March, 1986

IDEAL
Concord Super Series 3
50 ~ 300 Vertical
250 ~ 300 Horizontal
Modular Gas Fired Boilers
Installation, Commissioning & Servicing

B.G.C. Appliance No.'s

Concord Super	50V	Series 3	41 407 65	Concord Super	250V	Series 3	41 407 69
Concord Super	100V	Series 3	41 407 66	Concord Super	300V	Series 3	41 407 70
Concord Super	150V	Series 3	41 407 67	Concord Super	250H	Series 3	41 407 91
Concord Super	150VA	Series 3	41 407 90	Concord Super	300H	Series 3	41 407 92
Concord Super	200V	Series 3	41 407 68				

CONTENTS

STELRAD GROUP

INTRODUCTION

The CONCORD SUPER range of boilers is suitable for connection to fully pumped, open vented or pressurised central heating, indirect domestic hot water and combined systems – in Commercial and Industrial premises.

Note: British Gas Approval does not apply to pressurised systems.

BOILER DESCRIPTION

Each boiler consists of:

(a) The insulated, stainless steel casing with flue outlet, inspection covers, flue coupling point and condensate drain.

(b) The heat exchanger module(s).

And in the case of multi-module boilers:

(c) Gas header complete with individual module gas service taps, and mains inlet gas tap.

(d) Flow and return water headers.

(e) Wiring centre(s) with wiring harness.

The 50 kW boiler is supplied with a module gas service tap only, and the wiring centre with harness is optional.

Each module is connected in parallel across the flow and return water headers, so that water is flowing through all the modules at all times. The Concord Super range of boilers provides good load matching and sequence control by the following method:

As the load on the boiler decreases so the return water temperature increases.

Each module is fitted with an electronic thermostat capable of being set to within 0.5°C, and these thermostats sense the return water temperature.

Once the flow temperature reaches 82°C, i.e. the return reaches 71°C, the modules are set to switch off at intervals to maintain the flow at 82 ± 2°C.

The modules switch off from left to right and from top to bottom, thus the top left module is always the first to go off and the bottom right the last.

Each wiring centre provides facilities for wiring in remote indicators/alarms of 'burner on', 'lockout' and 'overheat trip' for up to three modules. Provision is also made for mains supply and direct connection of any interlock devices such as the water flow switch.

MODULE DESCRIPTION

Each module can be subdivided into three main elements:

(a) The heat exchanger which consists of finned copper tubes expanded into cast iron end plates, and cast iron flow and return elbows (Fig. 2).

(b) The controls chassis which incorporates the fan (which supplies air for combustion), and the electronic controls. (Fig. 3).

(c) The gas line which supplies and regulates the gas flow to the burner. (Fig. 4).

The normal mode of operation is as follows:

When the electronic thermostat calls for heat, the fan is switched on and purges the combustion chamber for 15 secs.

At the end of this time the ignition sequence starts; the control box delivers a spark from the ignition electrode to the burner, and the gas valves are opened.

Gas is delivered via the injector to the distribution plate at the inlet to the fan, this pre-mixes the gas with the air which then passes from the fan through a multihole plate to the burner, where it is ignited. The flame is sensed via the ionization electrode and the control box keeps the valves open until the thermostat is satisfied.

The module is protected against blockage of the burner, heat exchanger or flue, and against fan failure by the proportionator. This senses the difference in pressure across the multihole plate and controls the gas injector pressure according to the amount of air flowing.

After combustion, the products flow past the finned copper tubes, and through the gas distribution screen into the boiler casing, in doing so they give up their heat to the water flowing through the tubes.

INSTALLATION REQUIREMENTS

IMPORTANT

Gas Safety Regulations 1984:

All gas appliances must, by law, be installed by competent persons e.g. CORGI in accordance with the above regulations.

Failure to install appliances correctly could lead to prosecution.

It is in your own interest and that of safety to ensure that the law is complied with.

In addition, the installation must comply with the relevant British Standard Specifications and Codes of Practice, the current Building Regulations and any requirements of the Local Authority Health and Safety Executive, Gas Region and Insurance Companies.

All wiring MUST comply with I.E.E. Regulations for the electrical equipment of buildings.

LOCATION

The floor must be flat, level, and capable of supporting the weight of the WET boiler and pipework, in addition concrete floors must be sealed. The siting of the boiler must be in accordance with the guidance given in CP.332:3 and with reference to Minimum Boilerhouse clearances – refer Figs. 5 and 6.

CONNECTION TO GAS SUPPLY

The gas installation MUST be in accordance with the requirements of the Local Gas Region. (Refer also CP.331:3 and CP.332:3 where applicable.

The gas supply must be capable of maintaining a minimum pressure of 15.0 mbar (6in.w.g.) at the inlet to the boiler, with all modules firing. Gas consumption is given in Table 1.

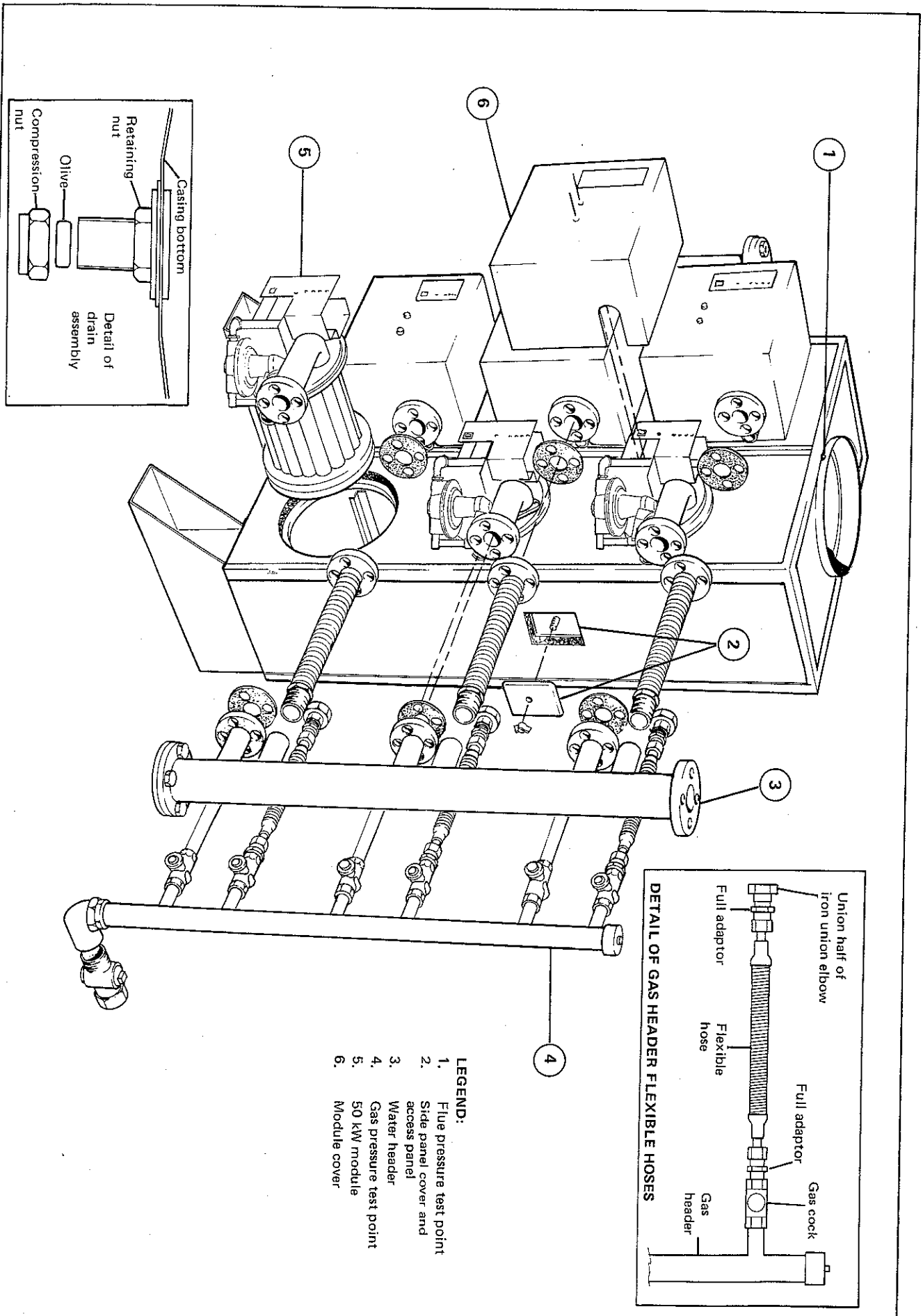
The boilers are for use with NATURAL GAS ONLY.

FLUE REQUIREMENTS

Open flue, induced draught and fan diluted systems may be used but must comply with the following basic requirements:

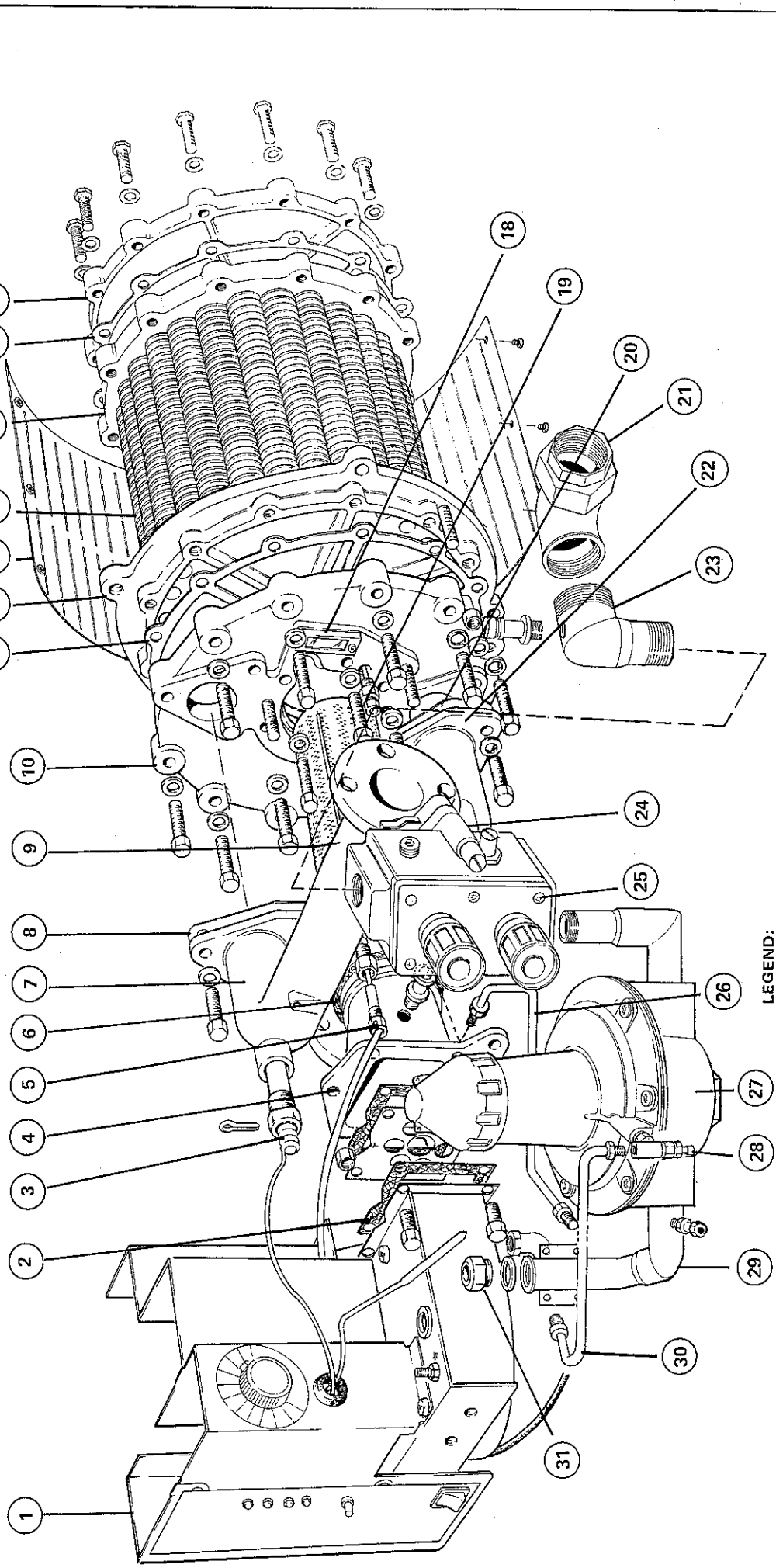
1. A draught diverter MUST NOT be fitted.
2. A draught stabiliser MUST be fitted to all types of flue systems and set to control the draught in the casing between neutral and 0.2 mbar (0.08in.w.g.), irrespective of flue height or number of modules firing. (See Figs. 8 and 9 for further guidance).
3. ALL flue systems must be insulated and/or lined and impervious to acid condensate.

   Prefabricated chimneys must have a 'U' value of no greater than 1.4 W/m^2 °C at 540°C (0.25 Btu/h ft^2 °F at 1 000°F).
4. Drainage must be provided at the base of the chimney or liner. (All boiler casings have a condensate drain point – see Fig. 1).
5. For fan diluted or induced draught systems, air flow/pressure switches MUST be fitted to protect against fan failure. Switches should be set to open if the air flow reduces by more than 15%.
6. Flue products must not be allowed to enter the boilerhouse or adjacent buildings.
7. Refer also BS.5440:1 and to the British Gas Publication 1M/11 – 'Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters', for further guidance.



300 kW VERTICAL BOILER EXPLODED VIEW

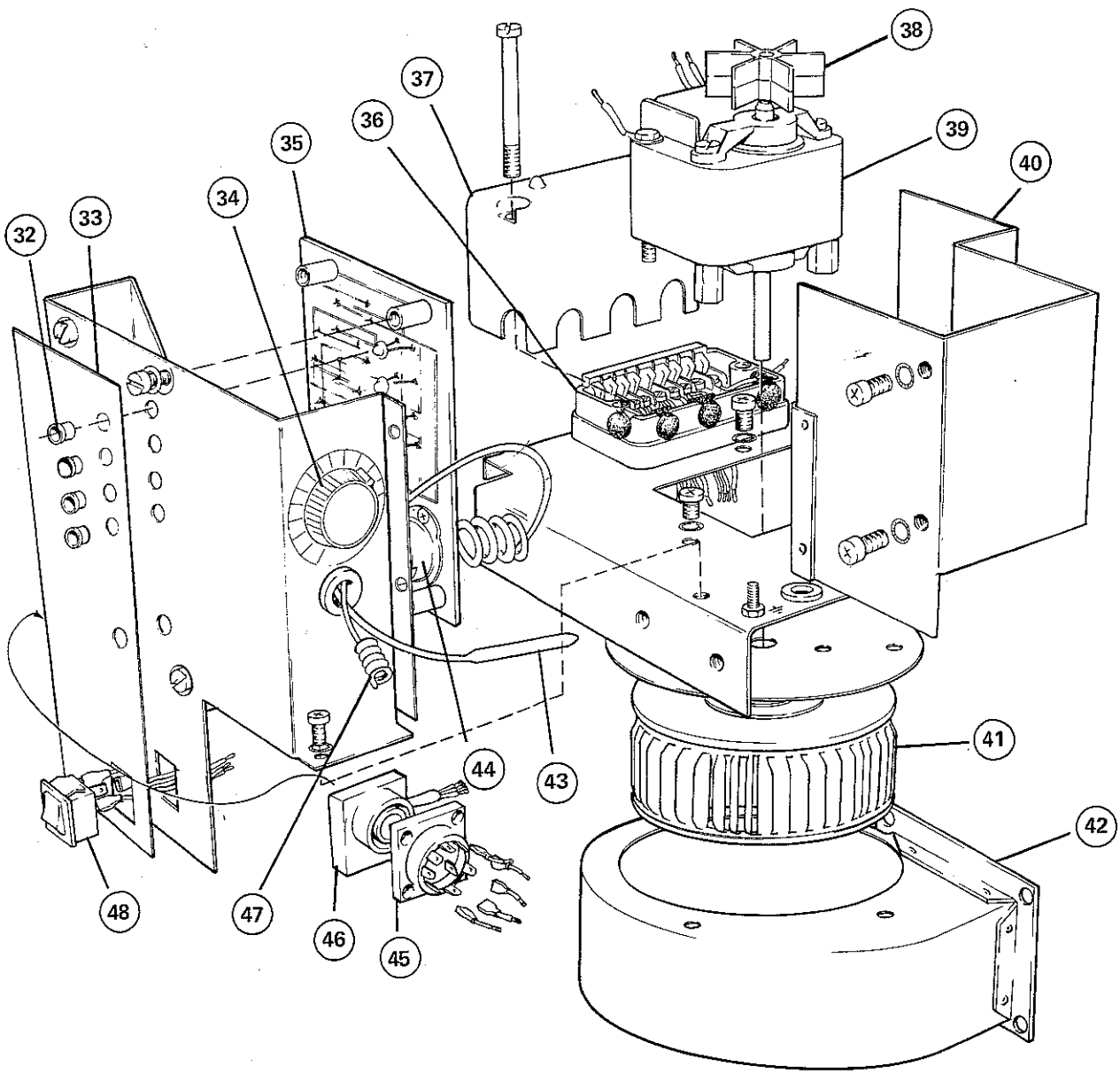
Fig. 1



LEGEND:

1. Control chassis assembly
2. Multi-hole plate and cork gaskets
3. Limit thermostat pocket
4. Square to round casting
5. Ignition electrode
6. Burner cork gaskets
7. Flow header
8. Flow header gasket
9. Burner
10. Top cover plate
11. Cover plate gasket
12. Top tube plate
13. Gas distribution screen
14. Finned copper tubes
15. Bottom tube plate
16. Cover plate gasket
17. Bottom cover plate
18. Sight glass
19. Flame sensor
20. Return header gasket
21. Union elbow
22. Return header
23. Inlet pipe with test nipple
24. Thermostat pocket
25. Combination gas control
26. Pressure sensing pipe
27. Proportionator
28. Pressure test nipple
29. Injector pipe with test nipple
30. Pressure sensing pipe
31. Injector

Fig. 2 **MODULE EXPLODED VIEW**

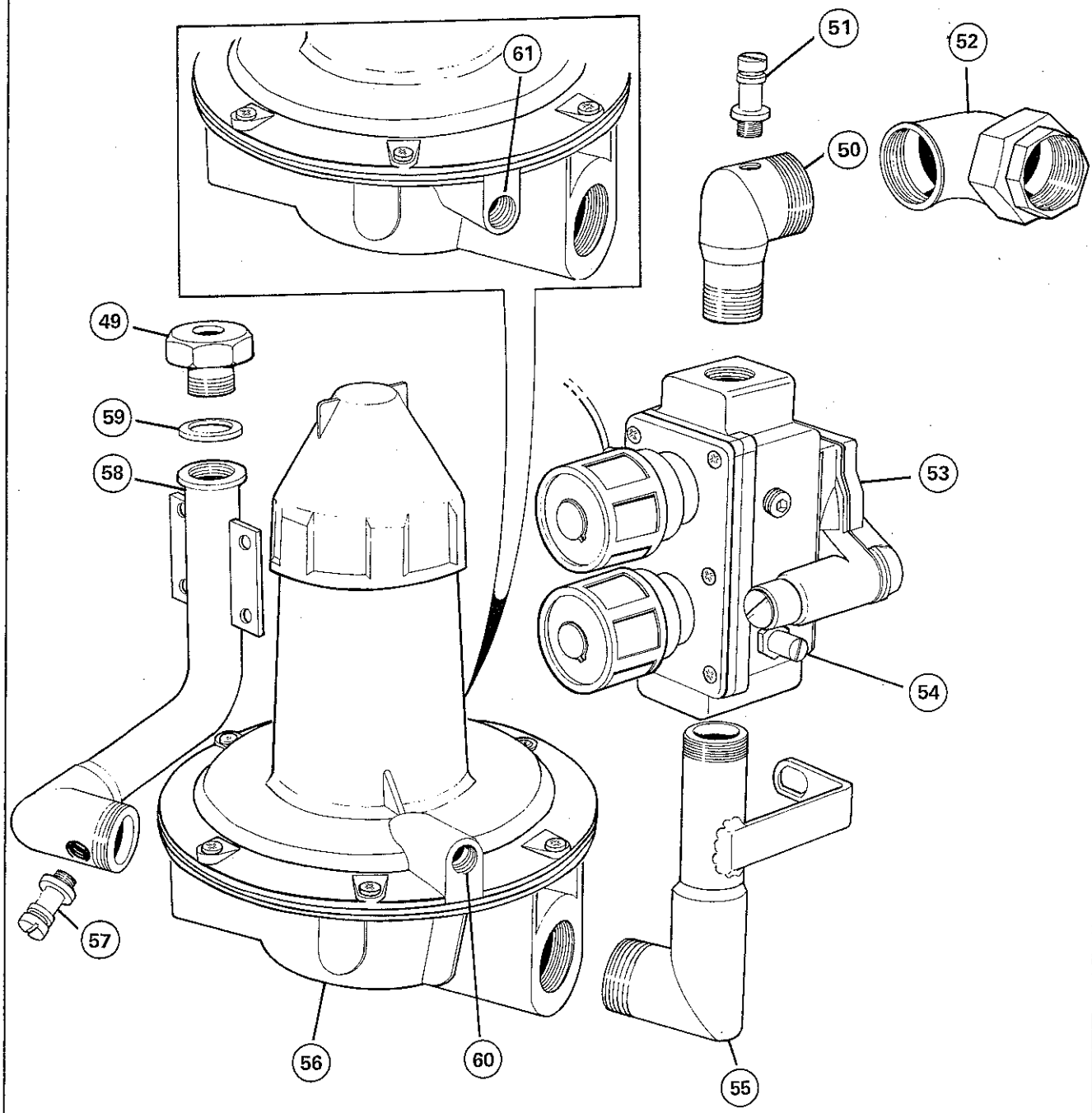


LEGEND:

32. L.E.D. grommets
33. Instruction fascia
34. Thermostat knob
35. Printed circuit board
36. PACTROL Control box base
37. PACTROL Control box top
38. Cooling impellor
39. Fan motor
40. Cooling duct
41. Fan impellor
42. Fan scroll
43. Thermostat sensing phial
44. Limit thermostat
45. Mains plug socket
46. Mains plug
47. Limit thermostat phial
48. On/Off switch

Fig. 3

ELECTRICAL CONTROLS
EXPLODED VIEW



LEGEND:

49. Injector
50. Gas inlet pipe
51. Pressure test nipple
52. Inlet union elbow
53. Combination gas control
54. Pressure test point
55. Gas manifold
56. Proportionator
57. Pressure test nipple
58. Injector pipe
59. Injector gasket
60. Right hand (pressure test point)
61. Left hand (suction test point)

Fig. 4

GAS LINE EXPLODED VIEW

Table 1

Boiler Model No.		50V	100V	150V	200V	250V	300V	150VA	250H	300H
No. of Modules		1	2	3	4	5	6	3	5	6
Heat Output	kW	50	100	150	200	250	300	150	250	300
	Btu/hx10^3	170.6	341.2	511.8	682.4	853.0	1023.6	511.8	853.0	1023.6
Heat Input	kW	58.8	115.6	173.4	231.2	289.0	346.8	173.4	289.0	346.8
	Btu/hrx10^3	200.6	394.4	591.6	788.9	986.1	1183.3	591.6	986.1	1183.3
Gas Rate	M^3/hr	5.5	10.9	16.3	21.7	27.1	32.5	16.3	27.1	32.5
	ft^3/hr	195	383	574	765	956	1148	574	956	1148
*Flue Gas Volume @ 135°C(275°F)	l/s	30	59	88	117	147	176	88	147	176
	ft^3/min	63	124	187	249	311	373	187	311	373
Required Water Flow Rate ± 10%	l/s	1.07	2.14	3.21	4.28	5.35	6.42	3.21	5.35	6.42
	gal/min	14.1	28.2	42.3	56.4	70.5	84.6	42.3	70.5	84.6
Hydraulic Resistance	kN/m^2	12.5								
	in.w.g.	50								
** Minimum Static Head	m	4.6								
	ft	15								
Maximum Static Head	m	45.7								
	ft	150								
Electrical Supply		240V, 50 Hz, SINGLE PHASE								
Power Consumption	W	75	150	225	300	375	450	225	375	450
+ Minimum Gas Supply Pressure	mbar	15.0								
	in.w.g.	6.0								
Boiler Height Overall	mm	780	1430	1910	1485	1965	1965	1485	1420	1420
	m	30 5/8	56¼	75 3/8	58½	77 3/8	77 3/8	58½	61	61
Boiler Width Overall	mm	475	930	942	1412	1425	1425	1412	1785	1785
	in	18¾	36 5/8	37 1/8	55 5/8	56 1/8	56 1/8	55 1/8	70¼	70¼
Boiler Depth Overall	mm	640								
	in	25¼								
Weights Casing/ Insulation	kg	29.1	47.7	61.5	76.6	106.6	98.9	84.0	107.0	99.0
	lb	64.1	105.2	135.5	168.8	235.0	218.0	185.0	235.0	218.0
Modules	kg	50	100	150	200	250	300	150	250	300
	lb	110	220	330	440	550	660	330	550	660
Gas/Water Headers	kg	–	25.4	39.5	51.2	70.1	72.7	49.0	70.0	73.0
	lb	–	56.0	87.1	112.9	154.6	160.4	107.0	155.0	160.0
Water Content Boiler	l	4.5	11.9	20.7	26.2	37.7	44.5	21.7	39.7	44.5
	gal.	1.0	2.6	4.6	5.9	8.3	9.9	4.9	8.8	9.9
++ Flow and Return Connection	mm	40	50	65		80		65	80	
	in	1½	2	2½		3		2½	3	
Gas Connection	Rc	¾	1	1¼		1½		1¼	1½	
	in.BSP	¾	1	1¼		1½		1¼	1½	
+++ Flue Pipe Size (Nominal Bore)	mm	125	175	200	250		300	200	250	300
	in	5	7	8	10		12	8	10	12
Flue Socket Size	mm	159	213	238	288		339	238	288	339
	in	6¼	8 3/8	9 3/8	11 3/8		13 3/8	9 3/8	11 3/8	13 3/8
Injector Size	mm	9.5								
	in	0.374								

Notes:

* Flue gas volumes are calculated from a calorific value of 38.4 MJ/m^3 (1 031 Btu/ft^3) at 15°C and 1.013 bar, and based on a CO_2 content of 8.5%.

** For further information on minimum head requirements see page 8.

\+ The minimum gas supply pressure is with all modules firing.

++ Flange size: Refer to BS.4504

+++ For 250 V and 250 H Models Only, a flue adaptor is supplied as standard.

AIR SUPPLY

Detailed recommendations for air supply are given in BS.5440:2 which MUST be consulted before proceeding.

The following notes are intended for general guidance only.

1. Contamination of the air supply from any external source must be avoided, with particular reference to dust, insulation debris, and flue products, concrete floors must be sealed. (If any work is to be carried out in the boilerhouse which is likely to generate dust (e.g. structural alterations or lagging of pipework), it is recommended that the boiler be shut down and the modules covered with a dust sheet, otherwise the boiler may require cleaning and servicing.
2. Boilers require ventilation openings at BOTH high and low levels, direct from outside, and allowance MUST be made for stabiliser dilution in all cases.
3. Mechanically forced ventilation systems must include provision for boiler shut down in the event of fan failure.
4. High speed air streams within the boilerhouse must be avoided.
5. Extraction mounted ventilation fans are NOT permitted.
6. The minimum effective areas of the permanent air vents direct from the outside by natural ventilation are given below in Table 2.

Table 2

Position of Air Vent		Boiler Output kW					
		50	100	150	200	250	300
HIGH LEVEL	cm^2	275	550	825	1100	1375	1650
	in^2	43	86	129	172	215	258
LOW LEVEL	cm^2	550	1100	1650	2200	2750	3300
	in^2	86	172	258	344	430	516

7. The minimum air requirements by mechanical ventilation are given in Table 3

Table 3

Air Flow Rate	Boiler Output kW					
	50	100	150	200	250	300
m^3/sec	0.08	0.16	0.24	0.32	0.40	0.48
ft^3/min	170	340	510	680	850	1020

WATER CIRCULATION SYSTEM

DESIGN REQUIREMENTS

CONCORD SUPER Gas Boilers are intended for use in conjunction with FULLY PUMPED, OPEN VENTED OR PRESSURISED systems subject to the requirements below. They are NOT SUITABLE for use on gravity circulation systems.

Water flow rate:

1.07 l/s (14.1 gal/min) ± 10% through each module. Thus a six module boiler requires 6.42 l/s (84.6 gal/min) volume flow rate. (See table 1 for other boilers)

Note: Failure to maintain this flow rate will result in operation of the module overheat cut off device.

The boilers are suitable for operation when connected to systems requiring lower flow rates than those quoted above, and to systems where the volume flow varies with load PROVIDED they are installed in accordance with Fig. 10. Any other method of installation should be discussed with STELRAD GROUP Ltd., before proceeding.

Hydraulic resistance:

When operating at the correct volume flow rate given above, the Hydraulic Resistance of all Concord Super Boilers is 12.5 kN/m^2 (50 in.w.g.)

Pump over-run:

A pump over-run time of 30 seconds minimum must be allowed for on plant shut-down.

Maximum static head:

45.7m (150ft) i.e. maximum operating pressure: 4.5 bar (65 lb/in^2).

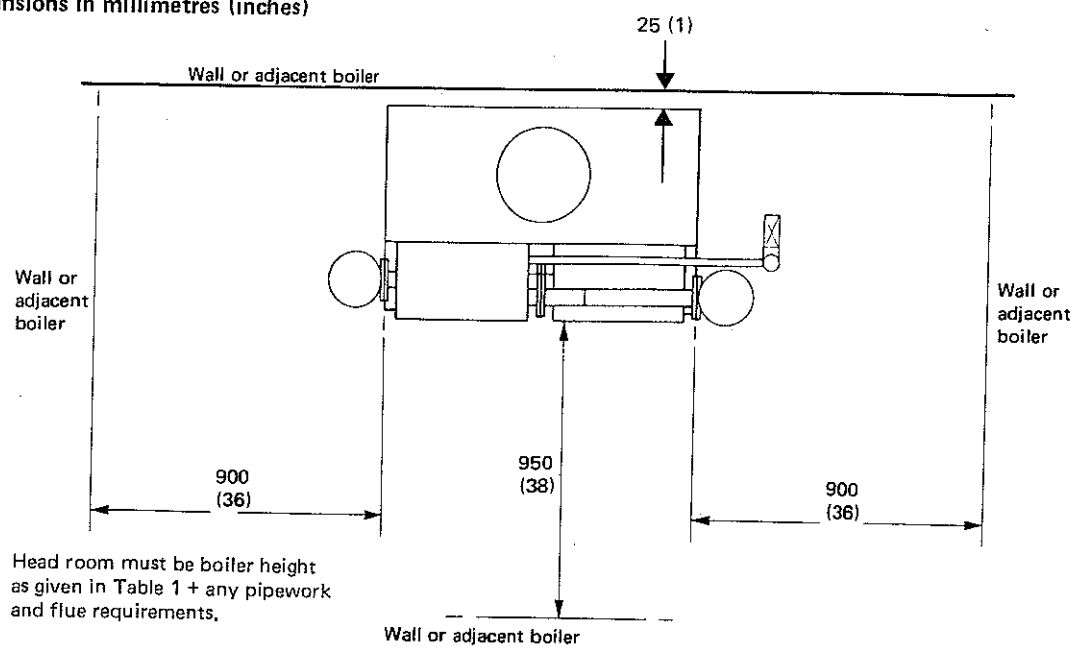
Minimum static head:

Minimum static head requirements for open vented systems must comply with boiler design characteristics, Pump Manufacturer's requirements and the requirements of the Health and Safety Executive Publication PM5.

In order to comply with the above a Minimum Static Head of 4.6m (15ft) i.e. 0.45 bar (6.5 lb/in^2) will be adequate under most operating conditions, measured either from the highest circulating point of the system, or from the boiler when the boilerhouse is roof mounted.

Note: In some cases, Pump Manufacturers will require a head as high as 12m (40ft), this must be allowed for and the minimum head increased accordingly. See Fig. 10 for further clarification.

All dimensions in millimetres (inches)



Note: Head room must be boiler height as given in Table 1 + any pipework and flue requirements.

Fig. 5 RECOMMENDED BOILERHOUSE CLEARANCES – for comfortable servicing access

All dimensions in millimetres

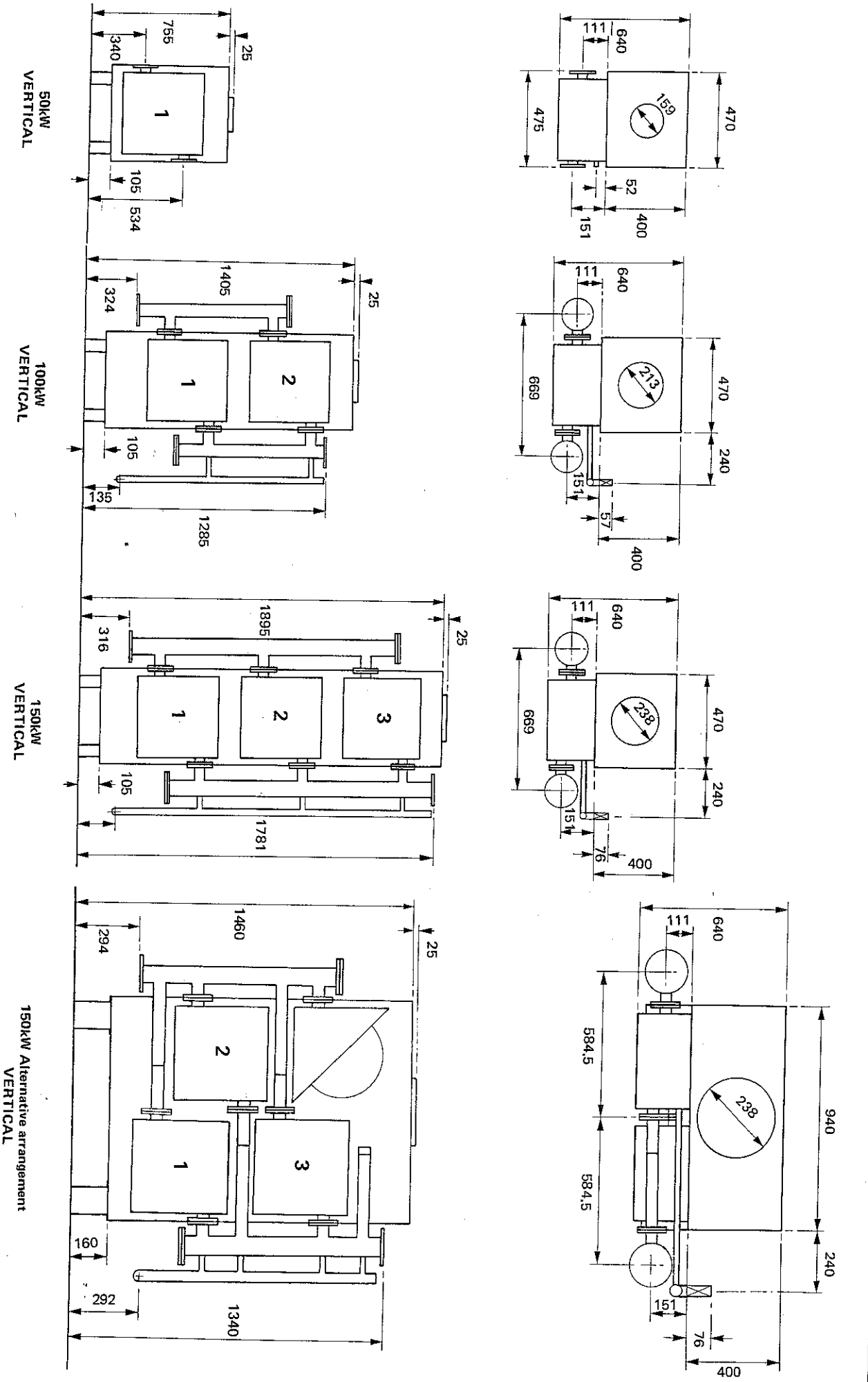
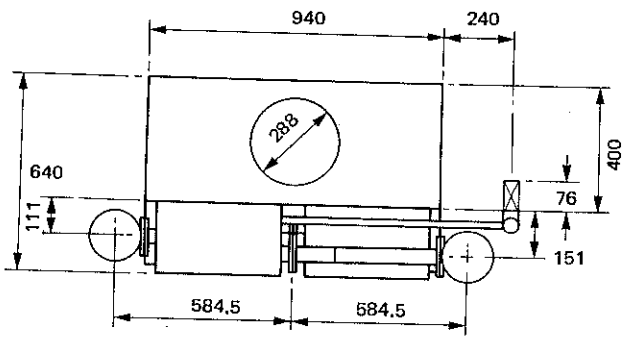


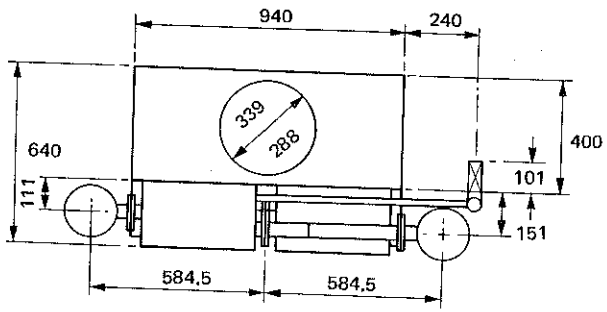
Fig. 6

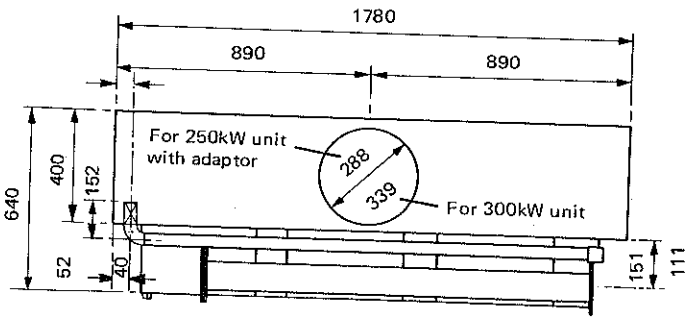
BOILER DIMENSIONS
50 kW MODELS

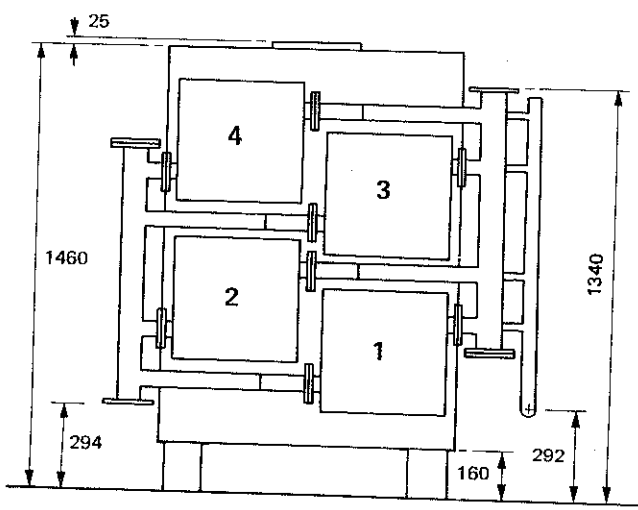
Fig. 7

All dimensions in millimetres

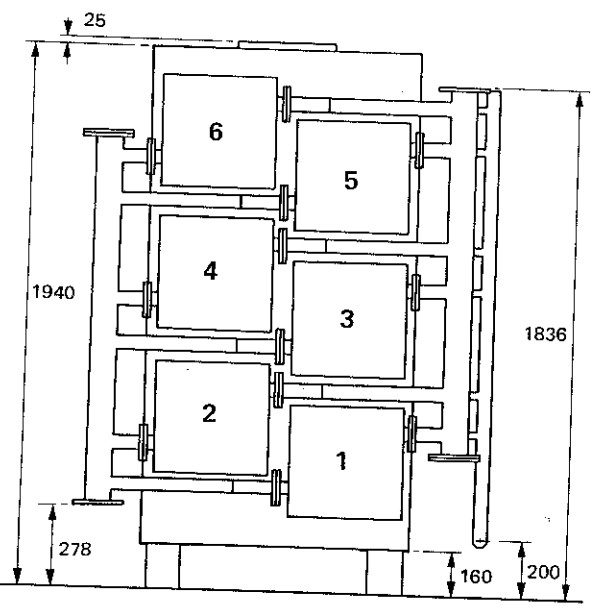




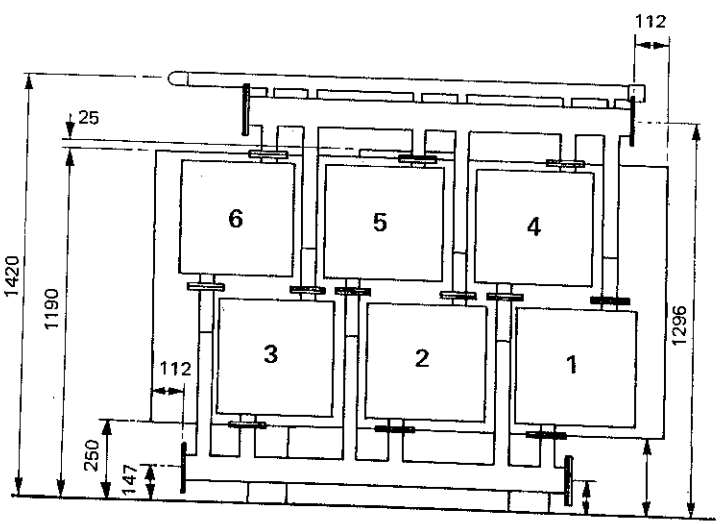




200kW
VERTICAL



250 & 300kW
VERTICAL



250/300kW
HORIZONTAL

BOILER DIMENSIONS
200kW–300kW MODELS

Note:
The discharge from both types of system MUST not allow recirculation of combustion products into the boilerhouse or adjacent buildings.

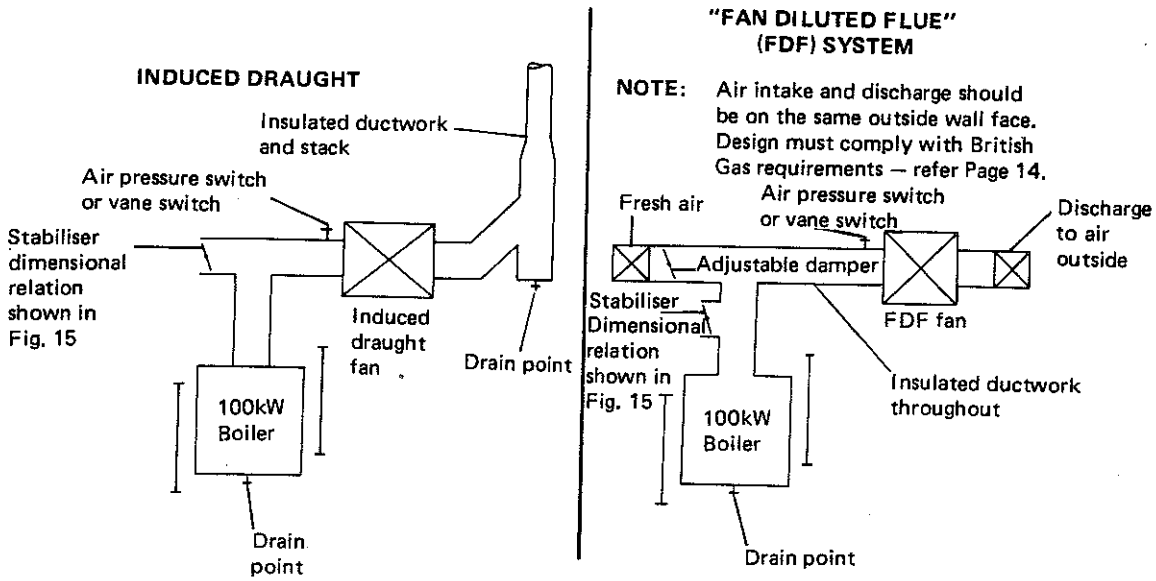
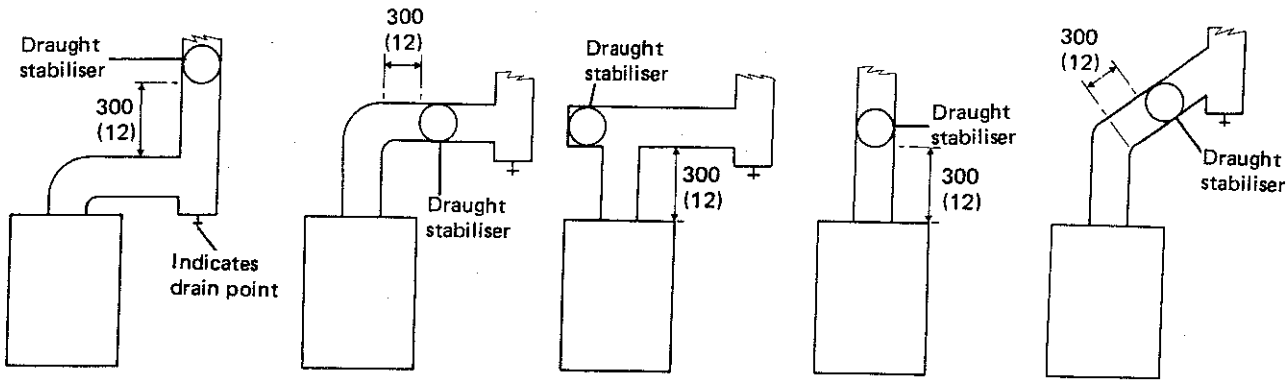


Fig. 8 APPLICATION OF DRAUGHT STABILISER — SINGLE BOILER INSTALLATION

All dimensions in millimetres (inches)



Note:
When a 90° bend or tee is positioned immediately above the boiler flue outlet the chimney height MUST take the added resistance into consideration.

Fig. 9 FLUING — GENERAL GUIDANCE

Safety Valve:

A safety valve must be fitted. The valve should be set at 0.7 bar (10 lb/in^2) above the available static head of water over the boiler.

The maximum safety valve setting is 0.7 bar (10 lb/in^2) above the maximum design operating head, i.e. 4.5 bar (65 lb/in^2).

Water flow switch

A water flow switch must be fitted to protect the boiler from pump failure.

GENERAL GUIDANCE ON APPLICATIONS

See Fig. 10

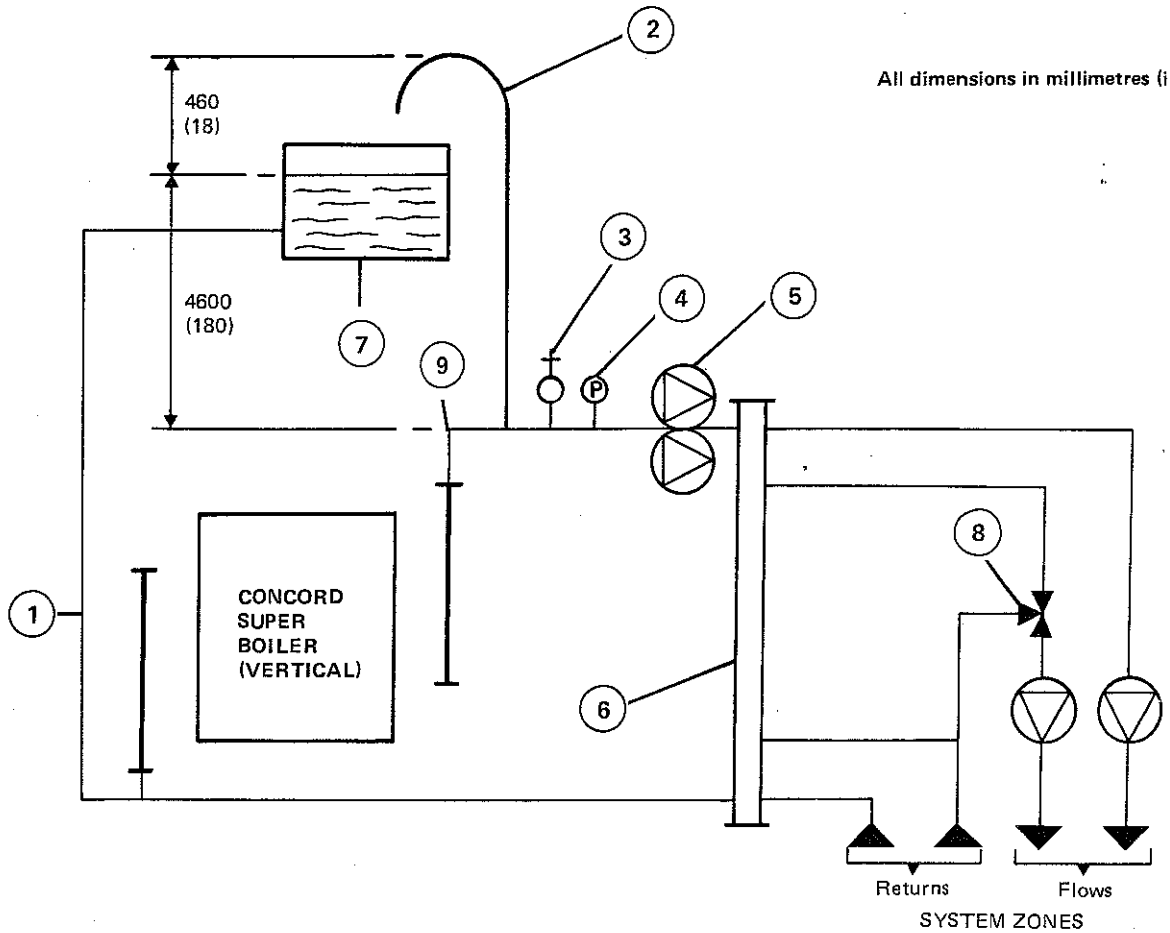
Fig. 10 is intended to provide basic information only on the application of the Concord Super Boiler. British Gas approval has not been sought in the matter.

It is essential that the water flow rates given above be maintained within the limits stated. Therefore, any compensating devices must not be connected to Concord Super boilers directly, but may be used in conjunction with a mixing header. The mixing header must be sized at least one size larger than the boiler flow and return manifold size, this will avoid hydraulic interference between the boiler primary pump and system zone pumps.

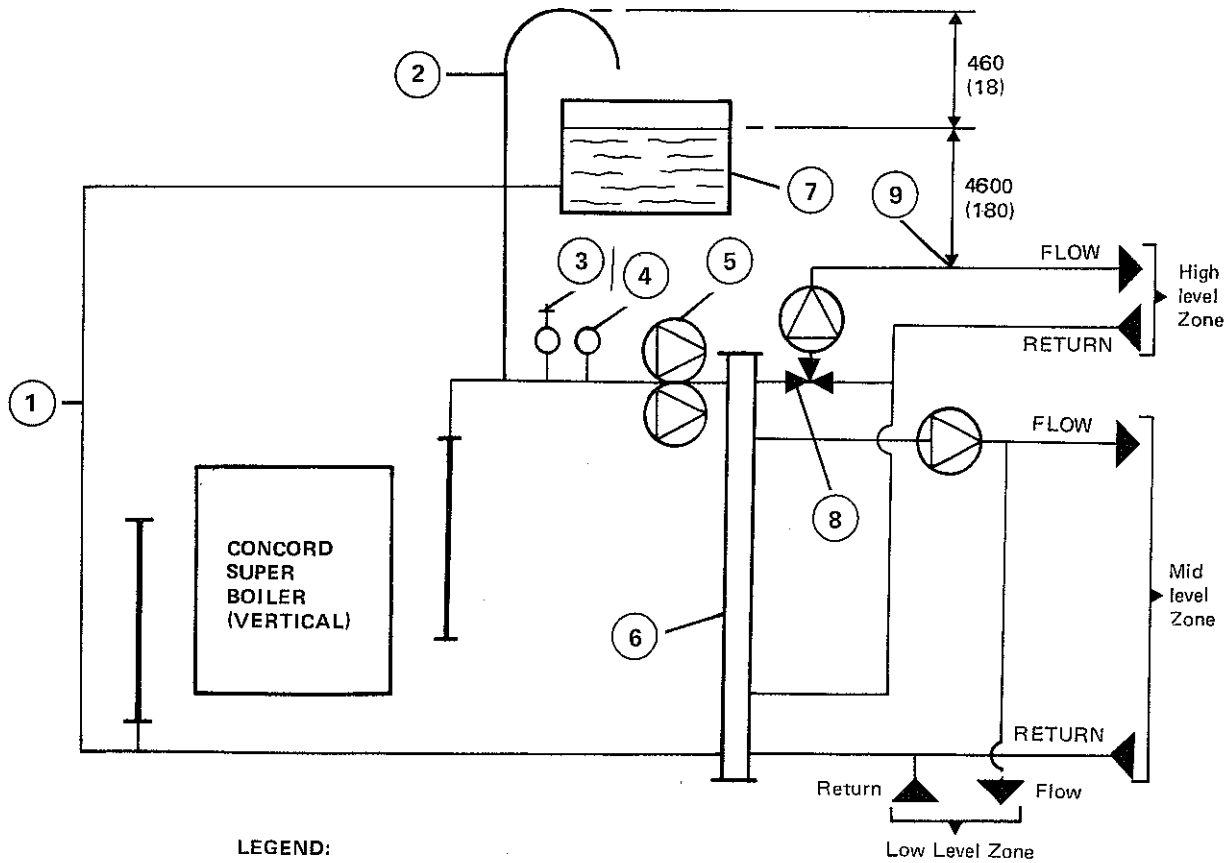
The use of a mixing header means that compensating controls can be used to operate mixing valves on a variable temperature circuit, without affecting the water flow rate through the boiler.

1. ROOF TOP OR SINGLE STOREY APPLICATIONS

All dimensions in millimetres (inches)



2. GROUND FLOOR OR BASEMENT APPLICATIONS



LEGEND:

1. Cold feed) Sizes MUST comply
2. Open vent) with CP:332:3
3. Safety valve
4. Water flow switch
5. Dual primary pumps
6. Mixing header
7. Feed and expansion tank
8. Mixing valve
9. Highest point in the system

Fig. 10 GUIDE TO MINIMUM REQUIREMENTS FOR OPEN VENT – FEED/EXPANSION TANK HEIGHT AND BOILER PRIMARY CIRCUIT.

Fig. 10 shows how constant and variable temperature circuits can be used on low and high head applications. The following points should be noted:

1. The recommended positions of the cold feed and open vent are shown, sizes should comply with CP.332:3. If isolating valves are to be fitted in the flow and return pipes of the boiler they must not isolate the boiler from the open vent, safety valve or cold feed.
2. **The minimum tank height** shown is measured from the highest point of the system, and must be increased, if necessary, to comply with Pump Manufacturers' requirements.
3. **The open vent height** above tank water level cannot be guaranteed adequate in all circumstances and does not take into account any instantaneous changes in head brought about by ancilliary equipment operating.
4. **Water flow switch** is shown in its recommended position. It MUST NOT be located on the mixing header where operation of zone pumps can cause reduction in flow.
5. **Production of condensate:** When operating normally and the design return temperature has reached 71°C, the boilers produce virtually no condensate. At lower temperatures the amount of condensate increases. It is normal for condensate to be produced as the boiler heats up from cold and, provided the time taken for the return to reach 71°C is not excessive, no harm will result.

   If however, large quantities of condensate are produced for long periods, this can adversely affect burner performance and cause the control box to lock-out.

   If the water content of a system is very large, it is advisable to switch on individual zones from cold, in sequence with a time delay sufficient to allow the boiler return temperature to reach 55°C as quickly as possible.
6. **Water treatment for hot water and heating boilers**

   There is a basic need to treat the water contained in all heating and indirect water systems, particularly open vented systems. This may be regarded as an essential requirement for systems incorporating Ideal Concord Super boilers.

   It is assumed, incorrectly, that because boilers are operating in conjunction with what is apparently a closed circuit, an open vented system will not under normal circumstances allow damage or loss of efficiency due to hardness salts and corrosion once the initial charge of water has been heated up a few times.

   This is not the case. Open vented systems are not completely sealed off from the atmosphere if proper venting and expansion of system water is to be achieved. The same tank is used to fill the system with water and it is through the cold feed pipe that system water expands into the tank as the system heats up. Conversely as the system cools, water is drawn back from the tank into the system together with a quantity of dissolved oxygen. Also there will be evaporation losses from the surface of the tank which depending on ambient temperature, may be high enough to evaporate a large portion of the system water capacity over a full heating season.

   For these reasons, even if the system is completely free from leaks, there will always be corrosion or salt deposition within a heating or hot water system, irrespective of water characteristic unless the initial fill water from the mains is treated. 1mm of lime reduces the heat transfer from metal to water by 10%.

   Lime deposition can also cause noises from the boiler body or even premature failure. Corrosion and the formation of black iron oxide sludge will ultimately result in premature radiator and pump failure.

   Existing systems and where necessary new systems should be thoroughly cleaned prior to the use of a stable inhibitor, which does not require continual topping up to combat the effects of hardness salts and corrosion on the heat exchangers of the boiler and associated systems.

   Stelrad Group advise contact directly with specialists on water treatment such as Fernox Manufacturing Co., Ltd., Britannica Works, Clavering, Essex. CB11 4QZ.

ELECTRICAL SUPPLY

220/240 Volt 50 Hz single phase A.C.

Consumption: 75 Watts per module (excluding remote alarms etc.).

Note: External wiring and any installer supplied remote warning lights MUST be in accordance with the I.E.E. Regulations and any Local Regulations which apply.

The method of connection to the mains supply should facilitate complete electrical isolation of the boiler.

Connection should be made via a fused double pole switch, or fused spur box, serving the boiler only and incorporating contacts with a separation of at least 3mm in all poles. The point of connection should be readily accessible and adjacent to the boiler.

50 kW Boilers: (Fig. 11)

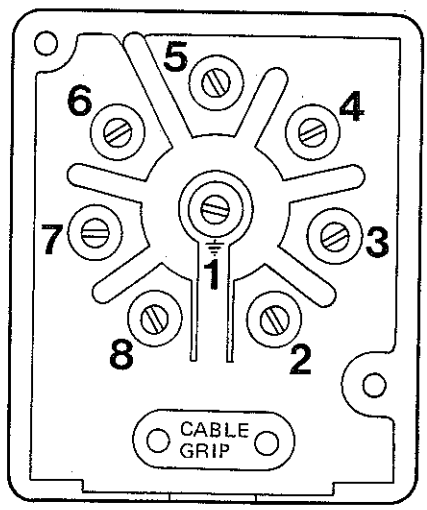
50 kW boilers are supplied with a multi-pin plug for connection to the mains as follows:—

EARTH — Terminal 1
LIVE — Terminal 2
NEUTRAL — Terminal 4

In addition a link should be made between Terminal 6 and Terminal 1 (Earth).

The water flow switch and any other overriding safety devices should be wired in series with the isolation mains supply to the boiler.

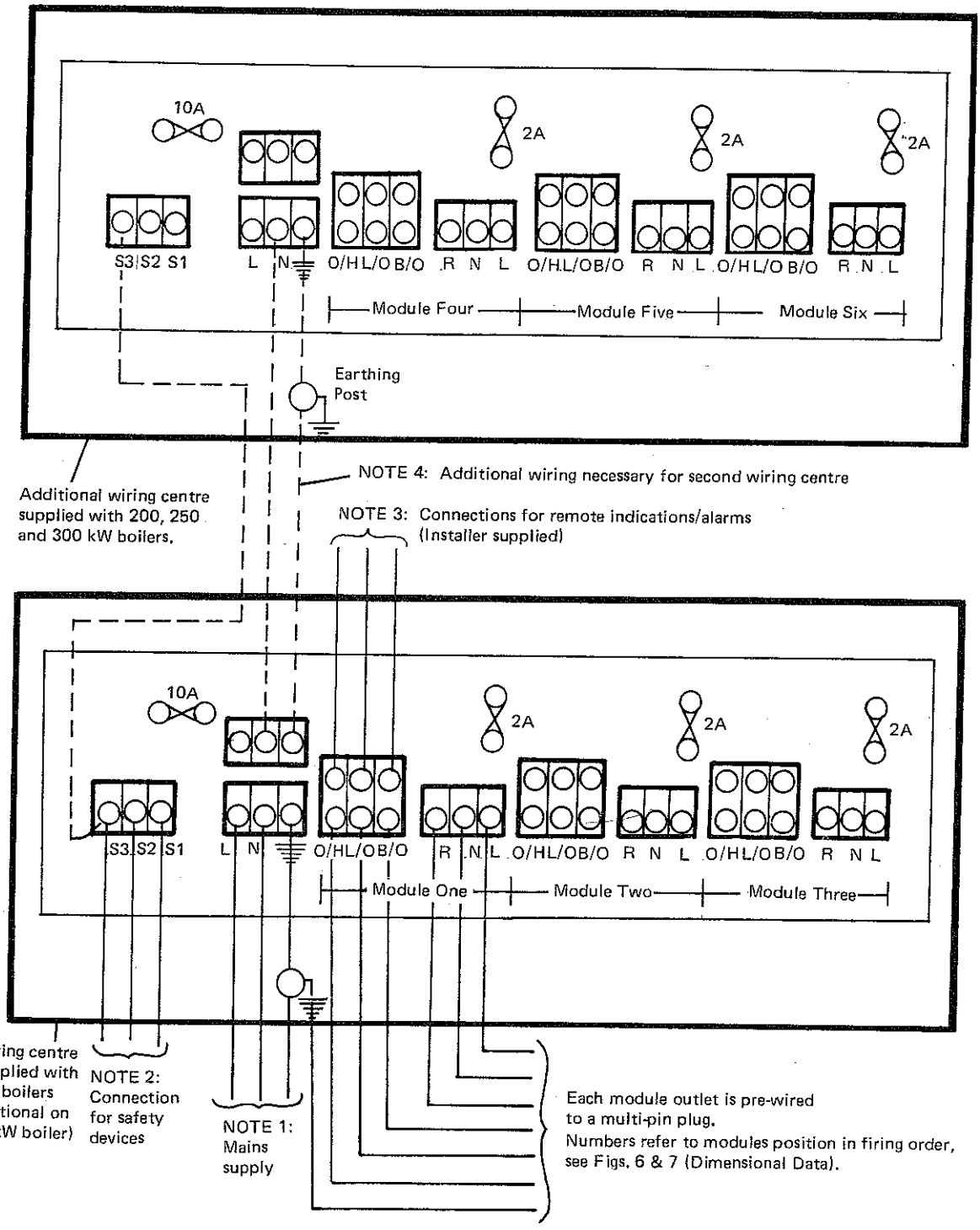
If remote indication of 'Burner On', 'Lockout' and 'Overheat Trip' is required a wiring centre can be supplied, pre-wired with a multi-pin plug. For connection to the electricity supply and details of wiring safety devices see following section.



LEGEND:
TERMINAL 1 — EARTH (GREEN/YELLOW)
TERMINAL 2 — LIVE (RED)
TERMINAL 4 — NEUTRAL (BLUE)

Note: Pin 6 must be shorted to Earth

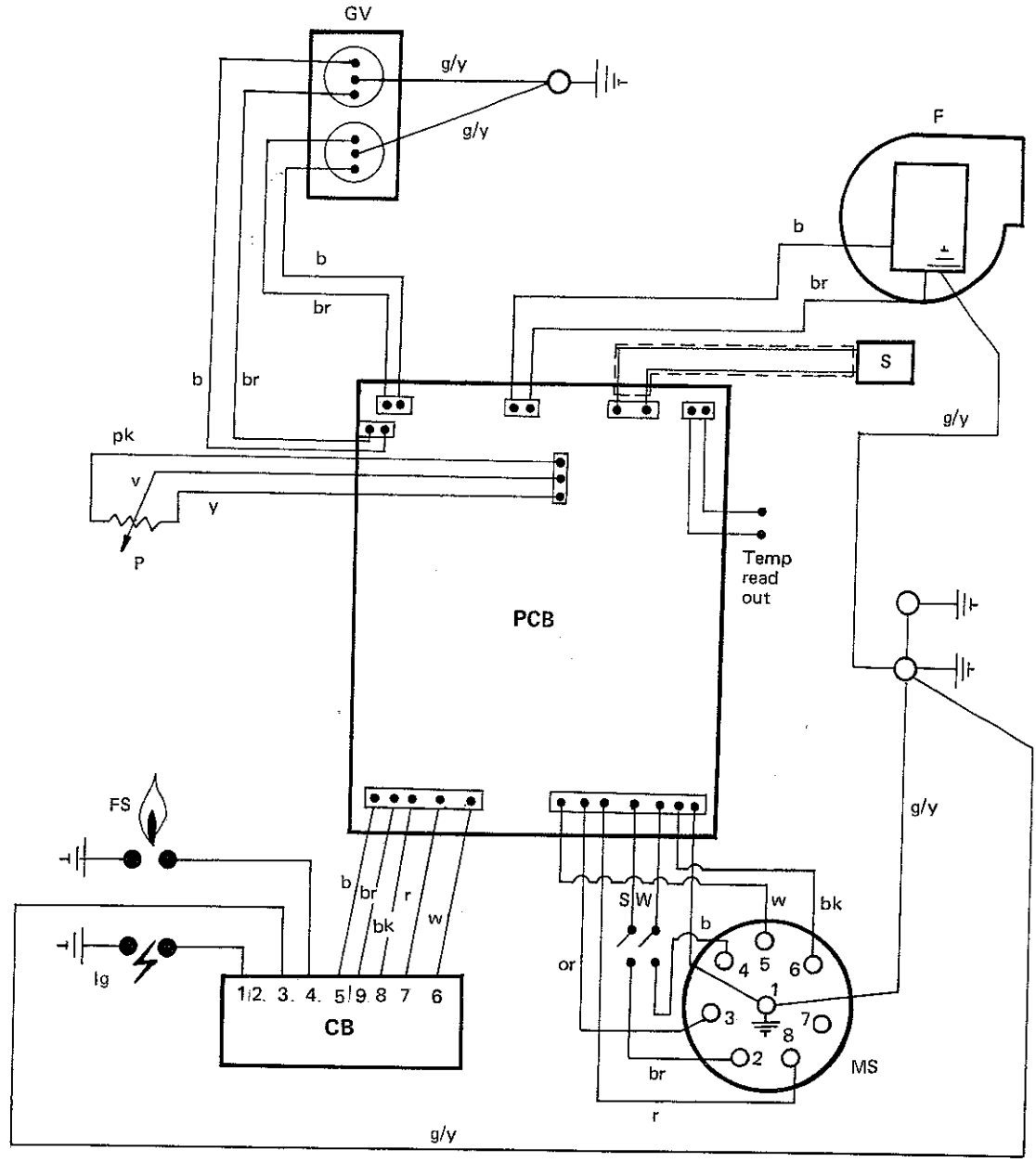
Fig. 11 MULTI-PIN PLUG WIRING FOR SINGLE MODULE BOILER ONLY

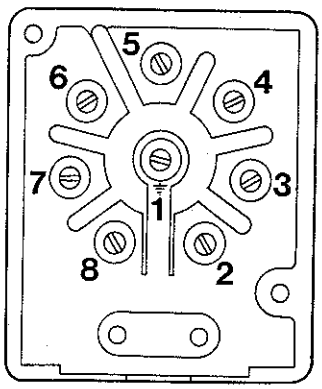


NOTES:

1. Isolation mains supply to boiler. All incoming earth connections must first be made to the earthing post inside the wiring centre casing.
2. Terminals S1, S2 and S3 provide facility for direct wiring of safety devices. The water flow switch should be connected between S1 and S2, and any other safety devices wired in series between S2 and S3.
   (Typical safety devices are: Air pressure switches, auxiliary switches on motorised valves, and safety relays activated by fire sensors).
   Terminal S2 is voltage free.
   If no other safety devices are to be used, the water flow switch should be connected across S1 and S3. If all over-riding safety devices are wired in series with the isolation mains supply to the boiler, link terminals S1–S3.
3. These connections provide a 240 Volt AC supply outlet for remote indicators and alarms with a maximum load of 1 Ampere.
   O/H: becomes live when the module overheat cut-off device has operated.
   L/O: becomes live when the module has gone to lock-out.
   B/O: becomes live when the module is running.
4. This indicates the additional wiring necessary on 200, 250 and 300 kW boilers which have two wiring centres.

Fig. 12 **WIRING FOR MULTI-MODULE BOILERS AND SINGLE MODULE BOILERS FITTED WITH A WIRING CENTRE**





MODULE PLUG LEGEND:

1. — Earth
2. — Live
3. — Lockout
4. — Neutral
5. — Burner On
6. — Delay resistor
7. — ————
8. — Overheat

LEGEND:

PCB	—	Printed circuit board
CB	—	Control box
GV	—	Gas valve
F	—	Fan
SW	—	Switch
MS	—	Module socket
Ig	—	Ignition electrode
FS	—	Flame sensor
MP	—	Module plug
S	—	Electronic thermostat sensor
P	—	Electronic thermostat potentiometer

b	—	blue
r	—	red
br	—	brown
g/y	—	green/yellow
or	—	orange
y	—	yellow
v	—	violet
pk	—	pink
w	—	white
bk	—	black

Fig. 13

50 kW MODULE WIRING

ASSEMBLY

PACKAGING

The boiler casing is supplied complete with insulation and feet, strapped to a packaging base and shrinkwrapped. Boilers up to and including 150 kW will have their water and gas headers packed and shrinkwrapped with the casing. Boilers of 200 kW and above will have their water and gas headers supplied on a pallet, shrink-wrapped. The water header bellows units, flanges and gaskets etc. will be packed in cartons in the bottom of the casing. The modules are supplied individually packed on a packaging base.

FOUNDATION

An insulated foundation is NOT necessary, as the bottom of the boiler casing will not exceed a temperature of 80°C (176°F).

The foundation MUST be flat and level, fireproof, dustfree, and capable of supporting the weight of the WET boiler.

CASING AND DRAIN CONNECTION

A 22mm copper street elbow is supplied in the water header hardware pack, for connection to the casing drain point. This elbow can be fitted in any direction and the compression nut tightened. A suitable drain should be connected to the elbow. Refer Fig. 1.

Note: Condensation will only occur on warming up, when the return water temperature is below 55°C (131°F) the Water Dew Point.

The boiler casing can now be placed in position.

N.B. EXTREME CARE **MUST** BE TAKEN WHEN HANDLING THE CASING, WHICH IS FITTED WITH AN ALUMINIUM-FACED, INSULATING CLADDING. THIS CLADDING CAN BE KEPT CLEAN BY WIPING WITH A DAMP CLOTH.

ASSEMBLING THE MODULE AND WATER HEADERS TO THE BOILER CASING (Refer Fig. 1)

WARNING:

CRACKING MAY OCCUR IF THE FLOW AND RETURN MODULE CASTINGS ARE OVER-STRESSED.

The following procedure is to be adopted:

1. With the module cover removed, fit the module(s)to the casing, but do NOT tighten the four fixing nuts.
2. **For boilers over 150kW ONLY:**

   Screw the flanged bellows unit into the internally threaded branches of the water headers, using a wrench on the hexagon, at the end of the bellows, to tighten in position. When tight, the flange on the bellows should finish approximately 470mm (18½in) away from the fixed flanges, with the flange holes in a vertical, and horizontal attitude – refer Fig. 1.

   UNDER NO CIRCUMSTANCES MUST THE FLANGE OR BELLOWS, BE USED FOR TIGHTENING.
3. Secure the flow and return water headers to the modules, rigid flanges first, using the gaskets and screws provided, taking adequate precaution to support the headers during assembly.

For 150 kW ALTERNATIVE and 350 kW V Boilers Only.

Ensure that the flange support bracket is fitted to the water header and module blanking plate.

Note: Care should be taken to avoid damage to the bellows units, whilst tightening the screws securing the bellow flanges.

GAS HEADERS 100kW–150kW boilers only

Remove the union half of the union elbow on the module and screw it into the mating branch projecting from the gas header assembly. Repeat for each module ensuring that the dimensions, between the header and the end faces of the elbow union halves are the same. Place the gas header in position so that the unions can be re-connected to the modules taking care to adequately support the gas header during assembly.

150kW (alternative arrangement) and boilers over 150kW

A short branch is fitted to the gas header for connection to the left hand modules, (right and left as viewed facing the modules.

Remove the union half of the union elbow from the top left hand module and screw a cadmium plated full adaptor into it (adaptors are supplied in hardware pack). Re-connect the union to the module. Repeat for each left-hand module. Remove the union half of the union elbow from the top right-hand module and screw it onto the mating branch of the gas header. Repeat for each right-hand module. Check that the dimensions between the header and the end faces of the elbow union halves are the same.

Place the gas header in position so that the unions can be re-connected to the modules taking care to adequately support the gas header during assembly.

Assemble the flexible hoses between the left hand modules and the gas header ensuring that the swivel nuts at each end of the hoses are tight on the full adaptors.

250kW and 300kW Horizontal Boilers only

A short branch is fitted to the gas header for connection to the top modules, and a flexible hose (supplied loose) for connection to the bottom modules. Remove the union half of the union elbow from the bottom left-hand module and screw a cadmium plated full adaptor into it (adaptors are supplied in hardware pack).

Reconnect the union to the module. Repeat for each bottom module. Remove the union half of the union elbow from the top left hand module and screw it into the mating branch of the gas header. Repeat for each top module. Check that the dimensions between the header and the end faces of the elbow union halves are the same. Place the gas header in position so that the unions can be reconnected to the modules taking care to adequately support the gas header during assembly.

Assemble the flexible hoses between the bottom modules and gas header ensuring that the swivel nuts at each end of the hoses are tight on the full adaptors.

Note: Ensure that all threaded connections are sealed using a suitable jointing compound.

CONNECTING BOILERS TO THE FLUE SYSTEM

Details of the flue design are in Figs. 8 and 9. Boiler socket and flue pipe sizes are indicated by Table 1.

WATER CONNECTIONS AND PRESSURES

Refer Installation Requirements

All service pipework, linking the flow and return headers, should be adequately supported, taking care that no strain is imposed upon them.

Allowance must be made for any additional service pipe-work expansion. Provision for draining the boiler should be made at the lowest point in the system.

A safety valve MUST be fitted.

The valve should be set at 0.7 bar (10 lb/in^2) ABOVE the available static head of water over the boiler, or the design operating pressure of the system, whichever applies.

If isolating valves are fitted in the flow and return pipes to the boiler, they must NOT isolate the boiler from the open vent safety valve or cold feed.

The maximum safety valve setting is 0.7 bar (10lb/in^2) above the maximum design operating head, or pressure of the boiler – 4.5 bar (65 lb/in^2).

COMMISSIONING AND TESTING

The IDEAL CONCORD SUPER Boiler must be commissioned and tested by a qualified Gas/Heating Engineer, a knowledge of electrical wiring is necessary.

Upon request, Stelrad Group Ltd., will provide a quote for commissioning or re-commissioning after servicing.

Turn the electrical supply to the boiler off and withdraw each modules electrical plug from the left hand side of the module cover.

Filling the boiler with water

Fill the system by admitting water at the lowest point.

This will ensure air is forced from the tubes of the heat exchanges.

Water circulation

Switch on the pump motor and check that water is circulating and the pump is vented.

Check operation of the water flow switch. It should switch off the electrical supply to the modules when the water flow falls by NO MORE THAN one third of the design flow-rate (given in Table 1).

Header gas tightness and purging the gas line

Turn the top module gas service tap ON. Connect a manometer to the tapping point at the top of the gas header (see Fig. 1).

Slacken the nut on the ¾in. union connecting the top module to the gas header, and purge the gas header by turning the mains inlet gas tap on until gas is smelt then retighten the union connection.

Turn off the top module gas service tap and ensure all other module gas service taps are in the off position. Take note of the manometer reading and turn off the mains inlet gas tap.

A subsequent fall in pressure indicates a leak between the mains inlet gas tap and individual module gas service taps which MUST be made good. The mains inlet gas tap can then be turned on again.

Control line gas tightness

Carry out the following test on each module in turn:

1. Turn on the module gas service tap.
2. Turn off the mains inlet gas tap, and observe the manometer pressure as above. This pressure should NOT fall by more than 2.5 mbar (1in.w.g.) in one minute. If this rate of fall is exceeded, leakage past the combination gas control seat or leakage from joints in this section of gas line MUST be investigated.
3. Turn off the module gas service tap and continue with the next module.

Pre-firing check (Refer Figs. 2, 3 & 4)

Ensure the electrical supply to the boiler is OFF.

Remove the electrical plugs from the modules and remove the covers.

Note: EXTREME CARE SHOULD BE TAKEN WHEN THE MODULE IS RUN WITHOUT A COVER.

Each module should be checked as follows:

1. Switch the module on/off switch to OFF (Fig. 3).
2. Turn the module gas service tap to OFF.
3. Plug in the electric plug, using the correctly numbered plug for the particular module.
4. Switch ON the electricity supply to the boiler.
5. Turn ON the module on/off switch.

   The following sequence of events will occur:

   (a) The mains ON light will illuminate.

   (b) After a delay of 0 to 35 seconds (depending on the modules position in the switching order) the fan will start. The fan will run for 15 seconds pre-purge period before:

   (c) The ignition spark commences, continues for 4 seconds then ceases. (The spark can be seen through the sight glass in the module front).

   (d) At the end of the four second ignition, the Lock-out light will be illuminated. The mains On light will remain illuminated and the fan will continue to run.

   (e) Turn the module On/Off switch to OFF. The lights will be extinguished and the fan will stop.

   (f) Turn OFF the electrical supply to the boiler.

FAN PERFORMANCE CHECKS

Connect an inclined gauge to measure the pressure difference across the multi-hole plate (Ref. Fig. 2). The pressure tapping is connected to the proportionator RH test point and the suction tapping is connected to the proportionator LH test point.

If, when the fan is operating as in the previous section, this differential air pressure is less than 1.1 mbar (0.44 in.w.g.) the commissioning procedure cannot be continued.

Check tightness of connections and fan performance.

IMPORTANT:

The gas setting pressures MUST NOT be reset to the values given in the following section unless the differential air pressure is greater than 1.1 mbar (0.44 in.w.g.).

FIRING CHECKS

Note: (i) The minimum gas pressure in the gas header should be 15 mbar (6in.w.g.) with all modules firing. The maximum pressure should not exceed 25 mbar (10in.w.g.)

(ii) The draught stabiliser should be set to control between neutral and 0.2 mbar (0.08in.w.g.) draught in the casing, with one or all modules firing. A test point is provided in the boiler casing adjacent to the flue outlet socket (see Fig. 1).

Carry out the following firing checks on each module commencing with the top left module and finishing with the bottom right.

1. Connect an inclined gauge to the injector pressure test point (Fig. 2).
2. Connect a manometer to the modules combination gas control pressure test point.
3. Turn on the module gas service tap, and mains inlet gas tap.
4. Switch the modules On/Off switch to ON. The following sequence of events should now occur:

   (a) The mains ON light will be illuminated.

   (b) After a delay of 0 to 35 seconds the fan will start and purge the combustion chamber for 15 seconds.

   (c) The ignition period will commence, the gas valves will open and a spark will be generated between the ignition electrode and the burner (visible through the sight glass).

   (d) The burner will light, and the burner ON light will be illuminated.

   If the burner fails to light, the lock-out light will be illuminated at the end of the 4 second ignition period.

   Another attempt at ignition can be made by turning off the module, waiting for five seconds and then turning it back on. The sequence in (a) to (d) above will then be repeated. Should any module still not fire, and the gas line has been properly purged, refer to the Fault Finding instructions.
5. When the burner is on and running, the injector pressure should be 2.0 mbar (0.8in.w.g.), and the combination gas control outlet pressure should be 7.0 mbar (2.8in.w.g.).
6. If adjustment is necessary, remove the cap screw of the combination gas control to expose the adjustment screw. Using a screw-driver, SLOWLY turn the adjustment screw until the required combination gas control outlet pressure of 7.0 mbar (2.8in.w.g.). This should result in an injector pressure of 2.0 mbar (0.8in.w.g.).

7. If different, the proportionator should be adjusted as follows: remove screw cap on top of the proportionator; undo the lock-nut on the brass screw at the base of the proportionator, and undo the screw several turns. The brass nuts at the top should now be adjusted to give an injector pressure of 2.1 mbar (0.84in.w.g.). Recheck the combination gas control outlet pressure and adjust if necessary. Recheck pressures, tighten the lock-nuts.

   Screw in the brass screw at the base of the proportionator until the injector pressure is clearly and positively reduced.
   Having found the adjustment point, withdraw the screw beyond range and then screw it in again until the injector pressure is seen to reduce from 2.1 mbar (0.84 in.w.g.) to 2.0 mbar (0.8 in.w.g.).
   Tighten the locknut on the screw, observing the manometer to ensure that the injector pressure does not alter.

   Switch module off and then on again recheck pressure.

   If setting is consistently repeated, refit combination gas control and proportionator caps.

SAFETY CHECKS TO BE CARRIED OUT ON ALL MODULES

1. Ensuring Lockout

With the module running, turn off the module gas service tap.

The burner will stop firing, the burner On light will be extinguished and the lock-out light will be illuminated.
A SINGLE attempt to relight will be made as follows:

After 15 seconds, during which the mains On and lock-out lights will be illuminated, the ignition sequence will start. The lock-out light will go out, the spark will be generated for 4 seconds, then the lock-out light will again be illuminated.

If this sequence of events does not occur, replace the module control box.

2. Combustion

Fire each module, on its own, blanking off the fan air inlets of ALL the NON-FIRING modules, using the sheets of self-adhesive paper supplied in the module Hardware Pack.
Measure CO and CO_2 for each module, a sampling point is provided in the top of the boiler casing, adjacent to the flue outlet socket. (Fig. 1).
For DRAEGAR Tests note the following:

(a) The sampling line, however short, should ALWAYS be purged.

(b) CO_2 tubes are marked in per cent divisions and ONE pump only is required (CO_2 tubes are also marked in divisions indicating parts per million (p.p.m.).

(c) The ratio % CO/%CO_2 should not exceed 0.001.

For convenient reference, the table below (Table 4) shows maximum p.p.m. CO levels in p.p.m. (read direct from tube) related to various CO_2 levels.

Low CO_2 levels are included to cover dilutions due to casing and flue volume on the larger boilers.

Remove the fan inlet blanking material from all modules and fire all modules together.
Measure the gas pressure at the gas header test point and ensure that it is not less than 15 mbar (6in.w.g.).

Check also that the draught stabiliser is controlling draught between neutral and 0.2 mbar (0.08in.w.g.).

With all modules firing measure CO and CO_2 levels again and refer to Table 4 for maximum allowable CO content.

Table 4 MAXIMUM ALLOWABLE CO CONTENT

CO_2 (as read)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5
Maximum allowable CO p.p.m. (as read)	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105

ADJUSTMENT OF SEQUENCE CONTROL

Thermometers mounted in the flow and return pipes to the boiler will give a check on the thermostat settings, and will indicate whether the water flow rate is correct to give a temperature rise across the boiler of 10°C to 12°C.

Each modules' individual electronic thermostat should be set with reference to Table 5 and Fig. 14, which shows the boiler thermostat scale.

This method of adjustment will give approximate control of the flow temperature which will be adequate for most applications. For more accurate control Stelrad Group Ltd., can quote for a commissioning which can, if required include the accurate calibration of the electronic thermostats.

OVERHEAT CUT-OFF DEVICE

If the water flow rate through the boiler is adequate, the cut-off devices should not operate when the load on the boiler is GRADUALLY reduced from maximum to minimum.

The overheat cut-off device is reset by pushing in the GREEN 'overheat reset' button.

ONCE COMMISSIONING HAS BEEN COMPLETED, ALL MODULE COVERS SHOULD BE REPLACED.

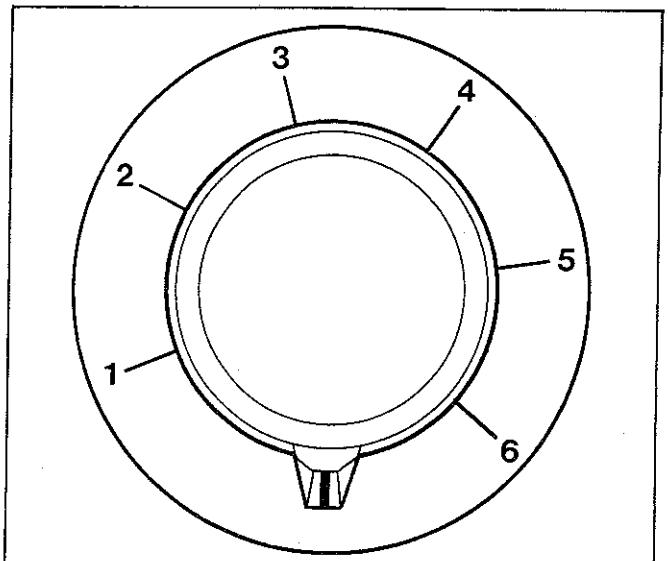


Fig. 14 BOILER THERMOSTAT

Table 5

Mixed RETURN temperature settings for module electronic boiler thermostat for individual boilers

Boiler Sizes kW Individual Boilers	THERMOSTAT SETTINGS					
50						1
100					1	4
150				1	3	5
200			1	2.5	4	5.5
250		1	2.2	3.4	4.6	5.8
300	1	2	3	4	5	6
Module No. refer Figs.6 & 7	6	5	4	3	2	1

IMPORTANT

In order to ensure safe and reliable operation of Ideal Concord Super boilers it is essential that regular maintainance be carried out by competent staff who have received instruction in maintainance, fault finding and commissioning procedures for this boiler series.

SERVICING INSTRUCTIONS

ANNUAL servicing is recommended.

BEFORE CARRYING OUT ANY SERVICING PROCEDURE:

1. ISOLATE THE BOILER ELECTRICAL SUPPLY.
2. TURN OFF THE GAS SERVICE TAP ON THE MODULE BEING SERVICED.

The following procedure should be carried out annually.

PREPARATION FOR SERVICING

Possible Spares Required:

Round cork burner gasket

Round cork burner gasket with 'U' shaped extension

Ignition electrode with integral lead

Flame sensing probe with integral lead

1. Withdraw the multi-pin plug from the side of the module, unscrew the two retaining screws from the front of the cover, and remove the cover.
2. Remove the Pactol control box by first unscrewing the two retaining screws.
3. Disconnect the lead to the spark electrode from terminal 1 in the control box base, noting its routing.
4. Disconnect the lead to the flame sensing probe from terminal 4 in the control box base, again noting its routing.
5. Disconnect the burner earth lead and gas valve earth lead from the earthing post at the front of the chassis.
6. Unplug the gas valves, electronic thermostat sensor from the printed circuit board, Ref. Fig. 13 for location of plugs.
7. Undo the suction sensing line union connections at the 'square to round' casting and at the proportionator and remove the sensing line.
8. Undo the pressure sensing line union at the proportionator, and at the base of the fan housing. Care should be taken in disconnecting the pipe from the fan housing, excessive force should not be applied to the soldered connection of the tapping to the fan housing.
9. Withdraw the over-heat cut-off device sensor from its pocket.
10. Undo the 3 elongated M8 nuts with slotted heads, securing the controls chassis.
11. Remove the controls chassis.
12. Remove burner complete with its integral ignition probe.

SERVICING THE SPARK ELECTRODE & BURNER

1. Remove the 3 split pins holding the distribution cone and burner end cap in place and withdraw the cone from the burner.
2. Brush the inside and outside of the burner making sure to clear any blockages in the burner.
3. Brush the distribution cone and replace.
4. If the burner shows any sign of deterioration it should be replaced.
5. Inspect the spark electrode, if it shows any signs of erosion or if there is damage to the insulation or integral lead, it should be replaced as follows:

   Undo the retaining nut and withdraw the electrode from its housing. Fit new electrode.
6. Check and adjust if necessary spark gap — it should be 4 — 5mm.

SERVICING THE FLAME SENSING PROBE

Undo the retaining nut and withdraw the probe. If it shows any signs of erosion, or damage to insulation or to the integral lead it MUST BE REPLACED.

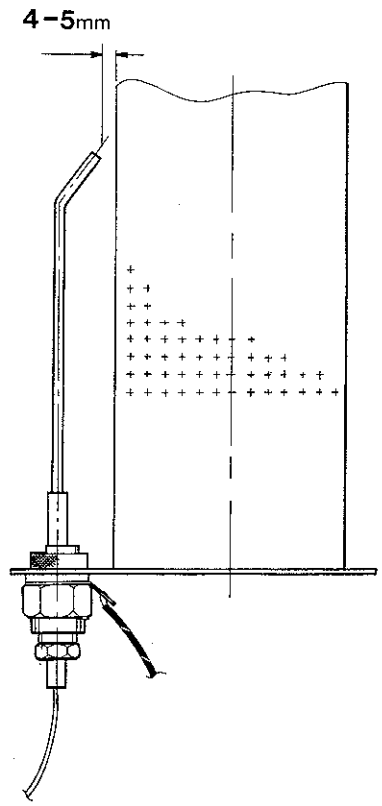


Fig. 15 SPARK ELECTRODE SETTING

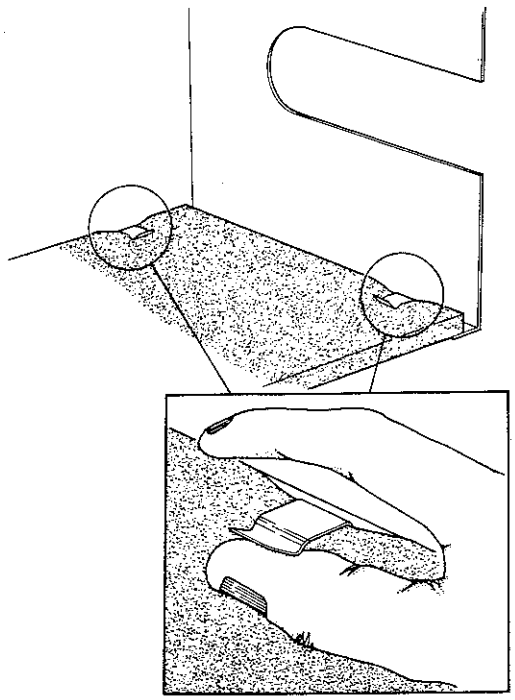


Fig. 16 REMOVAL OF MODULE COVER FILTER

INSPECTING THE FINNED TUBES OF THE HEAT EXCHANGER(S)

Inspect the DRY side of the heat exchanger finned tubes, both by viewing through the burner opening using an electric torch, and by removing the inspection panel(s) on the sides of the boiler.

In general, on intermittently operated systems, it will not be necessary to undertake chemical cleaning more than once every two years, although as mentioned above, the DRY side should be examined at least once a year to assess the rate of build up of debris.

When systems are operated virtually continuously, heat exchangers should not exceed 3 000 hours firing time between chemical cleaning.

For instructions on chemical cleaning see relevant section.

CLEANING THE FAN

1. Unplug the fan lead from the printed circuit board and disconnect the earth lead from the chassis earth post.
2. Remove the aluminium duct-work surrounding the fan motor by unscrewing the M4 x 10mm lg. screw between the duct and base at the left hand rear corner, and by removing the two similar screws at the front, right, which secure the duct to the front fascia panel.
3. Remove the fan assembly from the control chassis by unscrewing the three M4 x 10mm lg. screws.
4. Using a soft brush, remove any accumulation of dust from the fan blades, the inside of the fan scroll and 'square to round' casting, and the area around the multi-hole plate.

CLEANING THE MODULE COVER FILTER

The module cover is fitted with a polyurethene foam filter, which forms the bottom panel of the cover. This filter is retained by four spring steel edge clips.

To remove the filter, prise open each clip – as shown in Fig. 16 – and release the wire frame of the filter from the clip.

Wash the filter in lukewarm, soapy water.

It should then be thoroughly rinsed and allowed to dry.

Refitting is the reversal of the removal procedure.

RE-ASSEMBLY

1. Replace the burner in the module, renewing the round cork gasket with the 'U' shaped extension. Ensure the spark electrode lug is fully seated into its recess.
2. Replace the flame sensing probe in position and lightly tighten its retaining nut.
3. Re-assemble the control chassis ensuring the fan motor is re-fitted in its original position.
4. Re-connect the fan lead to the printed circuit board, and the earth lead to the earthing post.
5. Refit the controls chassis to the module.

Note: (i) Both pressure and suction sensing pipes should be blown through to ensure they are free from obstruction. Ensure that sensing pipe compression fittings are secure upon re-assembly. DO NOT apply excessive force to the soldered connection at the base of the fan housing.

(ii) If the round cork gasket between the square to round casting and the burner is damaged it must be replaced.

(iii) Do NOT overtighten the elongated M8 nuts or damage to the casting may occur.

ON COMPLETION OF SERVICE, RE-COMMISSION AND TEST THE BOILER IN ACCORDANCE WITH THE 'COMMISSIONING AND TESTING' INSTRUCTIONS WITH PARTICULAR REFERENCE TO FAN PERFORMANCE CHECKS.

HEAT EXCHANGER – CLEANING INSTRUCTIONS CHEMICAL CLEANING OF THE DRY SIDE OF BOILER MODULES

WARNING:

BEFORE CARRYING OUT ANY SERVICING PROCEDURE –

1. ISOLATE THE BOILER ELECTRICAL SUPPLY
2. TURN OFF THE GAS SERVICE TAPS ON THE MODULES BEING SERVICED.

This method of cleaning uses the cleaner FERNOX DS.10, which is available from a Local Stockist, or:

FERNOX MANUFACTURING Co., Ltd.,
Britannica Works, Clavering, Essex. CB11 4QZ
Tel: 079985 811

The following method of cleaning assumes there is an adequate supply of mains pressure water and a suitable drain on site.

CAUTION:

FERNOX DS.10 is an ACIDIC COMPOUND and MUST be treated and handle as such with ALL the required precautions.

Ingestion and contact with skin, eyes and clothing MUST be avoided.

Wear rubber gloves and protective clothing, including safety glasses to avoid splashes in eyes.

Accidental splashes SHOULD BE NEUTRALISED IMMEDIATELY with household soda as solution in water.

Sensitive areas, such as eyes, can be rinsed first with SODIUM BICARBONATE, followed by plain water.

Obtain the aid of a Medical Practitioner in the case of personal accident.

FERNOX DS.10 does NOT produce fumes or toxic gases, but it is recommended to work under good conditions of ventilation.

Contact with zinc, aluminium, magnesium, cement asbestos and bathtub enamel MUST be REDUCED, or best – COMPLETELY AVOIDED.

KEEP ALL CHEMICALS AWAY FROM CHILDREN.

MATERIALS AND SPARES REQUIRED IN ADDITION TO THOSE LISTED UNDER SERVICING

1. D.S. 10 Solution
2. Container, minimum dimensions 350mm x 350mm x 350mm.
3. Gas distribution screen (alumminium wrapper) and screws.
4. 40mm nominal bore gaskets (module to header).
5. Triangular gaskets between module flow and return headers and top cover plate.
6. Cover plate gasket (Top).
7. Cover plate gasket (Bottom).

PREPARING BOILER

1. Withdraw the electrical plug from each module unscrew the two 6mm retaining screws on EACH module and remove the module covers.
2. Isolate the boiler from the flow and return water pipes.
3. Drain the boiler.
4. Uncouple the flanges connecting the modules to the flow and return headers.
5. Release the union nuts connecting the gas inlet manifold to the modules.

6. Remove the fan and control chassis assembly, burner with spark electrode and the flame sensing probe – as described in the Servicing Instructions.
7. Remove the module gas line assembly as follows:
   (a) remove the four M4 x 10mm lg Pozi Pan Hd screws, which secure the injector pipe to the cast iron return pipe
   (b) remove the 3/8in UNC nut, securing the gas line bracket to its fixing stud.
8. Remove the four 10mm nuts, securing EACH module to the casing, and withdraw the modules.
9. Undo the screws holding the gas distribution screen over the finned tubes, remove the screen.

THE MODULE HEAT EXCHANGER IS NOW READY FOR CLEANING

PREPARING SOLUTION

Prepare a solution of FERNOX DS.10 and water, in the proportions of 20% DS.10 to 80% water.

This should provide a solution strength to adequately clean a lightly scaled heat exchanger in approximately five minutes, depending upon the severity of the scaling and, in order to reduce the cleaning time, a more concentrated solution may be made of proportions up to but NOT exceeding 50% DS.10 to 50% water.

Pour the solution into a suitable container – the MINIMUM dimensions of which should be 350mm x 350mm x 350mm.

A container of this size will require approximately 28 litres (6 gallons) of prepared solution to set up the initial bath.

When more than one module is to be cleaned, additional solution should be prepared for topping up the container.

Note: There should be sufficient solution in the container to ensure, with the module immersed, the solution level just reaches the underside of the top tube plate casting – refer Fig. 17.

CLEANING

1. Immerse the module in the solution.

   The period of immersion will depend upon the severity of the scaling.

   Lightly scaled tubes can be successfully cleaned in approximately five minutes.

   Note: For best results, agitate the module periodically in the solution.
2. Remove the module from the container and THOROUGHLY rinse – a length of hose, fitted with a piece of flattened copper tube to form a nozzle, will be found to be adequate for this purpose.
3. For severely scaled heat exchangers, it may be necessary to remove any remaining stubborn deposits by brushing and then re-immersing into the solution for a few minutes.

   In extreme cases, it may be necessary to repeat this process.

   After the final immersion, the heat exchanger should be given a THOROUGH rinse.
4. Repeat the cleaning operation for EACH module, topping up the solution each time to the underside of the top tube plate casting.

RE-ASSEMBLY

Re-assemble the module gas line, burner with spark electrode, fan and control chassis assembly, and flame sensing probe in the reverse procedure to that detailed in 'Preparing Boiler'.

SPECIAL ATTENTION should be made to the following points:

1. ENSURE the gap, between the gas distribution star plate and the gas injector, is 6mm to 10mm.
2. The slots in the gas distribution screen (aluminium wrapper) MUST BE IN LINE with the outermost points of the finned tubes.
3. The gas distribution screen MUST BE HELD TIGHTLY against the finned tubes when the securing screws are tightened.
4. Replace the burner in the module.

The round cork gasket, which seals the fan assembly to the burner, and also the round gasket, with 'U' shaped extension, sealing the burner to the module casing, MUST BE RENEWED.

MODULE WATERWAY CLEANING INSTRUCTIONS

WARNING: Before carrying out any servicing procedure:

1. ISOLATE THE BOILER ELECTRICAL SUPPLY.
2. TURN OFF THE GAS SERVICE TAPS ON THE MODULES BEING SERVICED.

If as a result of make-up water entering the system, or for any other reason, it is considered necessary to remove lime-scale from all modules, then this operation may be undertaken using the cleanser FERNOX DS.3 with the boiler disconnected, or isolated from the system but retaining all modules in situ.

Should it be suspected that one or two modules only require de-scaling individually then these modules may be removed and cleaned whilst the remaining modules continue to operate and provide some degree of heat service.

Module blanking plates and blank pipe flanges are available from Stelrad Group Ltd., for this purpose.

The manufacturers of FERNOX DS.3 – Fernox Manufacturing Co. Ltd., Britannica Works, Clavering, Essex CB11 4QZ, Telephone 079985 811, will provide general information and for literature on the most efficient procedure and the where-abouts of local stockists. An inspection of the module waterways may be undertaken before and / or after cleaning. The procedure below details the method of draining down the boiler, removing a module and dismantling for inspection of the waterways.

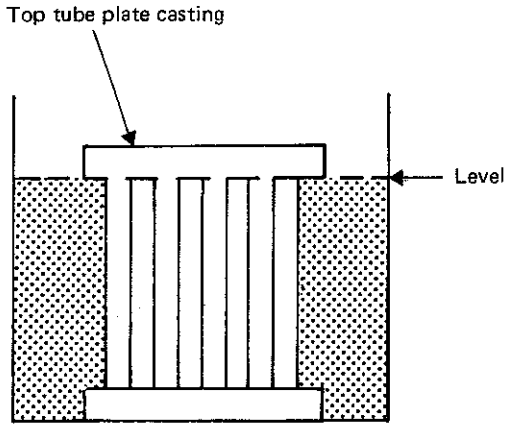


Fig. 17 **SOLUTION LEVEL**

PREPARING BOILER

1. Withdraw the electrical plug from each module, unscrew the two 6mm retaining screws, and remove the module covers.
2. Isolate the boiler from the flow and return water pipes.
3. Drain the boiler.
4. Uncouple the flanges connecting the modules to the flow and return headers.
5. Release the union nuts connecting the gas inlet manifold to the module.
6. Remove the fan and control chassis assembly, burner with spark electrode and the flame sensing probe — as described in the Servicing Instructions.
7. Remove the module gas line assembly as follows:
   (a) remove the four M4 x 10mm long pozi pan hd. screws which secure the injector pipe to the cast iron return pipe,
   (b) remove the 3/8in UNC nut, securing the gas line bracket to its fixing stud.
8. Remove the four 10mm nuts, securing EACH module to the casing, and withdraw the modules. Take care as modules may not have drained completely.
9. Undo the screws holding the gas distribution screen over the finned tubes.
   Remove the screen.
10. Remove the twelve 8mm bolts, and the centre 8mm bolt, which hold the bottom cover plate in the bottom tube plate.
    The plates can now be separated.
    The waterways can now be examined.

If the tubes are scaled, or partially blocked, the top cover plate MUST be removed by unscrewing the twelve 8mm bolts, disposed around the periphery, and the six 8mm bolts, around the centre.

The water passages in the tube plates, and in the tubes, can now be cleaned.

The water passages in the tube plates, and in the tubes can now be cleaned either by replacing the module in the boiler and cleaning all modules (refer FERNOX literature) or by immersing individual modules in a solution of DS.3.

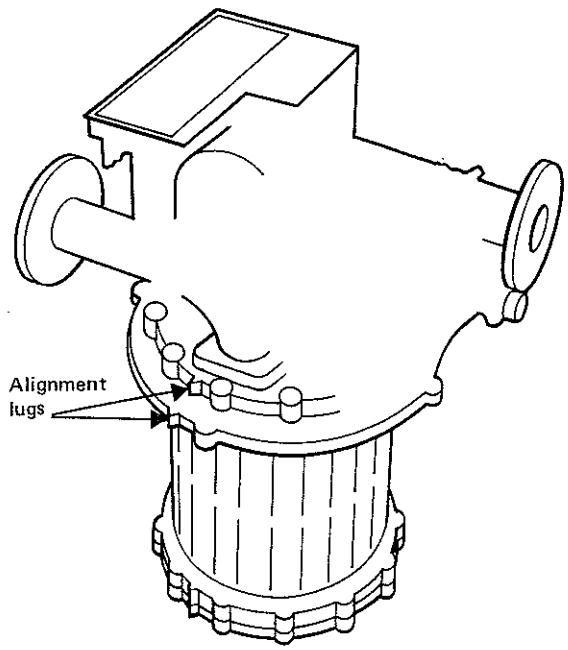


Fig. 18 **ALIGNMENT LUGS**

RE-ASSEMBLY OF THE MODULE AFTER WATER TUBE CLEANING

TAKE CARE:

1. The triangular lugs, on the cover plates are in register with the corresponding lugs on the header castings— Refer Fig. 18.
2. NEW gaskets should be used between mating flanges.
   The gaskets should be LIGHTLY GREASED before use.
3. Tighten the securing bolts EVENLY to a torque of 24.4 to 27.1 N/M (18 to 20 f/lbf).
   THE MAXIMUM SPECIFIED TORQUE MUST NOT BE EXCEEDED.
   Re-assembly can then be continued as detailed in the foregoing section.

REPLACEMENT OF COMPONENTS

WARNING: Before working on the appliance:

1. Isolate the boiler electrical supply.
2. Turn OFF the gas supply at the inlet gas cock.

Note: To replace the following components, it will be necessary to remove the module cover as previously described in the Servicing Instructions.

Sight Glass

1. Undo the two screws securing the sight glass assembly to the front header casting.
2. Fit the replacement sight glass ensuring the parts are in the correct order i.e. gasket, glass, gasket and frame.
3. Retighten the two screws to ensure an airtight seal. DO NOT OVERTIGHTEN.

Boiler Control Thermostat Sensing Probe

1. Remove the retaining clip from the thermostat pocket in the boiler return header, and withdraw the sensing probe.
2. Unplug the thermostat lead from the printed circuit board behind the controls fascia panel and withdraw the lead.
3. Fit the replacement probe in reverse order to removal.

Boiler Control Thermostat Potentiometer

1. Unplug the potentiometer lead from the printed circuit board behind the controls fascia panel.
2. Loosen the retaining screw of the thermostat control knob on the right hand side of the fascia and pull off the knob.
3. Undo the hexagon nut securing the potentiometer to the fascia, and withdraw the potentiometer.
4. Fit the replacement potentiometer in reverse order to removal.

Controls Fascia Panel

1. Unplug the boiler control thermostat sensor, fan, and gas valve leads from the top of the printed circuit board behind the controls fascia panel, and withdraw the leads.
2. Unplug the mains plug from the left hand side of the panel.
3. Disconnect the earth lead at the right hand side of the panel.
4. Remove the phial retaining plate from the overheat cut off device pocket on the boiler flow pipe, and withdraw the overheat cut-off device sensor.
5. Undo the five screws securing the panel to the chassis, and draw the panel forward.
6. Unplug the PACTROL control box lead from the bottom of the printed circuit board and withdraw the lead.
7. Remove the fascia panel from the boiler.

Printed Circuit Board

1. Remove the controls fascia panel as previously described.
2. Unplug the leads to the 'mains' socket and the boiler control thermostat potentiometer from the printed circuit board.
3. Thread the overheat cut-off device capillary through the grometted hole in the fascia panel.
4. Undo the four screws securing the printed circuit board to the fascia panel and withdraw the board.
5. Fit the replacement printed circuit board in reverse order to removal.

Overheat Cut-off Device

1. Remove the printed circuit board as previously described.
2. Pull off the two electrical connections from the overheat cut-off device.
3. Undo the securing nuts and bolts and remove the device.
4. Fit the replacement device in reverse order to removal.

PACTROL Control Box

1. Loosen the two screws on top of the control box and separate the top of the box from the base.
2. Fit the replacement control box in reverse order to removal.

Burner

1. Remove the fan assembly and controls chassis as previously described in the Servicing Instructions.
2. Withdraw the burner, complete with integral spark electrode from the module.
3. Undo the nut securing the spark electrode and transfer the electrode to the new burner.
4. Fit the replacement burner in reverse order to removal.

Note: Always fit a new cork gasket between burner and module.

Spark Electrode

1. Remove the PACTROL control box as previously described.
2. Disconnect the spark electrode from terminal 1 in the control box base.
3. Undo the locking nut securing the electrode and withdraw the electrode.
4. Fit the replacement electrode in reverse order to removal.

Flame Sensing Probe

1. Loosen the two screws on the top of the PACTROL control box and separate the top of the box from the base.
2. Disconnect the flame sensing probe lead from terminal 4 in the control box base, and withdraw the lead.
3. Undo the nut securing the probe in the front casting and withdraw the probe.
4. Fit the replacement probe in reverse order to removal.

Fan

1. Remove the fan assembly and controls chassis complete as previously described in the Servicing Instructions.
2. Unplug the fan electrical lead from the controls printed circuit board.
3. Disconnect the fan earth lead from the earthing post.
4. Undo the screws securing the air duct enclosing the fan motor, and remove the duct.
5. Undo the three screws securing the controls chassis complete with controls fascia panel.
6. Undo the four bolts securing the square to round casting to the fan outlet and transfer the casting to the new fan unit, replacing any damaged or deteriorating cork gaskets.
7. Fit the replacement fan in reverse order to removal.

Combination Gas Control

1. Turn off the module gas service tap.
2. Disconnect the gas valve leads from the printed circuit board and earthing post.
3. Disconnect the pressure and suction sensing lines from the proportiometer.
4. Unscrew the four M4 x 10mm lg pozi screws securing the injector pipe to the water return elbow.
5. Unscrew the 3/8in. UNF nut securing the gas line to the heat exchanger end plate.
6. Undo the iron union elbow and remove the gas line.
7. Unscrew the gas manifold from the proportiometer, to do this the gas valve will have to be unscrewed approximately 1/6 of a turn.
8. Unscrew the gas pipes from the inlet and outlet of the gas control.
9. Re-assemble in reverse order to removal, taking care with the alignment of the various components — refer Fig. 4.

Proportionater

1. — 7. as under Gas Control

8. Unscrew the injector pipe from the outlet of the proportionater, after first removing the suction pipe tee piece.
9. Re-assemble in reverse order to removal.

Gas Injector

1. Unscrew the injector from the end of the gas outlet pipe.
2. Fit the replacement injector, renewing the gasket, and ensuring that the gap between the gas distribution plate and injector is 6—10mm.

Gas Distribution Screen

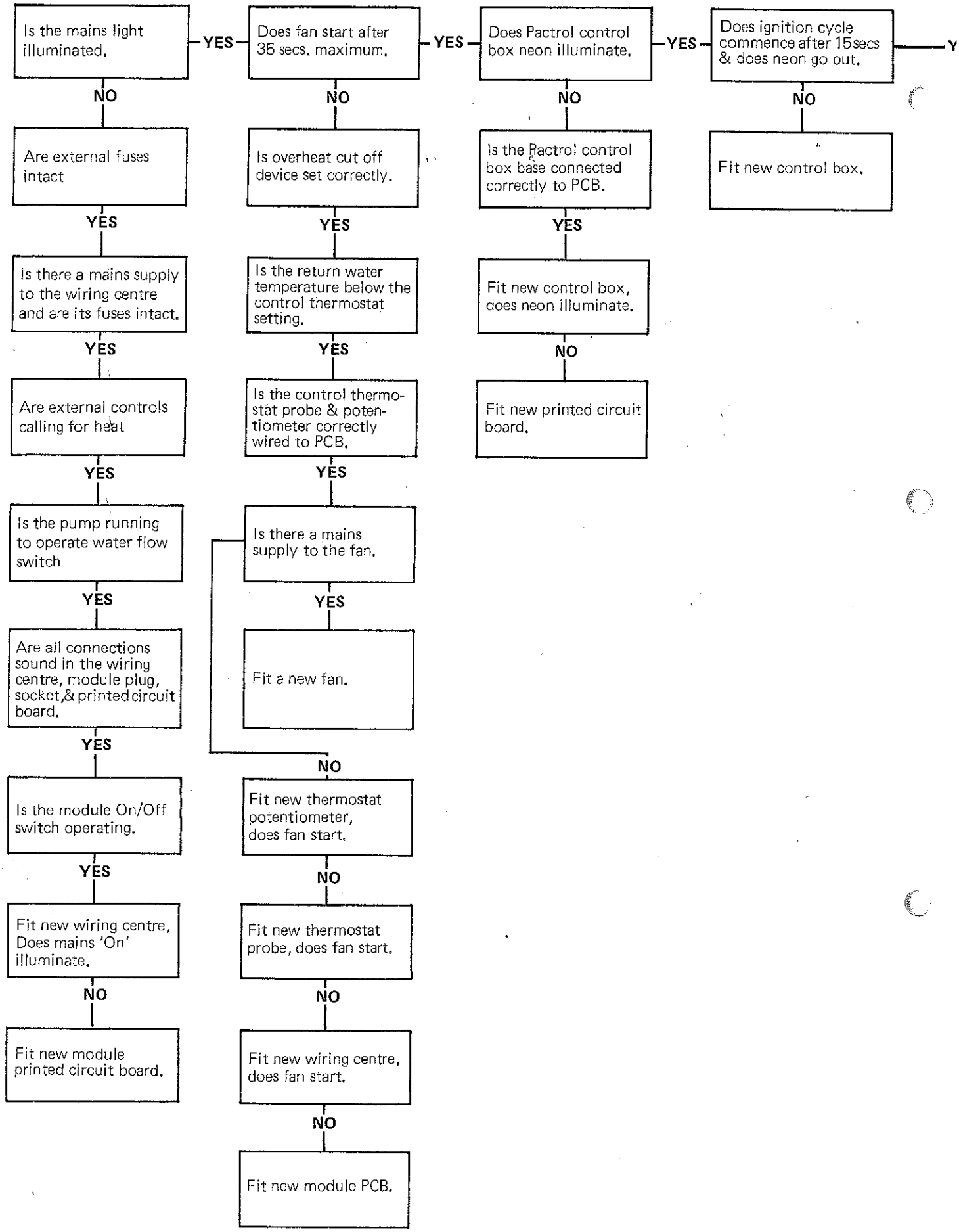
1. Remove the heat exchanger from the casing as described in 'Heat Exchanger — Cleaning Instructions'.
2. Undo the screws securing the gas distribution screen, and remove the screen.
3. Fit the replacement screen ensuring:
   (a) The slots in the screen are in line with the outermost points of the finned tubes.
   (b) The screen is held tightly against the finned tubes when the securing screws are tightened.
4. Re-assemble in reverse order to removal, re-newing any damaged or deteriorated gaskets as necessary.

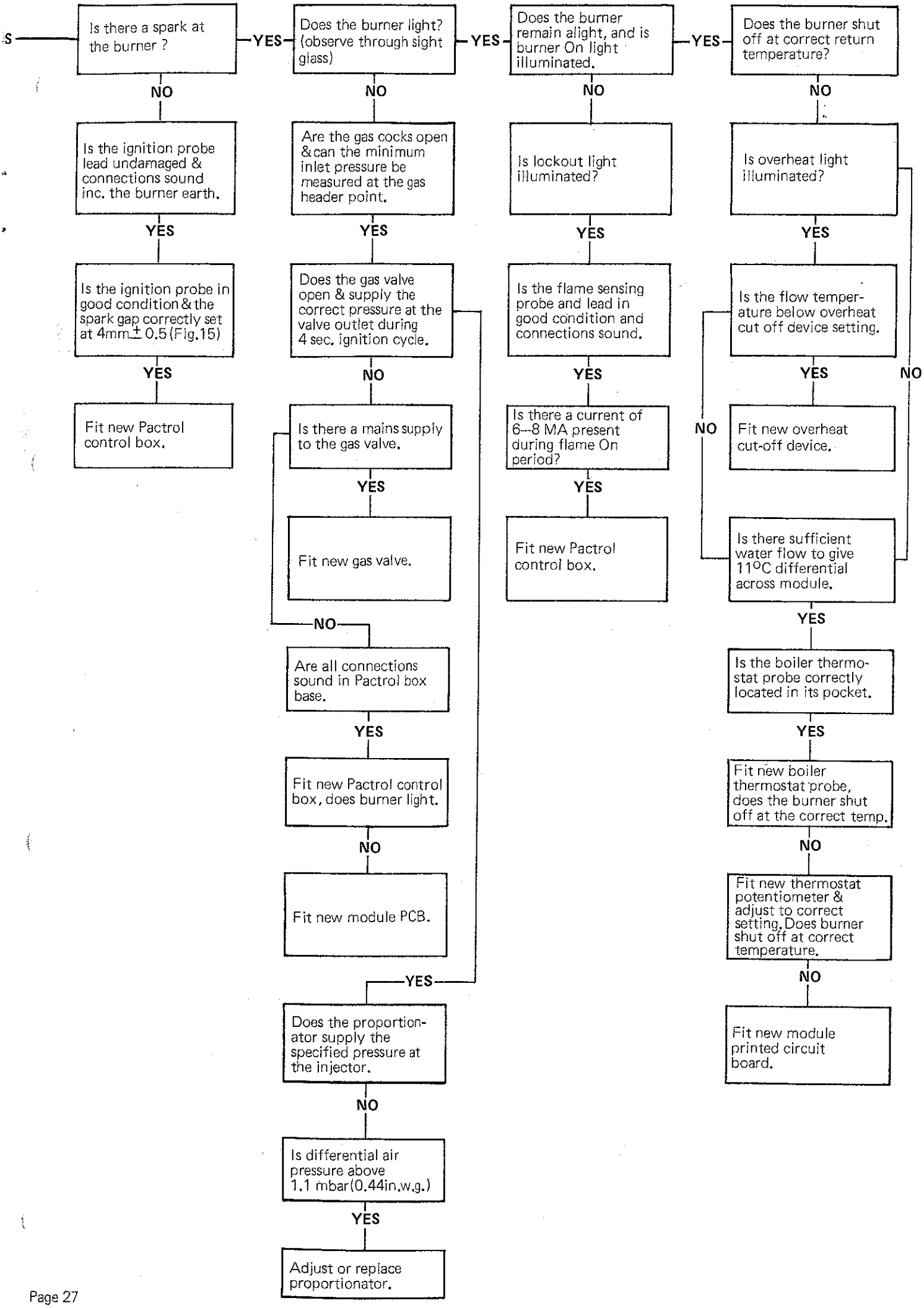
Module Cover Filter

1. Prise open the four securing clips and release the wire frame of the filter – refer Fig. 16.
2. Fit the replacement filter in reverse order to removal.

Wiring Centre

1. Undo the four screws securing the wiring centre cover and remove the cover.
2. Disconnect the electrical leads from the printed circuit board and earth posts – noting their positions – Refer Fig. 12.
3. Loosen the cable gland nut(s) and withdraw the cable(s) from the box.
4. Undo the four screws securing the wiring centre to the boiler side panel and withdraw the centre.
5. Fit the replacement wiring centre in reverse order to removal.


Is the mains light illuminated.
YES
Does fan start after 35 secs. maximum.
YES
Does Pactrol control box neon illuminate.
YES
Does ignition cycle commence after 15secs & does neon go out.
Y
NO
Are external fuses intact
YES
Is there a mains supply to the wiring centre and are its fuses intact.
YES
Are external controls calling for heat
YES
Is the pump running to operate water flow switch
YES
Are all connections sound in the wiring centre, module plug, socket,& printed circuit board.
YES
Is the module On/Off switch operating.
YES
Fit new wiring centre, Does mains 'On' illuminate.
NO
Fit new module printed circuit board.
NO
Is overheat cut off device set correctly.
YES
Is the return water temperature below the control thermostat setting.
YES
Is the control thermo-stat probe & poten-tiometer correctly wired to PCB.
YES
Is there a mains supply to the fan.
YES
Fit a new fan.
NO
Fit new thermostat potentiometer, does fan start.
NO
Fit new thermostat probe, does fan start.
NO
Fit new wiring centre, does fan start.
NO
Fit new module PCB.
NO
Is the Pactrol control box base connected correctly to PCB.
YES
Fit new control box, does neon illuminate.
NO
Fit new printed circuit board.
NO
Fit new control box.


S
Is there a spark at the burner ?
YES
Does the burner light? (observe through sight glass)
YES
Does the burner remain alight, and is burner On light illuminated.
YES
Does the burner shut off at correct return temperature?
NO
Is the ignition probe lead undamaged & connections sound inc. the burner earth.
YES
Is the ignition probe in good condition & the spark gap correctly set at 4mm ± 0.5 (Fig.15)
YES
Fit new Pactrol control box.
NO
Are the gas cocks open & can the minimum inlet pressure be measured at the gas header point.
YES
Does the gas valve open & supply the correct pressure at the valve outlet during 4 sec. ignition cycle.
NO
Is there a mains supply to the gas valve.
YES
Fit new gas valve.
NO
Are all connections sound in Pactrol box base.
YES
Fit new Pactrol control box, does burner light.
NO
Fit new module PCB.
YES
Does the proportionator supply the specified pressure at the injector.
NO
Is differential air pressure above 1.1 mbar (0.44in.w.g.)
YES
Adjust or replace proportionator.
NO
Is lockout light illuminated?
YES
Is the flame sensing probe and lead in good condition and connections sound.
YES
Is there a current of 6–8 MA present during flame On period?
YES
Fit new Pactrol control box.
NO
Is overheat light illuminated?
YES
Is the flow temperature below overheat cut off device setting.
YES
NO
Fit new overheat cut-off device.
NO
Is there sufficient water flow to give 11°C differential across module.
YES
Is the boiler thermostat probe correctly located in its pocket.
YES
Fit new boiler thermostat probe, does the burner shut off at the correct temp.
NO
Fit new thermostat potentiometer & adjust to correct setting. Does burner shut off at correct temperature.
NO
Fit new module printed circuit board.