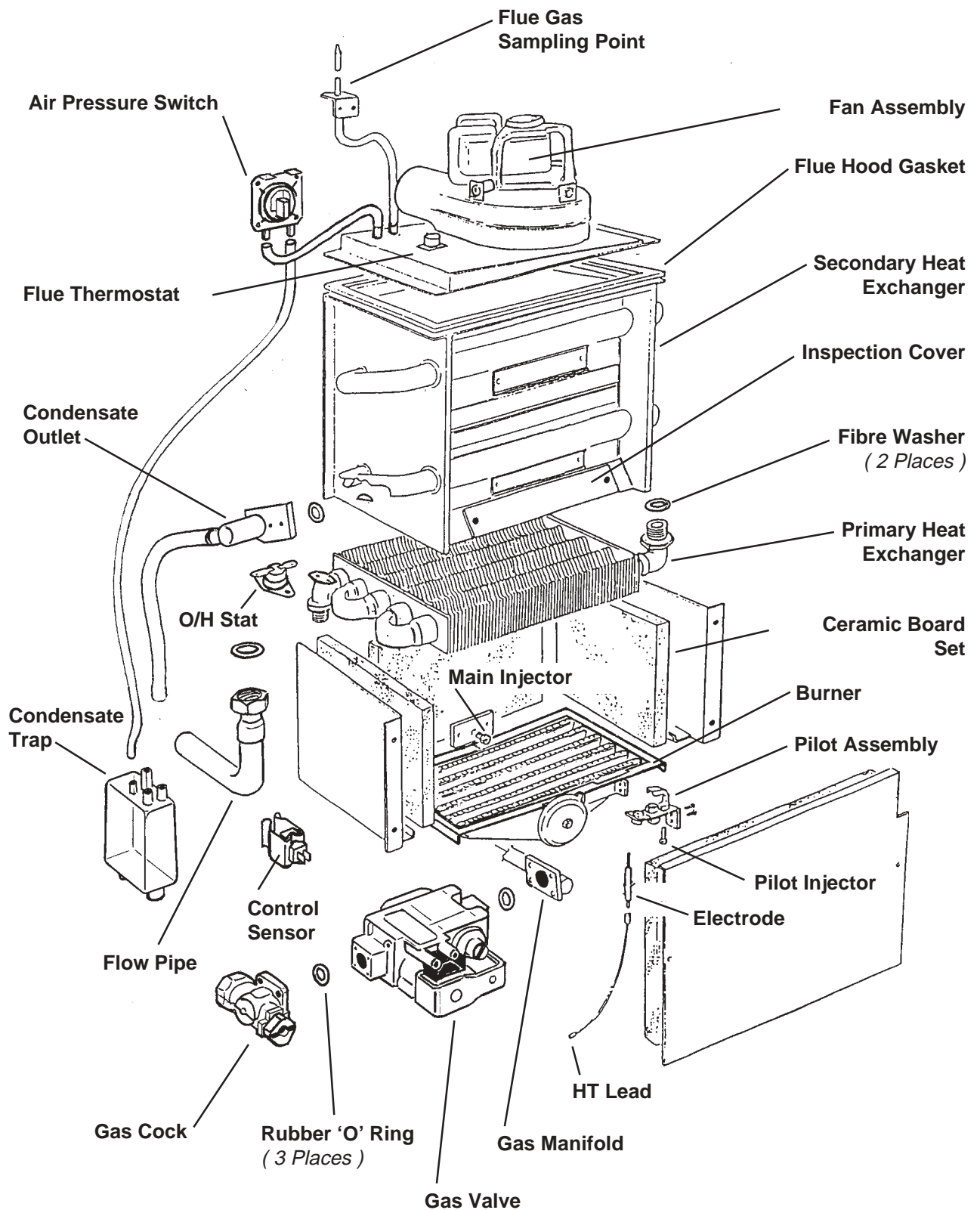


Fig.10

Example Condensate Disposal Methods

Note: Internal - minimum 19mm pipe
External - minimum 32mm pipe

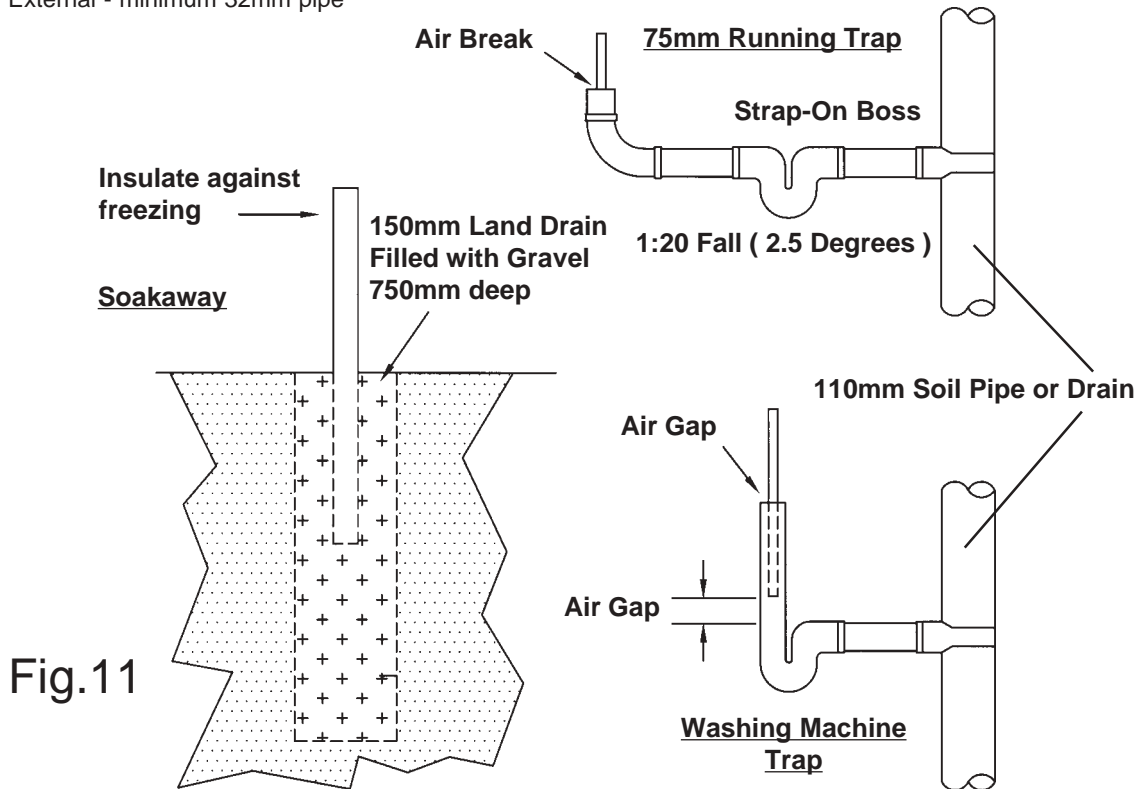


Fig.11

Condensate Drain Trap

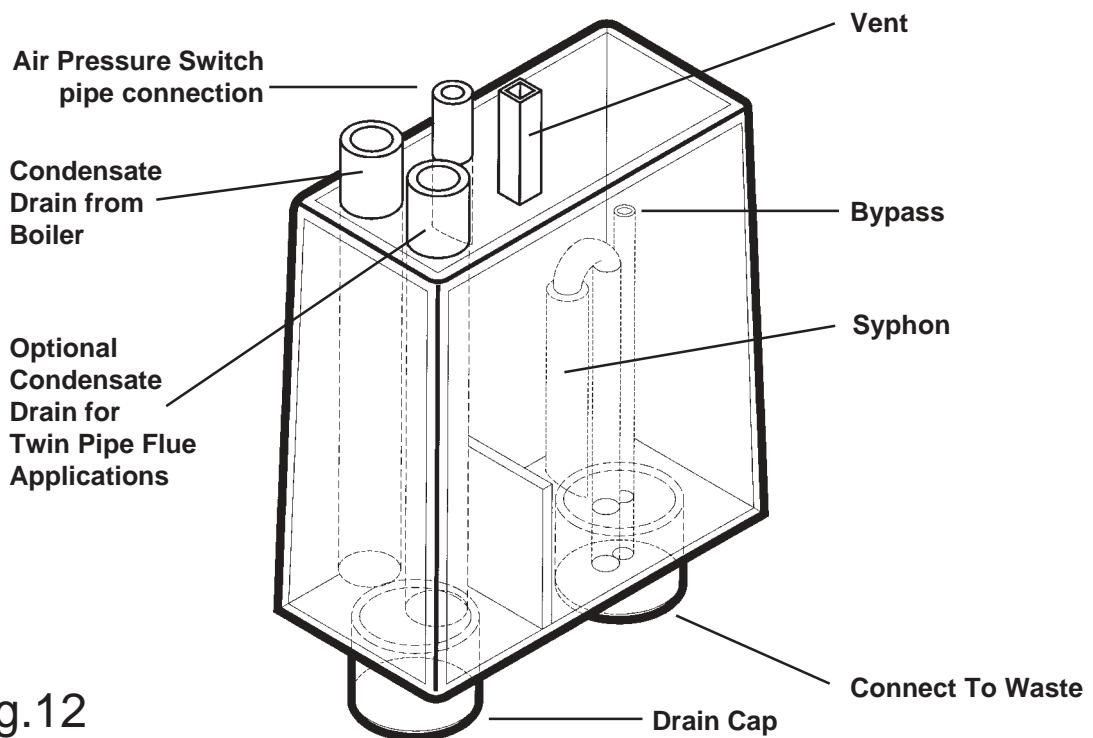


Fig.12



*Malvern Boilers supports
the Benchmark code of practice*

The Company reserves the right to change specification without notice.
Your statutory rights are not affected.

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