MODINE

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

DESIGN CERTIFIED AMERICAN GAS ASSOCIATION

CANADIAN GAS ASSOCIATION APPROVED

All models approved for use in California by the CEC (when equipped with IPI), in New York by the MEA division, and in Massachusetts. Unit heater is certified for non-residential applications.

⚠ 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 throroughly before installing or servicing this equipment.

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 units in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.

Contents

FOR YOUR SAFETY

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

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

Inspection on Arrival

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

SPECIAL PRECAUTIONS

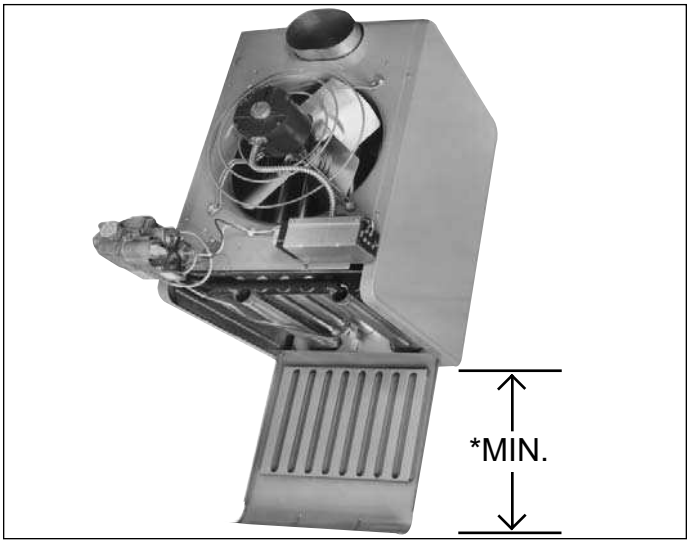
THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PROVIDE SAFE, EFFICIENT AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY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

1. 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. (1/2 psi).

   When leak testing the gas supply piping system, the unit and its combination gas control must be isolated during any pressure testing in excess of 14’ W.C. (1/2 psi).

   The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve.
4. Check gas inlet pressure at unit upstream from the combination gas control. The inlet pressure should be 6”-7” W.C. on natural gas or 12”-14” W.C. on propane gas. Purging of gas piping should be performed as described in ANSI Z223.1 Latest Edition, or in Canada in CAN/CGA-B149 codes.
5. All units must be vented to the outside atmosphere.
6. 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, including appropriate back flow prevention dampers, to the dust-laden room is recommended.
7. 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.
8. 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.
9. 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.
10. 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, at least 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.
11. Do not install unit outdoors.
12. For all sizes, minimum clearance to combustibles from the bottom is 12 inches and from the sides 18 inches; for sizes 30-100 from the top is 1 inch and from the vent connector 2 inches; for sizes 125-300 from the top is 2 inches and from the vent connector 3 inches; and for sizes 350 & 400 from the top is 3 inches and from the vent connector 6 inches.
13. Allow at least 6” clearance at the sides and 12” clearance at rear (or 6” beyond end of motor at rear of unit, whichever is greater) to provide ample air for combustion and proper operation of fan.
14. The minimum distance from combustible materials 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.
15. Do not install units below 7 feet measured from the bottom of the unit to the floor.
16. Modine unit heaters are designed for use 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.
17. Provide clearance for opening hinged bottom for servicing. See Figure 1A. Do not set unit on its bottom.
18. To assure that 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.
19. Do not lift unit heater by gas controls, gas manifold, or power venter.
20. Be sure no obstructions block air intake and discharge of unit heater.
21. Do not attach duct work, air filters, or polytubes to any propeller (PAE) model unit heaters.
22. 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 .
23. In garages or other sections of aircraft hangars 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 #88A and the Standard for Repair Garages NFPA #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.
24. Consult piping, electrical, and venting instructions in this manual before final installation.
25. 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.
26. Gas-fired heating equipment which has been improperly vented, or which experiences a blocked vent condition may have the flue gases accidentally spilled into the heating space. See page 20 for specific information about the blocked vent safety switch supplied on the unit.
27. When servicing or repairing this equipment, use only Modine approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the unit for complete unit model number, serial number and company address. Any substitution of parts or controls not approved by Modine will be at owners risk.

Figure 1A
Hinged Bottom for Burner Service
*(See Dimension "C" Table 6, page 12)



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. Alliinstallation 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 by 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

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

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

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, but maintain separation between units so discharge from one unit will not be directed into the inlet of another. In buildings exposed to prevailing winds, a large portion of the heated air should be directed along the windward wall. Avoid interference 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 are listed in Table 7 on page 18. Alternate mounting heights for units with deflector hoods or nozzles are shown 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.

Modine unit heaters are designed for use 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 communicating with interior areas having, in turn, adequate infiltration from the outside.

Unit Suspension

Be sure the means of suspension is adequate to support the weight of the unit. (See page 12 for unit weights.) 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 heaters above the maximum mounting height shown in Table 7 on page 13, or below seven feet from the bottom of the unit to the floor.

⚠ CAUTION

For all sizes, minimum clearance to combustibles from the bottom is 12" and from the sides 18"; for PAE sizes 30-100 from the top is 1" and from the vent connector 2"; for PAE sizes 125-300 from the top is 2" and from the vent connector 3"; for PAE sizes 350 & 400 from the top is 3" and from the vent connector 6”; and for all BAE sizes from the top and vent connector is 6".

Allow at least 12" at the rear, or 6" beyond the end of the motor (whichever is greater), to provide ample air for combustion and for proper operation of fan. Provide clearance for opening of the hinged bottom for servicing – SEE FIGURE 1A.

On all propeller units, except the PAE 300, PAE 350 and PAE 400, two tapped holes (3/8-16) are located in the top of the unit to receive ceiling hangers.

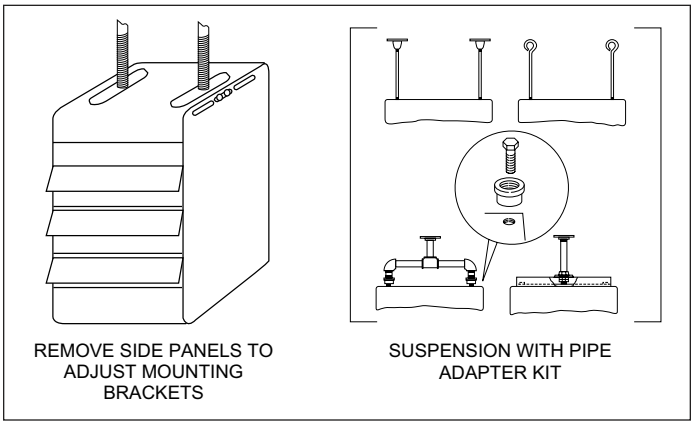
Units with two point suspension, models PAE30 through PAE250, incorporate a level hanging feature. Depending on what options and accessories are being used, the heater may not hang level as received from the factory. Do not hang heaters with deflector hoods until referring to the “installation manual for deflector hoods” and making the recommended preliminary adjustments on the heater. These preliminary adjustments need to be made with the heater resting on the floor.

PAE30 through PAE250 units without deflector hoods that do not hang level after being installed, can be corrected in place. Simply remove both outer side panels (screws to remove are on back flange of side panel) and you will see the (adjustable) mounting brackets (Fig. 2). Loosen the set screws holding the mounting brackets in place and using a rubber mallet or something similar, tap the heater into a position where it does hang level. Re-tighten set screws and replace the outer side panels

The PAE 300, PAE 350 and PAE 400 have four mounting holes. On all blower units, except the PAE 300, PAE 350 and PAE 400, two tapped holes are provided in the top of the unit and two holes in the blower support bracket. The PAE 300, PAE 350 and PAE 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: Pipe hanger adapter kits, as shown in Figure 2, are available as accessories from Modine. The hardware allows for pipe caps to be secured into the top of the unit heater with machine screws (as illustrated - machine screws are 3/8 - 16 x 1.75 UNC-2A THD). The pipe caps can then accommodate 3/4" NPT pipe for mounting. Three different kits are available with either 2, 4, or 6 adapters per kit. See price sheet to determine proper kit.

Figure 2
Adjustable Mounting Brackets/Suspension Methods



REMOVE SIDE PANELS TO ADJUST MOUNTING BRACKETS

SUSPENSION WITH PIPE ADAPTER KIT

INSTALLATION

⚠CAUTION

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

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

Gas-fired heating equipment that has been improperly vented or which experiences a blocked 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.

Installation must conform with local building codes or in the absence of local codes, with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - Latest Edition. In Canada installation must be in accordance with CAN/CGA-B149.1 for natural gas units, and CAN/CGA-B149.2 for propane units.

NOTE: A **vent** is the vertical passageway used to convey flue gases from the unit or the vent connector to the outside atmosphere. A **vent connector** is the pipe which connects the unit to a vent or chimney.

Venting Instructions

1. Using Table 1, determine the venting system category of the unit to be installed.
2. Using Table 2, determine the venting requirements for the category determined above. The installation of a Category II unit must conform to these requirements (detailed in following sections) in addition to those listed below.
3. Select size of vent pipe to fit vent pipe connection at rear of appliance (see Page 12, Dimension J). (Exception: All PAE/BAE 50 models with two-stage or modulating controls must use a 5 inch vent.) Do not use a vent pipe smaller than the vent pipe connection on the unit. Vent pipe should be galvanized steel or other suitable corrosion-resistant material. Follow the National Fuel Gas Code for minimum thicknesses of vent material; minimum thicknesses for vent connectors vary depending on pipe diameter.
4. Limit length of horizontal runs to 75% of vertical height. Install with a minimum upward slope from unit of 1/4 inch 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 vent together with at least three corrosion-resistant sheet-metal screws.
5. Avoid venting through unheated space when possible. When venting does pass through an unheated space, Modine recommends the use of Type B double wall vent. If single wall vent is used, insulate vent runs greater than 5 feet to minimize condensation. Use insulation that is noncombustible with a rating of not less than 350°F. Install a tee fitting at the low point of the vent system to provide a drip leg with a clean out cap as shown in Figure 3. The drip leg should be cleaned annually.
6. Keep single wall vent pipe at least 6 inches from combustible material (see page 2, section 12 for allowable reductions). For double wall vent pipe, maintain clearances listed on vent pipe (Category I and II units). The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the vent connector, vent, or top of unit may be required to be greater than the minimum clearance if heat damage other than fire (such as material distortion or discoloration) may occur.
7. Where the vent passes through a combustible floor or roof, a metal thimble 4 inches greater than the vent diameter is necessary. If there is 6 feet or more of vent pipe in the open space between the unit and where the vent pipe passes through the floor or roof, the thimble need only be 2 inches greater than the diameter of the vent pipe. If a thimble is not used, all combustible material must be cut away to provide the specified clearance to combustibles. Any material used to close the opening must be noncombustible.
8. Top of vertical vent should extend at least two feet above the highest point where it passes through a roof and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet (see Figure 3).
9. Use a vent terminal to reduce downdrafts and moisture in vent. A vent terminal that is very open will avoid spillage at unit's diverter relief opening and tripping of the blocked vent safety switch.

Table 1
PAE/BAE Venting System Category

Model Number	Gas Controls	Category
PAE 30	Single-Stage Two-Stage	I II
PAE/BAE 50-100	Single-Stage Two-Stage Modulating	I II II
PAE/BAE 125-400	All	I

Table 2
ANSI Unit Heater Venting Requirements

Category	Description	Venting Requirements
I	Negative vent pressure Non-condensing	Follow standard venting requirements.
II	Negative vent pressure Condensing	Condensate must be drained.
III	Positive vent pressure Non-condensing	Vent must be gastight.
IV	Positive vent pressure Condensing	Vent must be liquid and gastight. Condensate must be drained.

10. Check vent system to see that combustion products are being vented properly. Operate unit for several minutes and then pass a lighted match around the edge of the diverter relief opening. If the flame is drawn into the opening, the vent system is drawing properly. If not, make adjustments to provide adequate draft (see page 21).

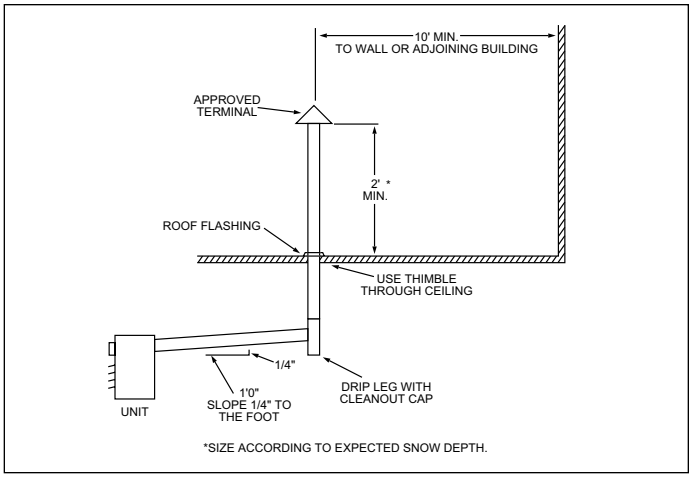
ADDITIONAL VENTING REQUIREMENTS FOR CATEGORY II UNITS

Vent system must provide for drainage of condensate. At the low point of the vent system, install a tee fitting with a connector and attach flexible tubing, minimum 3/8 inch I.D., and run to a drain.

ADDITIONAL VENTING REQUIREMENTS FOR VENTING INTO AN EXISTING MASONRY CHIMNEY OR COMMON VENT (CATEGORY I and II UNITS ONLY)

1. Do not vent a Category I or II unit into a common vent with mechanical draft systems operating under positive pressure (Category III or IV units).
2. When connecting vent to an existing chimney, do not push vent pipe beyond internal surface of chimney.
3. When venting into a common vent, the area of the common vent should be equal to or greater than the area of the largest vent plus 50 percent of the area of all additional vents.
4. When venting into a common vent, the individual vents should enter at different levels

Figure 3
Unit Heater Venting



INSTALLATION

Piping

⚠ CAUTION

Gas pressure to unit heater controls must never exceed 14" W.C. (1/2 psi).

When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).

The appliance should be isolated from the gas supply piping system by closing its field installed manual shut-off valve.

1. Installation of piping must be in accordance with local codes, and ANSI Z223.1, "National Fuel Gas Code," or CAN/CGA-B149 in Canada. **Do not use flexible connectors**.
2. Piping to units should 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 1/2". Table 1 allows for the usual number of fittings with a 0.3" W.C. pressure drop. Where the gas supplied has a specific gravity other than 0.60, apply the multiplying factor as given in Table 2.
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 sediment trap 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 1/4" per 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 combination gas control. **In no case should line be purged into heat exchanger.**
12. After installation, check system for gas leaks, using a soap solution.
13. Install a ground joint union and a manual shut off valve immediately upstream of the unit including a 1/8" 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. When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi)

    The appliance should be isolated from the gas supply piping system by closing its field installed manual shutoff valve.

Table 1
Gas Pipe Capacities

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

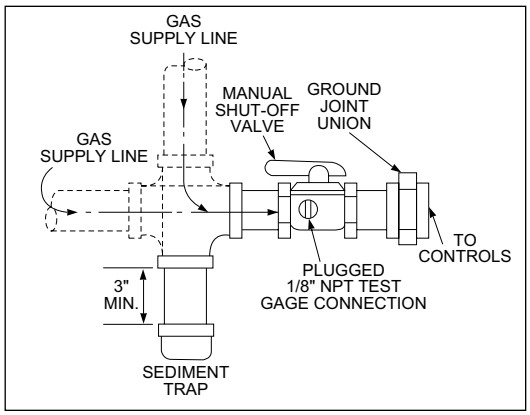
Length of Pipe in Ft.	Diameter of Pipe - Inches									
	1/2	3/4	1	1 1/4	1 1/2	2	3	4	6	8
15	76	218	440	750	1220	2480	6500	13880	38700	79000
30	73	152	285	590	890	1650	4700	9700	27370	55850
45	44	124	260	435	700	1475	3900	7900	23350	45600
60	50	105	190	400	610	1150	3250	6800	19330	39500
75		97	200	345	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 sued 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

⚠ 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 6-443.

The power to these unit heaters should be protected with a circuit breaker. Units for use with single-phase electric power, should be provided with a manual motor starter, having properly sized overload protection. 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 (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 dels (BAE) Models Only

⚠ CAUTION

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

Burned-out heat exchanger as well as shorter equipment life will result from not providing uniform air distribution.

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.

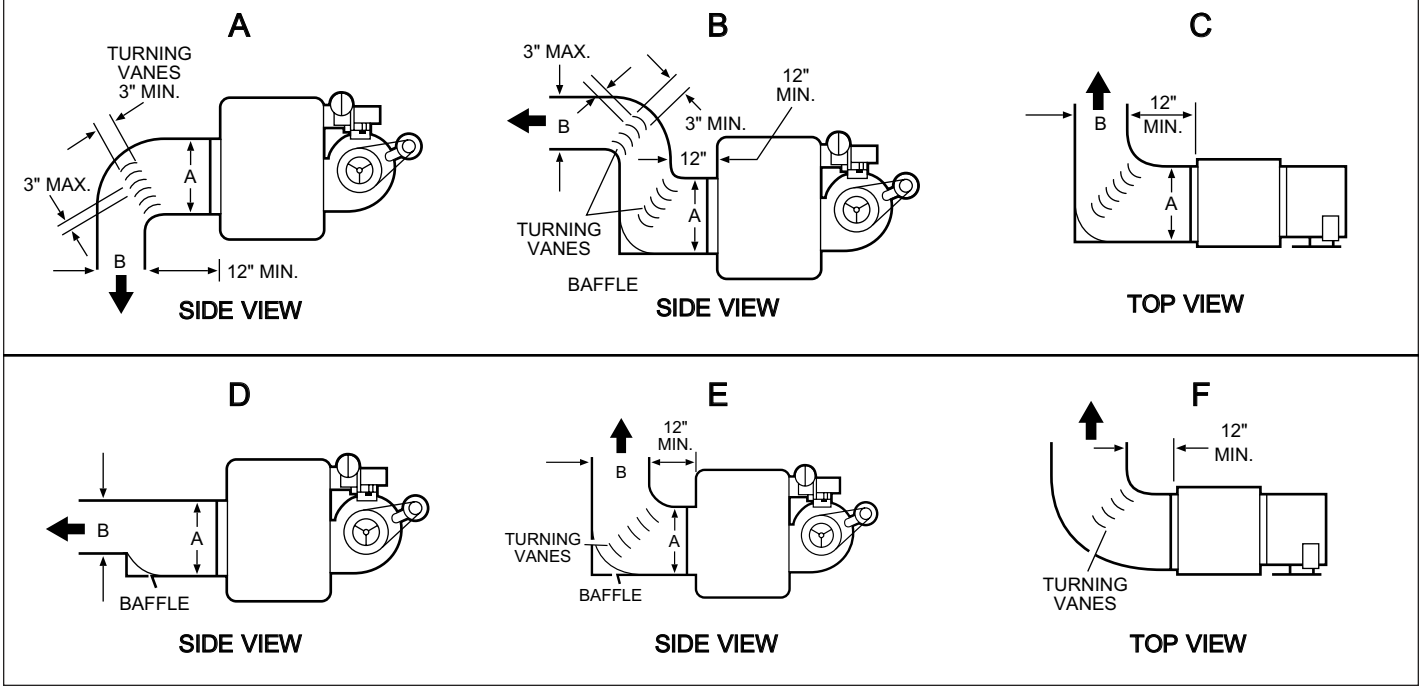
1. **Provide uniform air distribution over the heat exchanger.** Use turning vanes where required. See figures below.
2. Provide removable access panels in the ductwork on the downstream side of the unit heater. These openings should be large enough to view smoke or reflect light inside the casing to indicate leaks in the heat exchanger and to check for hot spots on exchanger due to poor air distribution or lack of sufficient air.
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 blower enclosure as shown on page 12.

⚠ 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.

Recommended Installations

Dimension "B" Should Never Be Less than 1/2 of "A"



INSTALLATION

Installation of Blower Models (BAE UNITS)

Determining Blower Speed

The drive assembly and motor on all gas-fired blower unit heaters are factory assembled. The adjustable motor sheave has been pre-set to permit operation of this unit under average conditions of air flow and without any external static pressure. The motor sheave 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 motor sheave turns open, 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 motor sheave turns open 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 BAE 350 unit, operating with no external static pressure, that is, no duct work, nozzles, etc., and is to deliver an air volume of 6481 cfm (cfm = cubic feet of air per minute) requires that the unit be supplied with a 5 hp motor, a C116 drive, and the drive sheave must be set at 3 turns open to achieve a blower speed of 940 rpm (see performance table for units with or without blower enclosure, page 18). See "Blower Adjustments" on page 8 for setting of drive pulley turns open.

If a blower unit is to be used with ductwork or nozzles, etc., the total external static pressure under which the unit is to operate, and the required air flow 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 pressure loss. The total of the pressure losses must be determined before adjusting the blower speed.

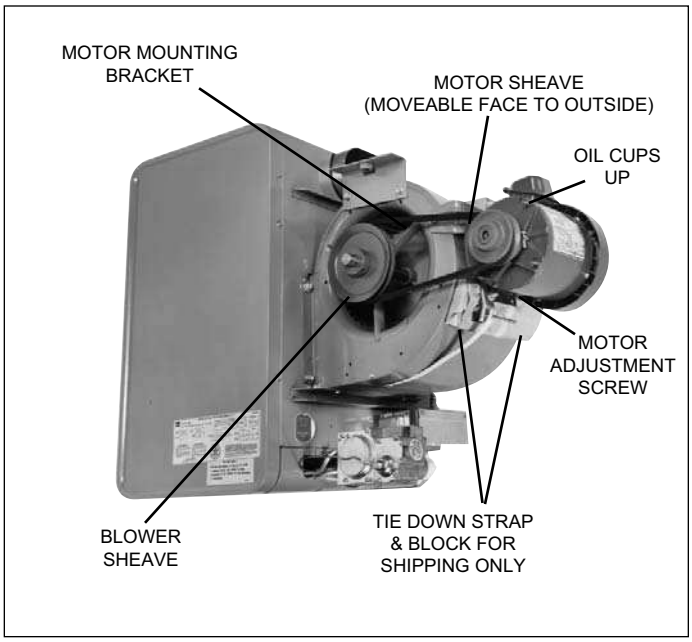
If Modine filters are used, the expected pressure loss through the filters is included in the performance data on page 19. If Modine supplied discharge nozzles are used, the expected pressure drop of the nozzles can be found footnoted at the bottom of page 14. If filters, nozzles or ductwork are to be used with the unit, and they are not supplied by Modine, the design engineer or installing contractor must determine the pressure loss for the externally added devices or ductwork to arrive at the total external static pressure under which the unit is to operate.

Once the total static pressure and the required air flow are known, the operating speed of the blower can be determined and the correct motor sheave adjustments made. As an example, let's say, a model BAE 350 is to be used with a Modine supplied blower enclosure and Modine supplied filters attached to someone else's ductwork. The unit is to move 6481 cfm or air flow against an external static pressure of 0.2" W.C. Entering the performance table on page 19 (Blower models with filters) for a BAE 350, at 6481 cfm and 0.2" W.C. static pressure, it is seen that the unit will require a 5 hp motor using a C116 drive, and the motor sheave should be set at .5 turns open to achieve a blower speed of 1055 rpm. You can see this example differs from similar conditions in paragraph 2 by the number of turns open and a higher rpm, which is needed to overcome the added external static pressure from the filters.

To Install (Figure 5):

1. Remove and discard the motor tie down strap and the shipping block beneath the belt tension adjusting screw (Not used on all models.)

Figure 5
Blower Model Installation



2. Adjust motor adjusting screw for a belt deflection of approximately 3/4" with five pounds of force applied midway between the sheaves (refer to Figure 6a). Since the belt tension will decrease dramatically after an initial run-in period, it is necessary to periodically re-check the tension. 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 installers responsibility to adjust the motor sheave to provide the specified blower performance as listed on pages 18 & 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 28 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 26 for drive sizes.

INSTALLATION

Blower Adjustments

Following electrical connections, check blower rotation to assure blow-through heating. If necessary interchange wiring to reverse blower rotation. Start fan 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. 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:

NOTE: Do not fire unit until blower adjustment has been made or unit may cycle on limit (overheat) control.

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 belt 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 motor 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 sheave and blower sheave are aligned. Re-align if necessary.
8. Re-check blower speed after adjustment.
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 pages18 and19 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

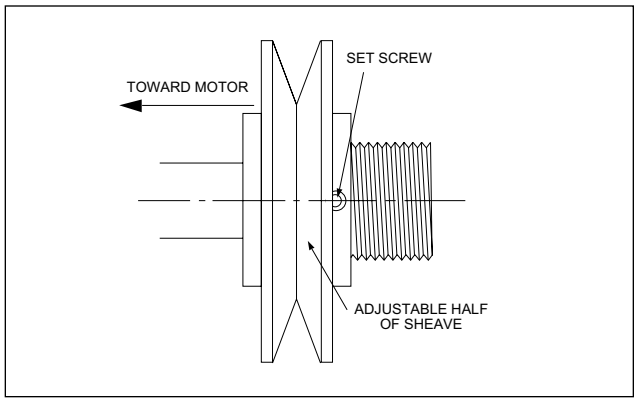
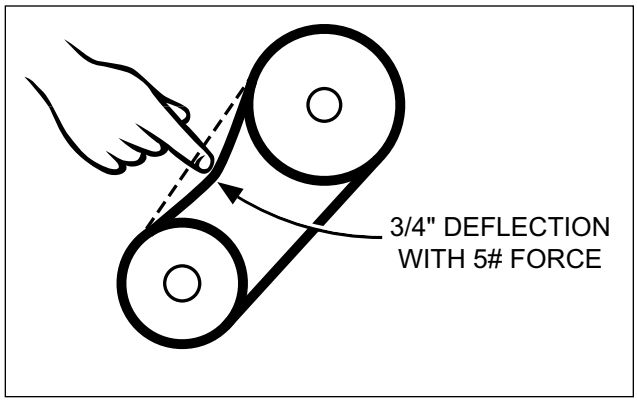


Figure 6a
Belt Tension Adjustment



OPERATION

⚠ CAUTION

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

Check the gas inlet pressure at the unit upstream of the combination gas control. The inlet pressure should be 6"-7" W.C. on natural gas or 12"-14" W.C. on propane. If inlet pressure is too high, install an additional pressure regulator upstream of the combination gas control.

The pilot flame must be adjusted as described below. 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 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. Turn off all electric power to the unit.
2. Check burner 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. If you are not familiar with the unit's controls (i.e. combination gas control), refer to the control manufacturer's literature supplied with the unit.
6. Check that all horizontal deflector blades are open a minimum of 30° as measured from vertical.

Lighting Instructions (also on unit)

For Units with Standing Pilot

1. Set thermostat to lowest setting. Move gas control knob (or lever) to off and wait 5 minutes.
2. Move gas control knob to PILOT (or move gas control lever to SET) and depress reset button while lighting the pilot and hold for 1 minute after pilot is lit.
3. Move gas control knob (or lever) to ON.
4. Set thermostat to desired setting.

For Units with Intermittent Pilot

1. Set thermostat to lowest setting. Move gas control knob (or lever) to off and wait 5 minutes.
2. Move gas control knob (or lever) to ON.
3. Set thermostat to desired setting (pilot and main burner will light automatically when thermostat calls for heat).

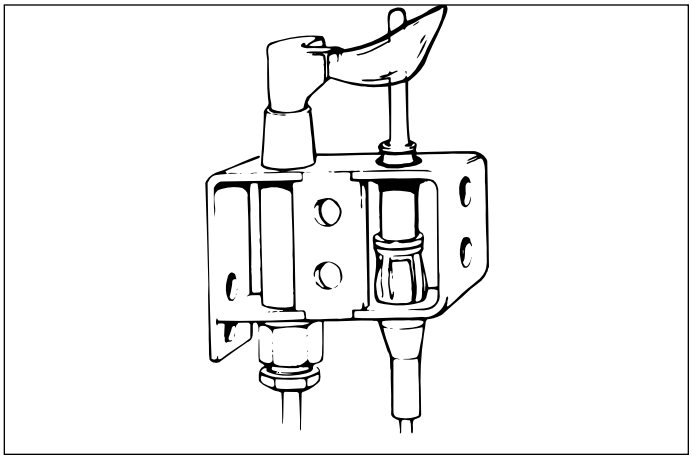
Shut Down Instructions

Turn off power and close manual gas valve.

After Initial Start Up

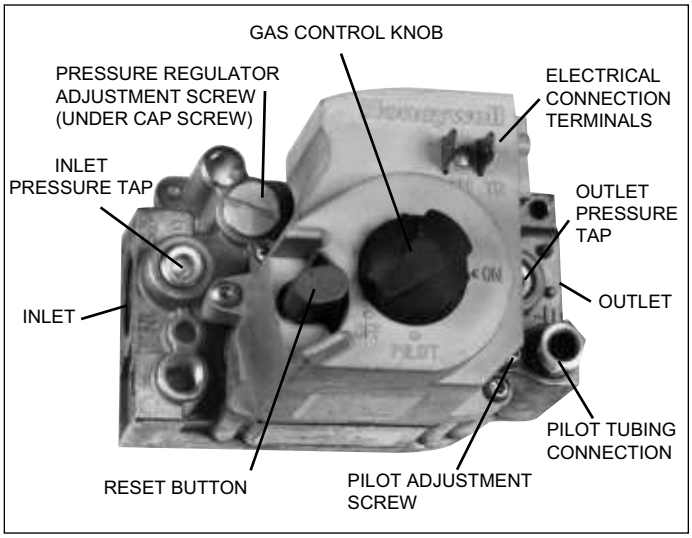
1. Check pilot flame adjustment as discussed below.
2. Check gas piping for leaks with a soap bubble solution to insure safe operation.
3. Check gas input rate to assure proper gas flow and pressure.

Figure 7
Correct Pilot Flame — Pilot Flame Adjustment



The pilot burner is orificed to burn properly with an inlet pressure of 6-7" W.C. on natural gas and 12-14" W.C. on propane gas, but final adjustment must be made after installation. Adjust to have a soft steady flame 3/4" to 1" long and encompassing 3/8"-1/2" of the tip of the thermocouple or flame sensing rod. Normally this flame will produce satisfactory results. To adjust flame use pilot adjustment screw on combination gas control (for location, see the combination gas control literature supplied with unit). If the pilot flame is longer and larger than shown by Figure 7, it is possible that it may cause soot and/or impinge on the heat exchanger causing burnout. If the pilot flame is shorter than shown it may cause poor ignition and result in the controls not opening the combination gas control. A short flame can be caused by a dirty pilot orifice. Pilot flame condition should be observed periodically to assure trouble-free operation.

Figure 8
Typical combination gas control — Natural



Gas Flame Control

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

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 core.

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 manifold 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 slightly yellow tip**. Prior to flame adjustment, operate unit heater with casing closed for at least five 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 to just a slightly yellow tip and a clean blue flame with a well-defined inner cone appears.

It may also be necessary to adjust the manifold position in addition to adjusting air shutters to obtain proper flame. Follow the instructions under "Natural Gas Flame Control" for adjusting the manifold.

Checking Input Rate

⚠ CAUTION

Check the gas inlet pressure at the unit upstream of the combination gas control. The inlet pressure should be 6"-7" W.C. on natural gas or 12"-14" W.C. on propane. If inlet pressure is too high, install an additional pressure regulator upstream of the combination gas control.

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

Input Adjustments

The gas pressure regulator (part of the combination gas control) is 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, and increases maintenance. 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 off during the test. If this is not possible, use the pressure method.

(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:

   F1 = 3600 C/T

   F2 = F1/C

   where:

   F1 = input to heater, Btuh.

   F2 = input to heater, cu. ft. per hr.

   C = heating value of gas, Btu per cu. ft.

   T = time to consume 1 cu. ft. of gas in sec.

   The heating 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 in Table 5 for model being tested, locate the combination gas control and pressure regulator adjustment screw (see Figure 8). Remove the cap screw from the pressure regulator and make 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.

If the correct number of seconds cannot be obtained check orifice size. Correct orifices can be obtained from Modine Manufacturing Company, Buena Vista, Virginia. When requesting orifices, state type of gas, heating value, and its specific gravity. Also give model number of unit.

For example, if the input to the heater is 100,000 Btuh and the heating value of the gas is 1000 Btu per cu. ft., then, by the second formula, the input is 100 cu. ft. per hr. Table 4 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. 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 correct manifold pressure from Table 4.
2. Locate combination gas control.
3. Move gas control knob (or lever) to off.
4. Remove the 1/8" pipe plug in outlet pressure tap in combination gas control (see Figure 9) and attach water manometer or “U” tube which is at least 12" high.
5. Follow lighting instructions and turn thermostat up to get unit to fire.
6. If pressure as indicated by “U” tube is less than 1/2" higher or lower than indicated in Table 4, adjust regulator as described under “Meter-Timing Method,” Step 3.

   If pressure as indicated by “U” tube is more than 1/2" higher or lower than indicated in Table 4, check inlet pressure at unit. The inlet pressure should be 6"-7" W.C. pressure on natural gas and 12"-14" W.C. on propane gas.

After adjustment move gas control knob (or lever) to off and replace 1/8" pipe plug. With the plug in place, follow the lighting instructions to put unit back in service.

CHECKING INPUT RATE

Figure 9

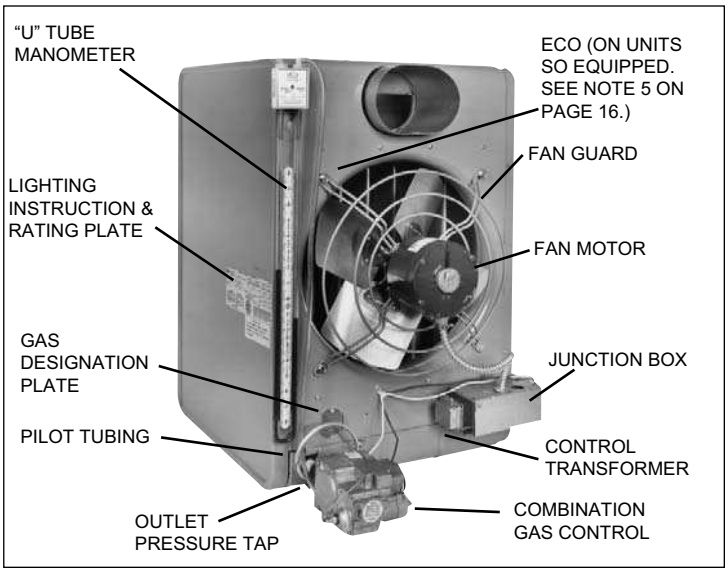


Table 3
Meter-Timing Gas

(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:			
	1/2 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 *

Model	BTU/Cu. Ft. Specific Gravity	Natural 1050 0.60	Propane 2500 1.53	No. of Orifices
Manifold Pressure In. W.C.		3.5	10.0	
PAE 30	CFH	28.6	12.0	
	Gal/Hr. Propane	–	.33	
	Sec/cu. ft.	126	300	1
	Orifice Drill Size	37	52	
PAE 50 BAE 50	CFH	47.6	20.0	
	Gal/Hr. Propane	–	.55	
	Sec/cu. ft.	76	180	1
	Orifice Drill Size	30	45	
PAE 75 BAE 75	CFH	71.4	30.0	
	Gal/Hr. Propane	–	.82	
	Sec/cu. ft.	50	120	1
	Orifice Drill Size	20	37	
PAE 100 BAE 100	CFH	95.2	40.0	
	Gal/Hr. Propane	–	1.15	
	Sec/cu. ft.	38	90	2
	Orifice Drill Size	30	45	
PAE 125 BAE 125	CFH	119.0	50.0	
	Gal/Hr. Propane	–	1.43	
	Sec/cu. ft.	30	72	2
	Orifice Drill Size	25	42	
PAE 145 BAE 145	CFH	138.1	58.0	
	Gal/Hr. Propane	–	1.64	
	Sec/cu. ft.	26	62	3
	Orifice Drill Size	30	45	
PAE 175 BAE 175	CFH	166.7	70.0	
	Gal/Hr. Propane	–	1.86	
	Sec/cu. ft.	22	51	3
	Orifice Drill Size	27	43	
PAE 200 BAE 200	CFH	190.5	80.0	
	Gal/Hr. Propane	–	2.19	
	Sec/cu. ft.	19	45	3
	Orifice Drill Size	23	40	
PAE 225 BAE 225	CFH	214.3	90.0	
	Gal/Hr. Propane	–	2.46	
	Sec/cu. ft.	17	40	4
	Orifice Drill Size	28	43	
PAE 250 BAE 250	CFH	238.1	100.0	
	Gal/Hr. Propane	–	2.74	
	Sec/cu. ft.	15	36	4
	Orifice Drill Size	25	42	
PAE 300 BAE 300	CFH	285.7	120.0	
	Gal/Hr. Propane	–	3.29	
	Sec/cu. ft.	13	30	5
	Orifice Drill Size	26	43	
PAE 350 BAE 350	CFH	333.3	140.0	
	Gal/Hr. Propane	–	3.84	
	Sec/cu. ft.	11	26	5
	Orifice Drill Size	22	39	
PAE 400 BAE 400	CFH	381.0	160.0	
	Gal/Hr. Propane	–	4.38	
	Sec/cu. ft.	9	23	6
	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
20	.1610	37	.1040
22	.1570	39	.0995
23	.1540	40	.0980
25	.1495	42	.0935
26	.1470	43	.0890
27	.1440	45	.0820
28	.1405	52	.0635
30	.1285		

Pilot Orifice Identity Numbers

Pilot Burner Manufacturer	Identity No. Natural Gas	Identity No. Propane Gas
Honeywell	HCR-18 or BCR-18	HBR or BBR-12 or 11
Robertshaw	1 • 8 N ①	L 1 • O P ①
Johnson	7715	4710

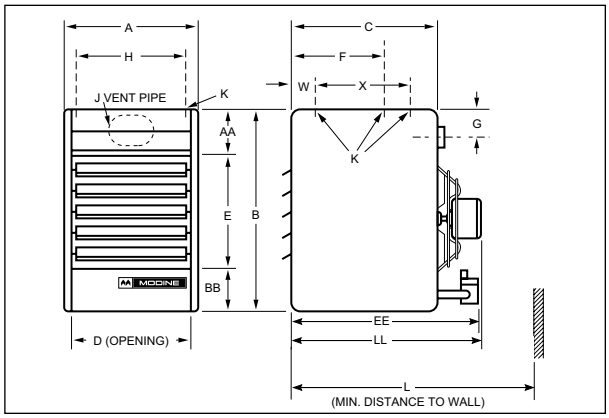
① As number appears on top of pilot orifice.

Figure 10
Dials of Typical Gas Meter

DIMENSIONS/PERFORMANCE – PAE

For all sizes, minimum clearance to com-bustibles from the bottom is 12 inches and from the sides 18 inches; for sizes 30-100 from the top is 1 inch and from the vent con-nector 2 inches; for sizes 125-300 from the top is 2 inches and from the vent connector 3 inches; and for sizes 350 and 400 from the top is 3 inches and from the vent connector 6 inches. Also, allow at least 12 inches at the rear, or 6 inches beyond the end of the motor (whichever is greater), to provide ample air for combustion and for proper operation of fan.

Clearance at bottom should equal “C” dimen-sion for each model number.



Dimensions (inches) — PAE

Do not use propeller units with duct work.

Dimension Symbol	Model Number												
	PAE 30	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 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	5	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 (Mounting Holes) ③	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-15	3/8-16	3/8-16
Gas Connections ②	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4
W	–	–	–	–	–	–	–	–	–	–	5	5	5
X	–	–	–	–	–	–	–	–	–	–	16	16	16
L ④	28-1/4	35	35	37-1/2	37-1/2	38	41	41	43	43	44-3/8	44-3/8	48-1/2
LL	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
EE	–	29	29	30-1/2	30-1/2	30-1/2	32-7/8	32-7/8	32-7/8	32-7/8	32-7/8	32-7/8	32-7/8
Fan Diameter	9	12	14	16	16	18	20	20	22	22	22	22	24
Approx. Weight	58#	102#	116#	156#	162#	169#	231#	231#	231#	261#	330#	330#	410#

① Diameter of round vent pipe to fit oval opening.
② For natural gas; may vary depending on control availability.
③ PAE 30 through PAE 250 — 2 holes (and the level hanging adjustment feature). PAE 300 through PAE 400 — 4 holes.
④ Dimension equals overall plus 6".

Performance — PAE

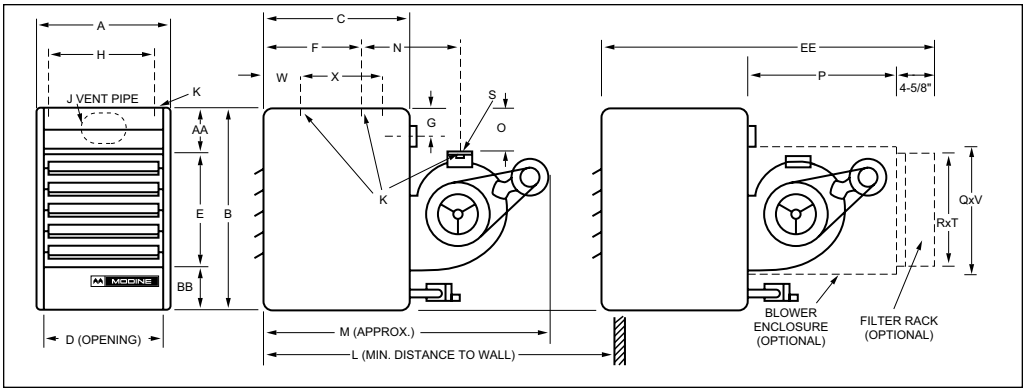
Standard		Model Number												
		PAE 30	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 400
Btu/Hr. Input		30,000	50,000	75,000	100,000	125,000	145,000	175,000	200,000	225,000	250,000	300,000	350,000	400,000
Btu/Hr. Output		24,300	40,000	60,000	80,000	100,000	116,000	140,000	160,000	180,000	200,000	240,000	280,000	320,000
Entering CFM		440	740	1130	1440	1850	2400	2500	3000	3300	4100	4400	5000	5900
Outlet Velocity		515	495	664	616	789	893	713	852	832	1024	960	1094	1094
Air Temp. Rise °F		51	50	49	51	50	46	52	49	51	45	51	52	50
Mounting Hgt. (Max. Ft.) ①		7	8	11	10	13	17	13	16	15	20	18	20	21
Heat Throw Ft. ①		25	27	39	36	47	59	45	55	54	72	64	71	74
Motor Data ②	Horsepower	1/40	1/40	1/30	1/30	1/15	1/6	1/6	1/6	1/6	1/3	1/3	3/4	3/4
	Amp Draw	1.3	1.3	2.3	2.3	2.7	3.1	3.1	3.1	3.1	5.7	5.7	9.1	9.1
	RPM	1550	1550	1050	1050	1050	1075	1075	1075	1075	1075	1075	1140	1140
	Type	Shaded Pole	Shaded Pole	Shaded Pole	Shaded Pole	Shaded Pole	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.	Perm. Split Cap.

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. (In Canada see rating plate.)
① At 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit, and without deflector hoods.
② All single phase motors are totally enclosed and thermal overload protected. Data listed is for standard 115-volt, 60 hertz, single-phase motors.

DIMENSIONS/PERFORMANCE – BAE

For blower sizes, minimum clearance to combustibles from the bottom is 12", from the sides 18", and from the top and vent connector is 6". Allow at least 12" at the rear, or 6" beyond the end of the motor (whichever is greater), to provide ample air for combustion and for proper operation of fan.

Clearance at bottom should equal "C" dimension for each model number.



Dimensions (inches) — BAE

Dimension Symbol	Model Number											
	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BAE 350	BAE 400
A	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	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	20	20	22	22	22	25	25	25	25	25	25	25
D	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	16	16	20	20	20	24	24	24	24	24	24	24
F	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	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	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	8	8	8	9	9	9	9	9	9	9
BB	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	5	6	6	7	7	8	8	8	9	10	10
K ④	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16	3/8-16
Gas Connections ②	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4
W	–	–	–	–	–	–	–	–	–	5	5	5
X	–	–	–	–	–	–	–	–	–	16	16	16
EE	46-5/8	49-5/8	56-5/8	56-5/8	56-5/8	63-5/8	63-5/8	63-5/8	63-5/8	63-5/8	63-5/8	63-5/8
L w/ Blwr Encl & Filt Rk	52-5/8	55-5/8	62-5/8	62-5/8	62-5/8	69-5/8	69-5/8	69-5/8	69-5/8	69-5/8	69-5/8	69-5/8
L w/o Blwr Encl & Filt Rk	43-3/4	46-3/4	52-3/4	52-3/4	53-3/4	58-3/8	58-3/8	58-3/8	58-3/8	58-3/8	58-3/8	64-1/2
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 ⑤	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	34	34	34
Q Blower Encl Ht	17-1/8	17-1/8	21-3/8	21-3/8	21-3/8	25-1/8	25-1/8	25-1/8	25-1/8	25-1/8	25-1/8	25-1/8
V Blower Encl Width	17-1/2	21-1/4	29	29	29	34-1/4	34-1/4	34-1/4	34-1/4	44-3/8	44-3/8	44-3/8
R Inlet Duct Height	15-3/4	15-3/4	20	20	20	23-3/4	23-3/4	23-3/4	23-3/4	23-3/4	23-3/4	23-3/4
T Inlet Duct 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	13-7/16	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. ⑥	3	3	3	3	3	3	3	3	3	3	41½2	41½2
Std. Blower Pulley Dia.	9	10	15	13	9	13	12	9	8	8	11	11
Blower Wheel Diameter	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.
② For natural gas; may vary depending on control availability.
③ This is an approximate dimension for standard motors, allow 3" for sheave and optional motors.
④ BAE 50 thru BAE 250 — 4 holes (2 on blower and 2 on unit).
BAE300 thru BAE 400 — 6 holes (2 on blower and 4 on unit).
⑤ Distance between mounting hole in unit casing and mounting hole on blower. On the BAE 300 thru BAE 400, the distance is from rear mounting hole in casing to the mounting hole on blower.
⑥ Motor pulley is adjustable.

Standard Blower Motor Data — BAE

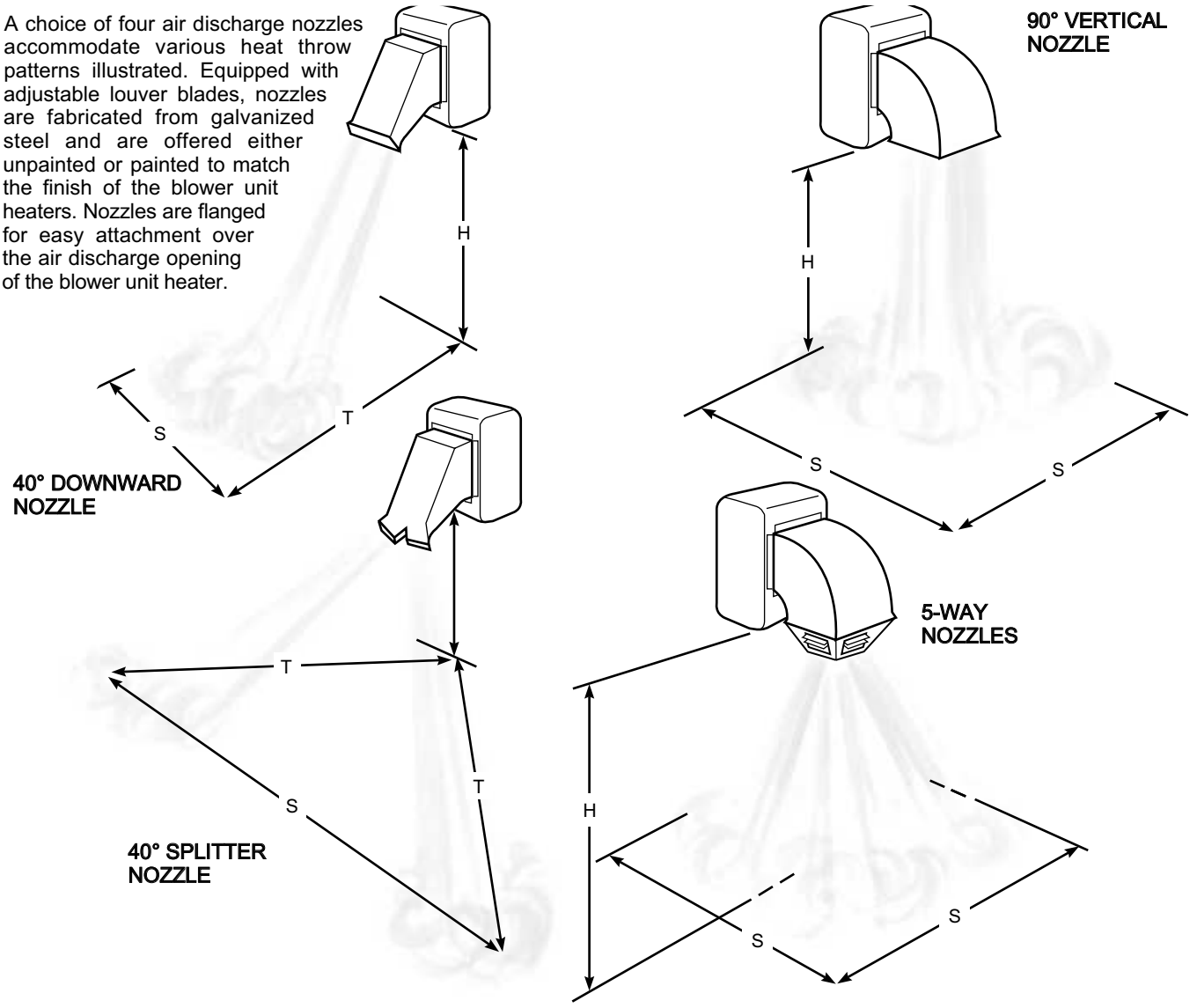
Note: Mounting heights and throws for BAE models, without ductwork or nozzles, and at a cfm yielding a 55° temperature rise are the same as those listed for equivalent size PAE units.

Standard	Model Number											
	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BAE 350	BAE 400
Horsepower	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/2	1/2	3/4	1	1-1/2
Amps (@ 115 volt) ①	5.4	5.4	5.4	5.4	5.4	5.4	5.4	8.5	11	11	13.4	15.0
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	Perm. Split Cap.	Cap. Start

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

PERFORMANCE DATA – NOZZLES

A choice of four air discharge nozzles accommodate various heat throw patterns illustrated. 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.

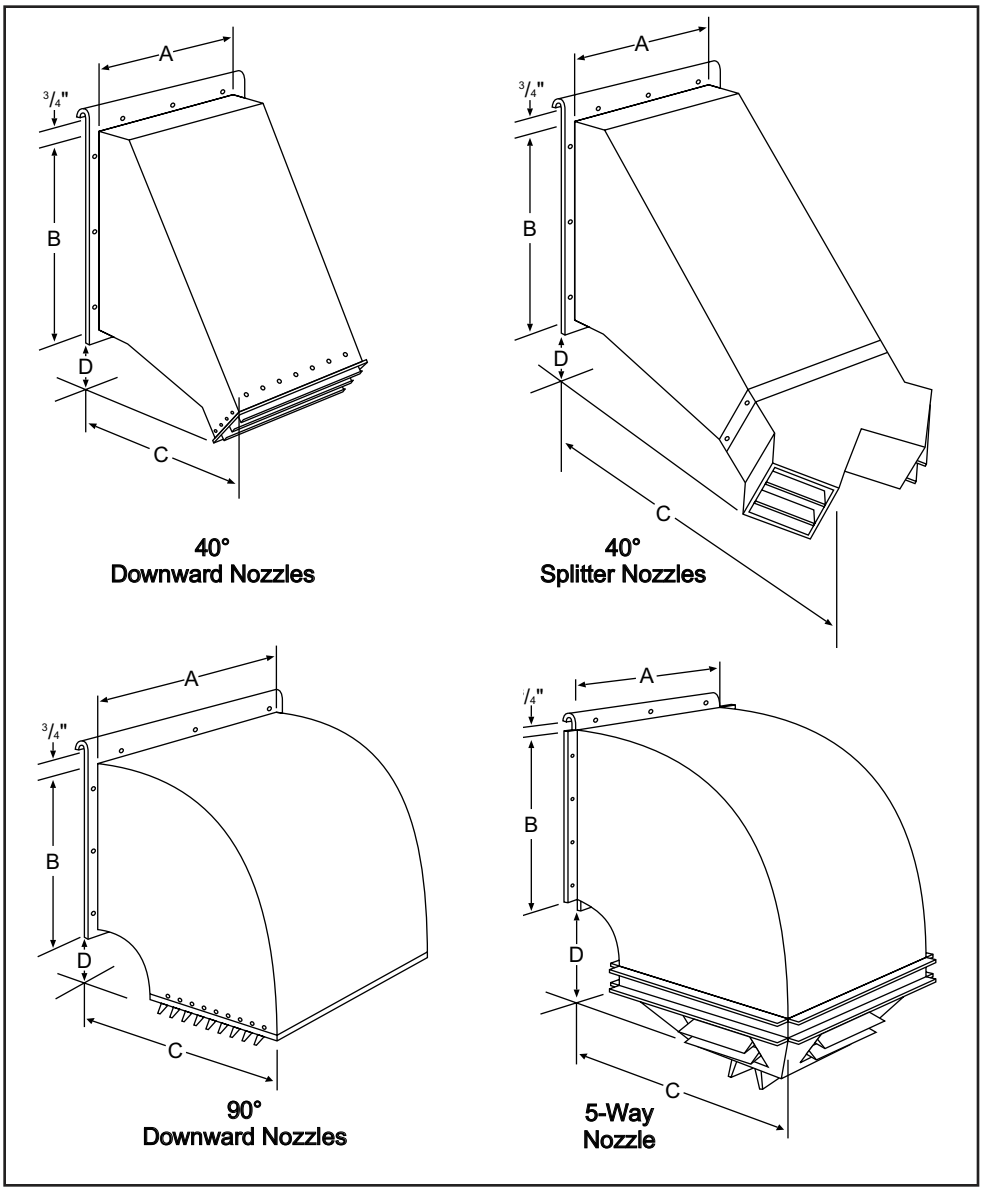


Mounting Height, Heat Throw, Heat Spread (in feet)

Nozzle Type		Model Number											
		BAE-50	BAE-75	BAE-100	BAE-125	BAE-145	BAE-175	BAE-200	BAE-225	BAE-250	BAE-300	BAE-350	BAE-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	12	14	15	18	17	18	20	20	21	20	23	26
	Heat Spread (ft.) S	17	20	21	26	24	25	28	27	30	27	32	37

The above table is based on an inlet air temperature of 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 18 and 19. Mounting height measured from bottom of unit.

DIMENSIONAL DATA



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	BAE-350	BAE-400
40° Downward 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	24	22	26	26	25	30	30	30	30	36	36	36
	D	4	3	4	4	4	4	4	6	6	11	11	11
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	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
40° Splitter 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	34	33	39	39	40	40	46	46	47
	D	–	–	10	10	11	12	12	14	14	19	19	20
5-Way Nozzle	A	14-13/16	16-13/16	18-9/16	18-9/16	21	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	20-3/4	22-3/4	24-1/2	24-1/2	27	29	29	32	32	37	37	43-1/2
	D	11	12	13	13	14	15	15	16	16	18	18	18

PERFORMANCE DATA – HOODS

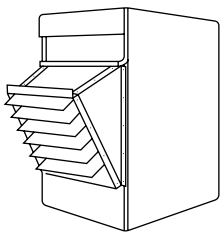
Performance Data — 30°, 60° and 90° Downward Deflector Hoods — Propeller Models

Mounting Height to Bottom of Heater	30° Downward Hood For Propeller Units ①											
Model	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 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'	6 14 19	10 24 32	9 22 31	14 30 41	18 38 52	13 28 39	17 36 49	17 36 49	23 48 65	20 42 57	23 48 65	24 50 68
10'	–	9 21 30	8 19 27	12 29 39	17 37 51	11 26 36	15 35 47	15 34 47	22 47 64	19 41 56	22 47 64	23 49 67
12'	–	6 17 24	5 13 19	11 26 36	16 36 49	10 24 33	14 33 45	14 33 45	21 46 63	18 40 54	21 46 62	22 48 65
14'	–	–	–	9 23 32	14 34 47	7 19 27	13 31 42	12 30 42	20 44 61	16 38 52	20 44 61	21 47 64
16'	–	–	–	–	12 31 43	–	10 27 38	10 27 37	18 42 58	15 36 49	18 42 58	19 45 62
18'	–	–	–	–	–	–	7 20 29	7 20 29	17 40 56	13 33 45	16 40 55	18 43 59
20'	–	–	–	–	–	–	–	–	15 37 52	10 27 38	15 37 51	16 40 55
22'	–	–	–	–	–	–	–	–	12 32 45	–	12 32 45	14 36 51
24'	–	–	–	–	–	–	–	–	–	–	–	9 27 39

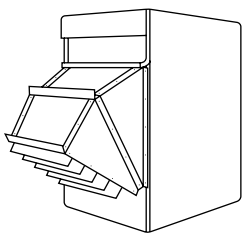
Mounting Height to Bottom of Heater	60° Downward Hood For Propeller Units ①											
Model	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 400
	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z	X Y Z
8'	0 13 18	0 24 33	0 22 30	0 32 43	0 41 56	0 30 40	0 38 52	0 38 51	0 51 70	0 45 61	0 51 69	0 53 73
10'	–	0 21 29	0 18 25	0 29 40	0 39 54	0 27 37	0 36 49	0 36 49	0 50 68	0 43 59	0 49 68	0 52 71
12'	–	0 15 21	0 9 13	0 26 36	0 37 51	0 23 32	0 34 46	0 33 45	0 48 66	0 41 57	0 48 65	0 50 69
14'	–	–	–	0 21 29	0 34 47	0 16 23	0 30 41	0 30 41	0 46 63	0 39 53	0 46 62	0 48 66
16'	–	–	–	0 15 22	0 30 41	–	0 25 35	0 25 34	0 43 59	0 35 49	0 43 59	0 46 63
18'	–	–	–	–	0 24 33	–	0 14 19	0 14 19	0 40 55	0 31 42	0 40 54	0 43 59
20'	–	–	–	–	–	–	–	–	0 35 49	0 23 32	0 35 48	0 39 53
22'	–	–	–	–	–	–	–	–	0 28 39	0 16 23	0 28 39	0 33 46
24'	–	–	–	–	–	–	–	–	–	–	0 21 30	0 22 31

Mounting Height to Bottom of Heater	90° Downward Hood For Propeller Units ①											
Model	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 400
	S	S	S	S	S	S	S	S	S	S	S	S
8'	14	23	23	34	46	32	44	44	65	57	68	74
10'	12	21	20	30	42	29	39	39	58	51	60	66
12'	11	19	19	27	38	26	36	36	53	47	55	60
14'	–	17	17	25	35	25	33	33	50	43	51	56
16'	–	16	16	23	33	23	31	31	46	41	48	52
18'	–	–	–	22	31	22	29	29	44	38	45	49
20'	–	–	–	21	29	21	28	28	41	36	43	47
22'	–	–	–	–	–	–	27	26	40	35	41	45
24'	–	–	–	–	–	–	25	25	38	33	39	43
26'	–	–	–	–	–	–	–	–	36	32	38	41
28'	–	–	–	–	–	–	–	–	35	31	36	40
30'	–	–	–	–	–	–	–	–	34	30	35	38
32'	–	–	–	–	–	–	–	–	–	–	34	37
34'	–	–	–	–	–	–	–	–	–	–	–	36

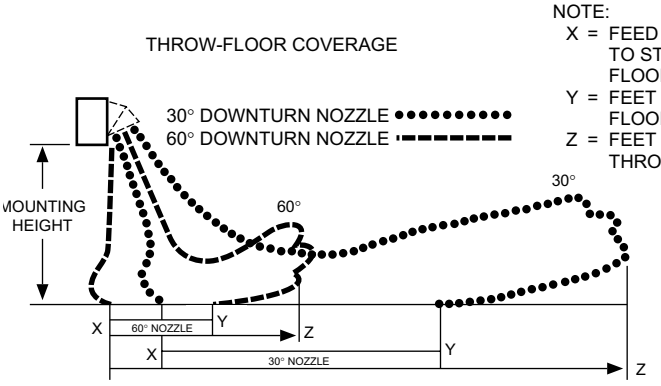
① Data Based on units fired at full rated input with an entering air temperature of 60°-80°F. Maximum mounting heights higher versus units without outlet devices.



30° HOOD



60° HOOD



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

PERFORMANCE DATA – HOODS

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

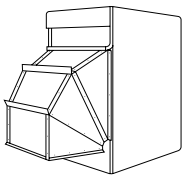
Mounting Height to Bottom of Heater	30° Downward Hood For Blower Units ②											
	Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BAE 350
BAE 400												
	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
8'	11 24 33	16 35 48	16 35 48	21 44 60	23 46 63	21 43 59	25 50 69	26 53 71	29 58 79	30 61 83	36 71 97	36 71 97
10'	9 22 30	15 34 46	15 34 46	20 43 59	21 46 62	20 42 58	24 50 68	25 52 70	28 57 78	29 60 82	35 71 96	35 70 96
12'	7 18 25	14 32 44	14 32 44	19 42 57	20 44 60	18 41 56	22 49 66	23 51 69	26 56 77	28 59 81	34 70 95	34 70 95
14'	–	12 29 41	12 29 41	17 40 55	19 43 59	17 39 54	21 47 65	22 49 68	25 55 75	27 58 80	33 69 94	33 69 94
16'	–	10 26 36	10 26 36	16 38 52	17 41 56	16 37 51	20 45 62	21 48 66	24 54 74	26 57 78	32 68 93	31 68 93
18'	–	–	–	14 35 49	16 38 53	14 34 48	18 43 60	19 46 63	23 52 71	24 56 76	30 67 92	30 67 91
20'	–	–	–	12 31 43	14 35 49	11 30 42	16 41 56	18 43 60	21 50 69	23 54 74	29 65 90	29 65 89
22'	–	–	–	–	–	–	14 37 52	16 40 56	18 48 66	21 51 71	28 64 88	27 63 87
24'	–	–	–	–	–	–	10 29 42	13 35 50	17 44 62	20 49 68	26 62 85	26 61 85
26'	–	–	–	–	–	–	–	–	15 40 56	17 45 63	25 59 82	24 59 82
28'	–	–	–	–	–	–	–	–	11 32 46	14 39 56	23 57 79	23 56 78
30'	–	–	–	–	–	–	–	–	–	–	21 53 74	20 52 74

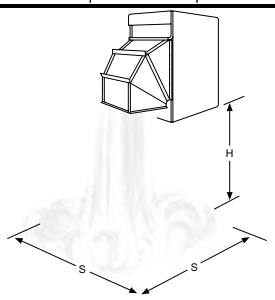
Mounting Height to Bottom of Heater	60° Downward Hood For Blower Units ②											
	Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BAE 350
BAE 400												
	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
8'	0 25 34	0 37 50	0 37 50	0 47 64	0 49 67	0 46 63	0 54 73	0 56 77	0 62 85	0 65 89	0 77 105	0 76 104
10'	0 22 30	0 35 48	0 35 48	0 45 62	0 48 66	0 45 61	0 53 72	0 55 75	0 61 83	0 64 88	0 76 103	0 75 103
12'	0 16 22	0 32 44	0 32 44	0 43 59	0 46 63	0 43 59	0 51 70	0 53 73	0 59 81	0 63 86	0 75 102	0 74 101
14'	–	0 29 40	0 29 40	0 41 56	0 44 60	0 40 55	0 49 67	0 52 70	0 58 79	0 61 84	0 73 100	0 73 100
16'	–	0 23 32	0 23 32	0 38 52	0 41 57	0 37 51	0 47 64	0 49 67	0 56 76	0 60 81	0 72 98	0 71 98
18'	–	–	–	0 34 47	0 38 52	0 33 45	0 43 60	0 46 64	0 53 73	0 57 78	0 70 96	0 70 95
20'	–	–	–	0 28 38	0 33 45	0 26 37	0 40 54	0 43 59	0 50 69	0 55 75	0 68 93	0 67 92
22'	–	–	–	–	0 24 34	–	0 34 47	0 38 53	0 47 64	0 51 71	0 65 90	0 65 89
24'	–	–	–	–	–	–	0 25 35	0 31 43	0 42 58	0 47 65	0 63 86	0 62 85
26'	–	–	–	–	–	–	–	–	0 36 50	0 42 58	0 59 81	0 59 81
28'	–	–	–	–	–	–	–	–	0 23 33	0 34 58	0 55 76	0 55 75
30'	–	–	–	–	–	–	–	–	–	–	0 50 69	0 49 68
32'	–	–	–	–	–	–	–	–	–	–	0 43 60	0 42 59

Mounting Height to Bottom of Heater	90° Downward Hood For Blower Units ②											
Model	BAE 50	BAE 75	BAE 100	BAE 125	BAE 145	BAE 175	BAE 200	BAE 225	BAE 250	BAE 300	BAE 350	BAE 400
	S	S	S	S	S	S	S	S	S	S	S	S
8'	24	38	41	55	60	58	71	75	86	96	121	124
10'	22	34	36	50	54	52	64	67	77	86	109	111
12'	20	31	33	45	49	47	58	61	71	79	99	101
14'	18	29	31	42	45	44	54	57	65	73	92	94
16'	17	27	29	39	42	41	50	53	61	68	86	88
18'	–	25	27	37	40	39	47	50	58	64	81	83
20'	–	24	26	35	38	37	45	48	55	61	77	78
22'	–	23	25	34	36	35	43	46	52	58	73	75
24'	–	–	–	32	35	33	41	44	50	56	70	72
26'	–	–	–	31	33	32	40	42	48	54	68	69
28'	–	–	–	30	32	31	38	40	46	52	65	66
30'	–	–	–	–	31	30	37	39	45	50	63	64
32'	–	–	–	–	–	–	36	38	43	48	61	62
34'	–	–	–	–	–	–	35	37	42	47	59	60

② Data Based on unit fired at full rated input, 60°-80°F entering air temperature, and a 40°F temperature rise through unit. Maximum mounting heights higher versus units without outlet devises.

90° HOOD





PERFORMANCE DATA - BLOWER UNIT HEATERS

Models With or Without Blower Enclosure ① ② ③ ④ ⑤

Model No.	Input Output	Temp Rise (°F)	Airflow (cfm)	0.0 Static Air Pressure				0.1 Static Air Pressure				0.2 Static Air Pressure				0.3 Static Air Pressure				0.4 Static Pressure			
				RPM	HP	Drive No.	Sheave Turns Open	RPM	HP	Drive No.	Sheave Turns Open	RPM	HP	Drive No.	Sheave Turns Open	RPM	HP	Drive No.	Sheave Turns Open	RPM	HP	Drive No.	Sheave Turns Open
BAE 50	50,000	40	938	635	1/4	C8	3.5	705	1/4	C8	2	775	1/4	C8	1	845	1/3	C1	4.5	910	1/3	C1	4
		45	833	**560**			0	645			3.5	725			2	800	1/4	C8	0.5	870			4.5
		50	750	505			1.5	595			4	685			2.5	765			1	845	1/4	C1	4.5
	40,500	55	682	460			2.5	560	1/4	C87	0	650			3	740			1.5	825			5
		60	625	420			3.5	530			1.5	630			3.5	725			2	810	1/4	C8	0.5
		65	577	390			4.5	505			1.5	610			4	710			2	805			0.5
		70	536	360			5	485			2	600			4	700			2.5	800			0.5
BAE 75	75,000	40	1406	**545**	1/4	C12	0.5	645	1/4	C90	3.5	725	1/3	C90	2	800	1/2	C92	0.5	865	1/2	C91	4.5
		45	1250	490			2	590			4.5	680			3	755	1/3	C90	1.5	830	1/2	C92	0
		50	1125	440			3	550	1/4	C12	0	645	1/4	C90	3.5	725	1/4	C90	2	800	1/3	C90	0.5
	60,750	55	1023	400			4	520			1	620			4	705			2.5	775			1
		60	938	370			5	495			1.5	595			4	685			2.5	760			1.5
		65	865	–	–	–	–	475			2	580			4.5	670			3	750	1/4	C90	1.5
		70	804	–	–	–	–	460			2.5	565			4.5	660			3	735			1.5
BAE 100	100,000	40	1875	**315**	1/4	C93	1	395	1/4	C94	3	465	1/3	C95	5	520	1/3	C95	4	575	1/2	C96	3
		45	1667	280			2.5	370			4	440			1.5	505	1/4	C95	4.5	560	1/3	C95	3
		50	1500	250			3.5	350			4.5	425			2	490			0.5	545			3.5
	80,000	55	1364	230			4.5	330			5	410	1/4	C94	2.5	475	1/4	C94	0.5	535	1/4	C95	3.5
		60	1250	210			5	320	1/4	C93	0.5	400			3	470			1	525			4
		65	1154	–	–	–	–	310			1	390			3	460			1	520			4
		70	1071	–	–	–	–	300			1.5	385			3.5	455			1.5	515			4
BAE 125	125,000	40	2315	390	1/3	C36	4.5	460	1/3	C36	2.5	520	1/2	C98	1	570	1/2	C38	4.5	620	3/4	C38	3.5
		45	2058	**345**	1/4	C97	1.5	425	1/4	C36	3.5	485	1/3	C36	2	545	1/2	C98	0.5	595	1/2	C38	4
		50	1852	310			3	395			4	465			2.5	525	1/3	C36	1	575			4.5
	100,000	55	1684	285			3.5	375	1/4	C97	0.5	445	1/4	C36	3	505	1/4	C36	1.5	560	1/3	C36	0
		60	1543	260			4.5	355			1	430			3.5	495			1.5	550			0
		65	1425	240	1/4	C93	4	340			1.5	420			3.5	480			2	540	1/4	C36	0.5
		70	1323	220			5	330			2	410			4	475			2	530			0.5
BAE 145	145,000	40	2685	635	3/4	C38	3.5	680	3/4	C38	2.5	725	1	C38	2	765	1	C38	1	805	1	C38	0.5
		45	2387	565	1/2	C38	4.5	615			4	665	3/4	C38	3	710	3/4	C38	2	755			1.5
		50	2148	510	1/2	C98	1	565	1/2	C38	4.5	620	1/2	C38	3.5	670			3	715	3/4	C38	2
	116,000	55	1953	465	1/3	C36	2.5	525	1/3	C36	1	580			4.5	635	1/2	C38	3.5	685			2.5
		60	1790	**425**			3.5	490			1.5	550	1/3	C36	0	605			4	660	1/2	C38	3
		65	1652	390	1/4	C36	4.5	465	1/4	C36	2.5	530			0.5	585	1/3	C115	4.5	640			3.5
		70	1534	365			5	440			3	510	1/4	C36	1	570			4.5	625	1/3	C115	3.5
BAE 175	175,000	40	3281	430	1/2	C101	3	480	3/4	C101	2	515	3/4	C101	1	555	3/4	C101	0	590	1	C107	4.5
		45	2917	385			0	435	1/2	C101	3	480	1/2	C101	2	515			1	555	3/4	C101	0
		50	2625	**350**	1/3	C24	1.5	400	1/3	C102	4	445			3	490	1/2	C101	1.5	530			0.5
	141,750	55	2386	315			2.5	375	1/3	C24	0.5	425	1/3	C102	3.5	465			2.5	510			1.5
		60	2188	290	1/4	C24	3.5	350			1.5	405			4	450	1/3	C102	3	490	1/2	C101	1.5
		65	2019	270			4.5	335	1/4	C24	2	390	1/4	C24	0	435			3	480			2
		70	1875	250			5	320			2.5	375			0.5	425	1/4	C102	3.5	470	1/3	C102	2.5
BAE 200	200,000	40	3704	490	3/4	C16	3	530	1	C16	2	565	1	C16	1.5	600	1	C16	0.5	635	1 1/2	C105	3.5
		45	3292	440	1/2	C16	4.5	480	3/4	C16	3.5	520	3/4	C16	2.5	555	3/4	C16	1.5	590	1	C16	1
		50	2963	395	1/2	C104	1	440	1/2	C16	4.5	485			3.5	525			2.5	560	3/4	C16	1.5
	160,000	55	2694	360	1/3	C103	2	410	1/2	C104	0.5	455	1/2	C16	4	500			3	535			2
		60	2469	**330**			3	385	1/3	C103	1	430			4.5	475	1/2	C16	3.5	515			2.5
		65	2279	305	1/4	C103	4	365	1/4	C103	2	415	1/3	C103	0	460			4	500	1/2	C16	3
		70	2116	280			4.5	345			2.5	400	1/4	C103	0.5	445	1/3	C99	4	490			3
BAE 225	225,000	40	4219	645	1 1/2	C106	5	680	1 1/2	C106	4	715	1 1/2	C106	3.5	745	2	C108	2.5	775	2	C108	2
		45	3750	575	1	C107	4.5	615	1	C107	4	650			5	685	1 1/2	C106	4	715	1 1/2	C106	3.5
		50	3375	520	3/4	C101	1	560	3/4	C101	0	600	1	C107	4	635	1	C107	3.5	670	1	C107	3
	182,250	55	3068	**470**	1/2	C101	2	515			1	560	3/4	C101	0	600	3/4	C107	4	635			3.5
		60	2813	430			3	480	1/2	C101	2	525			1	565			4.5	605	3/4	C107	4
		65	2596	400	1/3	C102	4	450			2.5	500	1/2	C101	1.5	540	1/2	C101	0.5	580			4.5
		70	2411	370	1/4	C102	5	425	1/3	C102	3.5	475			2	520			1	560	1/2	C101	0
BAE 250	250,000	40	4630	710	2	C110	1.5	745	2	C110	0.5	775	2	C33	4	800	2	C33	3.5	830	3	C111	2.5
		45	4115	630	1 1/2	C105	4	670	1 1/2	C105	2.5	700	1 1/2	C105	1.5	735	1/2	C105	0.5	765	2	C33	4
		50	3704	570	1	C16	1.5	610	1	C16	0.5	645			3.5	680			2.5	710	1 1/2	C105	1.5
	200,000	55	3367	520	3/4	C16	2.5	560	3/4	C16	1.5	600	1	C16	0.5	635	1	C16	0	670	1	C109	5
		60	3086	**475**			3.5	520			2.5	560	3/4	C16	1.5	600	3/4	C16	0.5	640			5
		65	2849	440	1/2	C16	4.5	490	1/2	C16	3	530			2	575			1	610	3/4	C16	0.5
		70	2646	405			5	460			4	505	1/2	C16	3	550	1/2	C16	1.5	590	3/4	C16	1
BAE 300	300,000	40	5556	830	3	C111	3	850	3	C111	2.5	875	3	C111	1.5	900	3	C111	1	–	–	–	–
		45	4938	735	2	C110	0.5	765	2	C110	0	790	2	C33	3.5	815			3	840	3	C111	2.5
		50	4444	665	1 1/2	C105	2.5	690	1 1/2	C105	2	720	1 1/2	C105	1	750	2	C110	0.5	775	2	C33	4
	240,000	55	4040	605	1	C16	0.5	635			3.5	665			2.5	695	1 1/2	C105	2	725	1 1/2	C105	1
		60	3704	**555**			1.5	590	1	C16	1	620	1	C16	0	655			3	685			2
		65	3419	510	3/4	C16	2.5	550	3/4	C16	2	585			1	620	1	C16	0	655	1	C109	5
		70	3175	475			3.5	515			2.5	555	3/4	C16	1.5	590	3/4	C16	1	625	1	C16	0
BAE 350	350,000	40	6481	970	5	C116	2.5	995	5	C116	2	1015	5	C116	1.5	1040	5	C116	1	1060	5	C116	0.5
		45	5761	865	3	C116	4.5	890			4	915			3.5	940			3	960			2.5
		50	5185	775	3	C27	2	805	3	C27	1	835	3	C27	0	860	3	C116	4.5	885	3	C116	4
	280,000	55	4714	705	2	C108	3.5	740	2	C108	2.5	770	2	C108	2	795	2	C108	1	825	3	C27	0.5
		60	4321	650	1 1/2	C23	1.5	680	1 1/2	C23	0.5	715	1 1/2	C106	3.5	745			2.5	775	2	C108	2
		65	3989	**600**	1	C23	3.5	635			1.5	670	1 1/2	C23	0.5	700	1 1/2	C106	3.5	730	1 1/2	C106	3
		70	3704	555			5	595	1	C23	3	630	1	C23	2	665	1 1/2	C23	1	695	1 1/2	C23	0
BAE 400	400,000	40	7407	945	5	C116	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		45	6584	840	5	C118	0	865	5	C116	4.5	890	5	C116	4	915	5	C116	3.5	940	5	C116	3
		50	5926	755	3	C118	2.5	785	3	C118	1.5	810	3	C118	1	840	5	C118	0	870			4.5
	320,000	55	5387	685	2	C108	4	720			3	750			2.5	780	3	C118	1.5	810	3	C118	1
		60	4938	**630**			2	665	2	C108	4.5	695	2	C108	4	730			3	765			2
		65	4558	580	1 1/2	C23	3.5	620	1 1/2	C23	2	655	1 1/2	C23	1	690	2	C108	4	725	2	C108	3
		70	4233	540			5	580			3.5	620			2	655	1 1/2	C23	1	695	1 1 /2	C23	0

PERFORMANCE DATA - CONTINUED

Models With or Without Blower Enclosure ① ② ③ ④ ⑤

Data for use with filters only

Model No.	Temp Rise (°F)	Airflow (cfm)	0.5 Static Air Pressure RPM	HP	Drive No.	Sheave Turns Open	0.6 Static Air Pressure RPM	HP	Drive No.	Sheave Turns Open
BAE 50	40	938	–	–	–	–	–	–	–	–
	45	833	940	1/3	C1	3.5	–	–	–	–
	50	750	920			4	–	–	–	–
	55	682	905			4	–	–	–	–
	60	625	895	1/4	C1	4	–	–	–	–
	65	577	890			4	–	–	–	–
	70	536	890			4	–	–	–	–
BAE 75	40	1406	925	1/2	C91	4	985	3/4	C91	3
	45	1250	890			4	955	1/2	C91	3.5
	50	1125	865			4.5	930			3.5
	55	1023	845	1/3	C114	4.5	910			4
	60	938	830			5	895			4
	65	865	820	1/3	C90	0	885			4
	70	804	810			0.5	875	1/3	C114	4.5
BAE 100	40	1875	625	1/2	C96	2	–	–	–	–
	45	1667	610			2	–	–	–	–
	50	1500	595	1/3	C95	2.5	–	–	–	–
	55	1364	585			2.5	–	–	–	–
	60	1250	580	1/4	C95	3	–	–	–	–
	65	1154	570			3	–	–	–	–
	70	1071	570			3	–	–	–	–
BAE 125	40	2315	665	3/4	C38	3	–	–	–	–
	45	2058	640	1/2	C38	3.5	–	–	–	–
	50	1852	625			3.5	–	–	–	–
	55	1684	610			4	–	–	–	–
	60	1543	600	1/3	C37	4	–	–	–	–
	65	1425	590			4	–	–	–	–
	70	1323	585			4.5	–	–	–	–
BAE 145	40	2685	845	1 1/2	C113	2.5	885	1 1/2	C113	1.5
	45	2387	795	1	C38	0.5	835	1	C38	0
	50	2148	760	3/4	C38	1.5	800	3/4	C38	0.5
	55	1953	730			2	775			1
	60	1790	710	1/2	C38	2	755			1.5
	65	1652	690			2.5	740	1/2	C38	1.5
	70	1534	680			2.5	730			2
BAE 175	40	3281	620	1	C107	3.5	–	–	–	–
	45	2917	590	3/4	C107	4.5	–	–	–	–
	50	2625	565			4.5	–	–	–	–
	55	2386	545	3/4	C101	0.5	–	–	–	–
	60	2188	530	1/2	C101	0.5	–	–	–	–
	65	2019	520			1	–	–	–	–
	70	1875	510			1	–	–	–	–
BAE 200	40	3704	665	1 1/2	C105	3	–	–	–	–
	45	3292	625	1	C16	0	–	–	–	–
	50	2693	595			0.5	–	–	–	–
	55	2694	570	3/4	C16	1.5	–	–	–	–
	60	2469	555			1.5	–	–	–	–
	65	2279	540	1/2	C16	2	–	–	–	–
	70	2116	530			2.5	–	–	–	–
BAE 225	40	4219	805	2	C108	1	–	–	–	–
	45	3750	745	1 1/2	C106	2.5	–	–	–	–
	50	3375	700			3.5	–	–	–	–
	55	3068	670	1	C107	3	–	–	–	–
	60	2813	640	3/4	C107	3.5	–	–	–	–
	65	2596	620			3.5	–	–	–	–
	70	2411	600			4	–	–	–	–
BAE 250	40	4630	855	3	C111	2	880	3	C111	1.5
	45	4115	790	2	C33	3.5	820	2	C33	3
	50	3704	740	1 1/2	C105	0.5	770	1 1/2	C100	4
	55	3367	705			1.5	735	1 1/2	C105	0.5
	60	3086	670	1	C109	5	705	1	C109	4.5
	65	2849	645	3/4	C109	5	680			4.5
	70	2646	625	3/4	C16	0	660	3/4	C109	5
BAE 300	40	5556	–	–	–	–	–	–	–	–
	45	4938	865	3	C111	2	890	3	C111	1.5
	50	4444	805	2	C33	3.5	830			2.5
	55	4040	755			4.5	780	2	C33	4
	60	3704	715	1 1/2	C105	1.5	745	1 1/2	C105	0.5
	65	3419	685			2	715			1.5
	70	3175	660	1	C109	5	690			2
BAE 350	40	6481	–	–	–	–	–	–	–	–
	45	5761	985	5	C116	2	1005	5	C116	1.5
	50	5185	910	3	C116	3.5	935			3
	55	4714	850			5	875	3	C116	4
	60	4321	800	2	C108	1	830	2	C108	0.5
	65	3989	760			2	790			1.5
	70	3704	730	1 1/2	C106	3	755	1 1/2	C106	2.5
BAE 400	40	7407	–	–	–	–	–	–	–	–
	45	6584	965	5	C116	2.5	990	5	C116	2
	50	5926	895			4	925			3
	55	5387	840	3	C118	0	870	3	C116	4.5
	60	4938	795			1	825	3	C118	0.5
	65	4558	760	2	C108	2	795			1
	70	4233	730			3	765	2	C108	2

Filters

For blower units with enclosure and filter, add the following static pressures to the static pressure determined by the system designer for total external static pressure.

BAE50	0.1" W.C.
BAE75	0.2" W.C.
BAE100	0.1" W.C.
BAE125	0.1" W.C.
BAE145	0.2" W.C.
BAE175	0.1" W.C.
BAE200	0.1" W.C.
BAE225	0.1" W.C.
BAE250	0.2" W.C.
BAE300	0.2" W.C.
BAE350	0.2" W.C.
BAE400	0.2" W.C.

① Shaded area indicates the unit's standard motor & standard drive arrangement. For operation outside the shaded area, specify motor Hp and drive number.

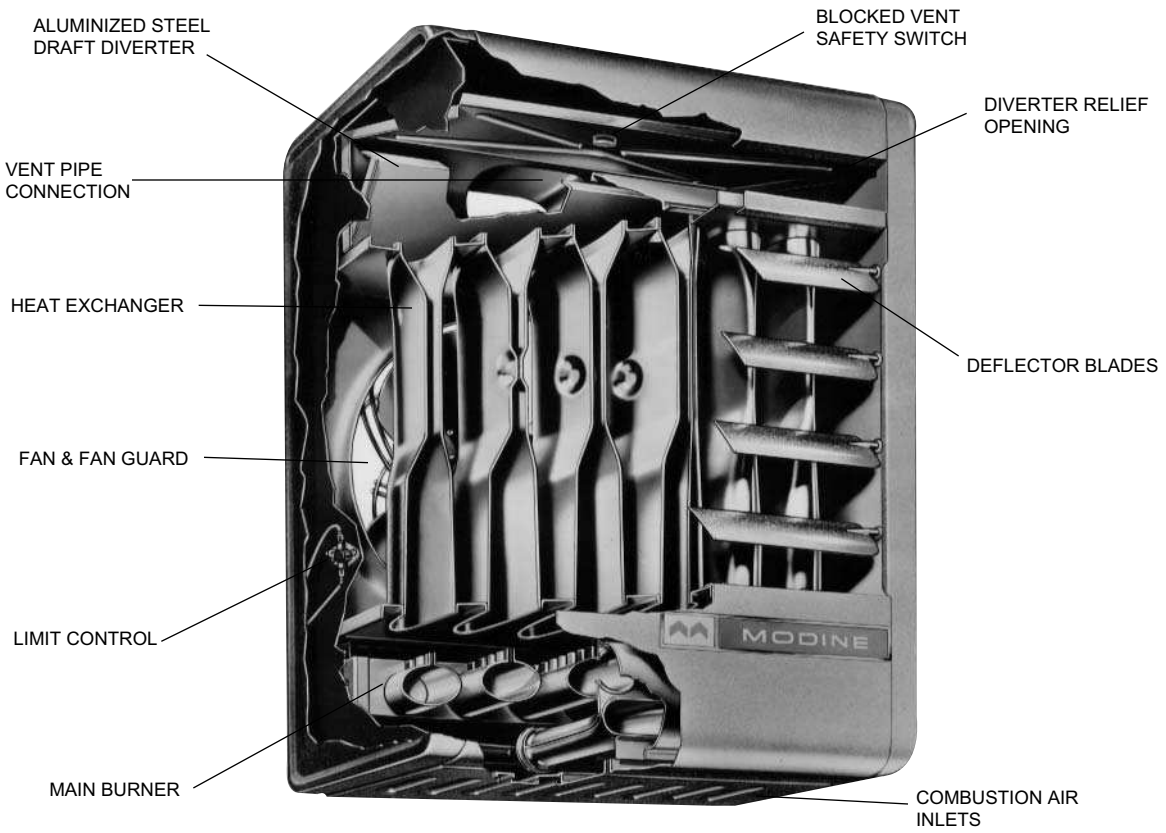
② Outputs shown are for elevations up to 2000'. For elevations over 2000', output needs to be reduced 4% for each 1000' above sea level. (Does not apply in Canada - see rating plate)

③ Sheave turns open are approximate. For proper operation, check blower rpm.

④ Mounting height and throw for BV models (w/o ductwork or nozzles and at Cfm's yielding a 55° temperature rise), are the same as those listed on page 8 for equivalent PV models.

⑤ Rpm setting shown in **bold** type indicate factory settings and standard drives.

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. The contacts open to shut the electric gas valve off in the event the unit should overheat. 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. Make sure deflector blades are open and that there are not any obstructions in the air inlet or discharge outlet.
2. Check actual input to unit against rated input.
3. Check to be sure motor is operating.
4. On propeller units, check that fan is not loose on motor shaft. On blower units, check belt and sheave for tightness or damage.
5. On propeller units, check fan speed against speed on motor nameplate. On blower units check blower speed against Performance Data on pages 18 or 19, check for restriction 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 (BVSS)

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

If the BVSS 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.

In the case of a restricted vent, there may not be enough dilution air to carry away the heat radiating off the heat exchanger top (and surrounding area), the BVSS may exceed the temperature setting and trip.

Spillage will also cause the BVSS to trip. If spillage exceeds five minutes, even though the vent is in compliance with the NFGC, some type of change must be made in the vent system to stop the spillage. These changes (improvements) could be lengthening the vertical vent run, reducing the horizontal vent run, insulating the vent pipe, using a larger diameter vent pipe, or using a less restrictive vent terminal.

If these changes do not stop the spillage or the installer

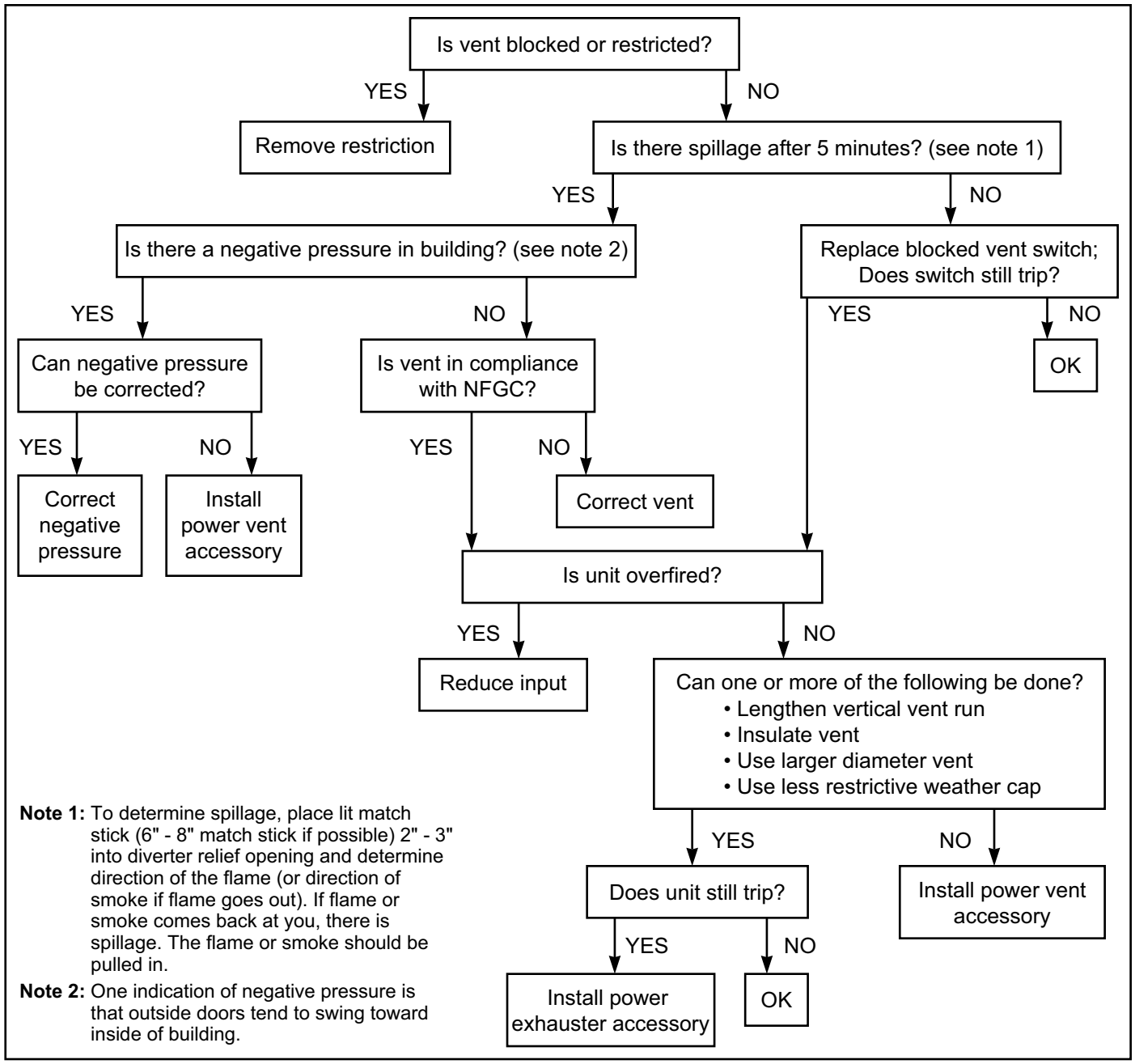
SERVICE INSTRUCTIONS – SAFETY DEVICES

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. The contacts open to shut the electric gas valve off in the event the unit should overheat. 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. Make sure deflector blades are open and that there are not any obstructions in the air inlet or discharge outlet.
2. Check actual input to unit against rated input.
3. Check to be sure motor is operating.
4. On propeller units, check that fan is not loose on motor shaft. On blower units, check belt and sheave for tightness or damage.
5. On propeller units, check fan speed against speed on motor nameplate. On blower units check blower speed against Performance Data on pages 18 or 19, check for restriction 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

Figure 13a
BVSS - Troubleshooting Flow Chart



Note 1: To determine spillage, place lit match stick (6" - 8" match stick if possible) 2" - 3" into diverter relief opening and determine direction of the flame (or direction of smoke if flame goes out). If flame or smoke comes back at you, there is spillage. The flame or smoke should be pulled in.

Note 2: One indication of negative pressure is that outside doors tend to swing toward inside of building.

SERVICE INSTRUCTIONS – GENERAL

ONLY PEOPLE TRAINED AND FAMILIAR WITH THE OPERATION OF UNIT HEATERS AND THEIR CONTROLS SHOULD SERVICE THIS UNIT.

General Maintenance

1. Service air moving components annually.
   a. On propeller units this includes checking motor for lubrication if motor is 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 belt and sheaves 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 abailable, use air hose to blow dirt and other foreign matter from within the burner. Also main burner orifices should be checked 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. Bottom pan.
   f. Fan blade.
3. Check wiring for possible loose connections.
4. Controls – See control instruction sheets furnished separately with the unit heater.

To Remove Main Burner

1. Turn off all electricity and gas to unit.
2. Lower bottom pan to expose burner and manifold. See Figure 1A, Page 2.
3. Disconnect pilot tubing and thermocouple lead (or ignition cable) at the combination gas control (and ignition control.)
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.

Troubleshooting Guide

Figure 14
Manifold Adjustment, Natural Gas

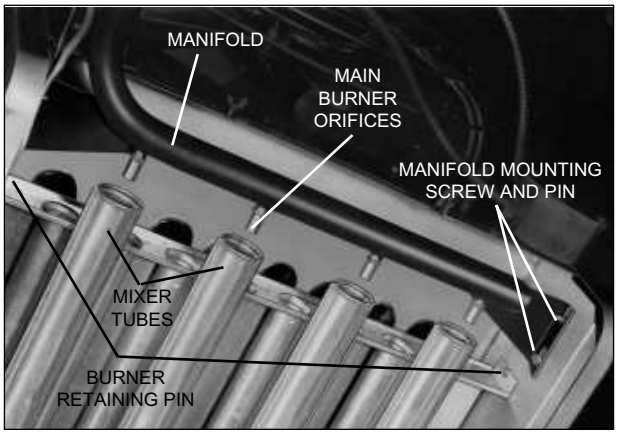
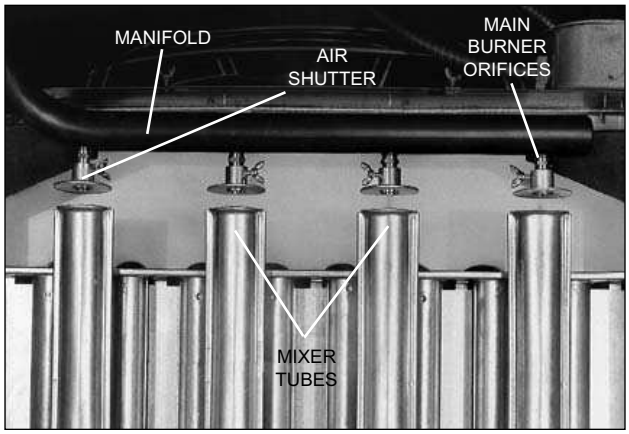


Figure 15
Air Shutter Adjustment, Propane Gas



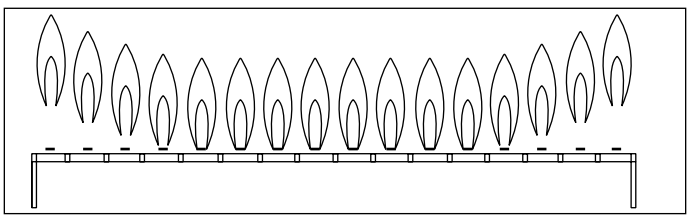
Combustion Problem Symptoms and Diagnosis

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

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.

Figure 18
Lifting Flame Condition



TROUBLESHOOTING GUIDE

2. Yellow Tipping

Yellow tipping of a normally blue flame is caused by insufficient primary air, and indicated 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.

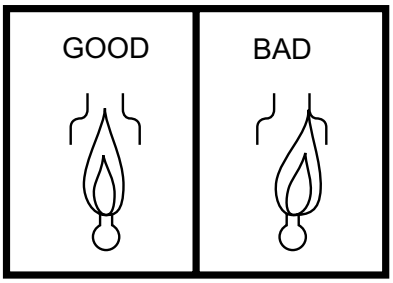
3. Flashback

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.

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 by misalignment of the burner. Draft-blown flames may indicate a cracked heat exchanger.

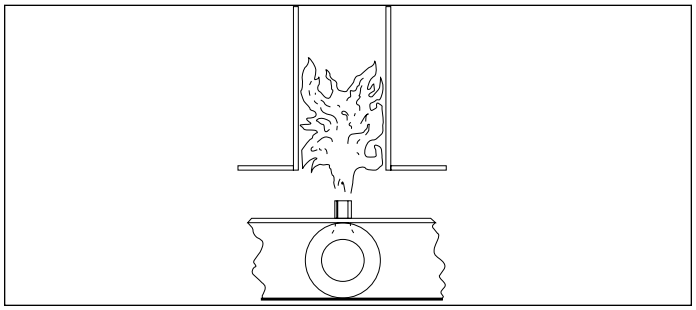
Figure 17
Wavering Flame or Misalignment



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 combustion 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 that may produce soot to block flueways. Make sure combustion air inlets are not blocked.

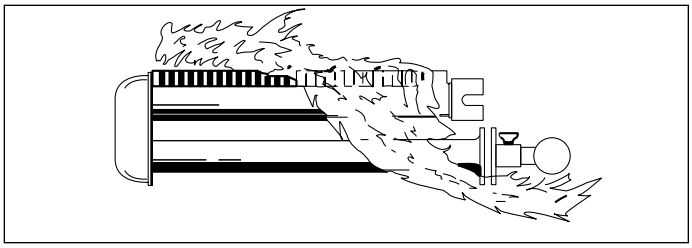
Figure 18
Floating Flame Condition



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 venting, or flue blockage.

Figure 19
Flame Rollout Appearance



Standing Pilot Problem Symptoms and Diagnosis

1. If pilot does not light:

POSSIBLE CAUSES AND REMEDIES
1a. Check that manual gas control (knob or lever) on combination gas control is in the pilot position.
1b. Bleed air from pilot line. (Use special care in bleeding propane units.)
1c. If pilot sputters, check pilot line for condensate or other obstruction.
1d. If pilot flame is feeble or short, check pilot orifice for cleanliness. Replace if necessary. See page 9 for pilot flame adjustment.
1e. Be sure thermocouple contact point is clean. If problem persists, replace thermocouple.
1f. If the above steps do not correct the condition, consult your local qualified installation and service contractor or appropriate utility company.

2. If standing pilot does not stay lit:

POSSIBLE CAUSES AND REMEDIES
2a. Check inlet pressure with all units operating, making certain that there is proper pressure.
2b. Check pipe or tubing size to unit. See Table 1.
2c. Be sure all pilot connections are tight.
2d. Check for excessive drafts.
2e. Check for clogged pilot orifice or pilot line.
2f. Check for leaks around pilot fittings. If leaks cause flame impingement on thermocouple lead, thermocouple may become inoperative.

TROUBLESHOOTING GUIDE

3. Effect of pilot operation on safety controls:

POSSIBLE CAUSES AND REMEDIES
3a. A short pilot flame may cause poor ignition and result in the controls not opening the combination gas control 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.
3b. Check electrical connection from the thermocouple element to the safety valve to assure good electrical contact. Also check location of pilot flame in relation to thermocouple element.

4. If main burners do not light:

POSSIBLE CAUSES AND REMEDIES
4a. Check that manual valve on combination gas control is in ON position.
4b. Be sure pilot is lit, correctly positioned and strong enough to ignite burner ports.
4c. Check wiring (electrical power supply) to combination gas control.
4d. 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.
4e. If the above does not correct the condition, consult your local gas company or local Modine representative.

Intermittent Pilot Problem Symptoms and Diagnosis

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. Check power exhauster pressure switch. Replace if defective.
1b. Dirty or defective flame sensor or loose connections to flame sensor.	1b. Check milli-ampls of sensor. Tighten loose connections. Clean sensor with steel wool. 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 valve 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 adjsut 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 safety switch tripped.	2p. Refer to page 20 for instructions

3. Burner shuts down before thermostat is satisfied.

POSSIBLE CAUSE	POSSIBLE REMEDY
3a. Flame sensing circuit failure.	3a. Check flame sensing rod, sensor ceramic, sensor lead and connections for damage or loss of continuity; Replace defective elements.
3b. Soot on sensing rod.	3b. Clean off soot and adjust pilot to smaller size.
3c. Blockage in heat exchanger.	3c. Clean heat exchanger. Determine cause and correct.
3d. Blockage in main burner orifice.	3d. Clean or replace orifice.

4. Burner fails to shut off after thermostat is satisfied:

POSSIBLE CAUSE	POSSIBLE REMEDY
4a. Faulty thermostat or improper heat anticipator setting.	4a. Check thermostat and anticipator setting. Replace if defective.
4b. Defective ignition controller.	4b. Replace
4c. Defective gas control.	4c. Replace.

If a qualified service person cannot solve the problem, consult your local gas company or Modine representative.

When servicing, repairing or replacing parts on these units always give the complete Model Number (which includes power code and control code) and Serial Number from the unit rating plate.

See page 28 for Model Number and Serial Number Designations.

⚠ CAUTION

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

MOTOR DATA

Power Code Description — Propeller PAE Models ① ② ③ ④

Pwr. Code	Electric Power	PAE 30	PAE 50	PAE 75	PAE 100	PAE 125	PAE 145	PAE 175	PAE 200	PAE 225	PAE 250	PAE 300	PAE 350	PAE 400
		Horsepower												
01	115/60/1	1/40	1/40	1/30	1/30	1/15	1/6	1/6	1/6	1/6	1/3	1/3	3/4	3/4
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	3/4	3/4
04	200/60/3	–	–	–	–	–	1/3	1/3	1/3	1/3	1/3	1/3	3/4	3/4
05	230/460/60/3	–	–	–	–	–	1/3	1/3	1/3	1/3	1/3	1/3	3/4	3/4

Motor Data and Total Unit Power Requirements — Propeller PAE 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	95	0.5	1550	0.6	105	–	–	–	–	–	–	–	–
1/30	2.1	1050	2.3	165	–	–	–	–	–	–	–	–	–	–	–	–
1/15	2.4	1050	2.7	210	1.3	1050	1.5	205	–	–	–	–	–	–	–	–
1/6	2.8	1075	3.1	300	1.6	1075	1.7	265	–	–	–	–	–	–	–	–
1/3	5.4	1075	5.7	510	2.5	1075	2.8	480	1.9	1140	2.3	500	2.1/1.1	1140	2.3/1.2	500
3/4	8.8	1075	9.1	965	4.4	1075	4.6	965	3.7	1140	3.9	750	3.4/1.7	1140	3.9/2.0	1040

Power Code Description — Blower BAE Models ② ③ ④ ⑤

Power Code	Electric Power	BAE 50		BAE 75		BAE 100		BAE 125		BAE 145		BAE 175		BAE 200		BAE 225		BAE 250		BAE 300		BAE 350		BAE 400	
		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	C97	1/3	C36	1/4	C24	1/3	C103	1/2	C101	3/4	C16	1	C16	1	C23	1 1/2	C23
02	230/60/1	1/4	C87	1/4	C88	–	–	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/2	C101	3/4	C16	1	C16	1	C23	1 1/2	C23
03	200/60/3	1/4	C87	1/4	C88	–	–	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/2	C101	3/4	C16	1	C16	1	C23	1 1/2	C23
04	230/460/60/3	1/4	C87	1/4	C88	–	–	1/4	C97	1/3	C36	1/4	C24	1/3	C103	1/2	C101	3/4	C16	1	C16	1	C23	1 1/2	C23
05	115/60/1	1/4	C8	1/4	C12	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/2	C107	3/4	C109	1	C109	1 1/2	C23	–	–
06	230/60/1	1/4	C8	1/4	C12	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/2	C107	3/4	C109	1	C109	1 1/2	C23	–	–
07	200/60/3	1/4	C8	1/4	C12	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/2	C107	3/4	C109	1	C109	1 1/2	C23	–	–
08	230/460/60/3	1/4	C8	1/4	C12	1/4	C94	1/4	C93	1/3	C115	1/4	C102	1/3	C99	1/2	C107	3/4	C109	1	C109	1 1/2	C23	–	–
09	115/60/1	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	1 1/2	C105	1 1/2	C106	–	–
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	1 1/2	C105	1 1/2	C106	–	–
11	200/60/3	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	1 1/2	C105	1 1/2	C106	2	C108
12	230/460/60/3	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	1 1/2	C105	1 1/2	C106	2	C108
13	115/60/1	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/2	C38	1/3	C24	1/2	C16	3/4	C107	1	C109	1 1/2	C100	–	–	–	–
14	230/60/1	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/2	C38	1/3	C24	1/2	C16	3/4	C107	1	C109	1 1/2	C100	–	–	–	–
15	200/60/3	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/2	C38	1/3	C24	1/2	C16	3/4	C107	1	C109	1 1/2	C100	–	–	3	C116
16	230/460/60/3	1/3	C1	1/3	C90	1/3	C95	1/3	C36	1/2	C38	1/3	C24	1/2	C16	3/4	C107	1	C109	1 1/2	C100	–	–	3	C116
17	115/60/1	–	–	1/3	C114	1/2	C96	1/3	C37	3/4	C38	1/2	C101	3/4	C16	1	C107	1 1/2	C105	–	–	–	–	–	–
18	230/60/1	–	–	1/3	C114	1/2	C96	1/3	C37	3/4	C38	1/2	C101	3/4	C16	1	C107	1 1/2	C105	–	–	–	–	–	–
19	200/60/3	–	–	1/3	C114	1/2	C96	1/3	C37	3/4	C38	1/2	C101	3/4	C16	1	C107	1 1/2	C105	2	C110	2	C108	3	C118
20	230/460/60/3	–	–	1/3	C114	1/2	C96	1/3	C37	3/4	C38	1/2	C101	3/4	C16	1	C107	1 1/2	C105	2	C110	2	C108	3	C118
21	115/60/1	–	–	1/2	C91	–	–	1/2	C98	1	C38	3/4	C101	1	C16	1 1/2	C106	1 1/2	C100	–	–	–	–	–	–
22	230/60/1	–	–	1/2	C91	–	–	1/2	C98	1	C38	3/4	C101	1	C16	1 1/2	C106	1 1/2	C100	–	–	–	–	–	–
23	200/60/3	–	–	1/2	C91	–	–	1/2	C98	1	C38	3/4	C101	1	C16	1 1/2	C106	1 1/2	C100	2	C33	3	C27	5	C118
24	230/460/60/3	–	–	1/2	C91	–	–	1/2	C98	1	C38	3/4	C101	1	C16	1 1/2	C106	1 1/2	C100	2	C33	3	C27	5	C118
25	115/60/1	–	–	1/2	C92	–	–	1/2	C38	1 1/2	C113	3/4	C107	1 1/2	C105	–	–	–	–	–	–	–	–	–	–
26	230/60/1	–	–	1/2	C92	–	–	1/2	C38	1 1/2	C113	3/4	C107	1 1/2	C105	–	–	–	–	–	–	–	–	–	–
27	200/60/3	–	–	1/2	C92	–	–	1/2	C38	1 1/2	C113	3/4	C107	1 1/2	C105	2	C108	2	C110	3	C111	3	C116	5	C116
28	230/460/60/3	–	–	1/2	C92	–	–	1/2	C38	1 1/2	C113	3/4	C107	1 1/2	C105	2	C108	2	C110	3	C111	3	C116	5	C116
29	115/60/1	–	–	3/4	C91	–	–	3/4	C38	1/4	C36	1	C107	1/4	C103	1/4	C102	–	–	–	–	–	–	–	–
30	230/60/1	–	–	3/4	C91	–	–	3/4	C38	1/4	C36	1	C107	1/4	C103	1/4	C102	–	–	–	–	–	–	–	–
31	200/60/3	–	–	3/4	C91	–	–	3/4	C38	1/4	C36	1	C107	1/4	C103	1/4	C102	2	C33	–	–	5	C116	–	–
32	230/460/60/3	–	–	3/4	C91	–	–	3/4	C38	1/4	C36	1	C107	1/4	C103	1/4	C102	2	C33	–	–	5	C116	–	–
33	115/60/1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/3	C102	–	–	3/4	C16	–	–	–	–
34	230/60/1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/3	C102	–	–	3/4	C16	–	–	–	–
35	200/60/3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/3	C102	3	C111	3/4	C16	–	–	–	–
36	230/460/60/3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/3	C102	3	C111	3/4	C16	–	–	–	–
37	115/60/1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/2	C16	–	–	–	–	–	–
38	230/60/1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/2	C16	–	–	–	–	–	–
39	200/60/3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/2	C16	–	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1/2	C16	–	–	–	–	–	–

① Shaded pole motors on models PAE 30 through PAE 125 – permanent split capacitor motors on models PAE 145 through PAE 400.

② Whenever 230V/1ϕ or 230V/3ϕ power is used, it is necessary to specify 230V/25V controls. Whenever 460/3ϕ power is used, it is necessary to specify 230V/24V controls and in addition, a 460V/230V 75VA step-down transformer (by others) is required (if the power exhauster accessory is used, the step-down transformer by others needs to be 250VA). On 230V/3ϕ or 460V/3ϕ systems, the motor starter coil voltage (motor starter by others) must be 230V. For 200V/3ϕ system, the motor starter coil voltage (motor starter by others) must be 200V.

③ BAE models – split phase motors 1/4-3/4 hp, capacitor start type motors 1-5 hp. 1/4-5 hp motors – 1725 rpm.

④ Units with 460V/3ϕ power supply are not listed by C.G.A.

⑤ All motors used 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 and all single phase motors have built-in thermal overload protection.

MOTOR DATA

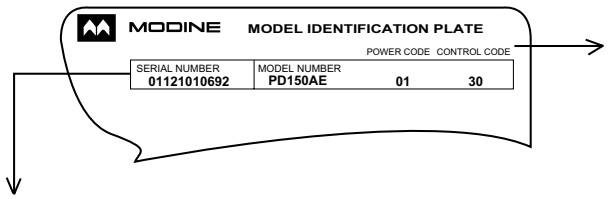
Motor Data and Total Unit Power Requirements – Blower BAE Models

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	5.0	1725	5.3	410	2.5	1725	2.7	410	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	15.0	1725	15.3	1490	7.5	1725	7.7	1490	5.6	1725	5.8	1500	5.2/2.6	1725	5.4/2.7	1500
2	–	–	–	–	–	–	–	–	6.8	1725	7.1	1950	6.6/3.3	1725	6.8/3.4	1950
3	–	–	–	–	–	–	–	–	10.6	1725	10.8	3300	8.8/4.4	1725	9.0/4.5	3300
5	–	–	–	–	–	–	–	–	14.3	1725	14.5	4400	13.2/6.6	1725	13.4/6.7	4400

Blower Drive Numbers

Drive No.	Blower Sheave			Motor Sheave		Drive No.	Blower Sheave			Motor Sheave	
	Belt No. Browning	Pitch Dia.	Bore	Max. Pitch Dia.	Bore		Belt No. Browning	Pitch Dia.	Bore	Max. Pitch Dia.	Bore
C1	A29	4	3/4	2.9	1/2	C99	A47	8	1	2.9	1/2
C5	A32	6	3/4	2.9	1/2	C100	A50	8	1	4.4	5/8
C16	A48	8	1	2.9	5/8	C101	A50	9	1	2.9	5/8
C24	A56	13	1	2.9	1/2	C102	A49	9	1	2.9	1/2
C27	A54	9	1	4.4	1 1/8	C103	A54	12	1	2.9	1/2
C33	A50	8	1	4.4	7/8	C104	A55	12	1	2.9	5/8
C36	A45	9	3/4	2.9	1/2	C105	A54	10	1	4.4	5/8
C37	A40	6	3/4	2.9	1/2	C106	A52	9	1	4.4	5/8
C38	A41	6	3/4	2.9	5/8	C107	A45	6	1	2.9	5/8
C87	A38	9	3/4	2.9	1/2	C108	A52	9	1	4.4	7/8
C88	A42	10	3/4	2.9	1/2	C109	A43	5	1	2.9	5/8
C89	A52	15	3/4	2.9	1/2	C110	A55	10	1	4.4	7/8
C90	A35	6	3/4	2.9	1/2	C111	A52	8	1	4.4	1 1/8
C91	A33	4	3/4	2.9	5/8	C112	A55	10	1	4.4	1 1/8
C92	A36	6	3/4	2.9	5/8	C113	A42	8	3/4	4.4	5/8
C93	A57	15	3/4	2.9	1/2	C114	A32	4	3/4	2.9	1/2
C94	A47	10	3/4	2.9	1/2	C115	A41	6	3/4	2.9	1/2
C95	A42	7	3/4	2.9	1/2	C116	A50	7	1	4.4	1 1/8
C96	A43	7	3/4	2.9	5/8	C117	A55	11	1	4.4	1 1/8
C97	A53	13	3/4	2.9	1/2	C118	A52	9	1	4.4	1 1/8
C98	A46	9	3/4	2.9	5/8	C119	A56	11	1	4.4	1 1/8

RATING PLATE IDENTIFICATION



Serial Number Designations

01 12 101 10 95

MOTOR VENDOR CODE
01 - Century
05 - Universal
etc.

FAN OR BLOWER VENDOR CODE
01 - Revcor
08 - Brookside
etc.

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

WEEK OF MANUFACTURE
10 - 10th week of 1995
25 - 25th week of 1995
etc.

YEAR OF MANUFACTURE
91 - 1991
92 - 1992
etc.

Model Number Designations

PAE 145 A G 01 08

PAE - Propeller Unit
BAE - Blower Unit

Input
145 - 145,000 Btu/hr input
175 - 175,000 Btu/hr input
250 - 250,000 Btu/hr input
etc.

Heat Exchanger
A - Aluminized
S - Stainless Steel

Ignition Type
C – Standing Pilot
G – Intermittent Pilot
K – Intermittent Pilot

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

Control Code Type
08 - 115v/25v intermittent pilot ignition, non-100% shut-off, natural gas
09 - 230v/25v intermittent pilot ignition, non-100% shut-off, natural gas
etc.

CONTROL OPTIONS

Propeller and Blower Unit Heaters – PAE and BAE Models ①②③

Control System Description	Control Code No.	Service Voltage	Thermostat Voltage	Type of Gas
Single-Stage, Standing Pilot, 100% Shut-Off – Utilizes a single-stage combination gas control and thermocouple. Pilot needs to be manually lit initially and stays lit.	11 12 81 82	115V 200/230V 115V 200/230V	24V 24V 24V 24V	natural natural propane propane
Two-Stage, Standing Pilot, 100% Shut-Off – Utilizes a two-stage gas control (which fires at 50% or 100% of full rated input) and thermocouple. Pilot needs to be manually lit initially and stays lit. Available on PAE/BAE models only.	25 26 83 84	115V 200/230V 115V 200/230V	24V 24V 24V 24V	natural natural propane propane
Single-Stage, Intermittent Pilot Ignition, 100% Shut-Off with Continuous Retry – Utilizes a single-stage combination gas control and an ignition control (continuous retry). Pilot is automatically lit on call for heat.	30 31 85 86	115V 200/230V 115V 200/230V	24V 24V 24V 24V	natural natural propane propane
Mechanical Modulation with Automatic Pilot Ignition, 100% Shut-Off with Continuous Retry – Utilizes a modulating combination gas control and an ignition control (continuous retry). Pilot is automatically lit whenever there is power to the unit. Modulation range is between 50% and 100% fire; gas control shuts off below 50% fire. Available on BAE models only.	59 60 89 90	115V 200/230V 115V 200/230V	24V 24V 24V 24V	natural natural propane propane
Two-Stage, Intermittent Pilot Ignition, 100% Shut-Off with Continuous Retry – Utilizes a two-stage combination gas control (which fires at 50% or 100% of full rated input) and an ignition control (continuous retry). Pilot is automatically lit only on call for heat. Available on PAE/BAE models only.	63 64 87 88	115V 200/230V 115V 200/230V	24V 24V 24V 24V	natural natural propane propane

① Models BAE 50 thru 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 hp motors or 14 amps @ 115V A.C. Contact factory for applications with units having motors with horsepower ratings above 1 hp or 14 amps @ 115V A.C.

③ 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/75VA step-down transformer (by others) is required (if the power exhauster accessory is used, the step-down transformer by others needs to be 250VA). On 230V or 460V/3ϕ systems, the motor starter coil voltage (motor starter by others) must be 230V. For 200V/3ϕ systems, the motor starter coil voltage (motor starter by others) must be 200V.

Control Operating Sequence

For Standing Pilot (with Pilot Lit)

Upon a call for heat from thermostat, power is supplied to the combination gas control and at the same time power is supplied to the fan timer. The main burner should light immediately. The fan motor will start in 15 to 45 seconds.

When the thermostat has been satisfied, power is turned off to the combination gas control and fan timer. The main burner will go out but the pilot will continue to burn. The fan motor will continue to operate for 45 to 75 seconds to allow the heat exchanger to cool down.

For Intermittent Pilot

Upon a call for heat from the thermostat, power is supplied to the ignition control and at the same time power is supplied to the fan timer. Sparking will start at the pilot immediately and at the same time the first operator of the combination gas control opens to allow gas to flow to the pilot burner. The pilot flame should light and be sensed (proven) in a few seconds. As soon as the pilot flame is sensed the sparking will stop and the second operator of the combination gas control will open allowing gas to flow to the main burner. In 15 to 45 seconds from the time the thermostat called for heat the fan motor will start.

On systems utilizing control codes 08 and 09, the ignition control will attempt to light the pilot once the system is turned on. If the pilot is not sensed for any reason, the spark will continue indefinitely until the pilot flame is sensed or until power is interrupted to the system.

On systems utilizing control codes 30, 31, 85 or 86 the sequence is similar, except that the system will attempt to light the pilot for 70 seconds once there is a demand for heat. If the pilot is not sensed for any reason, the ignition control will wait for a predetermined time with the combination gas control closed and no spark. After the predetermined time lapses, the cycle will begin again. The time that lapses between cycles is at pre-programmed intervals (approximately 6 minutes). This will continue indefinitely until the pilot flame is sensed or until power is interrupted to the system.

When the thermostat has been satisfied, power is turned off to the ignition control and the combination gas control, so both the main gas and pilot gas are turned off. The fan will continue to operate for 45 to 75 seconds to allow the heat exchanger to cool down.

Two-Stage Control Systems

The thermostat will start the unit with the combination gas control in the first stage (50% of normal input). If the thermostat senses a further drop in temperature the second stage (100% of normal input) of the combination gas control will be energized. When the thermostat senses an increase in temperature the combination gas control will be returned to the first stage operation.

Mechanical Modulation Systems

When power is turned on the pilot is automatically lit. When the sensing bulb attached to the combination gas control senses a drop in temperature the valve will open at 50% of normal input. If the temperature drops further the valve will open further. As the temperature rises the valve will return to 50% of normal input. If the temperature rises further the valve will close.

Service Checklist

Date Intalled		Serviced by &				
Serial No.		Date Serviced				
Model No.		Serviced by &				
Power Code		Date Serviced				
Control Code						

For local parts and service assistance, contact one of the following:

Sales Representatives

ALABAMA
Watts Engr. Sales
Birmingham, AL
(205) 871-4673

ALASKA
Proctor Sales, Inc.
Anchorage, AK
(907) 562-2608

ARIZONA
Climatec, Inc.
Phoenix, AZ
(602) 944-3330

ARKANSAS
John Lynn Co., Inc.
North Little Rock, AR
(501) 771-4343

CALIFORNIA
A/C Specialties
LaHabra, CA 90631
(714) 738-7711

Envir. Indus. Prod.
Mountain View, CA
(415) 964-6161

COLORADO
McCoy Sales Corp.
Englewood, CO
(303) 762-8012

CONNECTICUT
E.W. Leonard, Inc.
Moodus, CT
(203) 873-8691

DISTRICT OF COLUMBIA
Marva Sales, Inc.
Leesburg, VA
(540) 338-2009

FLORIDA
T.H. Brooks
Apopka, FL
(407) 886-8405

T.H. Brooks
Tampa, FL
(813) 622-7000

Aeromechanical, Inc.
Gulf Breeze, FL
(904) 932-2011

Power/Conditioning,
Tampa, FL
(813) 622-7000

GEORGIA
Herring Company, Inc.
Norcross, GA
(770) 416-0044

IDAHO
A.A. Maycock
Salt Lake City, UT
(801) 364-1926

ILLINOIS
John A. Sandberg Co.
East Moline, IL
(309) 796-2371

Fleming Hanson Sales
Downers Grove, IL
(708) 829-4060

Burden-Cooper, Inc.
Rockford, IL
(815) 633-6555

INDIANA
Jay Kress Assoc.
Indianapolis, IN
(317) 251-2498

Hydronic & Steam
South Bend, IN
(219) 234-6005

IOWA
Enquip/Peterson
Des Moines, IA
(515) 266-0844

KANSAS
Jorban Riscoe Assoc.
Kansas City, KS
(913) 722-1244

Jorban Riscoe Assoc.
Wichita, KS
(316) 687-3277

KENTUCKY
Climate Conditioning
Louisville, KY
(502) 267-4696

LOUISIANA
Schully Strawn
Metairie, LA
(504) 831-0000

Reed Mechanical
Shreveport, LA
(318) 865-3515

MAINE
Emerson-Swan, Inc.
Randolph, MA
(617) 986-2000

MARYLAND
Marva Sales, Inc.
Baltimore, MD 21217
(410) 945-0171

MASSACHUSETTS
Emerson-Swan, Inc.
Randolph, MA
(617) 986-2000

MICHIGAN
Raley Brothers
Grand Rapids, MI
(616) 742-0150

Air One Co.
Oak Park, MI
(810) 398-8700

Witheridge Co.
Saginaw, MI
(517) 792-2598

MINNESOTA
Walters-Climate, Inc.
Minneapolis, MN
(612) 544-8626

MISSISSIPPI
Ward Mechanical
Jackson, MS
(601) 956-3002

MISSOURI
Evans, Maille
St. Louis, MO
(314) 822-1023

MONTANA
John Klaboe
Butte, MT
(406) 782-6366

NEBRASKA
B.G. Peterson Co.
Omaha, NE
(402) 344-4311

NEVADA
John A. Sandberg Co.
Las Vegas, NV
(702) 367-1657

NEW HAMPSHIRE
Emerson-Swan, Inc.
Randolph, MA
(617) 986-2000

NEW JERSEY
C.R. Hutcheon, Inc.
Bloomfield, NJ
(201) 743-9770

NEW MEXICO
The Socha Company
Albuquerque, NM
(505) 839-0103

NEW YORK
Emerson-Swan, Inc.
East Greenbush, NY
(518) 477-2693

Edward H. Cox & Co.
Hamburg, NY
(716) 648-6321

R.P. Fedder Corp.
Rochester, NY
(716) 288-1600

Wales-Darby, Inc.
Ronkonkoma, NY
(516) 585-6800

Fedder Associates
Syracuse, NY
(315) 437-8451

NORTH CAROLINA
L.R. Gorrell Co.
Asheville, NC
(704) 253-1856

L.R. Gorrell Co.
Charlotte, NC
(704) 333-8436

L.R. Gorrell Co.
Greensboro, NC
(919)373-1281

L.R. Gorrell Co.
Raleigh, NC
(910) 821-1161

NORTH DAKOTA
Walters-Climate, Inc.
Minneapolis, MN
(612) 544-8626

OHIO
R.G. Anderson Co.,
Cincinnati, OH
(513) 527-2300

Mussun Sales, Inc.
Cleveland, OH
(216) 431-5088

Mussun Sales, Inc.
Columbus, OH
(614) 294-4822

Stoermer Equipment
Dayton, OH
(513) 275-5007

Toledo Thermal
Toledo, OH
(419) 475-7100

OKLAHOMA
A.M.E., Inc.
Oklahoma City, OK
(405) 843-9788

OREGON
Proctor Sales, Inc.
Portland, OR
(503) 639-1557

PENNSYLVANIA
H & H Associates
Mechanicsburg, PA
(717) 761-4370

B.J. Terroni
Bensalem, PA
(215) 639-3600

Charles W. Stanger
Allison Park, PA
(412) 492-9220

Hase, Inc.
Schuylkill Haven, PA
(717) 385-3682

RHODE ISLAND
Emerson-Swan, Inc.
Randolph, MA
(617) 986-2000

SOUTH CAROLINA
L.R. Gorrell Co.
Greenville, SC
(864) 297-7810

L.R. Gorrell Co.
Charleston, SC 29418
(803) 824-9449

SOUTH DAKOTA
Walters-Climate, Inc.
Minneapolis, MN
(612) 544-8626

TENNESSEE
Mech. & Indus. Sales
Gallaway, TN
(901) 867-0435

Charles F. Sexton Co.
Knoxville, TN
(423) 588-9691

Aircon Sales Agency
Nashville, TN
(615) 327-4640

TEXAS
SWK. Inc.
Dallas, TX
(214) 351-9985

Barnhart-Taylor
El Paso, TX
(915) 533-1231

Paschal-Harper, Inc.
Lubbock, TX
(210) 494-7593

Paschal-Harper, Inc.
San Antonio, TX
(210) 224-1661

UTAH
A.A. Maycock Co.
Salt Lake City, UT
(801) 364-1926

VERMONT
E.W. Leonard, Inc.
Moodus, CT
(203) 873-8691

VIRGINIA
L.A. Prillaman Co.
Richmond, VA
(804) 798-1455

WASHINGTON
Proctor Sales, Inc.
Lynnwood, WA
(800) 562-1321

Suntoya PSI
Spokane, WA
(509) 534-1516

WEST VIRGINIA
H.P. Heating Co., Inc.
Charleston, WV
(304) 345-9916

WISCONSIN
C & S Hydronics, Inc.
Delafield, WI
(414) 646-6325

WYOMING
John Klaboe
Butte, MT
(406) 782-6366

McCoy Sales Corp.
Englewood, CO
(303) 762-8012

A.A. Maycock Co.
Salt Lake City, UT
(801) 364-1926

Canadian Sales Outlets

ALBERTA
Kehoe Equipment Co.
Edmonton, Alberta
(403) 420-0040

Summit Engineering Sales
Calgary, Alberta
(403) 250-9780

BRITISH COLUMBIA
Dierks Equipment Sales
Vancouver, BC
(604) 872-7891

MANITOBA
H.F. Clarke, Ltd.
Winnipeg, Manitoba
(204) 694-8637

NOVA SCOTIA
MacLeod and Grant, Ltd.
Stellarton, NS
(902) 752-5532

ONTARIO
Michael Stuart Company, Ltd.
Concord, Ontario
(905) 738-6008

G.P. McEachern, Ltd.
Thunder Bay, Ontario
(807) 623-4951

QUEBEC
G. Mitchell Heating & A/C
St. Laurent, Quebec
(514) 332-8929

SASKATCHEWAN
Cypress Sales
Regina, Saskatchewan
(306) 757-5656

Cypress Sales
Saskatoon, Saskatchewan
(306) 242-3333

Parts Wholesalers

CONNECTICUT
E.W. Leonard, Inc.
Moodus, CT
(203) 873-8691

COLORADO
McCoy Sales Corp.
Englewood, CO
(303) 762-8012

GEORGIA
Herring Company, Inc.
Norcross, GA
(404) 416-0044

ILLINOIS
Heinlein Supply.
Chicago, IL
(312) 774-8616

MARYLAND
Marva Sales
Baltimore, MD
(410) 945-0171

MASSACHUSETTS
Emerson-Swan, Inc.
Randolph, MA
(617) 986-2000

MICHIGAN
Air One Company
Oak Park, MI
(313) 398-8700

Raley Brothers
Grand Rapids, MI
(616) 452-6043

MINNESOTA
Walters Climate, Inc.
Minneapolis, MN
(612) 544-8626

NEVADA
Best Supply, Inc.
Las Vegas, NV
(702) 474-4475

NEW JERSEY
C.R. Hutcheon, Inc.
Bloomfield, NJ
(201) 743-9770

NEW YORK
ABCO Supply
Hicksville, NY
(516) 938-8400

H.C. Oswald
New York, NY
(212) 722-7000

OHIO
Wolff Bros. Sply, Inc.
Medina, OH
(216) 725-3451

Toledo Thermal Equip. Co.
Toledo, OH
(419) 475-7100

PENNSYLVANIA
B.J. Terroni Co., Inc.
Bensalem, PA
(215) 639-3600

Myers Distributing Co., Inc.
Duquesne, PA
(412) 469-1010

TENNESSEE
A. T. Distributors
Memphis, TN
(901) 278-7211

TEXAS
K. Sales, Inc.
Dallas, TX
(214) 484-8885

UTAH
A.A. Maycock Company
Salt Lake City, UT
(801) 364-1926

VIRGINIA
L.A. Prillaman Co., Inc.
Ashland, VA
(804) 798-1455

WASHINGTON
Proctor Sales, Inc.
Lynnwood, WA
(206) 774-1441

WASHINGTON, DC
Marva Sales
Lovettsville, VA
(540) 882-3640

WISCONSIN
C & S Hydronics, Inc.
Delafield, WI
(414) 646-6325

For service contact your local qualified installation and service contractor or appropriate utility company.

MODINE

Heating Division
Modine Manufacturing Company
1221 Magnolia Avenue
Buena Vista, VA 24416
Telephone: 540-261-2166
Fax: 540-261-1563

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