

TRIANCO

EUROSTAR

**Premier 50/90 Condensing
Premier 100/125 Condensing**

**OIL FIRED CENTRAL HEATING BOILERS
FOR BALANCED OR CONVENTIONAL FLUE**



TRIANCO

CE BED 92/42 EEC
EMC 89/336 EEC

**USER, INSTALLATION
COMMISSIONING & SERVICING
INSTRUCTIONS**

To be retained by householder

HEALTH AND SAFETY

INFORMATION FOR THE INSTALLER AND SERVICE ENGINEERS

Under the Consumer Protection Act 1987 and the Health and Safety at Work Act 1974, it is a requirement to provide information on substances hazardous to health (COSHH Regulations 1988).

The Company takes every reasonable care to ensure that these products are designed and constructed to meet these general safety requirements, when properly used and installed.

To fulfil this requirement products are comprehensively tested and examined before despatch.

This appliance may contain some of the items below.

When working on the appliance it is the Users/Engineers responsibility to ensure that any necessary personal protective clothing or equipment is worn appropriate to parts that could be considered as being hazardous to health and safety.

INSULATION AND SEALS

Glass Rope, Mineral Wool, Insulation Pads, Ceramic Fibre, Glass Insulation.

May be harmful if inhaled. May be irritating to the skin, eyes, nose or throat. When handling avoid inhalation and contact with eyes. Use (disposable) gloves, face masks and eye protection.

After handling wash hands and other exposed parts. When disposing, reduce dust with water spray, ensure parts are securely wrapped.

GLUES, SEALANTS & PAINT

Glues, Sealants and Paints are used in the product and present no known hazards when used in the manner for which they are intended.

KEROSENE & GAS OIL FUELS (MINERAL OILS)

1. The effect of mineral oils on the skin vary according to the duration of exposure.
2. The lighter fractions also remove the protective grease normally present on the surface of the skin rendering the skin dry, liable to crack and more prone to damage caused by cuts and abrasions.
3. Skin rashes (oil acne). Seek immediate medical attention for any rash, wart or sore developing on any part of the body, particularly the scrotum.
4. Avoid as far as possible any skin contact with mineral oil or with clothing contaminated with mineral oil.
5. Never breathe any mineral oil vapours. Do not fire the Burner in the open i.e. out of the Boiler as a misfire will cause unburnt oil vapours.
6. Barrier cream containing lanolin such as Rosalex Antisol, is highly recommended together with a strict routine of personal cleaning.
7. Under no circumstances should mineral oils be taken internally.

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1. USER INSTRUCTIONS

Please note, to assist Trianco in improving customer service, it is important that the guarantee/registration card is returned.

HOW TO USE YOUR TRIANCO BOILER

The Trianco EuroStar Condensing boiler has been designed and constructed to give years of trouble free service. These instructions are provided to assist you in obtaining the best performance with the least trouble and cost.

The boiler is fully automatic in operation and requires little attention, other than the setting of the thermostat and any system controls (such as a room thermostat and time-switch).

On the control panel there are three neon indicator lights. (See Fig 1 below)

- Green - Power on to the boiler
- Amber - Boiler is calling for heat
- Red - Limit Thermostat Light

TO FIRE THE BOILER

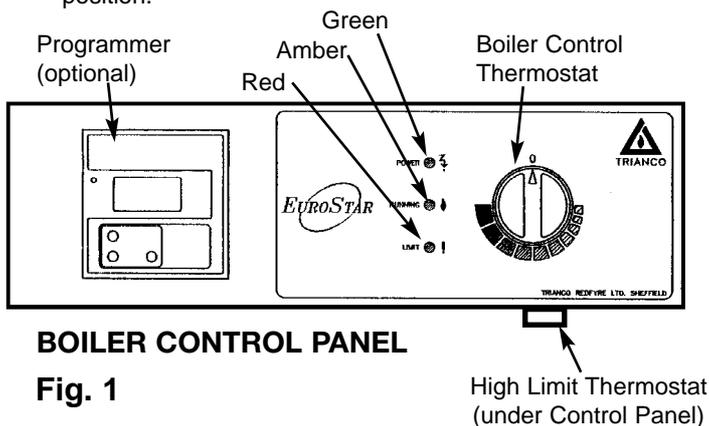
Before firing the boiler, ensure the system is full of water, there is sufficient oil in the storage tank and all valves are open.

1. Check that the Time-switch/Programmer (if fitted) is ON and the room thermostat is calling for heat.
2. Set the boiler thermostat to the desired temperature.
3. Switch on the electrical supply to the boiler. The green and amber neon lights will illuminate and the burner should fire after a few seconds of fan pre-purge.
4. Set the Time-switch/Programmer (if fitted) to the times and programme required.
5. The boiler will now operate automatically, cutting in and out according to the heat demand.

TO STOP THE BURNER

The burner may be stopped by turning the Boiler Control Thermostat fully anti-clockwise to the OFF position 'O'.

If the boiler is to be off for a long time, it is recommended that the mains supply to the boiler is switched off or the Time-switch/Programmer (if fitted) is switched to the OFF position.



BOILER CONTROL PANEL

Fig. 1

BOILER CONTROL THERMOSTAT

The boiler control thermostat allows you to select the temperature of the water leaving the boiler. It is calibrated between High and Low in five intermediate settings, corresponding to a temperature range between 82°C (High) and 55°C (Low). The thermostat is switched off when the knob is turned fully anti-clockwise with pointer opposite 'O'.

The installer must take into consideration that the return water temperature must not drop below 50°C when the appliance is up to full operating temperature.

Note: Where a cylinder thermostat or room thermostat is fitted ensure that the boiler thermostat is set above or equal to the highest setting.

HIGH LIMIT THERMOSTAT (Hand Reset)

The high limit thermostat is factory set and requires no adjustment. Should the boiler thermostat malfunction, the limit thermostat will take over and shut down the boiler. The red light will illuminate when the limit thermostat has operated.

If the limit thermostat operates frequently, consult your Service Engineer as there may be a fault in the system.

To reset the limit thermostat, remove the front panel and push in button.

Note: The limit thermostat can only be reset when the water temperature has dropped at least 20° C.

BURNER LOCK-OUT

If the burner has failed to light, the boiler will go into lock-out mode. The illuminated reset button on the burner control box will indicate this. To reset the burner press the illuminated reset button. In case of the burner not firing and the boiler returning to lock-out mode, wait a further minute and then press the reset button again. If the burner still fails to start, switch off the electrical supply to the boiler.

WARNING - DO NOT ATTEMPT TO START BURNER MORE THAN TWICE

(See Simple Fault Finding before contacting your Service Engineer).

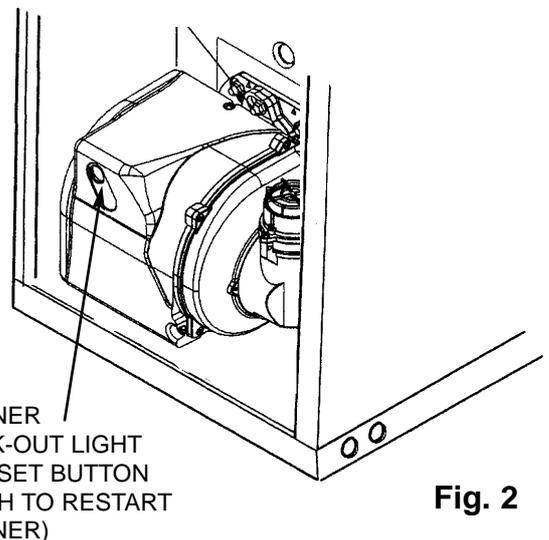


Fig. 2

SYSTEMS CONTROLS

ROOM THERMOSTAT

The room thermostat should not be positioned near a source of heat such as a radiator or be exposed to direct sunlight, as this will cause the central heating to switch off before the room is up to the correct required temperature. Always follow the manufacturer's instructions for the best siting position of the room thermostat.

TIME-SWITCH/PROGRAMMER

When choosing the operating times for your boiler, it is useful to remember that central heating systems usually take between half an hour and an hour before becoming effective and usually remain warm for up to half an hour after boiler shut-down. The timer can therefore be switched off earlier as an economy measure.

FROST PROTECTION

If the boiler and central heating is shut down for any period of time during very cold weather, or your boiler is located in a boilerhouse external to the property being heated, it is advisable to protect the installation with a frost thermostat.

Where the system is not protected, it is suggested the boiler is left switched on and the room thermostat set to a low setting (e.g. 7° C) to prevent the building temperature falling too low.

If the system is shut down for a long period during very cold weather, it is also advisable to completely drain the system. However, too frequent draining of the system should be avoided, especially in hard water areas, as this could lead to scaling of the boiler waterways.

See **page 4** for flushing and water treatment.

SHUTTING DOWN FOR THE SUMMER

If the boiler is shut down for the summer months, it is advisable to have it serviced and thoroughly cleaned as soon as possible to minimise corrosion of the heating surfaces.

OIL

The recommended oil for your boiler is Kerosene C2 to BS 2869.

Always ensure the oil storage tank is topped up regularly, do not wait until the tank is nearly empty before refilling, as sludge and water could be sucked into the oil pipe, affecting the operation of the burner and potentially reducing the life of the pump.

After a delivery of oil, it is recommended that the oil is allowed to settle in the tank for about half an hour before restarting the boiler.

Sludge and water caused by condensation should be drawn off at the tank drain-cock annually.

SIMPLE FAULT FINDING

If the burner fails to start for no apparent reason, make the following checks before calling your service engineer.

1. Check for failure in the electrical supply
2. Check for a blown fuse. If the fuse has blown and the replacement subsequently blows again, switch mains electrical supply to the boiler and contact your service engineer.
3. Check that there is adequate oil in the tank and that all isolation valves are fully open.
4. Check for burner lock-out (see **page 1**).
5. Check for excess water temperature (see high-limit thermostat details, **page 1**, for further details).

Note: If the boiler has been shut down due to a failure of the power supply, it may be necessary to reset the time-switch or programmer to the correct time, unless the device has a built-in power reserve.

SERVICING

To ensure efficient and reliable operation of the boiler, it is essential that the burner be **commissioned** immediately after installation, and prior to first use.. The boiler requires an annual service thereafter.

IMPORTANT NOTES

1. Only a OFTEC-trained and registered engineer can carry out commissioning and service work.
2. Electrical safety checks should be carried out by a qualified electrical engineer.
3. It is the responsibility of the installer to ensure proper commissioning is carried out.
4. It is a requirement of the guarantee and any extended warranty that an annual service is carried out.
5. The system water must always be protected by a corrosion inhibitor.

TRIANCO

CUSTOMER AFTER SALES SERVICE INFORMATION

A step by step guide to reporting a fault with your appliance

A qualified field SERVICE ENGINEER is available to attend a breakdown or manufacturing fault occurring whilst the appliance is under guarantee.

The appliance must be made available for service during normal working hours, Monday to Friday (no weekend work is accepted).

A charge will be made where:

- Our Field Service Engineer finds no fault with the appliance
or
- The cause of a breakdown is due to other parts of the plumbing/heating system (including oil line/lack of oil), or with equipment not supplied by Trianco.
or
- Where the appliance falls outside the guarantee period (see terms and conditions enclosed).
or
- The appliance has not been correctly installed, commissioned or serviced as recommended (see commissioning, installation and servicing instructions)
or
- The breakdown occurs immediately following an annual service visit. In this instance your appointed Service Agent must check all his work PRIOR to requesting Trianco to attend.

PLEASE NOTE:

Unauthorised invoices for attendance and repair work carried out on this appliance by any third party will not be accepted by Trianco.

NOTE: Burner nozzles are currently guaranteed until the first service.

Over 50% of all service calls made are found to have no appliance fault.

What to do in the event of an appliance fault or breakdown:

Step 1: Always contact your installer or commissioning engineer in the first instance, who must thoroughly check all his work PRIOR to requesting a service visit from Trianco.

Step 2: If your appliance has developed an in-guarantee fault your installer should contact Trianco Service Centre for assistance.

What happens if my installer/engineer is unavailable?

Step 3: Contact Trianco Direct. We will provide you with the name and telephone number of our Service Agent. However, a charge will apply if the fault is not covered by the appliance guarantee (payment will be requested on site by our independent Service Agent).

Note: Before contacting Trianco, please have the following information ready:

- 1) Boiler serial number or your customer ID number (issued upon registration of the boiler with Trianco).
- 2) Date of appliance installation.

Boiler Serial Number:	_____
Cust ID Number:	_____
Installation Date:	_____

SERVICE CENTRE AND TECHNICAL SUPPORT

Tel: 0114 257 2300 Fax: 0114 257 2338

Hours of business Monday to Thursday 8.30am - 5.00pm

Friday 8.30am - 2.30pm

2. INTRODUCTION

Trianco boilers have been designed to conform to European Directive/Standards BED 92/42 EEC LVD 73/23/EEC EMC 89/336/EEC..

The boiler design incorporates a secondary stainless steel heat exchanger, which recovers heat from the flue gasses that would normally be lost when using conventional oil fired boilers.

The matched pressure jet burner which is exceptionally quiet in operation, ensures clean and efficient combustion with low NO_x emissions

When installed in conjunction with a Trianco balanced flue kit, the boiler becomes a room-sealed appliance. As such, it is ideal for installation in a garage.

The EuroStar boilers are suitable for all normal open vented central heating and indirect hot water systems and can also be used with sealed systems up to a working pressure of 3 bar with the appropriate sealed system safety equipment.

Two flow and return sockets are provided to facilitate connection to the heating system.

To ensure the boiler is operating at its maximum efficiency, the central heating return temperature should be 50°C or above.

Maximum performance will be achieved by maintaining a differential of 20°-30°C between the flow and return temperatures.

All servicing can be carried out from the front, allowing the boiler to be fitted under a kitchen work top if required. The front mounted flue-cover permits easy access for the removal of the flue-baffles and cleaning of heating surfaces.

The boiler is fully automatic in operation and incorporates all necessary safety controls to ensure safe and reliable operation.

Trianco EuroStar boilers are supplied with the burner set for Kerosene C2 to BS 2869 fuel to meet the Building Regulation requirements for low level flue discharge. It is recommended this fuel is also used when the boiler is connected to a conventional chimney because of the clean burning characteristics of Kerosene.

Balanced Flue Kits

The boilers are supplied suitably equipped for connection to a conventional chimney, but can readily be converted into a room-sealed balanced flue appliance by using a Trianco balanced flue kit. These kits allow the boiler to be installed in a wide variety of site conditions. (see balanced flue kit details).

Flushing and Water Treatment

The performance of the appliance could be impaired by system debris or the effects of corrosion. New systems must be thoroughly flushed to remove metal filings, solder, machining oils and any other fluxes or greases before connecting the boiler.

When fitting the appliance to an existing system, it is advisable to clean the system by using an appropriate flushing and descaling agent. Refer to BS 7593 (1992) for guidance.

System additives - corrosion inhibitors and all flushing agents/descalers should be suitable for steel boilers and comply with BS 7593 requirements.

Always refer to the manufacturers' instructions.

Failure to flush and add inhibitors to the system will invalidate the appliance warranty.

The appliance is designed to be fitted to fully-pumped systems only. Failure to do so will invalidate the warranty.

The boiler must not be run without water in the system.

Important Notice:

To comply with regulations in force, your new boiler must be installed and commissioned by an OFTEC-registered engineer. The installation must also comply with current *Building Regulations, Part L.*

Failure to meet the terms of these requirements may invalidate your guarantee.

THE PERSON(S) WHO INSTALLS THIS APPLIANCE, COMMISSIONS, SERVICES OR CARRIES OUT ANY REMEDIAL WORK, IE ELECTRICAL FAULT FINDING, MUST HAVE SUITABLE ENGINEERING QUALIFICATIONS

3. TECHNICAL INFORMATION

	50/90	100/125
A	850	895
B	460	460
C	600	688
D	85	85
E	745	791
F	528	573
G	325	371
H	56	60
J	96	96
K	11	11

ALL DIMENSIONS IN MM
ALL UNUSED TAPPINGS ARE TO BE PLUGGED OFF

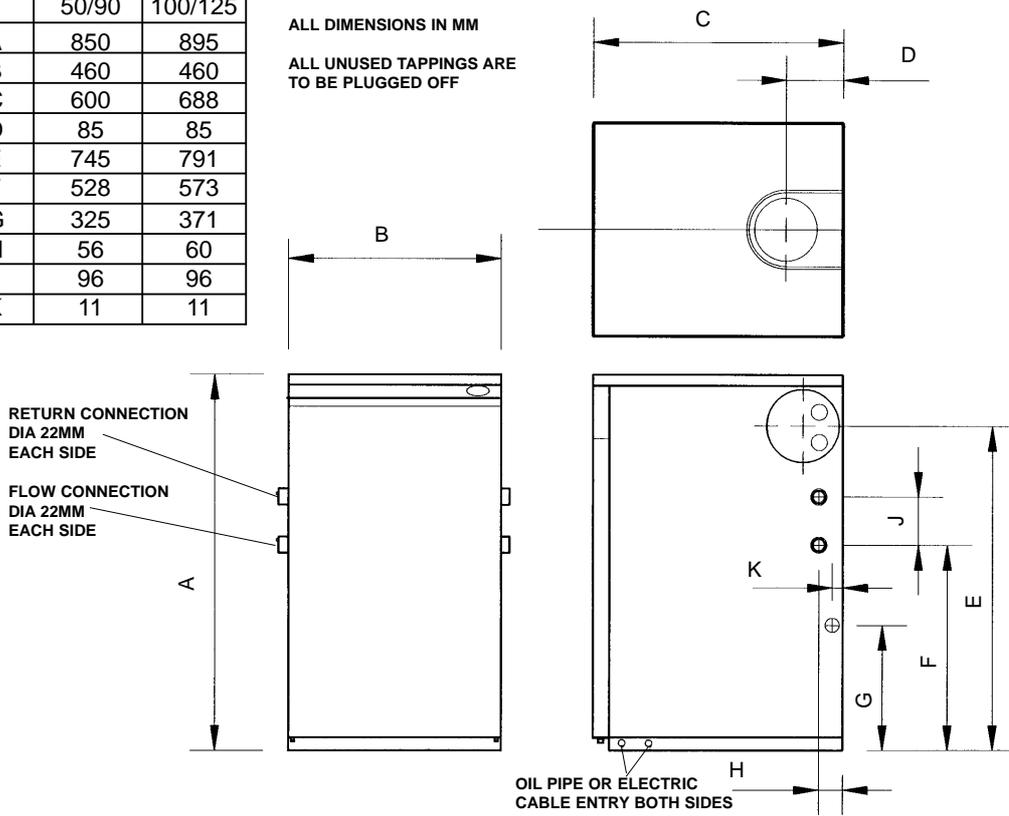
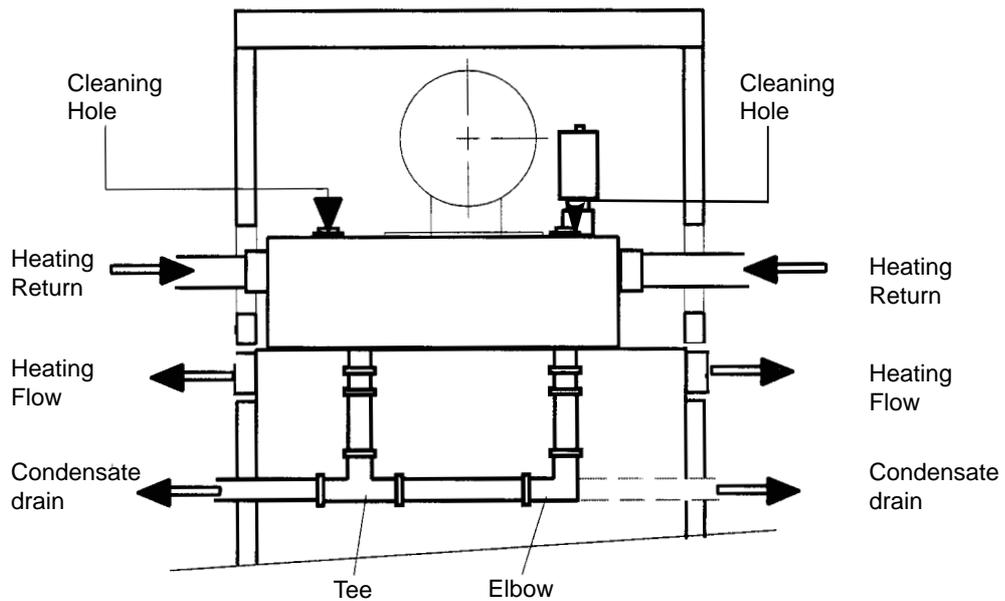


Fig. 3 OUTLINE DIMENSIONS



View of rear of boiler with back panel removed showing boiler connections
Connections can be made on L/H side or R/H side of boiler

Fig. 4

TECHNICAL SPECIFICATION

Boiler Models		50/90	100/125
Weight (empty)	Kg	140	170
Water Content	litres	26	32
Flow & Return Connections	-	22mm Compression	
Flue Socket Diameter	in.	4	
Max. Operating Pressure	bar psi	3 43.5	
Test Pressure	bar psi	4.5 65.3	
Water Side Resistance 10 diff 20 diff	mbar mbar	25 8.3	25.4 8.2
Starting Current	amp	3.5	
Running Current	amp	0.77	
Control Thermostat	- adjustable up to 82° C		
Limit Thermostat	- factory set at 110° C (hand reset)		
Casing Finish	- white with grey fascia trim		
Thermal Insulation	- boiler shell insulated with glass fibre		
Optional Extras	- Trianco balanced flue kits - programmer kit (Trianco part code 2340)		
Electricity Supply	- 230/280V - 50Hz Fused at 5 amp.		

Boiler	Model Output (non-condensing)	Output (Condensing)	Input	Nozzle	Pump Pressure (psi)	Co ₂ (%)
Eurostar Premier 50/90	50,000 btu's 14.65 kW	53,400 btu's 15.65 kW	52,700 btu's 15.42 kW	0.45 x 80°EH	120	12.0
	60,000 btu's 17.58 kW	64,000 btu's 18.74 kW	63,000 btu's 18.46 kW	0.5 x 80°EH	140	12.5
	70,000 btu's 20.51 kW	74,400 btu's 21.8 kW	73,300 btu's 21.48 kW	0.6 x 80°EH	125	12.5-13.0
	80,000 btu's 23.44 kW	84,800 btu's 24.85 kW	83,600 btu's 24.49 kW	0.65 x 80°EH	130	13.0
	90,000 btu's 26.37 kW	95,200 btu's 27.49 kW	93,800 btu's 27.49 kW	0.75 x 80°EH	125	13.0-13.5
Eurostar Premier 100/125	100,000 btu's 29.3 kW	104,700 btu's 30.69 kW	104,700 btu's 30.69 kW	1.0 x 80°EH	100	12.0
	110,000 btu's 32.2 kW	115,000 btu's 33.76 kW	115,200 btu's 33.76 kW	1.1 x 80°EH	105	11.5
	120,000 btu's 35.2 kW	125,000 btu's 36.84 kW	125,700 btu's 36.84 kW	1.1 x 80°EH	110	12.5
	125,000 btu's 36.6 kW	130,900 btu's 36.36 kW	130,900 btu's 36.36 kW	1.1 x 80°EH	115	12.5

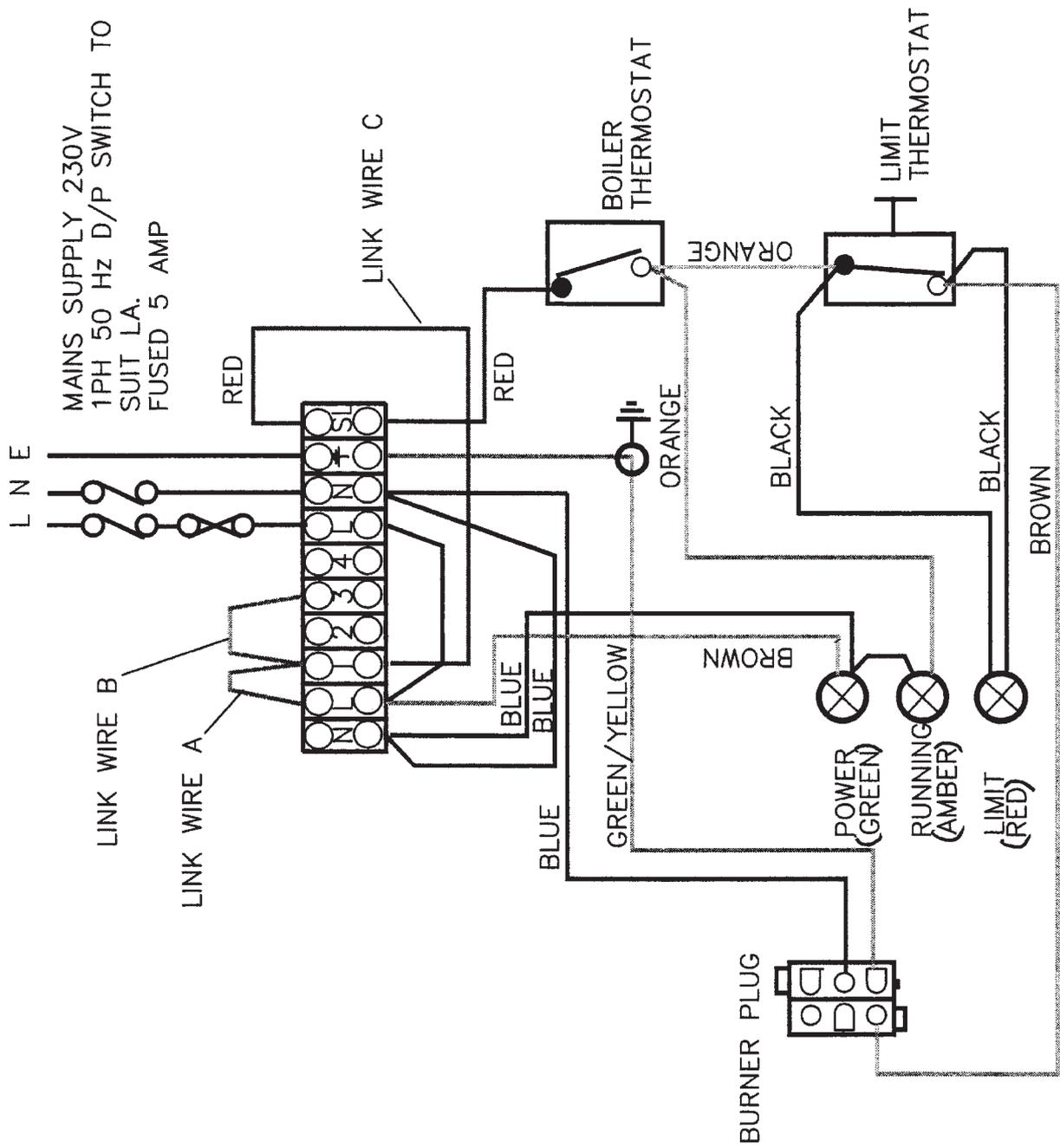


FIG. 5 WIRING DIAGRAM

4. INSTALLATION

Regulations

Installation of the boiler must comply with the following British Standards and Regulations:

BS 5410: Part 1 - Code of Practice for Oil Firing.

BS 5449 - Forced Circulation Hot Water Central Heating Systems.

The Building Regulations - Part 'J' (England and Wales)
Part 'F' Section 111 (Scotland)
Part 'L'

The Control of Pollution (Oil) Regulations
Current I.E.E. Regulations
Local Water Undertakings By-laws
OFTEC Installation Requirements for Oil Fired Boilers
and Oil Storage Tanks. OFST 100 and OFST 200.

Health and Safety at Work Act

The installer should be aware of his responsibilities under the Act and provide, where necessary, appropriate protection for persons carrying out the installation.

In the interest of safety, it is recommended that the appliance is installed, commissioned and maintained by an OFTEC registered technician.

A useful guide to 'Safe Working Practices for Oil Firing Technicians' is published by OFTEC.

Electrical work should be carried out in accordance with BS 7671:2001 by a qualified electrical engineer.

Siting the Boiler

Sound Levels

Whilst the low sound level of the Trianco EuroStar boiler makes it eminently suitable for kitchen and utility room installation, the following aspects should be considered before installation:

- Some people are particularly sensitive to even low noise levels so this aspect should be discussed with the householder.
- Small rooms tend to amplify noise, particularly if the wall construction is hollow or the surface tiled.
- A chimney passing through a bedroom can some times transmit noise.
- Low level flue terminals produce some exhaust noise, so care should be taken when siting adjacent to neighbouring property.
- Due to the condensing nature of the boiler, a plume of water vapour will be discharged from the flue. This should be taken into account when siting the flue terminal. Refer to section on flue systems.

System Design

When operating your Trianco condensing boiler, the heating system should be designed to the following parameters to achieve the maximum system efficiencies.

For central heating systems using radiators

Boiler flow temp	70°C to 90°C
Boiler return temp	50°C to 70°C
Flow differential temp	10°C to 30°C

Clearance and Service Access

When siting the boiler, ensure adequate clearance is allowed for making water and flue connections. As the boiler can be fully serviced from the front, there is no need for a headroom allowance nor provision for removal of the kitchen work top but a clearance of at least 750mm is required at the front of the boiler.

Hearth

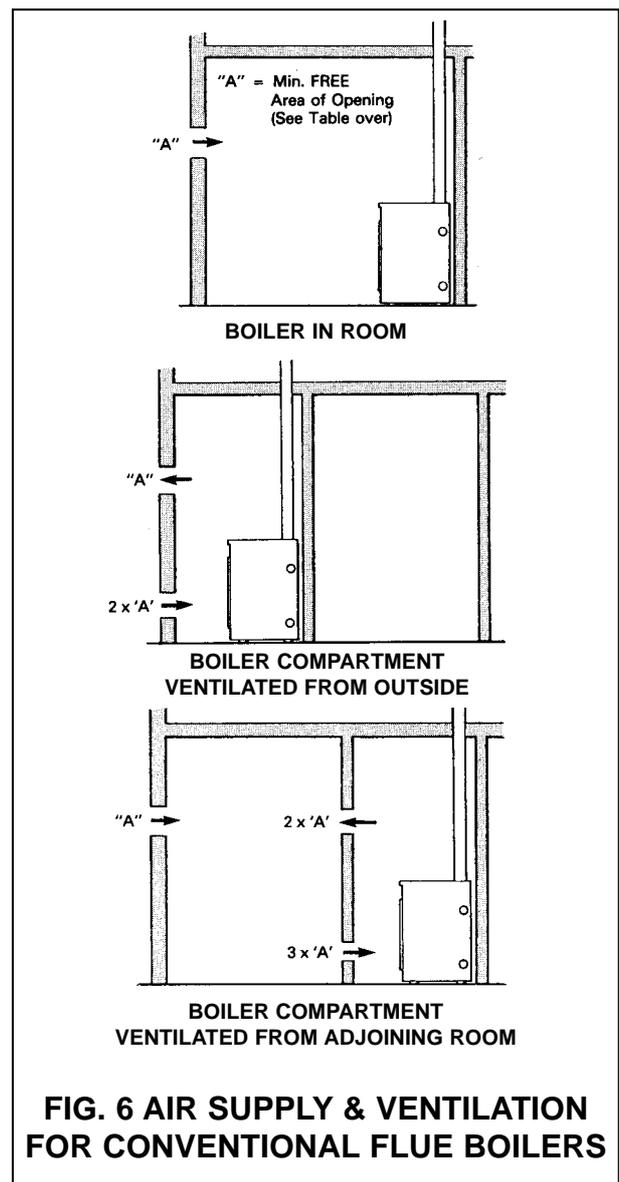
The boiler must be fitted on a non-combustible base. Also the floor must be level and capable of supporting the installed weight of the boiler, including its water content.

Combustion and Ventilation Air (Conventional flue boilers)

The provision of an adequate supply of combustion air is essential for the efficient and safe operation of the boiler. The air opening should be positioned so as to cause the least possible draught to the occupants and located so it is not liable to be accidentally blocked.

British Standard Code of Practice for Oil Firing BS 5410: Part 1 requires a permanent air inlet opening of 550mm² per kW of boiler rated output.

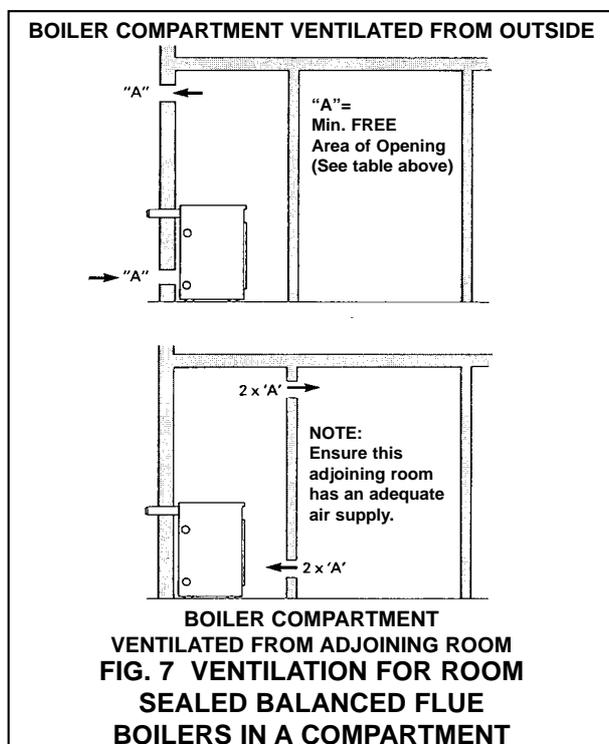
See Fig. 6 for air openings required for Trianco EuroStar boilers.



Ventilation (Room sealed balanced flue boilers)

Although no openings are required for the supply of combustion air (this comes from outside through the air duct system direct to the burner), ventilation is, however, necessary if the boiler is installed in a compartment or a confined space in order to prevent overheating of the boiler controls (See Fig. 7 for ventilation openings).

Output	Detail 'A' (Figs 6 & 7)
50,000 btu/h	105cm ²
90,000 btu/h	145cm ²
100,000 btu/h	161cm ²
125,000 btu/h	202cm ²



Extractor Fan (conventional flue only)

If the boiler room has an extractor fan, the combustion performance of the appliance must not be affected when the fan is running and all doors and windows are closed. A flue gas check on the CO₂% and smoke number should be carried out to prove that combustion is satisfactory.

The exact rate of the fan must not exceed 40 litres/sec.

Heating and Domestic Hot Water Systems

The heating system should be installed in accordance with current HVCA Codes of Practice and BS 5449 Part 1 'Forced Circulation Hot Water Systems'.

Flow and return water connections can be made to the boiler by using the tapings on the left or right hand side of the boiler.

Fit drain-off cock in the lowest part of the system.

Where a boiler is also used for providing domestic hot water, a double feed indirect cylinder to BS 1566 Part 1 must be used.

MAKE SURE ALL UNUSED BOILER TAPPINGS ARE PLUGGED BEFORE FILLING THE SYSTEM.

Flush out the system to remove any swarf or residues before fitting circulating pump.

Electrical Supply

230V 1 Phase 50Hz (Fused 5 Amp)

Note: THIS APPLIANCE MUST BE EARTHED

All electrical wiring must be carried out by a qualified electrician in accordance with current I.E.E. Regulations and any Local Regulations that may apply.

The 230v - 50Hz electrical supply must be fused by a double pole switch with a contact separation of at least 3mm in both poles, and shuttered socket (both complying with the requirements of BS 1363) adjacent to the boiler. Fuse supply at 5A. The minimum requirement for the power supply cable should be a PVC sheathed flexible cord, at least 0.75mm² (24x0,2mm) (code designation H05 VV-F or H05 VVH2-F) as specified in table 16 of BS 6500.

This appliance MUST be earthed and the electrical supply earth cable must be of a greater length than the current carrying conductor cables (ie live and neutral supply cables).

All external cables entering the control box must be secured in position by strain relief bushes supplied (see diagram on how to secure cable).

Terminal connections are also provided in the control panel for ancillary controls.

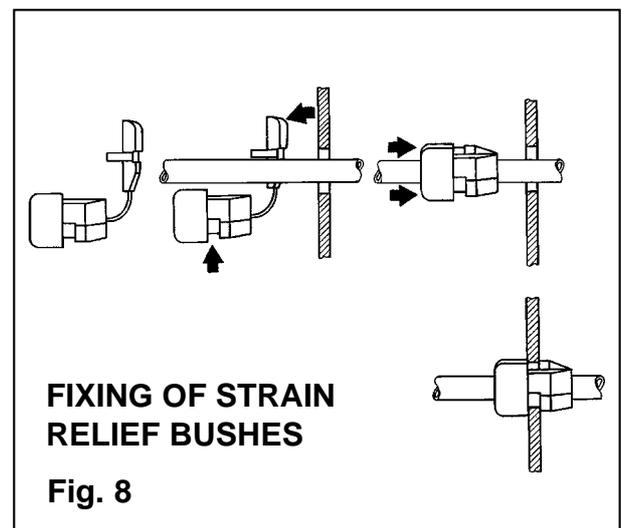
See wiring diagram Fig. 5.

Warning - High and Low Voltage

In certain parts of the country, where there is a known risk of high or low voltage fluctuations, the oil burner shall be prevented from starting by the use of a voltage sensitive device if the voltage drops or increases sufficiently to endanger the installation.

Thermostats

The boiler is fitted with a variable setting control thermostat and a pre-set limit thermostat. Should the boiler thermostat malfunction, the limit thermostat will take over control and shut down the boiler.



Condense Drain Connections

The condensate pipe can be run to either the left or the right side of the boiler.

To install the condensate pipe, after deciding the position of the trap, remove the back panel from the boiler. A set of plastic push-fit connections is supplied with the boiler. Cut 2 x pieces of plastic pipe to 175mm long and insert one into each of the plastic straight connectors which are fitted to the drain connections on the rear underside of the condensing unit. Fit the tee fitting onto the end of the pipe nearest the side where the drain will leave the boiler. Fit the elbow onto the end of the other pipe and connect this to the tee using a piece of pipe cut to 165mm long (refer to figs 4 & 10 for details).

Use a further piece of pipe to pass through the side casing and join up the pipework via the tee.

Cut the pipe protruding through the side casing to the length required and fit the elbow to the end of the pipe. Measure distance required for the elbow to the trap, cut the pipe to length, and fit. Re-fit the back panel and move the boiler into position.

Where possible, connect the condensate drain to an external waste drain.

If the boiler is to be fitted in a position where the external ground level is higher than the boiler, and there are no internal drains, a condensate pump can be fitted (refer to pump manufacturer's instructions).

The drain pipe must be installed to allow the condensate to drain naturally for the boiler on a minimum fall of 1:20.

The pipework from the condensate trap to the external drain is not supplied with the boiler.

IMPORTANT NOTES:

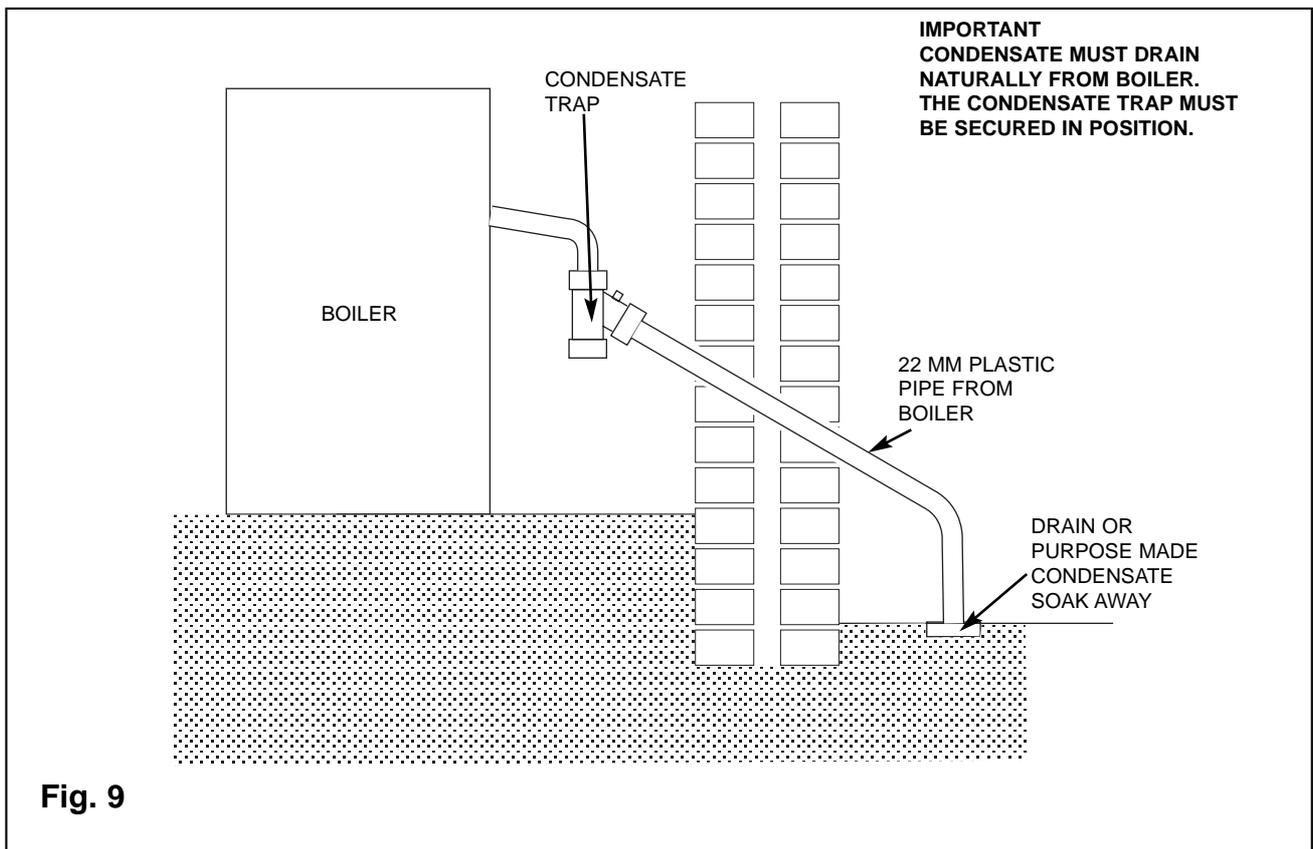
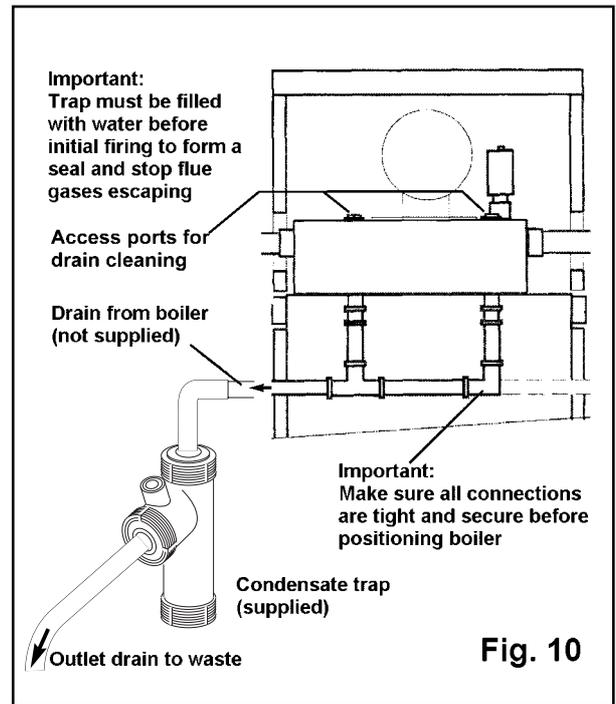
When running any external pipework from the trap to the drain, it is essential that the pipework is kept to a minimum and is insulated to prevent the condensate from freezing.

Ensure that the trap is in accessible position for any future servicing and maintenance to take place. Before initial firing, the condensate trap must be filled with water to prevent the escape of flue gases.

MAINTENANCE:

The trap should be inspected at regular intervals to ensure correct operation, and should be checked as part of the regular annual schedule.

The 2 x screws at the rear of the top face of the boiler can be removed to give access for cleaning the drain holes in the condensing unit.



5. OIL SUPPLY

Oil

The oil burner is factory set to burn Kerosene C2 to BS 2869.

Note: Only Kerosene is permitted for use on this appliance.

IMPORTANT NOTE:

The oil storage tank and supply pipe must be installed by an OFTEC-trained and registered engineer.

Oil Storage Tanks

Size and Location of Tank

The tank should be large enough to allow for economic deliveries and be located in the most unobtrusive position, having regard to the need for safety, filling, maintenance (if steel tank) and the head of oil required.

Whilst it is highly unlikely that a fire could start from a domestic oil tank, it does however need to be protected from a fire that may originate in a nearby building, therefore the tank should not be located nearer than 1.8 metres from a building, nor closer than 760mm from a site boundary. Where a tank has to be less than 1.8 metres, the building wall must not have any openings other than small ventilation openings. The wall shall have a half hour resistance to an internal fire and extend 1.8 metres from any part of the tank.

Alternatively, a non-combustible radiation barrier must be provided which meets the requirements of BS 5410 Part 1: This standard applies to tanks up to a capacity of 3,400 litres which is deemed the maximum size for a single family dwelling.

Steel Tanks

Steel tanks should comply with the requirements BS 799, Pt. 5: 1987 and mounted on brick or block piers with a waterproof membrane between the piers and tank.

The tank should be fitted with fill and vent connections (weather protected), a drain-off cock, shut-off valve and an oil level indicator.

Plastic Tanks

Polyethylene tanks are now widely used because of their advantages over traditional steel tanks:

- (a) They do not need pier supports and can be mounted directly on any flat surface giving uniform support for the tank base.
- (b) They do not corrode and therefore never need painting.
- (c) They are easier to handle because of their lower weight.
- (d) They have a 10 year manufacturer's guarantee.

Plastic tanks should be fitted with similar components to those used with steel tanks.

Fire Protection

To comply with building regulation **Section J5**:

- 1 Where a storage tank is close to a dwelling, fire cladding must be provided to the eaves, if less than 1.8m from the top of the tank.
- 2 The cladding must extend 300mm beyond the tank.
- 3 The tank must be sited on a non-combustible base.

Pollution Protection

To comply with building regulation **section J6**, the tank must be '**BUNDED**' (i.e. double walled) if:

- 1 The tank is less than 10m from a stream.
- 2 The tank is less than 50m from a well, spring, or drinking water.
- 3 The tank cannot be viewed from the delivery point.
- 4 In the event of a leak, there is a risk of oil reaching a manhole cover or drain.
- 5 The tank capacity exceeds 2500 Litres.

Oil supply line

A long life flexible oil hose is supplied with the boiler, a filter and shut-off valve are required. These should be fitted as shown in Figs. 11,12 & 13.

The oil shut-off valve should be fitted as close to the burner as practicable to enable the burner to be disconnected without undue loss of oil. The filter must be connected in the oil supply pipe and positioned outside the building.

Fire Valve

A fire-valve must be fitted in the oil line outside the building with its sensing phial positioned within the boiler casing above the level of the burner. A clip is provided for retaining the phial.

All oil line joints must be completely sealed and the total pipe run thoroughly flushed out before connecting to the burner. No soldered joints are permitted in the oil line.

The oil line can be fed into the back of the boiler base tray or through the holes at the side.

Single pipe oil supply (Fig. 11)

When, the bottom of the oil supply tank is above the burner, a single pipe gravity system can be used. The oil supply pipe must be connected to the suction port on the burner pump via the flexible hose.

Two pipe oil supply (Fig. 12)

Where the bottom of the oil storage tank is below the burner, a two pipe suction lift system is necessary.

When using a two pipe system, it is important to remove bypass washer from the oil pump on the burner. Refer to burner details leaflet for removal instructions.

An additional flexible hose is also required.

A spring loaded non- return valve must be fitted in the suction line to stop the oil running back to the tank. A filter, shut-off valve and fire valve must also be fitted in the line.

No valves are permitted in the return line which must remain unobstructed at all times.

Notes:

- (1) The pump suction should not exceed 0.4 bar, otherwise dissolved gas will be released from the oil to affect combustion.
- (2) The return pipe must end at the same level as the suction outlet to prevent loss of prime.
- (3) The outlet from the tank should be approximately 75mm (3 in) above the bottom to prevent sediment and water being drawn into the supply pipe.

Oil De-aerator - Single pipe supply (Fig. 13)

Where a two pipe suction lift system is required, but the return pipe is too long, or impractical to run, an Oil De-aerator can be used. The burner is piped as for a two pipe system up to the Oil De-aerator but only a single pipe is required to be run back to the oil storage tank. A non-return valve is not required with this system but the small horseshoe washer must be removed for a two pipe system (see burner details).

The Oil De-aerator which should be fitted close to but not inside the building, is available from most Builders Merchants and some Oil Tank manufacturers.

MAXIMUM OIL SUPPLY LINE LENGTH 'L'

HEAD 'H' METRES.		.0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
PIPE 6mm ID	MAXIMUM LENGTH (METRES)	10	21	31	41	52	62	73	83
PIPE 8mm ID		33	66	98	100	100	100	100	100

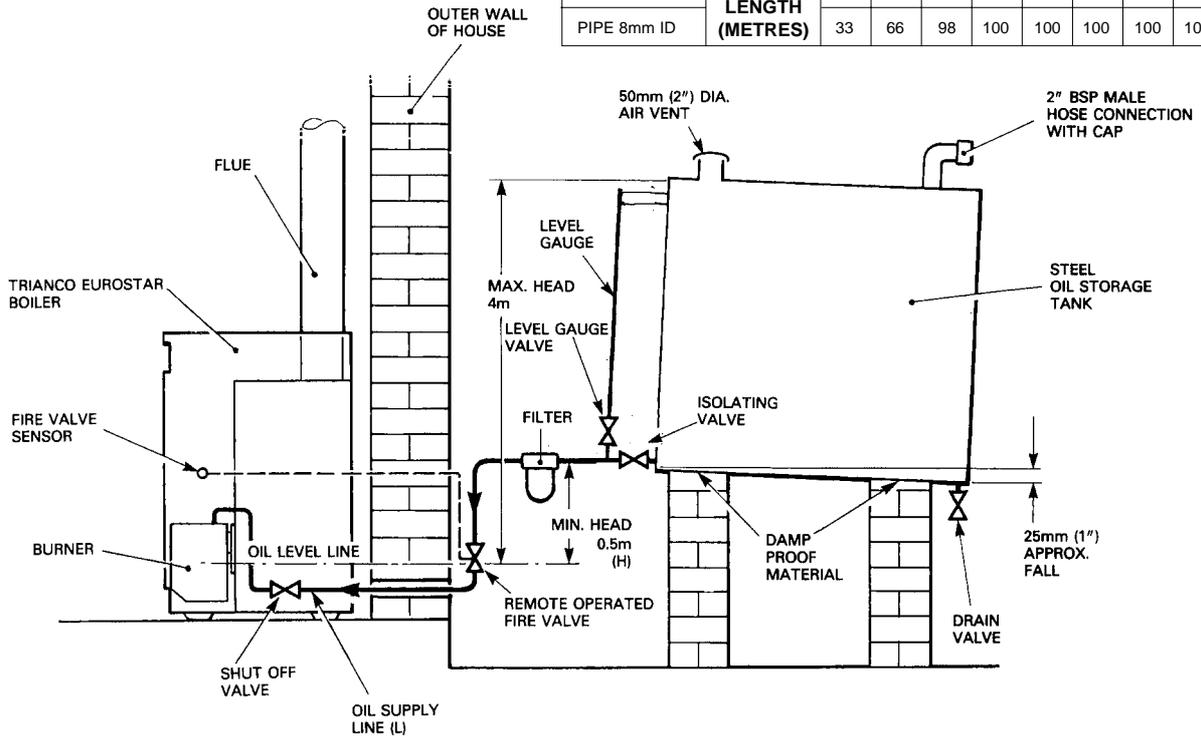


FIG. 11 SINGLE PIPE OIL SUPPLY INSTALLATION

MAXIMUM OIL SUPPLY LINE LENGTH 'L'

LIFT 'H' METRES.		.0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
PIPE 6mm ID	MAXIMUM LENGTH (METRES)	48	42	36	30	24	18	11	5
PIPE 8mm ID		100	100	100	94	75	55	36	16
PIPE 10mm ID		100	100	100	100	100	100	88	40

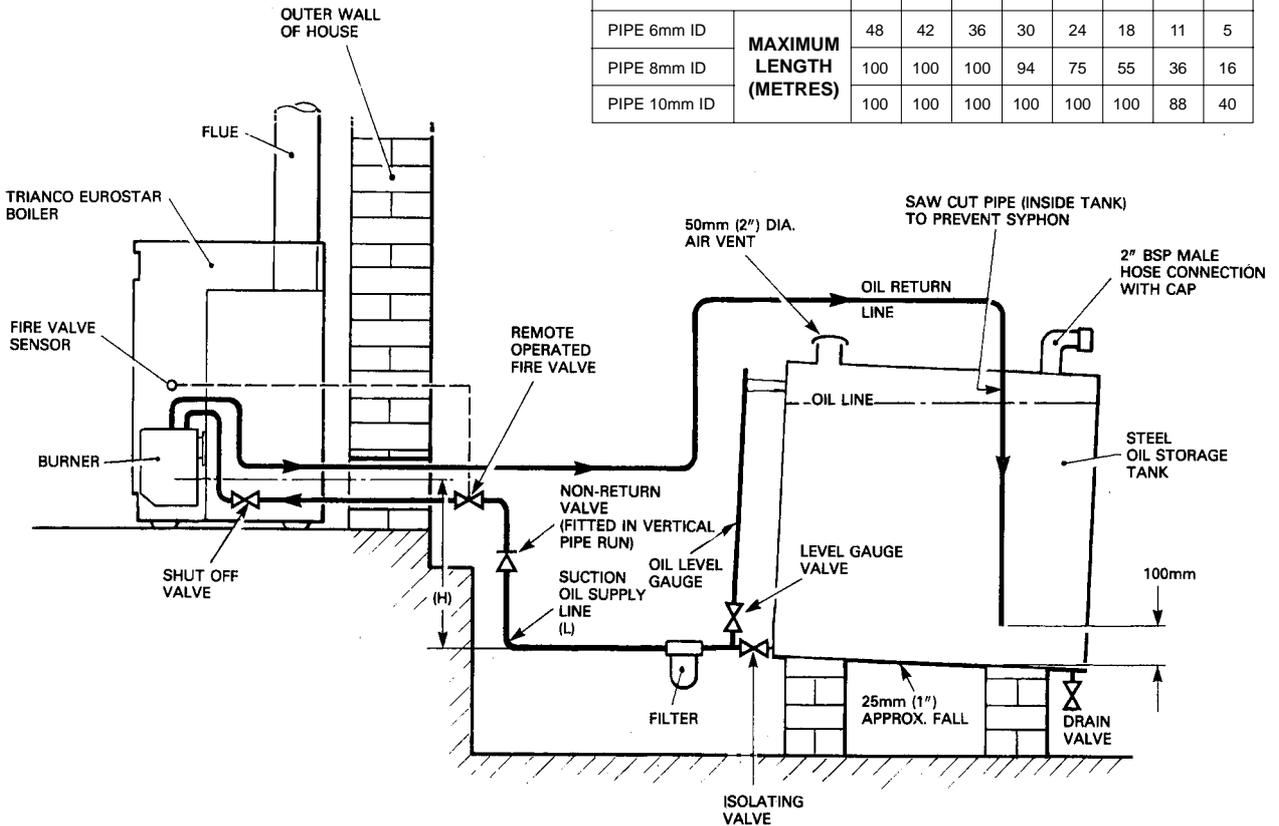


FIG. 12 TWO PIPE OIL SUPPLY INSTALLATION

REFER TO MANUFACTURERS
INSTRUCTIONS FOR 'OIL DE-AERATOR'
INSTALLATION DETAILS

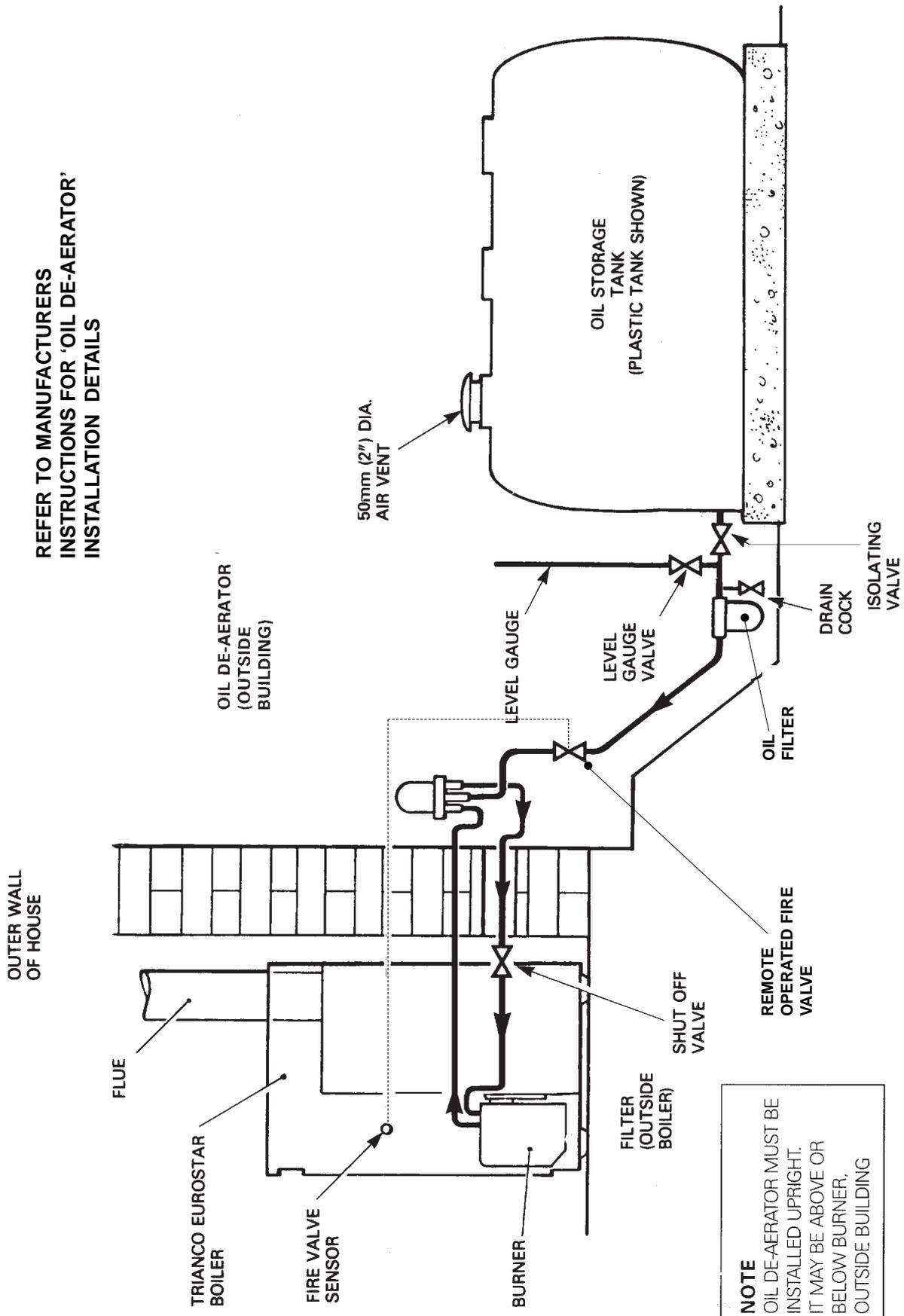


FIG. 13 DE-AERATED OIL SUPPLY INSTALLATION

6. FLUE SYSTEMS

To evacuate the products of combustion safely and thoroughly, the boiler must have an efficient flue system. Under no circumstances should the boiler be installed using an existing flue system.

All components used in the flue system should be suitable for wet flues. The design and construction of the Trianco balanced flue kits take these factors into account so the following guidance notes are for conventional chimneys. Reference should also be made to BS 5410 Part 1 if further information is required on conventional chimneys.

Conventional chimney (Fig. 14)

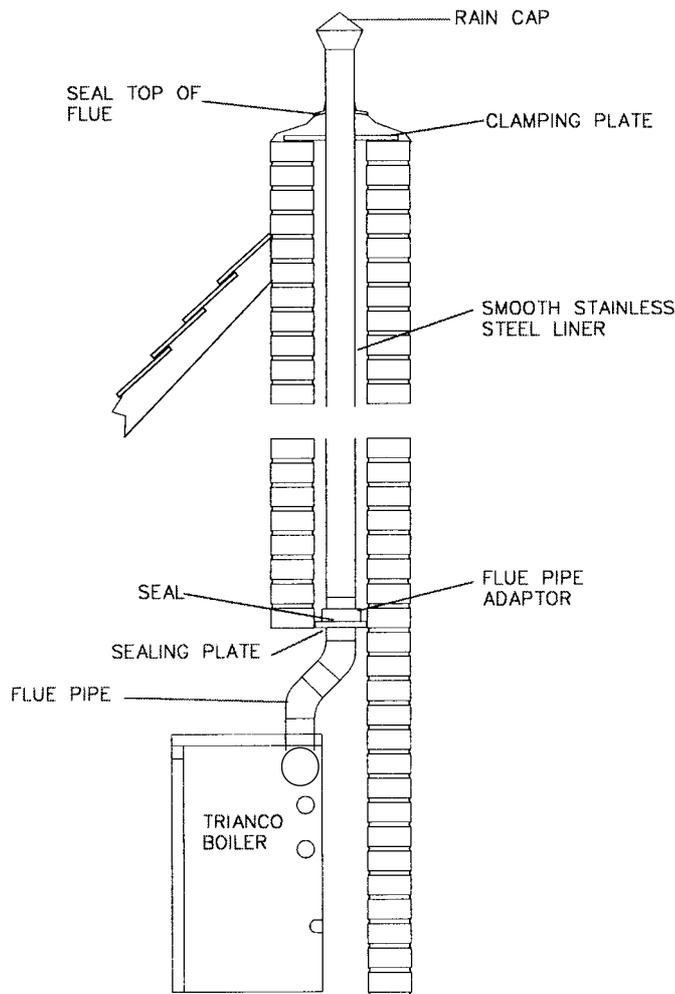
Trianco condensing boilers operate at high efficiencies with low flue gas temperatures. The flue system used on this boiler must be suitable for low flue gas temperatures and condensation.

- 1 The chimney should rise as vertically as possible and terminate at a point not subject to down draughts or wind effects.
- 2 The condensation produced in the flue system can be allowed to run back in to the boiler. No separate drain at the base of the flue system is required

- 3 Where an existing chimney is to be used it must be lined with a stainless steel liner that is approved for use on an oil fired condensing boiler. **Note:** Before fitting a flue liner the chimney must be thoroughly cleaned free from all traces of soot and scale.
- 4 If a rigid flue is to be fitted externally a twin wall flue must be used. The flue must be constructed with a stainless steel inner skin (suitable for condensation), insulation and incorporate seals and be weather proofed.
- 5 The internal flue diameter must be 100 mm (4 in) minimum.
- 6 The flue pipe between the boiler and the chimney must be manufactured from 316 stainless steel or higher. Aluminum or plastic must not be used on any part of the flue system.
- 7 The in-built flue gas resistance of the Eurostar is such that it allows the boiler to operate reliably over the wide range of chimney draughts encountered from typical domestic chimneys. Under normal draught conditions, the flue should terminate with a standard cowl.

IMPORTANT

Ensure that all the joints on the flue system are sealed and that no condense can escape.



TYPICAL CONVENTIONAL FLUE WITH BRICK CHIMNEY USING 135 DEG BENDS

FIG.14

Balanced Flue Systems (optional extra)

The Trianco balanced flue system offers much greater flexibility for siting, the boiler compared with a conventional chimney. The only requirement is for a suitable outside wall to fit the horizontal discharge terminal or, alternatively, a single storey roof for a vertical discharge.

In addition to the siting benefit, the performance of balanced flue boilers is virtually unaffected by high wind conditions since the wind pressures are applied equally to both air intake and flue gas discharge, thus creating a balanced condition.

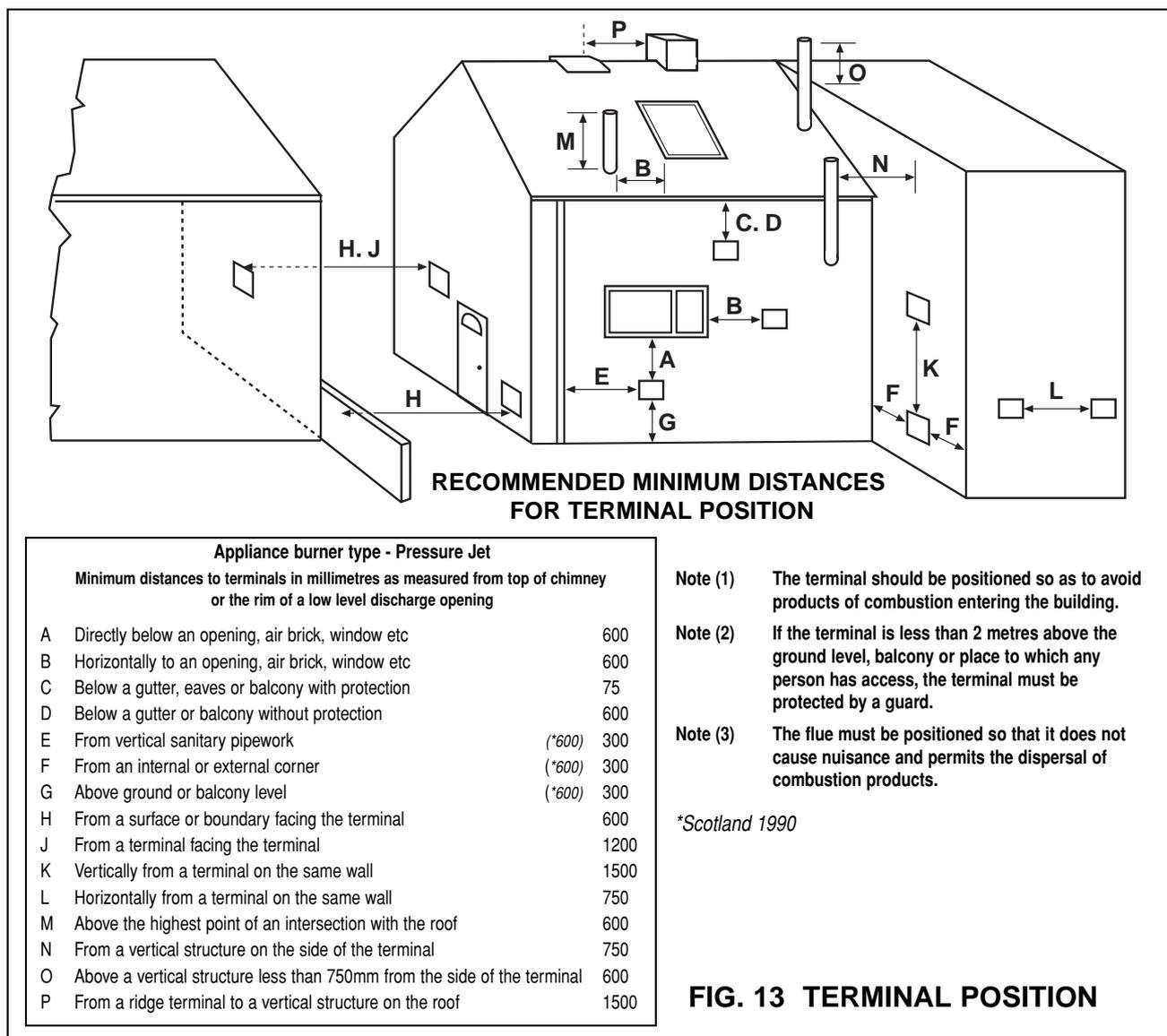
Whereas some balanced flue boilers rely on case sealing to achieve a room seal, Trianco boilers have a sealed air duct system which maintains the room sealed performance even when the casing door is removed for burner commissioning or adjustments.

The use of the balanced flue principle also enhances the overall thermal efficiency of the boiler since the incoming air extracts waste heat from the flue and returns it as pre-heated air to the burner where it aids combustion.

INSTALLATION NOTES

- Balanced-flue condensing boilers are designed to operate at low noise levels. During operation, a plume of condensation will be produced at certain times from the terminal. When positioning, these factors should be taken into consideration to ensure that they do not cause a nuisance to neighbouring properties. It should also be positioned to avoid the products of combustion from entering the building.
- Keep the terminal clear of infrared sensing devices such as these used to control security lighting.
- Positioning of flues under balconies and carports should be avoided.
- As the system operates under positive pressure, it is essential that all flue joints are sealed correctly.
- Only 28 sec. Kerosene Class C2 to BS 2869 is permitted for use with this appliance.

Note Trianco balanced flue kits have been designed exclusively for use with Trianco boilers and as such, compatibility with other makes of boiler cannot be guaranteed.



**Trianco flue kits are designed to incorporate the latest 'O'-ring seals.
Before commencing assembly, please make sure that all 'O'-rings seals are in position.**

2350 & 2351 HORIZONTAL TELESCOPIC BF ROUND KIT

ASSEMBLY METHOD

1. Having decided the position of the boiler, accurately mark out the position of the terminal and cut a hole 130mm diameter through the wall. (See Figs. 17/18 and 19).
2. Unpack the boiler.
3. Lift off the top panel.
4. Remove the four nuts securing the flue socket in place.
5. Take flue socket plate off the top of boiler leaving the flue gasket in position.
6. If the flue is to be fitted terminating to the left or right hand side of the boiler, the corresponding section of side casing must be removed.
7. To remove the section of side casing, cut through the retaining tabs.
8. Fit sealing plate over four studs leaving the flue gasket in position and place terminal gasket on top of sealing plate. Both these gaskets are supplied with boiler.
9. Position the boiler.
10. Unpack the Terminal Kit and identify all components.
11. Check to see that the O-ring is in location groove on the inner flue pipe of elbow duct assembly. Applying a small amount of lubricant i.e. vaseline to O-ring will aid assembly.
12. Assemble kit together by sliding flue terminal inside terminal elbow duct assembly.
13. Slide completed assembly through the wall from inside.
14. Move boiler in position and holding up terminal mounting flange, slide terminal back between fixing studs on boiler.
15. Slide terminal mounting plate down over studs and secure using the four nuts previously removed.
16. Adjust terminal length to give a minimum distance of 140mm from end of terminal to wall.
17. Connect hose from burner to socket on end of terminal using clip provided.
18. Make good the inside and outside wall around the flue (ie cement or suitable filler).
19. Replace top panel.

IMPORTANT: TO AID ASSEMBLY, IT IS NECESSARY TO APPLY A THIN BEAD OF LUBRICANT (E.G. WASHING - UP LIQUID OR VASELINE) TO ALL FLUE JOINTS THAT INCORPORATE 'O'- RING SEALS.

AS THE FLUE SYSTEM OPERATES UNDER POSITIVE PRESSURE, ALL FLUE JOINTS THAT DO NOT INCORPORATE 'O'- RING SEALS SHOULD BE SEALED WITH SILICONE SEALANT.

THE BOILER PRODUCES CONDENSATE DURING NORMAL RUNNING, IT IS IMPORTANT TO ENSURE ALL SEALS ARE MADE AND CORRECT GASKETS USED.

TO ENSURE ANY CONDENSE PRODUCED IN THE FLUE DRAINS AWAY INCLINE THE FLUE SLIGHTLY FROM THE BOILER

TERMINAL GUARDS (Fig. 16)

When the terminal is positioned where there is the possibility of accidental contact by persons, or of damage to the terminal, an approved guard is necessary.

Generally, exhaust 2 metres above ground level alleviates the necessity for a guard.

IMPORTANT: A suitable stainless steel or approved plastic-coated terminal guard should always be used. A suitable terminal guard is available from Trianco.

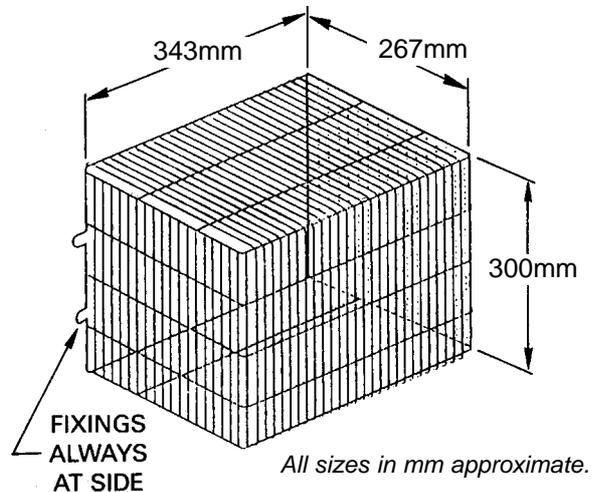


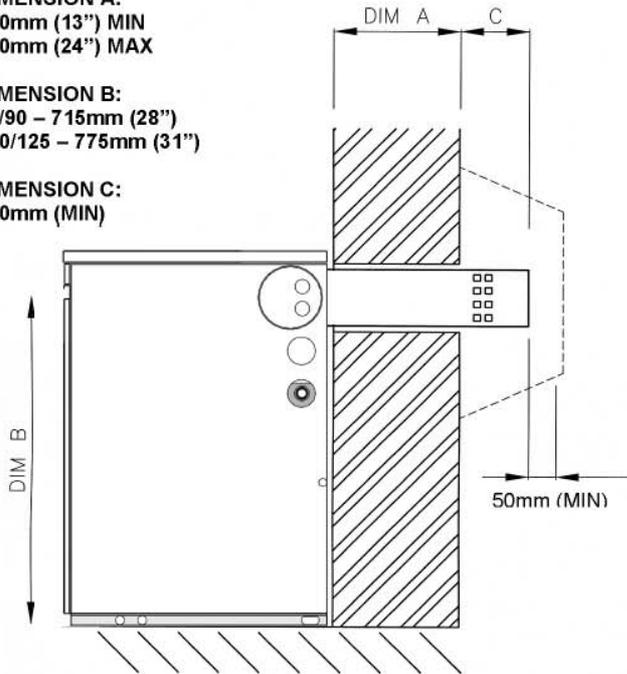
FIG.16

2350 – 600mm HORIZONTAL CIRCULAR BALANCED FLUE KIT

DIMENSION A:
330mm (13") MIN
600mm (24") MAX

DIMENSION B:
50/90 – 715mm (28")
100/125 – 775mm (31")

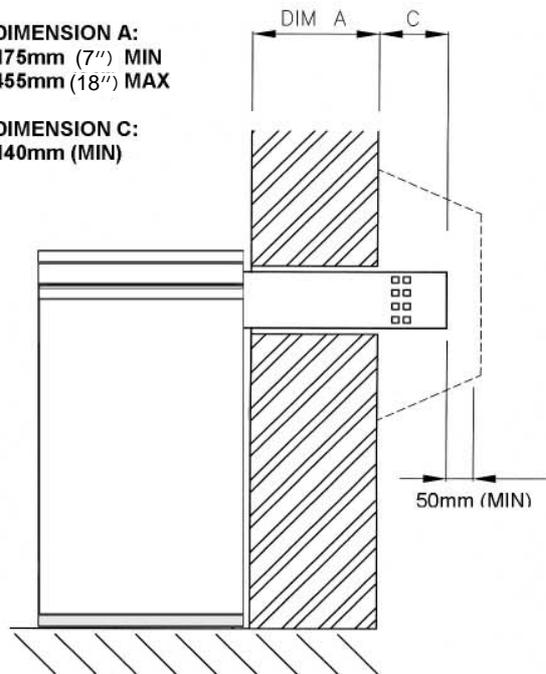
DIMENSION C:
140mm (MIN)



HOLE REQUIRED 130mm DIAMETER THROUGH WALL TO TAKE TERMINAL

DIMENSION A:
175mm (7") MIN
455mm (18") MAX

DIMENSION C:
140mm (MIN)



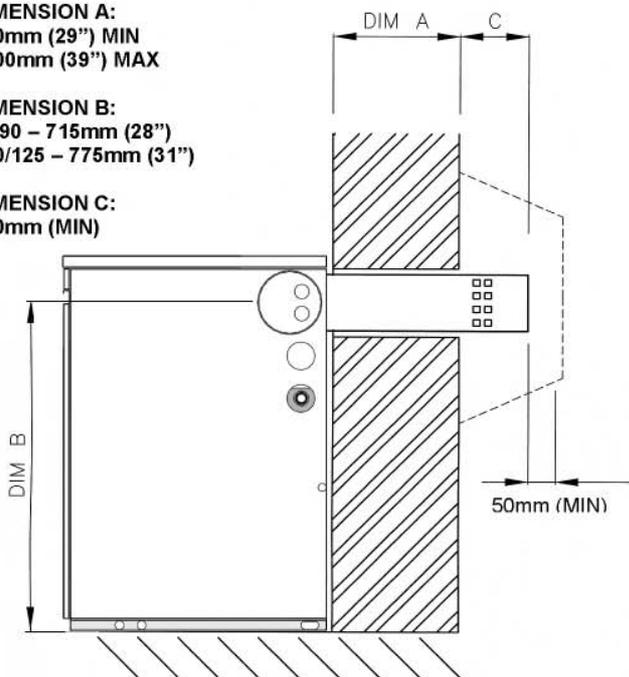
IMPORTANT:
WHEN INSTALLING THE FLUE SYSTEM, IT IS IMPORTANT THAT THE FLUE INCLINES SLIGHTLY UPWARDS FROM THE BOILER. THIS WILL ALLOW ANY CONDENSATION WHICH FORMS IN THE FLUE TO RUN BACK TO THE CONDENSATE DRAIN.

2351 – 1000mm HORIZONTAL CIRCULAR BALANCED FLUE KIT

DIMENSION A:
730mm (29") MIN
1000mm (39") MAX

DIMENSION B:
50/90 – 715mm (28")
100/125 – 775mm (31")

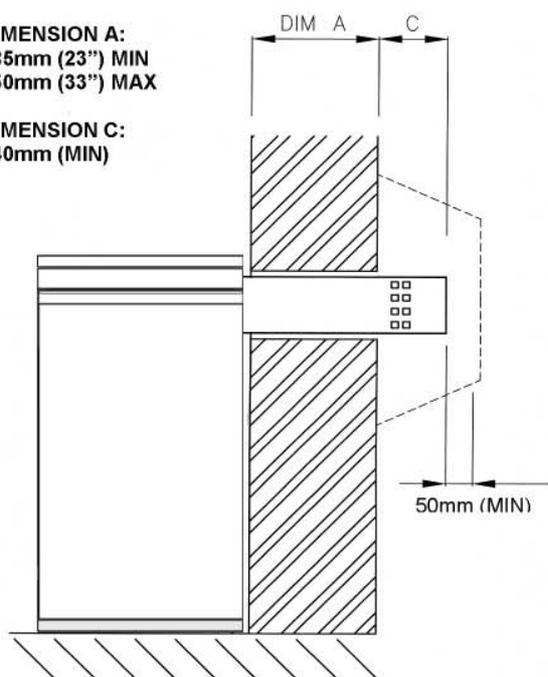
DIMENSION C:
140mm (MIN)



HOLE REQUIRED 130mm DIAMETER THROUGH WALL TO TAKE TERMINAL

DIMENSION A:
585mm (23") MIN
850mm (33") MAX

DIMENSION C:
140mm (MIN)



IMPORTANT:
WHEN INSTALLING THE FLUE SYSTEM, IT IS IMPORTANT THAT THE FLUE INCLINES SLIGHTLY UPWARDS FROM THE BOILER. THIS WILL ALLOW ANY CONDENSATION WHICH FORMS IN THE FLUE TO RUN BACK TO THE CONDENSATE DRAIN.

Fig. 19

FIG.17 KIT 2350 & 2351 ROUND FLUE KIT

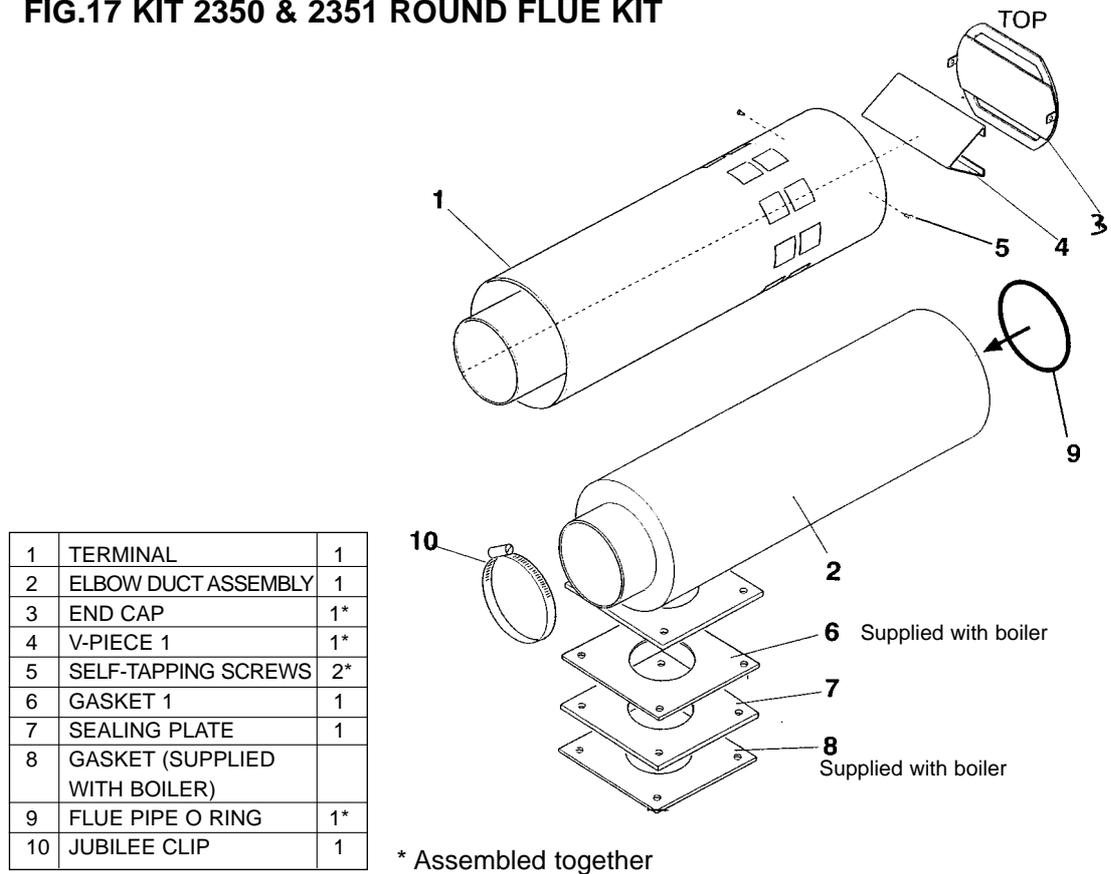
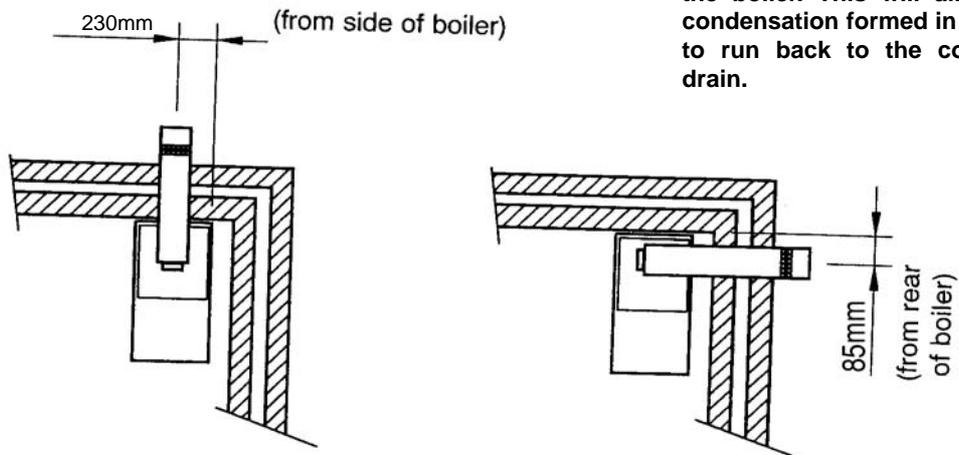


FIG.18 FLUE POSITION DIMENSIONS



IMPORTANT
When installing the flue system it is important that the flue assembly inclines slightly from the boiler. This will allow any condensation formed in the flue to run back to the condense drain.

ROUND KIT 2350 & 2351

7. COMMISSIONING

The boiler/burner **MUST** be commissioned by a qualified technician, preferably OFTEC trained and registered.

It is the responsibility of the installer to ensure the boiler is properly commissioned, failure to do so will make the boiler's guarantee and any extended warranty null and void.

Although all burners are factory tested before despatch, they will usually need further air adjustment to achieve the readings indicated in 'Burner detail leaflet' because of site variations in flue draught and back pressure.

Procedure

1. Switch off electrical supply to the boiler.
2. Ensure boiler is full of water and all valves are open.
3. Remove flue-cover and check that flue-baffles are correctly positioned (See Fig 20 for baffle arrangement).
4. Disconnect oil hose from burner, open shut-off valve and run off a quantity of oil into a container to check for a clean air free supply then reconnect hose. (This applies to single pipe gravity system only).
5. Check that the time-switch (if fitted) is in the ON position and room and boiler thermostats are calling for heat.
6. Switch on electrical supply and the burner should start.

Note: The burner may lock-out on first firing due to air in the pump, if this happens, wait about a minute before pressing reset button to restart burner. If a further lock-out occurs, the air should be bled from the pump pressure gauge connection.

7. Start and stop the burner two or three times until the flame cuts off sharply - this indicates any remaining air has been dispersed.
8. Allow the burner to run for about 15 minutes, then take a CO₂ reading through the sampling hole in flue-cover. Compare the reading with that given under 'Burner Settings' and adjust the air setting if necessary to achieve the required CO₂%. Also, check the smoke and flue gas temperature.
9. If the system is not going to be put into immediate operation, the fuel supply and electricity supply should be isolated.
If there is a possibility that the boiler will not be running during freezing conditions, the system should be drained down.

Handing Over

After completing the boiler installation, the installer should make a thorough check of the system to ensure it is completely satisfactory and demonstrate to the user the operation of the boiler and any system controls.

All instructions should be handed to the user for retention and advice regarding the need for annual servicing.

8. SERVICING

IMPORTANT: ISOLATE ELECTRICAL SUPPLY TO THE BOILER BEFORE SERVICING

To maintain the boiler's high thermal efficiency and reliable operation, it should be serviced annually by a qualified and registered OFTEC engineer. Electrical work should be carried out by a qualified engineer.

If the boiler is used to provide central heating and hot water all year round, the best time for its annual service is just before the start of the heating season.

Where the boiler is shut down for the summer months, the service should be carried out as soon as possible after the end of the heating season.

Oil tank

Open tank drain-cock to draw off any accumulated water and sludge.

Line filters

Turn off oil supply and remove filter bowl. Wash filter element clean with kerosene.

Important

Before commencing with service work on either the boiler or the fuel supply please read the health and safety information.

Before servicing the boiler carry out the following checks.

1. Ensure the air inlets on the flue terminal are not blocked or obstructed.
2. Check to ensure external controls are working correctly.
3. Check ventilation openings are not obstructed and are adequate for the size of the boiler.
4. Inspect all connections to boiler to ensure they are sound, remake any joints that are showing signs of leakage.
5. Inspect flexible oil supply lines and replace where necessary.

Condensate Trap

The condensate trap should be inspected as part of the annual service schedule.

Ensure there are no blockages within the condensate pipework and the trap itself, and clean all deposits from within.

The drain ports in the condensing unit should be also be cleaned. This is achieved by removing the 2 screws on the top face at the rear of the unit and using a tool to remove the deposits from within. Replace screws once complete.

Servicing the Boiler

- 1 Remove the flexible air supply hose from the flue kit to the burner.
- 2 Remove burner ensure that if flexible oil supply hose has to be disconnected that there is no spillage of oil.
- 3 Remove both flue-cleaning covers from front of boiler lift out flue baffles from boiler then slide baffles out of condensing unit.
- 4 Brush all deposits from the flue baffles and clean the internal surfaces of the boiler.
- 5 Remove any flue deposits from the combustion chamber floor using a vacuum cleaner.
- 6 Clean the flue way surfaces of the condenser unit removing any deposits.
- 7 Check flue sealing gasket.
- 8 Inspect flue cleaning door seals and replace if necessary.
- 9 Replace the nozzle.

- 10 Check to ensure that the condense drain is working and not blocked by pouring a small amount of water into condenser unit and checking to see that water discharges from condense port.
- 11 Replace flue baffles in correct arrangement (see diagram) Refit both flue covers securing in position making gas tight seal using washers and wing nuts previously removed.
- 12 Check condensate trap to ensure the outlet is not obstructed.
- 13 Refit the burner securing the air hose in position using the clips provided.
- 14 Reconnect the flexible oil line to the burner (if removed).
- 15 Turn on oil supply, switch on electricity ensure system is calling for heat, boiler should now fire.
- 16 Finally check the combustion settings to those given under Burner Settings and make any adjustments where necessary.

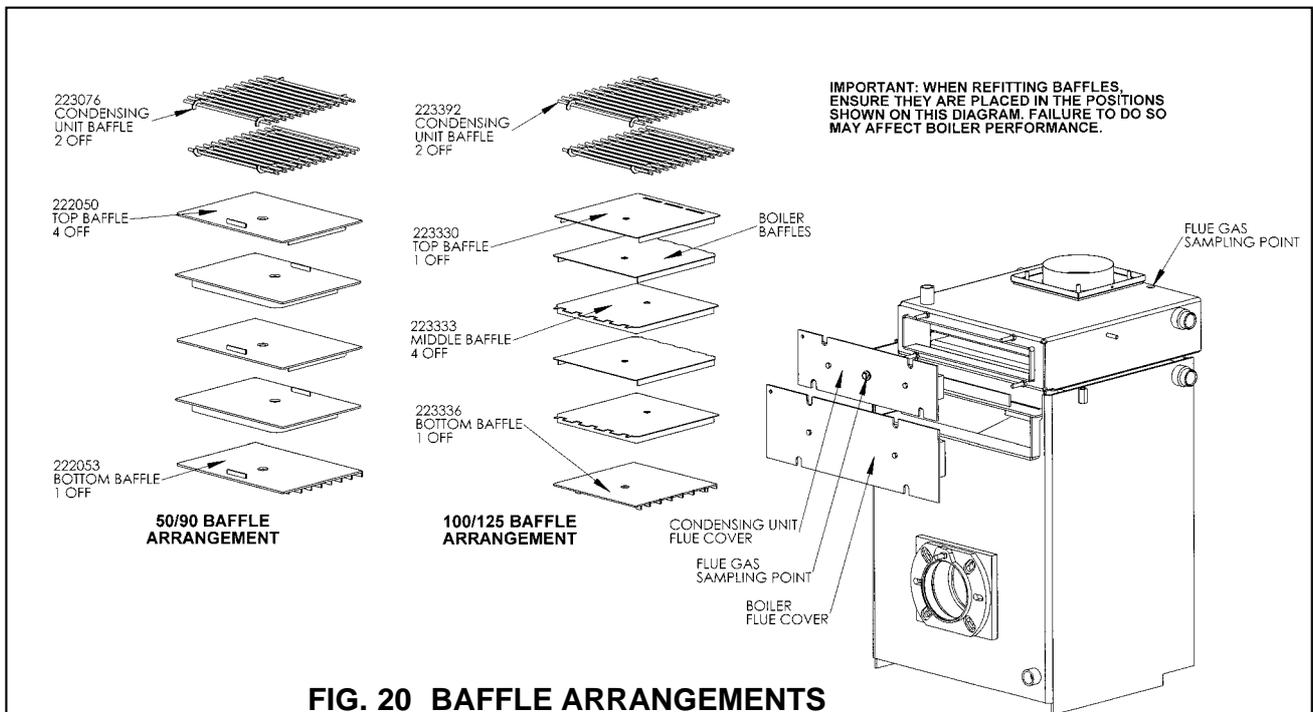


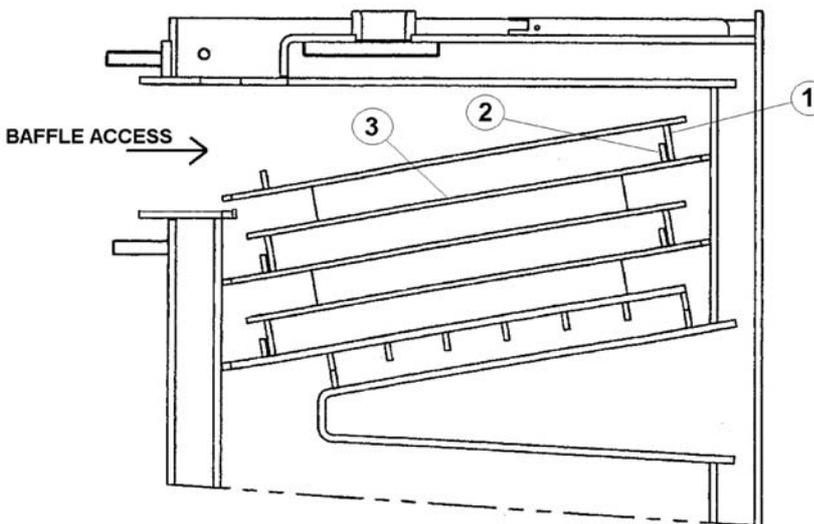
FIG. 20 BAFFLE ARRANGEMENTS

EUROSTAR PREMIER 50/90

It is important to note the specific placement of the baffles on the 50/90 model. As shown on the diagram opposite, the 'skirt' (1) on the underside of each baffle should always be hooked over to the rear of the lug (2) on the baffle immediately below.

The use of a tool may be required to lift the second baffle (3) from the combustion chamber. Insert a screwdriver or other into the lifting hole in the centre of the baffle and raise above the lip of the baffle access channel.

Failure to ensure the correct placement of baffles will result in incorrect combustion, reducing the efficiency of the boiler and invalidating the appliance warranty.



9. FAULT FINDING

ELECTRICITY SAFETY - Before making any electrical checks, switch off mains supply to boiler.

FAULT	POSSIBLE CAUSE	ACTION
BURNER WILL NOT START	Control box locked out	Press reset button on front of burner. N.B. ONLY TRY TWICE
	Limit-stat tripped	Press reset button under control panel and check function of boiler control thermostat.
	Boiler thermostat or other system controls satisfied	Ensure all controls are calling for heat.
	Fuse blown	Fit new 5 amp fuse, if it blows again, check for short circuit in wiring.
	Check for live supply continuity up to burner	If live supply confirmed, change control box
	Motor or pump seized	Check for rotation and replace as necessary.
BURNER STARTS BUT FLAME NOT ESTABLISHED	No oil supply	Check oil level in tank and feed to burner.
	Photo-cell not seeing flame	Clean photo-cell and ensure it is fully plugged in.
	Air trapped in pump	Bleed off air through pressure gauge tapping.
	Solenoid valve faulty	Check coil for continuity and replace if faulty.
	Nozzle blocked	Replace nozzle with one of same specification.
	Electrodes incorrectly set	Reset gap and position electrodes as shown in Burner diagram.
	Electrode insulator cracked	Check and replace if insulator cracked or crazed.
	Ignition transformer and H.T. contacts	Check for spark and condition of H.T. contacts. Replace as necessary.
	Low oil pressure	Check pump pressure and adjust to correct setting.
FLAME ESTABLISHED BUT BURNER LOCKS OUT AFTER FEW SECONDS	Oil contaminated with water	Run off oil at burner until free of water and drain condensation from tank
	Oil filter partially blocked	Wash filter clean with kerosene.
	Photo-cell fault	Clean photo-cell and ensure it is fully plugged in. Replace if faulty.
	Oil pressure low	Check pump pressure and adjust to correct setting.

FAULT FINDING (Cont'd)

FAULT	POSSIBLE CAUSE	ACTION
MORNING START LOCK-OUT	Faulty non-return valve or air leak in two pipe system	Replace non-return valve and cure leak.
	Low voltage	Check with local Electricity Board.
	Combustion readings incorrect	Check combustion under normal running conditions and compare readings with those given under 'Burner Settings'.
	Oil level in tank falling below burner	Raise tank or fit a 2-pipe system.
DELAYED IGNITION- BURNER PULSATES ON START UP	Nozzle partially blocked	Replace nozzle
	Oil pressure too low	Check and recommision
	Flue blocked or damaged	Check and rectify
	Fan slipping on shaft	Check and retighten
	Pump coupling loose pr worn	Check and replace
BURNER STARTS VIOLENTLY	Delayed ignition	Check electrode setting and adjust to correct gap
		Check electrodes for damage
		Check HT leads for damage and positive connection.
BURNER REPEATEDLY ATTEMPTS TO FIRE (Balanced Flue only)	Exhaust gas in combustion air	Remove air hose from boiler end of flue, leaving burner end in place. If burner starts normally, check flue for breakdown of seals and rectify as necessary.
		If indeterminate, leaving hose in place, pierce small hole in air hose and use flue gas analyser to check for carbon dioxide. If more than trace elements present, check flue for breakdown of seals and rectify as necessary.
COMBUSTION FUMES SMELL	Door not secure	Tighten wing nuts, securing door in position
	Seals on cleaning covers	Change door seals
	Burner incorrectly fitted	Check burner gaskets and replace if damaged, tighten burner fixing nuts
	Flue Gasket	Check flue is correctly sealed to boiler flue outlet.

EuroStar Boiler Spare

Item	Description	50/90	Qty	100/125	Qty
1	Boiler Body	223201	1	223301	1
2	R/H Side Panel Assembly	223091	1	223340	1
3	L/H Side Panel Assembly	223094	1	223343	1
4	Top Panel	223175	1	223346	1
5	Door	223083	1	223323	1
6	Fascia	223105	1	223105	1
7	Control Panel	223097	1	223097	1
8	Casing Stiffener	223170	1	223170	1
9	Condensing Unit Clamp ¹	223133	1	223133	1
10	Boiler Control Thermostat	206896	1	206896	1
11	High-Limit Thermostat	206892	1	209892	1
12	Flue Socket Plate	223135	1	223135	1
13	Flue Sealing Gasket	223138	1	223138	1
14	Boiler Top Baffle ²	223050	4	223330	1
15	Boiler Bottom Baffle ²	223053	1	223336	1
16	Boiler Middle Baffle ²	-	-	223333	4
17	Condensing Unit Baffle ²	223076	2	223392	2
18	Boiler Flue Cover	223019	1	223378	1
19	Condensing Unit Flue Cover	223130	1	223398	1
20	Control Box	221944	1	221944	1
21	Burner	223120	1	223230	1
22	Flexible Oil Line ³	207019	1	207019	1
23	Acoustic Hose	209491	1	209491	1
24	Burner Mounting Flange	223118	1	223118	1
25	Burner Mounting Gasket	223108	1	223108	1
26	Condensing Unit	223020	1	223380	1
27	Rear Panel	223086	1	223326	1

¹ Not Shown

² Not Shown; see Fig 20 (page 21) for baffle configurations.

³ Not Shown; see burner details for further information.

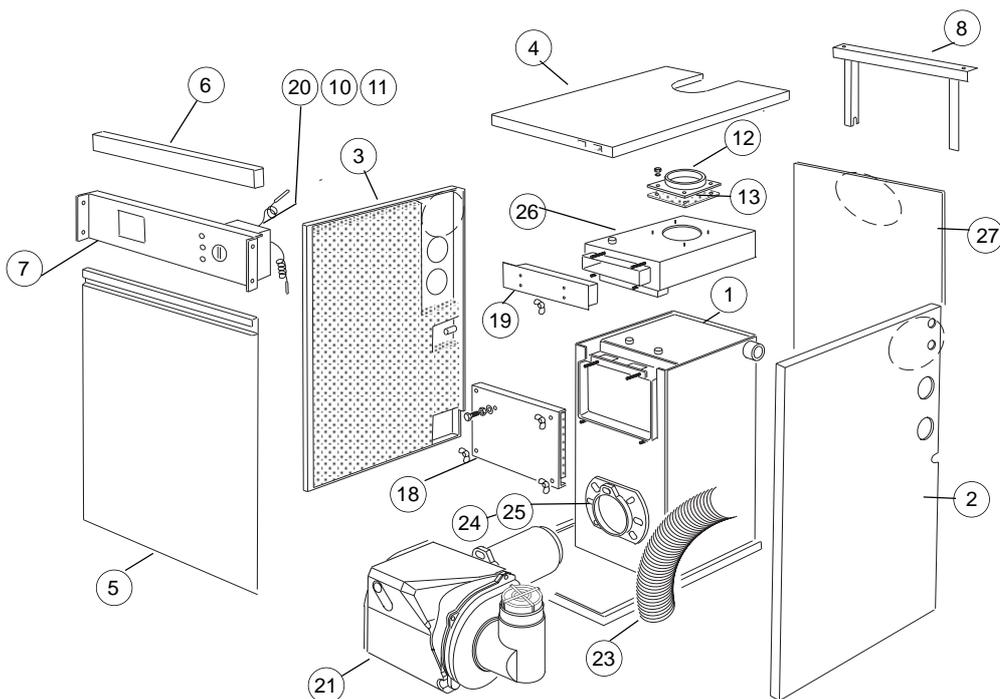


FIG. 21 BOILER EXPLODED VIEW



By appointment to H.M. Queen Elizabeth
The Queen Mother
Manufacturers of Domestic Boilers



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