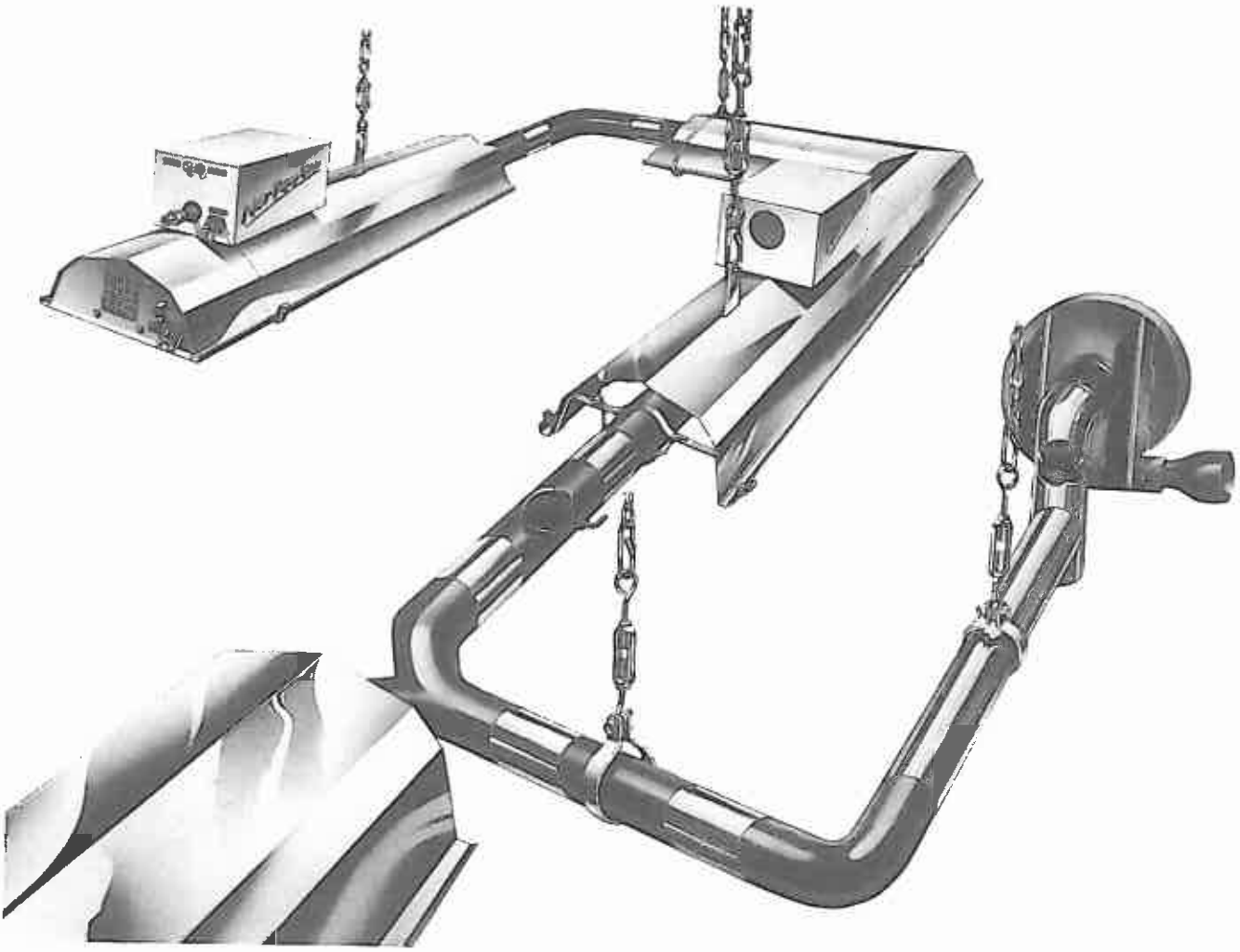
Nor-Ray-Vac®

'LR' SERIES CONTINUOUS RADIANT TUBE HEATING SYSTEM

TECHNICAL MANUAL - VOLUME 2



JUNE 1st

LLOYD'S REGISTER QUALITY COMPANY ISO9002 NATIONAL ACCREDITATION OF CERTIFICATION BODIES CE BG/EC/87/94/48

AMBI-RAD®

Energy Efficient Heating Systems

'LR' SERIES CONTINUOUS RADIANT TUBE HEATING SYSTEM

SECTION INDEX

CONTENTS:

3 SYSTEM INSTALLATION

4 SERVICE AND COMMISSIONING

3

'LR' SERIES CONTINUOUS RADIANT TUBE HEATING SYSTEM

SYSTEM INSTALLATION

CONTENTS:

1 STANDARDS
2 FIRST CONSIDERATIONS
3 TUBE COUPLERS
4 SUSPENSION POINTS
5 HANGING THE TUBE
6 REFLECTORS
7 BURNER ASSEMBLY
8 END VENT MODULE
9 GAS SUPPLY
10 ELECTRICAL SUPPLY
11 OUTSIDE AIR SUPPLY
12 VACUUM FAN
13 BALLGUARD SYSTEM
14 SLIMLINE 'M' SYSTEM
15 CONTROL SYSTEMS

1 STANDARDS

The Nor-Ray-Vac 'LR' heating system must be installed in accordance with the relevant provisions of the Gas Safety (Installations and Use) Regulations 1984 (as amended). Due account should also be taken of any obligations arising from the Health and Safety at Work etc. Act 1974. In addition the installation must be carried out in accordance with the I.E.E. Regulations, the Building (Standards) (Scotland) Consolidation Regulations, the requirements of BS 5440 : Part 1, BS 6891 : 1988, BS 6896 : 1991, BS 6501 : Part1 1984, BS 6500 : 1975 and any other relevant British Standards and Codes of Practice.

1. Ventilation Requirements

The Nor-Ray-Vac 'LR' Series heating system must be flued externally. The ventilation requirements as stated in BS 6896 : 1991 must be complied with.

1.1 Natural Ventilation

(preferably at low level)
Up to and
including 60kW – 4.5cm²/kW
over 60kW – 270cm² + 2.25cm²kW/in excess of 60kW total heat input.

1.2 Forced Ventilation
Minimum proven
air flow. – 2.35 m³/h per kW of total rated heat input.

2 FIRST CONSIDERATIONS

2.1 Clearances from Combustibles must be maintained. (see fig. 2)

2.2 There must be a minimum clearance distance of 500mm between any part of the heating system and the building wall. (see fig.1a).

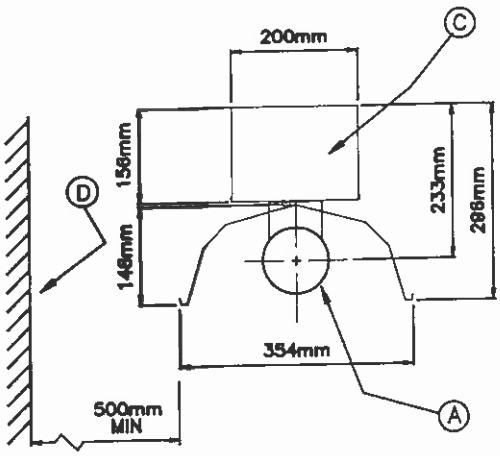
2.3 For ease of servicing and burner removal minimum clearances must be maintained. (see fig. 1b and 1c).

2.4 Ensure that the suspension is sufficiently flexible to allow for thermal expansion. (see fig. 3)

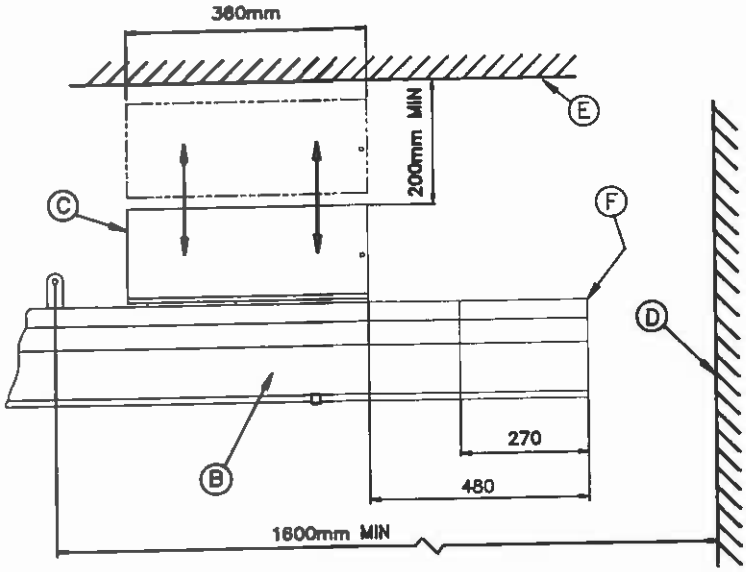
2.5 All radiant tube must have a fall of 10mm in 6 metres towards the Vacuum Fan.

2.6 All tailpipe must have a fall of 25mm in 6 metres towards the Vacuum fan.

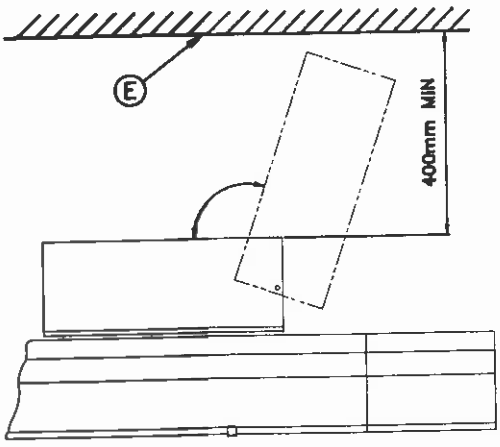
FIG. 1 OVERALL DIMENSIONS/CLEARANCES TO WALLS/CLEARANCES FOR SERVICE.



1a



1b



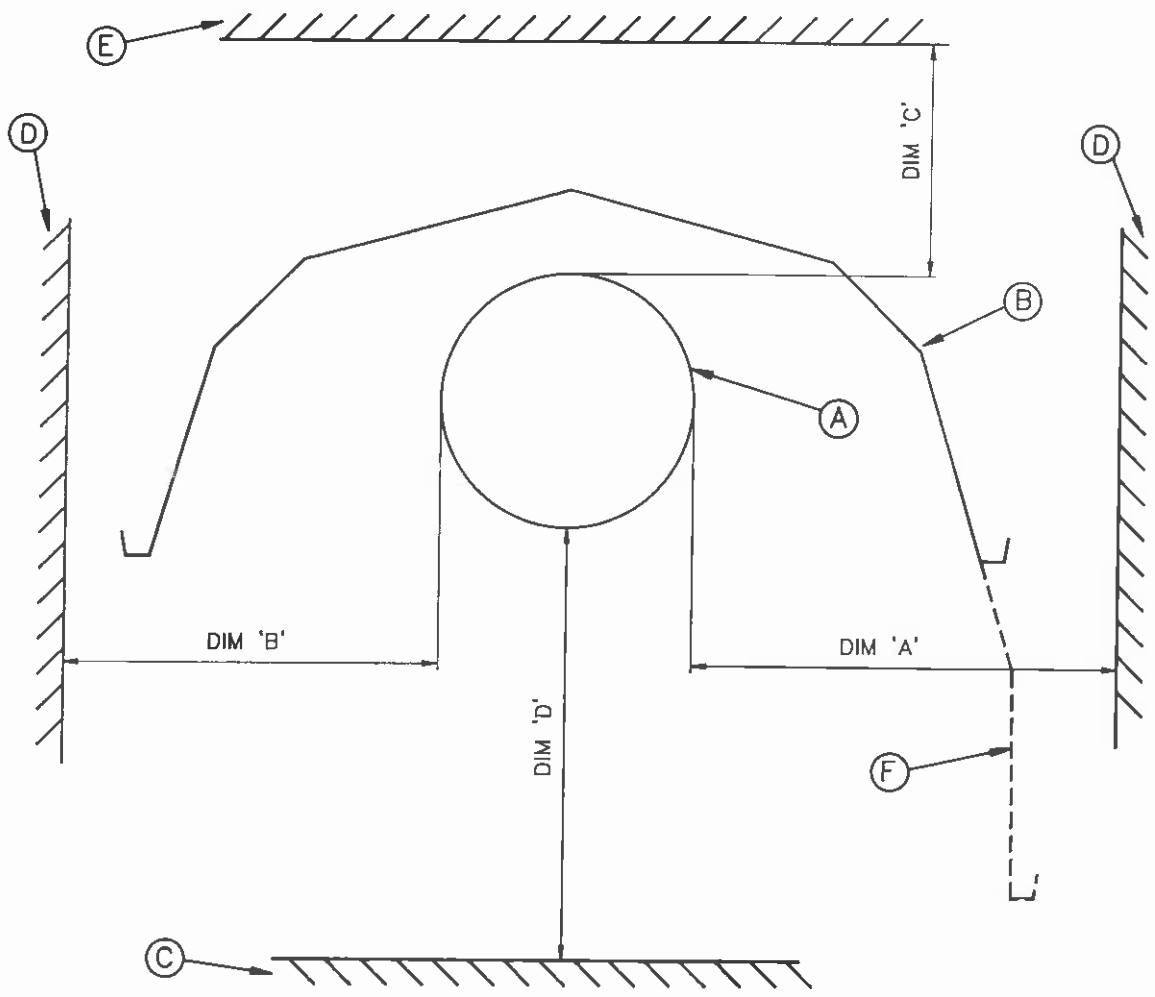
1c

A Radiant Tube
B Reflector
C Burner Lid
D Side Wall
E Obstacle over burner
F End Vent Module

FIG 2 CLEARANCE FROM COMBUSTIBLES

BURNER MODEL		NRV12LR	NRV18LR	NRV24LR	NRV30LR†
DISTANCE FROM COMBUSTIBLES mm (50°C rise in temperature above ambient of a black surface)					
BELOW TUBE					
WITHOUT UNDERSHIELD	DIM. D	1450	1450	1985	1985
WITH UNDERSHIELD	DIM. D	765	765	915	915
ABOVE TUBE	DIM. C	180	180	180	180
HORIZONTALLY					
STANDARD REFLECTOR	DIM. B	510	510	715	715
PERIMETER REFLECTOR	DIM. A	305	305	305	305

2a



2b

A Radiant Tube
B Standard Reflector
C Combustible Material Underneath
D Combustible Material on side
E Combustible Material Above
F Perimeter Reflector

3 TUBE COUPLERS

Tubing, combustion chambers, dampers and tube fittings are connected by 'wrap-around' stainless steel couplers which clamp by means of two high tensile stainless steel set pins. (see fig. 4a and 4b)

The aluminium tail pipe section of tubing is connected together by an internal aluminium coupler (see fig. 4c) except where a Mild Steel tail pipe meets an aluminium tail pipe. For joining Mild Steel to Aluminium a 'wrap-round' coupler must be used (see fig. 4a and 4b).

3.1 Ensure tube/fittings (B) are square and undamaged.

3.2 When assembling tube ends into the coupler (A) ensure that they are in line and the tube ends (C) butt against the stop pins (D) inside the coupler. A ring of silicon sealant should be applied around the circumference of each tube prior to fitting of the coupler.

3.3 Tighten both set screws (F) using a 6mm Allen key (E), ensuring that equal pressure is applied to each set screw in turn.

NOTE: Position set screws (F) on horizontal centre line of the tube.

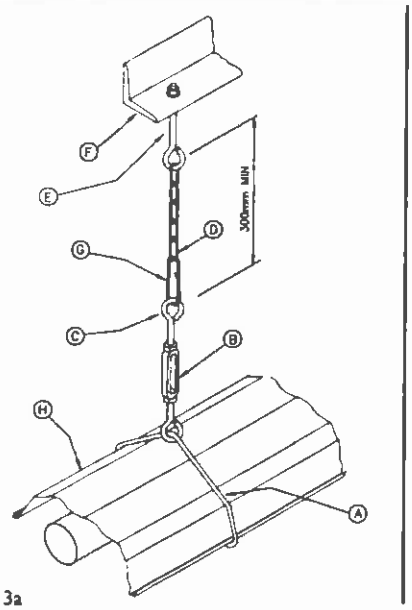
3.4 Tail pipe connection aluminium (see fig. 4c) Before assembling aluminium tail pipe ensure all burrs are removed and any grease or oil is removed with a clean rag.

3.5 Using an applicator gun exude a 4mm bead of high temperature silicon jointing compound externally around the end of the coupling and internally round the end of the tube.

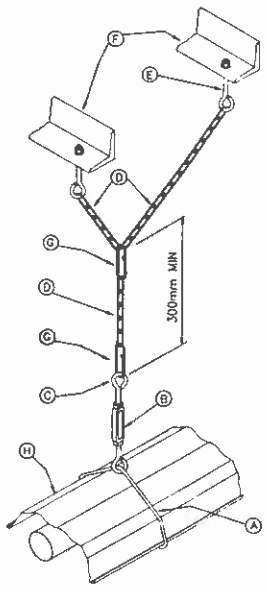
3.6 Enter the coupling into the tube using a slight rotating movement to spread the jointing compound uniformly until coupling is fully engaged. Note: The silicon jointing compound remains workable after application for only five minutes.

3.7 Secure the joint by drilling through the tube and coupling with 3 pop rivets at 12, 4 and 8 o'clock position. 3.5mm (3/16") dia, pop rivets are recommended.

FIG. 3 SUSPENSION DETAILS



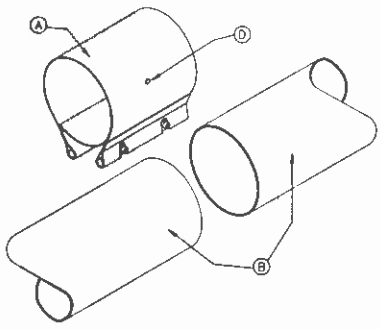
3a



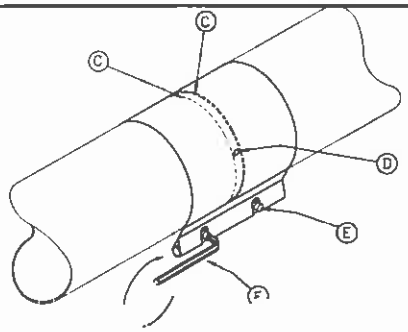
3a

A Tube & Reflector hanger
B Turnbuckle adjust eye (C) approx 380mm above radiant tube
D Chain
E Eye-Bolt
F Support Beam
G Speed Link
H Reflector

FIG. 4 FIXING TUBE COUPLER

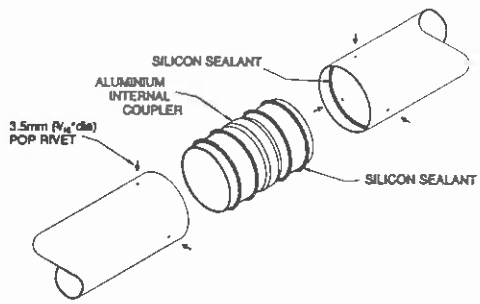


4a



4b

FIG. 4c INTERNAL ALUMINIUM TAIL PIPE COUPLER

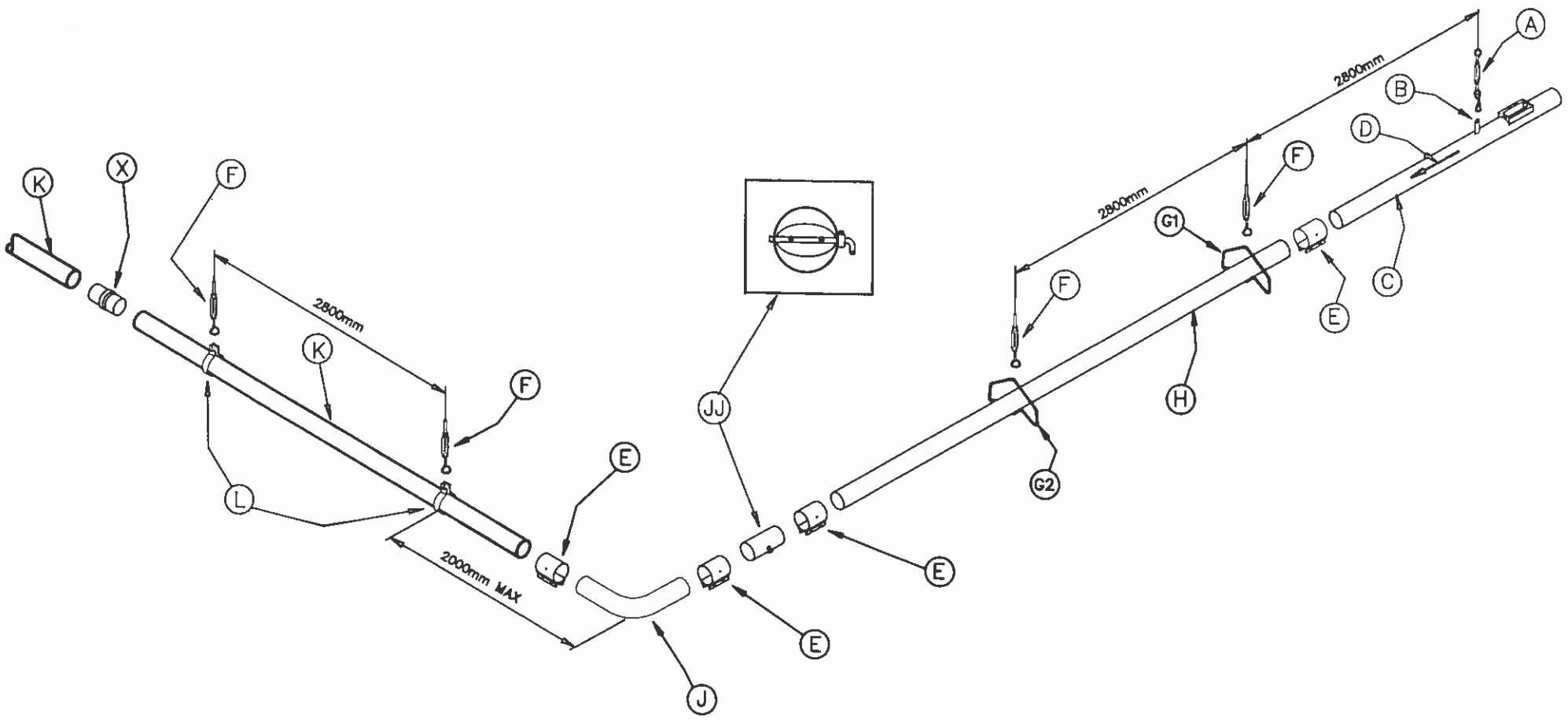


4c

A Tube Coupler
B Tube/fittings
C Tube End
D Stop pin
E Set pin
F Allen key

FIG. 5 INSTALLATION OF TUBE AND REFLECTORS

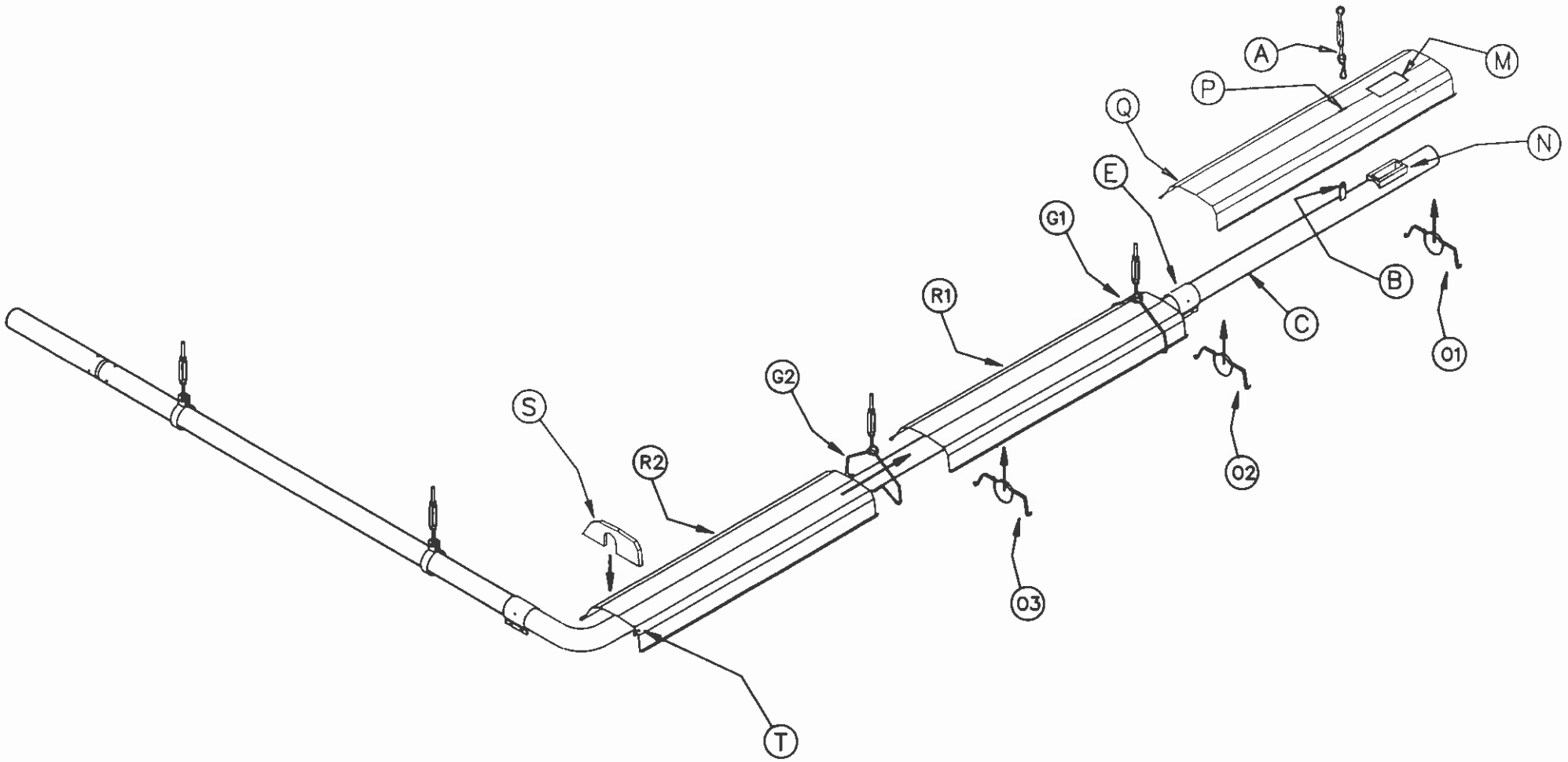
5a



A Turnbuckle with eyebolt & shackle
B Suspension lug
C Combustion chamber
D Direction of flow
E Tube coupler
F Turnbuckle with eyebolt
G Suspension support bracket
H Radiant tube
JJ Damper assembly
J 90° bend
K Tailpipe
L Tailpipe hanger
M Reflector cut-out
N Combustion chamber turret
O Reflector bracket
P Location hole for suspension lug
Q Combustion chamber reflector
R Plain reflector
S End cap
T Fixing hole for end cap
U Burner gasket
V Burner assembly
W End vent module
X Internal Aluminium tail pipe coupler

FIG. 5 INSTALLATION OF TUBE AND REFLECTORS

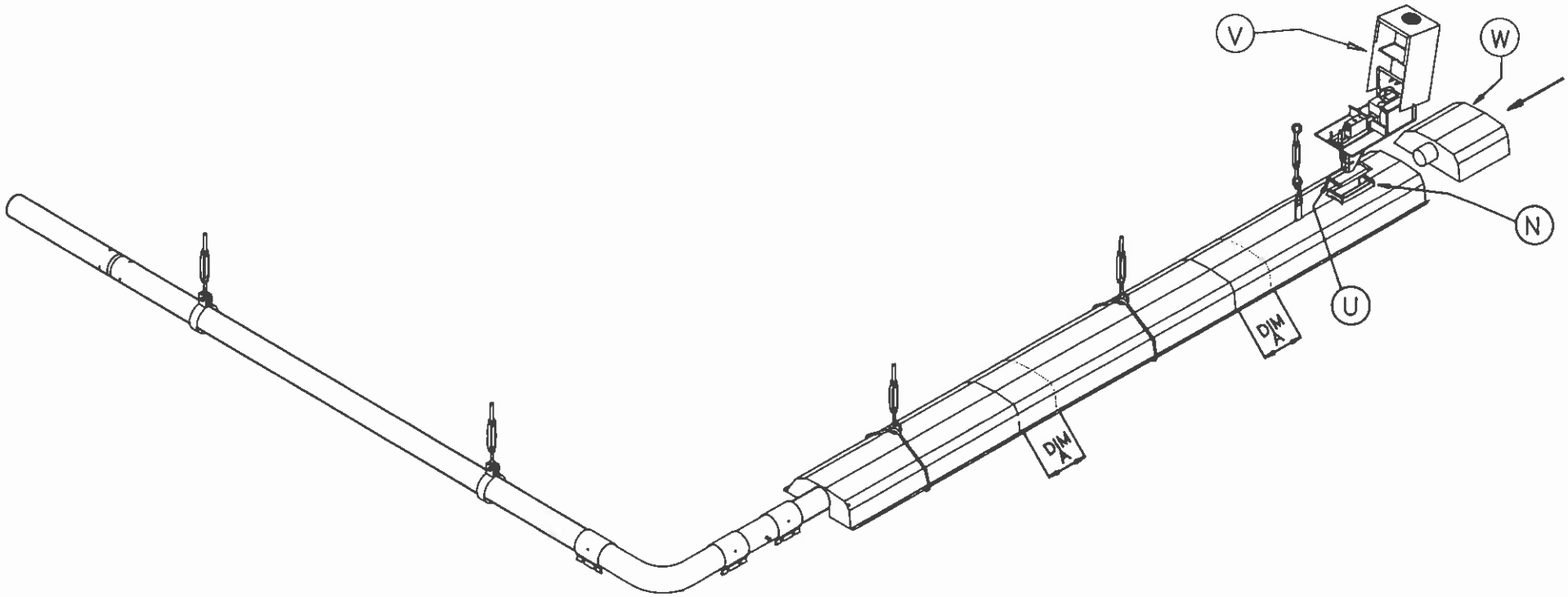
5b



A Turnbuckle with eyebolt & shackle
B Suspension lug
C Combustion chamber
D Direction of flow
E Tube coupler
F Turnbuckle with eyebolt
G Suspension support bracket
H Radiant tube
JJ Damper assembly
J 90° bend
K Tailpipe
L Tailpipe hanger
M Reflector cut-out
N Combustion chamber turret
O Reflector bracket
P Location hole for suspension lug
Q Combustion chamber reflector
R Plain reflector
S End cap
T Fixing hole for end cap
U Burner gasket
V Burner assembly
W End vent module
X Internal Aluminium tail pipe coupler

FIG. 5 INSTALLATION OF TUBE AND REFLECTORS

5c



A Turnbuckle with eyebolt & shackle
B Suspension lug
C Combustion chamber
D Direction of flow
E Tube coupler
F Turnbuckle with eyebolt
G Suspension support bracket
H Radiant tube
JJ Damper assembly
J 90° bend
K Tailpipe
L Tailpipe hanger
M Reflector cut-out
N Combustion chamber turret
O Reflector bracket
P Location hole for suspension lug
Q Combustion chamber reflector
R Plain reflector
S End cap
T Fixing hole for end cap
U Burner gasket
V Burner assembly
W End vent module
X Internal Aluminium tail pipe coupler

4 SUSPENSION POINTS

(see fig. 5a)

4.1 The first support (A) is positioned at the suspension point (B) on the end vent burner combustion chamber (C).

4.2 Subsequent supports (F) are placed approximately 2.8 metres apart, including one at each combustion chamber location. This gives a maximum load per support of 24kg.

4.3 A support must be located at a maximum distance of 2 metres from a Tee or Elbow fitting.

4.4 Except for the combustion chamber suspension points (B), suspension support brackets (G) are installed for the tube section which is covered with reflectors.

4.5 Tailpipe Hangers (L) are installed for the tube section which will be without reflectors.

5 HANGING THE TUBE

(see fig. 5a)

5.1 Suspend **the end vent combustion chamber** (C) by locating the turnbuckle shackle (A) through the eye of the suspension lug (B).
Note: The end vent combustion chamber will only fit in the end vent position.

5.2 Connect a length of radiant tube (H) to the end vent combustion chamber (C), ensuring it is supported by the suspension support brackets (G).

5.3 Repeat this procedure coupling the radiant tube to successive combustion chambers in the position shown in the layout drawing.

5.4 Ensure the radiant tube has the correct fall (10mm in every 6 metres towards the fan).

5.5 Dampers (JJ) must be located as indicated in the layout drawing. The adjustment lever must be positioned to one side to allow clear access for setting.

5.6 Connect the radiant tube section to the tailpipe section (K) as per the layout drawing.

5.7 Ensure the tailpipe section has the correct fall (25mm in every 6 metres towards the fan).

6 REFLECTORS

6.1 MAIN REFLECTORS
(see fig. 5b)

6.1.1 Starting at the end-vent combustion chamber position, disconnect the turnbuckle (A) from the combustion chamber suspension point (B). **Ensure combustion chamber is supported adequately to prevent undue strain on the tube coupling. (E).**

6.1.2 Locate the cut-out (M) of the combustion chamber reflector (Q) over the combustion chamber turret (N).

6.1.3 Reconnect the turnbuckle (A) on to combustion chamber suspension point (B).

6.1.4 Install the first reflector bracket (01) directly behind the combustion chamber turret (N). With quick fit clamp (A) push on spring clips (D) to hold on reflector (see fig. 6).

6.1.5 Install the second reflector bracket (02) 100mm from the other end of the combustion chamber reflector (Q).

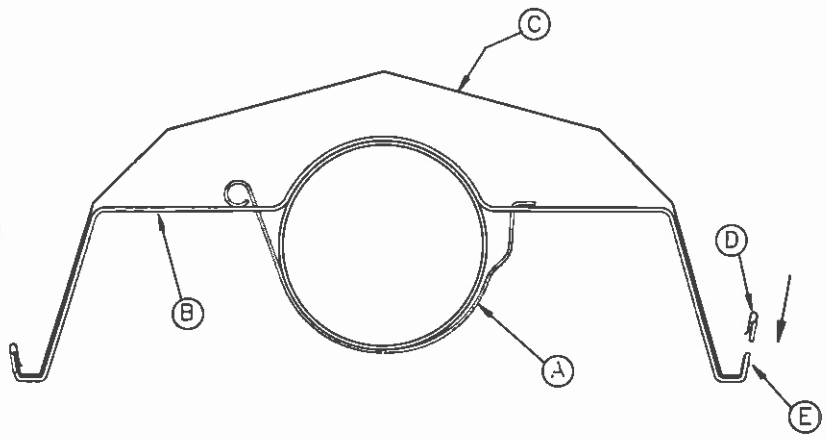
6.1.6 Slide the first plain reflector (R1) through the first downstream suspension support bracket (G1), then under the combustion chamber reflector (Q) and into the second reflector bracket (02). Ensure that the reflector overlap is 225mm.

6.1.7 The third reflector bracket (O3) is installed 100mm from the end of the first plain reflector (R1).

6.1.8 Slide the second plain reflector (R2) through the second downstream suspension support bracket (G2), then over the first plain reflector (R1) and into the third reflector bracket O3). Ensure that the reflector overlap is **225mm.**

6.1.9 Continue this sequence, installing additional combustion chambers where required until the radiant branch is complete.

FIG. 6 ATTACHMENT OF REFLECTOR BRACKET



A Quick-fit clamp
B Reflector bracket
C Reflector
D Spring clip
E Reflector up-turn

6.2 END CAPS
(see fig. 5b)

At the end of each reflected radiant branch the last reflector (R2) must have an end cap (S) fitted.

6.2.1 Using the end cap (S) as a template mark the positions of the two fixing holes (T) onto the last reflector (R2).

6.2.2 Drill two 5mm diameter holes through the positions marked on the last reflector (R2).

6.2.3 Position the end cap (S) under the last reflector (R2) and secure using the two M4 set-screws provided.

6.3 CORNERS
(see fig. 7)

6.3.1 Position the corner reflector module (A) over the ends of the two plain reflectors (B).

6.3.2 Ensure that the two reflector overlaps (D) are 225mm.

6.3.3 Position a reflector bracket (C) at the centre of each reflector overlap with quick fit clamp (A). Push on spring clips (D) to hold on reflector (see fig. 6).

6.4 TEES
(see fig. 8)

6.4.1 Position the reflector module (A) over the ends of the two plain reflectors (B).

6.4.2 Ensure that the reflector overlaps are 225mm.

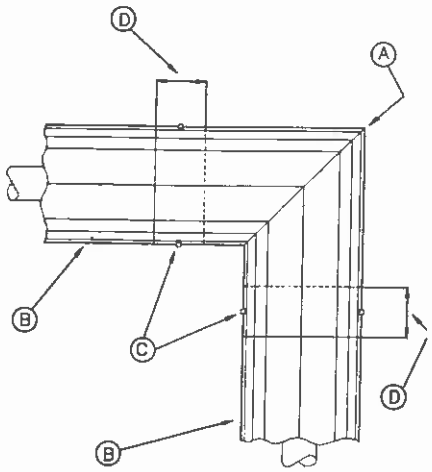
6.4.3 Position a reflector bracket (C) at the centre of each reflector overlap with quick fit clamp (A). Push on spring clips (D) to hold on reflector (see fig. 6)

6.4.4 At the entry to the tee section the plain reflector (B) is capped with a reflector end cap (E).

6.5 PERIMETER REFLECTORS

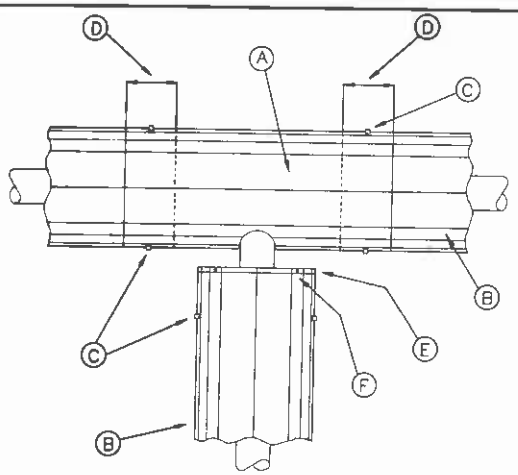
Perimeter reflectors are used when the radiant tube is mounted at the perimeter of the building. They are standard 2.4 metre long reflectors but with one side extended to direct the radiant heat away from the wall. Special perimeter suspension support brackets and perimeter reflector bracket assemblies are provided and the assembly procedure is the same as above.

FIG. 7 INSTALLATION OF REFLECTOR CORNER



A Reflector corner assembly
B Main Reflector
C Reflector bracket
D Reflector overlap

FIG. 8 INSTALLATION OF REFLECTOR TEE



A Reflector tee
B Main Reflector
C Reflector bracket
D Reflector overlap
E Reflector end cap
D End cap fixing position

7 BURNER ASSEMBLY

(see fig. 9)

7.1 Each burner is marked with its rated heat input and the correct burner must be located where indicated on the layout drawing.

7.2 Fit each burner onto the flanged turret (H) at the top of the combustion chamber. Ensure that the gasket (A) is located between the turret (H) and the burner base plate.

7.3 Secure the burner to the turret using the four M6 bolts (C) and washers (B) provided.

8 END VENT MODULE

(see fig. 9)

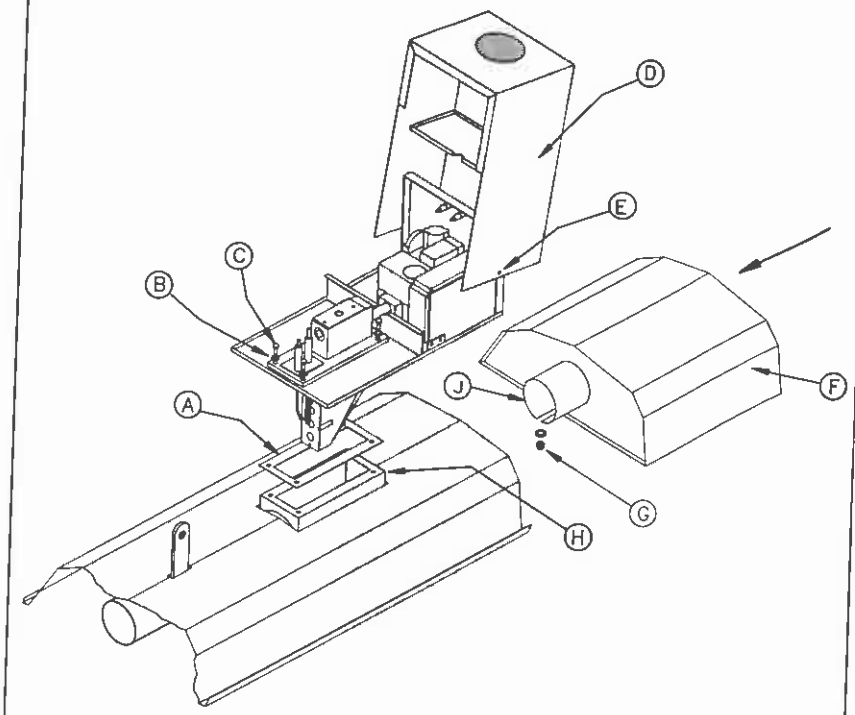
8.1 An End Vent Module (EVM) is positioned at each end vent burner position. Each module has a data badge attached to the casing for identification.

The correct end vent module must be located at the end vent burner position as indicated on the layout drawing.

8.2 Slide the EVM support spinning (J) over the end of the end vent combustion chamber tube.

8.3 Ensure that the combustion chamber tube end butts positively against the orifice plate inside the support spinning (J). Secure using the dome nut (G) provided.

FIG. 9 INSTALLATION OF BURNER AND END VENT MODULE



A	Burner gasket	F	End Vent Module
B	Washer	G	Dome nut
C	Set screw	H	Combustion chamber turret
D	Burner lid	J	EVM attachment spinning
E	Pivot point for lid		

9 GAS SUPPLY

(see fig. 10)

9.1 Gas connection to each burner is made using a flexible metallic hose (C) tested and certified to BS 6501 Part 1, 1984.

9.2 The connection is made to the 1/2" BSP male gas inlet connection on the burner assembly

9.3 The gas supply pipe (B) must terminate at each burner with a service cock (D).

9.4 A gas union (F) must be fitted between the service cock (D) and the burner gas inlet connection.

9.5 The linear expansion of the heating system will move the burners relative to the gas piping and it is therefore necessary at each burner connection to form an expansion loop with the flexible metallic hose (C) provided to permit this movement.

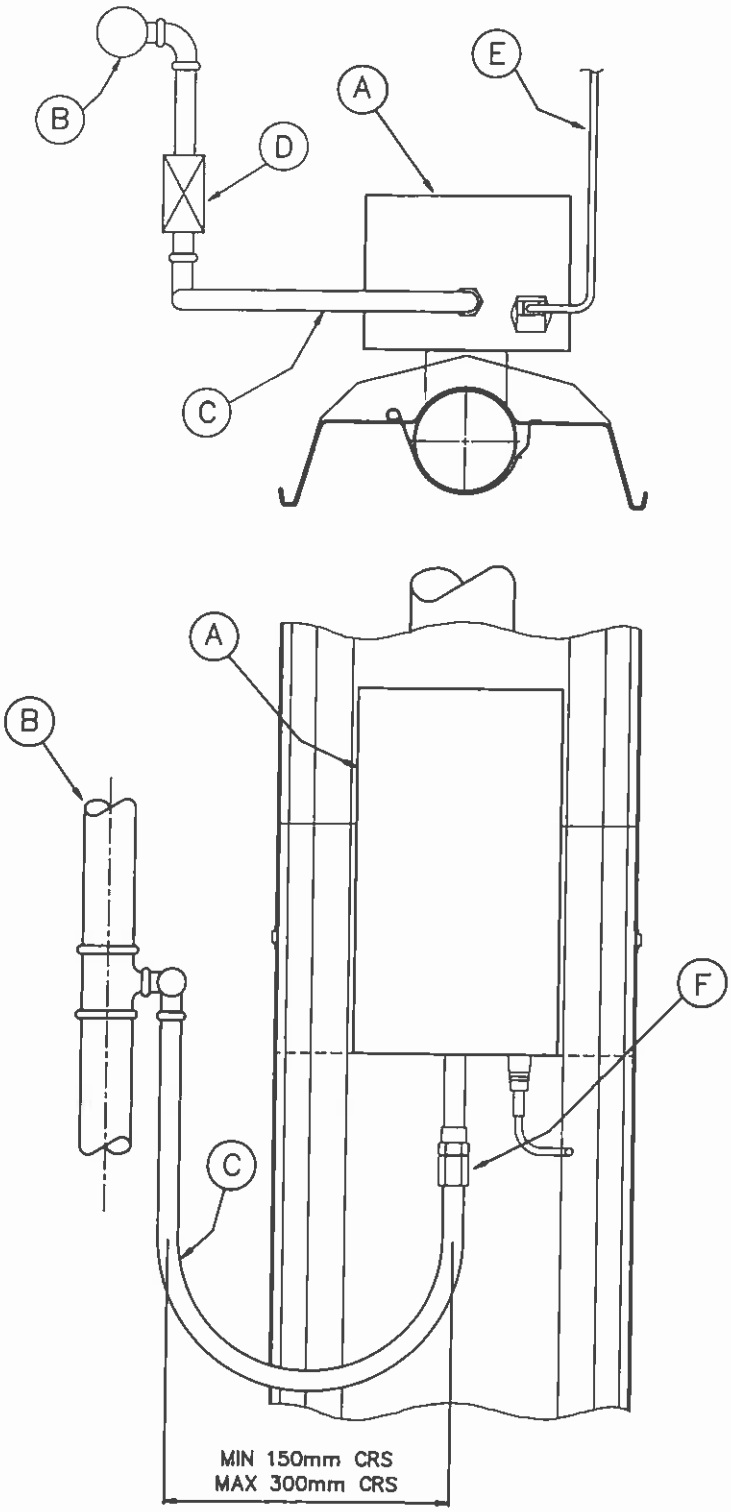
9.6 Do not overbend the flexible hose. Elbows must be fitted to eliminate sharp bends near end fittings. It must be in line without torsion or twisting.

9.7 Jointing compound resistant to the action of liquid petroleum gas should be used on all pipe threads.

9.8 Under no circumstances should the gas controls of the burner be subjected to more than **50mbar (20in. w.g.),** otherwise rupture of the control diaphragms and other damage will result.

9.9 In order to achieve a minimum inlet pressure of 12mbar (4.8in. w.g.) for "family 1" gases, it may be necessary to fit a gas booster.

FIG. 10 INSTALLATION OF GAS SUPPLY



A Burner housing lid
B Main gas supply pipe
C Flexible gas hose
D Service cock
E Flexible electrical cable
F Gas union

10 ELECTRICAL SUPPLY

10.1 Each component carrying an electrical supply must be earthed.

10.2 For burners and End Vent Modules a 240v, 50Hz single phase supply is required.

10.3 Exhaust fans and control panels are supplied for either 240v, 50Hz single phase or 415v, 50Hz three phase.

10.4 The electrical connection to the burners and End Vent Modules 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.

10.5 The flexible cable should be of 0.5mm dia.

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

11 OUTSIDE AIR SUPPLY

11.1 FITTING DUCTED AIR ADAPTORS TO BURNER ASSEMBLY (see fig. 11)

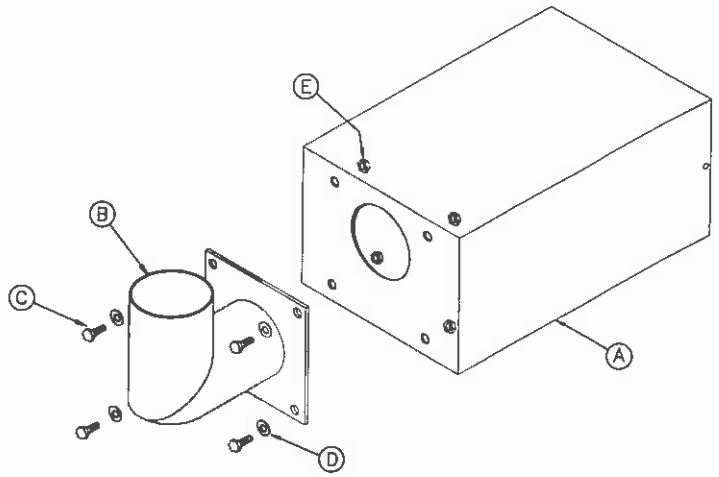
11.1.1 The ducted air adaptor (C) is fitted over the air inlet position of the burner housing lid (A) using the four M4 set-screws (B), and washers (D) provided.

11.1.2 The primary air filter can remain in place inside the housing lid (A).

11.2 FITTING DUCTED AIR ADAPTOR TO END VENT MODULE (see fig. 12)

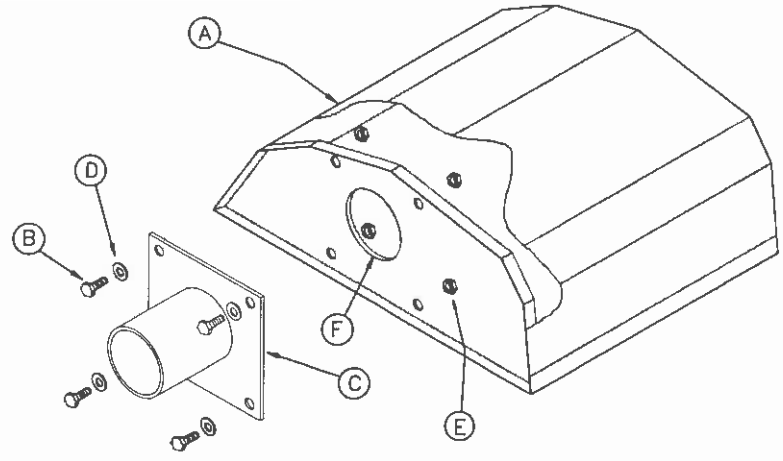
The ducted air adaptor spinning (C) is fitted to the air inlet position of the EVM (F) using the four M4 set-screws (B), washers (D) and nuts (E) provided.

FIG. 11 FITTING DUCTED AIR ADAPTOR TO BURNER



A Burner housing lid
B Set pin
C Ducted air adaptor
D Washer

FIG. 12 FITTING DUCTED AIR ADAPTOR TO END VENT MODULE



A EVM
B Set pin
C Ducted air adaptor
D Washer
G Nut
H Air intake

11.3 CONNECTION TO HEADER DUCT (see fig. 13)

11.3.1 Heat resistant flexible tube 450mm long and 75mm diameter is connected to the burner assembly ducted air adaptor (C) and the EVM ducted air adaptor (F) and secured with 75mm diameter jubilee clips (K).

11.32 The 75mm diameter flexible tube supplying the burners and End Vent Modules is connected to the branch air supply duct (B) which is 100mm diameter. **The maximum length of 75mm diameter ductwork is 2 metres.**

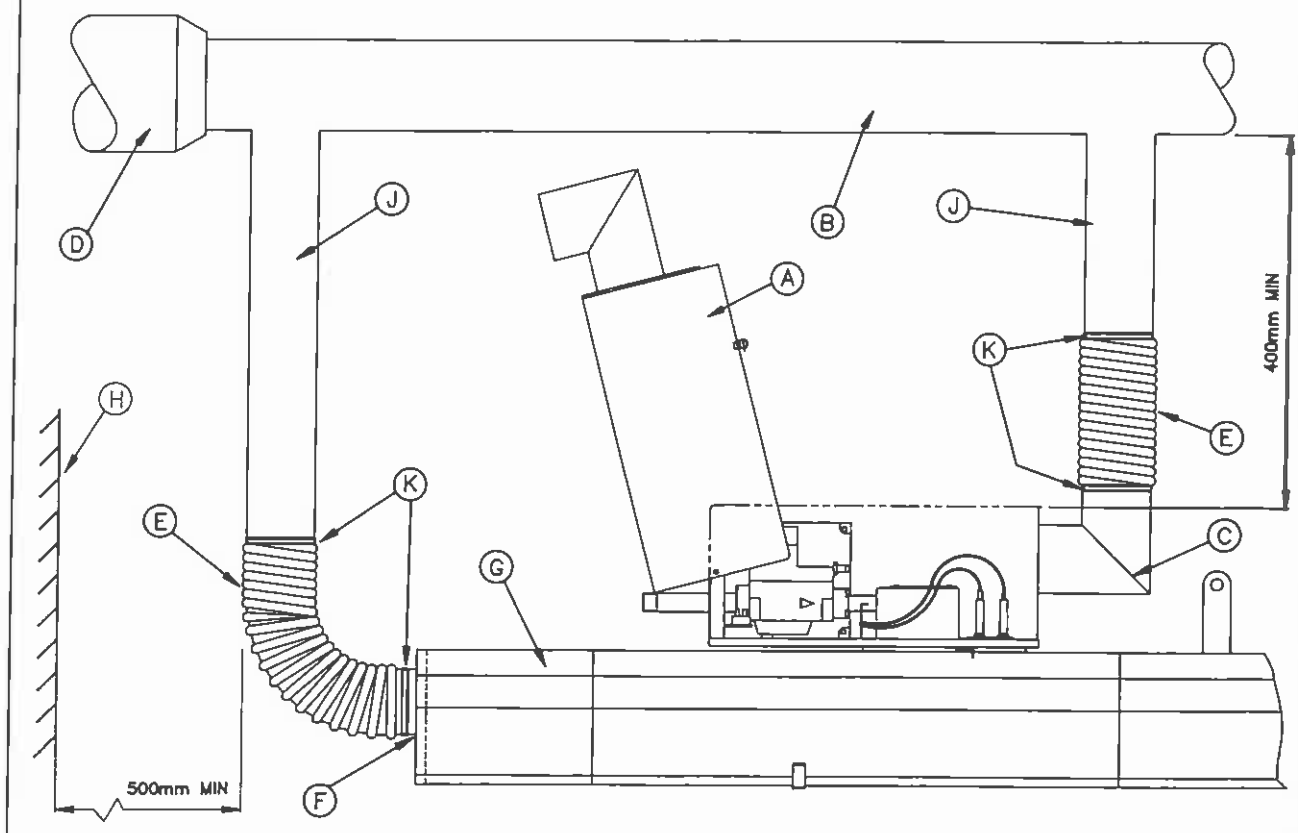
11.3.3 Ensure that the flexible supply duct (E) does not drape over or touch the reflector.

11.3.4 Ensure that the flexible ductwork is installed to allow for expansion of the heating system.

11.3.5 The main air supply header duct (D) which is feeding the individual branch ducts (B) must be 150mm diameter and have a maximum pressure drop of 0.25mbar (0.1in. w.g.). The 100mm dia. individual branch duct (B) may have a maximum length of 7m between burners with one 90° bend. The 75mm dia. burner duct (J) may have a maximum length of 2m with one 90°.

11.3.6 All joints and seams in the air supply system must be made air tight and a bird screen used at the inlet.

FIG. 13 INSTALLATION OF DUCTED AIR SUPPLY



A Burner housing lid
B 100mm Ø branch duct
C Burner ducted air adaptor
D 150mm Ø main header duct
E 75mm Ø flexible duct 450mm long
F EVM ducted air adaptor
G End vent module
H Building wall
K 75mm Ø jubilee clip
J 75mm Ø solid duct

12 VACUUM FAN

(see fig. 16)

12.1 LOCATION AND FIXING

12.1.1 The vacuum fan must be located as shown in the layout drawing.

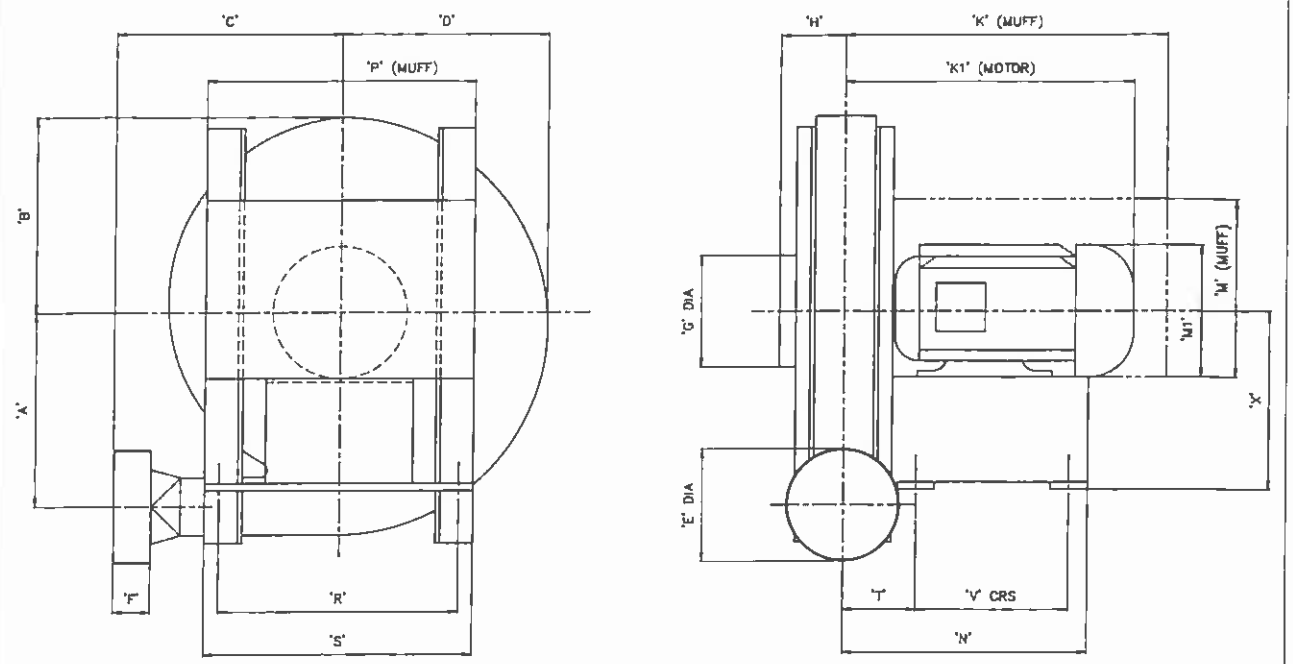
12.1.2 The vacuum fan must have a bottom horizontal discharge (see fig. 14).

12.1.3 The fan must be fitted to the mounting platform (F) which is fixed to the wall or building structure
Alternatively, the fan can be fixed to the roof structure using suitable brackets (Not supplied by Ambi Rad).
Anti-vibration mountings are fitted between the fan and the mounting platform

12.1.4 Fix the fan mounting platform (F) to the wall or building structure using the fixing holes (H).

12.1.5 Locate the fan mounting stool (E) in position on the platform (F) using anti-vibration mountings and secure in position.

FIG. 14 VACUUM FAN DIMENSIONS



FAN TYPE	kW	DIMENSONS																	
		'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'K'	'K1'	'M'	'M1'	'N'	'R'	'S'	'T'	'V'	'X'
F80	0.55	261	263	300	276	152	50	152	86	397	297	220	126	344	318	356	98	204	240
F120	0.75	261	263	300	276	152	50	152	86	432	332	240	158	344	318	356	98	204	240
F190	1.1	261	263	300	276	152	50	152	86	432	332	240	158	344	318	356	98	204	240
F300	1.5	276	279	308	299	152	50	152	103	459	359	260	178	344	318	356	115	204	240

FIG. 15 VACUUM FAN TECHNICAL DATA

FAN TYPE	Duty at 20°C		Max. operating temp. °C	Weight kg	Single Phase 240w/50Hz			Three Phase 415v/50Hz		
	Flow Units	Pressure mbar			Power kW	FLC Amps	Starting Current Amps	Power kW	FLC Amps	Starting Current Amps
F80	80	25	200	31	0.55	3.7	15	0.55	1.45	7.25
F120	120	25	200	35	0.75	4.5	15.75	0.75	1.85	9.25
F190	190	25	200	35	1.1	6.4	22.4	1.1	2.6	14.3
F300	300	25	200	41	1.5	8.7	26.1	1.5	3.5	21.0

12.2 FAN INLET PIPEWORK (see fig. 17)

12.2.1 The system tailpipe (A) is connected via a tube coupler (B) to the 150mm diameter fan inlet tee (H)

12.2.2 The fan inlet tee (H) must be supported using a turnbuckle (F) which is connected to the suspension lug (E) by a shackle.

12.2.3 The fan inlet tee (H) is connected via a tube coupler to a 150mm diameter 90° bend (J).

12.2.4 The 90° bend (J) is connected via an acoustic joint (L) to the 150mm diameter fan inlet connection and secured to bend and fan inlet by jubilee clips (K). A gap of approximately 150mm must be maintained between the fan inlet connection and the 90° bend (J)

12.3 FAN EXHAUST DUCT VERTICAL DISCHARGE (see fig. 17a)

12.3.1 If vertical discharge is used then a tee piece (V) must be fitted in the exhaust ducting with a connection to drain (Z)

12.3.2 Ensure that an adequate weatherproof seal (Y) is made where the duct passes through the roof.

12.4 FAN EXHAUST DUCT FOR HORIZONTAL DISCHARGE (see fig. 17b)

12.4.1 The exhaust duct must incline downwards away from the fan to avoid condensate running back into the fan.

12.4.2 Flue connectors (P) are used to connect all exhaust duct fittings.

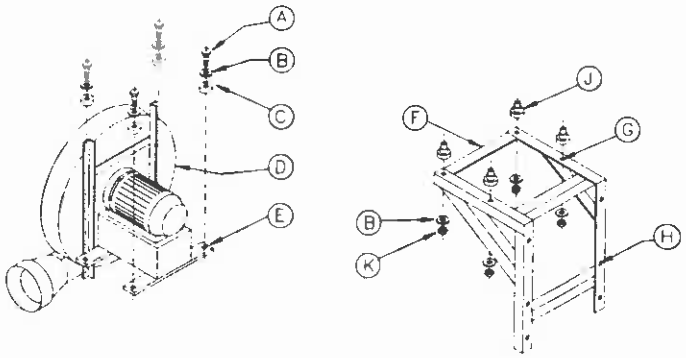
12.4.3 All ducting must be sealed using silicone sealant to avoid condensate leaking to the outside of the ductwork.

12.4.4 A non-combustible sleeve (T) (not supplied by Ambi Rad) must be fitted between the exhaust duct and a combustible wall.

12.5 CONDENSATE TRAP (see fig. 17)

12.5.1 Ensure that a ¾"drain tube is fitted to the connection on the under side of the trap. The drain tube must be resistant against the action of fluegas condensate and suitable for operation up to a maximum temperature of 150°C.

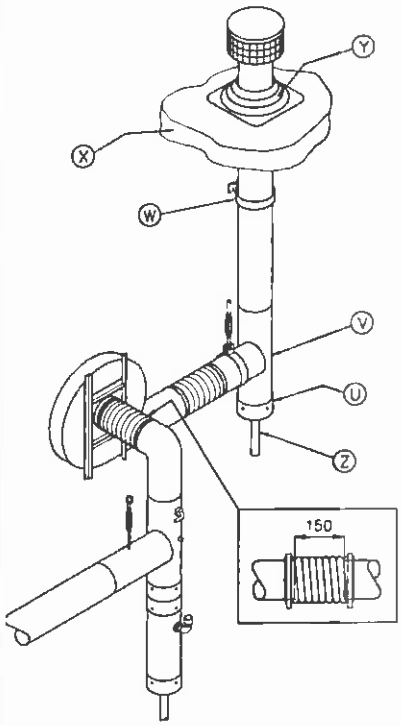
FIG. 16 INSTALLATION OF VACUUM FAN



A Bolt
B Washer
C Fan
D Mounting stool
F Fixing hole. (fan to platform)
F Mounting platform
G Fixing hole, (platform to wall)
H Nut

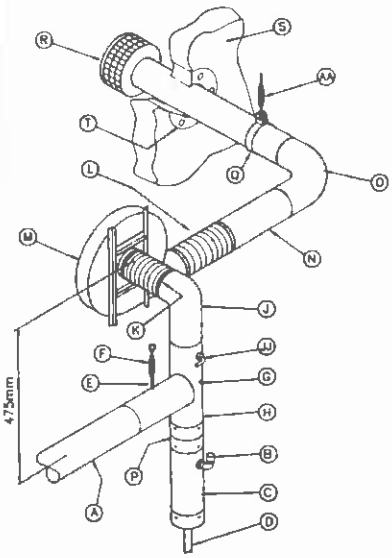
FIG. 17 INSTALLATION OF FAN DUCTWORK

17a



Vertical Discharge

17b



Horizontal Discharge

A Tailpipe
AA Turnbuckle with eyebolt
B Tube coupler
C Condensate trap
D Drain pipe for condensate trap
E Suspension lug for fan inlet tee
F Turnbuckle with eyelet and shackle
G Fluegas test point
H Fan inlet tee
I Damper adjustment lever
JJ 90° elbow
K Jubilee clip
L Acoustic joint
M Vacuum fan
N 150mm Ø flue duct
O 150mm Ø 90° elbow
P Flue connector
Q Tailpipe hanger
R Flue terminal
S Building wall
T Non-combustible sleeve
U 150mm Ø cap
V 150mm Ø tee piece
W Wall bracket
X Roof
Y Weatherproof roof seal
Z Drain pipe

13 BALLGUARD SYSTEM

The Nor-Ray-Vac ballguard system consists of standard 2.44m long ballguard modules which are supported from the underside of the radiant tube.
If necessary a standard 2.44m long ballguard can be shortened by the installation engineer.
The ballguard sections are fitted in tandem along the system.

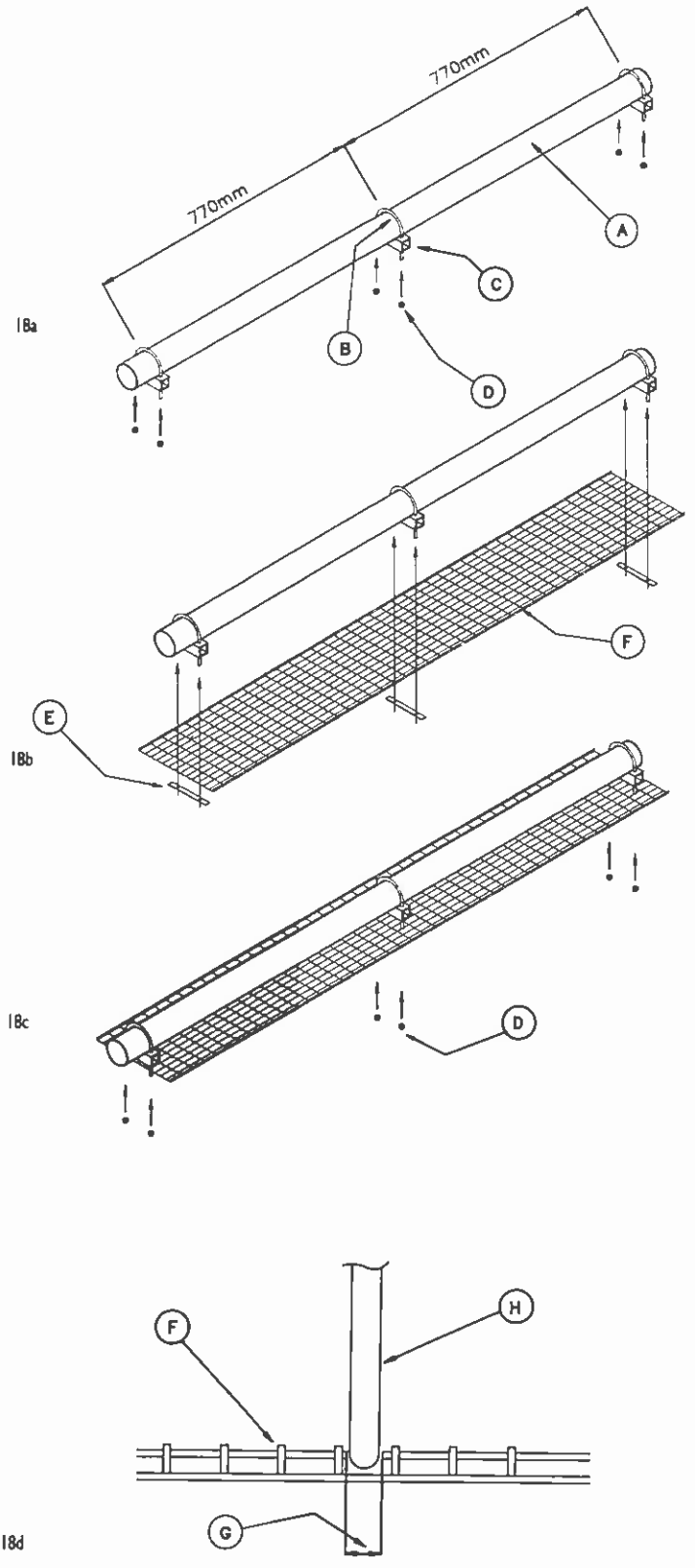
13.1 INSTALLATION (see fig. 18)

13.1.1 Starting at each system end vent, position the 3 'U' bolts (B) onto the radiant tube (A) and secure using square tubes (C) with M8 nuts (D). Ensure that the distance between the 'U' bolt is approximately 770mm. The 'U' bolt assemblies should be positioned **perfectly square** to ensure that the ballguard module lie horizontal when fitted.

13.1.2 A retaining plate (E) is positioned on the underside of the ballguard at each 'U' bolt assembly position and secured using M8 nuts (D).

13.1.3 It is necessary to cut the ballguard section (G) at the interface with the suspension support bracket (H). (see fig. 18d).

FIG. 18 INSTALLATION OF BALLGUARD SYSTEM



A Radiant tube
B 'U' bolt
C Square tube
D M8 nut
E Retaining plate
F Ballguard
G Cut-out
H Suspension support bracket

14 SLIMLINE 'M' DECORATIVE GRILLE SYSTEM

The Slimline 'M' Decorative grille system consists of standard 2.44m long modular grille assemblies which are supported from the underside of the radiant tube.

The modular assemblies are fitted in tandem along the system.

A standard 2.44m long modular grille assembly can be shortened to suit the system layout and also to accommodate corner reflector sections.

14.1 STANDARD 2.44m LONG MODULAR GRILLE ASSEMBLIES (see fig. 19)

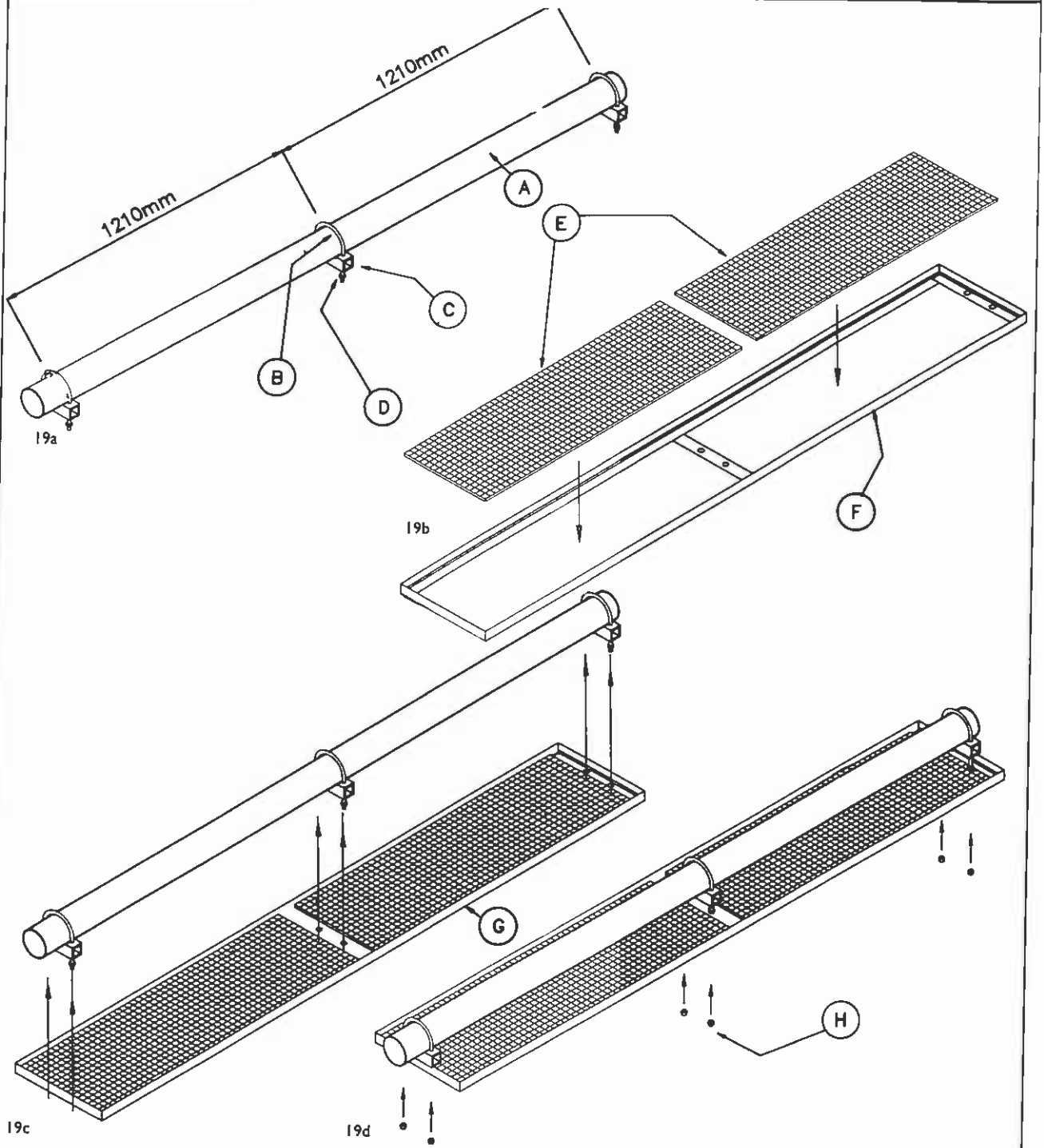
14.1.1 Starting at each system end vent, position the 'U' bolts (B) onto the radiant tube (A) and secure using the square tube (C) with M8 nuts. Ensure that the distance between 'U' bolts is 1210mm. The 'U' bolt assemblies should be positioned **perfectly square** to ensure that the modular grille assembly lies horizontal when fitted. Position 2 M8 locknuts (D) onto each 'U' bolt (B) to approximately 10mm from the ends of the threads.

14.1.2 Fit 2 eggcrate grille pieces (E) into the standard 2.44 long grille support frame (F).

14.1.3 Raise the modular grille assembly (G) and pass the threaded ends of the three 'U' bolts through the three sets of fixing holes.

14.1.4 Fit the M8 dome head nuts (H) to the threaded ends of the 'U' bolts and tighten down the M8 locknuts

FIG. 19 INSTALLATION OF SLIMLINE 'M' SYSTEM



A Radiant tube
B 'U' bolt
C Square tubes
D Nut
E Eggcrate grille
F Grille support frame
G Modular grille assembly
H Dome nuts

CHECK THAT THE MODULE IS SECURE

14.1.5 Addition modules are fitted in tandem along the system using the same procedure

14.2 SHORTENED MODULAR GRILLE ASSEMBLIES (see fig. 20)

14.2.1 Carefully disconnect one end support (M) from the standard 2.44m long grille support frame.

14.2.2 Cut the side support (J) to the required length, ensuring that the cut ends are square and free from burrs. Reposition the end support (M) and mark the fixing hole centres onto the side supports (J).

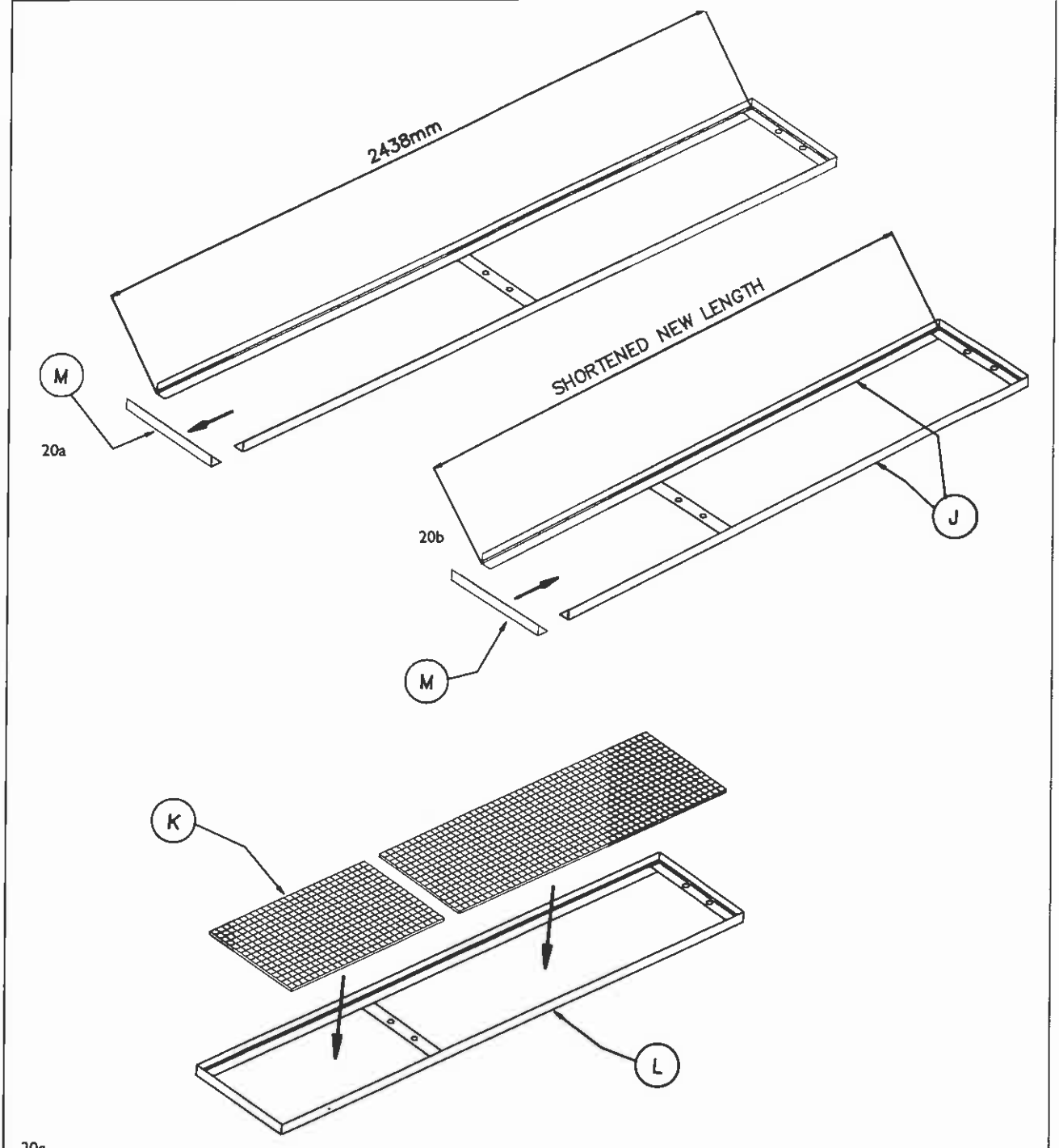
Drill 2 sets of 5.0mm diameter holes through the marked positions on the side supports (J). Secure the end support (M) to the support frame using 4.8mm pop rivets.

14.2.3 Cut grille (K) to the required length and position into the support frame.

14.2.4 Ensure that the 'U' bolts are positioned onto the tube to suit the new support frame fixing positions.

14.2.5 The shortened modular assembly can now be fitted to the heater using the procedure as stated in section 14.1.

FIG. 20 SHORTENING OF SLIMLINE 'M' SYSTEM MODULES



M End support
J Side supports
K Shortened eggcrate grille
L Shortened grille support frame

15 CONTROL SYSTEM

The control system must be installed in accordance with the design specification.

15.1 CONTROL PANEL DESIGN (see fig. 21)

Ambi-Rad control panels are available 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.

If a Nor-Ray-Vac control panel is used the following logic to operate in a safe and satisfactory manner is necessary

15.2 INSTALLATION OF CONTROL PANEL

To install the Ambi-Rad control panel remove the plastic plugs from the four 9mm diameter holes in the back of the control box. Using these holes fix the box in a convenient position to a suitable plugged wall or solid structure with No. 10 gauge woodscrews or 6mm diameter 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 relevant wiring diagrams and cut holes in the removable gland plate provided in the box. Conduit or strain relief glands should be used.

15.3 CONTROL PANEL TIMER (see fig. 22)

15.3.1 GENERAL

15.3.1.1 The Grassin 16/72/1 Digital time Switch is fitted to Ambi-Rad Control Panels.

15.3.1.2 Check the main electricity supply is connected.

15.3.1.3 Use pencil or similar instrument, press reset button – After five seconds window displays 00:00.

15.3.1.4 Depress +/- button to advance time by 1 hour for British Summer Time Depress once to cancel 1 hour advance.

15.3.2 TO SET DAY AND TIME

15.3.2.1 Depress O button continuously whilst setting day and time.

15.3.2.2 Depress day button until correct day appears in window.

15.3.2.3 To set time – depress h+ m+.

15.3.2.4 After setting day and time release O button.

15.3.2.5 Clock will commence working after five seconds.

15.3.3 PROGRAMMING

15.3.3.1 Depress button CHI – window will display — — : — —

15.3.3.2 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 Sun only.
(d) Press again for individual days.

FIG. 21 CONTROL PANEL DESIGN

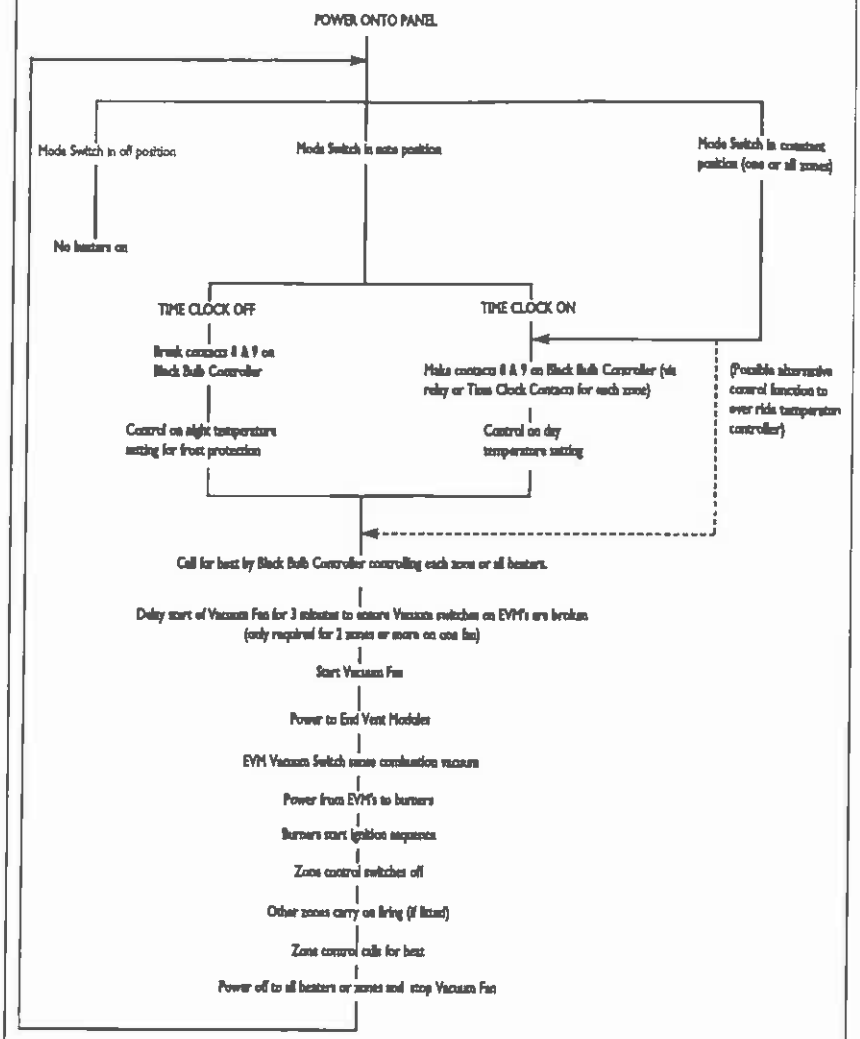
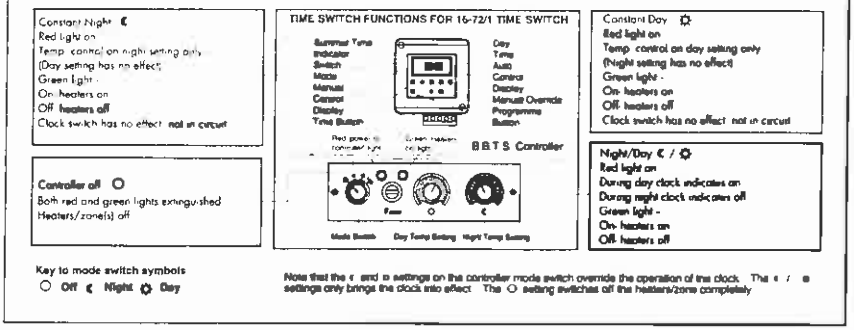


FIG. 22 TIME SWITCH AND FACIA MOUNTED BLACK BULB CONTROLLER



15.3.3.3 To set switching "on" times to suit day programme depress h+ m+ button.

15.3.3.4 To lock in the "on" programme – depress CHI button.

15.3.3.5 To set switching "off" time depress CHI button.

15.3.3.6 Depress day button to set "off" days required.

15.3.3.7 Using buttons h+ m+ set switching "off" days required.

15.3.3.8 To lock in the "off" programme depress CHI button.

15.3.3.9 After setting "on-off" programme depress button ◷ to reinstate day and time window.

15.3.3.10 To manually override programme, depress ⌒ 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 REFER TO MANUFACTURER'S OPERATING INSTRUCTIONS.

15.4 FIXING SENSOR UNIT
(see fig. 23)

15.4.1 A position should be selected 1.5m from the floor where the sensor will be free from undue draughts and if necessary between 4 and 5m from one of the heaters to be controlled. Avoid placing the sensor where it will be in an area shadowed from radiant heat (behind racking etc).

15.4.2 Remove the cover of the sensor unit by undoing the four screws.

15.4.3 Fix the base to the wall with two screws.

15.4.4 Connect the sensor using a three core cable of not less than 0.5mm² Maximum length of cable is 200m if 0.5mm² is used. Secure wires in the cable gland provided (alternative rear cable entry available – remove gland and seal with grommet if rear entry used).

15.4.5 Wire sensor to controller in accordance with wiring diagram.

15.4.6 Refit the sensor to the base.

15.5 FAN STARTER/OVERLOAD

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.

FIG. 23 FIXING SENSOR UNIT

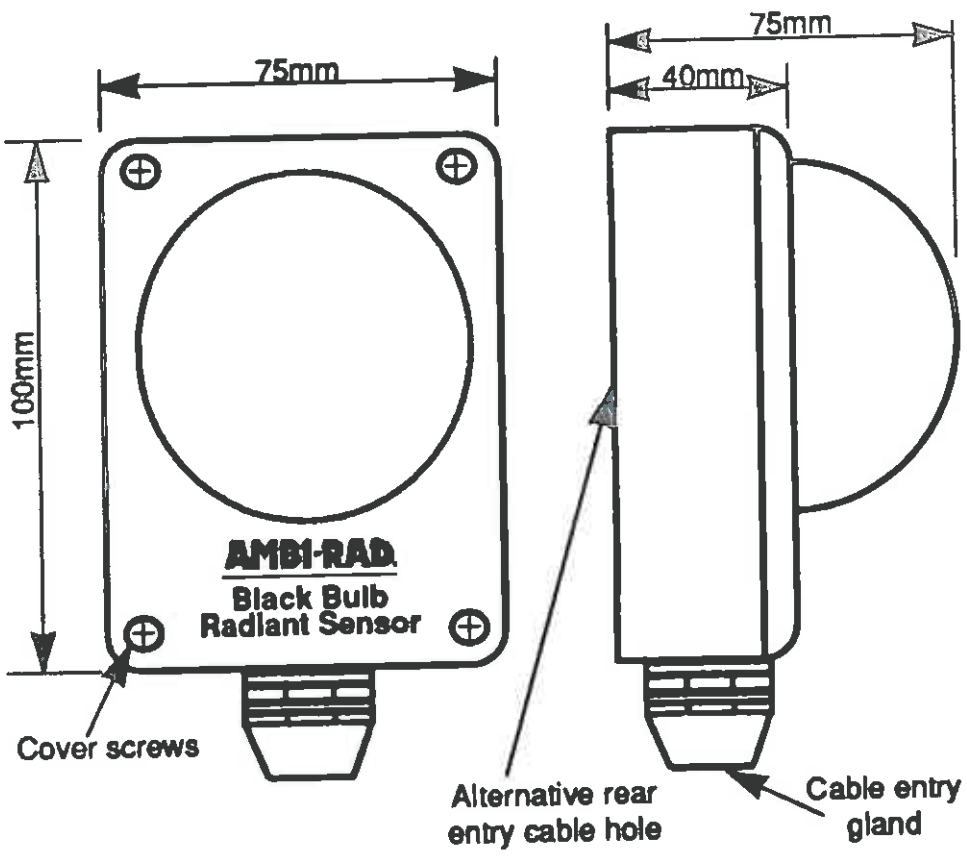
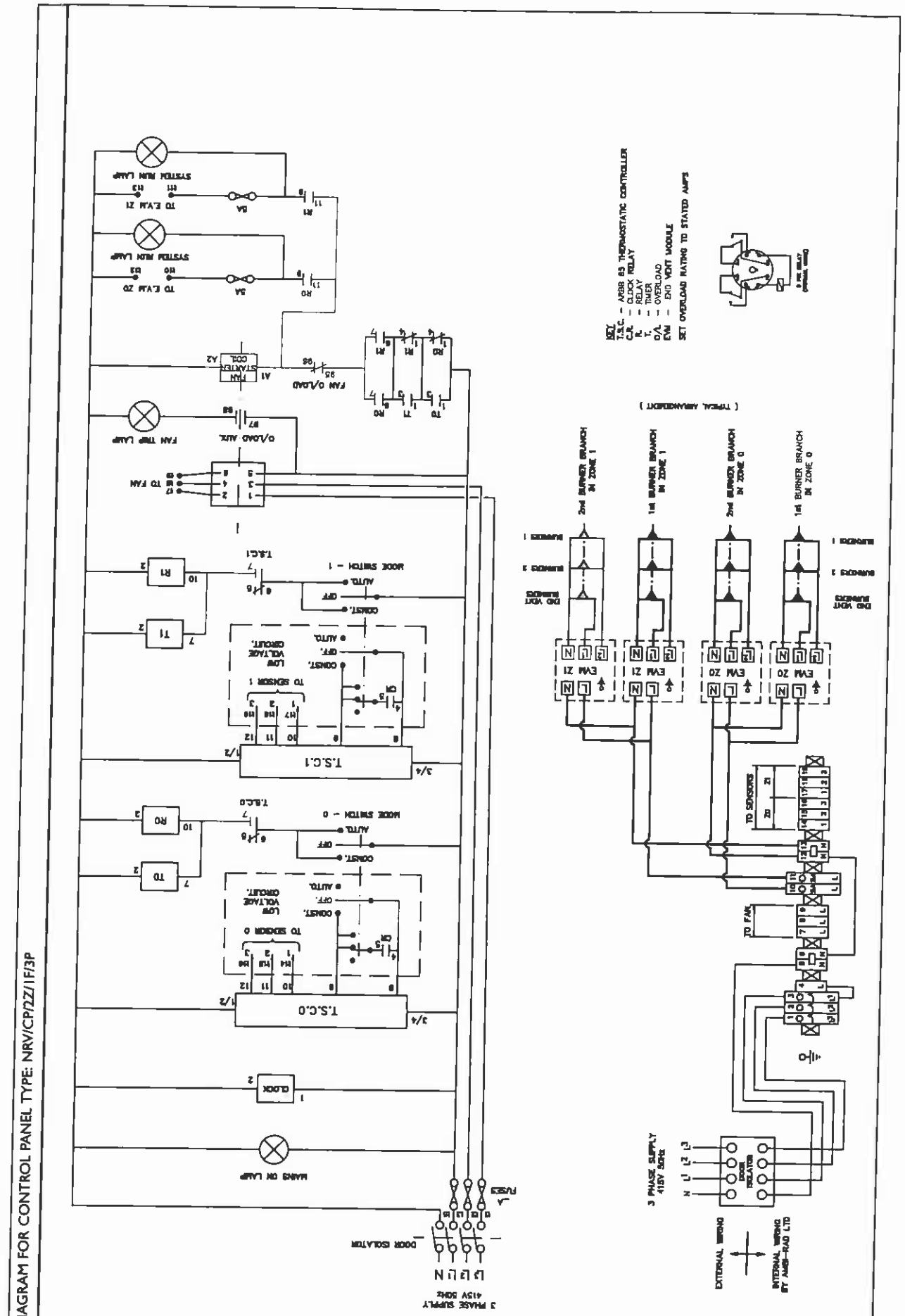


FIG. 24 WIRING DIAGRAM FOR CONTROL PANEL TYPE: NRV/CP/2Z/1F/3P



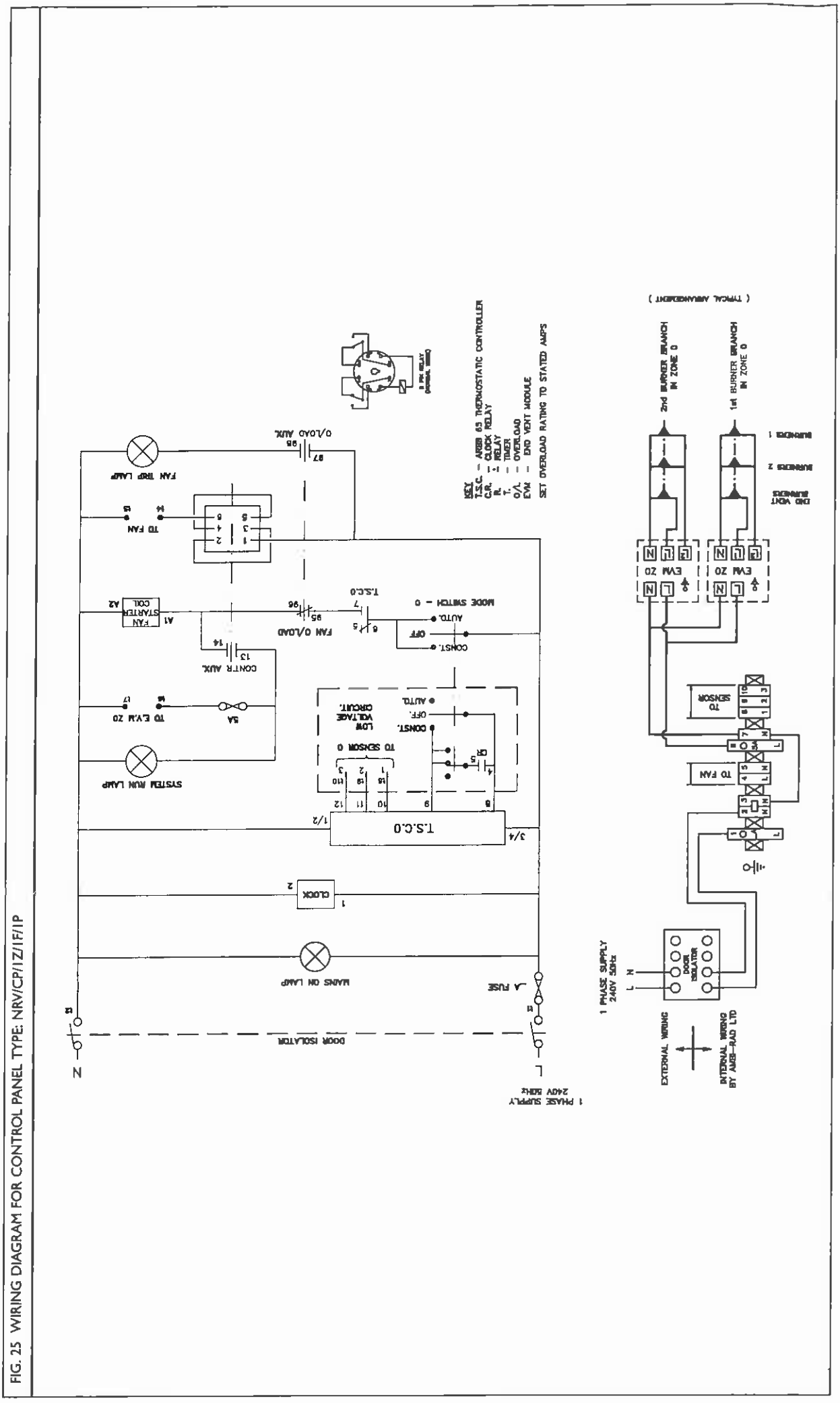


FIG. 25 WIRING DIAGRAM FOR CONTROL PANEL TYPE: NRV/CP/1Z/1F/1P

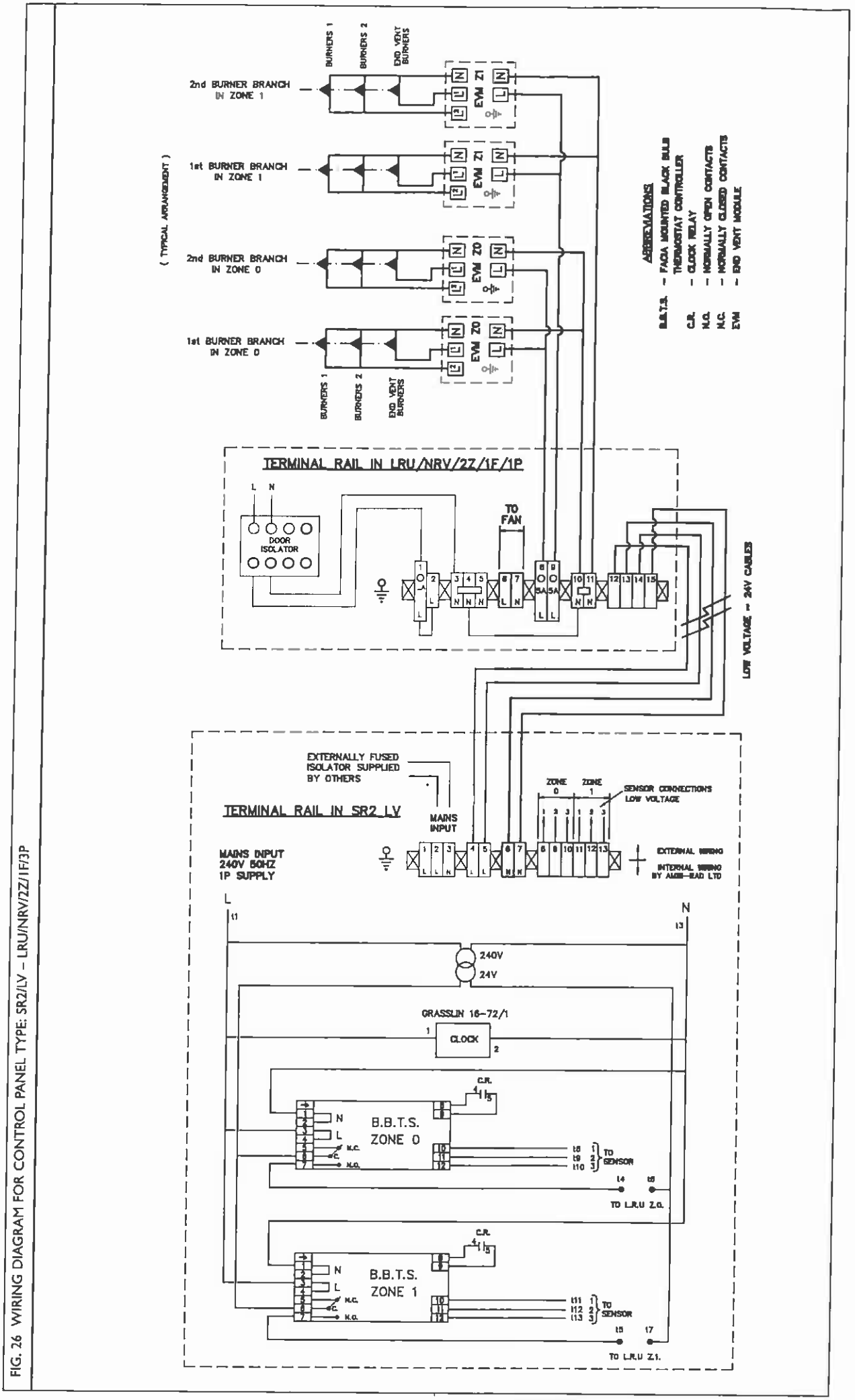


FIG. 26 WIRING DIAGRAM FOR CONTROL PANEL TYPE: SR2/LV - LRU/NRV/2Z/1F/3P

15.8

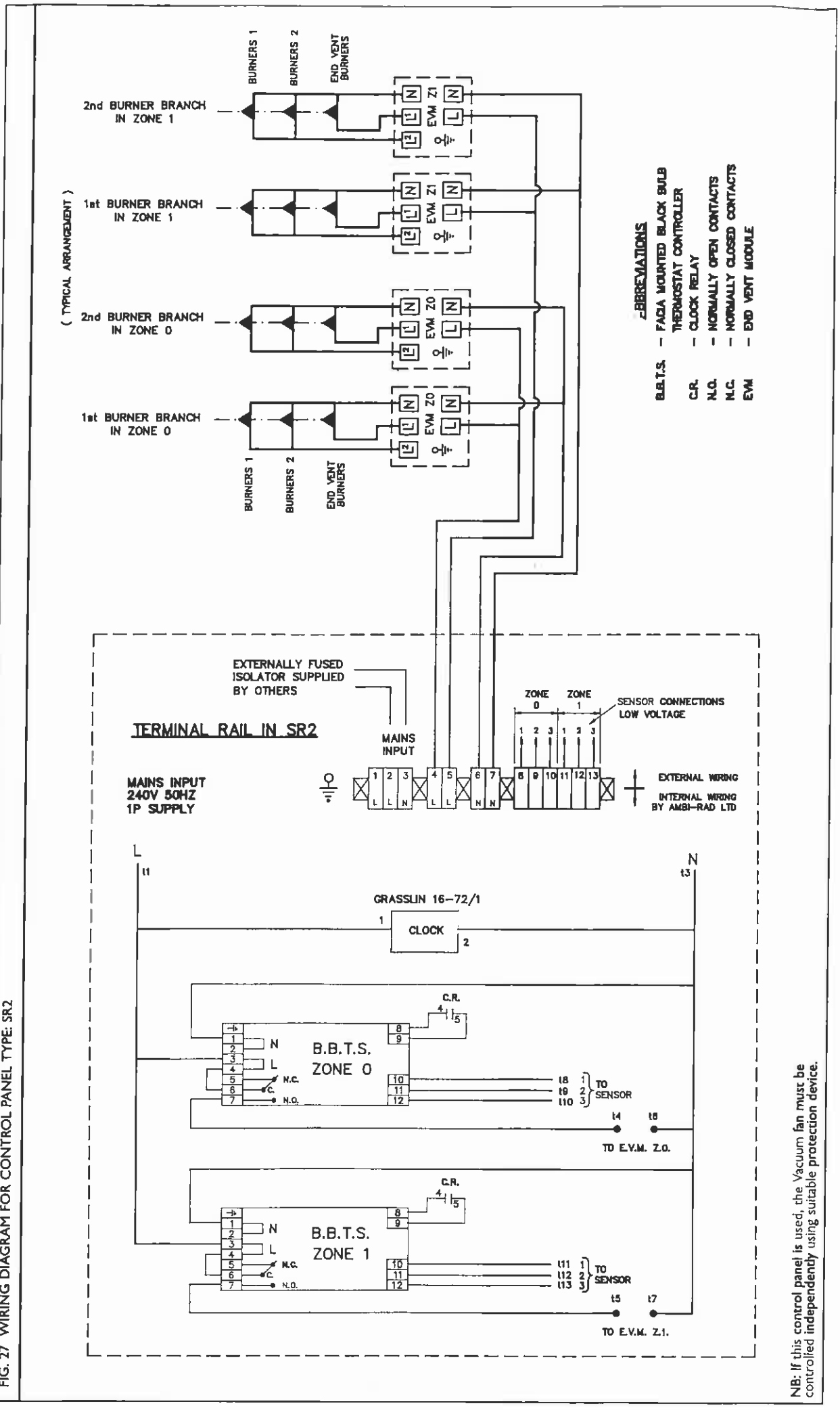


FIG. 27 WIRING DIAGRAM FOR CONTROL PANEL TYPE: SR2

NB: If this control panel is used, the Vacuum fan must be controlled independently using suitable protection device.

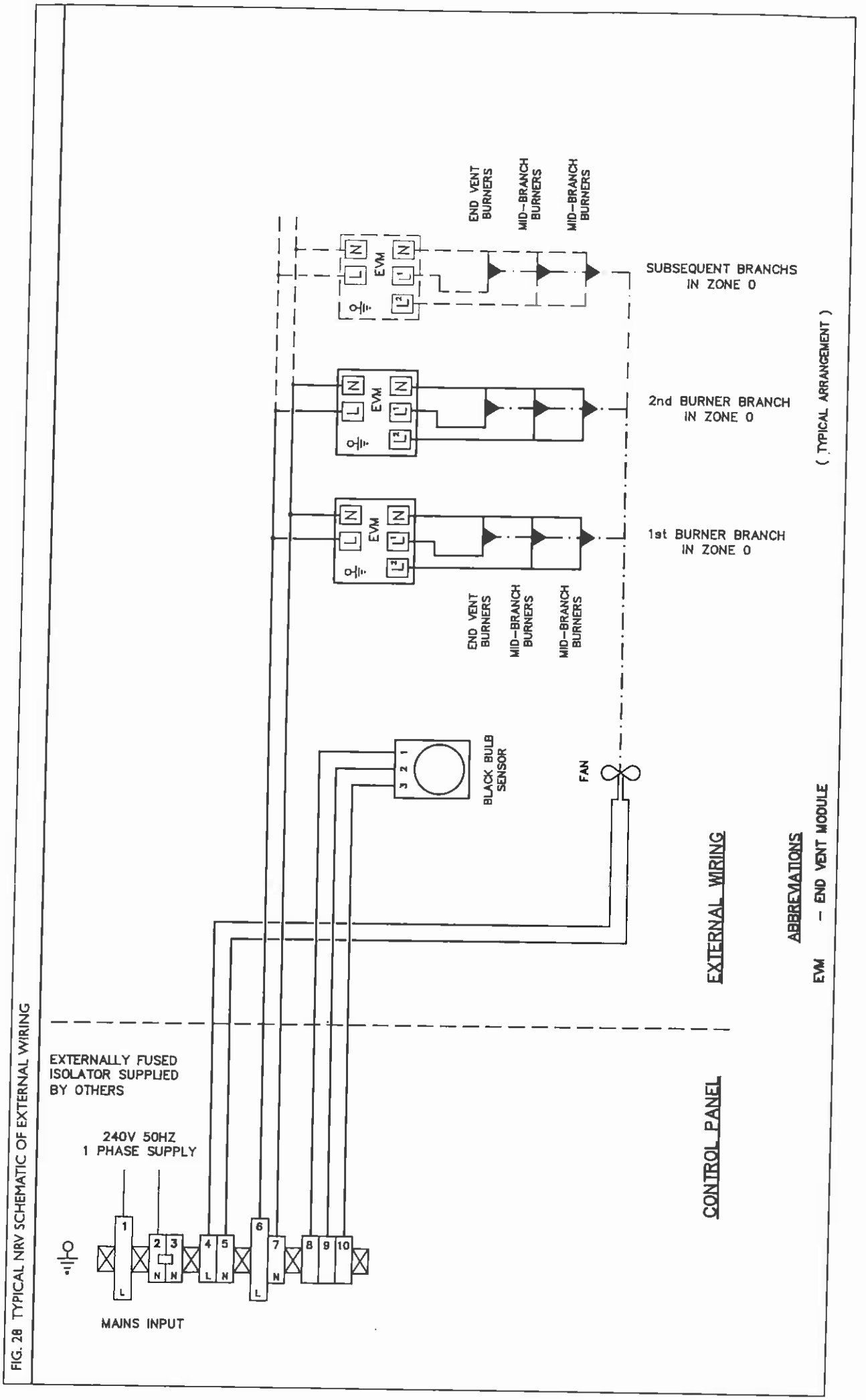
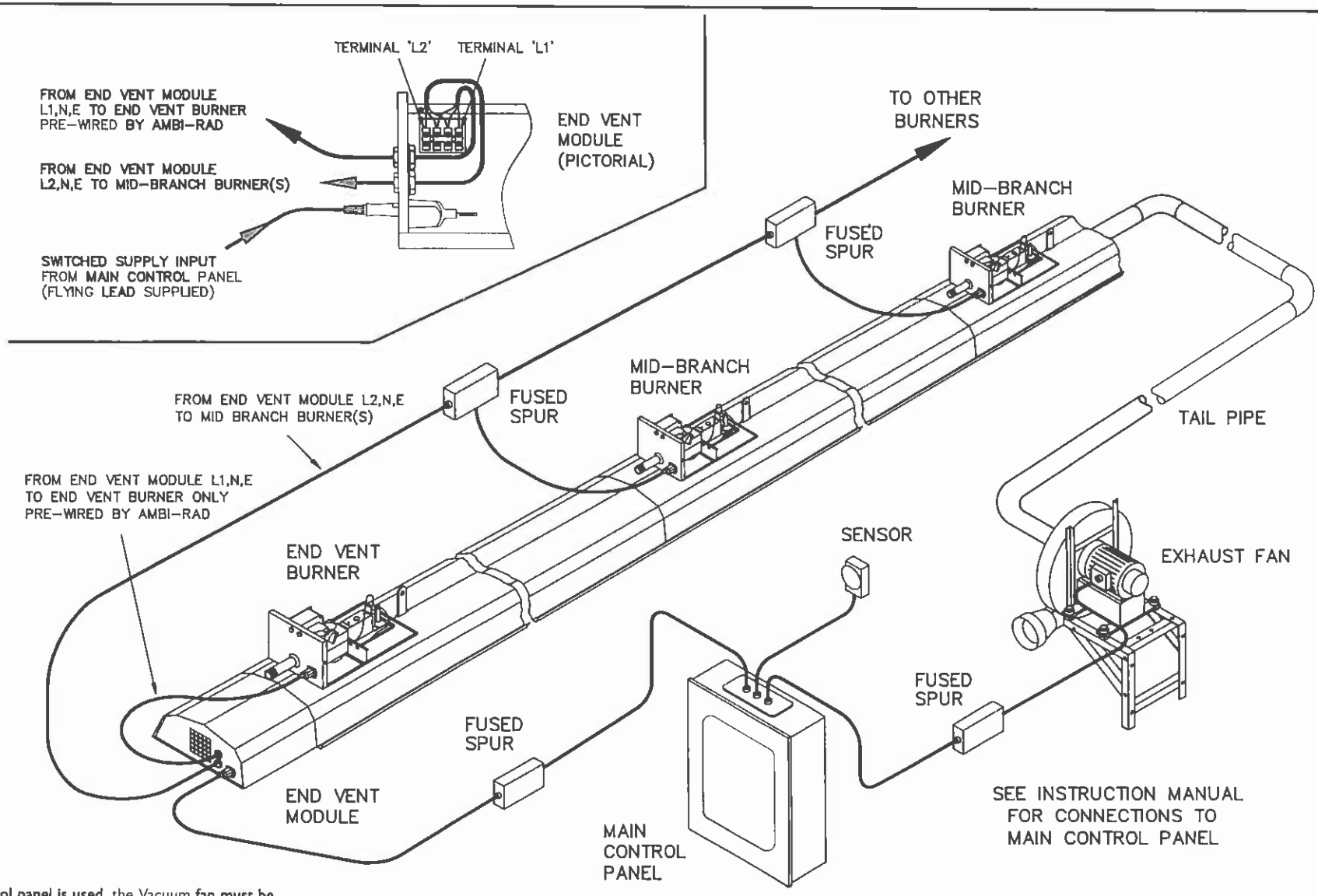


FIG. 28 TYPICAL NRV SCHEMATIC OF EXTERNAL WIRING

15.10

15.11

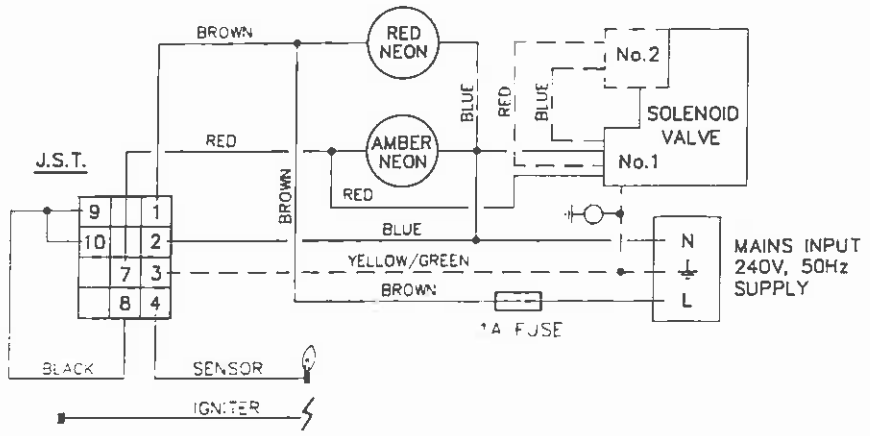
FIG. 29 PICTORIAL DETAIL OF NRV WIRING ARRANGEMENT



NB: If this control panel is used, the Vacuum fan must be controlled independently using suitable protection device.

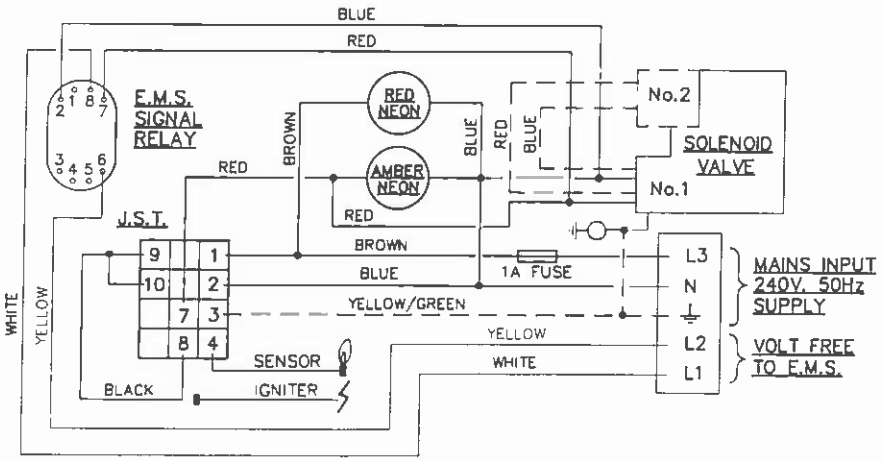
15.12

FIG. 30 LR BURNER INTERNAL WIRING DIAGRAM



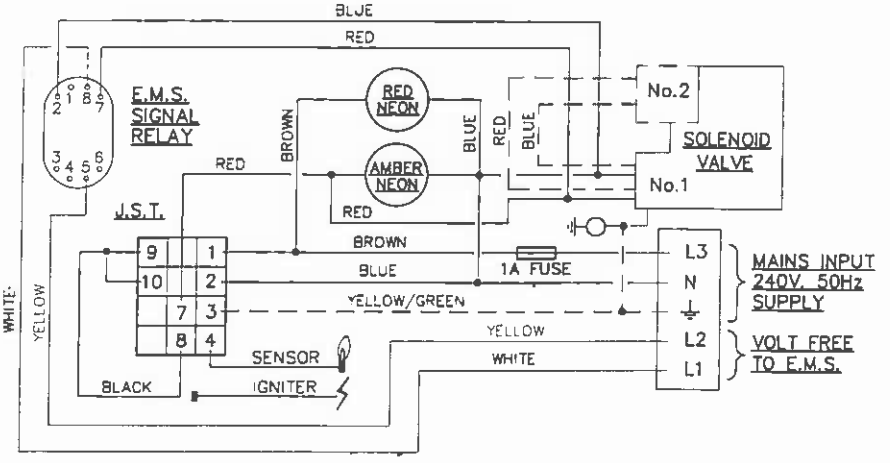
15.13

FIG. 31 LR BURNER INTERNAL WIRING DIAGRAM C/W N/O LOCKOUT CONTACTS



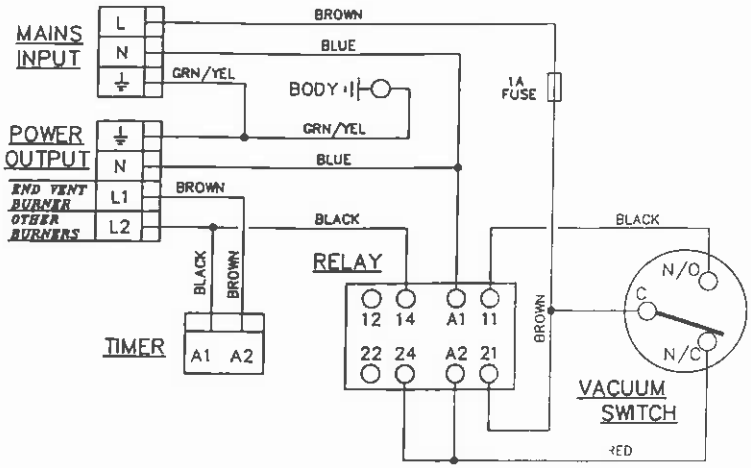
15.14

FIG. 32 LR BURNER INTERNAL WIRING DIAGRAM C/W N/C LOCKOUT CONTACTS



15.15

FIG. 33 INTERNAL WIRING DIAGRAM FOR END VENT MODULES TYPE: EVM AND EVMS



EVM

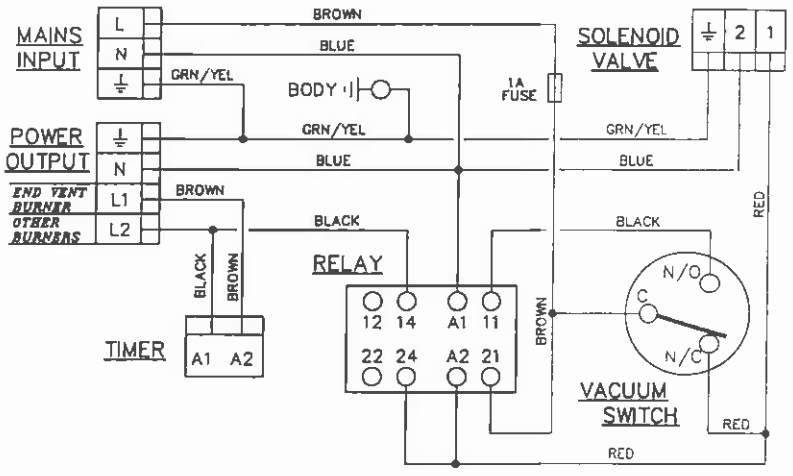
This is the standard end vent module, comprises an air pressure switch, relay, timer, mains input and power input.

EVMS

This is the same as the standard EVM except that it contains an end vent silencer box.

15.16

FIG. 34 INTERNAL WIRING DIAGRAM FOR END VENT MODULES TYPE: EVMW AND EVMSW



EVMW

This is the same as the standard EVM except that it contains a 3-way air valve.

EVMSW

This is the same as the EVMW except that it contains an end vent silencer box.

NB. Type EVMW and EVMSW end vent modules incorporate 3-way solenoid valves. The solenoid valve is positioned in the negative impulse air line of the air pressure switch. The air pressure switch must be proven in the 'closed position' by the influence of the vacuum within the radiant tube system.

On a 'split zone' system, operating a continuously running common fan, the solenoid valve is necessary in order to cut-off the impulsed vacuum, this proving the air pressure switch in the closed position prior to the start of the burner ignition sequence.

4

'LR' SERIES CONTINUOUS RADIANT TUBE HEATING SYSTEM

SERVICE AND COMMISSIONING

CONTENTS:

1 RECOMMENDATIONS

2 BURNER ASSEMBLY PARTS

3 END VENT MODULE PARTS

4 COMMISSIONING PROCEDURE

5 FAULTING FINDING GUIDE

6 ROUTINE MAINTENANCE

7 REMOVAL OF COMPONENTS

1 RECOMMENDATIONS

Under normal working conditions it is recommended that the Nor-Ray-Vac 'LR' Series System is regularly maintained to ensure long life and efficient operation. Normally, maintenance is required only once per year. In dusty or dirty conditions more frequent maintenance is desirable. Servicing work must be carried out by a qualified gas service engineer.

IMPORTANT: –

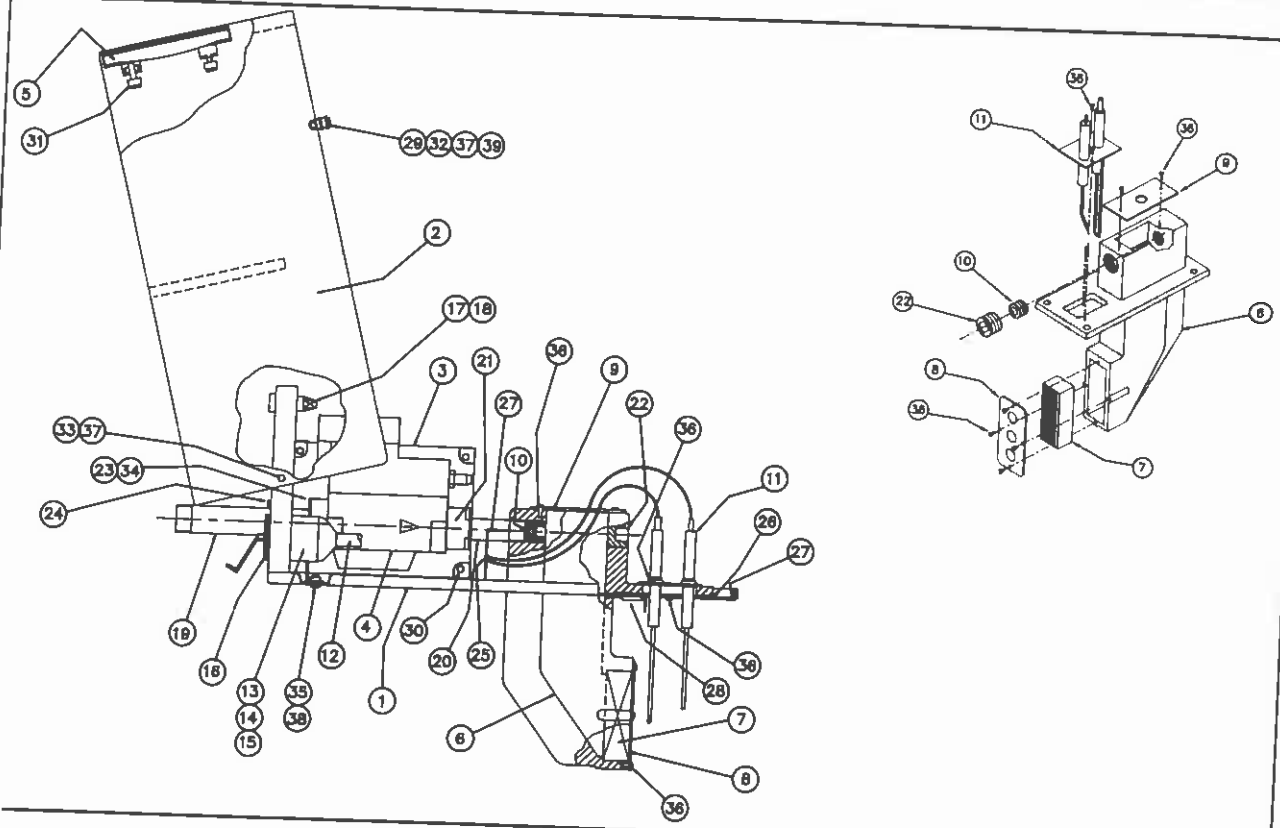
When maintaining or servicing the Nor-Ray-Vac 'LR' Series Systems:–

(a) Never rest anything, especially ladders against heating system.

(b) Isolate gas and electrical supplies before commencing any service work.

2 BURNER ASSEMBLY PARTS

FIG. 1 BURNER ASSEMBLY



ITEM	DESCRIPTION
1	Control Housing Base Plate
2	Control Housing Lid
3	Full Sequence Gas Controller
4	Multi Functional Gas Valve
5	Air Filter
6	Burner Head Casting
7	Burner Port Insert
8	Flame Retention Grid
9	Air Shutter Plate } See table A
10	Burner Jet } See table A
11	Electrode Assembly
12	Mains Input Socket Socket
13	Cover Boot for Input
14	Electrode Assembly
15	1 Amp Fuse
16	Input Socket Retaining Clip
17	Red Neon Light
18	Amber Neon Light
19	Gas Inlet Connection Pipe ⅜" x 4"
20	Gas Outlet Inlet Connection Pipe ½" x ¼"

ITEM	DESCRIPTION
21	½" - ⅜" Reducing Bush
22	½" Plug
23	Valve Mounting Bracket
24	Grommet (gas supply)
25	Grommet (10mm)
26	Burner Gasket
27	Silicone Gasket
28	Slide Latch
29	Slide Latch Plate
30	Push Clip
31	Thumb Grip
32	Set Pin M4 x 12
33	Set Pin M4 x 8
34	Set Pin M4 x 10
35	Set Pin M5 x 10
36	Set Pin M3 x 5
37	Washer M4
38	Washer M5
39	Nut M4

TABLE A. NRV LR JET/SHUTTER SELECTION CHART

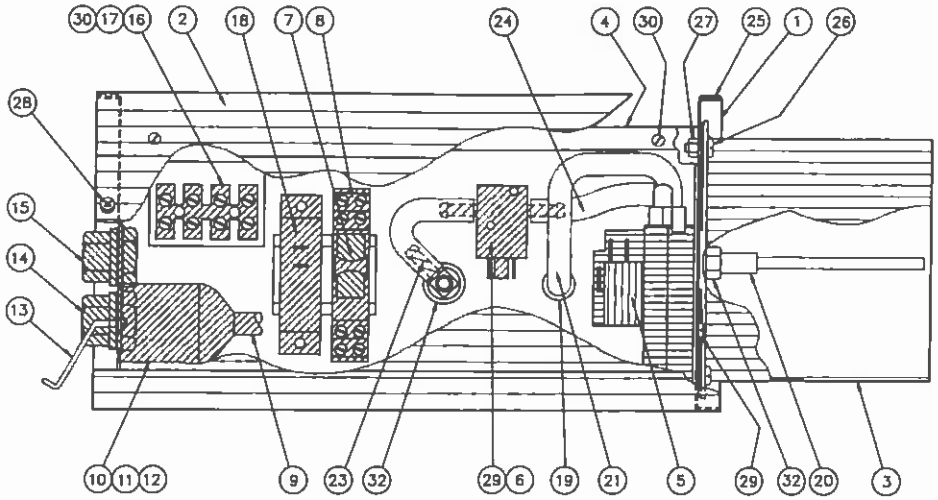
GAS TYPE	NATURAL	NATURAL	BUTANE	PROPANE	MANUFACTURED	MANUFACTURED
Ref. Gas	G20	G25	G30	G31	G110	G120
Family	II	II	III	III	I	I
Hs, MJ/m³	37.78	32.49	125.81	95.65	15.87	17.8
Hs, MJ/m³	34.02	29.25	116.09	88.00	13.95	16.3
d	0.555	0.612	2.006	1.55	0.411	0.411
Ws, HJ/m³	50.72	41.52	87.33	76.84	24.75	27.77
Wi, MJ/m³	45.67	37.38	80.58	70.69	21.76	25.4

BURNER TYPE	12 LR	18 LR	24 LR	30 LR	12 LR	18 LR	24 LR	30 LR	12 LR	18 LR	24 LR	30 LR	12 LR	18 LR	24 LR	30 LR	12 LR	18 LR	24 LR		12 LR	18 LR	24 LR	
JET SIZE diam. mm	3.5	4.3	4.9	5.3	3.7	4.6	5.2	5.9	2.6	3.2	3.7	4.2	2.8	3.5	4.0	4.3	4.9	5.9	6.7		4.6	5.6	6.5	
PART NO.	L100535	L100543	L100549	L100553	L100537	L100546	L100552	L100559	L100526	L100532	L100537	L100542	L100528	L100535	L100540	L100543	L100549	L100559	L100567		L100546	L100556	L10056	
SHUTTER SIZE diam. mm	13	17	19.5	20	13	17	19.5	20	13	17	19.5	20	13	17	19.5	20	13	17	19.5		13	17	19.5	
PART NO.	L100305	L100308	L100310	L100311	L100305	L100308	L100310	L100311	L100305	L100308	L100310	L100311	L100305	L100308	L100310	L100311	L100305	L100308	L100310		L100305	L100308	L100310	

Hs = Gross C.V, Hi = Net C.V, Ws = Wobbe No. on Gross C.V, Wi = Wobbe No. on Net C.V, d = specific density
Reference gas conditions – Dry, 15°C, 1013 mbar

3 END VENT MODULE PARTS

FIG. 2 END VENT MODULE ASSEMBLY



ITEM	DESCRIPTION
1	Control Housing
2	Control Housing Lid
3	Attachment Spinning/Orifice Plate (see table B)
4	Silencer Cover (Optional)
5	Air Pressure Switch
6	3-Way Air Valve
7	Relay 240v
8	Relay Base
9	Wiring Harness (see table B)
10	Mains Input Socket
11	Cover Boot for Input Socket
12	1 Amp Fuse
13	Input Socket Retaining Clip
14	Output Cable Gland
15	Output Cable Gland/Locknut (Other Burners)
16	Output Terminal Block

ITEM	DESCRIPTION
17	Insulation Patch
18	End Vent Timer
19	Tubing Grommet
20	Negative pressure Silicone Tube
21	Atmospheric Pressure Silicone Tube
22	Test Point Cap
23	Tee
24	Silicone Tubing
25	Strip Gasket
26	Set Pin M5 x 10
27	Nut M5
28	Set Pin M4 x 10
29	No. 6 x 1/4" Self Tapping Screw
30	No 8 x 3/8" Self Tapping Screw
31	Silencer Insulation (Optional - Not Shown)

TABLE B

Module Type	Wiring Harness	Wiring Dia.	Air Orifice Plate Spinning	Module Type	Wiring Harness	Wiring Dia.	Air Orifice Plate Spinning
EVM 12	EI22205	LI00632		EVM 24	EI22205	LI00632	
EVMS 12	EI22205	LI00632	LI04075	EVMS 24	EI22205	LI00632	LI04077
EVMSW 12	EI22204	LI00631		EVMSW 24	EI22204	LI00631	
EVMW 12	EI22204	LI00631	-SUB	EVMW 24	EI22204	LI00631	-SUB
EVM 18	EI22205	LI00632		EVM 30	EI22205	LI00632	
EVMS 18	EI22205	LI00632	LI04075	EVMS 30	EI22205	LI00632	LI04079
EVMSW 18	EI22204	LI00631		EVMSW 30	EI22204	LI00631	
EVMW 18	EI22204	LI00631	-SUB	EVMW 30	EI22204	LI00631	-SUB

4 COMMISSIONING PROCEDURE

4.1 Check that the installation is to the design layout drawing and installed in accordance with the installation instructions.

4.2 Check installation electrically. Ensure that the vacuum fan end vent modules burners and control panels are correctly wired.

4.3 Check condensate traps are filled to the correct level with water.

4.4 Ensure that each burner and end vent module is electrically disconnected at the plug/socket.

4.5 Start the vacuum fan. For control systems where the **temperature starts the vacuum fan** it is necessary to set the thermostat(s) to above room temperature. Check for correct fan rotation.

4.6 Check gas is turned on at meter and take meter gas pressure reading. Fit pressure manometer to the inlet pressure test point on the burner furthest from the gas supply and with all burners off observe pressure reading. Turn off gas at meter and again observe reading. If pressure falls check system for leaks.

4.7 The gas pressure at the burner inlet connection **must not exceed 50mbar** (20in.wg.).

4.8 Check vacuum fan inlet damper is fully open. (see fig 3 for adjustment instruction).

4.9 Measure the vacuum pressure at each end vent module and adjust each branch damper to obtain 6.25mbar (2.5in.wg.) (see fig 4 for adjustment instruction). Ensure that timer (M) fig 5 in end vent module is set to position 5.

4.10 Set the thermostat(s) below room temperature.

4.11 Turn on the gas supply and reconnect the electrical supply to the burners and end vent module in one radiant branch.

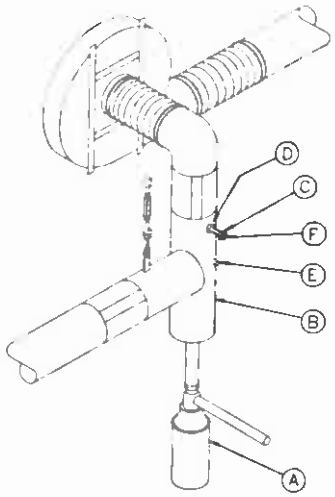
4.12 Set the thermostat(s) to above room temperature.

4.13 Observe the ignition of the burners in this radiant branch.

4.14 It may be necessary to temporarily break the union at a burner in order to purge the gas pipe of air.

4.15 Proceed to the next radiant branch and commission in the same manner.

FIG. 3 VACUUM FAN INLET TEE



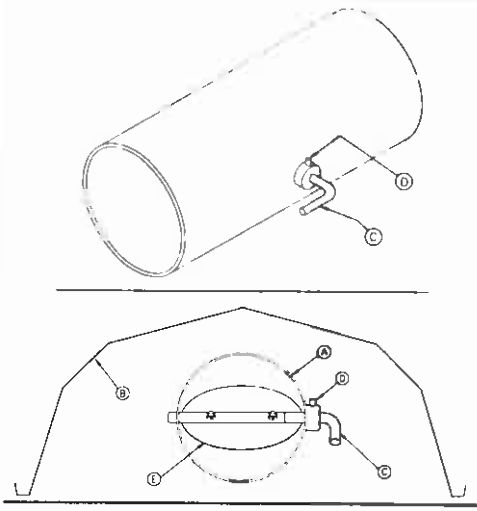
Adjustment instruction for fan damper

The fan damper is integral to the fan inlet tee piece.

1 Loosen grub screw (D)
2 Turn Adjustment lever (C)
3 Position of damper blade is indicated by position of bent elbow (F).
4 Tighten grub screw to secure damper position.

A Condensate Trap
B Fan Inlet Tee
C Damper Adjustment Lever
D Grub screw
E Sample Point
F Bent elbow showing blade position

FIG. 4 BRANCH DAMPER



Adjustment instruction for Branch Damper

1. Loosen grub screw (D)
2. Turn Adjusting nut (C).
3 Position of damper blade is indicated by position of bent elbow (F).
4 Tighten grub screw to secure damper position.

A Damper tube
B Reflector
C Damper Adjustment Lever
D Grub screw
E Damper blade
F Bent elbow showing blade position

4.16 When all burners have been running for thirty minutes check all end vent vacuum readings.
The correct setting must be 6.25mbar (± 0.5mbar) or 2.5in.wg (± 0.02in.wg.)
End vent vacuum adjustments are made first by means of the damper at the vacuum fan inlet this brings the end vent with the lowest reading to the normal operating vacuum. The dampers in the branches are then adjusted to bring the vacuum readings in other branches to the normal operating figure. Ensure that all dampers are locked securely after adjustment.

4.17 Check that the burner injector pressures are zero ± 0.25mbar (±0.1in.wg.) Adjust if necessary.
(see fig 6 for adjustment instruction)

4.18 Check operation of thermostat controllers a number of times, allowing the burner ignition cycle to complete each time, checking that each burner relights.

4.19 Reset thermostat controllers to required setting (see section 15 of Installation instructions).

4.20 Check correct setting and operation of time clock (see section 15 of Installation instructions)

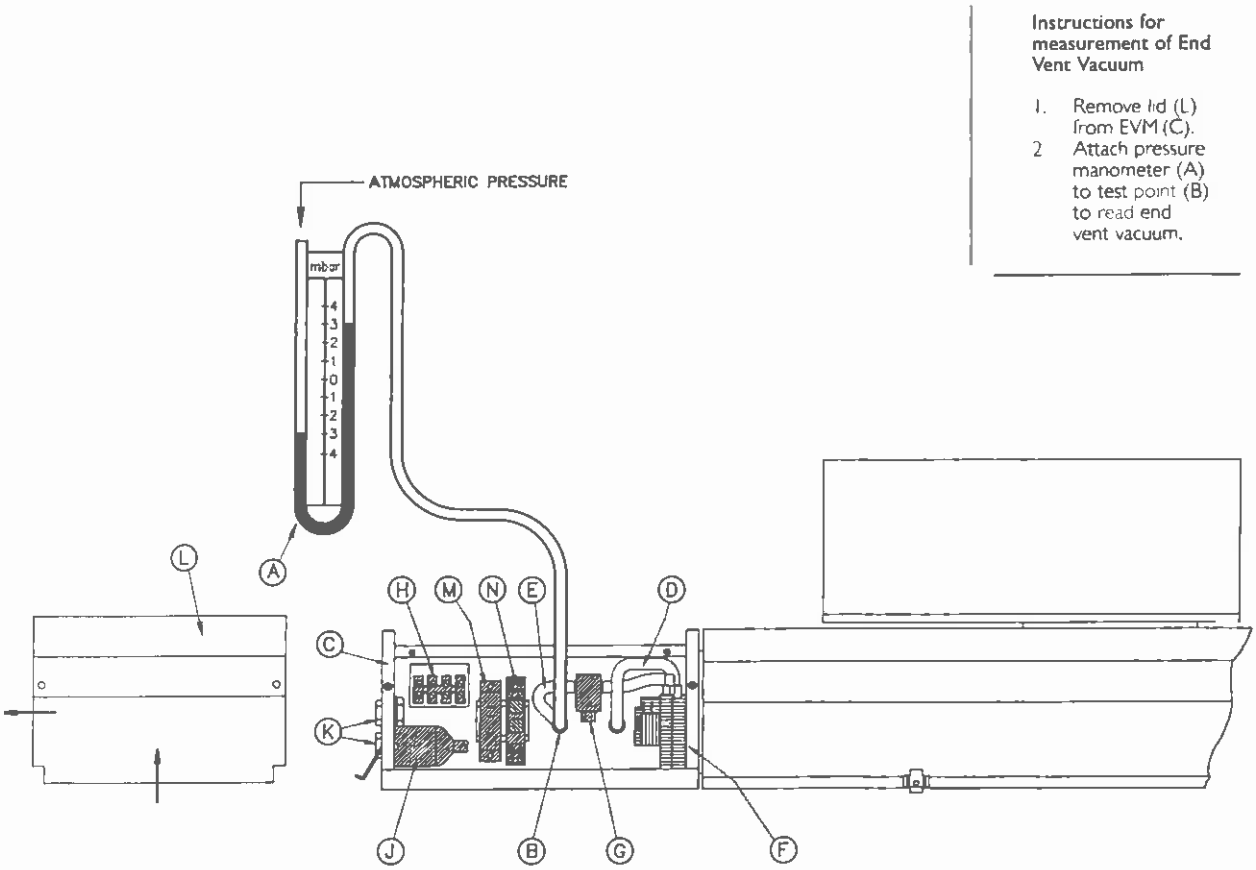
4.21 With all burners firing check the inlet gas pressure at the burner furthest away from the gas supply. The minimum inlet pressure is 12mbar (4.8in.wg.)
The difference between gas pressure at the burner, with all the burners on and all the burners off should not be more than 2.5mbar (1in.wg.)

4.22 Take gas consumption meter readings for each separate NRV system or building heated ensuring all other loads are off.

4.23 After the system has reached equilibrium take the following measurements
(a) The fluegas temperatures entering the vacuum fan. The fluegas sample point (E) located on the vacuum fan tee is used (see fig 3)
(b) The surface temperature of the underside of the tube at the end of each radiant branch.
(c) The surface temperature of the underside of the tube at a point directly underneath each combustion chamber suspension lug.

4.24 Complete service report sheet.

FIG. 5 END VENT VACUUM MEASUREMENT

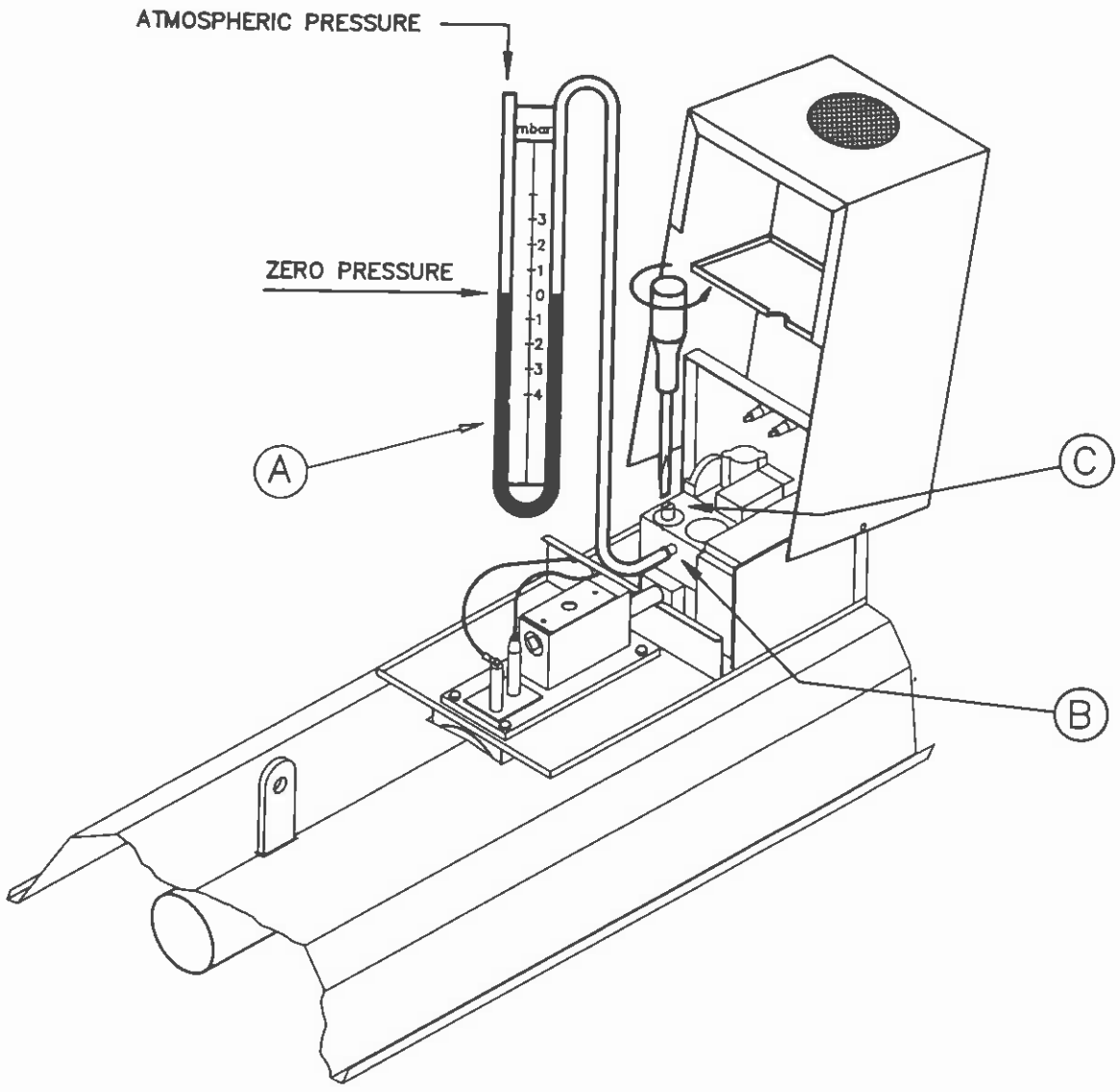


Instructions for measurement of End Vent Vacuum

1. Remove lid (L) from EVM (C).
2. Attach pressure manometer (A) to test point (B) to read end vent vacuum.

A Pressure manometer
B Vacuum test point
C End Vent Module
D Atmospheric pressure line
E Vacuum pressure line
F Air Pressure switch
G 3-way air valve
H Terminal block
J Mains input socket
K Power input socket
L Lid
M Timer
N Relay

FIG. 6 MEASUREMENT OF INJECTOR PRESSURE



A Pressure manometer

B Pressure test point

C Governor Adjustment screw

5 FAULT FINDING GUIDE

PROBLEM	CAUSE	ACTION
5.1 Vacuum fan is running but there is no power at burner. Neon lights are off.	(a) Thermostat is satisfied.	(a) Check to see that thermostat is calling for heat.
	(b) No power at burner.	(b) Check for 240v supply.
	(c) Blown fuse in supply to heater.	(c) Check and replace if necessary
	(d) End vent vacuum too low.	(d) Vacuum at end vent should be 6.25mbar. (2.5in w.g.) Check for air leaks on burner (see section 5.5).
	(e) Air pressure switch on EVM not opening	(e) Check and replace if necessary (see section 7.8).
	(f) 3-way air valve (if fitted) in EVM not opening	(f) Check and replace if necessary (see section 7.9)
	(g) No power out from EVM.	(g) Check for loose or broken wire or faulty relay.
5.2 Red neon comes on but ignition sequence does not start and Amber neon remains off.	(a) Loose or broken leads to full sequence gas controller.	(a) Check and repair
	(b) Fault in full sequence gas controller.	(b) Replace
5.3 Red neon comes on, Amber neon comes on for ignition period. Then Amber neon goes off.	(a) No ignition spark.	(a) Check for loose or broken high tension lead to spark electrode. Check spark gap and position of spark electrode (see fig 7). Check ceramic is not cracked. Check for loose earthwire connection on full sequence gas controller.
	(b) Fault in full sequence gas controller.	(b) Replace.
	(c) Insufficient gas supply to burner.	(c) Check service cock is open and gas pressure is available at inlet to gas valve.
	(d) Gas solenoid valve not opening.	(d) Check for loose or broken wires to the gas valve. Check for adequate end vent vacuum. Replace valve if necessary.
	(e) Injector pressure not set at zero.	(e) Check and adjust (see fig 6).
	(f) Incorrect aeration.	(f) Check that air shutter plate on mixing chamber is correctly positioned.
5.4 as 5.3 but burner lights for short time and then goes out. Amber neon off.	(a) Flame probe faulty or lead detached.	(a) Check for broken ceramic. Check for correct position of flame probe. (see fig 7).
	(b) Fault in full sequence gas controller.	(b) Measure flame current (see fig 8). The minimum signal is 3d.c.μA
	(c) Polarity of line and neutral incorrect.	(c) Check for correct polarity of the electrical supply.
	(d) Burner earth is poor.	(d) Check and ensure burner is correctly earthed.
	(e) Full sequence gas controller faulty.	(e) Replace.
	(f) Incorrect aeration.	(f) Check that air shutter plate on mixing chamber is correctly positioned.
5.5 End vent vacuum too low (ie. below 6.25mbar (2.5in.wg.)	(a) Branch damper closed or broken.	(a) Open branch damper until end vent vacuum is 6.25mbar (2.5in.wg.). Replace damper if necessary.
	(b) Fan rotation incorrect.	(b) Reverse two phase wires on 3 phase motors.
	(c) Fan speed wrong.	(c) Check voltage at motor. Replace if necessary.
	(d) Fan impellor loose or defective.	(d) Tighten or replace if necessary
	(e) Restriction to fan inlet.	(e) Clear restriction, repair flueduct.
	(f) Air leaks into system via poor joints	(f) Replace defective tube couplers gaskets or acoustic joints.
	(g) Insufficient fall of system towards fan allowing condensate blockage.	(g) Re-instate system fall.
	(h) Dry condensate trap.	(h) Fill trap with water to required level.

6 ROUTINE MAINTENANCE

6.1 VACUUM FAN

Inspect fan and flue ductwork for any contamination. Inspect acoustic joints for damage and replace if necessary.

6.2 TUBES

Inspect radiant tubes and fittings internally. If there is any appreciably build up of dust or deposits the tubes should be cleaned internally. If corrosion is present replace as necessary. Note: It may be necessary to determine whether chlorinated hydrocarbons are being used by the client.

6.3 TUBE COUPLERS

Inspect for evidence of holes and cracks and replace if necessary.

6.4 REFLECTORS

If necessary the reflectors may be cleaned with a soft cloth and detergent in water.

6.5 CONDENSATE TRAP

Inspect for dirt and scale and clean if necessary.

6.6 BURNER ELECTRODES

(see fig 7)

Check ceramic visually for build up of carbon or cracks. Check the spark distance and position of the electrodes relative to the burner head.

6.7 BURNER HEAD INSERT AND FLAME RETENTION GRID

(see fig 12)

Check condition of burner heads insert (7) and flame retention grid (8) and replace if necessary.

6.8 FILTER

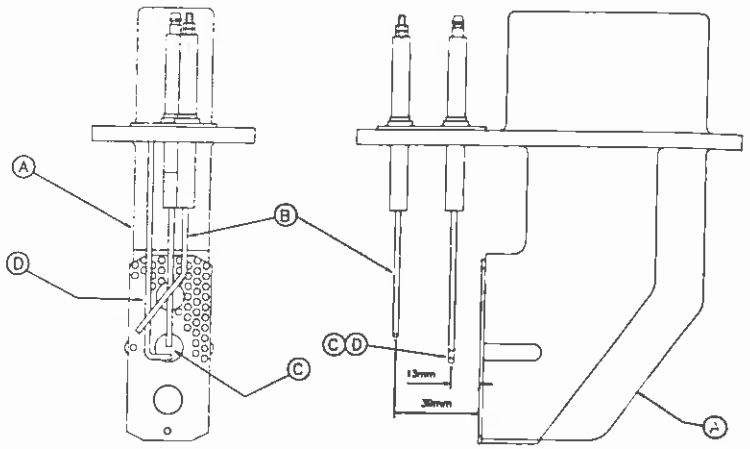
(see fig 10)

Replace if contaminated with dirt.

6.9 COMBUSTION CHAMBER VIEWING WINDOW

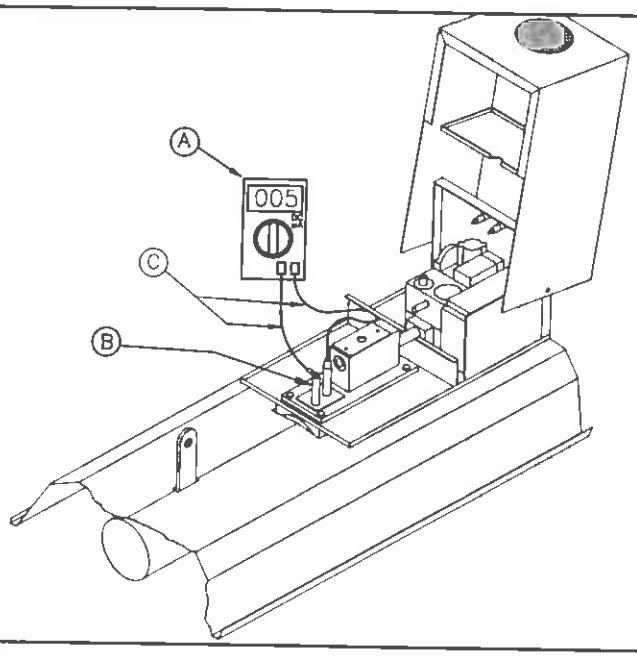
Window should be clean and free from cracks. Replace if necessary.

FIG. 7 BURNER ELECTRODE DETAIL



A Burner head
B Flame sense probe
C Spark gap 3.5mm
D Arcing rod for spark

FIG. 8 MEASUREMENT OF FLAME SIGNAL



A D.C. microammeter
B Flame sense probe
C Flame sense leads

7 REMOVAL OF COMPONENTS

7.1 REMOVAL OF BURNER ASSEMBLY (see fig 9a)

7.1.1 Disconnect electrical supply at burner mains inlet connection.

7.1.2 Turn-off gas supply at service cock and disconnect union.

7.1.3 Release and remove the four set screws (C) and washers (B) from the combustion chamber flange (F).

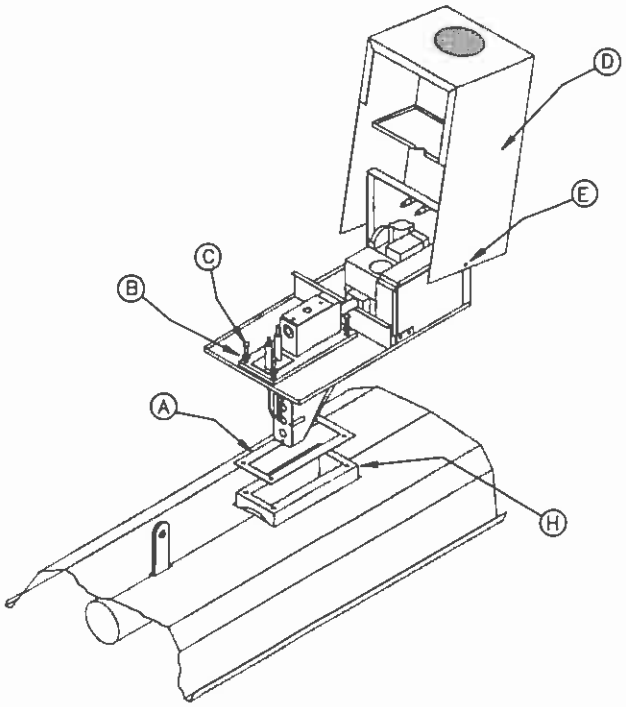
7.1.4 Retain combustion chamber gasket (A).

7.1.5 Lift burner clear of combustion chamber and withdraw.

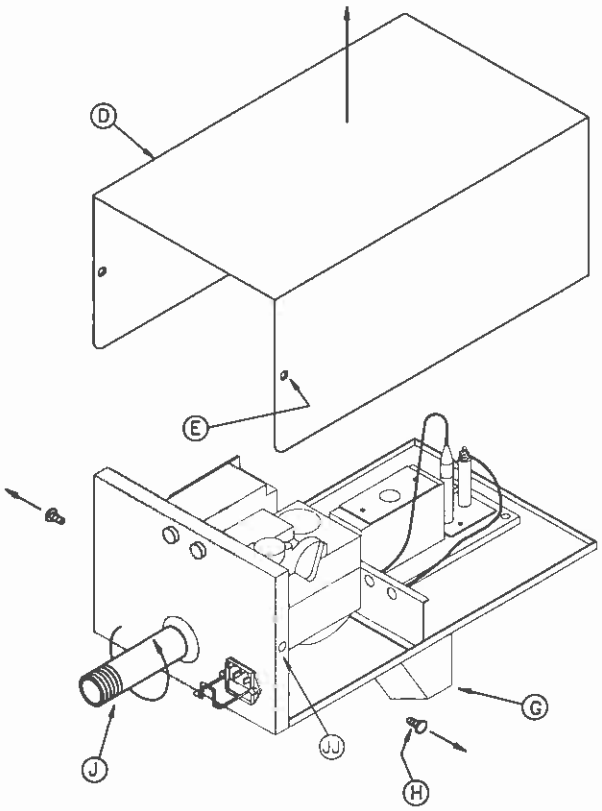
7.1.6 When replacing do so in the reverse order ensuring that the gasket between the burner and combustion chamber (A) is undamaged or replaced.

7.1.7 Check for gas soundness.

FIG. 9 DISMANTLING BURNER ASSEMBLY TO CHANGE GAS VALVE



9a



A	Gasket	H	Set pin
B	Washer	JJ	Hank Bush
C	Nut	J	Gas inlet pipe
D	Burner housing lid	K	Set pin M5
E	Lid pivoting point	L	Set pin M3
F	Combustion chamber turret	M	Gasket
G	Burner head	N	Gas valve

7.2 REMOVAL OF GAS VALVE

7.2.1 Remove burner assembly from combustion chamber.
(see section 7.1)

7.2.2 Remove burner housing lid (d) by unscrewing set pins (h) from base plate fixings (JJ)
(see fig 9b)

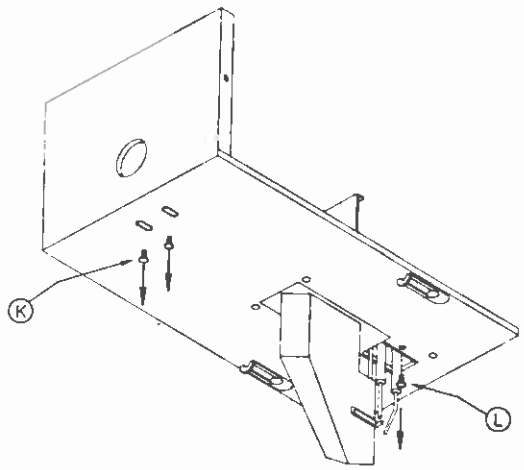
7.2.3 Secure burner head (G) and unscrew gas inlet pipe (J).
(see fig 9b)

7.2.4 Remove set screws (L) and (K) from burner base plate.
(see fig 9c)

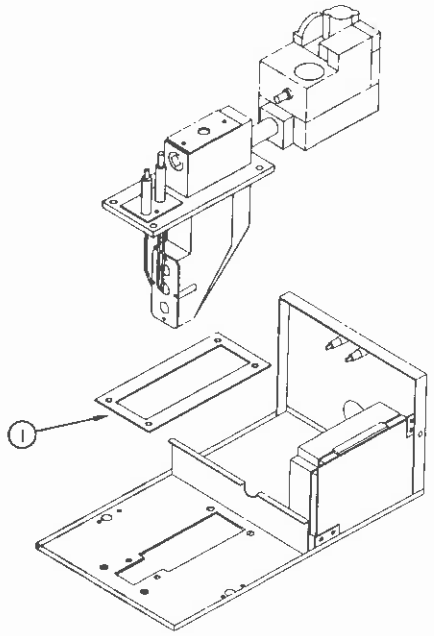
7.2.5 Withdraw burner head and valve from base plate. Retain burner gasket (M).
(see fig 9d)

7.2.6 Secure burner head (G) and unscrew gas valve (N).
(see fig 9e)

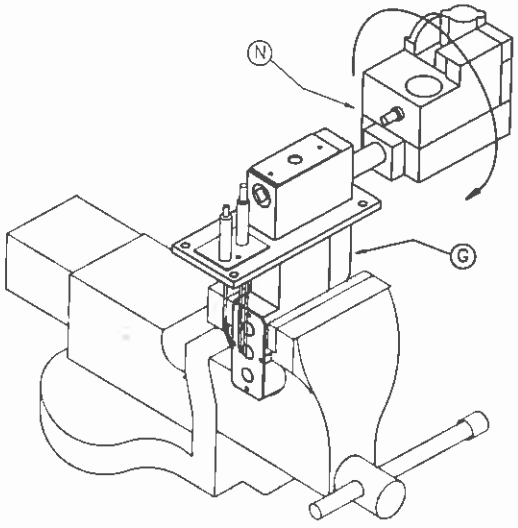
FIG. 9 DISMANTLING BURNER ASSEMBLY TO CHANGE GAS VALVE



9c



9d



9e

A	Gasket	H	Set pin
B	Washer	JJ	Hank Bush
C	Nut	J	Gas inlet pipe
D	Burner housing lid	K	Set pin M5
E	Lid pivoting point	L	Set pin M3
F	Combustion chamber turret	M	Gasket
G	Burner head	N	Gas valve

7.3 TO EXCHANGE FILTER
(see fig 10)

7.3.1 Lift the lid (A) from burner control housing.

7.3.2 Unscrew plastic thumb grip fastener (B).

7.3.3 Slide filter (C) out of location brackets.

7.4 TO REPLACE FULL SEQUENCE GAS CONTROLLER
(see fig 11)

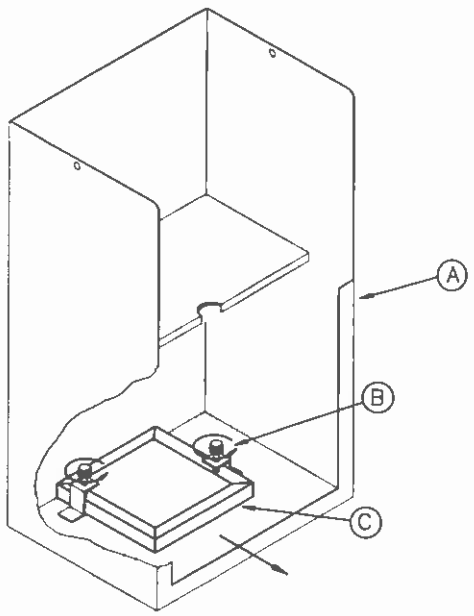
7.4.1 Disconnect electrical supply.

7.4.2 Disconnect JST connection (B).

7.4.3 Disconnect ignition wire from controller (A).

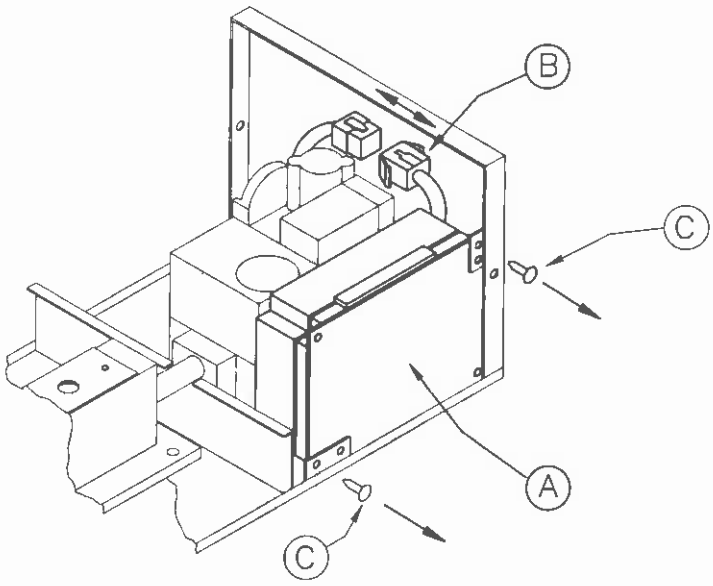
7.4.4 Release two push clips (C) from controller fixing holes.

FIG. 10 REPLACEMENT OF FILTER



A Burner housing lid
B Thumb grip screw
C Filter

FIG. 11 REPLACEMENT OF BURNER CONTROLLER



A Burner controller
B JST connection
C Plastic push clip

7.5 TO EXCHANGE ELECTRODE ASSEMBLY
(see fig 12)

7.5.1 Disconnect electrical supply.

7.5.2 Remove fixing screws (36) from electrode mounting flange (11).

7.5.3 Withdraw electrode assembly from burner.

7.6 TO CHANGE JET
(see fig 12)

7.6.1 Turn off gas and disconnect electrical supply.

7.6.2 Remove plug (22).

7.6.3 Unscrew brass jet (10). Inside mixing chamber using 8mm allen key and withdraw through ½" BSP hole.

7.6.4 Replace in reverse order.

7.7 TO CHANGE COMBUSTION CHAMBER VIEWING WINDOW
(see fig 13)

7.7.1 Turn off the system including the vacuum fan.

7.7.2 Release nuts (E), metal frame (D), gasket (C) and mica window (B).

7.7.3 Replace in reverse order.

FIG. 12 BURNER HEAD ASSEMBLY

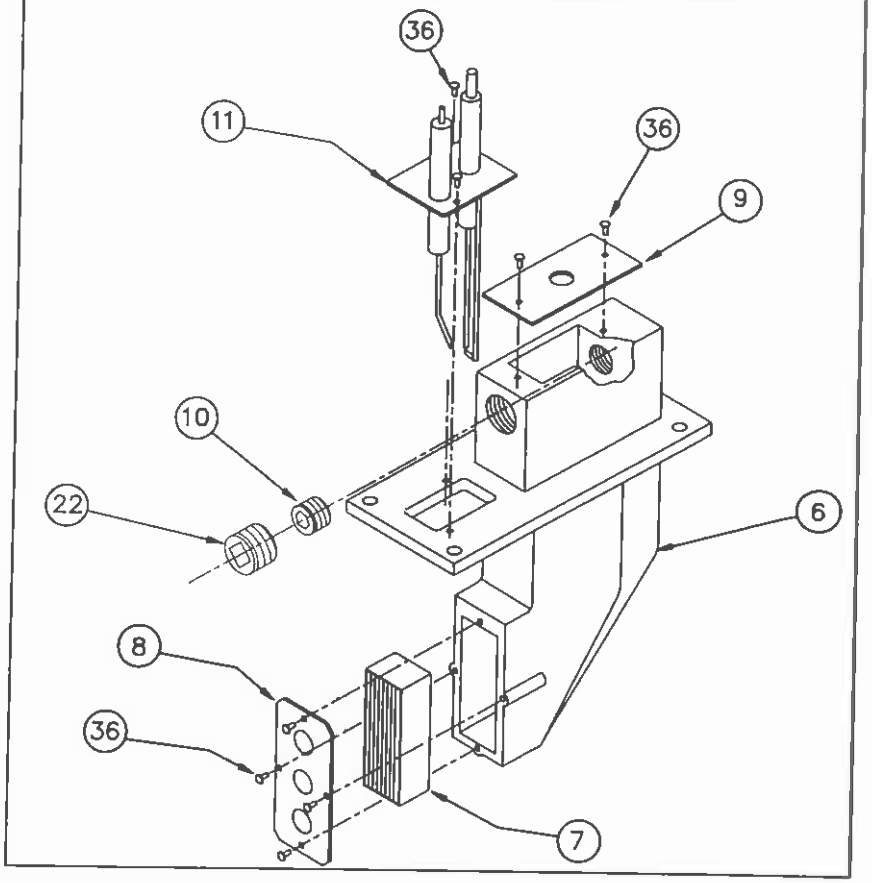
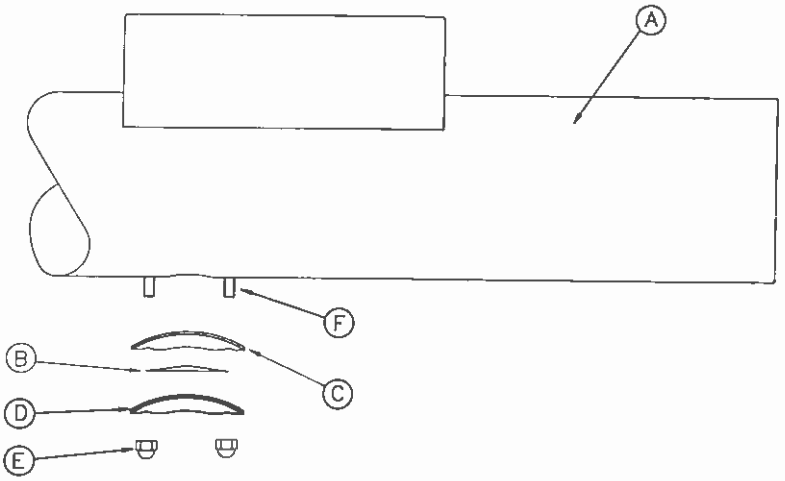


FIG. 13 REPLACEMENT OF COMBUSTION CHAMBER VIEWING CHAMBER WINDOW



A	Combustion chamber	D	Metal frame
B	Mica gland	E	Nuts
C	Gasket	F	Stud

7.8 TO CHANGE AIR PRESSURE SWITCH
(see fig 14)

7.8.1 Disconnect silicone tubing (24).

7.8.2 Unscrew 2 fixing screws (29).

7.8.3 Remove air pressure switch (5).

7.8.4 Replace in reverse order.

7.9 TO CHANGE 3-WAY AIR VALVE
(see fig 14)

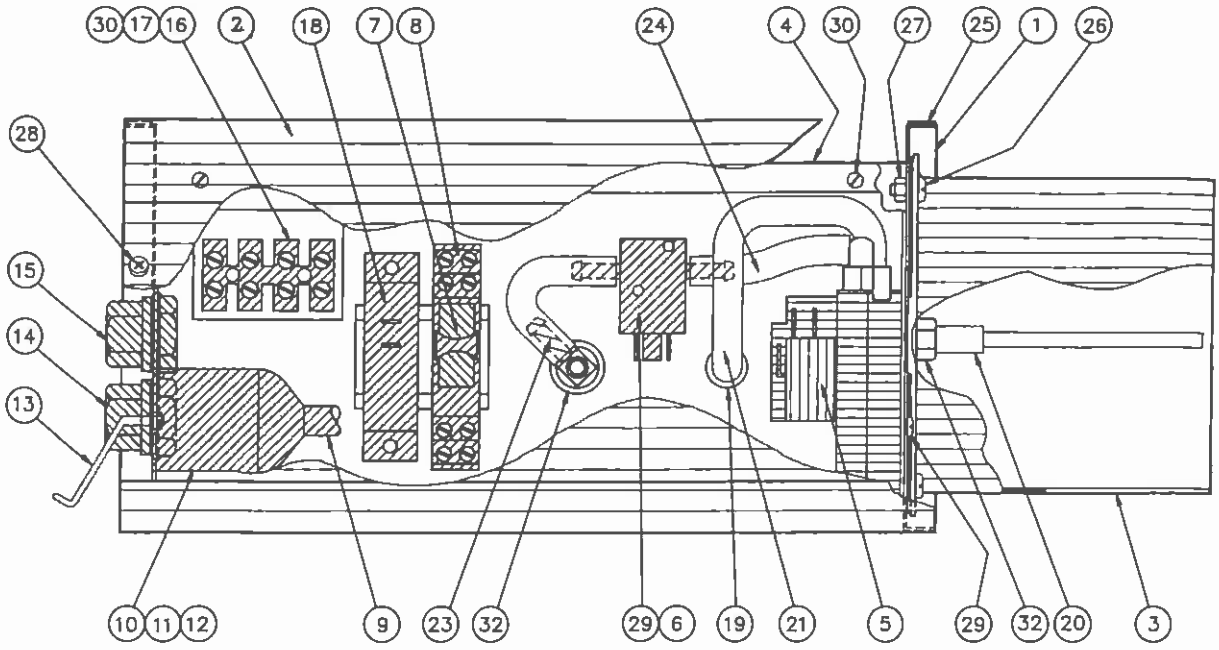
7.9.1 Disconnect silicone tubing (24).

7.9.2 Unscrew 2 fixing screws (29).

7.9.3 Remove 3-way air valve (6).

7.9.4 Replace in reverse order.

FIG. 14 END VENT MODULE ASSEMBLY



Nor-Ray-Vac®

LR SERIES OPERATING INSTRUCTIONS

1. Ensure that gas supply is turned on at each burner.
2. Switch on electrical supply to control panel.
3. Set thermostats (if fitted) to call for heat or to temperature settings required.
4. The vacuum fan will operate and at the same time the 'red' neon lights will illuminate at all mid-branch burners. After 10 seconds these burners will light with both 'red' and 'amber' neons illuminated at each burner. All end vent burners will light after a time delay of approximately 60 seconds.
5. If the lighting up sequence fails, switch off the electrical supply. After 40 seconds switch on. If lighting up fails again refer to installation and service leaflet.
6. CAUTION

   The heaters must be adequately earthed. The ignition sequence depends upon a properly earthed circuit.
7. To switch off, turn off electrical supply.

Due to continuous product innovation, AMBI-RAD reserve the right to change product specification without due notice.

AMBI-RAD®

Energy Efficient Heating Systems

AMBI-RAD LIMITED · PO BOX 30 · MUCKLOW HILL · HALESOWEN · WEST MIDLANDS B62 8DS
TELEPHONE 0121 503 0707 · FAX 0121 501 2955

DOC REF NRV/044/0495