

# PART K. AIR HEATER – Parts List

## K. SHORT LIST OF SPARE PARTS FOR MODEL J70-90 WARM AIR HEATER

Gas Council Appliance Number 42 416 76

G.C. Number	Maker's Part No.	Description	Qty.
	BOS 858	Air Circulating Fan with Integral Motor, 8 mf capacitor, and Amp-lock cap BOS 227 – 240 volts. Ref. FFB0806/009	1
	5.0017	Replacement Fan Motor, ½ h.p., 8 mf cap	1
	BOS 977	Filter – Mesh Metal (Aluminium) size 18½ in. x 17 in.	1
	J70-90/146Y	Filter Tray Assembly	1
	BOS 833	Electrical Control Panel	1
23-01-57	BOS 566	Fan Speed Selector Plug	1
	BOS 104	Fan Control Switch Honeywell L4068C	1
	BOS 105	Limit Control Switch Honeywell L4069C	1
	BOS 859	Combination Gas Control Honeywell V8800C/1048	1
39-02-10	BOS 36	Thermocouple 30 in. Honeywell Q309/1236	1
39-57-81	BOS 360	Thermostat Honeywell T803A/1001	1
23-02-67	BOS 689	Fuse 3 amp 1 in. long ceramic	1
	BOS 311	Pilot Burner Honeywell Q314A/4834	1
	J70-90/700W	Burner Bar Assembly – Towns Gas Groups 4-5-6, Natural Gas and Propane	1
	BBA 3825/G	Main Injector – Towns Gas Groups 4 and 5 – 5 mm dia.	3
	BBA 3825/H	Main Injector – Towns Gas Group 6 – 5.5 mm dia.	3
	BOS 855/1	Crosslighting Injector, Bray size 960/400	1
	BOS 457	Thermostat Plug – Belling & Lee Ref. L1495/P	1
<b>ADDITIONAL SPARES FOR NATURAL GAS</b>			
	BBA 3825/F	Main Injector – Natural Gas – 2.6 mm dia.	3
	BOS 855/2	Crosslighting Injector, Bray size 960/100	1
	BOS 371/1	Pilot Burner Orifice, Honeywell BCR 18 390686/4	1
<b>WHEN A TIME CONTROL IS FITTED (optional extra) THE FOLLOWING SPARE IS AVAILABLE</b>			
30-60-68	BOS 310	Horstmann Time Control – Type Emerald 423 J & S 4W	1



## J70-90 DOWNFLOW WARM AIR HEATER

(56-53)  
UDC 697.3

## Installation & Maintenance Instructions

Publication JA141

The J70-90 is a Gas-Fired Warm Air Heater for conventional flue application. Output is adjustable between 20.5–26.4 kW (73.8 MJ/h 70,000 Btu/h – 95 MJ/h 90,000 Btu/h) and there is a five-speed fan adjustment.

The Air Heater has an internal mounting for easy on-site installation of a Time Control. Order from Johnson & Starley Ltd. an X-A Time Control, this is a Horstmann Emerald Control complete with wiring tail and plug.

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### PART A. AIR HEATER – Components

#### A. COMPONENTS CHECK

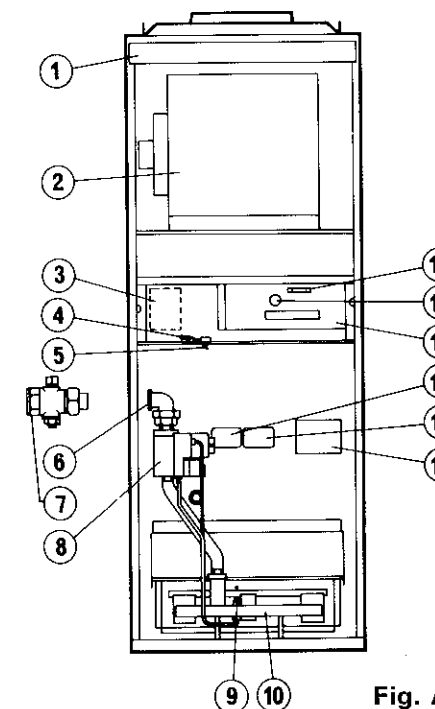


Fig. A1

#### J70-90 Air Heater

1. Air Filter
2. Air Circulating Fan
3. Time Control (if fitted)
4. Plug-in Connection for X-A Time Control
5. Summer Ventilation Switch
6. Gas Connection Elbow (¾" B.S.P.)
7. Union Gas Cock (¾" B.S.P. Female) (Supplied loose)
8. Combination Gas Control
9. Safety Pilot Burner
10. Multi-gas Burner
11. Fuse – 3 amp
12. Fan Speed Selector
13. Electrical Panel
14. Fan Control
15. Overheat Limit Switch
16. Heater Data Plate

Item	Qty.
GAS COCK	1
NUTS For Base	2
BOLTS Duct fixing	2
WASHERS	4
ROOM THERMOSTAT	1 (Supplied separately)

Item	Qty.
DRAUGHT DIVERTER	1
DRAUGHT DIVERTER FIXING SCREWS	4 Supplied in position on top of heater
2-PIN PLUG (for connection of room thermostat)	1 Supplied in linen bag

Check that Gas Group on heater data plate is as required.

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## PART B. AIR HEATER – Installation

### B. WARM AIR INSTALLATION REQUIREMENTS

Installation should be in accordance with:

Building Regulations.

British Standard Code of Practice CP 332, Part 4.

Institute of Electrical Engineers Regulations.

British Standard Code of Practice CP 337:1963 (Flues for Gas Appliances).

This appliance should be installed by a registered CORGI Installer.

#### (a) Ventilation of Heater Compartment

	Ventilation from inside building free area	Ventilation direct from outside building free area
Low Level grille	90 in <sup>2</sup> (580 cm <sup>2</sup> )	45 in <sup>2</sup> (290 cm <sup>2</sup> )
High Level grille	45 in <sup>2</sup> (290 cm <sup>2</sup> )	22.5 in <sup>2</sup> (145 cm <sup>2</sup> )

#### (b) Ventilation of Building

A purpose designed ventilation opening must be provided in an outside wall. This opening must be either:

- Into the room containing the heater, or
- Into an adjacent room which has a purpose designed opening into the room containing the heater.

Openings must have minimum effective areas of 22.5 in<sup>2</sup> (145 cm<sup>2</sup>).

#### (c) Return Air

Return Air Grille/s must be connected to the return air opening of the air heater by duct/s. Each heated room, with the exception of Kitchens, Bathrooms and W.C.s, must have either a return air grille or purpose made relief opening communicating with a collection area served by a return air grille. Openings must have minimum areas of 1 in<sup>2</sup> per 250 Btu/h (25 cm<sup>2</sup> per MJ/h) of designed heat input to the rooms they serve.

### C. PREPARATION

#### (a) Flues

A single 5 in. flue is required; lightweight asbestos treated with vinyl is recommended. Untreated asbestos MUST NOT be used if the flue is more than 20 ft. (6.1 m) long.

#### (b) Electrical Connections

- MAINS.** The heater is supplied complete with mains cable connected to the terminal strip, this cable can leave heater at either side. It is recommended that the appliance is wired through a double pole switch, fused at 5 amps, or, an unswitched socket outlet with plug fused at 5 amps. The earth wire must be fitted.
- ROOM THERMOSTAT.** A 24 volt 2-pin socket is provided on the right hand (facing) side of the heater. The 2-pin plug provided should be connected to the 24 volt room thermostat wires brought into the heater cupboard, and plug fitted to heater socket. Alternatively the thermostat wires may enter the left hand (facing) side of the heater but must then be connected directly to the terminal strip (terminals 4 and 5).
- TIME CONTROL.** A plug-in time control facility is provided on the air heater. Use X-A Time Control Kit (based on Horstmann Type 423 Emerald) obtainable only from Johnson & Starley Ltd. If a remote time control is required it is important that reference is made to the wiring diagram (see Section J), and an independent power supply is used.

#### (c) Gas Supply

The gas connection should be in  $\frac{3}{4}$  in. B.S.P. pipe or larger dependent upon length of pipe run from the meter. The gas pipe may enter the heater from either side. A  $\frac{3}{4}$  in. B.S.P. Gas Cock is supplied for external fitting.  
*Installation should conform to Local Gas Board requirements and Building Regulations.*

### H. DIMENSIONS AND DATA

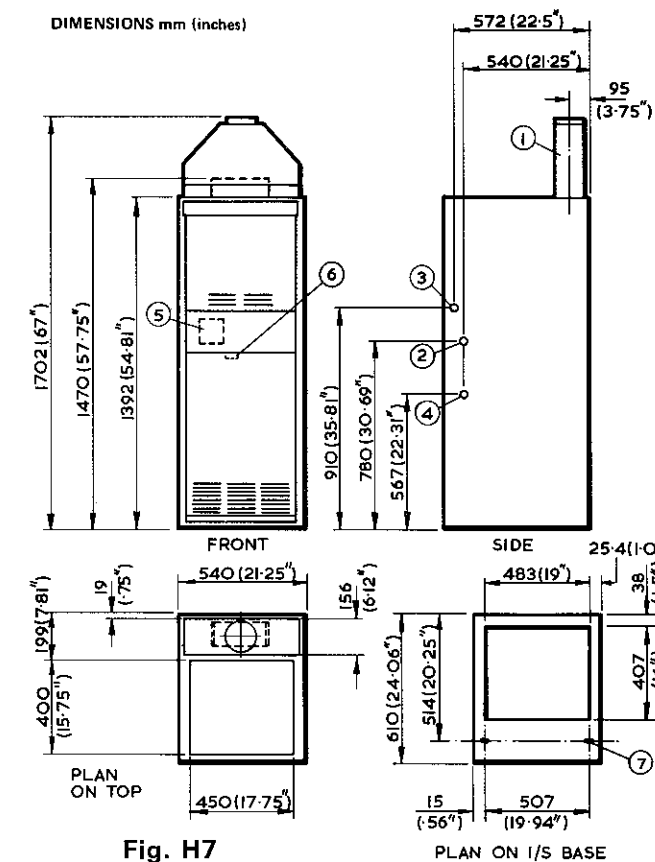


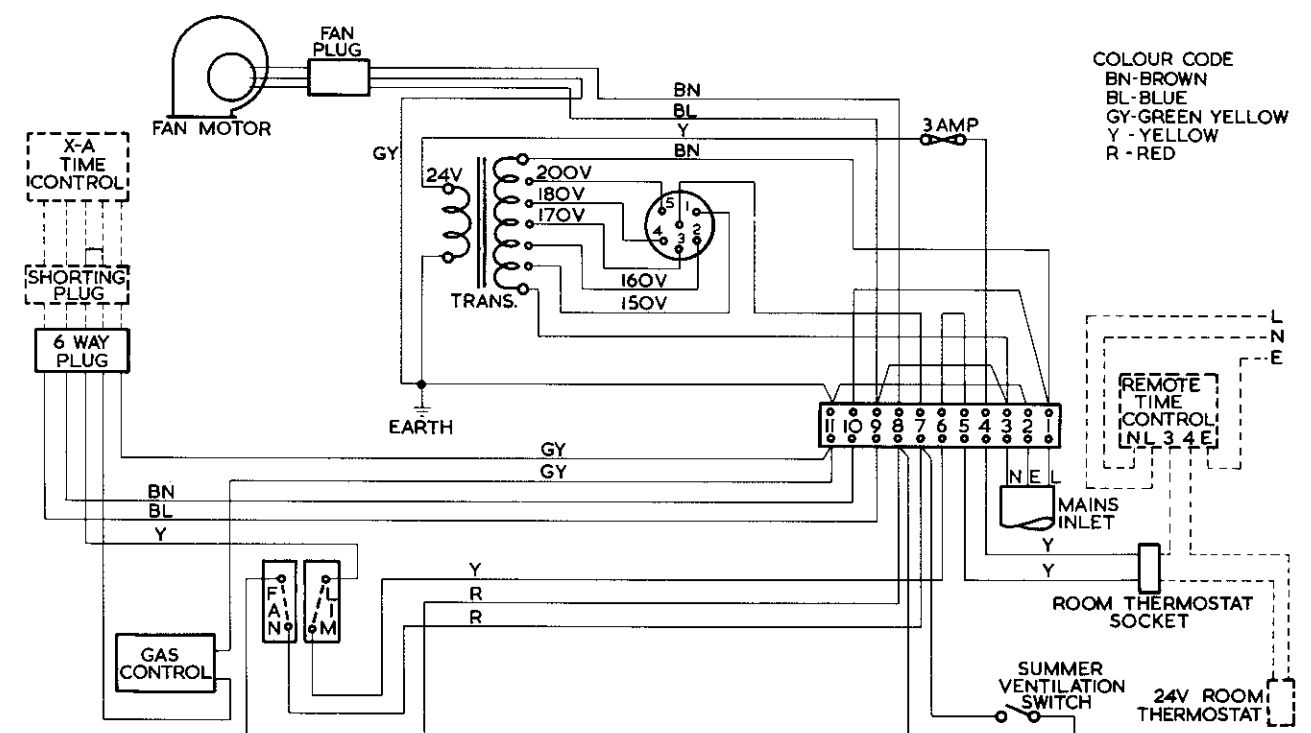
Fig. H7

### PART H. AIR HEATER – Dimensions

1. Draught Diverter.
2. Socket for Room Thermostat. R.H. side. (Plug also provided.)
3. Grommet for electrical connection (both sides).
4. Gas connection knockout (both sides).
5. X-A Time Control plug-in facility.
6. Summer ventilation switch.
7. Slots for fixing down bolts  $\frac{9}{32}$  in. by  $\frac{3}{4}$  in. long.

### PART J. AIR HEATER – Wiring Diagram

#### J. WIRING DIAGRAM



**PART G. AIR HEATER – Fault Finding**

**FAULT FINDING**

Symptom	Possible Cause	Remedy
(a) Pilot will not light.	(i) No gas supply to heater. (ii) Gas supply pipe not purged. (iii) Pilot orifice restricted.	Break gas cock union and listen for escape. Break gas cock union until gas is detected. Clear pilot orifice carefully or replace injector.
(b) Pilot lights but goes out on releasing 'START' button.	(i) Connection between thermocouple and gas control not secure. (ii) Faulty power unit on Gas Control. (iii) Faulty thermocouple. (iv) Pilot flame not sufficient.	Check connection is secure. Replace power unit – Honeywell Ref. 392393. Replace thermocouple. Adjust.
(c) Pilot lights but goes out after normal operation.	As above in (b)	As above in (b).
(d) Pilot alight but main burner not lighting.	(i) Mains electrical supply not connected to heater. (ii) Controls not calling for heat. (iii) 3 amp fuse failed. (iv) Loose connection on room thermostat, limit control, gas control head, time control or transformer. (v) Transformer open circuited. (vi) Gas Control operator faulty. (vii) Gas Control governor faulty. (viii) Limit control faulty. (ix) Faulty room thermostat or external wiring.	Check mains supply. Check time control (if fitted) and room thermostat are calling for heat. Replace and if failure occurs again check external room thermostat leads for shorting to earth. Check the connections for soundness. Check with test meter and replace electrical panel if necessary. Replace operator – Honeywell Ref. V804 Replace governor – Honeywell Ref. V5307 Check operation by shorting across control connections. Fit temporary loop in heater room thermostat socket. If heater fires, external circuit or room thermostat is faulty.
(e) Main burner lights but fan fails to operate.	(i) Loose electrical connection on fan control or fan plug and socket. (ii) Fan control settings incorrect. (iii) Faulty fan assembly. (iv) Faulty fan control. (v) Burner bar pressure not correct.	Check connections for soundness. Check settings suit system. Replace assembly ensuring that pressure is not placed on impeller or motor, or balance of assembly may be distorted. Replace component. Adjust pressure if necessary.
(f) Main burner operating intermittently with fan operating.	(i) Gas rate and burner bar pressure high. (ii) Temperature rise across unit excessive. (iii) Air filter or return air path restricted. (iv) Excessive number of registers closed.	Check gas rate and burner bar pressure. Adjust fan speed or gas rate accordingly. Check filter for cleanliness and return air for obstruction. Open additional registers.
(g) Main burner operating with intermittent fan operation.	(i) Gas rate or burner bar pressure low. (ii) Fan control settings incorrect.	Check gas rate and burner bar pressure. Check settings suit system.
(h) Fan continues running for excessive period or operates intermittently after main burner shuts down.	(i) Fan control settings incorrect.	As g (ii).
(i) Noisy operation.	(i) Gas pressure high. (ii) Noisy fan motor. (iii) Fan speed setting too high.	Check burner bar pressure. Replace fan motor. Adjust fan speed.

**PART C. AIR HEATER – Preparation**

**(d) Heater Installation Clearances**

Sides – 4 in. (100 mm) total  
1 in. (25 mm) minimum at only one side  
Front – 4 in. (100 mm) minimum  
Back – 2 in. (50 mm) minimum

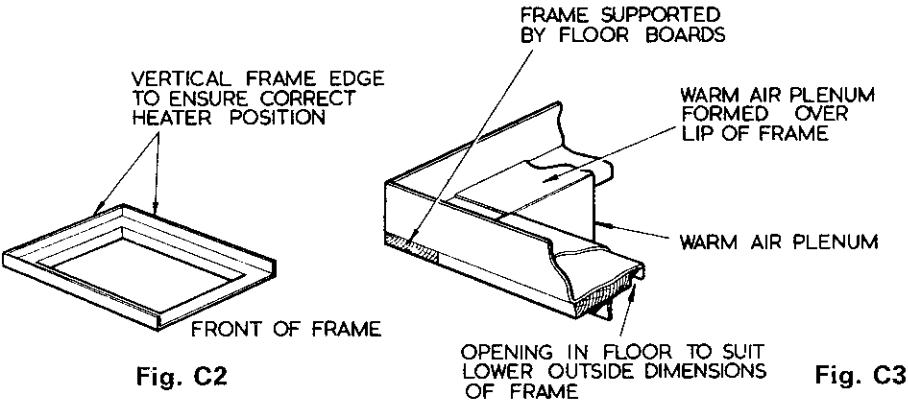
Servicing access required to the front of the heater is 22 in. (560 mm). It is recommended that the access door to the heater cupboard be large enough to permit heater removal.

**(e) Installation on Suspended Floors**

Combustible floors must be insulated from the heater.

**NOTE:**

When an underfloor warm air plenum is used, insulation can be provided by using a J & S Base Tray BT90 (see Figs. C2 and C3).



**Fig. C2**

**Fig. C3**

**PART D. AIR HEATER – Fixing**

**D. FIXING AIR HEATER**

- (a) **FIT DRAUGHT DIVERTER** over heater flue spigot on the top of heater and secure with four screws.
- (b) **POSITION HEATER ON PLENUM** or **BASE TRAY** when used. Make sure no air leakage can occur.
- (c) **CONNECT FLUE.** Use split clip above draught diverter and complete before return air plenum is fitted (flue must be supported to relieve weight from heater).
- (d) **CONNECT RETURN AIR DUCT.**
- (e) **MAKE GAS CONNECTION.** Fit gas cock provided.
- (f) **MAKE ELECTRICAL CONNECTIONS** – see Section C (b).

**PART E. AIR HEATER – Commissioning**

**E. COMMISSIONING**

- (a) Check that **REGISTERS** are open.
- (b) Set room thermostat anticipator to 0.2 and set the thermostat pointer to 'OFF' or lowest setting.
- (c) Check setting of **FAN** and **LIMIT** control.  
FAN 110°F OFF (40° DIFF.)  
LIMIT 200°F
- (d) Fit **GAS PRESSURE GAUGE** to test point.

		kW	MJ/h	Btu/h	kW	MJ/h	Btu/h	kW	MJ/h	Btu/h
Input		28.3	102	96,500	32	115	109,000	35.6	128	121,500
Output		20.5	73.8	70,000	23.5	84.5	80,000	26.4	95	90,000
Gas rate (500 cv)		193 ft³/h (5.46 m³/h)			218 ft³/h (6.17 m³/h)			243 ft³/h (6.88 m³/h)		
Gas rate (1000 cv)		96.5 ft³/h (2.73 m³/h)			109 ft³/h (3.08 m³/h)			121.5 ft³/h (3.44 m³/h)		
Gas	Injector									
	dia. mm	Burner Bar Pressures (measured hot)								
G4	5.0	2.5 mbar		1.0 in.	3.2 mbar		1.3 in.	4.0 mbar		1.6 in.
G5	5.0	3.0		1.2	3.8		1.5	4.7		1.9
G6	5.5	2.5		1.0	3.2		1.3	4.0		1.6
Natural	2.6	11.6		4.6	14.6		5.8	18.0		7.2
Propane	1.75	Lower rates not available						35.0		14.0

**Fig. E4**

## PART E. AIR HEATER – Commissioning

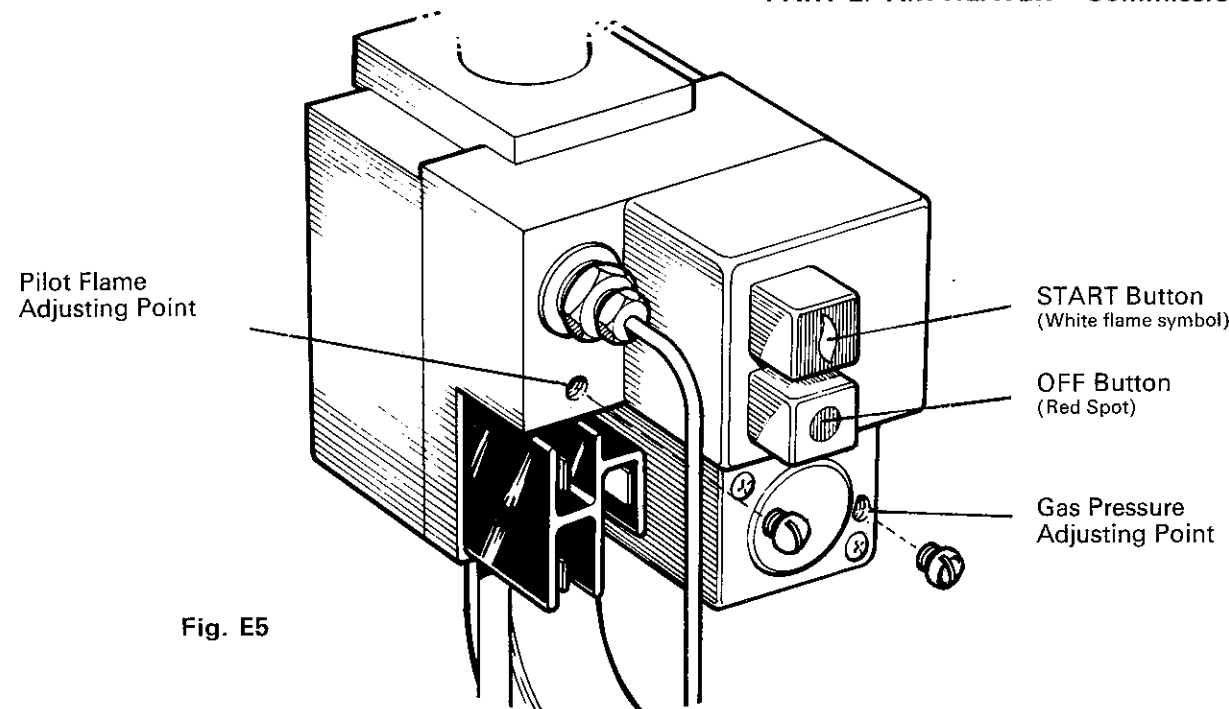


Fig. E5

- (e) Turn on GAS supply and bleed off air.
- (f) Switch on electricity. Summer ventilation switch should be at 'Auto'.
- (g) Light heater. See instructions mounted on inside of lower door of heater.
- (h) Adjust pilot flame if necessary so that it just envelops thermocouple tip. To adjust flame, remove screw cap from adjustment point (see Fig. E5) and turn screw *clockwise to decrease, anti-clockwise to increase* flame.
- (i) Adjust burner bar pressure to output required. (See Table Fig. E4). Heaters are factory set to pressure giving maximum output at gas group specified. To adjust pressure, remove screw cap from adjustment point (see Fig. E5) and turn screw *clockwise to increase, anti-clockwise to decrease* pressure.
- (k) Set Time Control if fitted.
- (l) Balance Warm Air System.  
Remove electrical panel cover. Adjustment of air circulating fan speed is by means of a selector plug on front of electrical panel.
  - (i) Adjust each register/diffuser damper and if necessary the air circulating fan speed to obtain designed cfm for each room.
  - (ii) Check temperature rise across air heater.
  - (iii) Re-adjust each register/diffuser damper if necessary.
  - (iv) Adjust Fan Control to suit system.
- (m) CHECK THAT FLUE OPERATES EFFECTIVELY with heating system on, all doors closed, and EXTRACT FAN/S, if fitted, running.

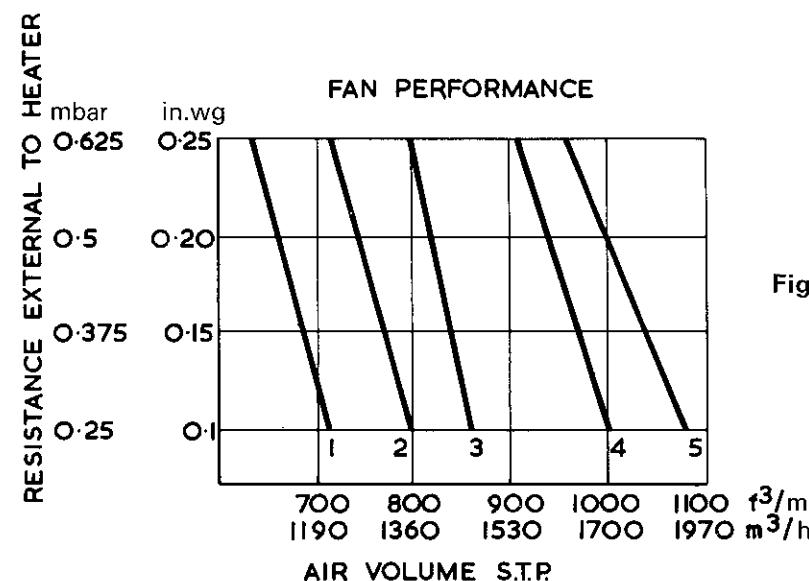


Fig. E6

## PART F. AIR HEATER – Maintenance

### F. MAINTENANCE

SWITCH OFF ELECTRICITY, REMOVE MAINS PLUG AND TURN OFF HEATER GAS COCK

Maintenance is recommended annually and should cover the following:

- (a) **Main Burner Cleaning**  
Remove Burner. Upon removal the burner merely requires a gentle removal of any dust which may have accumulated. *Under no circumstances should burner holes be enlarged or distorted, or brushed strongly.*
- (b) **Injector Cleaning (Main Injector, Pilot Burner and Cross Lighting Injector)**  
Remove injectors and clean carefully avoiding damage to orifice in each case. When injector replacement is a preferred alternative to cleaning, ensure that replacement injectors are of the correct orifice size.
- (c) **Thermocouple**  
Ensure that thermocouple connection to Gas Control is tight (finger tight plus quarter turn).
- (d) **Fan and Fan Motor Cleaning**  
Remove fan and fan motor. Remove all dust, etc. from both fan impeller and fan motor. *Great care must be taken whilst cleaning both items that the fan balance is not disturbed.*
- (e) **Gas Pressure Check**  
Attach a gas pressure gauge to gas pressure test point on burner manifold, light heater and check pressure and confirm by gas rate check at meter. See pressure table, Fig. E4, if gas pressure needs adjustment refer to Section E (i).
- (f) **Gas Control 'fail-safe' Operation Check**  
Reduce flame of pilot burner by turning screw clockwise at pilot flame adjusting point (see Fig. E5) until it extinguishes. Check that main burner extinguishes, i.e. gas control 'fails safe'.
- (g) **Pilot Flame Check**  
Pilot flame should just surround thermocouple probe. Adjust if necessary (see Section E (h)).
- (h) **Automatic Controls Inspection**  
Lighting the heater and allowing to run for a short time checks these controls.
- (j) **Heat Exchanger**  
The upper half of the appliance bulkhead, above the fan and limit controls, can be removed to expose plates at the top of each clamshell of the heat exchanger. These in turn can be removed to allow access for cleaning.

## PART G. AIR HEATER – Servicing

### G. SERVICING AND FAULT FINDING

SWITCH OFF ELECTRICAL SUPPLY TO HEATER BEFORE SERVICING

- (a) **Electrical Panel Cover** is removed by releasing the two screws – one either side of front face.
- (b) **Time Control Removal (if fitted)**
  - (i) With the electrical panel removed as in (a) above, loosen the fixing screw in the bottom wall of the time control casing and withdraw the casing.
  - (ii) Disconnect leads from time control terminal block, noting their respective positions.
  - (iii) Release the mounting screw (situated centrally on the rear top face of the mechanism); lift slightly and withdraw mechanism.
  - (iv) Position replacement mechanism on to the lugs of the mounting plate and lock by a downward movement of about  $\frac{1}{8}$  in. (3 mm). Tighten mounting screw and remake electrical connections.
- (c) **Electrical Panel Removal**
  - (i) Remove electrical panel cover as in (a) above.
  - (ii) Slide out filter tray. Undo two retaining screws from fan compartment door, lift door upwards and remove.
  - (iii) Disconnect fan plug and remove socket from fan compartment floor.
  - (iv) Disconnect all leads from terminal block, noting their respective positions.
  - (v) Undo three retaining screws and remove panel, from electrical chassis.
  - (vi) For replacement of electrical panel reverse above procedure.
- (d) **Fuse**  
Remove electrical panel cover for access to 3 amp fuse.
- (e) **Air Circulating Fan**  
Remove filter tray, electrical panel cover and fan compartment door for access to air circulating fan.