MODINE

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INSTALLATION AND SERVICE MANUAL
gas-fired duct furnaces
model DJE

DESIGN AMERICAN GAS ASSOCIATION CERTIFIED

CANADIAN GAS ASSOCIATION APPROVED

⚠ WARNING

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

FOR YOUR SAFETY

If you smell gas:

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

FOR YOUR SAFETY

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

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

All models approved for use in California by the CEC when equipped with intermittent pilot ignition, in New York by the MEA division, Massachusetts and for use in Minneapolis.

Contents

This manual is the property of the owner. please be sure to leave it with the owner when you leave the job. Duct furnace is certified for non-residential application.

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 meet available electric power at the point of installation.
3. Inspect unit received for conformance with description of product ordered (including specifications where applicable).

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

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 duct furnace.
3. Gas pressure to duct furnace controls must never exceed 14" W.C.

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

   The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply system at test pressures equal to or less than 1/2 psi.
4. Check gas supply pressure at unit upstream from pressure regulator. For the purpose of adjustment, the supply pressure should be 6"-7" W.C. on natural gas or 11"-14" W.C. on propane gas. Supply pressure with any gas may never exceed 14" W.C.; if so, install an additional special pressure regulator upstream of the combination gas valve to provide 11"-14" W.C. gas supply pressure for propane units and 6"-7" W.C. supply pressure for natural gas units. Purging of gas piping should be performed as described in ANSI Z223.1 – Latest Edition or in Canada in CAN/CGA-B149 codes. See page 6 for proper venting instructions.
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 duct furnace 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. Duct furnace must be installed on the positive pressure side of the air-circulating blower.
9. To prevent premature heat exchanger failure **do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.**
10. To prevent burned-out heat exchanger, or definitely shorter equipment life, provide uniform and sufficient air distribution over heat exchanger.
11. Avoid installing units in extremely drafty locations. Drafts can cause burner flames to impinge on heat exchangers which shortens life.
12. 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.
13. Do not install unit outdoors.
14. Do not locate unit closer to combustible materials than 6 inches.
15. The maximum allowable temperature rise through any Modine duct furnace is 85°F (DJE300 and 350 have a 100°F maximum). The maximum allowable final air temperature is 150°F. Do not exceed either of these temperature limits.
16. Allow at least 6" clearance at the sides and rear to provide ample air for combustion.
17. Duct furnace is designed for installation on non-combustible floors with a minimum of 6" clearance from sides, bottom, top and flue to combustible materials.
18. The minimum distance from combustible material is based on the combustible material surface not exceeding 160°F. Clearance from the top of the unit may be required to be greater than 6" if heat damage, other than fire, may occur to materials above the duct furnace at the temperature described.
19. Modine duct furnaces 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.
20. 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 property may shorten the life of the duct furnace.
21. Do not lift duct furnace by gas controls, or gas manifold.
22. Be sure no obstructions block draft diverter of duct furnace.
23. Do not enclose draft diverter in duct.
24. Provide room at either right hand or left hand side of unit for burner removal. Clearance must equal width of unit. See page 17 for dimensions.
25. Gas-fired heating equipment which has been improperly vented, or which experiences a blocked vent condition may have flue gases accidentally spilled into the heated space. See page 18 for specific information about the blocked vent safety switch supplied on the unit.
26. When a fan switch is installed with the furnace, it must be adjusted to start the blower motor within 30 seconds after burner ignition. This fan switch should be electrically timed rather than thermally controlled.
27. 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.
28. 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 No. 88A and the Standard for Repair Garages NFPA No. 88B. In Canada, installation of duct furnaces 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.
29. Consult piping, electrical, and venting instructions in this manual before final installation.
30. When the duct furnace is installed downstream from refrigeration systems, condensate may form and provisions should be made to dispose of the condensate. To prevent condensation on the furnace casing, duct furnaces installed downstream of cooling coils may require insulation on outer surfaces if the duct furnace is installed in an unconditioned space. Insulation must be installed according to, and meet the requirements of, NFPA No. 90A - Latest Edition.
31. 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.
32. 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 owner's risk.

INSTALLATION

In the U.S., the installation of these units must comply with the "National 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-B142.2, "Installation Code for Propane Burning Appliances and Equipment".

1. All installation and service of these units must be performed by a qualified installation and service agency only as defined in ANSI Z223.1, latest edition or in Canada by a licensed gas fitter.
2. This unit is certified by A.G.A. and C.G.A., with the controls furnished. For replacement parts, submit the complete model and serial numbers shown on rating plate on the unit. Modine reserves the right to substitute other authorized controls as replacements.
3. In applications where high humidity and condensation can be expected, or anticipated, it is recommended that stainless steel heat exchangers, burners and condensate drip pans are specified. Such applications can include make-up air systems where entering air temperatures to the heating equipment can be expected to be below 40°F or applications where duct furnaces are used downstream of air-conditioning coils. In these applications stainless steel will often provide longer furnace life than aluminized steel.
4. Information on controls is supplied separately.
5. Modine duct furnaces use the same burner for natural and propane gases.

Locating Furnace

⚠ CAUTION

Units must not be installed in potentially explosive, flammable or corrosive atmosphere. Units must be installed such that the gas ignition control system is not directly exposed to water spray, rain or dripping water.

1. Do not locate any gas-fired duct furnace in areas where chlorinated or acid vapors are present in the atmosphere.
2. When locating the furnace, consider general space and heating requirements, availability of gas and proximity to vent locations.
3. Avoid installation in drafty locations. Drafts cause burner flames to impinge on heat exchangers which will shorten their life.
4. Duct furnace is designed for installation on non-combustible floors. Allow at least a 6" clearance from anything combustible. Furnace wall insulation is recommended for any close clearances. Provide ample space for operation of draft diverter.
5. Provide clearance on sides of furnace to permit withdrawing burner for service.
6. Duct furnace must be installed on the positive pressure side of the air-circulating blower.
7. Units installed downstream of cooling systems may experience condensation, therefore, provisions should be made for disposal of condensate. Means have been provided in the bottom pan of the unit to accommodate a condensate drain line connection flange.
8. Modine duct furnaces 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.

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.

Furnace Suspension

⚠ CAUTION

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

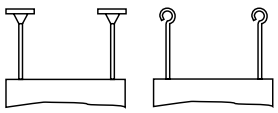
Furnace wall insulation is recommended for any close clearances. Do not enclose draft diverter in duct.

Provide uniform and sufficient air flow over heat exchanger. Provide clearance on sides of furnace to permit withdrawing burner for service.

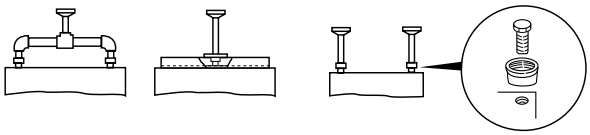
Be sure the means of suspension is adequate to support the weight of the unit. For proper operation, the unit must be installed in a level horizontal position. Clearances to combustibles as specified above must be strictly maintained.

1. Four 1/2" - 13NC tapped holes in top of furnace are provided to accept ceiling hangers. To assure that flames are directed into the center of the heat exchanger tubes, the furnace must be supported in a vertical position. Use a spirit level to ensure that unit is suspended correctly.
2. NOTE: A pipe hanger adapter kit, shown in Figure 1, is available as an accessory from Modine. One kit consists of two dripped 3/4" IPS pipe caps and two 1/2 - 13 x 1-3/4" cap-screws to facilitate threaded pipe suspension. Two kits are required for mounting all duct furnace models.

Figure 1 - Suspension Methods



(Threaded Rod Suspension)



(Suspension with Pipe Adaptor Kit)

Air Flow Section

⚠ CAUTION

Air distribution baffle shipped with duct furnace, if required, must always be on the air inlet side of the duct furnace. The sensing bulb of the limit control (overheat switch) must always be on the discharge air side of the duct furnace.

An air distribution baffle is provided on all Modine duct furnaces. This baffle must be in place if the air temperature rise through the duct furnace is 55°F or greater. When the air baffle is required it must always be on the air inlet side of the duct furnace. (See Figures 2 and 3.)

A limit control (overheat switch) is also provided on all Modine duct furnaces. The sensing bulb of the limit control must always be in place and must always be on the discharge air side of the duct furnace. (See Figures 2 and 3.)

Before installing duct furnace, determine the desired direction of the air flow through the duct furnace. If the installation is such that the desired air flow direction through the duct furnace is opposite of the direction required as the unit is shipped, the position of the air distribution baffle and limit control sensing bulb must be reversed. To make this change, do the following:

Select proper direction of air flow. **The distribution baffle** (if it is used) **must face the inlet direction.** The baffle may be changed to the opposite side, if the air flow direction is changed (Figures 2 and 3). **When reversing air flow the temperature sensing bulb between the heat exchanger tubes must be reversed to the air outlet side.** The sensing bulb must not touch sides of heat exchanger tubes (Figures 3 and 13). To change position of limit control sensing bulb, remove sensing bulb from clips on support bracket. (Note position of bulb relative to mounting bracket.) Thread capillary tube and sensing element back through access hole in bottom header of heat exchanger. Remove rubber grommet in bottom header of heat exchanger. Capillary tube has a liquid center, do not crimp tube or put sharp bends in tube. Bring sensing bulb and furnace capillary tube around the outside of the duct furnace, to the opposite side, and up through the access hole in bottom header. Replace rubber grommet. Mount sensing element in retaining clip on discharge end of duct furnace, locating the bulb in the same relative position as it was in its original location. Place capillary tube in remaining retaining clips. Be certain that neither the sensing bulb nor the capillary tube come in direct contact with the heat exchanger. The exposed capillary tube should be protected from damage due to cuts, blows or wear from vibration.

Figure 2 - Air Flow

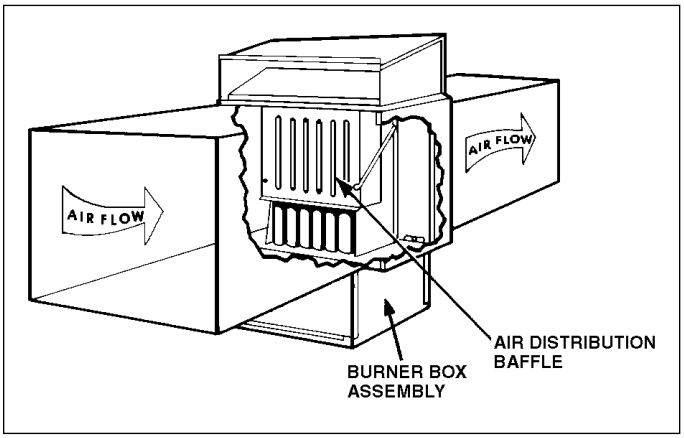
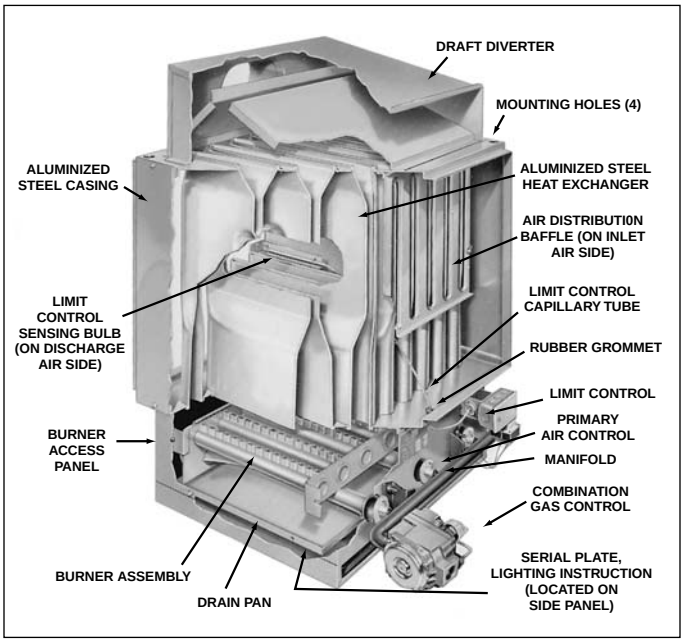


Figure 3 - Unit Cutaway



Installation in Duct

⚠ CAUTION

Proper air flow and distribution, across the duct furnace heat exchanger must be provided to prevent early failure of the duct furnace.

Insufficient air, or poor air distribution across the duct furnace heat exchanger will cause early failure of the duct furnace. When installing duct furnaces, always follow good duct design practices for even distribution of the air across the duct furnace heat exchanger. Recommended layouts are shown in Figure 4, as well as designs that are to be avoided. When installing duct furnaces the following must be done.

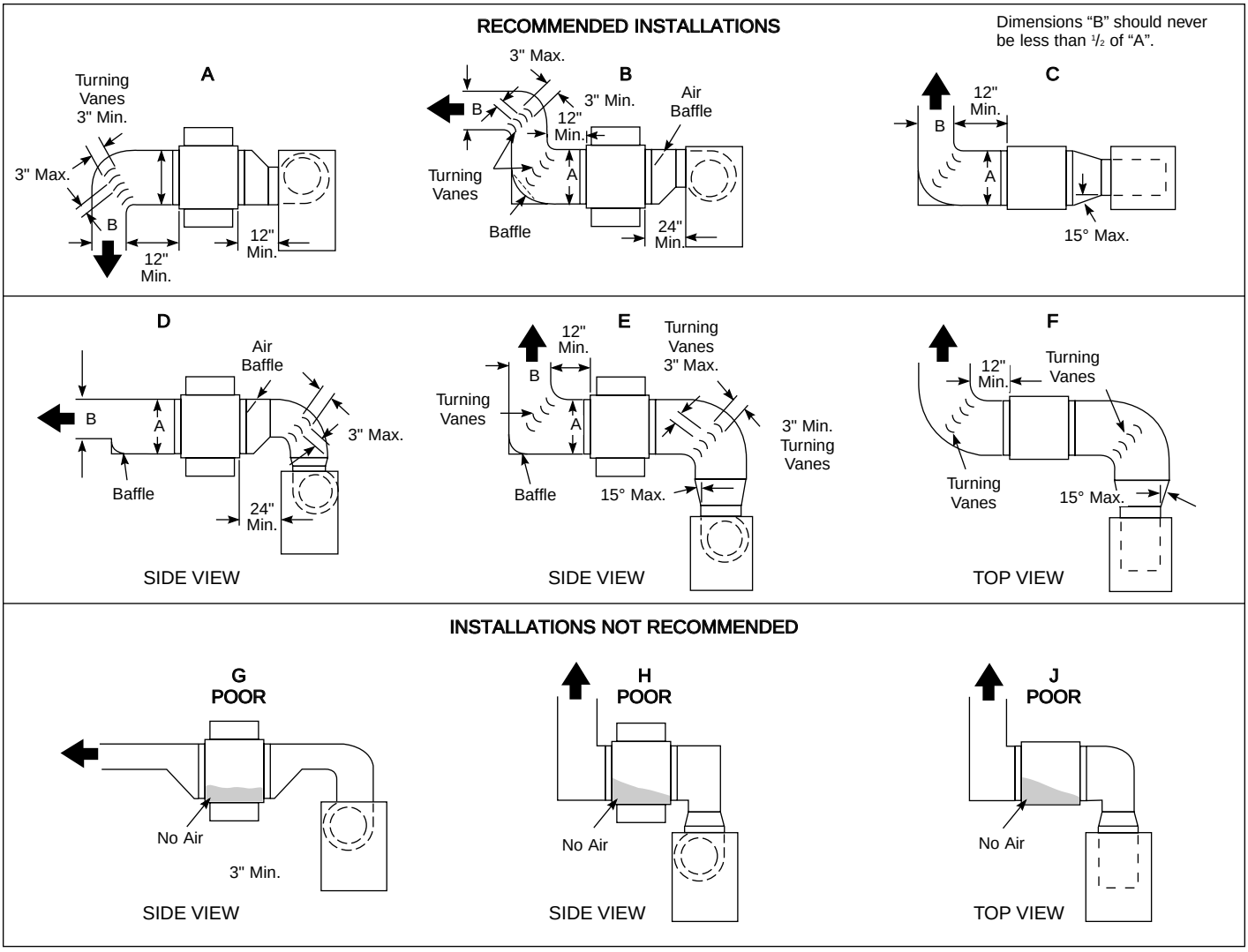
1. Provide air tight seal between ductwork and furnace. Seams with cracks in ductwork should be caulked and/or taped and be of permanent type. All duct connections MUST be air tight to prevent air-leakage that will disturb the flame. A duct system is generally under pressure and even a small leak can cause flame disturbance and/or pilot outage problems. **Do not block draft diverter opening or enclose diverter opening in ductwork.**
2. **Provide uniform air distribution over the heat ex-changer.** Use turning vanes where required (see Figure 4) to obtain uniform air distribution. Avoid installing as in G, H & J of Figure 4.

⚠ CAUTION

Check for red heat exchanger tubes. If bottom of tubes becomes red while blower and duct furnace are in operation, additional baffles must be inserted between blower and duct furnace, as shown in Figure 4, to assure uniform air flow across the heat exchanger.

INSTALLATION

Figure 4 – Installations Diagrams



3. A bottom, horizontal discharge type blower should be installed at least 12" from the furnace. (See "A", Figure 4.)
4. A top, horizontal discharge type blower should be in-stalled at least 24" from the furnace. (See "B", Figure 4.) Provide air baffle at top of duct to deflect air down over bottom of heat exchanger.
5. **Burned-out heat exchanger, or definitely shorter equipment life, will result from not providing uniform air distribution, a major cause of furnace failure.**
6. Provide removable access panels on both upstream and downstream sides of the duct furnace. These openings should be large enough to view smoke or reflect light inside the casing to indicate leaks in the heat exchanger and to check for hot spots on exchanger due to poor air distribution or lack of sufficient air (cfm).
7. When a fan switch is installed with the furnace, it **must** be adjusted to start the blower motor **30 seconds** after burner ignition.

   NOTE: All duct furnaces are designed for installation on non-combustible floors and with 6 inches clearance from sides, top and flue to combustible material.

Reversing Gas Control String

Modine duct furnaces are shipped with the gas control string on the opposite side of the duct furnace as the vent connector (see Figure 3). There may be applications however, where it is desirable to have the control string on the same side of the unit as the vent connector. For these applications, the control string position may be reversed.

To reverse the position of the control string, thread the limit control sensing bulb and capillary tube back through the bottom header of the heat exchanger, being careful not to damage the sensing bulb or its capillary tube. Once the sensing bulb and capillary is free of the heat exchanger, remove the entire burner box assembly (Figures 2 and 3) from the bottom heat exchanger header by removing the fastening screws holding it in place. Rotate the burner box assembly 180° and refasten the assembly to the heat exchanger.

Replace the limit control sensing bulb on the discharge air side of the unit by threading the sensing bulb and capillary tube up through the heat exchanger header, using the access hole provided in the header on the side the controls are now positioned, being careful to make sure the capillary tube does not touch any heat exchanger tube surfaces (see Figure 3).

⚠ CAUTION

DO NOT EXCEED MAXIMUM TEMPERATURE RISE SHOWN IN TABLE 7 ON PAGE 13.

Less than the minimum air flow (CFM) through the furnace will cause the air temperature rise to exceed the maximum allowed.

FINAL AIR TEMPERATURE

The maximum allowable final air temperature is 150 degrees F. The maximum allowable air temperature rise is 85 degrees F. (The maximum allowable air temperature rise for size 300 and 350 is 100°F.)

Venting

⚠ CAUTION

Gas duct furnaces must be vented — do not operate unvented.

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

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

Units which are supplied with two-stage, or modulating gas controls require a Category II vent system. Refer to Figure 5 to determine the vent category required for each size duct furnace.

Gas-fired heating equipment which has been improperly vented, or which experiences a blocked vent condition may have flue gases accidentally spilled into the heated space. See page 18 for specific information about the blocked vent safety switch supplied on the unit.

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

The following suggestions should be observed:

1. Comply with local code venting regulations.
2. Select size of vent pipe to fit opening at rear of unit (see page 17 for dimensions). Do not use a vent pipe smaller than the vent 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. Use an approved-type chimney when the vent passes through a floor or roof.
3. Keep vent pipe connector at least 6" from combustible material.

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

   Insulate carefully around section of vent pipe passing through combustibles. Where vent passes through floor or roof an opening 4" greater than vent diameter is necessary. If there is 6' or more of vent pipe in the open space between the duct furnace and where the vent pipe passes through floor or roof, the opening in the floor or roof need only be 2" greater than the diameter of the vent pipe.
4. Category I and II duct furnaces are defined as having non-positive pressure vent systems and must not be common vented with positive pressure vent systems serving Category III and IV appliances.
5. Category II vent systems must be installed to prevent accumulation of condensation in the vent system, and shall have a means provided for drainage of vent condensate. The drip leg should be cleaned annually.
6. A Category II vent system shall be water tight.

   For Category II vent systems, use either .025 inch thick aluminum or .018 inch thick stainless steel for exhaust vent. Seal the joints with a metallic tape suitable for temperatures up to 350°F (3M Company tapes 433 or 363 are acceptable). Wrap the tape two full turns around the vent pipe.
7. Limit vent pipe horizontal runs to 75% of vertical height with a minimum upward slope from unit of ¼" per foot and suspend securely from overhead structure at points no greater than 3 feet apart. For best venting, put as much vertical vent as close to the unit as possible. Fasten individual lengths of flue together with metal screws.
8. Keep vent pipes as straight as possible, avoiding sharp bends.

9. Where possible, avoid venting through unheated space. When necessary, insulate pipe from cold to prevent condensation and maintain draft head. Provide a drip leg with a clean out cap at bottom of vertical pipe.
10. Top of vertical stack should extend at least 2-1/2' above high point of roof. Use of weather cap will reduce moisture in vent.
11. Use of dampers or other devices in vents is prohibited.
12. When connecting vent to existing chimney, do not push vent pipe beyond internal surface of chimney.
13. For more than one vent in a stack or chimney, they should enter at different levels.
14. In general, a common stack or chimney must have an equivalent cross-sectional area of all vents entering the stack.
15. Do not install a gravity vented unit in a common stack with power exhausted equipment.
16. Do not install gravity vented units in buildings or areas which experience negative pressure conditions.

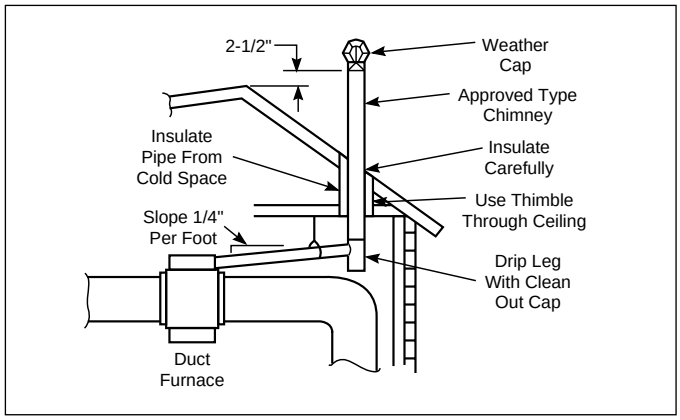


Figure 5 – Appliance Categories

Model Size	Gas Controls	Appliance Category
DJE75	Single-Stage Two-Stage Modulating	I II II
DJE100	Single-Stage Two-Stage Modulating	I II II
DJE125	Single-Stage Two-Stage Modulating	I II II
DJE150	Single-Stage Two-Stage Modulating	I II II
DJE200	Single-Stage Two-Stage Modulating	I II II
DJE225	Single-Stage Two-Stage Modulating	I II II
DJE250	Single-Stage Two-Stage Modulating	I II II
DJE300	Single-Stage Two-Stage Modulating	I II II
DJE350	Single-Stage Two-Stage Modulating	I II II
DJE400	Single-Stage Two-Stage Modulating	I II II

Table 1
ANSI Venting Requirements

Appliance 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.

Piping

⚠ CAUTION

Gas pressure to duct furnace controls must never exceed 14" W.C. (1/2 PSI).

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

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

1. Installation of piping must be in accordance with local codes, and ANSI Z223.1-Latest Edition, “National Fuel Gas Code,” or CAN/CGA-B149.1 and .2 in Canada. Do not use flexible connectors.
2. Piping to units should conform with local and national requirements for type and volume of gas handled, and pressure drop allowed in the line. Refer to Table 5, to determine the cubic feet per hour (cfh) for the type of gas and size of unit to be installed. Using the cfh value and the length of pipe necessary, determine the pipe diameter from Table 2. 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 2 allows for the usual number of fittings with a resistance of .3" water pressure drop. Where the gas supplied has a specific gravity other than 0.60, apply the multiplying factor as given in Table 3 to the flow capacities in Table 2 to determine total flow capacity.
3. After threading and reaming the ends, inspect piping and remove loose dirt and chips.
4. Support piping, so that no strains are imposed on unit or controls.
5. Use two wrenches when connecting pipe to unit controls.
6. Provide a drip pocket before each unit and in the line where low spots cannot be avoided. (See Figure 6.)
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 at least 1/4" in 15' of horizontal run.

10. Compounds used on threaded joints of gas piping shall be resistant to action of liquefied petroleum gases.
11. Purge air before lighting unit by disconnecting pilot at outlet of pilot valve. In no case should line be purged into heat exchanger.
12. After installation, the piping system must be checked for leaks. Use soap solution.
13. Install a ground joint union and a gas cock upstream of the unit for easy servicing of controls, including a 1/8" NPT plugged tapping accessible for test gauge connection (see Figure 6).
14. Allow at least 5 feet of piping between any high pressure regulator and unit controls.
15. Testing Piping System. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing if the test pressure is in excess of 1/2 psi.

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

Table 2 – Gas Pipe Capacities

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

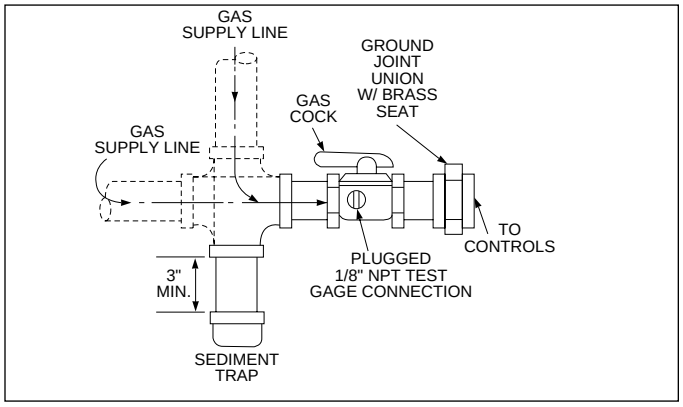
Length of Pipe in Ft.	Diameter of Pipe — Inches									
	1/2	3/4	1	1-1/4	1-1/2	2	3	4	6	8
15	76	218	440	750	1220	2480	6500	13880	38700	79000
30	73	152	285	590	890	1650	4700	9700	27370	55850
45	44	124	260	435	700	1475	3900	7900	23350	45600
60	50	105	200	400	610	1150	3250	6800	19330	39500
75		97	190	345	545	1120	3000	6000	17310	35300
90		88	168	320	490	930	2600	5400	15800	32250
105		80	160	285	450	920	2450	5100	14620	29850
120			158	270	420	860	2300	4800	13680	27920
150			128	242	380	710	2000	4100	12240	25000
180			120	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 3 – Specific Gravity Conversion Factors

Multiplying factors to be used with Table 2 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 6 – Recommended Piping to Controls



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 inside 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.

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

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

⚠ CAUTION

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

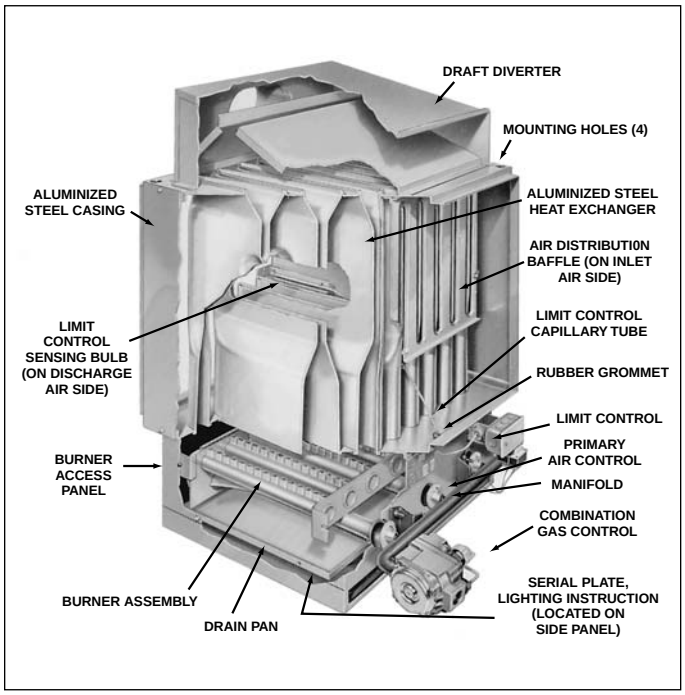
Gas pressure to unit heater controls must never exceed 14" W.C. When air pressure testing piping systems for leaks, be sure that test pressure does not exceed 14" W.C. if duct furnaces are already installed.

Check the gas supply pressure at the unit upstream from the pressure regulator. For the purpose of input adjustment, the minimum supply pressure should be 6" W.C. on natural gas or 11" W.C. on propane. The maximum inlet pressure on natural gas should be 7" W.C. and 14" W.C. on propane.

The pilot flame must be adjusted as described below. Supply pressure with any gas must never exceed 14" W.C.; if so, install an additional pressure regulator upstream of the combination gas valve. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1-Latest Edition “National Fuel Gas Code” (CAN/CGA-B149 in Canada).

Be sure no obstructions block draft diverter or air intake and discharge of unit heater.

Figure 7 – Duct Furnace Cutaway



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. For systems other than standing pilot, see separate literature shipped with unit:

1. Ensure that the electricity supply is off.
2. Check burner(s) to insure proper alignment.
3. With manual main valve turned to off, check thermostat, and gas valve. If these do not function, recheck wiring with diagram.
4. Turn on manual valve and light pilot. If air purging is required, disconnect pilot at outlet valve. In no case should line be purged into heat exchanger.
5. Check limit control. With blower motor disconnected turn the thermostat up to call for heat. The main burner should light. If the limit control is properly wired the main burner will shut-off within 2 or 3 minutes. If the main burner does not shut off within this time, turn off the gas and recheck wiring. If the limit control functions properly, reconnect motor and proceed with step 6 and 7.
6. Check gas input rate, as described on next page, to assure adequate gas volume and pressure.
7. Check gas piping for leaks with a soap bubble solution to insure safe operation.

Lighting Instructions (Also on Unit)

For Unit w/Standing Pilot

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

For Unit w/Intermittent Pilot

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

Shut Down Instructions

Turn off power and close all gas valves.

After Initial Start Up

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

Pilot Flame Adjustment

The pilot is orificed to burn properly with an inlet pressure of 6"-7" W.C. on natural gas and 11"-14" 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 10, 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 – Correct Pilot Flame

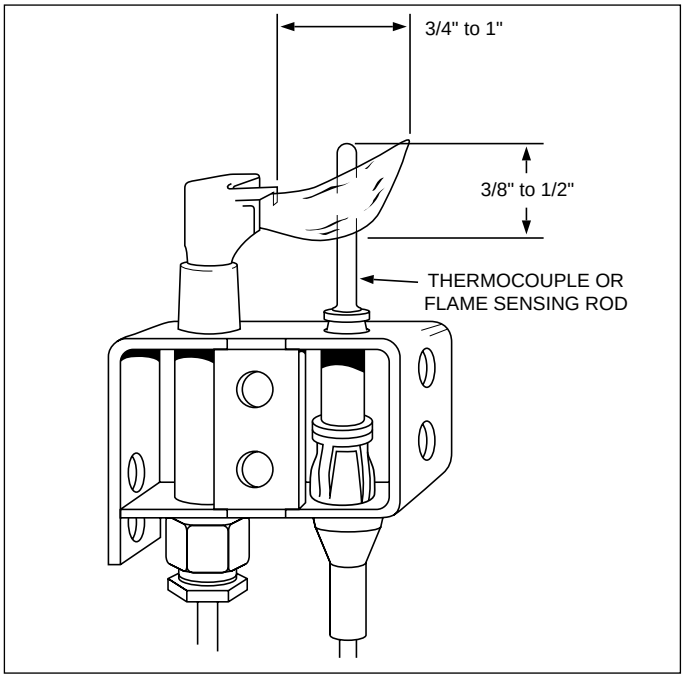
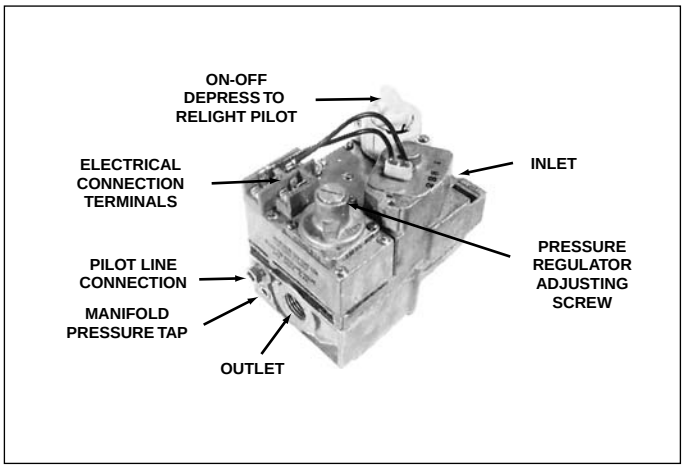


Figure 9 – Typical 25 Volt Combination Gas Control



Natural Gas Flame Control

Control of burner flames on duct furnaces utilizing natural gas is achieved by resetting the primary air shutters (Figure 16) to either increase or decrease primary combustion air. Prior to flame adjustment, operate for about five minutes. Operation can be viewed after loosening and pushing aside the 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 cone.

To increase primary air, loosen the air shutter setscrews and move the air shutters away from the mixer tubes until yellow-tipped flames disappear. See Figure 16. To decrease primary air move the air shutters closer to the mixer tubes until flames no longer lift from burner ports, but being careful not to cause yellow tipping. Retighten setscrews after adjustment.

Propane Gas Flame Control

See Figure 16. **An optimum flame will show a slight yellow tip.** Prior to flame adjustment, operate furnace for at least five minutes. Loosen wing screws and push shutters forward to reduce primary air until yellow flame tips appear. Then increase primary air until yellow tips diminish and a clean blue flame with a well defined inner cone appears. With propane gas, some yellow tipping is always present, but is not objectionable.

Checking Input Rate

⚠ CAUTION

Check the gas supply pressure at the unit upstream from the pressure regulator. For the purpose of input adjustment, the minimum supply pressure should be 6" W.C. on natural gas or 11" W.C. on propane. The maximum inlet pressure on natural gas should be 7" W.C. and 14" W.C. on propane. The pilot flame must be adjusted as described on page 9. Supply pressure with any gas must never exceed 14" W.C.; if so, install an additional pressure regulator upstream of the combination gas valve. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1- Latest Edition “National Fuel Gas Code” (CAN/CGA-B149 in Canada).

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

Input Adjustments

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

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

(A) Meter Timing Method

1. Shut off all other gas-burning equipment, including other pilot lights served by the gas meter.

CHECKING INPUT RATE

2. Start the furnace 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 = calorific value of gas, Btu per cu. ft.

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

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

These are representative values:

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

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

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

For example, if the input to the furnace is 100,000 Btu and the calorific value of gas is 1000 Btu per cu. ft., then, by the second formula, the input is 100 cu. ft. per hr. Table 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. See Table 4 similarly, if the 1/2 cu. ft. dial is used, we determine a time of 18 seconds for one revolution at the required input.

(B) Pressure Method

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

1. Determine orifice size from Table 5 and check actual orifice size (s) in unit.
2. Close manual valve.
3. Remove the 1/8" pipe plug in automatic valve and attach water manometer or “U” tube which is at least 12" high. (See Figure 10).
4. Open manual valve and start unit.
5. If pressure as indicated by “U” tube is not more than 1/2" higher or lower than indicated in Table 5, 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 indicates in Table 5, check main line gas pressure at input. Adjust main gas regulator to supply 6 to 7 inch W.C. on pressure to unit regulator on natural gas and 11-14" W.C. on propane gas.

Figure 10 - Checking Manifold Pressure with “U” Tube

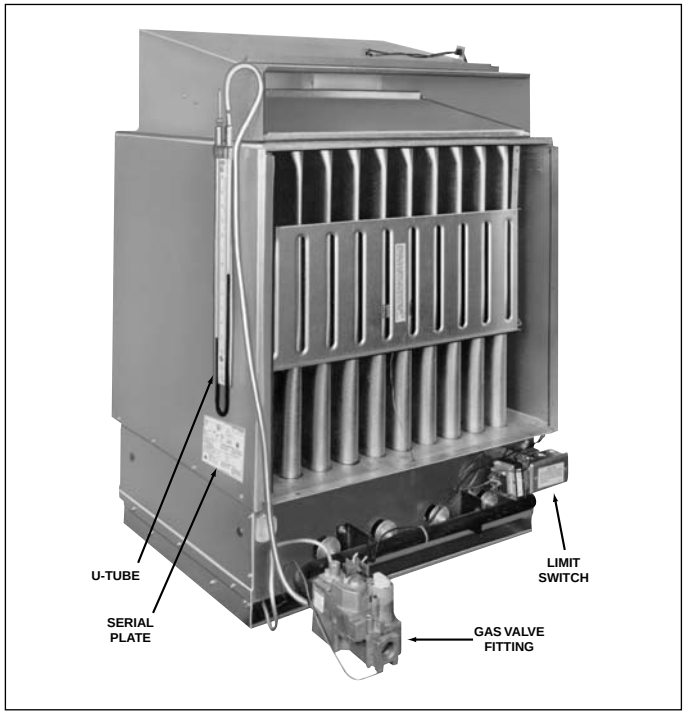
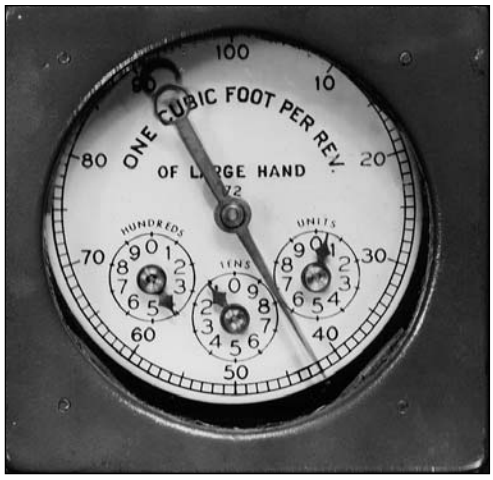


Figure 11 - Dials of Typical Gas Meter



CHECKING INPUT RATE

Table 4 - 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 5 - Manifold Pressure and Gas Consumption*

Model Size	Type of Gas / BTU/Cu. Ft. / Specific Gravity	Natural 1040 0.60	Propane 2500 1.53	No. of Orifices
Manifold Press. In. of H2O		3.5	10"	
DJE75	Cfh	72.1	30.0	1
	†Gal./Hr. Propane	–	.82	
	SEC/Cu. Ft.	50	120	
	Orifice Drill Size	20	37	
DJE100	Cfh	96.1	40.0	2
	†Gal./Hr. Propane	–	1.09	
	SEC/Cu. Ft.	37.5	90	
	Orifice Drill Size	30	45	
DJE125	Cfh	120.2	50.0	3
	†Gal./Hr. Propane	–	1.37	
	SEC/Cu. Ft.	29.9	72	
	Orifice Drill Size	31	48	
DJE150	Cfh	144.2	60.0	3
	†Gal./Hr. Propane	–	1.64	
	SEC/Cu. Ft.	24.9	60.0	
	Orifice Drill Size	30	45	
DJE200	Cfh	192.0	80.0	3
	†Gal./Hr. Propane	–	2.19	
	SEC/Cu. Ft.	19	45	
	Orifice Drill Size	23	40	
DJE225	Cfh	216.3	90.0	3
	†Gal./Hr. Propane	–	2.46	
	SEC/Cu. Ft.	16.6	40.0	
	Orifice Drill Size	20	37	
DJE250	Cfh	240.0	90.0	4
	†Gal./Hr. Propane	–	2.74	
	SEC/Cu. Ft.	15	36	
	Orifice Drill Size	25	42	
DJE300	Cfh	288.4	120.0	5
	†Gal./Hr. Propane	–	3.28	
	SEC/Cu. Ft.	12.5	30.0	
	Orifice Drill Size	26	43	
DJE350	Cfh	336.0	140.0	6
	†Gal./Hr. Propane	–	3.83	
	SEC/Cu. Ft.	10.7	25.7	
	Orifice Drill Size	27	43	
DJE400	Cfh	385.0	160.0	6
	†Gal./Hr. Propane	–	4.37	
	SEC/Cu. Ft.	9.3	22.5	
	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 6 - Orifice Drill Sizes with Decimal Equivalents

Main Burner Orifices

Drill Size	Dia. Decimal Equivalent	Drill Size	Dia. Decimal Equivalent
48	.0760	31	.1200
45	.0820	30	.1285
43	.0890	27	.1440
42	.0935	26	.1470
40	.0980	25	.1495
37	.1040	23	.1540
		20	.1285

Pilot Orifice Sizes (inches)

Pilot Type	Natural	Propane
J640DHA	.015	.010
J993DHW J994DHW	0.18	.010
Q345	.018	.012
5CHL-6	.018	.010
5SL-6ER	.018	.010

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Table 7 - Air Temperature Rise - Models DJE ① ②

Model No.	BTU/Hr.		Air Temperature Rise Through Unit (Degree F)																	
			Without Air Baffle ③							With Air Baffle ③										
	Input	Output	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
			Max. CFM	CFM (Standard Air)						CFM (Standard Air)									Min. CFM	
DJE75	75,000	60,000	2778	2222	1852	1587	1389	1235	1111	1010	926	855	794	741	694	654				
DJE100	100,000	80,000	3704	2963	2469	2116	1852	1646	1481	1347	1235	1140	1058	988	926	871				
DJE125	125,000	100,000	4630	3704	3086	2646	2315	2058	1852	1684	1543	1425	1323	1235	1157	1089				
DJE150	150,000	120,000	5556	4444	3704	3175	2778	2469	2222	2020	1852	1709	1587	1481	1389	1307				
DJE200	200,000	160,000	7407	5926	4938	4233	3704	3292	2963	2694	2469	2279	2116	1975	1852	1743				
DJE225	225,000	180,000	8333	6667	5556	4762	4167	3704	3333	3030	2778	2564	2381	2222	2083	1961				
DJE250	250,000	200,000	9259	7407	6173	5291	4630	4115	3704	3367	3086	2849	2646	2469	2315	2179				
DJE300	300,000	240,000	11,111	8889	7407	6349	5556	4938	4444	4040	3704	3419	3175	2963	2778	2614	2469	2339	2222	
DJE350	350,000	280,000	12,963	10,370	8642	7407	6481	5761	5185	4714	4321	3989	3704	3457	3241	3050	2881	2729	2593	
DJE400	400,000	320,000	14,815	11,852	9877	8466	7407	6584	5926	5387	4938	4558	4233	3951	3704	3486				

① Ratings are shown for elevations up to 2000 ft. For higher elevations, the input rating should be reduced at the rate of 4% for each 1000 ft. above sea level. Does not apply in Canada – See rating plate.
② Units approved for use in California by CEC when equipped with intermittent pilot ignition gas controls.
③ When high rates of CFM are used, the air distribution baffle may be removed to lessen the pressure drop through the duct furnace.

⚠ CAUTION

DO NOT EXCEED MAXIMUM TEMPERATURE RISE SHOWN IN TABLE 7

Less than the minimum air flow (CFM) through the furnace will cause the air temperature rise to exceed the maximum allowed. Air through-put must be adjusted to within the range specified on the unit rating plate.

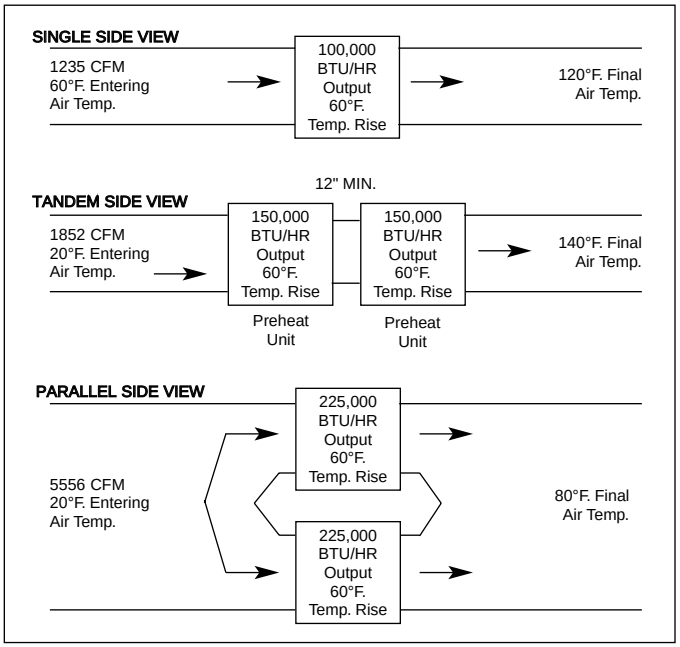
Unit Selection and Pressure Drop Determination

Using the btu/hr output capacity and desired air flow (CFM) determined from the building heat loss and/or make-up air requirements, match the desired unit btu/hr output with a duct furnace size shown in the performance table for duct furnaces. Make sure the air temperature rise and cfm fall within the range shown for the desired model size.

If one unit will not satisfy the design requirements, the units may be installed in tandem, or in parallel such that multiple units will, in combination, meet the desired performance.

Do not exceed the maximum temperature rise shown in the above performance rating table. Less than the minimum air flow (CFM) through the duct furnace will cause air temperature rise to exceed the maximum rise allowed. The maximum allowable final air temperature is 150°F. The maximum allowed air temperature rise is 85°F (DJE300 and 350 have a 100°F maximum). Shown above are typical applications for a single unit and other units installed in tandem and in parallel arrangements with their resulting final air temperatures.

Once the unit(s) size has been determined, it is necessary to find the expected pressure drop through the duct furnace and air temperature rise under the desired air flow conditions. Two graphs are shown for each model size on pages 14 thru 16. One graph shows air temperature rise curves and the other graph shows the pressure drop curves. The pressure drop curves on pages 14 and 16 show two sets of curves. One is for units with an air distribution baffle (solid lines), and the other is for units without an air distribution baffle (dotted lines).



If the desired air temperature rise is above 55°F, the factory supplied air distribution baffle must remain in place. If the air temperature rise is 55°F or less, the factory installed air distribution baffle may be removed. In these cases, (air temperature rises below 55°F) removal of the air distribution baffle will lower the pressure drop across the duct furnace and may allow lower horsepower motors to be used for a specific application.

Determining Unit Pressure Drop

To determine the expected pressure drop across the duct furnace, refer to the pressure drop curves shown on pages 14 thru 16 for the various duct furnace sizes.

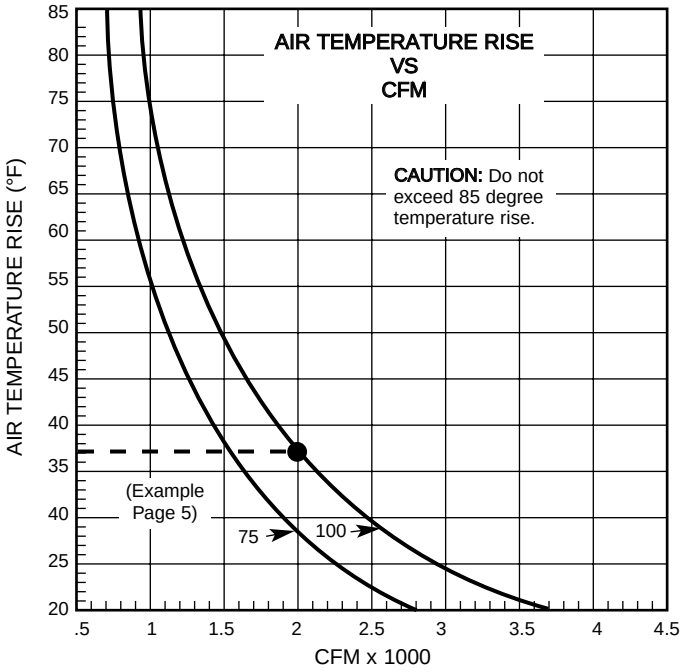
Example

Determine the pressure drop across a size 100 duct furnace with an air throughput of 2000 cfm, both with and without the factory supplied air distribution baffle in place.

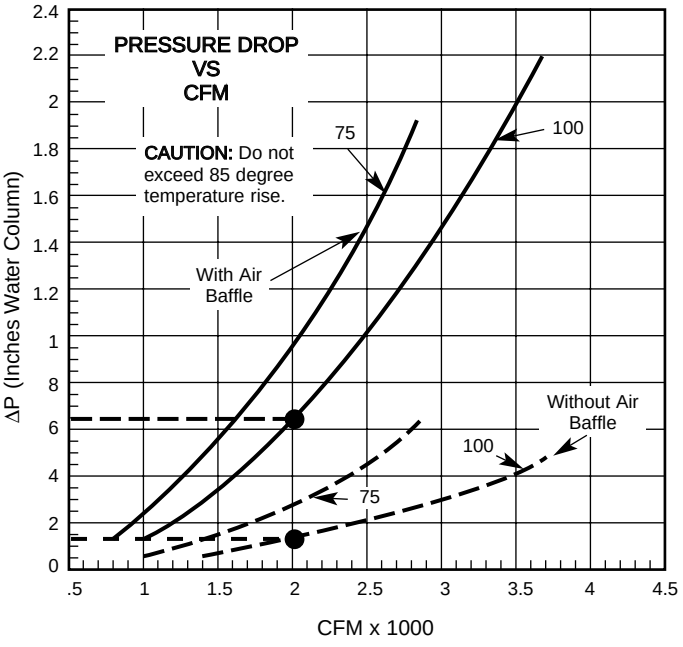
Solution:

1. Find the pressure drop curves for a size 100 both with and without the air distribution baffle. (See curve 2, page 14.) The solid line curves are for units with the air baffle removed.
2. Enter the bottom set of curves in curve 2 at 2000 cfm and read up the graph until the 2000 cfm line intersects the pressure drop curves for the size 100. At those points read to the left and find the pressure drop. For this example, the pressure drop for a size 100 with 2000 cfm, and with the air baffle in place, is approximately 0.65" W.C. The pressure drop across the unit with the air distribution baffle removed is approximately 0.13" W.C.
3. To find the air temperature rise for this example, enter the top set of curves shown in curve 1 at 2000 cfm. Read up the graph until the 2000 cfm. line intersects the performance curve for a size 100. At the point of intersection, read across to the left and find the air temperature rise. For this example, the air temperature rise is approximately 37°F.

Curve 1
Air Temperature Rise, DJE 75, 100



Curve 2
Pressure Drop Curves, DJE 75, 100



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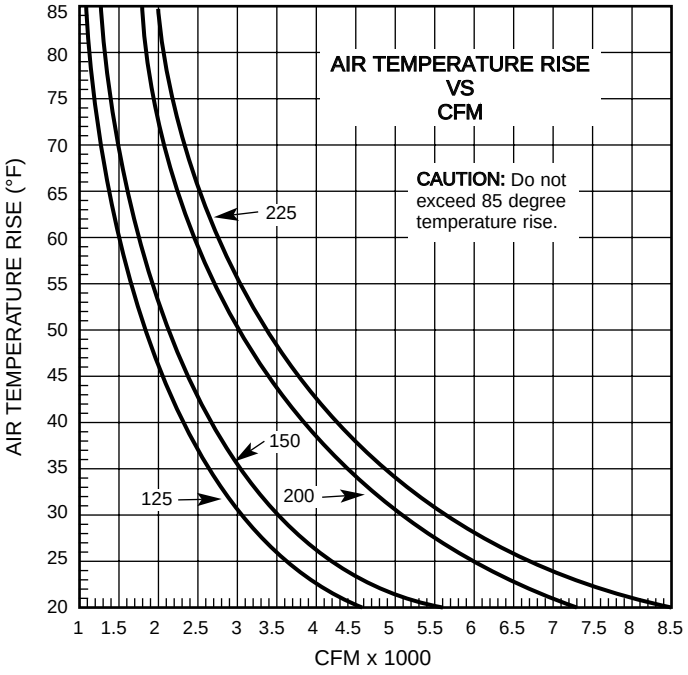
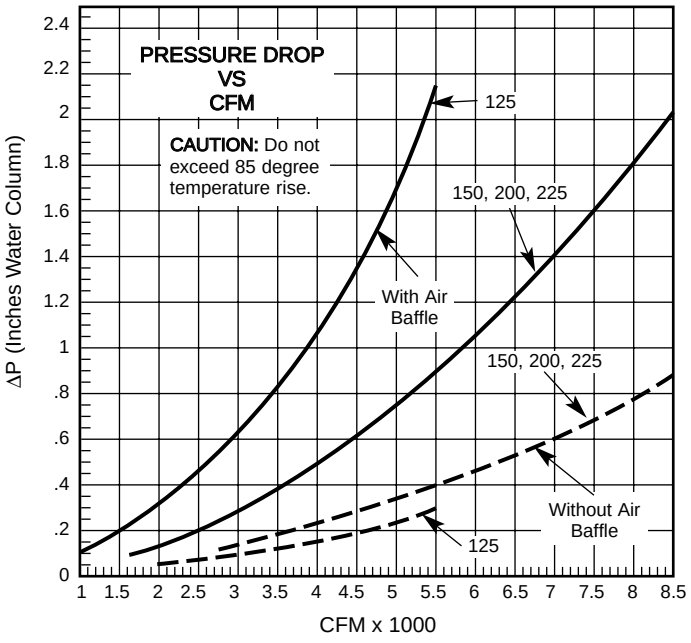
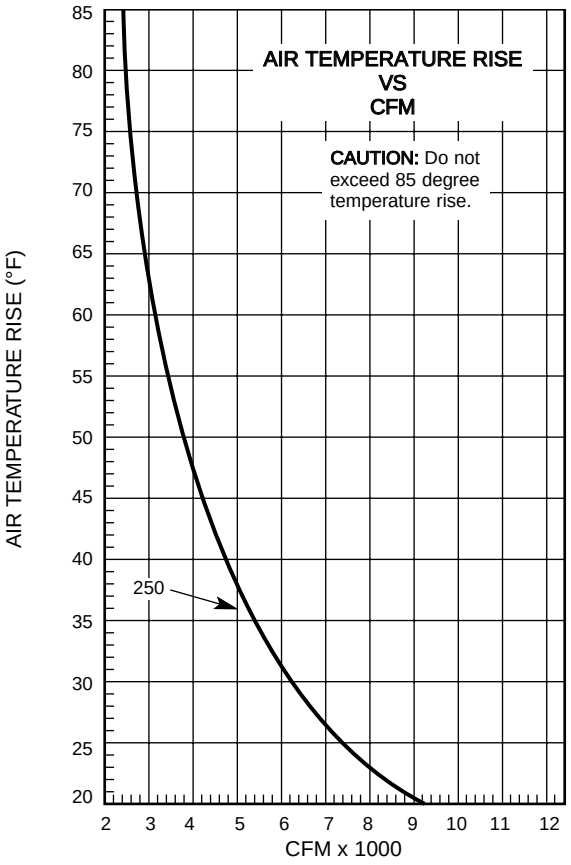
Curve 3
Air Temperature Rise, DJE 125, 150, 200, 225



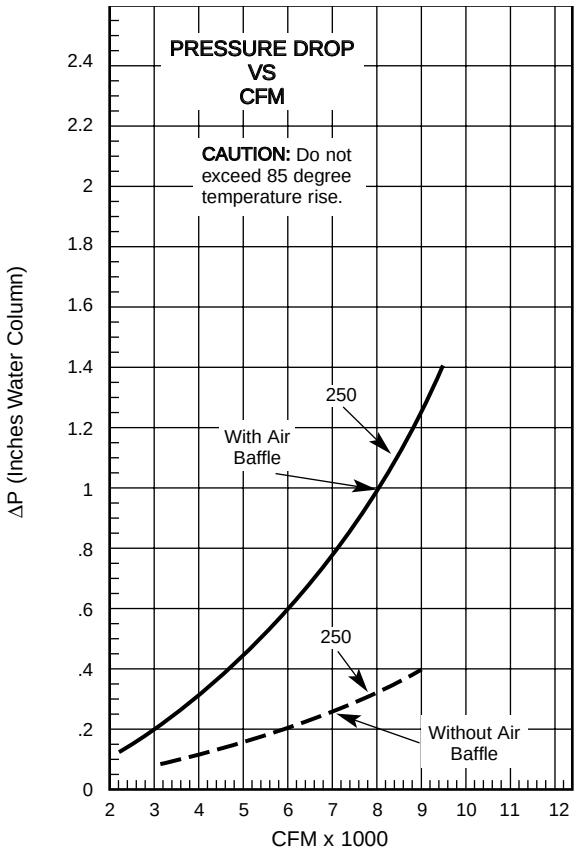
Curve 4
Pressure Drop Curves, DJE 125, 150, 200, 225



Curve 5
Air Temperature Rise, DJE 250

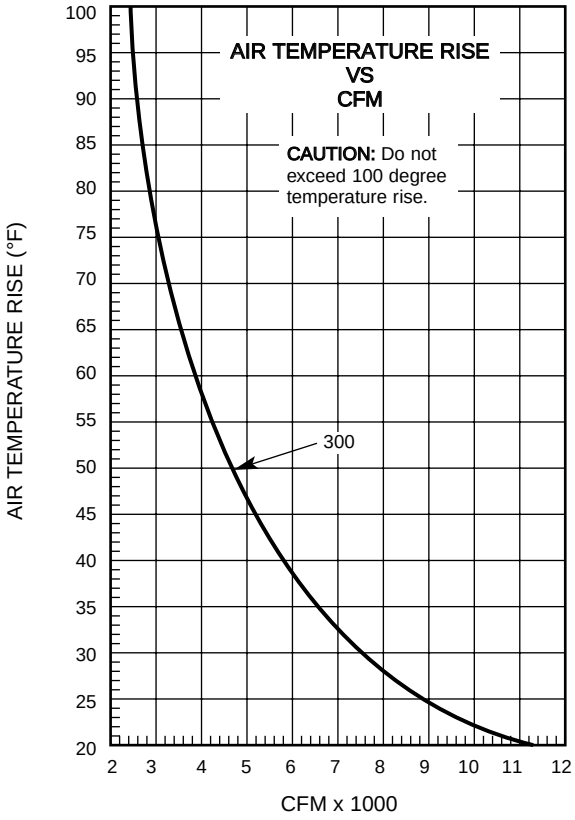


Curve 6
Pressure Drop Curves, DJE 250

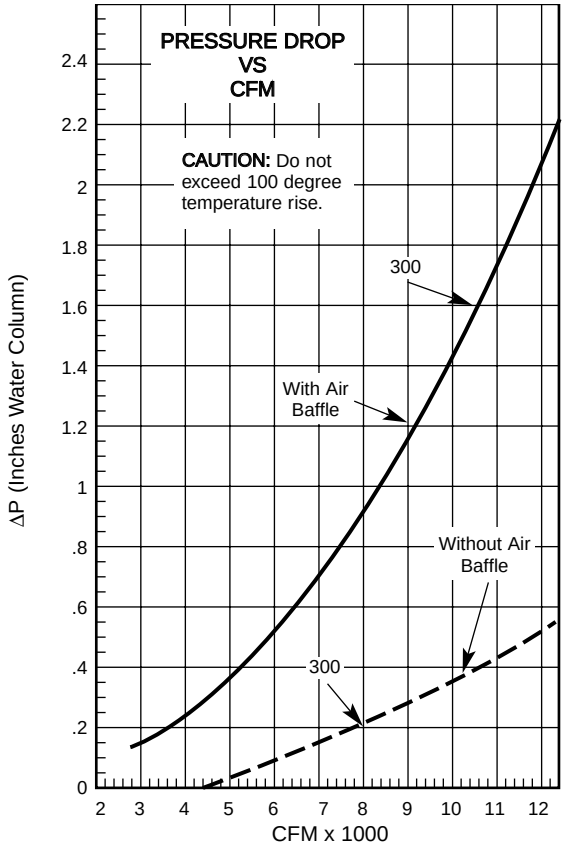


PERFORMANCE DATA

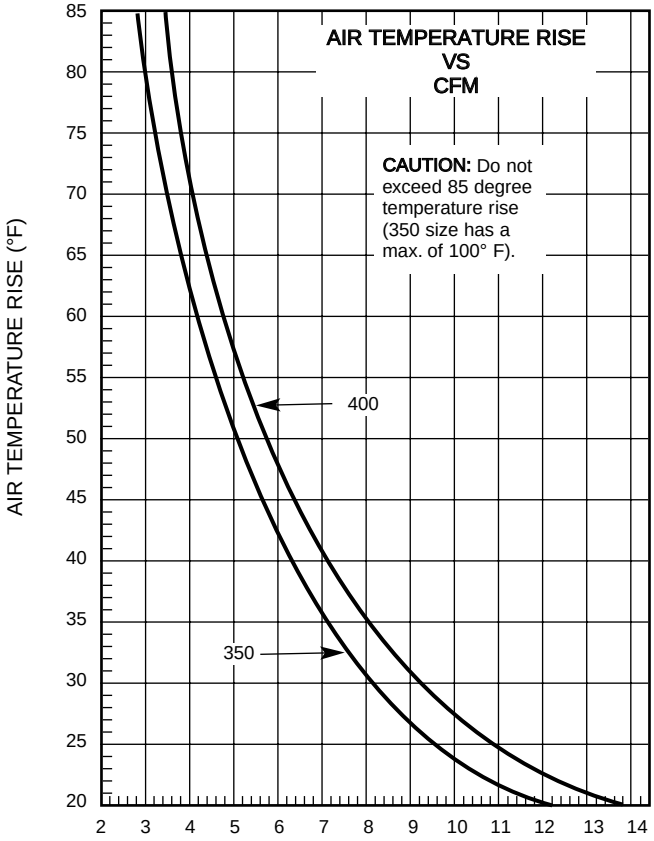
Curve 7
Air Temperature Rise, DJE 300



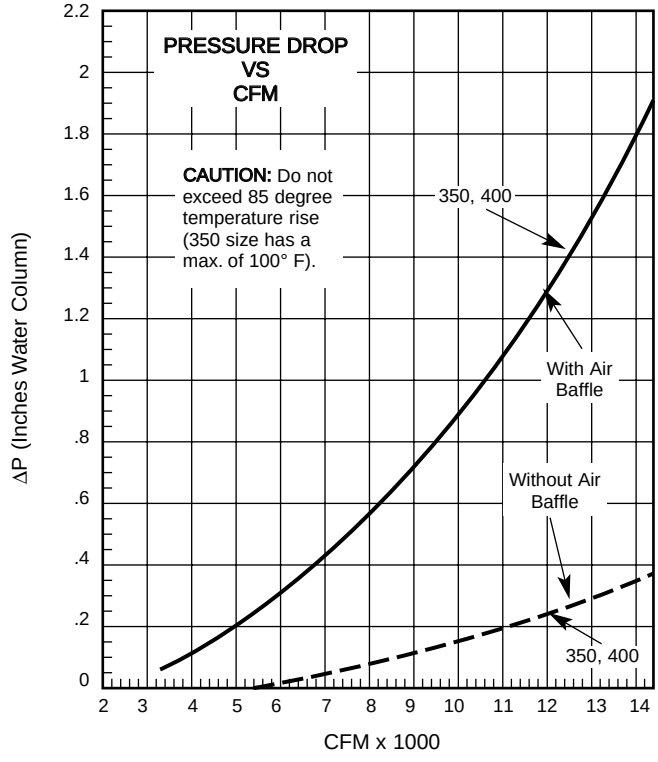
Curve 8
Pressure Drop Curves, DJE 300



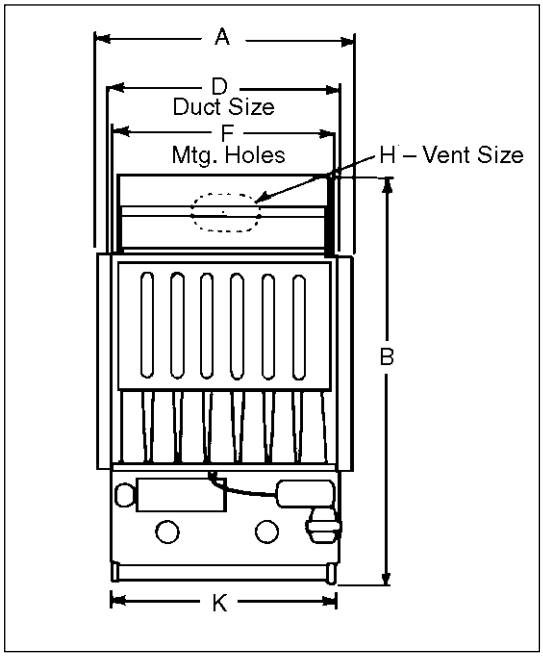
Curve 9
Air Temperature Rise, DJE 350, 400



Curve 10
Pressure Drop Curves, DJE 350, 400



DIMENSIONAL DATA



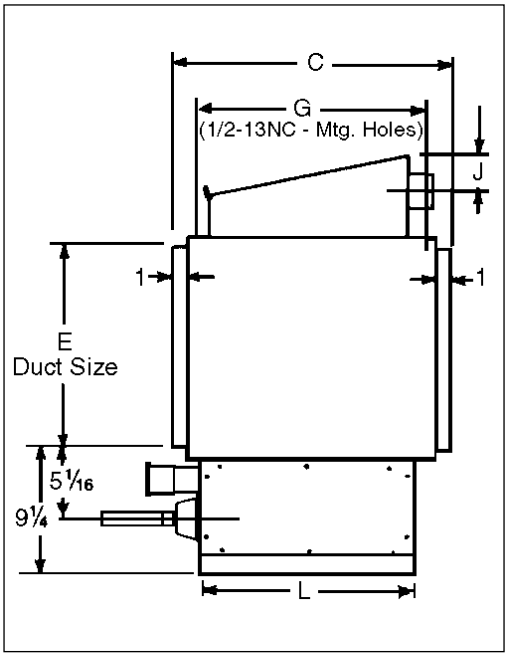


Table 8 – Furnace Dimensions in Inches

Dimensional Symbol	Model Size							
	DJE75	DJE100	DJE125	DJE150 DJE200	DJE225	DJE250	DJE300	DJE350 DJE400
A	16-1/4	18-1/4	22-1/2	24-3/4	24-3/4	27-3/4	32-3/4	38-7/8
B	30-7/8	30-7/8	36-5/8	41-5/8	41-5/8	41-5/8	44-3/8	45-3/4
C	20-1/2	20-1/2	22-1/2	25-1/2	25-1/2	25-1/2	25-1/2	25-1/2
D	15-1/4	17-1/4	21-1/2	23-3/4	23-3/4	26-3/4	31-3/4	37-7/8
E	15-1/16	15-1/16	19-1/16	23-1/16	23-1/16	23-1/16	23-1/16	23-1/16
F	14-3/4	16-3/4	21	23-1/4	23-1/4	26-1/4	31-1/4	37-3/8
G	17-1/16	17-1/16	19-1/16	22-1/16	22-1/16	22-1/16	22-1/16	22-1/16
H	5	6	7	8	8	9	10	10
J	2-1/2	2-1/2	3-1/4	4	4	4	4	4-1/4
K	15	17	21-1/4	23-3/8	23-3/8	26-3/8	31-3/8	37-3/4
L	15-7/8	15-7/8	17-11/16	20-5/8	20-5/8	20-5/8	20-5/8	20-5/8
① Gas Connection IPS	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4
② Approx. Shipping Wt.	85	95	138	183	183	206	260	308

① For natural gas.
② Weight in pounds.

Service Instructions

Limit Control (Overheat Switch)

The limit control will shut off the gas supply to the main burner in the event of overheating. This overheat switch should operate only when something is seriously wrong with the unit. Anytime this control operates, correct the difficulty immediately or serious damage may result. If the limit control cuts off the gas supply during normal operation.

1. See that there are not any obstructions in the air inlet, discharge or connecting ducts.
2. Check actual input to unit against rated input.
3. Check to be sure the blower motor supplying air to the unit is operating.
4. Check the blower belts and pulleys for tightness or damage.
5. Check the blower speed to insure proper air movement. Check for restrictions in ducts and for dirty filters.
6. Check to make sure the venting system is not damaged or blocked. Also check to be sure unit is venting normally and that there is not negative pressure in the building adversely affecting draft.
7. Clean heat exchanger tubes inside and out if necessary.
8. Check to be certain air distribution baffle is in place if required and on the air inlet side of the duct furnace.
9. If items 1-8 do not solve the problem, check overheat switch and replace if necessary.

Access to the temperature sensing bulb, which is positioned between two heat exchanger tubes at the center of the furnace can be made through the downstream field installed access panel. Before removing bulb from mounting bracket, note position of bulb relative to bracket, then remove. Inspect temperature sensing bulb to be sure it is straight. When positioning bulb, care should be taken to place it in the defective bulb's original position in the center between the two exchanger tubes. The long tubing between the sensing bulb and the switch mechanism should be placed to protect it from cuts, blows, wear due to vibration, etc. The rubber grommet should be replaced to prevent air leakage and damage to switch tubing.

IMPORTANT NOTE: The limit control (overheat switch) on this duct furnace will shut off the gas should excessive discharge temperatures occur. Do not attempt to control the fan (by others) with the limit control. Any change in wiring to attempt to control the fan with the limit control will result in a hazardous condition and void the warranty.

To prevent unnecessary rapid cycling and damage to capillary tube make sure the capillary tube does not touch the heat exchanger.

To Remove Burner (Refer to Fig. 12 and 13)

1. Turn off power and gas supply to unit.
2. Disconnect the pilot supply line and thermocouple leads from the gas valve. (If unit is supplied with intermittent pilot ignition, remove ignition and sensor cable from control module in addition to removing pilot tubing at gas valve). See Figure 12.
3. The burner may be removed from either side of the duct furnace. To remove the burner, remove all of the sheet metal screws holding the side burner access panel in place. (**NOTE:** with the side access panel screws removed, the access panel is free to move, be careful not to drop the panel.)
4. Remove the side access panel to expose the furnace burner assembly.
5. Carefully thread the pilot tube and thermocouple leads thru the combustion air slot (at the rear of the unit) into the burner box so they may be drawn out with the burner.
6. Slide the complete burner assembly out of the burner box. The complete burner and pilot assembly are now free for service (see Figure 13).
7. To replace the burner, follow the above steps in reverse order, being careful to align the burner assembly properly on the alignment pins on the access panels on both sides of the duct furnace (see Figure 12).

Blocked Vent Safety Switch (BVSS)

⚠ WARNING

Do not reset unit until vent pipe is inspected and cleared of any obstructions. Unit with blocked vent could cause personal injury or death.

5H73080A

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

If the BVSS has tripped, turn off the gas and electric supply to the duct furnace. Check the entire vent system connected to the duct furnace 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 to 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 chooses not to make changes, a power venter is really the only recommended fix (see bulletin 6-530.11).

Low ambient installations can also be a cause for extended spillage. Be aware that in these installations for freeze protection and/or condensate protection, there is a good chance that a power venter will be necessary.

In instances where the blocked vent safety switch trips repeatedly, refer to Figure 14.

After the vent system has been cleared, or if no blockage or damage is found in the vent system, the blocked vent switch may be reset. To reset the blocked vent switch, locate switch on top of draft diverter and depress the reset button located on the switch.

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

Figure 12

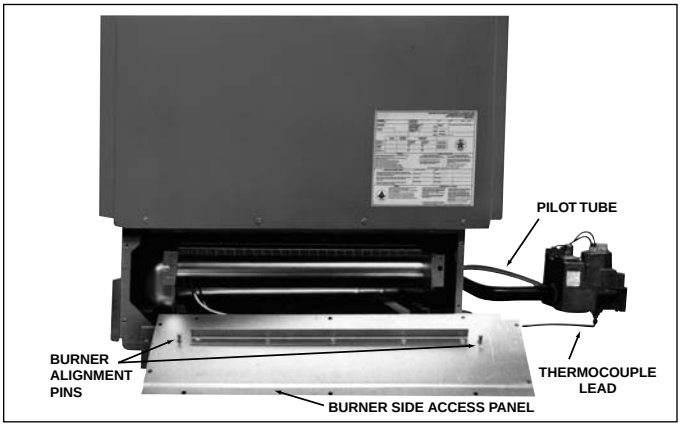


Figure 13

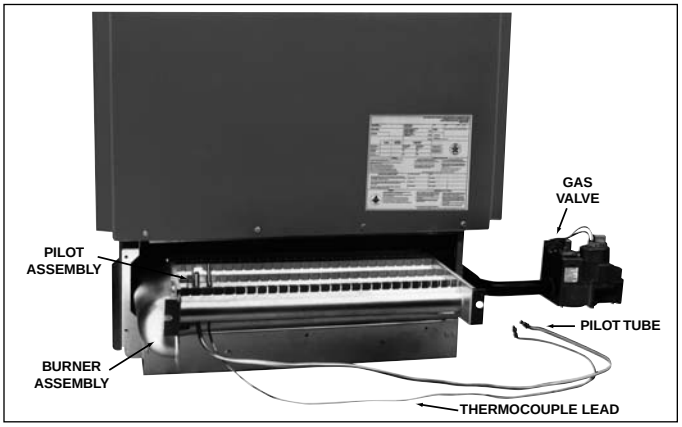
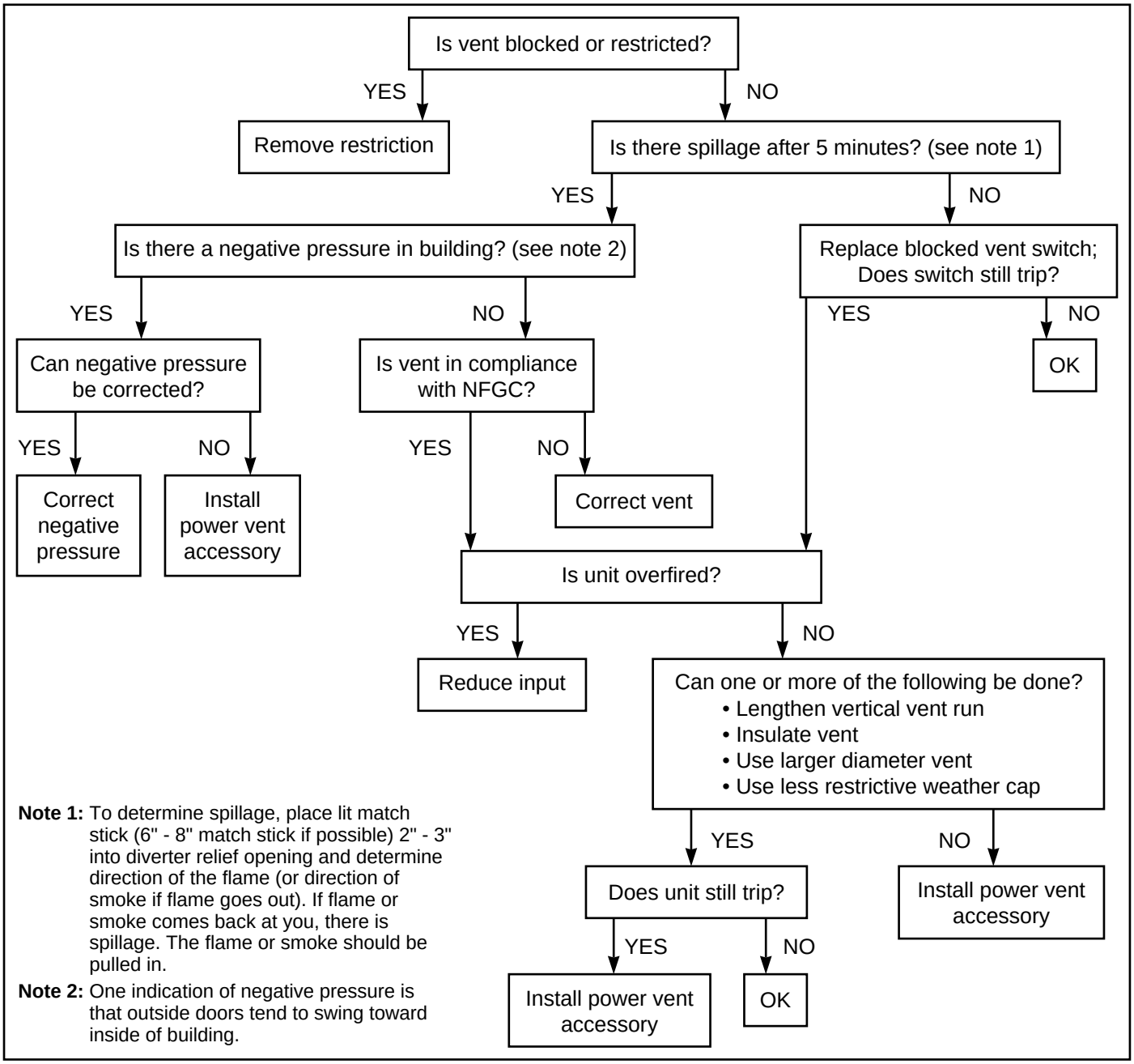


Figure 14 – BVSS Troubleshooting Flow Chart



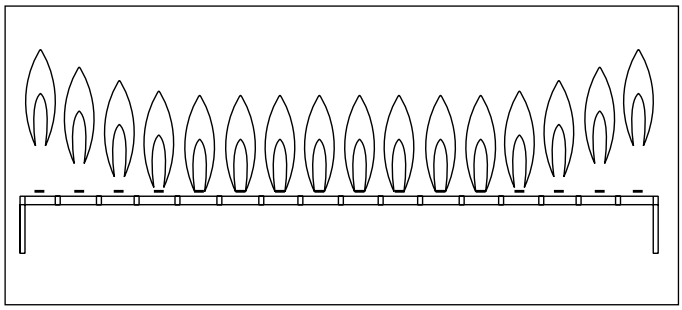
General Maintenance

1. Service air moving components annually.
   On duct blowers, this should include:
   (1) Checking motor and blower bearings for lubrication.
   (2) Checking belts and pulleys for proper alignment and adjustment.
   (3) Checking cleanliness of blower wheel and filters.
2. Keep unit free from dust, dirt, grease, and foreign matter, paying particular attention to:
   a. Secondary air intake slots.
   b. Burner ports, pilot burner, and main burner orifices (avoid use of hard, sharp instruments capable of damaging surfaces, for cleaning these ports.) If an air pressure system is available it can be used 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.
   d. Heat exchanger tubes (clean from bottom with wire brush after removing burner box assembly).
3. Check wiring for possible loose connections.
4. Controls - See control instruction sheets furnished separately with unit.

Combustion Diagnosis

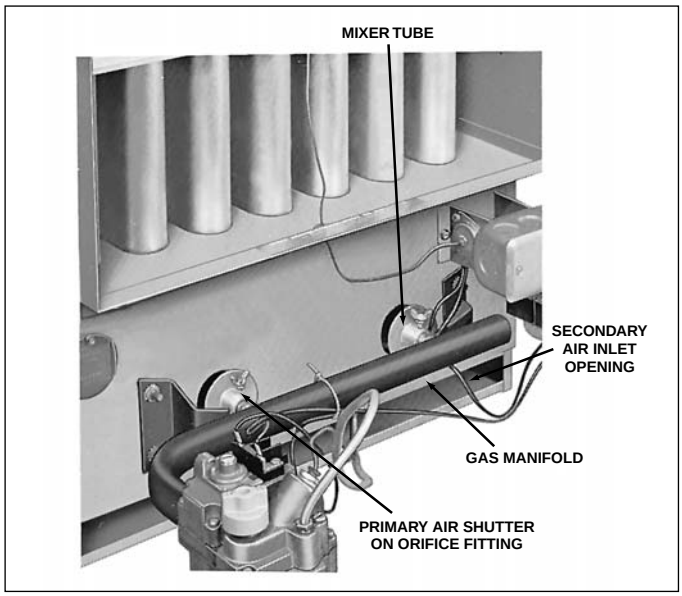
To realize full gas heating value requires periodic inspections with proper combustion control corrections as outlined and illustrated here.

Figure 15 - Lifting Flame Condition



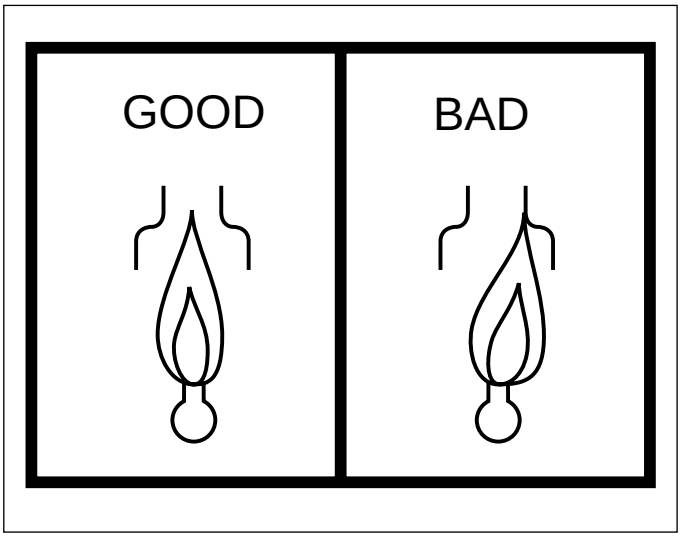
1. Lifting Flames. Lifting flames rise unevenly above the burner port and may occur on few or all the ports. Sometimes the flames drop and lift intermittently. Lifting can be eliminated by reducing primary air. If flame cannot be adjusted properly, check input rate to heater and manifold gas pressure; reduce if necessary. Check the orifice size with those listed in Table 5 to be sure the unit is not operating over rated input.
2. Yellow Tipping. Yellow tipping of a normally blue flame is caused by insufficient primary air, and indicates incomplete combustion producing carbon monoxide, aldehydes, and free carbon (soot). A dirty orifice or one that is out of line can also reduce primary air and cause yellow tipping. Check orifice, clean, realign, or replace if necessary. With propane gas some yellow tipping is always present, but is not objectionable.

Figure 16 – Air Shutter Adjustment



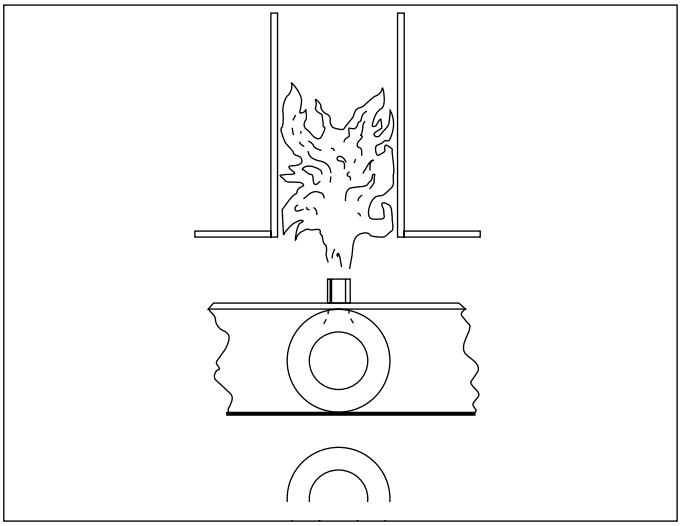
3. Flashback. Flashback occurs when air-gas mixture ignites inside the burner to burn near the orifice. Flashback on ignition or during burner operation usually can be eliminated by reducing primary air. The burner may also be operating below its rated capacity. Check input rate and adjust to correct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

Figure 17 – Wavering Flame or Misalignment



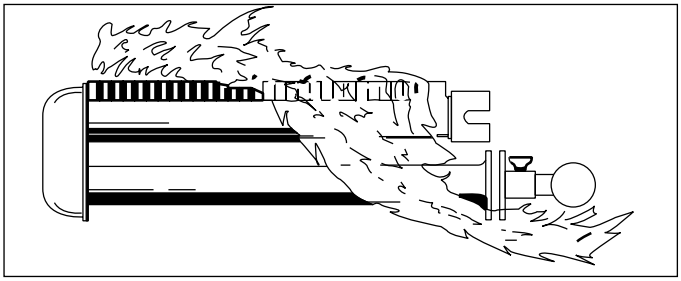
4. Wavering Flames. Drafts across burners may cause flames to waver or appear unstable. Wavering flames can lead to heat exchanger failure by impinging on heat exchanger surfaces. Wavering can be caused by air drafts into the burner compartment or diverter relief opening or by misalignment of the burner.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

Figure 18 – Floating Flame Condition



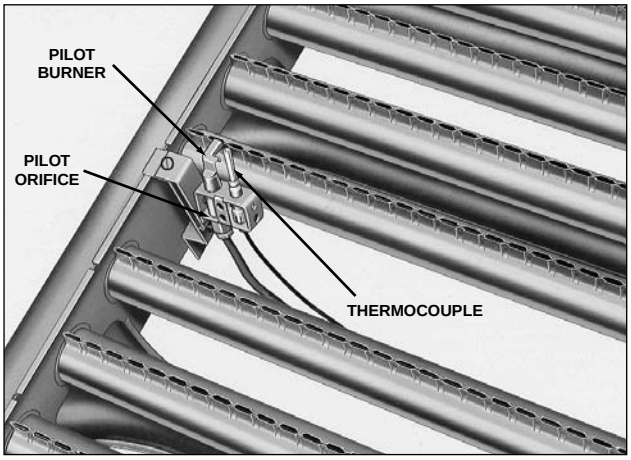
5. Floating Flames. Floating flames are long, do not have well-defined cones, roll around in the combustion chamber, sometimes completely off the ports. Usually an aldehyde odor is present to indicate incomplete combustion. If secondary air supply is reduced too far, burner flames will float. Often the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

Figure 19 – Flame Rollout Appearance



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

Figure 20 – Pilot and Burner



Standing Pilot Systems

If Pilot Does Not Light

1. Check gas supply to pilot.
2. Bleed air from pilot line (Use special care in bleeding propane units.)
3. If pilot sputters, check pilot line for condensation or other obstructions.
4. If flame is feeble or short, check pilot orifice for cleanliness. Replace if necessary. Do not enlarge orifice.
5. Be sure thermocouple contact point is clean. If problem persists, replace thermocouple and/or pilot safety valve.
6. If the above steps do not correct the condition, consult your local gas company.

⚠ CAUTION

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

If Standing Pilot Does Not Stay Lit

1. Check manifold pressure with all units operating making certain that there is proper pressure.
2. Check pipe or tubing size to unit. See Table 8.
3. Be sure all pilot connections are tight.
4. Check for excessive drafts.
5. Check for clogged pilot orifice or pilot line.
6. Check for leaks around pilot fittings. If leaks cause flame impingement on thermocouple lead, thermocouple may become inoperative.

Effect of Pilot Operation on Safety Controls

1. A weak pilot flame may cause poor ignition or reduce heat on thermocouple to the point where the automatic controls become inoperative, thereby shutting off gas supply to main burners. This may result from a plugged orifice, dirty pilot valve or poor adjustment.
2. Check electrical connections from the thermocouple element to the safety valve to assure good electrical contact. Also check location of pilot flame in relation to thermocouple element.

If Main Burners Do Not Light

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

Intermittent Pilot Ignition Systems

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. Defective flame sensor or loose connections to flame sensor.	1b. Check milliamps of sensor. Clean sensor with steel wool. Tighten loose connections. Replace flame sensor if necessary.
1c. Pilot valve electrical connections loose.	1c. Tighten connections.
1d. Defective pilot valve.	1d. Replace.
1e. Poor ground connections.	1e. Check grounding means.
1f. No power from control transformer.	1f. Check transformer voltage on secondary side for 25v.
1g. Spark not located in pilot gas stream.	1g. Correct or replace pilot.
1h. Dirty or plugged pilot orifice.	1h. Clean or replace.
1i. Pilot line kinked or obstructed.	1i. Correct or replace pilot line.
1j. Pilot flame too low.	1j. Check pilot flame and adjust per 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 adjust if necessary to manufacturer's recommendations
2f. Insufficient current signal from flame sensor.	2f. Check current according to manufacturer's recommendations and replace if necessary.
2g. Incorrect or loose wiring.	2g. Check wiring.
2h. Poor ground to ignition controller.	2h. Check grounding means.
2i. No power to ignition controller or gas valve.	2i. Check voltage to controller and gas valve.
2j. Loose limit control connections or defective limit.	2j. Check connections. Replace limit control if necessary.
2k. Defective or plugged gas valve regulator.	2k. Inspect gas valve regulator. Replace if necessary.
2l. Defective thermostat or thermostat out of calibration.	2l. Calibrate thermostat or replace if necessary.
2m. Thermostat heat anticipator incorrectly set.	2m. Check anticipator setting and correct if necessary.
2n. Defective ignition controller.	2n. Replace.
2p. Blocked vent switch tripped.	2p. Refer to page 17 for instructions.

3. System Shuts Down Before Thermostat is Satisfied.

Possible Cause	Possible Remedy
3a. Flame sensing circuit failure.	3a. Check flame sensing rod, ceramic sensor, sensor lead and connections for damage or loss of continuity. Replace defective elements.
3b. Soot on sensing rod.	3b. Clean off soot with steel wool 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. System 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 valve.	4c. Replace.

For Service…

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

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

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

See page 24 for Model Number and Serial Number Designations.

Table 9 – Duct Furnace Control Option Descriptions

Control System Description	Control Code	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 208V/230V 115V 208V/230V	25V 25V 25V 25V	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 a call for heat.	30 31 85 86	115V 208V/230V 115V 208V/230V	25v 25v 25v 25v	natural natural propane propane
Two-Stage, Standing Pilot, 100% Shut-Off — Utilizes a two-stage combination gas (which fires at 50% or 100% of full rated input) and thermocouple. Pilot needs control to be manually lit initially and stays lit.	25 26 83 84	115v 208v/230v 115v 208v/230v	25v 25v 25v 25v	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 on a call for heat.	63 64 87 88	115V 208V/230V 115V 208V/230V	25V 25V 25V 25V	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.	59 60 89 90	115V 208V/230V 115V 208V/230V	25V 25V 25V 25V	natural natural propane propane
Electronic Modulation with Intermittent Pilot Ignition, 100% Shut-Off with Continuous Retry — For use with room sensing or duct sensing with remote temperature set-point adjustment. Includes combination gas control, ignition control (continuous retry), modulating amplifier and modulating/regulator valve. Duct sensing requires addition of Maxitrol Duct Sensing System. Room sensing requires addition of Maxitrol Selectra-stat. When duct sensing is used, room override stat can be added.	43 44 39 40	115V 208V/230V 115V 208V/230V	25V 25V 25V 25V	natural natural propane propane

Model Number Designations

DJE 150 A F M 63

DJE
Indoor Gas-fired Duct Furnace

MBH Input
150- 150,000 Btu/Hr
225 - 225,000 Btu/Hr
300 - 300,000 Btu/Hr
etc.

Heat Exchanger
A - Aluminized
S - Stainless Steel

Control Code Type
63 - 115v/25v two-stage intermittent pilot ignition, 100% shut-off w/ continuous retry, natural gas
64 - 230v/25v two-stage intermittent pilot ignition, 100% shut-off w/ continuous retry, natural gas
etc.

M - Found on serial plate if unit is equipped with 2 stage, mech modulation, or eletronic modulation only.

Unit Development Sequence
B - 1st Development (w/ standing pilot)
C - 2nd Development (w/ standing pilot)
F - 1st Development (w/ intermittent pilot)
G - 2nd Development (w/ intermittent pilot)

Modine Manufacturing Company
1221 Magnolia Avenue
Buena Vista, Virginia 24416
540-261-2166

GAS-FIRED DUCT FURNACE FOR INDUSTRIAL/COMMERCIAL USE
GENERATEUR D'AIR CHAUD A GAINE
POUR USAGE INDUSTIEL/COMMERCIAL
Made in U.S.A.

MODEL NUMBER / NUMERO DE MODELE	MIN.INPUT BTU/HR / DEBIT CALORIFIQUE MIN. BTU/HEURE	VOLTS	AMPS	PHASE	HERTZ
DJE150AFM 63	75,000	115	.34	1	60

SERIAL NUMBER / NUMERO DE SERIE	MIN. INLET PRESS.FOR PURPOSE OF INPUT ADJUSTMENT / PRESSION D'ALIMENTATION EN GAZ MIN. ADMISE	CATEGORY / CATÉGORIE	DESIGN COMPLIES W/DUCT FURNACE STANDARD:
20126961959	6 IN. W.C. PO.C.D'E		ANS Z83.9a - 1992
TYPE OF GAS / TYPE DE GAZ: natural	MANIFOLD PRESSURE / PRESSION A LA TUBULURE D'ALIMENTATION: 3.5 IN. W.C. PO.C.D'E	APPROVALS	

Serial Number Designations

201 26 96 1959

Series Identity Number
Identifies which series of controls were furnished on the unit.

Week of Manufacture
01 - First week of year
26 - 26th week of year
etc.

Year of Manufacture
96 - 1996
97 - 1997
etc.

Sequence number

Installed Location/Identification _____

Serial Number _____

Model Number _____

Power Code _____

Control Code _____

Service Checklist

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

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

WARRANTY

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

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

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

Heat Exchangers
Models PV, BV, PAE, BAE, GHE unit heaters.

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

Heat Exchanger (Condenser) for models listed below, and **Burners and Sheet Metal** for all models: Models PSH, BSH, DJE, DJ, WDG, WDP, WGD, WPD, WBG, WBP, WGB, WPB, WSG, WSP, WGS, WPS, DHE, L, RH, PAB, PBH, GLW, HE, VE, PTE, POH, HS, HC, V, PT, VN, PTN, GHS, C, CW and CR unIts.

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

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

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

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

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

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

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2/02 - Litho in USA