



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

JU SERIES WARM AIR HEATERS INSTALLATION, COMMISSIONING & SERVICING INSTRUCTIONS

JU78: G.C. No 42 417 79

JU117: G.C. No 42 417 78

JU156: G.C. No 42 417 77

Publication No. ZZ 602/6
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These appliances have been tested and certified by B G Technology for use with natural gas.

1.

BRIEF DESCRIPTION

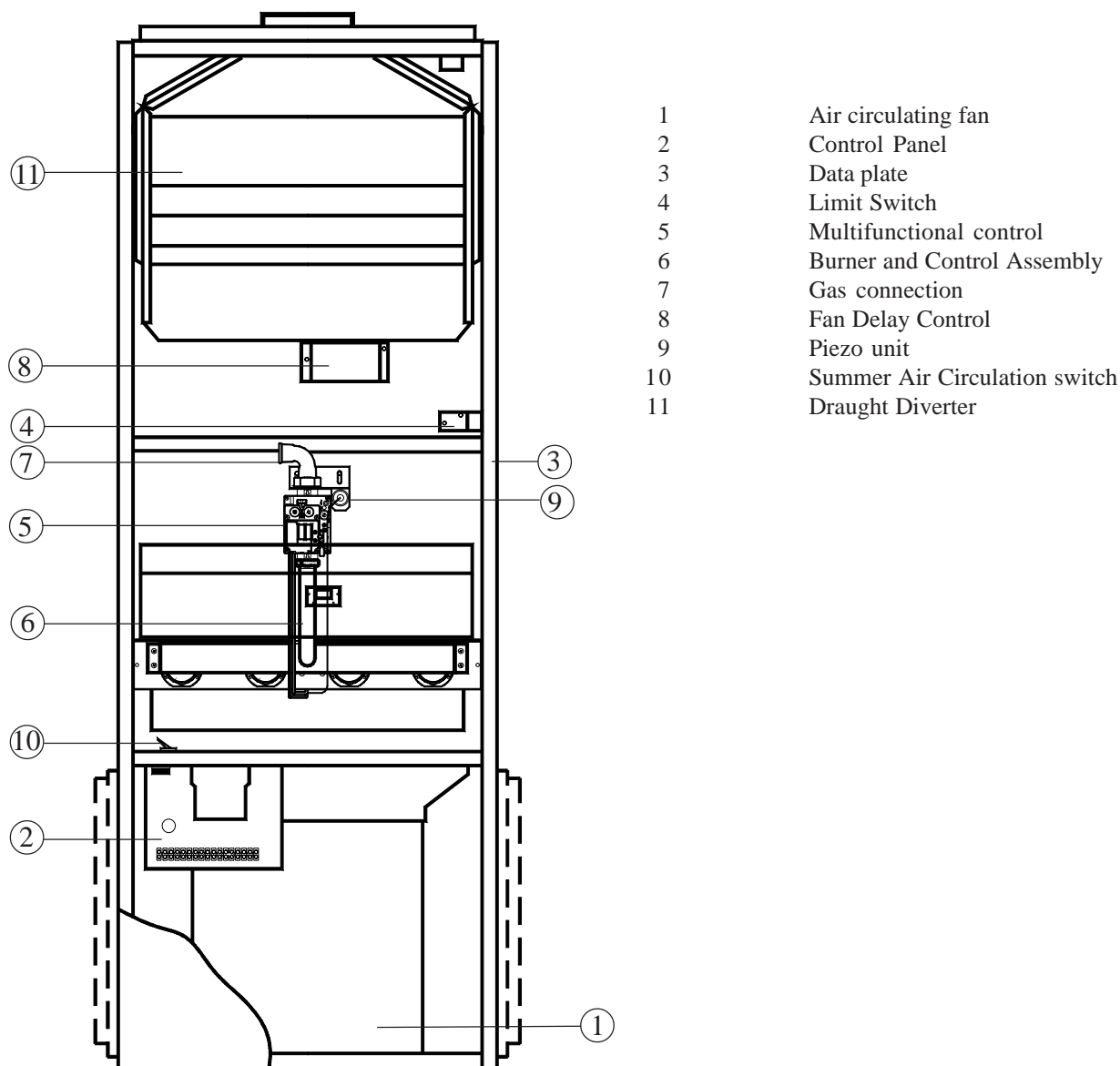


Fig. 1
General Layout Diagram

1.1 JU78, JU117 and JU156 are open-flued, fan assisted Upflow, ducted warm air heaters, the outputs of which are as follows:

JU78:	23.0kW (82.8MJ/h, 78,500Btu/h)
JU117:	34.3kW (123.4MJ/h, 117,000Btu/h)
JU156:	45.7kW (164.5MJ/h, 156,000Btu/h)

THESE APPLIANCES CONFORM TO BS800

6 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 5440 Pt. 1 (Flues for Gas Appliances).

BS 5440 Pt. 2 (Installation of ventilation for gas appliances)

BS6230 Installation of Gas Fired Forced convection Air Heaters for Commercial and Industrial space heating (2nd family gases).

British System Design Manual "Gas Fired Warm Air Heating".

Model and Local Authority Bye-laws.

IM/2 Purging procedures for non-domestic gas installations.

IM/5 Soundness testing procedures for industrial and commercial gas installations.

IM/11 Flues for commercial and industrial gas fired boilers and air heaters.

IM/16 Notes on installation of pipework (excluding domestic installations of 25mm and below).

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.

1.2 GENERAL DATA

	JU78	JU117	JU156
Appliance height (excluding air discharge top or swivel heads)	1830mm (72in)	1830mm (72in)	1830mm (72in)
Appliance width	375mm (14.8in)	525mm (20.7in)	675mm (26.2in)
Appliance depth	778mm (30.6in)	778mm (30.6in)	778mm (30.6in)
Appliance weight	110kg (242lb)	140kg (308lb)	220kg (484lb)
Flue diameter	125mm (5in)	150mm (6in)	150mm (6in)
Fuse rating	T6.3A	T6.3A	T6.3A

2. HEATER COMPARTMENT AND CLEARANCES (See BS6230)

2.1 When a heater is fitted into a compartment, the following minimum clearances must be maintained:

2.1.1 12mm (0.5in) from rear, and a side fitted with a blanking plate, allowing extra space if a gas supply pipe enters the appliance from this side.

2.1.2 600mm (24 in) from a side fitted with a louvre side return panel.

2.1.3 230mm (9 in) from the front for combustion air supply.

2.1.4 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.

2.2 For service access, a minimum of 750mm (30ins) is required at the front of the heater. Space must also be allowed, in a compartment installation, to permit the removal of the heater. Where clearances between the appliance and the compartment are less than 75mm, the internal surface of the compartment must be lined with non-combustible material. The compartment must be of a fixed rigid structure.

2.3 **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 When the air heater is free standing or ducted, but in an open area, there must be a adequate supply of air for combustion in accordance with BS 6230 Clause 12.1.1. The openings should be sited so that they cannot be easily blocked (refer to BS 6230 Clause 12.1.3).

3.2 Where natural ventilation is used for compartment or plant rooms, suitable permanent openings at low and high level, communicating directly with outside air, shall be provided in accordance with BS 6230 Clause 12.1.5.

3.3 If the installation includes more than one heater, the ventilation requirements of BS 6230 must be observed.

Position of Air Vents	Air direct from outside
JU78 - High Level JU78 - Low Level	132 cm ² (21 in ²) 264 cm ² (42 in ²)
JU117 - High Level JU117 - Low Level	197 cm ² (31 in ²) 393 cm ² (62 in ²)
JU156 - High Level JU156 - Low Level	261 cm ² (41 in ²) 522 cm ² (82 in ²)

Table 1: Minimum Effective Areas

4.

DUCTSYSTEM

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

4.1 RETURN AIR

- 4.1.1 If the air heater is installed in a compartment, all return air shall be **POSITIVELY** ducted from outside the compartment to the bottom of the unit. It is recommended that the return air duct be not routed directly from the main occupied area, but from a convenient central area serving the remainder of the building.
- 4.1.2 The return air system must be constructed of non-combustible 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. Return air duct sizes and minimum open areas of return air grilles are as listed in Table 2.

Appliance	Minimum return air duct size	Minimum free area of Return air grilles
JU78	300mm x 300mm (12 in x 12 in)	1887cm ² (291 in ²)
JU117	450mm x 300mm (18 in x 12 in)	2796cm ² (434 in ²)
JU156	600mm x 300mm (24 in x 12 in)	3725cm ² (578 in ²)

**Table 2
Minimum Return Air and Free Area**

- 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 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 diameter as specified in para 1.2.
- 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 combustibile materials.
- 5.1.7 All materials shall be in accordance with local gas region and 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 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 3. K_o and K_i are obtained from Table 4.

- c. Table 3 gives resistance factors for common flue components for use in the formula. Table 4 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			
Chimney	213 x 213	0.02	Terminal	100 mm ridge	2.5
90° Bend	100 mm pipe	1.22 per		125 mm ridge	1.0
	125 mm pipe	0.50 fitting		150 mm ridge	0.48
	150 mm pipe	0.24		100 mm GCI	0.6
				125 mm GCI	0.25
			150 mm GCI	0.12	

Table 3
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 4
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 (refer Fig. 2):

From table 4:

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 @ 0.78)	= 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.

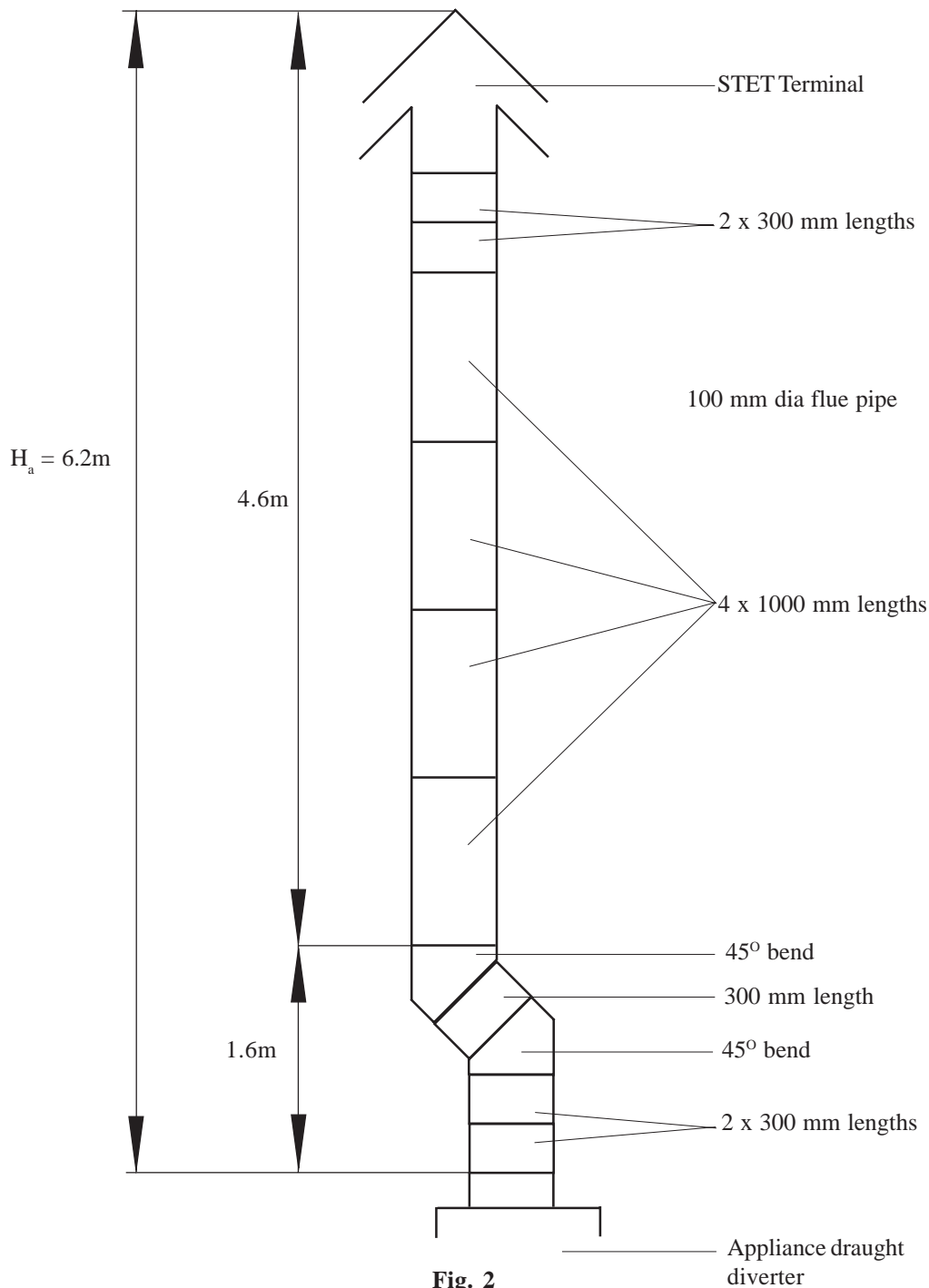


Fig. 2

Worked example of equivalent flue height

- 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 BS5440 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.
- 5.1.14 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 1m (3ft) from any vertical or inclined roof structure must be allowed for.

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

5.2 ELECTRICAL

5.2.1 **Mains.** A single phase 230V 50Hz mains connection from a fused spur, rated at 13A with a double pole switch for isolation is required for the installation. Location of connections is shown at Fig. 5. Mains may be brought into the appliance via the electrical entry holes on either side, 600mm above the floor. A cable clamp with 2 self tapping screws is provided to secure the mains cable adjacent to the entry hole, using the 2 screw holes provided. All wiring must be to I.E.E regulations for electrical installations, using heat resisting 3 core cable to BS 6500
WARNING: TERMINALS MARKED '0V' ARE NOT EARTH.

5.2.2 Thermostat and its location.

- a. A 24V thermostat which complies with BS 800, BS 3955 and BS 4201 must be supplied and is essential to ensure close control of the comfort level. An anticipator is located in the thermostat which is rated in amps. The current rating of the anticipator should correspond with the current rating of the multifunctional control, (i.e. 0.6A). The anticipator should be checked and adjusted as necessary. Connection to the air heater is as shown in Fig. 5, using sheathed conductors compliant with BS6500.

IMPORTANT: When a thermostat is fitted to the installation, ENSURE THAT THE BLUE LINK WIRE between terminals '8' and '11' IS REMOVED.

- b. The Thermostat should be located where there is free air circulation approx. 1.5m (5ft) from the floor, and avoiding 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.

5.3 GAS (See BS5864 and BS6891)

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 BS6891).

5.3.2 The $\frac{3}{4}$ 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 $\frac{3}{4}$ ($\frac{3}{4}$ in BSP. external [taper] thread).

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 fan chamber door and the air filter (if fitted).

6.2.2 Set the Fan Speed selector to 230V for heaters fitted to ducted installations, or 210V for heaters utilizing discharge heads.

6.2.3 Refit the fan chamber door and air filter (if required).

6.3 SYSTEM BALANCING:

6.3.1 Set the SUMMER AIR CIRCULATION switch to 'ON'.

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

NOTE: If 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.

6.3.3 Set the SUMMER AIR CIRCULATION switch to 'OFF'.

6.4 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'.

- 6.4.1 Set the Thermostat to the lowest or OFF setting.
- 6.4.2 On the Multifunctional Control, remove the Outlet Pressure test point cover, and a fit pressure test gauge (refer fig. 4).
- 6.4.3 On the Multifunctional Control, remove the Gas Pressure Adjustment cover.
- 6.4.4 Turn ON the Gas supply to the heater, test for gas soundness and purge the whole gas pipe as described in IM/2 and IM/5.
- 6.4.5 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.
Note: If the Piezo unit should fail to provide a spark, the pilot burner may be ignited by applying a lighted taper to the pilot burner whilst holding the OPERATING CONTROL depressed.
- 6.4.6 After 20 seconds release the OPERATING CONTROL and let it spring out; ensure that the Pilot burner remains alight. If the Pilot burner extinguishes, wait three minutes and repeat steps 6.3.5 and 6.3.6 until Pilot burner remains alight, holding the OPERATING CONTROL depressed for a longer period than previously.
- 6.4.7 Ensure that the pilot flame envelops the thermocouple tip, adjusting the Pilot Adjuster as required (refer Figs. 3 and 4).
Note: This appliance uses a low energy pilot burner, which is factory set at 4 full turns anticlockwise from closed.
- 6.4.8 Set the Heater Electricity supply ON.
- 6.4.9 Set the Time Control to required Heating On periods and the Selector switch to 'TIMED'.
- 6.4.10 Set the room thermostat to MAXIMUM.
- 6.4.11 Ensure that the main burner has now ignited.
- 6.4.12 Test for gas soundness at the supply, Multifunctional Control, Pilot and Main burners using a proprietary detection fluid and sealing any leaks found.
- 6.4.13 Allow heater to operate for a minimum of 15 minutes to ensure stability.

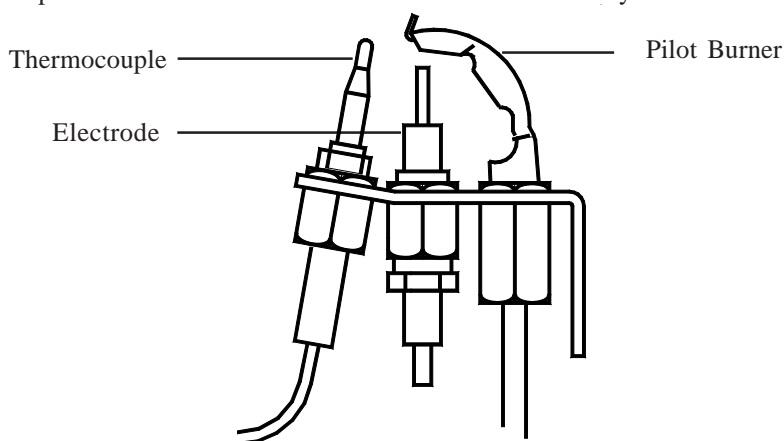


Fig. 3
Pilot Burner Assembly

6.5 MAIN BURNER PRESSURE TEST:

NOTE: AIR HEATER BURNERS ARE FACTORY SET TO PROVIDE A NOMINAL HIGH PRESSURE OUTPUT AS DETAILED IN SUB PARA 1.1

- 6.5.1 Referring to Table 5 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 the correct burner pressure as detailed in Table 5.
 - iii. Refit the Burner Pressure Adjuster cover.

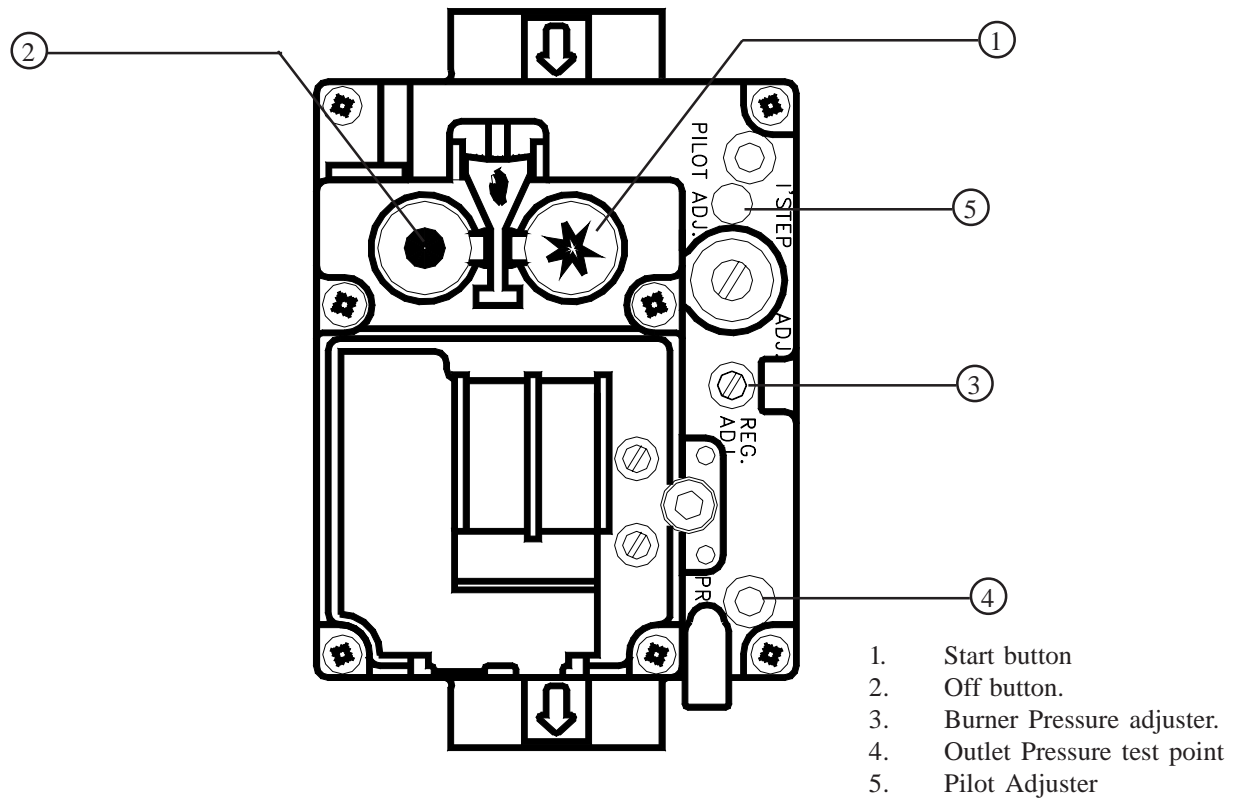


Fig. 4
Multifunctional Control

6.6 EXTINGUISHING OF BURNERS AND TEMPERATURE RISE TEST:

- 6.6.1 At the Multifunctional control press the OFF button and ensure that both the Main and Pilot burners extinguish.
- 6.6.2 Remove the pressure test gauge from the Multifunctional Control and refit the Outlet Pressure test point cover.
- 6.6.3 Ignite the Pilot and Main burners and allow to operate for 15 minutes to ensure stability.
- 6.6.4 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). The fan speed is adjusted by selecting the fan speed at the control panel (decrease voltage selection to decrease fan speed).

6.7 AUTOMATIC CONTROLS CHECK

- 6.7.1 Set the TIME CONTROL to 'ON'.
- 6.7.2 Turn the Thermostat slowly clockwise until the Main burner ignites.
- 6.7.3 Ensure that the fan starts to operate after a short period (approx. 1-2 minutes).
- 6.7.4 When the temperature reaches the control setting, ensure that the Main burner extinguishes followed by the fan switching off after a short period.
- 6.7.5 When temperature falls below control setting, ensure 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 **Spillage test:** 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 the 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.
- b. Extinguish the Main and Pilot burners.
- c. Ensure that there is no spillage evident by visually observing the draught diverter location on the air heater.
- d. If spillage is evident, further investigation and rectification is required before re-testing the appliance.

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

- 6.8.3 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 Multifunctional Control).
- 6.8.4 Turn gas supply ON at service cock.
- 6.8.5 Switch the appliance electrical supply OFF.
- 6.8.6 Disconnect the fan voltage selector flying lead 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 6.4.1 to 6.4.8
- 6.8.9 Ensure that the Limit Switch operates, indicated by the Pilot and Main Burners extinguishing, within 120 and 180 seconds.
- 6.8.10 Switch the appliance electrical supply OFF.
- 6.8.11 Reconnect the fan voltage selector flying lead..
- 6.8.12 Switch the appliance electrical supply ON.
- 6.8.13 Re-ignite the Pilot burner as detailed in sub-paras 6.4.5 and 6.4.6
- 6.8.14 Ensure that the Main Burner re-ignites when the appliance temperature reduces, (note: with the fan having been disconnected, there may be some delay before the Main Burner re-ignites).

	JU78			JU117			JU156		
	kW	MJ/h	Btu/h	kW	MJ/h	Btu/h	kW	MJ/h	Btu/h
INPUT	29.3	105.5	100,000	43.7	157.3	149,000	58.0	208.8	198,000
OUTPUT	22.9	82.4	78,000	34.3	123.4	117,000	45.7	164.5	156,000
Gas rate cv 1020Btu/ft ³	2.78m ³ /h (98.0ft ³ /h)			4.14m ³ /h (146.1ft ³ /h)			5.49m ³ /h (194.1ft ³ /h)		
Burner setting pressure (hot)	12.5mbar (5.0 in wg)			12.5mbar (5.0 in wg)			12.5mbar (5.0 in wg)		
Main Injector	BRAY CAT 33/1250								

Table 4

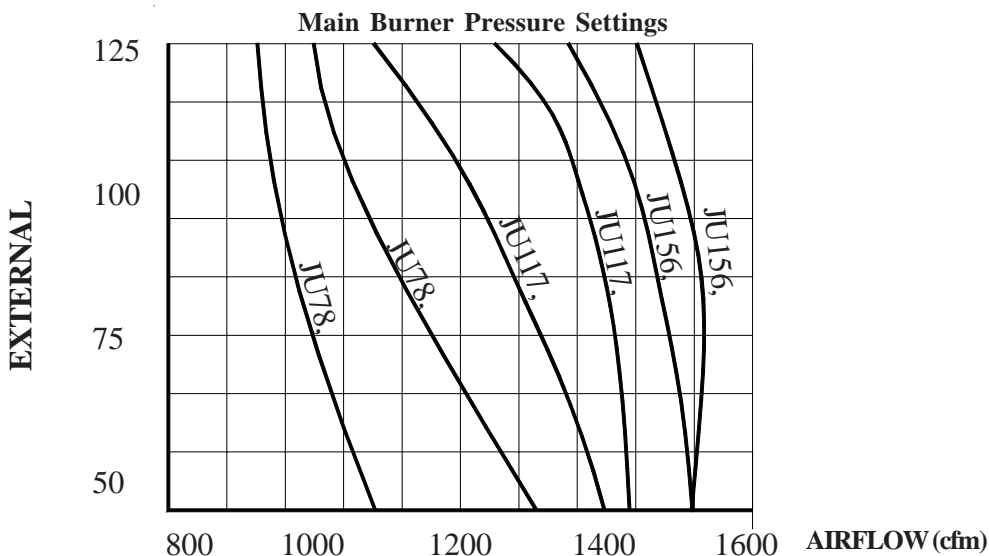


Table 5

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 thermostat, time control (if fitted) and heater ON/OFF switches and summer air circulation switch, and that the time control (if fitted) 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 (if fitted) and at what intervals (i.e. fortnightly, or weekly for new premises).
 - 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 the correct function of the burner and controls.
- 8.1.2 Turn OFF the gas and electrical supplies to the appliance.
- 8.1.3 Remove the air heater front panel.
- 8.1.4 Remove and check the return air filter/cleaner for cleanliness, remove and clean the Air Circulation fan as detailed in para 8.9.
- 8.1.5 Remove the Burner and Controls Assembly as detailed in para 8.2. Inspect and clean the main burner and injector as necessary. Examine the main burner for cracks, including hairline cracks, exchanging the burner as necessary.
- 8.1.6 Inspect and clear the pilot burner orifice.
- 8.1.7 Clean the heat exchanger flueways by thoroughly brushing from above and below.
- 8.1.8 By viewing through the Fan Aperture, and using a torch or similar, examine the heat exchanger externally for signs of cracks or holes, particularly around welded joints.
- 8.1.9 Using a torch or similar, introduce a light source into the heat exchanger burner aperture and upper access port, and again examine the heat exchanger for signs of cracks or holes, particularly around welded joints, whilst again viewing through the Fan Aperture.
- 8.1.10 Refit the Air Circulation fan, Burner and Controls Assembly, and air filter/air cleaner.
- 8.1.11 Light the appliance and note the main burner flame profile. If the flame profile is affected when the Air Circulation fan switches on, check for any air leaks between the air heater and the base plenum, paying particular attention to heaters with rear draught diverters. Rectify any air leaks before continuing with this procedure.
- 8.1.12 Allow the air heater to operate for approximately 15 minutes to ensure stability, and with the main burner lit, ensure that the operation of Air Circulation fan does not affect the main burner flame profile.
- 8.1.13 If no defects are found, fully commission the air heater in accordance with the Installation, Commissioning and Maintenance instructions applicable to the appliance.

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 central front door.
- 8.2.3 Disconnect the Multifunctional Control and Limit Switch electrical connections.
- 8.2.4 Disconnect the gas supply by breaking the union at the input side of the Multifunctional Control.
- 8.2.5 Remove the 4 x Burner assembly fixing screws and withdraw the Burner and Controls Assembly.
- 8.2.6 Refit Burner and Controls Assembly in reverse order, ensuring that the Multifunctional Control leads pass through the grommet on the burner mounting bracket.

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 AND BURNER ARMS, REMOVAL, CLEANING AND REPLACEMENT:

- 8.4.1 Remove the Burner and Controls Assembly as details in 8.2.
- 8.4.2 Disconnect the Thermocouple and Pilot Feed Pipe at the Multifunctional Control.
- 8.4.3 Disconnect the Igniter Lead at the Piezo Unit.
- 8.4.4 Release the 4 x screws and nuts securing the Burner Assembly, and withdraw the Burner Assembly from the Burner Manifold.
- 8.4.5 Release the Main Injectors from their housings in the Burner Assembly.
- 8.4.6 Release the Crosslighting Injector from its housing in the Burner Assembly.
- 8.4.7 Release the 3 x screw and nuts securing each main burner and the Crosslighting Burner to the mounting plate, and withdraw each burner.
- 8.4.8 Release the 2 x securing screws and nuts, and withdraw the Pilot Burner Assembly.
- 8.4.9 Clean as necessary. **DO NOT ENLARGE, DISTORT OR DAMAGE MAIN INJECTOR HOLES.**
- 8.4.10 If the injectors are to be replaced, ensure that they are correctly marked, referring to the Data Badge for details.
- 8.4.11 Refitment or replacement of injectors or burner arms is in reverse order.

Important: DO NOT OVER-TIGHTEN the Thermocouple connection. Tighten to finger tight + 1 flat. Burners should be cleaned with a soft brush. **Under no circumstance should the burner holes be enlarged, distorted or brushed strongly.** If an injector is replaced, ensure that is correctly marked, referring to Table 4 or short list of spares. After replacement or refitment of the Pilot Burner, ensure that the gap between the igniter electrode and the Pilot Burner tip is approximately 3mm, and that the flame profile is correct, adjusting as necessary.

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

- 8.5.1 Remove the Burner and Controls Assembly as detailed in 8.2
- 8.5.2 Disconnect Igniter lead from 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 Feed Pipe from the Multifunctional Control.
- 8.5.5 Remove the 2 x 4mm screws securing the Pilot Burner Assembly to the 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 the Thermocouple, tighten only to FINGER TIGHT + 1 FLAT.

8.6 MULTIFUNCTIONAL CONTROL REMOVAL:

- 8.6.1 Remove the Burner and Controls Assembly as detailed in 8.2
- 8.6.2 Disconnect the Thermocouple and adapter at the Multifunctional Control, avoiding damage to the capillary.
- 8.6.3 Disconnect the Pilot Feed 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 Piezo unit.
- 8.7.2 Release the Piezo retaining nut and remove the Piezo unit from its mounting bracket.
- 8.7.3 Refitting or replacement is in reverse order.

8.8 CONTROL PANEL REMOVAL:

- 8.8.1 Ensure that the electrical supply to the appliance is isolated.
- 8.8.2 Release the 2 x securing screws and remove the appliance lower front door.
- 8.8.3 At the Control Panel terminal block, (and referring to Fig. 6), disconnect the following:
 - a. 230V connections 'L', 'N' and 'E' to the Air Circulating Fan at terminals '15', '16' and '17'.
 - b. 230V mains 'L', 'N' and 'E' connections from terminals marked **230V 50 Hz 'L'** and 'N', and the earth stud.
 - c. Thermostat connections from connection block terminals '8', '9' and '11'.
 - d. Multifunctional Control connections from connection block terminals '5' (YELLOW) and '7' (BLACK).
 - e. Fan Delay Control connections from connection block terminals '1' (BROWN), '2' (BLUE with RED sleeve) and earth stud (GREEN/YELLOW).
- 8.8.4 Disconnect the 2 BROWN conductors from the SUMMER AIR CIRCULATION switch.
- 8.8.5 Whilst supporting the Control Panel, release the 4 securing screws and withdraw the Control Panel from the appliance, releasing the wiring from cable clamps and grommets as required.
- 8.8.6 Refitting or replacement is in reverse order.

8.9 AIR CIRCULATING FAN, REMOVAL AND CLEANING:

- 8.9.1 Ensure that the electrical supply is isolated.
- 8.9.2 Remove the Control Panel as detailed in para 8.8
- 8.9.3 Release the securing screw from the upper front flange of the fan skirt, and withdraw the flange.
- 8.9.4 Release the 2 screws securing the Fan Assembly to the fan chamber floor, and withdraw the Fan Assembly by sliding it forward, avoiding damage to fan blades.
- 8.9.5 Remove all dust from impeller and motor, avoiding damage to the fan blades and taking care not to disturb the balance of the fan..
- 8.9.6 Refitting or replacement is in reverse order.

8.10 CAPACITOR REMOVAL:

- 8.10.1 Remove the Air Circulating Fan as detailed in para 8.9.1 to 8.9.4
- 8.10.2 Release the capacitor from the retaining clip.
- 8.10.3 Remove the protective cover from the capacitor and disconnect the 2 black conductors from the capacitor terminals.
- 8.10.4 Refitment or replacement is in reverse order.

8.11 FAN DELAY CONTROL REMOVAL:

- 8.11.1 Ensure that the electrical supply is isolated.
- 8.11.2 Remove the appliance central front door.
- 8.11.3 Release the 2 x screws securing the Fan Delay Control cover, and withdraw the cover.
- 8.11.4 Disconnect 'LOAD' (BLUE), 'COMM' (BROWN) and **EARTH** (GREEN/YELLOW) connections from the Fan Delay Control.
- 8.11.5 Release the 2 securing screws and withdraw the Fan Delay Control.
- 8.11.6 Refitment or replacement is in reverse order.

8.12 LIMIT SWITCH REMOVAL:

- 8.12.1 Ensure that the electrical supply is isolated.
- 8.12.2 Remove the appliance central front door.
- 8.12.3 Disconnect the 2 BLUE conductors from the Interrupter at the Multifunctional Control.
- 8.12.4 Release the 2 x screws securing the Fan Delay Control cover, and withdraw the cover.
- 8.12.5 Release the 2 x screws securing the Temperature Probe assembly, and withdraw the assembly.
- 8.12.6 Remove the Temperature Probe from the terry clip, and withdraw the probe from the assembly having first removed the grommet.
- 8.12.7 Release the 2 x screws securing the Limit Switch, and withdraw the control from the appliance.
- 8.12.8 Refitment or replacement is in reverse order.

8.13 HEAT EXCHANGER ACCESS:

- 8.13.1 Remove the upper and central front doors.
- 8.13.2 Remove the Burner and Controls assembly as detailed in para 8.2
- 8.13.3 Release the 4 x securing screws and remove heat exchanger access plate and gasket from the front of the draught diverter.
- 8.13.4 Release the nuts securing the baffle retaining plate, and remove the retaining plate and washers.
- 8.13.5 Remove the heat exchanger baffles.
- 8.13.6 Reassembly is in reverse order.

NOTE: When reassembling, ensure that the 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 **WARNING: When purging or checking gas supplies, ensure that the ventilation to the room or cupboard is adequate, and that 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.
	iv. Piezo system faulty.	Check igniter, lead, and electrode.
	v. Limit Switch has operated	Relight Pilot or replace Limit Switch
	vi. Limit Switch connections damaged	Check connections and wiring.
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. Pilot flame too small.	Adjust.
	v. Pilot orifice restricted.	Replace Pilot injector
	vi. Limit control has operated	Relight Pilot or replace Limit Switch.

c. Main burner lights but fan fails to run after approx. 3 min.	i. Loose electrical connection Fan Delay Control.	Check connections.
	ii. Fan Delay Control set incorrectly.	Check for correct settings.
	iii. Faulty fan assembly.	Replace, taking care not to damage impeller.
	iv. Faulty Fan Delay Control.	Replace.
	v. Burner pressure setting incorrect.	Adjust Burner pressure.
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.
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 Delay Control set incorrectly.	Check for correct settings.
f. Fan runs for excessive period or operates intermittently after main burner shuts down.	i. Fan Delay 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.
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 and thermostat are operating correctly.
	iii. 6.3A fuse failed. wiring for short circuits.	Replace. If failure occurs again, check
	iv. Loose connection to thermostat, Limit Switch , time control, Multifunctional Control or transformer.	Check connections.
	v. Transformer open circuit.	Check with test meter and replace transformer.
	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.	Fit temporary loop in heater thermostat socket. If heater ignites, external circuit or room thermostat is faulty.

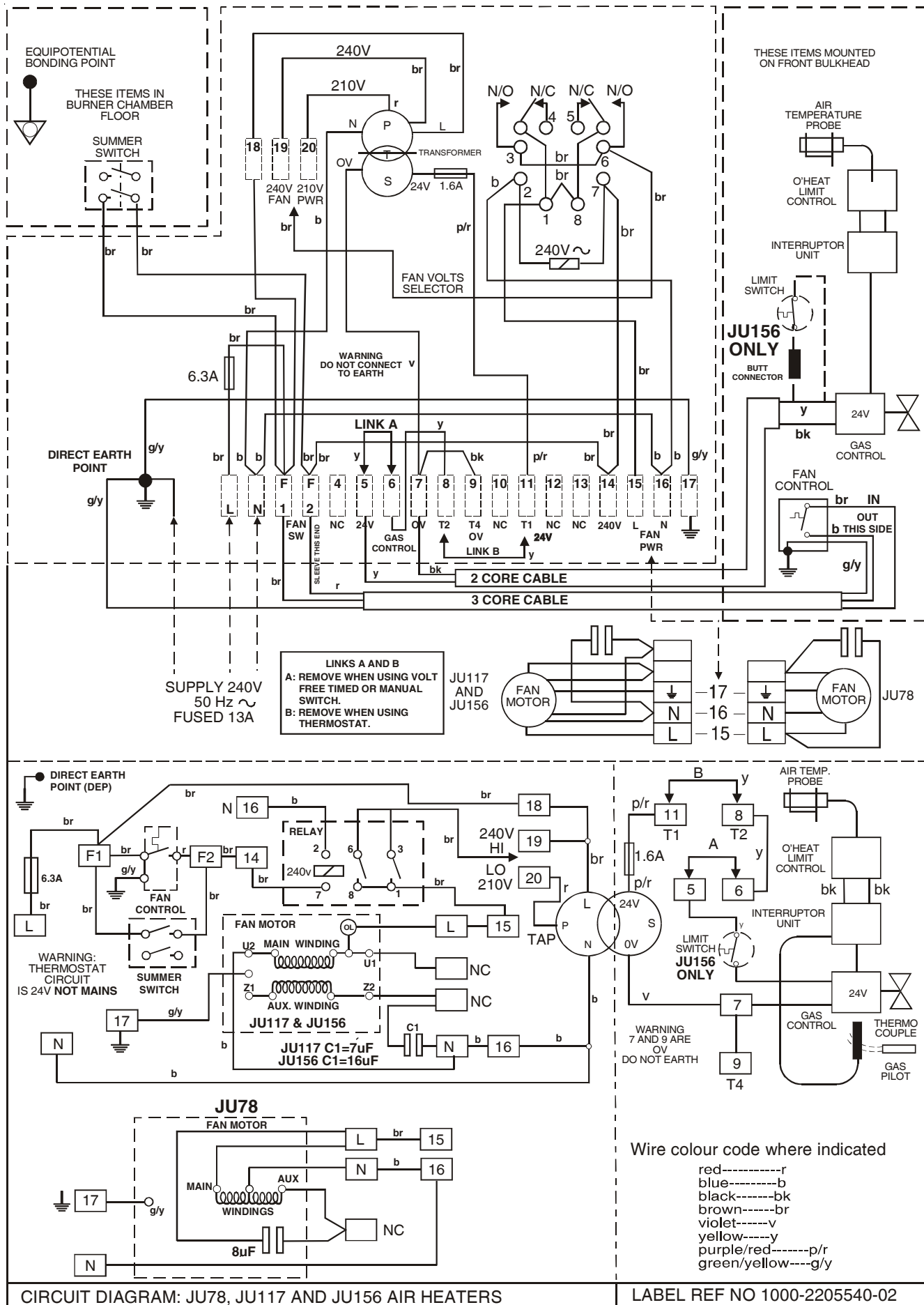


Fig. 5
JU Series Air Heaters Wiring Diagram

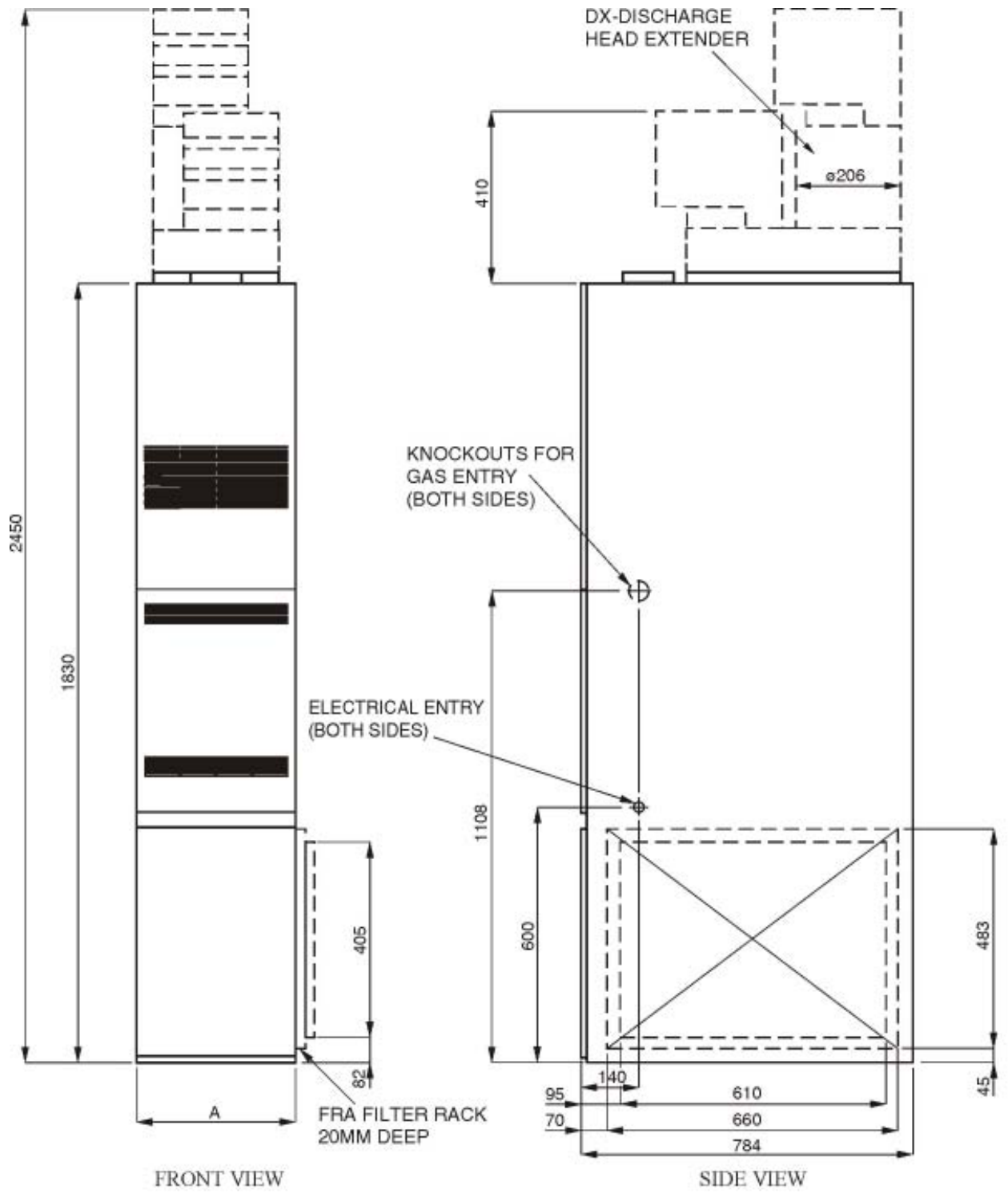


Fig. 6
JU Series Air Heaters Principle Dimensions

10.

SHORTLIST OF SPARES

ITEM No	G.C. No	MAKER'S No	DESCRIPTION	JU78	JU117	JU156
1		JAH82/545	Fan assembly	1		
		JAH122/545	Fan Assembly		1	
		JAH163/545	Fan Assembly			1
2		BOS1858	Filter tray assembly (if fitted)	1	1	1
3		1000-0514840	Limit Switch	1	1	
		1000-0522200	Temperature Probe Assembly			1
4		U560-0530000	Thermo-Switch Assembly			1
5		BOS 01841	Multifunctional control	1	1	1
			SIT Eletrosit			
6	E39538	BOS 02397/4	Pilot assembly	1	1	1
7	386 820	1000-0703870	Thermocouple (SIT 0.290.174)	1	1	1
8	386 775	BOS 01970	Electrode	1	1	1
9	397 819	BOS 02394	Electrode lead	1	1	1
10		U780-0700000	Burner and Controls Assembly	1		
		U117-0700000	Burner and Controls Assembly		1	
		U560-0700000	Burner and Controls Assembly			1
11		U780-0752000	Main Burner	2	3	4
12		1000-0703720	Main Injector BRAY Cat. 33/1250	2	3	4
13						
		BOS 01676/4	Cross Lighting Injector Inter Albion T100		1	1
14		S 00461	Heat Exchanger exchange kit	1		
		S 00462	Heat Exchanger exchange kit		1	
		S 00463	Heat Exchanger exchange kit			1
15	384 505	BOS01441	Piezo Unit	1	1	1
16		U560-0504000	Control Panel	1	1	1
17	385 159	BOS 00104	Fan Delay Control Honeywell L4068C	1	1	1
18		1000-0513100	Fuse 6.3A 20mm Quick Blow (BS4265)	1	1	1
18		1000-0513110	Fuse 1.6A 20mm Quick Blow (BS4265)	1	1	1
19		1000-0505850	Relay	1	1	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.

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