MODINE

6-551.23
Part 5H70880A (Rev. R)

May 1991

INSTALLATION AND SERVICE MANUAL
gas-fired unit heaters
models PA/PAE and BA/BAE

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 state agencies to cause cancer, birth defects or other reproductive harm. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

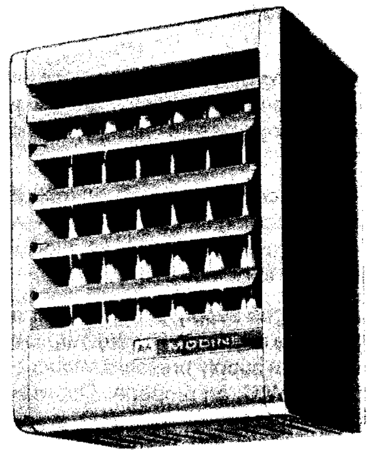


Figure 1
Models PA/PAE and BA/BAE gas-fired unit heaters

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.**

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

To prevent premature heat exchanger failure do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

inspection on arrival

1. Inspect unit upon arrival. In case of damage, report immediately to transportation company and your local Modine sales representative.
2. Check rating plate on unit and motor to verify that power supply and motor specification requirements meet available electric power at the point of installation.
3. Inspect unit received for conformance with description of product ordered (including specifications where applicable).

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

contents

SPECIAL PRECAUTIONS

1. 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 furnished with the unit.
2. Turn off all gas before installing unit heaters.
3. Gas pressure to unit heater controls must never exceed 14" W.C.

   Testing Piping System. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing if the test pressure is in excess of 1/2 psi.

   The appliance must be isolated from the gas supply piping system by closing its individual manual shuoff valve during any pressure testing of the gas supply system at test pressures equal to or less than 1/2 psi.
4. Check the gas supply pressure at the unit upstream from the pressure regulator. For the purpose of input adjustment, the minimum supply pressure should be 6" W.C. on natural gas or 11" W.C. on propane. The maximum inlet pressure on natural gas should be 7" W.C. and 14" W.C. on propane. Supply pressure with any gas must never exceed 14" W.C.; if so, install an additional pressure regulator upstream of the combination gas valve. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1 - Latest Edition National Fuel Gas Code (CAN/CGA-B149 in Canada).
5. All units must be vented to the outside atmosphere. See page 4 for proper venting instructions.
6. Gas-fired heating equipment which has been improperly vented, or which experiences a block vent condition may have flue gases accidently spilled into the heated space. See page 20 for specific information about the blocked vent safety switch supplied on the unit.
7. Do not install in potentially explosive or flammable atmospheres laden with grain dust, sawdust, or similar air-borne materials. In such applications a blower type heater installed in a separate room with ducting to the dust-laden room is recommended.
8. Installation of units in high humidity or salt water atmospheres will cause accelerated corrosion resulting in a reduction of the normal life span of the units.
9. To prevent premature heat exchanger failure **do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.**
10. Avoid installing units in extremely drafty locations. Drafts can cause burner flames to impinge on heat exchangers which shortens life. Maintain separation between units so discharge from one unit will not be directed into the inlet of another.
11. Do not locate units in tightly sealed rooms or small compartments without provision for adequate combustion air and venting. Combustion air must have access to the confined space through a minimum of two permanent openings in the enclosure, one near the bottom. They should provide a free area of one square inch per 1000 BTU per hour input rating of the unit with a minimum of 100 square inches for each opening, whichever is greater.
12. Do not install units outdoors.
13. Do not locate unit closer to combustible materials than 6 inches to top and flue pipe, 18 inches to sides, and 12 inches to bottom.
14. Allow at least 6" clearance at the sides and 12" clearance at rear to provide ample air for combustion and proper operation of fan.
15. The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the top of the unit may be required to be greater than 6" if heat damage, other than fire, may occur to materials above the unit heater at the temperature described.
16. Do not install units below 7 feet measured from the bottom of the unit to the floor.
17. Modine unit heaters are designed to be used for heating applications with ambient temperatures between 32°F and 90°F. If an application exists where ambient temperatures can be expected to fall outside of this range, contact factory for recommendations.
18. Provide clearance for opening hinged bottom for servicing. See Figure 2. Do not set unit on its bottom.
19. To assure that the flames do not impinge on heat exchanger surfaces, the unit must be suspended in a vertical and level position. Failure to suspend unit properly may shorten the life of the unit heater.
20. Do not lift unit heater by gas controls or gas manifold.
21. Be sure no obstructions block air intake and discharge of unit heater.
22. Do not attach duct wok, air filters, or polytubes to any propeller (PA/PAE) model unit heaters.
23. In aircraft hangars, keep the bottom of the unit at least 10' from the highest surface of the wings or engine enclosure of the highest aircraft housed in the hangar and in accordance with the requirements of the enforcing authority and/or NFPA No. 409, Latest Edition.
24. In garages or other sections of aircraft hangers such as offices and shops which communicate with areas used for servicing or storage, keep the bottom of the unit at least 7' above the floor. In public garages, the unit must be installed in accordance with the Standard for Parking Structures NFPA No. 88A and the Standard for Repair Garages NFPA No. 88B. In Canada, installation of unit heaters in airplane hangars must be in accordance with the requirements of the enforcing authority and in public garages, in accordance with the current CAN/CGA-B149 codes.
25. Consult piping, electrical, and venting instructions in this manual before installation.
26. All literature shipped with your unit should be kept for future use for servicing or service diagnosis. Do not discard any literature shipped with your unit.

installation

In the U.S., the installation of these units must comply with the "National Fuel Gas Code," ANSI Z223.1, latest edition (also known as NFPA 54) and other applicable local building codes.

In Canada, the installation of these units must comply with local plumbing or waste water codes and other applicable codes and with the current code CAN/CGA-B149.1, "Installation Code for Natural Gas Burning Appliances and Equipment" or CAN/CGA-B149.2, "Installation Code for Propane Burning Appliances and Equipment."

1. All installation and service of these units must be performed by a qualified installation and service agency only as defined in ANSI Z223.1, latest edition, or in Canada by a licensed gas fitter.
2. This unit is certified by A.G.A. and C.G.A., with the controls furnished. For replacement parts, submit the complete model and serial numbers shown on rating plate on the unit. Modine reserves the right to substitute other authorized controls as replacements.
3. Unit is balanced for correct performance. Do not alter fan or operate motors at reduced speed.
4. Information on controls is supplied separately.
5. Modine unit heaters use the same burner for natural and propane gases.

LOCATING UNIT HEATERS

CAUTION

1. Units must not be installed in potentially explosive, flammable or corrosive atmospheres.

In locating units, consider general space-heating requirements, availability of gas, and proximity to vent locations. Unit heaters should be located 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. In buildings exposed to prevailing winds, a large portion of the heated air should be directed along the windward wall. Avoid interference of air streams as much as possible.

Mounting height (measured from bottom of unit) at which unit heaters are installed is critical. Maximum mounting heights for standard units are listed in Table 7. (If optional outlet devices are used, see mounting height listed in separate tables on pages 14, 16 and 17.) 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 assure maximum comfort.

Motors and controls used on Modine unit heaters are designed to be used in heating applications with ambient temperatures between 32° F and 90° F. If an application exists where ambient temperatures can be expected to fall outside of this range, contact factory for recommendations.

COMBUSTION AIR REQUIREMENTS

Units installed in tightly sealed buildings or confined spaces should be provided with two permanent openings, one near the top of the enclosure and one near the bottom. Each opening should have a free area of not less than one square inch per 1,000 BTU per hour of the total input rating of all units in the enclosure, freely commmunicating with interior areas having, in turn, adequate infiltration from the outside.

To prevent premature heat exchanger failure do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

UNIT SUSPENSION

CAUTION

Do not locate unit closer to combustible materials than 6" to top and flue, 18" to sides, and 12" to bottom of unit.

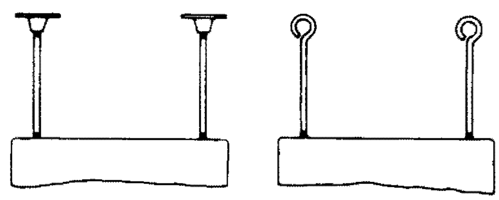
Allow at least 12" at the rear of unit to provide ample air for combustion and proper operation of fan.

Provide clearance for opening hinged bottom for servicing. See Figure 12, page 13.

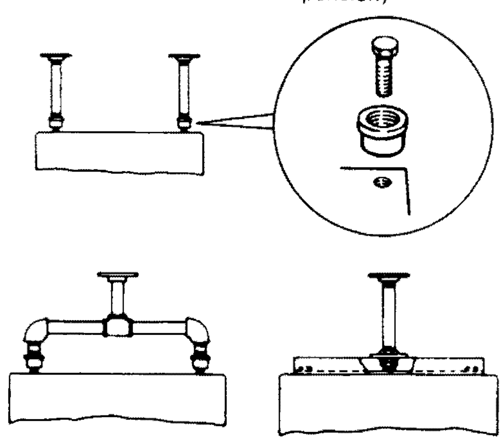
Be sure the means of suspension is adequate to support the weight of the unit. For proper operation, the unit must be installed in a level horizontal position. Clearances to combustibles as specified above must be strictly maintained. Do not install standard unit heater above the maximum mounting height shown in Table 7 or below seven feet from bottom of unit to the floor. (If optional outlet devices are used, see mounting height listed in separate tables on pages 14, 16 and 17.)

On all propeller units, except the PAE 300, PA 350 and PA 400, two tapped holes (1/2-13) are located in the top of the unit to receive ceiling hangers. The PAE 300, PA 350 and PA 400 have four mounting holes. On all blower units, except the BAE 300, BA 350 and BA 400, two tapped holes are provided in the top of the unit and two holes in the blower support bracket. The BAE 300, BA 350 and BA 400 have four tapped holes in the top of the unit and two in the blower support bracket for mounting. **To assure that flames are directed into the center of heat exchanger tubes, 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 unit.**

NOTE: A pipe hanger adapter kit, shown in Figure 2, is available as an accessory from Modine. One kit consists of two drilled 3/4" I.P.S. pipe caps and two 1/2-13 x 1 3/4" capscrews to facilitate threaded pipe suspension. Two kits are required for mounting BAE 50 thru BAE 250 models, models PAE 300, PA 350 and PA 400, and three kits for models BAE 300, BA 350 and BA 400. One kit will pipe mount all other PAE models.



(Threaded Rod Suspension)



(Suspension with Pipe Adaptor Kit)

Figure 2
Suspension methods

installation

VENTING

CAUTION

Gas Unit Heaters must be vented – do not operate unvented.

A built-in draft diverter is provided – additional external diverters are not required or permitted.

Units using single-stage gas controls can be installed with a Category I vent system.

Some units which are supplied with two-stage, or modulating gas controls may require a Category II vent system. Refer to the table below to determine the vent category required for each PA/PAE and BA/BAE model unit heater.

Gas-fired heating equipment which has been improperly vented, or which experiences a block vent condition may have flue gases accidentally spilled into the heated space. See page 20 for specific information about the blocked vent safety switch supplied on the unit.

The installation must conform with local building codes or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 latest edition, or in Canada CAN/CGA-B149.1 "Installation Code for Natural Gas Burning Appliances" and CAN/CGA-B149.2 "Installation Code for Propane Burning Appliances".

The following suggestions should be observed.

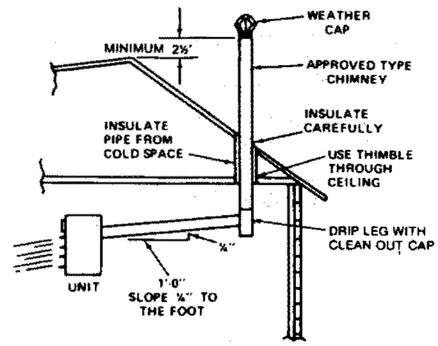
1. Comply with local code venting regulations.
2. Select size of vent pipe to fit opening at rear of unit (see page 10 for dimensions). Do not use a vent pipe smaller than the vent on the unit. Pipe should be no less than 24-ga. galvanized steel or other suitable rust-resistant metal. Use an approved-type chimney when the vent passes through a floor or roof.
3. Keep vent pipe at least 6" from combustible material.

The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the top of the unit may be required to be greater than 6" if heat damage, other than fire (such as material distortion or discoloration) may occur to materials above the unit heater at the temperature described.

Insulate carefully around section of vent pipe passing through combustibles. Where vent passes through floor or roof an opening 4" greater than vent diameter is necessary. If there is 6' or more of vent pipe in the open space between the unit heater and where the vent pipe passes through floor or roof, the opening in the floor or roof need only be 2" greater than the diameter of the vent pipe.

4. Category I and II unit heaters are defined as having negative pressure vent systems and must not be common vented with positive pressure vent systems serving Category III and IV appliances.
5. Category II vent systems must be installed to prevent accumulation of condensation in the vent system, and shall have a means provided for drainage of vent condensate. The drip leg should be cleaned annually.
6. A Category II vent system shall be water tight.
7. Limit vent pipe horizontal runs to 75% of vertical height with a minimum upward slope from unit of ¼" per foot and suspend securely from overhead structure at points no greater than 3 feet apart. For best venting, put as much vertical vent as close to the unit as possible. Fasten individual lengths of flue together with metal screws.
8. Keep flue pipes as straight as possible, avoiding sharp bends. When venting into a common flue, the area of the flue should be equal to or greater than the combined areas of the individual vents.
9. Where possible, avoid venting through unheated space. When necessary, insulate pipe from cold to prevent condensation and maintain draft head. Provide a drip leg with a clean out cap at bottom of vertical pipe.
10. Top of vertical stack should extend at least 2½' above high point of roof. Use of weather cap will reduce downdrafts and moisture in vent.
11. Use of dampers or other devices in vents are not allowed.
12. When connecting vent to existing chimney, do not push vent pipe beyond internal surface of chimney.
13. For more than one vent into a stack or chimney, they should enter at different levels.
14. In general, a common stack or chimney must have an equivalent cross-sectional area of all vents entering the stack.
15. Do not install a gravity vented unit in a common stack with power exhausted equipment.
16. Do not install gravity vented units in buildings or areas which experience negative pressure conditions.

Figure 3
Heater Venting



Model Number	Gas Controls	Vent Category
PAE 30	Single-Stage Two-Stage	I II
PAE/BAE 50	Single-Stage Two-Stage Modulating	I II II
PAE/BAE 75	Single-Stage Two-Stage Modulating	I II II
PAE/BAE 100	Single-Stage Two-Stage Modulating	I II II
PAE/BAE 125	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 145	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 175	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 200	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 225	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 250	Single-Stage Two-Stage Modulating	I I I
PAE/BAE 300	Single-Stage Two-Stage Modulating	I I I
PA/BA 350	Single-Stage Two-Stage Modulating	I I I
PA/BA 400	Single-Stage Two-Stage Modulating	I I I

installation

PIPING

CAUTION

Gas pressure to unit heater controls must never exceed 14" W.C.

Testing Piping System. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing if the test pressure is in excess of ½ psi.

The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply system at test pressures equal to or less than ½ psi.

1. Installation of piping must be in accordance with local codes, and ANSI Z223.1-Latest Edition, "National Fuel Gas Code," or CAN/CGA-B149.1 and .2 in Canada. Do not use flexible connectors.
2. Piping to units must conform with local and national requirements for type and volume and gas handled, and pressure drop allowed in the line. Refer to Table 4, to determine the cubic feet per hour (cfh) for the type of gas and size of unit to be installed. Using this cfh value and the length of pipe necessary, determine the pipe diameter from Table 1. Where several units are served by the same main, the total capacity, cfh, and length of main must be considered. Avoid pipe sizes smaller than ½". Table 1 allows for the usual number of fittings with a 0.3" W.C. presure drop. Where the gas supplied gas a specific gravity other than 0.60, apply the multiplying factor given in Table 2 to the flow capacities in Table 1 to determine total flow capacity.
3. After threading and reaming the ends, inspect piping and remove loose dirt and chips.
4. Support piping so that no strains are imposed on unit or controls.
5. Use two wrenches when connecting piping to unit controls.
6. Provide a drip pocket before each unit and in the line where low spots cannot be avoided. (see Figure 4).
7. Take-off to unit should come from top or side of main to avoid trapping condensate.
8. Piping, subject to wide temperature variations, should be insulated.
9. Pitch piping up toward unit at least ¼" in 15' of horizontal run.
10. Compounds used on threaded joints of gas piping must be resistant to action of liquefied petroleum gases.
11. Purge air before lighting unit by disconnecting pilot tubing at gas valve. In no case should line be purged into heat exchanger.
12. After installation, the system must be checked for leaks. Use soap solution.
13. Install a ground joint union and a gas cock upstream of the unit for easy servicing of controls, including a ⅛" NPT plugged tapping accessible for test gage connection. (See Figure 4).
14. Allow at least 5 feet of piping between any high pressure regulator and unit control string.
15. Testing Piping System. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing if the test pressure is in excess of ½ psi.

    The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply system at test pressures equal to or less than ½ psi.

table 1 / gas pipe capacities

In Cu. Ft. per Hour with Pressure Drop of 0.3 in. W.C. with Specific Gravity 0.60

Length of Pipe in Ft.	DIAMETER OF PIPE — INCHES									
	½	¾	1	1¼	1½	2	3	4	6	8
15	76	218	440	750	1220	2480	6500	13880	38700	79000
30	73	152	285	590	890	1650	4700	9700	27370	55850
45	44	124	260	435	700	1475	3900	7900	23350	45600
60	50	105	190	400	610	1150	3250	6800	19330	39500
75		97	200	345	545	1120	3000	6000	17310	35300
90		88	160	320	490	930	2600	5400	15800	32250
105		80	168	285	450	920	2450	5100	14620	29850
120			158	270	420	860	2300	4800	13680	27920
150			120	242	380	710	2000	4100	12240	25000
180			128	225	350	720	1950	4000	11160	22800
210				205	320	660	1780	3700	10330	21100
240				190	300	620	1680	3490	9600	19740
270				178	285	580	1580	3250	9000	18610
300				170	270	545	1490	3000	8500	17660
450				140	226	450	1230	2500	7000	14420
600				119	192	380	1030	2130	6000	12480

table 2 / specific gravity conversion factors

Multiplying factors to be used with Table 1 when the specific gravity of gas is other than 0.60.

NATURAL GAS		PROPANE GAS	
Specific Gravity	Factor	Specific Gravity	Factor
0.55	1.04	1.50	0.633
0.60	1.00	1.53	0.626
0.65	0.962	1.60	0.612

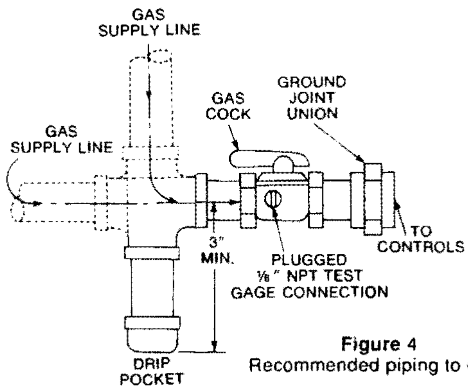


Figure 4
Recommended piping to controls

installation

WIRING GENERAL

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 FURNISHED WITH UNIT.

ANY WIRING DIFFERENT FROM WIRING DIAGRAM MAY BE HAZARDOUS TO PERSONS AND PROPERTY.

Any damage to or failure of Modine units caused by incorrect wiring of the units is not covered by MODINE'S STANDARD WARRANTY (see Back Cover).

All field installed wiring must be done in accordance with the National Electrical Code ANSI/NFPA 70 — Latest Edition or Canadian Electrical Code CSA C22.1 Part 1 or local codes. Unit must be electrically grounded according to these codes. See wiring diagram shipped with unit. For optional wiring diagrams see Bulletin 6-430.

The power to these unit heaters should be protected with a fused disconnect. Units for use with three-phase electric power must be provided with a motor starter having properly sized overload protection.

Location of thermostat should be determined by heating requirements and be mounted on an inside wall about 5' above floor level . . . where it will not be affected by heat from the unit or other sources, or drafts from frequently opened doors. See instructions packed with thermostat.

INSTALLATION OF BLOWER MODELS (BA/BAE UNITS)

CAUTION

Proper air flow and distribution, across the heat exchanger must be provided to prevent early failure of the blower unit heater.

ATTACHMENT OF FIELD INSTALLED DUCTWORK, BLOWER BA MODELS ONLY

CAUTION

Do not attempt to attach ductwork of any kind to propeller PA/PAE models.

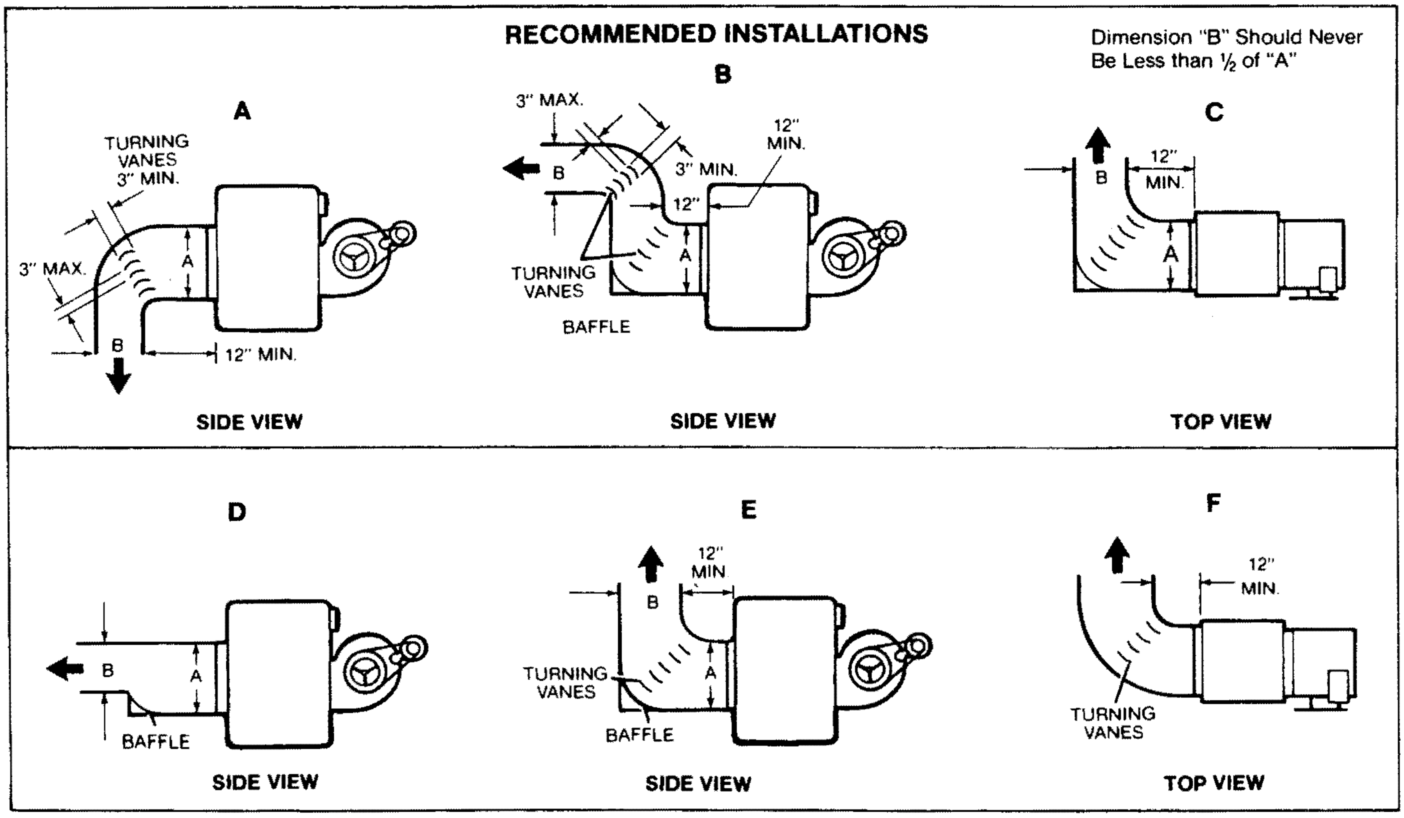
Burned-out heat exchanger, or definitely shorter equipment life, will result from not providing uniform air distribution.

Insufficient air, or poor air distribution across the heat exchanger will cause early failure of the blower unit heater. When installing heater, always follow good duct design practices for even distribution of the air across the heat exchanger. Recommended layouts are shown below. When installing blower units with ductwork, the following must be done.

1. **Provide uniform air distribution over the heat exchanger.** Use turning vanes where required. See figures below.
2. Provide removable access panels in the ductwork on the downstream side of the unit heater. These openings should be large enough to view smoke or reflect light inside the casing to indicate leaks in the heat exchanger and to check for hot spots on exchanger due to poor air distribution or lack of sufficient air (cfm).
3. If ductwork is connected to the rear of the unit, use Modine blower enclosure kit, or if using field designed enclosure, maintain dimensions of proper blower enclosure as shown on page 13.

CAUTION

Check for red heat exchanger tubes. If bottom of tubes become red while blower unit is in operation, check for proper air volume and air distribution. Adjust blower speed or correct discharge duct design to correct problem.



installation

INSTALLATION OF BLOWER MODELS (BA/BAE UNITS)

Determining Blower Speed

The drive assembly and motor on all gas-fired blower unit heaters are factory assembled. The adjustable motor pulley has been pre-set to permit operation of this unit under average conditions of air flow and without any external static pressure. The motor pulley should be adjusted as required when the unit is to be operated at other than average air flows and/or with external static pressures. Adjustment must always be within the performance range shown on pages 18 and 19 and the temperature rise range shown on the unit's rating plate.

To determine the proper blower speed and drive pulley setting, the conditions under which the unit is to operate must be known. If the blower unit is to be used without duct work, nozzles or filters, the only criteria for determining the pulley setting and blower speed is the amount of air to be delivered. The performance tables for blower models are shown on pages 18 and 19. As an example, a model BA 350 unit, operating in a free blow mode, that is, no duct work, filters, etc., and is to deliver an air volume of 4537 cfm (cfm=cubic feet of air) requires that the unit be supplied with a 1½ hp motor, a C23 drive and, the drive pulley must be set at 2 turns open to achieve a blower speed of 625 rpm (see performance table for units **without** blower enclosure, page 18). See "Blower Adjustments" for setting of drive pulley turns open.

If a blower unit is to be used with ductwork and/or filters, nozzles, etc., the total external static pressure under which the unit is to operate, and the required air volume must be known before the unit can be properly adjusted. Any device added externally to the unit, and which the air must pass through, causes a resistance to air flow. This resistance is called static pressure loss. The total of the external static pressure losses must be determined before adjusting the blower speed.

If Modine filters are used, the expected pressure drop through the filters can be determined from the pressure drop curves shown on page 14. If Modine supplied discharge nozzles are used, the expected pressure drop of the nozzles can be found footnoted at the bottom of page 14. If filters, nozzles, or ductwork is to be used with the unit, and they are not supplied by Modine, the design engineer or installing contractor must determine the pressure drop for the externally added devices, or ductwork, to arrive at the total static pressure under which the unit is to operate.

Once the total static pressure, and the required cfm (air volume) are known, the operating speed of the blower can be determined and the correct drive pulley adjustments made. As an example, if a model BA 350 is to be used with a Modine supplied blower enclosure, Modine supplied filters, and is attached to ductwork supplied by others, and the unit is to move 4537 cfm of air, the filter pressure drop would be approximately 0.78" W.C. (from filter pressure drop curves on page 14). Assuming the ductwork has been designed for a 0.15" W.C. pressure drop, the total external static pressure the unit is to operate against would be 0.78" W.C. +0.15" W.C. or 0.23" W.C. Entering the performance table on page 19 (units with blower enclosure) for a BA 350, at 4537 cfm and 0.3" W.C. static pressure, it is seen that the unit will require a 2 hp motor using a C19 drive, and the drive pulley should be set at a ½ turns open to achieve a blower speed of 785 rpm. See "Blower Adjustments" for setting of drive pulley turns open.

To Install (Figure 6):

1. Remove and discard the motor tie down strap and the shipping block beneath the adjustable foot on the motor base. (Not used on all models.)

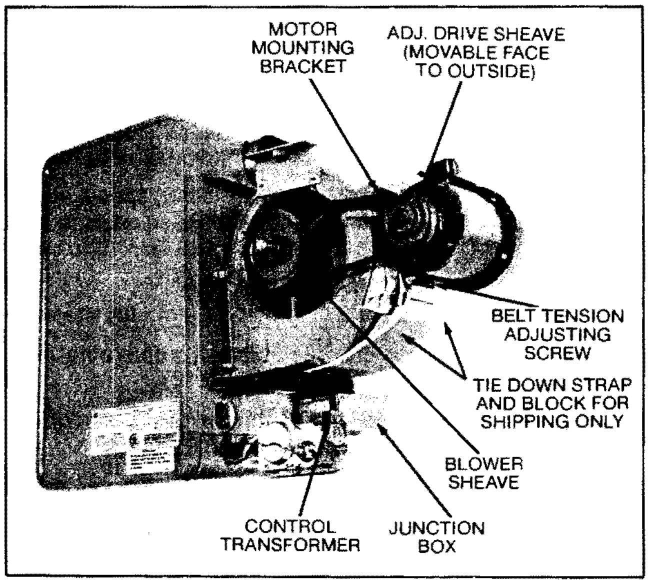


Figure 5
Blower Model Installation

2. Adjust motor adjusting screw for a belt deflection of approximately ¾ with five pounds of force applied midway between the sheaves (refer to Figure 6a). Since the belt tension will decrease dramatically after an initial running period, it is necessary to periodically re-check the tension to assure continual proper belt adjustment. Excessive tension will cause bearing wear and noise.
3. The blower bearings are lubricated for life; however, before initial unit operation the blower shaft should be lubricated at the bearings with SAE 20 oil. This will reduce initial friction and start the plastic lubricant flowing.
4. Make electrical connections according to the wiring diagram.
5. Check rotation of the blower. Motor should be in clockwise rotation when facing motor pulley. If rotation is incorrect, correction should be made by interchanging wiring within the motor. See wiring diagram on the motor.
6. The actual current draw of the motor should be determined. Under no condition should the current draw exceed that shown on the motor rating plate.
7. **It is the installer's responsibility to adjust the motor pulley to provide the specified blower performance as listed on pages 18 and 19, for blower settings different from the factory set performance.** The drive number on the unit may be identified by referring to the Power Code number on the serial plate of the unit (see page 27 for model number nomenclature) and matching that number with those shown on page 25. From the listing the drive number can be determined.
8. Blower sheave and motor sheave should be measured to assure correct drive is on unit. Refer to page 25 for drive sizes.

BLOWER ADJUSTMENTS

Following electrical connections, check blower rotation to assure blow-through heating. If necessary, interchange wiring to reverse blower rotation. Start blower motor and check blower sheave RPM with a hand-held or strobe-type tachometer. RPM should check out with the speeds listed in Performance Data shown on pages 18 and 19 according to the job specifications. A single-speed motor with an adjustable motor sheave is supplied with these units. If blower fan speed changes are required, adjust motor sheave as follows:

1. **Shut-off power before making blower speed adjustments.** Refer to Determining Blower Speed on page 7 and to Blower Drive Selection on pages 18 and 19 to determine proper blower RPM.
2. Loosen motor base and take belt off of motor sheave.
3. Loosen set screw on outer side of adjustable motor sheave (see Figure 6).
4. To reduce the speed of the blower, turn outer side of motor sheave counterclockwise.
5. To increase the speed of the blower, turn outer side of motor sheave clockwise.
6. Retighten motor sheave set screw, replace belt and retighten motor base. Adjust belt tension adjusting screw such that there is 3/4" belt deflection when pressed with 5 pounds of force midway between the blower and motor sheaves (see Figure 6a). Since the belt tension will decrease dramatically after an initial run-in period, it is necessary to periodically re-check the tension to assure continual proper belt adjustment.
7. Check to make certain motor pulley and blower sheave are aligned. Re-align if necessary.
8. Re-check blower RPM after adjustment.

   NOTE: Do not fire unit until blower adjustment has been made or unit may cycle on limit (overheat) control.
9. Check motor amps. Do not exceed amps shown on motor nameplate. Slow blower if necessary.
10. Check air temperature rise across unit. Check temperature rise against values shown in Performance Tables on pages 18 and 19 to assure actual desired air flow is being achieved.
11. If adjustments are required, recheck motor amps after final blower speed adjustment.

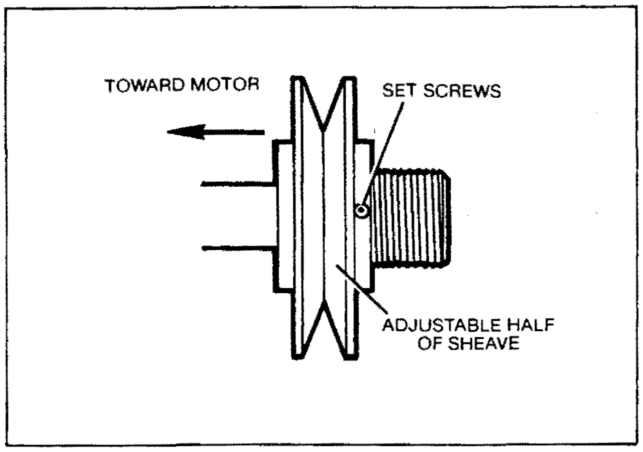


Figure 6
Motor Sheave Adjustment

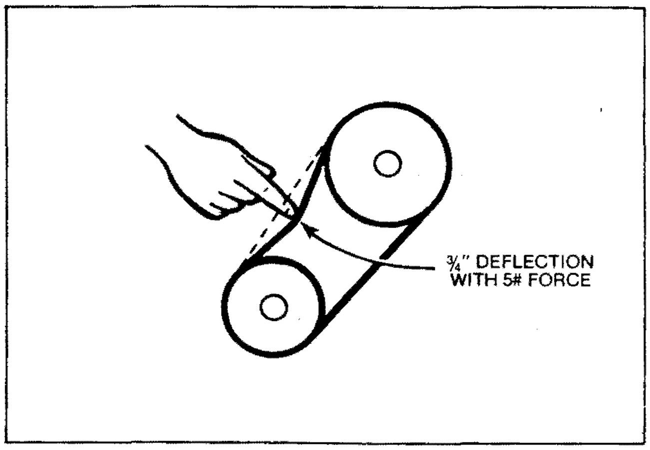


Figure 6a
Belt Tension Adjustment

operation

CAUTION
Start-up and adjustment procedures should be performed by a qualified serviceman.
Gas pressure to unit heater controls must never exceed 14" W.C. When air pressure testing piping systems for leaks, be sure that test pressure does not exceed 14" W.C. if unit heaters are already installed. Check the gas supply pressure at the unit upstream from the pressure regulator. For the purpose of input adjustment, the minimum supply pressure should be 6" W.C. on natural gas or 11" W.C. on propane. The maximum inlet pressure on natural gas should be 7" W.C. and 14" W.C. on propane. The pilot flame must be adjusted as described on page 9. Supply pressure with any gas must never exceed 14" W.C.; if so, install an additional pressure regulator upstream of the combination gas valve. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1.— Latest Edition "National Fuel Gas Code" (CAN/CGA-B149 in Canada).
Be sure no obstructions block draft diverter or air intake and discharge of unit heater.

PRIOR TO OPERATION

Although this unit has been assembled and fire-tested at the factory, the following pre-operational procedures should be performed to assure proper on-site operation:

1. Ensure that the electricity supply is off.
2. Check burner(s) to insure proper alignment.
3. Check fan clearance. Fan should not contact casing when spun by hand.
4. Check all electrical connections to be sure they are secure.
5. Check that all horizontal deflector blades are open a minimum of 30° as measured from vertical.

LIGHTING INSTRUCTIONS (ALSO ON UNIT)

For Unit w/Standing Pilot

1. Turn off power. Turn thermostat down. Close manual main gas valve and wait 5 minutes.
2. Open manual pilot valve. Depress safety reset while lighting and hold for 1 minute.
3. Open manual main gas valve. Turn on power. Set thermostat at desired setting.

For Unit w/Intermittent Pilot

1. Turn off power. Turn thermostat down. Close manual main gas valves and wait 5 minutes.
2. Open all gas valves. Turn on power.
3. Set thermostat at desired setting. (Pilot and main burner will light automatically when thermostat calls for heat).

Shut Down Instructions

Turn off power and close all gas valves.

AFTER INITIAL START UP

1. Check pilot flame adjustment as shown below.
2. Check gas piping for leaks with a soap bubble solution to insure safe operation.
3. Check gas input rate, as described on next page, to assure adequate gas volume and pressure.

PILOT FLAME ADJUSTMENT

The pilot is orificed to burn properly with an inlet pressure of 6"-7" W.C. on natural gas and 11"-14" on propane gas, but its pressure cannot be easily measured. Therefore, adjust pilot valve to give a soft steady flame ¾" to 1" long and encompassing ⅜" to ½" of the tip of the thermocouple.

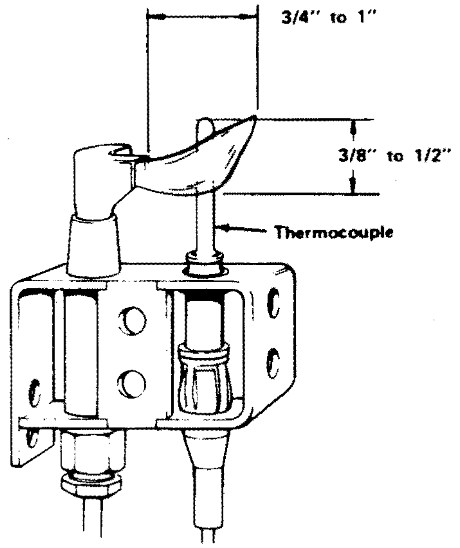


Figure 7
Correct pilot flame

Normally, this flame will produce satisfactory thermocouple output. To adjust flame, use pilot adjustment screw on control valve. If the pilot flame is longer and larger than shown by Figure 7 it is quite possible that it will impinge on the heat exchanger header causing burnout. If line pressures higher than 6"-7" W.C. on natural gas are anticipated or experienced, it is recommended that a pressure regulator be installed upstream of the unit heater gas control valve. A short flame, while pressure is constant, indicates a dirty pilot orifice or pilot valve. A weak pilot flame causes poor burner ignition and can reduce thermocouple output enough to shut off gas supple. Pilot flame condition should be observed periodically to assure trouble-free operation.

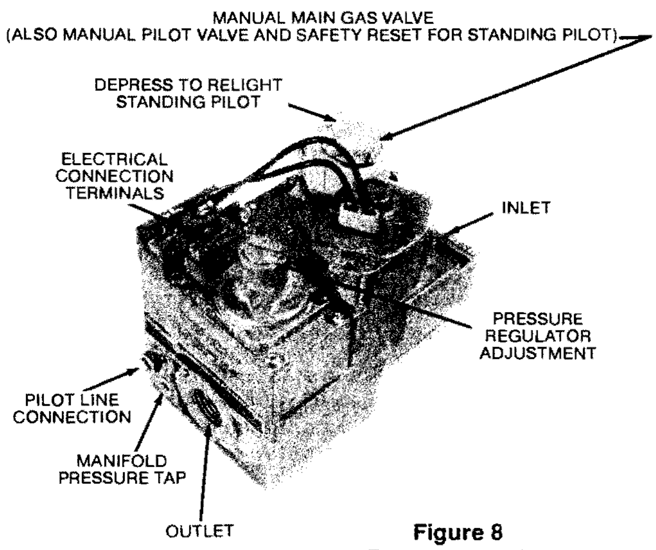


Figure 8
Typical gas valve

NATURAL GAS FLAME CONTROL

Control of burner flames on unit heaters utilizing natural gas is achieved by resetting the gas manifold to either increase or decrease primary combustion air. Prior to flame adjustment, operate unit with casing bottom closed for about fifteen minutes. Operation can be viewed after loosening and pushing aside the blue gas designation disc on rear of unit.

operation

Lack of primary air will cause soft yellow-tipped flames. Excess primary air produces short, well-defined flames with a tendency to lift off the burner ports. Proper operation with natural gas provides a soft blue flame with a well-defined inner cone.

To increase primary air, loosen the manifold mounting screws and tap the manifold away from the mixer tubes until yellow-tipped flames disappear. See Figure 14. To decrease primary air move the manifold closer to the mixer tubes until flames no longer lift from burner ports, but being careful not to cause yellow tipping. Retighten mounting screws after adjustment.

PROPANE GAS FLAME CONTROL

Adjustable primary air shutters are attached to the orifices on the gas manifold for units equipped for propane gas operation. See Figure 15. An optimum flame will show a slight yellow tip. Prior to flame adjustment, operate unit heater with casing bottom closed for at least fifteen minutes. Then lower hinged bottom and adjust primary air shutters. Loosen wing screws and push shutters forward to reduce primary air until yellow flame tips appear. Then increase primary air until yellow tips diminish and a clean blue flame with a well-defined inner cone appears. It may also be necessary to adjust the manifold position to obtain proper flame. Follow the instructions under "Natural Gas Flame Control" for adjusting the manifold.

checking input rate

CAUTION

Check the gas supply pressure at the unit upstream from the pressure regulator. For the purpose of input adjustment, the minimum supply pressure should be 6" W.C. on natural gas or 11" W.C. on propane. The maximum inlet pressure on natural gas should be 7" W.C. and 14" W.C. on propane. The pilot flame must be adjusted as described on page 7. Supply pressure with any gas must never exceed 14" W.C.; if so, install an additional pressure regulator upstream of the combination gas valve. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1-Latest Edition "National Fuel Gas Code" (CAN/CGA-B149 in Canada).

Important — Supply pressure and manifold pressure must be checked with unit in operation when making final adjustments.

INPUT ADJUSTMENTS

Gas pressure regulators are adjusted at the factory for average gas conditions. It is important that gas be supplied to the heater in accordance with the input rating stamped on the serial plate. Actual input should be checked and necessary adjustments made after the heater is installed. Over-firing, a result of too high an input, reduces the life of the unit, increases maintenance, and lowers efficiency. Under no circumstances should the input exceed that shown on the rating plate.

Input can be determined by the meter-timing method provided other gas equipment connected to the meter is inoperative during the test . . . or by checking manifold pressure.

(A) Meter Timing Method

1. Shut off all other gas-burning equipment, including other pilot lights served by the gas meter.
2. Start the heater and determine the number of seconds it takes to consume 1 cu. ft. of gas. Two basic formulas are useful:

$$F_1 = 3600\ C/T$$
$$F_2 = F_1/C$$

where

F_1 = input to heater, Btuh.
F_2 = input to heater, cu. ft. per hr.
C = calorific value of gas, Btu per cu. ft.
T = time to consume 1 cu. ft. of gas in sec.

The calorific value of gas may be determined from the local utility or gas dealer.

These are representative values:

GAS	Btu per cu. ft.
Natural	1000 - 1150
Propane	2500

3. If the seconds for 1 cu. ft. are more (input less) than shown on Table 4 for model being tested, remove the cap from the pressure regulator and take one clockwise turn at a time on the adjustment screw until the correct time is obtained. If the seconds are less (input greater) than indicated in the table follow the same procedure in a counter-clockwise direction. Never remove adjustment screw from regulator.

If the correct number of seconds cannot be obtained without exceeding the limitations given above, then re-orificing is necessary. Correct orifices can be obtained from Modine Manufacturing Company, Racine, Wisconsin. When requesting orifices, state type of gas, Btu content, and its specific gravity. Also give model number of unit heater.

For example, if the input to the heater is 100,000 Btuh and the calorific value of gas is 1000 Btu per cu. ft., then, by the second formula, the input is 100 cu. ft. per hr. Table 3 indicates the time for one revolution of various size meter dials with various input rates. If a 1 cu. ft. meter dial is used, we proceed down the cu. ft. column to 100 cu. ft. per hr. and then horizontally to the left to determine a time of 36 seconds for one revolution of the dial. See Table 3 similarly, if the 1/2 cu. ft. dial is used, we determine a time of 18 seconds for one revolution at the required input.

(B) Pressure Method

The pressure method determines input by measuring the pressure of the gas in the manifold in inches of water.

1. Determine orifice size from Table 4 and check actual orifice size(s) in unit.
2. Close manual gas valve.
3. Remove the 1/8" pipe plug in automatic valve and attach water manometer or "U" tube which is at least 12" high.
4. Open manual valve and start unit.
5. If pressure as indicated by "U" tube is not more than 1/2" higher or lower than indicated in Table 4, adjust regulator as described under "Meter-Timing Method," Step 3 above.

   If pressure as indicated by "U" tube is more than 1/2 inch higher or lower than indicated in Table 4, check main line gas pressure at unit. Adjust main gas regulator to supply 6 to 7 inch W.C. pressure to unit regulator on natural gas and 11"-14" W.C. on propane gas.

checking input rate

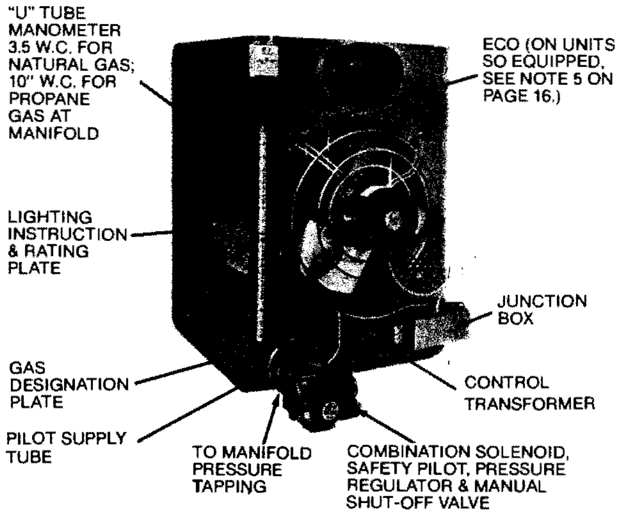


Figure 9

Checking input rate with manometer

table 3 /meter-timing gas

Time required for one revolution is charted for various size meter dials and various rates of gas input in cu. ft. per hour. To convert to BTUH, multiply by the heating value of the gas used.

Time for 1 Revolution, Sec.	Input, Cu. Ft. per Hour, When Meter Dial Size Is:			
	½ cu. ft.	1 cu. ft.	2 cu. ft.	5 cu. ft.
10	180	360	720	1800
12	150	300	600	1500
14	129	257	514	1286
16	112	225	450	1125
18	100	200	400	1000
20	90	180	360	900
22	82	164	327	818
24	75	150	300	750
26	69	138	277	692
28	64	129	257	643
30	60	120	240	600
35	51	103	206	514
40	45	90	180	450
45	40	80	160	400
50	36	72	144	360
55	33	65	131	327
60	30	60	120	300
70	26	51	103	257
80	22	45	90	225
90	20	40	80	200
100	18	36	72	180
120	15	30	60	150

table 4 /manifold pressure & gas consumption*

Models	BTU/Cu. Ft. Specific Gravity	Natural 1040 0.06	Propane 2500 1.53	No. of Orifices
	Manifold Press. In. W.C.	3.5	10.0	
PAE 30	Cfh	28.8	12.0	1
	Gal./Hr. Propane	–	.33	
	Sec./cu. ft.	125	300	
	Orifice Drill Size	37	52	
PAE 50 / BAE 50	Cfh	48.0	20.0	1
	Gal./Hr. Propane	–	.55	
	Sec./cu. ft.	75	180	
	Orifice Drill Size	29	44	
PAE 75 / BAE 75	Cfh	72.0	30.0	2
	Gal./Hr. Propane	–	.82	
	Sec./cu. ft.	50	120	
	Orifice Drill Size	32	49	
PAE 100 / BAE 100	Cfh	101.0	42.0	2
	Gal./Hr. Propane	–	1.15	
	Sec./cu. ft.	36	86	
	Orifice Drill Size	29	44	
PAE 125 / BAE 125	Cfh	124.0	52.0	2
	Gal./Hr. Propane	–	1.43	
	Sec./cu. ft.	29	67	
	Orifice Drill Size	25	42	
PAE 145 / BAE 145	Cfh	144.0	60.6	3
	Gal./Hr. Propane	–	1.64	
	Sec./cu. ft.	25	60	
	Orifice Drill Size	30	45	
PAE 175 / BAE 175	Cfh	163.5	68.0	3
	Gal./Hr. Propane	–	1.86	
	Sec./cu. ft.	22	53	
	Orifice Drill Size	27	43	
PAE 200 / BAE 200	Cfh	192.0	80.0	3
	Gal./Hr. Propane	–	2.19	
	Sec./cu. ft.	19	45	
	Orifice Drill Size	23	40	
PAE 225 / BAE 225	Cfh	216.0	90.0	4
	Gal./Hr. Propane	–	2.47	
	Sec./cu. ft.	17	40	
	Orifice Drill Size	28	43	
PAE 250 / BAE 250	Cfh	240.0	100.0	4
	Gal./Hr. Propane	–	2.74	
	Sec./cu. ft.	15	36	
	Orifice Drill Size	25	42	
PAE 300 / BAE 300	Cfh	288.0	120.0	5
	Gal./Hr. Propane	–	3.29	
	Sec./cu. ft.	12	30	
	Orifice Drill Size	26	42	
PA 350 / BA 350	Cfh	337.0	140	5
	Gal./Hr. Propane	–	3.84	
	Sec./cu. ft.	11	26	
	Orifice Drill Size	21	39	
PA 400 / BA 400	Cfh	385.0	160	6
	Gal./Hr. Propane	–	4.38	
	Sec./cu. ft.	9	23	
	Orifice Drill Size	23	40	

*Above gases based on average standards. Units can be furnished for gases of different values and specific gravities. (Gal./Hr. based on 60°F, 30" Hg., 91,500 BTU/Gal.) In Canada, refer to rating plate on side of unit for orifices at high altitude.

table 5 /orifice drill sizes with decimal equivalents

MAIN BURNER ORIFICES

Drill Size	Dia. Decimal Equivalent	Drill Size	Dia. Decimal Equivalent
52	.0635	32	.1160
49	.0730	30	.1285
45	.0820	29	.1360
44	.0860	28	.1405
43	.0890	27	.1440
42	.0935	26	.1470
40	.0980	25	.1495
39	.0995	23	.1540
37	.1040	21	.1590

PILOT ORIFICE SIZES (INCHES)

Pilot Type	Natural	Propane
J640DHA	.015	.010
J993DHW J994DHW	0.18	.010
Q345	.018	.011
5CHL-6	.018	.010
5SL-6ER	.018	.010

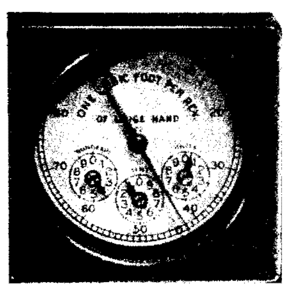


Figure 10

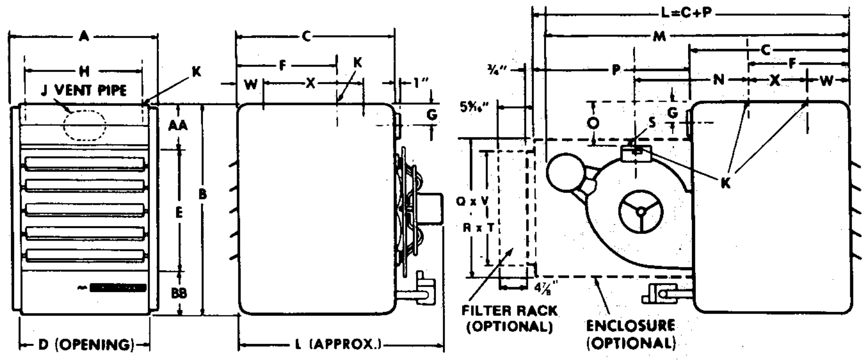
Dials of Typical Gas Meter

dimensional data

table 6 / gas-fired propeller & blower unit heaters

Figure 11
Dimensions
(In inches)

Minimum recommended installation clearances from top and rear (motor) 6", sides 18". Clearance at bottom should equal "C" dimension for each model number.



PROPELLER AND BLOWER MODELS

Dimension Symbol	Model Number												
	PAE 30	PAE 50 BAE 50	PAE 75 BAE 75	PAE 100 BAE 100	PAE 125 BAE 125	PAE 145 BAE 145	PAE 175 BAE 175	PAE 200 BAE 200	PAE 225 BAE 225	PAE 250 BAE 250	PAE 300 BAE 300	PA 350 BA 350	PA 400 BA 400
A	12 7/8	17 1/4	19 1/4	21	21	23 1/2	25 5/8	25 5/8	28 5/8	28 5/8	33 5/8	33 5/8	40
B	24 1/4	28 3/4	28 3/4	35 1/4	35 1/4	35 1/4	40 1/4	40 1/4	40 1/4	40 1/4	40 1/4	40 1/4	40 1/4
C	14 3/4	20	20	22	22	22	25	25	25	25	25	25	25
D	10 7/16	14 13/16	16 13/16	18 9/16	18 9/16	21 1/16	23 3/16	23 3/16	26 3/16	26 3/16	31 3/16	31 3/16	37 1/2
E	13	16	16	20	20	20	24	24	24	24	24	24	24
F	8 7/8	11 1/2	11 1/2	12 1/2	12 1/2	12 1/2	14 1/2	14 1/2	14 1/2	14 1/2	—	—	—
G	1 7/8	2 5/8	2 5/8	3 3/8	3 3/8	3 3/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/4	4 1/4	4 1/4
H	9 1/4	13 5/8	15 5/8	17 3/8	17 3/8	19 7/8	22	22	25	25	30	30	36 3/8
AA	6 1/4	6 1/4	6 1/4	8	8	8	9	9	9	9	9	9	9
BB	6 1/2	6 1/2	6 1/2	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4	7 1/4
J ①	4	4	5	6	6	7	7	8	8	8	9	10	10
K ④	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13	1/2-13
Gas Connections ②	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4
W	—	—	—	—	—	—	—	—	—	—	5	5	5
X	—	—	—	—	—	—	—	—	—	—	16	16	16

PROPELLER MODELS ONLY

Model	PAE 30	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PA 350	PA 400
L ⑤	18 1/2	24	27	31 1/2	31 1/2	32	35	35	35	37	38 3/8	38 3/8	42 1/2
Fan Diameter	9	12	14	16	16	18	20	20	22	22	22	22	24
Approx. Weight	58#	102#	116#	156#	156#	169#	231#	231#	243#	261#	359#	359#	435#

BLOWER MODELS ONLY

		BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BA 350	BA 400
M ③	—	37 3/4	40 3/4	46 3/4	46 3/4	47 3/4	52 3/8	52 3/8	52 3/8	52 3/8	52 3/8	52 3/8	58 1/2
N ⑥	—	14 3/8	17 1/8	21	21	21	24 1/4	24 1/4	24 1/4	24 1/4	18	18	22
O	—	5 3/4	5 3/4	7 1/4	7 1/4	7 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2
P	—	22	25	30	30	30	34	34	34	34	36	36	36
Q Hgt.	—	17	17	21 3/8	21 3/8	21 3/8	25	25	25	25	25	25	25
V Width	—	17 5/8	21	29	29	29	34	34	34	34	44 1/8	44 1/8	44 1/4
Duct Conn. Inlet of Filter Rack: R Hgt.	—	15 5/8	15 5/8	20	20	20	23 1/4	23 1/4	23 5/8	23 5/8	23 5/8	23 5/8	23 5/8
Duct Conn. Inlet of Filter Rack: T Width	—	16	19 3/4	27 1/2	27 1/2	27 1/2	32 3/4	32 3/4	32 3/4	32 3/4	42 7/8	42 7/8	42 7/8
Center to Center Blower Mtg. Holes S	—	10 15/16	13 7/18	17 3/8	17 3/8	17 3/8	20 3/8	20 3/8	20 3/8	20 3/8	20 3/8	20 3/8	20 3/8
Std. Mtr. Pulley Dia. ③	—	3	3	3	3	3	3	3	3	3	3	3	4 1/2
Std. Blower Pulley Dia.	—	9	10	15	13	9	13	12	9	8	8	8	11
Blower Wheel Dia.	—	8	9	13	13	13	15	15	15	15	15	15	15
Approx. Weight	—	146#	158#	215#	215#	231#	307#	307#	331#	331#	420#	420#	490#

① Diameter of round vent pipe to fit oval opening. All single stage units require a Category I vent system. Models PAE 30 thru PAE 100 with two stage gas controls require a Category II vent system.
② For natural gas.
③ This is an approximate dimension for standard motors, allow 3" for sheave adjustment and optional motors.
④ PAE 30 thru PAE 250 — 2 holes
BAE 50 thru BAE 250 and PAE 300, PA 350, PA 400 — 4 holes
BAE 300, BA 350, BA 400 — 6 holes
⑤ On blower units L=C+P is distance from front of unit to back of blower enclosure, and minimum distance to wall.
⑥ Distance between mounting hole in unit casing and mounting hole on blower, except on BAE 300, BA 350 and BA 400. Then distance from rear mounting hole in casing.
⑦ Motor pulley is adjustable.

performance data

table 7 / propeller type unit

Model	BTU/Hr. Input ①	BTU/Hr. Output ①	CFM @ 70°F.	Outlet Velocity	Air Temp. Rise °F.	Maximum Mounting Hgt. (Ft.)	Heat Throw Ft. ③	Standard Motor Data ②			
								Horse Power	Amps	RPM	Type
PAE 30	30,000	24,300	440	515	51	7	15	1/40	1.3	1550	Sh. Pole
PAE 50	50,000	40,500	740	496	51	7	17	1/40	1.3	1550	Sh. Pole
PAE 75	75,000	60,750	1130	665	50	9	23	1/30	2.3	1550	Sh. Pole
PAE100	100,000	80,000	1440	616	51	9	23	1/30	2.3	1050	Sh. Pole
PAE125	125,000	100,000	1850	789	50	12	30	1/15	2.7	1050	Sh. Pole
PAE145	145,000	116,000	2400	893	46	14	36	1/6	3.1	1075	PSC
PAE175	175,000	140,000	2500	713	52	11	29	1/6	3.1	1075	PSC
PAE200	200,000	160,000	3000	852	49	14	35	1/6	3.1	1075	PSC
PAE225	225,000	180,000	3300	832	51	14	35	1/6	3.1	1075	PSC
PAE250	250,000	200,000	4100	1024	45	18	46	1/3	5.7	1075	PSC
PAE300	300,000	240,000	4400	960	51	16	42	1/3	5.7	1075	PSC
PA 350	350,000	269,500	4400	975	57	20	65	1/2	7.5	1075	PSC
PA 400	400,000	304,000	5300	995	53	20	65	1/2	7.5	1075	PSC

① Note: Ratings shown are for elevations up to 2,000 ft. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (Does not apply in Canada – see Rating Plate.)
DO NOT USE PROPELLER UNITS WITH DUCT WORK.

② Data listed is for standard 115-volt, 60-Hertz, single-phase motors.

③ At 65°F ambient and unit fired at full rated input. Mounting height as measured from bottom of unit.

table 8 / standard blower motor data ①

	MODEL NUMBER											
	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BA 350	BA 400
HP	1/4	1/4	1/4	1/4	1/3	1/4	1/3	1/2	3/4	1	1	1 1/2
Amps (@ 115 volt) ①	5.4	5.4	5.4	5.4	4.6	5.4	4.6	8.5	11	13.4	13.4	15.6
RPM	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
Type	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Split Phase	Cap. Start	Cap. Start

① Data listed is for standard 115-volt, 60-Hertz, single-phase motors.

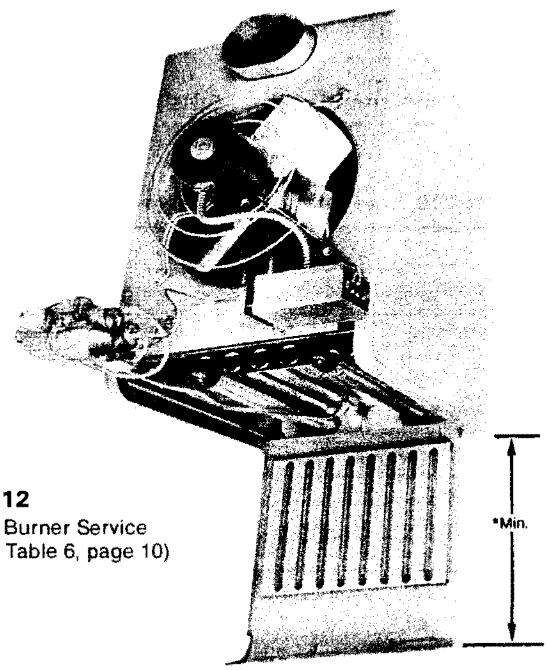
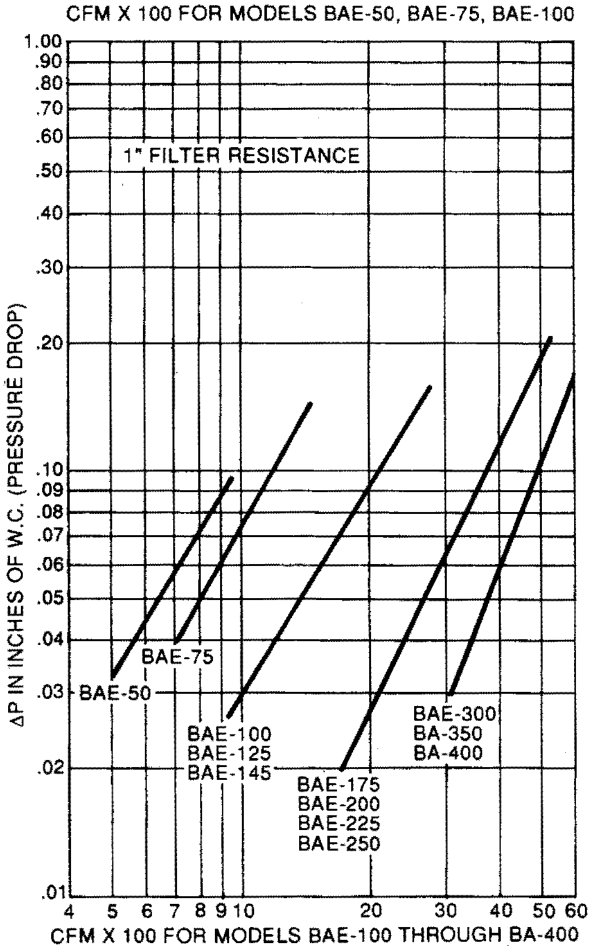


Figure 12
Hinged Bottom for Burner Service
*(See Dimension "C" Table 6, page 10)

performance data

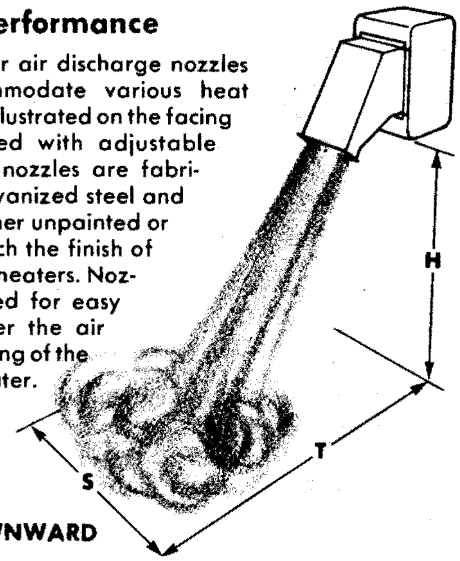
Inlet filters • Performance

The application of Modine filter kits require the addition of a blower enclosure kit, therefore, to determine filter resistance, select unit size and Cfm from table on page 13. Enter chart below at corresponding Cfm (top of chart for 0-1000 Cfm — bottom of chart for 1000-10,000 Cfm) and proceed up or down vertical line to a point where it intersects the diagonal line for the unit selected. Move to the left edge of chart and read filter resistance.

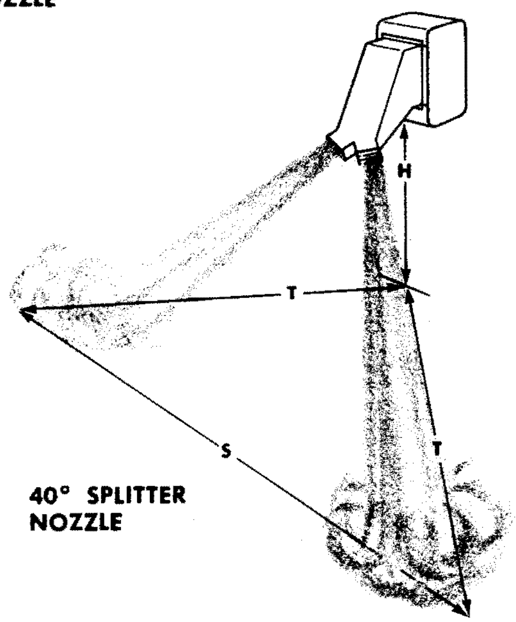


Nozzles • Performance

A choice of four air discharge nozzles (above) accommodate various heat throw patterns illustrated on the facing page. Equipped with adjustable louver blades, nozzles are fabricated from galvanized steel and are offered either unpainted or painted to match the finish of the blower unit heaters. Nozzles are flanged for easy attachment over the air discharge opening of the blower unit heater.



40° DOWNWARD NOZZLE



40° SPLITTER NOZZLE

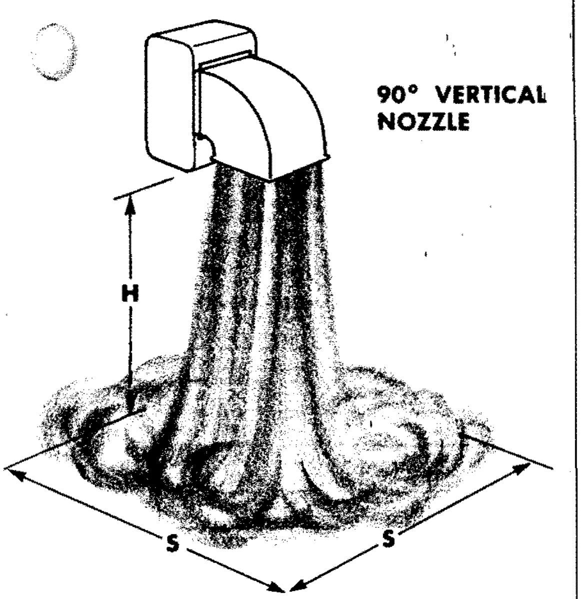
Nozzle performance* mounting height, heat throw, heat spread (in feet)

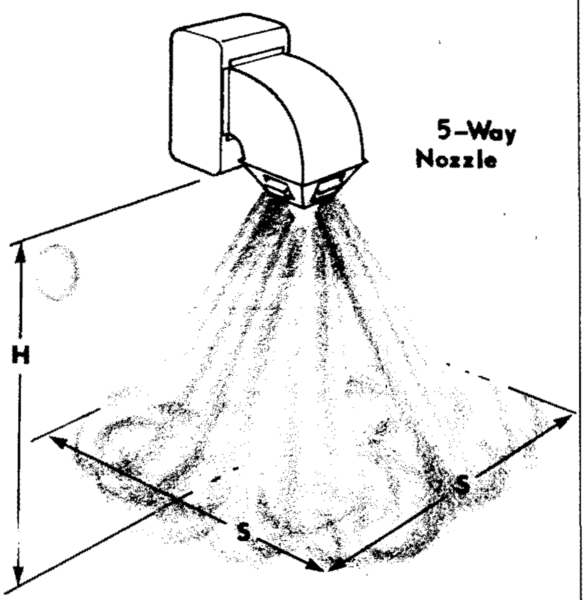
NOZZLE TYPE		MODEL NUMBER											
		BAE-50	BAE-75	BAE-100	BAE-125	BAE-145	BAE-175	BAE-200	BAE-225	BAE-250	BAE-300	BA-350	BA-400
40° Downward Nozzle	†Max. Mounting Ht. (ft.) H	14	16	18	22	21	24	27	24	26	28	32	32
	Heat Throw (ft.) T	41	49	54	66	63	72	81	71	78	83	96	96
	Heat Spread (ft.) S	14	16	18	22	21	24	27	24	26	28	32	32
90° Vertical Nozzle	†Max. Mounting Ht. (ft.) H	15	17	18	22	22	21	24	24	26	28	32	32
	Heat Spread (ft.) S	15	17	18	22	22	21	24	24	26	28	32	32
40° Splitter Nozzle	†Max. Mounting Ht. (ft.) H	–	–	16	20	'20	21	24	21	23	26	30	32
	Heat Throw (ft.) T	–	–	41	50	49	52	59	53	58	65	75	80
	Heat Spread (ft.) S	–	–	81	100	97	104	117	106	116	129	151	160
5-way Nozzle	†Max. Mounting Ht. (ft.) H	–	–	15	18	17	18	20	20	21	20	23	26
	Heat Spread (ft.) S	–	–	21	26	24	25	28	27	30	27	32	37

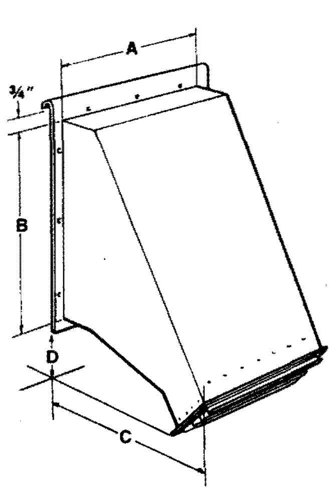
* The above table is based on an inlet air temperature 70°F and an air temperature rise of 55°F. Air deflectors on, 40° and 90° discharge nozzles set perpendicular to the face of the air discharge opening. On 5-way nozzles all air deflectors set perpendicular to floor. Static pressure measured at 0.1" W.C. for 90° nozzle, 0.2" W.C. for 40° downward and 5-way nozzle, and 0.3" W.C. for 40° splitter nozzle. Outlet velocities are approximately 1750 FPM for the 40° nozzles, 1000 FPM for the 90° nozzle, and 1300 FPM for 5-way. For motor size, drive and blower rpm refer to pages 12 and 13.

† Mounting height measured from bottom of unit.

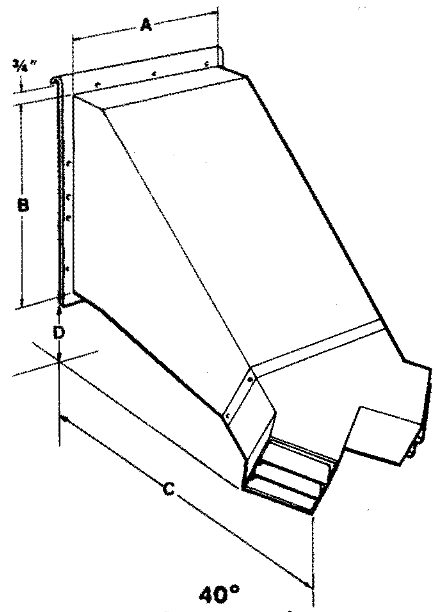
performance data



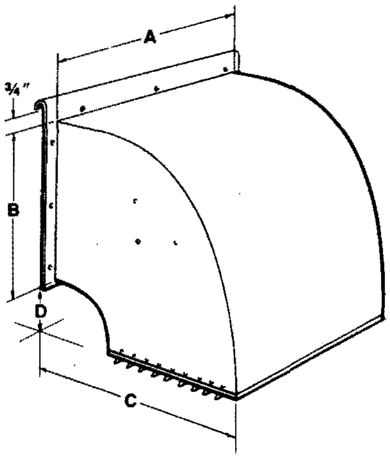




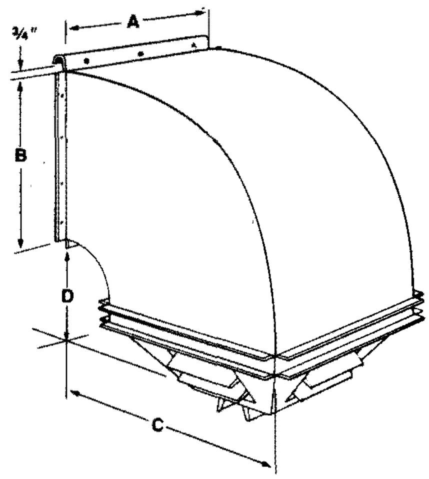
40°
Downward Nozzle



40°
Splitter Nozzle



90°
Vertical Nozzle



5-Way
Nozzle

Dimensions (in inches)

NOZZLE TYPE	DIMENSION SYMBOL	MODEL NUMBER											
		BAE-50	BAE-75	BAE-100	BAE-125	BAE-145	BAE-175	BAE-200	BAE-225	BAE-250	BAE-300	BA-350	BA-400
40° Downward Nozzle	A	–	–	18 9/16	18 9/16	21 1/16	23 3/16	23 3/16	26 3/16	26 3/16	31 1/8	31 1/8	37 1/2
	B	–	–	20	20	20	24	24	24	24	24	24	24
	C	–	–	34 1/2	34 1/2	33 1/2	40	40	40 1/2	40 1/2	47 1/2	47 1/2	48
	D	–	–	11	11	11	12 1/4	14	14	14	20	20	20 1/2
90° Vertical Nozzle	A	14 13/16	16 13/16	18 9/16	18 9/16	21 1/16	23 3/16	23 3/16	26 3/16	26 3/16	31 1/8	31 1/8	37 1/2
	B	16	16	20	20	20	24	24	24	24	24	24	24
	C	23 1/2	21 1/2	26	26	25	30	30	30	30	36	36	36
	D	4	3 1/2	4	4	4	4	5 1/2	5 1/2	5 1/2	10 1/2	10 1/2	10 1/2
40° Splitter Nozzle	A	14 13/16	16 13/16	18 9/16	18 9/16	21 1/16	23 3/16	23 3/16	26 3/16	26 3/16	31 1/8	31 1/8	37 1/2
	B	16	16	20	20	20	24	24	24	24	24	24	24
	C	15	17	22	22	23	29	29	30	30	34	34	34
	D	6	6	8	8	8	10	10	10	10	14	14	14
5-way Nozzle	A	14 13/16	16 13/16	18 9/16	18 9/16	21 1/16	23 3/16	23 3/16	26 3/16	26 3/16	31 1/8	31 1/8	37 1/2
	B	16	16	20	20	20	24	24	24	24	24	24	24
	C	22	24	25 13/16	25 13/16	28 3/8	30 5/8	30 5/8	33 3/8	33 3/8	38 3/8	38 3/8	44 13/16
	D	12	13	14	14	15	16	16	17	17	19	19	19

Performance Data — 30° and 60° Downward Deflector Hoods — Propeller Models

Mounting Height to Bottom of Heater	30° Downward Deflector Hood	PROPELLER MODELS ① (See Figures A and B)										
Model	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PA 350	PA 400
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	7 13 15	9 23 27	9 21 25	11 28 34	14 36 42	11 27 32	13 34 40	13 33 39	17 44 52	15 40 47	15 44 62	16 48 67
10'	6 10 12	9 20 24	9 18 21	11 28 32	14 36 42	11 26 30	13 33 39	13 33 39	17 44 52	15 40 47	15 44 61	16 48 67
12'	— — —	12 13 15	— — —	11 25 30	14 35 41	11 23 27	13 32 38	13 32 37	17 44 52	16 39 46	15 43 60	16 48 66
14'	— — —	— — —	— — —	11 20 24	14 33 39	10 21 24	13 30 35	13 29 35	17 43 50	16 38 45	14 40 57	16 46 64
16'	— — —	— — —	— — —	— — —	14 30 35	9 15 17	13 25 30	13 25 29	17 41 49	16 36 43	14 37 52	16 43 61
18'	— — —	— — —	— — —	— — —	13 22 26	— — —	— — —	— — —	17 39 46	16 33 39	14 36 48	16 39 55
20'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	17 35 42	15 30 35	13 31 42	15 39 51
22'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	14 26 30	12 23 32	14 31 47
Mounting Height to Bottom of Heater	60° Downward Deflector Hood	PROPELLER MODELS ① (See Figures A and B)										
Model	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PA 350	PA 400
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	0 13 16	0 20 25	0 19 23	0 25 31	0 31 38	0 23 29	0 29 36	0 29 35	0 37 47	0 34 42	0 29 41	0 32 45
10'	6 10 12	0 20 24	0 18 22	0 25 31	0 31 38	0 23 29	0 29 36	0 29 35	0 37 47	0 34 42	0 29 41	0 32 45
12'	— — —	0 16 20	— — —	0 24 30	0 31 38	0 23 28	0 29 36	0 29 35	0 37 47	0 34 42	0 30 42	0 31 44
14'	— — —	— — —	— — —	0 22 28	0 30 38	0 18 23	0 28 35	0 28 35	0 37 47	0 34 42	0 27 39	0 30 43
16'	— — —	— — —	— — —	— — —	0 29 37	— — —	0 26 33	0 26 32	0 37 46	0 33 42	0 27 39	0 30 43
18'	— — —	— — —	— — —	— — —	0 26 32	— — —	— — —	— — —	0 37 46	0 33 41	0 26 39	0 30 43
20'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 36 44	0 32 39	0 25 35	0 27 42
22'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 23 35	0 27 38
24'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 21 32	0 24 34
26'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 22 31

① Data based on units fired at full rated input and with an entering air temperature of 80°F.

30° HOOD

60° HOOD

FIGURE A

THROW-FLOOR COVERAGE

NOTE:
O-X = FEET FROM HEATER TO START OF FLOOR COVERAGE.
O-Y = FEET TO END OF FLOOR COVERAGE.
O-Z = FEET TO END OF THROW.

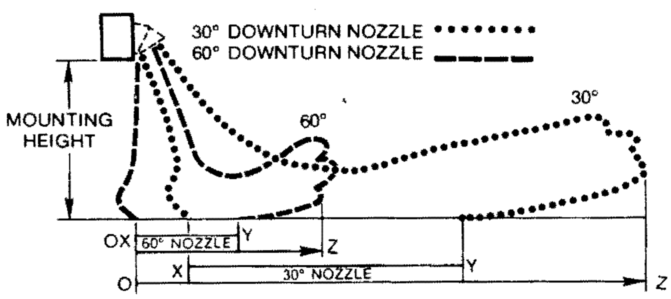


FIGURE B

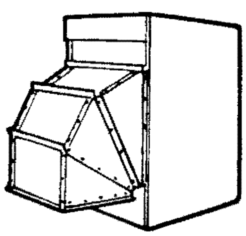
Performance Data — 30°, 60° and 90° Downward Deflector Hoods — Blower Models

Mounting Height to Bottom of Heater	30° Downward Deflector Hood	BLOWER MODELS ② (See Figures A and B)										
Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BA 350	BA 400
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	8 6 7	8 18 22	8 18 22	10 24 29	10 26 30	10 25 29	11 28 33	12 30 35	13 33 38	14 35 41	13 40 55	13 39 54
10'	— — —	7 14 16	7 14 16	10 23 27	10 24 29	10 23 27	11 27 32	12 29 34	13 32 38	14 35 41	13 40 55	13 39 54
12'	— — —	6 8 10	— — —	9 18 21	10 21 25	10 19 23	11 25 30	12 27 32	13 31 36	14 34 40	13 37 52	13 36 51
14'	— — —	— — —	— — —	— — —	9 17 20	8 13 16	11 20 23	11 23 27	13 28 33	14 32 38	13 34 48	13 33 47
16'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	12 23 27	14 29 34	12 32 43	13 32 42
18'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	12 19 23	11 28 39	11 24 39

Mounting Height to Bottom of Heater	60° Downward Deflector Hood	BLOWER MODELS ② (See Figures A and B)										
Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BA 350	BA 400
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	0 9 11	0 17 21	0 17 21	0 21 27	0 23 28	0 22 27	0 25 30	0 26 32	0 28 35	0 30 37	0 26 38	0 26 38
10'	— — —	0 15 19	0 15 19	0 21 26	0 22 28	0 22 27	0 25 30	0 26 32	0 28 35	0 30 37	0 24 38	0 25 37
12'	— — —	7 12 15	— — —	0 19 24	0 21 27	0 20 25	0 24 30	0 25 31	0 28 35	0 30 37	0 23 37	0 25 37
14'	— — —	— — —	— — —	— — —	0 19 24	0 16 21	0 22 27	0 24 29	0 27 34	0 30 37	0 23 37	0 24 37
16'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 25 31	0 29 36	0 24 35	0 23 36
18'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 24 30	0 23 33	0 23 31
20'	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	0 20 30	0 20 28

Mounting Height to Bottom of Heater	90° Downward Deflector Hood	BLOWER MODELS ② (See Figures C and D)										
Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BA 350	BA 400
	S	S	S	S	S	S	S	S	S	S	S	S
8'	12	18	20	27	29	29	34	36	42	47	47	47
10'	10	16	17	24	26	26	31	33	37	42	45	45
12'	9	15	16	22	24	23	28	30	34	38	43	43
14'	—	14	15	20	22	22	26	28	32	35	41	41
16'	—	—	14	19	21	20	24	26	30	33	39	39
18'	—	—	—	18	19	19	23	24	28	31	37	37
20'	—	—	—	—	18	18	22	23	27	30	35	35
22'	—	—	—	—	—	—	21	22	25	28	33	33
24'	—	—	—	—	—	—	—	—	24	27	31	31
26'	—	—	—	—	—	—	—	—	—	26	29	29
28'	—	—	—	—	—	—	—	—	—	—	27	27

② Data based on units fired at full rated input, 80°F entering air temperature, and a 60°F temperature rise through unit.



90° HOOD

FIGURE C

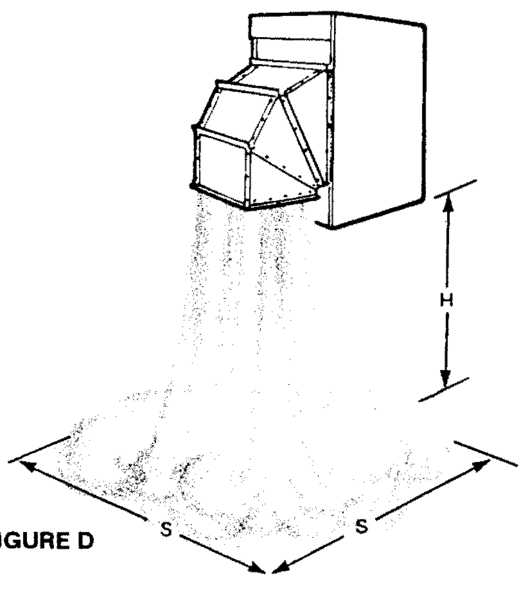


FIGURE D

performance data

table 9 / blower models, without blower enclosure ①②③④⑧

Model No.	Input Btu/Hr.	Output Btu/Hr.	Temp Rise °F	Air Flow Cfm	Outlet Velocity Fpm	0.0 Static Pressure ⑤ Rpm	Hp	Drive No.	Pully Turns Open	0.1 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.2 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.3 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.4 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open
			40	938	616	635	¼	C5	3.5	695			2.5	770			1	860	¼	C1	4.5	940	¼	C1	3.5
			45	833	553	565			0	640	¼	C5	3.5	720			2	815			0.5	900			4
			50	750	502	510			1	600			4	685			2.5	785			1	870	¼	C1	4.5
BAE50	50,000	40,500	55	682	460	465	¼	C87	2.5	565			0	660	¼	C5	3	760	¼	C5	1	845			4.5
			60	625	425	425			3.5	540			0.5	640			3.5	740			1.5	825			0
			65	577	396	390			4.5	515	¼	C87	1	625			3.5	725			2	810	¼	C5	0.5
			70	536	371	365			5	500			1.5	610			4	715			2	800			0.5
			40	1406	813	550	¼	C90	5	650			3	740	¼	C90	1.5	815	¼	C92	0.5	875	¼	C91	4.5
			45	1250	729	490			0.5	600			4	695			2.5	770	¼	C90	1	830	¼	C92	0
			50	1125	662	440			2	565	¼	C90	4.5	655			3	735			1.5	795	¼	C90	0.5
BAE75	75,000	60,750	55	1023	607	400	¼	C88	3	530			5	625			3.5	705			2	770			1
			60	938	561	365			4	505			0	605	¼	C9	4	680	¼	C90	2.5	745			1.5
			65	865	522	340			5	485	¼	C88	0.5	585			4.5	660			3	725	¼	C90	2
			70	804	489	–	–	–	–	470			1	565			4.5	645			3.5	710			2
			40	1875	786	315			1	405			3	475			0.5	535	¼	C95	3.5	585	¼	C96	2.5
			45	1667	705	280			2.5	380			3.5	450			1.5	510	¼	C95	4	560	¼	C95	3
			50	1500	640	255	¼	C93	3.5	360	¼	C94	4	435			2	490			0	540			3.5
BAE100	100,000	81,000	55	1364	587	230			4.5	340			4.5	415	¼	C94	2.5	475			0.5	525	¼	C95	4
			60	1250	542	210			5	330			0	405			3	465	¼	C94	1	515			4
			65	1154	505	–	–	–	–	320	¼	C93	0.5	395			3	455			1.5	505			0
			70	1071	473	–	–	–	–	310			1	385			3.5	445			1.5	495	¼	C94	0
			40	2315	970	395	¼	C36	4	465	½	C36	2.5	535	½	C98	0.5	590	½	C38	4	635	¾	C38	3.5
			45	2058	870	350			1	430	¼	C36	3	500	½	C36	1.5	560	½	C98	0	605	½	C38	4
			50	1852	790	315			2.5	405			4	475			2	535	½	C36	0.5	585			4.5
BAE125	125,000	100,000	55	1684	724	290	¼	C97	3.5	385			0	455			2.5	515			1	565	½	C36	0
			60	1543	669	265			4.5	365			0.5	440	¼	C36	3	500			1.5	550			0
			65	1425	623	245			5	350	¼	C97	1	425			3.5	485	¼	C36	2	535	¼	C36	0.5
			70	1323	584	–	–	–	–	340			1.5	415			3.5	475			2	525			1
			40	2685	991	640	¾	C38	3.5	695	1	C38	2.5	740	1	C38	1.5	775	1	C38	1	820	1½	C113	3
			45	2387	888	570	½	C38	4.5	625	¾	C38	3.5	670	¾	C38	3	715	¾	C38	2	765	1	C38	1
			50	2148	806	515	½	C98	1	570	½	C38	4.5	620	½	C38	3.5	675			2.5	725	¾	C38	2
BAE145	145,000	116,000	55	1953	739	465			2.5	530	½	C98	0.5	585			4.5	640	½	C38	3.5	695			2.5
			60	1790	684	430			3.5	495			1.5	555			0	615			4	670	½	C38	3
			65	1652	636	395	½	C36	4	470	½	C36	2	530	½	C36	0.5	590	½	C115	4	650			3
			70	1534	596	365			5	450			3	510			2.5	575			4.5	635	½	C115	3.5
			40	3281	917	440	½	C102	3.5	465	¾	C101	2.5	510	¾	C101	1	550	¾	C101	0	590	1	C107	4
			45	2917	823	390			4.5	425	½	C101	3.5	475	½	C101	2	515			1	555	¾	C101	0
			50	2625	747	355			1	395	½	C102	4.5	445			3	490	½	C101	2	525			1
BAE175	175,000	141,750	55	2386	685	320			2.5	370			0.5	420	½	C102	3.5	465			2.5	505	½	C101	1.5
			60	2188	633	295	½	C24	3.5	345			1.5	405	½	C102	4	445	½	C102	3	485			2.0
			65	2019	589	270			4.5	330	½	C24	2	385	½	C24	0	430			3	470	½	C102	2.0
			70	1875	552	250			5	315			2.5	375			0.5	420	½	C102	3.5	460			2.5
			40	3704	1035	505	¾	C16	3	515	1	C16	2.5	560	1	C16	1.5	600	1½	C105	1.5	635	1½	C105	[illegible]
			45	3292	928	450			4	470	¾	C16	3.5	515	¾	C16	2.5	555	1	C16	1.5	595	1	C16	[illegible]
			50	2963	843	405	½	C104	0.5	435	½	C16	4.5	480			3.5	525	¾	C16	2.5	560	¾	C16	1.5
BAE200	200,000	160,000	55	2694	773	365			1.5	405	½	C104	0.5	455	½	C16	4	500			3	535			2
			60	2469	714	335			3	380			1	435			4.5	475	½	C16	3.5	515			2.5
			65	2279	685	310	½	C103	3.5	360	½	C103	2	415	½	C103	0	460			4	495	½	C16	3
			70	2116	623	290			4.5	345			2.5	400			0.5	445	½	C99	4	480			3.5
			40	4219	1044	640	1½	C106	5	670	1½	C106	4.5	715	1½	C106	3.5	750	2	C108	2.5	785	2	C108	1.5
			45	3750	936	570	1	C107	4.5	605	1	C107	4	650			5	690	1½	C106	4	725	1½	C106	3
			50	3375	850	510	¾	C101	1	555	¾	C101	0	605	1	C107	4	640	1	C107	3.5	675	1	C107	2.5
BAE225	225,000	182,250	55	3068	779	465			2.5	515			1	565	¾	C101	0	605	¾	C107	4	635			3.5
			60	2813	720	425			3.5	480			2	530			0.5	570			4.5	605	¾	C107	4
			65	2596	671	395	¾	C101	4.5	455	¾	C101	2.5	505	¾	C101	1.5	545	¾	C101	0.5	580			4.5
			70	2411	628	365			5	430			3.5	480			2	520			1	555	½	C101	0
			40	4630	1146	710	2	C110	1.5	730	2	C110	0.5	775	2	C33	4	810	2	C33	3	845	3	C111	2.5
			45	4115	1027	630	1½	C105	4	660	1½	C105	3	705	1½	C105	1.5	745	1½	C105	0.5	775	2	C33	4
			50	3704	933	570	1	C16	1.5	605	1	C16	0.5	650			3	690			2	725	1½	C105	1
BAE250	250,000	200,000	55	3367	855	515			2.5	560			1.5	610	1	C16	0.5	645	1	C109	5	680	1	C109	4.5
			60	3086	791	475			3.5	525	¾	C16	2.5	570			1	610			0.5	645			5
			65	2849	736	435	¾	C16	4.5	490			3	540	¾	C16	2	580	¾	C16	1	615	¾	C16	0
			70	2646	689	405			5	465			3.5	515			2.5	555			1.5	590			1
			40	5556	1190	795	3	C111	3.5	815	3	C111	3	850	3	C111	2.5	880	3	C111	1.5	–	–	–	–
			45	4938	1067	710	2	C110	1.5	735	2	C110	0.5	770			4	805			3.5	835	3	C111	2.5
			50	4444	969	635	1½	C105	3.5	670	1½	C105	2.5	710	2	C110	1.5	745	2	C110	0.5	775	2	C33	4
BAE300	300,000	240,000	55	4040	889	580			1	615			4	660	1½	C105	3	695	1½	C105	2	725	1½	C105	1
			60	3704	821	530			2	575			1	615			0	655			3	685			2
			65	3419	765	490	1	C16	3	535	1	C16	2	580	1	C16	1	620	1	C16	0	650	1	C109	5
			70	3175	716	455			4	505			3	550			1.5	590			1	625	1	C16	0
			55	4537	959	625	1½	C23	2	665	1½	C23	0.5	700			0	720	2	C19	3	740	2	C19	2.5
			60	4160	888	570			3.5	615			2.5	650	1½	C23	1	675	1½	C23	0.5	700			3.5
			65	3840	826	525			2.5	575			1	610			2.5	645			1.5	670	1½	C23	0.5
BA350	350,000	269,500	70	3565	775	490			3	540			2	580			1	615			0	645			1.5
			75	3327	730	460	1	C16	4	510	1	C16	2.5	555	1	C16	1.5	590	1	C16	1	620			0
			80	3120	690	430			4.5	480			3.5	530			2	570			1.5	605	1	C16	0.5
			85	2936	655	410			5	460			4	505			3	555			1.5	585			1
			55	5050	889	680	2	C19	4	715	2	C19	3	704	2	C19	2.5	770	2	C19	2	795			1
			60	4630	822	610	1½	C23	2.5	655			1	690			4	725			3	750	2	C19	2.5
			65	4273	766	555			4	610			2.5	650			1	685			0	715			3.5
BA400	400,000	300,000	70	3968	718	510			2.5	570	1½	C23	3.5	615			2.5	650			1	680			0
		⑥	75	3703	675	470	1½	C26	4	535			5	580	1½	C23	3.5	625	1½	C23	2	655	1½	C23	1
			80	3472	638	430			5	500			3	555			4	600			3	630			2
			85	3268	607	400	–	–	–	475	1½	C26	4	530			5	580			3.5	610			2.5

① Shaded area indicates unit standard motor and drive range.
② For unit operation in non-shaded area; specify on order optional motor and drive number.
③ Ratings shown are for elevations up to 2,000 feet. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (Does not apply in Canada – see rating plate.)
④ Pulley turns open are approximate. For proper operation, check blower rpm.
⑤ RPM and pulley settings shown in bold type, in shaded areas for 0.0 static pressure on page 12, indicate factory settings of standard drives.
⑥ In Canada, output is 77% of input.
⑦ Mounting heights and throws for BA/BAE models, without duct work or nozzles, and at cfm's yielding a 55° temperature are the same as those listed on page 11 for equivalent sized PA/PAE models.

performance data

table 10 / blower models, with blower enclosure ① ② ③ ④ ⑧

Model No.	Input Btu/Hr.	Output Btu/Hr.	Temp Rise- °F	Air Flow Cfm	Outlet Velocity Fpm	0.0 Static Pressure ⑤ Rpm	Hp	Drive No.	Pully Turns Open	0.1 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.2 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.3 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open	0.4 Static Pressure Rpm	Hp	Drive No.	Pully Turns Open
			40	938	616	740			1.5	830			0	900	½	C1	4	965	½	C1	3.5	—	—	—	—
			45	833	553	685			2.5	775			1	850	¼	C1	4.5	915			4	975	½	C1	3
			50	750	502	645	¼	C5	3	735			1.5	810			0.5	875	¼	C1	4.5	935			3.5
BAE50	50,000	40,500	55	682	460	610			4	705	¼	C5	2	780			1	845			4.5	905	¼	C1	4
			60	625	425	585			4.5	675			2.5	755	¼	C5	1.5	820			0	880			4.5
			65	577	396	560	¼	C87	0	655			3	730			1.5	800	¼	C5	0.5	855			4.5
			70	536	371	540			0.5	635			3.5	715			2	780			1	840	¼	C5	0
			40	1406	813	695	½	C90	2.5	775	½	C92	1	845	½	C92	0	905	½	C91	4	960	¾	C91	2.5
			45	1250	729	650			3	730	½	C90	1.5	800	½	C90	0.5	860			4.5	915	½	C91	3
			50	1125	662	615			4	695			2.5	765			1	830	½	C90	0	880			3.5
BAE75	75,000	60,750	55	1023	607	585	¼	C90	4.5	665			3	740			1.5	800			0.5	855	½	C114	3.5
			60	938	561	560			4.5	645	¼	C90	3	715	¼	C90	2	775			1	830			4
			65	865	522	540			5	625			3.5	695			2.5	755	¼	C90	1.5	810	½	C90	4
			70	804	489	520	¼	C88	0	605			4	680			2.5	740			1.5	795			4.5
			40	1875	786	385	¼	C94	3.5	465			1	525	½	C95	4	575	½	C95	3	620	½	C96	2
			45	1667	705	360			4	440			2	500			0	550			3.5	595	½	C95	2.5
			50	1500	640	340			0	420			2.5	480			0.5	535	¼	C95	3.5	580			3
BAE100	100,000	81,000	55	1364	587	320			0.5	405	¼	C94	3	465			1	520			4	565			3
			60	1250	542	310	¼	C93	1	390			3	455	¼	C94	1.5	505			0	550	¼	C95	3.5
			65	1154	505	295			1.5	380			3.5	445			1.5	495	¼	C94	0	540			3.5
			70	1071	473	285			2	370			4	435			2	485			0.5	530			4
			40	2315	970	480	½	C98	2	545	½	C98	0.5	600	½	C38	4	645	¾	C38	3	690	¾	C38	3.5
			45	2058	870	445			3	515	½	C36	1	570			4.5	615	½	C38	3.5	660			4
			50	1852	790	420	¼	C36	3.5	490			2	545	½	C36	5	595			4	635	½	C38	4.5
BAE125	125,000	100,000	55	1684	724	400			4	470			2.5	525			1	575	½	C37	4.5	615			0
			60	1543	669	380			0	455	¼	C36	2.5	510	¼	C36	1	560	½	C36	0	600			0
			65	1425	623	370	¼	C97	0.5	440			3	495			1.5	545	¼	C36	0.5	590	½	C37	0.5
			70	1323	584	355			1	425			3.5	485			2	535			0.5	580			1
			40	2685	991	715	1	C38	2	755	1	C38	1.5	800	1	C38	0.5	835	1½	C113	2.5	875	1½	C113	1.5
			45	2387	888	650	¾	C38	3	695	¾	C38	2.5	745	¾	C38	1.5	785	1	C38	1	825	1	C38	0
			50	2148	806	600	½	C38	4	650			3	700			2.5	745	¾	C38	1.5	790	¾	C38	0.5
BAE145	145,000	116,000	55	1953	739	565	½	C98	0	610	½	C38	4	670	½	C38	3	715			2	760			1
			60	1790	684	530			0.5	585	½	C115	4.5	645			3.5	695			2.5	740			1.5
			65	1652	636	505	½	C36	1.5	560	½	C36	0	625	½	C115	3.5	675	½	C38	2.5	720	½	C38	2
			70	1534	596	485			2	545			0.5	605			4	660			3	705			2
			40	3281	917	480	¾	C101	2	535	¾	C101	0.5	565	1	C101	0	595	1	C107	4	630	1	C107	3.5
			45	2917	823	440	½	C101	3	495			1.5	525	¾	C101	1	565	¾	C101	0	595	¾	C107	4
			50	2625	747	410			4	465	½	C101	2.5	500	½	C101	1.5	535			0.5	570			4.5
BAE175	175,000	141,750	55	2386	685	385	½	C24	0	440	½	C102	3	475			2	515			1	545	¾	C101	0
			60	2188	633	365			0.5	420			3.5	460			2.5	495	½	C101	1.5	530			0.5
			65	2019	589	350	¼	C24	1.5	405	¼	C102	4	445	½	C102	3	480			2.5	515	½	C101	1
			70	1875	552	335			2	390			0	430			3.5	470	½	C102	3.5	500			1.5
			40	3704	1035	520	1	C16	2.5	565	1	C16	1.5	600	1½	C105	4.5	635	1½	C105	3.5	670	1½	C105	2.5
			45	3292	928	475	¾	C16	3.5	520	¾	C16	2.5	560	1	C16	1.5	595	1	C16	0.5	630	1	C16	0
			50	2963	843	440	½	C16	4.5	485			3	530	¾	C16	2	565	¾	C16	1.5	595			0.5
BAE200	200,000	160,000	55	2694	773	410	½	C104	0	460	½	C16	4	500			3	540			2	570	¾	C16	1
			60	2469	714	385			1	435			4.5	480	½	C16	3.5	515			2.5	550			1.5
			65	2279	665	365	½	C103	1.5	420	½	C103	0	460			4	500	½	C16	3	535	½	C16	2
			70	2116	623	350			2.5	400			0.5	445	½	C99	4	485			3.5	520			2.5
			40	4219	1044	685	1½	C106	4	730	1½	C106	3	765	2	C108	2	795	2	C108	1	825	2	C108	0.5
			45	3750	936	625	1	C107	3.5	670			4.5	705	1½	C106	3.5	735	1½	C106	3	765	1½	C106	2
			50	3375	850	575	¾	C107	4.5	620	1	C107	3.5	655	1	C107	3	690	1	C107	2.5	715			3
BAE225	225,000	182,250	55	3068	779	535	¾	C101	1	580	¾	C107	4.5	615	¾	C107	3.5	650			3	680	1	C107	2.5
			60	2813	720	505			1.5	550	¾	C101	0	585			4.5	615	¾	C107	3.5	645			3
			65	2596	671	475	½	C101	2	520	½	C101	1	560	½	C101	0	590			4	620	¾	C107	3.5
			70	2411	628	450			2.5	495			1.5	535			0.5	565	½	C107	4.5	595			4
			40	4630	1146	790	2	C33	3.5	825	2	C33	3	860	3	C111	2	890	3	C111	1.5	915	3	C111	0.5
			45	4115	1027	720	1½	C105	1	755	1½	C105	0	790	2	C33	3.5	820	2	C33	3	845	2	C33	2.5
			50	3704	933	660			3	700			1.5	735	1½	C105	0.5	765	1½	C105	0	795	1½	C100	3.5
BAE250	250,000	200,000	55	3367	855	615	1	C16	0	655	1	C109	0.5	690	1	C109	4.5	720			1	750	1½	C105	0
			60	3086	791	580			1	620			0	655			5	685	1	C109	4.5	715	1	C109	4
			65	2849	736	545	¾	C16	2	590	¾	C16	1	625	¾	C16	0	655	¾	C109	5	685			4.5
			70	2646	689	520			2.5	560			1.5	595			0.5	630	¾	C16	0	655	¾	C109	5
			40	5556	1190	830	3	C111	2.5	865	3	C111	2	—	—	—	—	—	—	—	—	—	—	—	—
			45	4938	1067	750	3	C112	0	790			3.5	820	3	C111	3	850	3	C111	2.5	875	3	C111	1.5
			50	4444	969	690	2	C110	2	725	2	C110	1	760	2	C33	4.5	790	2	C33	3.5	815			3
BAE300	300,000	240,000	55	4040	889	635	1½	C105	3.5	680	1½	C105	2.5	710	1½	C105	0.5	740	2	C110	0.5	770	2	C33	4
			60	3704	821	595			0.5	635			3.5	670			2.5	700	1½	C105	1.5	730	1½	C100	0
			65	3419	765	560	1	C16	1.5	600	1	C16	0.5	635	1	C109	5	670			2.5	695	1½	C105	2
			70	3175	716	530			2	575			1	610	1	C16	0.5	640	1	C109	5	665	1	C109	5
			55	4537	959	695	1½	C23	0	735	2	C19	2.5	770	2	C19	2	785	2	C19	1.5	800			1
			60	4160	888	640			1.5	690	1½	C23	0	725			3	740			2.5	755	2	C19	2
			65	3840	826	585			1	640			1.5	675	1½	C23	0.5	700			0	720			3
BA350	350,000	269,500	70	3565	775	550			1.5	605			0.5	645			1.5	670	1½	C23	0.5	695			0
		⑥	75	3327	730	515	1	C16	2.5	507	1	C16	1.5	610			0.5	640			1.5	670	1½	C23	0.5
			80	3120	690	480			3.5	540			2	585	1	C16	1	615	1	C16	0	645			1.5
			85	2936	655	455			4	515			2.5	560			1.5	595			0.5	625	1	C16	0
			55	5050	889	755	2	C19	2	708	2	C19	1.5	795	2	C19	1	815			0.5	845			0
			60	4630	822	655			4.5	715			3.5	745			2.5	765	2	C19	2	790	2	C19	1.5
			65	4273	766	620			2	660			1	685			0	720			3	750			2.5
BA400	400,000	300,000	70	3968	718	570	1½	C23	3.5	610	1½	C23	2.5	645			1.5	680			0	710			3.5
		⑥	75	3703	675	525			5	570			3.5	610	1½	C23	2.5	650	1½	C23	1	680			0
			80	3472	638	485	1½	C26	3.5	535			5	580			3	625			2	650	1½	C23	1
			85	3268	607	450			5	505	1½	C26	3	550			4.5	600			2.5	625			2

① Shaded area indicates unit standard motor and drive range.

② For unit operation in non-shaded area, specify on order optional motor and drive number.

③ Ratings shown are for elevations up to 2,000 feet. For elevations above 2,000 feet, ratings should be reduced at the rate of 4% for each 1,000 feet above sea level. (Does not apply in Canada – see rating plate.)

④ Pulley turns open are approximate. For proper operation, check blower rpm.

⑤ RPM and pulley settings shown in bold type, in shaded areas for 0.0 static pressure on page 12, indicate factory settings of standard drives.

⑥ In Canada, output is 77% of input.

⑦ Mounting heights and throws for BA/BAE models, without duct work or nozzles, and at cfm's yielding a 55° temperature are the same as those listed on page 11 for equivalent sized PA/PAE models.

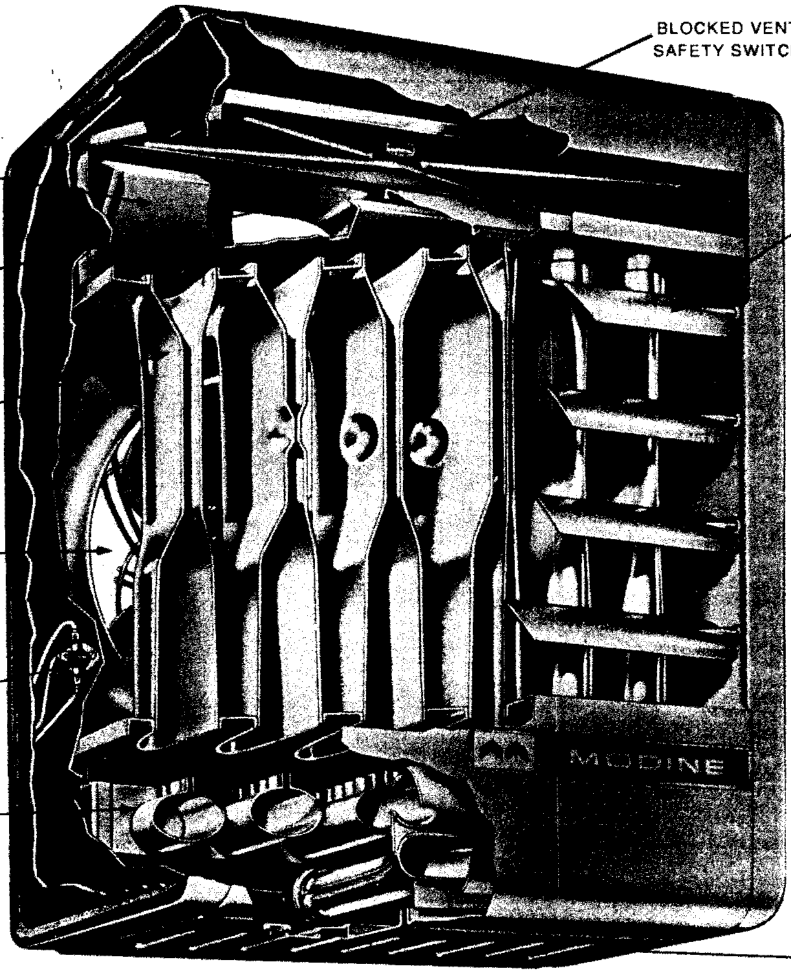


Figure 13
Cross-section of propeller type unit

LIMIT CONTROL (OVERHEAT SWITCH)

The limit control, mounted on the left inner side panel (when facing front of unit), will shut off the gas supply to the main burner in the event of overheating. It is a single pole single-throw switch. This limit control should operate only when something is seriously wrong with the unit. Anytime this control operates, correct the difficulty immediately or serious damage may result. If the limit control cuts off the gas supply during normal operation:

1. See that front louvers 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 to be sure motor is operating
4. Check that fan is not loose on motor shaft. On blower units check belts and pulleys for tightness or damage.
5. Check fan speed (on propeller units) against speed on motor nameplate. On blower units check blower speed against Tables 9 or 10; check for restrictions in ducts and for dirty filters.
6. Check to make sure the venting system is not damaged or blocked. Also check to be sure unit is venting normally and that there is not negative pressure in the building adversely affecting draft.
7. Clean heat exchanger tubes inside and out if necessary.
8. If items 1-7 do not solve the problem, check limit control and replace if necessary. The control is accessible by removing the left outer side panel, held in place by screws at the rear of the unit.

IMPORTANT NOTE:

The limit control (overheat switch) on this unit heater will shut off the gas should excessive discharge temperatures occur. Do not attempt to control the fan with the limit control. Any change in wiring to attempt to control the fan with the limit control will result in hazardous conditions and void the warranty.

BLOCKED VENT SAFETY SWITCH

A blocked vent safety switch is supplied on all gravity-vented unit heaters and is designed to prevent operation of the main gas burner if the venting system is blocked.

If the blocked vent switch has tripped, turn off the gas and electric supply to the unit heater. Check the entire vent system connected to the unit heater for blockage or damage.

After the vent system has been cleared, or if no blockage or damage is found in the vent system, the blocked vent switch may be reset. To reset the blocked vent switch, remove the access cover in the top panel of the unit heater and depress the reset button located on the switch.

With the switch reset, turn on the electric and gas supply to the unit heater and restart the unit. Carefully observe the operation of the unit to assure that it is operating correctly. If the block vent switch does not allow the unit to function, or trips after the unit has operated for a period of time, call a qualified service agency to service the equipment. **Do not attempt to bypass the blocked vent safety switch. Do not attempt to replace a defective blocked vent switch with any switch other than that supplied by the unit heater manufacture.**

service instructions

TO REMOVE BURNER

1. Turn off all electricity and gas to unit.
2. Lower bottom pan to expose burner and manifold. see Figure 12.
3. Disconnect pilot supply line and thermocouple lead at the controls.
4. Remove the two burner retaining pins holding the burner in place. The burner can then be easily lowered from the unit. In replacing the burner, be certain that the slots at the front of the burner are located properly on their shoulder rivets and that the burner retaining pins are put back into their proper locations.

GENERAL MAINTENANCE

1. Service air moving components annually.
   a. On propeller units this includes checking motors for lubrication if motors are not the permanently lubricated type and check fan for fit on motor shaft and for damage to blades.
   b. On blower units this should include:
      (1) Checking motor and blower bearings for lubrication.
      (2) Checking belts and pulleys for proper alignment and adjustment.
      (3) Checking cleanliness of blower wheel and filters.
2. Keep unit free from dust, dirt, grease, and foreign matter, paying particular attention to —
   a. Combustion air inlets.
   b. Burner ports, pilot burner, and main burner orifices **(avoid use of hard, sharp instruments capable of damaging surfaces, for cleaning these ports.)** If air pressure is available, use air hose to blow dirt and other foreign material from witin burner. Also check main burner orifices for blockage due to spider webs etc.
   c. Primary air shutters (when used).
   d. Clean heat exchanger tubes from bottom with stiff brush after removing burner. (Do not use wire brush.)
   e. Hinged bottom pan.
   f. Fan blades.
3. Check wiring for possible loose connections.
4. Where gas contains considerable impurities, occasional cleaning of automatic gas valve is required.
5. Controls — See control instruction sheets furnished separately with the unit heater.

service diagnosis

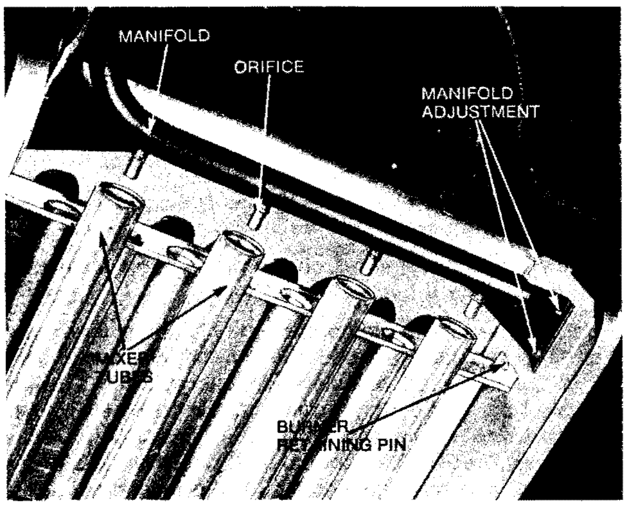


Figure 14
Manifold adjustment natural gas

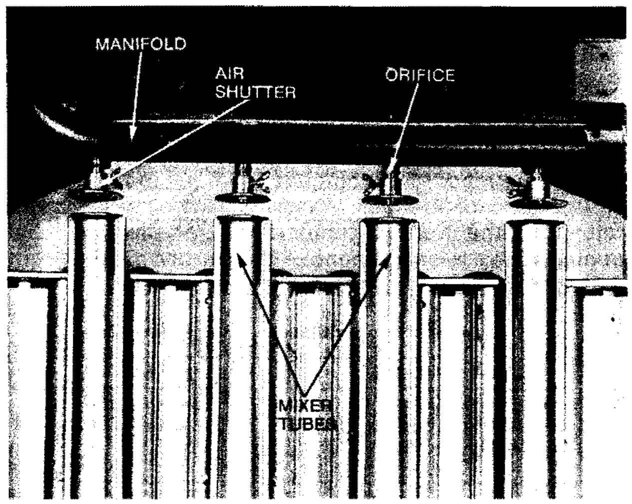


Figure 15
Air shutter adjustment, propane gas

COMBUSTION DIAGNOSIS

To realize full gas heating value requires periodic inspections with proper combustion control corrections as outlined and illustrated here.

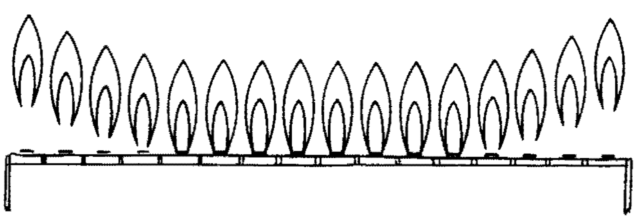


Figure 16
Lifting flame condition

1. LIFTING FLAMES. Lifting flames rise unevenly above the burner port and may occur on few or all the ports. Sometimes the flames drop and lift intermittently. Lifting can be eliminated by reducing primary air. If flame cannot be adjusted properly, check input rate to heater and manifold gas pressure; reduce if necessary. Check the orifice size with those listed in Table 5 to be sure the unit is not operating over rated input.

2. YELLOW TIPPING. Yellow tipping of a normally blue flame is caused by insufficient primary air, and indicates incomplete combustion producing carbon monoxide, aldehydes, and free carbon (soot). A dirty orifice or one that is out of line can also reduce primary air and cause yellow tipping. Check orifice, clean, realign, or replace if necessary. With propane gas, some yellow tipping is always present, but is not objectionable.

3. FLASHBACK, Flashback occurs when air-gas mixture ignites inside the burner to burn near the orifice. Flashback on ignition or during burner operation usually can be eliminated by reducing primary air. The burner may also be operating below its rated capacity. Check input rate and adjust to correct value by increasing orifice size or manifold gas pressure.

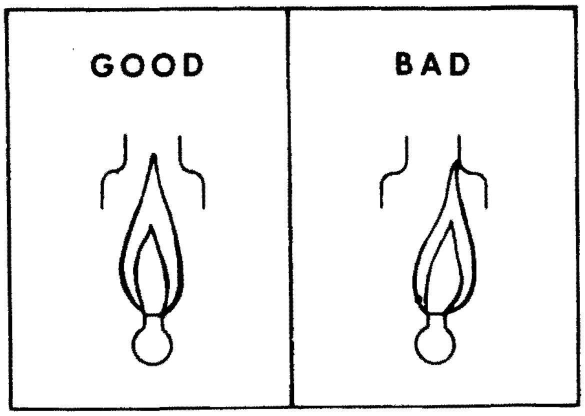


Figure 17
Wavering flame or misalignment

4. WAVERING FLAMES. Drafts across burners may cause flames to waver or appear unstable. Wavering flames can lead to incomplete combustion if flames impinge on cool surfaces. Wavering can be caused by air drafts into the burner compartment or diverter relief opening or by misalignment of the burner. Draft-blown flames may indicate a cracked heat exchanger.

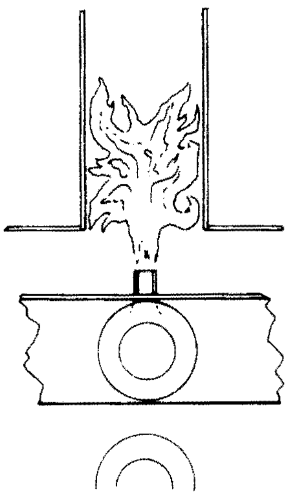


Figure 18
Floating flame condition

5. FLOATING FLAMES. floating flames are long — do not have well-defined cones, roll around in the combustion chamber, sometimes completely off the ports. Usually an aldehyde odor is present to indicate incomplete combustion. If secondary air supply is reduced too far, burner flames will float. Often the pilot flame near the port smothers and goes out. Lack of combustion air causes burner flames to float. The unit may be overfired so its flue outlet area may be too small for the increased firing rate. Check input rate and reduce if necessary. Soot or dust may be blocking the flue. Check flue and clear any blockage. Adjust primary air to get rid of yellow tipping tht may produce soot to block flueways. Make sure combustion air inlets are not blocked.

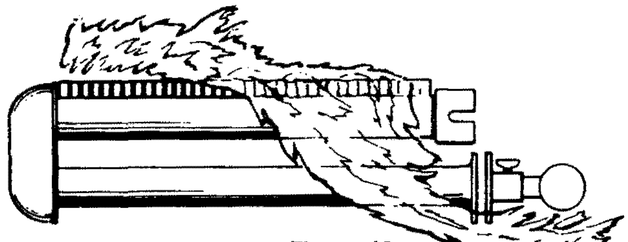


Figure 19
Flame rollout appearance

6. FLAME ROLLOUT. Flames rolling out of the combustion air inlets when the burner is turned on can create a fire hazard, scorch unit finish, burn wires, or damage controls. Gas in the burner mixer may be ignited, producing flashback. Flame rollout is a variation of floating flames, with flames reaching for air outside the combustion chamber. Basic cause is lack of combustion air that may be due to overfiring, poor draft, or flue blockage.

STANDING PILOT SYSTEMS

IF PILOT DOES NOT LIGHT

1. Check gas supply to pilot.
2. Bleed air from pilot line. **(Use special care in bleeding propane units.)**
3. If pilot sputters, check pilot line for condensate or other obstruction.
4. If flame is feeble or short, check pilot orifice for cleanliness. Replace if necessary.
5. Be sure thermocouple contact point is clean. If problem persists, replace thermocouple and/or pilot safety valve. If unit is equipped with an ECO (energy cut-off device located on rear panel of unit.) Check fuse in ECO and make sure it has not blown and is operating correctly. **Caution:** The ECO fuse should blow only if excessive unit temperatures are experienced. If fuse is blown make sure the cause of the unit overheating is found and corrected before replacing the fuse and placing the unit back into operation.
6. If the above steps do not correct the condition, consult your local gas company, or local Modine factory representative.

IF STANDING PILOT DOES NOT STAY LIT

1. Check manifold pressure with all units operating making certain that there is proper pressure.
2. Check pipe or tubing size to unit. See Table 1.
3. Be sure all pilot connections are tight.
4. Check for excessive drafts.
5. Check for clogged pilot orifice or pilot line.
6. Check for leaks around pilot fittings. If leaks cause flame impingement on thermocouple lead, thermocouple may become inoperative.

service diagnosis

EFFECT OF PILOT OPERATION ON SAFETY CONTROLS

1. A weak 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 plugged orifice, dirty pilot valve or gum filter.
2. Check electrical connections from the thermocouple element to the safety valve to assure good electrical contact. Also check location of pilot flame in relation to thermocouple element.

IF MAIN BURNERS DO NOT LIGHT

1. Check gas supply to burners.
2. Bleed air from pipe lines.
3. Be sure pilot is lit, correctly positioned and strong enough to ignite burner ports.
4. Check wiring (electric power supply) to automatic gas valve.
5. If the above does not correct the condition, consult your local gas company or local Modine factory representative.

INTERMITTENT PILOT IGNITION SYSTEMS

CAUTION
Do not attempt to reuse ignition controllers which have been wet. Replace defective controller.

1. Pilot will not light or stay lit.

POSSIBLE CAUSE	POSSIBLE REMEDY
1a. No spark at ignitor.	1a. Check connections. Check for proper spark gap, cracked or broken electrode ceramic, blown controller fuse or brittle, cracked or loose high tension cable.
1b. Defective flame sensor or loose connections to flame sensor.	1b. Check mili-amps of sensor. Tighten loose connections. Replace flame sensor if necessary.
1c. Pilot valve electrical connections loose.	1c. Tighten connections.
1d. Defective pilot valve.	1d. Replace.
1e. Poor ground connections.	1e. Check grounding means.
1f. No power from control transformer.	1f. Check transformer voltage on secondary side for 25v.
1g. Spark not located in pilot gas stream.	1g. Correct or replace pilot.
1h. Dirty or plugged pilot orifice.	1h. Clean or replace.
1i. Pilot line kinked or obstructed.	1i. Correct or replace pilot line.
1j. Pilot flame too low.	1j. Check pilot flame and adjust per manufacturer's recommendations.
1k. Flame sensor out of position.	1k. Reposition.
1l. Defective ignition controller.	1l. Replace.

2. Pilot lights, main burner will not light.

POSSIBLE CAUSE	POSSIBLE REMEDY
2a. Gas valve in off position.	2a. Turn to on position.
2b. System in lock-out mode.	2b. Reset system.
2c. Cracked or broken sensor ceramic.	2c. Replace sensor.
2d. Defective or loose connections to flame sensor or flame sensor lead.	2d. Correct or replace.
2e. Incorrect gas pressure.	2e. Check and adjust if necessary to manufacturer's recommendations.
2f. Insufficient current signal from flame sensor.	2f. Check current according to manufacturer's recommendations and replace if necessary.
2g. Incorrect or loose wiring.	2g. Check wiring.
2h. Poor ground to ignition controller.	2h. Check grounding means.
2i No power to ignition controller or gas valve.	2i. Check voltage to controller and gas valve.
2j. Loose limit control connections or defective limit.	2j. Check connections. Replace limit control if necessary.
2k. Defective or plugged gas valve regulator.	2k. Inspect gas valve regulator. Replace if necessary.
2l. Defective thermostat or thermostat out of calibration.	2l. Calibrate thermostat or replace if necessary.
2m. Thermostat heat anticipator incorrectly set.	2m. Check anticipator setting and correct if necessary.
2n. Defective ignition controller.	2n. Replace.
2p. Blocked vent switch tripped.	2p. Refer to page 20 for instructions.

3. System goes into lock-out.

POSSIBLE CAUSE	POSSIBLE REMEDY
3. Refer to "Pilot will not light or stay lit".	3. Reset system. If lock-out persists, check item 1, "Pilot will not light or stay lit".

4. System shuts down before thermostat is satisfied.

POSSIBLE CAUSE	POSSIBLE REMEDY
4. Flame sensing circuit failure.	4. Check flame sensing rod, sensor ceramic, sensor lead and connections for damage or loss of continuity. Replace defective elements.

5. System fails to shut off after thermostat is satisfied.

POSSIBLE CAUSE	POSSIBLE REMEDY
5a. Faulty thermostat or improper heat anticipator setting.	5a. Check thermostat and anticipator setting. Replace if defective.
5b. Defective ignition controller.	5b. Replace.
5c. Defective gas valve.	5c. Replace.

If the foregoing checks do not solve the problem, consult your local gas company or local Modine factory representative.

When servicing, repairing or replacing parts on these units always give the complete Model Number, Power Code Number, Control Code Number and Serial Number from the unit rating plate.

See page 27 for Model Number and Serial Number Designations.

motor data

Power Code Description — Propeller PAE/PA Models ① ② ⑤

Power Code	Electric Power	PAE30	PAE50	PAE75	PAE100	PAE125	PAE145	PAE175	PAE200	PAE225	PAE250	PAE300	PA350	PA400
		Horsepower												
01	115/60/1	1/40	1/40	1/20	1/20	1/15	1/6	1/6	1/6	1/6	1/3	1/3	1/2	1/2
02	230/60/1	1/40	1/40	1/15	1/15	1/15	1/6	1/6	1/6	1/6	1/3	1/3	1/2	1/2
04	200/60/3	–	–	–	–	–	1/3	1/3	1/3	1/3	1/3	1/3	1/2	1/2
05	230/460/60/3	–	–	–	–	–	1/3	1/3	1/3	1/3	1/3	1/3	1/2	1/2

Motor Data and Total Unit Power Requirements — Propeller PAE/PA Models

Voltage	115/60/1				230/60/1				200/60/3				230/460/60/3			
HP	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts
1/40	1.0	1550	1.3	90	0.5	1550	0.6	90	–	–	–	–	–	–	–	–
1/20	2.1	1050	2.3	155	1.3	1050	1.4	165	–	–	–	–	–	–	–	–
1/15	2.5	1050	2.7	200	1.3	1050	1.4	200	–	–	–	–	–	–	–	–
1/6	2.8	1075	3.1	260	1.6	1075	1.7	230	–	–	–	–	–	–	–	–
1/3	5.4	1075	5.7	485	2.5	1075	2.8	455	1.9	1140	2.3	485	2.2/1.1	1140	2.4/1.2	485
1/2	7.5	1075	7.8	710	3.5	1075	3.7	690	2.6	1140	3.2	730	3.0/1.5	1140	3.2/1.6	730

① Shaded pole motors on models PAE30 through PAE125 – Permanent split capacitor motors on models PAE145 through PA400.
② Whenever 230v/1φ or 230v/3φ power is used, it is necessary to specify 230v/25v controls. Whenever 460w/3φ power is used, it is necessary to specify 230v/25v controls and in addition, a 460v/230v step-down transformer (by others) is required. This transformer should be 75VA for units without power venters, and 250VA for units with power venters. On all 3φ systems, the motor starter coil voltage (motor starter by others) must 230v.
③ BA/BAE models – split phase motors 1/4-3/4 hp, capacitor start type motors 1-1½hp. 1/4-2 hp motors – 1725 rpm. 3 hp motors – 1755 rpm.
④ Units with 460 volt, 3φ power supply are not listed by C.G.A.
⑤ All motors used on Modine gas unit heaters are produced, rated, and tested by reputable manufacturers in accordance with NEMA standards and carry the standard warranty of both the motor manufacturer and Modine. All motors are totally enclosed. Single phase motors have built-in thermal overload protection.

Power Code Description — Blower BAE/BA Models ② ③ ④ ⑤

Power Code	Electric Power	BAE50		BAE75		BAE100		BAE125		BAE145		BAE175		BAE200		BAE225		BAE250		BAE300		BA350		BA400	
		HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive	HP	Drive
01	115/60/1	1/4	C87	1/4	C88	1/4	C93	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/3	C101	3/4	C16	1	C16	1	C16	1½	C23
02	230/60/1	1/4	C87	1/4	C88	1/4	C93	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/3	C101	3/4	C16	1	C16	1	C16	1½	C23
03	200/60/3	1/4	C87	1/4	C88	1/4	C93	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/3	C101	3/4	C16	1	C16	1	C16	1½	C23
04	230/460/60/3	1/4	C87	1/4	C88	1/4	C93	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/3	C101	3/4	C16	1	C16	1	C16	1½	C23
05	115/60/1	1/4	C5	1/4	C89	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/3	C107	3/4	C101	1	C109	–	–	–	–
06	230/60/1	1/4	C5	1/4	C89	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/3	C107	3/4	C101	1	C109	–	–	–	–
07	200/60/3	1/4	C5	1/4	C89	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/3	C107	3/4	C101	1	C109	–	–	–	–
08	230/460/60/3	1/4	C5	1/4	C89	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/3	C107	3/4	C101	1	C109	–	–	–	–
09	115/60/1	1/4	C1	1/4	C90	1/4	C95	1/4	C36	1/2	C98	1/3	C102	1/3	C104	3/4	C101	1	C16	1½	C105	1½	C23	–	–
10	230/60/1	1/4	C1	1/4	C90	1/4	C95	1/4	C36	1/2	C98	1/3	C102	1/2	C104	3/4	C101	1	C16	1½	C105	1½	C23	–	–
11	200/60/3	1/4	C1	1/4	C90	1/4	C95	1/4	C36	1/3	C98	1/3	C102	1/3	C104	3/4	C101	1	C16	1½	C105	1½	C23	2	C19
12	230/460/60/3	1/4	C1	1/4	C90	1/4	C95	1/4	C36	1/3	C98	1/3	C102	1/3	C104	3/4	C101	1	C16	1½	C105	1½	C23	2	C19
13	115/60/1	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/3	C38	1/3	C24	1/3	C16	3/4	C107	1	C109	1½	C100	–	–	–	–
14	230/60/1	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/3	C38	1/3	C24	1/3	C16	3/4	C107	1	C109	1½	C100	–	–	–	–
15	200/60/3	1/3	C1	1/2	C90	1/3	C95	1/3	C36	1/3	C38	1/3	C24	1/3	C16	3/4	C107	1	C109	1½	C100	2	C19	–	–
16	230/460/60/3	1/3	C1	1/2	C90	1/3	C95	1/3	C36	1/3	C38	1/3	C24	1/3	C16	3/4	C107	1	C109	1½	C100	2	C19	–	–
17	115/60/1	–	–	1/3	C114	1/3	C96	1/3	C37	3/4	C38	1/3	C101	3/4	C16	1	C107	1½	C105	–	–	–	–	–	–
18	230/60/1	–	–	1/3	C114	1/3	C96	1/3	C37	3/4	C38	1/3	C101	3/4	C16	1	C107	1½	C105	–	–	–	–	–	–
19	200/60/3	–	–	1/3	C114	1/3	C96	1/3	C37	3/4	C38	1/3	C101	3/4	C16	1	C107	1½	C105	2	C110	–	–	–	–
20	230/460/60/3	–	–	1/3	C114	1/3	C96	1/3	C37	3/4	C38	1/2	C101	3/4	C16	1	C107	1½	C105	2	C110	–	–	–	–
21	115/60/1	–	–	1/3	C91	–	–	1/3	C98	1	C38	3/4	C101	1	C16	1½	C106	1½	C100	–	–	–	–	1½	C26
22	230/60/1	–	–	1/3	C91	–	–	1/3	C98	1	C38	3/4	C101	1	C16	1½	C106	1½	C100	–	–	–	–	1½	C26
23	200/60/3	–	–	1/3	C91	–	–	1/3	C98	1	C38	3/4	C101	1	C16	1½	C106	1½	C100	2	C33	–	–	1½	C26
24	230/460/60/3	–	–	1/3	C91	–	–	1/3	C98	1	C38	3/4	C101	1	C16	1½	C106	1½	C100	2	C33	–	–	1½	C26
25	115/60/1	–	–	1/3	C92	–	–	1/2	C38	1½	C113	3/4	C107	1½	C105	–	–	–	–	–	–	–	–	–	–
26	230/60/1	–	–	1/3	C92	–	–	1/2	C38	1½	C113	3/4	C107	1½	C105	–	–	–	–	–	–	–	–	–	–
27	200/60/3	–	–	1/3	C92	–	–	1/3	C38	1½	C113	3/4	C107	1½	C105	2	C108	2	C110	3	C111	–	–	–	–
28	230/460/60/3	–	–	1/3	C92	–	–	1/3	C38	1½	C113	3/4	C107	1½	C105	2	C108	2	C110	3	C111	–	–	–	–
29	115/60/1	–	–	3/4	C91	–	–	3/4	C38	–	–	1	C107	–	–	–	–	–	–	–	–	–	–	–	–
30	230/60/1	–	–	3/4	C91	–	–	3/4	C38	–	–	1	C107	–	–	–	–	–	–	–	–	–	–	–	–
31	200/60/3	–	–	3/4	C91	–	–	3/4	C38	–	–	1	C107	–	–	–	–	2	C33	3	C112	–	–	–	–
32	230/460/60/3	–	–	3/4	C91	–	–	3/4	C38	–	–	1	C107	–	–	–	–	2	C33	3	C112	–	–	–	–
33	115/60/1	–	–	–	–	–	–	–	–	–	–	1	C101	–	–	–	–	–	–	–	–	–	–	–	–
34	230/60/1	–	–	–	–	–	–	–	–	–	–	1	C101	–	–	–	–	–	–	–	–	–	–	–	–
35	200/60/3	–	–	–	–	–	–	–	–	–	–	1	C101	–	–	–	–	3	C111	–	–	–	–	–	–
36	230/460/60/3	–	–	–	–	–	–	–	–	–	–	1	C101	–	–	–	–	3	C111	–	–	–	–	–	–

motor data

Motor Data and Total Unit Power Requirements — Blower BAE/BA Models

Voltage	115/60/1				230/60/1				200/60/3				230/460/60/3			
HP	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts	Mtr. Amps	Mtr. Rpm	Total Amps	Total Watts
1/4	5.4	1725	5.7	390	2.7	1725	2.9	390	1.6	1725	1.8	370	1.4/0.7	1725	1.6/0.8	370
1/3	4.6	1725	4.9	385	2.3	1725	2.5	385	1.8	1725	2.0	400	1.6/0.8	1725	1.8/0.9	400
1/2	8.5	1725	8.8	600	3.8	1725	4.0	600	2.5	1725	2.7	600	2.6/1.3	1725	2.8/1.4	600
3/4	11.0	1725	11.3	870	5.5	1725	5.7	870	3.2	1725	3.4	840	3.0/1.5	1725	3.2/1.6	840
1	13.4	1725	13.7	1080	6.7	1725	6.9	1080	4.0	1725	4.2	1100	3.8/1.9	1725	4.0/2.0	1100
1 1/2	15.4	1725	15.6	1560	7.7	1725	7.8	1560	5.6	1725	5.8	1500	5.2/2.6	1725	5.4/2.7	1500
2	–	1725	–	–	–	1725	–	–	6.8	1725	7.1	1950	6.6/3.3	1725	6.8/3.4	1950
3	–	1725	–	–	–	1725	–	–	10.6	1725	10.8	3300	8.8/4.4	1725	9.0/4.5	3300

Blower Drive Numbers

Drive No.	Belt No. Browning	Blower Pulley Pitch Dia.	Blower Pulley Bore	Motor Pulley Maximum Pitch Dia.	Motor Pulley Bore
C1	A29	4	3/4	3	1/2
C5	A32	6	3/4	3	1/2
C16	A48	8	1	3	5/8
C24	A56	13	1	3	1/2
C33	A50	8	1	4.5	7/8
C36	A45	9	3/4	3	1/2
C37	A40	6	3/4	3	1/2
C38	A41	6	3/4	3	5/8
C87	A38	9	3/4	3	1/2
C88	A42	10	3/4	3	1/2
C89	A52	15	3/4	3	1/2
C90	A35	6	3/4	3	1/2
C91	A33	4	3/4	3	5/8
C92	A36	6	3/4	3	5/8
C93	A57	15	3/4	3	1/2
C94	A47	10	3/4	3	1/2
C95	A42	7	3/4	3	1/2
C96	A43	7	3/4	3	5/8
C97	A53	13	3/4	3	1/2
C98	A46	9	3/4	3	5/8
C99	A47	8	1	3	1/2

Blower Drive Numbers

Drive No.	Belt No. Browning	Blower Pulley Pitch Dia.	Blower Pulley Bore	Motor Pulley Maximum Pitch Dia.	Motor Pulley Bore
C100	A50	8	1	4.5	5/8
C101	A50	9	1	3	5/8
C102	A49	9	1	3	1/2
C103	A54	12	1	3	1/2
C104	A55	12	1	3	5/8
C105	A54	10	1	4.5	5/8
C106	A52	9	1	4.5	5/8
C107	A45	6	1	3	5/8
C108	A52	9	1	4.5	7/8
C109	A43	5	1	3	5/8
C110	A55	10	1	4.5	7/8
C111	A52	8	1	4.5	1 1/8
C112	A55	10	1	4.5	1 1/8
C113	A42	8	3/4	4.5	5/8
C114	A32	4	3/4	3	1/2
C115	A41	6	3/4	3	1/2

control options

propeller and blower (horizontal delivery unit heaters) – PA/PAE and BA/BAE models ① ② ③ ④

Control System Description	Control Code No.	Service Voltage	Thermostat Voltage	Type of Gas
(Intermittent-duty pilot ignition without lockout). Includes a combination automatic gas valve and spark ignition controller, overheat control, low voltage transformer, fan timer, and an intermittent pilot without lockout. Ignition system is energized by thermostat. Pilot is established only on call for heat. ① ② ③ ④	08 09	115V 230V	25V 25V	natural natural
(Low voltage control system). Includes a combination automatic gas valve, overheat control, low voltage transformer, fan timer, and a standing pilot with 100% safety shut-off. gas valve is energized by thermostat (or manual switch). ① ② ④	11 12 81 82	115V 230V 115V 230V	25V 25V 25V 25V	natural natural propane propane
(Two-stage control). Includes two-stage automatic gas valve, overheat control, low voltage transformer, fan timer, pressure regulator, manual shut-off valve, and a standing pilot with 100% safety shut-off. Gas valve is energized by control thermostat. First stage 50% fire, second stage 100% fire.	25 26 83 84	115V 230V 115V 230V	25V 25V 25V 25V	natural natural propane propane
(Intermittent-duty pilot ignition with lockout). Includes a combination automatic gas valve and spark ignition controller, overheat control, low voltage transformer, fan timer, and intermittent pilot with lockout. Ignition system is energized by thermostat. Pilot is established only on call for heat. ① ② ③ ④	28 29 78 79	115V 230V 115V 230V	25V 25V 25V 25V	natural natural propane propane
(Mechanical modulation with Intermittent-duty ignition without lockout). Includes a combination automatic gas valve and spark ignition controller, overheat control, low voltage transformer, mechanical modulating gas valve, pressure regulator, manual shut-off valve, and an intermittent pilot without lockout. Designed for 100% make-up air. System is non-override type and is assembled and pre-wired to the unit. Valve modulates rated input from 100% to 40% and shuts off gas below 40%. Temperature range 50°F to 90°F. ① ③ ④ (Available on blower units only.)	51 52	115V 230V	25V 25V	natural natural
(Two stage control with Intermittent-duty pilot ignition without lockout). Includes two-stage automatic gas valve and spark ignition controller, overheat control, low voltage transformer, fan timer, and an intermittent pilot without lockout. Ignition system is energized by thermostat. Pilot is established only on call for heat. First stage 50% fire, second stage 100% fire. ① ② ③ ④	55 56	115V 230v	25V 25V	natural natural
(Mechanical modulation with Intermittent-duty pilot ignition, with lockout). Includes a combination automatic gas valve and spark ignition controller, overheat control, low voltage transformer, mechanical modulating gas valve, pressure regulator, manual shut-off valve and an intermittent pilot with lockout. Designed for 100% make-up air. System is non-override type and is assembled and pre-wired to the unit. Valve modulates rated input from 100% to 40% and shuts off gas below 40% fire. Temperature range 50°F to 90°F. ① ③ ④ (Available on blower units only.)	61 62 76 77	115V 230V 115V 230V	25V 25V 25V 25V	natural natural propane propane
(Two-stage control with Intermittent-duty pilot ignition with lockout). Includes two-stage automatic gas valve, and spark ignition controller, overheat control, low voltage transformer, fan timer, and an intermittent pilot with lockout. Ignition system is energized by thermostat. Pilot is established only on call for heat. First stage 50% fire, second stage 100% fire. ① ② ③ ④	65 66 95 96	115V 230V 115V 230V	25V 25V 25V 25V	natural natural propane propane

① All single stage units require a Category I vent system. Models PAE 30 and PAE/BAE 50 thru PAE/BAE 100 with two-stage or modulating gas controls require a Category II vent system.

② For units with control systems having fan timer. Fan starts 30 seconds (max.) after ignition and shuts down approximately 60 seconds after main burner shuts down. Available on units with up to 1 H.P. motors or 14 amps @ 115V A.C. Contact Factory for applications with units having motors with horsepower ratings above 1 H.P. or 14 amps @ 115V A.C.

③ Nuisance lockout or ignition malfunction may result if ignition controller is exposed to rain, sprinklers, water from gas pipe leak testing, condensation, and accidental exposure to cleaning solutions.

④ Whenever 230v/1ϕ or 230v/3ϕ power is used, it is necessary to specify 230v/25v controls. Whenever 460v/3ϕ power is used, it is necessary to specify 230v/25v controls and in addition, a 460v/230v step-down transformer (by others) is required. This transformer should be 75 VA for units without power venters, and 250VA for units with power venters. On all 3ϕ systems, the motor starter coil voltage (motor starter by others) must be 230v.

Model Number Designations

PAE 1 4 5 A F 0 1 0 8

PA/PAE - Propeller Unit
BA/BAE - Blower Unit

MBH Input
145 - 145,000 Btu/Hr
175 - 175,000 Btu/Hr
250 - 250,000 Btu/Hr
etc.

Heat Exchanger
A - Aluminized
S - Stainless Steel

Control Code Type
08 - 115v/25v intermittent pilot ignition, non-lockout, natural gas
09 - 230v/25v intermittrnt pilot ignition, non-lockout, natural gas
etc.

Power Code
01 - Complete Power Code descriptions are
02 - shown on pages 18 and 19 of this manual
etc.

Unit Develoment Sequence
B - 1st Developement (with standing pilot)
C - 2nd Developemnt (with standing pilot)
F - 1st Development (with intermittent pilot)
G - 2nd Development 2nd intermittent pilot)

MODINE **RATING PLATE**

SERIAL NUMBER	MODEL NUMBER	POWER CODE	CONTROL CODE
01121010691	PAE145AF	01	08

SERIAL NUMBER DESIGNATIONS

01 12 101 06 91

MOTOR VENDOR CODE
01 - Century
02 - Westinghouse
etc.

FAN OR BLOWER VENDOR CODE
10 - Lau
12 - Brundage
etc.

SERIES IDENTITY NUMBER
Identifies which series of controls were furnished on the unit.

YEAR OF MANUFACTURE
91 - 1991
92 - 1992
etc.

MONTH OF MANUFACTURE
01 - January
02 - February
etc.

Installed Location/Identification ______________________________

Serial Number ______________________________

Model Number ______________________________

Power Code ______________________________

Control Code ______________________________

Service Checklist

	Installed Date	Service Date						
Proper Service Voltage								
Check for Gas Leaks								
Check Gas Pressure								
Check Burner Light Off								
Check Fan Operation								
Serviced By (Initials)								

Note to Service Technician: Fill in data from each unit and leave this manual with owner for a future service record.

WARRANTY

Modine warrants its products to be free from defects in material and workmanship, EXCLUSIVE, HOWEVER, of failures attributable to the use of materials substituted under emergency conditions for materials normally employed. This warranty covers replacement of any parts furnished from the factory of Modine, but does not cover labor of any kind and materials not furnished by Modine, or any charges for any such labor or materials, whether such labor, materials or charges thereon are due to replacement of parts, adjustments, repairs, or any other work done. This warranty does not apply to any equipment which shall have been repaired or altered outside the factory of Modine in any way so as, in the judgment of Modine, to affect its stability, nor which has been subjected to misuse, negligence, or operating conditions in excess of those for which such equipment was designed. This warranty does not cover the effects of physical or chemical properties of water or steam or other liquids or gases used in the equipment.

BUYER AGREES THAT MODINE'S WARRANTY OF ITS PRODUCTS TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP, AS LIMITED HEREIN, SHALL BE IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED, WHETHER ARISING FROM LAW, COURSE OF DEALING, USAGE OF TRADE, OR OTHERWISE. **THERE ARE NO OTHER WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.**

This warranty is void if the input to the product exceeds the rated input as indicated on the product serial plate by more than 5% on gas-fired and oil fired units, or if the product in the judgment of MODINE has been installed in a corrosive atmosphere, or subjected to corrosive fluids or gases, been subjected to misuse, negligence, accident, excessive thermal shock, excessive humidity, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to MODINE's printed instructions, or if the serial number has been altered, defaced or removed.

Heat Exchangers
Models PA, BA, PAE, BAE, PAH, BAH, GHG, GHE unit heaters.

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF MODINE, ANY HEAT EXCHANGER WHICH SHALL, WITHIN TEN YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITIONS, OR WITHIN ONE HUNDRED TWENTY-SIX MONTHS FROM DATE OF SHIPMENT FROM MODINE, WHICHEVER OCCURS FIRST, BE RETURNED TO MODINE WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF MODINE SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM MODINE. FOR GAS-FIRED PRODUCTS INSTALLED IN HIGH HUMIDITY APPLICATIONS AND UTILIZING STAINLESS STEEL HEAT EXCHANGERS, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO TEN YEARS FROM DATE OF SHIPMENT FROM MODINE.

Heat Exchanger (Condenser) for models listed below, and **Burners and Sheet Metal** for all models
Models PSH, BSH, DJ, DJE, WGD, WPD, WGB, WPB, WGS, WPS, WDG, WDP, WBG, WBP, WSG, WSP, PBG, PBP, PSG, PSP, DMW, DMS, DHP, DHE, RH, L, PAB, PBH, GLW, HE, VE, PTE, POH, HS, V, PT, VSS, PTS and GHS units.

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF MODINE, ANY HEAT EXCHANGER (CONDENSER) OR BURNER WHICH SHALL, WITHIN ONE YEAR FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN ONE YEAR FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN EIGHTEEN MONTHS FROM DATE OF SHIPMENT FROM MODINE, WHICHEVER OCCURS FIRST, BE RETURNED TO MODINE WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF MODINE SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM MODINE.

All Other Components Excluding Heat Exchanger (Condenser), Burner, and Sheet Metal
All Modine Heating Products

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF MODINE, ANY PART OR PARTS WHICH SHALL, WITHIN TWO YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TWO YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN THIRTY MONTHS FROM DATE OF SHIPMENT FROM MODINE, WHICHEVER OCCURS FIRST, BE RETURNED TO MODINE WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF MODINE SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM MODINE.

BUYER AGREES THAT IN NO EVENT WILL MODINE BE LIABLE FOR COSTS OF PROCESSING, LOST PROFITS, INJURY TO GOODWILL, OR ANY OTHER CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND RESULTING FROM THE ORDER OR USE OF ITS PRODUCT, WHETHER ARISING FROM BREACH OF WARRANTY, NONCONFORMITY TO ORDERED SPECIFICATIONS, DELAY IN DELIVERY, OR ANY LOSS SUSTAINED BY THE BUYER.

To prevent premature heat exchanger failure do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.

MODINE

Heating Division
Modine Manufacturing Company
1500 DeKoven Avenue, Racine, WI 53403
Telex: 26-4447 Fax: 414/636-1665
Phone: 414/636-1200

1/92 15M