

# **AMBI-RAD®**

**Energy Efficient Heating Systems**

**Floor Standing Oil Fired Heaters**

**Installation, Servicing**

**&**

**Operating Instructions**

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# Introduction

## 1. General

- 1.1.1 Before installation check that the appliance as described on the packaging label is in accordance with the correct type and model specified on the data plate and complies with your customer order.
- 1.1.2 The heater is delivered wrapped in heavy duty polythene and should be checked to ensure that it has been delivered undamaged.
- 1.1.3 Please read this document before commencing installation. The onus rests with the installer to ensure that all relevant manuals are read and understood, especially with regard to any safety instructions stipulated by the manufacturer.
- 1.1.4 These instructions are only valid for the country of use indicated on the appliance, i.e. GB - IE. If these symbols are not shown it is necessary to obtain appropriate technical instructions which will provide information concerning the necessary modification of the appliance for use in the country concerned. Such instructions may be obtained from your supplier upon request.
- 1.1.5 Check that the local distribution conditions of electricity supply, type of oil line, pressure and adjustment of the appliance are compatible.
- 1.1.6 When installed in Great Britain the total installation must comply with the requirements and recommendations of the relevant British Standards and local laws. The installation must also be in accordance with the relevant Electrical Regulations and I.E.E. Regulations.
- 1.1.7 Unauthorised modification of this appliance or departure from use in the manner for which it was intended by the manufacturer, or installation in a manner contrary to these instructions may constitute a hazard and jeopardise all warranties. Deviations should only be carried out after formal consent has been obtained from the manufacturer.
- 1.1.8 Ensure that the environment in which the air heater is to be installed will not create a hazard, i.e. where excessive (volatile) dust, flammable or corrosive substances and/or vapours and combustible materials may be present. Suitable protection should be given to prevent damage to the appliance, for example from fork lift trucks.
- 1.1.9 These appliances have been tested and set according to the data plate before leaving the factory.

## 1.2 Quality Products

- 1.2.1 The Ambi-Rad range of oil fired cabinet heaters is manufactured in the EC and supplied in accordance with BS EN 9002: 1994 Quality Assurance System.
- 1.2.2 Certificates of conformity are available from the Quality Control department at Ambi-Rad Limited.

## 1.3 CE-Approval-European Directives

- 1.3.1 Ambi-Rad cabinet heaters have been fully assessed and tested and meet the following EC Directives:
  - Machinery Directive (89/392/EEC)
  - Low Voltage Directive (73/23/EEC & 93/68/EEC)
  - Electromagnetic Compatibility Directive 89/336/EEC & 91/36 EEC)
  - Product Liability Directive (65/379/EEC)
- 1.3.2 In addition Ambi-Rad oil fired cabinet heaters conform to the following harmonised standards:
  - BS EN 292 - Part 1: 1991  
Safety of Machinery - Basic Concepts, General Principles for terminology, methodology.
  - BS EN 292 - Part 2: 1991  
Safety of Machinery - Basic Concepts, General Principles for Design Technical Principles and Specifications.
  - BS EN 60204 - Part 1: 1993  
Safety of Machinery - Electrical Equipment for Machine Specification for General Requirements.
  - BS EN 60335 - Part 1: 1988  
Safety of Household and Similar Electrical Appliances General Requirements.
  - BS EN 55014 - 1993  
Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.
  - prEN 50165 - 1995  
Electrical equipment of non-electric heating appliances for household and similar purposes, safety requirements.

## **1.4. Product Information**

**1.4.1** Ambi-Rad cabinet heaters are available with burner outputs from 30kW to 293kW and can only be floor mounted.

Cabinet heaters can be used in free blowing or ducted applications. Each heater must have its own individual open flue.

**1.4.2** All cabinet heaters are fitted with a pre-tested and set forced draught burner. A sequential control box is fitted to each burner to provide safety  
Note: No asbestos or soldered joints are present in the construction of the heater.

**1.4.3** All the materials selected can withstand the range of chemical, mechanical and thermal demands expected during the foreseen and normal use of the product, as stipulated by manufacturers' instructions and recommendations.

**1.4.4** Before final location of the product the following criteria should always be considered in placing the heater:-

- Flue outlet access
- Placing for efficient distribution of warm air
- Oil supply
- Electrical services
- Fresh air supply (when applicable)
- Service access and maintenance requirements

## **1.5 Warning**

Heaters should not be installed in a corrosive or solvent atmosphere (i.e. near plating or degreasing plants), in areas where there is a fire risk, or any other environment which is detrimental to the heater or its operation.

Consult BS 6230 for further information on hazardous areas.

2.1 Class D Oil – Single Stage

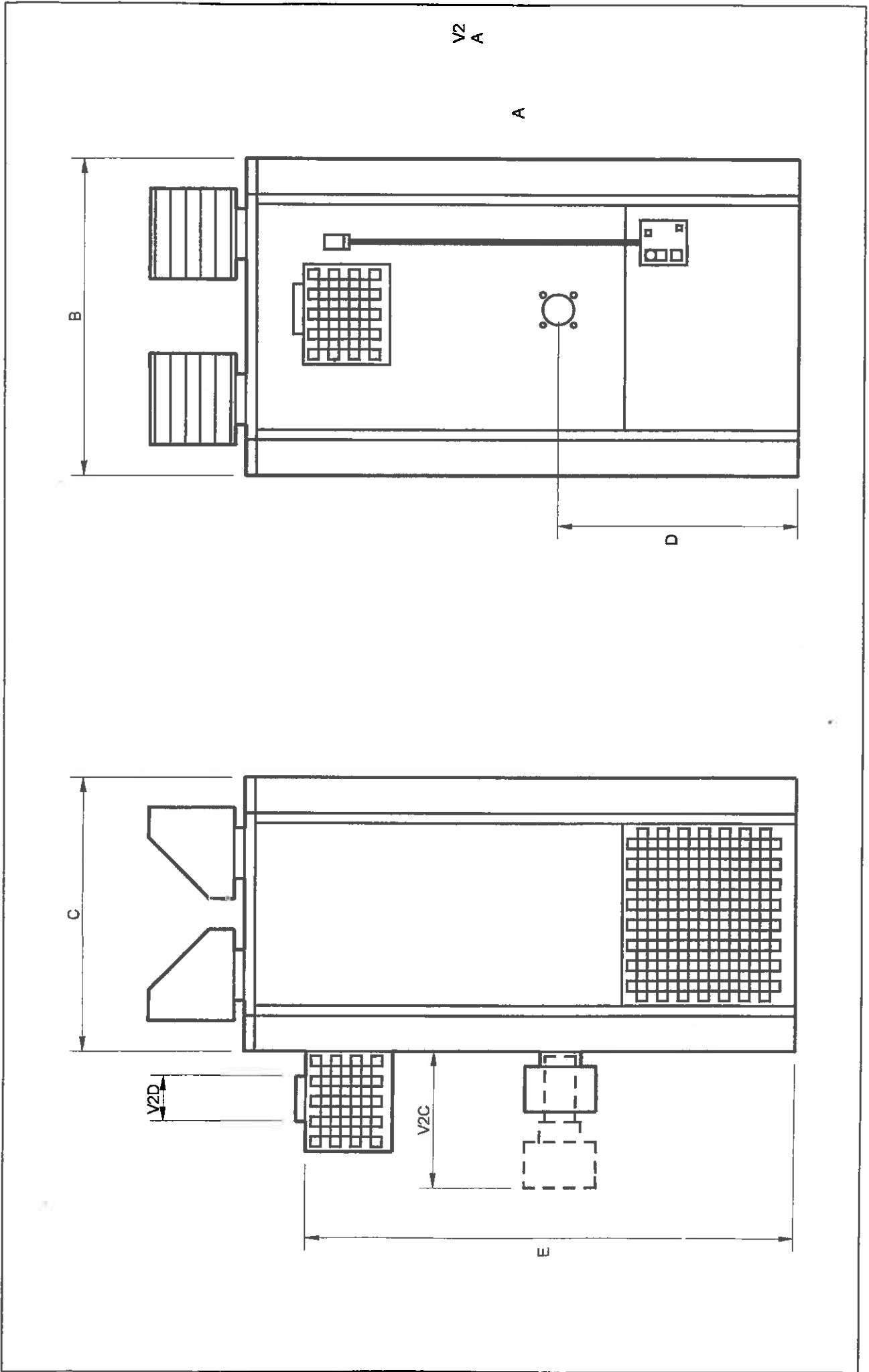
VCH model	100	150	200	300	400	500	600	700	800	1000
Nominal air flow	m <sup>3</sup> /h ft <sup>3</sup> /min	2514 1515	5182 3050	5182 3050	7135 4200	8750 5150	10364 6100	12190 7175	14101 8300	17329 10200
Air throw (approx)*	m ft	18 59	21 69	21 69	20 66	25 82	25 82	30 98	25 82	30 98
CO <sub>2</sub>	%	11.7	11.5	11.5	12	12	12	12	TBA	TBA
Temperature rise through heater (nominal)	°C °F	33 60	33 60	50 90	50 90	50 90	50 90	50 90	50 90	50 90
Sound level# (for guidance only)	dba	65	67	70	71	73	75	77	76	78
Flue diameter	mm	125	125	150	175	175	175	225	225	225
Minimum flue height	m	3	3	3	3	3	3	3	3	3
Gross flue temperature (20°C ambient)	°C	TBA	TBA	264	369	351	280	327	TBA	TBA
Electrical supply	1PH 230/1/50 3PH 415/3/50	1PH	1PH	1PH	1PH	3PH	3PH	3PH	3PH	3PH
Main fan motor size	kW	0.55	0.736	0.73	1.1	2.2	3	4	4	5.5
Running current	A	7.5	9	9	2.6	5	6.6	8.5	8.5	11.5
Weight	kg	230	279	283	398	410	480	501	690	710

\* Unobstructed in still air with a terminal velocity of 50ft/min.  
 # Please contact our Technical Department for specific sound levels.

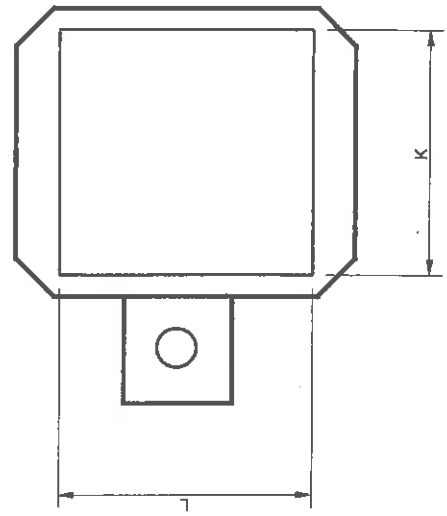
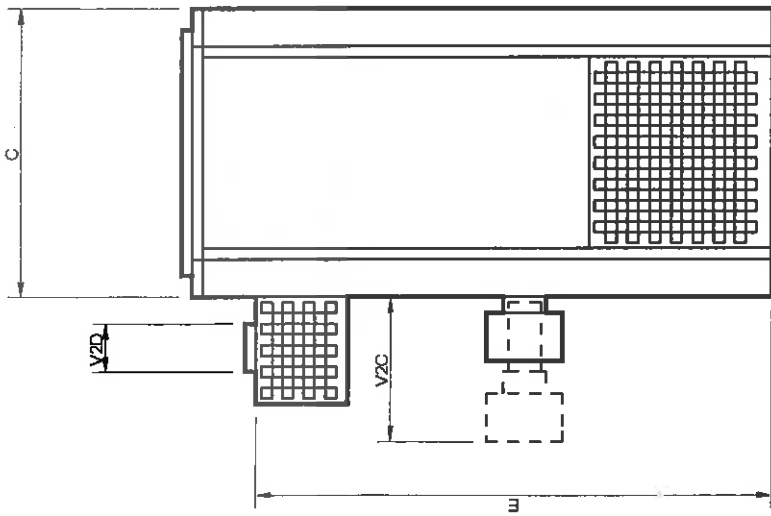
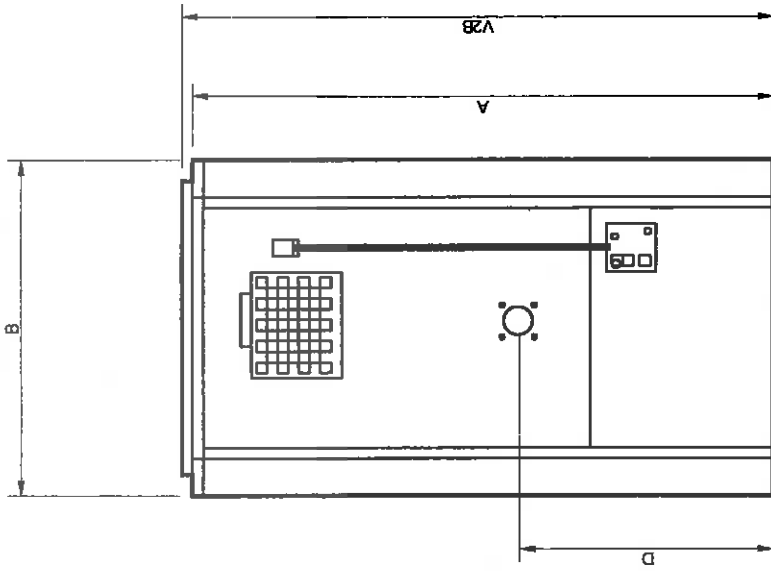
2.1 Class D Oil – Single Stage

VCH model	100	150	200	300	400	500	600	700	800	1000
Heat output	kW Btu/h	43.91 150000	58.6 200000	87.9 300000	117.2 400000	146.5 500000	175.8 600000	205.1 700000	234.4 800000	289.1 986500
Heat input (gross)	kW Btu/h	57.1 129825	76.1 259653	114.2 389650	152.2 519306	190.2 648962	228.3 778959	266.3 908615	304.4 1038612	375.4 1280864
Oil consumption	Kg/hr gal/hr	4.34 1.14	5.78 1.52	8.67 2.28	11.56 3.04	14.45 3.80	17.34 4.56	20.23 5.32	23.12 6.08	28.90 7.60
Burner type	Riello 40	G5	G10	G10	G20	G20S	G20S	Press GBV	Press GBV	Press GBV
Pump pressure	bar p.s.i.	12 174	11.5 166	12 174	10.7 155	10.0 145	12 174	12 174	TBA	TBA
Smoke No.		0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
Nozzle	Size Angle Shape	1.00 60° W	1.35 60° B	2.0 60° S	2.75 45° S	3.5 45° S	4.00 60° S	5.00 60° S	TBA	TBA
Head Setting At zero flue resistance	Number	4.0	1.0	4.0	2.0	3.5	6.0	4.0	TBA	TBA
Air shutter setting (at 0 flue resistance)	Number	4.2	3.0	4.8	3.2	5.4	4.5	3.0	TBA	TBA
Inlet oil connection	ins BSP	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Available outlet pressure	Pa ins WG	63 0.25	125 0.5	100 0.4	125 0.5	150 0.6	100 0.4	125 0.5	125 0.5	150 0.6

Vertical heater range

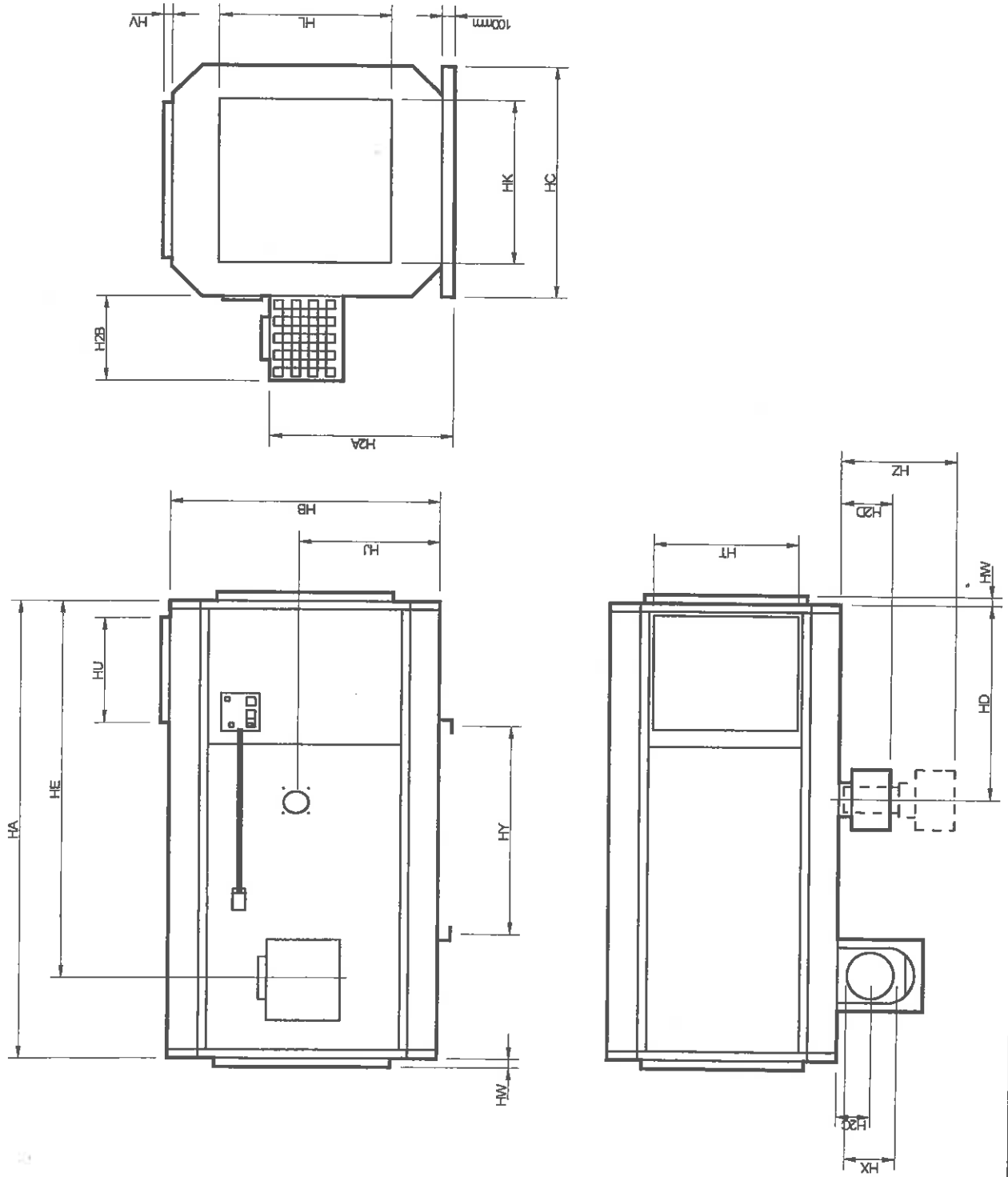


Vertical duct heater range

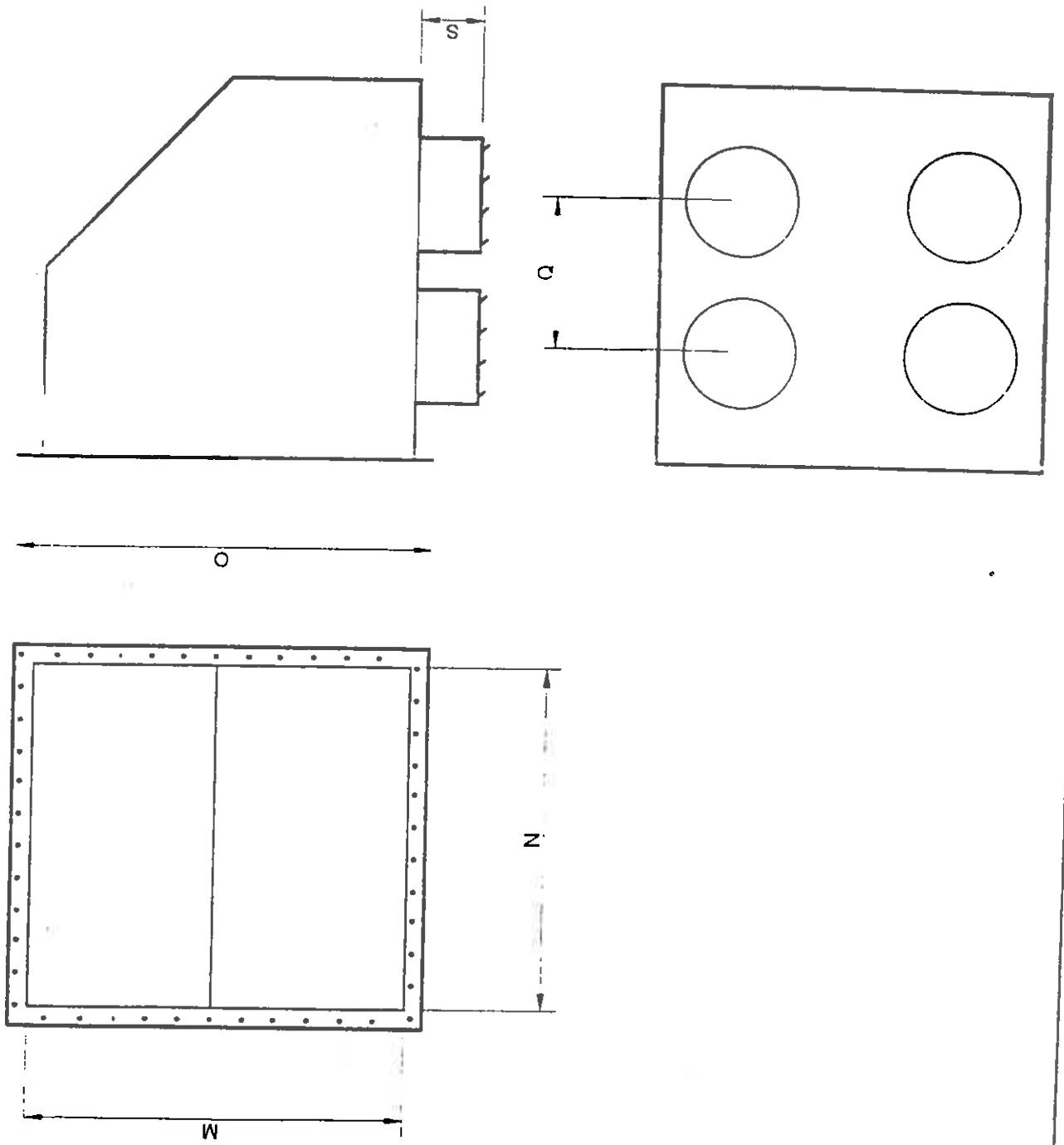




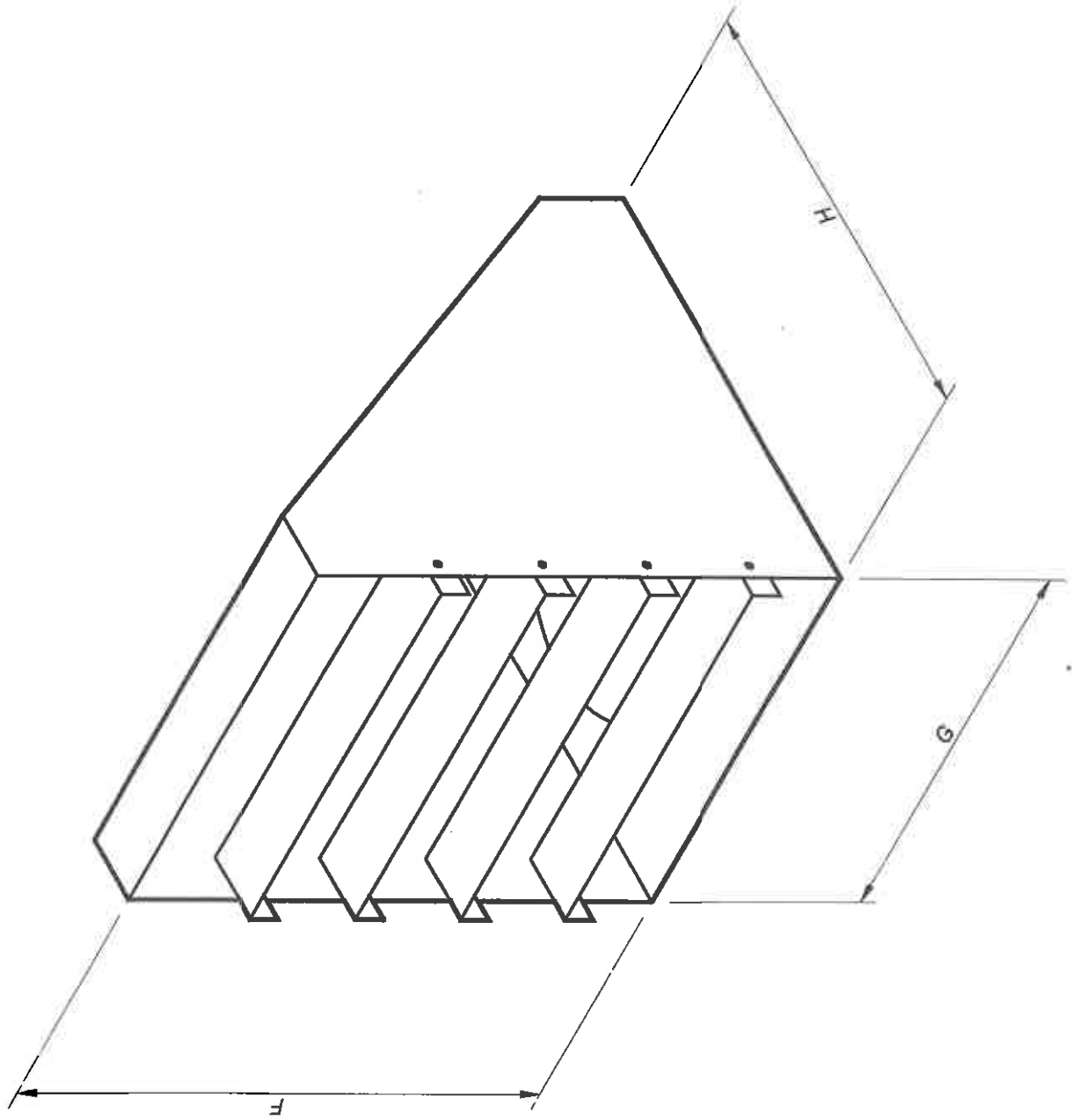
Horizontal duct heater range



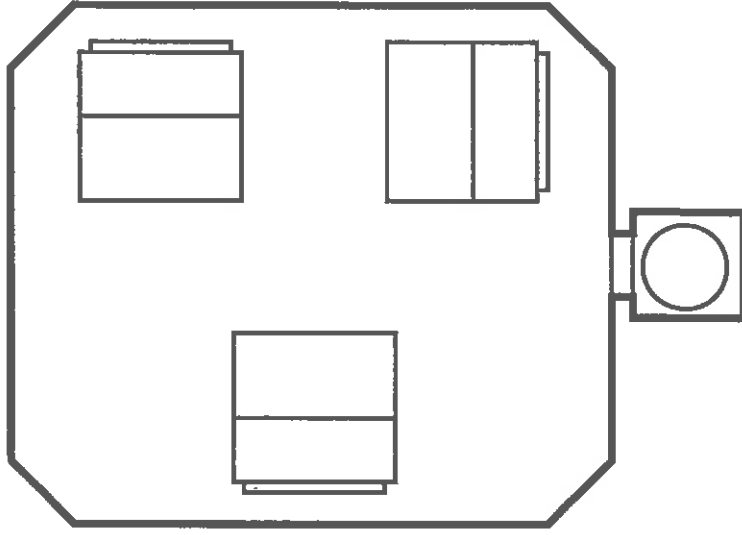
Nozzled outlet



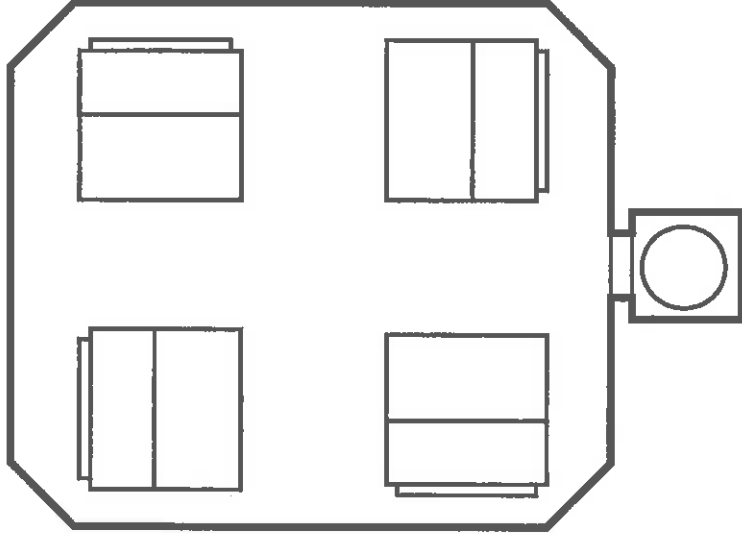
Nozzle dimensions



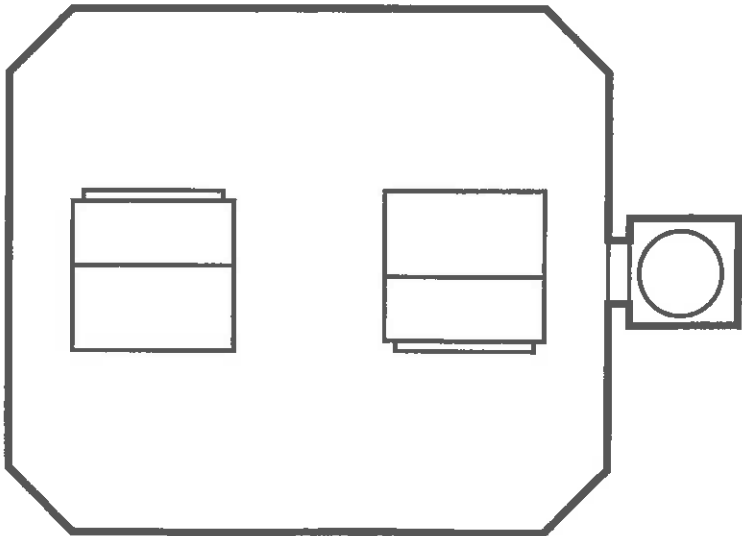
No. of nozzles on heaters



60 - 88



117 - 293



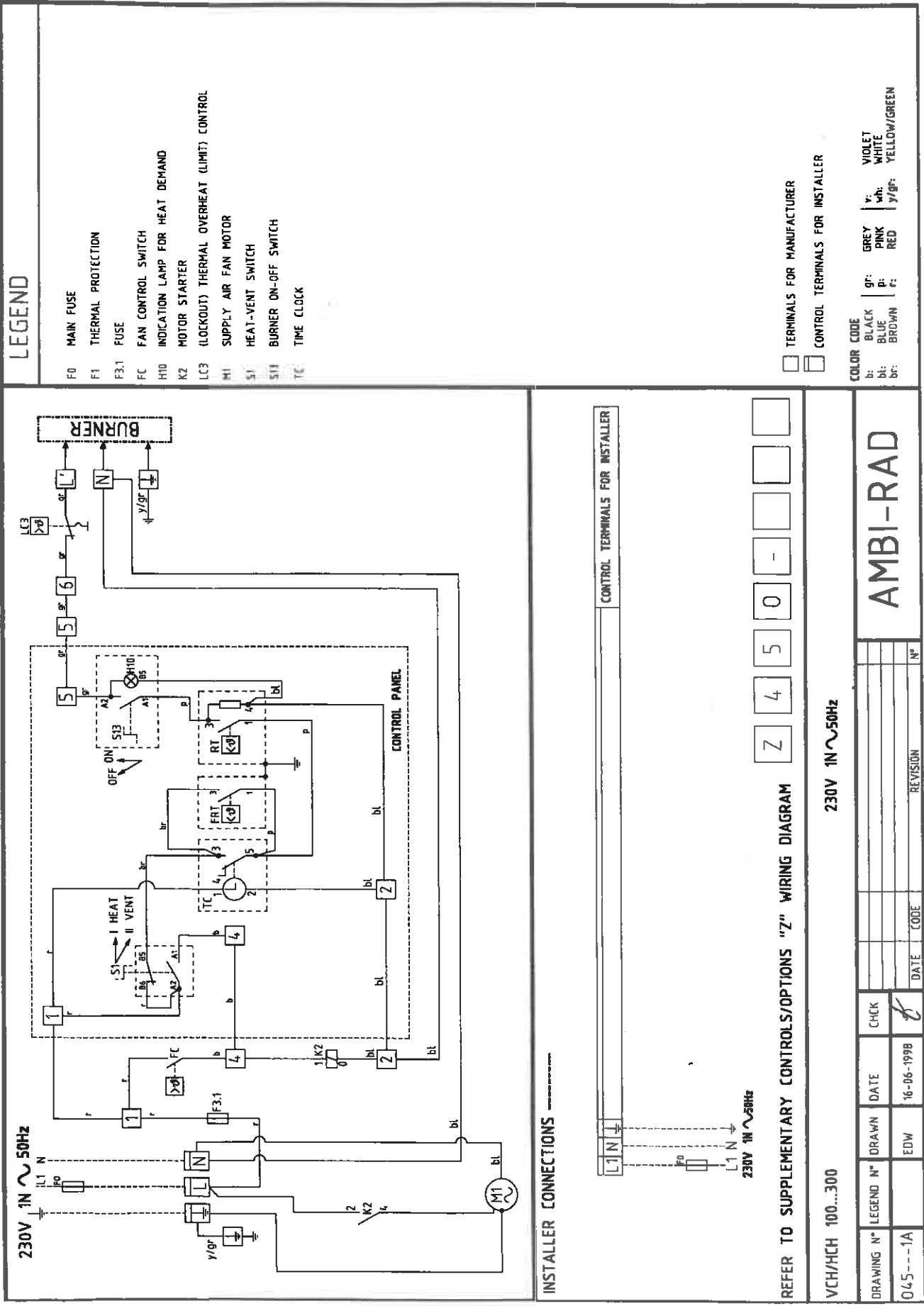
29 - 44



## 2.2 Dimensions

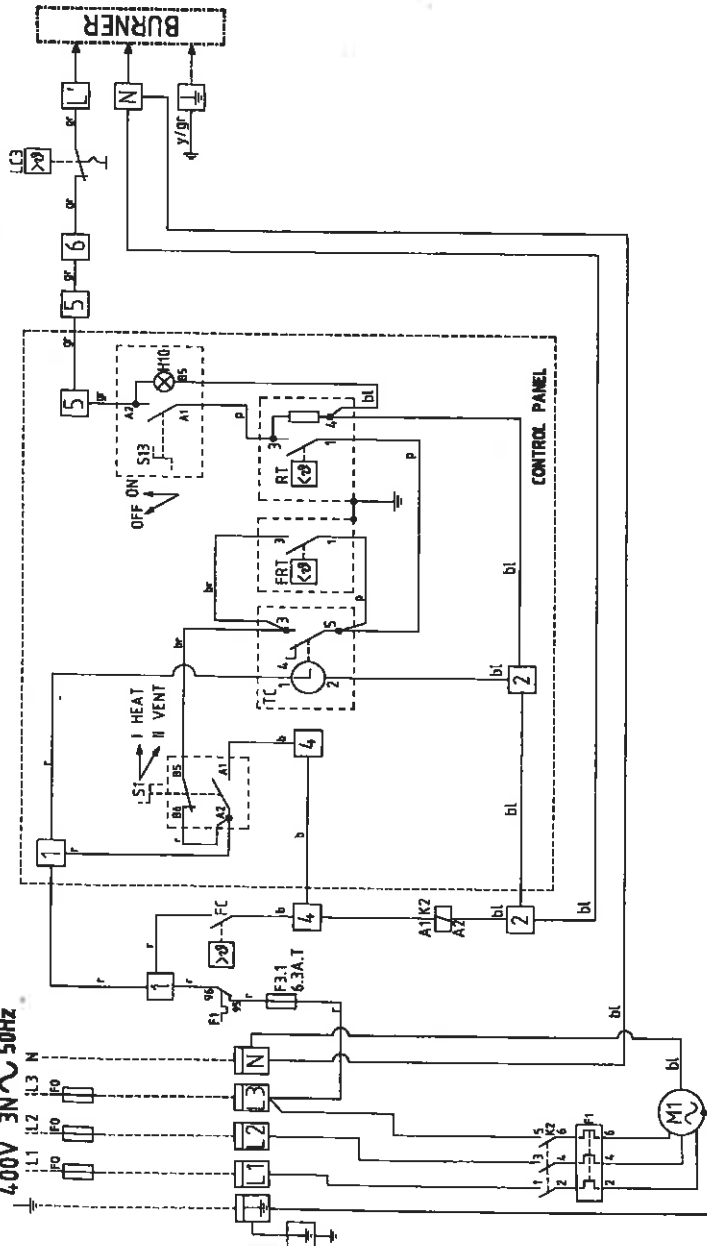
VCH model	100	150	200	300	400	500	600	700	800	1000
Horizontal height	HB	985	985	985	986	986	1186	1186	1186	1186
Horizontal depth	HC	615	615	855	855	1156	1300	1300	1506	1506
Burner position	HD	984	984	1018	1018	1155	1132	1132	1132	1132
Flue position	HE	1438	1438	1484	1484	1771	1718	1718	1718	1718
Burner height	HJ	447.5	447.5	492.5	492.5	493	593	593	593	593
Outlet duct width	HK	475	475	500	500	650	830	830	830	830
Outlet duct depth	HL	475	475	660	660	825	950	950	1150	1150
Fresh air duct width	HT	280	280	500	500	630	700	700	1000	1000
Fresh air duct depth	HU	480	480	480	480	500	500	500	500	500
Duct height	HV	75	75	75	75	75	75	75	75	75
Duct height	HW	75	75	75	75	75	75	75	75	75
Flue clearance dia.	HX	128	128	155	180	180	180	230	230	230
Centre distance of feet	HY	900	900	900	900	900	900	900	900	900
Burner withdrawal	HZ	420	420	480	480	540	540	860	970	970
Stackbox height	H2A	657.5	657.5	702.5	702.5	703	843	843	843	843
Stackbox guard size	H2B	310	310	310	310	310	380	380	380	380
Flue position	H2C	150	150	150	150	150	190	190	190	190
Burner protrusion	H2D	350	350	390	390	430	350	670	780	780

# 3.0 Wiring Diagrams



# LEGEND

- F0 MAIN FUSE
- F1 THERMAL PROTECTION FUSE
- F3.1 FAN CONTROL SWITCH
- FC INDICATION LAMP FOR HEAT DEMAND
- H10 MOTOR STARTER
- K2 (LOCKOUT) THERMAL OVERHEAT (LIMIT) CONTROL
- H1 SUPPLY AIR FAN MOTOR
- S1 HEAT-VENT SWITCH
- S3 BURNER ON-OFF SWITCH
- TC TIME CLOCK



- TERMINALS FOR MANUFACTURER
- CONTROL TERMINALS FOR INSTALLER

- COLOR CODE
- BLACK VIOLET
  - BLUE BLUE
  - BROWN BROWN
  - GRAY GRAY
  - PINK PINK
  - RED RED
  - WHITE WHITE
  - YELLOW/GREEN YELLOW/GREEN

## INSTALLER CONNECTIONS



400V 3N~50Hz

CONTROL TERMINALS FOR INSTALLER

L1	L2	L3	N							
----	----	----	---	--	--	--	--	--	--	--

REFER TO SUPPLEMENTARY CONTROLS/OPTIONS "Z" WIRING DIAGRAM

400V 3N~50Hz

DRAWING N°	LEGEND N°	DRAWN	DATE	CHECK	REVISION	N°
1453501A		EDW	16-06-1998			

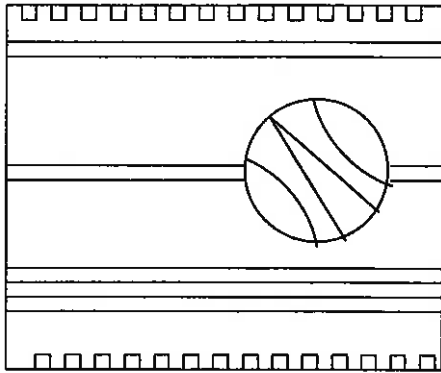
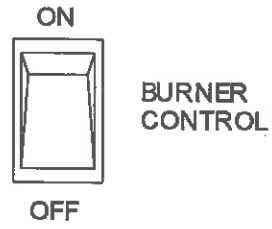
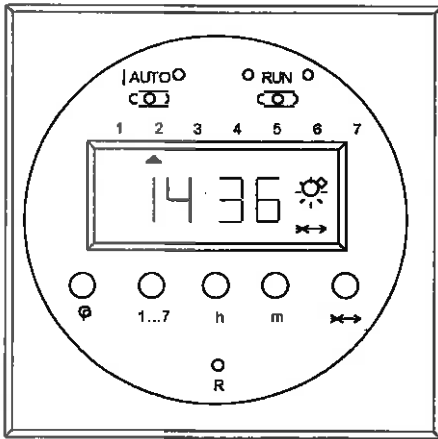
DATE CODE

Z	4	5	0	-		
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# AMBI-RAD

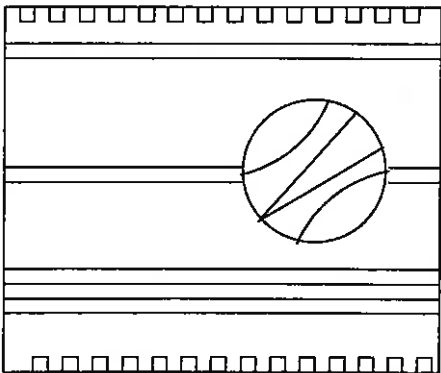


Front electrical cover

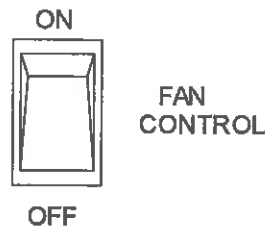


ROOM

**WARNING !**  
ISOLATE HEATER  
BEFORE OPENING



FROST



## 4.0 Mechanical/Electrical Services

### 4.1 Oil Supply

- 4.1.1 Connection to an oil supply may only be carried out by suitably qualified persons. The oil installation must comply with the rules in force using materials appropriate for oil installations.
- 4.1.2 Check that the oil grade is in accordance with the data described on the air heater.
- 4.1.3 An adequate oil line sized to provide the dynamic pressure for the volume required by the air heater(s) is essential to maintain the nominal heat input.
- 4.1.4 A shut off tap and, to facilitate servicing, a disconnect union fitting must be provided adjacent to the appliance.
- 4.1.5 Ensure that the installations a filter and has been tested and purged in accordance with prescribed practice prior to commissioning and taking the air heater into service.

### 4.2 Oil Pipework

- 4.2.1 The burners fitted to the Ambi-Rad air heaters are suitable for Class D (35 sec) oil via a suitable oil pipe line and filter to a storage tank installed externally to the building.
- 4.2.2 The pipework can be constructed for use on either a single pipe, or two pipe system. Whether a gravity feed or pumped system is required is determined by the parameters of the installation i.e. number of heaters and length of pipe line.
- 4.2.3 Please refer to the burner manual as to the limitations of the oil line and most suitable pipe diameters after deciding on which pipework system to adopt.
- 4.2.4 The storage tank and heater are to be installed with the appropriate safety/service components as shown by the following figures

Tank and single pipe system

Pressure ring main.

- 4.2.5 Any external piping from the tank or filter should be adequately lagged to avoid waxing during the winter.  
  
Always ensure the correct grade of fuel is used and especially ensure winter grade is used for the winter period as this will be suitable down to  $-12^{\circ}\text{C}$  whereas summer grade will wax and plug the filter at  $-4^{\circ}\text{C}$ .
- 4.2.6 When using a pumped ring main ensure that correct pressure regulating valves are used prior to each heater and a ring main pressure below 0.4bar is used to avoid aeration and consequential 'air locks'.

- 4.2.7 All pipework must be adequately sealed using approved sealing compounds suitable for oil.

### **GALVANISED PIPEWORK AND FITTINGS MUST NOT BE USED.**

The pipework must be effectively sealed so as to eliminate the ingress of air which will ultimately stop the flow of oil.

### 4.3 Electrical connection

- 4.3.1 The electrical installation may only be carried out by suitably qualified persons observing the rules in force.
- 4.3.2 Check that the electrical specification is in accordance with the specified data on the air heater. A unique appliance wiring diagram is supplied as a separate document attached to this one, plus an additional copy attached to the air heater.
- 4.3.3 These appliances must be earthed.
- 4.3.4 A separate key operated (lockable) electrical isolator for each heater must be provided adjacent to the appliance and in view when facing the service compartment. The isolator must have a contact separation of at least 3.0mm on all poles.
- 4.3.5 Ancillary controls may be included with the heater to provide timed heat cycles, room comfort temperature level, frost protection, override air circulation, etc.
- 4.3.6 Ensure when planning the external appliance control circuitry that power will be supplied at all times to the air heater, even when it is control switched in the 'heat-off' mode. This is necessary to ensure that the fan can operate independently of the heating control. Therefore never incorporate automatic controls that electrically isolate the appliance.

### 4.4 Ventilation requirements

- 4.4.1 It is essential that sufficient fresh air is provided for combustion and room ventilation. Most traditional building constructions have a natural air change rate of at least 0.5/h. Where it is known that the air change rate is at least 0.5/h and the volume of the heated space is greater than  $4.7\text{m}^3$  per kW of total rated heat input, additional ventilation is not required.

**4.4.2 Building volume limits for Ambi-Rad cabinet heaters based upon 4.7m<sup>3</sup> per kW of rated heat input for one air heater only.**

VSH Model	Heat Input kW	Room Vol M <sup>3</sup>
100	38.0	180
150	57.1	268
200	76.1	357
300	114.2	536
400	152.2	715
500	190.2	894
600	228.3	1073
700	266.3	1251
800	304.4	1416
1000	375.4	1764

If the minima volumes stated above exist together with appropriate similar allowances for other combustion plant that may be installed in the same space or zone, then additional ventilation is not required.

**4.4.3** Where it is known that the air change rate is less than 0.5/h or where the building column is less than 4.7m<sup>3</sup> per kW of heat input ventilation grilles must be provided at low level, i.e. below the level of the appliance flue connection. In cases where doubt exists over the air change rate ventilation should be provided.

For air heaters of heat input less than 60kW the total minimum free area shall not be less than 4.5 cm<sup>2</sup> per kW of total rated heat input for low level inlet and 2.25cm<sup>2</sup> for high level inlet.

For our heaters of heat input 60kW or more the total minimum free area shall not be less than 540cm<sup>2</sup> plus 4.5cm<sup>2</sup> per kW in excess of the 60kW rated heat input for low level grills and 270cm<sup>2</sup> plus 2.25cm<sup>2</sup> per kW in excess of the 60kW rated heat input for high level outlet grills.

**4.4.4 Air Supply Requirement for Combustion and Ventilation.**

VCH Model	Heat Input kW	Low Level Grill cm <sup>2</sup>	High Level Grill cm <sup>2</sup>
100	38.0	171	86
150	57.1	257	128
200	76.1	882	441
300	114.2	1054	527
400	152.2	1225	612
500	190.2	1396	698
600	228.3	1567	783
700	266.3	1738	869
800	304.4	1910	955
1000	375.4	2229	1115

Note: Ventilation grilles must be installed so that air is drawn directly from outdoors. In the event that communication from the space where the heater is installed to outdoors is via another room then the route to outdoors must be ducted through the communicating area.

The grille velocity for all air supply must not exceed 2.0 m/s. Grilles should be sited where they cannot easily be blocked or flooded. Notices should be provided advising about the need to keep air supply grilles unobstructed.

**4.4.5** Where mechanical ventilation is used it shall be by mechanical inlet with either mechanical or natural extraction. Automatic means of control such as interlocks must be provided. The function of other ventilation plant in the zone must be taken into account. At no time should it be possible to create a negative pressure in the zone as this will lead to a hazardous situation whereby the air heater flue will act as a pressure relief.

**4.4.6** Normally cabinet air heaters which are used in the free blowing mode, i.e. without discharge air ducting, are installed within the room to be heated. If it is necessary to install the air heater in a separate room and blow the air into an adjoining room then a short duct may be used to connect the appliance to the air discharge louvre.

A return air grille must be provided to ensure that an unobstructed path for recirculation air back to the air heater is maintained. This is to ensure that a negative pressure cannot develop within the space where the air heater is installed.

Grilles sized in accordance with table below must be installed at low level. Sizes stated must be regarded as the minimum free area size to be fitted.

Such grilles should be situated as low as possible in the dividing wall and in a location. Such grilles should be situated as low as possible in the dividing wall and in a location where they are unlikely to become obstructed. It is recommended that a guard be fitted to prevent obstruction, i.e. stored materials.

Permanent notices should be fitted in a prominent location on either side of the grille worded "This grille must be kept clean and unobstructed at all times".

Return air grille sizes based upon the appliance operated at standard air flow.

VSH Model	Air Vol M <sup>3</sup> /h	Grille Size Cm <sup>2</sup>
100	2144	2958
150	2574	3552
200	3568	4924
300	5182	7151
400	7135	9846
500	8750	12075
600	10364	14302
700	12190	16822
800	14101	19460
1000	17329	23914

For spigot connection sizes to heater see dimensions in section 2.2.

For appliances operating at higher air volumes the size should be calculated to ensure that the grille velocity does not exceed 2.0 metres per second.

- 4.4.7 Where ducted cabinet heaters are installed within a separate room from the space being heated and the appliance does not have a direct supply connection to the outside, a return air grille must be provided to ensure that an unobstructed path for recirculation of air back to the heater is maintained. This is to ensure that a negative pressure cannot develop within the space where the air heater is installed.

#### 4.5 Electronic time switch Group 884 switches & push buttons functions

- 4.5.1 884 Timer programming  
Press R (reset) to clear any previous inputs

Set button 'clock-RUN-P' to button 'clock'

Set time of day using h(hours) and m(minutes) buttons

Set actual day using 1—7 push button.

An arrow under the required day will be displayed..

Set button 'clock-RUN-P' to RUN

Actual time and day will be displayed (flashing colon).

Set button 'clock-RUN-P' to button P

Select day or group of days by pressing 1—7 button (arrow will indicate in the display the selection)

Select ON/OFF switch selection (9 ONS & 9 OFFS) by pressing push button P (number and symbol in the display indicates selection)

Select time of ON/OFF program required by pressing h & m buttons

"Ensure day or group of days selected as required for each ON/OFF programming"

When all the switching selections for the set days are completed, set button "clock-RUN-P" to RUN.

If the programming has not been completed correctly the display will show E EE\* indicating an error, with a number \* indicating which ON/OFF position has been incorrectly programmed.

Ensure I AUTO O set to AUTO.

Timer is now set to run automatically on times programmed.

To use skip function X→

Press grey push button above skip sign (The sign will be displayed in display indicating selection).

The skip function will then operate from midnight for 24h. During this period a flashing arrow will be displayed under the applicable day (program commences again 24 hours on).

#### 4.5.2 Switches & push buttons functions

##### Switches

I AUTO O :

I selected = timer permanently ON

O selected = timer permanently OFF

AUTO = timer operating to program selected

##### Button "clock RUN P"

###### Selected clock :

allows actual time of day to be set using h & m buttons

allows actual day to be set using 1—7 buttons

###### Selected P :

enables push buttons to be used to set program ON & OFF times

###### RUN selected :

Displays time of day and allows set program to run

##### Push buttons

###### 1234567

The arrow displayed under the number as selected by pushing 1—7 button indicates day or group of days selected for programming ON/OFF times.

This button selects the 18 programme memories (9 ON & 9 OFF) as indicated in the display (depending on selected repeat programmes up to 126 switching selections per week)

### 1--7

This button selects :

Single days

M,T,W,Th, Fri group (5 days)

Sat, Sun group (2 days)

M,T,W,Th,Fri,Sat group (6 days)

M,T,W,Th,Fri,Sat,Sun group (7 days)

**h**

This button selects units of hours increasing. Held for approx 3 secs or more a fast run/increase operates.

**m**

This button selects units of minutes increasing. Held for approx 3 secs or more a fast run/increase operates

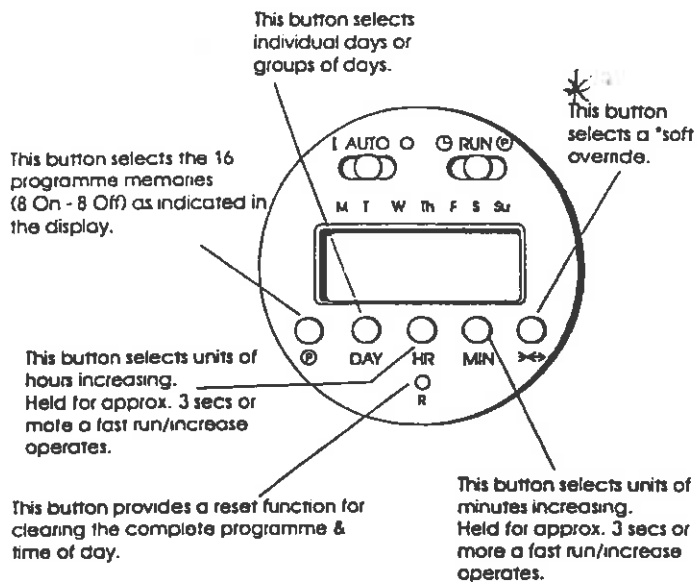
**X→**

This button selects a soft override ie skips the next day programme without clearing the total set programme. Commences at midnight of day selected and continues for 24hrs allowing first programme of following day to commence normal running, sign is displayed.

**R**

This button provides a reset function for clearing the complete programme and time of day.

#### 4.5.3 Operation of buttons :



## 5.0 Installation

### 5.1 Location

- 5.1.1 Ensure the structural elements of the building are adequate to carry the weight of the appliance and its ancillary components, i.e. the flue system, and that the surface on which the heater is located level and combustible.
- 5.1.2 Sufficient space must be maintained around the heater for servicing and the appliance should not be sited where it may suffer damage, e.g. fork lift trucks or traffic.
- 5.1.3 The location must also allow for fitting an effective flue system and for adequate

clearance for the air supply, return air, circulation, oil and electrical supplies whilst providing good and safe working access.

- 5.1.4 When positioning the heater it is strongly advised that the lifting eyes are used. Adequate clearance from combustible materials must be maintained between the appliance and its flue system.

### 5.2 Heater clearances

- 5.2.1 The following minimum clearances must be observed when installing the heater:

Minimum clearance around a free standing vertical heater.

VCH Model	* Front	LHS	RHS	Rear	# Top
100	1000	1000	1000	1500	1200
150	1000	1000	1500	1500	1200
200	1200	1000	1000	1500	1500
300	1200	1000	1000	1500	1500
400	1300	1000	1000	1500	1500
500	1300	1000	1000	1500	1500
600	1300	1200	1200	1500	1750
700	1600	1200	1200	1500	1750
800	1800	1500	1500	2000	2000
1000	1800	1500	1500	2000	2000

\*Measured from front panel.

#Measured from top of outlet nozzle.

All dimensions in mm. Front is when looking at the burner.

### 5.3 Flue

- 5.3.1 Ambi-Rad cabinet heaters must be connected to a flue system venting the products of combustion directly to outdoors.

Flue systems must be installed in accordance with the rules in force taking into account the location of flue termination relative to the construction elements of the building, i.e. windows, roof levels, etc., and in accordance with statutory requirements.

- 5.3.2 Ambi-Rad recommend that appliances are connected to individual flues sized in accordance with the diameter appropriate to the appliance flue connection socket.

Flues must be terminated with an approved terminal fitting.

- 5.3.3 A minimum length of 3.0m is required to ensure a good flue draught condition.

5.3.4 Install the flue directly into the appliance flue socket and secure firmly using self tapping sealant or fibre glass rope and fire clay.

5.3.5 The use of twin wall flue should be considered if condensation in the flue system is a possibility.

#### 5.4 Nozzled Heaters

5.4.1 The nozzles, supplied loose, should be pushed home on the spigots and roughly positioned to provide the desired airflow. They should then be fixed securely upon completion of commissioning.

#### 5.5 Ducted Heaters

5.5.1 The Ambi-Rad ducted cabinet heater is designed to be used with discharge ducting. A positive seal should be made between any ducting and the air heater. A flexible connection is desirable to eliminate transmission of noise and to take account of thermal expansion.

5.5.2 Consideration should be given to the application of duct fittings directly connected to the appliance. Air outlet elbows, transitions etc. should be designed to ensure an unrestricted and turbulent free air flow. This requirement is to ensure that an even air temperature is maintained when leaving the appliance thus eliminating heat exchanger "hot-spots" and nuisance shut-down of the burner due to over heating.

#### 5.6 Controls

5.6.1 Ambi-Rad cabinet heaters are supplied and fitted with a pre-wired control panel comprising:-

1. On/off switch
2. Heat/vent switch
3. Manual/automatic switch
4. Room thermostat
5. Frost thermostat
6. Timeswitch

The above components are located on a removable panel, which when separated from the heater can be repositioned to offer a remote facility. However, to facilitate this it is necessary to order and fit an electrical panel cover and blanking plate to the heater in place of the control panel.

On the horizontal model the control panel is supplied as a loose item.

Oil tanks should be installed externally and be manufactured from steel or moulded medium density polyethylene in accordance with the relevant OFTEC, local and national fire regulations. Steel tanks should be suitably painted. Every tank must be fitted with the following components :

- Fuel level gauge none glass with isolating valve.
- Vent pipe that has a diameter greater than that of the filler pipe

and is suitably terminated with a weather proof outlet,

- Filler pipe installed at the opposite end to the vent pipe.
- Sludge or drain valve at the lowest point in the tank.
- Outlet valve at the opposite end of the tank to the sludge valve.

The size of the oil tank should take into account the usage requirements of the installation.

The typical arrangement shows the tank installed at an angle to avoid contaminating the oil supply to the heater. This slope should be approximately 6mm for every 300mm.

## 6.0 Commissioning

6.1 Only suitably trained personnel or specialist commissioning engineers should be used to carry out the commissioning of the installed equipment. Ensure that all relevant manuals and user instructions are available before the commissioning engineer proceeds.

Although the heater is test fired at the factory, each installation has a different set of site conditions. Therefore commissioning is very important. Note: The heater should not just be switched on and left to function. The correct type of combustion analysis equipment, correctly calibrated, should be used at all times.

### 6.1.2 Pre-Commissioning Checks

Always ensure electrical safety and soundness of the oil installation before commencing, then proceed with the following checks:-

- (a) Ensure electrical supply has been switched off.
- (b) Ensure the oil supply is switched off.
- (c) Check that the heater has been installed on a suitable level base and is supported correctly with adequate clearance around the inlet grilles.
- (d) Fully open louvres on nozzled outlets or duct work grilles.
- (e) Ensure the flue system is adequately supported with correct termination and sealing of the joints.
- (f) Check that all heater panels are securely fastened and correctly fitted.
- (g) Locate flue gas sampling point and ensure this can be resealed on completion of commissioning.
- (h) Check fan and limit stat

Fan off	40°C
Fan on	60°C
Overheat Limit	100°C

Ensure white button is pulled out and red button has been reset.

- (j) Where applicable check pulley alignment and belt tension.
- (j) Test for earth continuity between the heater, control panels, burner and oil pipework.
- (k) Turn on the electrical supply and ventilation manual switch. The fan will start enabling the direction of the fan impeller to be verified.
- (l) Switch off electrical supply.
- (m) At the heater control panel or remote panel set the required positions of the thermostats and time clock.

## 6.2 Commissioning Procedure

- 6.2.1 Do not proceed with this section unless all parts of section 6.1.2 have been successfully completed. In the event that one part does not comply DO NOT PROCEED. Seek assistance from the supplier. Refer to the burner manual, supplied separately, ensuring all setting data is known before commencing.
- (a) Turn on electrical supply and move switches at control point, heat/vent to 'heat' and on/off to 'on'.
  - (b) Check that burner goes through correct ignition sequence and goes to 'lock-out'.
  - (c) Switch on/off switch to the 'off' position. If the burner does not go to lock-out DO NOT PROCEED until the fault has been correctly identified and repaired.
  - (d) Switch on the oil supply and connect a suitable pressure gauge to the pump on the burner.
  - (e) Switch on/off switch to the 'on' position and reset the control box from lock-out. The burner will start and a pressure will be indicated on oil gauge. N.B. It may be necessary to purge the oil pump of air before pressure is indicated on the gauge. Check this value is in line with the technical specification in section 2. If not adjust accordingly. See burner manual accompanying this manual.
  - (f) Using approved and calibrated combustion analysis equipment measure the percentage CO<sub>2</sub>, smoke no., gross flue temperature and ambient temperature.
  - (g) If the CO<sub>2</sub> levels do not correspond to the technical specification in section 2 adjust the air damper, more open for less CO<sub>2</sub> and more closed for more CO<sub>2</sub>, until the correct level has been obtained.
  - (h) Re-check all readings and enter on the commissioning sheet.
  - (i) From readings calculate the net efficiency of the unit. This is not to be less than 84%.
  - (j) The operation of the fan/limit stat is checked by depressing and holding the main fan starter overload button. This will stop the main fan without stopping the burner. After 3 minutes the burner will stop.

- (k) If the burner has not stopped release the button and allow the main fan to cool down the heater. Then check the following:-
  - Fan and limit stat settings are correct.
  - The bi-metal strip has not been damaged.
  - The bi-metal strip casing is not in contact with the heat exchanger body.
- (l) Adjust thermostats and time clocks to ensure that the burner operates when required by the controls.
- (m) Switch on/off switch to 'off'. The burner will stop. Note the time it takes for the fan to stop, approximately two minutes, thus ensuring the fan side of the fan/limit stat is operating correctly.
- (n) Complete the commissioning sheet and return a copy to the Service Department.

In the event of any problems occurring during the commissioning process which cannot be properly rectified please consult the Technical Department of Ambi-Rad Limited.

## 6.3 Commissioning Outlets

For free standing heaters it is essential to ensure that the nozzled outlet louvres have been adjusted to the required angle of discharge and have been rotated to give the optimum distribution of air throughout the premises. Take care to avoid the short cutting of hot air back into the fan system, i.e. when installed close to a wall, as this can lead to a nuisance overheating condition.

Securely fix all nozzle outlets after final adjustments have been made.

Outlets for ducted systems are generally adjusted by the duct work commissioning engineer. On completion ensure that the static pressure at the top of the heater does not exceed that as quoted in the technical specification in section 2 of this manual. This can be achieved by the use of a manometer taking a pressure reading in the plenum of the duct work. Also check the running current of the main fan motor.

If the duct work pressure is correct then the running current will be as quoted on the data plate. If the static pressure is too low this will be verified by a high running current which could lead to premature failure of the fan motor. Consequently, the duct work grilles will have to be closed to increase the static pressure. If the static pressure is too high this will be verified by a low running current of the motor which could lead to overheating of the heater. Consequently the duct grilles will have to be opened.

## 6.4 User Instructions

- (a) Complete all commissioning data on the commissioning sheet.
- (b) Instruct end user in correct operation and function of heater and ancillary controls. Particular awareness should be made to start up and shut down of the equipment.
- (c) Instruct on the safety features of the heater.
- (d) Hand over to the end user a copy of the 'User Instructions' complete with a copy of the commissioning sheet.
- (e) Advise on the need for regular servicing of the equipment. In particular that the fan belts will require tensioning after the first 100 hours of running.

## 7.0 Instructions for Servicing

Servicing should be carried out on a regular basis by a suitably qualified engineer or fully trained competent personnel. Failure to undertake this servicing could lead to premature failure of various components and invalidation of the warranty for individual parts or the heater as a whole.

Only approved spares or replacement parts may be used. Failure to comply with requirement could lead to an unsafe condition within the heater and invalidate any warranty claim.

Reference should also be made to the appropriate burner manual accompanying this manual before the commencement of any work.

For safety reasons no service should commence before isolating both the electrical and oil supplies to the heater and the heater has been allowed to cool down until the heat exchanger is completely cold.

### 7.1 Frequency

In order to maintain a safe, reliable and efficient operation of the heater we recommend that the following planned service maintenance programme is adopted by the end user.

First 100 hours of use:-  
Inspect fan belts and retension if required.

#### Quarterly inspection:-

- (a) Visual inspection of outer panels
- (b) Visual inspection of burner
- (c) Clean and check position of ionisation and ignition probes.
- (d) Check operation of burner lock-out.
- (e) Check operation of safety overheat and device.

#### Half-yearly inspection

- (a) As quarterly inspection
- (b) Carry out check on all combustion readings.

#### Annual inspection

- (a) As half yearly inspection.
- (b) Heat exchanger inspection and cleaning.
- (c) Burner maintenance.
- (d) Main fan and motor.
- (e) Pulley and belts.
- (f) Stack box and flue.
- (g) Control panel and electrical connections.
- (h) Oil supply connections.

## 7.2 Procedures

### Heat Exchanger

Access to the heat exchanger is made via the top rear panels, i.e. the panels opposite the burner. Loosen the hex head screws on the top of the heater and remove the insert strip. The rear panel and heat shield can now be lifted off the locating lugs and removed.

The cover plate over the end assembly will now be exposed and can be removed by undoing the brass nuts around the periphery of the cover, thus exposing all the heater exchanger tubes.

Inspect for deposits and clean, using a strong flue brush suitable for 51mm diameter tubes. The loose deposits can now be vacuumed up using an industrial vacuum cleaner. Special attention should be made to any deposit that may have fallen into the combustion chamber or stack box. During the inspection of these parts the deposit can also be vacuumed out.

The whole of the heat exchanger and combustion chamber should be given a good inspection ensuring there are no splits, cracks or severe distortion. If the condition of either the heat exchanger or the combustion chamber gives cause for concern please notify the end user and the **Ambi-Rad UK Limited Service Department** immediately.

Replace access cover plate ensuring the new gasket material is used. The outer panels can also be replaced with the insert strip. Retighten the hex screws on the top of the heater.

### Burner Maintenance

Remove the burner from the heater and carry out the following procedures:-

- (a) Clean burner head with a stiff brush, removing any deposits.
- (b) Clean and check positions of ionisation and ignition probes.
- (c) Check airways for any obstructions.
- (d) Check ionisation and ignition probes for wear or burning. Replace if necessary.
- (e) Clean the blades of the burner fan impeller with a stiff brush to remove any dust.
- (f) Check oil pressure setting on pump.
- (g) Inspect condition of sequence



controller and ensure the blade terminals are clean and tight.

- (h) Fit new gasket to burner and replace to combustion chamber.

Refer to burner manual for any other specific instructions.

### Main fan and motor

Remove the access panels to the fan section and clean by removing any foreign matter and dust with a vacuum cleaner or compressed air. The blades of the fan impellor should also be cleaned free of dust and dirt by means of a stiff brush and a vacuum cleaner.

The following inspection routine should be carried out:-

- (a) Check the fan bearing resilient mounts for signs of distortion or excessive wear.  
Change for new rubber mountings if required.
- (b) Check bearings for any signs of excessive play in the housing.  
Replace if required.
- (c) Check the shaft for alignment, straightness and rusting. Realign, replace or oil where necessary.
- (d) Check the bearings locking collars for correct fitting and tightness.
- (e) Check all screws and nuts holding the fan and motor for tightness.
- (f) For indirect drive systems check that the locking nut on the adjustment bolt is securely fastened.

### Pulleys and Belts

Using a straight edge check that the fan and motor pulleys are in line and are as close to the bearings as possible. If necessary adjust the position of the pulleys to achieve this.

Check the condition of the belts for splits or fraying; if one belt in any set appears to have worn excessively then change the whole set immediately. **DO NOT MIX BELTS OF DIFFERENT AGES OR BATCHES.** As the belts stretch at a different rate according to the batch curing number and age, premature failure could occur if they are mixed.

Ensure that the belts are correctly tensioned. This can be confirmed when the mid point of the belt is displaced to a maximum of 6mm when a force of 3kg is

applied in a plane perpendicular to the belt.

Check the pulleys for signs of wear in the grooves and replace where required, also ensure the keys.

### Stack Box and Flue

Remove the guard around the stack box exposing the pressure relief door of the heat exchanger. Undo the four nuts holding the springs and remove the pressure relief door plate. Inspect for signs of wear or leakage. Repair or replace where necessary.

Using a vacuum cleaner clean out any deposits remaining when the heat exchanger tubes were cleaned.

Replace pressure relief door plate ensuring a new gasket is used, replace springs, nuts and stack box guard.

Inspect the flue and terminal for water ingress, if any found reseal where necessary.

### Control Panel and Electrical Connections

Check all electrical connections to ensure they are tight and free from corrosion. Any connections that have signs of loose strands that may come into contact with adjacent terminals should be removed and a new connection made.

Check the operation and correct functioning of the individual thermostats and time clocks. Ensure the settings are in accordance with the end users requirement.

### Oil Supply Connections

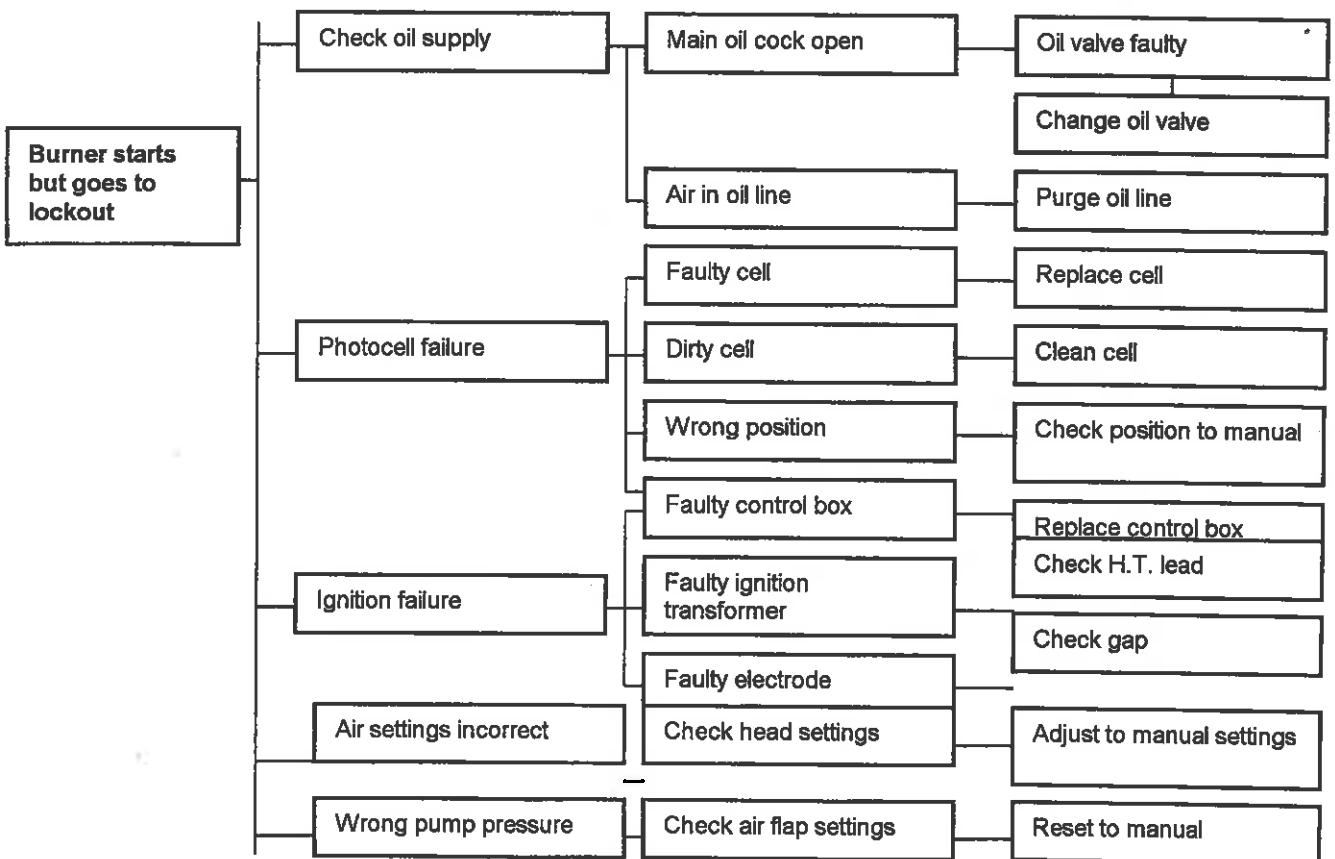
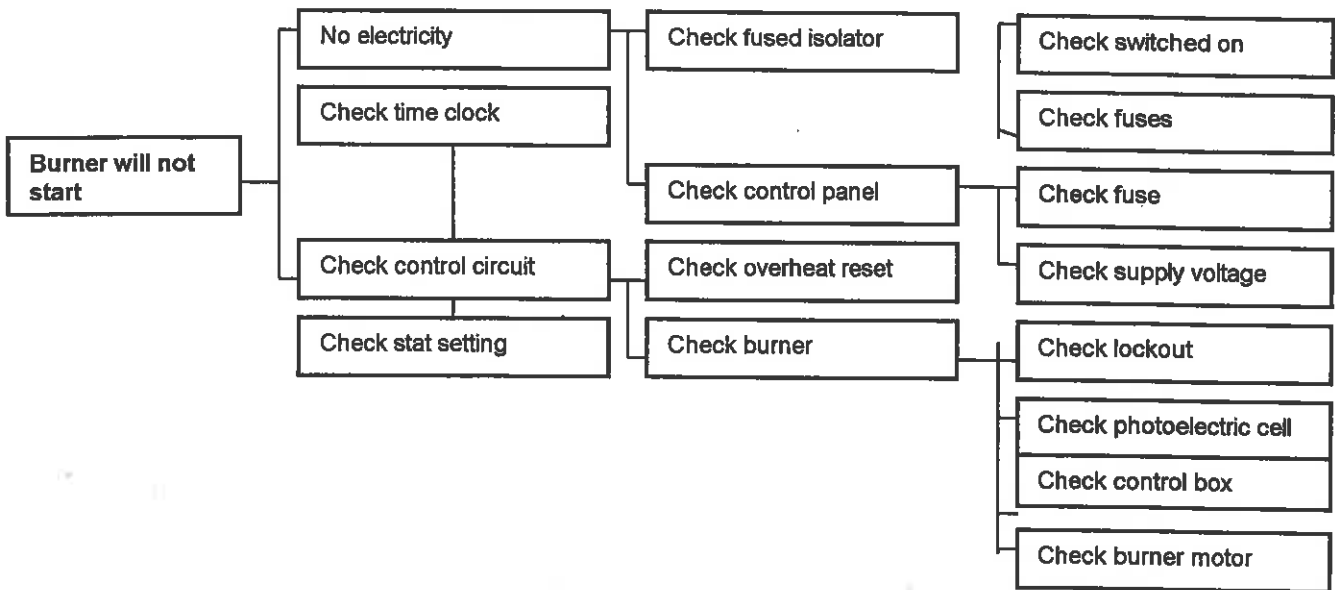
Inspect the supply pipes and joints for any signs of wear and corrosion. Ensure any support brackets are secure and correctly adjusted. Any suspect joints should be checked for soundness in accordance with the appropriate standard.

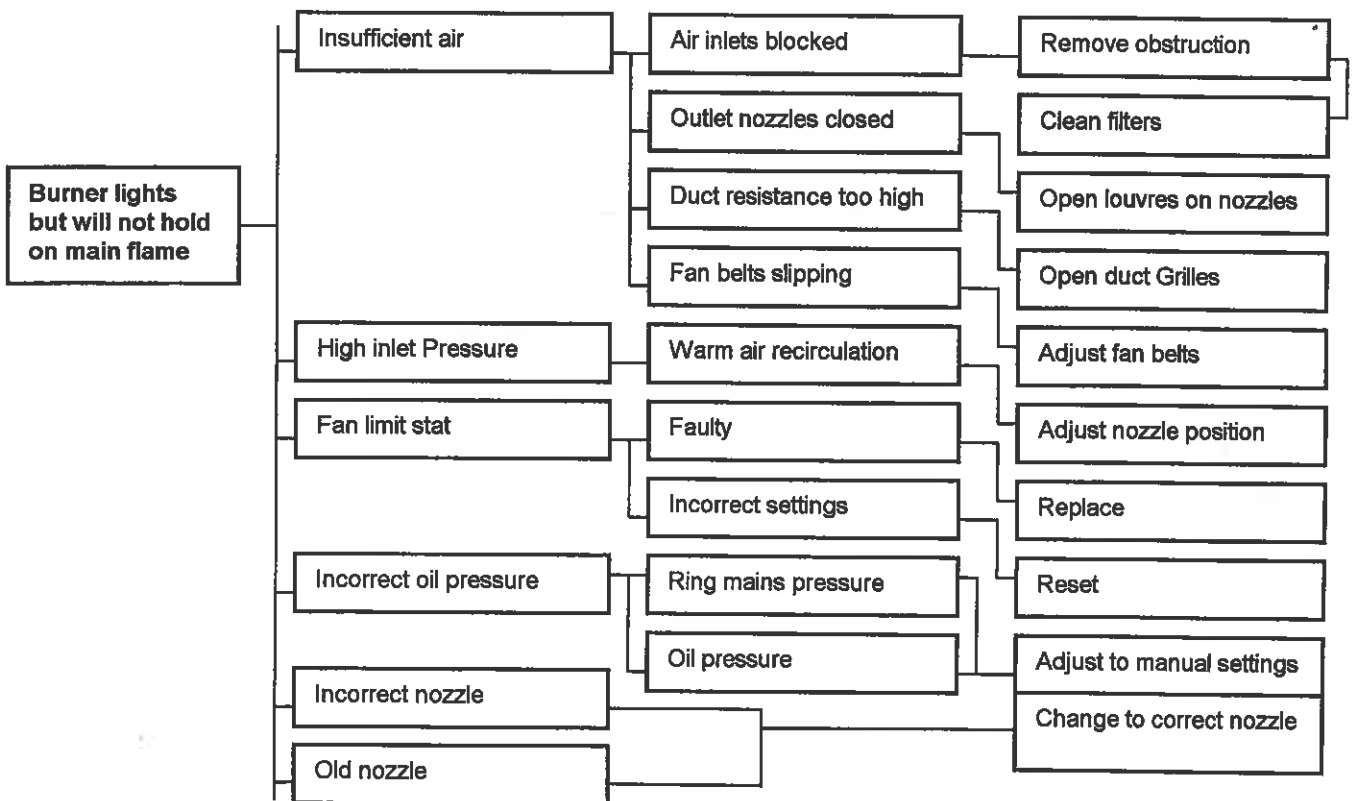
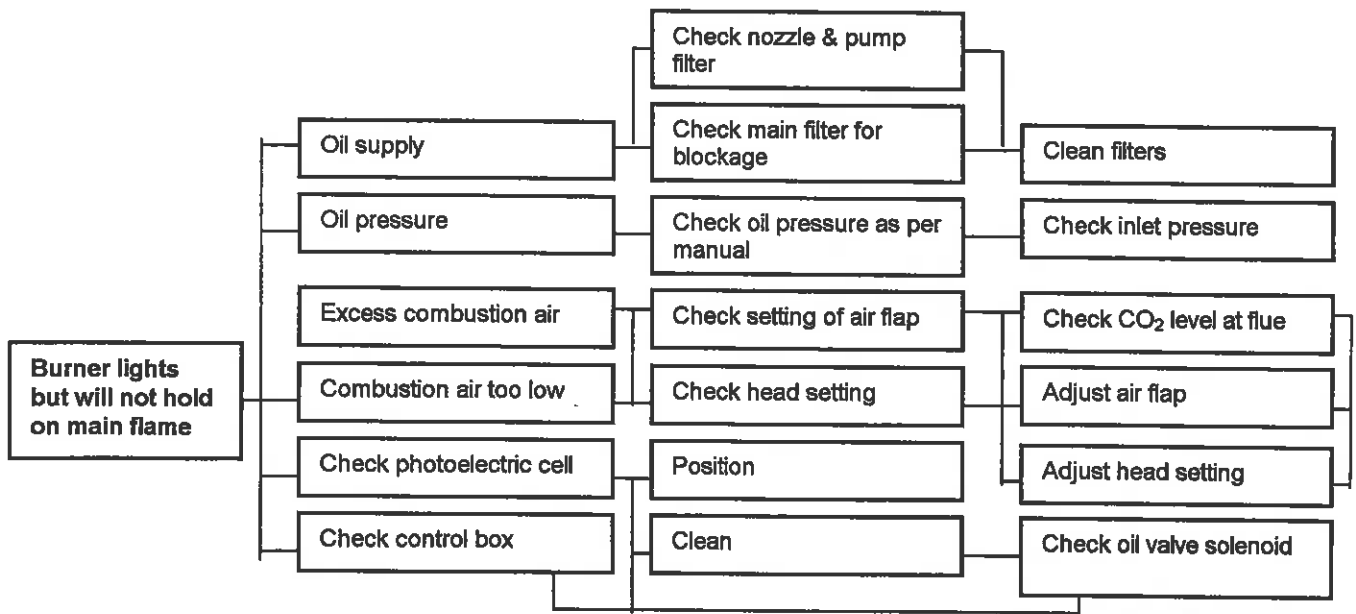
## 7.2.1 Re-Commissioning

On completion of the service work the heater and burner are to be re-commissioned in accordance with the manual section 6.2.

A record of the service work carried out, any recommendations and commissioning details are to be completed as a report and issued to the end user.

## 8.0 Fault Finding

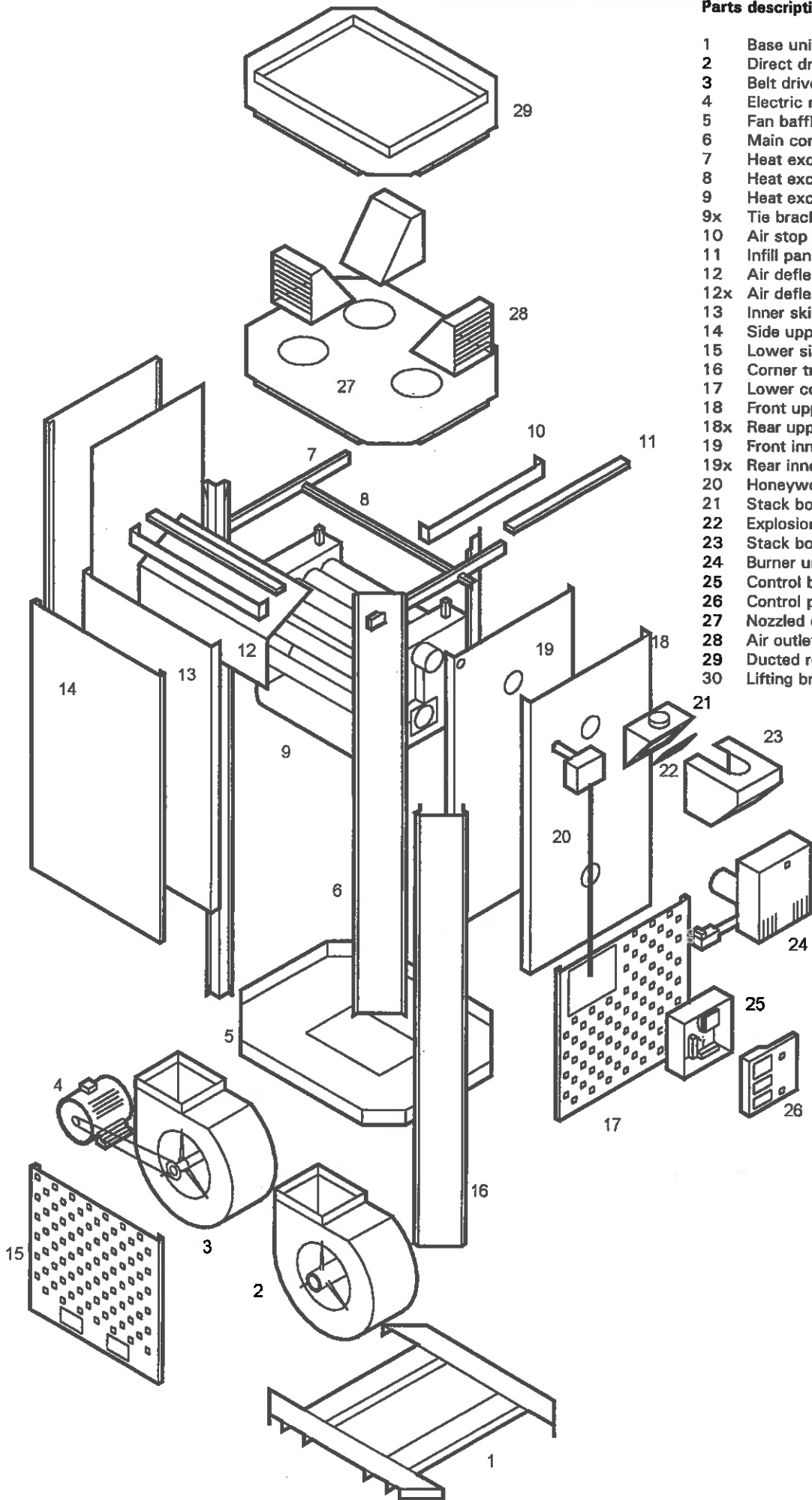




## 9.0 Spare Parts

### Parts descriptions

- 1 Base unit
- 2 Direct drive fan unit (frame 1 - 2)
- 3 Belt driven fan unit (frame 3 - 5)
- 4 Electric motor (frame 3,4, & 5)
- 5 Fan baffle plate
- 6 Main corner posts
- 7 Heat exchanger mounting bracket
- 8 Heat exchanger mounting rail ("Z" rail)
- 9 Heat exchanger (combustion chamber)
- 9x Tie brackets (not shown)
- 10 Air stop panels
- 11 Infill panels
- 12 Air deflectors
- 12x Air deflector stiffeners (airstrut)
- 13 Inner skins
- 14 Side upper panels
- 15 Lower side panels
- 16 Corner trims
- 17 Lower control panel
- 18 Front upper panel
- 18x Rear upper panel (not shown)
- 19 Front inner skin
- 19x Rear inner skin (not shown)
- 20 Honeywell thermostat
- 21 Stack box
- 22 Explosion relief panel
- 23 Stack box cover
- 24 Burner unit
- 25 Control box
- 26 Control panel lid
- 27 Nozzled outlet roof
- 28 Air outlet nozzles
- 29 Ducted roof (optional)
- 30 Lifting bracket (not shown)



## **10.0 Reference Standards**

### **BSEN292**

Parts 1 & 2 1992 Safety of Machinery.

### **BSEN 60335**

Part 1: 1988

Safety of Electrical Appliances.

### **BSEN 60204**

Part 1: 1993

Safety of Machinery Electrical.

### **BSEN 55014**

Electromagnetic Compatibility: 1993

### **BSEN 50165**

Safety of Electrical Equipment: 1995

### **BS 5440**

Part 1: 1990

Specification/Installation of Flues.

### **BS 5854**

Code of Practice - Flues/Flue Structures 1980.

### **BS 715**

Metal Flue Pipes & Fittings: 1993.

### **BS 6891**

Installation of Pipe Work: 1988

### **ISO 7/1**

Specification for Metric Pipe Threads.

### **ISO 228/1**

Pipe Threads Seals and Couplings.

**Ambi-Rad<sup>®</sup>**

**Floorstanding Oil fired Heaters**

**Installation, Servicing  
&  
Operating Instructions**

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