



# JT/RS 22-25 MK 2 SERIES AIR HEATERS for SE-Duct and Balanced Flue Applications (MODAIRFLOW and Conventional Control)

(56-53)
UDC 697.3

## Installation, Commissioning & Servicing Instructions

Publication ZZ319

**NOTE:** For Balanced Flue Installation refer to instructions in BF25 Fittings Kit.

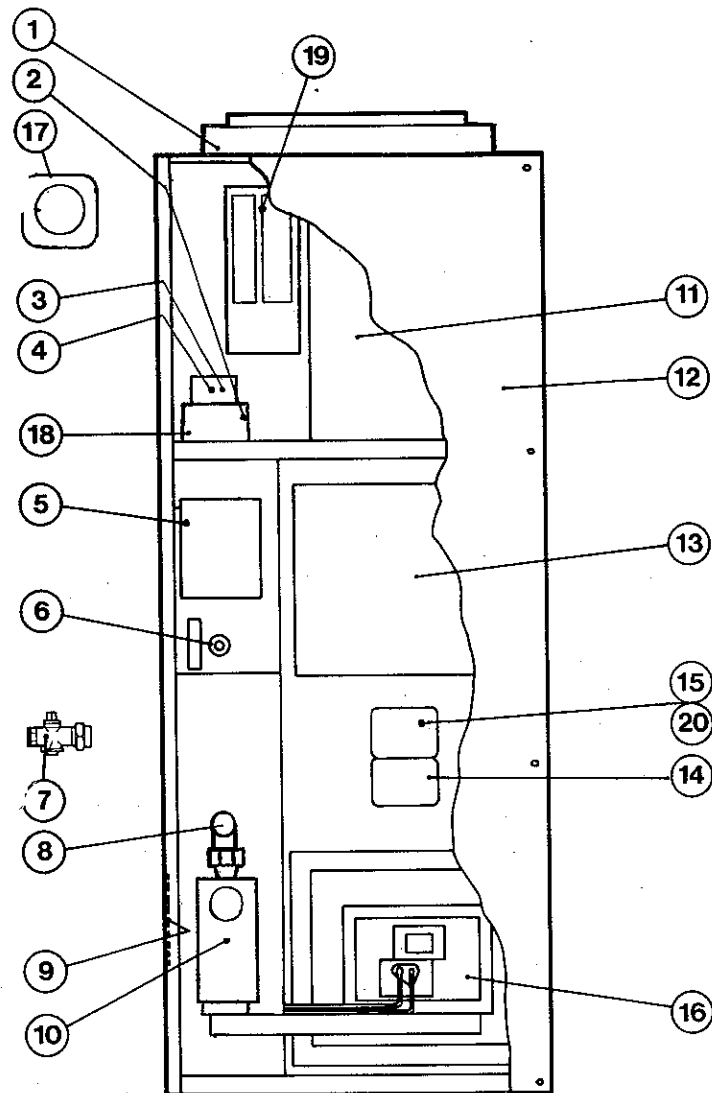


Fig. 1

1. Air Filter.
2. Electrical Panel.
3. Fan Speed Selector.
4. Fuse.
5. Time Control (Clock).
6. Lighting Button.
7. Service Gas Cock  $\frac{1}{2}$ " B.S.P. Female (supplied loose).
8. Gas Connection.
9. Heater Data Plate.
10. Multifunctional Gas Control.
11. Air Circulating Fan.
12. Heater Front Cover.
13. Heat Exchanger Access Cover Plate.
14. Limit Switch.
15. Fan Switch.
16. Main Burner Assembly.

### MODAIRFLOW Control Heaters only:

17. Thermosta-stat (supplied loose).
18. Electronic Panel.
19. Fan Speed Regulator.
20. Air Flow Sensor.

Installation shall be in accordance with:  
Building Regulations.  
British Standard BS 5864  
Institute of Electrical Engineers Regulations  
British Standard BS 5440 Pts. 1 & 2  
British Gas Material and Installation Spec. Latest Edition.  
Gas Safety Regulations.

CP 331 Pt. 3  
CP 3 Chapter IV Pts. 1-3 } applicable only to installations  
in new buildings.



## 2. VENTILATION REQUIREMENTS

### Ventilation of Heater Compartment

A room sealed appliance does not require a combustion air vents in the room or internal space in which it is installed.

When appliance is installed in a compartment ventilation air vents to the compartment at both high and low levels should be:

Ventilation from inside building	Low level	91cm <sup>2</sup> (14in <sup>2</sup> )	} Minimum acceptable free areas
	High level	91cm <sup>2</sup> (14in <sup>2</sup> )	
Ventilation from outside building	Low level	45cm <sup>2</sup> (7in <sup>2</sup> )	}
	High level	45cm <sup>2</sup> (7in <sup>2</sup> )	

## 3. PREPARATION

### SE-DUCT Connections

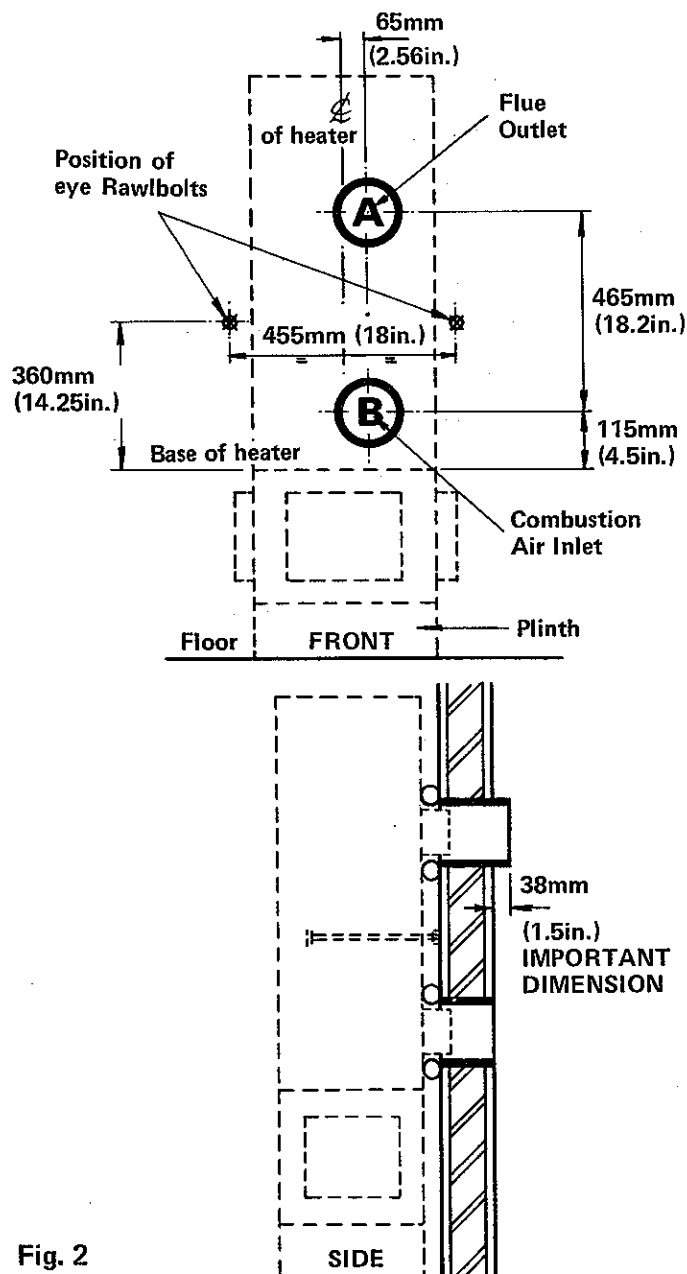


Fig. 2

Openings to receive heater spigots must be provided in SE-duct face by cementing pieces of 125mm (5in) I/D tube of suitable non-combustible material into holes A and B as shown in Fig. 2.

**IMPORTANT:** Ends of above tube are to be flush with SE-duct except at A where the pipe must project 38mm (1.5in) into duct.

Fix Rawlbolts as supplied for tie bar fixing at positions shown in Fig. 2, ensuring firm anchorage.

Existing holes must be sealed with cement to give a smooth inside face. Ensure that sealing arrangement used is leak free and does not interfere with heater sealing washers.

**IMPORTANT:** Any debris which falls into the SE-duct must be removed.

If in any doubt contact your local British Gas Service Department.

### Electrical Connections

**MAINS:** The heater is supplied complete with mains cable (PVC sheathed, high temp. resistant, 3 core, 5A, 0.75mm<sup>2</sup>) which leaves the heater at the top. This cable, suitable for 240V, 50Hz, single phase supply, must be protected by a 3A fuse and the earth wire connected. A double pole switch or fused spur box should be used or, a 3-pin plug into an unswitched socket outlet.

**THERMOSTAT/THERMISTA-STAT:** Should be positioned on an internal wall approximately 1.5m (5ft) from the floor, away from direct sunlight, draughts and local warmth. A two pin plug connection is provided on the electrical/electronic panel.

**IMPORTANT (MODAIFLOW Models only):** On original installations, the Thermista-stat replaces the conventional room thermostat and polarity of the connecting wires must be observed i.e. side marked + on Thermista-stat to be connected to the yellow wire of the two pin connection.

### Gas Supply

The gas pipe may enter the heater from either side through the slots provided.

### Heater Installation Clearances

There must be 50mm (2in) minimum clearance at either side of the heater.

A servicing access of 300mm (12in) is required to the front of the heater and it is recommended that the access door to the heater cupboard be large enough to permit heater removal.

### Return Air

The heater may be installed without return air ducting. The path between return air grille and appliance return air inlet must be protected in such a manner that the required airflow is maintained at all times, and that user access to the fan compartment is prevented.

## 4. AIR HEATER INSTALLATION

If Side Return Air is to be used, it will be necessary to prepare heater prior to fixing. **NOTE:** Return air ducting may be connected to either side of the heater.

Method:—

Remove Air Filter, Front Cover of Heater and Air Circulating Fan.

Cut hole in chosen side of heater cabinet. The Knockouts determine its size and position.

Undo screws from around filter frame and remove frame. Retain screws

Place frame centrally over prepared hole so that the top front is flush with front of heater.

Mark through from frame to position fixing screw holes and drill No. 30 (1.28in) dia.

Screw frame to side of heater using retained screws.

Replace Fan, Front Cover and Filter.

Using a suitable material, make a plate to cover the original filter opening in the top of the heater and secure.

### SE-Duct — using SE25 Fixing Kit

Fit orifice cup as supplied into upper spigot of heater as shown in Fig. 3 and retain with self-tapping screws.

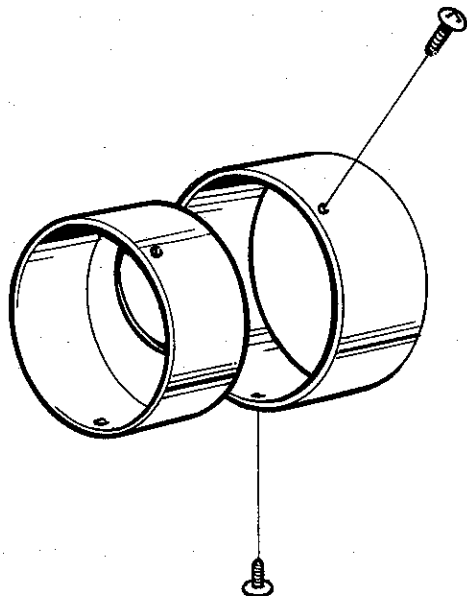


Fig. 3

Fit threaded end of each tie-rod through respective hole in clamping bracket. Start nut on thread and insert clamping brackets into slots provided in cabinet sides.

Fit sealing washers to both rear spigots and carefully lift heater onto base duct (plenum box) so that spigots engage SE-Duct.

Hook each tie-rod in Rawlbolt eye and tighten each side so that sealing washers compress evenly to form an effective seal between back of heater and SE-Duct. Complete return air connections as required.

#### Electrical Connections

Remove front cover of heater and arrange mains lead to exit through fixed grommet provided in top of heater. Connect mains lead to supply using plug fused 3A.

Thermostat or Thermista-stat wires to be connected to the 2-pin connection provided on the left hand top face of the heater.

**IMPORTANT — MODAIFLOW Models only:** When connecting the Thermista-stat, correct polarity must be observed i.e. side marked + on Thermista-stat to be connected to the yellow wire of the two pin connection.

If a summer switch is required, fit switch in a suitable position external to the heater and connect wires to terminals 7 and 8 as shown on wiring diagram.

## 5. COMMISSIONING

### (a) Conventional Control Models only

Check that warm air delivery outlets are open.

Set room thermostat anticipator to 0.2 and set thermostat pointer to OFF or lowest setting.

Check settings of FAN and LIMIT controls:  
FAN 100°F OFF (10°F DIFF)

LIMIT 200°F and **must not** be adjusted.

Fit gas pressure gauge to test point.

Turn on gas supply and bleed off air.

Light Pilot Burner — see instructions on appliance.

Adjust pilot flame if necessary so that it just surrounds thermocouple probe (approximately 15mm in length).

Switch on electricity.

Turn thermostat to MAXIMUM setting and ensure that Time Control is at an ON period.

Check that main burner lights.

Check for gas soundness.

### Balance Warm Air System

Remove heater Front Cover and fit fan speed selector plug to a number corresponding with the fan curve selected from Fig. 6.

Adjust burner bar pressure to output required (see table Fig. 5). NOTE: Heaters are factory set to a pressure giving maximum output. To adjust pressure, remove cover from adjustment point (see Fig. S4) and turn screw **clockwise to increase, anti-clockwise to decrease** pressure. Enter pressure in space provided on Data Plate — see Fig. 1.

With front cover of heater in place, check velocities to design figures. Adjust fan speed if necessary by the fan speed selector plug.

NOTE: If the system includes ceiling diffusers, it is important that the velocities of the air through these (except in very small rooms e.g. bathrooms etc.) is at least 1.5 m/s (300 ft/m). To achieve this, it may be necessary to blank off part of the outlet face.

Check temperature rise across heater (85°–100°F) and adjust fan speed if necessary.

### Check 'fail-safe' operation of Multifunctional Control.

With main burner off, reduce pilot burner flame by turning screw at pilot flame adjustment point clockwise until it extinguishes. After 50-90 seconds, a loud click should be heard i.e. control has failed safe.

Reset pilot burner flame so that it just surrounds thermocouple probe (approximately 15mm in length)

**Check Overheat Limit Control** by operating heater with main burner alight and fan disconnected — main burner must extinguish within 3-5 minutes.

**Automatic Controls Check.** Lighting the heater and allowing to run for a short time checks these controls.

Check for gas soundness.

Check that flue operates effectively with heating system on, all doors closed and extractor fan/s if fitted, running.

### (b) MODAIFLOW Models only.

Check that warm air delivery outlets are open.

Check LIMIT control is correctly set:-  
LIMIT 200°F and **must not** be adjusted.

Fit gas pressure gauge to test point.

Turn on gas supply and bleed off air.

Light Pilot Burner — see instructions on appliance.

Adjust pilot flame if necessary so that it just surrounds thermocouple probe (approximately 15mm in length).

Switch on electricity.

Turn Thermista-stat to MAXIMUM setting and ensure that Time Control is at an ON period.

Check that main burner lights.

Check for gas soundness

### Balance Warm Air System

Remove front cover of heater for access to Electronic Panel.

Set Fan Override Switch to CONTINUOUS.

Turn Balancing Knob to a number corresponding with the fan curve selected from Fig. 6 — fan should run at selected speed.

Adjust burner bar pressure to output required (see table Fig. 5). NOTE: Heaters are factory set to a pressure giving maximum output. To adjust pressure, remove cover from adjustment point (see Fig. 4) and turn screw clockwise to increase, anti-clockwise to decrease pressure.

Enter pressure in space provided on Data Plate — see Fig. 1.

With front cover of heater in place, check velocities to design figures. Adjust fan speed if necessary by using the BALANCING KNOB.

NOTE: If the system includes ceiling diffusers, it is important that the velocities of air through these (except in very small rooms like bathrooms etc) is at least 1.5 m/s (300 ft/m). To achieve this, it may be necessary to blank-off part of the outlet face.

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### HONEYWELL MULTIFUNCTIONAL GAS CONTROL

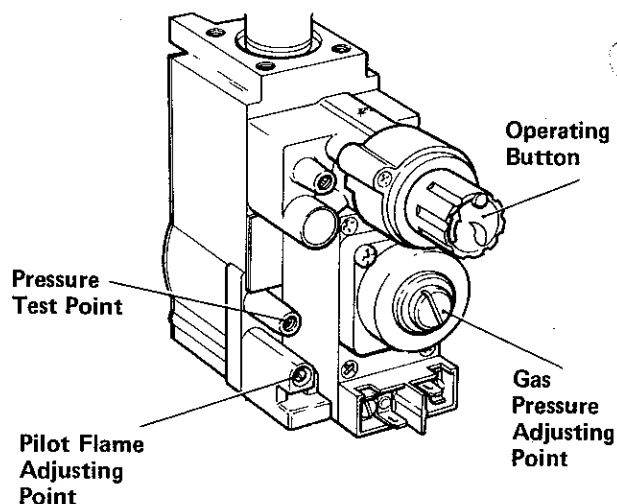


Fig. 4

	kW	MJ/h	Btu/h	kW	MJ/h	Btu/h
INPUT	9.01	32.45	30,750	10.22	36.80	34,880
OUTPUT	6.44	23.21	22,000	7.33	26.38	25,000
GAS INJECTOR Dia.	BURNER BAR GAS PRESSURES (measured hot)					
NAT 1.9mm	11.5mbar	4.6 in. wg	15.2mbar	6.1 in. wg		

Fig. 5

### Fan Performance Curves

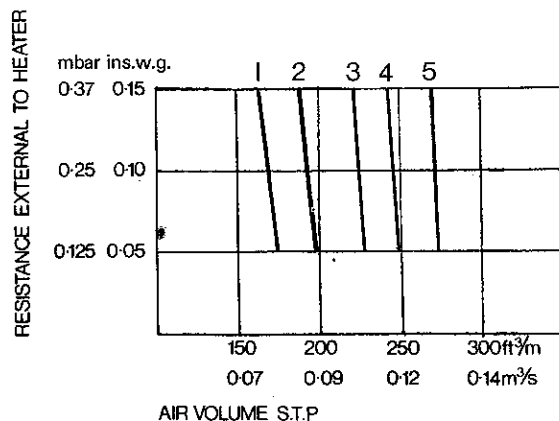


Fig. 6

## 6. SERVICING

Switch off electricity, remove mains plug and turn off service gas cock.

Removal of heater Front Cover allows complete access for servicing.

### Main Burner Cleaning

Remove pilot gas feed by disconnecting from elbow at burner door and multifunctional control.

Undo thermocouple connection at burner door and bend away.

Pull off electrode connecting lead at rear of igniter.

Remove screws surrounding burner door and release union connection at multifunctional control.

Remove burner assembly complete and lightly brush burner ports. **Under no circumstances should burner holes be enlarged, distorted and brushed strongly.**

### Injector Cleaning — (Main Burner and Pilot Burner).

Unscrew to remove and clean carefully avoiding damage in each case. Take care not to distort baffle plate near main injector.

When injector replacement is a preferred alternative to cleaning, ensure that replacement injectors are of the correct orifice size.

### Thermocouple

Ensure that thermocouple connection to gas control is tight (finger tight + quarter turn).

### Gas Pressure Check

Attach a gas pressure gauge to pressure test point on gas control. Light heater, check pressure and confirm by gas rate check at meter, adjust pressure if necessary — (see Section 5).

**NOTE:** Should Pilot Burner fail to light and electrode igniter is suspect, the electrode can be changed easily by releasing back nut where it enters the burner door and by pulling off the connecting lead at the rear of the igniter.

## 7. FAULT FINDING

**NOTE:** When purging or checking gas supplies, ensure there is adequate ventilation to the room or cupboard and all naked lights are extinguished.

### MODAIRFLOW Models only:

Before commencing fault finding, turn Thermista-stat to maximum setting, turn mains supply on and check that Time Control is at an ON position.

Care must be taken during replacement and handling of electronic assemblies, viz Electronic Panel, Fan Speed Regulator, Air Flow Sensor, Thermista-stat. It is not practical to rectify any faults in these assemblies except in the factory and any attempt to do so may render any guarantee or factory replacement arrangement void.

### Symptom

(a) Pilot will not light.

### Possible Cause

- (i) No gas supply to heater.
- (ii) Gas supply pipe not purged.
- (iii) Pilot orifice restricted.

### Remedy

Break service cock union and listen for escape. Break service cock union until gas is detected. Clear pilot orifice carefully or replace injector. Replace electrode. Replace igniter.

(b) Pilot lights but goes out on releasing 'START' button during initial light-up or after normal operation.

- (iv) Faulty electrode.
- (v) Faulty igniter.
- (i) Connection between thermocouple and gas control not secure.
- (ii) Faulty power unit on gas control.
- (iii) Faulty thermocouple.
- (iv) Pilot flame of insufficient length.

Check connection is secure. Replace power unit. Replace thermocouple. Adjust.

### Air Circulating Fan Removal and Cleaning

#### Air Circulating Fan Removal and Cleaning

Disconnect fan fly-lead at electrical panel and remove fan retaining screw.

Handling with care, withdraw fan assembly.

Remove all dust from both impeller and motor taking care not to disturb the balance of the fan.

#### Time Control Removal

Loosen fixing screw in bottom of Time Control casing, withdraw casing and disconnect leads.

### Electrical Panel Removal

Disconnect 3-way plug (fan fly-lead) from panel.

Disconnect all leads from terminal block.

Undo two fixing screws and remove panel.

### Electronic Panel Removal — MODAIRFLOW Models only

Disconnect 3-way and 6-way plugs from panel.

Disconnect all leads from terminal blocks after identifying and marking connection to terminal 5.

Undo two fixing screws.

### Fan Speed Regulator Removal — MODAIRFLOW Models only

Disconnect 3-way and 6-way plugs from Electronic Panel.

Undo single fixing bolt situated between large green resistors.

### Heat Exchanger Access — All Models

Remove access panel from top front face of bulkhead.

Remove cover plate from front of heat exchanger together with gasket.

Brush heat exchanger through and inspect.

**IMPORTANT:** Refit cover plate complete with gasket.

**Recommission heater carrying out checks as detailed in Section 5.**

In the event of Heat Exchanger or Burner(s) replacement being necessary contact Johnson & Starley Service Department.

### Conventional Control Heaters only:

- |  |  |   |
|--|--|---|
| (c) Pilot alight but main burner not igniting.   | (i) Mains electrical supply not connected to heater.<br>(ii) Controls not calling for heat.<br>(iii) 3A fuse failed.<br><br>(iv) Loose connection on room thermostat, Limit control, gas control head, Time control or transformer.<br>(v) Transformer open circuited.<br>(vi) Gas control operator faulty.<br>(vii) Gas control governor faulty.<br>(viii) Faulty Limit control.<br><br>(ix) Faulty room thermostat or external wiring. | Check mains supply.<br><br>Check that time control (if fitted) and room thermostat are calling for heat. Replace. If failure occurs again, check external room thermostat leads for short to earth.<br>Check connections for soundness.<br><br>Check with test meter and replace electrical panel if necessary.<br>Replace operator.<br>Replace governor.<br>Short across control and replace if necessary.<br>Fit temporary loop in heater room thermostat socket. If heater fires, external circuit or room thermostat is faulty.<br>Check connections for soundness. |
| (d) Main burner lights but fan fails to run.   | (i) Loose electrical connection on fan control or fan plug and socket.<br>(ii) Fan control settings incorrect<br>(iii) Faulty fan assembly.<br><br>(iv) Faulty Fan control.<br>(v) Burner bar pressure not correct.  | Check settings.<br>Replace, taking care not to damage impeller.<br>Replace.<br>Adjust pressure if necessary.  |
| (e) Main burner operating intermittently with fan running.                                 | (i) Gas rate or burner pressure high.<br>(ii) Temperature rise excessive.<br>(iii) Air filter or return air path restricted.<br>(iv) Excessive number of outlets closed.   | Check gas rate and burner bar pressure. Adjust fan speed or gas rate accordingly.<br>Check filter is clean and return air path is clear<br>Open additional outlets.   |
| (f) Main burner operating with intermittent fan operation.                                 | (i) Gas rate or burner pressure low.<br>(ii) Fan control settings incorrect.   | Check gas rate and burner bar pressure.<br>Check settings.  |
| (g) Fan runs for excessive period or operates intermittently after main burner shuts down. | Fan control settings incorrect.  | Check settings.   |
| (h) Noisy operation.   | (i) Gas pressure high.<br>(ii) Noisy fan motor.<br>(iii) Fan speed setting too high.   | Check burner bar pressure.<br>Replace fan motor.<br>Adjust fan speed.   |

### MODAIRFLOW Models only:

- |  |   |  |
|--|---|--|
| (i) Main burner not lighting — Pilot alight, 24V across gas control.                   | (i) Pressure regulator set too low.<br>(ii) Multifunctional control operator faulty.  | Screw down and adjust to required pressure<br>Replace operator.  |
| (j) Main burner not lighting — Pilot alight, NO 24V across gas control.                | (i) Fault in mains supply.<br>(ii) Internal 1.5A fuse blown.<br>(iii) Replacement fuse blows due to fault in gas control operator.<br><br>(iv) Replacement fuse blows due to fault in Electronic Panel.<br>(v) Fault in external wiring to Thermista-stat, either<br>(a) Break in circuit.<br><br>(b) Reversed polarity.<br><br>(vi) Faulty Thermista-stat.<br>(vii) Faulty Limit control.<br><br>(viii) Faulty Electronic Panel. | Check supply.<br>Replace fuse.<br>Disconnect wires to gas control and if fuse remains intact replace operator and check connections.<br>Replace Electronic Panel.<br><br>Check for continuity by shorting wires at Thermista-stat plug. Main burner should light.<br>Check for correct polarity by reversing connections at Thermista-stat terminal block.<br>Replace Thermista-stat.<br>Short across control and replace if necessary.<br>Replace Electronic Panel. |
| (k) Main burner lights but fan fails to run when override switch is set to continuous. | (i) Poor electrical connections on fan circuit.<br><br>(ii) Faulty fan assembly.<br>(iii) Faulty panels.  | Check connections, especially plug and socket contacts. It is important that the 6-way plug is making good contact.<br>Replace, taking care not to damage impeller.<br>Replace Electronic Panel and Fan Speed Regulator — ONE at a time.   |

- (l) Main burner lights but fan fails to run when override switch is set to AUTO from CONTINUOUS.
- (m) Main burner operates for short periods ONLY on initial light-up.

- (i) Faulty panels.
- (ii) Faulty Air Flow Sensor.

Replace Electronic Panel and Fan Speed Regulator — ONE at a time.  
Short across Air Flow Sensor. If fan runs, replace Air Flow Sensor.

- (n) Main burner remains ON with controls set to OFF.

- Fault in external wiring to Thermista-stat, either
- (a) Break in circuit.
- (b) Reversed polarity.
- (i) Faulty Thermista-stat.
- (ii) Short to earth in external wire to Thermista-stat.

Check for continuity by shorting wires at Thermista-stat plug.  
Check for correct polarity by reversing connections at Thermista-stat terminal block.

Replace Thermista-stat.  
Check and rectify. NOTE: return wire from Thermista-stat is connected to earth within heater.  
Replace Electronic Panel.

#### All Heaters:

- (o) Insufficient heating.

- (iii) Faulty Electronic Panel.
- (iv) Multifunctional control fails to close down.
- (i) Heater gas rate low.
- (ii) Limit control operation due to
- (a) Temperature rise set too high.
- (b) Air filter or return air path restricted.
- (c) Excessive number of outlets closed.
- (d) Limit control out of calibration.
- (iii) Incorrect siting of Thermista-stat.
- (iv) Thermista-stat out of calibration.
- (v) Insufficient return air relief.

Disconnect wire from control. If burner does not extinguish, replace control.  
Check and adjust gas rate accordingly.

Adjust fan speed and/or gas rate accordingly.  
Check filter is clean and return air path is clear.  
Open additional outlets.

Replace Limit control.

Reposition.  
Replace Thermista-stat.  
Check for relief and where no provision has been made, fit grilles to area/s where no positive return air collection is made.  
Check velocities and underfloor heat losses.

- (p) Heater operates outside required periods. Applicable only when equipped with Time Control.

- (vi) Substandard installation e.g. poor insulation, faulty duct connections or damaged ductwork.
- (i) Time Control motor running slowly.
- (ii) Time Control tappets slipping.
- (iii) Time Control tappets not set in correct sequence.

Replace Time Control.

Replace Time Control.  
Refer to Time Control section in User's Instructions and set tappets accordingly.

## 8. WIRING DIAGRAM

### Conventional Control Models

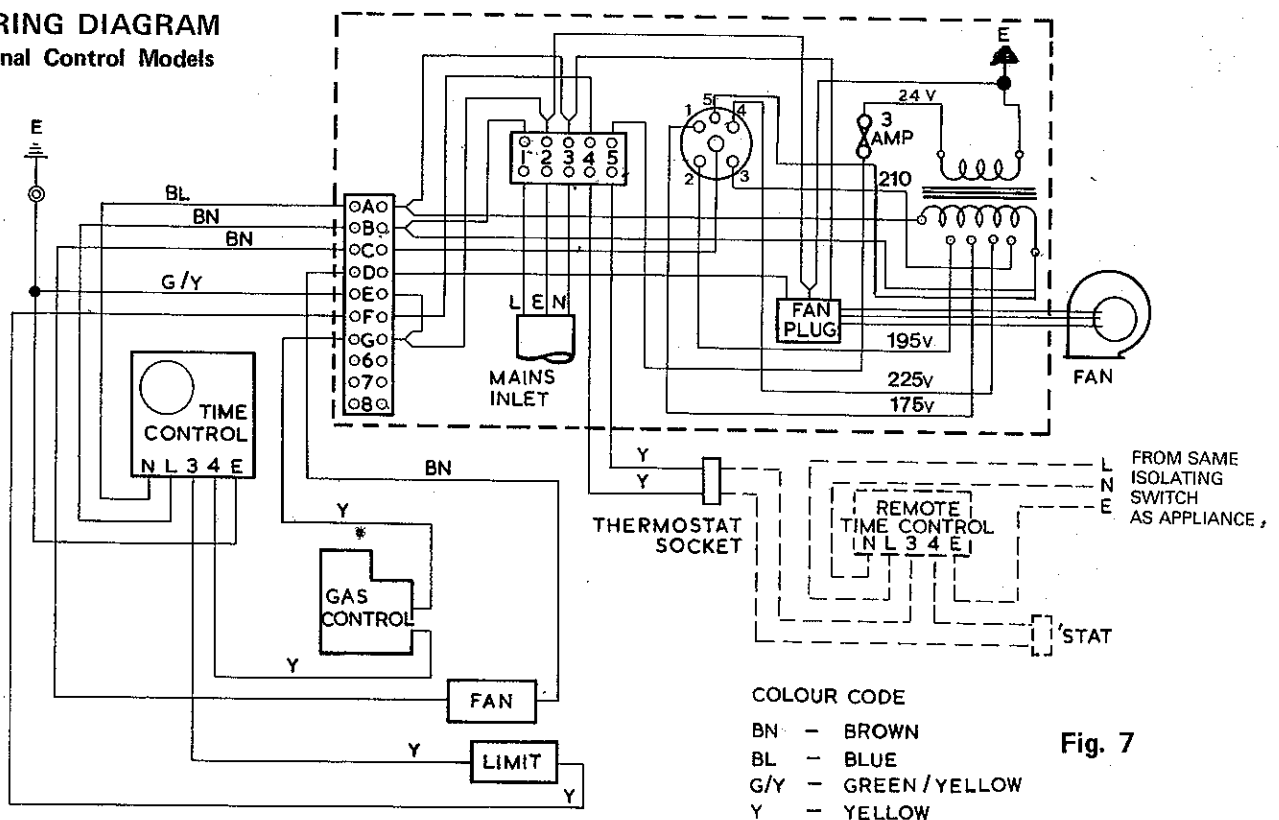


Fig. 7

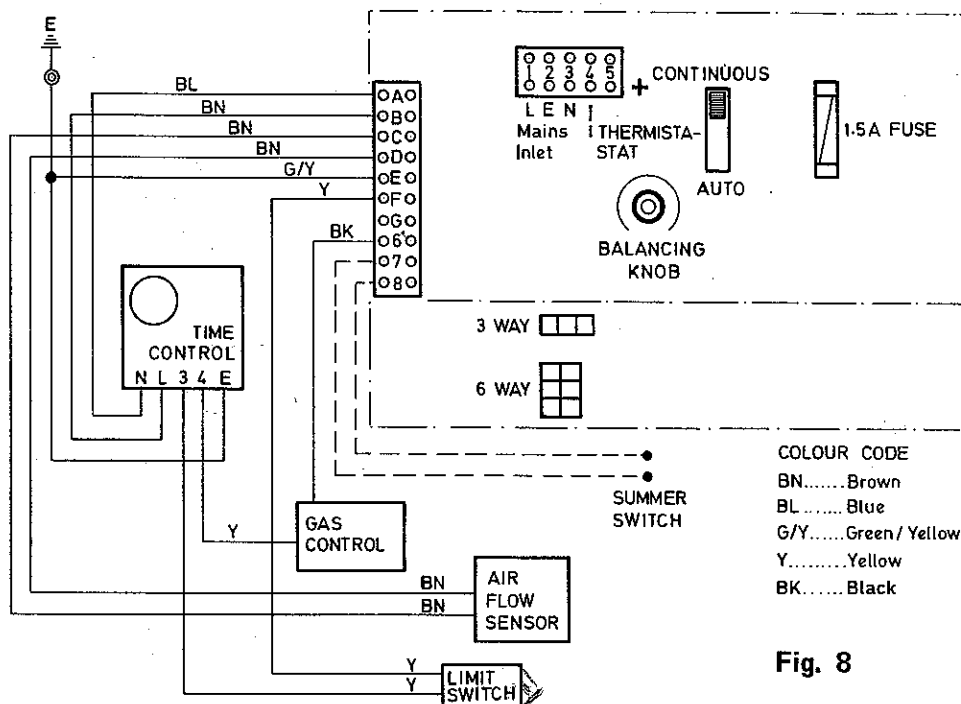


Fig. 8

## 9. SHORT LIST OF SPARE PARTS

G.C. Number	Makers Number	Description	Quantity	JT/RS22-25	JT RS22-25 MAF
232 878	BOS 2064	Air Circulating Fan	1	X	X
232 879	S.0144	Replacement Motor Kit	1	X	X
	JTR22-25 Mk2/151Y	Filter Tray Assembly	1	X	X
	CL2 S	Time Control	1	X	X
232 881	BOS 2028	Electrical Panel Assembly	1	X	
393 239	S.0078	Electronic Panel Assembly	1		X
385 102	BOS 105	Limit Control — Honeywell L4069C 1066	1	X	X
385 103	BOS 104	Fan Control — Honeywell L4068C 1026	1	X	
230 496	S.0076	Air Flow Sensor	1		X
393 412	BOS 1301	Multifunctional Control. Honeywell V8600C — 1020	1		X
391 158	BOS 1455	Pilot Burner Assembly. Honeywell Q314A/5625	1		X
390 210	BOS 36	Thermocouple. Honeywell Q309A 1236	1		X
230 146	BOS 384	Fuse 3A 1in long ceramic	1	X	
230 494	BOS 1237	Fuse 1.5A 1½in long ceramic	1		X
	BOS 1235/2	Thermostat/Thermista-stat Plug	1	X	X
	JTR22-25 Mk2/700X	Burner Bar Assembly complete with Multifunctional Control	1	X	X
	BOS 1431	Burner Arm Assembly	2	X	X
232 723	BBA 3647	Main Injector — 1.9mm dia.	2	X	X
	BOS 2082	Wiring Harness	1	X	
	BOS 1436	Wiring Harness	1		X
230 157	BOS 566	Fan Speed Selector Plug	1	X	
230 495	S.0075	Fan Speed Regulator	1		X
386 475	BOS 1242	Thermista-stat	1		X
393 624	BOS 1441	Push Button Igniter	1	X	X
393 623	BOS 1449	Electrode	1	X	X

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