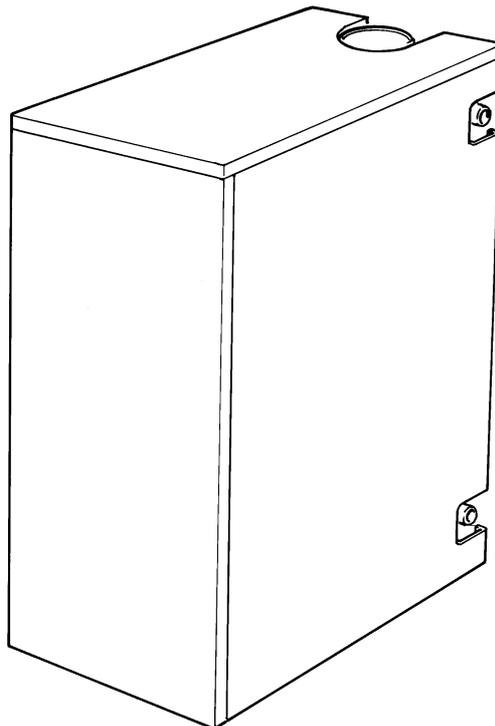


WORCESTER BOSCH

50/70, 70/90, 90/110

FLOOR STANDING OIL-FIRED PRESSURE JET APPLIANCES

INSTALLATION AND SERVICING INSTRUCTIONS



THESE INSTRUCTIONS ARE TO BE LEFT WITH THE APPLIANCE

This appliance must be installed and serviced by a competent person

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1. Installation Regulations

1.1 General installation information and advice may be obtained from the Oil Firing Technical Association for the Petroleum Industry (OFTEC). Training courses are also offered by OFTEC, leading to inclusion on their list of registered engineers.

1.2 The appliance should be installed by a competent person. The person installing the appliance should be aware of the Health and Safety at Work Act and take appropriate action to ensure that the regulations are adhered to.

1.3 A qualified engineer must commission the appliance before handing over to the user. OFTEC recommends the use of registered engineers for the commissioning of oil-fired burners.

1.4 The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

1.5 The compliance with a British Standard does not, of itself, confer immunity from legal obligations. In particular the installation of this appliance must be in accordance with the relevant requirements of the following British Standards and regulations in respect of the safe installation of equipment.

BS 5410: part 1: 1997 Code of practice for Oil Fired Boilers.

BS 799: part 5: 1987 Specification for Oil Storage Tanks.

BS 7593: 1992 Code of Practice for treatment of water in domestic hot water central heating systems.

BS 5449: part 1: 1990 Code of practice for Central Heating for Domestic Premises.

BS 7074: part 1: 1989 Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems.

BS 7671: IEE Wiring Regulations, current edition.

The Building Regulations Part J England and Wales; Part F Section III Scotland; Part L Northern Ireland.

Local water company bye-laws.

The Control of Pollution (Oil) Regulations.

1.6 To ensure that the installation will perform to the highest standards, the system and components should conform to those mentioned in the instructions.

2. General Information

2.1 The Worcester Bosch range of appliances covered in these instructions have been designed to serve domestic central heating and hot water requirements ranging from 15 kW to 32 kW (51,000 Btu/h to 109,000 Btu/h) and may be used on sealed or open vent primary systems.

2.2 The appliances are factory set to burn 28 second Kerosene heating oil and the output can be altered to suit the application by adjusting the burner as specified in tables 2 to 4.

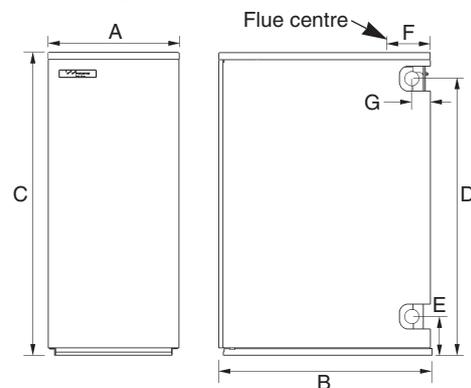
2.3 The appliances may be converted to burn 35 second Gas Oil by changing the nozzle and burner settings as specified in tables 2 to 4.

2.4 A flueless kit is available which allows the user to dispense with the need for a conventional chimney. The kit incorporates a silencer which eliminates excessive combustion noise.

Note: It is a mandatory requirement of the building regulations that only 28 second kerosene is used on low level discharge flues.

3. Technical Data

Fig. 1. Principal Dimensions



Model	A	B	C	D	E	F	G
50/70	370	600	855	780	110	92	57
70/90	370	600	855	780	110	92	57
90/110	520	600	855	775	110	92	57

Table 1

SPECIFICATIONS			
Model	50/70	70/90	90/110
POWER SUPPLY	230/240V 50 Hz	230/240V 50 Hz	230/240V 50 Hz
HEATING FLOW	1 in. BSP	1in. BSP	1 1/4 in. BSP
HEATING RETURN	1 in. BSP	1in. BSP	1 1/4 in. BSP
FUEL LINE	1/4 in. BSP	1/4 in. BSP	1/4 in. BSP
CONVENTIONAL FLUE DIAMETER	125 mm (5 in.)	125 mm (5 in.)	125 mm (5 in.)
MINIMUM FLUE REQUIREMENT	Class 2 Below 260° C	Class 2 Below 260° C	Class 2 Below 260° C
HEARTH TEMPERATURE	Below 100°C	Below 100°C	Below 100°C
MAXIMUM STATIC HEAD	30 m (98 ft.)	30 m (98 ft.)	30 m (98 ft.)
PRIMARY WATER CAPACITY	20 litres (4.4 gal.)	23.5 litres (5.2 gal.)	29.1 litres (6.4 gal.)
WEIGHT	97Kg (214 lbs.)	107 Kg (236 lbs.)	138 Kg (306 lbs.)
BURNER	Electro Oil Inter B9 B	Electro Oil Inter B11C	Electro Oil Sterling 40
WATER SIDE RESISTANCE 10°C Difference	8 mbar	18 mbar	35 mbar
WATER SIDE RESISTANCE 20°C Difference	6 mbar	12 mbar	19 mbar
EXIT FLUE GAS MASS FLOW	35 kg/hr	46 kg/hr	57 kg/hr
CONTROL THERMOSTAT RANGE	55°C minimum Cut In to 82°C maximum Cut Out		
CONTROL THERMOSTAT DIFFERENTIAL	5°C		
HIGH LIMIT THERMOSTAT SET POINT	100°C +0/-6°C		
MANUAL RESET OVERHEAT THERMOSTAT	110°C +0/-6°C		

50/70 Table 2. Electro Oil Inter B9B Burner (See Fig. 13)

NOMINAL BOILER RATING AT NORMAL OPERATING TEMPERATURE											
Fuel	Nozzle ‡	Pump Pressure (p.s.i.) †	Fuel Flow Rate		Flue Gas Temp. (°C)**	%CO ₂	Approx. Air Setting	Appliance			
			Kg/h	l/h				Input		Output	
								kW	Btu/hr	kW	Btu/hr
28 Sec. Kerosene	0.50 60°ES	110	1.40	1.77	215	10.5	8.5	17	58,000	15	51,000
28 Sec. Kerosene	0.55 80°EH	100	1.59	2.01	225	10.5	8.75	19	65,000	17	58,000
28 Sec. Kerosene	0.60 60°ES	105	1.78	2.25	235	11.5	9.0	21.5	73,000	19	65,000
35 Sec. Gas Oil*	0.50 80°S	155	1.80	2.12	235	11.5	9.0	21.5	73,000	19	65,000

70/90 Table 3. Electro Oil Inter B11C Burner (See Fig. 14)

NOMINAL BOILER RATING AT NORMAL OPERATING TEMPERATURE											
Fuel	Nozzle ‡	Pump Pressure (p.s.i.) †	Fuel Flow Rate		Flue Gas Temp. (°C)**	%CO ₂	Approx. Air Setting	Appliance			
			Kg/h	l/h				Input		Output	
								kW	Btu/hr	kW	Btu/hr
28 Sec. Kerosene	0.60 80°EH	110	1.87	2.37	215	10.5	6.0	22.5	77,000	20	68,000
28 Sec. Kerosene	0.75 80°EH	115	2.10	2.66	225	10.5	7.0	25	86,000	22.5	77,000
28 Sec. Kerosene	0.75 80°EH	135	2.34	2.96	240	11.5	7.5	28	96,000	25	85,000
35 Sec. Gas Oil*	0.60 80°S	130	2.13	2.51	225	11.0	7.25	25	86,000	22.5	77,000
35 Sec. Gas Oil*	0.60 80°S	160	2.37	2.79	240	11.5	8.0	28	96,000	25	85,000

90/110 Table 4. Electro Oil Sterling 40 Burner (See Fig. 15)

NOMINAL BOILER RATING AT NORMAL OPERATING TEMPERATURE											
Fuel	Nozzle ‡	Pump Pressure (p.s.i.) †	Fuel Flow Rate		Flue Gas Temp. (°C)**	%CO ₂	Approx. Air Setting	Appliance			
			Kg/h	l/h				Input		Output	
								kW	Btu/hr	kW	Btu/hr
28 Sec. Kerosene	0.85 80°EH	110	2.36	2.99	225	11.0-11.5	11	28.5	97,000	26	89,000
28 Sec. Kerosene	0.85 80°EH	130	2.66	3.37	240	11.0-11.5	12	32	109,000	29	99,000
28 Sec. Kerosene	1.00 80°EH	130	2.95	3.74	245	11.5-12.0	16	35.5	121,000	32	109,000
35 Sec. Gas Oil*	0.50 80°H	260	2.44	2.87	220	11.5-12.0	9	28.5	97,000	26	89,000
35 Sec. Gas Oil*	0.55 80°H	265	2.76	3.25	235	11.5-12.0	14	32	109,000	29	99,000
35 Sec. Gas Oil*	0.55 80°H	330	3.06	3.60	240	12.0-12.5	16	35.5	121,000	32	109,000

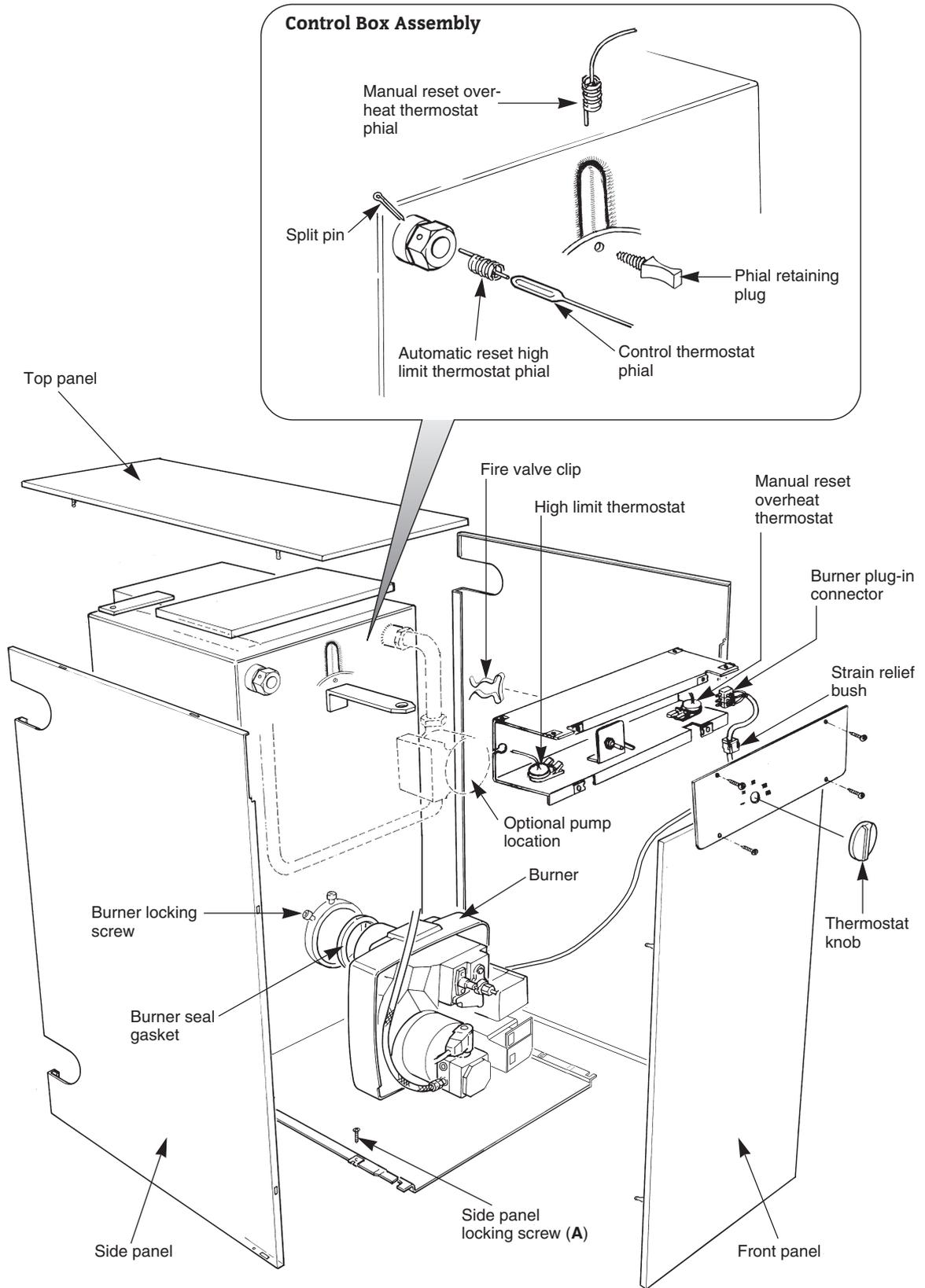
* NOTE: For use on conventional flue only.

** NOTE: The flue gas temperature is measured in the gas sampling hole on the flue outlet plate. The probe should be inserted to a depth of 50mm and angled towards the flue outlet. The temperature measured is not an absolute flue gas temperature and is for general guidance purposes only!

†NOTE: The pump pressure given is for general guidance only as variations in nozzle output can be up to ± 15%. It is, therefore, essential that the air is adjusted to give the correct CO₂ value.

‡NOTE: The nozzle type used on 28 Sec. Kerosene outputs are nozzles calibrated specifically for use with 28 Sec. Kerosene which gives less variation in nozzle output than the standard 35 Sec. Gas Oil nozzles. However, if a 28 Sec. Kerosene nozzle is not available at servicing or commissioning it is appropriate to install a 35 Sec. Gas Oil nozzle providing the output, spray angle and pattern of the nozzle is the same as the 28 Sec. Kerosene nozzle (e.g. 0.75 80°EH may be replaced with a 0.75 80°H).

Fig. 2. General Assembly.



4. Siting The Appliance

4.1 The appliance is not suitable for external installation unless a suitable enclosure is provided.

4.2 The appliance should be positioned on a non-combustible solid base as near to the flue location as possible. Care should be taken to ensure that the appliance is level; use packing at the corners where necessary.

4.3 When using a low level discharge flue system the rear of the appliance must be positioned against an external wall such that the flue terminal can safely discharge the flue gases as described in Section 7.

4.4 The following clearances must be left to allow access for installation and servicing:

- Above 300mm
- In front - 600mm
- Right and left hand side – sufficient for panel removal and access to pipe connections where required.

5. Removal Of The Cabinet

See Fig. 2.

For installation and servicing of the appliance the cabinet should be removed as follows:

5.1 Remove the cabinet top panel by lifting squarely upwards to release the four ball stud connections.

5.2 Remove the front panel by pulling the bottom of the panel forwards to release the lower ball studs and then repeat the procedure at the top end to release the upper ones. Take care not to pull the bottom end too far forwards as this may cause damage to the spring clips.

5.3 The side panels are removed by firstly following procedures 5.1 to 5.2 as described above, then remove screw (A) from the side panel base and the three screws located in the upper flange of each side panel. Ease the side panel clear of the electrical control box and slide forwards to release from the locating lugs on the base plate.

5.4 The control box can be removed by undoing the four screws in the front fascia cover and then removing the wing nut on the underside of the control box. The thermostat phials should be carefully removed from the phial pockets and the control box placed in a safe place taking care not to kink the thermostat capillary tubes.

6. Air Supply

6.1 In order to ensure clean and efficient combustion an adequate supply of air must be delivered to the combustion chamber. To provide sufficient air a suitable inlet should be provided into the room or space in which the boiler is situated, the sizes of which are shown in table 5. An air brick or other form of continuous air supply may have to be built into the installation in order to ensure an adequate supply of air.

6.2 If the appliance is to be installed in a confined space or compartment two air vents are required, one at high level and one at low level. The minimum free area of each vent is given in Table 6 and depends whether the air is taken from another room or from outside the building. Where the air is taken from another room that room must contain an air inlet as described in 6.1.

6.3 There must be sufficient clearance around the appliance to allow proper circulation of ventilation air. The clearances required for Installation and Servicing will normally be adequate for ventilation. See Section 4.

Table 5. Minimum Combustion Air Inlet Free Area for open flue appliances.

MODEL	AREA OF AIR INLET	
	cm ²	in. ²
50/70	105	16.5
70/90	138	21.5
90/110	176	27.5

Table 6. Minimum Air Vent Free Area for Open Flue appliances installed in a compartment.

Appliance model	Ventilation to room or internal space		Ventilation to outside	
	High Level	Low Level	High Level	Low Level
50/70	209cm ²	314cm ²	105cm ²	209cm ²
70/90	275cm ²	413cm ²	138cm ²	275cm ²
90/110	352cm ²	528cm ²	176cm ²	352cm ²

7. Flue System

A flue system must be provided in accordance with BS5410:Part 1 and the Building Regulations, Part J, Section J2.

The flue terminal must be located in a suitable position as shown in Fig. 5, such that the products of combustion can be fully dispersed without the possibility of the gases entering the dwelling or that of a neighbouring dwelling.

7.1 Conventional Flue (See Fig. 3)

Conventional Flue Diameters:

50/70 125mm (5 in.) or 100mm (4 in.)

70/90 125mm (5 in.) or 100mm (4 in.)

90/110 125mm (5 in.)

The boiler is fitted with a conventional flue locating spigot. The flue pipe fits into the spigot and should be correctly sealed with fire cement.

Note: The size of the flue must never be reduced from that specified above. An increase in flue size is permissible provided that the joint is sealed correctly.

When installed the flue should be vertical and contain as few bends as possible. Where bends are necessary, a maximum of two are permitted and 135 degree bends should be used.

All brick and masonry chimneys should be lined with a suitable non-combustible material, properly jointed and able to withstand the effects of the working temperature of the appliance and any condensate which may form.

Fig. 3. Flue Installation.

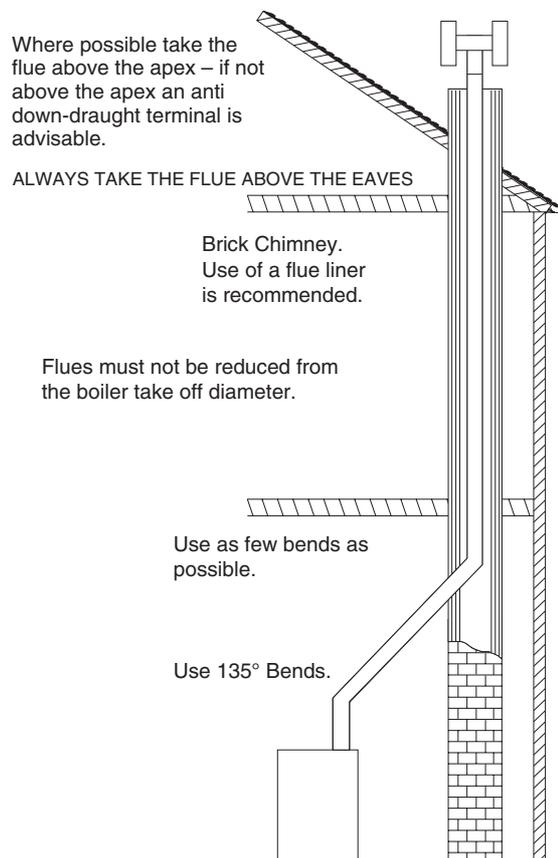
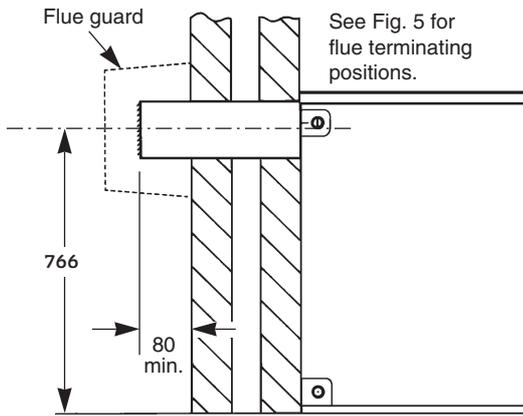


Fig. 4. Flue Installation (Rear Discharge).



Down draught conditions will adversely effect the operation of the boiler and must be avoided. Where possible the flue should be extended beyond the apex of the roof and should always be

taken beyond the eaves of the building. Where down-draught is experienced a suitable anti down-draught terminal should be fitted to the flue termination.

The natural flue draught must be checked in the flue pipe immediately above the appliance or in the hole provided in the flue outlet plate. The flue draught should be no less than 0.75mm W.g. and no greater than 5.1mm W.g. If a flue draught greater than 5.1mm W.g. is experienced a draught stabiliser should be introduced into the flue and adjusted to achieve a flue draught within the specified range.

7.2 Low Level Discharge (See Fig. 4)

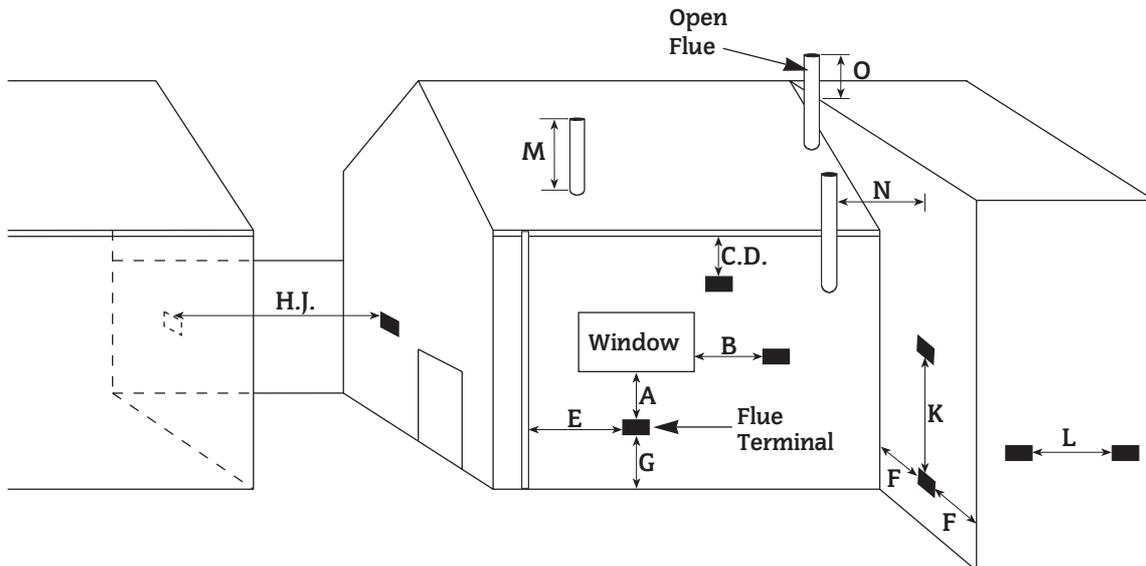
The appliance may be converted to discharge the products of combustion at low level. For this purpose a special flueless kit and associated ducting is available, allowing the conventional flue to be discarded. Detailed instructions for converting the appliance to low level discharge are supplied with the conversion kit. The 5 inch flue spigot should be removed from the flue outlet plate, by undoing the three retaining screws, and the hole blanked off with the plate provided in the kit.

Note: Under no circumstances may 35 Second Gas Oil be burned with this type of flue terminal arrangement.

Fig. 5. Flue terminating positions for oil-fired appliances

NOTE: The dimensions given are for general guidance only. Other surrounding buildings or objects may affect the clearance of combustion products. An alternative flue terminal position should be sought when there is any possibility of a nuisance being caused by inadequate dispersal of flue products.

The flue terminal must be located in a suitable position as shown, such that the products of combustion can be freely dispersed without the possibility of the gases entering the dwelling or that of a neighbouring dwelling.



Terminal Position	Minimum Distance (mm)	
	Open Flue	Low-Level Discharge
A Directly below an opening, air brick, window, etc.	Not allowed	600
B Horizontally to an opening, air brick, window, etc.	Not allowed	600
C Below a gutter or sanitary pipe.....	Not allowed	75
D Below eaves or a balcony.....	Not allowed	600
E From vertical sanitary pipework.....	Not allowed	75
F From an internal or external corner.....	Not allowed	300
G Above ground or balcony level.....	Not allowed	300
H From a surface facing the terminal.....	Not allowed	600
J From a terminal facing the terminal.....	Not allowed	1200
K Vertically from a terminal on the same wall.....	Not allowed	1500
L Horizontally from a terminal on the same wall.....	Not allowed	300
M Above an intersection with the roof.....	600	Not applicable
N From a vertical structure on the side of the terminal.....	600	Not applicable
O Above a vertical structure less than 750 mm from the side of the terminal.....	600	Not applicable

8. Oil Supply

See Figs. 6 and 7.

8.1 The oil storage tank must be installed in accordance with BS 799 Part 5. The tank should be arranged with a slope of 1 in 24 away from the outlet valve with a sludge cock at its lower end.

8.2 Do not use galvanised steel tanks or pipework for the oil supply system.

8.3 Do not use soldered joints on the oil supply pipework as this could cause a hazard in the case of a fire.

8.4 The burners on all appliances are supplied so as to be connected to a single pipe gravity feed system. Details of how to convert the burners to a double-pipe sub-gravity feed system are shown in Fig. 6.

8.5 If a single pipe system is employed then the tank must be positioned such that the oil level does not exceed 4 metres above the level of the burner oil pump and in addition the oil level must be at least 0.3 metres above the level of the oil pump. Should it prove impossible to site the tank below the 4 metres maximum oil level a head breaking device must be installed between the tank and the burner.

8.6 If a double pipe system is used then the maximum suction height allowable is 3.5 metres.

8.7 The oil supply pipe diameter can be determined using Tables 7 and 8 depending on whether a single or double pipe system is being installed. Selection of the correct pipe diameter will depend on the position of the oil storage tank relative to the burner and the length of the pipe run.

8.8 The oil supply pipe should be laid as level as possible to avoid air pockets and unnecessary friction losses.

8.9 The following components should be fitted in the fuel line between the storage tank and burner.

1. A manual isolating valve installed as close to the tank as possible.

2. A fire valve in accordance with BS799: Part 2 as shown in Fig. 7. The fire valve should be fitted externally with a fire detection element located within the appliance case. Use of a capillary type valve will allow a neat and simple installation. A suitable valve is the KBB manufactured by Teddington Controls Limited. A spring clip has been provided behind the electrical panel shown in Fig. 2 to allow a fire valve element to be mounted. Alternatively a fusible link or electrical system may be used. Under no circumstances should a combination isolating/fire valve be used as the sole fire protection device.

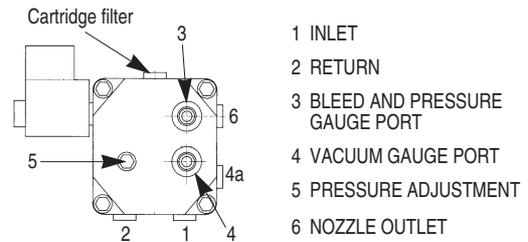
3. A paper element filter complying with the requirements of BS799, Parts 2, 3 and 4 should be fitted in the fuel line between the isolating valve and the burner and as near to the latter as possible.

TABLE 7 Single Pipe Gravity Feed System

HEAD (metres)	MAXIMUM ALLOWABLE PIPE RUN (metres)	
	8 mm inside dia. pipe (10 mm O.D. copper)	10 mm inside dia. pipe (12 mm O.D. copper)
0.5	10	20
1.0	20	40
1.5	40	80
2.0	60	100

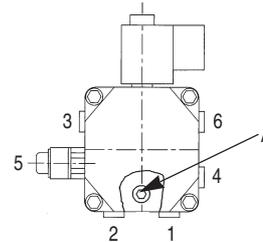
Fig. 6. Oil Pump.

(a) Danfoss BFP 41.



To convert to a double pipe system, remove plug 4a and insert the grub screw provided into the threaded hole. Connect flow and return pipes to (1) and (2).

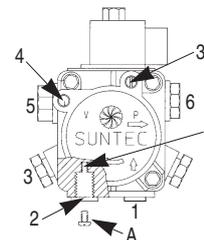
(b) Danfoss BFP 11 Oil Pump.



To convert to a double pipe system: Remove the pump front cover, remove the changeover screw (A) nearest to ports 1 and 2, and the horseshoe washer underneath. Replace the changeover screw back into the threaded hole. Connect the flow and return pipes to 1 and 2.

Note: When removing the pump front cover ensure that a suitable receptacle is placed below the pump to catch the oil residue.

(c) Suntec AS47C Oil Pump.



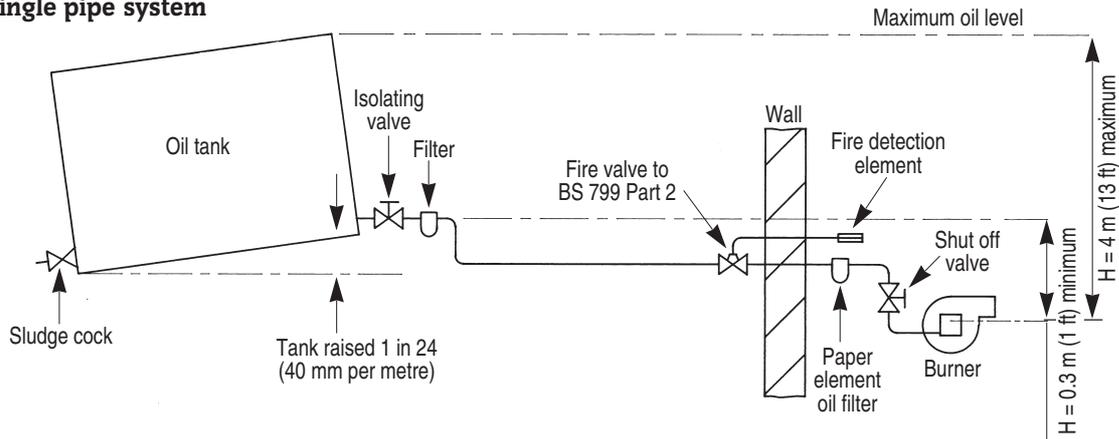
To convert to a double pipe system, remove the return port plug (2) and insert the grub screw (A) provided into the threaded hole (B). Connect flow and return pipes to (1) and (2).

TABLE 8 Double Pipe Sub-Gravity Feed System

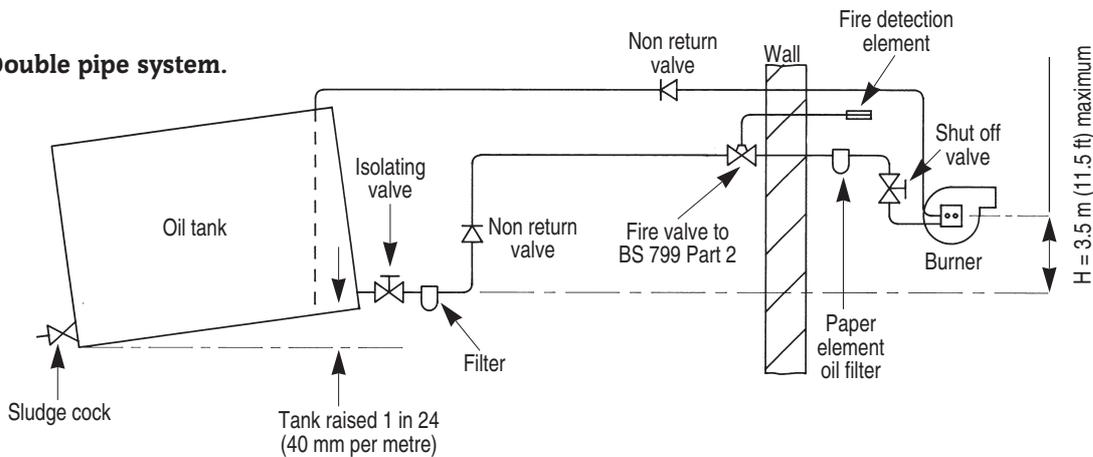
HEAD (metres)	MAXIMUM ALLOWABLE PIPE RUN (metres)	
	8 mm inside dia. pipe (10 mm O.D. copper)	10 mm inside dia. pipe (12 mm O.D. copper)
0	35	100
0.5	30	100
1.0	25	100
1.5	20	85
2.0	15	70
2.5	11	50
3.0	8	30
3.5	6	20

Fig. 7. Oil Supply.

(a) Single pipe system



(b) Double pipe system.



9. Heating And Hot Water System

- 9.1 The appliance is suitable for connection to open vent or sealed primary systems.
- 9.2 The appliance is suitable for connection to all conventional indirect hot water systems utilising an indirect double feed cylinder.
- 9.3 The flow and return sockets are located at the rear of the appliance, two at high level (flow) and two at low level (return). Connection of the flow and return sockets can either be made on diagonally opposite sockets or on the same side of the boiler.
- 9.4 The appliance is supplied with an extra flow tapping to allow a circulating pump to be mounted on the front face of the boiler. This will allow the pump to be enclosed within the cabinet case. Where this option is chosen the flow pipe can run either side of the boiler. (See Fig. 2).
- 9.5 There is no requirement for a system bypass.
- 9.6 The pressure jet burner fitted to the appliance has full automatic control and hence there is no requirement for heat leak radiators.
- 9.7 Any unused boiler tappings should be plugged prior to filling. It should be noted that the flow tapping on the front of the boiler requires plugging when not used.
- 9.8 The primary system should be flushed and treated in accordance with the recommendations of BS 7593:1992 before the system is handed over to the user.
- 9.9 The pump should be set in accordance with the heating load requirements to give a flow and return differential temperature of 11°C under full load conditions.

Open Vent Primary System (See Figs. 8 and 9).

The following points are for guidance only. The system installation should be carried out in accordance with BS 5449: Part 1.

1. Feed and Expansion System

The feed and expansion pipes must rise continuously from the appliance and must be of the minimum diameter shown in Figs 8 and 9.

The cistern must be arranged to provide a minimum static head of 1 metre above the top of the highest point in the heating circuit.

2. Filling and Venting

Air in the appliance is expelled through the vent pipe or dissipated into the system. Manual air vents should be fitted at any high points in the system.

Sealed Primary System

The appliance is supplied with a manual reset high limit thermostat and may therefore be fitted to a sealed heating system.

General

The system should be installed in compliance with the requirements of BS5449: Part 1. The boiler must be fitted with a spring loaded safety valve set to operate at 3 bar (45 psi) and the pipe connections made throughout the system must be capable of sustaining a pressure of up to 3 bar.

The following is a list of major items which must be fitted to the system:

- 1. Safety valve – 3 bar
- 2. Pressure gauge – 0 to 4 bar.
- 3. Expansion vessel
- 4. Automatic air vent.

Fig. 8. Typical Open Vent Gravity Primary System.

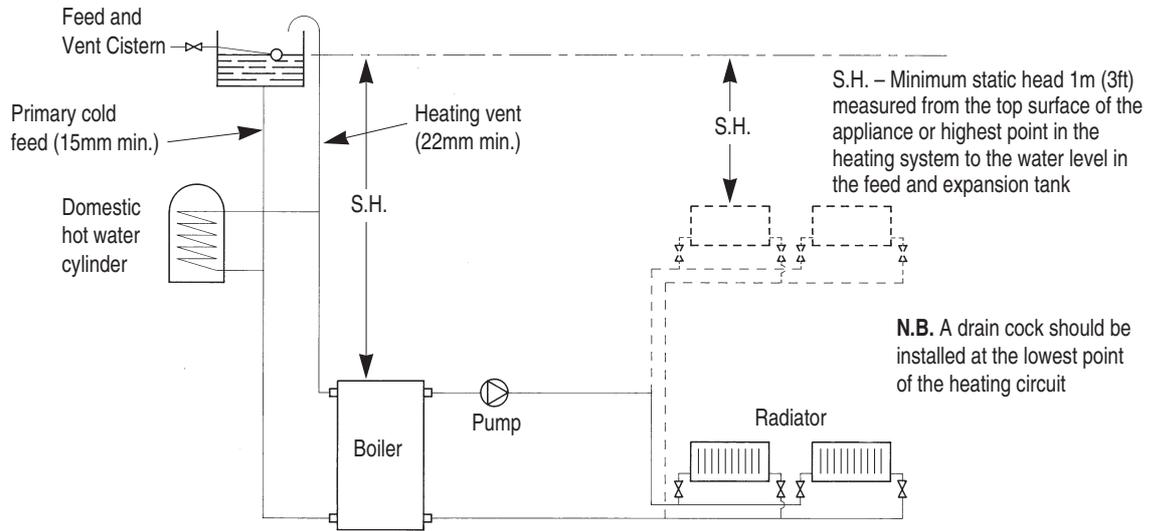
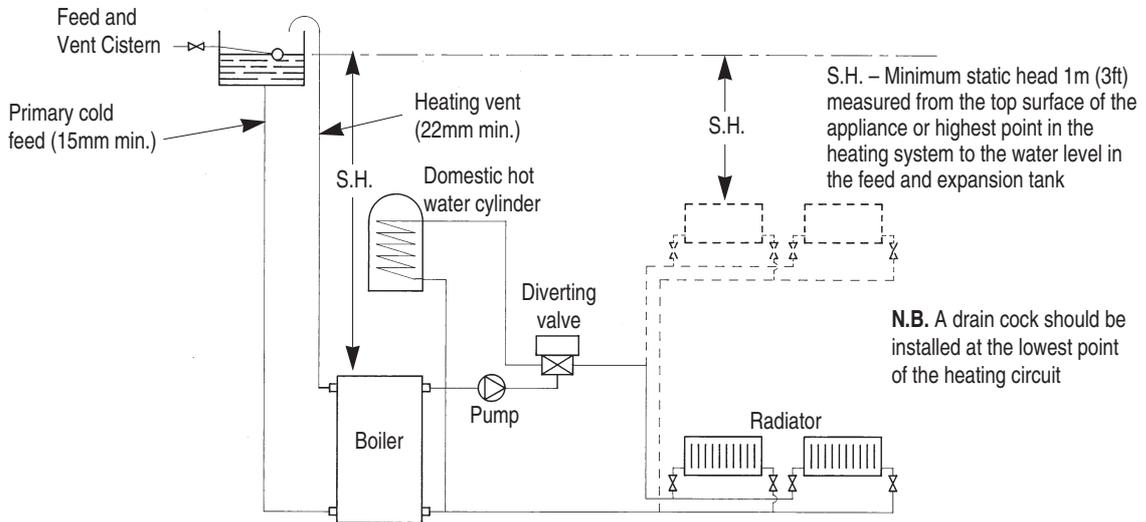


Fig. 9. Typical Open Vent Fully Pumped System (Honeywell 'Y' plan).



10. Electrical

(See Figs. 10 to 12).

10.1 The wiring between the appliance and the electrical supply shall comply with current IEE Wiring Regulations and any local regulations which apply.

10.2 To gain access to the electrical terminal strip.

1. Isolate the mains electrical supply.
2. Remove the cabinet front panel by pulling forwards to release the ball studs.
3. Pull the thermostat control knob forwards to remove from its spindle.
4. Undo the fascia retaining screws and remove the plate.

10.3 Mains Wiring

Mains supply - 230 / 240 V AC ~ 50 Hz 5A External Fuse.

LIVE - Brown, NEUTRAL - Blue, EARTH - Green/Yellow

Mains Cable: 0.75mm² (24 x 0.20mm) to BS 6500 Table 16.

The method of connection to the appliance must allow complete isolation of the appliance, preferably via a double pole isolator with a contact separation of 3 mm in all poles supplying the boiler and controls only.

The mains supply cable should be connected into the terminals marked **L** (Live), **N** (Neutral) and **E** (Earth) on the appliance terminal strip and securely held in the cable clamp located in the right-hand side of the electrical tray base. To secure the cable, remove the clamp retaining screw and pull its inner body out to allow the cable to be fed through. With the cable in position refit the screw and fully tighten to grip the cable. Feed the cable between the side panel and the boiler insulation jacket and route to the connection point avoiding any hot surfaces.

The appliance must be earthed.

10.4 Programmer (See Fig. 11 and 12).

A time clock or programmer may be added to the control system. A two channel programmer will allow independent control of the central heating and hot water. However, it must be noted that the programmer used must be suitable for gravity feed applications when used as shown in Figs. 11 and 12, such that the hot water channel is always on when the central heating channel is on, otherwise the boiler will not fire when there is a central heating demand.

10.5 Safety Check

In the event of an electrical fault after the installation of the appliance, the electrical system shall be checked for short circuits, fuse failure or incorrect polarity of connections.

10.6 Basic Control (Room Thermostat) (See Fig. 11).

As supplied the hot water and central heating circuits are controlled by the boiler thermostat. Additional control may be obtained by the use of a room thermostat. The boiler will remain hot when there is no demand via the room thermostat.

10.7 Off On No Demand (Room and Cylinder Thermostat)

(See Fig. 12).

This control system allows the boiler to cool when both the cylinder and room thermostats are de-energised. The boiler control thermostat must be set to a temperature above that of the cylinder thermostat for the control system to function correctly.

10.8 Frost Protection (See Fig. 11 and 12).

For full frost protection a single pole double switch thermostat should be fitted so that both the boiler and the circulating pump circuits are energised under frost conditions. A suitable frost thermostat is manufactured by SOPAC Ltd.

Fig. 10. Wiring Diagram (Standard).

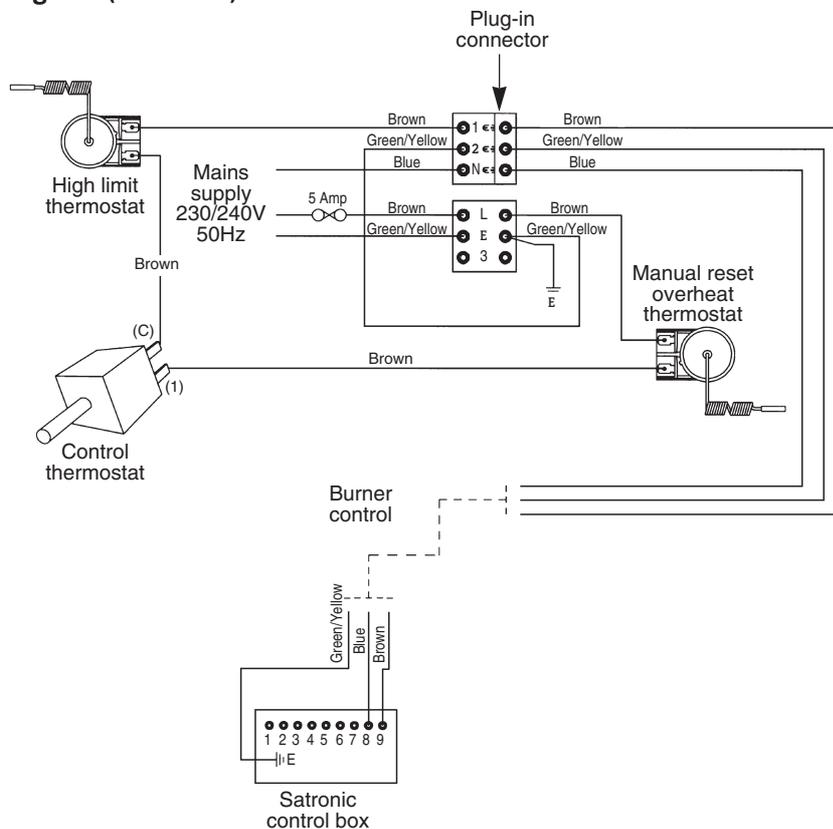


Fig. 11. Basic control.

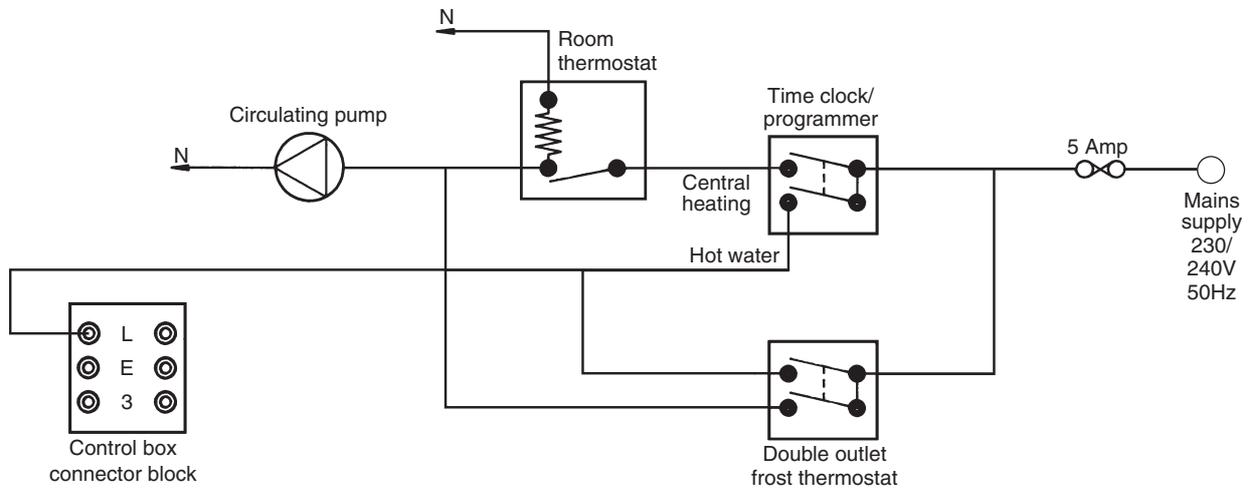
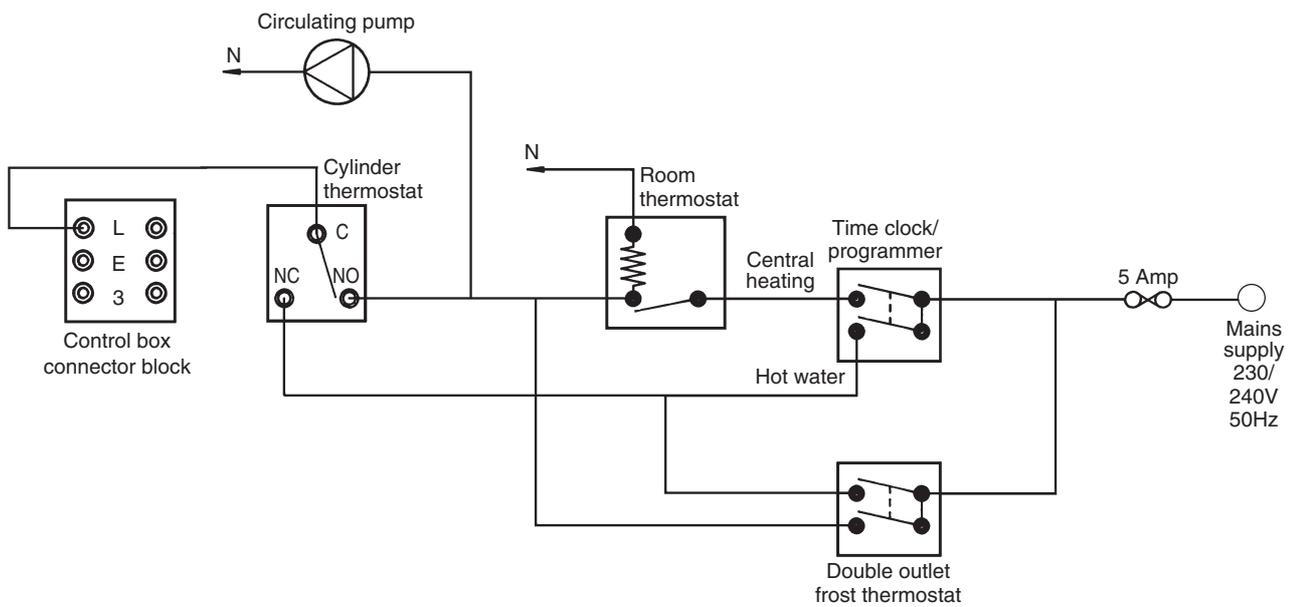


Fig. 12. Off On No Demand.



11. Installation

11.1 After unpackaging the appliance it is recommended that all cabinet panels are removed, as described in Section 5, and stored in a safe place to avoid damage during installation and allow easy inspection for any leaks after the system has been filled. Where the appliance is installed close to a wall the rear panel may be discarded as this is supplied for cosmetic reasons only. This will then allow the panels to be easily removed if access is required in the future.

11.2 Remove the burner as described below and store in a safe place until the appliance is ready for commissioning.

1. Remove the electrical lead plug by removing the electrical fascia and pulling the three pin connector free. Slide the locating bush from the electrical box.

2. Remove the burner from the boiler by slackening the two M6 retaining screws located in the burner housing ring and pulling the burner clear. This will require the use of a 5mm allen key.

11.3 Flue system installation.

Install the appliance flue system as described in Section 7.

11.4 Heating system installation.

1. Plumb the boiler into the central heating system.

2. Check that all unused sockets have been plugged.

3. Fill the system and vent all radiators and high points to remove air from the system.

4. Check the boiler and all pipework connections for leaks.

5. The primary system should be flushed and treated in accordance with the recommendations of BS 7593: 1992.

11.5 Oil supply installation (See Fig. 7).

Note: Never route the oil supply pipe/hose directly below the combustion chamber base.

1. Fit the oil supply pipe as described in Section 8. The pipe can be routed down either side of the boiler in the gap between the base tray and the boiler shell.

Note: Never use soldered joints on oil supply pipes as this could cause a hazard in the case of a fire.

2. Fit an isolating valve at the end of the oil line close to the burner and ensure that the valve is closed.

3. Open the main oil supply valve at the tank and check for any leaks.

4. Place a suitable container below the isolating valve and open the valve.

5. Draw off at least 2.5 litres of oil until a steady flow of clear uncontaminated oil can be seen and turn off the isolating valve.

Note: This method may not be possible on some installations where a sub-gravity system is used. Where this problem arises bleed the system using the oil pump as described in Section 12.6 and remove and clean the oil pump filter to remove any debris collected as a result of installation.

11.6 Replace the electrical control panel and side panels in reverse order to the removal procedure of Section 5 and connect the electrical supply as described in Section 10.

12. Commissioning the Appliance

A qualified engineer must commission the appliance before handing over to the user.

Ensure that no foreign matter is left in the system as this could cause damage to the appliance.

12.1 Check that the electrical supply to the appliance is switched off.

12.2 When commissioning the appliance after initial installation follow the procedure from 12.3, otherwise remove the burner first as described in section 14.3.

12.3 Prepare the heating system

1. After initial installation and checking for leaks, as previously described, drain down the system sufficiently to add a flushing agent. Flush the system in accordance with BS 7593:1992.

2. Refill the system

12.4 Check the Burner

1. Check that the nozzle and electrode settings are correct for the relevant burner. (See Figs. 13, 14 and 15).

2. Check that the nozzle lies central with the combustion head hole.

3. Check for any visible defects.

12.5 Replace the burner

1. Connect the flexible oil supply hose to the isolating valve and tighten sufficiently to form a good seal. Where a double pipe system is being used fit the bypass plug, as described in Fig. 6, and connect the oil return flexible hose to the return pipe fitting.

2. With the sponge O-ring gasket around the burner blast tube insert the burner into the housing tube. Push the burner firmly forward to compress the gasket and tighten the two locking screws using a 5mm Allen key.

Note: It is important that a good seal is made between the burner and the boiler to prevent re-circulation of the flue gases from the combustion chamber to the room.

3. Re-connect the electrical lead plug into the control box.

12.6 Check the installation

1. Check that the appliance is correctly wired as described in Section 10.

2. Check that all baffles are correctly located and the heat shield is correctly mounted (70/90 and 90/110 models only) as shown in Fig. 16.

3. Check that the baffle retainer is correctly mounted (70/90 and 90/110 models only) as shown in Fig. 16.

6. Check that the control thermostat and auto reset high limit thermostat phials are correctly located in the boiler thermostat pocket positioned in the top front of the boiler.

7. Check that the manual reset limit thermostat is located in the steel pocket above the electrical box mounting bracket on the front face of the boiler.

8. Check that all of the air-ways to the burner are clear of any obstruction.

12.7 Fit a pressure gauge and manifold to the burner pump at the point indicated in Fig. 6 or the pressure gauge port shown in Fig. 14 on the 70/90.

12.8 Turn on the electricity to the appliance.

12.9 Bleed the burner.

Single Pipe System

Release the fuel bleed port on the manifold and place a suitable receptacle beneath. Turn on the boiler thermostat and allow the burner to run through to lockout. Wait two minutes and reset the burner control box. Repeat the procedure at least three times or until a steady stream of oil, without air, is exhausted from the bleed port. Re-lock the bleed port.

Two Pipe System

A two pipe system will automatically vent the air back to the oil tank. Turn on the boiler thermostat and allow the burner to run through to lockout. Wait two minutes and reset the burner control box. Repeat the procedure until the burner fires and

runs in a steady state. This may take several attempts depending on the oil pipe length and height.

12.10 Adjust the air shutter and pump pressure to the settings recommended in Tables 2 to 4. After a pre-ignition period of approximately 15 seconds the burner should ignite. Flame sensing is carried out by means of a photocell mounted in the burner body. Should the boiler fail to establish a normal firing pattern (or should flame failure occur during running), the absence of a flame is sensed and the control box is monitored to a safe lockout condition and the boiler is shut down. The lockout indicator light/reset button in the burner control box will illuminate indicating that the burner has gone to lockout. In this instance wait two minutes and press the lockout reset button to initiate another start sequence. Repeat the procedure until a flame is established.

Note: Persistent lockout when running indicates a fault and a Service Engineer should be consulted.

12.11 Run the boiler for approximately 3 minutes and switch off checking that there is no after-sputtering from the nozzle. This can be detected by oil saturation on the blast tube. If after-sputtering occurs remove the burner from the boiler, unscrew the nozzle, and while holding the burner in a vertical position, fill the nozzle holder with oil and refit the nozzle. Replace the burner and continue to run the boiler for three minute periods until after-sputtering stops.

Note: In order that after-sputtering is reduced to a minimum during the commissioning period it is recommended that a pressure gauge only is fitted on the external pressure gauge port on the Electro Oil B11 (See Fig. 14). Use of a "T" piece pressure gauge manifold will increase the oil line volume and hence increase the degree of after-sputtering.

12.12 Run the boiler for a further 15 minute period and then finally fine tune the air shutter setting to give the CO₂ level specified in Tables 2 to 4 less 0.5%CO₂. During this period some smoke will be emitted due to the burning of the organic binder in the base insulation board. Smoke readings will therefore be inaccurate at this point.

Note: A flue gas sampling point is located on the boiler top plate.

12.13 Check that the smoke reading is in the range 0-1. If this cannot be achieved then check that the burner head is set correctly and the nozzle is in good condition.

12.14 Check that the flue temperature does not exceed the value specified in Tables 2 to 4. If this is the case then check that the baffles are correctly located. If the baffles are correctly located then reduce the pump pressure since nozzle variations of up to + or - 15% may occur.

12.15 Remove the oil pressure gauge and manifold and check all oil system joints for any signs of leakage.

12.16 Refit the cabinet front panel.

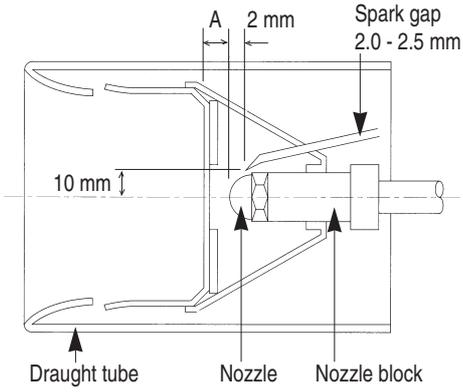
12.17 Allow the burner to run for a further five minutes and then recheck the CO₂ level and adjust the air setting if required. With the cabinet front panel fitted as 12.16, repeat the previous test procedure and Check that the smoke number is in the range 0-1. Repeat the fine tuning procedure if found necessary.

12.18 Refit the cabinet top and front panels in the reverse order to that described in Section 5.

12.19 When the heating circuit has reached full operating temperature check the whole system for any leaks.

Fig. 13. Electro Oil Inter B9 Burner.
(50/70 Model).

Combustion Head



Output kW	Combustion Head	Dimension A
15	PL 6/7/21.5/10 x 78 mm	3 mm
17	PL 6/7/21.5/10 x 78 mm	5 mm
19	PL 6/7/21.5/10 x 78 mm	5 mm

To adjust the nozzle position, undo the locking screw located at the rear of the nozzle line and rotate the adjusting disc one turn anti-clockwise to move forward by 1 mm.

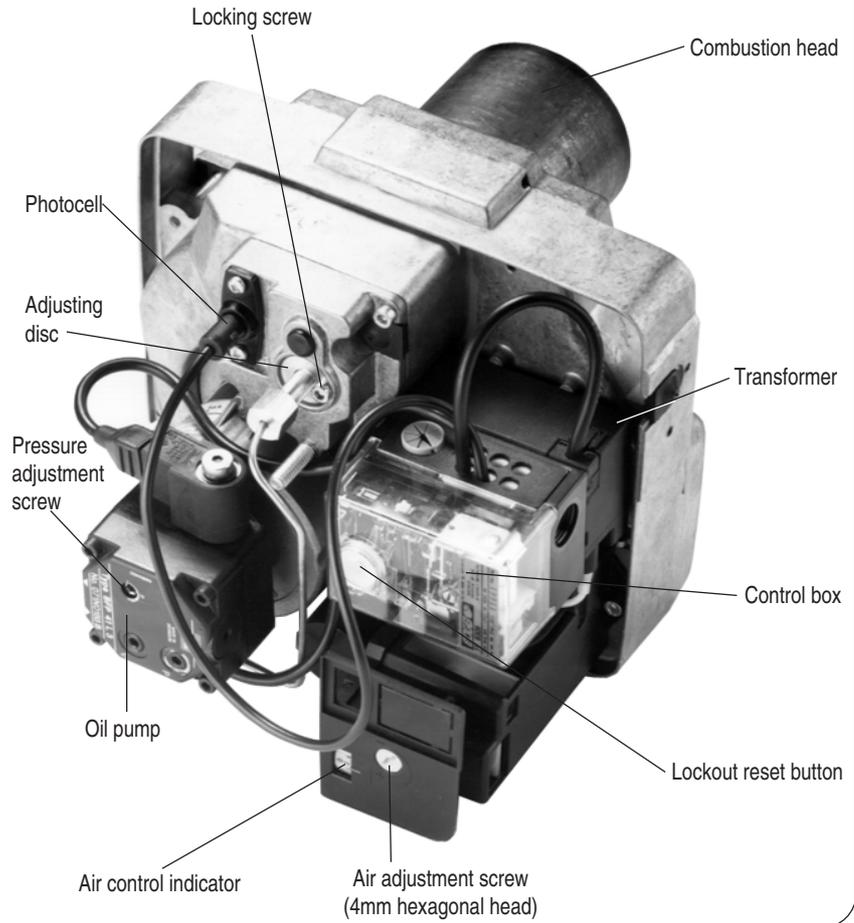
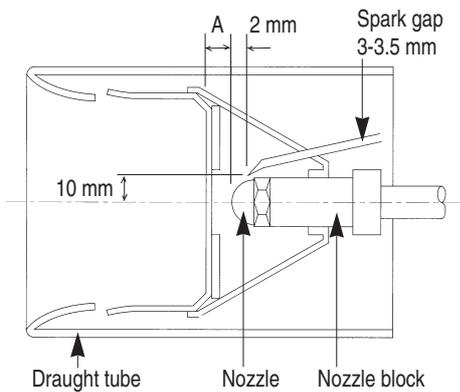
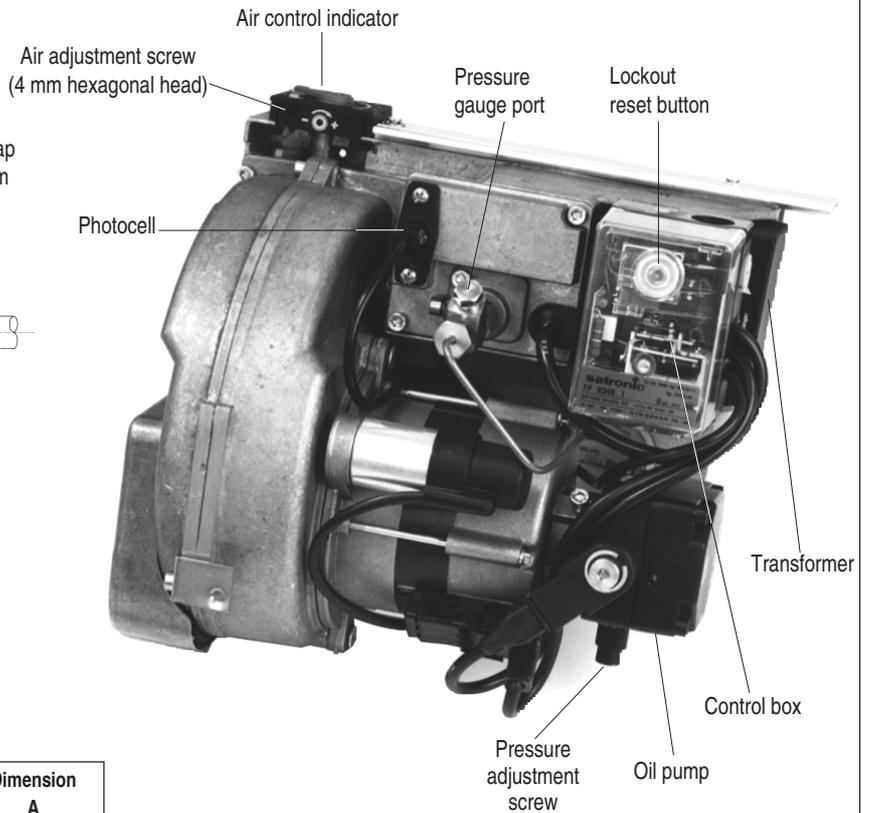


Fig. 14. Electro Oil Inter B11 Burner.
(70/90 Model).

Combustion Head



Output kW	Combustion Head	Dimension A
20-25	PL 10/4/24/10 x 78 mm	5 mm



**Fig. 15. Electro Oil Sterling 40 Burner.
(90/110 model).**

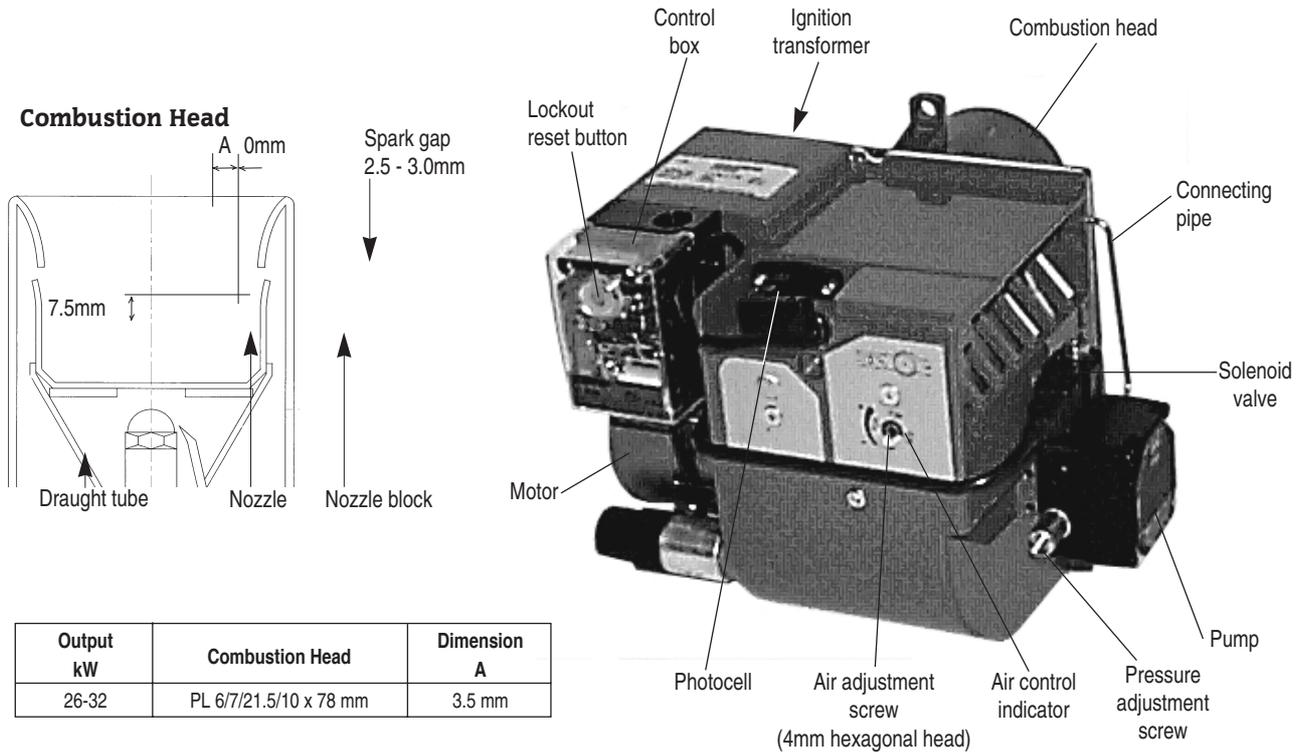
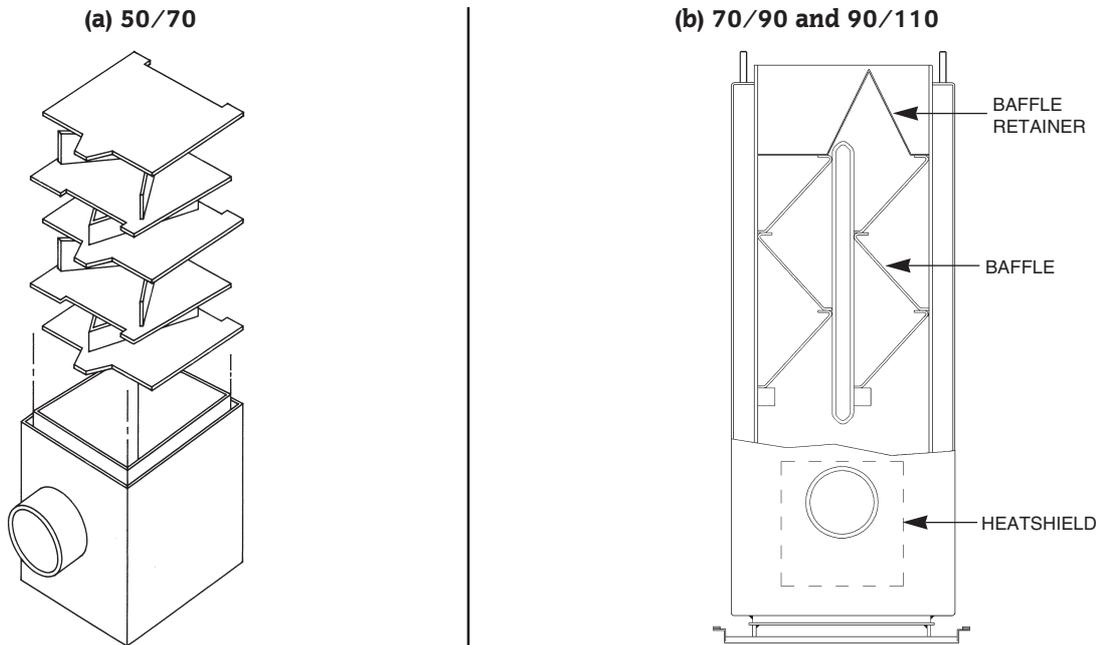


Fig. 16. Location of Boiler Flueway Baffles.



ENSURE THAT ALL BAFFLES ARE FIRMLY SEATED IN POSITION

13. Instructions To The User

13.1 Hand the users instructions to the user or purchaser for retention and instruct them in the efficient and safe operation of the appliance and the heating/hot water system.

13.2 Advise the user or purchaser of the precautions necessary to prevent damage to the heating/hot water system and to the building in the event of the heating system remaining inoperative during frost conditions.

13.3 Finally advise the user or purchaser that for continued efficient and safe operation of the appliance it is important that adequate servicing is carried out by a qualified engineer at least once per year.

Worcester Heat Systems Limited will be pleased to discuss and offer a comprehensive maintenance contract.

13.4 Set the system controls to the users requirements.

14. Routine Cleaning And Inspection

14.1 The following should be carried out at least once per year for 28 second Kerosene and twice per year for 35 second Gas Oil, to ensure efficient, trouble free operation.

1. Carry out a pre-service check noting any operational faults.
2. Check and clean the burner.
3. Check and clean the air intake grille located in the boiler room.
4. Check and clean the baffle retainer (70/90 and 90/110 models only).
5. Check and clean the baffles.
6. Check and clean the heat exchanger surface.
7. Check the heat shield (on 70/90 and 90/110 models only).
8. Check the combustion chamber base insulation board.
9. Check that the flue system is unobstructed and clean as necessary.
11. If the appliance has been installed in a compartment check that the ventilation areas are clear.
12. Clean all oil filters.

Some of the servicing points are covered more fully in the following instructions:-

14.2 Pre-Service Check

1. Remove the cabinet front and top panels as described in section 5 .
2. Operate the appliance and system, noting any faults which may need to be corrected during the service.

14.3 Cleaning the Burner

IMPORTANT: Disconnect the electrical supply at the mains before commencing any servicing. Turn off the oil at the service cock.

1. Remove the burner.
 - (a) Isolate the oil supply at the valve located close to the burner.
 - (b) Slacken the two burner locking screws, remove the burner, and carefully place on the floor.
2. Clean the fan impeller using the following procedure:

Electro-oil Inter B9 Burner

- (a) Remove the two screws holding the combustion head in position and withdraw the combustion head and air guide collar.
- (b) Remove the three remaining screws holding the front cover plate in position and withdraw the cover to expose the fan impeller.
- (c) Clean both sides of the fan impeller and remove any debris from the burner housing.
- (d) Check that the impeller rotates freely.
- (e) Clean the air inlet passage and check that the adjustment mechanism operates freely.
- (f) Re-assemble the components.

Electro Oil Inter B11

- (a) Remove the acoustic fan inlet cover.
- (b) Remove the three screws holding the fan cowl in position and remove the cowl noting how the fan control flap is positioned.
- (c) Check that the air control flap pivots freely and ensure the air path to the burner head is clear.
- (d) Clean both sides of the fan impeller and remove any debris from the burner housing.
- (e) Check that the impeller rotates freely.
- (f) Re-assemble the components.

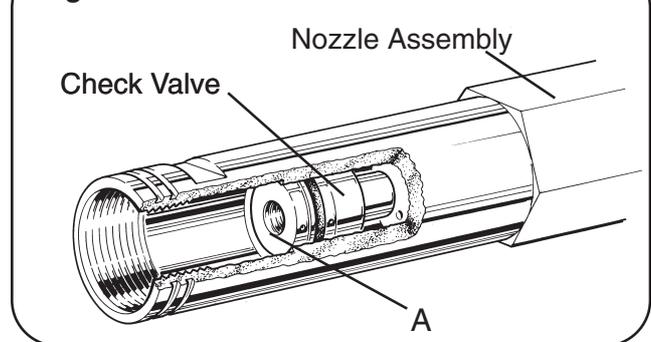
Electro Oil Sterling 40

- (a) Remove the air adjustment cover.
- (b) Separate the main body of the burner from the burner front by removing the M6 allen screw (located beneath the air adjustment screw), using a 5mm allen key.

- (c) Note the position of the air damper adjustment and check the air damper moves freely.
- (d) Check the air path to the burner head is clear.
- (e) Clean both sides of the fan impeller and remove any debris from the burner housing.
- (f) Check the impeller rotates freely.
- (g) Re-assemble the components.

3. Remove the combustion head and thoroughly clean all deposits.

Fig. 17. Mechanical Shut-off Valve.



4. Inspection of Mechanical Shut-off Valve.

- a) Remove the nozzle.
- b) Fasten an M5 screw, with a minimum length of 30mm, into the threaded hole (A) and pull the screw to withdraw the check valve.
- c) Check that the nozzle holder is clear of any debris and clean if necessary.
- d) Check that the 3 holes in the check valve are clear of any debris. Discard the check valve if the holes cannot be cleared or if the unit is defective and replace with a new one.
- e) Replace in the reverse order.

5. It is strongly recommended that the oil atomising nozzle is replaced at each service. If this is not possible then remove and clean the integral filter, but under no circumstances should the nozzle be stripped into its component parts and never attempt to clean the nozzle tip.

6. Check and reset the electrodes, where necessary, as shown in Figs. 13, 14 and 15.

7. Replace the combustion head and check that the nozzle lies central to the combustion head and the head settings are as shown in Figs. 13, 14 and 15.

8. Withdraw the photocell from its housing and clean.

9. Remove and clean the oil pump internal filter using kerosene or white spirit. The internal filter is accessed by removing the oil pump cover on the Danfoss BFP 11 and Suntec AS47C and by unscrewing and withdrawing the cartridge on the Danfoss BFP 41 as indicated in Fig 6.

10. It is recommended that the standard flexible oil line is replaced at each yearly service to prevent the possibility of a leak due to ageing.

11. Re-assemble the burner components.

12. Check the sponge O-ring seal located around the combustion head and replace if necessary. It is imperative that this seal is in good condition since failure will cause the flue gases to leak into the room.

14.4 Remove the paper element from the external oil filter and replace. If the filter contains a washable element then thoroughly clean in Kerosene or white spirit and re-assemble into the filter.

14.5 Clean the Boiler

1. Remove the boiler top access door by releasing the two M10 nuts and check the fibreglass rope seal. Replace the seal if necessary.

2. Remove and clean the baffle retainer (70/90 and 90/110 models only). See Fig. 16b.
 3. Remove the baffles and clean and check their condition. Replace any baffles considered to be badly corroded.
 4. Thoroughly clean all of the heat exchanger surfaces using a stiff wire brush and vacuum clean all loose debris from the combustion chamber. Take care not to damage the base insulation !
 5. Remove and check the heat shield where fitted (70/90 and 90/110 models only). See Fig. 16b.
 6. Check the condition of the combustion chamber base insulation and replace if there is any sign of significant damage.
 7. Check and clean the flue.
 8. Replace the items in reverse order noting the baffle positions shown in Fig. 16.
- 14.6 Check that a fire valve is fitted to the incoming oil line with the body located outside the premises and the detection

element located within the appliance case. A fire valve clip is provided for this purpose as shown in Fig. 2. test the operation of the fire valve to ensure that the mechanism operates and that the oil supply is completely isolated.

14.7 Recommission the Burner.

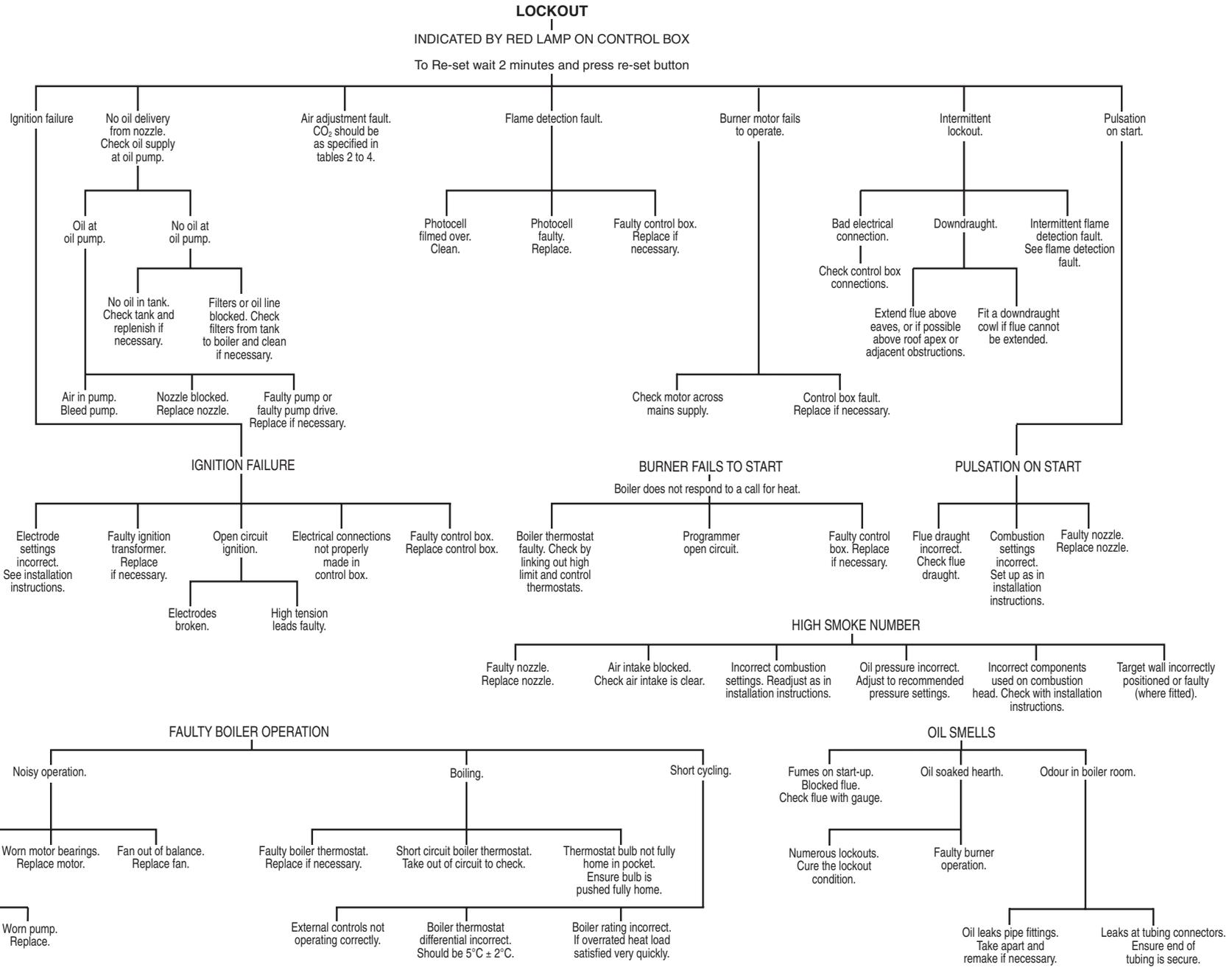
1. Connect the flexible oil supply hose to the isolating valve and tighten sufficiently to form a good seal. Where a double pipe system is being used connect the oil return hose to return pipe fitting.
2. With the sponge O-ring gasket around the burner blast tube insert the burner into the housing tube. Push the burner firmly forward to compress the gasket and tighten the two locking screws.

Note: It is important that a good seal is made between the burner and the boiler to prevent emission of the flue gases from the combustion chamber.

2. Turn on the oil supply at the service cock.
3. Recommission the burner as described in Section 12.

15. Short Parts List

Part	Manufacturers Reference	Qty	WHS Part No.
Burner Control 1. Box Photocell	Satronic TF832.3	1	8 716 156 648 0
	Satronic MZ770	1	8 716 142 735 0



NOTES:



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