

INSTALLATION, COMMISSIONING AND SERVICING INSTRUCTIONS

WALL HUNG RSF GAS FIRED CONDENSING SYSTEM BOILER

GREENSTAR i SYSTEM

FOR SEALED CENTRAL HEATING SYSTEMS AND INDIRECTLY FED DOMESTIC HOT WATER



The appliance is for use with Natural Gas or L.P.G. (Cat II 2H3P type C13, C33 & C53)

	Model	GC Number
Natural Gas	12i System	41-311-67
	15i System	41-311-84
	18i System	41-311-86
	24i System	41-311-68
Liquid Petroleum Gas	12i System	41-311-69
	15i System	41-311-85
	18i System	41-311-87
	24i System	41-311-70




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1 KEY TO SYMBOLS AND SAFETY PRECAUTIONS

1.1 KEY TO SYMBOLS

WARNINGS




Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **NOTICE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

IMPORTANT INFORMATION



This symbol indicates important information where there is no risk to people or property.

ADDITIONAL SYMBOLS

Symbol	Explanation
▶	Step in an action sequence
→	Cross-reference to another part of the document
•	List entry
-	List entry (second level)

SYMBOLS USED IN THIS MANUAL







	Domestic Hot Water
	Central Heating
	Hot Water Storage Cylinder
	Domestic Cold Water Supply
	Electrical Supply
	Gas Supply

Table 1 Commonly used symbols

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.

These instructions are applicable to the Worcester appliance model(s) stated on the front cover of this manual only and must not be used with any other make or model of appliance.

These instructions apply in the UK and Ireland only and must be followed except for any statutory obligations.

This appliance must be installed by a **GAS SAFE** registered, competent person. Failure to install correctly could lead to prosecution.

If you are in any doubt, contact the Worcester Technical help line (030 123 3366).

Please leave these instructions with the completed BENCHMARK CHECKLIST, (or a certificate confirming compliance with IS 813, Eire only) and the user manual with the owner or at the gas meter after installation or servicing.

Distance learning and training courses are available from Worcester.

The BENCHMARK CHECKLIST can be found in the back of this Installation manual.

Ø	Diameter
NG	Natural Gas
LPG	Liquid Petroleum Gas
CH	Central Heating
DHW	Domestic Hot Water
DCW	Domestic Cold Water
PRV	Pressure Relief Valve
NTC	Negative Temperature Coefficient (sensor)
IP	Ingress Protection
RCD	Residual Current Device
TRV	Thermostatic Radiator Valve
ECV	Emergency Control Valve
WRAS	Water Regulations Advisory Scheme
SEDBUK	Seasonal Efficiency of Domestic Boilers in the UK

Table 2 Abbreviations use in this manual

1.2 SAFETY PRECAUTIONS

IF YOU SMELL GAS

A gas leak could potentially cause an explosion. If you smell gas, observe the following rules.

- ▶ Prevent flames or sparks:
 - Do not smoke, use a lighter or strike matches.
 - Do not operate any electrical switches or unplug any equipment.
 - Do not use the telephone or ring doorbells.
- ▶ Turn off the gas at the meter or regulator.
- ▶ Open windows and doors.
- ▶ Warn your neighbours and leave the building.
- ▶ Prevent anyone from entering the building.
- ▶ Well away from the building: call the National Gas Emergency Service on 0800 111 999.
- ▶ L.P.G. boilers: Call the supplier's number on the side of the gas tank.

BOILER OPERATION:

This boiler must only be operated by a responsible adult who has been instructed in, understands, and is aware of the boiler's operating conditions and effects.



Benchmark places responsibilities on both manufacturers and installers.

The purpose is to ensure that customers are

provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer's instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hotwater Industry Council who manage and promote the scheme.

Visit centralheating.co.uk for more information.

HEALTH AND SAFETY

The appliance contains no asbestos and no substances have been used in the construction process that contravene the COSHH Regulations (Control of Substances Hazardous to Health Regulations 1988).

COMBUSTION AND CORROSIVE MATERIALS

Do not store or use any combustible materials (paper, thinners, paints etc.) inside or within the vicinity of the appliance.

Chemically aggressive substances can corrode the appliance and invalidate any warranty.

FITTING AND MODIFICATION

Fitting the appliance and any controls to the appliance may only be carried out by a competent engineer in accordance with the current Gas Safety (Installation and Use) Regulations.

FLUE SYSTEMS

Only use Worcester, Bosch approved flue systems, no other manufacturer's flue systems have been approved for use with Worcester appliances.

Flue systems must not be modified in any way other than as described in the fitting instructions. Any misuse or unauthorised modifications to the appliance, flue or associated components and systems could invalidate the guarantee. The manufacturer accepts no liability arising from any such actions, excluding statutory rights.

SERVICING

Advise the user to have the system serviced annually by a competent, qualified Gas Safe registered engineer. Approved spares must be used to help maintain the economy, safety and reliability of the appliance.

IMPORTANT

The service engineer must complete the Service Record on the Benchmark Checklist after each service.

INSTALLATION REGULATIONS

Current Gas Safety (Installation & Use) Regulations:

All gas appliances must be installed by a competent person in accordance with the above regulations.

Failure to install appliances correctly could lead to prosecution.

The appliance must be installed in accordance with, and comply to, the current: Gas Safety Regulations, IEE Regulations, Building Regulations, Building Standards (Scotland) (Consolidation), Building Regulations (Northern Ireland), local water by-laws, Health & Safety Document 635 (The Electricity at Work Regulations 1989) and any other local requirements.

British Standards:

Where no specific instruction is given, reference should be made to the relevant British Standard codes of Practice.

BS7074:1 Code of practice for domestic and hot water supply

BS6891	Installation of low pressure gas pipe work up to 28mm (R1)
BS5546	Installation of gas hot water supplies for domestic purposes
EN12828	Central heating for domestic premises
BS5440:1	Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Flues
BS5440:2	Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Air Supply
BS7593	Treatment of water in domestic hot water central heating systems
BS6798	Installation of gas fired boilers of rated input up to 70kW (net)

Irish Standards

The relevant Irish standards should be followed, including:

- ECTI National rules for electrical installations
- IS 813:2002 for Domestic Gas Installations.

LPG Installations

An appliance using L.P.G. must not be installed in a room or internal space below ground level unless one side of the building is open to the ground.

Timber framed building:

Where the boiler is to be fitted to a timber framed building the guidelines laid down in BS5440: Part 1 and IGE "Gas Installations in Timber Frame Buildings" should be adhered to.

Potable water:

All seals, joints and compounds (including flux and solder) and components used as part of the secondary domestic water system must be approved by WRAS.

CH Water:

Artificially softened water must not be used to fill the central heating system.

BOILER FEATURES AND CHECKLIST

- Pre-wired and pre-plumbed
- Galvanised steel inner frame
- Digital control system
- FX Intelligent controls
- Low NOx option
- Automatic ignition
- Direct burner ignition electrodes
- Built-in frost protection
- Built-in fault finding diagnostics
- Modulating automatic gas valve
- Combustion air fan with speed regulator
- CH temperature sensor & control
- Pump anti-seizure protection
- Flue gas temperature sensor
- Condensate siphonic trap
- Temperature control

APPLIANCE AND FLUE INSTALLATION

The appliance must be installed in such a manner so that:

- a service engineer has clear and safe access to work on the appliance, as described in the installation manual.
- the home owner has reasonable access to the appliance controls for adjustment and possible resetting or re-pressurising.

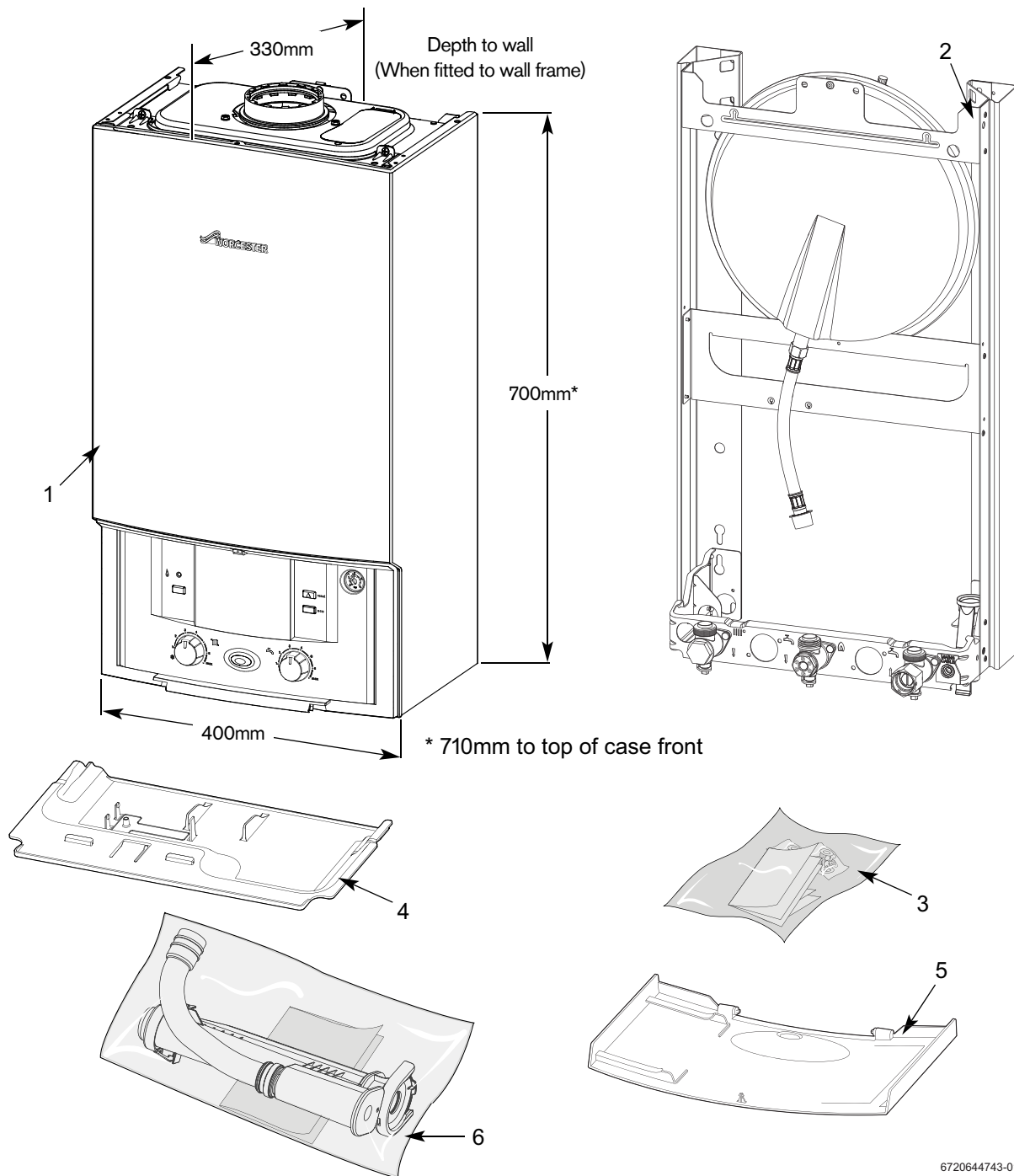
Loft cavities where appliances are fitted, must have:

- permanently fitted, lighting.
- permanently fitted, retractable loft ladder.
- fixed floor area sufficient to allow access for normal use and servicing directly under and around the appliance and between the appliance and the loft access hatch, as stated in the Gas Safety Installation regulations.

Adequate provision must be made for visual inspection of all flue connections or joints.

2 APPLIANCE INFORMATION

2.1 APPLIANCE



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Fig. 1

STANDARD PACKAGE:

- [1] Wall hung gas fired condensing system boiler for central heating and domestic hot water
- [2] Wall mounting frame
- [3] Hardware literature pack:
 - Greenstar 12i/15i/18i & 24i System Installation, Commissioning and Servicing Instructions
 - User instructions
 - Consumer Guarantee card
 - Seal pack:
 - Compression nut 22mm = 3
 - Compression ring 22mm = 3
 - Compression nut 15mm = 3
 - Compression ring 15mm = 3

- Fibre washer 18.6 x 13.5 x 1.5 = 2
- Fibre washer 23.9 x 17.2 x 1.5 = 2
- Bonded washer 3/4" = 1
- Siphon assembly:
 - Installation instructions

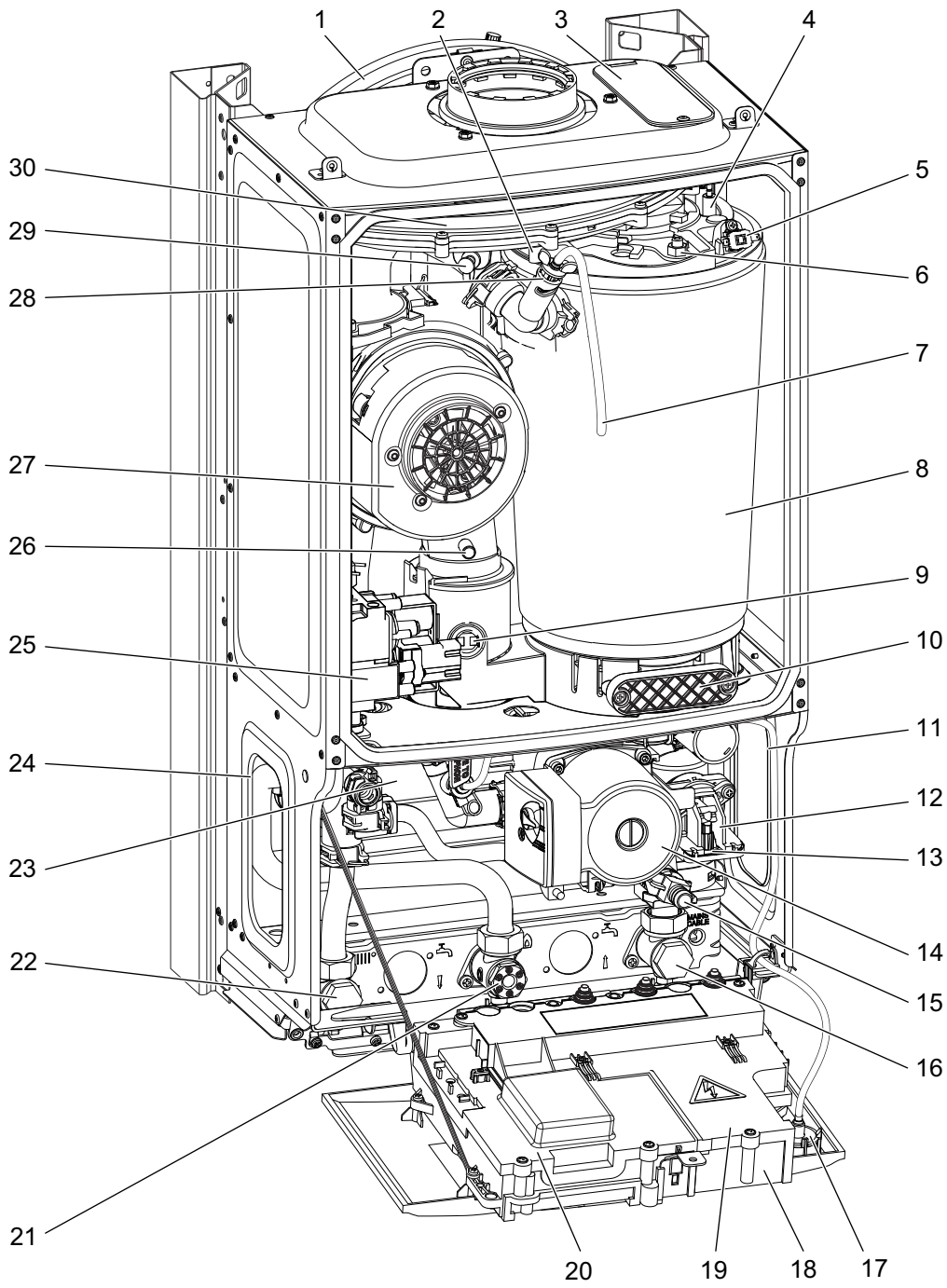
- [4] Bottom Panel
- [5] Fascia panel
- [6] Siphon assembly

2.2 TECHNICAL DATA

DESCRIPTION	NATURAL GAS				LPG				
	UNIT	12i	15i	18i	24i	12i	15i	18i	24i
Gas flow rate - Max. 10 minutes from lighting									
Natural Gas G20	m ³ /h	1.33	1.63	1.96	2.67	-	-	-	-
Propane Gas (LPG)	kg/h	-	-	-	-	0.96	1.20	1.44	1.91
Central Heating									
Maximum rated heat input (net)	kW	12.32	15.40	18.48	24.62	12.32	15.40	18.48	24.62
Minimum heat input	kW	3.45	4.62	5.54	7.38	5.95	5.95	9.64	9.64
Max. rated heat output 40/30 °C	kW	12.85	16.06	19.28	25.67	12.85	16.06	19.28	25.67
Max. rated heat output 50/30 °C	kW	12.74	15.92	19.11	25.45	12.74	15.92	19.11	25.45
Max. rated heat output 80/60 °C	kW	12	15	18	24	12	15	18	24
Max. flow temperature	°C	82	82	82	82	82	82	82	82
Max. flow temperature to cylinder (with integral optional diverter valve)	°C	75	75	75	75	75	75	75	75
Max. permissible operating pressure	bar	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Available pump head at 21 °C system temp. rise	m	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Flue									
Flue gas temp. 80/60 °C, rated/min. load	°C	62/56	66/58	70/60	78/63	62/57	66/59	71/61	79/64
Flue gas temp. 40/30 °C, rated/min. load	°C	41/33	44/33	48/34	54/35	43/35	46/36	49/37	55/38
CO ₂ level at max. rated heat output (after 30 min)	%	9.65	9.8	9.8	9.8	11.0	11.0	11.0	11.0
CO ₂ level at min. rated heat output (after 30 min)	%	8.65	9.2	9.2	9.2	10.5	10.5	10.5	10.5
NOx class		5	5	4	5	5	5	4	5
NOx rating	mg/kWh	39	60	84	66	44	60	84	66
Condensate									
Maximum condensate rate	l/h	0.93	1.2	1.5	2.0	0.7	0.9	1.2	1.5
pH value, approx.		4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Electrical									
Electrical power supply voltage	a.c. V	230	230	230	230	230	230	230	230
Frequency	Hz	50	50	50	50	50	50	50	50
Maximum power consumption	W	140	140	140	140	140	140	140	140
Power consumption in standby mode.	W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
General data									
Appliance protection rating	IP	X4D	X4D	X4D	X4D	X4D	X4D	X4D	X4D
Appliance protection rating with mechanical or RF mechanical timer or FW100 module fitted	IP	20	20	20	20	20	20	20	20
Permissible ambient temperatures	°C	0 - 50	0 - 50	0 - 50	0 - 50	0 - 50	0 - 50	0 - 50	0 - 50
Nominal capacity of appliance	litre	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
Noise output level (Max central heating)	dB(A)	42	42	42	42	42	42	42	42
Packaged boiler weight	kg	41	41	41	41	41	41	41	41
Total boiler weight	kg	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
Lift weight	kg	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1
SEDBUK	band	A	A	A	A	A	A	A	A
SEDBUK 2005	%	90.1	90.1	90.1	90.1	91.4	91.4	91.4	92.0

Table 3 Technical data i System

2.3 LAYOUT

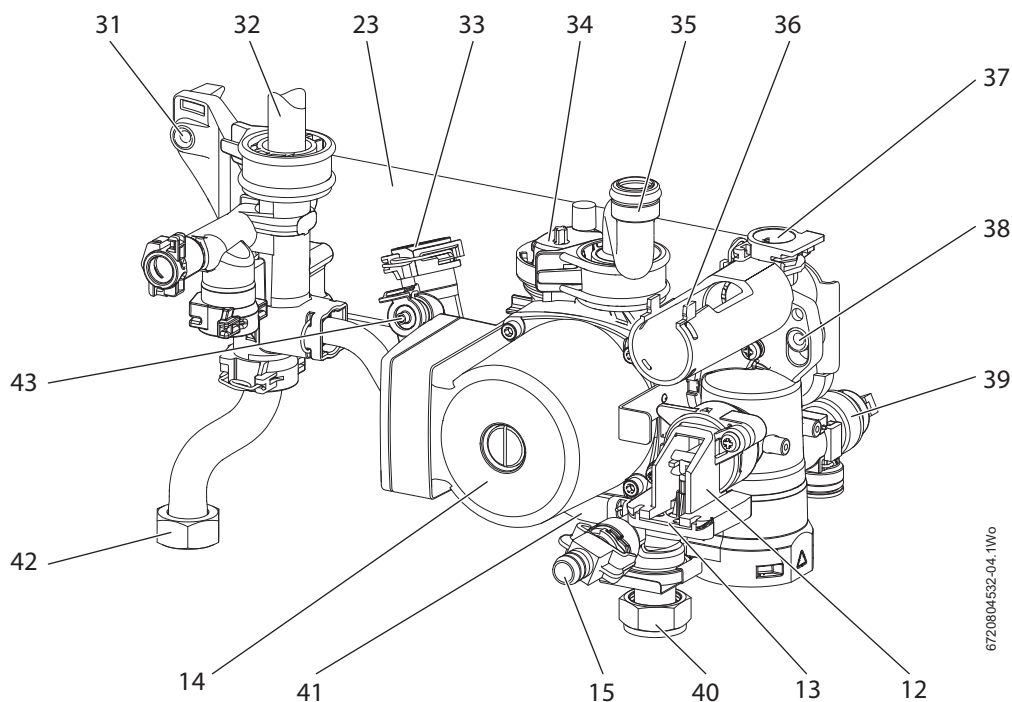


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Fig. 2 Main boiler components

1	Expansion Vessel	23	Hydraulic block mounting plate
2	Sensor - Boiler flow	24	Left side hand-hold for lifting boiler
3	Removable panel - for servicing	25	Gas valve
4	Electrode assembly	26	Flue air pressure switch connection (not used)
5	Overheat thermostat	27	Fan
6	Securing nut - Air/Gas manifold clamp	28	Manual vent point
7	Silicon tube - heat exchanger air vent	29	Fan pressure test point
8	Heat exchanger	30	Air/Gas manifold
9	Flue over heat thermostat	31	Compact hydraulic - left mounting point
10	Access panel - Heat exchanger/sump cleaning	32	Flow connector from heat exchanger
11	Right side hand-hold for lifting boiler	33	Expansion vessel hose connection point
12	Diverter valve assembly (body)	34	Auto air vent
13	Diverter valve actuator (stepper motor blank)	35	Return connection to heat exchanger
14	Pump	36	Flow turbine housing (not used on i System)
15	Drain point	37	Unused port
16	Central Heating (CH) return isolator	38	Compact hydraulic - right mounting point
17	System pressure gauge	39	Pressure relief valve
18	Control panel (in service position)	40	CH return connection to service valve
19	Cover - external wiring connections	41	Internal by-pass
20	Cover - PCB	42	CH flow connection to service valve
21	Gas inlet connection 22 mm	43	Pressure gauge connection point
22	Central Heating (CH) flow isolator		

Table 4 Boiler components



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Fig. 3 Hydraulic block components

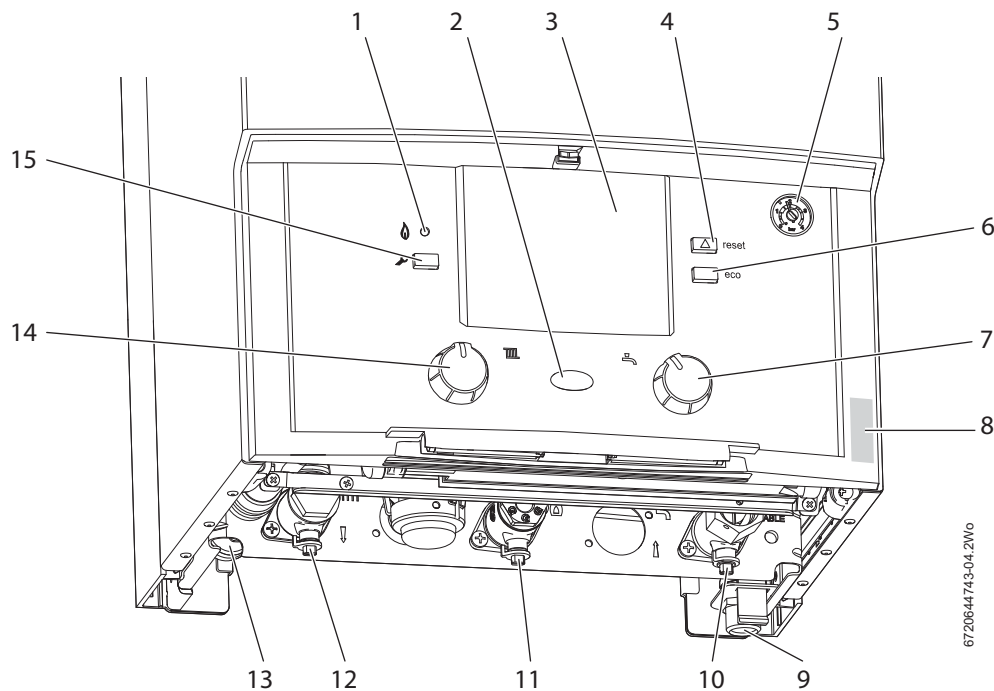


Fig. 4 Additional components

1	Burner ON indicator light (green)	9	PRV pipe connection point
2	Power ON/OFF indicator/fault diagnostic light (blue)	10	CH return isolator
3	Position for optional programmer	11	Gas inlet connection 22mm & isolator
4	Reset button	12	CH flow isolator
5	System pressure gauge	13	Condensate connection
6	ECO button (not used)	14	CH temperature control
7	DHW temperature control*	15	Service mode button
8	Boiler identification label		

Table 5 Additional boiler components



* The DHW temperature control is only operational when the "Optional Internal Diverter Valve" is fitted.

3 PRE-INSTALLATION

3.1 CLEANING PRIMARY SYSTEMS



NOTICE:

- ▶ All the following Pre-Installation sections must be read and requirements met before starting boiler or flue installations.



CAUTION:

- ▶ ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.



NOTICE:

Debris from the system can damage the boiler and reduce efficiency. Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance warranty.

BEFORE CLEANING THE SYSTEM:

- ▶ Ensure that the system and pipe work is in good working order.
- ▶ **Where possible keep the existing boiler/circulating pump in place when flushing the system.**

FOLLOW THE GUIDANCE OF BS7593:

Treatment of water in domestic hot water central heating and also the flushing guidelines below.



NOTICE: ARTIFICIALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.


FLUSHING THE SYSTEM

- ▶ Fill the system with cold water and check for leaks.
- ▶ Open all drain cocks and drain the system.
- ▶ Close drain cocks and add a suitable flushing agent **compatible with aluminium** at the correct strength for the system conditions in accordance with the manufacturer's instructions.
The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.
- ▶ Circulate the flushing agent before the boiler is fired up.
- ▶ Run the boiler/system at normal operating temperature as directed by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.
- ▶ It may be necessary to use a power flushing machine to aid the cleansing procedure in some circumstances.
- ▶ Close the drain cocks and refill with fresh water and a suitable inhibitor.
- ▶ Vent any air from the boiler and system.

PRE-INSTALLATION

INHIBITOR

Add a suitable inhibitor or combined inhibitor/anti-freeze, if the system is exposed to freezing conditions, to the heating system in accordance with the DWTA code of practice and manufacturer's guidelines.



WARNING: Sealing agents

- ▶ Normally the addition of sealing agents to the system water is not permitted as this can cause problems with deposits left in the heat exchanger.
- ▶ In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

WATER TREATMENT PRODUCTS

Suitable water treatment products can be obtained from the following manufacturers:

FERNOX	0870 601 5000 or www.fernox.com
SENTINEL	0800 389 4670 or www.sentinel-solutions.net


ARTIFICIALLY SOFTENED WATER

It is possible to have an ion exchange water softener fitted to the cold water system of the property. However, the boiler requires an untreated cold water connection taken from the mains supply, before the water softener, to the primary water filling point of the heating system. Alternatively there are water softening/treatment devices that do not adjust or alter the pH levels of the water. With these devices it may not be necessary to provide an untreated water by-pass to the primary water filling point of the heat system.

3.2 MAINS SUPPLY

3.2.1 ELECTRICAL SUPPLY

- Supply: 230V - 50 Hz, 140 Watts
- Cable: PVC insulated 0.75mm² (24 x 0.2mm) temperature rated to 90°C.
- External 3A fuse to BS1362.
- The appliance must be earthed.
- This appliance must not be connected to a three phase supply.
- IPX4D.




NOTICE: This is reduced to IP20 if the following mechanical timers are fitted; 7 716 192 036 or 7 716 192 037 or the FW100 controller 7 716 192 067.

- Wiring must comply with the latest edition of BS 7671 (IEE wiring regulations).

3.2.2 GAS SUPPLY

To ensure that the equipment is in good working order and can meet the gas flow and pressure requirements, in addition to the demand from any other appliance being served, the following applies:

- Boilers using Natural Gas (NG) must be connected to a governed meter.
- Liquid Petroleum Gas (LPG) must be connected to a regulator.
- Installation and connection of the gas supply to the boiler must be in accordance with BS6891.
- The meter or regulator and pipe work to the meter must be checked, preferably by the gas supplier.



NOTICE: 12, 15, 18 and 24 iSystem models.

- ▶ Provided that the correct gas supply working pressure and gas rate can be achieved (see technical data on page 6, Check gas inlet pressure on page 31, also refer to B.S. 6891)
- ▶ Then it may be possible to reduce the gas supply pipe diameter to 15mm.
- ▶ Ensure that the inlet pressure is satisfactory with all the other gas appliances working.


3.3 WATER SYSTEM AND PIPE WORK

PLASTIC PIPE WORK:

- Any plastic pipe work must have a polymeric barrier with 600mm (minimum) length of copper pipe connected to the boiler.
- Plastic pipe work used for underfloor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approximately 50 °C.


PRIMARY SYSTEMS CONNECTIONS/VALVES:

- All system connections, taps and mixing valves must be capable of sustaining a pressure up to 3 bar.
- Radiator valves should conform to BS2767:10.
- All other valves should conform to BS1010.
- Thermostatic radiator valves (TRV's) must be used on all radiators within the sleeping accommodation but not the radiator where the room thermostat is sited. This must be fitted with lock-shield valves and left open.
- A drain cock is required at the lowest point in the system.
- An air vent is required at all the high points in the system.



The boiler is equipped with an internal by-pass. The internal bypass is not intended to be a substitute for an external system bypass. An external automatic bypass should be used if the system flow can be significantly adjusted or stopped by zone valves and thermostatic radiator valves (TRV).

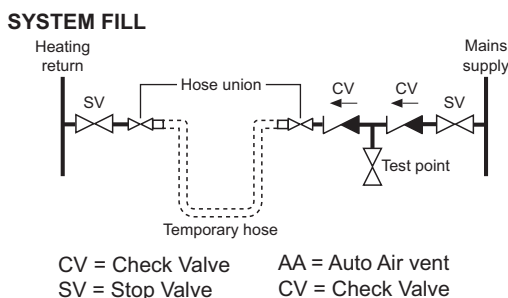
SEALED PRIMARY SYSTEM:



NOTICE: Artificially softened water must not be used to fill the central heating system.

- The CH sealed system must be filled using a WRAS approved filling loop or comply with figure 5 for system fill.
- Where the system volume is more than 100 litres or exceeds 2.65 bar at maximum heating temperature, an extra expansion vessel (2) must be fitted as close as possible to the appliance in the central heating return.
- Pressurise the extra expansion vessel (2) to the same figure as the expansion vessel built into the appliance.
- **Do not use galvanised pipes or radiators.**

SYSTEM FILL



SYSTEM MAKE UP

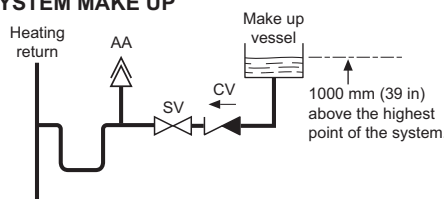


Fig. 5 System fill

672064743-08-2Wo

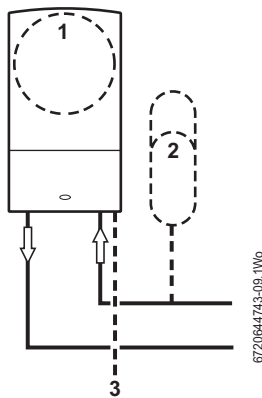


Fig. 6 Additional expansion vessel

1	Appliance expansion vessel - CH
2	Extra expansion vessel - CH return
3	Pressure relief discharge

Table 6 Key to fig. 5

EXISTING BUILDS: S AND Y PLAN SYSTEMS:

NOTICE: The boiler is fitted with its own internal bypass.

1	Diverter/Zone valve
2	Radiator valve (flow)
3	Lock shield valve (return)
4	Bypass

S PLAN LAYOUT

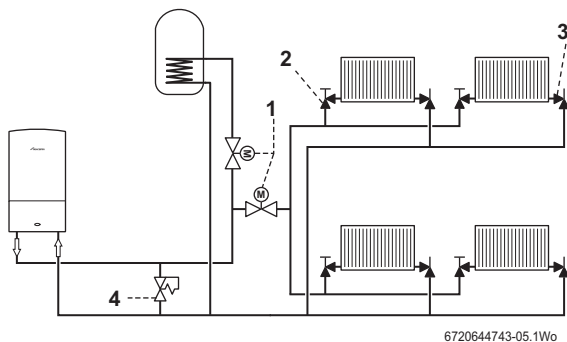


Fig. 7 Existing build - S Plan

Y PLAN LAYOUT WITH EXTERNAL DIVERTER VALVE

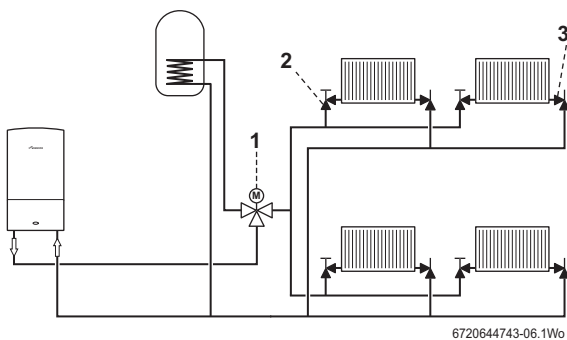


Fig. 8 Existing build - Y Plan external diverter valve

NOTICE: A drain cock should be fitted at the lowest point of the heating circuit and beneath the appliance.

OPTIONAL DIVERTER VALVE

This boiler is designed to operate on a sealed system only. The boiler will require a second return pipe from the water cylinder to the wall mounting frame and terminate in 15mm copper pipe.

EXISTING BUILD - SYSTEM LAYOUT WITH OPTIONAL INTERNAL DIVERTER VALVE (NOT SUPPLIED WITH BOILER)

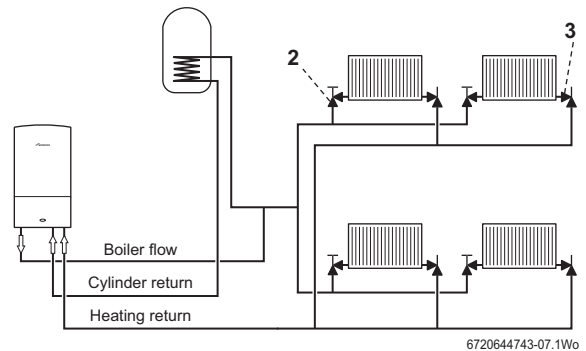


Fig. 9 Existing build - Internal diverter valve

NEW BUILD - TWO ZONED HEATING SYSTEM

The latest Part L1a regulation for new installations require separate zone controls for the central heating.

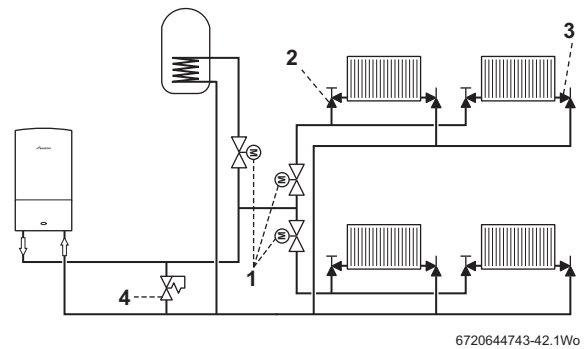


Fig. 10 New build - System layout

3.4 CONDENSATE PIPE WORK

NOTICE:

- ▶ Where a new or replacement boiler is being installed, access to an internal "gravity discharge" point should be one of the factors considered in determining boiler location.
- ▶ The condensate pipe must be nominally 22mm Ø plastic pipe.
- ▶ The condensate pipe work must fall at least 52mm per metre towards the outlet and should take the shortest practicable route.
- ▶ Ensure there are no blockages in the pipe run.

Key to condensate illustrations	
1	Condensate discharge from boiler
2	Soil and vent stack
3	Minimum 450mm and up to three storeys
4	Visible air break at plug hole
5	Sink or basin with integrated overflow
6	75mm sink waste trap
7	Condensate pump
*	Condensate trap of 75mm already incorporated into the boiler

3.4.1 INTERNAL CONNECTIONS

In order to minimise risk of freezing during prolonged cold spells, the following methods of installing condensate drainage pipe should be adopted, in order of priority.

Wherever possible, the condensate drainage pipe should be routed and terminated so that the condensate drains away from the boiler under gravity to a suitable internal foul water discharge point such as an internal soil and vent stack. A suitable permanent connection to the foul waste pipe should be used.

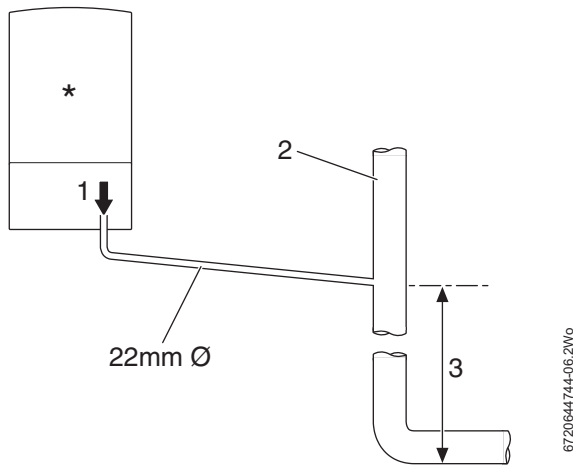


Fig. 11 Disposal to soil vent stack

Alternatively if the first option is not possible an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. can be used. Ensure that the condensate drain pipe is connected “down stream” of the waste trap.

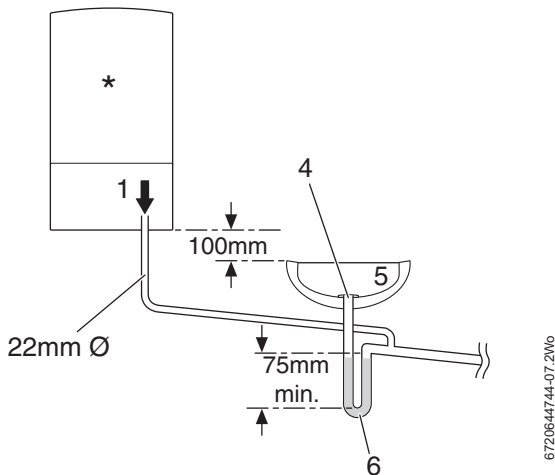


Fig. 12 Disposal to a waste pipe

CONDENSATE PUMP

Where “gravity discharge” to an internal termination is not physically possible, or where very long internal runs would be required to reach a suitable discharge point, condensate should be removed using a proprietary condensate pump, of a specification recommended by the boiler or condensate pump manufacturer.

The pump outlet pipe should discharge to a suitable internal foul water discharge point such as an internal soil and vent stack, internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used.

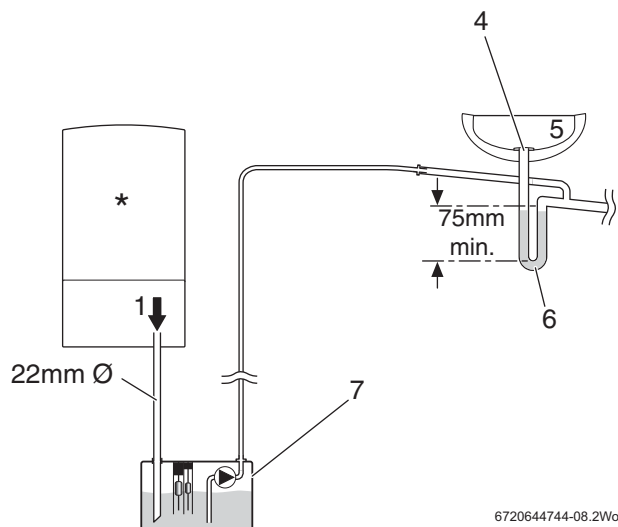


Fig. 13 Condensate pump disposal

3.4.2 EXTERNAL CONNECTIONS



NOTICE: Freezing conditions

- ▶ When the position of the boiler prevents internal routing, we recommend installing a CondenseSure siphon to significantly reduce the risk of freezing.
- ▶ Pipe work length should be kept to a minimum and the route as vertical as possible.
- ▶ Weather proof insulation must be used, if not using a CondenseSure siphon.



NOTICE: Condensate waste

- ▶ Care should be taken when siting a soak-away to avoid obstructing existing services.

Continued - Key to condensate illustrations

8	PVCu strap on fitting
9	100mm Ø minimum plastic pipe
10	Drainage holes
11	Limestone chippings
12	Bottom of sealed tube
13	Insulate and increase pipe size
14	Pipe work transition
15	External air break
16	Air gap
17	External rain water pipe into foul water
18	43mm 90° male/female bend
*	Condensate trap of 75mm already incorporated into the boiler

If no other discharge method is possible then the use of an externally run condensate drainage pipe terminating at a suitable foul water discharge point, or purpose-designed soak away, may be considered. If this method is chosen then the following measures should be adopted:

- ▶ Use a CondenseSure siphon to help prevent the condensate freezing.
- ▶ The external run be kept as short as possible and not exceed 3 metres.
- ▶ The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to 32mm before it passes through the wall to the exterior. The pipe should be insulated using suitable waterproof and weather resistant insulation, if not using a CondenseSure siphon.

- ▶ The external pipe should take the shortest and least exposed route to the discharge point, and should "fall" as steeply as possible away from the boiler, with no horizontal runs in which condensate might stand.
- ▶ The use of fittings, elbows etc. should be kept to a minimum and any internal "burrs" on cut pipe work should be removed so that the internal pipe section is as smooth as possible.

FITTING AN EXTERNAL AIR BREAK

- Refer to figure 14 when a rain water down pipe is used to dispose of condensate.
- An air break must be installed in the 43mm pipe work, between the boiler condensate outlet and the drainpipe, outside the property, to avoid flooding during adverse weather conditions.

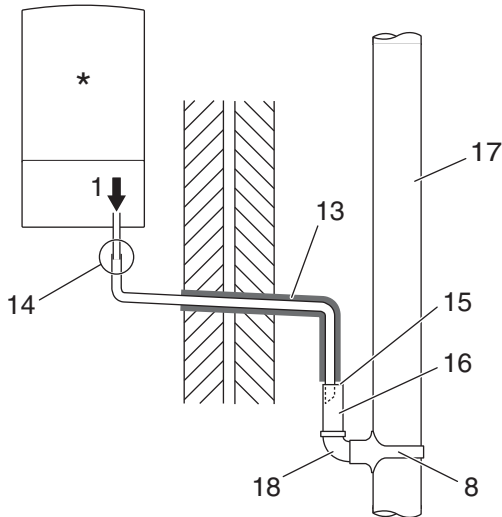


Fig. 14 Disposal into a rainwater down pipe

i Condensate drainage pipe can be run above or below ground.

Where the pipe terminates over an open drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise "wind chill" at the open end.

The use of a drain cover (such as those used to prevent blockage by leaves) may offer further protection from wind chill.

Pipe drainage will be improved if the end is cut at 45° as opposed to a straight cut.

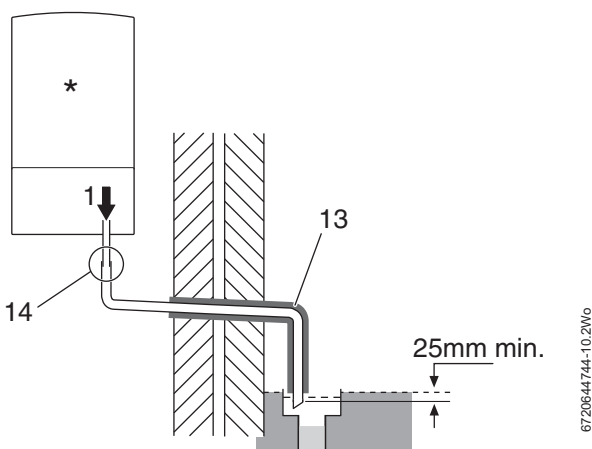


Fig. 15 External disposal

CONDENSATE SOAK AWAY

- The condensate drainage pipe may be run above or below the ground to the soak away. The examples shown on this page run above ground.

- The soak away must use a 100mm Ø plastic tube with two rows of three 12mm holes on 25mm centres and 50mm from the bottom of the tube. The holes must face away from the house.
- The tube must be surrounded by at least 100mm of limestone chippings to a depth of 400mm.



Minimum hole size for the condensate soak away must be 400mm deep by 300mmØ.

In situations where there are likely to be extremes of temperature or exposure, the use of a proprietary trace-heating system for external pipe work, incorporating an external frost thermostat, should be considered. If such a system is used, the requirement to use 32mm pipe does not apply. However, all other guidance above and the instructions for the trace heating system, should be closely followed.



NOTICE: Unheated internal areas.

- ▶ Internal pipe runs in unheated areas such as lofts, basements and garages should be treated as external runs and consideration should be given to using a CondenseSure siphon.

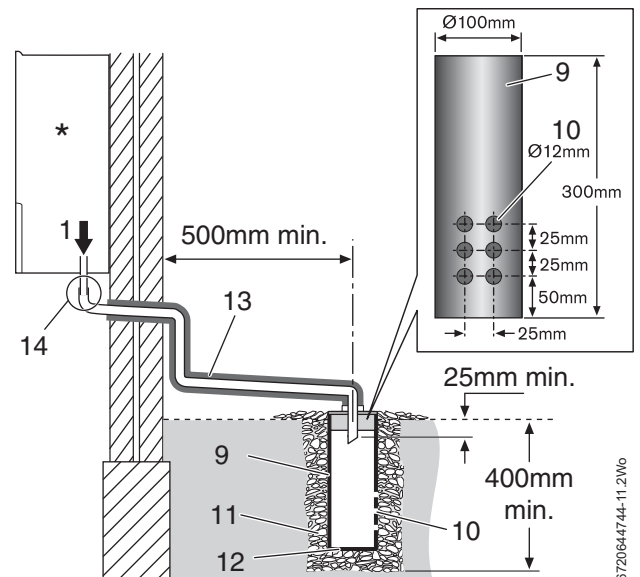


Fig. 16 Soak away

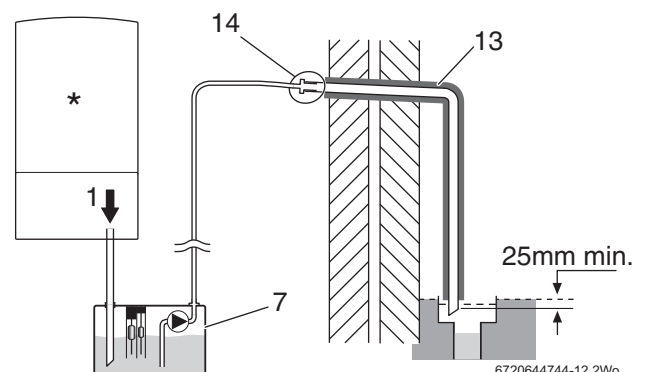


Fig. 17 Condensate pump to external disposal

3.5 PRESSURE RELIEF PIPE WORK



NOTICE:

- ▶ The pressure relief valve is a safety device for the boiler and if activated may discharge boiling water or steam through the relief valve drain pipe.
- ▶ Care should be taken when siting the outlet pipe so that it does not cause an obstruction or discharge above a window, entrance or other public access where it could cause a hazard.

- The pressure relief drain pipe (1) from the boiler should be at least 15mm diameter copper pipe and run downwards, away from any electrical equipment or other hazard, preferably to an external drain or soak away.
- Pipe (1) should be finished with a partial bend, near the outlet to face the external wall (as shown) to help prevent freezing.

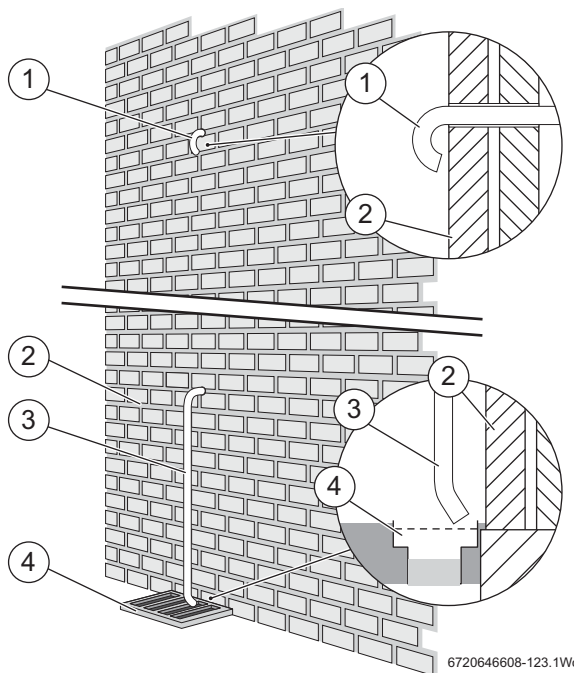


Fig. 18 Pressure relief pipe work

2	Outside wall
1,3	Drain pipe
4	External drain

Table 7 Key to fig 7

3.6 BOILER LOCATION AND CLEARANCES

3.6.1 INSTALLATION

This boiler is only suitable for installing internally within a property at a suitable location onto a fixed, rigid surface at least the same size as the boiler and capable of supporting the boiler weight.



NOTICE:

No surface protection is required against heat transfer from the boiler

3.6.2 SERVICING CLEARANCES - VENTILATED COMPARTMENT

Figure 19 shows the minimum space required to install and service the boiler in a ventilated compartment.

- If a boiler is installed in a compartment with clearances less than shown in the tables 10, 11, or 12 ventilation is required. Refer to table 8 for ventilation requirements.

Vent position	To room or internal space	Direct to outside
High level	Minimum free area 122cm ²	Min. free area 61cm ²
Low level	Minimum free area 122cm ²	Min. free area 61cm ²

Table 8 Compartment ventilation

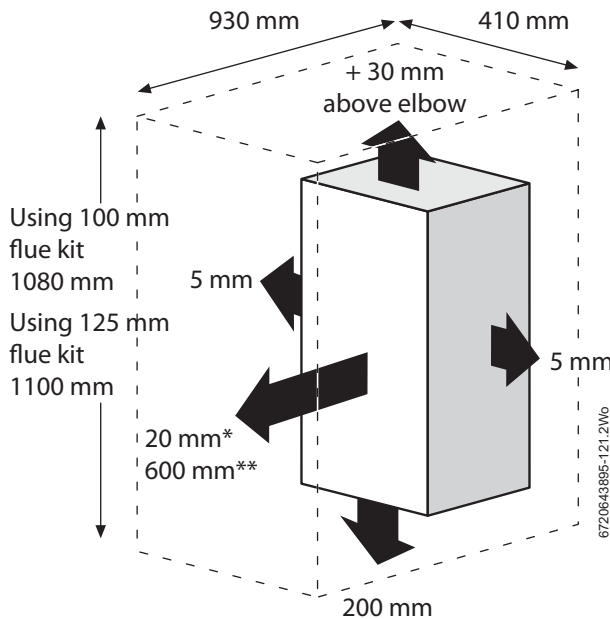


Fig. 19 Ventilated compartment

*	Minimum clearance to removable door
**	Minimum clearance required for servicing

Table 9 Minimum clearances

3.6.3 COMPARTMENTS:

Follow the requirements of BS6798 and BS5440 Part 2 and note:

- Minimum clearances must be maintained.
- An access door is required to install, service and maintain the boiler and any ancillary equipment.
- If the boiler is installed in an unventilated airing/storage cupboard, there is no requirement to make a partition between the boiler and the storage space as long as the minimum clearances around the boiler are maintained.
- Ideally, storage should be below the boiler, where the boiler is mounted in the upper part of the cupboard, whilst maintaining the clearances given in tables 10, 11, or 12.

3.6.4 BOILER CLEARANCES- UNVENTILATED COMPARTMENTS

The tables below show the options for the minimum space required to install and service the boiler inside an unventilated compartment.

3.6.5 INSTALLATION CLEARANCES - UNVENTILATED COMPARTMENTS



CAUTION: CLEARANCES

- ▶ Top and bottom clearances must not be reduced below the values shown in table 10 as they are the minimum clearances required for servicing.

Unventilated Compartment Installation Clearances (millimetres)

Suggested total unventilated compartment minimum clearances are:

Side	Above	Below	Front (to removable door)
400	170 approx. (30 above the elbow)	200	100

Table 10 Minimum unventilated compartment clearances

If Side Clearances are Reduced (millimetres)			
If total side clearance is reduced to: (Combined left & right clearances excluding the appliance)	Increase height clearances to (approx): (Combined top and bottom clearances excluding appliance)	O R	Front clearance (to removable door) must be increased to:
350	441		129
300	523		161
250	617		200
200	717		243
150	856		295
100	1012		358
50	1202		434

Table 11 Reduced side clearances

If Front Clearance is Reduced (millimetres)			
If front clearance (to removable door) is reduced to:	Increase overall height clearances to (approx): (Combined top and bottom clearances excluding appliance)	O R	Increase total side clearance to: (Combined left and right clearances excluding appliance)
50	511		505
25	596		569

Table 12 Reduced front clearances

3.6.6 BATHROOMS

A boiler fitted with a mechanical timer or RF mechanical timer (receiver) or FW100 controller may only be installed outside the shaded area.

A boiler with any other timer fitted (or blanking panel for optional programmer) can be installed in zone 2.

Additional RCD (Residual Current Device) protection may be required.

Refer to the latest IEE wiring regulations.

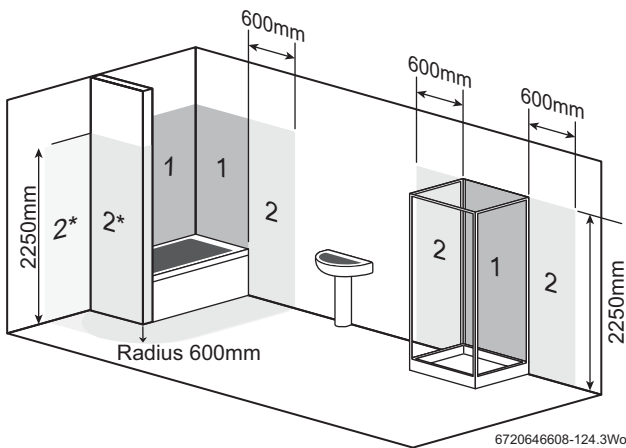


Fig. 20 Bathroom installations

3.7 PLUMBING MANIFOLD

3.7.1 CONNECTIONS

WARNING: IF FITTING AN OPTIONAL INTERNAL DIVERTER VALVE
 ▶ Refer to the “Greenstar Optional Integral Diverter Valve” installation instructions.

Heating System	22mm compression fittings
Gas	22mm

Use the fittings supplied in the Hardware literature pack.

- If the boiler pipes are to be run behind the appliance ensure that the pipes pass through the slot in the white cardboard guide. This is fitted to the frame.

Further guidance on pipe routing can be found printed on the boiler template (supplied with the boiler).

- For further ease of fitting, an optional Vertical Pre-piping Assembly kit is available, comprising five pre-formed copper pipes and an earth bonding strip.
Part number: 7 716 192 570.



Fig. 21 Pipe dimensions

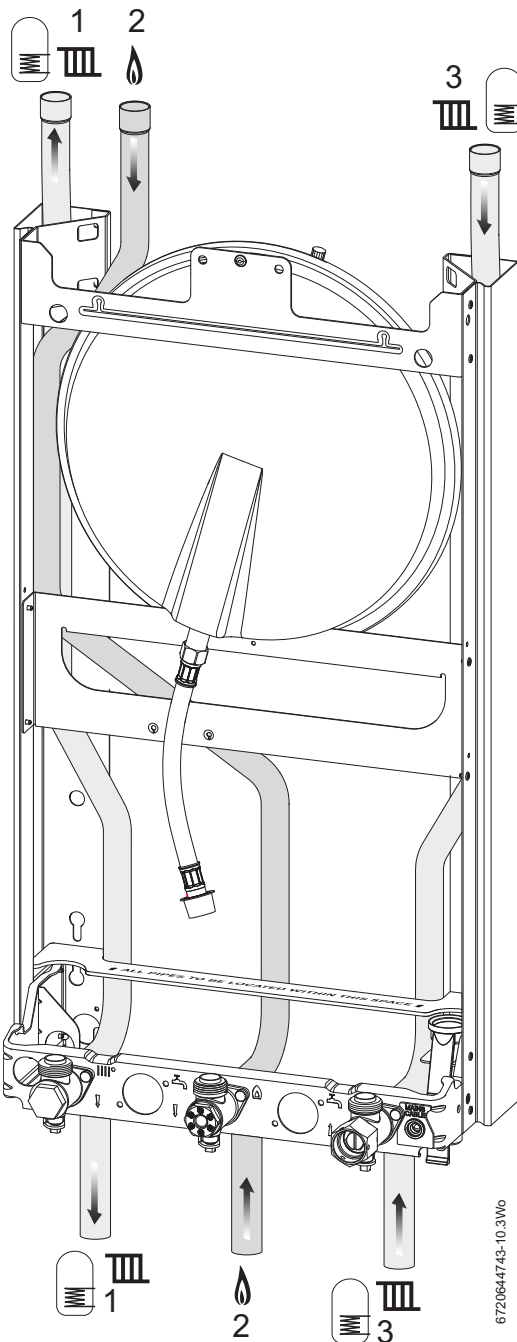


Fig. 22 Plumbing manifold

#	Function	From left case edge	Diameter of pipe
1	CH Flow	70mm	22mm
2	Gas	200mm	22mm
3	CH Return	330mm	22mm
4	Condensate	35mm	22mm
5	Pressure Relief Valve	367mm	15mm

Table 13 Key to figures 21 & 22

3.8 FLUE OPTIONS



WARNING: Flue systems

► Only use Worcester, Bosch approved flue systems, no other manufacturer's flue systems have been approved for use with Worcester appliances.



CAUTION: Non accessible flue systems:

- Where a flue system is not going to be accessible, provision must be made for service and inspection.
- Voids containing concealed flues must have at least one inspection hatch no less than 300mm square.
- Flue joints within the void must not be more than 1.5 metres from the edge of the inspection hatch.
- Inspection hatches should be located at changes of direction.
- If this is not possible, bends should be viewable from both directions.



NOTICE: Effective flue lengths:

- each 90° bend is equivalent to 2 metres of straight flue
- each 45° bend is equivalent to 1 metre of straight flue



Plume management kits are available for the 60/100 horizontal flue system.

Refer to the manual supplied with the plume management kits for complete installation instructions

FLUE LENGTHS

The flue systems have different maximum flue lengths

The Greenstar series has the option of two horizontal 60/100 RSF (telescopic and longer telescopic) and one horizontal 80/125 RSF (telescopic) flue system and two vertical RSF (60/100 or 80/125) flue systems:

The next page shows various fluing options.

Refer to the Flue options in table 14 for the straight flue lengths required to achieve the maximum flue length.

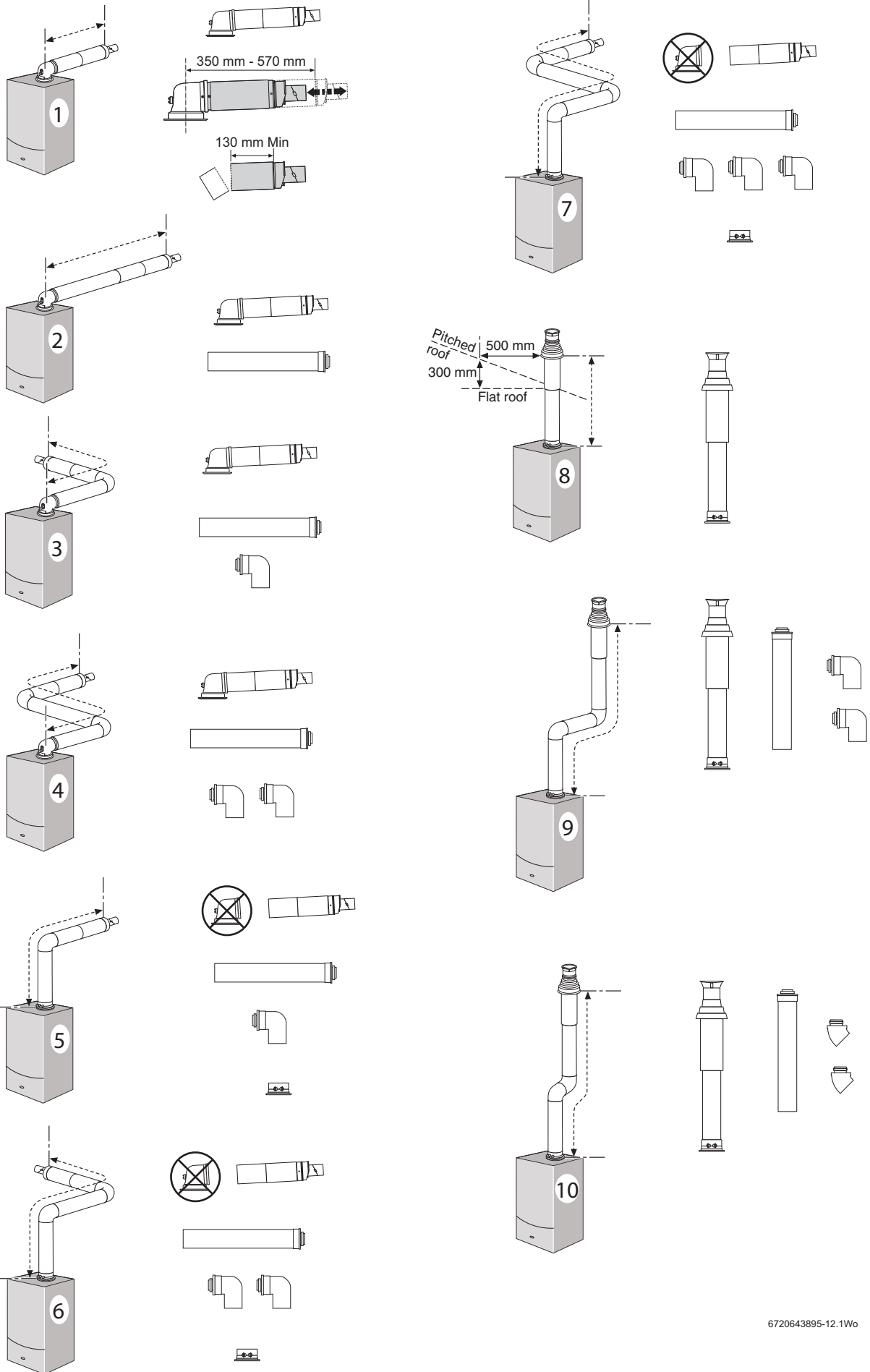
Condensfit II

i System boilers		Maximum total flue length (mm)	
		60/100	80/125
FLUE TYPE			
1	Telescopic horizontal flue assembly	570	1,070
	Longer telescopic horizontal flue assembly	790	N/A
2	Horizontal flue extension	4,600	13,000
3	Horizontal flue with 1 x 90° bend	2,600	11,000
4	Horizontal flue with 2 x 90° bends	N/A	9,000
5	High level horizontal flue	4,600	13,000
6	High level horizontal flue with 2 x 90° bends	2,600	11,000
7	High level horizontal flue with 3 x 90° bends	N/A	9,000
8	Vertical balanced flue assembly	6,400	15,000
9	Vertical balanced flue with 2 x 90° bends	2,400	11,000
10	Vertical balanced flue with 2 x 45° bends	4,400	13,000

Table 14 Flue options

Part number	Flue	Description
7 716 191 082	60/100	Telescopic horizontal flue assembly
7 716 191 171	60/100	Longer telescopic horizontal flue assy
7 719 003 702	80/125	Telescopic horizontal flue assembly
7 719 002 430	60/100	Vertical flue assembly
7 719 002 431	80/125	Vertical flue assembly

Table 15 Flue option part numbers



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3.9 FLUE TERMINAL POSITIONS

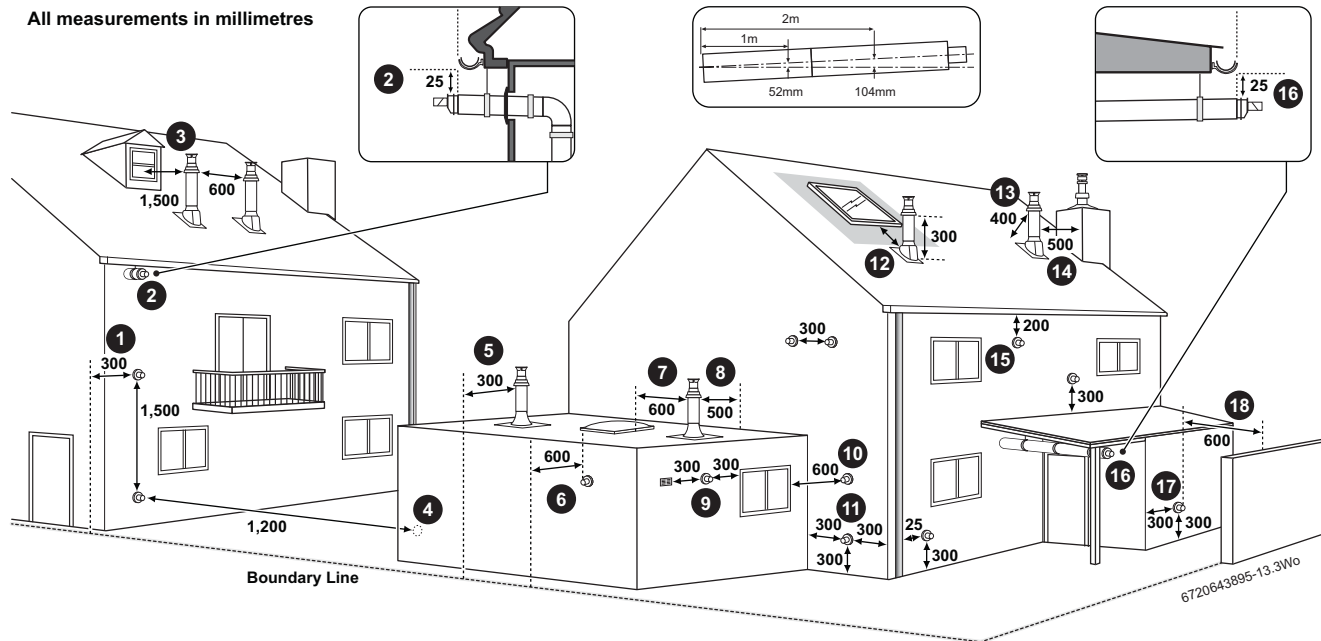


Fig. 23 Flue terminal positions

NOTICE:

- ▶ All measurements are the minimum clearances required.
- ▶ Terminals must be positioned so to avoid combustion products entering the building.
- ▶ Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings. (flue bracket 100mm part number: 7 716 191 177, flue brackets 100mm x 6 part number: 7 716 191 178, flue bracket 125mm part number: 7 716 191 179).

Key to illustration

1. 300mm adjacent to a boundary line.
2. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
3. 1,500mm between a vertical flue terminal and a window or dormer window.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
6. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
7. 600mm minimum clearance from a skylight to a vertical flue.
8. Vertical flue clearance, 500mm to non-combustible building material, and 1,500mm clearance to combustible building material.
9. 300mm above, below and either side of an opening door, air vent or opening window.
10. 600mm diagonally to an opening door, air vent or opening window.
11. 300mm to an internal or external corner.
12. 2,000mm below a Velux window, 600mm above or to either side of the Velux window.
13. 400mm from a pitched roof or 500mm in regions with heavy snow fall.
14. 500mm clearance to any vertical structure on a roof, 600mm to room sealed flue or 1,500 to an open flue.
15. 200mm below eaves and 75mm below gutters, pipe and drains.
16. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
17. Flue clearance must be at least 300mm from the ground. Terminal guards must be fitted if the flue is less than 2 metres from the ground or if a person could come into contact with the flue terminal.
18. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.



Note:

- ▶ Installations in car ports are not recommended.
- ▶ The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- ▶ Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.

3.10 PLUME MANAGEMENT TERMINAL POSITIONS

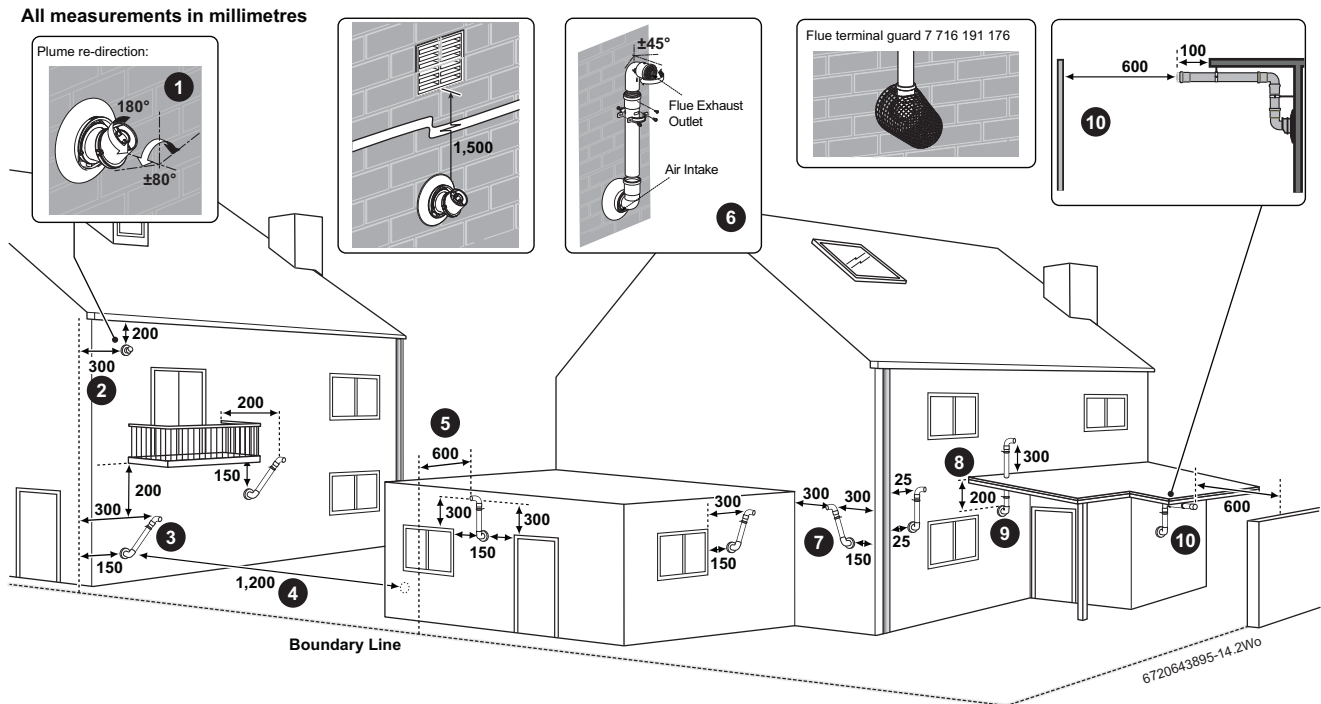


Fig. 24 Plume terminal positions



Maximum and minimum plume management lengths:

- ▶ A minimum distance of 500mm must be maintained between the plume management outlet and the flue air intake.
- ▶ The maximum plume management length is 4.5 metres for the appliances detailed on the front of this manual.
- ▶ The 45° bend is equivalent to 0.75 metres of straight plume management and the 90° bend is equivalent to 1.5 metres.



NOTICE:

- ▶ All measurements are the minimum clearances required.
- ▶ Refer to previous page for all concentric flue terminal positions unless the flue position is specified on the figure above “Plume terminal positions”.
- ▶ Terminals must be positioned so to avoid combustion products entering the building.
- ▶ Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.

Key to illustration

1. This feature allows some basic plume re-direction options on a standard telescopic horizontal flue terminal. 300mm minimum clearances to a opening e.g. window. However the minimum clearances to an opening in the direction that the plume management is facing, must be increased to 1,500mm. Where the flue is less than 150mm to a drainpipe and plume re-direction is used the deflector should not be directed towards the drainpipe.
2. 300mm adjacent to a boundary line.
3. Plume Management kit air intake can be reduced to 150mm providing the flue exhaust outlet is no less than 300mm adjacent to a boundary line.
4. 1,200mm between terminals facing each other.
5. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
6. Using a Plume Management kit the air intake measurement can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance. Plume kits running horizontally must have a 10° fall back to the boiler for proper disposal of condensate. For details on specific lengths see relevant boiler Technical & Specification information.
7. Internal/external corners. The air intake clearance can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
8. Clearances no less than 200mm from the lowest point of the balcony or overhang.
9. 1,200mm from an opening in a car port on the same wall e.g. door or window leading into the dwelling.
10. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.



Note:

- ▶ Installations in car ports are not recommended.
- ▶ The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- ▶ Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.

4 INSTALLATION



WARNING: All the previous “Pre-Installation” sections must be read and the requirements met before starting boiler or flue installation.

4.1 UNPACKING THE WALL FRAME AND ANCILLARY ITEMS



CAUTION: LIFTING AND CARRYING

- ▶ Only lift a manageable weight, or ask for help.
- ▶ Bend the knees and keep the back straight with feet apart, when lifting or putting down heavy objects.
- ▶ DO NOT lift and twist at the same time.
- ▶ Lift and carry object close to the body.

1. Wall mounting frame
2. Wall mounting template
3. Inner packaging
4. Installer pack
5. Bottom panel
6. Front fascia
7. Syphon assembly

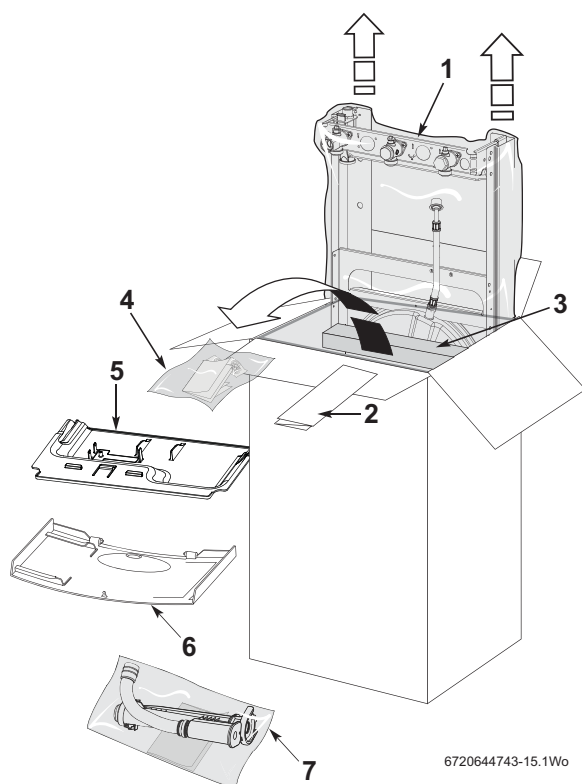


Fig. 25 Unpacking

IMPORTANT HANDLING INSTRUCTIONS:

- It is advised that two people are used to carry the carton from the van to the point of delivery.
- Once the carton has been delivered, the outer carton is removed first. Care should be taken when releasing the straps. If a sharp implement is used make sure the outer carton is not pierced and that the implement is used in such a way so that it may not cause personal injury.
- All sharp objects must be covered or the blade retracted after use and put away in a safe place. Care should be taken when lifting the boiler from the base and the

proper technique for safe lifting of any heavy object should be strictly observed.

Additional requirements for roof space installation:

- The boiler should be first unpacked before ascending ladder to loft space.
- Two sets of steps should be used.
- Two people should share the lifting of the boiler up to the loft hatch, where the boiler is entered into the loft space tilted and slid on its back into the loft.
- Once the appliance is removed from its packaging check the contents against the packing list.



NOTICE:

▶ Before installing the appliance, ensure that the system has been cleaned as explained on page 9.

1. Remove straps and open the top of the boiler packaging.
2. Remove the wall mounting frame (1) and wall mounting template (2) and from the packaging.
3. Remove the boiler bottom panel (5), front fascia (6), hardware literature pack (4) and syphon assembly (7) from the carton.

4.2 WALL MOUNTING TEMPLATE & FLUE OPENING



WARNING: BEFORE DRILLING:
ENSURE THAT THERE ARE NO PIPES, ELECTRICAL CABLES, DAMP PROOF COURSES OR OTHER HAZARDS.

SAFETY:

All relevant safety precautions must be undertaken. Protective clothing, footwear, gloves and safety goggles must be worn as appropriate.

FIXING THE WALL MOUNTING FRAME:

- ▶ The boiler template shows the relative positions of the flue and the top and bottom fixing of the mounting frame.
1. Fix the template to the wall in the desired position.
 2. Drill 4 holes for the wall mounting frame through the template.



The wall mounting template has been sized to allow for minimum clearances of 5mm sides, 200mm base and 30mm above a 100mm diameter flue elbow.

REAR FLUE OUTLET

- ▶ The drawing opposite shows the boiler template with the flue centre lines of both the 100mm and 125mm flue systems.
3. Mark centre line of flue to be used (3); the external diameter of the hole can also be marked if required.
- ▶ If a 100mm diameter flue is to be used, a 125mm diameter hole is required. However, if using the weather sealing collar by pushing it through from inside the property, then a 150mm diameter hole is required to accommodate this.
 - ▶ The flue turret of the 100mm flue has an in-built 3° angle.
 - ▶ If extensions are to be added then the complete flue must rise at an angle of 3°.
 - ▶ The 125mm diameter flue system will require the flue to rise at an angle of 3°.
 - ▶ Drill hole using a core drill or similar.

SIDE OUTLET:

4. Mark from the centre line of the wall template to the wall which the flue will pass through (4).
- ▶ Allow for a rise of 52mm per metre length of flue, to give a 3° angle.
 - ▶ Clear any debris from the site.

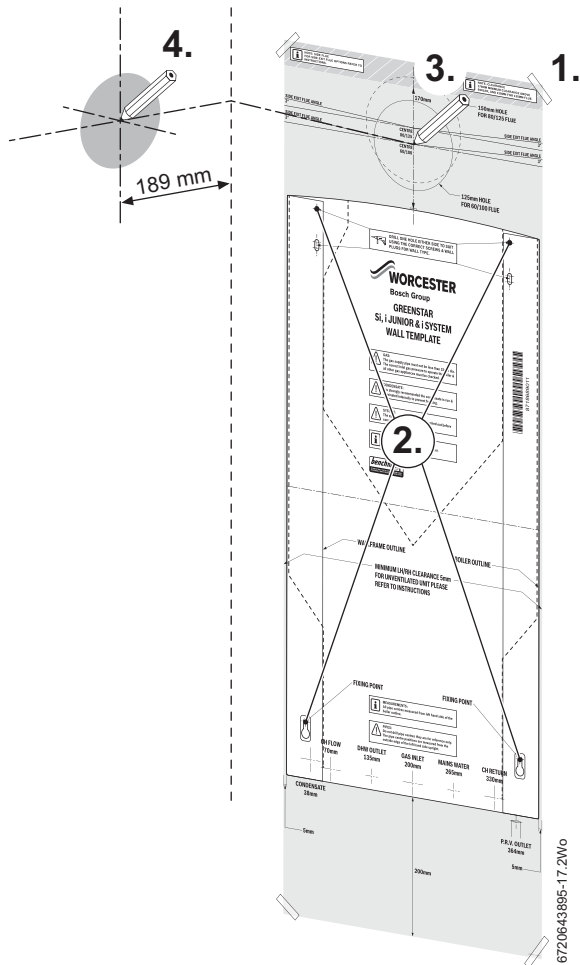


Fig. 26 Marking the flue position

4.3 UNPACKING THE APPLIANCE

1. Outer carton
 2. Inner sleeve (unwrap from front)
 3. Packing base
 4. Protective wrapping
 5. Appliance outer case
- ▶ Remove outer carton (1) and place safely away from the working area.
 - ▶ With the outer packaging removed and the inner sleeve (2) still in place gently lay the boiler on its back.
 - ▶ The boiler will lie at an angle to the floor to allow the boiler outer casing (5) to be removed.
 - ▶ The inner sleeve (2) opens as shown in figure 29.
 - ▶ Remove the protective wrapping (4).
1. Undo but do not remove the two screws at the bottom of the boiler
 2. Undo the two screws at the top (see fig. 30).
 3. Remove the outer case (5).
- ▶ Remove any packaging within the boiler and the packaging base (3).

CAUTION: Hanging the boiler

- ▶ Remove the plastic strip fitted to pipes before hanging the boiler.

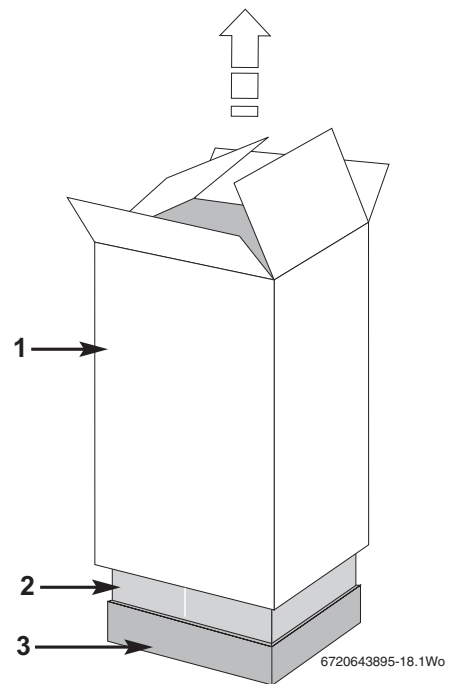


Fig. 27 Remove outer carton

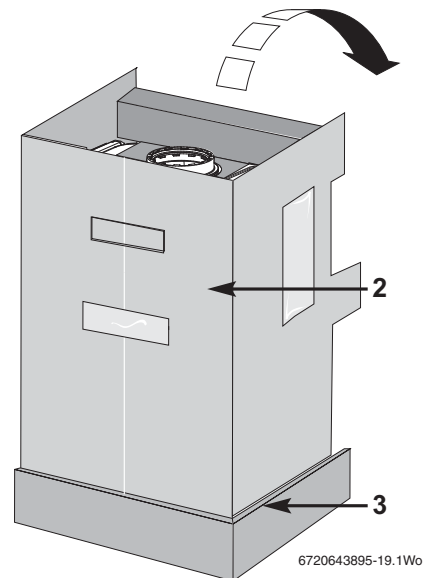


Fig. 28 Lay boiler down

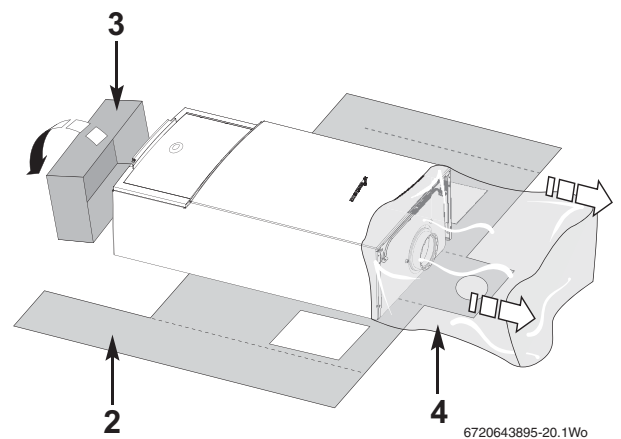


Fig. 29 Remove packaging

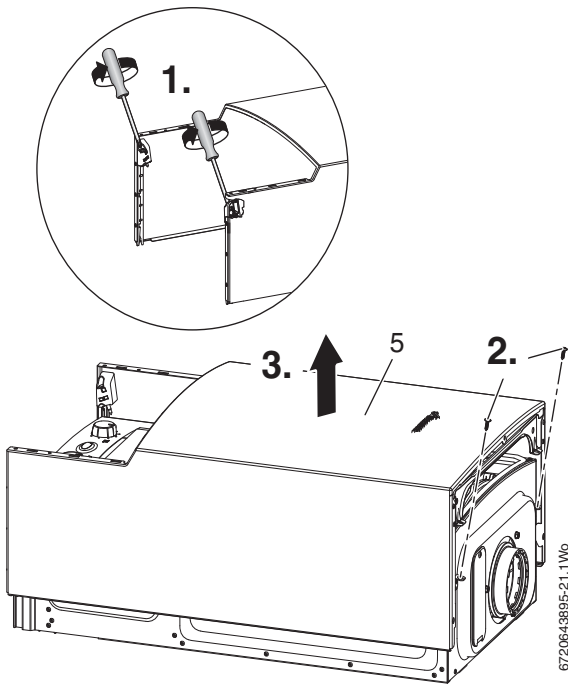


Fig. 30 Outer case screw removal

4.4 BOILER CONNECTIONS

CAUTION: ISOLATE THE MAINS GAS SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

NOTICE: DIVERTER VALVE
 ► If the optional integral diverter valve kit is required, fit the kit now before hanging the boiler on the wall frame.

GAS AND WATER CONNECTIONS

- Remove wall mounting template and secure the wall mounting frame to the wall with the appropriate fittings for the boiler weight and wall type.
 - System pipes may be run vertically upwards behind the boiler or below it. See Plumbing Manifold Section on page 15.
1. CH flow (22mm),
 2. Gas inlet (22mm),
 3. CH return (22mm),

i The bonded washer supplied is for the Gas connection only.

FITTING THE CONDENSATE PIPE WORK

Pre-fit the plastic condensate drain pipe through the wall frame as shown in the example below.

1. Secure the pipe to the wall at the last joint.
 2. Ensure the pipe protrudes through the wall frame by 25mm.
- If exiting through the wall, to run externally, the pipe must have a 3° fall and be increased to a 32mm insulated pipe.

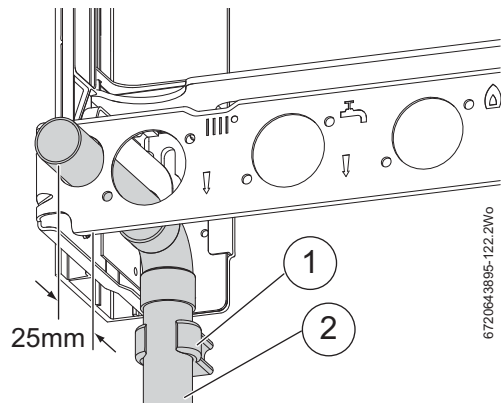


Fig. 31 Condensate drain pipe work detail

PREPARING THE WALL FRAME

- Fit sealing washers to service valves before hanging boiler.

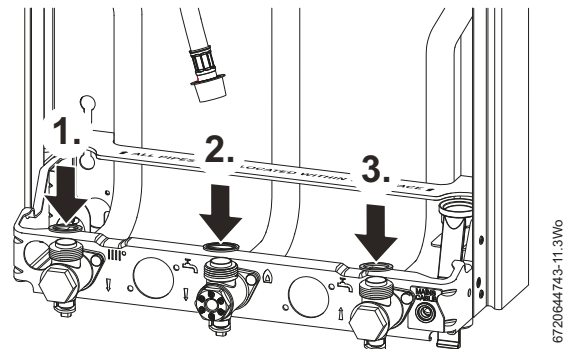


Fig. 32 Sealing washers

NOTICE: Before hanging the boiler onto the wall mounting frame ensure that the pressure relief valve connection is in the DOWN position. This is located on the right hand side of the wall frame at the rear. Apply a smear of silicone lubricant to the seal to ease connection later.

1. Pull the extended tab/lever forward and down until there is no further travel.

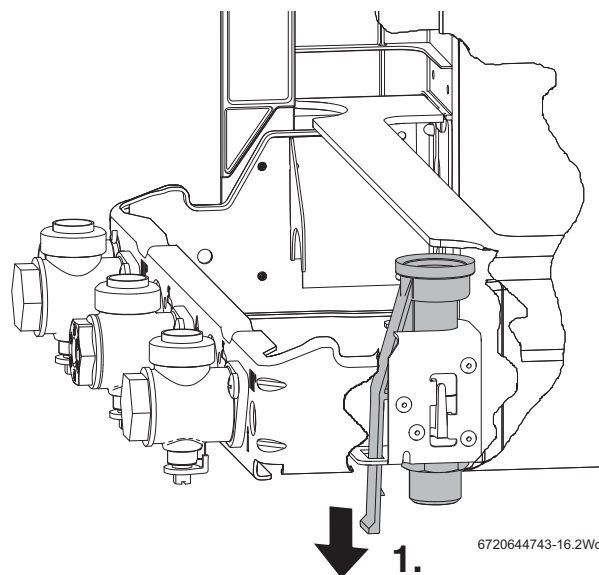


Fig. 33 PRV connection in the down position



CAUTION: Caps or plastic strip fitted to pipes must be removed before hanging the boiler.

HANGING THE BOILER

- ▶ Hang the boiler on to the wall mounting frame by the two brackets positioned left and right at the top rear of the appliance. Do not lift the appliance by the air gas manifold. There are two handling holes incorporated into the inner casing left and right in the lower section of the appliance.

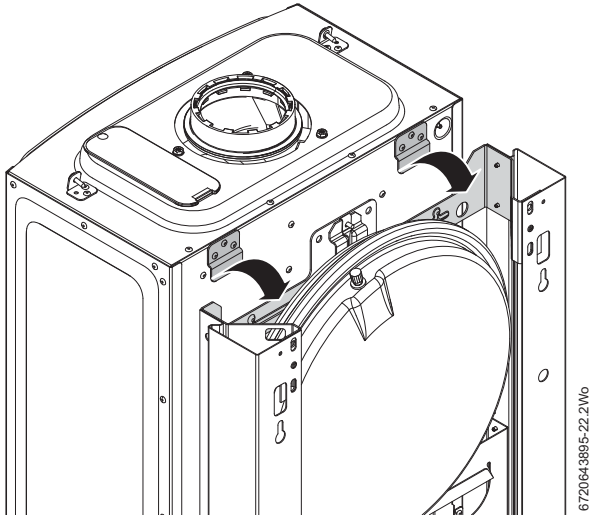


Fig. 34 Hanging the boiler

PRESSURE RELIEF CONNECTIONS



NOTICE: The pressure relief connector must be repositioned after the boiler has been correctly mounted to the wall mounting frame.



To ease assembly of components, apply silicone lubricant to sealing surfaces.

1. Push the lever on the pressure relief connector UP until the stop on the inside of the handle is over the shoulder of the metal bracket to secure in place.

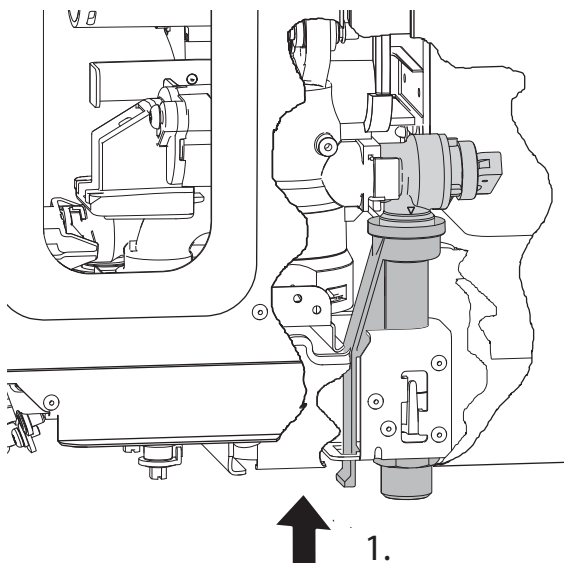


Fig. 35 PRV in the up position

- ▶ Remove the screw from the control panel retaining bracket and lower the control panel into the service position.
- ▶ Make connections to the heating system. Connect the gas supply to the boiler gas cock 22mm compression.

EXPANSION VESSEL CONNECTION

To connect the expansion vessel flexible pipe to the hydraulic manifold situated to the left of the pump:

- ▶ Remove and discard the plastic cap from the expansion vessel flexible pipe.
1. Refer to figure 36, release the retaining clip.
 2. Remove and discard the orange plastic blanking plug from the pressure vessel connection at the hydraulic manifold.

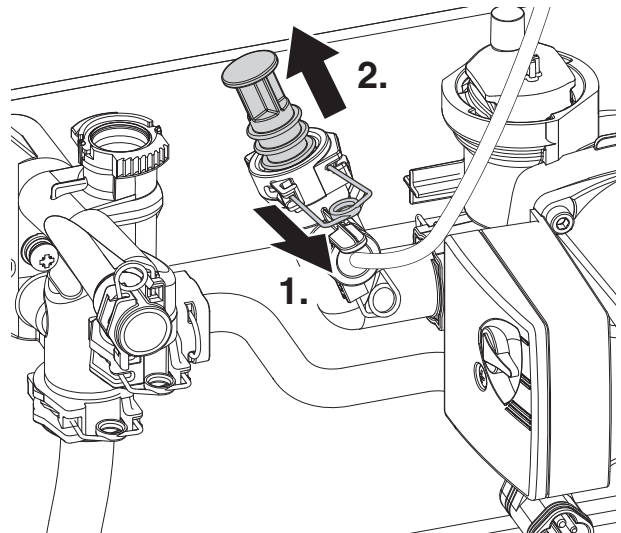


Fig. 36 Blanking plug

1. Refer to figure 37 and insert the expansion vessel flexible pipe into the fitting on the pump.
2. Secure in place with the wire retaining clip.

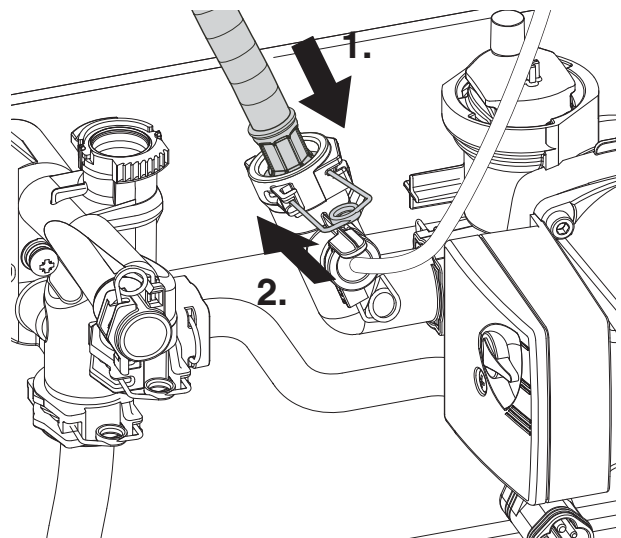


Fig. 37 Expansion vessel hose connection

- ▶ Connect the pressure relief drain pipe to 15mm compression joint using the compression nut and olive supplied in the literature/ hardware pack.

4.5 FLUE INSTALLATION

HORIZONTAL FLUE (60/100mm diameter)

For vertical flues and 80/125mm horizontal flues, please refer to separate instructions supplied with the flue kit.

i To ease assembly of flue components, apply silicone lubricant to sealing surfaces.

Basic instructions for the 60/100mm diameter flue are shown below.

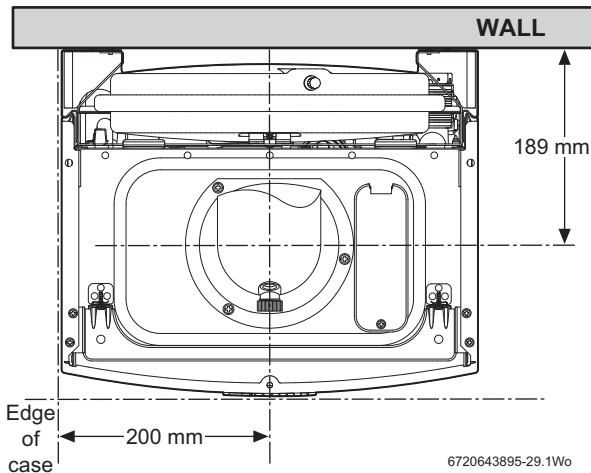


Fig. 38 Flue turret centre

4.5.1 MEASURING THE FLUE (STANDARD FLUE):

- ▶ Measure from the outside of the wall to the centre line of the flue turret to determine length L.
- ▶ Subtract 50mm from the length L to give the correct dimension to the flue elbow connection.
- ▶ If the length L falls within the telescopic range of 350 to 570mm or 570 to 790mm using the longer telescopic flue, then no cutting will be required.
- ▶ If the required length is less than 350mm the standard telescopic flue can be modified, refer to fig. 40.
- ▶ If the required length is greater than 570mm, then the longer telescopic flue, giving a range of 570 - 790mm, can be used
- ▶ If the required length is greater than 790mm, then flue extensions will have to be used. Refer to the 60/100 Horizontal Flue Instruction manual provided in the telescopic flue kit.
- ▶ Refer to section 3.8 for flue options.

Adjusting the telescopic flue length:

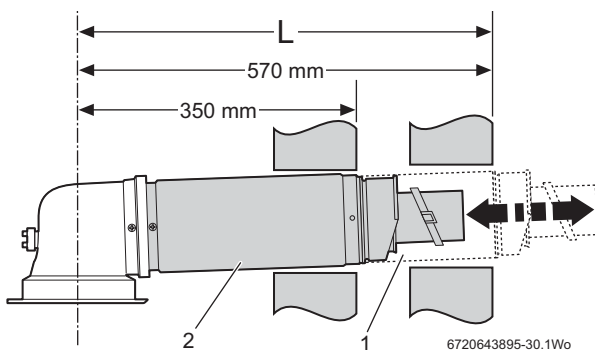


Fig. 39 Standard telescopic flue

Extend tube (1) by withdrawing from tube (2) to achieve the flue length required, between 350 - 570mm.

Secure with screw provided and seal joint with the aluminium tape supplied.

4.5.2 REDUCING THE TELESCOPIC FLUE LENGTH:

i Ensure that the "TOP" label is facing up before securing the flue section to the turret.

The flue terminal MUST be fitted with the 'TOP' label uppermost to allow the correct fit and use of the plume management system.

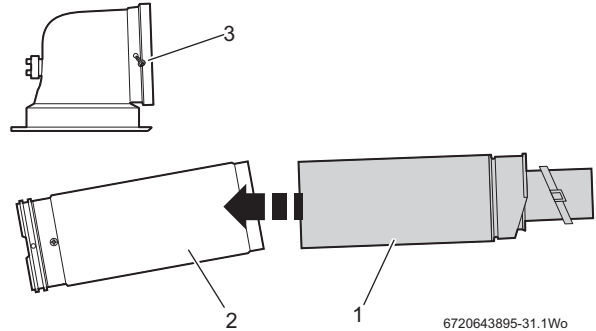


Fig. 40 Reducing the standard terminal

- ▶ Remove securing screws (3) to detach the terminal assembly from the turret.
- ▶ Slide terminal section (2) from the terminal assembly and discard.
- ▶ To use terminal (1) without cutting remove the location lug (4) on the inner flue tube (5) and remove any burrs.

To reduce the flue length further:

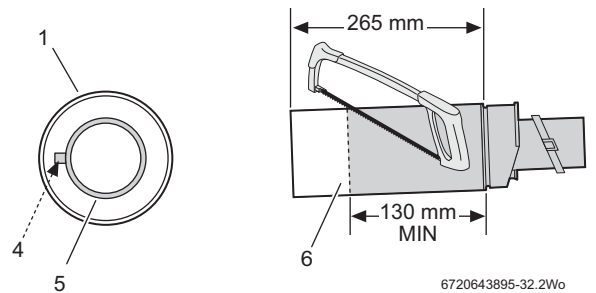


Fig. 41 Further reduction

- ▶ Mark the length required for the terminal as shown (min. 130mm) and cut square, taking care not to damage the tubes.
- ▶ Remove any burrs and chamfer the outer edge of the tubes to assist ease of connection and prevent seal damage.

i The aluminium tape is not required when reducing the terminal.

4.5.3 INSTALLING THE TELESCOPIC FLUE:

1. Refer to figure 42 and set the flue length to the distance required, secure with screws provided.
2. Seal the joint with the aluminium tape provided.
3. Slide the inner wall seal onto the terminal.
4. If fitting from inside the building; slide the outer wall seal onto the terminal.

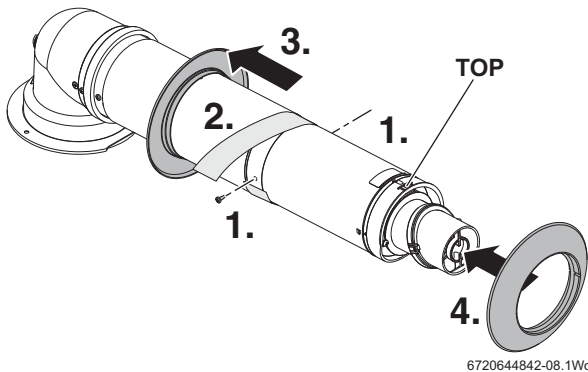


Fig. 42 Telescopic flue



The turret securing screws are from the boiler and are not in flue kit.

1. Refer to figures 43 and 44 and remove the three inner flue tube retaining screws (2). The inner tube will be held in place in the appliance.
2. Check the boiler flue seal is correctly seated and apply silicone grease.
3. Position terminal through the flue opening in the wall to the outside of the building by the distance shown.
4. Align the flue turret to the boiler flue outlet with flat facing (1) to the rear of the boiler.
The flue turret should be pushed straight down, on to the boiler.

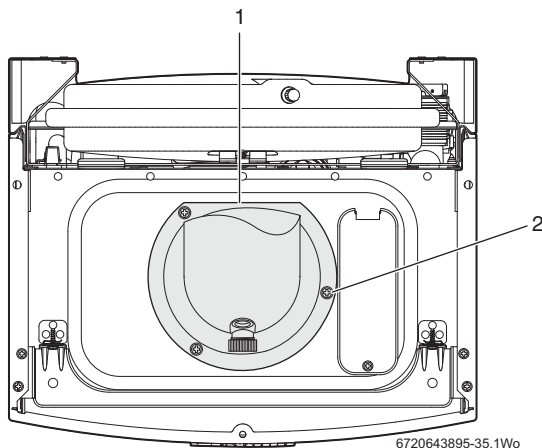


Fig. 43 Aligning the turret

- ▶ Fit the screws removed in step 1 to secure flue turret.
- ▶ If fitting the outer seal from outside the building, slide the outer wall seal onto the terminal as shown.

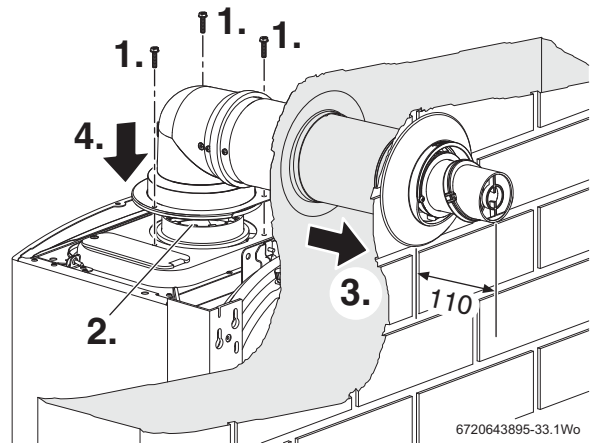


Fig. 44 Telescopic flue installation



For more information refer to the 60/100 Horizontal Flue kit Instruction Manual

ADDITIONAL NOTES AND REMINDERS:

- Ensure that all cut lengths are square and free from burrs.
- The flue is sealed when assembled correctly and the components are pushed fully home.
- The flue is set at an angle of 3° or 52mm per metre length.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings (flue bracket 100mm part number: 7 716 191 177, flue brackets 100mm x 6 part number: 7 716 191 178, flue bracket 125mm part number: 7 716 191 179)

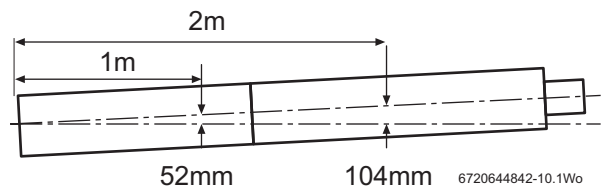


Fig. 45 Slope for condensate disposal

4.5.4 FLUE TERMINAL PLUME RE-DIRECTION

The flue discharge can be re-directed allowing some plume redirection control, alternatively, a complete plume management system can be fitted to the flue terminal.

RE-DIRECTING THE FLUE DISCHARGE

1. Using a suitable tool, unclip (1 & 2) the terminal end and rotate through 180°.



NOTICE: DO NOT rotate the complete terminal assembly.

1. Refit to the terminal, ensuring that the clips (1 & 2) are engaged and secure.
2. Loosen screws (3) and rotate the entire outlet assembly to redirect the plume. Tighten screws (3) to secure in the required position.



The flue terminal outlet has built-in stops to limit rotation for horizontal flue to allow condensate to run back into the boiler for safe disposal. Do not attempt to force beyond the limit stops.

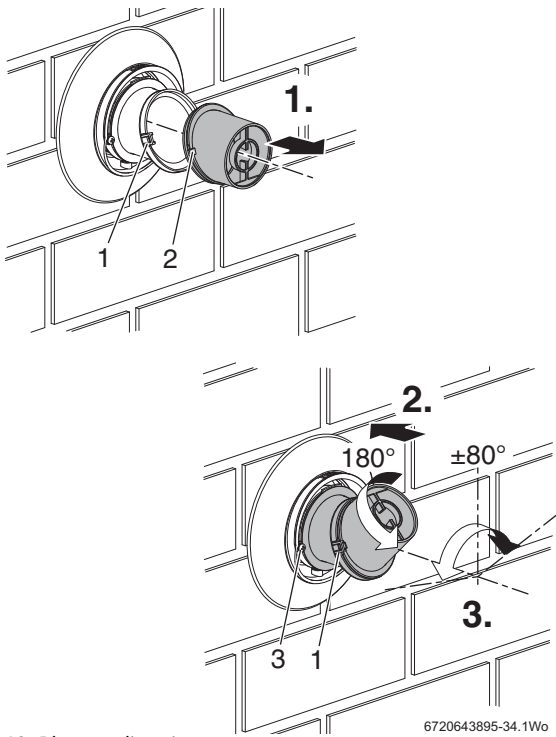


Fig. 46 Plume redirection

NOTICE: Outlet position

- ▶ The flue terminal outlet position must follow those stated in the relevant appliance instruction manual. When redirecting the flue discharge the outlet terminal must be at least 1500mm from any opening in the direction of the discharge to prevent combustion products from entering the building.

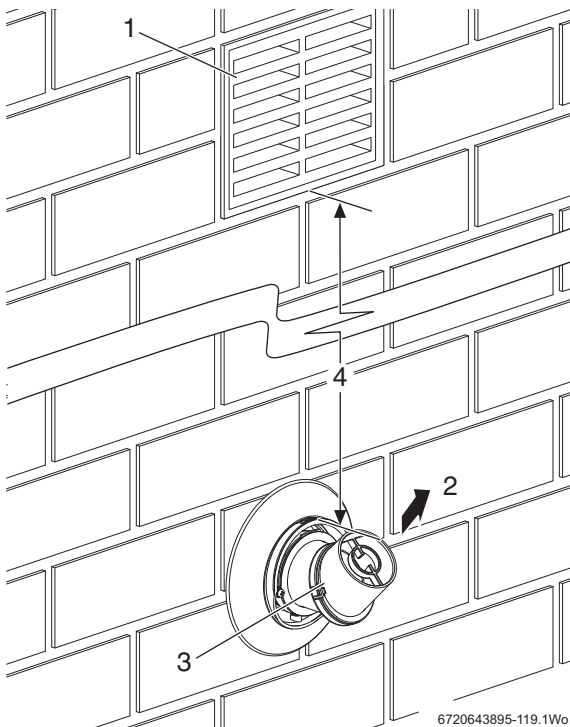


Fig. 47 Plume distance to opening

1	Opening in building
2	Flue discharge
3	Plume deflector
4	Minimum 1500mm from an opening in the building

Table 16 Key to figure 47

4.6 CONDENSATE CONNECTION

Never terminate or discharge into any open source, including: sink, bath, shower, bidet, toilet etc.

NOTICE: Any external condensate pipe work must be protected with weather resistant insulation to help prevent freezing.

- Ensure that the condensate drain is a 22mm diameter plastic pipe. The pipe must fall at least 50mm per metre towards the outlet.

i Do not use lubricants or sealing compounds.

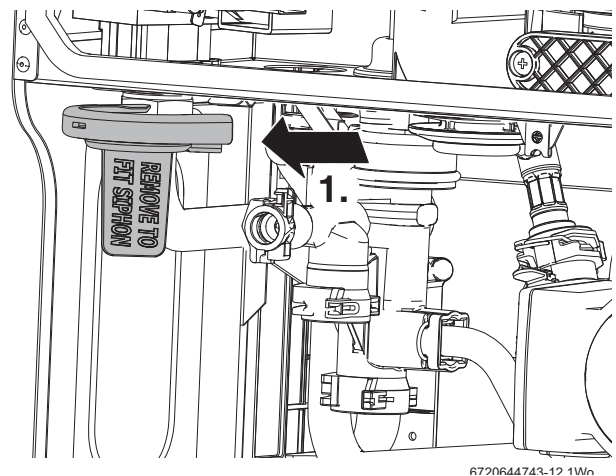


Fig. 48 Remove blanking cap

1. Remove the sump blanking cap from the sump.
- ▶ Fill syphon with 200 to 250 millilitres of water.

NOTICE: Pull the fan lead, DHW NTC sensor lead and ignition cable out of the way when fitting the syphon to ensure that they are not trapped by the syphon assembly or discharge hose.

2. To fit the syphon assembly:
 - ▶ Remove orange seal retainer and discard.

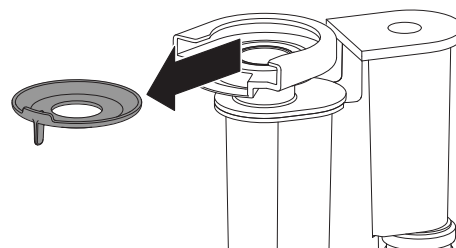


Fig. 49

- ▶ Push the syphon onto the sump assembly, until the lug on the sump is fully engaged with the slot on the back of the syphon assembly and the clip is engaged in the top of the syphon.

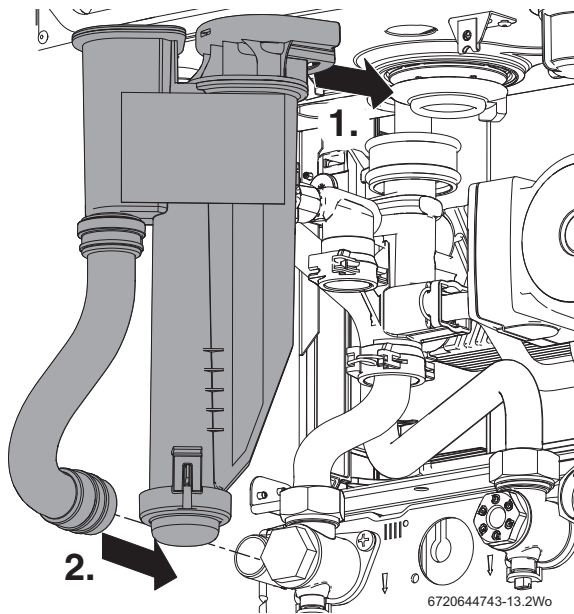


Fig. 50 Fitting syphon

NOTICE: Do not use solvents, adhesive or lubricant when pushing the pipe onto the rubber connector.

3. Push the discharge hose, onto the condensate outlet pipe.

Maintenance

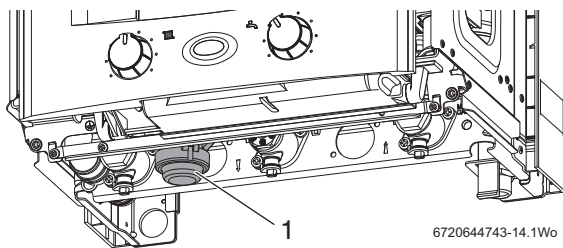


Fig. 51

There is no need to remove the Syphon Assembly for cleaning.

To drain debris from the syphon, during the annual service:

- ▶ Release the clips and remove the drainage cap from the bottom of the syphon.
- ▶ Empty the debris and condensate from the syphon into a suitable container.
- ▶ Re-fit the drainage cap to bottom of the syphon.

4.7 ELECTRICAL

CAUTION: ISOLATE THE MAINS ELECTRICITY SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

i The boiler is pre-wired with a two metre mains supply cable.
A spare strain relief block is supplied in case the pre-wired cable is not used.

- The mains electrical supply to the boiler must be through either a fused double pole isolator or a fused three pin plug and unswitched socket.
- The isolator shall be situated next to the boiler for new systems and, where practicable, replacement boilers.
- The isolator must have a contact separation of 3mm minimum in both poles. Any system connected to the boiler must not have a separate electrical supply.
- External fuse rating 3A.

ACCESS TO ELECTRICAL CONNECTIONS:

▶ Remove boiler casing to access control panel.

1. Refer to figure 52 and remove the screw securing the control panel.
2. Lower the control panel into the horizontal service position.

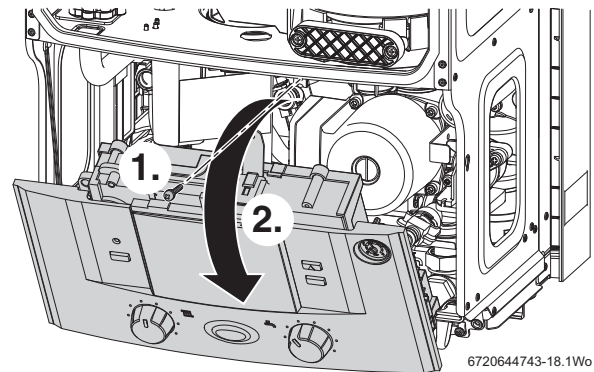


Fig. 52 Moving control panel into the service position

i When stripping wires always ensure copper strands do not fall into the control box.

1. Refer to figure 53 and unscrew the three screws in the control panel.
2. Pull off the connections cover.

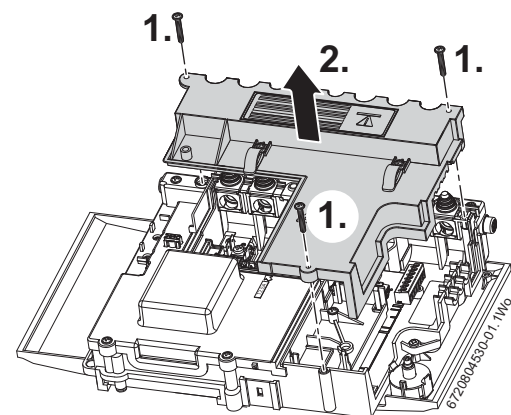


Fig. 53 Removing the connection cover (SMPS)

▶ Pass the 230 V mains power cable, from the control box, through the grommet at the right hand side of the pre-plumbing manifold and route to the mains isolator next to the boiler.

S11	Fuse F1 2.5A
ST6	Frost thermostat connection
ST10	Mains in & external controls connections
ST18	Code plug

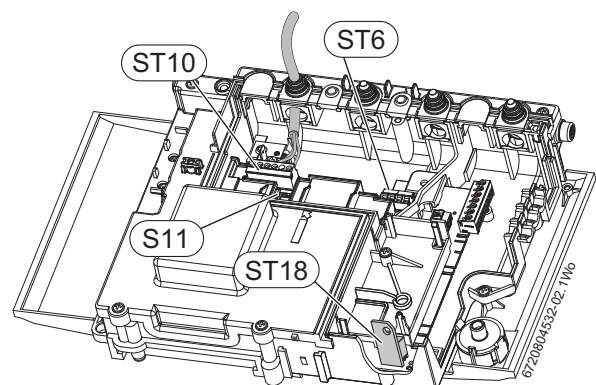


Fig. 54 Electrical connector information

4.7.1 MOUNTING OPTIONAL PLUG-IN CONTROLS



Refer to the Programmer/Timer manual for set up and operation of the unit.

PLUG-IN PROGRAMMER/TIMERS

The programmers/timers listed can be used with the boilers stated on the front of this manual.

Part number	Description
7 716 192 038	DT20 twin channel digital timer
7 716 192 054	DT20RF digital RF thermostat with twin channel programmer
7 716 192 052	DT10RF digistat
7 716 192 065	FR10 intelligent room thermostat
7 716 192 066	FR110 programmable room thermostat
7 716 192 067	FW100 weather compensation controller

REMOVING THE BLANKING PLATE

- ▶ Remove boiler casing to access control panel.
 - ▶ Refer to figure 52 and remove the screw securing the control panel.
 - ▶ Lower the control panel into the horizontal service position.
1. Release the securing screw.
 2. Pull the cover panel up to remove.
 3. Grip the tab [1], pull up to disengage the clips.
 4. Pull forward to remove the blanking plate.

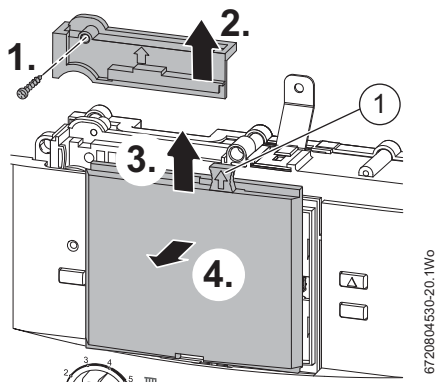


Fig. 55 Removing the blanking panel

FITTING THE PROGRAMMER/TIMER

1. Align the connector pins [1] with the socket on the circuit board [2] and push fully home. Ensure the ribbon cable fits into the recess [3]
2. Align the Programmer/Timer and locating clips with the slots.

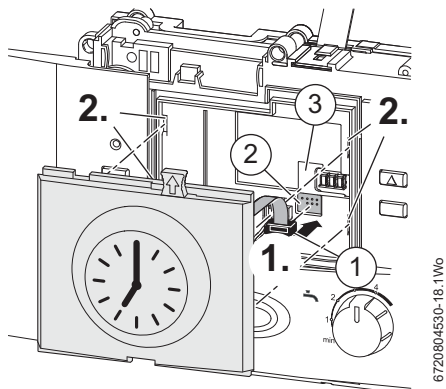


Fig. 56 Plug in connector

1. Once the Programmer/Timer is aligned push the module into the slots.
2. Push the module down to secure into position.
3. Replace the cover panel to lock the module in place.
4. Replace the securing screw.

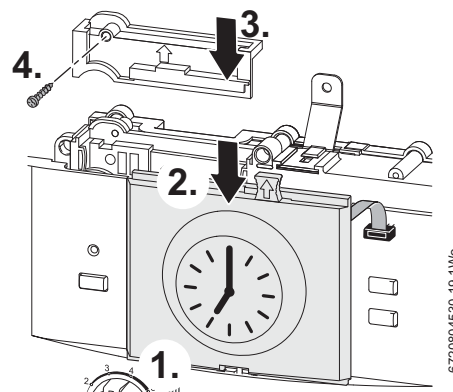


Fig. 57 Securing the module into the control panel

4.7.2 DOMESTIC INSTALLATIONS

NEW COMPLETE SYSTEM INSTALLATIONS

If a new complete heating system is installed in a new build property or it is a first time installation in an existing property, heating systems must conform to current building regulations Part L1a.

All new heating systems in dwellings must have at least two heating zones. Each of these zones will be controlled by a thermostat and zone valve.

The exception to this are single storey, open plan dwellings where the living area is more than 70% of the total usable floor area. Then this type of dwelling can be controlled as one zone.

An alternative would be individual electronically controlled TRVs. Hot water supplied would require separate time and temperature control.

For dwellings with a floor area over 150m², separate time and temperature control for each zone is required. All radiators must have TRVs fitted in all rooms except bathrooms and rooms with thermostats.

EXISTING INSTALLATIONS

For boiler replacements on an existing system, it is not necessary to zone the upstairs and downstairs differently, compliance with the zone requirements can be achieved by a single room thermostat or programmable room thermostat.

While the system is drained down, TRVs must be fitted to all rooms except the bathrooms and the room with the thermostat.

SYSTEM WIRING CENTRE CONNECTION (ST10)

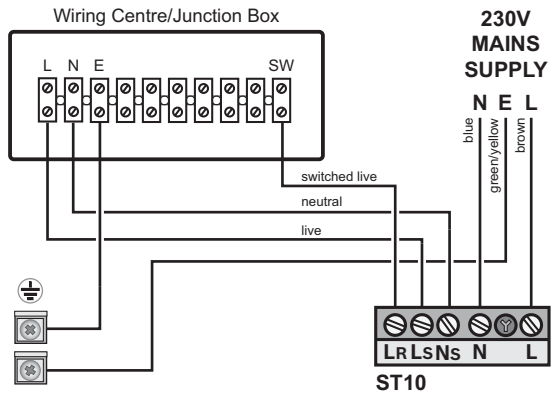
Remove the link between L_R and L_S from ST10.

- ▶ Connect the LIVE feed wire from terminal (LS) to the LIVE on the system wiring centre.
- ▶ Connect NEUTRAL wire from terminal (NS) to the neutral on the system wiring centre.
- ▶ Connect SWITCHED LIVE wire from terminal (LR) to the boiler demand on the system wiring centre.



A pump is already fitted to the boiler!
No other pump should be fitted.

- ▶ Refit the control panels removed earlier.



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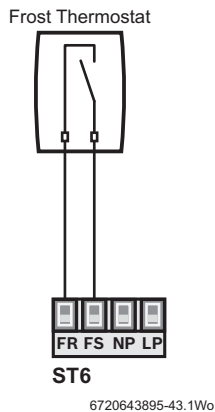
Fig. 58 Wiring centre



NOTICE:

- ▶ External diverter valve(s) and all other 230V parts are not supplied with the boiler.
- ▶ A fascia mounted programmer/timer cannot be fitted unless optional integral diverter valve is used.
- ▶ Refer to manufacturers' instructions when connecting external parts to the wiring centre.
- ▶ Worcester, Bosch Group cannot be held responsible for wiring errors.
- ▶ There is an option to fit an internal diverter valve. This also requires fitting an extra harness and a code plug change. See "Optional Diverter Valve" instructions supplied with the integral diverter valve kit.
- ▶ Option Integral Diverter Valve kits:
12kW - 7 716 192 566
15kW - 7 716 192 567
18kW - 7 716 192 568
24kW - 7 716 192 409

OPTIONAL EXTERNAL FROST STAT CONNECTION ST6:



6720643895-43.1Wo

Fig. 59 Frost Thermostat

- ▶ Connect frost thermostat cables to terminals F_S & F_R.
- ▶ These are not polarity sensitive.
- ▶ The external frost thermostat only operates the pump (see page 55 for internal frost protection).

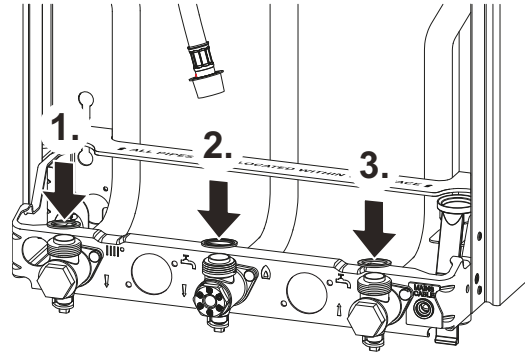
5 COMMISSIONING

5.1 PRE-COMMISSIONING CHECKS



CAUTION: ISOLATE THE MAINS ELECTRICITY SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

Check that the service and water pipes are connected to the correct position on the manifold.



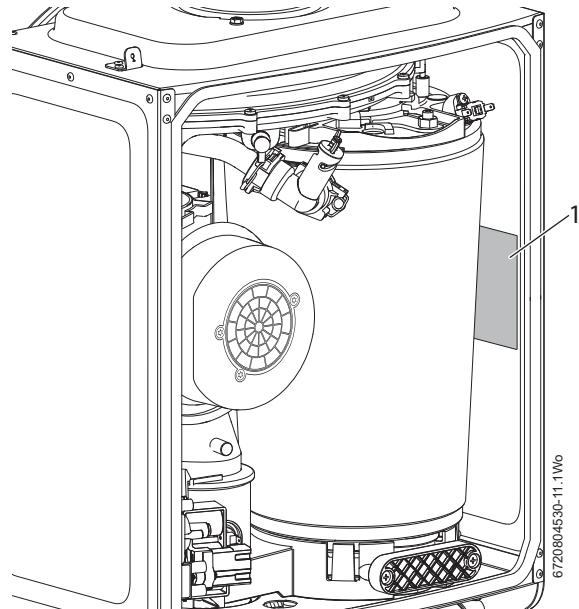
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Fig. 60 Pipe fittings

Ensure that the washers have been fitted to the water connections and the bonded washer to the gas connection on the manifold.

1. - CH Flow (22mm)
2. - Gas inlet (22mm)
3. - CH Return (22mm)

- ▶ Check the gas type specified on the identification plate (1), on the inside of the flap, matches that of the gas supply.



6720804530-11.1Wo

Fig. 61 Identification plate

- ▶ Turn on the main gas supply, check the gas pipe work, connections and rectify any leaks.
- ▶ Check that the discharge pipe (1) has been connected to the syphon and condensate outlet pipe.

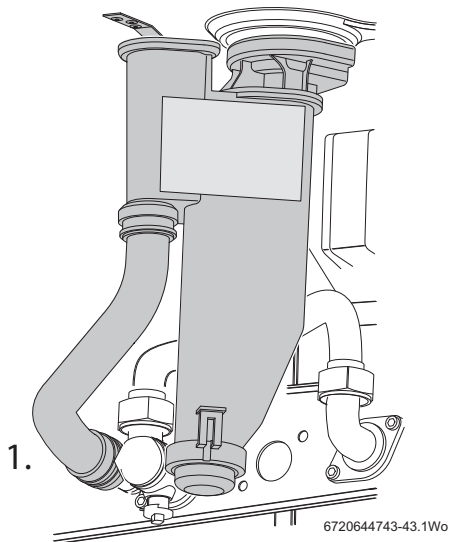


Fig. 62 Syphon connection

- ▶ Referring to figure 63, check pressure relief drain pipe (1) is correctly fitted and securely tightened.

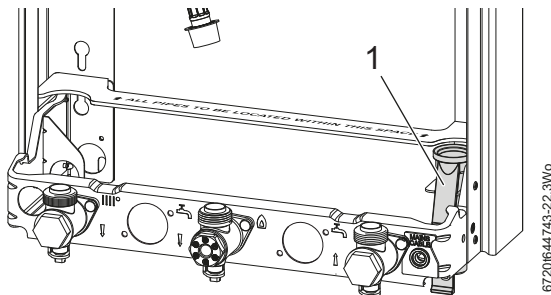


Fig. 63 Pressure relief drain pipe

NOTICE: If the boiler is not to be commissioned immediately then, after successfully completing all of the checks and any rectification work:

- ▶ Close the gas valve
- ▶ Close the water shut off valve
- ▶ Isolate the gas supply
- ▶ Isolate the electricity supply
- ▶ Label appropriately

5.2 FILLING THE SYSTEM

1. Turn on the water main and open the system valves.
2. Open all radiator valves.
3. Fill the system via a WRAS approved filling loop to 1 bar then turn the valve anti-clockwise to close.
4. Vent (1) any air from the boiler heat exchanger using a suitable container to collect any water. Ensure tube outlet (2) is directed away from the fan or any other electrical component to prevent any water damage. Also place a suitable cover over the fan to prevent any spillage of water on to electrical connections. Ensure the cover is removed after venting.

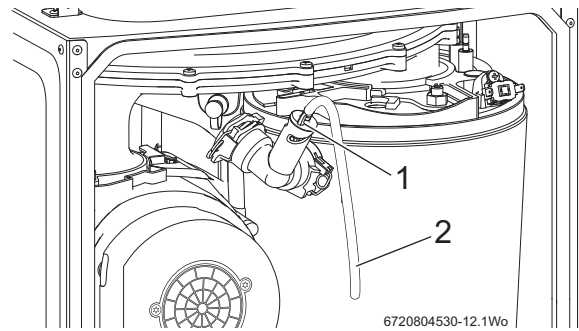


Fig. 64 Venting

5. Vent all radiators, tighten when completed and check the system and correct any leaks.
 - ▶ The boiler integral expansion vessel is pre-charged to 0.75 bar (equal to a static head of 7.5m (22ft). A Schraeder type valve is fitted to the expansion vessel to allow for pressure adjustment if required.
 - ▶ If an extra expansion vessel is fitted to the central heating return, adjust this to the same pressure as the appliance internal expansion vessel, refer to separate instructions with the extra expansion vessel.
6. Briefly open the pressure relief valve to test its operation.
7. If required increase system pressure back to 1 bar.
8. Isolate and remove filling loop connection to system or if using the optional integral filling connection (not supplied with the boiler) remove the key and place in its storage position on the bottom cover of the boiler.

5.3 WATER TREATMENT

NOTICE:

- ▶ ARTIFICIALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.

ENSURE THAT THE SYSTEM HAS BEEN CLEANED AS ON PAGE 9 OF THESE INSTRUCTIONS.

FLUSHING (Central Heating):

- ▶ Switch off the boiler.
- ▶ Open all drain cocks and drain the system while the appliance is hot.
- ▶ Close drain cocks and add a suitable flushing agent at the correct strength for the system condition in accordance with the manufacturer's instructions.
- ▶ Run the boiler/system at normal operating temperature for the time stated by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.

INHIBITOR (Central Heating):

- ▶ Check drain cocks are closed and all radiator valves are open before adding a suitable inhibitor compatible with aluminium (or combined inhibitor/anti-freeze if the system is exposed to freezing conditions) to the heating system water in accordance with the manufacturers instructions.

i The pH value of the system water must be less than 8 or the appliance warranty will be invalidated.

- ▶ Fill system via a WRAS approved filling loop to between 1 and 2 bar.
- ▶ Vent all radiators; tighten vents when complete.
- ▶ Vent any air from the boiler heat exchanger using a suitable container to collect any water.
- ▶ Ensure tube outlet is directed away from the fan or any other electrical component to prevent damage. Also place a suitable cover over the fan to prevent any spillage of water onto electrical connections. Ensure the cover is removed after venting. Vent all radiators.

- ▶ Re-pressurise if necessary to 1bar.
- ▶ Set all controls to maximum.
- ▶ Record the date when the inhibitor was added to the system on the warrantee card.

NOTICE:

- ▶ The concentration of inhibitor in the system should be checked every 12 months or sooner if content is lost.
- ▶ Normally the addition of sealing agents to the system water is not permitted as this can cause problems with deposits left in the heat exchanger.
- ▶ In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

WATER TREATMENT PRODUCTS

Suitable water treatment products can be obtain from the following manufacturers:

FERNOX	0870 601 5000 - or - www.fernox.com
SENTINEL	0800 389 4670 - or - www.sentinel-solutions.net

5.4 STARTING THE APPLIANCE

CAUTION: RUNNING THE APPLIANCE

- ▶ Never run the appliance when the appliance/system is empty or partially filled.

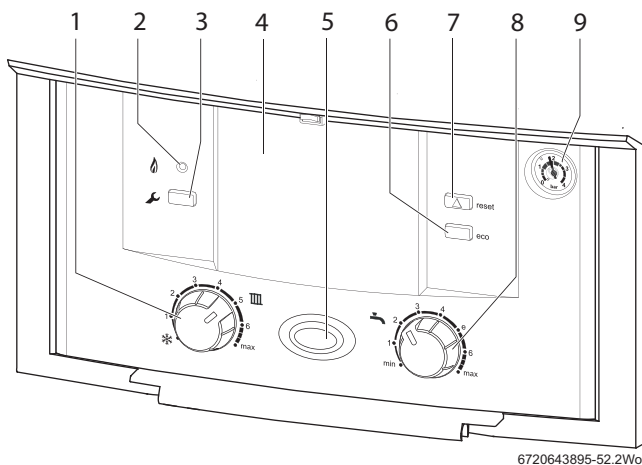


Fig. 65 Control panel

Switching the appliance on/off:

- ▶ Turn on mains power supply, the power on indicator (5) illuminates BLUE.
- ▶ Turn on any external controls
- ▶ Set the thermostatic radiator controls to maximum temperature
- ▶ Set the clock/programmer to continuously ON and the room thermostat to maximum temperature

1	Central heating temperature control
2	Burner indicator (Green)
3	Service button
4	Cover or optional Programmer
5	Power ON and fault indicator (Blue)
6	ECO button - Not used
7	Reset button
8	DHW temperature control
9	System pressure gauge

Table 17 Control panel legend

Turn the boiler CH temperature control (1) to maximum. The burner on indicator (2) illuminates GREEN when the burner has lit.

If the boiler fails to light, the BLUE power indicator (5) and reset button (7) will flash.

NOTICE: RESET

- ▶ Do not press the blue power indicator (5) to reset the boiler.

To reset press and hold the reset button (7) for more than two seconds. The boiler will be reset.

5.5 COMMISSIONING

NOTICE: The combustion settings on this gas-fired boiler have been checked, adjusted and preset at the factory for operation on the gas type defined on the data plate. No measurement of the combustion values is necessary provided there is a meter installed allowing the gas rate to be checked.
DO NOT ADJUST THE AIR/GAS RATIO VALVE.

i When running in the service mode, the boiler will operate both the central heating and the domestic hot water circuits. This is to allow sufficient time for this part of the commissioning procedure. It will be necessary to run water through the domestic hot water circuit to ensure that the boiler will not cycle on low heating demands.

Having checked:

- ▶ That the boiler has been installed in accordance with the installation instructions.
- ▶ The integrity of the flue system and flue seals, as described in section 6.3 of this manual.
- ▶ The integrity of the boiler combustion circuit and relevant seals.

5.5.1 CHECKING THE GAS INLET PRESSURE

The inlet pressure to the appliance must be checked using the following procedure:

MEASURING THE INLET PRESSURE

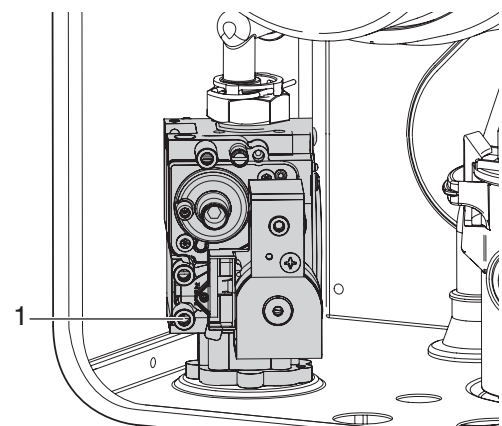


Fig. 66 Inlet pressure test point

- ▶ Close gas isolation valve.
- ▶ Slacken the screw in the inlet pressure test point (1) and connect a manometer.
- ▶ Open gas isolation valve.
- ▶ Measure the pressure with the boiler running at maximum.
 - Press service button for more than ten seconds and set Central Heating temperature to maximum.
 - The service button will illuminate continually and the blue power indicator will pulse five times.
- ▶ Check the gas supply working pressure at the gas valve conforms to values shown in Fig. 67 or Fig. 68 .

NOTICE: Inlet gas pressure
 ▶ Ensure that the inlet pressure is satisfactory with all other gas appliances working.

GAS PRESSURE WITHIN THE SYSTEM

Refer to the figures below for natural gas or L.P.G gas pressures.

The pressure at the boiler must not be less than the pressure read at the meter minus:

- 1mbar for Natural Gas
- 2.5mbar for L.P.G.

The pressure drop from the meter to the gas valve must not be more than:

- 2.5mbar for Natural Gas
- 4mbar for L.P.G.

If the pressure drops are greater than shown below, then this would indicate a problem with the pipe work or connections within the system.

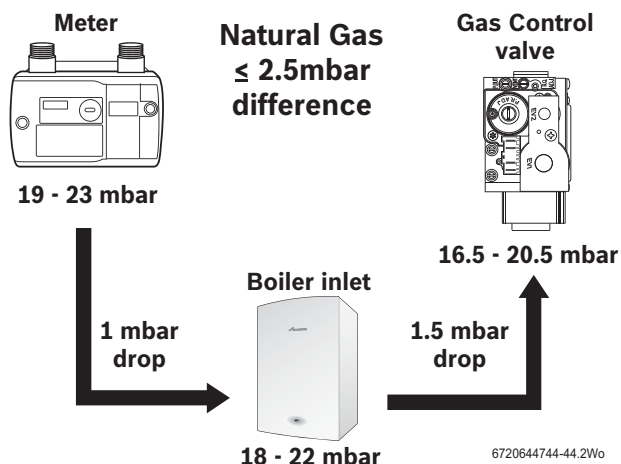


Fig. 67 Natural gas pressures

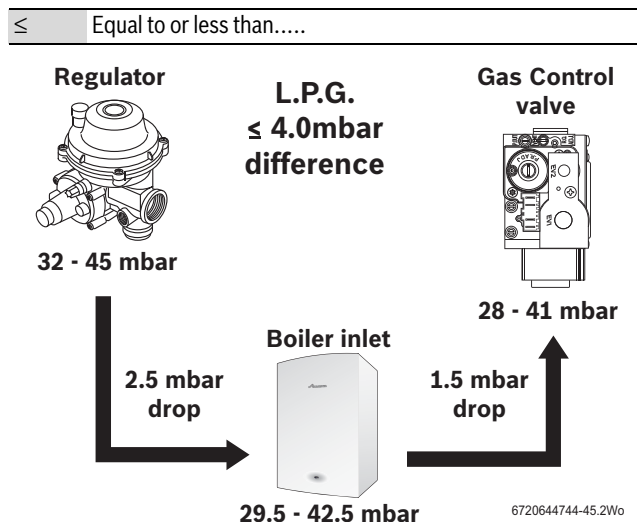


Fig. 68 L.P.G. pressures

NOTICE:
 Do not continue commissioning until the correct gas pressure is achieved.

5.5.2 CHECKING THE GAS RATE

- ▶ The gas rate should be measured at the gas meter after 10 minutes operation at maximum.
 See technical data section at the front of this manual.
- ▶ Where a gas meter is not available (e.g. L.P.G.) the CO/CO₂ must be checked to the units shown in the setting of the air/gas ratio, refer to section 6.6.
- ▶ If pressure and gas rate are satisfactory press the service button again and the boiler will return to normal operation.
 – If left in the service mode the control will return to normal operation after 15 minutes.
- ▶ Close the gas isolation valve.
- ▶ Remove the manometer.
- ▶ Re-seal the screw in the gas inlet pressure test point.
- ▶ Open the gas isolation valve.
- ▶ Ensure that there are no gas leaks.
- ▶ Replace the outer case.

5.5.3 DOMESTIC HOT WATER:

Controlling the hot water temperature:

NOTICE: Domestic Hot Water
 ▶ The hot water temperature can only be controlled when the “Optional diverter valve” kit is fitted.

The hot water temperature can be set to between approximately 40°C and 60°C using the DHW temperature control.

5.6 CO AND COMBUSTION CHECK

The following combustion and flue integrity checks will be mandatory from April 2014 and these values must be recorded on the Benchmark check list, at the back of this manual.

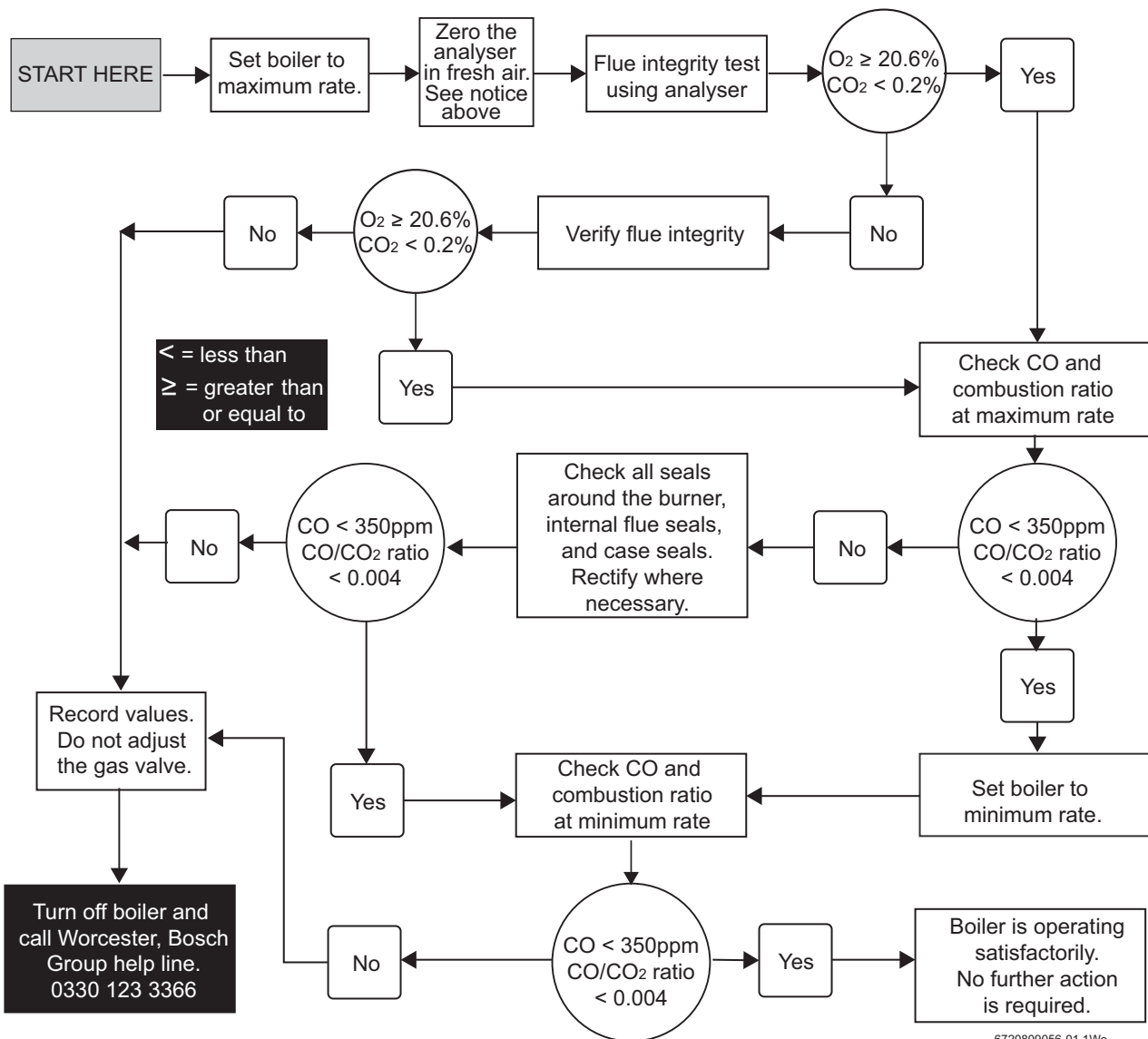
Once the gas rate and pressure have been confirmed as acceptable then the CO and combustion checks can be undertaken.

The flow chart is given for guidance, the details of the checks are given in the following sections:

- Checking flue integrity, refer to section 6.3, page 36
- Flue gas analysis, refer to section 6.5, page 37

NOTICE: BEFORE CO AND COMBUSTION CHECKS:

- ▶ Refer to section 5.5.1 and 5.5.2 to verify gas type, gas inlet pressure, and gas rate. Visually check the integrity of the whole flue system and confirm that all the components are correctly assembled, fixed and supported.
- ▶ The flue gas analyser must be the correct type as specified in BS 7967. Before use the analyser must have been calibrated as specified by the manufacturer. The installer must be competent in the use of the analyser. Check and zero the analyser in fresh air as specified by the manufacturer.
- ▶ The air/gas ratio valve is factory set and must not be adjusted during commissioning unless this action is recommended following contact with the Worcester, Bosch Group help line 0330 123 3366.



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Fig. 69 Combustion check flow chart

5.7 FINISHING COMMISSIONING

5.7.1 REPLACE OUTER CASING:

- ▶ Replace outer casing making sure that the securing points are properly located.
- ▶ Replace top two screws (1).
- ▶ Tighten bottom two screws (2).

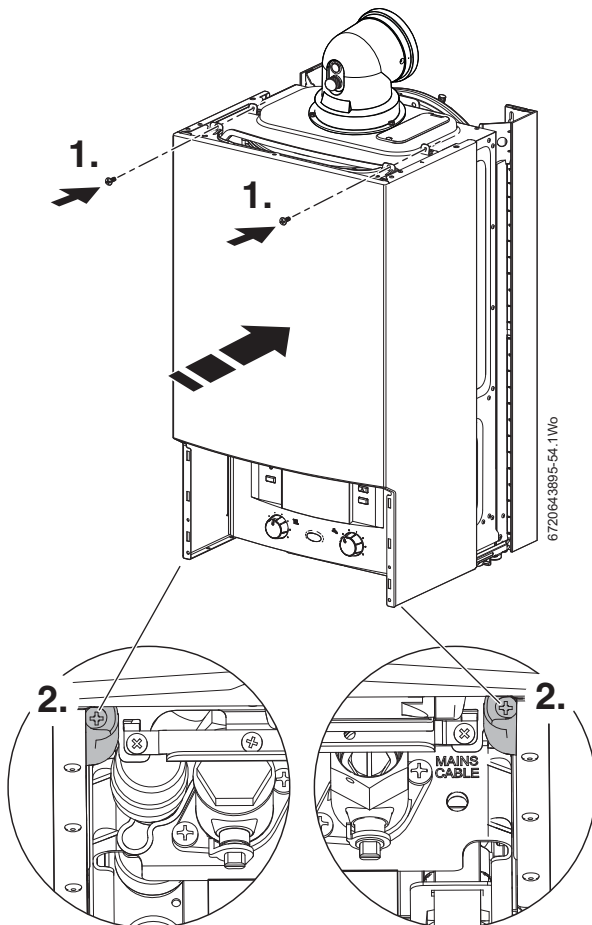


Fig. 70 Fitting case

5.7.2 FITTING FASCIA FLAP

- ▶ Present the flap up to the appliance with the hinge pins facing the appliance.
- ▶ Engage the left hand pin into the grey pivot. The hinge pin and pivot hole are both square, rotate the flap to ensure that the pin is located in the pivot.
- ▶ Support the flap in your left hand and with your right hand, bend the right side down. This should enable you to engage the right hand pin in the pivot. Rotate the flap to ensure that the pins and pivots are located securely.
- ▶ Close the flap.

5.7.3 INSTALLING BOTTOM PANEL

- ▶ The bottom panel slides onto two ledges (C) either side of the boiler frame.
- ▶ Hold the panel up against the underside of the boiler and slide towards the rear, until there is no more movement.
- ▶ Slide the panel forward until it is fully engaged.

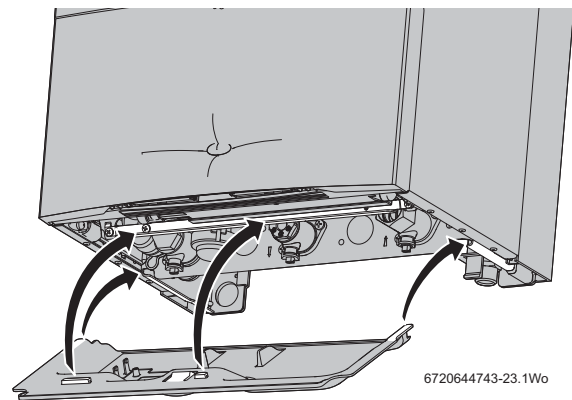


Fig. 71 Bottom panel installation



NOTICE: Every time the power to the appliance is turned off and on, the appliance enters a learning mode and may take some time to optimise the boiler performance. This time is variable and is dependant on hot water and central heating demand.

5.7.4 HAND OVER

- ▶ Complete the Benchmark Gas Boiler Commissioning Checklist.





The Benchmark Checklist can be found at the rear of these instructions.


- ▶ Open the fascia cover by gently pressing the centre top of the cover.
- ▶ Set up the controls and show the user how to operate all the controls shown in the User Guide.
- ▶ Ensure that the user guide is left with the boiler or homeowner.
- ▶ If the appliance is unused and exposed to freezing conditions, shut off all the mains supplies and drain the system and boiler.

6 SERVICE AND SPARES

6.1 INSPECTION AND SERVICE

 **CAUTION:** TURN OFF THE GAS SUPPLY AND ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

 **NOTICE:** COMPONENTS.
▶ After replacement of any components always check for gas tightness where relevant and carry out functional checks as described in Commissioning. Damaged O-rings or gaskets must be replaced.

 **NOTICE:** Service work must be carried out by a competent registered engineer, such as British Gas or Gas Safe registered personnel!

 **NOTICE:** SERVICE MUST **NOT** BE ATTEMPTED IF A CO/CO₂ ANALYSER IS **NOT** AVAILABLE.

- To ensure the continued efficient operation of the appliance it must be checked at regular intervals.
- The frequency of servicing will depend upon the particular installation conditions and usage however, an annual service is recommended.
- The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers.
- The service interval record sheet at the rear of these instructions must be completed after each service.

INSPECTION

1. Check that the terminal and the terminal guard, if fitted, are clear and undamaged.
2. If the appliance is in a compartment or cupboard check that the specified service space around the appliance is clear.
3. Check all the joints and connections in the system and remake any that show signs of leakage. Refill and re-pressurise if applicable as described in Commissioning.
4. Operate the appliance and take note of any irregularities. Refer to Fault Finding for rectification procedures.

COMPONENT ACCESS

1. Removing outer case
 - Remove bottom panel by pushing it fully back and then pulling it forward and down to remove.
 - Undo and remove two screws (1) securing boiler casing at the top of the appliance.
 - Undo but do not remove the two screws (2). Pull case forward and remove.

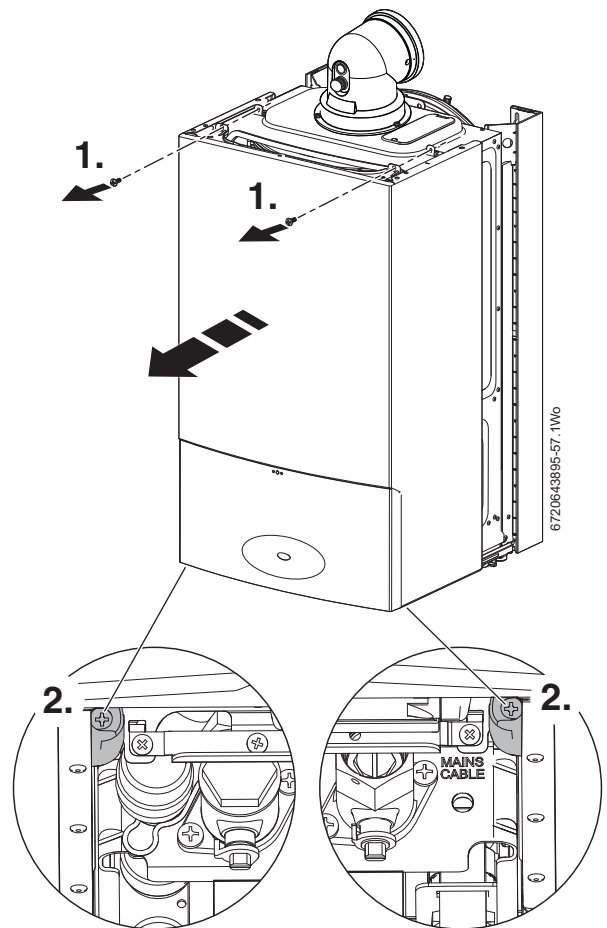


Fig. 72 Remove outer case

2. Lowering boiler control to the service position:
 - Remove screw (1) securing the control panel.
 - Pull the panel (2) forward into the service position.

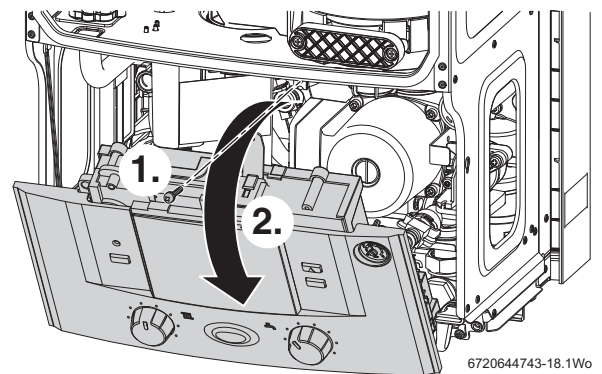



Fig. 73 Moving control panel into the service position

6.2 CHECK THE GAS INLET PRESSURE

Refer to section 5.5.1 for checking the gas inlet pressure.

 **NOTICE:**

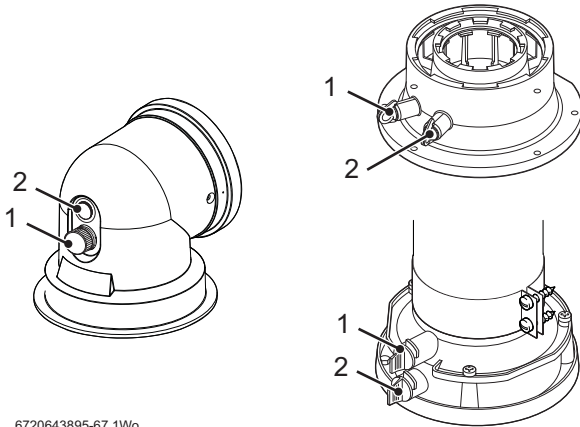
- ▶ Ensure that the gas inlet pressure is satisfactory with all other gas appliances working.
- ▶ Do not continue with the other checks if the correct gas inlet pressure can not be achieved.

6.3 CHECKING FLUE INTEGRITY

The integrity of the flue system and performance of the boiler can be checked via the flue turret sample points.

Flue gas sample point	1
Air inlet sample point	2

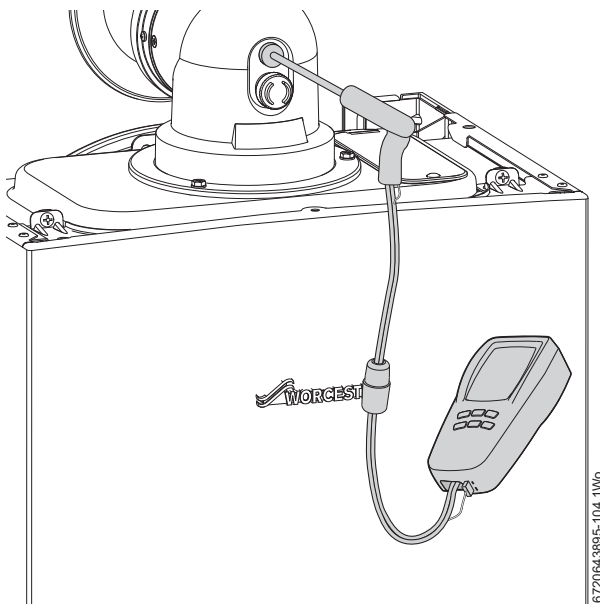
Table 18 Key to figure 74



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Fig. 74 Flue test points

- ▶ With the boiler case on and the boiler running at maximum.
- ▶ Insert the analyser probe into the air intake test point.
- ▶ Allow the readings to stabilise and check that:
 - O₂ is equal to, or greater than 20.6%
 - CO₂ is less than 0.2%
- ▶ If the readings are outside these limits then this indicates that there is a problem with the flue system or combustion circuit.



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Fig. 75 Flue integrity test

6.4 FAN PRESSURE TEST

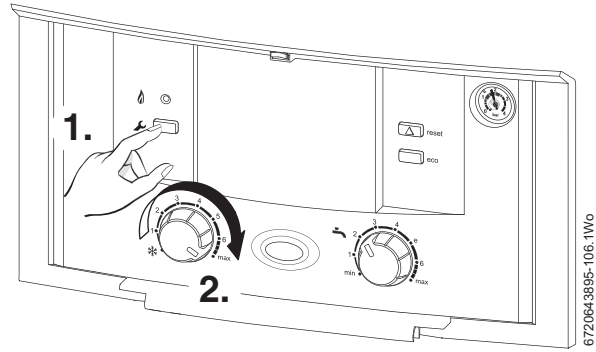


This test is to determine if the heat cell requires cleaning/attention.

SETTING THE BOILER TO MAXIMUM

1. Press and HOLD service button for more than 10 seconds
2. Set the Central Heating temperature to maximum.
 - The service button will illuminate continually and the blue power indicator will pulse 5 times.

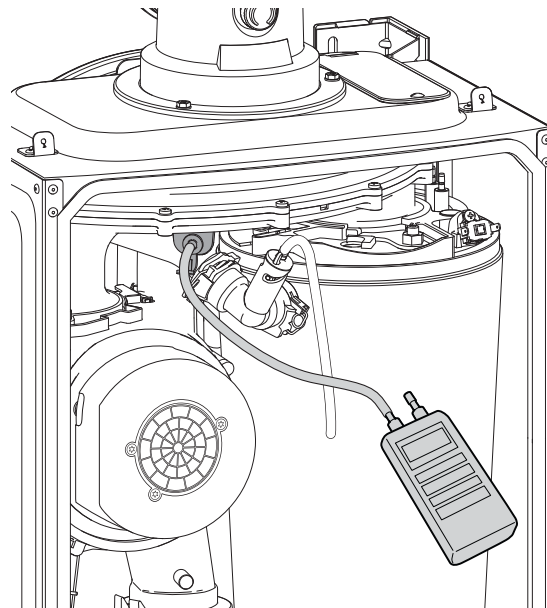
- The boiler will stay in this mode for 15 minutes unless the service button is pressed again.



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Fig. 76 Set boiler to maximum

FAN PRESSURE



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Fig. 77 Fan pressure test point

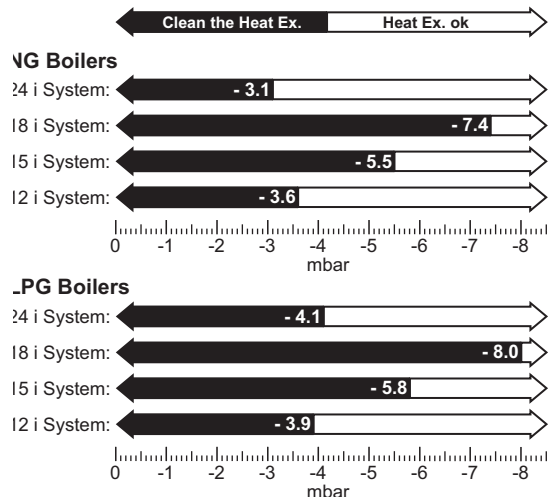
- ▶ Remove the cover and connect a digital manometer to the fan pressure test point.
- ▶ After measurement replace test point cover.
- ▶ The pressure will read negative, refer to the chart in figure 78.



NOTICE:

The boiler must be run at maximum output for Fan Pressure test and the Flue Gas analysis.

FAN PRESSURE TEST



6720644743-32.1W6

Fig. 78 Fan pressure readings

If the boiler fails the fan pressure test then before adjusting the air/gas ratio, try the following:

- ▶ Check the syphon is not blocked.
- 1. Remove the screws securing the sump cover.
- 2. Remove the sump cover.
- 3. Clean the sump and heat exchanger with a suitable brush
- ▶ Check the exhaust path and flue for restriction.
- ▶ Re-check the Fan Pressure readings

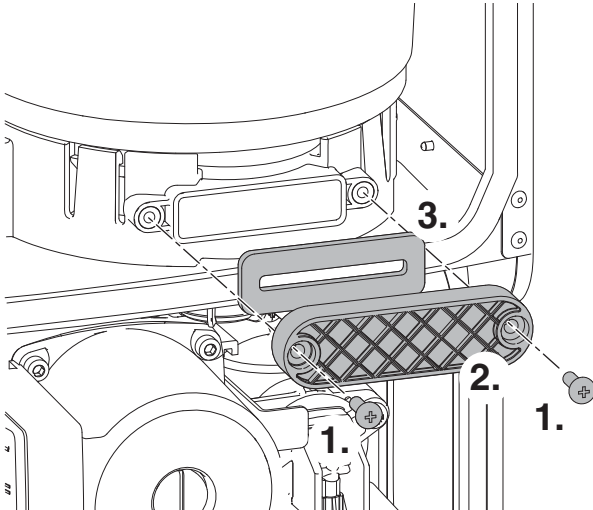


Fig. 79 Sump access

6.5 FLUE GAS ANALYSIS

COMBUSTION TEST:

- ▶ Connect the flue gas analyser to the flue gas sampling point as shown in the figure below.
- ▶ Run the boiler at maximum output for at least 10 minutes.
- ▶ Check the CO/CO₂ readings against the information in table 19 CO/CO₂ settings.

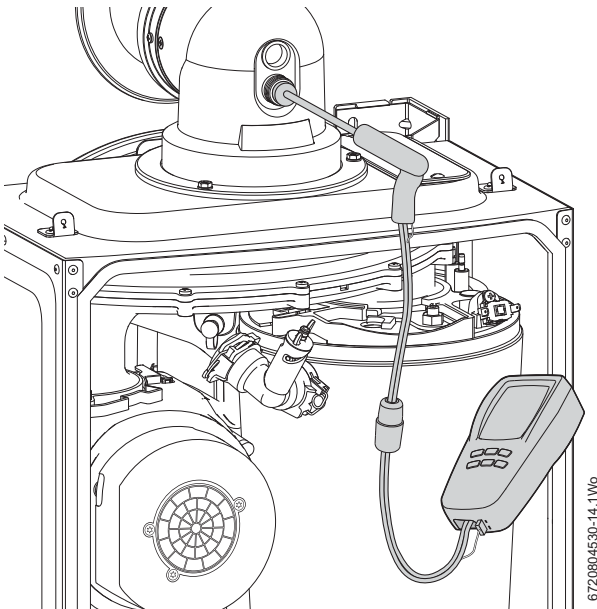


Fig. 80 Combustion test

If the boiler fails the combustion test, check:

1. Air intake for restriction
2. Diaphragm in the fan, for correct operation
3. Cleanliness of the heat cell, plus blockages in the condensate disposal

6.6 SETTING THE AIR/GAS RATIO



NOTICE: THE SETTING OF THE GAS RATIO MUST BE CARRIED OUT BY A COMPETENT PERSON. SETTING OF THE GAS RATIO MUST NOT BE ATTEMPTED UNLESS THE PERSON CARRYING OUT THE TEST IS EQUIPPED WITH A COMBUSTION ANALYSER CONFORMING TO BS 7927 AND IS COMPETENT IN ITS USE.

6.6.1 SETTING THE CO/CO₂

- ▶ Refer to section 5.6.1 and ensure that the gas inlet pressure is correct before continuing.
- ▶ To adjust the CO/CO₂ it will be necessary to first operate the boiler at maximum output.
- 1. Press and hold down the service button for more than 10 seconds until illuminated.
The blue power indicator will pulse 5 times.
- 2. Turn central heating control to maximum; the boiler will then go to maximum output.



The control will resume normal operation after 15 minutes or if the service button is pressed for more than a second.

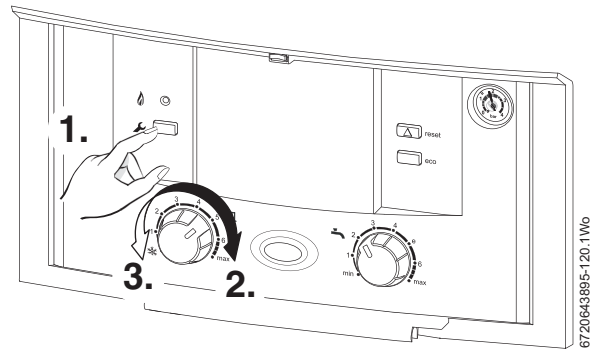


Fig. 81 Setting the boiler

- ▶ Refer to table 19 and check the CO/CO₂ at maximum. If required set the maximum CO/CO₂ via adjuster (1) on the gas valve using a 2.5mm Allen key.
- ▶ Check CO is less than 200ppm.
- 3. Set the central heating control to minimum.
- ▶ The boiler will go to minimum power.
- ▶ Measure the CO/CO₂ and check against table 19 below.
If required set the minimum CO/CO₂ via adjuster (2) on the gas valve until the correct measurement is set:
 - Remove dust cap with flat bladed screw driver.
 - Using a 4mm Allen key adjust CO₂.
 - Replace the dust cap.
- ▶ Check that the CO is less than 200ppm.
- ▶ Return to maximum and re-check the CO/CO₂.
If correct, press the service button; the button will cease to be illuminated and the blue power indicator will be permanently illuminated.
- ▶ Re-assemble and refit boiler case.

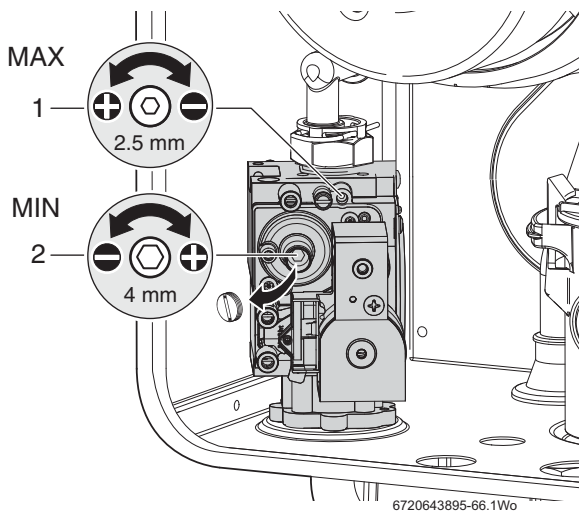


Fig. 82 Gas valve adjustment

CO/CO ₂ settings for Greenstar i System		
CO/CO ₂ should be measured after 10 minutes.		
Gas type	CO ₂ max.	CO ₂ min.
Natural gas 12i System	9.65% ± 0.5	8.65% ± 0.5
Natural gas 15,18 & 24i System	9.8% ± 0.5	9.2% ± 0.5
L.P.G.	11.0% ± 0.5	10.5% ± 0.5

NOTE: When checking an existing appliance the tolerance is ± 0.5.
If checking after cleaning or component replacement or for adjustment when the reading obtained is outside the tolerances given above, then the tolerance is ± 0.2.

CO - less than 200 ppm (0.002 ratio)

Table 19 CO/CO₂ settings

6.7 CLEANING THE HEAT EXCHANGER

NOTICE: COMBUSTION TESTING

- ▶ Combustion testing must be carried out by a competent person. Testing must not be attempted unless the person carrying out the combustion check is equipped with a Combustion Analyser conforming to BS 7927 and is competent in its use.

NOTICE: CO/CO₂ CHECKS

- ▶ If the joint between the Air/Gas manifold and heat exchanger is disturbed sealing gasket must be replaced.
- ▶ After completing the service of the appliance, the CO/CO₂ must be checked and set to the limits shown in "Setting the air/gas ratio" on page 37.

i There is a special accessory kit available specifically designed for cleaning the heat exchanger. If required order 7 716 192 312.

▶ Isolate the power to the appliance and remove outer case and base panel.

1. Refer to figure 83 and remove the clip from gas valve outlet.

i If the plastic elbow can not be easily removed, undo the nut to push the plastic elbow out of the fitting.

2. Pull the gas outlet elbow free from the gas valve.

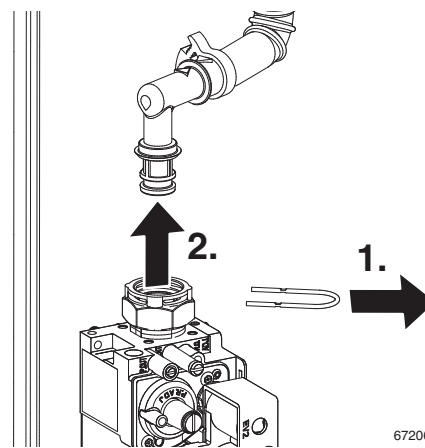


Fig. 83 Gas valve connection

▶ Remove electrical connector and earth wire from fan.



To prevent damage to the electrodes when removing the air/gas manifold, disconnect the leads to the electrodes.

▶ Disconnect spark electrode and flame sensor connections.

1. Refer to figure 84 and undo the securing nut on the top of the heat exchanger and remove the retaining plate assembly.

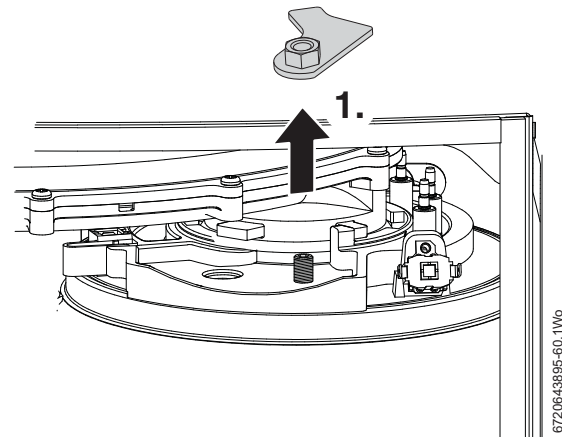


Fig. 84 Securing nut

1. Refer to figure 85 and rotate fan and air/gas manifold assembly around the top of the heat exchanger until it stops at the lug.

▶ Lift up assembly and remove from boiler.

2. Remove the cover panel by removing retaining screw.

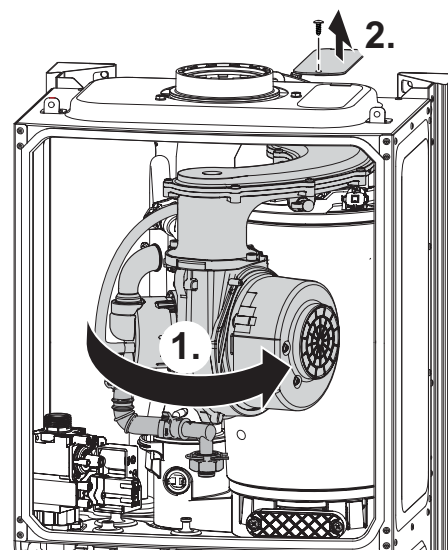
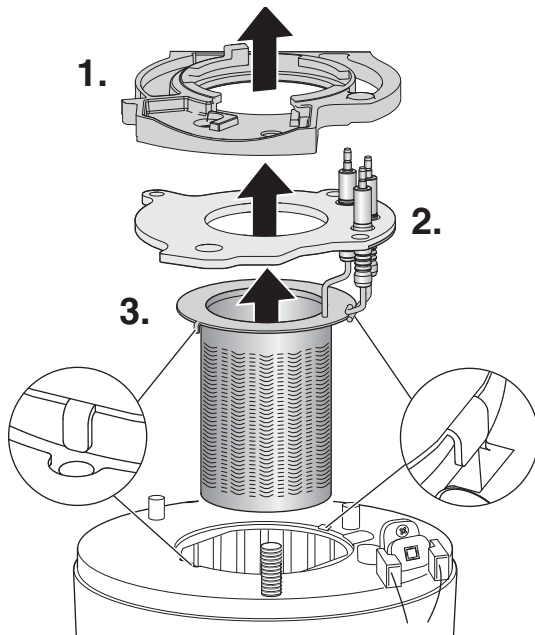


Fig. 85 Rotate air/gas manifold

BURNER REMOVAL

Refer to figure 86

1. Remove clamping plate.
2. Remove spark/flame electrode assembly and seal from the top of the heat exchanger.
3. Remove burner.



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Fig. 86 Burner removal

Checking and cleaning the electrode assembly:

	<p>NOTICE: Cleaning</p> <ul style="list-style-type: none"> ▶ Do not use wire wool to clean the electrodes
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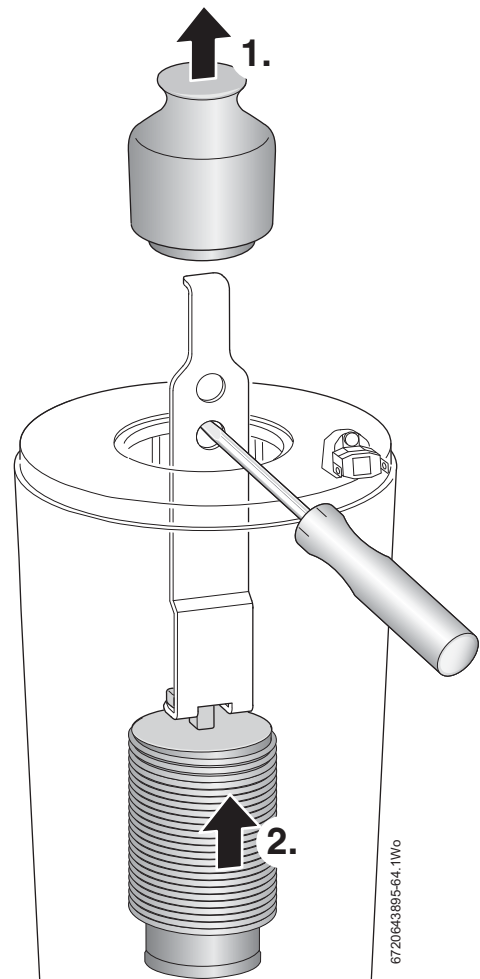
- ▶ Inspect the condition of the electrodes and ceramics, replace if necessary.
- ▶ Use a plastic scouring pad to clean the electrodes.

BAFFLE REMOVAL

Refer to figure 87.

1. Remove top baffle.
2. Remove lower baffle.

	<p>If the lower baffle is stuck, it may be necessary to use the "Baffle removal tool" from the heat exchanger cleaning kit - 7 716 192 312, as shown in figure 87.</p>
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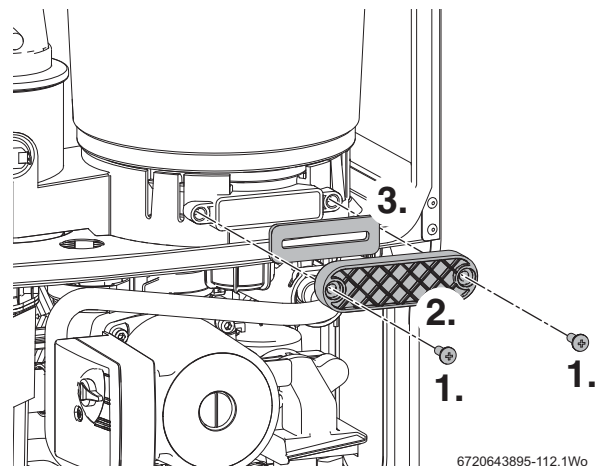
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Fig. 87 Baffle removal

ACCESS COVER REMOVAL

Refer to figure 88.

1. Remove the two pozi-drive screws
2. Remove the access cover
3. Remove the gasket.



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Fig. 88 Access cover removal

CLEANING THE PRIMARY HEAT EXCHANGER

- ▶ Refer to figure 89 and access the heat exchanger flue ways by inserting the cleaning brush (7 716 192 312) through the top access hole in the casing, removal of panel shown in figure 85.
- ▶ Clean heat exchanger flue ways using the cleaning brush removing any debris from the access point in the sump.
- ▶ Clean around the sealing surface on the sump.
- ▶ Replace the access cover.

- ▶ Using a suitable container to collect water from syphon connection at the base of the boiler flush heat exchanger with water.
- ▶ Re-assemble ensuring that the lower baffle (2) and the top baffle (1) are refitted correctly.
- ▶ Refer to figure 86 when re-fitting the burner to ensure that it fits centrally within the heat exchanger and location tabs are situated in location holes.
- ▶ Ensure that the seal is replaced with a new seal and ensure that the seal is correctly fitted.
- ▶ Check the syphon unit is clean before refitting to boiler.
- ▶ Reassemble and check combustion as stated in "SETTING THE AIR/GAS RATIO" section on page 37.



THE HEAT EXCHANGER DOES NOT HAVE TO BE REMOVED TO CLEAN.

The heat exchanger is shown removed from the boiler to illustrate cleaning more clearly.

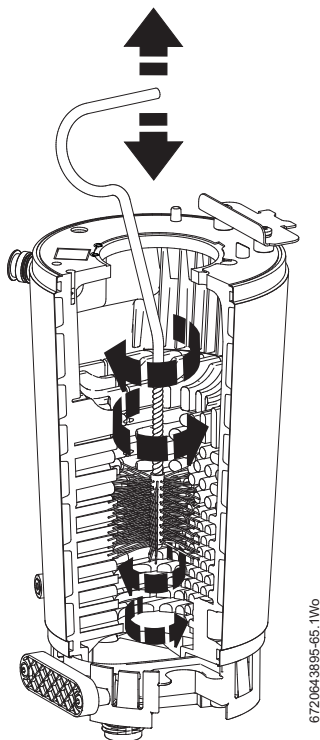


Fig. 89 Cleaning heat exchanger



NOTICE: Heat exchanger baffles.

The baffles (1) and (2) must be refitted into the heat exchanger in the order shown in figure 87. Failure to do so may result in damage to the boiler.



NOTICE: CO/CO₂ CHECKS

- ▶ If the joint between the Air/Gas manifold and heat exchanger is disturbed sealing gasket must be replaced.
- ▶ After completing the service of the appliance, the CO/CO₂ must be checked and set to the limits shown in "Setting the air/gas ratio" on page 37.
- ▶ When replacing the burner gasket ensure that the clamping plate is fully tightened down to the heat exchanger.

CLEANING THE SIPHON

There is no need to remove the Siphon to clean.

To drain debris from the syphon, release the clips and remove the drainage cap from the bottom of the syphon.

Catch the debris and condensate from the siphon in container.

6.8 REPLACEMENT OF PARTS



CAUTION: Turn off the gas supply and isolate the mains supplies before starting any work and observe all relevant safety precautions.



NOTICE: REPLACEMENT OF COMPONENTS.

- ▶ After replacement of any components always check for gas tightness where relevant and carry out functional checks as described in Commissioning. Damaged O-rings or gaskets must be replaced.

6.8.1 REMOVING OUTER CASE

1. Undo the two screws securing the top of the boiler casing.
 2. Undo the two screws securing the bottom of the boiler casing.
- ▶ Pull the case forward and remove. To remove bottom tray, pull forward on the tag on the underside of the tray.

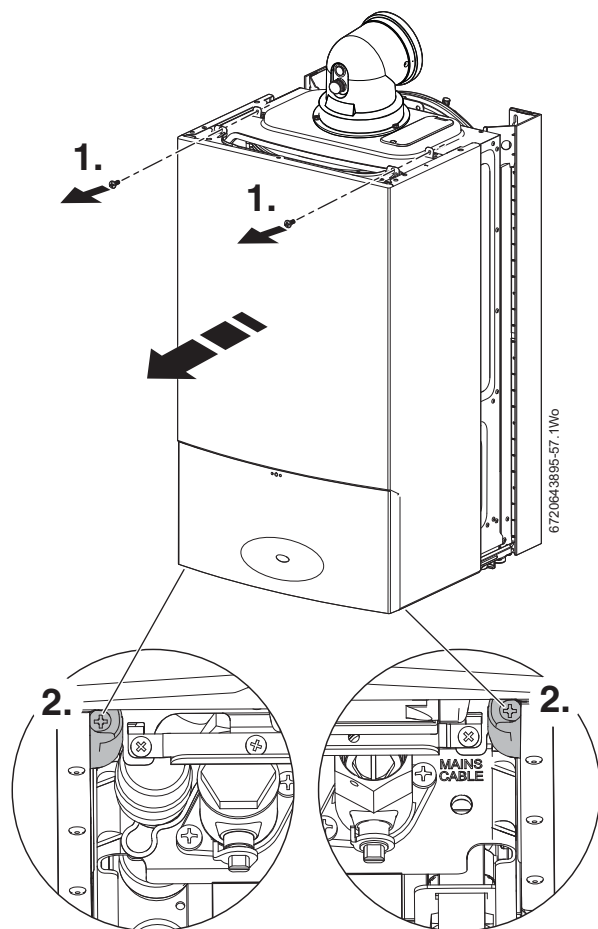


Fig. 90 Remove outer case



To gain access to the following components the outer case has to be removed:

- ▶ Primary sensor
- ▶ Overheat thermostat
- ▶ Flue limit thermostat

6.8.2 PRIMARY SENSOR

Refer to figure 91 for removal.

1. Remove electrical connection by pulling upwards. Squeeze retaining clip on plastic moulding of sensor and pull back and up until clear of pocket in heat exchanger.
 2. Pull forward to remove completely.
- ▶ Coat new sensor with heat conductive paste and replace.

6.8.3 OVERHEAT THERMOSTAT

Refer to figure 91 for removal.

- ▶ Remove two electrical connectors from thermostat.
- 3. Slacken and remove fixing screw and thermostat (3).
- ▶ When replacing ensure thermostat sits correctly on surface of the casting with the left hand side of thermostat sitting up against the shoulder.



It is essential that the mating surface of the thermostat is coated with heat conductive paste.

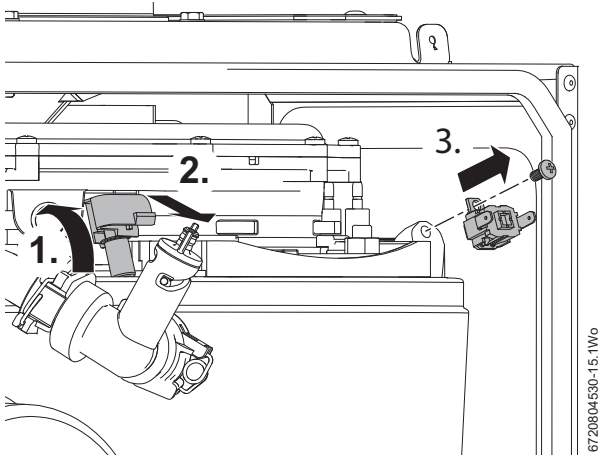


Fig. 91 Primary sensor and overheat thermostat

6.8.4 FLUE OVERHEAT THERMOSTAT (WITH GROMMET)

To remove and replace the thermostat either:

- ▶ Using a small terminal screwdriver, prise the thermostat and grommet from the plastic housing.
- Take care not to damage the grommet or plastic housing.

-or-

1. Release the flue connection from the sump.
2. Push the flue tube up.

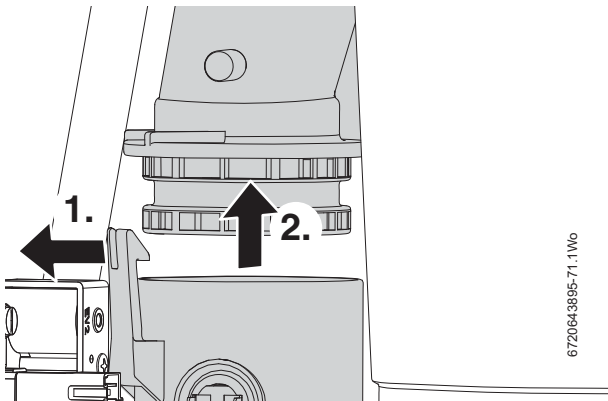


Fig. 92 Lower exhaust section

- ▶ Remove electrical connections.
- ▶ Push the flue limit thermostat in from the sump.
- ▶ Retrieve the thermostat from the sump well.

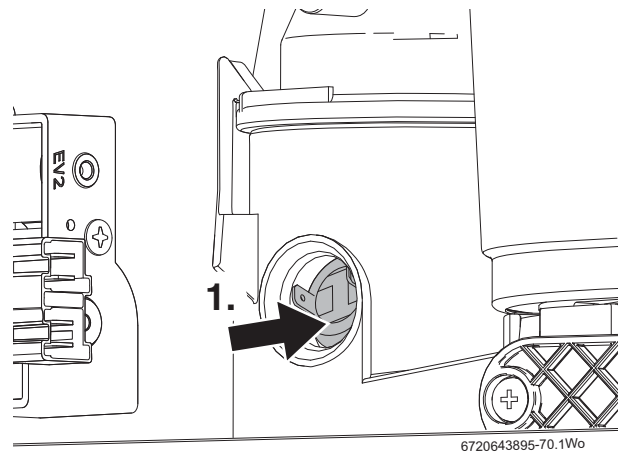


Fig. 93 Remove thermostat

To replace, push the thermostat and grommet gently back into the opening until contact with the locating ridge is felt.

6.8.5 MOVING CONTROLS TO SERVICE POSITION



To remove the following components require the control box must be moved in to the service position:

- ▶ Gas valve
- ▶ Syphon
- ▶ PCB
- ▶ Fuse



NOTICE: REPLACEMENT OF THE GAS VALVE MUST NOT BE CARRIED OUT IF A CO/CO₂ ANALYSER IS NOT AVAILABLE.

1. Remove the screw securing control panel.
2. Gently pull the panel forward.

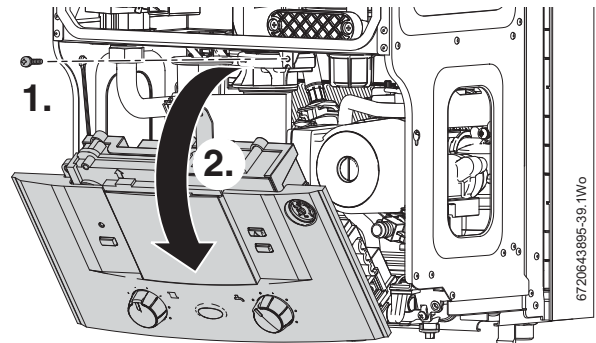


Fig. 94 Control panel to service position

6.8.6 GAS VALVE

- ▶ Isolate gas supply at boiler gas cock.

1. Refer to figure 95 and remove wire clip from the gas valve outlet.
 2. Pull the gas pipe free from the gas valve.
- If the pipe will not pull out, unscrew the nut to aid removal.

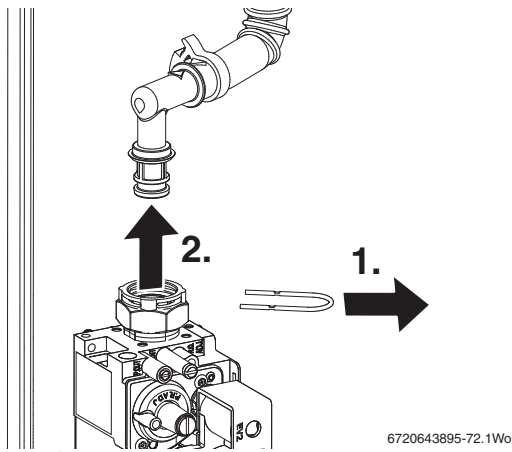


Fig. 95 Gas valve upper connection

1. Refer to figure 96 and undo bottom gas connection to gas valve.
 2. Undo two securing screws on the underside of casing.
- ▶ Disconnect electrical connections.
 - ▶ Pull valve up and forward out of boiler.
 - ▶ Replace valve with new seals and check for gas tightness.

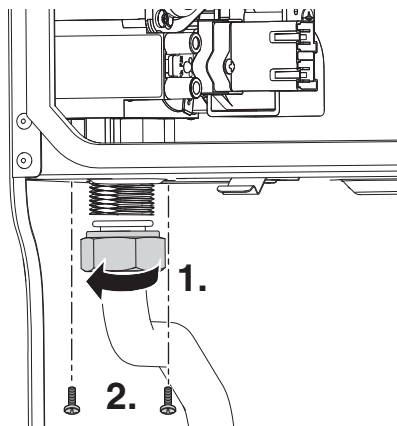


Fig. 96 Gas valve lower connection

NOTICE: The valve will require setting; follow procedure “Setting the air/gas ratio”.

6.8.7 AIR/GAS MANIFOLD AND FAN ASSEMBLY

- i** The following components require the air/gas manifold and fan assembly to be removed:
- ▶ Fan electrode assembly
 - ▶ Burner
 - ▶ Heat exchanger

NOTICE:

- ▶ If the joint between the Air/Gas manifold and heat exchanger is disturbed sealing gasket must be replaced.
- ▶ After re-assembly the combustion must be checked using the procedure in the section “Setting the Air/Gas ratio”. Measurement and setting (if necessary) of the gas ratio must not be attempted unless the person is equipped with a combustion analyser conforming to BS 7927 and is competent in its use.

- ▶ Remove electrical connector and earth wire the from fan.
- ▶ Remove wire clip from gas valve outlet then pull gas pipe free from the gas valve (see figure 95).

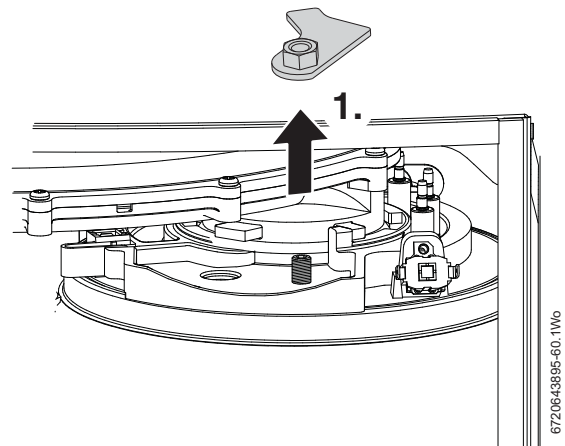


Fig. 97

- ▶ Undo the securing nut at the top of the heat exchanger and remove the retaining plate assembly (1).

i Disconnect spark electrodes and flame sensor connection. This will prevent damage to the electrodes and sensor when the air/gas manifold is rotated.

- ▶ Rotate fan and air/gas manifold assembly (1.) around the top of the heat exchanger until the lug on the air/gas manifold is visible.

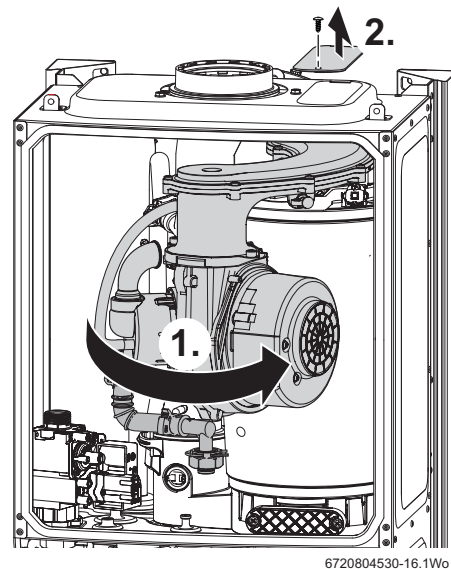


Fig. 98 Rotate the air/gas manifold assembly

- ▶ Lift up assembly and remove from boiler.

NOTICE: After re-assembly, check the CO/CO₂ levels as described in section 6.6 Setting the air/gas ratio.

6.8.8 FAN

- ▶ Remove the air/gas manifold from the boiler as described in the previous section.
1. Remove two screws retaining the fan to the air/gas manifold.
 2. Remove the air/gas manifold.
 3. Remove the screw holding the retaining plate.
 4. Remove the retaining plate.
 5. Remove three screws and the mixing chamber.
- Re-assemble with new fan ensuring seals are correctly fitted.

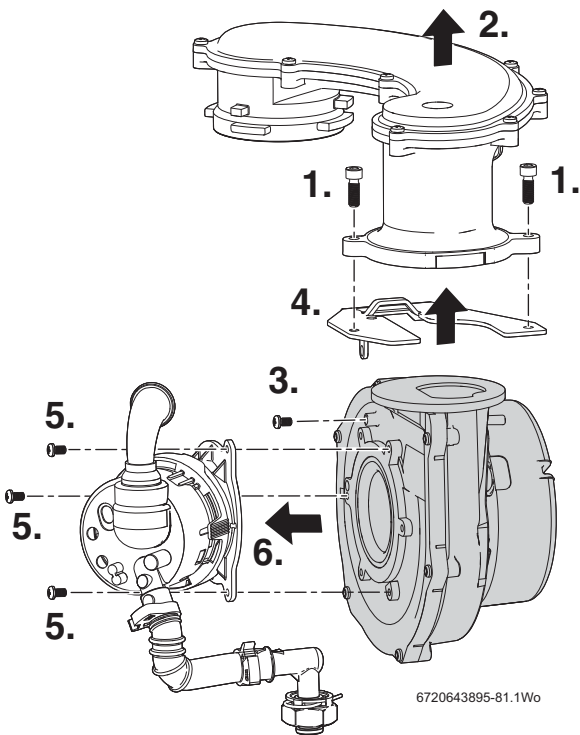


Fig. 99 Dismantling the air/gas manifold assembly

FLAP VALVE ASSEMBLY

1. Twist the mounting flange clockwise to release.
 2. Pull mounting flange off the flap valve assembly.
 3. Pull rubber flap off flap valve assembly.
- To replace the flap valve:
- Press the two lugs on the back of the flap into the two slots in the flap valve assembly.

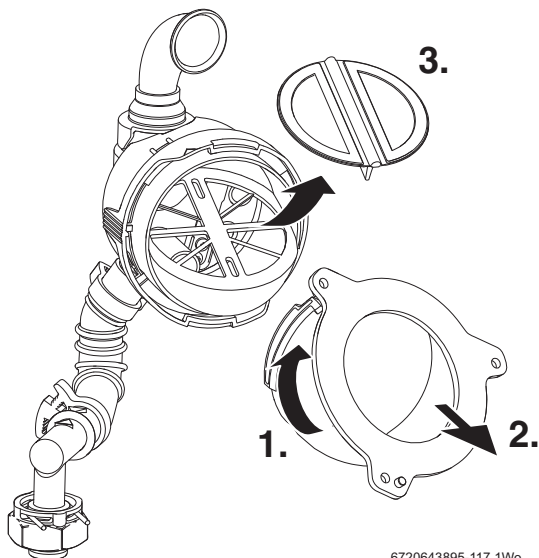


Fig. 100 Flap valve assembly

6.8.9 ELECTRODE ASSEMBLY AND BURNER

- Refer to figure 101 and disconnect spark electrodes and flame sensor connection.
- Remove clamping plate.
1. Remove spark/flame electrode assembly from heat exchanger.
 2. Remove the seal from the top of the heat exchanger.
 3. Remove the burner.
- Replace new burner in correct position.

- Ensure that burner tabs, as shown in figure 101, fit correctly their respective locations.

NOTICE: Heat exchanger seal

- If the joint between the Air/Gas manifold and heat exchanger is disturbed sealing gasket must be replaced.
- After re-assembly the combustion must be checked using the procedure in the section 6.6 "Setting the Air/Gas ratio".

- Ensure that the seal is fitted.

CAUTION: Clamping plate

- Ensure that the clamping plate is firmly tightened down on top of the heat exchanger.

- Replace the clamping plate.

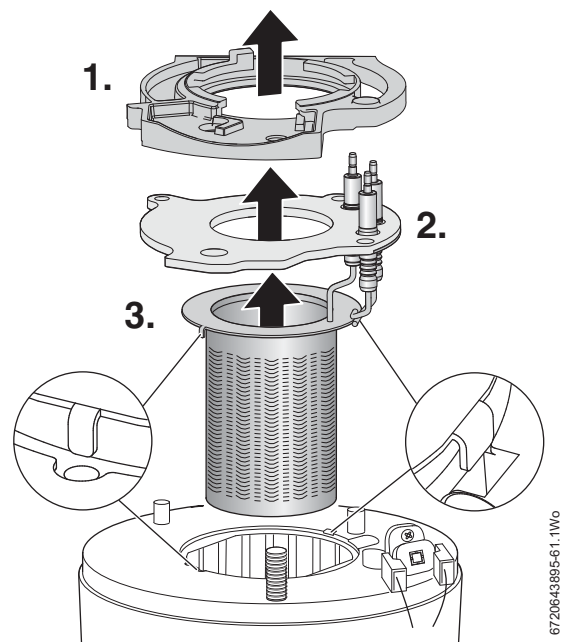


Fig. 101 Electrode assembly and burner

6.8.10 RE-ASSEMBLY OF THE BURNER CLAMPING PLATE

NOTICE: Heat exchanger seal

- If the joint between the Air/Gas manifold and heat exchanger is disturbed the sealing gasket must be replaced.
- After re-assembly the combustion must be checked using the procedure in the section 6.6 "Setting the Air/Gas ratio".

- Ensure that the new gasket is fitted, with the electrode assembly and gasket heat shield

CAUTION: Clamping plate

- Ensure that the clamping plate is firmly tightened down on top of the heat exchanger.

- Locate the edge of the clamping plate [7] under the bracket [4] and fit the retaining plate [1] hand tight
- Ensure that the retaining plate [1] is in the position shown in figure 102

- ▶ At this point the Air/Gas Manifold/Fan assembly [8] should be fitted, engage the lugs in the slots in the clamping plate and rotate clockwise to the stop position.
- ▶ Rotate the retaining plate assembly [1] in the slot on the clamping plate [2], this will prevent the Air/Gas manifold [8] rotating back
- ▶ Initially there will be a gap between the clamping plate and the top of the heat exchanger, refer to figure 102

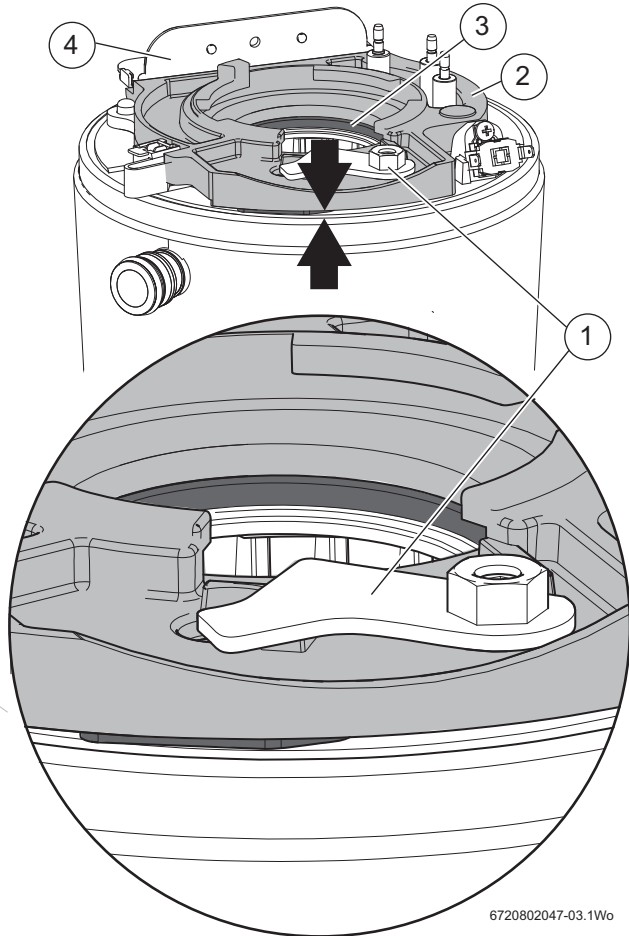


Fig. 102 Initial location of the clamping plate

- [1] Retaining plate assembly
- [2] Clamping plate
- [3] Gasket
- [4] Bracket
- [5] Underside view of the clamping plate
- [6] Mating surface
- [7] Location edge
- [8] Air/Gas manifold assembly

- ▶ Tighten the nut on the retaining plate assembly [1] until the underside face of the clamping plate mates with the top of the heat exchanger as indicated by the two arrows in figure 104
Refer to figure 103 for detail of the clamping and mating surface [6]
- ▶ It is important to clamp the plate down firmly, without over tightening, to the heat exchanger to ensure a gas tight seal

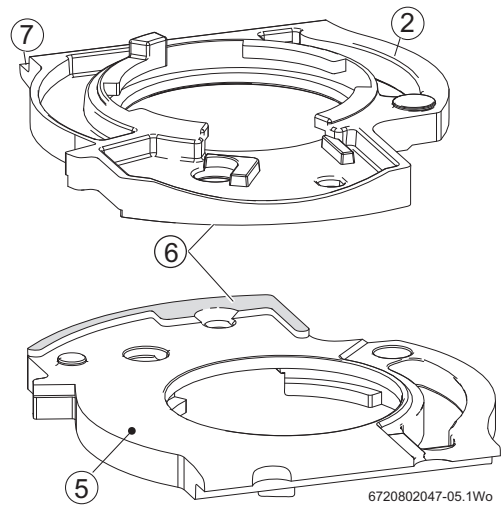


Fig. 103 Clamping plate detail

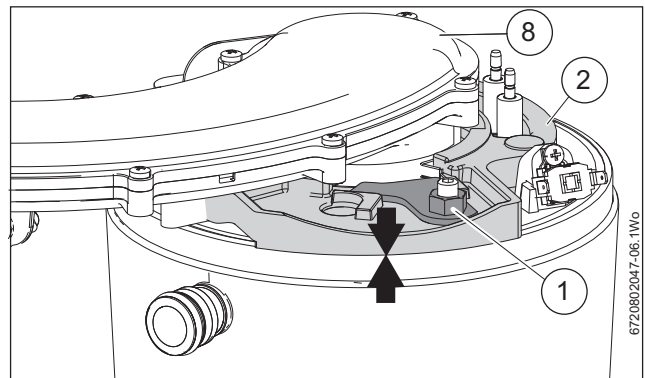


Fig. 104 Clamping plate secured

6.8.11 HEAT EXCHANGER

- ▶ Isolate flow and return valves then drain the boiler.
- ▶ Remove syphon.

1. Refer to figure 105 and remove the clip from plastic elbow on the flow pipe.
2. Pull flow pipe away from heat exchanger.

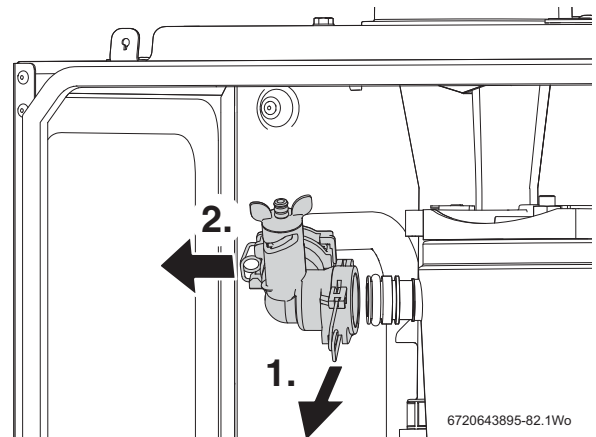


Fig. 105 Flow pipe removal

1. Refer to figure 106 and remove the three screws securing the turret to the top of the boiler.
2. Turn the upper exhaust connector clockwise to release from the hook.
3. Pull the upper exhaust connector down.

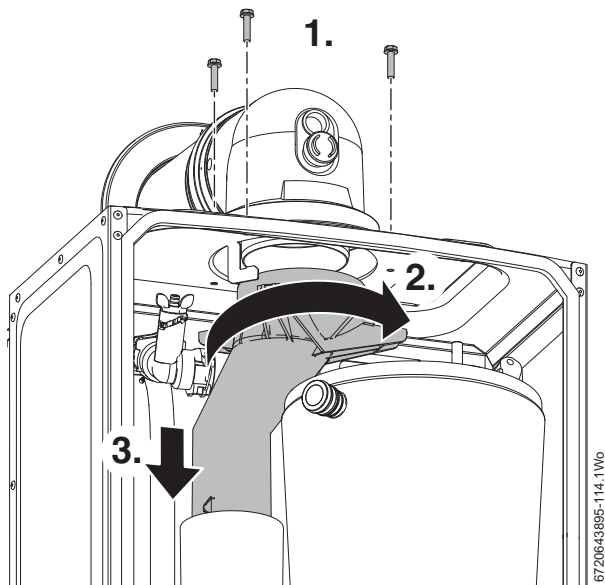


Fig. 106 Upper exhaust assembly

1. Refer to figure 107 and release the clip.
 2. Move the lower exhaust connector up
- Remove the complete exhaust assembly.

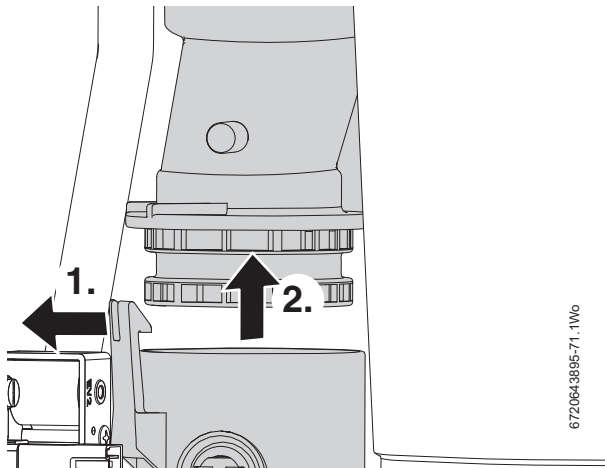


Fig. 107 Release lower exhaust connection

1. Refer to figure 108 and unscrew the plastic nut.
2. Remove the nut from the bottom of the boiler.
3. Rotate lever to release the return pipe.

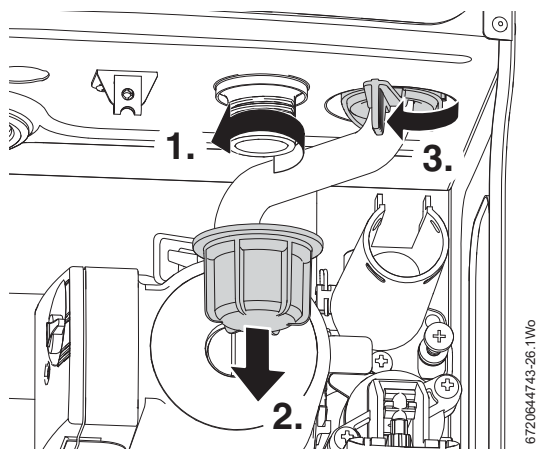


Fig. 108

1. Refer to figure 109 and lift the heat exchanger up to clear.
2. Pull the heat exchanger forward from the case.

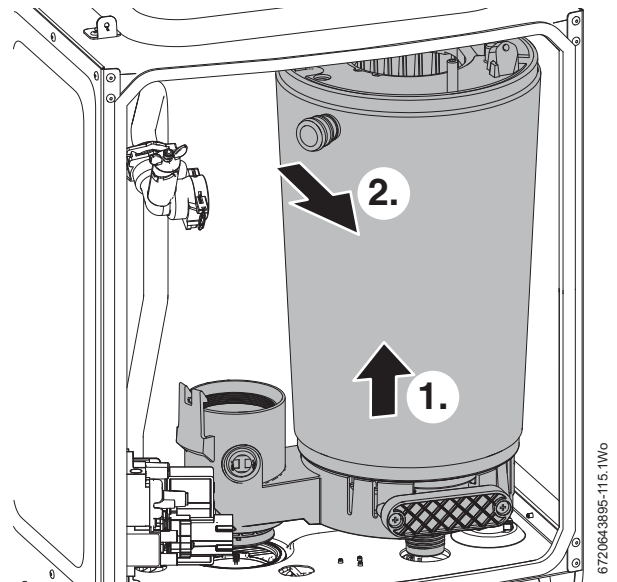


Fig. 109 Heat exchanger removal

- Reassemble and check combustion as stated in the gas conversion section. 6.6.



NOTICE: CO/CO₂ CHECKS

- If the joint between the Air/Gas manifold and heat exchanger is disturbed sealing gasket must be replaced.
- After completing the service of the appliance, the CO/CO₂ must be checked and set to the limits shown in "Setting the air/gas ratio" on page 37.

6.8.12 ACCESS TO BOILER CONTROL COMPONENTS

1. Remove three screws.
2. Remove cover from control.

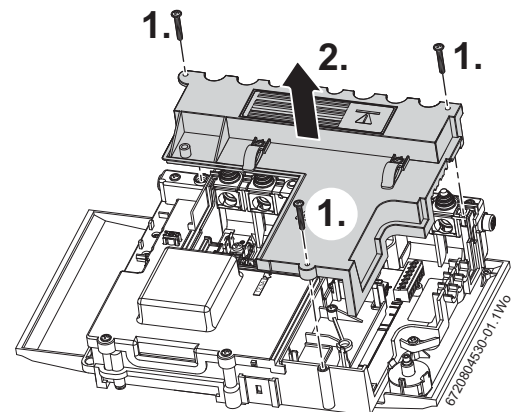


Fig. 110 Removing the connection cover (SMPS)

6.8.13 PCB FUSE

- Remove fuse holder with the fuse F1 (1) from the PCB, change the fuse and replace in the PCB.

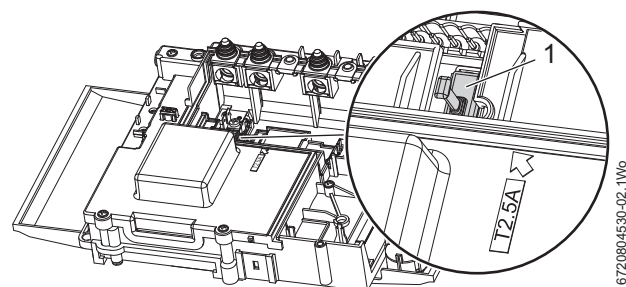


Fig. 111 Fuse location (SMPS)

► Spare fuses are clipped into the underside of the electrical cover.

1. T1.6L 250V

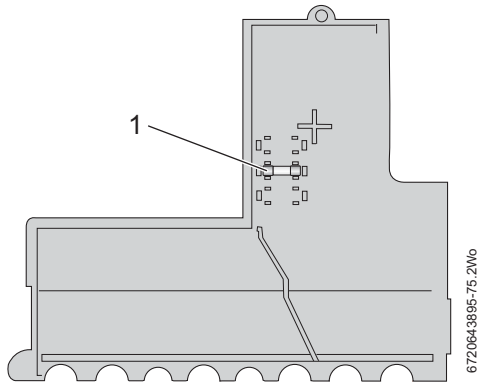


Fig. 112 Spare fuses

6.8.14 ACCESS TO PCB

► Refer to figure 113 and disconnect all electrical connections from the control.

1. Remove five screws retaining the rear panel of the control.
2. Remove the rear panel.

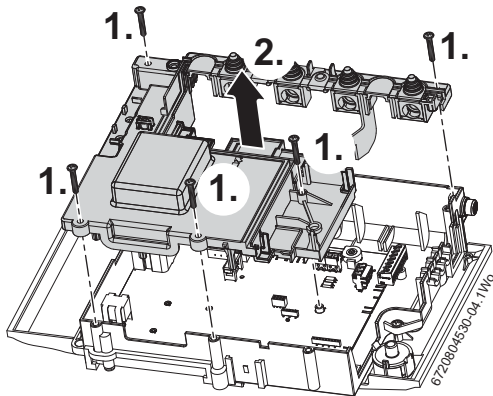


Fig. 113 PCB access

REFITTING THE CONTROL BOARD COVER:

- Ensure that all wires are fully within the control board.
- Align the front right hand corner of the cover with the front right hand corner of the control board.
- Align the rear right hand.
- Holding the cover level, slide the cover onto the control board, ensuring that the incoming cables, at the top, are held clear.

6.8.15 REPLACING CONTROLS

	NOTICE: ► Do not replace the control unit if a CO/CO ₂ analyser is NOT available.
--	---

	The control box is supplied within its plastic housing. The complete unit must be replaced.
--	---

Refer to figure 114.

1. Remove ALL electrical connections from the control PCB including where cables run through restraints. These can be unclipped from the plastic moulding noting their position.
2. Carefully remove the system pressure gauge from the fascia by parting the plastic retaining lugs securing the gauge in place. Take care not to damage or kink the capillary tube.
3. Remove the code plug. The code plug should be left attached to the frame of the boiler by its plastic safety thread.

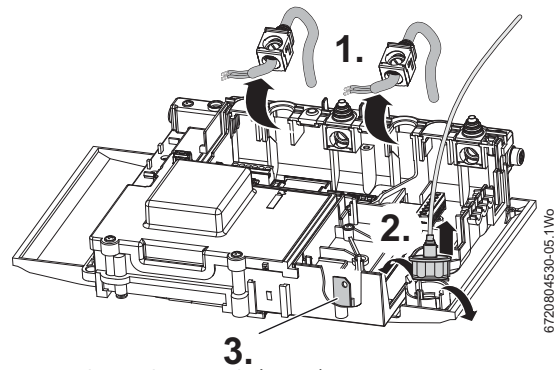


Fig. 114 Replacing the controls (SMPS)

Refer to figure 115.

1. Remove the three screws retaining the front fascia making sure to support the fascia when removing the last screw.
2. Remove the front fascia.

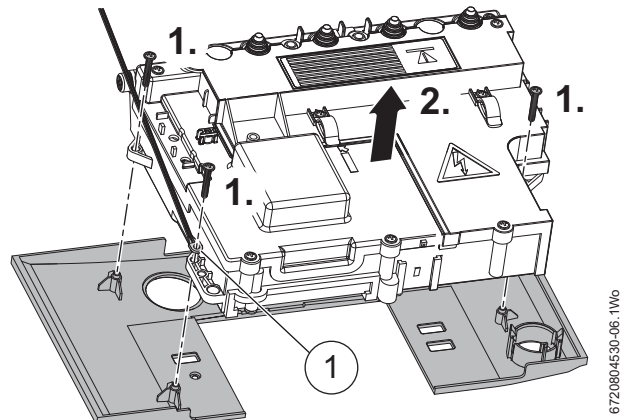


Fig. 115 Fascia removal (SMPS)

Refer to figure 116.

1. Using a suitable tool, press the button upwards.
2. Slide the control support bracket to the left.

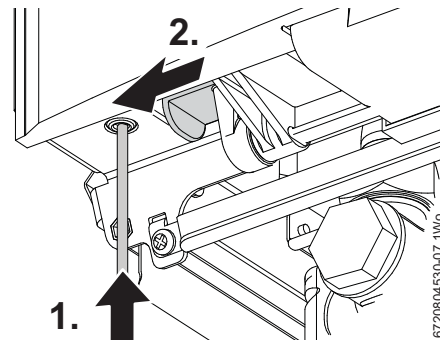


Fig. 116 Control unit release

- Remove appropriate cable restraints from the new control unit.
- Fit control unit to the boiler. Ensuring the control support bracket is fully engaged to the right.
- Re-connect all electrical connections and system to the new control.

Refer to figure 117.

- Replace the fascia to the new control unit remembering to re-connect the support cable (1).

- ▶ Secure the system pressure gauge back in the fascia, routing the capillary as indicated (2)

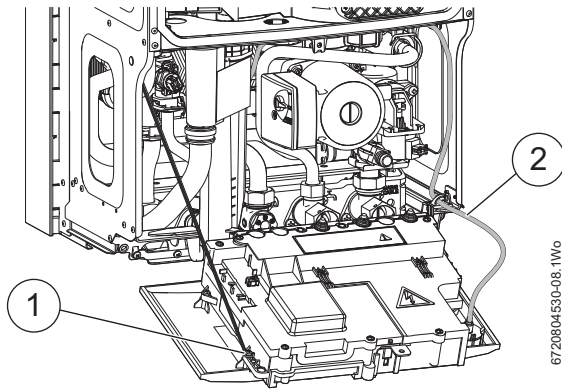


Fig. 117 Support cable connection

- ▶ Ensure that the code plug is re-fitted to the new control. If this is not done, the boiler will indicate an error and will not function.

NOTICE:

- ▶ After re-assembly, check the CO/CO₂ levels as described in section 6.6 "Air/Gas ratio setting".

6.8.16 SIPHON REMOVAL

i Removal of the siphon assembly will give access to the Auto Air Vent.

To release the siphon from the sump:

1. Disconnect the discharge hose from the condensate outlet pipe.
2. Using a screwdriver, disengage the retaining clip on top of the syphon.
3. Pull the siphon towards you and remove the complete assembly.

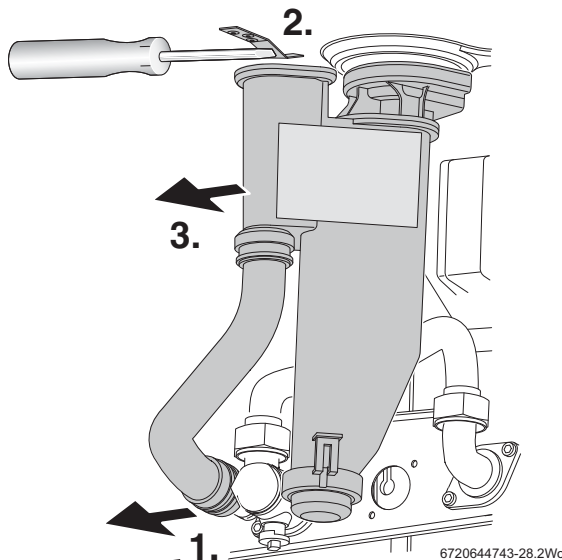


Fig. 118 Siphon removal

6.8.17 DIVERTER VALVE MOTOR (IF FITTED)

- ▶ Connect electrical power to the appliance.
 - ▶ Enter the service mode to ensure that the diverter valve is in the mid position (there is no need to drain the appliance).
 - ▶ Electrically isolate the appliance.
 - ▶ Remove diverter valve cover, if fitted.
 - ▶ Disconnect the electrical connector from the diverter valve motor.
1. Pull the motor assembly towards you.
The assembly will slide free from the valve.
- ▶ To fit the new diverter valve motor, slide the body into the housing.

- ▶ Ensure that "H" section of the motor actuator is fitted correctly into valve body.
- ▶ Re-connect the electrical connection.
- ▶ Re-fit the protective cover (if available).

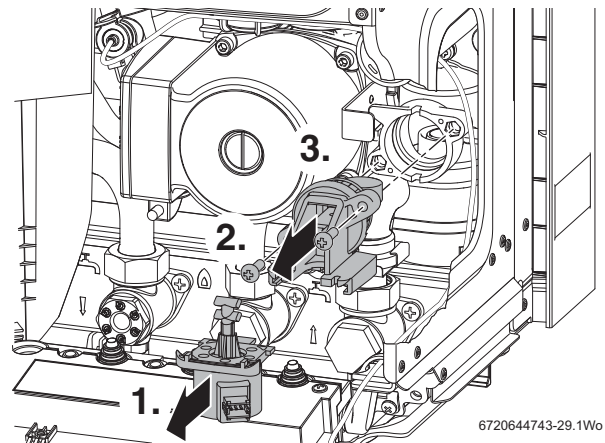


Fig. 119 Diverter valve and motor

6.8.18 DIVERTER VALVE (IF FITTED)

- ▶ Ensure the appliance has been fully drained.
 - ▶ Disconnect the electrical connector from the diverter valve motor.
 - ▶ Remove the diverter valve cover, if fitted.
2. Undo the two screws holding the valve to the plastic housing.
 3. Withdraw the valve and clean the valve chamber if necessary.
- ▶ To refit, follow the above in reverse.
 - ▶ Ensure any seals that have been disturbed are renewed.

6.8.19 AUTO AIR VENT

i Removal of the syphon assembly will give access to Auto air vent. Refer to page 47.

- ▶ Ensure the appliance has been fully drained.
- ▶ Use a screwdriver or similar to rotate the air vent anti-clockwise, as shown below.

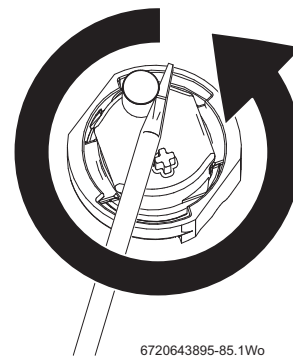


Fig. 120 Auto air vent

1. Lift the air vent (1) out of the housing and remove.

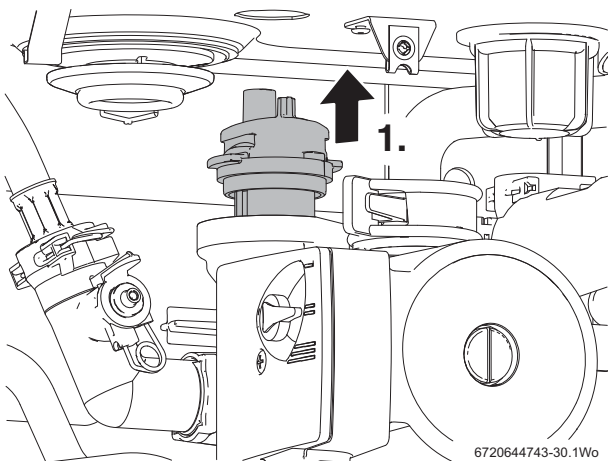


Fig. 121 Auto air vent removal

NOTICE:

- ▶ The “O” ring must be fitted to the Auto air vent and NOT the hydraulic block otherwise the Auto air vent will be difficult to fit.
- ▶ Apply silicone lubricant to the “O” ring to ease assembly.

▶ To refit, follow the above in reverse.

6.8.20 PUMP HEAD

- ▶ Ensure the boiler is fully drained).
- ▶ Disconnect the electrical connection from the bottom of the pump.

NOTICE: Water damage

- ▶ Protect the Control unit from water ingress when removing the Pump head.

1. Remove the four Allen bolts securing the pump at each corner.
2. Gently pull the pump towards you and remove.

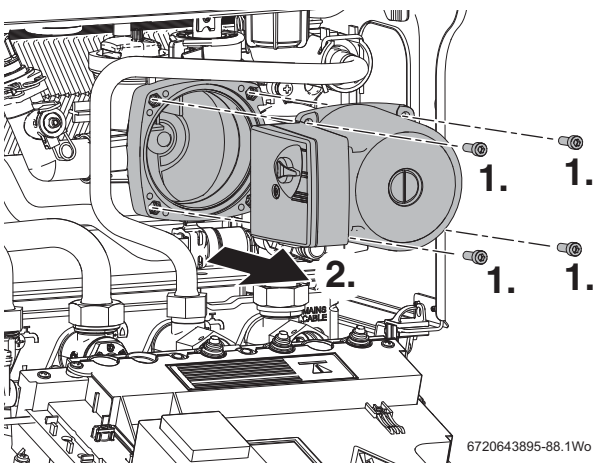


Fig. 122 Pump head removal

▶ To refit, follow the above in reverse.

6.8.21 DRAIN TAP

- ▶ Ensure the appliance has been fully drained.
1. Rotate the drain tap fully anti-clockwise.
 2. Withdraw the drain tap from its housing

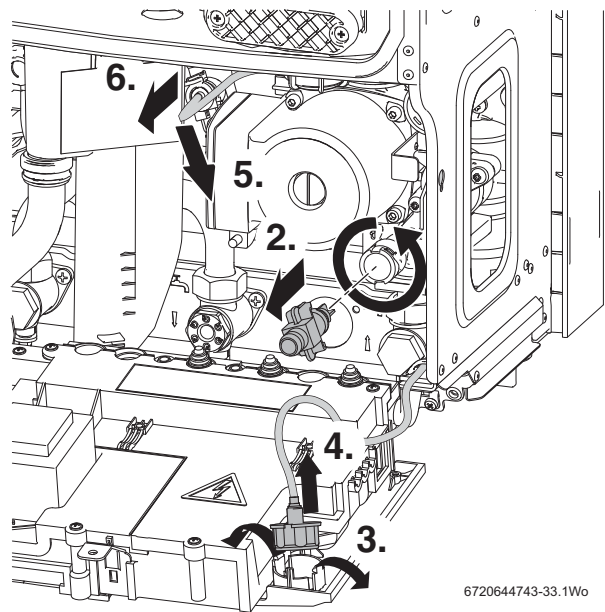


Fig. 123

▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

6.8.22 PRESSURE GAUGE

- ▶ Refer to figure 123
 - ▶ Ensure the appliance has been fully drained.
3. Pry the lugs apart (3) securing the pressure gauge to the fascia.
 4. Remove the gauge (4) taking care not to damage or kink the capillary.
 5. Withdraw the spring clip from the pressure sensing head housing.
 6. Remove the pressure sensing head and pressure gauge capillary from the housing.

NOTICE: Heat damage

- ▶ Route the plastic capillary tube away from the pump to ensure that the pipe is not melted against the hot pump body.

▶ To refit, follow the above in reverse. DO NOT forget to fit the washer from the capillary when fitting a replacement gauge.

6.8.23 HYDRAULIC BLOCK REMOVAL

i Remove the syphon assembly.
Refer to Syphon assembly removal page 47

- ▶ Ensure the appliance has been fully drained.
 - ▶ Disconnect the electrical connections to the NTC sensor, turbine and pump.
 - ▶ Undo the nuts securing the copper water pipes to the manifold (there is no need to remove the gas pipe).
1. Release the spring clips securing these water pipes to the plastic housing and remove the pipes.
 - ▶ Release the spring clip securing the expansion vessel pipe to the plastic housing and remove the pipe.
 - ▶ Release the spring clip securing the pressure gauge sensing head to the plastic housing and remove the sensing head.
 - ▶ Release the locking devices that secure the two copper water pipes leading to the combustion chamber by squeezing the two tabs together and rotating anti-clockwise (viewed from above).

i This is not essential but makes the removal of the block easier.

- ▶ Remove the rubber pipe connecting the sump and remove the syphon.
- 2. Undo the two screws securing the hydraulic block to the chassis (located top left / top right of the housing).

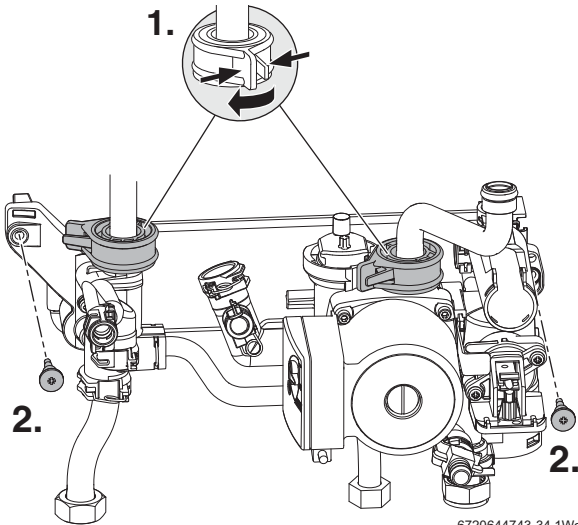


Fig. 124 Hydraulic block removal part 1

- 3. Lift the left hand side of the block slightly.
- 4. Manoeuvre the block out, starting at the right hand side.
- ▶ Take care not to snag the harness.

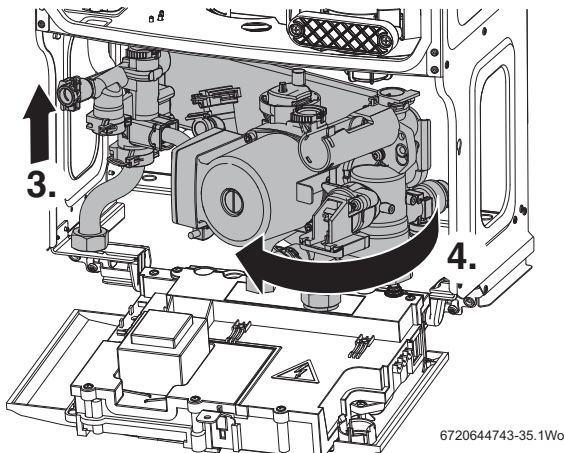


Fig. 125 Hydraulic block removal part 2

- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

6.8.24 CH PRESSURE RELIEF VALVE

- ▶ Remove the hydraulic block from the boiler (See Removing the Hydraulic Block).
- 1. Release the spring clip from the Pressure Relief Valve housing.
- 2. Withdraw the Pressure Release Valve from its housing.

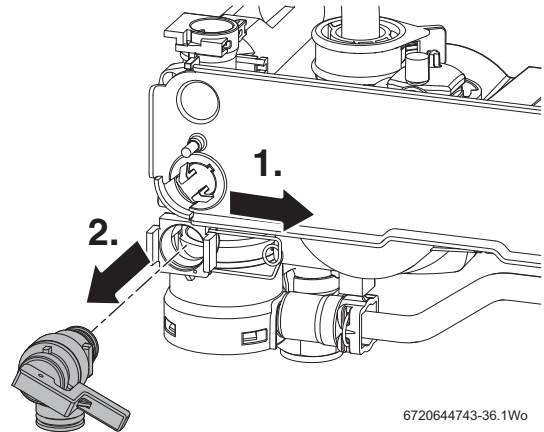


Fig. 126 PRV removal

- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are renewed.

6.8.25 BYPASS VALVE

- 1. Remove the two spring clips at either end of the copper bypass pipe.

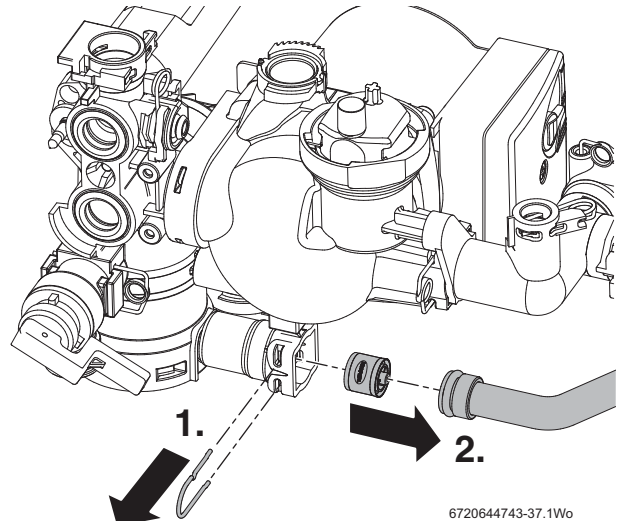


Fig. 127 Removing the bypass valve

- ▶ Undo the screw securing the left hand plastic housing to the heat exchanger.
- ▶ Move the housing to the left to free up the one end of the pipe.
- ▶ Remove the pipe from the right hand housing to reveal the bypass valve.
- 2. Using a pair of pliers, pull out the bypass valve from the housing
- ▶ To refit, follow the above in reverse. Ensure any seals renewed.

6.8.26 EXPANSION VESSEL

The expansion vessel can be replaced with the boiler in position if there is a side exit flue fitted and a minimum clearance of 340mm above the boiler casing. If a vertical flue is fitted then a similar clearance to one side of the flue is required.

If this clearance is not available, then the boiler will need to be removed from the mounting frame to gain access to the expansion vessel.

Alternatively a second vessel of at least the capacity of seven litres can be fitted to the return from the heating system as close as possible to the boiler.

Expansion vessel replacement (Boiler in place)

- ▶ Isolate mains power from the boiler.
- ▶ Lower the control panel to the service position.
- ▶ Isolate the boiler from the heating system (and cylinder return if internal diverter valve is fitted) using service valves.
- ▶ Drain the boiler.
- ▶ At the pump manifold, release the clip and disconnect the expansion vessel hose.

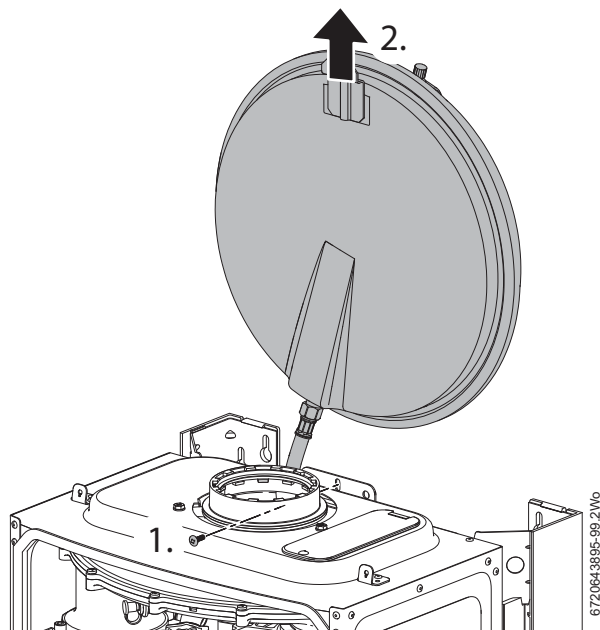


Fig. 128 Removing the expansion vessel

1. Remove screw (1) retaining the vessel to the top of the boiler casing.
2. Pull the vessel up (2) and out over the flue system or to one side if fitted with a vertical flue.

- ▶ Remove the flexible hose from the expansion vessel and fit to the replacement vessel using a new seal.
- ▶ Reassemble expansion vessel into wall frame and reconnect the flexible pipe to pump manifold and secure with the clip.

Expansion vessel replacement (Removing the Boiler)

- ▶ Isolate electrical supply.
- ▶ Isolate system and gas connections at the service valves.
- ▶ Drain the boiler.
- ▶ Disconnect electrical supply and any external controls.
- ▶ Disconnect flue connection from the boiler.

- ▶ Undo connection to boiler at the service valves.

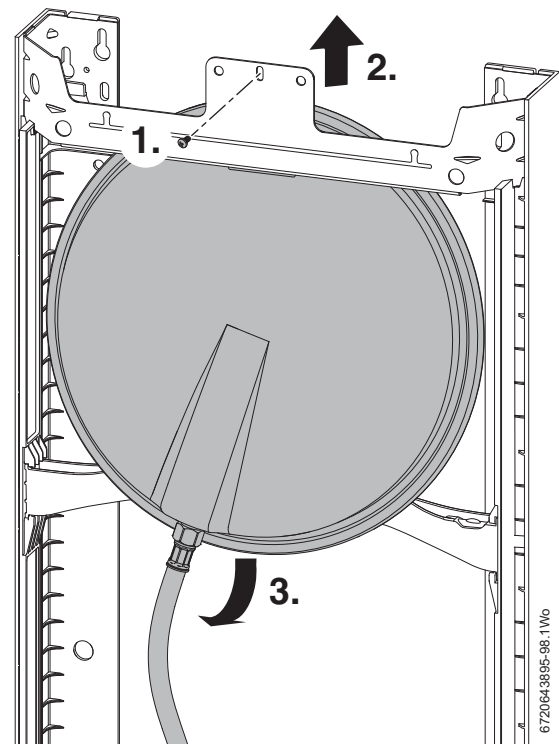


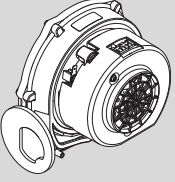
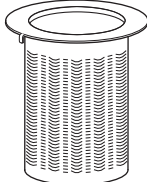
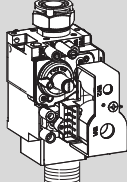
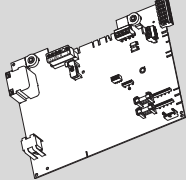
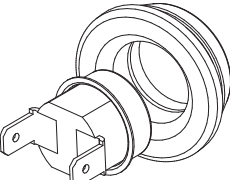
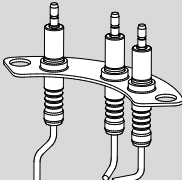
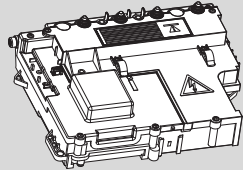
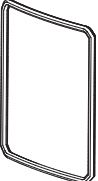

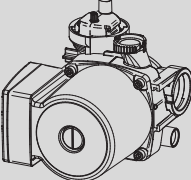
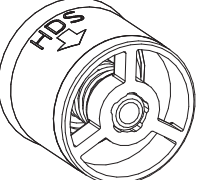
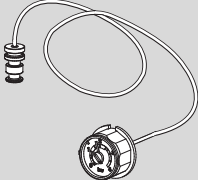
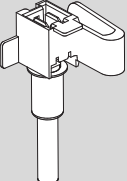
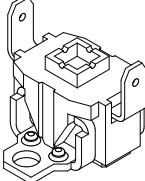
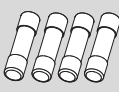
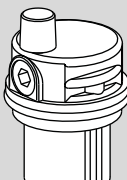

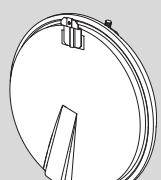
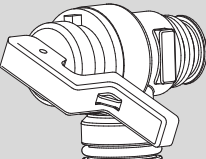
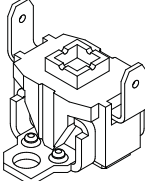
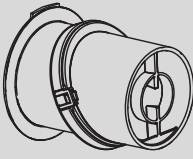


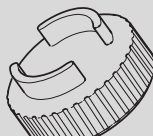


Fig. 129 Removing expansion vessel from wall frame

- ▶ Release the clip from expansion vessel connection to the pump manifold.
- ▶ Carefully lift the boiler off the mounting frame.

 1. Remove the expansion vessel retaining screw.
 2. Lift the expansion off the cross beam.
 3. Pull the expansion vessel towards you to remove.

- ▶ Replace expansion vessel in the reverse order and refit the boiler to the mounting frame.
- ▶ Follow the commissioning procedure in this manual.

6.9 SHORT PARTS LIST

 <p>Fan 8 716 116 067 0 GC No. H26 536</p>	 <p>Burner 8 718 120 619 0 GC No. H26 538</p>	 <p>Gas Valve 8 716 111 325 0 GC No. H26 540</p>
 <p>Control board HT3 BUS enabled 8 748 300 713 0</p>	 <p>Flue overheat thermostat (grommet type) 8 710 506 267 0</p>	 <p>Electrodes (including gasket) 8 718 107 087 0</p>
 <p>Used on: Si & i System boilers Control box assembly 8 737 703 818 0</p>	 <p>Seal - Inner case/mantel 8 716 106 635 0</p>	 <p>Gasket - burner 8 716 110 534 0</p>
 <p>Pump assembly 3 speed 8 716 106 355 0 GC No. H02 527</p>	 <p>By-pass valve 8 716 106 434 0 GC No. H02 532</p>	 <p>Pressure gauge 8 718 224 344 0</p>
 <p>Flow temperature sensor - (NTC) 8 716 106 688 0 GC No. H26 542</p>	 <p>High limit stat 8 707 206 196 0 GC No. H26 584</p>	 <p>Fusing element set 8 744 503 010 0 Containing fuses: 3.15 Amp 2.5 Amp 1.6 Amp 0.5 Amp</p>
 <p>Automatic air vent 8 716 106 445 0</p>	 <p>Seals kit 8 716 107 224 0 GC No. H10 876</p>	 <p>Expansion vessel 8 716 105 545 0 GC No. H05 206</p>
 <p>Pressure relief valve 8 716 106 431 0 GC No. H09 750</p>	 <p>High limit stat 8 707 206 196 0 GC No. H26 584</p>	 <p>Terminal end 8 718 681 828 0</p>
 <p>Flue sample plug - vertical adapter 8 710 506 199 0</p>	 <p>Flue sample plug - air intake 8 716 111 253 0</p>	 <p>Flue sample plug - gas outlet 8 716 111 252 0</p>
 <p>Sump gasket 8 716 113 829 0</p>	 <p>O ring - Siphon 8 716 113 851 0</p>	

7 FAULT FINDING AND DIAGNOSIS

7.1 FAULT FINDING

This fault finding information is for guidance only. Worcester cannot be held responsible for costs incurred by persons not deemed to be competent.

The electronic control system for this boiler incorporates a blue central indicator. This normally confirms the permanent mains supply but, by flashing at different rates during a fault, provides a guide to the cause as listed. This fault finding system assumes that the appliance has been

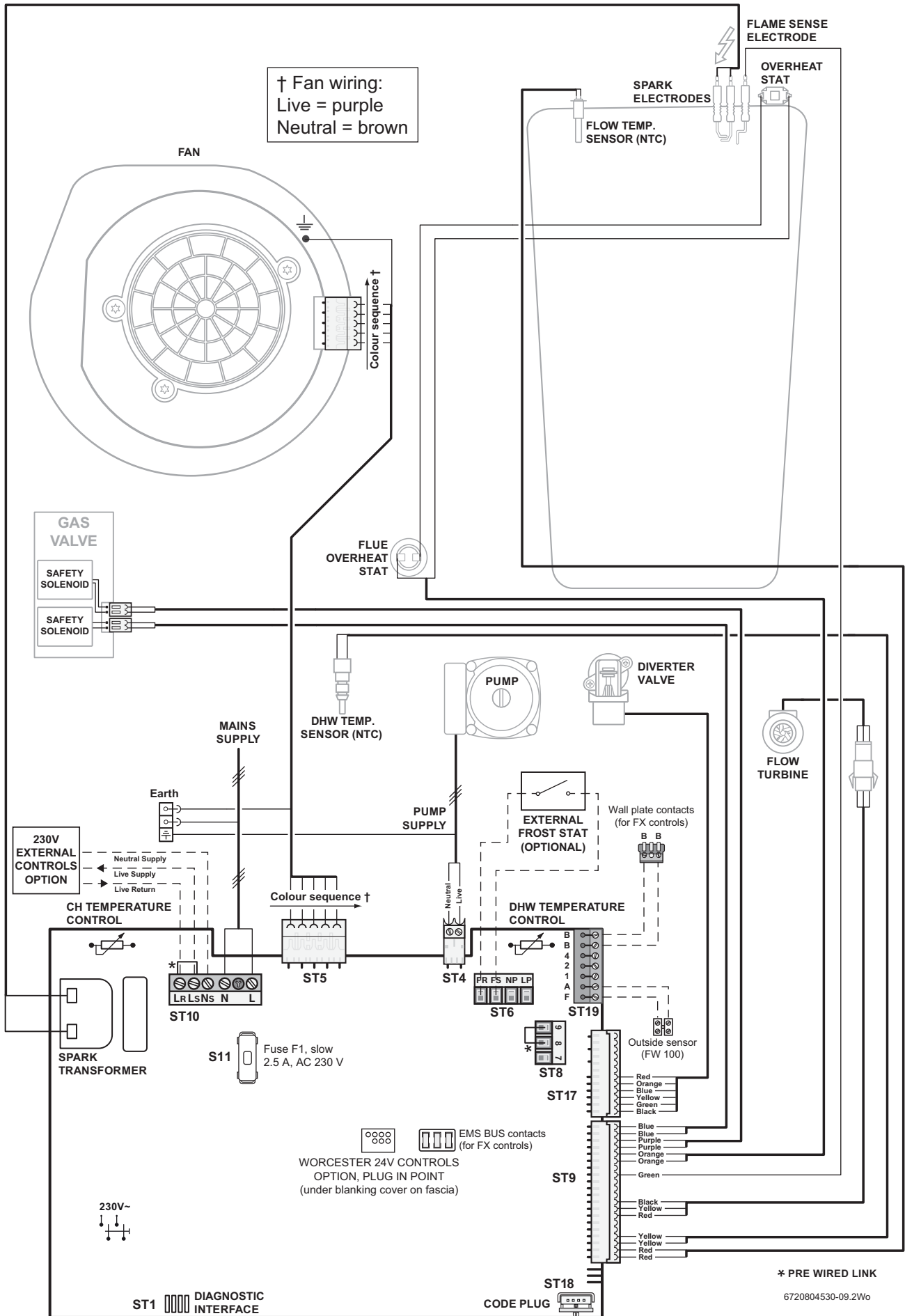
operating normally until the time of failure (i.e. not a first installation error).

PRELIMINARY CHECKS : Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check:

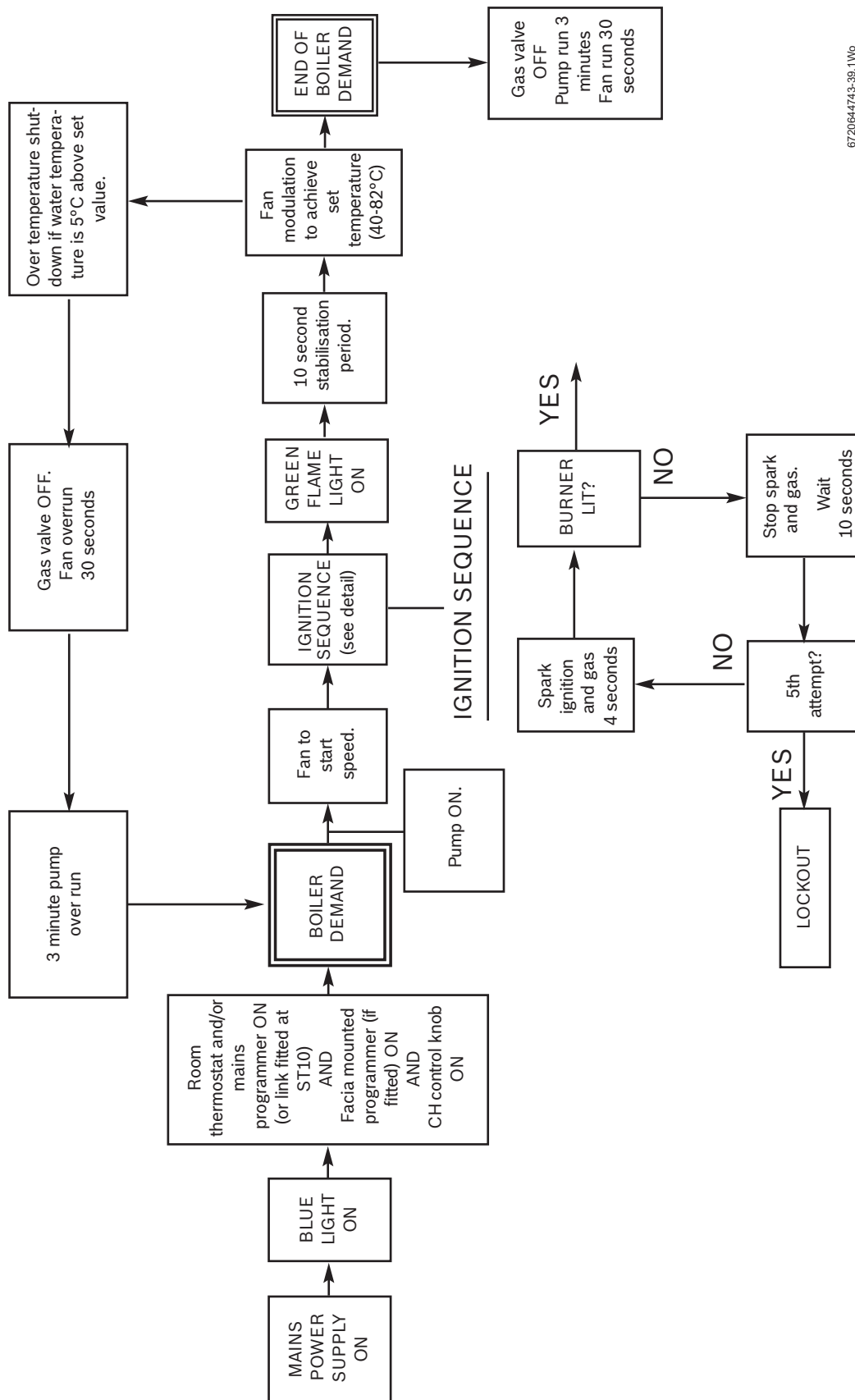
- (a) EARTH CONTINUITY,
- (b) SHORT CIRCUIT CHECK,
- (c) POLARITY and
- (d) RESISTANCE TO EARTH.

Blue light indication	Lockout reset button	Fault	Possible solution/check
Off	Off	No power at control board	Permanent mains supply to boiler. Fuse F1 - 2.5A. Otherwise replace control board.
On	Off	Boiler not operating during central heating demand (HW ok)	Live demand at ST10-L _R (from external room thermostat/timer) Fascia mounted timer (if fitted) CH knob in winter position Diverter valve Control board
		Boiler operating without live demand at ST10-L _R (from external room thermostat timer)	Some older thermostats (containing capacitors) may give a low voltage return at ST10-L _R when the thermostat contacts are open. Check that there is no permanent live at ST10-L _R from another source.
		Boiler not operating during hot water demand (CH ok)	Ensure cold inlet DHW outlet are correctly piped i.e. are not crossed piped. If the optional Integral Diverter Valve kit has been fitted, check diverter valve and motor and control board.
		Boiler not operating during any demand.	Fan Control board
Slow flash (mostly off, flashes on)	Flashing (reset required)	Ignition lockout	<ul style="list-style-type: none"> ▶ Gas present and at correct pressure? ▶ Gas valve <ul style="list-style-type: none"> - Check that there is approximately 27V d.c. to each solenoid - Check the resistance of each solenoid: Top solenoid = 380 Ω ± 10% (342 - 418 Ω) Bottom solenoid = 190 Ω ± 10% (171 - 209 Ω) ▶ Combustion CO₂ level. ▶ Flue condition - Blocked flue? ▶ Blocked condensate pipe or frozen condensate. ▶ Gas valve adjustment. ▶ Ignition electrodes/harness/connections - Check for condition and resistance of leads (approximately 2100 Ω). ▶ Otherwise replace control board
Slow flash (mostly on, flashes off)	Flashing (reset required)	Flue overheat	▶ Heat exchanger baffles removed and not refitted.
		Heat exchanger overheat	<ul style="list-style-type: none"> ▶ Heat exchanger blocked ▶ Water pressure ▶ All air vented ▶ Pump/harness/connections. ▶ Water leaks/blockage ▶ Safety thermostats/low voltage wiring harness/connections ▶ Otherwise replace control board
Fast flash	Off	Volatile lockout - Fan does not run	<ul style="list-style-type: none"> ▶ Temperature sensors - Check condition and continuity of leads and resistance of sensors (approximately 2100 Ω) ▶ Fan - 230V a.c. across the live (purple) and neutral (brown) ▶ Fan lead - Check continuity ▶ Code plug - Is the code plug missing or not inserted properly
Fast flash	Flashing	Internal fault	Replace control board
2 pulses	No light	Not a fault code	Service mode selected to minimum, press service button to return to normal
5 pulses	No light	Not a fault code	Service mode selected to maximum, press service button to return to normal

7.1.1 CIRCUIT DIAGRAM



7.2 BOILER FUNCTION

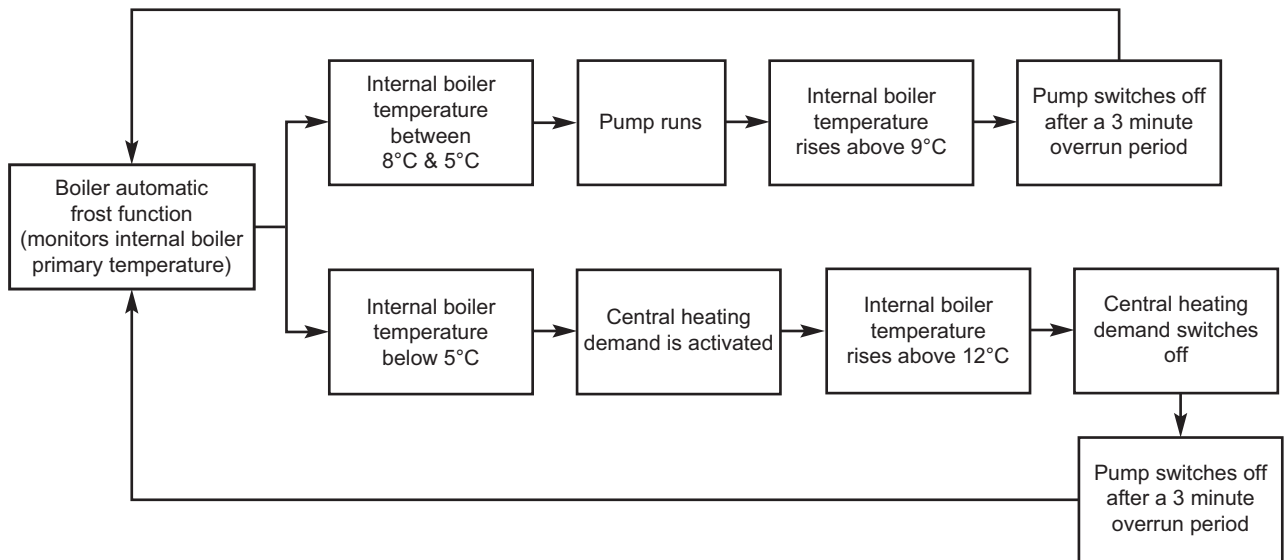


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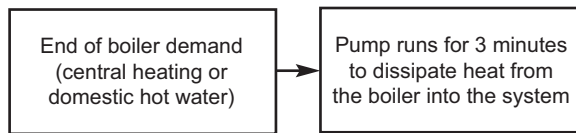
Fig. 130 Boiler function

7.3 PROTECTION FUNCTION

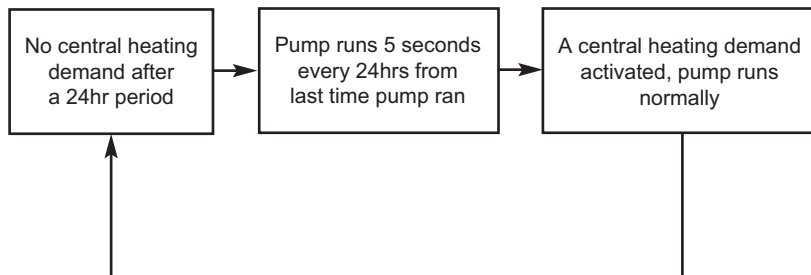
AUTOMATIC INTERNAL FROST FUNCTION



PUMP OVERRUN FUNCTION



PUMP ANTISEIZE FUNCTION



6720643895-111.1W6

Fig. 131 Protection function

NOTES

NOTES

GAS BOILER SYSTEM COMMISSIONING CHECKLIST

This Commissioning Checklist is to be completed in full by the competent person who commissioned the boiler as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission according to the manufacturer's instructions and complete this Benchmark Commissioning Checklist will invalidate the warranty. This does not affect the customer's statutory rights.

Customer name:	Telephone number:
Address:	
Boiler make and model:	
Boiler serial number:	
Commissioned by (PRINT NAME):	Gas Safe register number:
Company name:	Telephone number:
Company address:	
Commissioning date:	
To be completed by the customer on receipt of a Building Regulations Compliance Certificate*	
Building Regulations Notification Number (if applicable):	

CONTROLS (tick the appropriate boxes)			
Time and temperature control to heating	Room thermostat and programmer/timer		Programmable room thermostat
	Load/weather compensation		Optimum start control
Time and temperature control to hot water	Cylinder thermostat and programmer/timer		Combination Boiler
Heating zone valves	Fitted		Not required
Hot water zone valves	Fitted		Not required
Thermostatic radiator valves	Fitted		Not required
Automatic bypass to system	Fitted		Not required
Boiler interlock			Provided

ALL SYSTEMS			
The system has been flushed and cleaned in accordance with BS7593 and boiler manufacturer's instructions			Yes
What system cleaner was used?			
What inhibitor was used?			Quantity litres
Has a primary water system filter been installed?			Yes <input type="checkbox"/> No <input type="checkbox"/>

CENTRAL HEATING MODE measure and record:			
Gas rate	m ³ /hr	OR	ft ³ /hr
Burner operating pressure (if applicable)	mbar	OR Gas inlet pressure	mbar
Central heating flow temperature			°C
Central heating return temperature			°C

COMBINATION BOILERS ONLY			
Is the installation in a hard water area (above 200ppm)?			Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, and if required by the manufacturer, has a water scale reducer been fitted?			Yes <input type="checkbox"/> No <input type="checkbox"/>
What type of scale reducer has been fitted?			

DOMESTIC HOT WATER MODE Measure and Record:			
Gas rate	m ³ /hr	OR	ft ³ /hr
Burner operating pressure (at maximum rate)	mbar	OR Gas inlet pressure at maximum rate	mbar
Cold water inlet temperature			°C
Hot water has been checked at all outlets			Yes <input type="checkbox"/> Temperature °C
Water flow rate			l/min

CONDENSING BOILERS ONLY	
The condensate drain has been installed in accordance with the manufacturer's instructions and/or BS5546/BS6798	
Yes <input type="checkbox"/>	

ALL INSTALLATIONS					
Record the following:	At max. rate:	CO	ppm	AND	CO/CO ₂ Ratio
	At min. rate: (where possible)	CO	ppm	AND	CO/CO ₂ Ratio
The heating and hot water system complies with the appropriate Building Regulations					Yes <input type="checkbox"/>
The boiler and associated products have been installed and commissioned in accordance with the manufacturer's instructions					Yes <input type="checkbox"/>
The operation of the boiler and system controls have been demonstrated to and understood by the customer					Yes <input type="checkbox"/>
The manufacturer's literature, including Benchmark Checklist and Service Record, has been explained and left with the customer					Yes <input type="checkbox"/>

Commissioning Engineer's Signature
Customer's Signature
(To confirm satisfactory demonstration and receipt of manufacturer's literature)

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.



SERVICE RECORD

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions. Always use the manufacturer's specified spare part when replacing controls.

SERVICE 01					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 02					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 03					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 04					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 05					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 06					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 07					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 08					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 09					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 10					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.



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Worcester, Bosch Group is a brand name of Bosch Thermotechnology Ltd.
worcester-bosch.co.uk

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LITERATURE:	0330 123 9119
TRAINING:	0330 123 0166
SALES:	0330 123 9669



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