

installation and service manual  
**CE** gas-fired unit heaters  
 models PDE  
 G20, G31

0120



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**⚠ WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death, and could cause exposure to substances which have been determined by various agencies to cause cancer, birth defects or other reproductive harm. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

**FOR YOUR SAFETY**

The use and storage of gasoline or other flammable vapours and liquids in open containers in the vicinity of this appliance is hazardous.

To prevent premature heat exchanger failure do not install ANY gas fired units in areas where chlorinated, halogenated or acid vapours are present in the atmosphere.

**IMPORTANT**

The use of this manual is specifically intended for a qualified installation and service agency. All installation and service of these units must be performed by a qualified installation and service agency.

**FOR YOUR SAFETY**

If you smell gas:

1. Open windows
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

THIS MANUAL IS THE PROPERTY OF THE OWNER. PLEASE BE SURE TO LEAVE IT WITH THE OWNER WHEN YOU LEAVE THE JOB.

**Inspection on Arrival**

1. Inspect unit upon arrival. In case of damage, report immediately to transportation company, and your local sales representative.
2. Inspect unit received for conformance with description of product ordered.

# INSTALLATION

## SPECIAL PRECAUTIONS

**THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO ENSURE SAFE, EFFICIENT AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY DAMAGE OR LOSS, PERSONAL INJURY, OR DEATH.**

1. Any power supply must be disconnected before making wiring connections to prevent electrical shock and equipment damage. All units must be wired strictly in accordance with the wiring diagram (see Fig. 6 page 9).
2. The gas supply must be turned off before commencing installation of the heaters. An isolating union gas cock or union and isolating gas cock **MUST** be fitted before the inlet to the gas valve to allow replacement of parts.
3. The gas supply pressure to the unit heater controls must never exceed 45mbar.  
When leak testing the gas supply system, the unit, and its combination gas control, must be isolated during any pressure testing in excess of 45mbar. The unit should be isolated from the gas supply system by closing the manual shutoff valve.
4. Start-up and adjustment procedures should be performed by a qualified engineer. The gas inlet pressure should be checked upstream of the combination gas control. The inlet pressure should be at least 20mbar on natural gas or 37mbar on propane. Purging of gas piping should be performed as described in IM2. Supply pressure and setting pressure must be checked with heater in operation when making final adjustments.
5. All units must be flued to outside.
6. The units **MUST NOT** be installed in potentially explosive or flammable atmospheres laden with grain dust, sawdust or similar airborne materials.
7. Installation of units in high humidity or salt water atmospheres should be avoided as this will cause accelerated corrosion resulting in a reduction of the normal life span of the units.
8. To prevent premature heat exchanger failure do not locate **ANY** gas fired unit in areas where chlorinated, halogenated or acid vapours are present in the atmosphere.
9. Do not install units in extremely draughty locations. Draughts can cause burner flames to impinge on the heat exchanger thereby shortening its life. Separation between units should be maintained to avoid discharge from one unit entering the inlet of another.
10. Do not install units in tightly sealed rooms or small compartments without provision for adequate combustion air and venting. Combustion air must have access to the space through a minimum of two permanent openings in the enclosure, one near the bottom and the other near the top. They should provide a free area of at least the values given in Section 2.2 'Ventilation'.
11. Do not install units outdoors
12. For all sizes, required minimum clearance to combustible materials from the bottom of the unit is 300mm (however see page 2 section 16 which may require greater clearances for servicing) and from the sides 450mm. For PDE units sizes 30-50 minimum clearance from the top is 25mm and from the flue collar 50mm; for PDE units sizes 75-300 minimum clearance from the top is 50mm and from the flue collar is 75mm; for PDE unit 350 minimum clearance from the top is 75mm and from the flue collar is 100mm, for PDE unit 400 minimum clearance from the top is 100mm and from the flue collar is 125mm.
13. At least 150mm clearance at the sides and 300mm clearance at rear (or 150mm beyond end of motor at rear of unit, whichever is greater) must be allowed to provide sufficient air for combustion and correct operation of the fan. However see page 2 section 12 for clearances to combustible material.
14. The minimum distance required from combustible materials is based on the combustible material surface not exceeding 70°C. Clearance from the top of the unit may be required to be greater than 150mm if heat damage, other than fire, may occur to materials above the unit heater at the temperature described.
15. PDE unit heaters are designed for use in heating applications with ambient temperatures between 0°C and 32°C. If an application exists where ambient temperatures can be expected to fall outside of this range, contact your local sales representative for recommendations.
16. Clearance must be provided for opening hinged bottom for servicing. See Figure 1. Do not stand unit on its base.
17. To ensure that flames do not impinge on heat exchanger surfaces, the unit must be suspended in a vertical and level position. Failure to suspend a unit properly may shorten its life.
18. The unit heater must not be lifted by its gas controls or gas manifold.
19. Ensure there are no obstructions which block air intake and discharge of the unit heater.
20. Do not attach duct work or air filters to any PDE model unit heaters.
21. In aircraft hangars, the bottom of the unit must be at least 3m from the highest surface of the wings or engine enclosures of the highest aircraft housed in the hangar and the installation must be in accordance with the requirements of the enforcing authority.
22. In garages or other sections of aircraft hangars such as offices and shops which communicate with areas used for servicing or storage, the bottom of the unit must be at least 1.8m above the floor.
23. The piping, electrical, ventilation and flueing instructions in this manual should be carefully read before commencing installation.
24. All literature shipped with the unit should be kept for future use for servicing or service diagnosis. None of the literature shipped with the unit should be discarded.
25. Only approved service replacement parts should be used when servicing or repairing these unit heaters. A complete replacement parts list may be obtained by contacting your appliance supplier. The data plate on the unit gives the unit model number, serial number and company address. Any substitution of non-approved parts or controls is at the owners risk and may invalidate the EC Certification.
26. Always turn off the gas supply at the gas cock and disconnect the electricity supply to the appliance before servicing or replacing any components.
27. These unit heaters will normally be controlled by a room thermostat. Harry Taylor have available a proportional temperature controller (PTC-1) which can be used to provide this control. If a room thermostat is to be used contact Harry Taylor for details of suitable models.

# MODINE GAS FIRED UNIT HEATERS PDE MODELS

## GENERAL INTRODUCTION

These instructions are for the PDE unit set up as a Category I<sub>2H</sub> heater to use natural gas (G20) at a nominal supply pressure of 20mbar. This is one of its many CE certified forms. Information on the PDE unit set up as a Category I<sub>3+</sub> heater to use propane (G31) at a nominal supply pressure of 37mbar, another certified form, is given in Table 4, page 12. **Heaters must not use gases other than those for which they were designed and built.**

These instructions should be read thoroughly before commencing installation of the appliance.

It is the law that all gas appliances are installed by competent persons, e.g. CORGI Registered, in accordance with the Gas Safety (Installation and Use) Regulations 1984 (As Amended). Failure to install the appliance correctly could lead to prosecution and it is therefore in your interest, and that of safety, to ensure the law is complied with.

The installation of the appliance must be in accordance with

the current I.E.E. Regulations (BS 7671), and relevant requirements of the local gas region, local authority, British Standard Codes of Practice and Building Regulations.

### See also:

BS 6891 Installation of Low Pressure Pipework.

BS 6230 Installation of Gas Fired Forced Convection Air Heaters for Commercial and Industrial Space Heating.

### British Gas Publications:

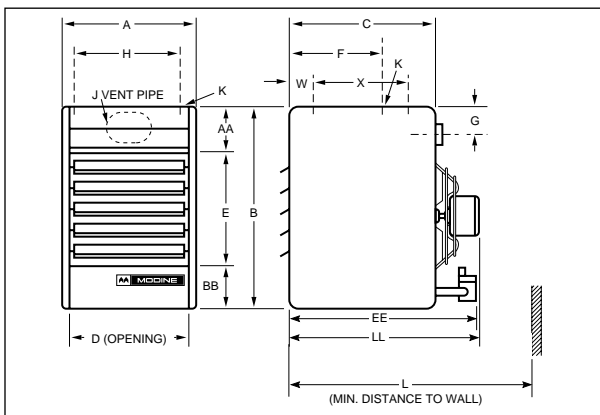
IM 2 Purging Procedures of Non-Domestic Gas Boilers.

IM 5 Soundness Testing Procedures for Non-Domestic Gas Installations.

IM 11 Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters.

IM 16 Guidance Notes for the Installation of Gas Pipework.

**TABLE 1. TECHNICAL DATA**  
**DIMENSIONS PERFORMANCE — PDE**



### Dimensions (mm)

Dimension Symbol	Model Number -PDE											
	30	50	75	100	125	150	175	200	250	300	350	400
A	327	438	438	489	489	533	597	651	651	727	854	1,016
B	616	616	730	730	895	895	895	1,022	1,022	1,022	1,022	1,022
C	375	375	508	508	559	559	559	635	635	635	635	635
D	265	376	376	427	427	472	535	589	589	665	792	953
E	330	330	406	406	508	508	508	610	610	610	610	610
F	235	235	279	279	305	305	305	343	343	356	—	—
G	51	51	70	70	92	92	92	111	111	111	108	108
H	235	346	346	397	397	448	505	559	559	635	762	924
AA	127	127	159	159	203	203	203	229	229	229	229	229
BB	159	159	165	165	184	184	184	184	184	184	184	184
J (Inches)	3"	4"	5"	6"	6"	7"	7"	7"	8"	9"	10"	10"
K'	M10											
Gas Conn. "	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4
W	—	—	—	—	—	—	—	—	—	—	127	127
X	—	—	—	—	—	—	—	—	—	—	406	406
L <sup>2</sup>	718	718	914	914	927	943	943	1,038	1,041	1,073	1,073	1,200
LL	448	457	590	599	650	669	699	775	775	797	797	797
EE	565	565	737	737	775	775	775	835	835	835	835	835
Fan Diameter	228	305	305	348	348	408	458	508	508	560	560	650
Approx. Weight (kg)	26.4	32.7	46.4	52.7	69.1	73.6	76.8	105	105	118.6	150	186.4

<sup>1</sup> PDE30 to PDE300 inclusive - 2 holes (and the level hanging adjustment feature). PDE350 and PDE400 - 4 holes.

<sup>2</sup> Dimension equals overall plus 150mm.

**NOTE: NOT ALL MODELS ARE AVAILABLE IN THE UK. CHECK WITH YOUR SUPPLIER.**

**TABLE 2**

Performance — natural gas only. See page 12 for propane details.

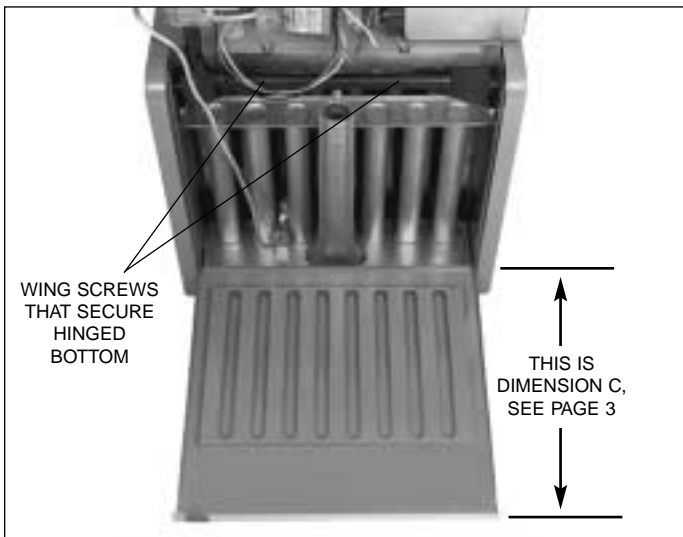
	Model Number-PDE											
	30	50	75	100	125	150	175	200	250	300	350	400
Heat Input (gross) kW*	8.8	14.7	22.0	29.3	36.6	44.0	51.3	58.6	73.3	87.9	102.6	117.2
Heat Input (net) kW*	7.9	13.2	19.8	26.4	32.6	39.6	46.2	52.7	66.0	79.1	92.3	105.5
Output kW*	7.0	11.7	17.6	23.4	29.3	35.1	41.0	46.9	58.6	70.3	82.0	93.8
Burner set. press. mbar	7.0	6.7	6.8	6.7	6.5	6.1	5.7	7.1	5.5	7.2	6.5	6.4
Injector - No.	1	1	1	2	2	2	3	3	3	4	5	6
Diam. mm	2.71	3.45	4.30	3.45	3.91	4.30	3.86	3.86	4.7	4.22	4.22	4.09
Marking	36	29	18	29	23	18	24	24	13	19	19	20
Gas rate m³/h	0.82	1.36	2.04	2.72	3.39	4.08	4.76	5.43	6.8	8.15	9.51	10.87
Approx. flue gas vol. in secondary flue* 3.7% CO <sub>2</sub> & 100°C 1/sec	9	14	21	29	36	43	50	57	71	86	100	114
Air flow m³/sec	0.21	0.35	0.51	0.69	0.87	1.03	1.20	1.36	1.75	2.10	2.34	2.66
Outlet velocity m/sec	2.6	3.2	3.7	4.3	4.4	4.7	4.8	4.1	5.3	5.7	5.6	5.3
Air Temp rise °C	27	27	28	27	27	28	28	28	27	27	28	28
Mounting ht. (max) m	2.1	2.7	3.7	4.3	4.3	4.9	5.2	4.6	5.8	6.4	6.1	6.7
Heat throw (at max mount. ht.) m**	7.6	10.1	12.5	14.9	15.5	16.8	18.0	15.5	20.4	22.6	21.9	23.2
Power supply	230V 50Hz											
Power use (watts)	125	150	200	225	400	450	450	400	750	850	950	1,200

\* Based on natural gas - typical calorific value 37.78 MJ/M³.

\*\* At 18°C ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit.

NOTE: NOT ALL MODELS ARE AVAILABLE IN THE UK. CHECK WITH YOUR SUPPLIER.

**Figure 1**  
**Hinged Base for Servicing**  
(See Dimension "C", page 3)



## INSTALLATION

### 2.1 Positioning Unit Heaters

#### **⚠ CAUTION**

Units must not be installed in potentially explosive, flammable, or corrosive atmosphere. To prevent premature heat exchanger failure do not locate ANY gas fired unit in areas where chlorinated, halogenated or acid vapours are present in the atmosphere.

When siting units, consider general spaceheating requirements, availability of gas, and proximity to flue locations. Unit heaters should be positioned so heated air streams wipe exposed walls without blowing directly against them. In multiple unit installations, arrange units so that each supports the air stream from another, setting up circulatory air movement in the area, but maintain separation between units so discharge from one unit will not be directed into the inlet of another. In buildings exposed to prevailing winds, a large portion of the heated air should be directed along the windward wall. Avoid interference to air streams as much as possible. Mounting height (measured from bottom of unit) at which unit heaters are installed is critical. Maximum mounting heights are listed in the Table 1 on page 3.

The maximum mounting height for any unit is that height above which the unit will not deliver heated air to the floor. The maximum mounting heights must not be exceeded in order to ensure maximum comfort. PDE unit heaters are designed for use in heating applications with ambient temperatures between 0°C and 32°C. If an application exists where ambient temperatures can be expected to fall outside this range, contact your local sales representative for recommendations.

## 2.2 Ventilation

Safe, efficient and trouble free operation of conventionally flued appliances is vitally dependent on the provision of an adequate supply of fresh air to the room in which the appliance is installed.

In buildings having a design air change rate of less than 0.5/h, and where indirect fired heaters are to be installed in heated spaces having volume less than:

- (a) 4.7 m<sup>3</sup> per kilowatt of total rated heat input for heaters fitted with natural draught burners: or
  - (b) 2.2 m<sup>3</sup> per kilowatt of total rated heat input for heaters fitted with forced or induced draught burners;
- grilles shall be provided at low level (i.e. below the level of the appliance flue connection); except that:
- (1) for heaters of heat input less than 60 kW, the total minimum free area shall be not less than 4.5 cm<sup>2</sup> per kilowatt of rated heat input; or
  - (2) for heaters of heat input 60 kW or more, the total minimum free area shall not be less than 270 cm<sup>2</sup> plus 2.25 cm<sup>2</sup> per kilowatt in excess of 60 kW rated heat input.

*Most traditional building constructions will provide air changes of at least 0.5/h without the need for ventilation openings. In the case of a building having an air change rate less than 0.5/h, low level ventilation will be necessary.*

*For indirect heaters installed in buildings with a design air change rate of 0.5/h or greater, and where the volume of the heated space is greater than 4.7 m<sup>3</sup> per kilowatt of total rated heat input, as appropriate, additional high and low level ventilation will not be required.*

## 2.3 Unit Suspension

The most common method of hanging PDE unit heaters is to utilize M10 threaded rod. On each piece of threaded rod used, screw a nut about 25mm onto the end of the rods that will be screwed into the unit heater. Then put a washer over the end of the threaded rod and screw the rod at least 5 turns, and no more than 10 turns, into the weld nuts on the top of the heater. Tighten the nut first installed onto the threaded rod to prevent it from turning. Drill holes into a steel channel or angle iron at the same centreline dimensions as the heater that is being installed. The steel channels or angle iron pieces need to span and be fastened to appropriate structural members. Cut the threaded rods to the preferred length, push them through the holes in the steel channel or angle iron and secure with washers and lock nuts or lock washers and nuts. A double nut arrangement can be used here instead of at the unit heater (a double nut can be used at both places but is not necessary). The entire means of suspension must be adequate to support the weight of the unit (see page 3 for unit weights).

For proper operation, the unit must be installed in a level horizontal position. Clearances to combustibles as specified below must be strictly maintained. The heaters must not be installed above the maximum mounting height shown in Table 2 on page 4.

### ⚠ CAUTION

For all sizes, required minimum clearance to combustible materials from the bottom of the unit is 300mm (but see 2.1.16) and from the sides 450mm. For PDE units sizes 30-50 minimum clearance from the top is 25mm and from the flue collar 50mm; for PDE units sizes 75-300 minimum clearance from the top is 50mm and from the flue collar is 75mm; for PDE unit 350 minimum clearance from the top is 75mm and from the flue collar is 100mm; for PDE unit 400 minimum clearance from the top is 100mm and from the flue collar is 125mm. Allow at least 300mm clearance at the rear or 150mm beyond the end of motor (whichever is greater) to provide sufficient air for combustion and correct operation of the fan. Provide clearance for opening at the hinged bottom for servicing. See Figure. 1.

On all units, except the PDE 350 and PDE 400, two M10 tapped holes are located in the top of the unit to receive threaded rods.

Units with two point suspension, models PDE30 to PDE300, incorporate a level hanging feature.

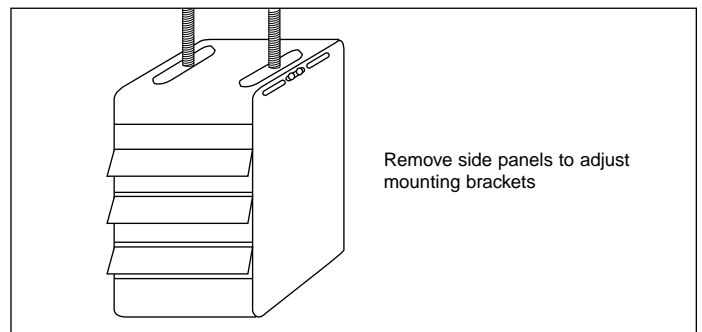
PDE30 to PDE300 units that do not hang level after being installed, can be corrected in place. Remove both outer side panels (screws are on back flange of side panel) exposing the (adjustable) mounting brackets (Fig.2). Loosen the set screws holding the mounting brackets in place and using a rubber mallet or something similar, tap the heater into a position where it does hang level. Tighten set screws and replace the outer side panels.

The PDE 350 and PDE 400 have four mounting holes in the top of the unit.

**To ensure that flames are directed into the centre of the heat exchanger tubes, the unit must be supported in a vertical position, with suspension hangers "UP". Check with a level.**

This is important to the operation and life of the unit.

**Figure 2**  
**Adjustable Mounting Brackets**



### ⚠ CAUTION

PDE unit heaters must be flued to outside – do not operate without a flue. A built in draught diverter is fitted – additional external draught diverters are not required or permitted.

## 2.4 Flue System

To ensure safe and satisfactory operation of the heater, the flue system must be capable of the complete evacuation of flue products at all times. The height of the flue terminal above the draught diverter must be at least 2m and for this height no more than 0.6m horizontal run may be installed immediately after the appliance outlet. For greater heights 0.3m horizontal run may be added for each extra metre of flue height.

The chimney must terminate in a downdraught free zone. Compliance with the recommendations made in BS.6644; British Gas publication IMII Flues for Commercial and Industrial Gas fired boilers and gas heaters' and the 'Third Edition of the 1956 Clean Air Memorandum' should be strictly observed where applicable.

The flue/chimney design should avoid the formation of excessive quantities of condensate and for this reason it is recommended that all chimneys are suitably insulated and lined.

Drain points should be fitted at the bottom of all vertical flue sections. Drain pipes must be a minimum of 25mm internal diameter and manufactured from acid condensate resistant materials (e.g. stainless steel) and positioned so that pipe runs and discharge points are not subject to the effects of frost and that flue gases cannot leak into the room.

Any terminal fitted must be an approved type.

Do not use a flue smaller than the flue pipe connection on the unit. Flue should be stainless steel, aluminum or other suitable corrosion resistant material.

Install with a minimum upward slope from unit of 20mm per metre and suspend securely from overhead structure at points no greater than 1 metre apart. For best flue operation, install the vertical flue as close to the unit as possible. Avoid running flue through unheated space when possible. When it does pass through an unheated space, it is recommended that double walled flue pipe is used. If single wall is used, insulate runs of greater than 1.5m to minimize condensation. Use insulation that is noncombustible with a rating of not less than 200°C.

Keep single wall flue pipe at least 150mm from combustible material (see page 2 section 12 for permissible reductions). For double wall pipe maintain clearances listed in manufacturer's literature. The minimum distance from combustible material is based on the combustible material surface not exceeding 70°C. Clearance from the flue connector, or top of unit may be required to be greater than the minimum clearance if heat damage other than fire (such as material distortion or discoloration) may occur. Where the flue passes through a combustible floor or roof, a metal sleeve 100mm greater than the flue diameter is necessary. If there is 2m or more of flue pipe in the open space between the unit and where the flue pipe passes through the floor or roof, the sleeve need only to be 50mm greater than the diameter of the flue pipe. If a sleeve is not used, all combustible material must be cut away to provide the specified clearance to combustibles. Any material used to close the opening must be noncombustible.

The top of the vertical flue should extend at least 600mm above the highest point where it passes through a roof and at least 600mm higher than any portion of a building within a horizontal distance of 3m (see Figure 3).

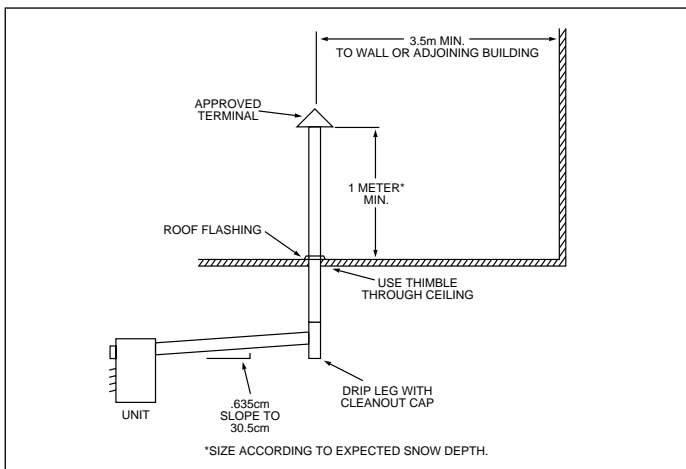
Use a flue terminal to reduce downdraughts and moisture in the flue.

Check flue system to see that combustion products are being satisfactorily cleared. Operate unit for several minutes and then pass a lighted match around the edge of the diverter relief opening. If the flame is drawn into the opening, the system is drawing properly. If not, make adjustments to provide adequate draught.

#### ADDITIONAL REQUIREMENTS FOR FLUEING INTO AN EXISTING MASONRY CHIMNEY

In the case of brick or similar structures a stainless steel rigid or flexible flue liner (grade 304/316) may be used in conjunction

**Figure 3**  
**Unit Heater Installation**



with a 50mm (minimum) thick layer of vermiculite or perlite granules between the liner and the inner skin of the chimney body. Liners should be sealed at both the top and the bottom.

In situations where a conventional flue is inappropriate, a flue boost kit is available for all PDE models allowing up to 10 metres (or equivalent length) of horizontal flue.

## 2.5 Piping

### ⚠ CAUTION

Gas pressure to unit heater controls must never exceed 45mbar.

When leak testing the gas supply system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 45mbar. The appliance should be isolated from the gas supply system by closing the inlet manual shutoff valve.

## 2.6 Gas Supply

If there is any doubt regarding the capacity of the gas meter, the available gas pressure, the adequacy of existing service pipes or the size required for new service pipes then the advice of the gas supplier should be requested. Installation pipework should be fitted and tested for gas soundness in accordance with BS. 6891 for small installations or IGEUP1 and IGEUP2 for large installations.

The local gas supplier must be consulted if it is necessary to employ a gas pressure booster.

An isolating union gas cock or union and isolating gas cock **MUST** be fitted before the inlet to the gas valve to allow replacement of parts.

Before installation, check that the local distribution conditions, nature of gas and pressure, and the current state of adjustment of the appliance are compatible.

## 2.7 Electrical Supply

### ⚠ CAUTION

Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage. ALL UNITS MUST BE WIRED STRICTLY IN ACCORDANCE WITH WIRING DIAGRAM SUPPLIED WITH HEATER. ANY WIRING DIFFERENCE FROM WIRING DIAGRAM MAY BE HAZARDOUS TO PERSONS AND PROPERTY.

**THIS APPLIANCE MUST BE CORRECTLY EARTHED.**

A 230V~50 Hz mains supply is required, fused at 5 amps (PDE 350 and 400 10 amps).

Wiring external to the appliance **MUST** be in accordance with I.E.E. (BS. 7671) Wiring Regulations and any local regulations which apply.

The mains wiring to the appliance must be fixed, PVC insulated and the wires should be between 1 and 2.5 mm<sup>2</sup> cross sectional area.

The mains wiring inlet to the junction box is in the base of the box and the installer **MUST** fit a suitable strain relief bush to this hole.

### 3. COMMISSIONING

## ⚠ CAUTION

Start-up and adjustment procedures should be performed by a qualified engineer.

Before commencing commissioning:

Ensure that the electrical supply is off.

Extinguish all naked lights and open all doors and windows. **DO NOT SMOKE.** Check that the gas supply is turned on at the meter and that the main gas cock is open. Loosen the union and allow air to be purged from the gas line until gas is smelled. Tighten the union. See BS 6891 and/or IM 2 for further details. Turn off the gas supply and connect a manometer to the test point at the outlet of the combination gas control. Turn on the gas supply. Check for gas soundness.

#### 3.1 Pre-operational Checks

Although this unit has been assembled and fired at the factory, the following pre-operational procedures should be performed to ensure correct on site operation:

Check burner for alignment.

Check fan clearance. Fan should not contact casing when spun by hand.

Check all electrical connections to ensure they are secure.

Check that all horizontal deflector blades are open a minimum of 30° as measured from vertical.

#### 3.2 Lighting Instructions

3.2.1. Set room thermostat to lowest setting

3.2.2. Drop down the bottom pan (see 4.1.1 page 8). Set gas control knob to PILOT and push in while lighting the pilot with gas match or taper. Hold in for 1/2 minute after pilot is lit.

3.2.3. Check pilot flame adjustment. The pilot burner is fitted with an injector such that it will operate correctly with an inlet pressure of 15-20 mbar on natural gas and 37mbar on propane but final adjustment must be made after installation. Adjust to have a soft steady flame 20-25mm long and encompassing 8 to 12mm of the tip of the thermocouple. Normally this flame will produce satisfactory results. To adjust flame use the pilot adjustment screw on combination gas control (for location, see Figure 4). If the pilot flame is longer and larger than shown by Figure 5 it is possible that this will cause soot and/or impinge on the heat exchanger causing burnout. If the pilot flame is shorter than shown it may cause poor ignition and result in the controls not opening the combination gas control. A short flame can be caused by a dirty pilot injector. Pilot flame condition should be observed periodically to ensure trouble free operation.

3.2.4. Move gas control knob to ON.

3.2.5. Set room thermostat to desired setting.

3.2.6. Check gas piping for leaks as described in IM 5.

## ⚠ CAUTION

Important – Supply pressure and setting pressure must be checked with heater in operation when making final adjustments.

3.2.7. Check gas input rate by measuring burner pressure using the manometer fitted to test point at the outlet of the combination gas control. Allow unit to operate for 15 minutes to stabilize. Check the pressure and if necessary adjust to the figure shown in Table 2 on page 4 for the particular model. The location of the pressure setting adjuster on the combination gas is shown in Figure 4. Remove the dust cover over the adjuster and, using a

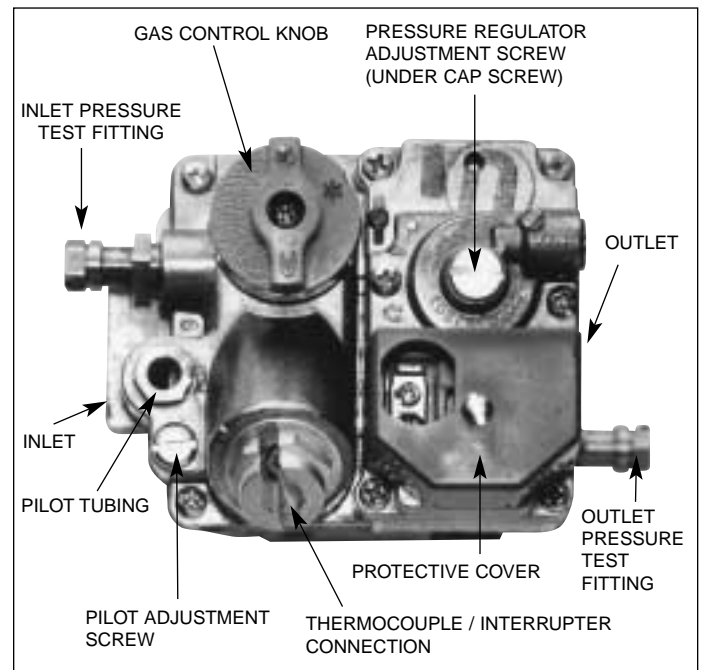
small screwdriver turn the screw beneath clockwise to increase and anti-clockwise to decrease the pressure. Allow the unit to operate for 15 minutes then check the pressure again. Replace the dust cover when finished.

Disconnect the manometer from the test point and replace the sealing screw in the pressure test nipple.

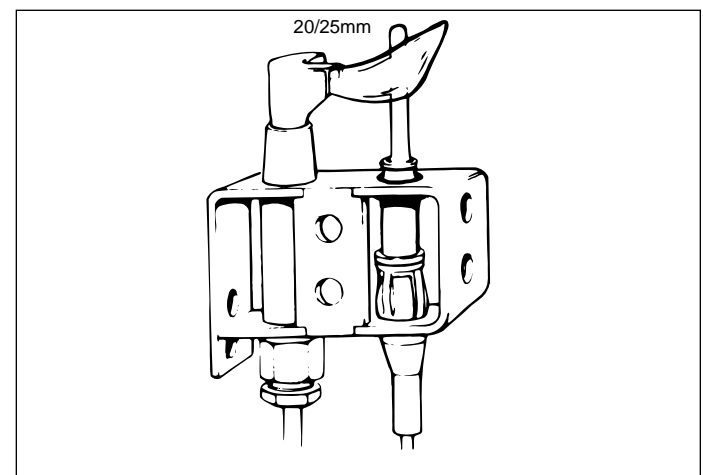
#### 3.3 Control Operating Sequence

With pilot alight, when the thermostat calls for heat, power is supplied to the combination gas control and at the same time power is supplied to the fan timer. The main burner should light immediately. The fan motor will start in 15 to 45 seconds. When the thermostat has been satisfied, power is turned off to the combination gas control and fan timer. The main burner will go out but the pilot will continue to burn. The fan motor will continue to operate for 45 to 75 seconds to allow the heat exchanger to cool down.

**Figure 4**  
**Combination Gas Control**



**Figure 5**  
**Pilot Flame Adjustment**



## 4. SERVICING

It is recommended that a full service be carried out at least once a year by a qualified heating engineer (CORGI Registered).



### CAUTION

Always turn off the gas supply at the gas cock and disconnect the electricity supply to the appliance before servicing or replacing any components.

### 4.1 Cleaning the Heater

#### 4.1.1 Main Burner

Lower bottom pan by removing wing screws on the unit base.

Disconnect pilot pipe, and thermocouple lead from multifunctional control.

Remove the two burner retaining pins holding the burner assembly in place.

**IMPORTANT: Do not attempt to remove the gas manifold to ease removal of the burner as this could seriously affect the correct operation of the appliance if it is not re-positioned exactly as intended. The assembly can now be lowered from the unit.**

**NOTE: On refitting the burner assembly ensure that the slots at the front of the burner are correctly located on their shoulder rivets and that the retaining pins are refitted in the correct location.**

Clean the burner ports (avoid using hard, sharp instruments capable of damaging the ports) and check the injector (s) for blockage. Clean carefully as necessary.

#### 4.1.2 Pilot Burner

Inspect the pilot burner and thermocouple. Ensure they are clean and in good condition.

##### Check:

- The pilot burner is securely fixed.
- The thermocouple tip is not burned or cracked. Replace if necessary.
- The pilot burner head is undamaged.
- The pilot pipe/pilot connection is gastight.

#### 4.1.3 Heat Exchanger

After removing the burner assembly clean heat exchanger tubes from bottom using a stiff brush (**not wire**).

#### 4.1.4 Fan and Motor

Remove fan guard. Check fan is securely fitted to motor shaft and for damage to blades. Clean fan blades as necessary taking care not to damage them.

**NOTE: Ensure all four fixings sleeves are fitted before re-fixing fan as overtightening could result in reduced fan life.**

#### 4.1.5 General

Check wiring for possible loose connections paying particular attention to the overheat thermostat interrupter leads.

Check air louvres in bottom pan are clean and unobstructed. Clean as necessary.

### 4.2 Overheat Thermostat

The overheat thermostat, bulb mounted on the left inner side panel (when facing front of unit) – body in junction box, will shut off the gas supply to the main burner in the event of overheating. The manual reset button is located beneath a black screw off cap positioned on the side of the junction box. See Figs. 6 and 7.

It is a single pole single throw switch. The contacts open to shut the combination gas control in the event of the unit overheating. This overheat thermostat should operate only when something is wrong with the unit. Whenever this thermostat operates, the problem should be identified and corrected immediately or serious damage may result. If the overheat thermostat cuts off the gas supply during normal operation:

1. Make sure deflector blades are open and that there are not any obstructions in the air inlet or discharge outlet.
2. Check actual input to unit against rated input.
3. Check motor is operating.
4. Check fan is not loose on motor shaft.
5. Check fan speed against motor data plate.
6. Check flue system is not damaged or blocked. Also check unit is flued correctly and that there is not a negative pressure in the building adversely affecting draught.
7. Clean heat exchanger tubes inside and out if necessary.
8. Check operation of fan delay timer.
9. If items 1 to 8 do not solve the problem, check overheat thermostat and replace if necessary.

**IMPORTANT NOTE: The overheat thermostat on this unit heater will shut off the gas should excessive discharge temperatures occur. Do not attempt to control the fan with the overheat thermostat. Any change in wiring to attempt to control the fan with the overheat thermostat will result in hazardous conditions and invalidate the warranty.**

### 4.3 Testing after Servicing

After re-assembly restore the electrical and gas supplies. Light the appliance (see Lighting Instructions on inside of casing) and check the gas connections for soundness as follows:

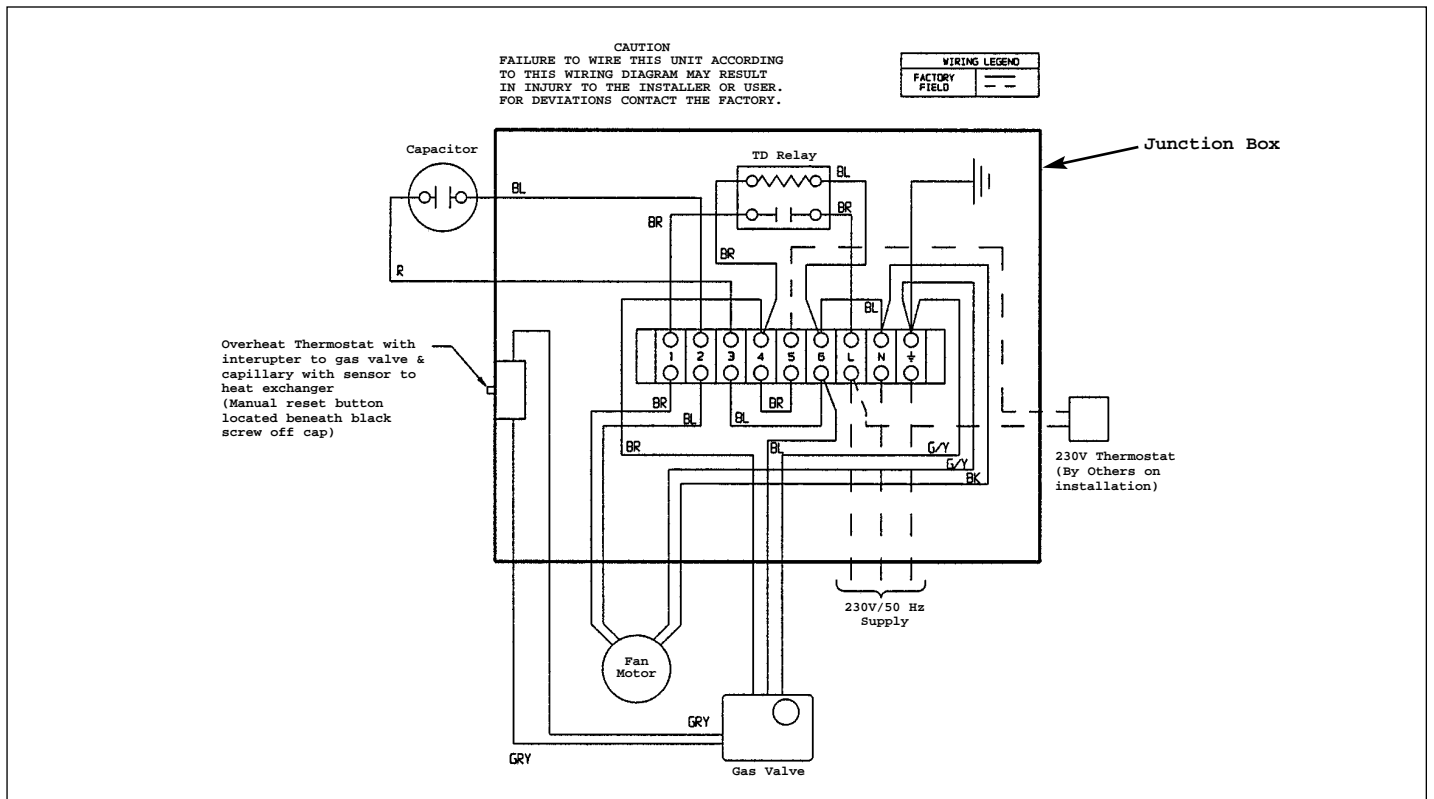
Close gas supply cock at the meter.

Remove the screw in the inlet pressure test point and connect a manometer to the test nipple. Open the gas supply cock at the meter and the appliance gas cock. Record the static pressure.

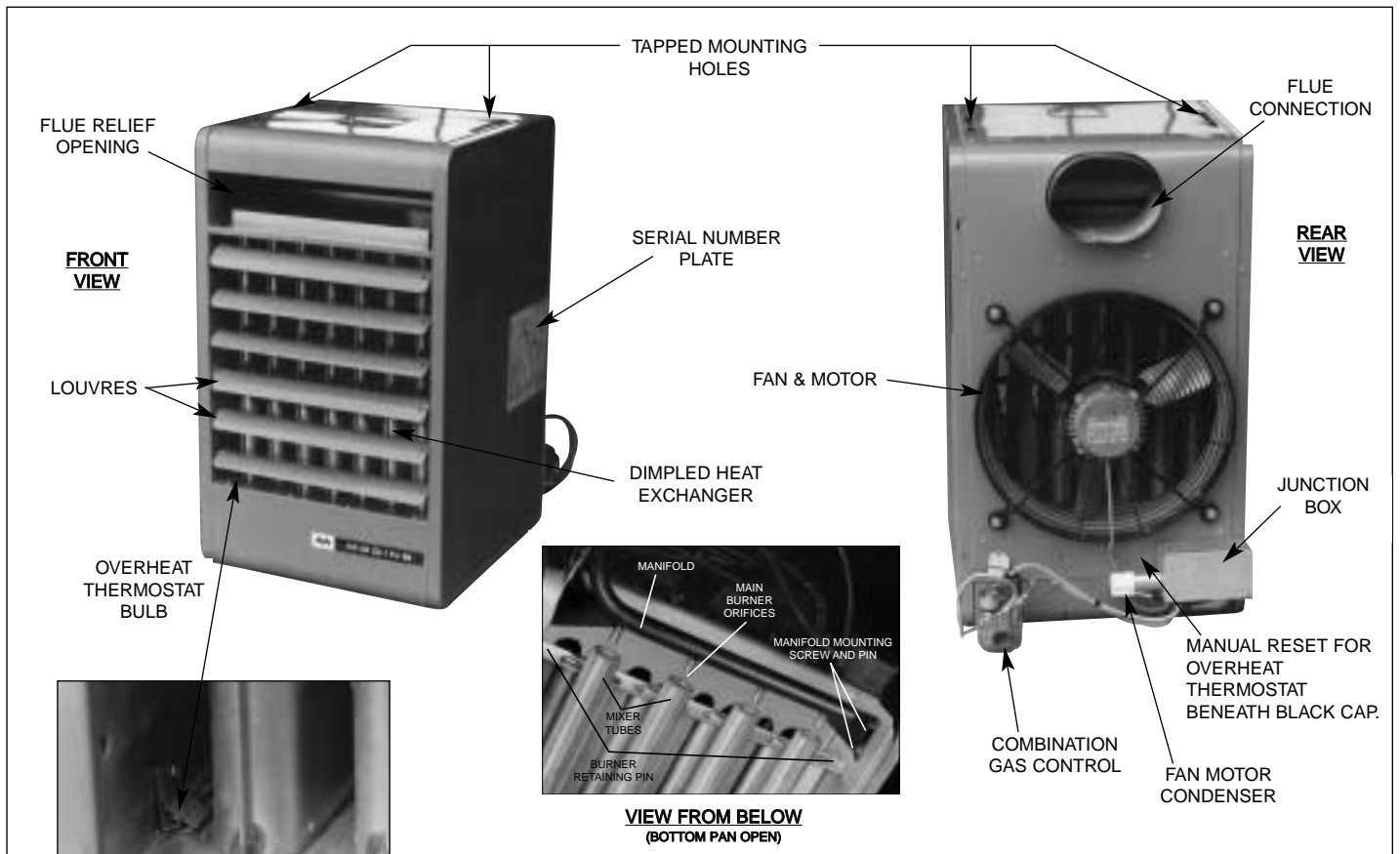
Close the gas supply cock at the meter and watch the pressure gauge for approximately 3 minutes. Any decrease in pressure (after the first minute of temperature stabilization) indicates a gas leak which must be cured (first check connection of manometer to test nipple). When satisfied remove manometer and refit test nipple sealing screw.



**Figure 6**  
**Air Heater Wiring Diagram**



**Figure 7**  
**Major Component Location**



## 5. REPLACEMENT OF PARTS



### CAUTION

Always turn off the gas supply at the gas cock and disconnect the electricity supply to the appliance before servicing or replacing any components.

To replace:

### 5.1 Burner/pilot/thermocouple

Lower bottom pan by removing wing screws on the unit base.

Disconnect pilot pipe, and thermocouple lead from multifunctional control.

Remove the two burner retaining pins holding the burner assembly in place.

**IMPORTANT: Do not attempt to remove the gas manifold to ease removal of the burner as this could seriously affect the correct operation of the appliance if it is not re-positioned exactly as intended. The assembly can now be lowered from the unit.**

**NOTE: On refitting the burner assembly ensure that the slots at the front of the burner are correctly located on their shoulder rivets and that the retaining pins are refitted in the correct location.**

#### 5.1.1 Burner

It is not possible to replace single burner bars. The complete burner assembly must be replaced. Remove the pilot and thermocouple (see 5.1.2.) and refit to the new assembly.

#### 5.1.2 Pilot

Remove the burner assembly as detailed above. Unscrew the thermocouple. Undo the pilot bracket retaining the nut. The pilot gas pipe can now be unscrewed (take care not to lose the pilot injector) and the pilot assembly released by removing the two retaining screws. Replace defective component and reassemble in reverse order.

### 5.2 Thermocouple

Lower bottom pan by removing wing screws on the unit base. The thermocouple can be unscrewed.

### 5.3 Main Burner Injector

Lower bottom pan by removing wing screws on the unit base.

The main injector can be unscrewed from the manifold and replaced.

### 5.4 Gas Valve

Disconnect pilot gas pipe, thermocouple and thermocouple interrupter from the gas valve.

Remove green cover from the solenoid actuator on the valve and detach flying leads from the terminal block, noting their position.

Having ensured isolation of the gas supply uncouple the union gas cock and unscrew the gas valve from the appliance inlet gas pipe.

Replace gas valve and reassemble in reverse order.

### 5.5 Thermocouple Interrupter

Unscrew thermocouple from top of gas valve and extract thermocouple interrupter from the gas valve. Release spade connections on interrupter cable from the overheat thermostat in the heater junction box and feed back through the cable grommet. Replace component and reassemble in reverse order.

### 5.6 Delay Timer

The delay timer is located in the junction box. Remove the junction box front cover by taking out the two retaining screws. Remove the single retaining screw from beneath the junction box, pull off the electrical connectors (taking care to note their positions) and lift out the timer. Replace defective component and reassemble in reverse order. If in doubt regarding the electrical connections consult the wiring diagram on page 9.

### 5.7 Overheat Thermostat

The overheat thermostat body is located in the junction box. Remove the junction box cover by taking out the two retaining screws. Remove the thermostat cover retaining nut from the outside of the junction box and pull back into the box. Remove the left hand side casing of the heater (looking from the front) by taking out the two retaining screws at the rear and pull the side panel clear. The overheat thermostat bulb is mounted in the air stream at the bottom left of the appliance. Remove the two screws holding it in place and feed it back through the hole in the inner casing. To refit remove the two lower front louvres which can be sprung out. The thermostat bulb can now be positioned and the retaining screws fitted.

### 5.8 Fan/Fan Motor/Capacitor

The capacitor is mounted alongside the junction box. Remove the junction box front cover by taking out two retaining screws. Disconnect the wires from the terminal block noting their position. The capacitor retaining nut can be seen on the left hand side of the junction box and should be removed. Replace the defective component and reassemble in reverse order. If in doubt regarding the electrical connections consult the wiring diagram on page 9.

The fan/fan motor is mounted in the centre of the guard. Remove the junction box front cover by taking out two retaining screws. Disconnect the fan motor wires from the terminal block noting their position and feed back through the grommet. Remove the four guard mounting bolts and lift assembly clear. The fan and motor can be removed from the guard by undoing the four bolts.

**IMPORTANT: Care must be taken to note if the guard is mounted on the front or rear fixing points of the motor. Incorrect re-assembly will cause damage to the unit.**

The fan can be removed from the motor by removing the retaining screw.

Reassemble in reverse order making sure the fan and guard are correctly mounted using the four sleeves to prevent overtightening, and that the fan spins freely without catching on the casing. If in doubt as to the correct electrical connection consult the wiring diagram on page 9.

## 6. FAULT FINDING GUIDE

### 6.1 If pilot does not light:

#### POSSIBLE CAUSES AND REMEDIES

- Check that manual gas control knob on combination gas control is in the pilot position.
- Bleed air from the pilot line (take special care when bleeding propane units).
- If pilot splutters, check pilot line for condensate or other obstruction.
- If pilot flame is feeble or short, check orifice for cleanliness. Replace if necessary. See page 7 for pilot flame adjustment.
- If the above steps do not correct the condition, consult your qualified installation and service contractor or gas supplier.

### 6.2 If pilot does not remain alight:

#### POSSIBLE CAUSES AND REMEDIES

- Check inlet pressure with all units operating, making certain that there is correct pressure.
- Check pipe size to unit.
- Be sure all pilot connections are tight.
- Check for excessive draughts.
- Check for blocked pilot orifice or pilot line.
- Check for leaks around pilot fittings. If leaks cause flame impingement on thermocouple lead, thermocouple may become inoperative.
- Ensure thermocouple and interrupter connections are both clean and tight at the gas valve.
- Ensure all connections between overheat thermostat and thermocouple are clean and secure.
- Check the overheat thermostat for correct operation. See page 8.
- If the above steps do not correct the condition, consult your qualified installation and service contractor or gas supplier.

### 6.3 Effect of pilot operation on safety controls:

#### POSSIBLE CAUSES AND REMEDIES

- A short pilot flame may cause poor ignition or reduce heat on thermocouple to the point where the automatic controls become inoperative, thereby shutting off gas supply to main burners. This may result from a blocked injector.
- Check electrical connection from the thermocouple interrupter to the safety valve to ensure good electrical contact. Also check location of pilot flame in relation to thermocouple element.

### 6.4 If main burners do not light:

#### POSSIBLE CAUSES AND REMEDIES

- Check power to appliance is turned on.
- Check room thermostat and time switch (if fitted) are calling for heat.
- Check that knob on combination gas control is in ON position.
- Be sure pilot is lit, correctly positioned and strong enough to ignite burner ports.
- Check wiring (electrical power supply) to combination gas control.
- If the above steps do not correct the condition, consult your qualified installation and service contractor or gas supplier.

## TABLE 3 SPARE PARTS LIST

Description	Number per unit	Modine part number
<b>Combination gas valve</b> Models 30 - 250 Models 300 - 400	1	5H75043B 5H75116B
<b>Complete fan &amp; motor</b> 30 50 75 100 125 150 175 200 250 300 350 400	1	HTPMG2304101 HTPMG31541xx HTPMG3154107 HTPMG3504118 HTPMG3504106 HTPMG4104135 HTPMG45041xx HTPMG5106130 HTPMG5106129 HTPMG5606116 HTPMG5606116 HTPMG61041xx
<b>Fan motor</b> 30 50 75 100 125 150 175 200 250 300 350 400	1	HTM44026112D HTM44080195A HTM44080195A HTM44180189A HTM44180189A HTPMG4106141 HTM44180189A HTM46370183A HTM46370183A HTM46500201A HTM46500201A HTM46500201A
<b>Fan guard</b> 30 50 75 100 125 150 175 200 250 300 350 400	1	HTSFB2290004 HTSFB2290002 HTSFB2290002 HTSFB2290002 HTSFB2290002 HTSFB2290001 HTSFB2290005 HTSFB2290000 HTSFB2290000 HTSFB2290003 HTSFB2290003 HTSFB2290006
<b>Fan</b> 30 50 75 100 125 150 175 200 250 300 350 400	1	HTFFF1241005 HTCF69200003 HTCF69218063 HTCF69224053 HTCF69200006 HTCF69218003 HTCF69218006 HTCF69231006 HTCF69227016 HTCF69227036 HTCF69227036 HTCF69212006
<b>Limit thermostat</b>	1	HTLM7P009062
<b>Delay timer</b>	1	5H7381CB
<b>Thermocouple</b>	1	HTQ309A2754B
<b>Thermocouple interrupter</b>	1	HT0000021609

When servicing, repairing or replacing parts on these units always give the complete Model Number and Serial Number from appliance data plate.

**TABLE 3 continued**

Description	Number per unit	Modine part number
<b>Capacitor</b>	1	
30		Not required
50		HTFFE1049039
75		HTFFE1049039
100		HTFFE1049031
125		HTFFE1049031
150		HTFFE1049031
175		HTFFE1049031
200		HTFFE1049026
250		HTFFE1049027
300		HTFFE1049028
350		HTFFE1049028
400		HTFFE1049029
<b>Burner assembly</b>	1	
30		3H33073B1
50		3H33073B2
75		3H33073B3
100		3H33073B4
125		3H33073B16
150		3H33073B5
175		3H33073B6
200		3H33073B7
250		3H33073B7
300		3H33073B9
350		3H33073B10
400		3H33073B11

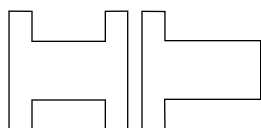
Description	Number per unit	Modine part number
<b>Pilot assembly</b>	1	
30		3H31982B1
50		3H31982B1
75		3H31982B2
100		3H31982B2
125		3H31982B2
150		3H31982B5
175		3H31982B5
200		3H31982B5
250		3H31982B5
300		3H31982B5
350		3H31982B6
400		3H31982B6
<b>Main burner injector</b>		
30	1	36
50	1	29
75	1	18
100	2	29
125	2	23
150	2	18
175	3	24
200	3	24
250	3	13
300	4	19
350	5	19
400	6	20

**TABLE 4 Performance — Propane Units Only**

	Model Number-PDE											
	30	50	75	100	125	150	175	200	250	300	350	400
<b>Heat Input (gross) kW</b>	8.8	14.7	22	29.3	36.6	44	51.3	58.6	73.3	87.9	102.6	117.2
<b>Heat Input (net) kW</b>	8	13.5	20.2	27	33.7	40.5	47.2	53.4	67.4	80.9	94.4	107.8
<b>Output kW</b>	7	11.7	17.6	23.4	29.3	35.1	41	46.9	58.6	70.3	82	93.8
<b>Inlet set. press. mbar</b>	37											
<b>Injector -No.</b>	1	1	1	2	2	2	3	3	3	4	5	6
<b>Diam. mm</b>	1.40	1.85	2.18	1.85	2.08	2.26	1.99	2.08	2.37	2.26	2.18	2.08
<b>Marking</b>	54	49	44	49	45	43	47	45	42	43	44	45
<b>Gas rate kg/h</b>	1.16	1.94	2.9	3.86	4.83	5.8	6.76	7.72	9.66	11.6	13.5	15.4
<b>Approx. flue gas vol.in secondary flue* 4.4% CO<sub>2</sub> &amp; 120°C 1/sec</b>	9	14	21	29	36	43	50	57	71	86	100	114
<b>Air flow m<sup>3</sup>/sec</b>	0.21	0.35	0.51	0.69	0.87	1.03	1.20	1.36	1.75	2.10	2.34	2.66
<b>Outlet velocity m/sec</b>	2.6	3.2	3.7	4.3	4.4	4.7	4.8	4.1	5.3	5.7	5.6	5.3
<b>Air temp. rise °C</b>	27	27	28	27	27	28	28	28	27	27	28	28
<b>Mounting ht. (max) m</b>	2.1	2.7	3.7	4.3	4.3	4.9	5.2	4.6	5.8	6.4	6.1	6.7
<b>Heat throw (at max mount. ht.) m*</b>	7.6	10.1	12.5	14.9	15.5	16.8	18	15.5	20.4	22.6	21.9	23.2
<b>Power supply</b>	230V 50Hz											
<b>Power consupt. (watts)</b>	125	150	200	225	400	450	450	400	750	850	950	1,200

\* Based on propane gas - typical calorific value 91.65 MJ/M<sup>3</sup>.

\*\* At 18°C ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit.



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