



These instructions are to be left with the User or adjacent to the Gas Meter

HI-SPEC JU55 WARM AIR HEATERS
MODAIRFLOW and non-MODAIRFLOW Control
INSTALLATION, COMMISSIONING & SERVICING INSTRUCTIONS
G.C. No 42 451 16

Publication No. ZZ 905/4
October 2006

This appliance has been tested and certified for use with natural gas.

1. **BRIEF DESCRIPTION**

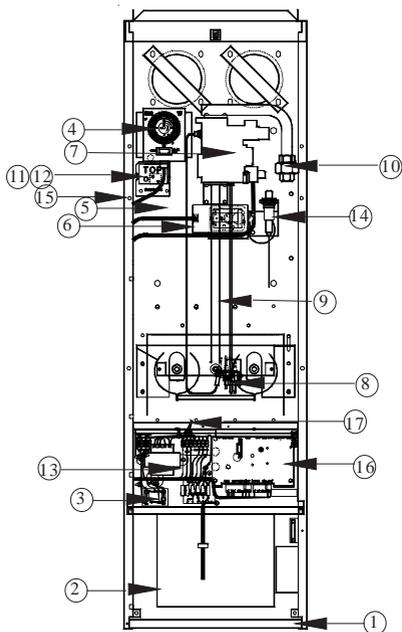


Fig. 1

- | | |
|----|--------------------------------------------|
| 1 | Air Filter |
| 2 | Air circulating fan |
| 3 | Fuse |
| 4 | Time control |
| 5 | Data plate |
| 6 | Limit switch |
| 7 | Multifunctional control |
| 8 | Pilot burner |
| 9 | Burner and Control Assembly |
| 10 | Gas connection |
| 11 | Airflow sensor (Modairflow models) |
| 12 | Fan Delay Control (non-Modairflow) |
| 13 | Electrical Assembly |
| 14 | Piezo unit |
| 15 | Spillage monitoring device (TTB) (at rear) |
| 16 | Electronics module (MODAIRFLOW) |
| 17 | Summer Air Circulation switch |

- 1.1 HI-SPEC JU55 is an open-flued, fan assisted Upflow, ducted warm air heater, which may be supplied with MODAIRFLOW control. A non-MODAIRFLOW version is available as an option. A Spillage Monitoring Device (TTB) is fitted which senses the temperature in the draught diverter, and shuts down the appliance when this temperature rises due to the presence of flue gases.
- 1.2 The Air heater output can be adjusted between 11.72kW (42.2MJ/h, 40,000Btu/h) and 16.1kW (58.0MJ/h, 55,000Btu/h). "Summer air circulation" of unheated air is available by manual selection (see User's Instructions).

THIS APPLIANCE CONFORMS TO BS EN 55014

Installation shall be in accordance with the current editions of:-

- Building Standards (Scotland) (Consolidation) Regulations
- Building Regulations
- Gas Safety (Installation and Use) Regulations (as amended)
- BS 7671 Institute of Electrical Engineers (IEE.) Wiring Regulations
- BS 6891 Installation of Low Pressure Gas Pipework of up to 28mm (R1) in domestic premises (2nd family gases).
- BS 5440 Pt. 1 (Flues for Gas Appliances)
- BS 5440 Pt. 2 (Air Supply for Gas Appliances)
- BS 5864 Installation of Gas Fired Ducted Air Heaters
- British System Design Manual "Gas Fired Warm Air Heating"
- Model and Local Authority Bye-laws

IMPORTANT: STATUTE LAW DEFINES THAT ALL GAS APPLIANCES MUST BE INSTALLED BY COMPETENT PERSONS, (i.e. CORGI REGISTERED INSTALLERS) IN ACCORDANCE WITH THE GAS SAFETY (INSTALLATION AND USE) REGULATIONS (CURRENT EDITION). FAILURE TO COMPLY WITH THESE REGULATIONS MAY LEAD TO PROSECUTION.

2. HEATER COMPARTMENT AND CLEARANCES (See BS 5864)

- 2.1 **IMPORTANT:** If the heater is to be fitted to an existing base duct (warm air plenum), always ensure that installation is carried out such that the rear left hand corner of the heater is aligned with the rear left hand corner of the base duct, so that any overhang or blanking off will be at the front and/or right hand side. In any event, blanking plates must be mechanically secured and all joints sealed.
- 2.2 When the heater is fitted into a compartment, a minimum clearance from the compartment walls of 25mm (1in) at the sides and 75mm (3in) at the front must be left. Consideration should also be given to the space required for the removal and replacement of the filter tray and the entry of the gas and electrical supplies.
- 2.3 For service access, a minimum of 450mm (18ins) is required at the front of the heater. Space must also be allowed, in a compartment installation, to permit the removal of the heater. The clearance between the appliance and the compartment should not be less than 75mm (3in). However, where clearances are less than 75mm, the internal surface of the compartment must be lined with non-combustible material. The compartment must be of a rigid structure.
- 2.4 In airing cupboard installations, the part used as the air heater compartment must comply with the relevant section of BS5864 and must be completely separated by either a non-combustible partition or a perforated metal partition with the perforations not exceeding 13mm (1/2in). The secondary flue must be a tight fit where it passes through the partition and must be suitably protected (see BS 5440: Part 1).
- 2.5 In under-stairs installations, the compartment must comply with the relevant section of BS 5864, provided that in addition, all internal surfaces, including the base, are non-combustible or lined with non-combustible material. This requirement is applicable only to dwellings of not more than two storeys.
- 2.6 **IMPORTANT:** When the heater is installed in a compartment, the ‘SAFETY’ label supplied with the heater **MUST BE AFFIXED** in a prominent position on the **INSIDE** of the **COMPARTMENT DOOR**.

3. VENTILATION AND COMBUSTION AIR

- 3.1 The room or internal space in which the heater is installed requires a permanent air vent of minimum effective area 67cm² (12in²). The air vent should be either direct to outside air or to an adjacent room or internal space (other than a toilet or bathroom) that itself has an equivalent air vent direct to outside.
- 3.2 Combustion air may be introduced, via a 120mm (5in) nominal bore pipe, connected to a return air duct or plenum from a ventilated area and fitted with a lockable damper. The damper should be adjusted to control combustion airflow to 0.0121m³/s (25.6cfm) i.e. 0.98m/s (195ft/min) velocity in a 120mm (5in) bore pipe. If this arrangement is used, a non-closable warm air register **MUST** be provided in the same area as the front of the air heater or heater compartment if a return air grille is not located in that area.
- 3.3 When installed in a compartment, two permanent ventilation openings into the compartment are required, one at high level and one at low level, both communicating either directly with outside air or with a ventilated room or space. The minimum effective areas specified in Table 1 are related to the rated heat input of the Air Heater.
- 3.4 If any room or area from which air is drawn for ventilation or combustion contains an extract fan, the permanent vents must be sized to ensure that the operation of the appliance at full rate is/are not adversely affected. A spillage test as specified in sub-para 6.8 (Safety Checks) is carried out and any remedial work undertaken.

VENTILATED FROM INSIDE BUILDING	Low level grille	392cm ² (60in ²)
	High level grille	196cm ² (30in ²)
VENTILATED FROM OUTSIDE BUILDING	Low level grille	196cm ² (30in ²)
	High level grille	98cm ² (15in ²)

**Table 1
Minimum Effective Areas**

4. DUCT SYSTEM

(See British Design Manual - Gas fired Warm Air Heating)

4.1 **RETURN AIR**

- 4.1.1 All return air shall be **POSITIVELY** ducted from outside the compartment to the bottom of the unit either via a plenum, or if appropriate using Side Return Kit SR55, and mechanically secured. The plenum must be constructed to support the weight of the heater, and the heater must be secured to the plenum with screws on at least 2 sides, and sealed using self adhesive foam strip, ducting tape or sealing compound. It is recommended that the return air duct be not routed directly from the main living area, but from a convenient central area serving the remainder of the dwelling.
- 4.1.2 The return air system should be constructed of fire-resistant material. The flue shall not be run through an area serving as a return air path. It is extremely important that the correct size of return air grilles and ducting is used. For heaters on maximum output the return air duct size should not be less than the equivalent of 300mm x 300mm (12" x 12"). If flexible duct is used the duct diameter should not be less than 400mm (16") dia. The return air grille should have a free area of not less than 1365cm² (212in²).
- 4.1.3 An adequate and unobstructed return air path is essential from areas not served by a directly ducted return and to which warm air is delivered. All such rooms should be fitted with relief grilles which have a free area of 0.0088m²/kW (1in²/250Btu/h) of heat supplied to the room. The only exceptions are kitchens, bathrooms and WC.'s.
- 4.1.4 The warm air duct should allow for ease of removal for access to the flue.
- 4.1.5 All duct work in the room or internal space in which the heater is installed shall be mechanically secured, and sealed with ducting tape.

4.2 **WARM DELIVERED AIR**

- 4.2.1 All duct work, including riser ducts, should be fully insulated with 50mm (2in) fibreglass or similar. If short extended duct runs are taken below floor level these should be similarly insulated, and in addition wrapped with a sound vapour proof barrier, and protected from crushing.
- 4.2.2 The duct system should be carefully designed (as given in the guidelines in the British System Design Manual) to suit the needs of its specific heating requirements and building layout. The type of duct system, i.e. radial/ extended plenum/ stepped should be installed using the least number of fittings to minimise airflow resistance.

5. INSTALLATION REQUIREMENTS

5.1 **FLUES** (see British Standards BS5440 Pt.1 Flues)

- 5.1.1 All joints shall be soundly sealed.
- 5.1.2 The flue should be kept as short and warm as possible.
- 5.1.3 Sufficient support brackets shall be installed to bear the weight of the total flue system.
- 5.1.4 The spigot connection of the heater draught diverter will accept internally the spigot end of a non-asbestos flue to BS567 or twin wall metal flue to BS715 of nominal 100mm (4in) diameter.
- 5.1.5 A split collar should be fitted to provide for flue maintenance or inspection.
- 5.1.6 The flue shall be in accordance with the Building Regulations and British Gas Materials and Installations specification 3rd edition) with regard to clearance and shielding from combustible materials.
- 5.1.7 All materials shall be in accordance with Building Regulations requirements.
- 5.1.8 The flue should run as vertically as possible. Horizontal runs should be avoided if at all possible and any directional change should be as gentle as possible. If there is any doubt about the flue configuration, the equivalent flue height should be determined (see 5.1.10).
- 5.1.9 If the appliance to be fitted is a replacement, the old appliance should be checked for signs of spillage prior to commencement of the installation and appropriate action taken. i.e. check flue system and renew as necessary.

5.1.10 It is recommended that at least 600mm of vertical flue should be provided from the top of the draught diverter (for new installations this shall be incorporated into the flue design). However, when carrying out replacement installations, an existing flue system may be encountered, where the vertical flue above the appliance to the first bend is less than 600mm. In the first instance, the installer must judge whether this distance can be achieved practically by some means. Where this is not practicable, the existing flue system may be used, providing there is no evidence of spillage from the old appliance (see 5.1.9 above). Every effort must be made, however, to ensure that the existing flue complies in every other way to BS 5440 Part 1, including the visual inspection, flue flow and spillage test described in 4.3.2 of the above standard. Flue configurations may be assessed in terms of equivalent vertical height - details are given in 5.1.11. For air heaters, the minimum equivalent vertical height is 1 metre. The installer must make a judgement based on his knowledge and experience and the examination and testing described above as to whether an existing flue system can be used.

Note: Ventilation of the compartment, room or internal space in which the appliance is to be installed must be checked for compliance with the requirements of BS 5440 Part 2 (Ref. Section 3 of these instructions) and upgraded as necessary

5.1.11 **Calculation method for flue sizing: (from BS 5440: Part 1, Appendix A)**

- a. This appendix provides a procedure for estimating whether a given flue design is likely to ensure full clearance of combustion products.
- b. The procedure is based on calculating the 'equivalent height' of the flue under consideration, i.e. that height of the straight vertical circular flue pipe of specific size which will produce the same flow rate as the flue under consideration. The equivalent height is calculated from the formula:

$$H_e = H_a \times \frac{(K_i + K_o)_e}{(K_i + K_o)_a - K_e H_a + \text{Sum K}}$$

where:

H_e is the height of the equivalent flue;

H_a is the vertical height of the actual or proposed flue;

K_i is the inlet resistance of the flue;

K_o is the outlet resistance from the flue;

subscript e refers to the equivalent flue diameter;

subscript a refers to the actual or proposed flue diameter;

K_e is the resistance per unit length of the equivalent flue;

Sum K is the resistance (other than the inlet and outlet resistance) of the actual or proposed flue.

Note: K and Sum K are obtained from Table 2. K_i and K_o are obtained from Table 3.

- c. Table 2 gives resistance factors for common flue components for use in the formula. Table 3 contains the appropriate inlet and outlet flue resistances. **(the flue is likely to be satisfactory if its equivalent height exceeds 1m).**

Component	Internal Size (mm)	Resistance Factor	Component	Internal Size (mm)	Resistance Factor	
Flue Blocks	197 x 67	0.85 per meter	135° Bend	100 mm pipe	0.61 per	
	231 x 65	0.65 run		125 mm pipe	0.25 fitting	
	317 x 63	0.35		150 mm pipe	0.12	
	140 x 102	0.60		197 x 67	0.30	
	200 x 75	0.60		231 x 65	0.22	
	183 x 90	0.45		317 x 63	0.13	
Pipe	100	0.78	Raking block	Any	0.30 per block	
	125	0.25		Adaptor block	Any	0.50
	150	0.12			Terminal	100 mm ridge
Chimney	213 x 213	0.02	125 mm ridge	1.0		
	90° Bend	100 mm pipe	1.22 per	150 mm ridge		0.48
		125 mm pipe	0.50 fitting	100 mm GCI		0.6
150 mm pipe		0.24	125 mm GCI	0.25		
			150 mm GCI	0.12		

Table 2
Resistance factors for use in calculating equivalent heights

Appliance	Inlet Resistance (K _i)	Flue	Outlet Resistance (K _o)
100 mm dia spigot	2.5	100 mm flue	2.5
125 mm dia spigot	1.0	125 mm flue	1.0
150 mm dia spigot	0.48	150 mm flue	0.48

Table 3
Inlet and outlet resistance

d. **Worked Calculation Example:**

A warm air unit with a 100 mm diameter flue spigot, fitted with a pre-fabricated flue system leading to a ridge tile in the loft (refer Fig. 2):

From table 2:

K _{ia}	Inlet resistance of actual flue	= 2.5
K _{oa}	Outlet resistance of actual flue	= 2.5
K _{ie}	Inlet resistance of equivalent flue	= 2.5
K _{oe}	Outlet resistance of the actual flue	= 2.5

From table 3:

Other resistances of actual flue:

Terminal	= 2.5
Pipe bend (2 x 0.61)	= 1.22
Pipe (4 x 1m @ 0.78)	= 3.12
(5 x 0.3m @ 0.234)	= 1.17
Sum K	= 8.01

Equivalent height :

From the formula

$$H_e = 6.2 \times \frac{(2.5 + 2.5)}{(2.5 + 2.5) - (0.78 \times 6.2) + 8.01}$$

H_e = 3.793 This flue exceeds 1.0m equivalent height and is therefore satisfactory

5.1.12 Where flue blocks are used, builders should ensure that no obstruction is created during erection. The installer should ensure that the connection flue does not project beyond the internal wall of the flue blocks and that there is provision for examination and servicing.

5.1.13 **Important:** Before installing the appliance, carry out a visual check of the flue system as directed in the relevant section of BS 5440 Pt.1, then check the flue performance as follows:-

- Close all doors and windows in the room in which the appliance is to be installed.
- Introduce some heat into the flue, using a blow torch or other means.
- Carry out a flow visualisation check with a smoke pellet at the intended position for the appliance. Ensure that there is discharge of smoke from the correct terminal only, and no spillage into the room. Smoke coming out of other than the correct terminal only, or a down draught or 'no flow' condition, indicates that the flue has failed the test, and the appliance shall not be connected until the defect has been found and rectified, and the test satisfactorily completed.

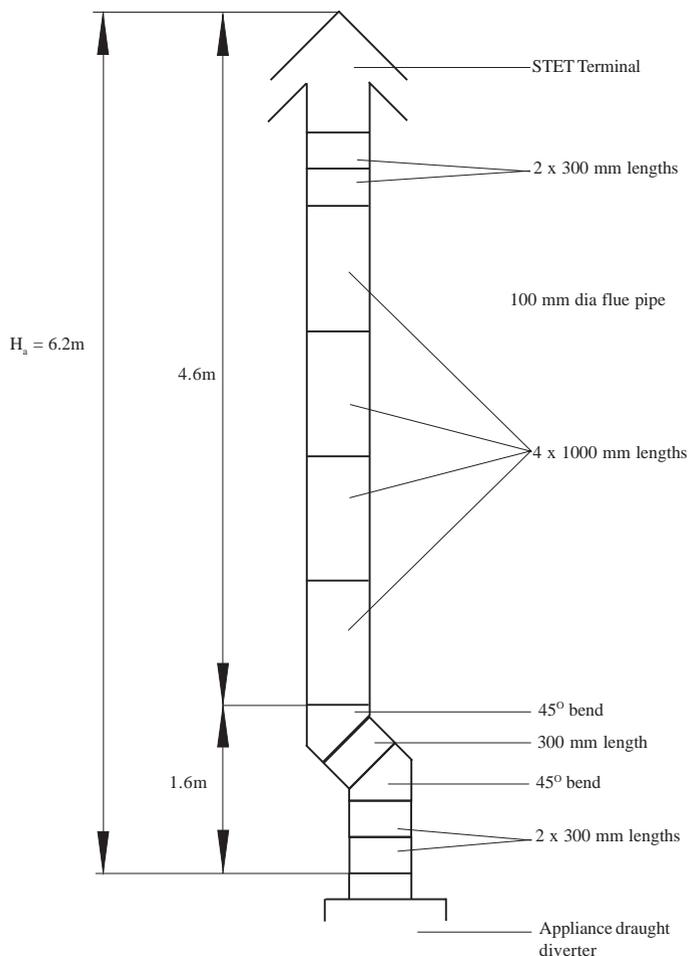


Fig. 2
Worked example of equivalent flue height

5.2 ELECTRICAL

5.2.1 Mains.

- The heater is supplied with mains cable (PVC sheathed, heat resisting to 85°C), 3-core Brown-Blue-Green/Yellow, 6A, 0.75mm^2 , connected to a terminal block. The cable may exit through either side of the fan compartment via a Universal bush. The cable is suitable for a 230V 50Hz supply and shall be connected to the fixed wiring using a double pole switched, fused spur, incorporating a protective earth link. The fuse fitted shall be rated 5A to BS 1362. Connections shall be in accordance with the current edition of I.E.E Regulations.
Note: If a Side Return Kit SR55 is fitted, the mains cable should exit the heater from the OPPOSITE side.
- MODAIRFLOW Models:** An electronic controller (Thermista-stat) is supplied which acts as a room thermostat.
- Non-MODAIRFLOW models:** A 24V room thermostat (not supplied), that complies with BS 800, BS 3955 and BS 4201 is essential to ensure close control of comfort conditions. An anticipator is located within the thermostat and is graded in amps. The anticipator should be checked and adjusted to 0.2A.

5.2.2 Thermista-stat/Room Thermostat and its location.

- a. The Thermista-stat/Room Thermostat should be located where there is free air circulation approx. 1.5m (5ft) from the floor.
- b. Avoid the following locations:-
 - i) In a room where temperature is greatly affected by the sun or any other heat source, e.g. radiant fire, wall light fittings or TV set.
 - ii) Near an outside door or windows, or on an outside wall.
 - iii) Where affected by warm air ducts, diffusers, waste pipes or the heater itself.
 - iv) Where subject to vibration.
- c. For MODAIRFLOW models, connect Thermista-stat wires to control panel terminals '4' and '5' (see Fig. 5a and 6a), connection polarity being important, connect +ve side on control panel to +ve side on Thermista- stat.
- d. For non-MODAIRFLOW models, connect room thermostat wires control panel terminals '16' and '17'

5.3 GAS (See BS 5864 and BS 6891)

- 5.3.1 An independent gas supply pipe from the meter is to be preferred wherever possible. When this is not possible, the pipe must be capable of taking the complete input of the heater and all other gas appliances being served by this same pipe. This supply should be suitably sized to conform to British Standards requirements of no more than 1.0 mbar (0.4in wg) pressure drop (See table of discharge in BS 6891).
- 5.3.2 The 1/2in union gas cock (supplied) must be fitted to the gas inlet of the heater for easy isolation during servicing. The gas pipe should be so fitted and installed as to be durable, substantial and gas tight. To assist in determining where a gas connection may not be tight, a leak detection fluid should be applied around the connection. Under no circumstances should a flame be used to locate a gas leak. Gas entry to the air heater is through either side to a Rc1/2 (1/2in BSP. external [taper] thread).

5.4 Draught Diverter:

- 5.4.1 The HI-SPEC JU55 heater is supplied with a draught diverter which requires fitting to the rear of the heater prior to installation, using 6 x 4mm screws and lock washers (provided), and the TTB connection to the terminal block which is situated beneath the Overheat (Limit) switch cover (see para 8.15).

6. COMMISSIONING

6.1 PREPARATION:

- 6.1.1 Ensure that:
 - a. Gas and Electrical supplies are **OFF**.
 - b. Filter, fan and fan compartments are free from obstructions.
 - c. All registers or grilles are open and conform to design specifications.
 - d. Return, relief and ventilation air installations are adequate.

6.2 SETTING OF FAN SPEED: (Non-MODAIRFLOW models)

- 6.2.1 Remove the air filter and fan chamber door.
- 6.2.2 Ensure that the Fan Control is set to '**100° OFF**' and '**40° DIFF**',
- 6.2.3 Ensure that the Limit switch is set to '**200° F**'. **This control is not to be set to any other setting.**
- 6.2.4 Refit the fan chamber door and air filter.

6.3 IGNITION OF PILOT AND MAIN BURNERS:

WARNING: If the pilot light is extinguished either intentionally or unintentionally, no attempt should be made to relight the gas for a minimum of 3 minutes. Ensure that the Electrical supply, time control and Selector switches are set to '**OFF**'.

- 6.3.1 Set the Thermista-stat/room thermostat to lowest or **OFF** setting.
- 6.3.2 On the Multifunctional control, remove the Outlet Pressure test point cover, and fit a pressure test gauge (refer Fig. 4).
- 6.3.3 Turn the heater Gas supply **ON**, test for gas soundness and purge the whole gas pipe as described in BS 6891.
- 6.3.4 Referring to Fig. 4, press and hold the OPERATING CONTROL, and whilst observing the Pilot Burner, repeatedly press the Piezo igniter button until Pilot burner ignites.

- 6.3.5 After 20 seconds release the OPERATING CONTROL and let it spring out; ensure that the Pilot burner remains alight. If Pilot burner extinguishes, rotate the OPERATING CONTROL clockwise to '1' position and ensure that the OPERATING CONTROL is fully reset. Wait three minutes and repeat steps 6.3.4 and 6.3.5 until the Pilot burner remains alight, holding the OPERATING CONTROL depressed for a longer period than before.
- 6.3.6 Ensure that the pilot flame envelops thermocouple tip, adjusting the Pilot Adjuster as required (refer Fig. 3).
- 6.3.7 Set the Heater Electricity supply **ON**.
- 6.3.8 Set the Time control to the required Heating On periods.
- 6.3.9 Set the Selector switch to 'TIMED'.
- 6.3.10 Set Thermosta-stat or room thermostat to **MAXIMUM**.
- 6.3.11 Ensure that the main burner has now ignited.
- 6.3.12 Test for gas leakage at supply, Multifunctional control, Pilot and Main burners using proprietary detection fluid, sealing any leaks found.
- 6.3.13 Allow heater to operate for a minimum of 15 mins. to ensure stability.

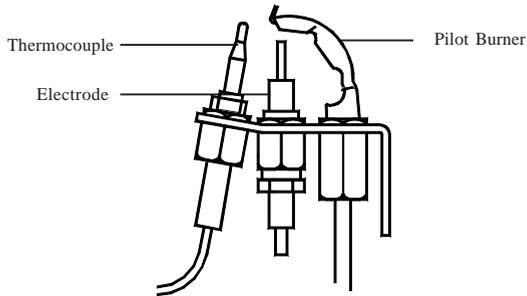


Fig. 3
Pilot Burner Assembly

6.4 MAIN BURNER PRESSURE TEST:

NOTE: AIR HEATER BURNERS ARE FACTORY SET TO PROVIDE A NOMINAL HIGH PRESSURE OUTPUT AS DETAILED IN SUB PARA 1.2

- 6.4.1 Referring to Table 4 and Fig. 4 below, ensure that the pressure test gauge indicates the correct burner pressure, resetting if required as follows:
 - a. At the Multifunctional control:
 - i. Remove the Burner Pressure Adjuster cover.
 - ii. Set the Burner Pressure Adjuster to provide a pressure test gauge indication for correct burner pressure as detailed in Table 4.
 - iii. Refit the Burner Pressure Adjuster cover.
- 6.4.2 Apply the pressure set arrow to indicate the appropriate burner pressure on the data badge.

6.5 EXTINGUISHING OF PILOT AND MAIN BURNERS:

- 6.5.1 On the Multifunctional control, rotate the OPERATING CONTROL clockwise to the '1' position and ensure that the OPERATING CONTROL fully resets, and both Pilot and Main Burners are extinguished.
- 6.5.2 On the Multifunctional control, remove the pressure test gauge and refit the Outlet Pressure test point cover.

6.6 TEMPERATURE RISE CHECK:

- 6.6.1 Ignite the Pilot and Main burners and allow 15 minutes for stability before continuing.
- 6.6.2 With the Main Burner operating continuously, check that the temperature rise across heater is between 45°C - 55°C, setting the fan speed accordingly, (decrease fan speed to increase temperature rise). For MODAIRFLOW heaters, adjusting the balancing screw sets fan speed; for non-MODAIRFLOW heaters, fan speed is adjusted by selecting fan speed at control panel (decrease voltage selection to decrease fan speed).

Note: Tapping 1 = 130V, Tapping 2 = 140V, Tapping 3 = 150V, Tapping 4 = 170V, Tapping 5 = 230V

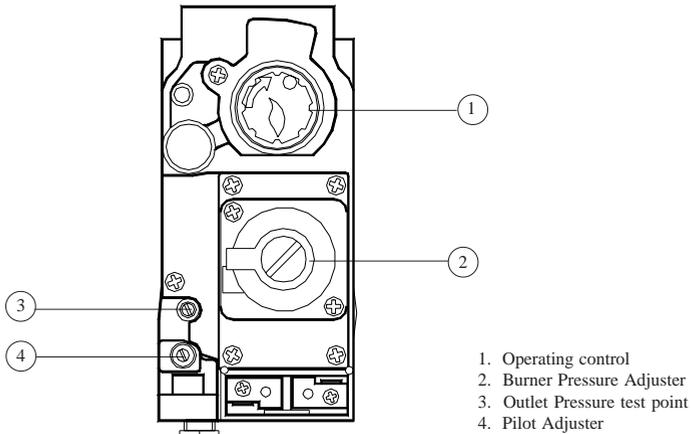


Fig. 4
Multifunctional Control

1. Operating control
2. Burner Pressure Adjuster
3. Outlet Pressure test point
4. Pilot Adjuster

6.7 AUTOMATIC CONTROLS CHECK

- 6.7.1 Ignite the Pilot and Main burners and allow to operate for 15 minutes to ensure stability.
- 6.7.2 Set the TIME CONTROL (if fitted) to 'ON'.
- 6.7.3 Turn the Thermosta-stat or room thermostat slowly clockwise until the Main burner ignites.
- 6.7.4 Ensure that the fan starts to operate after a short period (approx. 1-2 minutes).

MODAIRFLOW models:

- 6.7.5 Ensure that the fan speed increases to full speed.
- 6.7.6 When the temperature reaches the control setting, check that the Main burner cycles ON and OFF, at approximately 75 to 120 seconds.

Non-MODAIRFLOW models:

- 6.7.7 When the temperature reaches the control setting, ensure that the Main burner extinguishes followed by the fan switching off after a short period.
- 6.7.8 When the temperature falls below the control setting, ensure that the Main Burner re-ignites followed by fan operation.

6.8 SAFETY CHECKS:

- 6.8.1 Check for gas soundness within the appliance.
- 6.8.2 Carry out a full spillage test as follows, and ensure that the flue operates effectively with all doors closed and any extractor fans in operation.

NOTE: If an extractor fan is situated in an adjoining or adjacent room, carry out the spillage test with interconnecting doors open.

If the Draught Diverter is accessible:

- a. Introduce smoke into the draught diverter adjacent to an exit from the heat exchanger, by means a smoke match or puffer.
- b. Ensure that there is no spillage present (indicated by displacement of smoke downwards and out of the draught diverter).

If the Draught Diverter is not accessible:

- a. Introduce smoke ,by means of part of a smoke pellet on a non-combustible support, into the heat exchanger but not in contact with the heat exchanger.
- b. Extinguish the Main and Pilot Burners as detailed in para 6.5
- c. Ensure that there is no spillage present (indicated by discharge of smoke from the draught diverter).
- d. Repeat spillage tests but with the fan running, or Summer Airflow switch set to ON.**

- 6.8.3 Extinguish the Main and Pilot Burners as detailed in sub para 6.5.
- 6.8.4 Switch the electrical supply OFF.

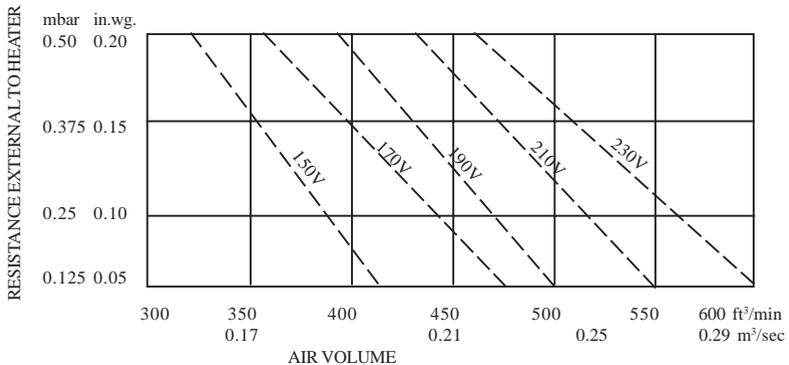
- 6.8.5 **MODAIRFLOW models**, disconnect the Air Circulation fan at the flying socket
- 6.8.6 **Non-MODAIRFLOW models**, disconnect the Air Circulation fan at the electrical control panel.
- 6.8.7 Switch the electrical supply ON.
- 6.8.8 Ignite the Main and Pilot burners as detailed in sub para 6.3.1 to 6.3.5
- 6.8.9 Ensure that the Limit switch operates, indicated by the Main Burner extinguishing, within 120 and 180 seconds.
- 6.8.10 Switch the electrical supply OFF.
- 6.8.11 Reconnect the Air Circulation Fan.
- 6.8.12 Switch the electrical supply ON.
- 6.8.13 Ensure that the Main Burner re-ignites when the appliance temperature reduces, (**note:** with the fan disconnected, there may be some delay before the Main Burner re-ignites).
- 6.8.14 Turn OFF the gas supply at the service cock and ensure that the Multifunctional control fail-safe operates within 60 secs (indicated by loud click from the Multifunctional control).

6.9 SYSTEM BALANCING AND COMPLETION:

- 6.9.1 Set the SUMMER AIR CIRCULATION switch to 'ON'.
- 6.9.2 Balance the system to provide the required volume proportions at the warm air outlets.
NOTE: If the system includes ceiling diffusers, air velocities through these should be NOT LESS THAN 1.5m/s (300ft/min), except for very small rooms (i.e. bathrooms, etc.). Outlet faces may require partial blanking in order to achieve this.
- 6.9.3 Turn the gas supply ON at the service cock.
- 6.9.4 Ignite the Pilot and Main burners as detailed in sub para 6.3.1 to 6.3.5.

	Low Rate			Low Medium Rate			High Medium Rate			HighRate		
	kW	MJ/h	Btu/h									
INPUT	15.9	57.3	54,340	17.9	64.6	61,234	19.6	70.5	66,860	21.3	76.7	72,670
OUTPUT	11.7	42.2	40,000	13.2	47.5	45,000	14.7	52.7	50,000	16.1	58.0	55,000
Gas rate cv 1037Btu/ft ³	1.52m ³ /h (53.65ft ³ /h)			1.71m ³ /h (60.46ft ³ /h)			1.87m ³ /h (66.02ft ³ /h)			2.03m ³ /h (71.75ft ³ /h)		
Burner setting pressure (hot)	10.2mbar (4.1 in wg)			12.9mbar (5.2 in wg)			15.7mbar (6.3 in wg)			18.0mbar (7.2 in wg)		
Main Injector	BRAY CAT 23/600											

**Table 4
Main Burner Pressure Settings**



**Table 5
Fan Performance Curve**

7.

INSTRUCTIONS FOR USERS

7.1 If the building is unoccupied, ensure that the Instructions for User are left taped to the air heater for the User, and Installation Instructions are left at or near the air heater for use on future service calls.

7.2 If the building is occupied, hand the User Instructions over and ensure the User understands:

7.2.1 How to ignite the pilot and burner.

7.2.2 How to operate the Thermosta-stat/room thermostat, time and heater ON/OFF switch and summer air circulation switch, and that the time control must be reset following a power failure.

7.2.3 How to extinguish the pilot and main burner at the Multifunctional control, and switch off electrical supply to the heater.

7.2.4 How to remove, clean and re-fit the air filter and at what intervals (i.e. fortnightly, or for new houses, weekly).

7.2.5 How to control the heating system by opening and closing warm air outlets.

7.2.6 How to obtain summer air circulation.

7.2.7 That the air grilles on the heater or heater compartment; grilles and ventilators in the walls, windows or doors of the building must not be obstructed.

7.2.8 That the heater must be serviced at least once a year by a competent person to ensure efficient and safe operation.

7.2.9 That the red instructions for safe use have been pointed out and understood.

7.2.10 That expert help must be obtained if persistent failure of the pilot burner occurs.

8.

MAINTENANCE

IMPORTANT: Ensure gas and electricity supplies are isolated before commencing any maintenance or replacement of components. After completion of any maintenance, always test for gas soundness and carry out a complete functional test of the appliance in accordance with Commissioning Instructions at Sect 6.1 to 6.8 inclusive.

8.1 **ROUTINE MAINTENANCE:**

8.1.1 Operate the appliance and check for correct function of the burner and controls.

8.1.2 Check return air filter/air cleaner (if fitted) for cleanliness, remove and clean the air circulation fan as detailed in Sect. 8.8.

8.1.3 Remove the burner and controls assembly as detailed in 8.2, inspect and clean the main burner and injectors as necessary. Examine the main burner for cracks, including hairline cracks, exchanging the burner as necessary.

8.1.4 Inspect and clear the pilot burner orifice.

8.1.5 Check the condition of thermocouple, igniter electrode and leads, cleaning as necessary.

8.1.6 Clean the heat exchanger flueways by thoroughly brushing from above and below, and inspect for damage.

8.1.7 Reassemble all items in reverse order and carry out the commissioning procedure as detailed in Sect 6.

8.2 **BURNER AND CONTROLS ASSEMBLY REMOVAL:**

8.2.1 Ensure that the Gas and Electrical supplies are switched OFF

8.2.2 Remove the appliance upper front door.

8.2.3 Disconnect the igniter at the piezo unit.

8.2.4 Disconnect the Multifunctional control electrical connection.

8.2.5 Disconnect the gas supply by breaking the union at the input side of the Multifunctional control.

8.2.6 Remove the 6 x Burner assembly fixing screws and withdraw the Burner and Controls assembly.

8.2.7 Refit the Burner and Controls assembly in reverse order, ensuring that the guide plates on the end of each burner arm engage in the slots at the rear of the heat exchanger, and that the spillage baffle above the burner assembly contacts the top of each burner arm.

8.3 **MAIN BURNER ASSEMBLY CLEANING:**

8.3.1 Remove the Burner and Controls assembly as detailed in 8.2.

8.3.2 Clean the burner thoroughly both inside and out with a soft brush. **DO NOT ENLARGE, DISTORT OR DAMAGE BURNER HOLES.**

8.3.3 Reassemble in reverse order.

8.4 **MAIN INJECTORS REMOVAL, CLEANING AND REPLACEMENT:**

- 8.4.1 Remove the Burner and Control assembly as details in 8.2
- 8.4.2 Remove the 2 x screws securing the Pilot burner assembly to the Burner and Control assembly and withdraw the Pilot burner assembly, taking care to avoid causing damage to the thermocouple capillary.
- 8.4.3 Remove the 2 x screws securing the Burner arm to the Burner and Controls assembly, and withdraw the Burner Arm.
- 8.4.4 Unscrew the 2 x Main injectors, and 1 x cross lighter injector from their housings.
- 8.4.5 Clean as necessary. **DO NOT ENLARGE, DISTORT OR DAMAGE MAIN INJECTOR HOLES.**
- 8.4.6 If the injectors are to be replaced, ensure that they are correctly marked, referring to the Data Badge for details.
- 8.4.7 Refit or replace injectors in reverse order.

8.5 **PILOT BURNER, THERMOCOUPLE AND ELECTRODE, REMOVAL AND REPLACEMENT:**

- 8.5.1 Remove the Burner and Control assembly as detailed in 8.2
- 8.5.2 Disconnect the Igniter lead from the Piezo unit.
- 8.5.3 Disconnect the Thermocouple from the Thermocouple adapter on the Multifunctional control, taking care to avoid causing damage to the thermocouple capillary.
- 8.5.4 Release the Pilot Gas Feed pipe from the Multifunctional control.
- 8.5.5 Remove the 2 x 4mm screws securing the Pilot Burner assembly to Burner and Control assembly, and withdraw the Pilot Burner Assembly.
- 8.5.6 Release the Thermocouple securing nut from the Pilot Burner assembly and withdraw the Thermocouple, taking care to avoid causing damage to the Thermocouple capillary.
- 8.5.7 Release the Electrode securing nut from the Pilot Burner assembly and withdraw the Electrode.
- 8.5.8 Release the Pilot Feed Pipe securing nut from the Pilot burner assembly and withdraw the Pilot Feed pipe and Pilot Injector from the Pilot Burner assembly, and disconnect the Pilot Injector from the Pilot Feed Pipe hook.
- 8.5.9 Refitting or replacement is in reverse order.

NOTE: When refitting or replacing Thermocouple, tighten only to FINGER TIGHT + 1 FLAT.

8.6 **MULTIFUNCTIONAL CONTROL REMOVAL:**

- 8.6.1 Remove the Burner and Control assembly as detailed in 8.2
- 8.6.2 Disconnect the Thermocouple at Multifunctional control including adapter, avoiding damage to capillary.
- 8.6.3 Disconnect the Pilot gas supply pipe from the Multifunctional control.
- 8.6.4 Disconnect the Multifunctional control input and output supply feeds.
- 8.6.5 Refitting or replacement is in reverse order.

8.7 **PIEZO UNIT REMOVAL:**

- 8.7.1 Disconnect the 2 x conductors from the Piezo unit.
- 8.7.2 Unscrew the Piezo retaining nut and remove the unit from mounting its bracket.
- 8.7.3 Refitting or replacement is in reverse order.

8.8 **AIR CIRCULATING FAN, REMOVAL AND CLEANING:**

- 8.8.1 Ensure that the electrical supply is isolated.
- 8.8.2 Remove Air Filter and appliance lower and upper doors.
- 8.8.3 Release the 3 x screws securing the Electrical panel, and withdraw the panel, avoiding damage to wiring.
- 8.8.4 Disconnect the 2 x conductors from the Summer Air Circulation switch.
- 8.8.5 Release the Summer Air Circulation switch bezel, and remove the switch from the fan compartment diaphragm.
- 8.8.6 Withdraw the Fan Assembly from the Heater cabinet by sliding it forward, avoiding damage to fan blades.
- 8.8.7 Disconnect the 230V (L/N/E) connections from fan assembly.
- 8.8.8 Remove all dust from the impeller and motor, avoiding damage to the fan blades.
- 8.8.9 Refitting or replacement is in reverse order.

8.9 ELECTRICAL ASSEMBLY REMOVAL:

- 8.9.1 Ensure that the electrical supply is isolated.
- 8.9.2 Remove the Air Filter and appliance lower and upper doors.
- 8.9.3 Release the 2 x 4mm screws securing Limit switch cover and withdraw cover.

MODAIRFLOW models:

- 8.9.4 Disconnect the following:
 - a. Disconnect 230V connections (L/N/E) from Fan Assembly,
 - b. 230V mains 'L', 'N' and 'E' from connection block terminals '1', '3' and '2' respectively,
 - c. Thermosta-stat connections from connection block terminals '4' (+ve) and '5' (-ve),
 - d. Limit switch 'LOAD' and 'COMMON' connections,
 - e. 2 x Airflow sensor connections,

NON-MODAIRFLOW models:

- 8.9.5 Disconnect the following:
 - a. Disconnect 230V connections (L/N/E) from Fan Assembly,
 - b. 230V mains 'L', 'N' and 'E' from connection block terminals '1' and '3', and earth stud respectively,
 - c. Room thermostat connections from connection block terminals '5' and '6',
 - d. Limit switch 'LOAD' and 'COMMON' connections,
 - e. Fan Delay Control 'LOAD', 'COMMON' and 'EARTH' connections,

Both model types:

- 8.9.6 Disconnect the 2 x TTB connections.
- 8.9.7 Disconnect the Multifunctional control connections.
- 8.9.8 Release the 3 x 4mm screws securing the Electrical assembly to the heater cabinet and remove the Electrical assembly, releasing wiring from cable clamps and grommets as required..
- 8.9.9 Refitting or replacement is in reverse order.

8.10 ELECTRONIC MODULE REMOVAL (MODAIRFLOW models only)

- 8.10.1 Remove the Electrical Assembly as detailed in Sect. 8.9.
- 8.10.2 Disconnect the Electronic module from the Electrical assembly.
- 8.10.3 Release the 3 x screws securing the Electronic module to the Electrical assembly and remove the module.
- 8.10.4 Refitting or replacement is in reverse order.

8.11 TRANSFORMER REMOVAL (MODAIRFLOW models only):

- 8.11.1 Remove Electrical assembly as detailed in sect 8.9.
- 8.11.2 Disconnect Transformer from Electrical assembly terminal block, and fuse from Earth stud,
- 8.11.3 Release 2 x screws and nuts securing Transformer to Electrical assembly, and remove Transformer.
- 8.11.4 Refitting or replacement is in reverse order.

8.12 TIME CONTROL REMOVAL:

- 8.12.1 Ensure electrical supply is isolated.
- 8.12.2 Release securing screw situated on lower face of Time Control and remove by partially withdrawing bottom of Time Control and then lifting upwards.
- 8.12.3 Disconnect Time Control electrical connections from integral terminal strip.
- 8.12.4 Refitting or replacement is in reverse order.
- 8.12.5 Set Time Control to required ON and OFF times.
- 8.12.6 Set Time Control to correct time.

8.13 FAN DELAY CONTROL, LIMIT SWITCH AND AIRFLOW SENSOR REMOVAL:

NOTE: Airflow sensor applies to MODAIRFLOW models only, whilst Fan Delay Control applies solely to non-MODAIRFLOW models.

- 8.13.1 Ensure electrical supply is isolated.
- 8.13.2 Remove appliance lower and upper doors.
- 8.13.3 Release 2 x 4mm screws securing Limit switch cover and withdraw cover.
- 8.13.4 Disconnect required control/switch.
- 8.13.5 Release 2 x securing screws and remove required control/switch.
- 8.13.6 Refitting or replacement is in reverse order.

8.14 SPILLAGE MONITORING DEVICE (TTB) REMOVAL:

- 8.14.1 Ensure electrical supply is isolated.
- 8.14.2 Remove appliance lower and upper doors, and TTB Terminal cover secured to the Overheat (Limit) switch cover.
- 8.14.3 Disconnect the TTB from the terminal block.
- 8.14.4 Remove the TTB wiring guard to upper left hand side of the heater (the rear screw need not be removed as the rear of the wiring guard has a keyhole slot).
- 8.14.5 Withdraw the TTB wiring from the grommet situated on the upper left hand side of the Air Heater.
- 8.14.6 If the heater is fitted in a compartment, ascertain if access to the TTB Mounting bracket is possible from the top left hand side of the heater. If access to the TTB is not possible, remove the Delivery duct from the top of the heater, and ascertain if access to the TTB mounting bracket is now possible. **If access to the TTB mounting bracket is not possible from either the side or the top of the heater, the heater must be removed from the installation before proceeding.**
- 8.14.7 With access to the TTB Mounting bracket gained, release the stainless steel fixing screw securing the TTB Assembly to the Draught Diverter, and withdraw the TTB Assembly.
- 8.14.8 Refitting or replacement is in reverse order.

8.15 HEAT EXCHANGER ACCESS:

- 8.15.1 Release 2 x securing screws and remove heat exchanger access cap and gasket.
- 8.15.2 Remove heat exchanger baffle.
- 8.15.3 Reassembly is in reverse order.

NOTE: When reassembling, ensure baffle is pushed fully home and access cap is fully sealed. In the event of heat exchanger replacement being necessary, contact Johnson and Starley Service Department.

9. DEFECT DIAGNOSIS

9.1 **IMPORTANT: If an electrical defect occurs after installation of the appliance; preliminary earth continuity, polarity, and resistance to earth checks should be carried out with a multimeter. On completion of any maintenance/fault-finding task that has required the breaking and remaking of electrical connections, then checks of continuity, polarity, and resistance to earth must be repeated.**

9.2 WARNINGS:

- 9.2.1 When purging or checking gas supplies, ensure ventilation to the room or cupboard is adequate, and all naked lights are extinguished.
- 9.2.2 **MODAIRFLOW models:** Before commencing defect diagnosis, ensure Thermista-stat is set to maximum, mains supply is 'ON' and time control (if fitted) is at an 'ON' position.
- 9.2.3 Care is to be taken during the replacement and handling of electronic assemblies (i.e. electronic panel, airflow sensor or Thermista-stat), it is not practical to rectify defects on these assemblies, except at the manufacturer, and any attempt to do so may render the guarantee or factory replacement arrangement invalid.

SYMPTOM	POSSIBLE CAUSE	REMEDY
a. Pilot will not light.	i. No gas supply to heater.	Check for gas at inlet pressure test point on multifunctional control.
	ii. Gas supply pipe not purged.	Purge gas supply pipe in accordance with BS 6891.
	iii. Pilot orifice restricted.	Clear pilot orifice or replace pilot injector.
	iv. Piezo system faulty.	Check igniter, lead, and electrode.
	v. Excessive gas supply pressure.	Check that mains gas pressure is 20mbar, and reduce if necessary.
b. Pilot lights but goes out on releasing START button during initial light-up, or after normal operation.	i. Connection between thermocouple and multifunctional control not secure.	Check connection is secure.
	ii. Faulty power unit on gas control.	Replace Multifunctional control.
	iii. Faulty thermocouple.	Replace Thermocouple.
	iv. Combustion air contaminated.	Conduct spillage test and rectify.
c. Main burner lights but fan fails to run after approx. 3 min.	i. Loose electrical connection fan delay control.	Check connections.
	ii. Fan control set incorrectly.	Check for correct settings.
	iii. Faulty fan assembly.	Replace, taking care not to damage impeller.
	iv. Faulty fan control.	Replace.
d. Main burner operating intermittently with fan running.	i. Gas rate or burner pressure setting high.	Check gas rate and burner pressure setting.
	ii. Temperature rise excessive.	Adjust fan speed or gas rate accordingly.
	iii. Air filter or return air path restricted.	Check filter is clean and air path is clear.
	iv. Excessive number of outlets closed.	Open additional outlets.
	v. Spillage of flue gases.	Carry out spillage test and rectify.
	vi. Spillage monitor device (TTB) faulty.	Replace Spillage device (TTB)
e. Main burner operating with intermittent fan operation.	i. Gas rate or burner pressure setting too low.	Check gas rate and burner pressure setting.
	ii. Fan control set incorrectly.	Check for correct settings.
f. Fan runs for excessive period or operates intermittently after main burner shuts down.	i. Fan control set incorrectly.	Check for correct settings.
g. Noisy operation.	i. Gas pressure too high.	Check burner pressure setting.
	ii. Noisy fan motor.	Replace fan assembly.
	iii. Fan speed setting too high.	Adjust fan speed.

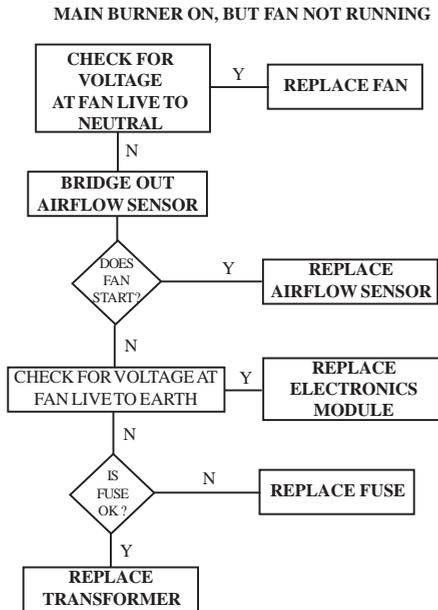
MODAIRFLOW models:

- | | | |
|-----------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------|
| h. Incorrect operation of fan or main burner. | Fault related to Modairflow Control system (refer to pages 14-18) | Consult diagnostic chart and follow recommended procedure. |
|-----------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------|

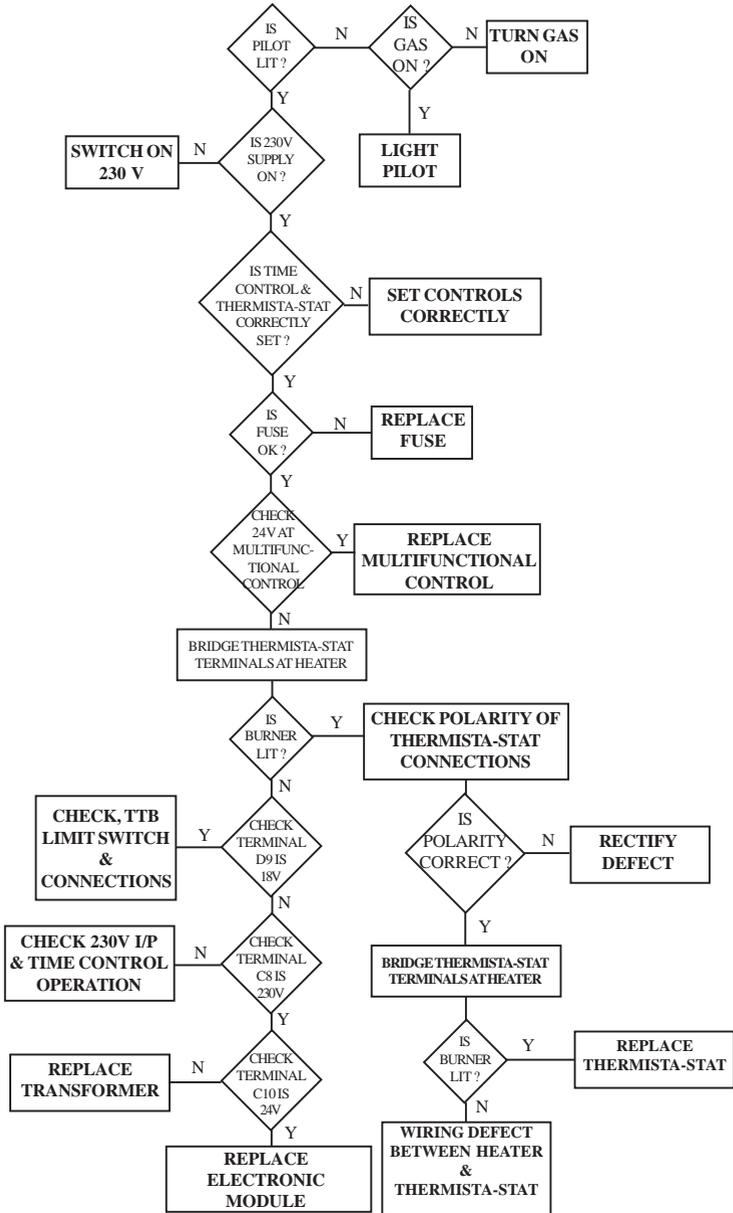
Non-MODAIRFLOW models:

- | | | |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| j. Pilot alight but main burner not igniting. | i. Mains electrical supply not connected to heater. | Check mains supply. |
| | ii. Controls not demanding heat | Check that time control (if fitted) and room thermostat are operating correctly. |
| | iii. 3A fuse failed. wiring for short circuits. | Replace. If failure occurs again, check |
| | iv. Loose connection to room thermostat, overheat (limit) control, gas control lead, time control, or transformer. | Check connections. |
| | v. Transformer open circuit. | Check with test meter and replace transformer (Modairflow) or electrical assembly (non-Modairflow). |
| | vi. Multifunctional control faulty. | Replace Multifunctional control. |
| | vii. Limit switch faulty. | Short circuit switch and replace if necessary. |
| | viii. Room thermostat or external wiring faulty. or room thermostat is faulty. | Fit temporary loop in heater thermostat socket. If heater ignites, external circuit |
| | ix. TTB faulty | Check TTB and wiring for open circuit. |

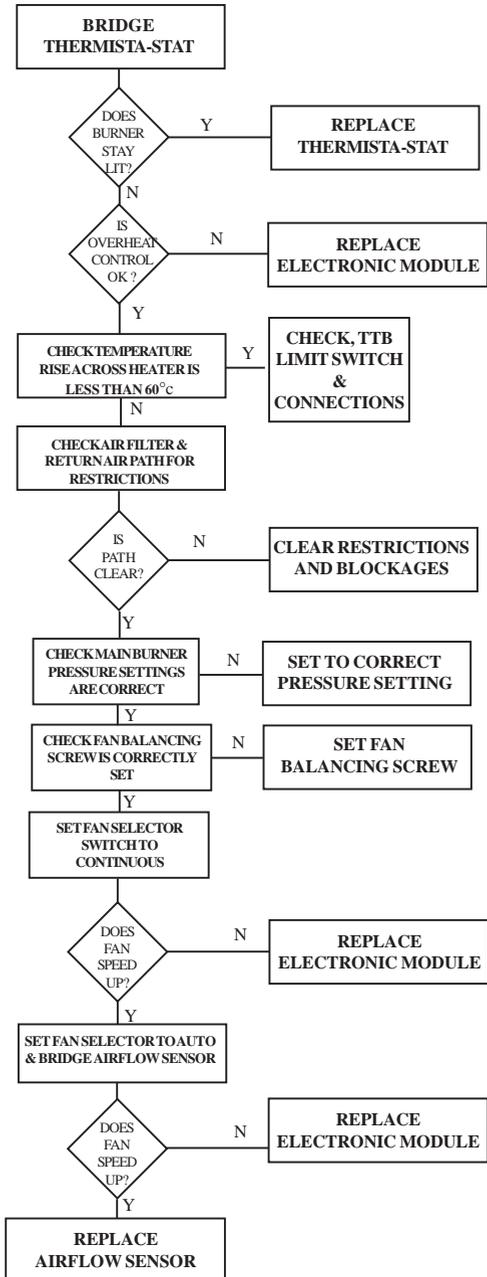
MODAIRFLOW DEFECT DIAGNOSIS FLOW CHART



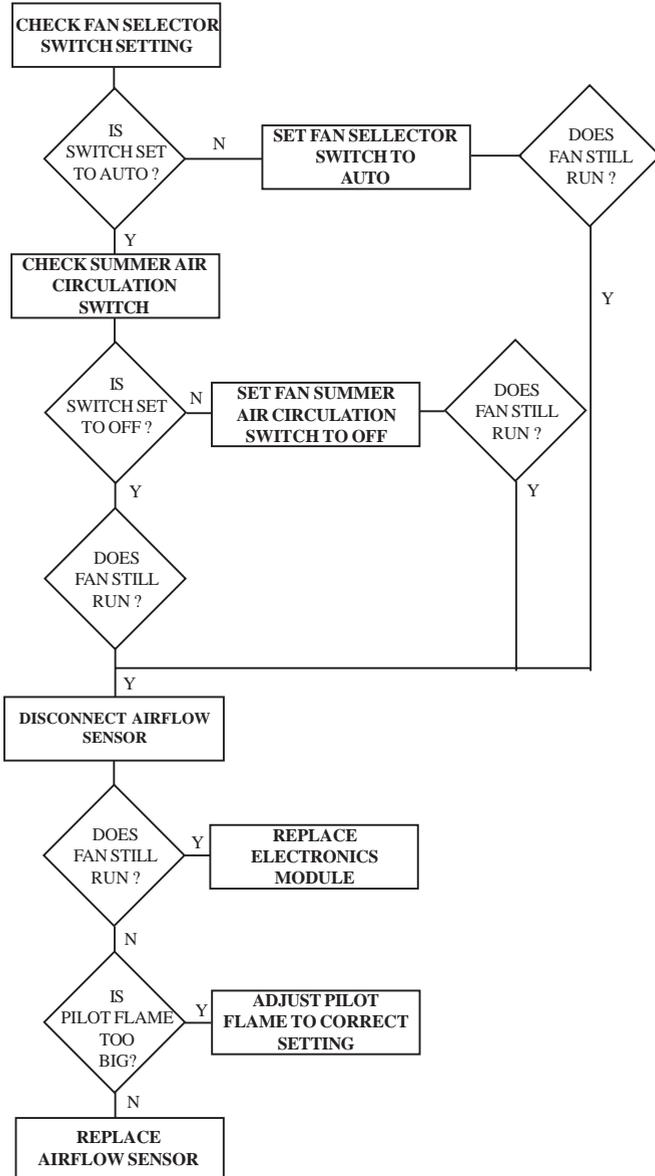
MAIN BURNER NOT OPERATING



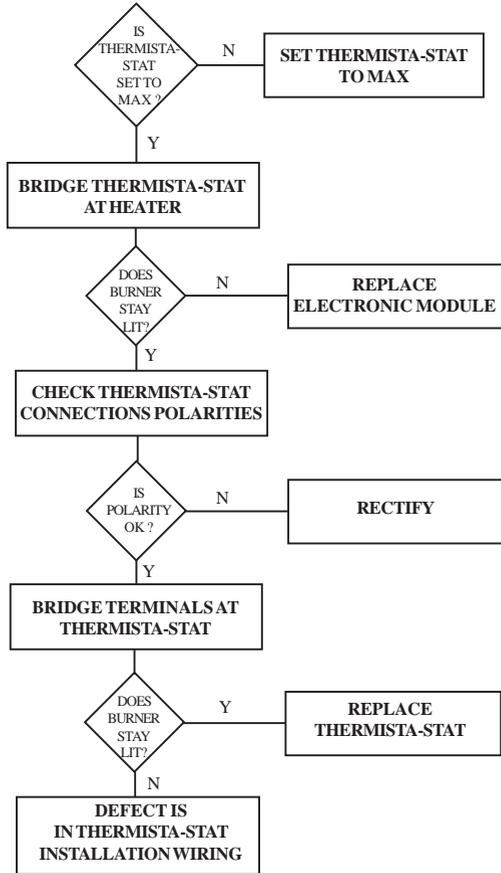
FAN OPERATES, BUT BURNER CYCLES BEFORE REQUIRED TEMPERATURE IS REACHED



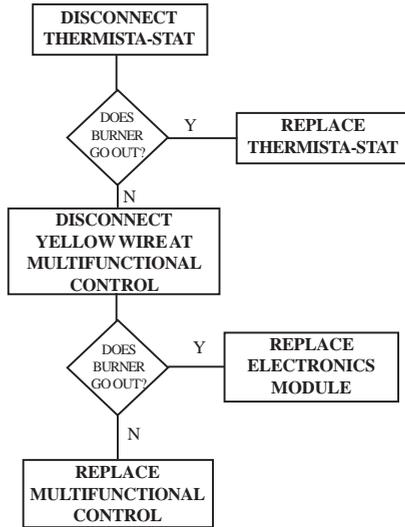
FAN CONTINUES TO RUN AFTER HEATING IS TURNED OFF



MAIN BURNER ONLY FIRES FOR SHORT PERIODS



**MAIN BURNER NOT CYCLING
(ROOM TEMPERATURE TOO HIGH)**



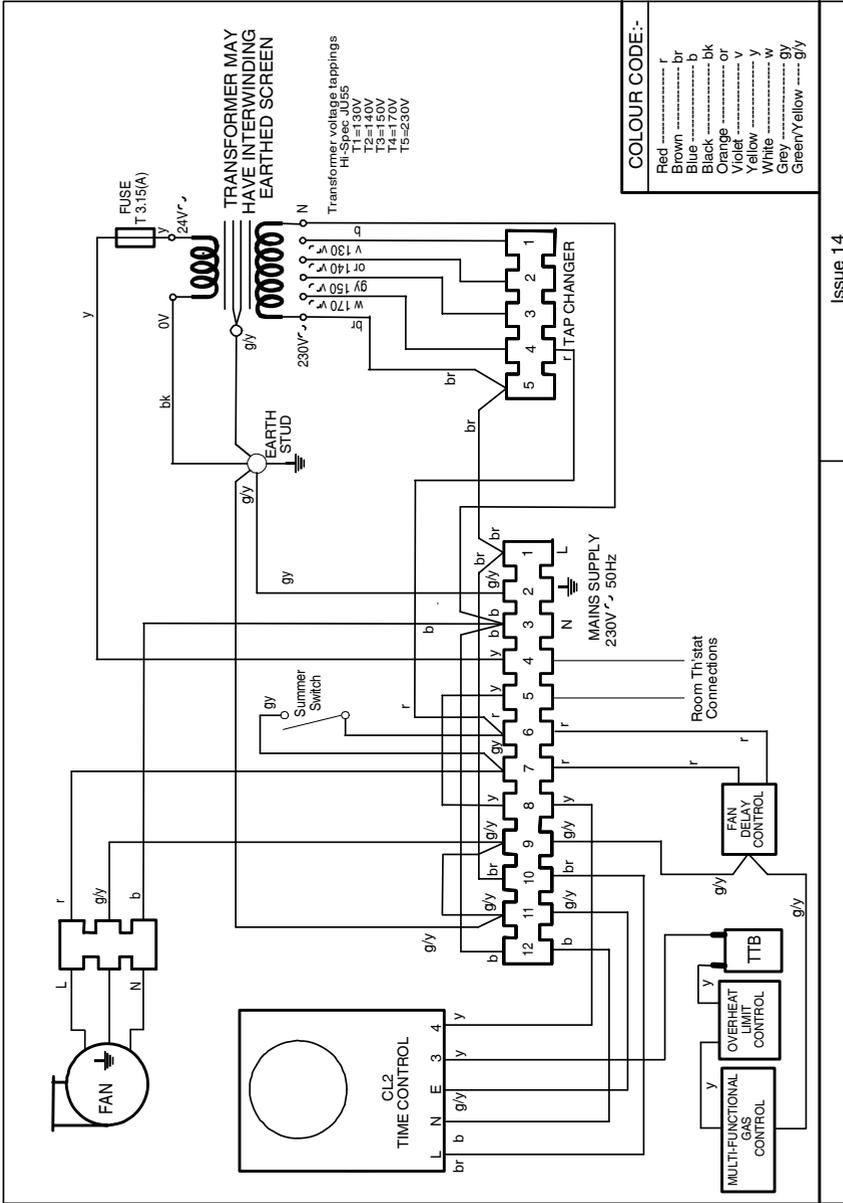


Fig. 5b, Non-MODAIREFLOW CIRCUIT DIAGRAM

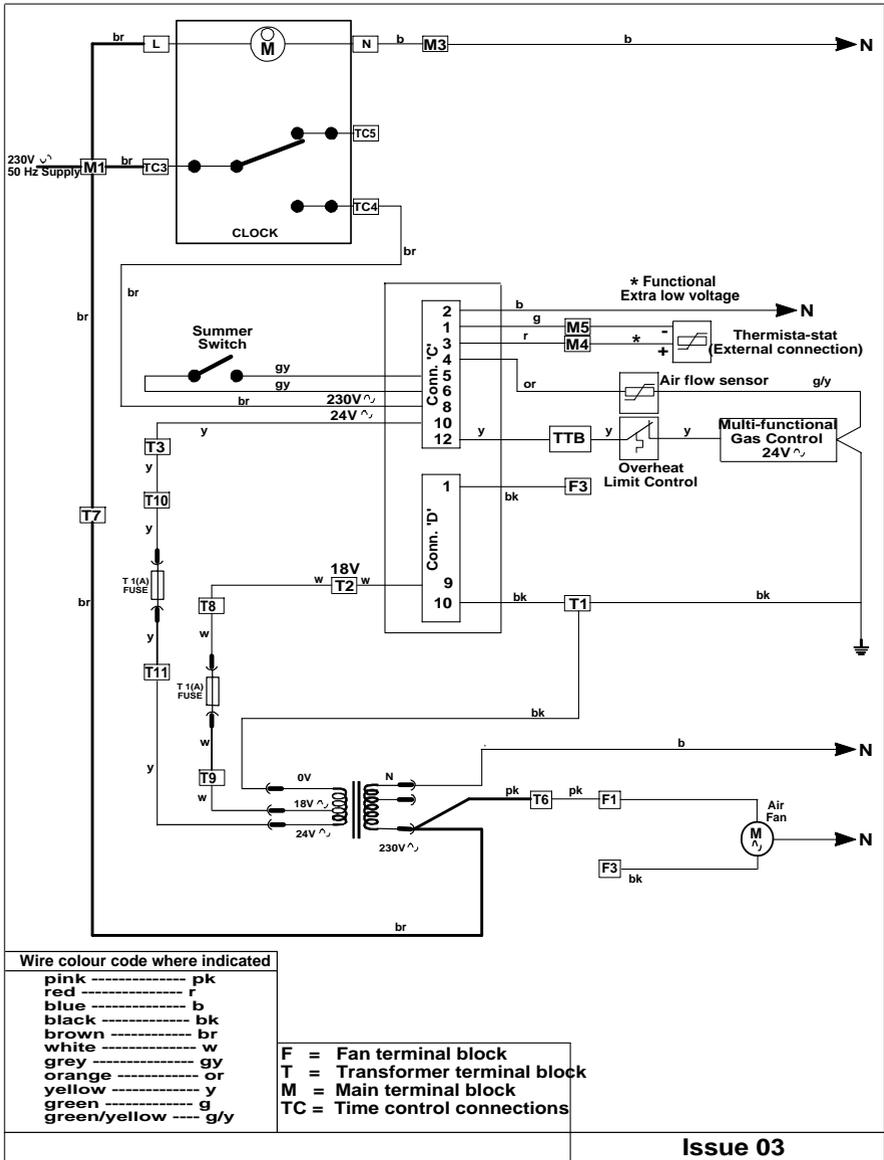


Fig. 6a, MODAIRFLOW FUNCTIONAL DIAGRAM

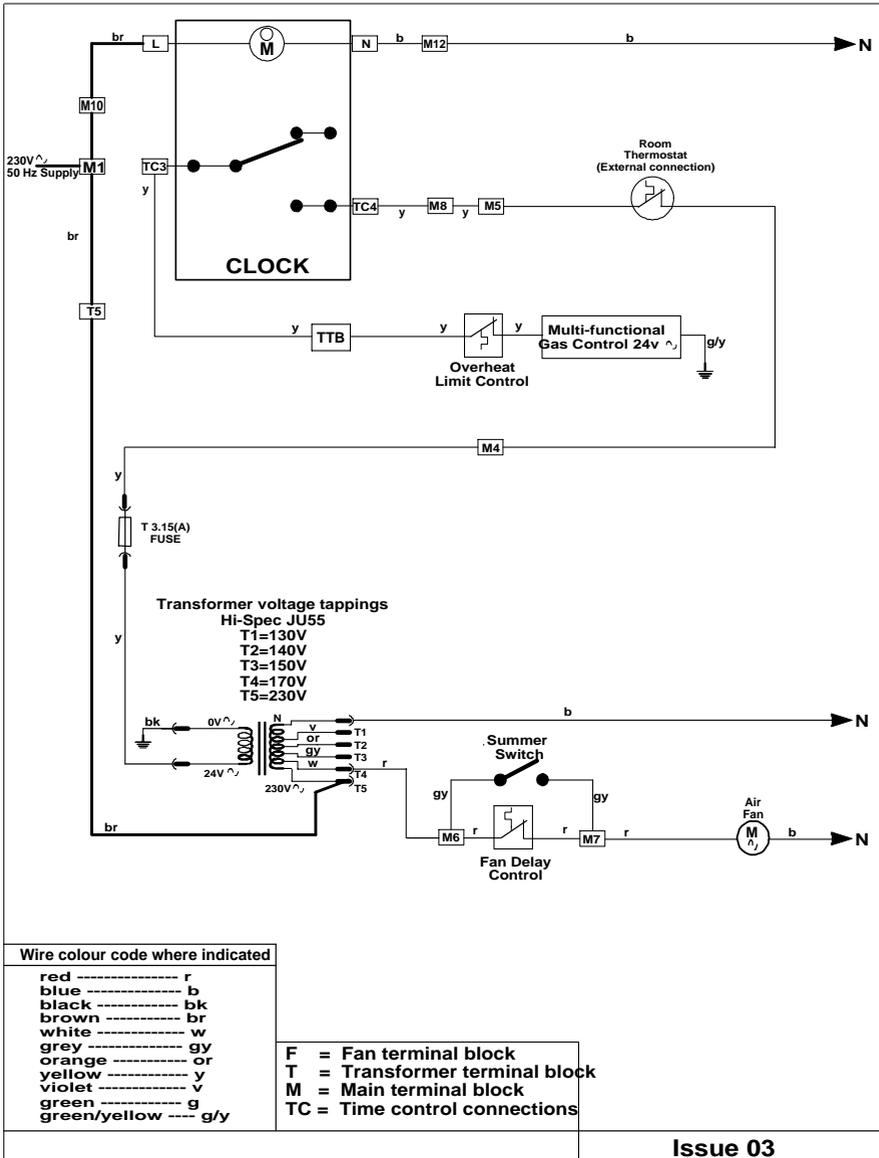
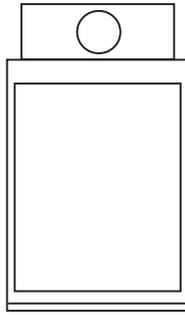
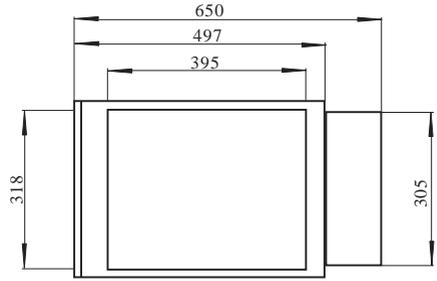


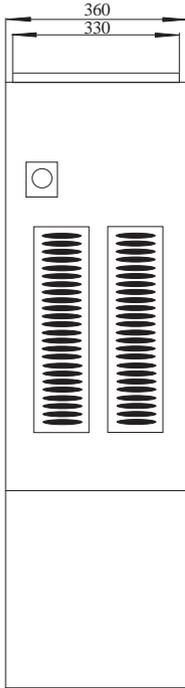
Fig. 6b, non-MODAIRFLOW FUNCTIONAL DIAGRAM



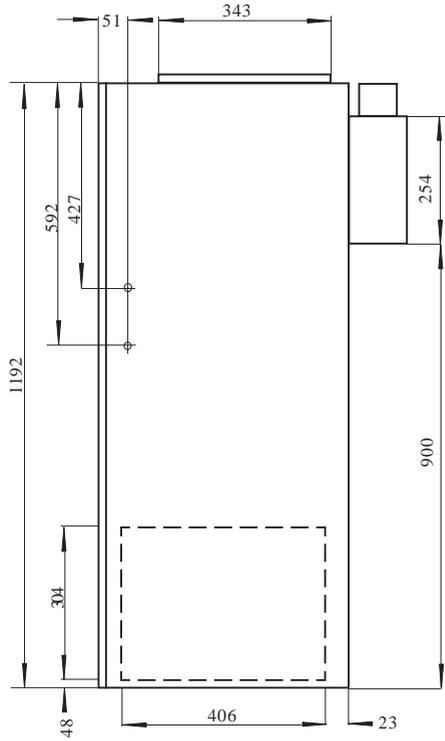
TOP VIEW



BASE VIEW



FRONT VIEW



SIDE VIEW

Fig. 7, PRINCIPAL DIMENSIONS (mm)

SHORT LIST OF SPARES

ITEM No	G.C. No	MAKER'S No	DESCRIPTION	QTY	
1	382	758	1000-0500720	Fan assembly	1
2			U550-0182000	Filter tray assembly	1
3	232	962	CL2/0100	Time control CL2	1
4	244	926	1000-0000070	Time Control Cover	1
5	384	739	BOS00105	Overheat (limit Control)	1
				Honeywell L4069C	
6	393	412	BOS01301	Multifunctional control valve	1
				Honeywell V8600C	
7	232	948	BOS02061	Sealing ring (for item 6)	2
8			BOS02397/4	Pilot assembly	1
9	392	935	1000-0701260	Pilot Injector	1
10			1000-0705260	Pilot Feed Pipe	1
11			1000-0703870	Thermocouple	1
12	386	775	BOS01970	Electrode	1
13	397	819	BOS02394	Electrode lead	1
14	244	898	BOS02406	Electrode Nut	1
15			U552-0502000	Spillage switch (TTB)	1
16			U552-0700000	Burner and Controls Assembly	1
17			1000-0705280	Burner and Cross Lighter Assembly	1
18			1000-0700980	Main Injector	2
19			1000-0705340	Cross Lighting Injector (Bray)	1 or
			1000-0705310	Cross Lighting Injector (Stereomatic)	1
20			U552-0300005	Heat Exchanger exchange kit	1
21	395	945	1000-0700570	Piezo Unit	1
22	244	971	B300-0706000	Igniter Bracket	1
23	244	957	1000-2500010	Rope Ring Seal (for heat exchanger cap)	2
24			U550-0380005	Draught Diverter Assembly	1
MODAIRFLOW MODELS					
25			U552-0156000	Upper Cabinet Door	1
26			U552-0160000	Lower Cabinet Door	1
27			U550-0530005	Control Panel with Transformer	1
28	245	220	1000-0501000	Wiring Harness	1
29	245	218	R006	Electronics Module	1
30	230	496	S00076	Airflow Temperature Sensor	1
31			1000-0500170	Fuse 1A x 1.25 inch (T)	2
32	386	475	BOS01242	Thermista-stat	1
33			1000-0516870	Transformer	1
NON-MODAIRFLOW MODELS					
34			U552-0157000	Upper Cabinet Door	1
25			U552-0161000	Lower Cabinet Door	1
36	244	222	1000-0500810	Control Panel	1
37	245	223	1000-0500890	Wiring Harness	1
38	385	159	BOS00104	Fan Control Honeywell L4068C	1
39			BOS 00689	Fuse 3A x 1 inch, (T)	1

Johnson and Starley prides itself on its ability to supply spare parts quickly and efficiently. If you have a problem in obtaining a spare part, please contact Johnson and Starley Spares Department at the address below.

Telephone: (01604) 762881

Telefax: (01604) 767408

**JOHNSON & STARLEY LTD.
Rhosili Road,
Brackmills,
Northampton NN4 7LZ**