

WARNING

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RAYBURN

Home on the Range.

Consumer Protection Act 1987

As manufacturers and suppliers of cooking and heating products, in compliance with Section 10 of the Consumer Protection Act 1987, we take every care to ensure, as far as is reasonably practicable, that these products are so designed and constructed as to meet the general safety requirement when properly used and installed. To this end, our products are thoroughly tested and examined before despatch.

IMPORTANT NOTICE: Any alteration that is not approved by Aga-Rayburn could invalidate the approval of the appliance, operation of the warranty and could also affect your statutory rights.

Control of Substances - Health and Safety Important

This appliance may contain some of the materials that are indicated below. It is the Users/Installers responsibility to ensure that the necessary personal protective clothing is

Installation Instructions for Rayburn 360K/L Central Heating Cooker

worn when handling, where applicable, the pertinent parts that contain any of the listed materials that could be interpreted as being injurious to health and safety, see below for information.

Firebricks, Fuel beds, Artificial Fuels - when handling use disposable gloves.

Fire Cement - when handling use disposable gloves.

Glues and Sealants - exercise caution - if these are still in liquid form use face mask and disposable gloves.

Glass Yarn, Mineral Wool, Insulation Pads, Ceramic Fibre, Kerosene/ Gas Oil - may be harmful if inhaled, may be irritating to skin, eyes, nose and throat. When handling avoid inhaling and contact with skin or eyes. Use disposable gloves, face-masks and eye protection. After handling wash hands and other exposed parts. When disposing of the product, reduce dust with water spray, ensure that parts are securely wrapped.

INTRODUCTION

The Rayburn 360 K/L is a combined cooker and hot water boiler providing central heating, domestic hot water and cooking facilities. It is available with vertical flue outlet. The appliance is fired by a pressure jet oil burner. The boiler is designed for use with a indirect cylinder on a fully pumped water system, with a pumped over run facility.

During the summer four loose fire bricks are fitted in the boiler to reduce hot water output.

IMPORTANT:

An Indirect Cylinder to BS 1566 Part 1 Must Be Fitted.

.. a 190 litre cylinder is to be used, then a 1.5kW dissipating radiator must be fitted.

If a 160 litre is to be used, then a 2.0kW dissipating radiator must be used.

If a 140 litre is to be used, then a 2.5kW dissipating radiator must be used.

A Fire Valve Must Be Fitted

An Inline Filter Must Be Fitted

BS 5449 Central heating for domestic premises. Part 1. Forced circulation hot water systems

Building Regulations J 1/2/3 Provision for introduction of air supply and discharge of products of combustion for appliances.

BS 4543 Specification for chimney for oil fired appliances. Part 3.

Building Regulations J/1/2/3 Provision for protection against fire and heat.

Appliance Hearth This appliance must be installed on a solid floor or base of incombustible material which is capable of supporting the total weight.

Location

The location chosen for the appliance must permit installation and the provision of a satisfactory flue and an adequate air supply. The location must also provide adequate space for servicing and air circulation around the appliance. See 'Installation of Appliance'

Oil Storage (See Fig 1)

The minimum recommended oil tank size is 1400 litres (300 gallons) and the Codes Of Practice governing it's installation are covered by BS 5410. The requirements for mild steel tanks should be to BS 799 Part 5 and advice should be sought from the manufacturers for the installation of Plastic Oil Tanks as an alternative consideration.

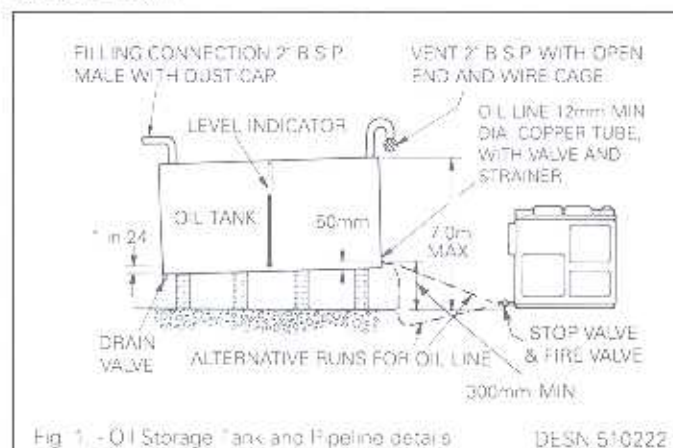


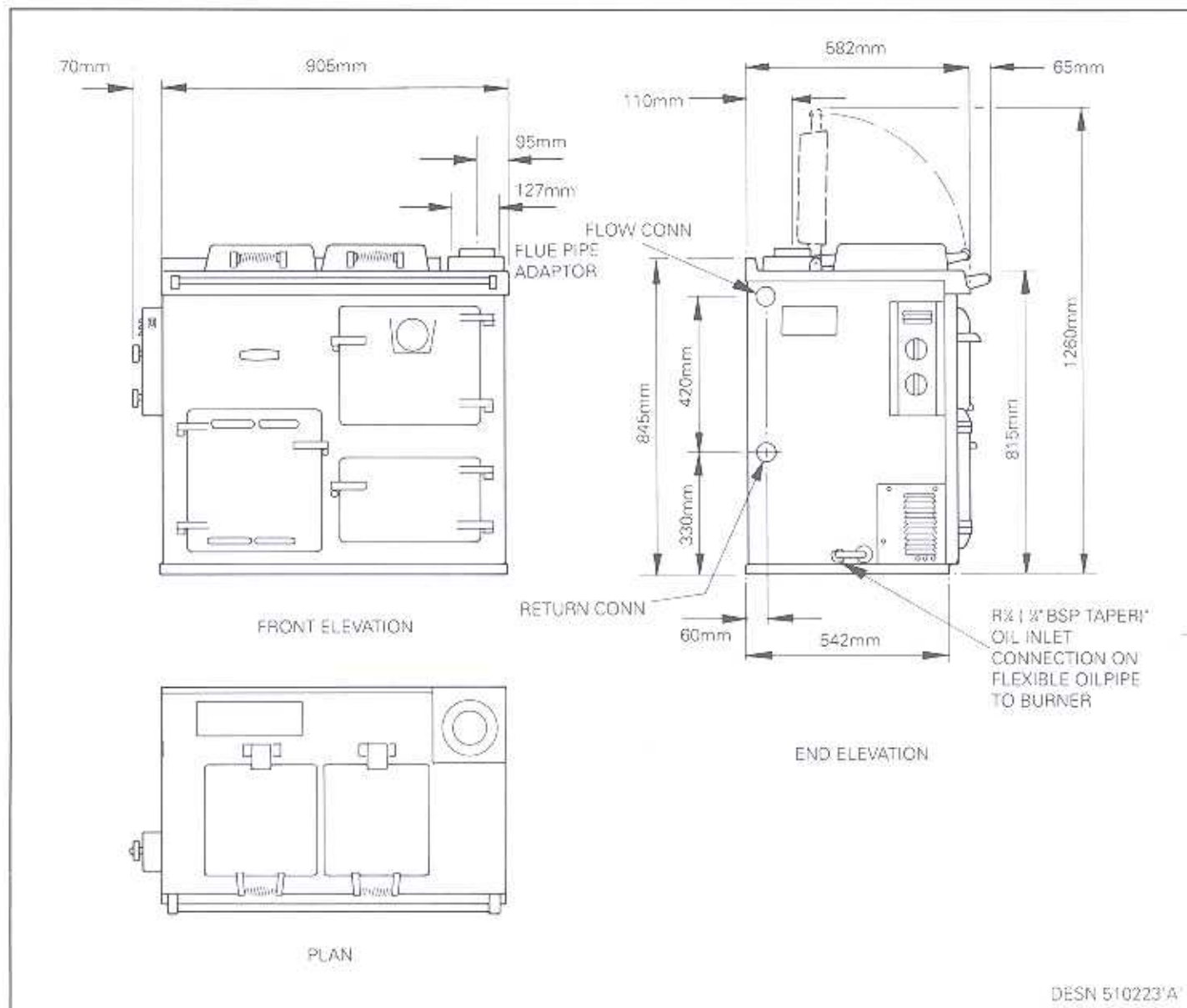
Fig 1. - Oil Storage Tank and Pipeline details

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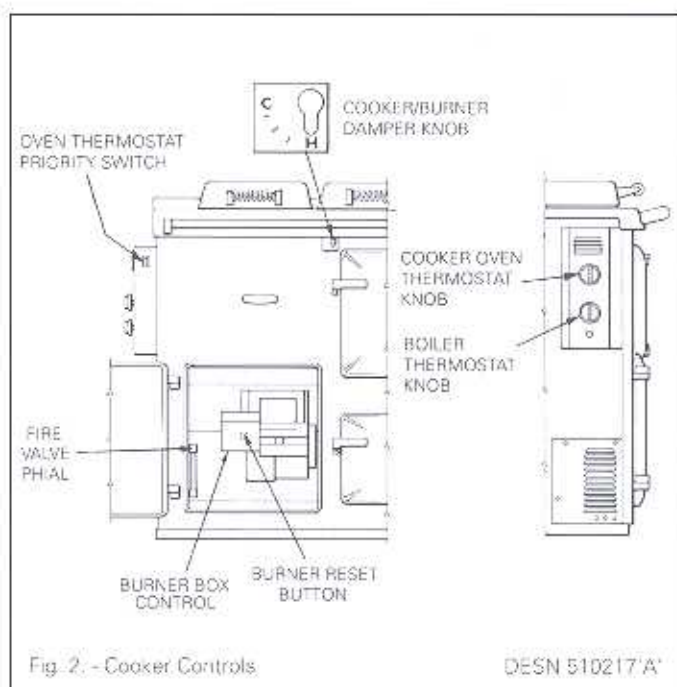
INSTALLATION INSTRUCTIONS

The installation of the appliance must be in accordance with the relevant requirements of the current Building Regulation, current IEE Wiring Regulations and the byelaws of the local Water Undertaking. It should be in accordance also with the relevant recommendations of the following current British Codes of practice:

BS 5410 Installation of oil fired space heating and hot water supply purposes. Part 1. Boilers of rated output not exceeding 44kW.



SPECIFICATIONS	KEROSENE OIL MODEL		GAS OIL MODEL	
HEAT INPUT	24.6 kW 84000 Btu/h		24.6 kW 84000 Btu/h	
OIL INPUT	40cc/minute at 8.3 bar (120lbs/in ²)		38cc/minute at 10.2 bar (150lbs/in ²)	
HEAT OUTPUT TO WATER	HEATING MODE	COOKING MODE OVEN SET 220°C	HEATING MODE	COOKING MODE OVEN SET 220°C
NO BRICKS (WINTER)	60000 Btu/h 17.6kW	23500 Btu/h 6.9kW	60000 Btu/h 17.6kW	23500 Btu/h 6.9kW
SIDE BRICK FITTED	50000 Btu/h 14.7kW	15000 Btu/h 4.4kW	50000 Btu/h 14.7kW	15000 Btu/h 4.4kW
REAR BRICKS & SIDE BRICKS FITTED (SUMMER)	38000 Btu/h 11.1KW	10300 Btu/h 3.0kW	38000 Btu/h 11.1KW	10300 Btu/h 3.0kW
BURNER JET NOZZLE	2.27 Litres/h (0.6 U.S.Gallons/h) 80° Hollow		0.579MH 80°	
BURNER PRESSURE	8.3 bar (120lbs/in ²)		10.2 bar (150lbs/in ²)	
FUEL	28 Seconds Commercial Kerosene to BS2869: Part 2:1988 Class 'C2'		35 Seconds Commercial Gas Oil to BS2869: Part 2:1988 Class 'D'	
Boiler Water Connections		Water Capacity of	18.75 Litres (3.7 galls)	
Flow (one) Rp 1 (1in. BSP Int)		Boiler		
Return (one) Rp 1 (1in. BSP Int)		Weight of		
Both connections are located towards the rear edge of the appliance L.H. side panel.		Appliance	340kg	
Oil Inlet R 1/4 (1/4 BSP Taper Ext)				
Flue Outlet 127mm (5in Int)				
Electrical Supply 240 – 50 Hz 5 amp Fused.				

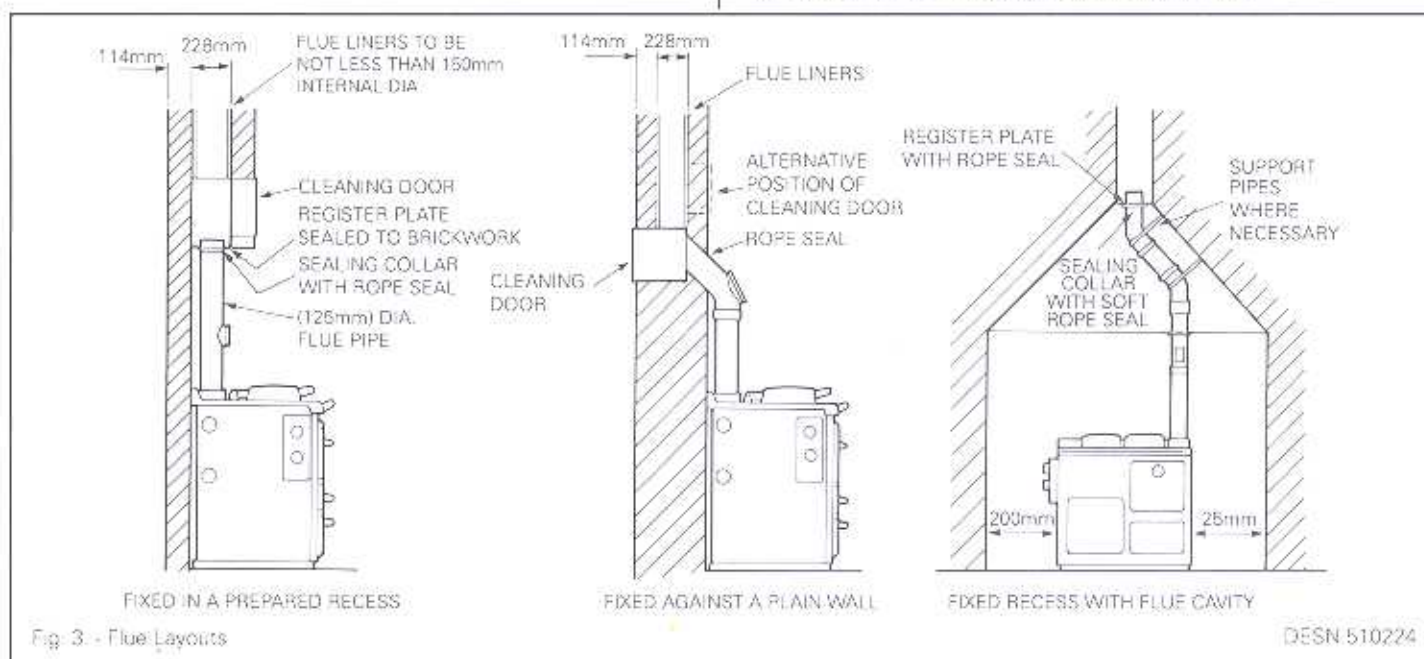


Oil Pipe Line.

The oil line from the storage tank to the appliance **MUST** be fitted with a remote acting fire valve (such as TEDDINGTON KBB C 66°C 1.5m capillary) and the heat sensing phial of the fire valve **MUST** be fitted to the clips in the burner compartment (See Fig 2). a 5-10 micron oil filter **MUST** also be fitted on the oil line, and the minimum size of the copper oil pipe line should not be less than 10mm diameter. A stop valve **MUST** be fitted near the appliance in an accessible position. The flexible pipe connection to the burner is to allow for removal of the burner without disconnection. Therefore the connection between the copper oil pipe and the burner flexible should be made as close to the cooker as possible to allow for ease of the burner removal.

Flue System - See Fig 3

Detailed recommendations for fluing are given in the current Building Regulations J1/2/3.



The following notes are intended to give general guidance:

The flue pipe and chimneys must be Class 1 as recommended for flue gases temperatures exceeding 260°C in Building Regulations J1/2/3.

The cross sectional area of the flue serving the appliance must be not less than the area of the flue outlet of the appliance and be at least 4.5m high.

The flue pipe to be used must be not less than 127mm internal diameter. Flue pipes and fittings should be constructed from one of the following materials:

- Mild Steel with a wall thickness of 3mm minimum.
- Stainless Steel to BS 1449 Part 2.
- Cast Iron to BS 41.
- Mild Steel, acid resistant vitreous enamel lined to BS 1344 Part 2.

Chimneys.

Chimneys should be built of masonry or be assembled from factory-made insulated components. Masonry chimneys may be built of any masonry material, with a lining, or if flue blocks, without a lining. The chimney lining should be 150mm minimum diameter and be formed of moisture and acid resistant liners to BS 1181 with rebated or socketed joints uppermost. Alternatively, linings may be imperforate clay flue pipes as described in BS 65 or flue blocks to BS 1289 and installed to BS 6461 Part 1.

Ensure the chimney is swept over its entire height before connection of new appliance. No other appliance can share the chimney. Ensure all chimney mid-feather walls are intact and the complete chimney airtight. When confirmed, sufficient draught will be available to operate the appliance correctly.

Chimney Termination

All chimneys should terminate at least 600mm above the roof level in accordance with current Building Regulations and statutory requirements as outlined in BS 6461: Part 1 and BS 7566 Parts 1 to 4.

Chimney Cleaning

Ensure there are accessible airtight flue cleaning doors in order to obtain cleaning access to the complete chimney. Providing the appliance is operating correctly, an annual chimney flue cleaning will suffice, but if in doubt, arrange for a half yearly clean, preferably at the beginning/end of the central heating season.

Chimney Draughts

A well sealed, tall exposed chimney on a hill, is an instance where generated draughts could be in excess of 6.0mm w.g. Should this occur, a flue stabiliser must be fitted either in the flue pipe or chimney, but in the same room as the appliance, and adjusted accordingly.

Air Supply

Detailed recommendations for air supply are given in the current Building Regulations J/1/2/3-Section1. The following notes are intended to give general guidance:

Effect of Extractor Fan

Avoid, if possible, the installation of an extractor fan in the same room as the appliance or the room where the permanent vent is located. Compensating extra air inlets must be introduced equivalent to the capacity of the fan when fitted.

WATER CIRCULATION SYSTEM

In a combined central heating and domestic hot water system the hot water storage vessel must be of the indirect cylinder e.g. (as manufactured by Albion Cylinders to BS 1566 Part 1: 190 litre (40 gallon) with 1.5kW dissipating radiator, 160 litre (35 gallon) with 2.0kW dissipating radiator, 140 litre (30 gallon) with 2.5kW dissipating radiator.

A HEAT DISSIPATING RADIATOR OF THE CORRECT SIZE MUST BE FITTED.

The hot water storage vessel should be insulated preferably, with not less than 75mm thick mineral fibre, or its equivalent.

Pipework not forming part of the useful heating surface should be insulated to help prevent heat loss and possible freezing, particularly where pipes are run through roof spaces and ventilated under-floor spaces. Cisterns situated in areas which may be exposed to freezing conditions should also be insulated.

Draining taps must be located in accessible positions which permit the draining of the whole system, including the appliance and hot water storage vessel. Draining taps should be at least 1/2in BSP nominal size and be in accordance with BS 2879.

The appliance boiler section should be connected to a cistern water supply, subject to a maximum head of 18.25m.

The heating system must be designed (and adjusted if necessary) to give a temperature differential across the boiler at full output of 10° - 14°C. The use of horizontal pipe runs should be avoided wherever possible in order to prevent the collection of air in the system. If horizontal runs are unavoidable, the pipes should rise upwards in the direction away from the appliance.

HEATING CONTROLS

Hot water systems should be in accordance with the relevant recommendations given in BS 6700.

A time-switch plus independent temperature controls for each radiator are recommended for providing comfortable room temperatures (EXCEPT FOR THE DISSIPATING RADIATOR).

IMPORTANT NOTICE: A HEAT DISSIPATING RADIATOR MUST BE FITTED TO THE MAIN FLOW CIRCUIT (PREFERABLY IN BATHROOM) TO DISSIPATE EXCESS HEAT FROM THE APPLIANCE. (SEE WATER CIRCULATION SYSTEM AND FIG.4 FOR SIZE).

DURING SUMMER OPERATION THE HEAT DISSIPATING RADIATOR FITTED TO YOUR CENTRAL HEATING SYSTEM MUST BE OPEN TO ALLOW THE CIRCULATION OF HOT WATER GENERATED DURING COOKING.

PROLONGED SUMMER COOKING MAY NECESSITATE THE OPENING OF AN ADDITIONAL RADIATOR TO ALLOW CONTINUED OPERATION OF THE COOKER.

NOTE: THIS WILL BE NECESSARY IF A CYLINDER THERMOSTAT IS FITTED.

COOKING CONTROLS

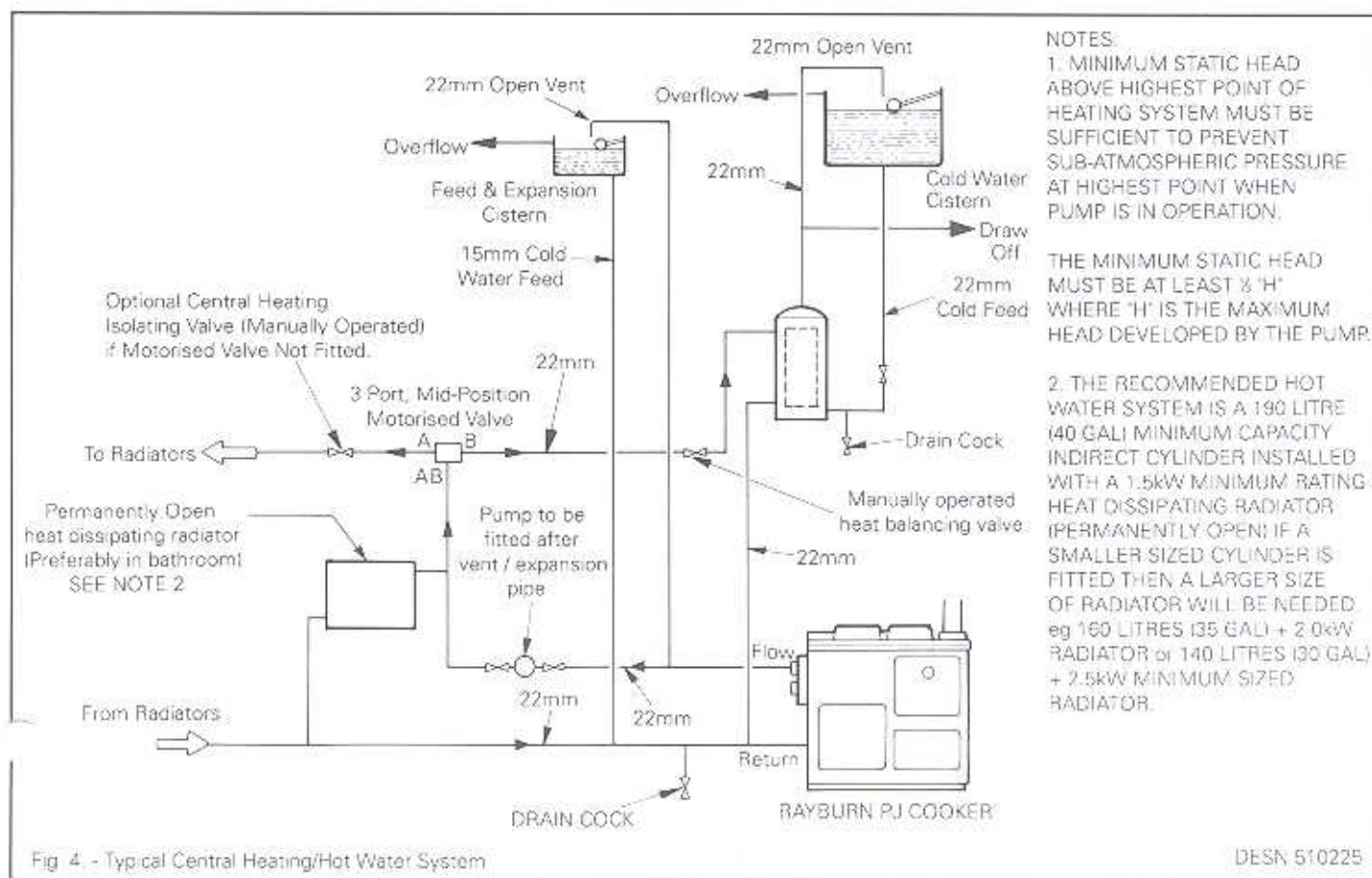
Circulating Pump

It is recommended that the selected pump be of a proprietary type and manufacture, and be adequate to give the required temperature differential between the flow and return. The pump should be able to meet the requirements of the system design and be fitted in a readily accessible position, see Fig. 4.

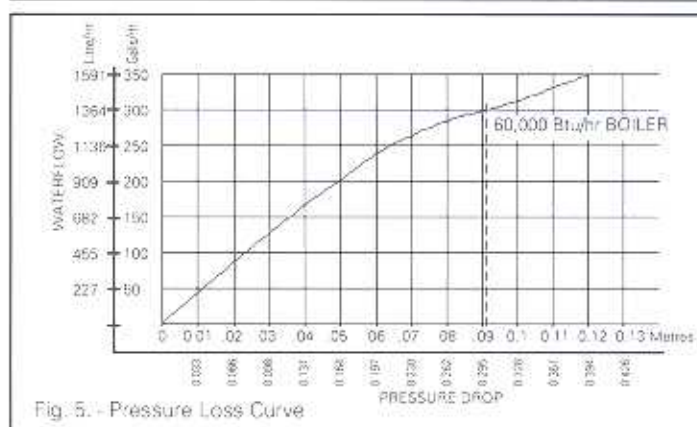
The boiler section pressure loss curve, see Fig. 5 indicates the loss of head across the boiler section and should be considered when selecting the correct pump size.

Isolating Valves

Isolating valves (preferably of the keyless type) must be fitted to the inlet and outlet of the circulating pump to facilitate service and replacement of pump without draining the system.



DESN 510225



INSTALLATION OF APPLIANCE

General

The combined appliance is floor-mounted and the space in which the appliance is to be fitted must have the following minimum dimensions.

- Between wall and LH side of appliance 200mm
- Between wall and RH side of appliance 25mm
- Above the raised insulating cover handle 60mm

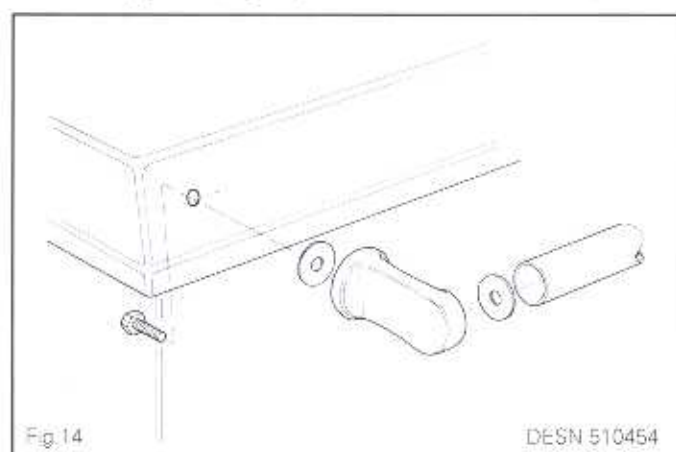
In addition, adequate clearance must be available at the front of the appliance to enable it to be operated and serviced.

Preliminary Installation

The appliance is delivered in a fully assembled condition with the exception of the following items which are supplied separately packed and require assembly.

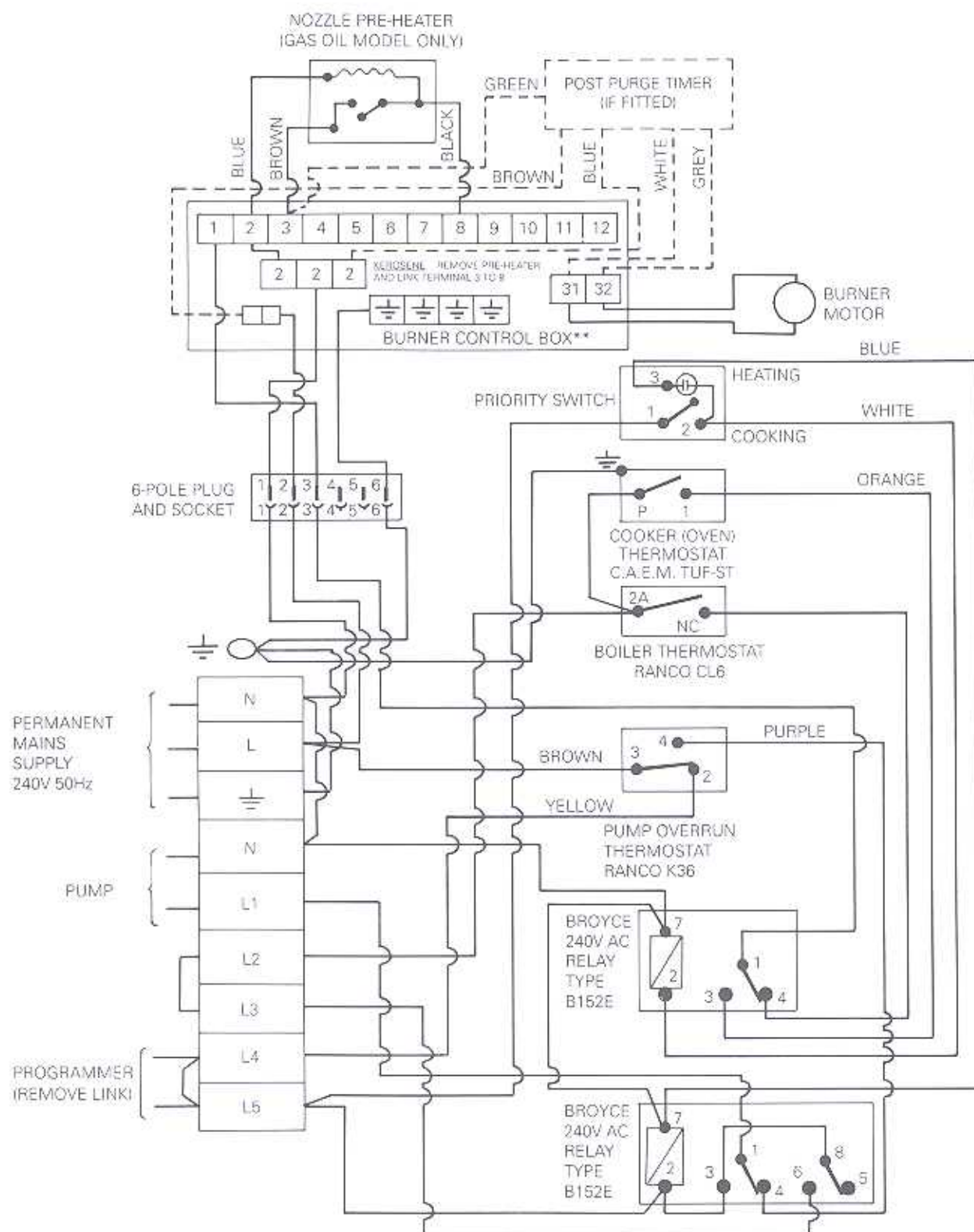
Appliance rear distance bracket:- **If the rear wall is of combustible material, there must be an air gap of 25mm between the wall and rear of appliance. Fit rear distance bracket as shown in fig.7.**

The handrail brackets are held on the front ends of the cooker top-plate casting. Remove the travel nuts and replace with the handrail brackets ensuring the fibre protecting washers are in position. Insert the handrail into the brackets, positioning them correctly, and tighten the locating bolts (Fig.14).



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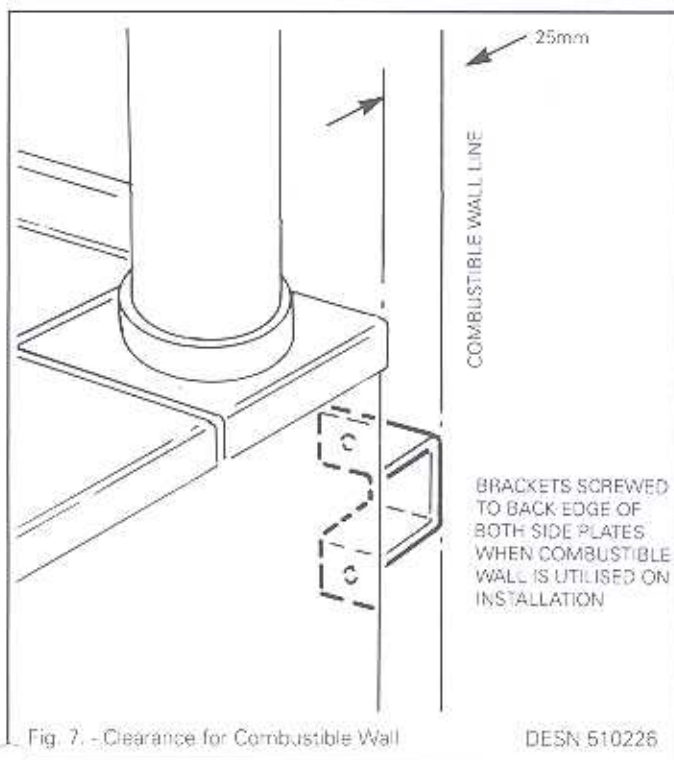
Wherever possible it is recommended that skirting board is removed for the width of the appliance to enable the rear edge of the appliance top plate to make contact with the vertical wall, and avoid a rear gap. (Combustible walls excepted). **Where the cooker is to stand in a recess or against a wall which is to be tiled, in no circumstances should the tiles overlap the cooker top plate.**



** BURNER CONTROL BOX:
KEROSENE MODEL:- DANFOSS BHO 61 or LANDIS & GYR LOA 21
GAS OIL MODEL:- DANFOSS BHO 62 or LANDIS & GYR LOA 22
(Burner Fitted with nozzle pre-heater)

WIRING DIAGRAM - WITH C.A.E.M. OVEN THERMOSTAT & SEPARATE OVEN THERMOSTAT PRIORITY SWITCH

Fig.6 Wiring Diagram



Site Location

1. Check that the hearth is level, then move the appliance from its transit wooden pallet, and position it with its back against the wall and in its intended position for flue connection.

2. Locate and fit flue pipe into socket of flue pipe adaptor, sealing joint with fire cement. **NOTE:- Ensure four drain holes inside flue socket are clear of cement.**

3. Connect and terminate the flue system in accordance with standard practice.

4. Lift up the insulating covers and remove the hot plate (see fig. 9 under commissioning instructions). The removal will expose the two brick baffles (see fig. 10 under commissioning instructions).

5. Remove the enamelled cover behind the L.H. insulating lid and remove sealing plate (twist clip on L.H. side) and check that boiler flue baffle is correctly positioned (see fig 8). Reassemble sealing plate and enamelled cover.

Check that the two brick baffles are correctly positioned i.e. slide both towards the right leaving a passage for flue gases on the left hand side only. These baffles are permanent but are removable to allow for the fitting of the loose summer firebricks.

For summer use it will be necessary to fit the set of loose fire bricks supplied with the cooker (see under commissioning instructions).

After checking the firebrick, replace the hot plate ensuring it seals around its edge.

Electrical Supply

Wiring external to the appliance must be installed in accordance with current National Wiring Regulations and any local regulations which apply. The appliance is supplied for 220/240 Volt ~ 50 Hz and a fuse rating of 5 amps.

The method of connection to the mains supply should facilitate complete electrical isolation of the appliance, by the use of a fused double pole switch having a contact separation of at least 3mm serving only the appliance. The point of connection to the mains should be readily accessible and adjacent to the appliance. The installation should be protected by a 30mA Residual Current Circuit Breaker (RCCB).

The minimum requirement for the power cable is that it should be a 3 core PVC sheathed flexible cord (85°C min) at least 0.75mm² (24 x 0.2mm) to the relevant standard.

WARNING THIS APPLIANCE MUST BE EARTHED

In the event of an electrical fault after installation of the appliance, preliminary electrical system checks must be carried out i.e. earth continuity, short circuit, polarity and resistance to earth.

for wiring instructions see wiring diagram.

IMPORTANT:- The wiring from the pump must be fed through the grommet adjacent to the cable cord and clamped accordingly.

Fully Pumped System

The domestic hot water flow pipes are pumped, and a pumped overrun facility is fitted. See Fig. 4.

Water Circulation Supply

The whole of the system should be thoroughly flushed out with cold water without the pump fitted, the system should be fitted and air locks cleared. Vent all heat emitters and check for water soundness.

Oil Supply Connections

The oil supply connections between the storage tank and the burner should be run in copper, steel or aluminium pipe. Galvanised pipes and fittings should not be used. All pipework and fittings must be oil tight and screwed joints should be made good with an oil resistant compound.

The supply should terminate close to the burner with an isolation valve, Fire valve, and filter, and approximately the last 1/2m should run in flexible pipe to facilitate moving the burner away from the appliance during servicing.

The size and arrangement of the pipework will depend on the distance and height of the storage tank in relation to the oil pump inlet on the burner.

WINTER AND SUMMER FIRE BRICK POSITIONS

The appliance is provided with a set of fire bricks which have to be fitted in the boiler once the heating season is over to reduce the heat transfer to the water when central heating is not required. **IMPORTANT:- To fit the bricks turn both thermostats off and disconnect mains supply including programmer to prevent burner firing.**

Lift out the hot plate (see Fig. 9). Carefully remove the two baffle bricks which are fitted under the hot plate by separating them and lifting at the front (see Fig. 10).

Now fit the two rear Summer bricks by placing the rectangular brick with the rebate to the bottom in the channel welded on boilerface above the rear flue outlet. Fit the 'L' shape rear Summer brick by positioning on floor of combustion chamber and touching brick already fitted (see diagram 11). Locate back brick retaining bracket in groove in boiler to retain bricks in position at top. When located, slide both bricks to the right hand side.

The left hand side summer bricks stand on the base of the combustion chamber. Slide small side fire brick in position. The front side brick is secured by a removable stainless steel bar located on brackets welded to boiler (Fig. 11).

When the summer bricks have been secured replace the top baffle bricks, right hand side first, then the left hand

side. Finally move both bricks together to the right leaving a passage for the flue gases on the left hand side only. Replace the hot plate ensuring it seals around its edge.

COMMISSIONING

The air control is pre-set at the factory, however small adjustments may be necessary to suit site conditions (See Fig. 13)

Bleed Air from Oil Supply

Disconnect the flexible oil pipe at the pump inlet, open the stop valve slowly and run off some oil into a receptacle to establish an air free supply to the pump. Remake the connection oil tight and leave valve open.

Fit Pressure Gauge (see Fig. 12)

Remove bleed screw from pump and fit an oil pressure gauge with R 1/8 connection, to check the pump output pressure.

Electrical Installation

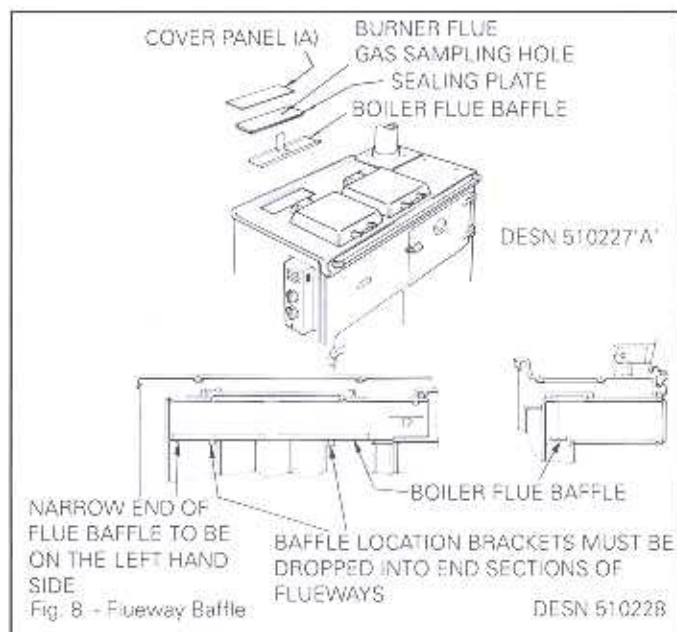
Checks to ensure electrical safety should be carried out by a competent person.

Switch on Electricity

Turn the oven thermostat to 9. The burner should start and run on pre-purge for 7 to 15 seconds, with the ignition spark energised, before the solenoid valve opens admitting oil and allowing it to fire. Until all the air from the oil pump is flushed out there may be some flame instability resulting in the burner locking out as indicated by the signal light in the re-set button of the control box (see Fig. 2). In this event, wait at least one minute, then press the re-set button to re-start.

Vent the Oil Pump (see Fig. 12)

Whilst the burner is running, vent air from the pump by slackening the pressure gauge connection sufficient to allow air to bleed out. When bubble free oil seeps out, re-tighten.



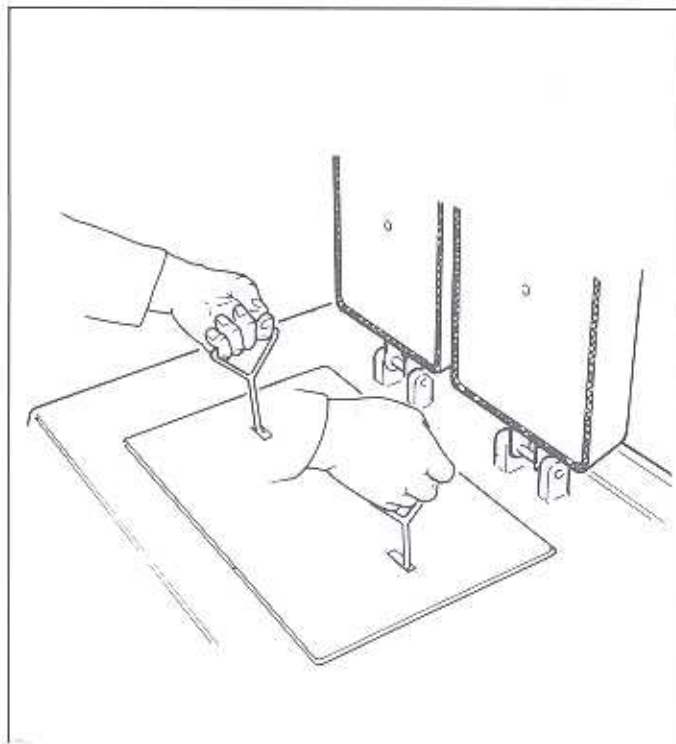


Fig. 9 - Removal of Hotplate

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Adjust Oil Pressure (see Fig. 12)

Switch on the burner and check the oil pressure on the pressure gauge.
If the pressure gauge is not indicating the correct reading then adjust the pressure by turning the pressure regulator (1) clockwise to increase, or anti-clockwise to decrease the pressure until the pressure gauge reads 8.3 bar (120lb/in²) For kerosene oil or 10.2 bar (150lb/in²) for gas oil.

To Set Combustion Air (see figs. 8, 9 & 13)

Switch off the burner, disconnecting from electricity supply. **IMPORTANT:- Ensure that outer burner door is closed during setting procedures, and that only the baffle bricks are fitted.**

Remove the pressure gauge and screw in bleed screw.
Switch on the burner and set cooker/burner damper to H (Heating).

Remove the enamelled top plate cover panel (A) behind the L.H. insulating cover where a plugging screw will be seen. Remove this screw and insert sensing end of portable indicator to check the CO₂ (Carbon-Dioxide) level. Adjust the burner air intake until 11.5 % CO₂ of flue gases is recorded in the indicator.
Low Level Flue Installations, adjust the burner air intake to give 8.5 - 9.0% CO₂ (carbon dioxide)

Check smoke

Remove the CO₂ indicator and using the same hole for flue sampling insert the sensing end of Baccarach Smoke Pump and check that the smoke in the flue exit does not exceed No.2 on the scale.

Check Ancillary Controls

Before leaving the site, check that any thermostats or other safety limit controls are working correctly and are capable of switching the burner off.
Check the operation of the Control Box. In the event of flame failure the control box will cut off oil supply by closing the solenoid valve. The re-set button on the box will then be illuminated. **Wait 1 minute before re-setting the control Box.**

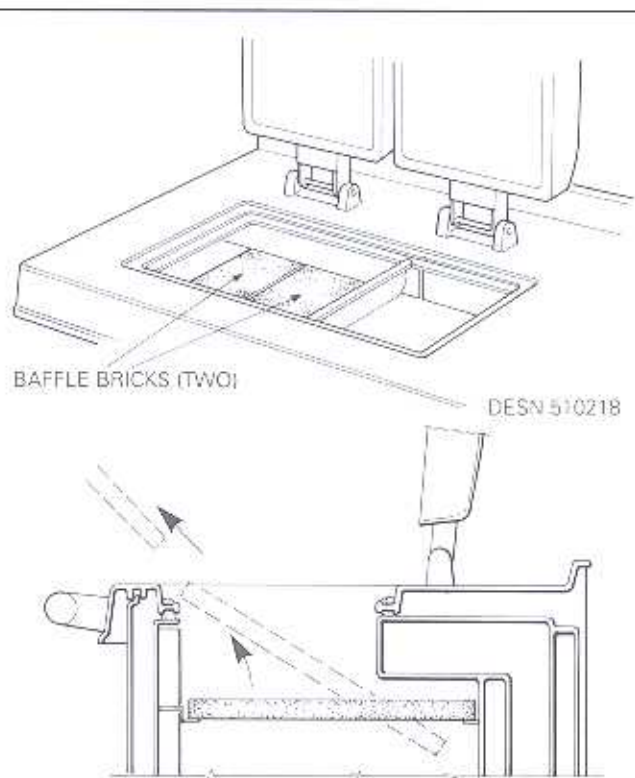


Fig. 10 - Removal of Baffle Bricks

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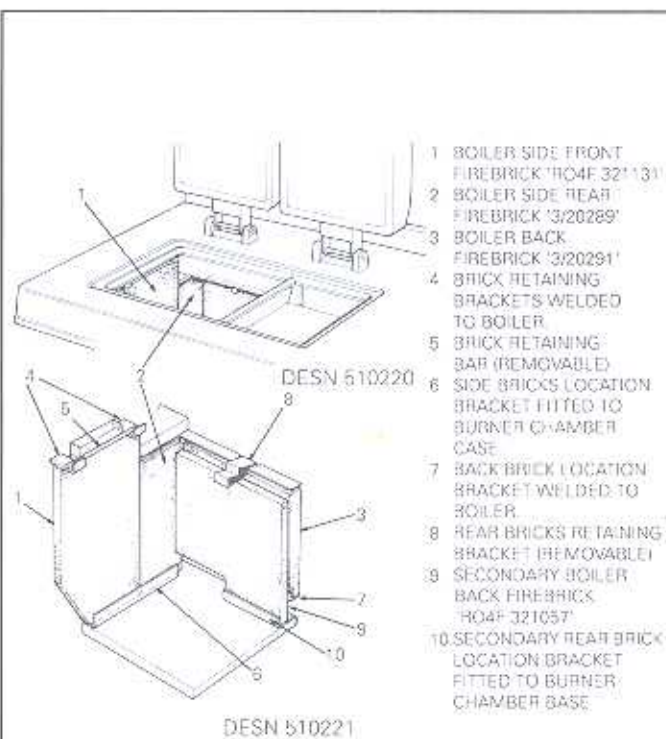


Fig. 11 - Fitting of Fire Bricks for Summer Use

Boiler Control Check

Check that

1. The boiler system is full of water and all valves are fully open
2. Any programmer or time switch is set at continuous heating.

NOTE: The oven thermostat priority switch on the front of thermostat access panel must be OFF (non-illuminated). (See Fig.2).

3. Ensure the electricity supply is ON, that the pump is running and the boiler thermostat set at 80°C (180°F).
4. Allow the heating system to warm up then set the pump adjuster to maintain a boiler 'flow and return' temperature differential of 10°C-14°C (18°-25°F). Checks must be made by the installer to see that this differential is obtained after the boiler 'Flow' temperature is stabilised. The system should be balanced by regulating the water flow rate through individual heat emitters to ensure a satisfactory water temperature at each emitter. A system balance must also be made, so that the minimum flow required through the heat dissipating radiator is achieved when supplying DHW only.
5. When the water system reaches working temperature check that the boiler thermostat operates satisfactorily. Check that any programmer or time switch are fully operational.
6. Examine the system for water soundness. The system should then be turned off and rapidly drained while still hot. The water system should again be filled and cleared of all air locks.

INSTRUCT USER

1. Demonstrate the correct operation of the appliance and system controls in accordance with the instructions in the sections 'COOKING', 'HEATING and 'WINTER' AND SUMMER USE' of the OPERATING INSTRUCTIONS.

NOTE: IT IS IMPORTANT THAT THE USER IS MADE AWARE THAT WHEN THE COOKER IS USED THAT HOT WATER WILL ALWAYS BE PRODUCED. IT IS, THEREFORE, NOT NECESSARY TO PRE-HEAT THE DOMESTIC HOT WATER BEFORE COOKING.

2. Advise the User of the precautions necessary to prevent damage to the heating system and to the building in the event of the heating system remaining inoperative during frost conditions.

3. Advise the User that, for continued efficient and safe operation of the appliance, it is important that adequate servicing is carried out at regular 6 monthly intervals.

4. Leave the operating, installation and servicing instructions with user.

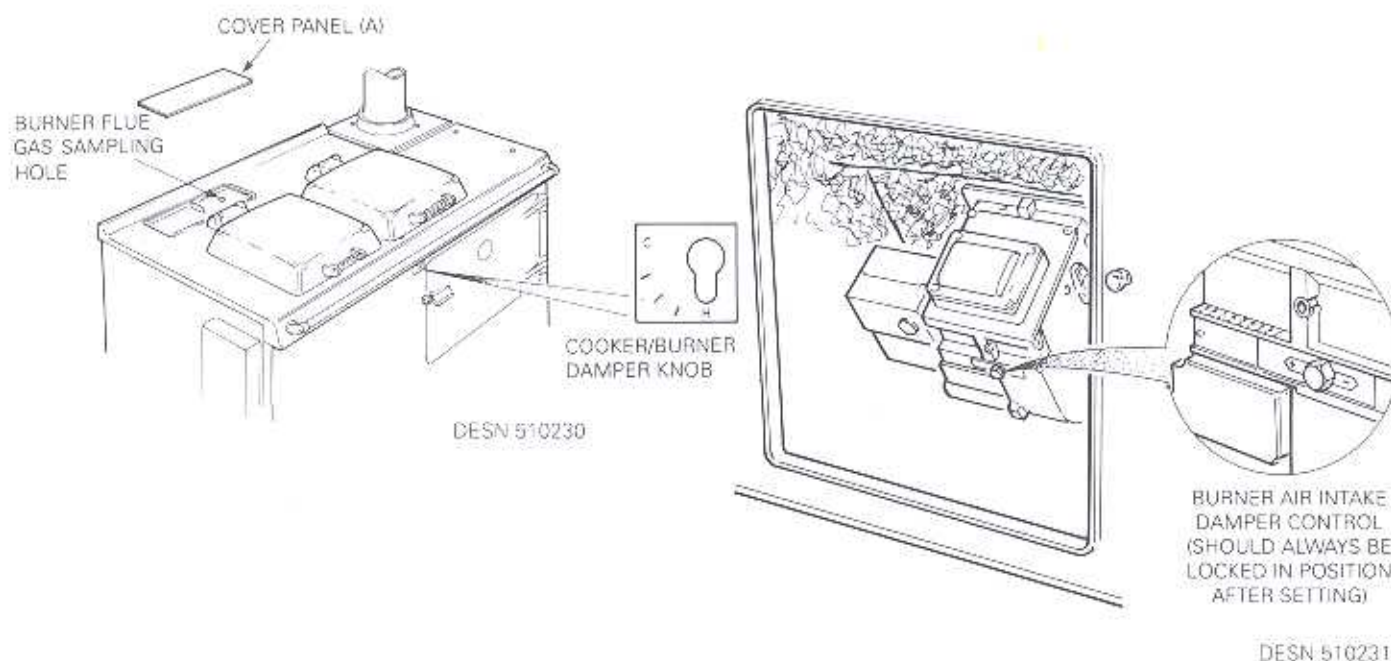
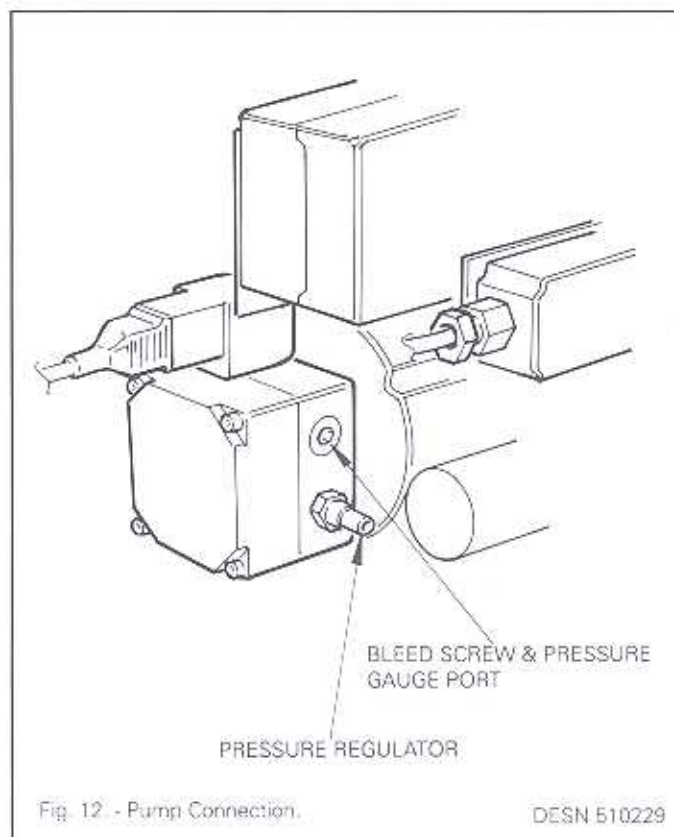
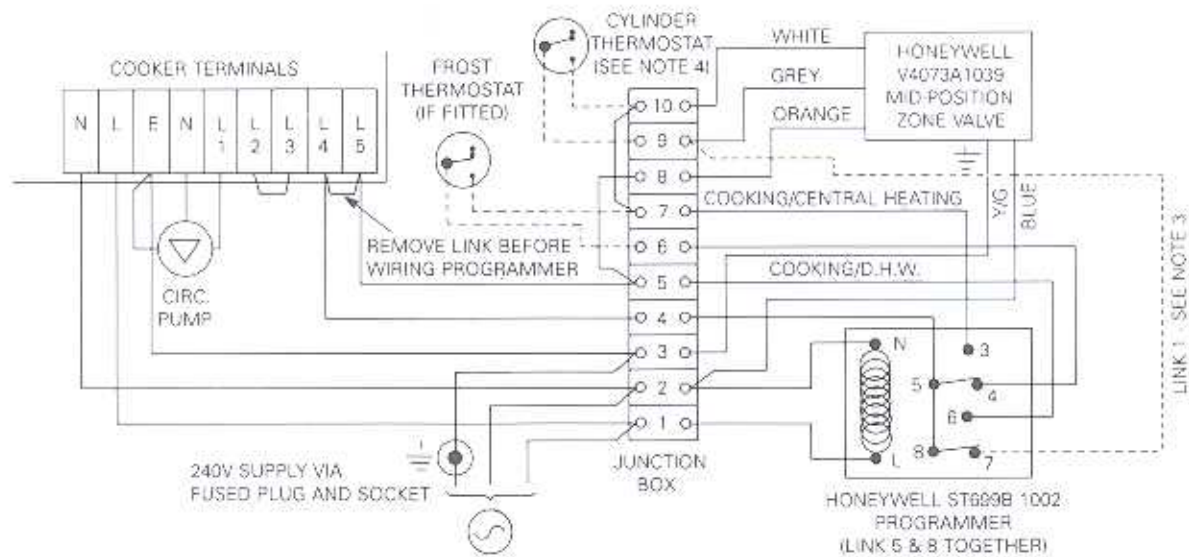


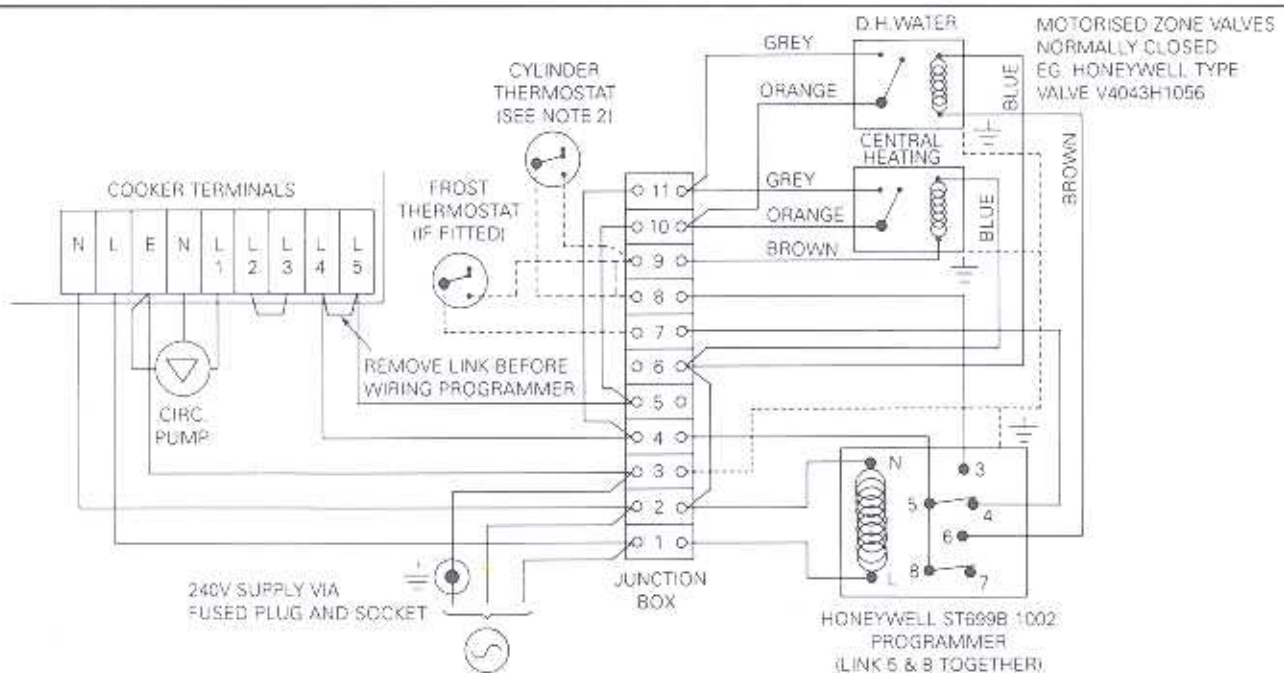
Fig. 13. Flue Gas Sampling and Combustion Air Adjustment



Typical Fully Pumped System - With One 3 Port, Mid-Position Valve

NOTES:

1. To operate the burner a live supply must be connected to Terminal L5.
2. **For Cooking and D.H.W.** - This is provided through the switch connections of the Cooking/D.H.W. Switch.
3. **For Cooking and Central Heating - Insert link 1.** When power is applied through the connection of the central heating switch to the white wire (Terminal 10) and through the OFF connection of the D.H.W. switch to the grey wire (Terminal 9) then the motorised valve closes off the D.H.W. and supplies a power through the orange wire (Terminal 8) to switch the burner on.
4. **For Cooking/and both Central Heating and D.H.W.** - This is supplied through the "ON" connections of both switches applying power to the orange wire (Terminal 8) and the white wire (Terminal 10) this opens up both sides of the valve and switches on the burner. For control of the D.H.W. temperature **remove link 1** and connect the 'Make-on-rise' connections of a cylinder thermostat across Terminals 10 (White) and 9 (Grey). This will close off the valve to the cylinder when the hot water demand is satisfied.



Typical Fully Pumped System - With Two Motorised Valves

NOTES:

1. For the pump overrun facility to work successfully the "Heat Dissipating Radiator" **must** be before the motorised valves in the flow pipe from the cooker.
2. A domestic hot water priority can be obtained when running the central heating by replacing the link between 8 & 9 with the 'Make-on-rise' connections of a cylinder thermostat. To operate the burner both time switches must be made.