

# INSTALLATION, COMMISSIONING & SERVICING INSTRUCTIONS

Models covered by these instructions

(42-416-09) HI-SPEC JU55P WARM  
AIR HEATERS



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

## HI-SPEC JU55P WARM AIR HEATERS

Publication No. ZZ 1021/2

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This appliance is for use with PROPANE gas G31 only.

## 1. BRIEF DESCRIPTION

Fig. 1

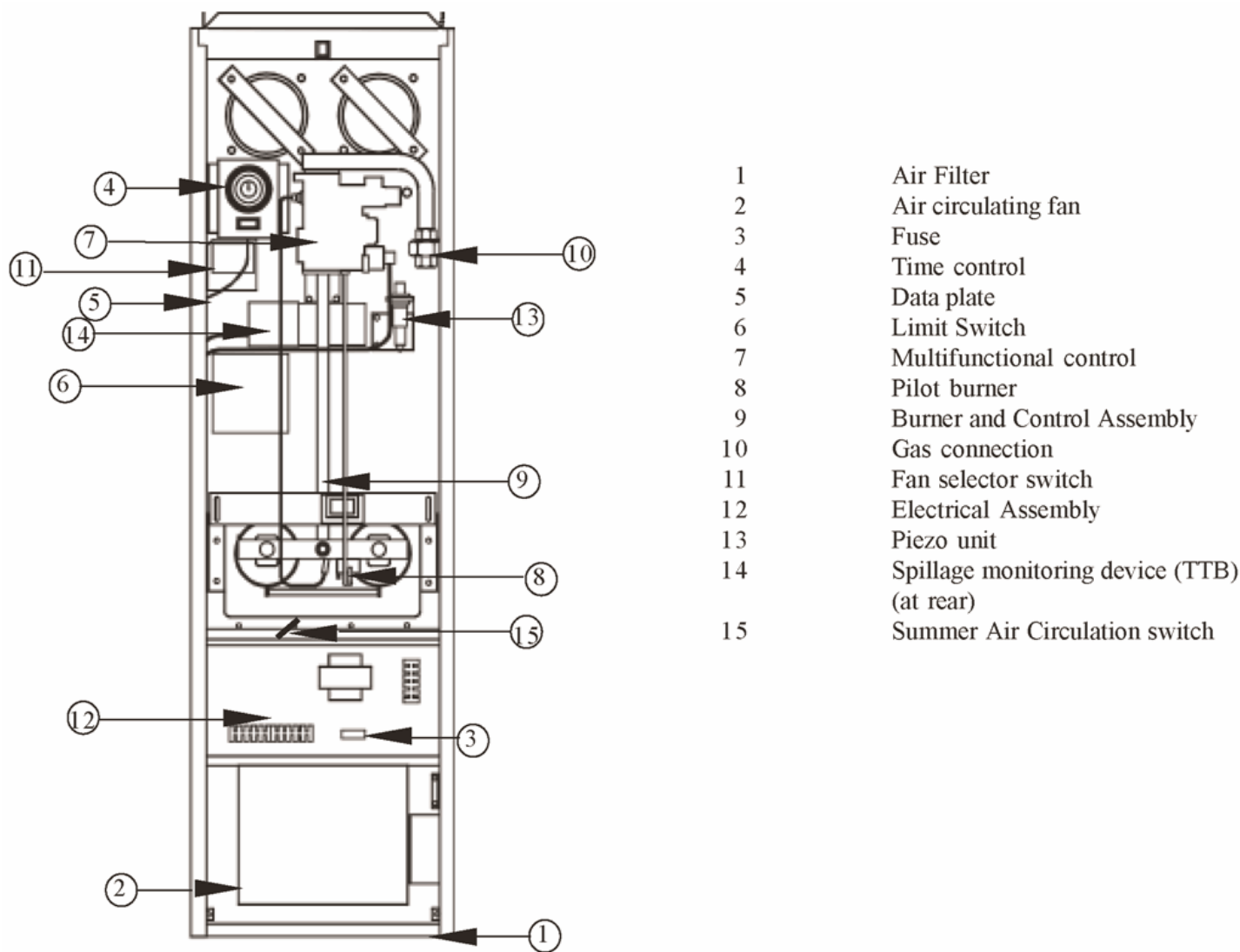


Fig. 1

HI-SPEC JU55P is an open-flued, fan assisted Upflow, ducted warm air heater. 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 is 16.1 kW (58.0 MJ/h, 55.000 Btu/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 (I.E.E.) Wiring Regulations.

BS 5482 Pt. 1 Domestic Butane- and Propane-gas-burning installations.

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 25 mm (1 in) at the sides and 75 mm (3 in) 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 450 mm (18 ins) 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 be not less than 75 mm (3 in). However, if clearances are less than 75 mm, the internal surface of the compartment must be lined with a non-combustible material. The compartment must be of a fixed rigid structure.

### 2.4

In airing cupboard installations, the part used as the air heater compartment must comply with the relevant section of BS 5864 and must be completely separated by either a non-combustible partition or a perforated metal partition with the perforations not exceeding 13 mm (½ in). 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  $67 \text{ cm}^2$  ( $12 \text{ in}^2$ ). 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 120 mm (5 in) 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  $0.0121 \text{ m}^3/\text{s}$  (25.6 cfm) i.e.  $0.98 \text{ m/s}$  (195 ft/min) velocity in a 120 mm (5 in) bore pipe. If this arrangement is used, a non-closeable 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.

**Table 1 Minimum Effective Areas**

VENTILATED FROM INSIDE BUILDING	Low level grille	$392 \text{ cm}^2$ ( $60 \text{ in}^2$ )
	High level grille	$196 \text{ cm}^2$ ( $30 \text{ in}^2$ )
VENTILATED FROM OUTSIDE BUILDING	Low level grille	$196 \text{ cm}^2$ ( $30 \text{ in}^2$ )
	High level grille	$98 \text{ cm}^2$ ( $15 \text{ in}^2$ )

## 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  $300 \text{ mm} \times 300 \text{ mm}$  ( $12" \times 12"$ ). If flexible duct is used the duct diameter should not be less than  $400 \text{ mm}$  ( $16"$ ) dia. The return air grille should have a free area of not less than  $1365 \text{ cm}^2$  ( $212 \text{ in}^2$ ).

#### 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  $0.0088 \text{ m}^2/\text{kW}$  ( $1 \text{ in}^2/250 \text{ Btu/h}$ ) 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  $50 \text{ mm}$  (2 in) 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 BS 5440 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 BS 567 or twin wall metal flue to BS 715 of nominal 100 mm (4 in) 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 600 mm. In the first instance, the installer must judge whether this distance can be achieved practicably 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.  $K_o$  and  $K_i$  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).

**Table 2 Resistance factors for use in calculating equivalent heights**

Component	Internal Size (mm)	Resistance Factor
Flue Blocks	197 × 67	0.85 per meter
	231 × 65	0.65 run
	317 × 63	0.35
	140 × 102	0.60
	200 × 75	0.60
	183 × 90	0.45
Pipe	100	0.78
	125	0.25
	150	0.12
Chimney	213 × 213	0.02
90° Bend	100 mm pipe	1.22 per
	125 mm pipe	0.50 fitting
	150 mm pipe	0.24
135° Bend	100 mm pipe	0.61 per
	125 mm pipe	0.25 fitting
	150 mm pipe	0.12
	197 × 67	0.30
	231 × 65	0.22
	317 × 63	0.13
Raking block	Any	0.30 per block
Adaptor block	Any	0.50
Terminal	100 mm ridge	2.5
	125 mm ridge	1.0
	150 mm ridge	0.48
	100 mm GCI	0.6
	125 mm GCI	0.25
	150 mm GCI	0.12

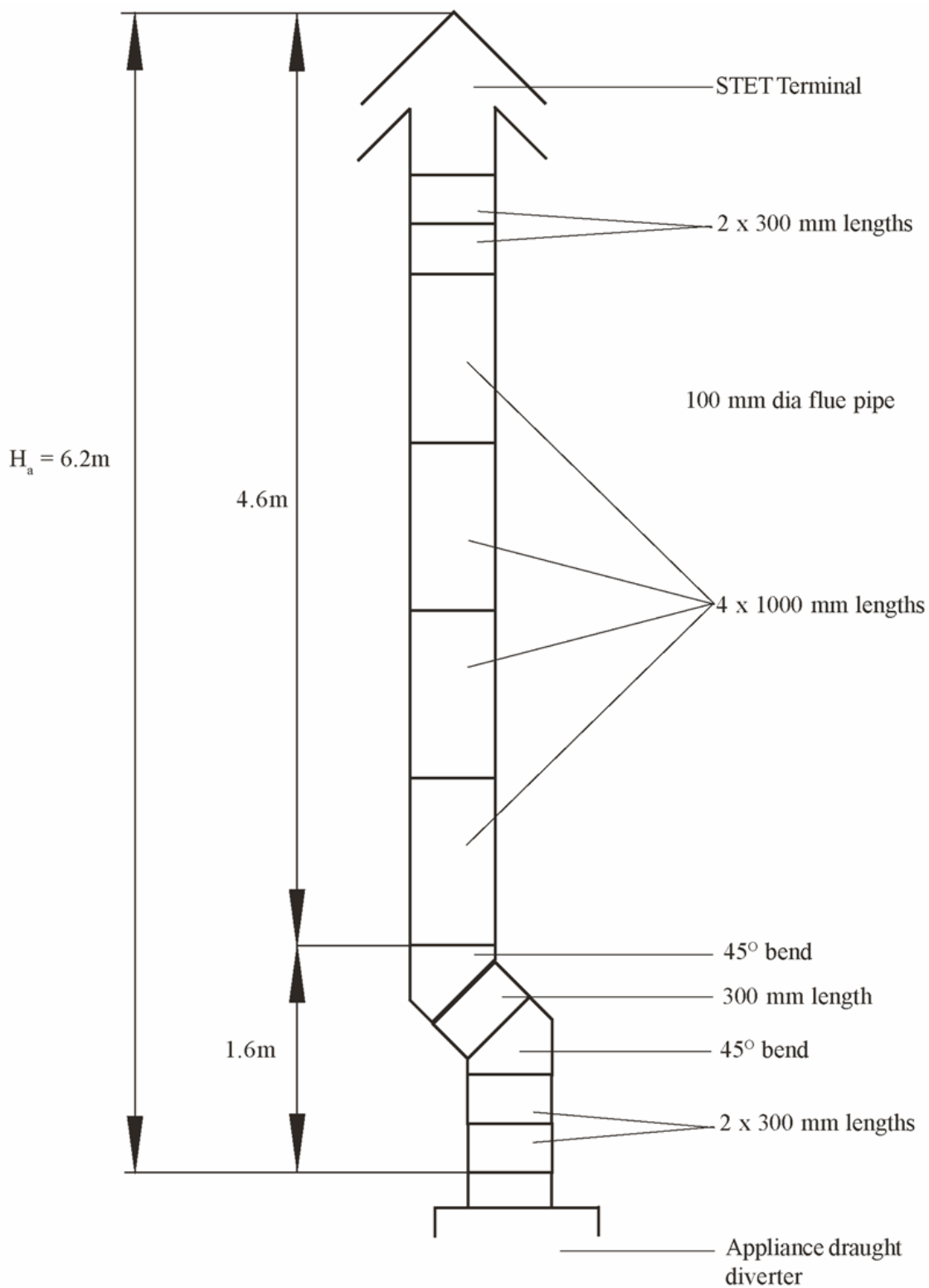
**Table 3 Inlet and outlet resistance**

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

**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):

Fig. 2 Worked example of equivalent flue height



**Fig. 2**  
**Worked example of equivalent flue height**

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
<b>Sum K</b>	<b>= 8.01</b>

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

Special consideration must be given to external flues with a view to prevention of condensation and weathering problems.

#### 5.1.13

An approved terminal should always be used; a ridge terminal or "GC1" terminal is specifically recommended. The latter should be positioned in a free air space where it is not shielded by any structure. A minimum of 1 m (3 ft.) from any vertical or inclined roof structure must be allowed for.

#### 5.1.14

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.

#### 5.1.15

#### **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.

### 5.2 ELECTRICAL

#### 5.2.1 Mains.

a. The heater is supplied with mains cable (PVC sheathed, heat resisting to 85°C), 3-core Brown-Blue-Green/Yellow, 6A, 0.75 mm<sup>2</sup>), 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.**

b. 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

Room Thermostat and its location.

- The Room Thermostat should be located where there is free air circulation approx. 1.5 m (5 ft) from the floor.
- Avoid the following locations:-
  - 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.
  - Near an outside door or windows, or on an outside wall.
  - Where affected by warm air ducts, diffusers, waste pipes or the heater itself.
  - Where subject to vibration.
- Connect room thermostat wires control panel terminals '4' and '5'

### 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 (0.4 in wg) pressure drop (See table of discharge in BS 6891)

#### 5.3.2

The ½ in 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 Rc ½ (½ in BSP. external [taper] thread).

## 5.4 Draught Diverter:

### 5.4.1

The HI-SPEC JU55P heater is supplied with a draught diverter which requires fitting to the rear of the heater prior to installation, using 6 × 4mm screws and lock washers (provided), and the TTB connection to the terminal block which is situated beneath the 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:

#### 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 Electrical supply, time control and Selector switches are set to 'OFF'.***

#### 6.3.1

Set the room thermostat to the 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, test **ON** for gas soundness and purge the whole gas pipe as described in BS6891.

#### 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 the Pilot burner ignites.

#### 6.3.5

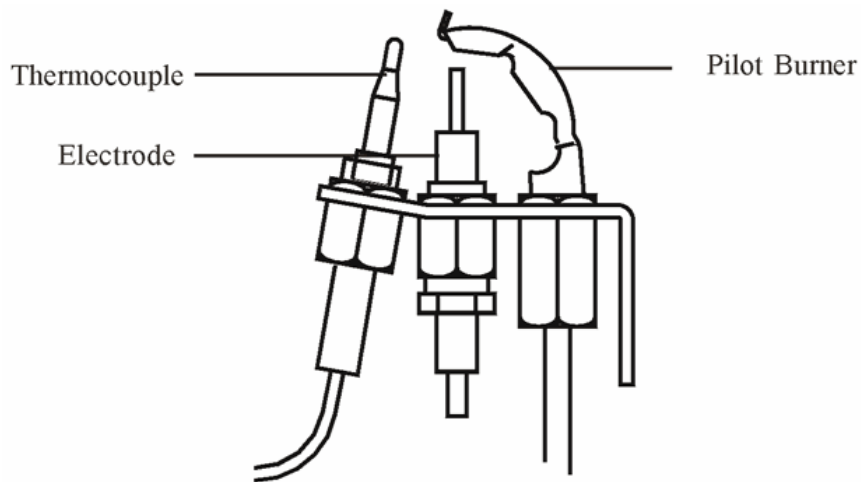
After 20 seconds release the OPERATING CONTROL and let it spring out; ensure the Pilot burner remains alight. If the Pilot burner extinguishes, rotate the OPERATING CONTROL clockwise to the position and ensure the OPERATING CONTROL is fully reset. Wait three minutes and repeat steps [6.3.4](#) and [6.3.5](#) until Pilot burner remains alight.

#### 6.3.6

Ensure that the pilot flame envelops thermocouple tip, adjusting Multifunctional control valve Pilot Adjuster as required (refer [Fig.3](#)).



Fig. 3 PILOT BURNER ASSEMBLY



**Fig. 3**  
**PILOT BURNER ASSEMBLY**

**6.3.7**

Set the Air Heater Electrical 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 the room thermostat to MAXIMUM.

**6.3.11**

Ensure the main burner has now ignited.

**6.3.12**

Test for gas leakage at the supply, Multifunctional control, Pilot and Main burners using proprietary detection fluid, sealing any leaks found.

**6.3.13**

Allow the heater to operate for a minimum of 15 mins. to ensure stability.

**6.4 MAIN BURNER PRESSURE TEST:**

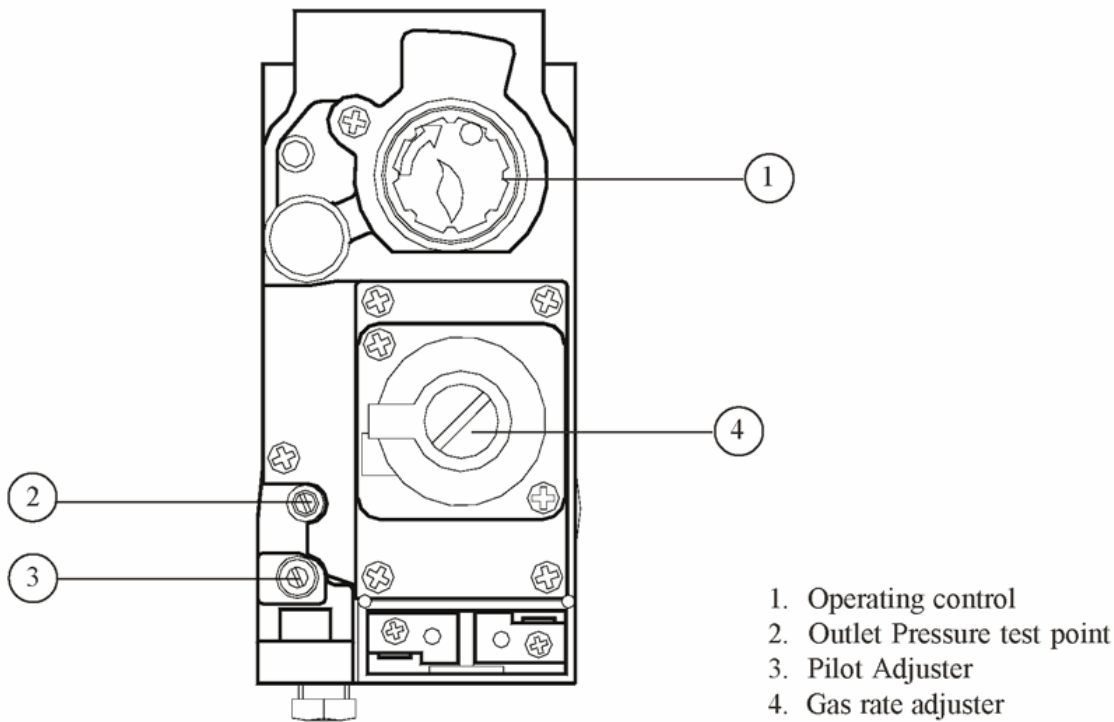
**IMPORTANT:**

**AIR HEATER BURNERS ARE FACTORY SET TO PROVIDE A NOMINAL PRESSURE OUTPUT AS DETAILED IN SUB PARA [1.2](#)**

**6.4.1**

Referring to [Table 4](#) and [Fig. 4](#) below, ensure the pressure test gauge the indicates correct burner pressure.

Fig. 4 MULTIFUNCTIONAL CONTROL



**Fig. 4**  
**MULTIFUNCTIONAL CONTROL**

## **6.5 EXTINGUISHING OF PILOT AND MAIN BURNERS:**

### **6.5.1**

On the Multifunctional control, rotate the OPERATING CONTROL clockwise to the 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**

Check the temperature rise across heater is between 45°C - 55°C, setting fan speed accordingly, (decrease fan speed to increase temperature rise). The fan speed is adjusted by selecting fan speed at control panel (decrease voltage selection to decrease fan speed).

## **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 room thermostat slowly clockwise until the Main burner ignites.

### **6.7.4**

Ensure the fan starts to operate after a short period (approx. 1-2 minutes).

### **6.7.5**

When the temperature reaches the control setting, ensure the Main burner extinguishes followed by the fan switching off after a short period.

### **6.7.6**

When the temperature falls below the control setting, ensure the Main Burner re-ignites followed by fan operation.

## **6.8 SAFETY CHECKS:**

### **6.8.1**

Ensure that the appliance has been operating for at least 15 minutes to ensure stability.

### **6.8.2**

Check for gas soundness within the appliance.

### **6.8.3**

Carry out a full spillage test as follows, and ensure 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 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 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. Extinguish the Main and Pilot Burners as detailed in sub para [6.5](#).
- b. 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.
- c. Extinguish Main and Pilot Burners as detailed in para [6.5](#)
- d. Ensure there is no spillage present (indicated by discharge of smoke from the draught diverter).

#### **WARNING:**

*The appliance shall not be left connected to the gas supply unless it has successfully passed the above spillage test*

### **6.8.4**

Extinguish the Main and Pilot Burners as detailed in sub para [6.5](#).

### **6.8.5**

Switch the appliance electrical supply OFF.

### **6.8.6**

Disconnect the fan at the electrical control panel.

### **6.8.7**

Switch the appliance 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 the Limit Switch operates, indicated by the Main Burner extinguishing, within 120 and 180 seconds.

### **6.8.10**

Switch the appliance electrical supply OFF.

### **6.8.11**

Reconnect the Air Heater Fan.

### **6.8.12**

Switch the appliance electrical supply ON.

### **6.8.13**

Ensure 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 the Multifunctional control fail-safe operates within 60 seconds (indicated by loud click from Multifunctional control).

Table 4 Main Burner Pressure Settings

	kW	MJ/h	Btu/h
INPUT	20.72	74.60	70700
OUTPUT	16.11	58.00	55000
Gas rate cv (gross)	95.65 MJ/m <sup>3</sup>		
Burner setting pressure (hot)	34.8 mbar (13.9in wg)		
Main Injector	Bray Cat 960/320		

Table 5 Fan Performance Curve

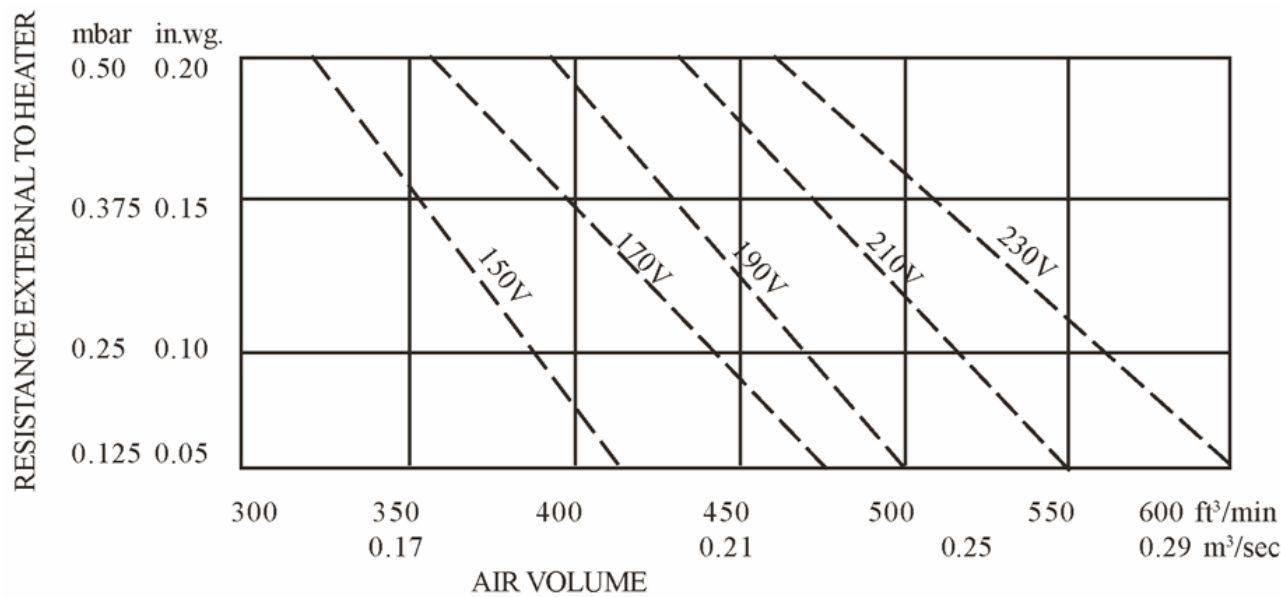


Table 5  
Fan Performance Curve

6.9 WARM AIR SYSTEM BALANCING

6.9.1

Set the SUMMER AIRFLOW switch to. 'ON'

6.9.2

Balance the system to provide the required volume proportions at warm air outlets.

NOTE:

*If the system includes ceiling diffusers, air velocities through these should be NOT LESS THAN 1.5 m/s (300 ft/min), except for very small rooms, (i.e. bathrooms etc.). Outlet faces may require partial blanking in order to achieve this.*

6.9.3

Set the SUMMER AIRFLOW switch to 'OFF'.

6.9.4

Turn the gas supply ON at the service cock.

6.9.5

Ignite the Pilot and Main burners as detailed in sub-paras [6.3.1](#) to [6.3.5](#).

7. INSTRUCTIONS FOR USERS

7.1

If the building is unoccupied, ensure that the Instructions for the 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 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 that the gas and electricity supplies are isolated before commencing any maintenance or re-placement 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 [6.9](#) 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 the return air filter/air cleaner (if fitted) for cleanliness.

#### **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 the 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 6 × 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 detailed in [8.2](#)

#### **8.4.2**

Remove 2 × screws securing the Pilot burner assembly to the Main Burner and Control assembly and withdraw the Pilot burner assembly, taking care to avoid damage to the thermocouple capillary.

#### **8.4.3**

Remove 2 × screws securing the Burner arm to the Burner and Controls assembly, and withdraw the Burner Arm.

#### **8.4.4**

Unscrew the 2 Main injectors, and 1 cross lighter injector from the housing.

#### 8.4.5

Clean as necessary. **DO NOT ENLARGE, DISTORT OR DAMAGE MAIN INJECTOR HOLES.**

#### 8.4.6

If injectors are to be replaced, ensure 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 assembly and Multifunctional control 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 damage to the thermocouple capillary.

#### 8.5.4

Release the Pilot Gas Feed pipe from the Multifunctional control.

#### 8.5.5

Remove 2 × 4mm screws securing the Pilot Burner assembly to the Main 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 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 the 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 the Multifunctional control, including the adapter, avoiding damage to the capillary.

#### 8.6.3

Disconnect the Pilot Feed Pipe from 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 2 × conductors from the Piezo unit.

### **8.7.2**

Unscrew the Piezo retaining nut and remove the Piezo unit from mounting the 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 the Air Filter and appliance lower and upper doors.

### **8.8.3**

Release 3 × screws securing the Electrical panel, and withdraw the panel, avoiding damage to wiring.

### **8.8.4**

Disconnect 2 × 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 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 the electrical supply is isolated.

### **8.9.2**

Remove the Air Filter and appliance lower and upper doors.

### **8.9.3**

Release 2 × 4mm screws securing Limit switch cover and withdraw cover.

### **8.9.4**

Disconnect the following:

- a. 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 '4' and '5',
- d. Limit switch 'LOAD' and 'COMMON' connections,



e. Fan Control '**LOAD**', '**COMMON**' and '**EARTH**' connections,

#### **8.9.5**

Disconnect 2 × TTB connections.

#### **8.9.6**

Disconnect the Multifunctional control connections.

#### **8.9.7**

Release 3 × 4mm screws securing the Electrical assembly to the heater cabinet and remove the Electrical assembly, releasing the wiring from cable clamps and grommets as required.

#### **8.9.8**

Refitting or replacement is in reverse order.

### **8.10 TIME CONTROL REMOVAL:**

#### **8.10.1**

Ensure that the electrical supply is isolated.

#### **8.10.2**

Release the securing screw situated on the lower face of the Time Control and remove the Time Control by partially withdrawing the bottom of the Time Control and then lifting upwards.

#### **8.10.3**

Disconnect the Time Control electrical connections from the integral terminal strip.

#### **8.10.4**

Refitting or replacement is in reverse order.

#### **8.10.5**

Set the Time Control to the required ON and OFF times.

#### **8.10.6**

Set the Time Control to correct time.

### **8.11 FAN DELAY CONTROL AND LIMIT SWITCH REMOVAL:**

#### **8.11.1**

Ensure that the electrical supply is isolated.

#### **8.11.2**

Remove the appliance lower and upper doors.

#### **8.11.3**

Release 2 × 4mm screws securing the Limit switch cover and withdraw the cover.

#### **8.11.4**

Disconnect the required control/switch.

#### **8.11.5**

Release 2 × securing screws and remove the required control/switch.

#### **8.11.6**

Refitting or replacement is in reverse order.

### **8.12 SPILLAGE MONITORING DEVICE (TTB) REMOVAL:**

#### **8.12.1**

Ensure that the electrical supply is isolated.

#### 8.12.2

Remove the appliance lower and upper doors, and TTB Terminal cover secured to the Limit switch cover.

#### 8.12.3

Disconnect the TTB from the terminal block.

#### 8.12.4

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).

#### 8.12.5

Withdraw the TTB wiring from the grommet situated on the upper left hand side of the Air Heater.

#### 8.12.6

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.**

#### 8.12.7

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.

#### 8.12.8

Refitting or replacement is in reverse order.

### 8.13 HEAT EXCHANGER ACCESS:

#### 8.13.1

Release 2 × securing screws and remove heat exchanger access cap and gasket.

#### 8.13.2

Remove the heat exchanger baffle.

#### 8.13.3

Reassembly is in reverse order.

#### NOTE:

*When reassembling, ensure that the baffle is pushed fully home and the 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

#### WARNING:

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

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.

SYMPTOM	POSSIBLE CAUSE	REMEDY
b. Pilot lights but goes out on releasing START button during initial light-up, or after normal operation.	iv. Piezo system faulty.	Check igniter, lead, and electrode.
	v. Excessive gas supply pressure.	Check that cylinder gas pressure is 37 mbar, and reduce if necessary.
	i. Connection between thermocouple and multifunctional control not secure.	Check connection is secure.
	ii. Faulty power unit on gas control.	Replace Multifunctional control.
c. Main burner lights but fan fails to run after approx. 3 min.	iii. Faulty thermocouple.	Replace Thermocouple.
	iv. Combustion air contaminated.	Conduct spillage test and rectify.
	i. Loose electrical connection fan delay control.	Check connections.
	ii. Fan control set incorrectly.	Check for correct settings.
d. Main burner operating intermittently with fan running.	iii. Faulty fan assembly.	Replace, taking care not to damage impeller.
	iv. Faulty fan control.	Replace.
	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.
e. Main burner operating with intermittent fan operation.	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)
f. Fan runs for excessive period or operates intermittently after main burner shuts down.	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.
g. Noisy operation.	i. Fan control set incorrectly.	Check for correct settings.
h. Pilot alight but main burner not igniting.	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.
	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.	Replace. If failure occurs again, check wiring for short circuits.
	iv. Loose connection to room thermostat, limit switch, gas control lead, time control, or transformer.	Check connections.
	v. Transformer open circuit.	Check with test meter and replace transformer electrical assembly.
	vi. Multifunctional control faulty.	Replace Multifunctional control.
	vii. Limit switch faulty.	Short circuit control 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.

Fig. 6 MODAIRFLOW CIRCUIT DIAGRAM



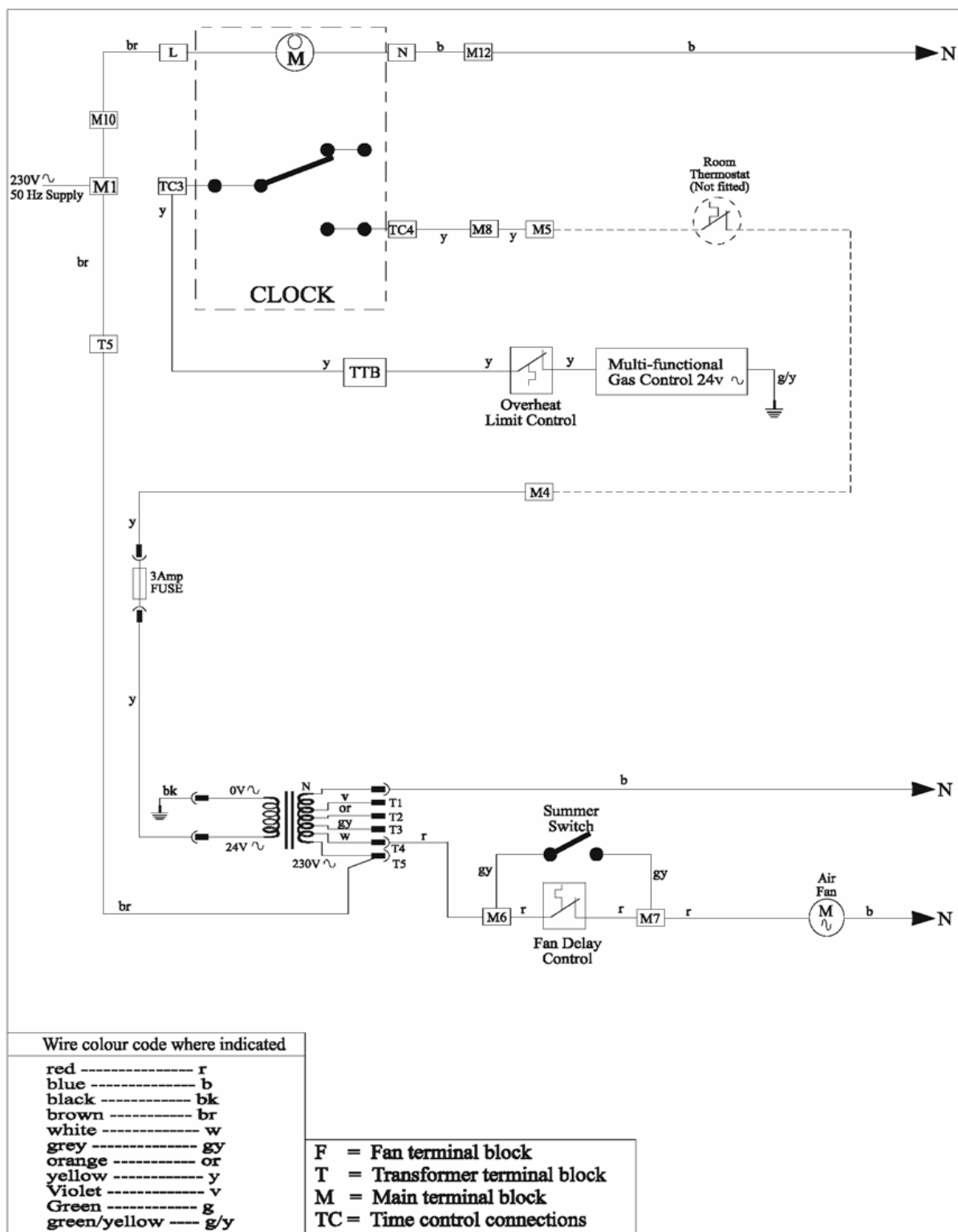
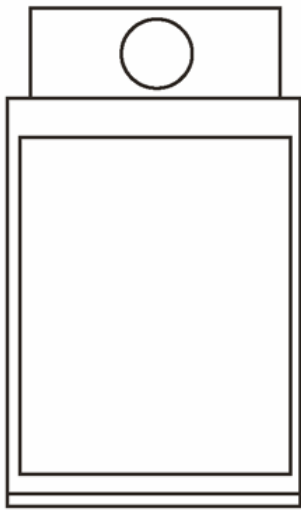
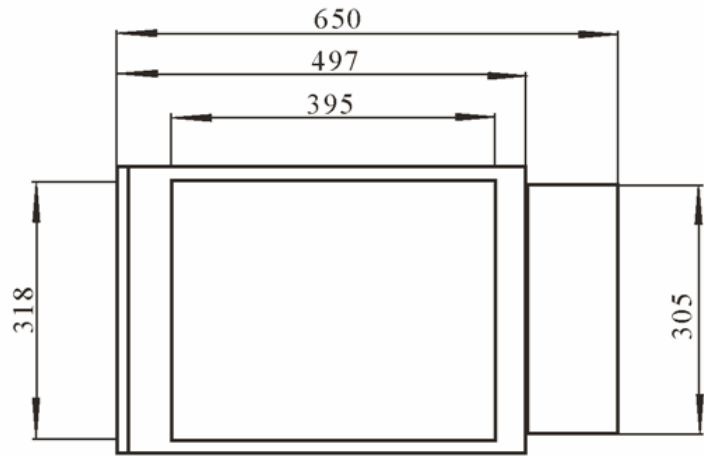


Fig. 7, FUNCTIONAL DIAGRAM

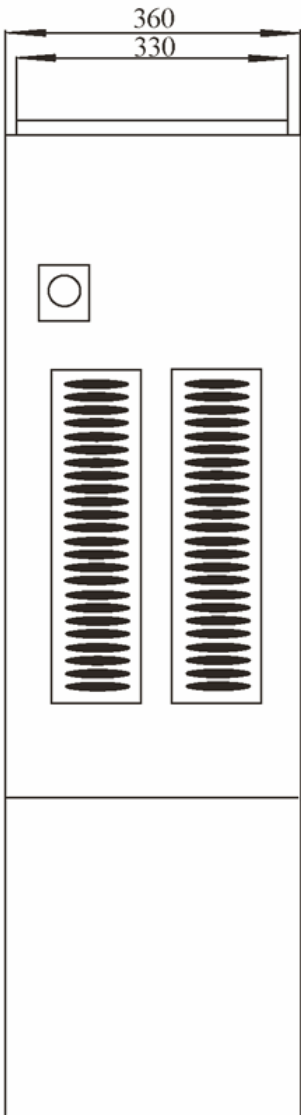
Fig. 8, PRINCIPAL DIMENSIONS (mm)



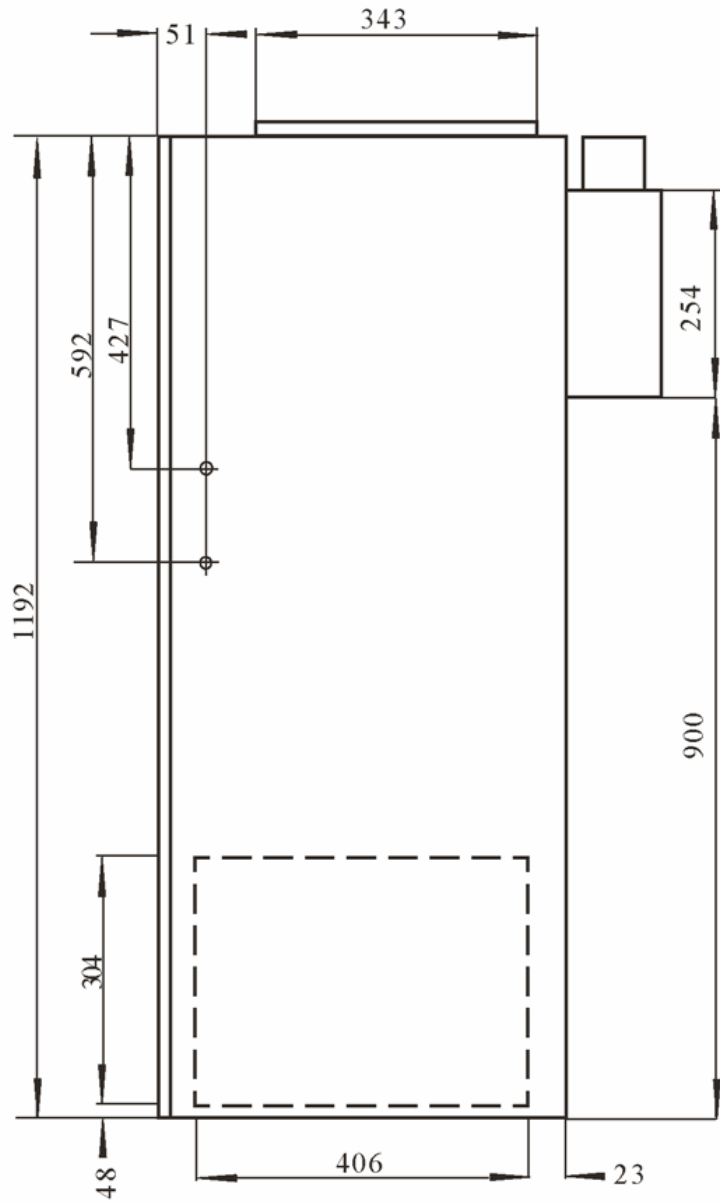
**TOP VIEW**



**BASE VIEW**



**FRONT VIEW**



**SIDE VIEW**

**Fig. 8, PRINCIPAL DIMENSIONS (mm)**

**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.**

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