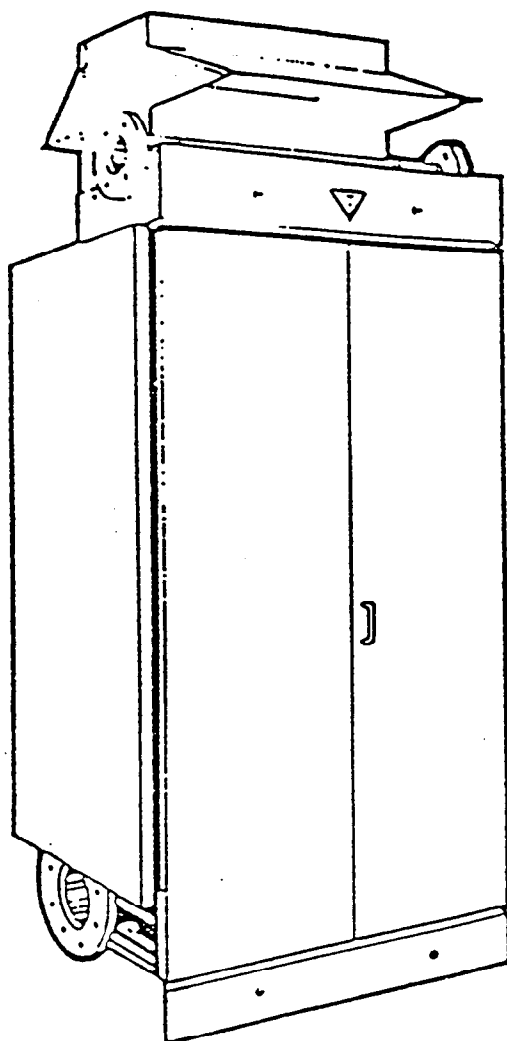


CHAFFOTEAUX ET MAURY LTD

**FLEXIFLAME 70 / 105**



**INSTALLATION & SERVICING**

**INSTRUCTIONS**

INTRODUCTION

The CORVEC Flexiflame 70 and 105 are developments of the widely used CORVEC Flexiflame 35 and comprise two or three standard boiler assemblies connected together in one casing.

The boiler assemblies (modules), each with an output of 38 kW (130,000 Btu/h), are mounted vertically above each other providing high output to floor space and high output to weight ratios.

The CORVEC Flexiflame 70 and 105 are supplied with flanged water and gas connections to allow the simple connection of second or subsequent boilers. Each boiler has an integral common flue and is contained in a pre-assembled case that permits easy access for installation and maintenance.

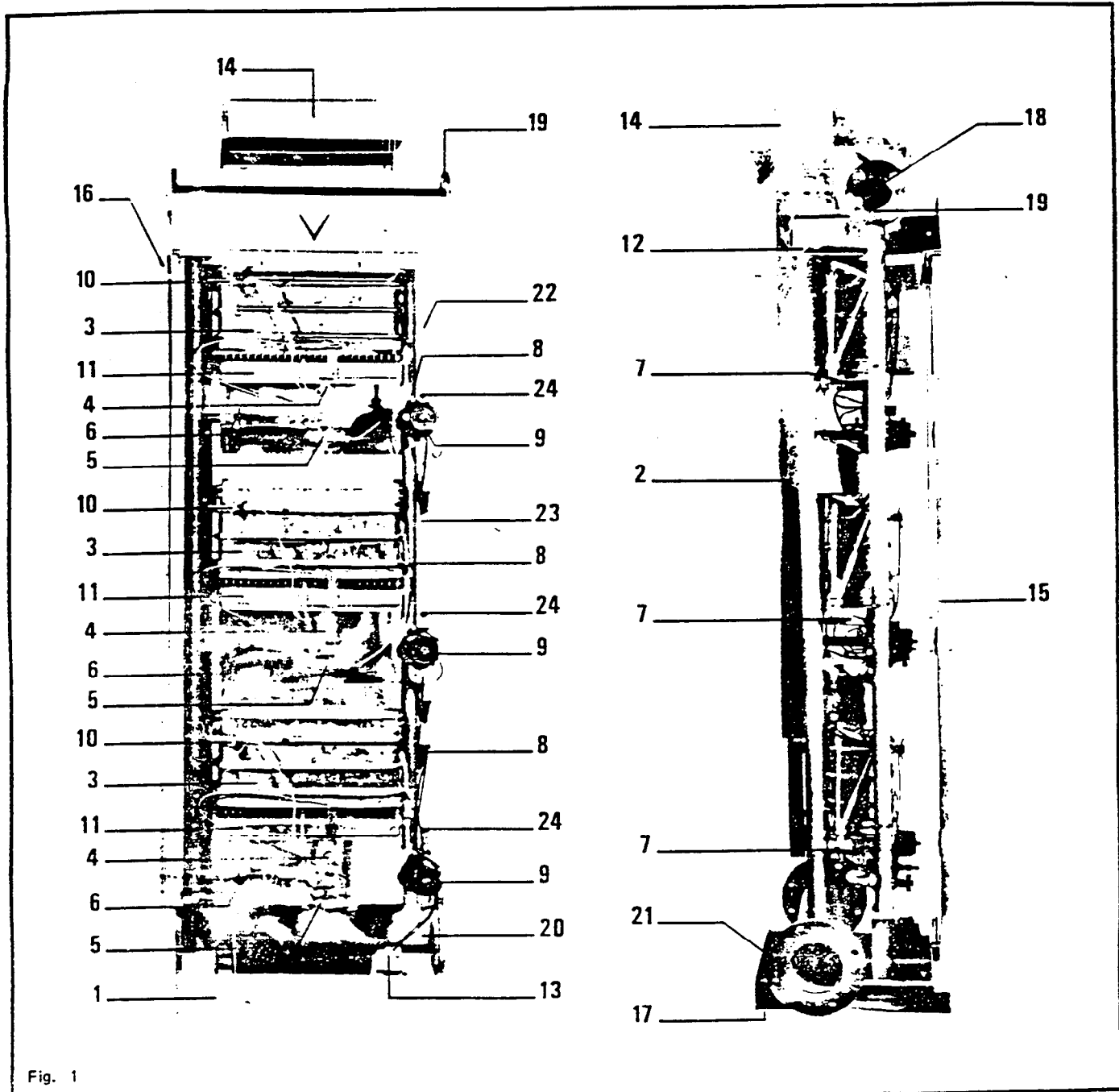


Fig. 1

PLEASE NOTE - IF SIDE PANELS ARE REQUIRED TO COMPLETE AN INSTALLATION, PLEASE CONSULT INSTALLATION INSTRUCTIONS SECTION 4 BEFORE ORDERING BOILERS.

INSTALLATION and OPERATING FEATURES

The CORVEC Flexiflame 70 and 105 are designed to be used in installations where space for plant accommodation is limited, and where modulating output is a requirement. Three features distinguish these boilers from others of comparable output.

Compact Construction - The materials and methods of construction produce the following output to floor space and output to weight ratios.

CORVEC Flexiflame 70 - equivalent to 214 kW/m<sup>2</sup> and 0.6 kW/kg

CORVEC Flexiflame 105 - equivalent to 320 kW/m<sup>2</sup> and 0.6 kW/kg

These ratios will be of particular significance where existing plant rooms are required to provide higher outputs, and where roof top installations are under consideration.

System Design - The use of a unique monotube water flow arrangement obviates the need to include boiler resistance in pump sizing. Each module is provided with a pump to overcome the resistance of the associated heat exchanger. The modules are connected in parallel to a single water flow pipe (monotube) flanged at each end for simple connection to the system or additional boilers. This arrangement simplifies design, particularly in changeover installations where existing pump sizes may not be known.

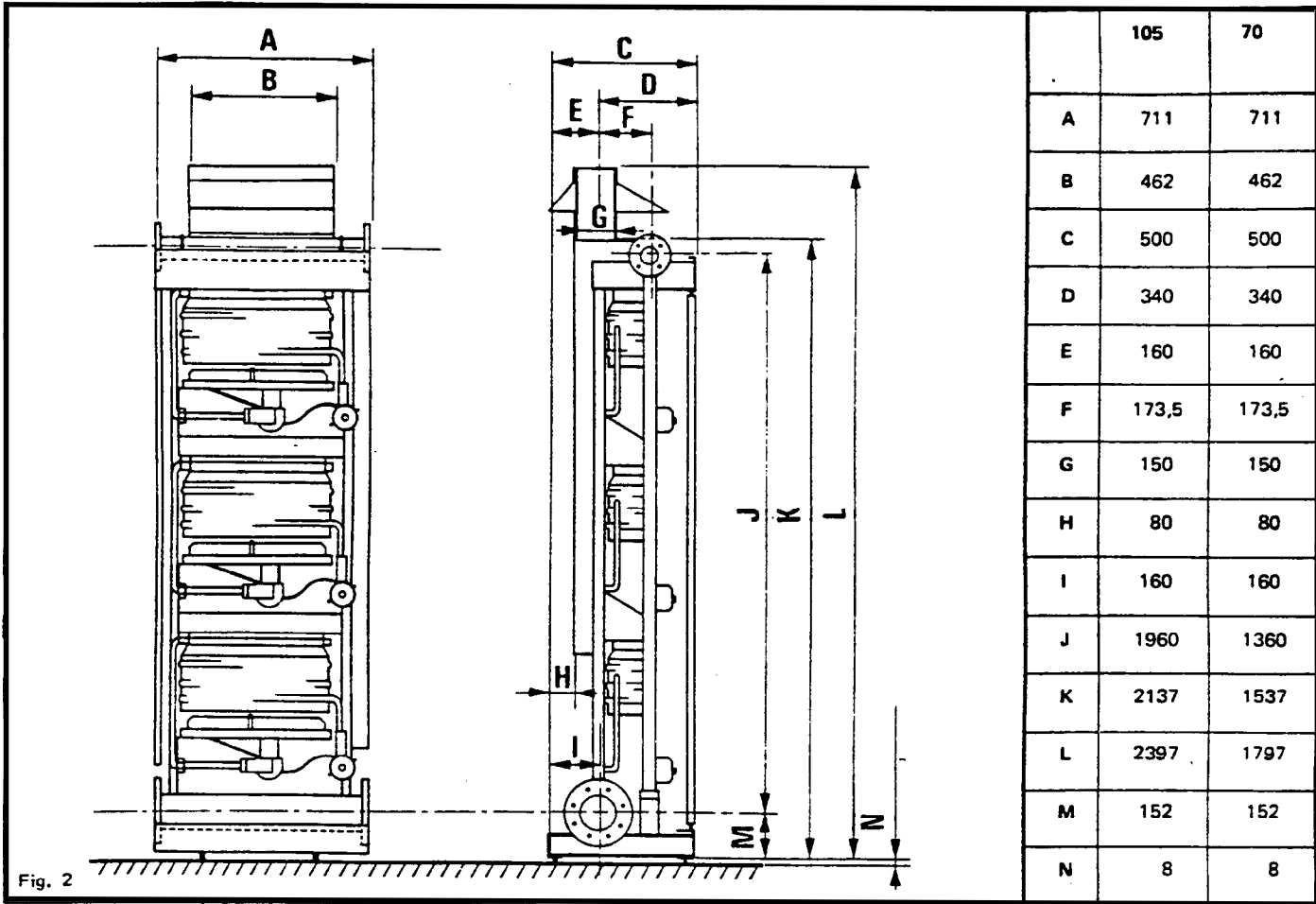
Controls - The boilers are fitted with simple controls suitable for use in a wide variety of applications. On/off control of modules is by starting and stopping the associated pump either under the influence of the boiler thermostat or an external control signal. Each boiler is fitted with a variable setting thermostat that brings modules under fire at 1°C intervals. Where more than one boiler is installed, continuous sequencing of modules can be effected, either by using boiler thermostats or by using an external signal from a step controller. Each module also includes a water stopping device that prevents unnecessary water circulation through unfired modules.

DESCRIPTION (Fig 1)

- |   |  |
|---|--|
| 1. Steel chassis  | 12. Automatic air vents (flow and return)                |
| 2. Aluminium flue duct  | 13. Boiler thermostat                                    |
| 3. Tinned copper finned tube heat exchanger   | 14. Draught diverter                                     |
| 4. Gas section. On/off gas section with two stage gas valve for quiet and stable ignition                             | 15. Doors  |
| 5. Water section. Differential pressure water section which ensures gas valve cannot open until pump (9) is operating | 16. Side panel (see Installation Instructions Section 4) |
| 6. Gas valve connected to fusible overheat device to protect against spillage of combustion products                  | 17. Levelling bolts                                      |
| 7. Flow isolating valve   | 18. Flanged gas header                                   |
| 8. Return isolating valve   | 19. Gas flange   |
| 9. Pump   | 20. Flanged water monotube                               |
| 10. High temperature overheat thermostat  | 21. Monotube flange                                      |
| 11. Stainless steel all gas burner with permanent pilot and thermo-electric flame failure protection                  | 22. Electrical connection box                            |
|   | 23. Cable duct   |
|   | 24. Double pole isolating switches for each module       |

DIMENSIONS

4



TECHNICAL DATA

	70	105	70	105
Output	76 kW	114 kW	260,000 Btu/h	390,000 Btu/h
Input	98 kW	147 kW	334,000 Btu/h	501,000 Btu/h
Gas Rate	9.0 m <sup>3</sup> /h	13.5 m <sup>3</sup> /h	324 ft <sup>3</sup> /h	486 ft <sup>3</sup> /h
Burner Pressure	12.3 mbar	12.3 mbar	4.9 ins w.g.	4.9 ins w.g.
Burner Injector Diam	1.18 mm	1.18 mm	0.046 ins	0.046 ins
Pilot Injector Diam	0.30 mm	0.30 mm	0.012 ins	0.012 ins
Height	1.80 m	2.40 m	70.7 ins	94.4 ins
Width	0.71 m	0.71 m	28.1 ins	28.1 ins
Depth	0.50 m	0.50 m	19.7 ins	19.7 ins
Weight	130 kg	180 kg	287 lbs	397 lbs
Water Content	17 l	20 l	3.7 galls	4.4 galls
Max Flow Temperature	110°C	110°C	230°F	230°F
Max Return "	90°C	90°C	194°F	194°F
Min Static Head	0.3 bar*	0.3 bar	10 ft w.g.*	10 ft w.g.
Max Static Head	7.0 bar	7.0 bar	233 ft w.g.	233 ft w.g.
Flue Connection	0.46 metres x 0.15 metres			
Electrical Supply	240V a.c. fused 3 Amp. per boiler, 1 Amp. per module			

\* All combustion data is for natural gas. For data on town and LP gases, please contact Chaffoteaux Limited.

\* Minimum static head for flow temperatures not exceeding 82°C (180°F).

DESIGN DATA

(i) Hydraulics - The maximum number of boilers that can be installed in series is dependent upon the maximum mass flow capacity of the monotube. The following tables detail the total monotube resistance for installations of up to 2280 kW (7.8 million Btu/h) output, and for various system design temperature drops.

CORVEC Flexiflame 70

No of Boilers	Total Output kW	Total Length of Monotube m	Total Monotube Resistance in Metres w.g.			
			T = 20°C	T = 15°C	T = 11°C	T = 8°C
1	76	0.71	Total Monotube Resistance is less than 0.01 Metres w.g.			
2	152	1.42				
3	228	2.13				
4	304	2.84				
5	380	3.55		0.01	0.01	0.02
10	760	7.10	0.03	0.04	0.07	0.14
15	1140	10.65	0.07	0.15	0.24	0.46
20	1520	14.20	0.20	0.32	0.58	1.07
25	1900	17.75	0.36	0.62	1.12	-
30	2280	21.30	0.62	1.04	1.91	-

CORVEC Flexiflame 105

1	114	0.71	Total Monotube Resistance is less than 0.01 Metres w.g.			
2	228	1.42				
3	342	2.13				
4	456	2.84				
5	570	3.55	0.01	0.01	0.02	0.04
10	1140	7.10	0.05	0.10	0.17	0.32
15	1710	10.65	0.17	0.30	0.53	1.02
20	2280	14.20	0.41	0.69	1.27	-

T is the design temperature drop around the system. Where resistances are not shown, this is because the monotube velocity would exceed 4 m/s.

The boilers are arranged in series to provide increments of temperature rise to match variations in load and hence return water temperatures. The boilers are designed for a system temperature drop of 20°C (36°), but the monotube arrangement provides a built-in by pass feature for temperature differences of less than 20°C. Figures 3 and 4 show a typical boiler arrangement and a schematic layout of a single boiler.

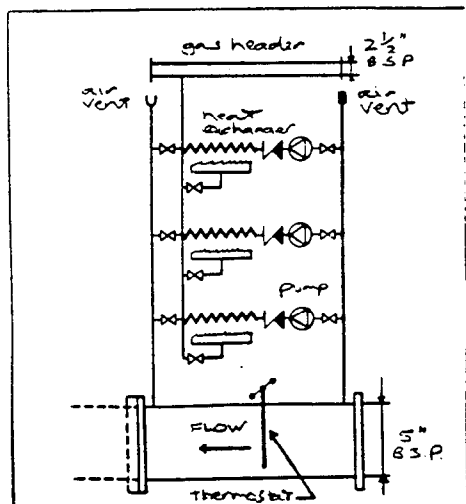


Fig. 4

EXAMPLE OF BOILER ARRANGEMENT

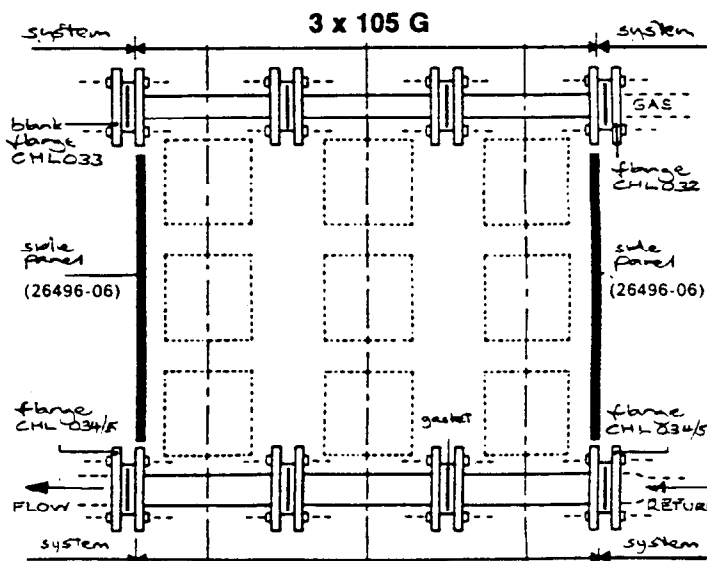


Fig. 3

- (ii) Systems and Controls - The CORVEC Flexiflame 70 and 105 are suitable for use with open or sealed systems, and can be used with the primary circulation pump located in the flow or return. Chaffoteaux Limited generally recommend that where boiler resistance is relatively high, the primary circulation pump be located in the return to the boiler with the cold feed on the suction side of the pump. This will maintain all the system including the boiler at a positive pressure relative to the neutral point. The water monotube in the Flexiflame 70 and 105 has a relatively small resistance for installations of up to 1000 kW output, and therefore the pump position is not critical.

The controls provided with each boiler are suitable for constant temperature/constant flow conditions, and normally no other primary control would be required. Where variable temperature at constant flow is required, an external signal source will be needed to select the correct number of modules to fire. Where secondary controls are used to maintain design conditions, the boiler thermostats will normally be adequate primary control. The boilers are particularly suitable for applications where optimum start is to be a feature, and Chaffoteaux Limited are always ready and able to assist in discussions concerning design and control choice.

- (iii) Electrical Connections - The boiler wiring is terminated in the electrical connection box at the top right hand corner of the boiler. The attached sketches show the internal wiring of the Flexiflame 105 and alternative suggestions for internal and external control.

N.B. The latest versions of the Flexiflame 70/105 have a composite electrical control and connection box mounted in the base of the boiler.

- (iv) Flues - The CORVEC Flexiflame 70 and 105 are designed to be used with natural draught and mechanically assisted flues.

Flue systems should be designed in accordance with current regulations, and particularly with reference to the British Gas Corporation publication, 'Technical Notes on the Design of Flues for Non Domestic Gas Boilers 1976'.

For details of flue sizing, please contact Chaffoteaux Limited.

- (v) Air for Combustion and Ventilation - The air supply to a boiler house for combustion and ventilation should be as follows;

Installations of up to 586 kW (2,000,000 Btu/h) output

In accordance with British Standard Code of Practice CP 332: Part 3: 1970 Section 4.

Installations in excess of 586 kW (2,000,000 Btu/h) and up to 1025 kW (3,500,000 Btu/h) output

At low level	0.650 m <sup>2</sup>	(7.0 ft <sup>2</sup> )
At high level	0.325 m <sup>2</sup>	(3.5 ft <sup>2</sup> )

Installations in excess of 1025 kW output (3,500 000 Btu/h)

At low level	0.634 m <sup>2</sup> (2.0 ft <sup>2</sup> )	for every 1000 kW output for every 1,000,000 Btu/h output)
At high level	0.317 m <sup>2</sup> (1.0 ft <sup>2</sup> )	for every 1000 kW output for every 1,000,000 Btu/h output)

- (vi) Regulations and Standards - the following regulations and standards may be of use at the time of design.

The Building Regulation - 1972

The Gas Safety Regulations - 1972

The Public Health Act - 1936

British Gas Publications - 'Technical Notes on the Design of Flues for Non Domestic Gas Boilers'

'Combustion and Ventilation Air - Guidance Notes for Boiler Installations in excess of 586 kW output'

'Central Heating - Watson House Bulletin Supplement'

British Standards

BS 145 and 1256

Malleable cast iron and cast copper alloy screwed pipe fittings for steam, air, water, gas and oil'

BS 417

'Galvanized mild steel cisterns and covers. Tanks and cylinders'

BS 864: Part 2

'Capillary and compression tube fittings of copper and copper alloy'

BS 1387

'Steel tubes and tubulars suitable for screwing to BS 21 pipe threads'

BS 2871: Part 1

'Copper tubes for water gas and sanitation'

BS 2871: Part 2

'Copper and copper alloy tubes for general purposes'

Codes of Practice

BS CP 331: Part 3

'Gas supplies to appliances'

BS CP 332: Part 3: 1970

'Air for Combustion and Ventilation for Installations of up to 586 kW output'

- (vii) Chaffoteaux Limited Services - Chaffoteaux Limited are delighted to assist with technical and design enquiries on all the product range. Chaffoteaux Limited do not normally prepare working drawings for installations, but all Consultants and Designers are encouraged to submit their proposals to the Company for comment.

Chaffoteaux Limited have a Field Engineer force, who, for a normal fee to cover travelling and time, is available to commission installations throughout the United Kingdom. Field Engineers will attend on site if appliance problems exist, but only where the installer will be present and when Representatives of other manufacturers who may be involved are present.

The guarantee form at the end of this booklet should be completed and returned to Chaffoteaux Limited as soon as the boilers are received or installed.

## INSTALLATION INSTRUCTIONS

### 1) HANDLING THE BOILER

The boilers are delivered fully assembled in wooden crates. The draught diverter is packed separately.

The delivered weights are 130 kg(70) and 180 kg(105).

Remove the wooden crate and any other packing materials.

Remove the accessory boxes and gaskets from within the boiler casing.

DO NOT LIE THE BOILER ON ITS BACK

INSTALLATION INSTRUCTIONS Cont.

2) POSITIONING THE BOILER Check that the proposed boiler location is sufficiently strong to take the weight of the boilers and other components.

No purpose made plinth is required for reasonably even floors.

Position the boilers away from adjacent walls by a minimum of 100 mm (4"). The boilers are self supporting and do not need to be fixed to the structure.

Level the boiler using the bolts provided in the accessory box (17 - Fig 1).

3) CONNECTING THE BOILERS For multi boiler installations fit the intermediate gaskets and bolt up the flanges.

DO NOT CONNECT THE END APPLIANCES TO THE SYSTEM BEFORE READING 4.

4) SIDE PANELS

Side panels are not supplied with the boilers.

If side panels are required, the following accessories are available from Chaffoteaux Limited.

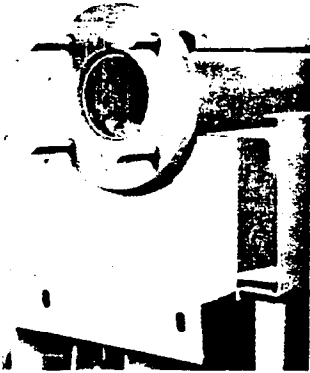


FIG. 5

<u>Component</u>	<u>Part No</u>
Side panel for 70 (left and right)	26875/06
Side panel for 105 (left and right)	26496/06
Top brackets 70/105 (left and right)	26499/06
Bottom bracket 70/105 (left)	26498
Bottom bracket 70/105 (right)	26497/06
Screws 70/105 (six of each required per panel)	5799/13
Nuts 70/105	26501/03

Before connecting end appliances to the system, fit side panel support brackets (Figs 5 and 6).

5) CONNECTING TO SYSTEM

Mating flanges are not provided with the boilers.

Should mating flanges not be readily obtainable, the following are available from the manufacturer.



FIG. 6

<u>Flange</u>	<u>Part No</u>
Blank for gas supply	CHL 033
Mating for gas supply screwed 2 1/2" BSP internal	CHL 032
Mating for monotube screwed 4" BSP internal "	034
Mating for monotube, slip on 4" BSP pipe for welding	CHL 035

6) DRAUGHT DIVERTER

Fit the draught diverter to each boiler and complete flue.

7) ELECTRICAL CONNECTIONS

Connect the boilers to the electrical supply as in the wiring diagrams attached.

Where the boiler thermostat is to be used as the primary control method, fit links between 1 and 2, and 2 and 3.

When the links are fitted the supply to the boiler should be fused 3 Amp. for the 105, and 2 Amp. for the 70.

Where an external signal is fed to each module, do not fit links.

Fuse each supply to a module 1 Amp.

The boilers are now ready to be commissioned.

OPERATING and COMMISSIONING INSTRUCTIONS

8) FILLING THE SYSTEM

Fill the system slowly, using the air vents on each boiler (12 - Fig 1) to remove the air from the flow and return manifolds. The filling operation should be carried out with the flow and return isolating valves on each module (7 and 8 - Fig 1) fully open.

9) LIGHTING THE PILOTS

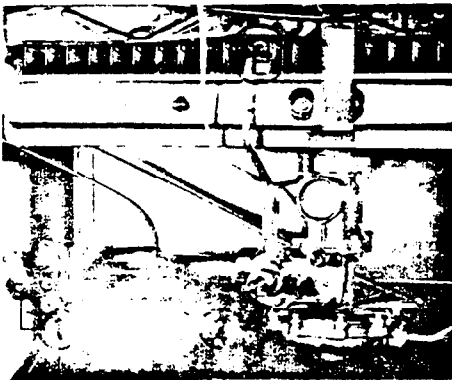


FIG. 7

Open the gas valve on each module by pulling the centre knob towards you (1 - Fig 7).

Depress the main gas control spindle (2 - Fig 7) and hold in. Light the pilot (circled - Fig 7) and wait for approximately 20 seconds.

Release the gas control spindle (2 - Fig 7) and the pilot should remain alight. If the pilot will not establish, check that the gas supply to each boiler is purged of air.

Repeat the lighting procedure.

Adjust the position of the thermocouple so that the top 3 mm ( $\frac{1}{8}$ " ) is enveloped in the pilot flame.

10) FIRING THE MODULES

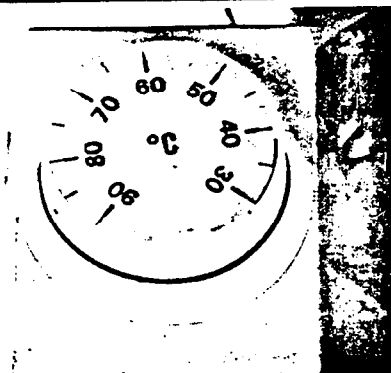


FIG. 8

Establish the pilots on all modules as in 9.

Set the boiler thermostat on each boiler (Fig 8) to a minimum, and check that all module isolating switches are off (24 - Fig 1). The switches are wired to be on when up, and off when down.

Set the primary circulation pump in operation, and check that all system circuits are open and will allow circulation.

Turn up the boiler thermostat (Fig 8) to the required value, and switch on the individual modules at the isolating switches. The modules should now fire.

11) CHECKING THE GAS RATE



FIG. 9

The gas rate of each module should be checked before completing the commissioning.

Turn off the module to be checked at the isolating switch (24 - Fig 1) and remove the cap from the volume governor (1 - Fig 9).

Remove the plug from the pressure test point on the front of the burner manifold and connect a suitable pressure gauge.

Turn on the module at the isolating switch and adjust the gas pressure to the value given in Technical Data on page 3.

OPERATING and COMMISSIONING INSTRUCTIONS Cont.

Earlier models of the Flexiflame 70 and 105 have a knurled ring fitted around the main gas valve spindle. Where this is fitted, screw in to reduce the gas rate, and screw out to increase the gas rate (2 - Fig 7).

12) SETTING THE BOILERS THERMOSTATS

Where the modules are operated by an external control, signal set the boiler thermostat to 5°C above the maximum expected return temperature.

Where the modules are to be controlled in sequence by the boiler thermostats, the following table details the intervals between thermostat settings for various design temperature drops around the system.

No of Boilers	Interval between thermostat settings °C.			
	T = 20°C	T = 15°C	T = 11°C	T = 8°C
2	10	7.5	5.5	4
3	7	5	4	3
4	5	4	3	2.5
5	4	3	2.5	-
6	3.5	2.5	-	-
7	3	-	-	-
8	2.5	-	-	-

Where the interval would be less than 2.5°C, it is recommended that boilers be grouped in pairs or threes, depending on the total number.

E.g. 1 - If 5 boilers were installed to provide a flow temperature of 82°C at a system drop of 11°C, the thermostat settings would be 82, 79.5, 77, 74.5 and 72°C. The boiler nearest the flow would be set at 82°C and the boiler nearest the return at 72°C.

E.g. 2 - If 8 boilers were installed to provide a flow temperature of 90°C at a system drop of 20°C, the thermostat settings would be 90, 87.5, 85, 82.5, 80, 77.5, 75, 72.5°C. The boiler nearest the flow would be set at 90°C and the boiler nearest the return at 72.5°C.

E.g. 3 - If 12 boilers were installed to provide a flow temperature of 82°C at a system drop of 11°C, the thermostat settings would be 82 for boilers 1 and 2, 79.5 for boiler 3 and 4, 77 for boilers 5 and 6, 74.5 for boilers 7 and 8, 72 for boilers 9 and 10, and 69.5 for boilers 11 and 12.

MAINTENANCE INSTRUCTIONS

13) FREQUENCY OF MAINTENANCE

Chaffoteaux Limited recommend that boilers receive detailed maintenance once every two years, and a visual examination at least once a year.

Spare parts lists and prices are available from the manufacturer and a short list of spares is included at the end of this leaflet.

Installers and clients are reminded that the boilers are fully guaranteed for twelve months from the date of receipt, and the heat exchangers guaranteed for five years from the date of receipt.

Your attention is drawn to the guarantee form at the end of this leaflet which should be completed and returned to Chaffoteaux Limited as soon as possible after receipt of the boiler.

14) TO REMOVE THE BURNER

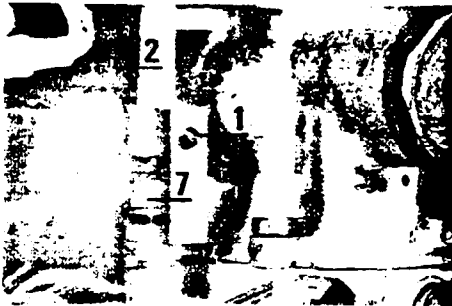


FIG. 10

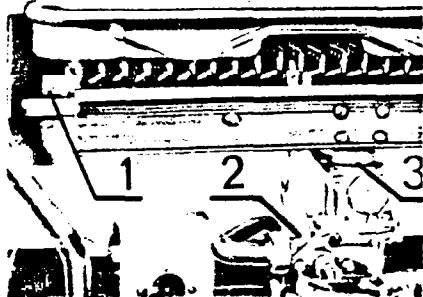


FIG. 11

Remove the boiler doors by lifting and pulling forwards at the bottom. It may be necessary to release the bolts securing the top panel.

Isolate the module to be serviced by turning the isolating switch off (24 - Fig 1) and close the flow and return isolating valves (7 and 8 - Fig 1).

Close the gas isolating valve by pressing the lever around the central knob (6 - Fig 1).

Release the screw (1 - Fig 10) holding the pilot supply pipe and remove the pipe (2 - Fig 10).

Unscrew the union securing the thermocouple to the electromagnet at the rear of the gas section (4 - Fig 1).

Remove the screws holding the burner to the back plate (1 - Fig 11).

Unscrew the union nut securing the burner to the gas section (2 - Fig 11) and remove the burner.

Clean the burner by removing any deposits with a brush.

15) TO REMOVE THE PILOT

Isolate the module as detailed in 14.

Release the screw (1 - Fig 10) holding the pilot supply pipe and remove the pipe (2 - Fig 10).

Unscrew the pilot injector (7 - Fig 10) and replace if necessary. Do not attempt to clean the pilot injector as this could result in damage.

16) TO REMOVE THE BURNER MANIFOLD

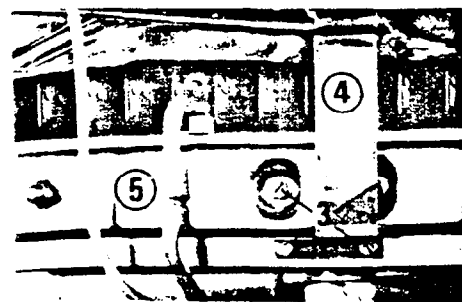


FIG. 12

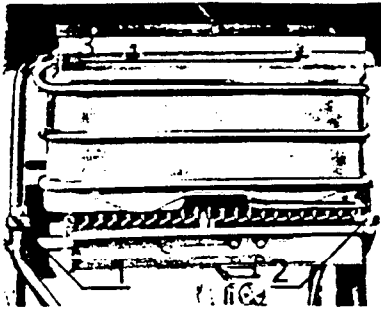
Isolate the module as detailed in 14.

Remove the pilot supply pipe as in 14.

Unscrew the manifold retaining screws (3 - Fig 12) taking care not to release the fusible overhear link. Remove the burner manifold and clean away any lint with a soft brush.

MAINTENANCE INSTRUCTIONS Cont.

17) TO REMOVE THE HEAT EXCHANGER



Isolate the module as in 14.

Remove the burner as in 14.

Drain down the module using the drain plugs fitted to the flow and return isolating valves (7 and 8 - Fig 1).

Unscrew the unions securing the heat exchanger to the flow and return isolating valves (1 and 2 - Fig 13).

Remove the retaining plate from within the heat exchanger (4 - Fig 13).

Remove the retaining plate from the top of the heat exchanger (3 - Fig 13).

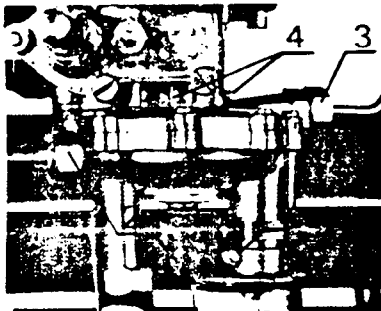
Ease the heat exchanger forwards at the bottom and remove.

Clean the heat exchanger with very hot water and detergent. Do not use wire wool or similar.

Replace the heat exchanger using new washers where necessary.

Replace the burner.

18) TO REMOVE THE DIAPHRAGM



Isolate the module as in 14.

Drain down the module as in 17.

Disconnect the high and low pressure pipes from the water section (2 and 3 - Fig 14).

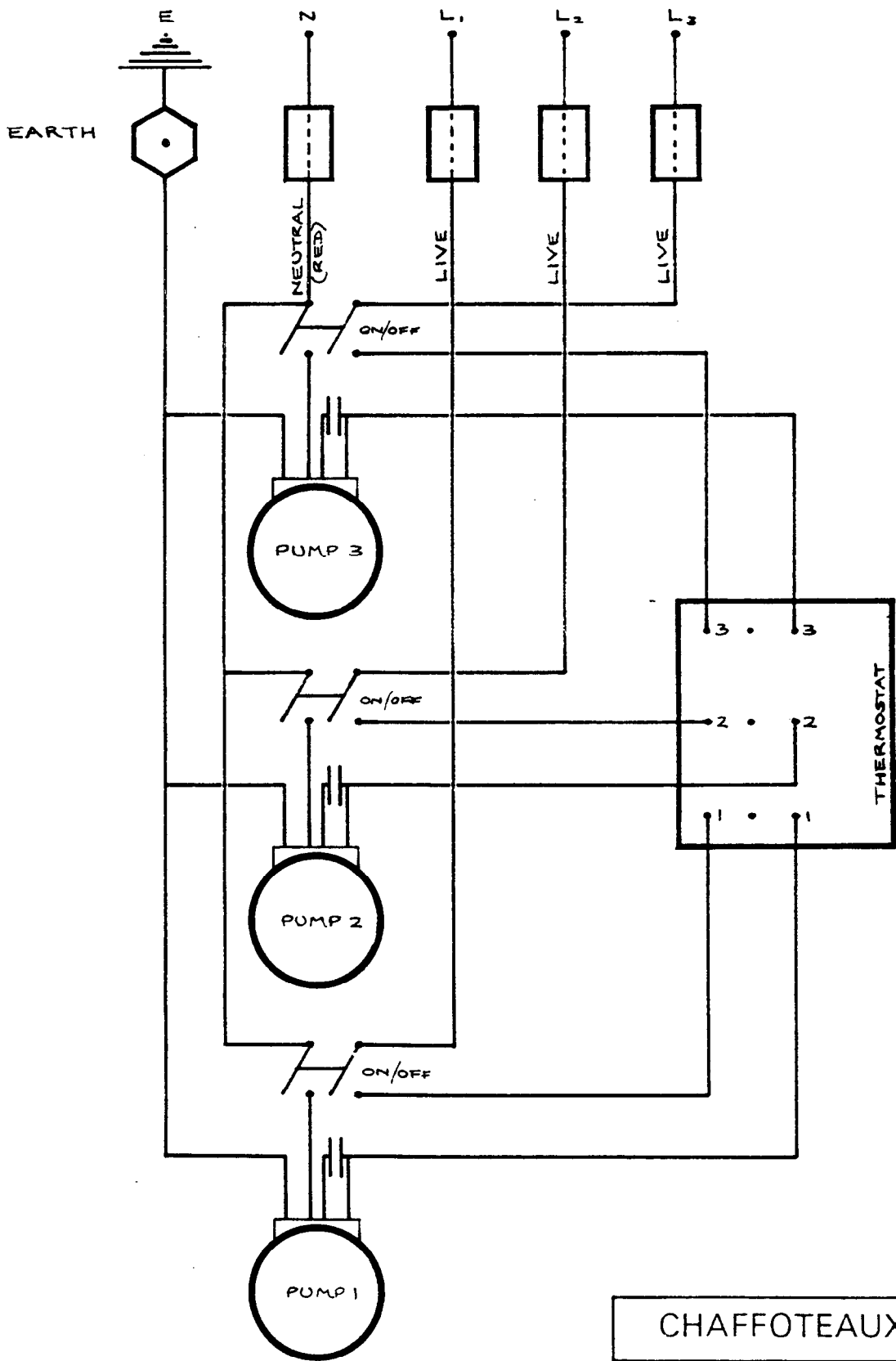
Unscrew the retaining screws holding the water section to the underside of the gas section (4 - Fig 14).

Remove water section.

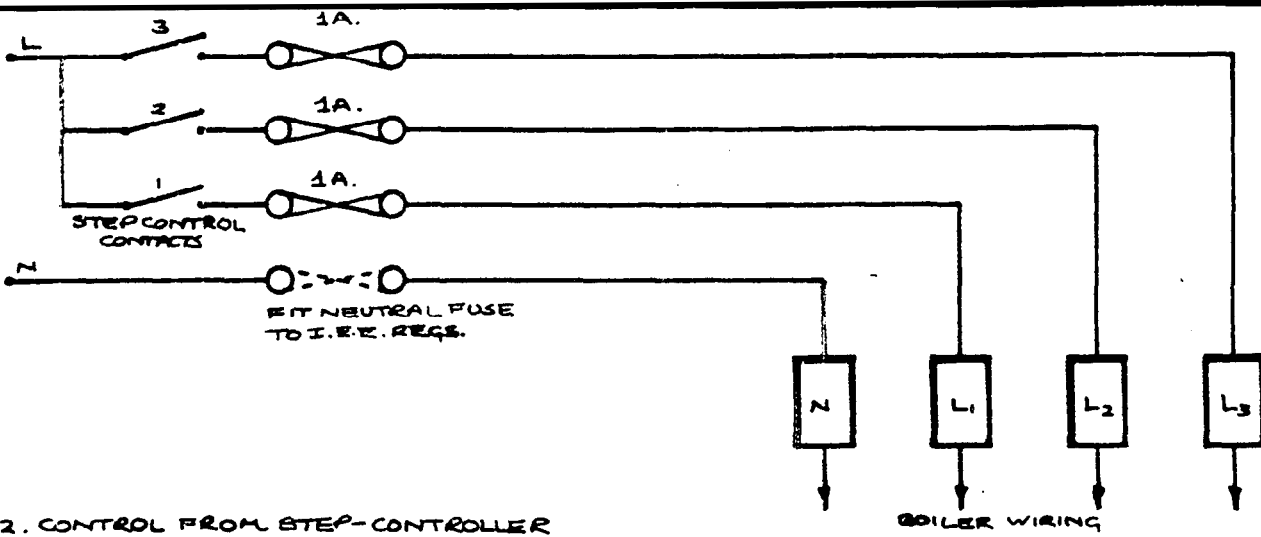
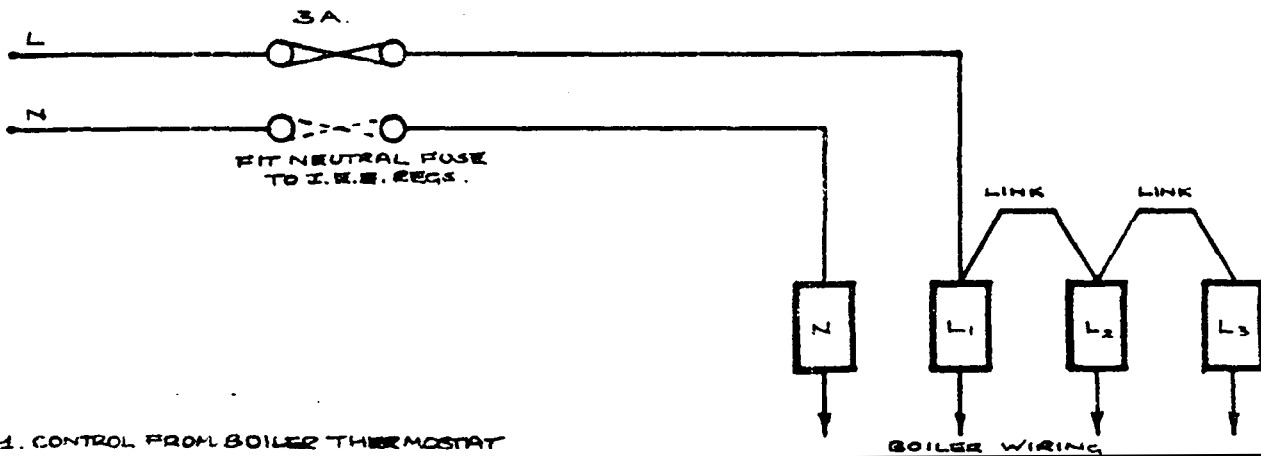
Remove screws from water section and split into two halves.

Replace the diaphragm and 'O' ring.

Reassemble water section and refit to module.



CHAFFOTEAUX LIMITED	
TITLE WIRING DIAGRAM FLEXIFLAME 105	
CLIENT —	
SCALE —	DATE SEPT. 1976
DRWG. No. —	DRN. BY BA



<b>CHAFFOTEAUX LIMITED</b>	
TITLE ALTERNATIVE WIRING FOR FLEXIFLAME 105	
CLIENT	
SCALE	DATE SEPT. 1976
DRWG. No.	DRN. BY PM

## FAULT FINDING GUIDE

### FLEXIFLAME G70 & G105 Boilers

FAULT	POSSIBLE CAUSE	REMEDY
A) Pilot will not light	1) Gas supply not turned on.	Turn on
	2) Spillage Fusible device Fused.	Replace Fusible device and reset gas cock. Refer to section 'F'
	3) Gas supply not purged of air	Purge
	4) Pilot injector blocked	Clean or replace
B) Pilot Goes out When gas knob is released	1) Gas Control knob not fully held in before releasing.	Press firmly before releasing
	2) Thermocouple not in tip of pilot flame	Adjust
	3) Faulty thermoelectric or union loose	Replace or tighten
	4) Faulty thermoelectric valve	Replace
	5) Main gas valve not purged	Repeat ignition procedure
	6) Fusible link overheat device fused	Replace and investigate
	7) Loose connection on fusible link	Tighten
	8) Insulation washers incorrectly fitted in link carrier	Refit
	9) Fusible link shorting out to carrier	Refit.
	10) Pilot flame too soft	Clean pilot tube and or tighten pilot injector securing nut.
C) Main Burner will not light or lights at Low Flame	1) Electricity supply not turned on.	Turn on
	2) Switch/es on control box not turned on.	Turn on
	3) Fuses missing or blown in control box.	Replace
	4) Boiler thermostat at low setting	Turn up
	5) Boiler thermostat faulty	Replace or check connections.
	6) Gas supply insufficient	Investigate! 8" w.g. required at appliance inlet.
	7) Lack of water in system	Refill
	8) Low Flow rate through module Air in system or pump duty failing	Purge module or replace pump
	9) High or low pressure tubes blocked	Remove and clean
	10) Bearing plate spindle bent or dry	Replace or grease
	11) Diaphragm split or stretched	Replace
	12) Heat exchanger blocked	Descale or replace
	13) Pump siezed	Free off or replace
D) Complaints of Noise	1) Overgassed	Check gas rate and adjust

