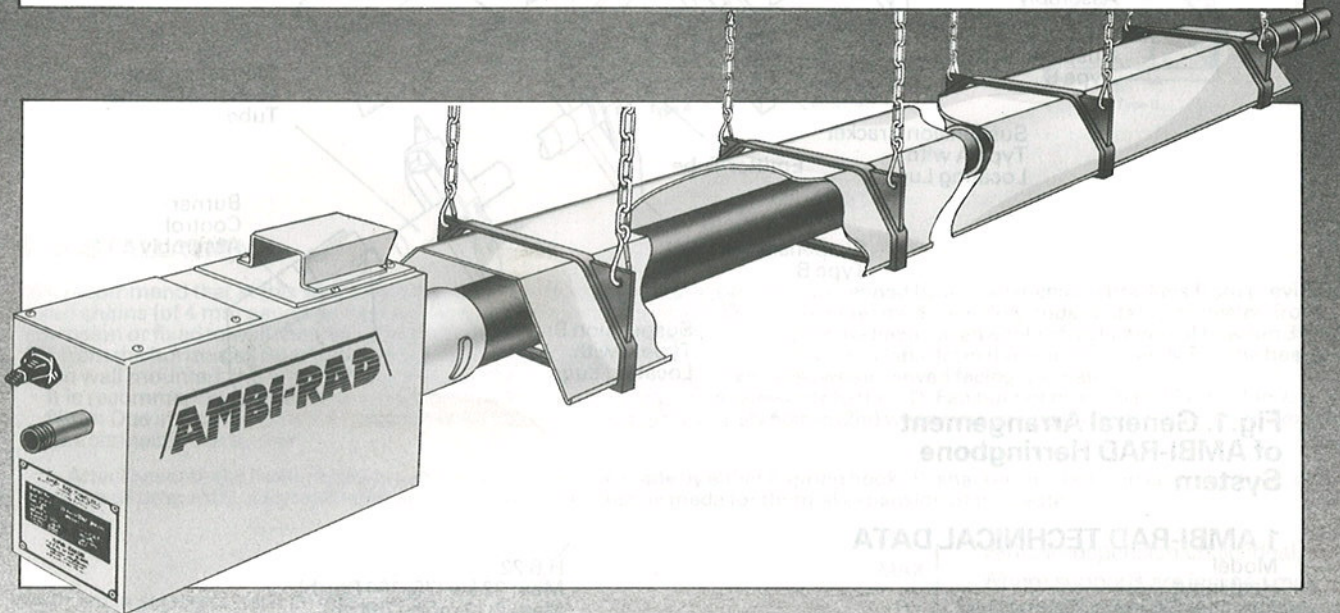


# USERS INSTALLATION AND SERVICING INSTRUCTIONS.



## MODEL HB22

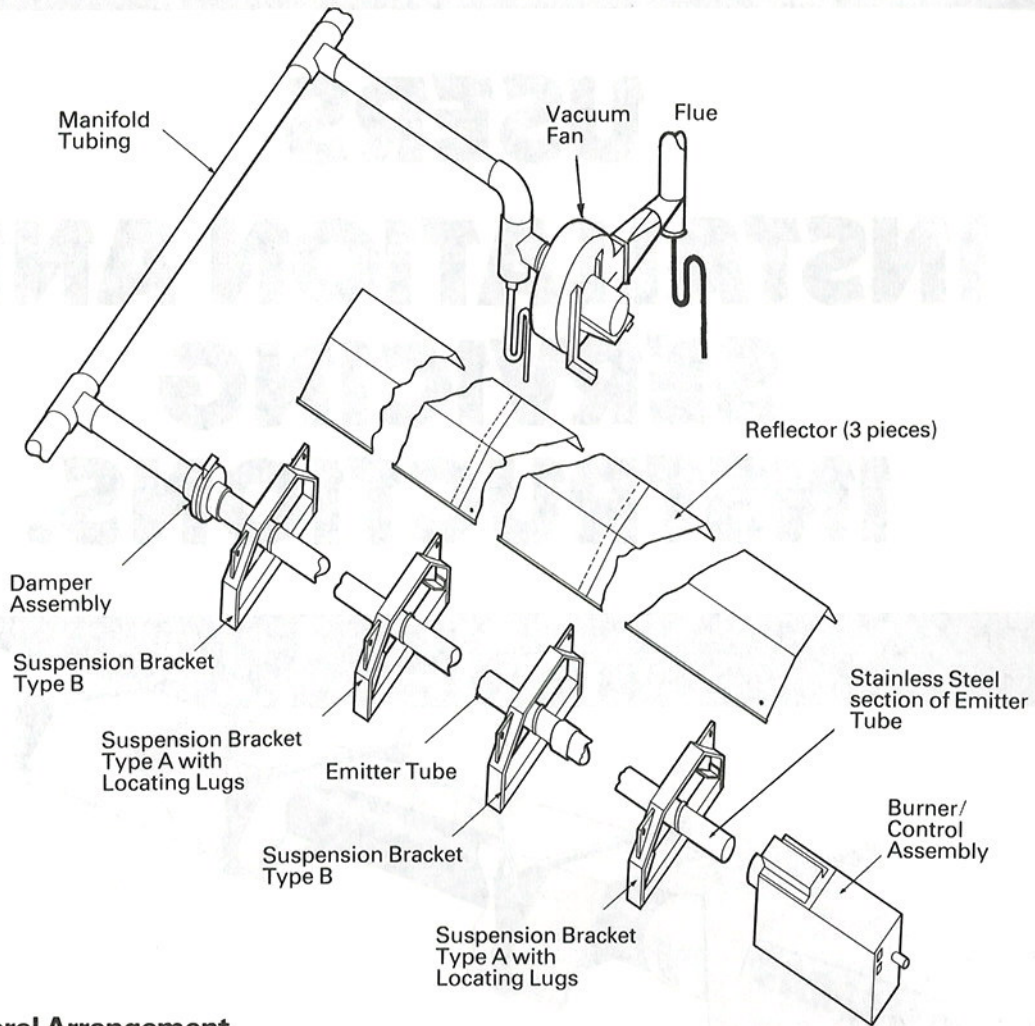
Approved by British Gas for use on Natural Gas G.C. No. 36.229.02

### IMPORTANT

This appliance is for use on Natural Gas or Propane as indicated on the Data Badge. It must be installed and serviced by a competent person as stated in the Gas Safety (Installation & Use) Regulations 1984.

**AMBI-RAD**  
radiant heating systems

# INSTALLATION INSTRUCTIONS FOR AMBI-RAD HERRINGBONE HEATING SYSTEM.



**Fig. 1. General Arrangement of AMBI-RAD Herringbone System**

## 1 AMBI-RAD TECHNICAL DATA

Model	H B 22
Heat Input	Max: 22 kw (75, 100 Btu/h)
Nominal Gas Rate (Natural Gas)	Max: 2.12 m <sup>3</sup> /h (75ft <sup>3</sup> /h)
Gas Supply Connection	R <sup>1</sup> / <sub>2</sub> (1/2" B.S.P. external)
Electrical Supply	240 v 1 phase 50Hz
Power Absorbed	14 VA
Internal Fuse Rating	1 amp External Fuse 3 amp
Ignition	Electronic programme start up with spark ignition
Total Installed Weight	89 Kg (196 lb)

### Standards

The Ambi-Rad heater must be installed in accordance with the relevant provisions of the Gas Safety (Installations and Use) Regulations 1984. Due account should also be taken of any obligations arising from the Health and Safety at Work Act 1984. In addition the installation must be carried out in accordance with the current I.E.E. Regulations, the requirements of BS 5440: part 1, BS 6896 and any other relevant British Standards and Codes of practice.

## 2 UNPACKING

The AMBI-RAD Herringbone System is supplied as follows for each heating unit:

- 1 radiant tube 76 mm (3 in.) outside diameter 7620 mm (25 ft) long Supplied in two sections.
- 3 stainless steel reflectors 2438 mm (8 ft) long
- 1 carton containing: Burner/control assembly  
Damper assembly  
Sundry components
- 2 suspension brackets with reflector locating lugs - Type A
- 2 suspension brackets without reflector locating lugs - Type B
- 1 electrical connector socket
- 1 manifold kit to individual specification but including aluminium manifold tubing, manifold tees, connectors, bends etc.
- 1 jointing compound gun and quantity of jointing compound
- 1 vacuum fan complete with inlet flexible connector 4 in. (for up to five heaters) or 6 in. dia. (for up to ten heaters)
- 1 square to round exhaust flue transition piece (square telescopic wall flue available upon request)
- 1 lockable control panel see page 6 for logic sequence and wiring diagrams.

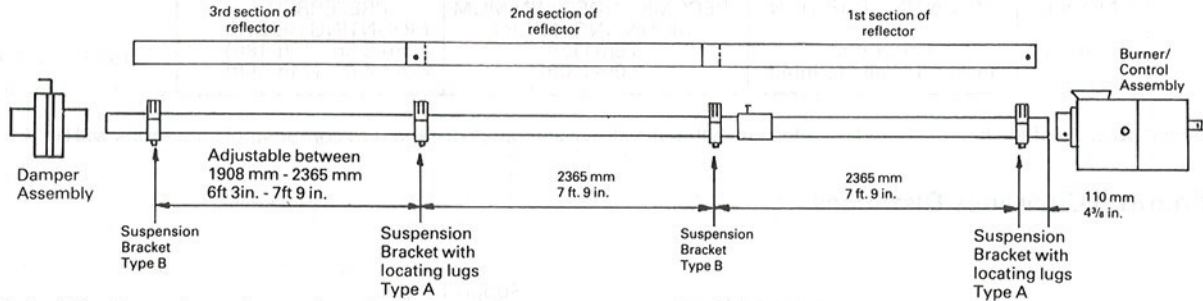
### 3 ASSEMBLY

Each heating unit is assembled as follows:

Support radiant tube on blocks or trestles etc. at least 250 mm (6 in.) above floor level, preferably under position of installation. Ensure that the tube is clear internally. **Note: Stainless steel section to be at burner end.**

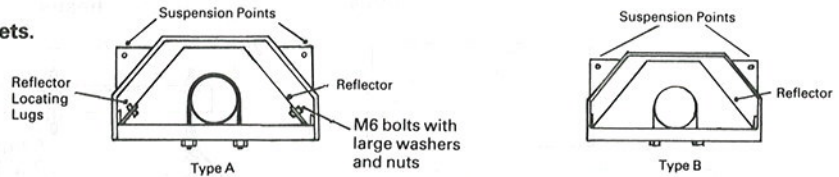
Slip four suspension brackets onto the tube noting that there are two distinct types of suspension bracket. Type A and Type B. Two are fitted with reflector locating lugs, Type A and two are without, Type B. These must be fitted alternatively along the length of the emitter tube. The bracket nearest the burner should be with locating lugs, the second without, the third with and the bracket furthest from the burner without locating lugs. See Fig. 3. Position the brackets in the positions shown in Fig. 2. These positions are critical. Tighten the nuts to secure the brackets to the tubes and ensuring that all brackets have the same orientation on the tube. A spirit level may conveniently be used for this purpose if the tube is firmly located so that it cannot move.

**Fig. 2. Location of the Suspension Brackets.**



**Note:** The dimensions shown above for the positions of the suspension brackets are critical.

**Fig. 3. Section through Suspension Brackets.**



### 4 INSTALLATION

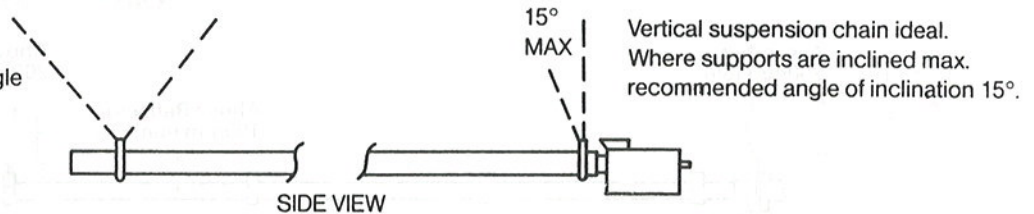
We recommend that at this stage the tube assembly is raised into position and suspended by all 4 suspension brackets from previously fixed chains (of 4 mm gauge galvanised, welding link construction) or 10 mm diameter mild steel drop rods, suitably protected from corrosion or fixed to wall mounting brackets. Wall mounting brackets must support the heater at an angle of inclination of between 35° and 55° from the horizontal. Suitable brackets, adjustable to angles of 35°, 45° and 55° are available from the manufacturer. N.B. If the heater is to be wall mounted, the burner/control assembly must be on the right hand side when viewed facing the wall.

It is recommended that the heater is arranged to slope very slightly downwards to the I. D. Fan but not more than 25 mm (1 in.).

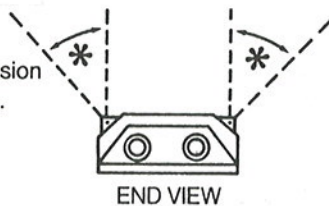
**Note:** Due allowance must be made for linear expansion of approximately 50mm (2in) when suspending the heater and fitting flexible gas connection at burner.

Attachment to the heater bracket support lugs should be made by either a spring hook, 'D' shackle, nut, bolt and large washers, or in the case of drop rods, a formed hook and due allowance must be made for thermal expansion of the heater.

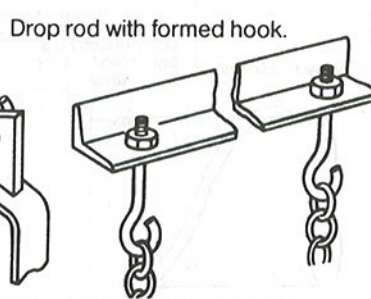
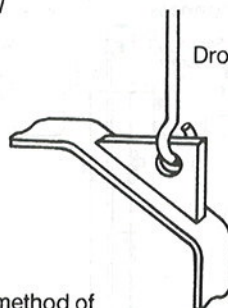
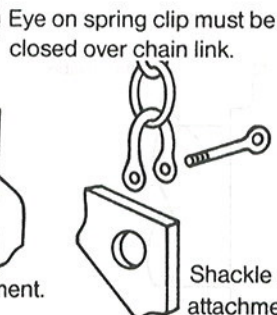
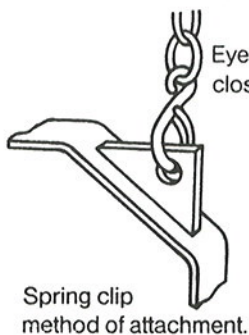
When chain supports have an angle of inclination greater than 15° on equal and opposite support is recommended.



Vertical or Inclined suspension on this plane is acceptable.



\*These angles to be equal and not more than 45°



Alternative method of suspension for "U" Tubes and linear type heaters.

The hanging attachments to overhead steelwork etc. must be purpose made to good sound engineering practice or of a proprietary type fixing.

They must be adequately fixed and designed to carry the whole weight of the heater and to permit free movement due to linear expansion.

In the event of suitable roof steelwork not being available, additional steelwork should be fitted to enable vertical hangers to be used for suspending the heaters.

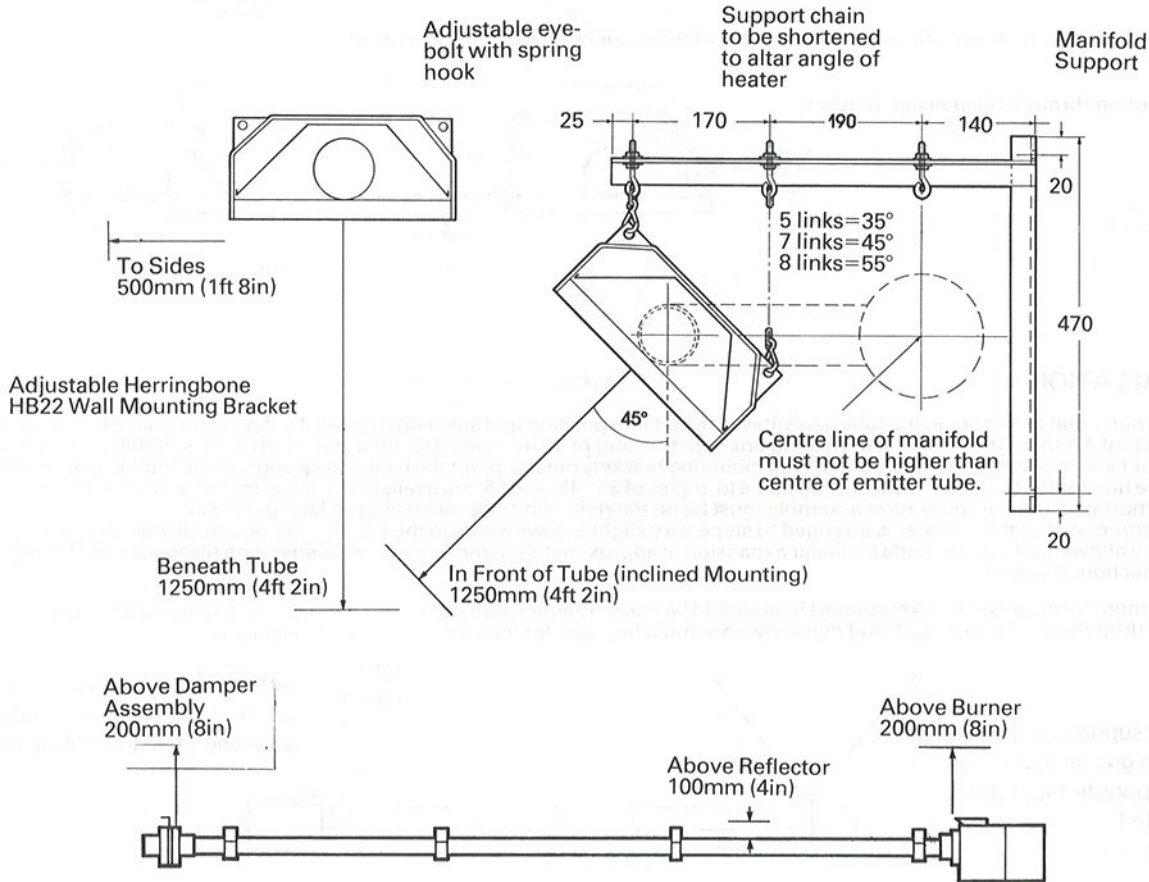
If there is any doubt as to the strength or suitability of roof steelwork to which heaters are to be suspended, please refer to consultant/architect/Client owner of the building.

The recommended minimum and preferred mounting heights for the AMBI-RAD heaters are as follows:

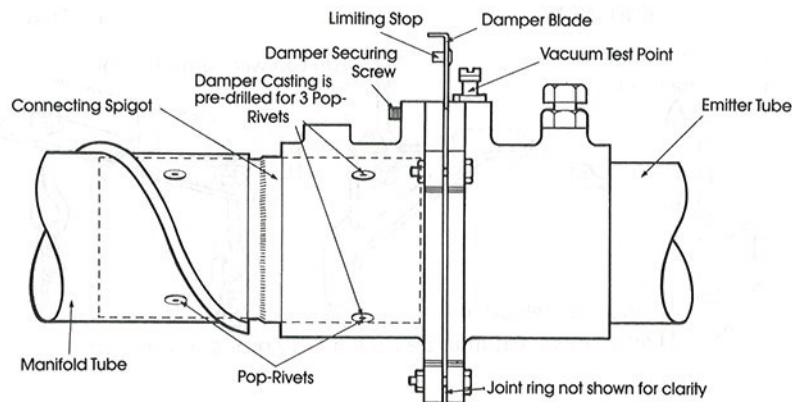
MODEL	MOUNTING POSITION	RECOMMENDED MINIMUM MOUNTING HEIGHT	PREFERRED MOUNTING HEIGHT
HB22	Horizontal	3.6m (12ft)	4.8m-5.5m (16ft-18ft)
	Inclined/Wall Mounted	3.0m (10ft)	4.2m-4.6m (14ft-15ft)

The proposed position of the heater should be selected so that the above clearance distances to combustable materials will be ensured.

**Fig.4. Minimum Clearance Distances**



**Fig.5. Damper Assembly**



Remove the protective plastic film from the reflector surface. Note: When removing protective covering from reflector do not stand on inside face of reflector. Each section of the reflector has two holes punched at one end. This end is firmly fixed by bolting to the lugs provided on suspension bracket Type A. The other end of each reflector section is free floating in suspension bracket type B thereby allowing for thermal expansion.

Position the first reflector section and secure it with M6 bolts, nuts and large washers provided to the suspension bracket nearest the burner.

Position the second and third sections of reflector so that they overlap with the punched holes in line with the lugs provided on the third suspension bracket from the burner. Secure using M6 bolts, nuts and large washers passing through both reflectors.

Slide burner/control assembly onto the burner end of the emitter tube (nearest to suspension bracket, Type A), see Fig 2, ensuring it is fully engaged and upright, (i.e. with the air inlet plate facing upwards) and secure with locking screws provided.

Slide damper assembly onto the tube ensuring it is fully engaged and with the damper blade in the vertical plane. Secure damper assembly with locking screw provided.

### Manifold Assembly

The manifold connecting the exit end of each heater to the vacuum fan should now be erected.

The layout and sizing of the manifold must follow the design criteria given in the appendix and the Ambi-Rad design manual. The manifold should be as compact as possible with a minimum of bends and fittings and preferably but not essentially with the final exit connection to the vacuum fan approximately central in the manifold length.

The manifold should be arranged to fall slightly in the direction of the fan, care being taken to ensure that any condensate formed in the pipe on cold start up will flow towards the fan and will not be trapped or drain back into the heater unit.

The manifold should be supported at the following centres by chains, stainless steel flexible wire or other semi flexible means from roof structure.

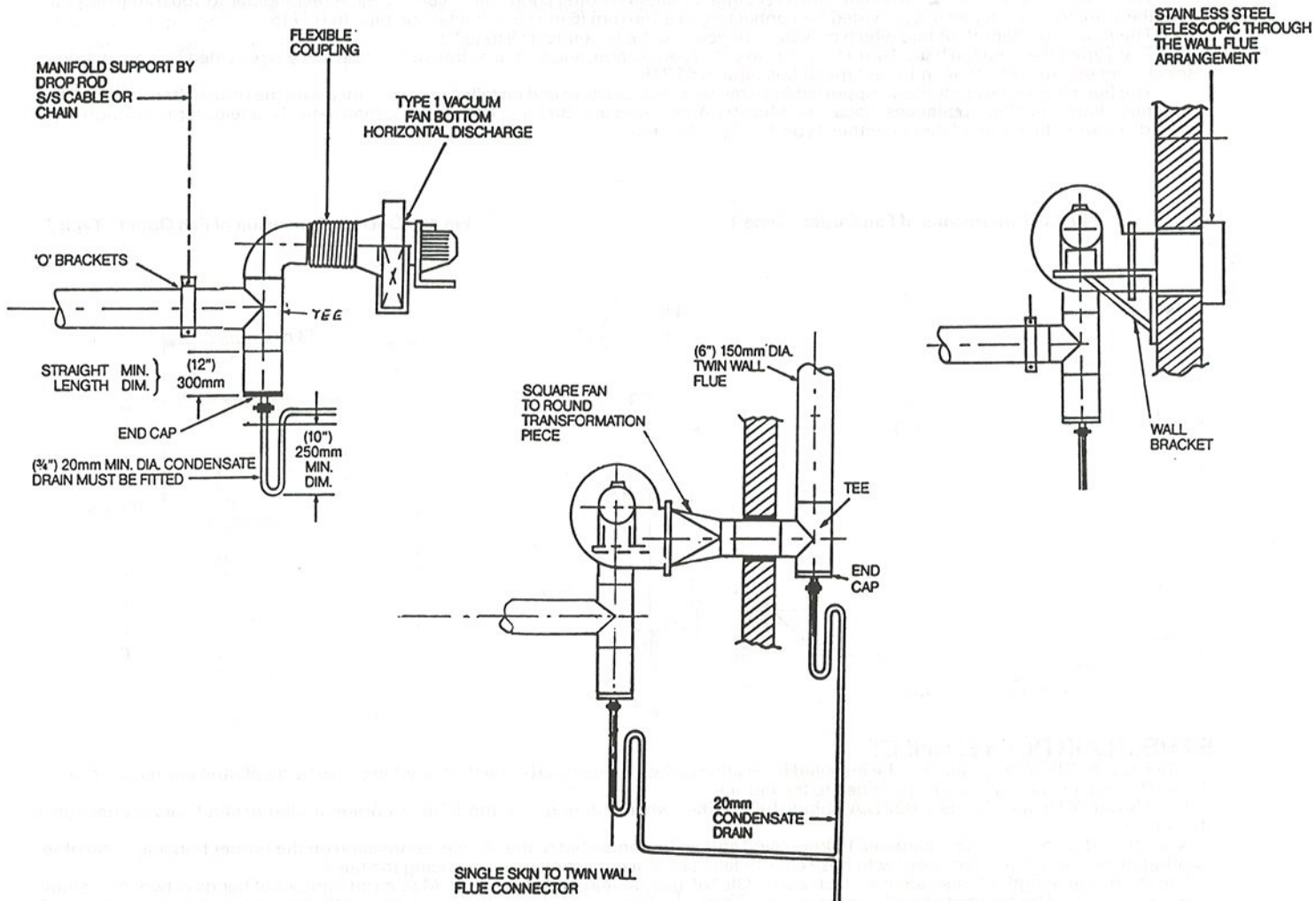
Flexible couplers (supplied by manufacturer) must be inserted within the manifold system to allow linear expansion to take place and prevent stress and strain.

Manifold pipe size	Maximum distance between supports
75 mm	2.4 m (8 ft)
100 mm	2.4 m (8 ft)
150 mm	3 m (10 ft)
200 mm	3 m (10 ft)

At the exit from the manifold before entering the fan, provision should be made for the collection of condensate and for the drainage of condensate to a drain via a deep 'U' shaped trap. (Minimum depth 250 mm (10 in.). A suitable arrangement for this is shown in Fig. 6.

Note: The fan casing can be arranged to give either a vertical or horizontal discharge by removing the four nuts attaching it to the motor support frame and rotating it through 90 degrees one way or the other. Bottom discharge is preferred from the fan to prevent condensate lying in the fan and causing corrosion.

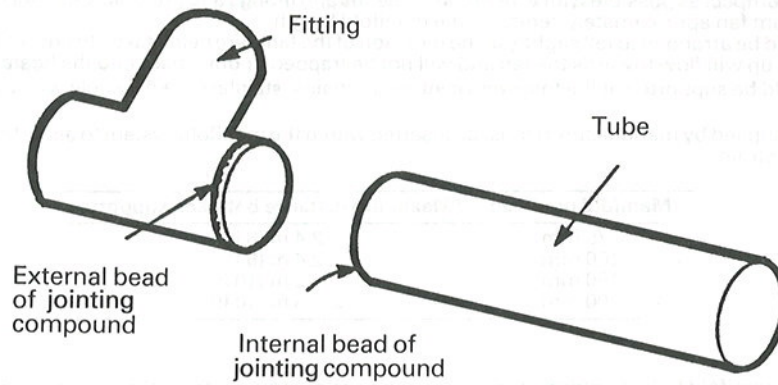
**Fig. 6. Recommended Manifold to Fan to Flue Arrangements For Type 1 and Type 2 Fan.**



## Method of Jointing Aluminium Tube

All fittings (bends, tees, couplers etc.) are dimensioned to be a close internal slip fit in the manifold tubing. The method of jointing is as follows. Cut the tube to correct length allowing for minimum 50 mm (2 in.) of penetration of the fitting into the tube. Remove any burrs from the end of fitting and tube. Wipe off any grease of oil with a clean rag. Using the mastic gun and high temperature silicone jointing compound provided, exude a 4 mm dia. bead of compound externally round the end of the fitting and internally round the end of the tube. Enter the fitting into the tube using a slight rotating movement to spread the compound uniformly until a penetration of 50 mm (2 in.) is achieved. The jointing compound remains workable after application for only five minutes. Secure the joint by drilling through the tube and fitting with a 5 mm ( $\frac{3}{16}$  in.) dia drill, and fixing  $3\frac{3}{16}$  in pop rivets in the 12 o'clock, 4 o'clock and 8 o'clock positions. Do not fix rivets in the underside of the tube in order to avoid risk of leakage of condensate. Where the heater damper assembly connects to the manifold a special connecting spigot supplied with the damper assembly should be used.

Fig. 7. Method of Jointing Manifold Tube.



## Flue Connection to Fan Outlet

The Type 1 vacuum fan is provided with a rectangular flanged outlet connection, see Fig. 8a. A rectangular to 150 mm (6 in.) circular transformation piece is provided for connecting to a 150 mm (6 in.) sheet metal flue pipe to BS715.

The maximum length of flue which may be connected to the fan outlet is 9 m (30 ft).

The Type 2 vacuum fan has a 100 mm (4 in.) fan outlet connection, and a circular transformation piece is provided for connection for connecting to 150 mm (6 in.) sheet metal flue pipe to BS715.

The flue should be adequately supported from the building structure and installed in accordance with the British Standard Code of Practice - Flues for Gas Appliances, Local and Ministry Authorities and Building Regulations. Alternatively, a telescopic through the wall discharge duct is available for either Type 1 or Type 2 Fans.

Fig. 8a. Dimensions of Fan Outlet - Type 1.

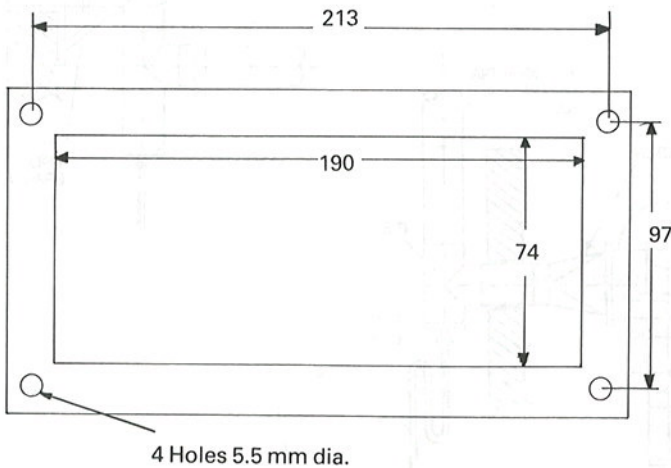
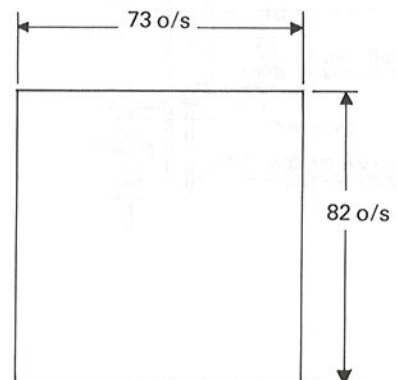


Fig. 8b. Outside Dimension of Fan Outlet - Type 2.



## 5 FRESH AIR DUCTED INLET

When the AMBI-RAD system is to be installed in locations where there is airborne dust or where there is a polluted atmosphere, a ducted fresh air supply should be provided to the burner.

The AMBI-RAD heater, Model HB22 D.A. should be specified when ordering. This model incorporates a 100mm (4in.) duct connection at the burner.

A fresh air duct of minimum diameter 100mm (4in.) should be connected to the air inlet connection on the burner housing. A flexible jointing piece should be used, fixed with hose clips to facilitate disconnection when servicing the burner.

The maximum length of fresh air inlet duct is 7m (23ft.) of 100mm (4in.) diameter duct. Maximum number of bends is two. A position should be selected for the inlet of the fresh air duct such that it will receive dust free clean air. A cowl of the British Gas Approved type such as the G.C.1 or G.L.C. terminal should be fitted at the inlet of the duct. If the duct inlet is located on a roof the underside of the inlet cowl must be at least 600mm (2ft.) above the roof level and at least 250mm (10in.) higher than any projection on the roof within a two metre radius of the cowl.

## 6 GAS CONNECTION

The gas connection on the AMBI-RAD heater is R $\frac{1}{2}$  (1/2" B.S.P. external thread).

GAS	NATURAL GAS	PROPANE
Maximum supply pressure	40 mbar (16 in. wg)	40 mbar (16 in. wg)
Minimum supply pressure	13 mbar (5 in. wg)	30 mbar (12 in. wg)
Burner setting pressure	10.6 mbar (4.2 in. wg)	28.7 mbar (11.5 in. wg)

A gas meter is connected to the service pipe by the local Gas Region or local Gas Region contractor. An existing meter should be checked preferably by the Region to ensure that the meter is adequate to deal with the rate of gas supply required. Installation pipes should be fitted in accordance with BS 6891: 1988 such that the minimum pressure at least as stated above will be achieved. Pipes of a smaller size than the heater inlet gas connection should not be used. The complete installation must be tested for soundness as described in the above Code.

The gas supply must not be in a position where it is subject to overheating.

A gas union service cock MUST be fitted in the gas supply close to the heater, but not onto the burner itself.

It is essential to provide some flexibility in the final gas connection by use of a tested and certified metallic hose to BS 6501: Part 1, 1984 (minimum acceptable quality Type B Class 1) or copper expansion loop. When stainless steel flexible hoses are used the hose should be connected in a 180° bend without any strain or torsion. See Leaflet 410/12/88 for details.

**Note:** Take care when making a gas connection to the heater not to apply excessive turning force to the internal controls.

## 7 ELECTRICAL CONNECTION

**WARNING: THIS APPLIANCE MUST BE EARTHED.**

Supply 240 v 50 Hz Single Phase.

Power Absorbed 14VA.

Fuse: Internal 1 amp. External 3 amp.

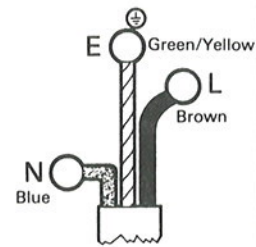
All electrical work should be carried out to I.E.E. standards by a competent electrician.

The electrical connection to the heater is made by means of a three pin plug-in power connector. Live, Neutral and Earth connections should be made via a flexible supply cable to the power connector and routed clear of the heater or tubes. The flexible supply cable should be of 0.5 mm<sup>2</sup> complying with BS 6500, 1975.

### IMPORTANT

The wires in the mains lead are coloured in accordance with the following code:

Green and Yellow	- Earth
Blue	- Neutral
Brown	- Live



Instructions for connecting mains lead to plug:

Connect Green and Yellow to plug terminal marked E or Green or Green and Yellow.

Connect Blue wire to terminal marked N or Black or Blue.

Connect Brown wire to terminal marked L or Red or Brown.

It is recommended that the electrical circuit controlling the heater or group of heaters incorporates thermostats, a time switch and if required manual control switches See Fig. 10.

**Important:** All such controls and switchgear must be rated to handle the total inductive load of the circuit they control. The inductive load per AMBI-RAD Model HB22 is given above. For large installations the use of relays or contractors should be considered.

The method of connection to the electricity supply must facilitate complete isolation and should be made via a fused double pole isolation having a contact separation of at least 3 mm in all poles and supplying the appliance only.

Alternatively connection may be made via a fused three pin plug and unswitched shuttered socket both complying with the requirements of BS 1363.

Ensure that a copy of the lighting instructions (back page of user manual) is affixed adjacent to the electricity supply switch. Should this switch serve more than one heater it is only necessary to fit one plate per service switch.

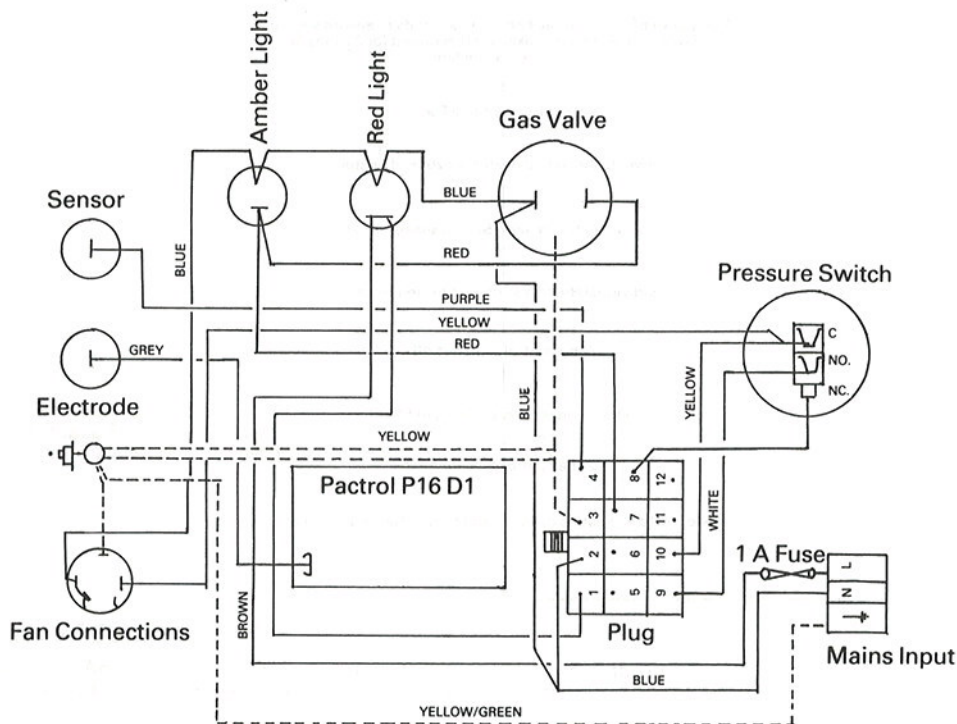


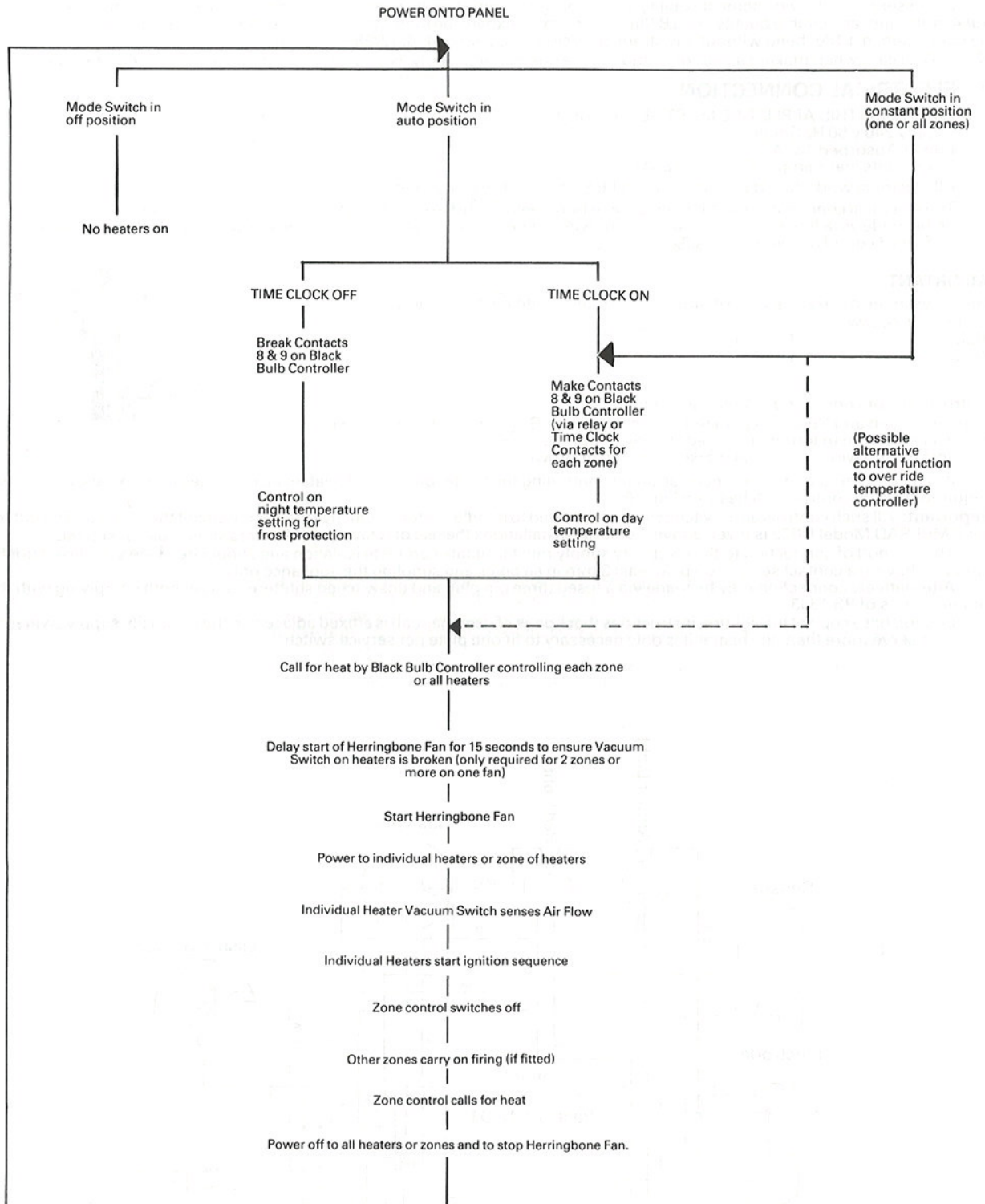
Fig 8. Wiring Diagram HB22 Control Housing.

## Control Panel Design

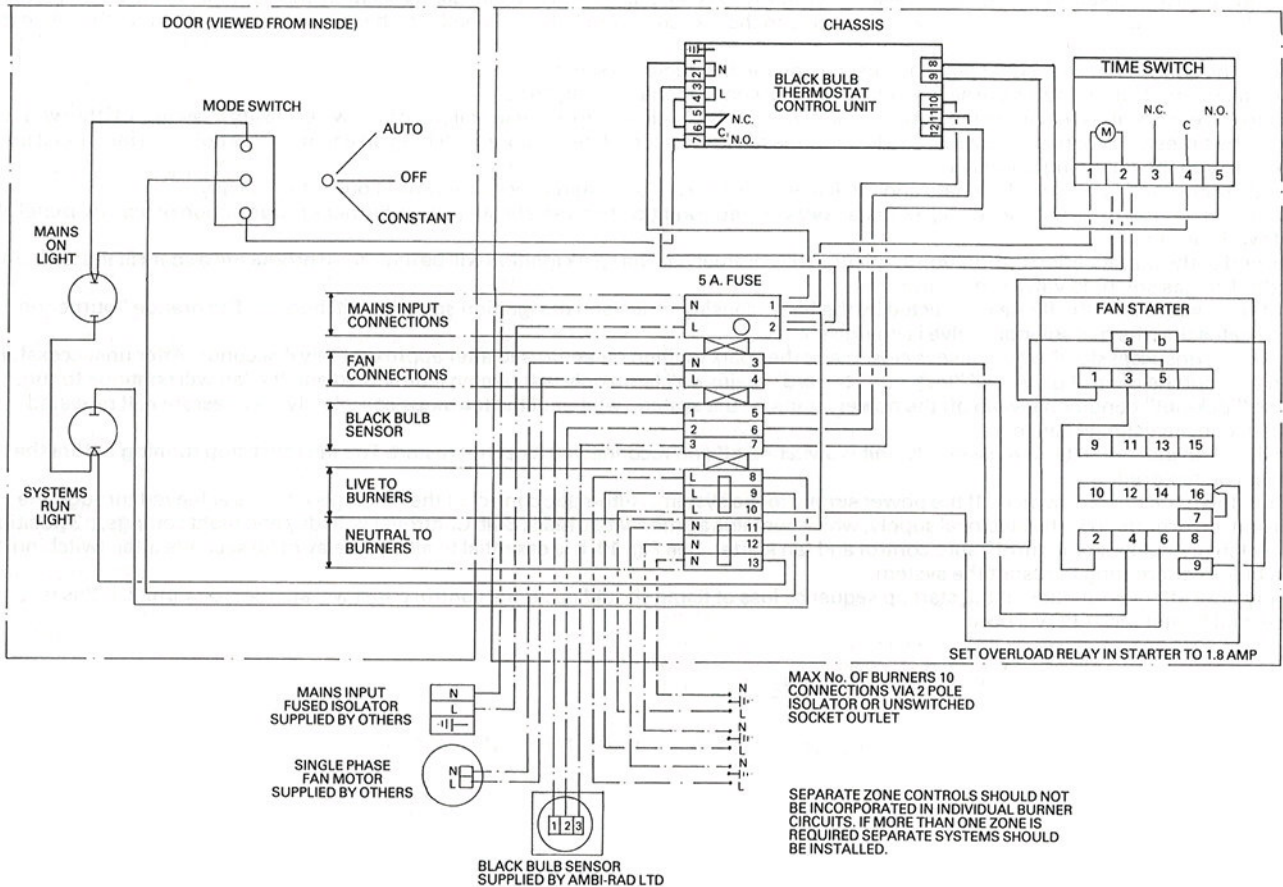
Ambi-Rad control panels are available either as standard units to control single or multiple zones of heaters utilising the Ambi-Rad black bulb radiant thermostat. Special control functions are available on request.

Each herringbone control panel MUST use the following logic to operate in a safe and satisfactory manner:-

**Fig. 9. Logic Sequence for Herringbone Control Panel.**



**Fig. 10. Internal and external wiring arrangement for single phase fan utilising a type 1 Herringbone fan.**



- Note: 1. 3 Phase Fan Starter is available for Type 1 Herringbone Fan.  
 2. Type 2 Herringbone Fan does not require a Fan Starter.

### Installation of Control Panel

To install the Ambi-Rad control panel remove the plastic plugs from the four 9 mm dia. holes in the back of the control box. Using these holes fix the box in a convenience position to a suitable plugged wall on solid structure with No. 10 gauge wood screws or 6 mm dia. bolts or set screws. Access to the holes may be gained from the inside of the box without the necessity of removing the wiring chassis. Make the electrical connections in accordance with Fig. 10 and cut holes in the removable gland plate provided in the box. Conduit or strain relief glands should be used.

## 8 COMMISSIONING

Inspect installation and ensure that it has been carried out in accordance with these instructions. Ensure that electrical and gas supplies are isolated.

The gas supply should be purged and tested for soundness in accordance with the British Standard Code of Practice CP 331 Part 3 and B.G.C. Report 1M/2.

Ensure that the settings of any time switch and thermostat are such that the heating system will be required to operate (or put the mode switch to "constant").

Before attempting to start up the heating system it is essential to perform the preliminary balancing of the vacuum level at each burner unit. Isolate each heater unit by unplugging each electrical connector and closing each gas isolating valve.

Adjust the damper at exit of each heater using a 4mm hexagon wrench in the M8 locking screw. Observing the vacuum reading using a U tube manometer connected to the vacuum test point (See Fig 5) set each damper in turn to give a cold conditions reading at 1.5m. bar (0.6in. w.g.). After adjusting all dampers check to ensure that the vacuum reading at all test points is 1.5m.bar.

### Referring Now to Each Individual Heater Unit

Open isolating gas valve and test gas connections for soundness using leak detecting solution.

Remove the combustion chamber cover plate by unscrewing 6 fixing screws. Take care not to damage the sealing gasket. Inspect the burner and electrode assemblies ensuring these are securely fixed and all electrical connections securely made. Replace the cover plate ensuring that the sealing gasket is correctly positioned and the six screws are fully tightened. The heater will not operate until this plate is refitted.

Remove the control housing cover plate by unscrewing the five securing screws.

Ensure all internal components are securely fixed and all connections securely made.

Reinsert the electrical connector to the burner control assembly. To allow the heater to start up it is now necessary to switch off the whole system at the timeswitch or manual switch and to allow the fan to stop completely before switching on again. At this point the individual unit will start up with the following sequence.

The red "mains on" lamp will illuminate and the fan will start to run. Safe-start checks are carried out automatically.

After the fan has run up to full speed and a satisfactory vacuum condition been established at the burner a purge period of approximately 9 seconds will commence.

At the end of the purge period the ignition sequence will commence. The spark ignition will be energised producing a spark at the ignition electrode. The gas solenoid valve is energised.

If ignition is successful the flame is detected by the flame sensing probe and the ignition spark is switched off. The orange "burner on" lamp indicates that the gas solenoid valve is energised.

If ignition is unsuccessful the gas valve is closed and the spark ignition de-energised after approximately 4 seconds. After unsuccessful ignition attempt the control panel will "lock-out", the red "mains on" lamp only will remain illuminated and the fan will continue to run. To reset this "lock-out" condition switch off the power supply to the system, wait until the fan stops completely then restore it. If repeated lock-out occurs investigate cause.

Note that if an individual burner assembly unit is switched off and reconnected it cannot restart. The fan must stop running before the burner can be restored.

To shut down the heaters switch off the power supply to the system. Automatic control of the heating system is achieved through the control unit, incorporated in the electrical supply, which contains a time switch, Black Bulb Controller with day and night settings, a 3 position mode switch giving constant on/off/auto control and fan starter. See Fig. 10. It is essential to allow a delay of 30 seconds after switching off heaters before attempting to restart the system.

If at any time after completion of the start up sequence loss of flame should occur the control panel will attempt to reignite. If this is unsuccessful heater lock-out will occur.

Set burner gas pressure as follows. Unplug mains input connector to heater. Unscrew the 5 fixing screws of the safety control housing lid and remove pressure test point screw and connect a 'U' tube manometer to the pressure test nipple located between the gas pressure regulator and the gas valve. Remove the slotted cover from the pressure test regulator revealing the adjustable screw. Replace mains input connector and start heater. Using a suitable screwdriver adjust the pressure regulator, turning the screw clockwise to increase the pressure or anti-clockwise to decrease the pressure. Set the burner pressure to the required figure given in section 5. Switch off the heater by pulling out the mains connector. Disconnect 'U' Tube manometer and refit screw in pressure test nipple. Replace cover on pressure regulator. The data badge must be marked by the commissioning engineer to indicate the gas pressure setting to which the burner has been adjusted to and, if de-rated, heat input of heater.

Check the operation of the flame safeguard equipment as follows. With the heater running normally switch off the gas supply at the appliance isolating valve. Observe that the "burner on" lamp extinguishes within one second. After a purge period of approximately 9 seconds the heater should attempt to relight and if the gas isolating valves have been left off lock-out should occur indicated by power light only being illuminated and fan running.

Check the operation of the vacuum proving switch as follows. With the heater running normally, pull off the silicone rubber tube connecting the vacuum switch to the combustion chamber. Within 3 seconds the burner should shut off. Observe for at least 20 seconds that there is no attempt to reignite. Then replace the tube securely and observe that the heater proceeds to ignite in the normal way.

Replace the Safety Control housing cover which is secured with the 5 fixing screws.

Repeat the above procedure for each of the heater units in the heating system.

**IMPORTANT**

When all heater units have been commissioned as above the vacuum settings must be finally balanced in the hot condition. Start all burners up and allow them to run for at least 20 minutes.

Determine vacuum reading at the damper assembly on each heater unit. This should be set at a hot conditions reading of 1 mbar (0.4 in. wg) by the method described above.

It will be noted that the emitter tube has a tendency to bow when hot, this is normal and quite acceptable.

**To Set the Timer and Black Bulb Thermostat Controller**

The Grasslin 16/72/1 Digital Time Switch fitted to Ambi-Rad Control Panels should be set as follows:

1. Check the main electricity supply is connected.
2. Use pencil or similar instrument, press reset button-After five seconds window displays 00:00.
3. Depress  $\pm$  1h button to advance time by 1 hour for British Summer Time. Depress once to cancel 1 hour advance.

**TO SET DAY AND TIME**

4. Depress  $\odot$  button continuously whilst setting day and time.
5. Depress day button until correct day appears in window.
6. To set time-depress button h+ m+.
7. After setting day and time-release  $\odot$  button. Clock will commence working after five seconds.

**PROGRAMMING**

8. Depress button CH1-window will display
9. Depress day button to set "on" days required.
  - a) Press once for 7 day display.
  - b) Press again for 5 day display.
  - c) Press again for Sat. and Sunday only.
  - d) Press again for individual days.

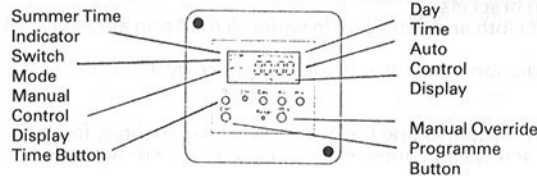
10. To set switching "on" times-to suit day programme-depress h + m + button.
11. To lock in the "on" programme-depress CH1 button.
12. To set switching "off" time-depress CH1 button.
13. Depress day button to set "off" days required.
14. Using buttons h + m + set switching "off" days required.
15. To lock in the "off" programme-depress CH1 button.
16. After setting 'on-off' programme-depress button  $\odot$  to reinstate day and time in window.
17. To manually override programme-depress  $\sim$  button-

'on' or 'off' will be displayed in window.

**NOTE**

If buttons h+ m+ are depressed for longer than 2 seconds rapid advance will take place. FOR FULL OPERATING INSTRUCTIONS- PLEASE REFER TO MANUFACTURER'S OPERATING INSTRUCTIONS.

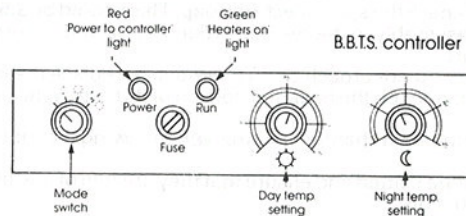
**Mode Switch Functions for 16-72/1 Time Switch**



Ambi-Rad reserve the right to change the time clock at a future date if necessary. In all cases the enclosed clock instructions should be consulted.

**Constant Night**  $\odot$   
 Red light on  
 Temp control on night setting only  
 (Day setting has no effect)  
 Green light:-  
 On - heaters on  
 Off - heaters off  
 Clock switch has no effect, not in circuit

**Controller off**  $\circ$   
 Both red and green lights extinguished  
 Heaters/zone(s) off



**Constant Day**  $\odot$   
 Red light on  
 Temp. control on day setting only  
 (Night setting has no effect)  
 Green light:-  
 On - heaters on  
 Off - heaters off  
 Clock switch has no effect, not in circuit

**Night/Day**  $\odot$ / $\odot$   
 Red light on  
 During day clock indicates on  
 During night clock indicates off  
 Green light:-  
 On - heaters on  
 Off - heaters off

**Key to mode switch symbols**

- $\circ$  Off    $\odot$  Night    $\odot$  Day

Note that the  $\odot$  and  $\odot$  settings on the controller mode switch override the operation of the clock  
 • The  $\odot$ / $\odot$  setting only brings the clock into effect • The  $\circ$  setting switches off the heaters/zone completely.

**Fig. 11. Black Bulb Thermostat Controller.**

## Fan Starter Overload (Type 1 Herringbone Fan Only)

The red "reset" button on the fan starter is used only to restart the fan should it cut out due to overload or malfunction. Should repeated lock-out occur then a qualified electrician should be consulted.

## Room Thermostat Setting "Air Type"

The correct setting of an air type room thermostat can only be determined by experience in cold weather. It should be set to shut off the heaters when a comfortable level of warmth has been achieved. This setting will normally be several degrees below that which would be required with a conventional warm air/convective heating system.

AMBI-RAD Black Bulb Radiant Thermostats - available if required.

## Users Instructions

Hand the Users Instructions to the user and explain how to operate the heater.

Leave the Installation and Servicing Instructions at the users meters or, preferably, with the service/maintenance engineer/manager for use on future service calls.

Fix the Users Instructions plate adjacent to the central control panel.

## 9 SERVICING INSTRUCTIONS

Under normal working conditions, it is recommended that the AMBI - RAD heater has a routine service once per year. In exceptionally dirty or dusty conditions such as may occur in a foundry more frequent servicing may be desirable. Servicing work should be carried out by a qualified gas servicing engineer.

### IMPORTANT

- 1 Never rest anything, especially ladders against the heater.
- 2 Isolate gas and electrical supplies before commencing any servicing work or component exchange.
- 3 Unless otherwise instructed, reassemble parts in reverse order to the instructions given below.
- 4 Always test for gas soundness with a suitable leak detection fluid after completing any service or exchange of gas carrying components.

## 10 ROUTINE SERVICE

### 10.1 ID Fan

Inspect the main fan impeller and remove any dust by brushing with a soft brush. Similarly remove any dust from the finger guard covering the secondary ( cooling ) impeller. Ensure that the impeller turns freely and that there is not excessive play in the bearings.

### 10.2 Emitter Tubes Inspection

Brush away any dust on the exterior of the emitter tubes.

Inspect the emitter tube internally. If there is any appreciable build up of dust or deposits the tube should be cleaned internally.

Remove the burner/control assembly as directed in 10.4 below.

The tubes can then be cleaned by passing rods and a suitable scraper through them or be cleaned by use of an industrial vacuum cleaner with long extension tube.

### 10.3 Reflector

Although not considered part of an annual routine service, the condition of the reflector should be noted and the users attention drawn to any cleaning necessary. The reflectors can be simply withdrawn for cleaning by removing the two M6 nuts and bolts securing them and sliding them out of the suspension brackets.

The reflectors can be cleaned with a soft cloth and detergent in water. A mild non abrasive metal polish may be used in cases of extreme discolouration.

Dirty reflectors will increase the heat radiation upwards into the roof space by 3-4%.

### 10.4 Removal of Burner/Control Assembly

Remove the burner/control assembly by disconnecting the gas and electrical supply, fresh air inlet ( if fitted ) and the fan electrical connection. Slacken the burner fixing pinch screws and draw the assembly off the emitter tube:

### 10.5 Burner/Electrode Assembly

Inspect the burner electrode assembly by removing the six dome head screws securing the combustion chamber cover plate on top of the burner box, taking care not to damage the sealing gasket. Remove the burner head by unscrewing it from the injector, tacking care not to drop it onto the leads of the ignition electrodes. Renew the electrode assembly if it is not in good condition. The assembly is removed by removing two 2BA screws which attach it to the frontwall of the combustion chamber. The assembly is then lifted out of the combustion chamber and the two connection cables disconnected.

If the electrode assembly is in good order check the spark electrode gap. This should be  $3.5 \text{ mm} \pm 0.5 \text{ mm}$ . Adjust the gap if necessary by bending the earth rod. Refit the electrode assembly in the reverse order of removal, ensuring that the electrical connections to the assembly are the correct way round and secure.

Inspect the injector and clean as necessary do not broach out. To remove or replace the injector with the burner head removed, unscrew the injector from its carrier using a spanner on the hexagon portion of its body. When replacing the injector ensure that it is fully tightened in its carrier.

Replace the burner head. Replace the combustion chamber plate cover, renewing the rubber sealing gasket Part No. 358 if this is not in good condition.

Inspect the burner fresh air inlet duct and flue if fitted and ensure that they are free of any blockage or obstruction. Inspect the air inlet terminal and ensure this is not liable to obstruction.

Replace the burner/control assembly fully onto the emitter tube and secure by tightening the pinch screws ensuring the burner is squarely and neatly positioned in the vertical position.

Re-commission the heater by following the procedure for commissioning as per section 8, taking care to check that the burner gas pressure is correctly set to that indicated on the data badge and that the vacuum switch and flame safeguard equipment function correctly.

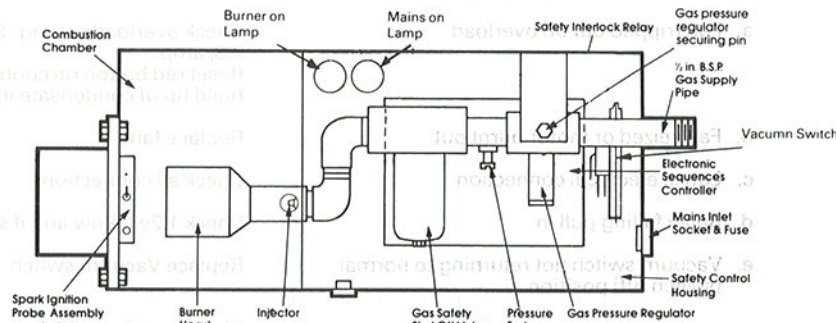
### 10.6 Auxiliary Controls

Check that auxiliary controls such as room thermostats, switches, frost thermostats, etc. function correctly and set to operate at the desired temperatures. Ensure that the user is aware of the functions of the auxiliary control and their correct settings. For the most efficient operation of the heating system the time switch if fitted should be set to switch on normally between ¼ hour and 1 hour before commencement of the occupation of the building, depending on local conditions. The correct setting of the room thermostat can only be determined by experience in cold weather when it should be set to shut off the heaters when a comfortable level of warmth has been achieved. This setting will normally be several degrees below that which would be required with a convective heating system.

## 11 REPLACEMENT OF COMPONENTS

**Warning:** Isolate gas and electrical supplies before carrying out any repair work. Always test for gas soundness with a suitable leak detection fluid.

**Fig. 12 Layouts of Gas Controls (Viewed from top of control Housing).**



### 11.1 To Replace Any Components In The Burner/Control Assembly

This assembly should be removed from the heater by first disconnecting the gas and electrical supplies, the fresh air intake duct if fitted and the fan electrical connection. Slacken the securing pinch screws and draw the burner/control assembly off the emitter tube. When refitting the burner assembly to the heater ensure the box is vertical.

### 11.2 To Replace Electrode Assembly

Remove top cover of combustion chamber by removing the six dome headed fixing screws taking care not to damage the gasket. Remove the 2BA screws securing the electrode assembly and pull off the two electrode cable connectors. Reconnect the cable connectors to the new electrode assembly (the two connectors are non interchangeable) and refit the electrode assembly. Refit the combustion chamber cover plate, and rubber gasket replacing the combustion chamber cover plate, replacing the rubber gasket if this is damaged.

### 11.3 To Replace The Burner Head

Remove combustion chamber cover as in paragraph 11.3 Unscrew burner head from injector taking care not to drop it onto the ignition leads. Refit new burner head and replace combustion chamber cover plate, replacing the rubber gasket if this is damaged.

### 11.4 To Replace The Injector

Refer to 11.5 above. The injector size for Natural Gas 4.1 mm and for propane 2.4 mm.

### 11.5 To Replace Gas Safety Control Valve

Remove combustion chamber cover as in paragraph 11.3 Remove control housing cover by removing the two dome headed fixing screws. Remove burner head as in paragraph 11.3 slacken the support flange grub screw securing the gas pipe nipple and unscrew the 1/2" BSP gas supply pipe entering the gas control valve.

Unplug the gas valve electrical connection marking each connection. The gas valve and injector can now be removed as an assembly. Using an approved pipe joining compound on pipe threads refit the support bracket and pipe fittings onto the replacement control valve. Replace the control valve into the control housing and refit the 1/2" BSP gas supply pipe using a suitable joining compound. N.B. Refit Carry out commissioning (Section 9) setting the burner pressure to that indicated on the data badge.

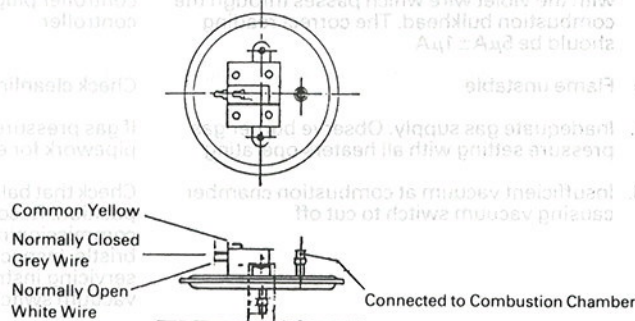
### 11.6 To Replace The Electronic Sequence Controller

Remove the safety control housing lid by unscrewing 5 screws. Unplug the edge connector on the side of the electronic sequence controller. Unplug the single grey wire from the connector on the bulkhead at the side of the electronic sequence controller. Remove the two bolts securing the sequence controller to the control house door and replace the sequence controller using a high tension lead (grey) from an old controller unless its insulation is damaged.

When refitting the Pactrol sequence controller take care that the rear flange of the sequence controller is correctly located underneath the retaining lip in the control housing (Pactrol P16DI only). Refit the two bolts and edge connector into the sequence controller and high tension leads into its connector.

### 11.7 To Replace the Vacuum Proving Switch

Disconnect the rubber tube connection at the vacuum switch. Disconnect the three push on connectors from the vacuum switch. Remove the two screws securing the vacuum switch and slip the vacuum switch out of the control housing. Refitting is a reversal of the above taking care to correctly reconnect the three cables. See Fig. 13 below.



**Fig. 13. Honeywell Vacuum Proving Switch**

### 11.9 To Replace Fuse

Withdraw fuse carrier which is located directly underneath the main electrical input socket, slip the old fuse from the carrier and replace with a new fuse of 1 amp rating.

# 12 TROUBLE SHOOTING CHECKLIST FOR HB22 HERRINGBONE SYSTEM

Symptoms	Possible Causes	Remedy
<b>1 BURNER WILL NOT START</b>		
<b>1.1 Red "Mains On" light does not illuminate</b>	<ul style="list-style-type: none"> <li>a. External Controls, thermostat, time switch etc. calling for heat</li> <li>b. Fuse blown</li> </ul>	<p>Adjust controls</p> <p>check for short circuit wiring or individual electrical components. Check solenoid coil - replace if necessary</p>
<b>1.2 Red "Mains On" light (Burner Assembly unit)</b>	<ul style="list-style-type: none"> <li>c. Mains electrical input plug housing</li> <li>a. Fan tripped out on overload</li> <li>b. Fan seized or motor burnt out</li> <li>c. Loose electrical connection</li> <li>d. Relay failing pull in</li> <li>e. Vacuum switch not returning to normal (switch off) position</li> </ul>	<p>Re-connect</p> <p>Check overload setting: Single phase 1.8, amp 3 phase 0.8, amp. Reset red button on contractor in control panel. Check for build up of condensate in fan casing</p> <p>Replace fan</p> <p>Check all connections</p> <p>Check 1.2e below and if satisfactory replace relay</p> <p>Replace Vacuum switch</p>
<b>1.3 Red "Mains On" light illuminates (Control Panel)</b>		Check as 1.2a and 1.2c
<b>1.4 Fan starts but burner does not attempt ignition</b>	<ul style="list-style-type: none"> <li>a. Insufficient vacuum generated by fan</li> <li>b. Blocked emitter tube/manifold</li> <li>c. Combustion chamber cover permitting air in leakage</li> <li>d. Vacuum impulse line between combustion chamber and vacuum switch unsecure or defective</li> <li>e. Vacuum switch does not "pull in"</li> <li>f. Vacuum switch "pulls in" but electronic sequence controller does not proceed to programme ignition sequence. Illumination of orange light on burner electronic sequence controller (visible only when control housing cover is removed) indicates start of sequence</li> <li>g. Leaks or joint separation in manifold system</li> </ul>	<p>Clean fan blades with soft bristle brush</p> <p>Clean emitter tube internally</p> <p>Examine condition of rubber gasket tighten down lid securely</p> <p>Fix securely or replace</p> <p>Check that balancing damper has not slipped into closed position. Recommission and set damper. See commissioning instruction. Replace vacuum switch</p> <p>Replace burner electronic sequence controller but first check that cause of failure is not short on output circuit by measuring resistance between pins 2 and 7 of burner control unit wiring base. Now repeat this test with meter probes reversed (gas valve solenoid incorporates rectifier diode). If either reading is less than about 5000 then a short circuit is indicated in the gas valve solenoid, burner indicator light of associated wiring. Replace</p> <p>Reseal or reconnect seal</p>
<b>1.5 Burner Control proceeds to ignition stage (normally indicated by audible spark gas valve energised and "burner on" light illuminated) but burner does not light</b>	<ul style="list-style-type: none"> <li>a. No spark</li> <li>b. Gas control valve burnt out or defective</li> <li>c. Insufficient gas pressure</li> <li>d. Burner injector blocked</li> </ul>	<p>Check electrode for cracks-replace if necessary. Check high tension-connection are secure. Check sparkgap is <math>3.5 \pm 0.5</math>mm. If no high tension output from electronic sequence controller. Replace controller.</p> <p>Replace solenoid operator section of gas valve</p> <p>Set burner gas pressure. (See commissioning instructions)</p> <p>Clean burner injector</p>
<b>2. BURNER LIGHTS BUT SHUTS DOWN AFTER A FEW SECONDS</b>	<ul style="list-style-type: none"> <li>a. Inadequate flame signal. This can be verified by connecting a sensitive microammeter in series with the violet wire which passes through the combustion bulkhead. The correct reading should be <math>5\mu A \pm 1\mu A</math></li> <li>b. Flame unstable</li> <li>c. Inadequate gas supply. Observe burner gas pressure setting with all heaters operating</li> <li>d. Insufficient vacuum at combustion chamber causing vacuum switch to cut off</li> </ul>	<p>Replace flame electrode. Check connections to electrodes and terminal 4 of electronic sequence controller plug. Replace an electronic sequence controller</p> <p>Check cleanliness of burner and set burner gas pressure</p> <p>If gas pressure drops below examine gas supply pipework for excessive pressure loss.</p> <p>Check that balancing damper has not slipped into closed position. Recommission and set damper. See commissioning instruction. Clean fan blades with soft bristle. Inspect tube internally and clean if necessary (see servicing instructions). If problem persists replace vacuum switch.</p>
<b>3. HEATER SHUTS DOWN AFTER OPERATING FOR A PERIOD OF TIME.</b>	Refer to 2a and 2d above	

# SPARE PARTS LIST

## RADIANT HEATER MODEL HB22

<b>Part No.</b>	<b>Description</b>
102	Emitter Tube - Mild Steel section
109	Emitter Tube - Stainless Steel section
120	Emitter Reflector 94in. section
200	Vernitron 22508/013 Electronic Sequence Controller
207	Gas Safety Control Valve No. 243 1221-15
207.1	Gas Safety Control Valve No. 243 1221-45
209	Honeywell Vacuum Proving Switch
233	Mains Input Connector and Flexible Cable
236	Fuse P16 Type DI (DP) 400601 Sequence Controller
251	Amber Lamp 240/220V
252	Red Lamp 240/220V
273	Type 1 Fan Assembly 1 Phase
274	Type 1 Fan Assembly 3 Phase Type 1 Fan Motor 1 Phase
279	Type 1 Fan Motor 3 Phase
278	Type 2 Fan Assembly 1 Phase
295	HT Lead
296	Rectification Lead
308	Burner Support Casting
314	Burner Head
328	Burner Injector Carrier
329	Burner Injector
330	Impulse Line Assembly
347	Electrode Ignition/Assembly
358	Burner Gasket
395	Bracket Type A
396	Bracket Type B
BA22ER	Burner Assembly
DA	Damper Assembly
201	P14 110AL Controller
250.1	P16 Type DI(DP) Controller Fitted with JST Harness
219	Relay
221	Relay Base

**Note:** When ordering spare parts - please order replacement items identical to that item being replaced.

## USERS INSTRUCTIONS FOR AMBI-RAD HEATERS MODEL HB22

AMBI-RAD is an overhead radiant heating system for industrial and commercial buildings. The AMBI-RAD system is suspended from the roof or mounted at an angle on the wall and heats by radiation in the same way as the sun.

### IMPORTANT:

1. This system must only be installed by a qualified person in accordance with the requirements of the Gas Safety Regulations 1972 and The Health and Safety at Work Act.
2. Each burner, the central control unit and the fan must be earthed.
3. Never rest anything especially ladders, against the heater units or manifold ducting.

### To Start the AMBI-RAD Heating System

1. First ensure that the gas supply to each heater unit is turned on.
2. Ensure that the settings of any time-switch and thermostat are such that the heating system will be required to operate.
3. Switch on electrical supply to the system. Mains lights, coloured red, at each burner will illuminate and ignition sequence commence.
4. After completion of an air purge period, ignition of each burner will occur and burner lights, coloured orange, will illuminate.
5. If ignition attempt fails individual burner controller will lock out with mains light only illuminated.
6. If lock out occurs switch off electrical supply to the system, wait 30 seconds then switch on again. If lock out occurs again switch off individual burner unit and call service engineer. The overall system may continue in operation in this condition if no other fault is evident.

### To Switch Off the AMBI-RAD System

Switch off the electrical supply to the system using the timeswitch, the thermostat or the mode switch. The burners will shut off and the fan will stop.

### Servicing:

To ensure continued efficient and safe operation it is recommended that the system is serviced regularly by a qualified person e.g. every year in normal working conditions but in exceptionally dusty or polluted conditions more frequent servicing may be required. The manufacturers whose address is given below offer a maintenance service, details available on request.

Because of our policy of continuous development Ambi-Rad Ltd. reserve the right to vary the equipment specification without notice

# AMBI-RAD

## radiant heating systems

Southern Office  
Unit 18c, Chapman Way  
Haslemere Highbrooms Estate  
Tunbridge Wells, Kent, TN2 3EF  
Tel: (0892)512760 Fax (0892) 512788

**Ambi-Rad Limited, PO Box 30,  
Enfield Works, Mucklow Hill,  
Halesowen,  
West Midlands B62 8DS, England.**  
Tel: 021-503 0707 Telex: 333003 AMBIG  
Fax: 021-501 2955

Northern Office  
Unit 27, Etherow Industrial Estate,  
Woolley Bridge Road, Hollingsworth,  
Cheshire SK14 8NS  
Tel (04574) 60080 Fax (04574) 60045

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