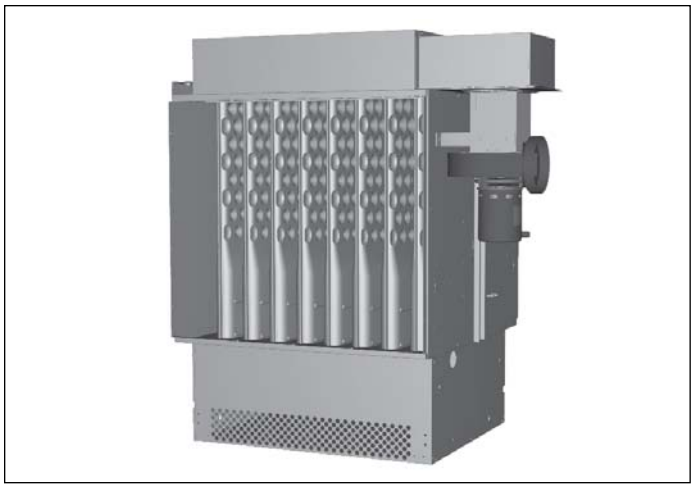
MODINE

5-564
5H080637A

December, 2008

INSTALLATION AND SERVICE MANUAL
gas-fired indoor power vented duct furnaces
model DFP



ETL LISTED C US

All models approved for use in California by the CEC

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.

⚠ 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

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

⚠ CAUTION

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.

IMPORTANT

The use of this manual is specifically intended for a qualified installation and service agency. A qualified installation and service agency must perform all installation and service of these appliances.

Inspection on Arrival

1. Inspect unit upon arrival. In case of damage, report it immediately to transportation company and your local factory 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 upon arrival 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. THESE INSTRUCTIONS ARE SUBJECT TO ANY MORE RESTRICTIVE LOCAL OR NATIONAL CODES.

HAZARD INTENSITY LEVELS

1. **DANGER:** Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
2. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
3. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

⚠ DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

⚠ WARNING

1. Gas fired heating equipment must be vented - do not operate unvented.
2. A built-in power exhauster is provided - additional external power exhausters are not required or permitted.
3. If you are replacing an existing heater, it may be necessary to resize the venting systems. Improperly sized venting systems can result in vent gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 or CSA B149.1 latest edition. Failure to follow these instructions can result in injury or death.
4. Under no circumstances should two sections of double wall vent pipe be joined together within one horizontal vent system due to the inability to verify complete seal of inner pipes.
5. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
6. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).
7. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
8. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
9. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input, or 5% below the minimum rated input of duel rated units.
10. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than the rated voltage.
11. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
12. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owners risk.

⚠ CAUTION

1. Purging of air from gas lines should be performed as described in ANSI Z223.1 - latest edition “National Fuel Gas Code”, or in Canada in CAN/CGA-B149 codes.
2. Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.
3. Ensure that the supply voltage to the application, as indicated on the serial plate, is not 5% less than the rated voltage.

IMPORTANT

1. To prevent premature heat exchanger failure, do not locate ANY gas-fired appliances in areas where corrosive vapors (i.e. chlorinated, halogenated or acid) are present in the atmosphere.
2. To prevent premature heat exchanger failure, the input to the appliance, as indicated on the serial plate, must not exceed the rated input by more than 5%.
3. To prevent premature heat exchanger failure, observe heat exchanger tubes by looking at the heat exchanger through field installed access openings in connecting ductwork. If the bottom of the tubes become red while blower and duct furnace are in operation, additional baffles must be inserted between blower and duct furnace to assure uniform air flow across the heat exchanger.
4. To prevent premature heat exchanger failure, with all control systems, a blower starting mechanism must be provided so that the blower is running or energized within 45 seconds of the gas control operation.
5. Start-up and adjustment procedures should be performed by a qualified service agency.
6. To check most of the Possible Remedies in the troubleshooting guide listed in Table 20.1, refer to the applicable sections of the manual.

Table of Contents

SI (METRIC) CONVERSION FACTORS / UNIT LOCATION

SI (METRIC) CONVERSION FACTORS

Table 3.1

To Convert	Multiply By	To Obtain
"W.C.	0.24	kPa
psig	6.893	kPa
°F	(°F-32) x 0.555	°C
inches	25.4	mm
feet	0.305	meters
CFM	0.028	m^3/min

To Convert	Multiply By	To Obtain
CFH	1.699	m^3/min
Btu/ft^3	0.0374	mJ/m^3
pound	0.453	kg
Btu/hr	0.000293	kW/hr
gallons	3.785	liters
psig	27.7	"W.C.

UNIT LOCATION

⚠ DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

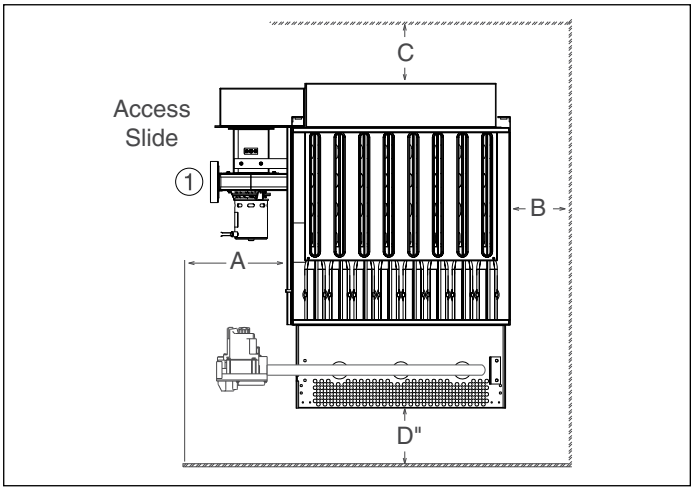
IMPORTANT

To prevent premature heat exchanger failure, do not locate ANY gas-fired appliances in areas where corrosive vapors (i.e. chlorinated, halogenated or acid) are present in the atmosphere.

Location Recommendations

1. When locating the furnace, consider general space and heating requirements, availability of gas and electrical supply, and proximity to vent locations.
2. Unit must be installed on the positive pressure side of the circulating blower.
3. Be sure the structural support at the unit location site is adequate to support the weight of the unit. For proper operation the unit must be installed in a level horizontal position.
4. Do not install units in locations where the flue products can be drawn into the adjacent building openings such as windows, fresh air intakes, etc.
5. Be sure that the minimum clearances to combustible materials and recommended service clearances are maintained. Units are designed for installation on non-combustible surfaces with the minimum clearances shown in Figure 3.1 and Tables 3.2 and 3.3.
6. Units installed downstream of refrigeration systems, or exposed to inlet air temperatures of 40°F or less, 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.
7. When locating units, it is important to consider that the exhaust vent piping must be connected to the outside atmosphere.
8. 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.
9. Do not install units in locations where gas ignition system is exposed to water spray, rain, or dripping water.

Figure 3.1 - Combustible Material and Service Clearances



① A 3" minimum clearance to combustible material is required from the vent collar.

Table 3.2 - Combustible Material Clearances

Model Size	Clearance to Combustible Materials			
	Access Side (A)	Non-Access Side (B)	Top (C)	Bottom (D)
75	12"	1"	3"	2"
100/125	12"	1"	3"	2"
150/175	12"	1"	3"	2"
200/225	12"	2"	3"	2"
250/300	12"	2"	3"	2"
350/400	12"	2"	3"	2"

Table 3.3 - Service Clearances

Model Size	Recommended Service Clearance			
	Access Side (A)	Non-Access Side (B)	Top (C)	Bottom (D)
75	18"	6"	10"	0"
100/125	20"	6"	10"	0"
150/175	25"	6"	10"	0"
200/225	27"	6"	10"	0"
250/300	30"	6"	10"	0"
350/400	41"	6"	10"	0"

Combustion Air Requirements

Units installed in tightly sealed buildings or confined spaces must be provided with two permanent openings, one near the top of the confined space 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 off all units in the enclosure, freely communicating with interior areas having, in turn adequate infiltration from the outside.
For further details on supplying combustion air to a confined (tightly sealed) space or unconfined space, see the National Fuel Gas Code ANSI Z223.1 of CAN/CGA B149.1 or .2 Installation Code, latest edition.

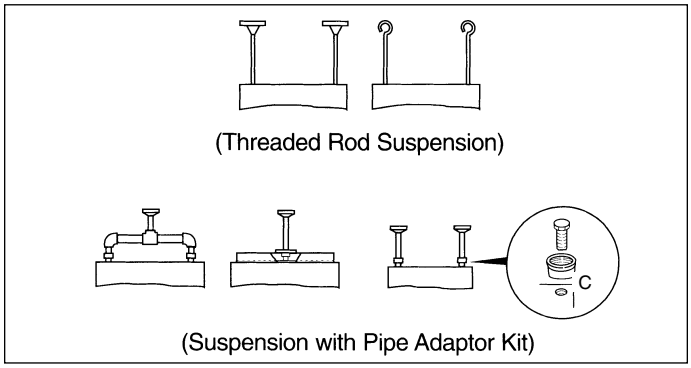
UNIT SUSPENSION / INSTALLATION

UNIT SUSPENSION

Be sure the means of suspension is adequate to support the weight of the unit (see Dimensional Data for unit weights). For proper operation, the unit must be installed in a level horizontal position. Combustible material and service clearances as specified in Figure 3.1 and Tables 3.2 and 3.3 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 4.1, is available as an accessory. One kit consists of two drilled 3/4" IPS pipe caps and two 1/2 - 13 x 1-3/4" capscrews to facilitate threaded pipe suspension. Two kits are required for mounting all duct furnace models.

Figure 4.1 - Suspension Methods



(Threaded Rod Suspension)

(Suspension with Pipe Adaptor Kit)

INSTALLATION

Direction of Airflow

Select proper direction of airflow. The air baffle must face the air inlet direction as shown in Figure 4.2. If it is necessary to reverse the airflow direction, remove the four screws securing the air distribution baffle, reverse the air distribution baffle to the air inlet side and replace the screws. See Airflow Reversal Note.

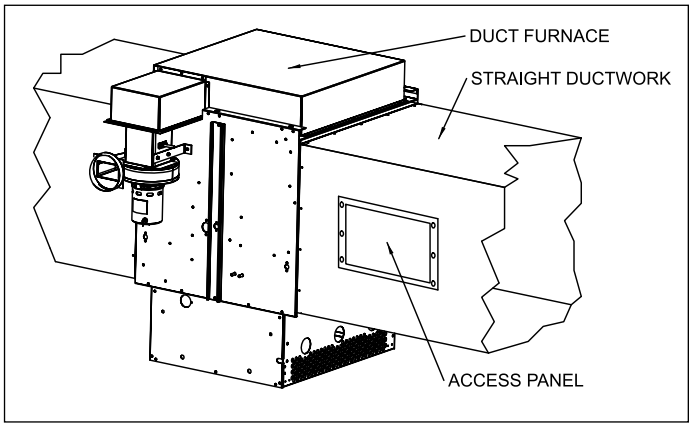
Figure 4.2 - Air Distribution Baffle Location
Baffle location shown on entering air side of duct furnace.

Airflow Reversal Note: If factory installed discharge air options (thermostat, freeze protection, etc.) were provided, these options would have to be relocated to the discharge air side of the duct furnace.

Duct Installation

1. The furnace is designed to accept straight ductwork. See Figure 4.3. Provide an airtight seal between the ductwork and the furnace. Seams with cracks in ductwork should be caulked and/or taped and be of permanent type. All duct connections MUST be airtight to prevent air leakage.
2. Provide removable access panels on both the upstream and downstream sides of the ductwork; see Figure 4.3. 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 heat exchangers due to poor air distribution or lack of sufficient air (CFM)

Figure 4.3 - Duct Connections



Airflow Distribution

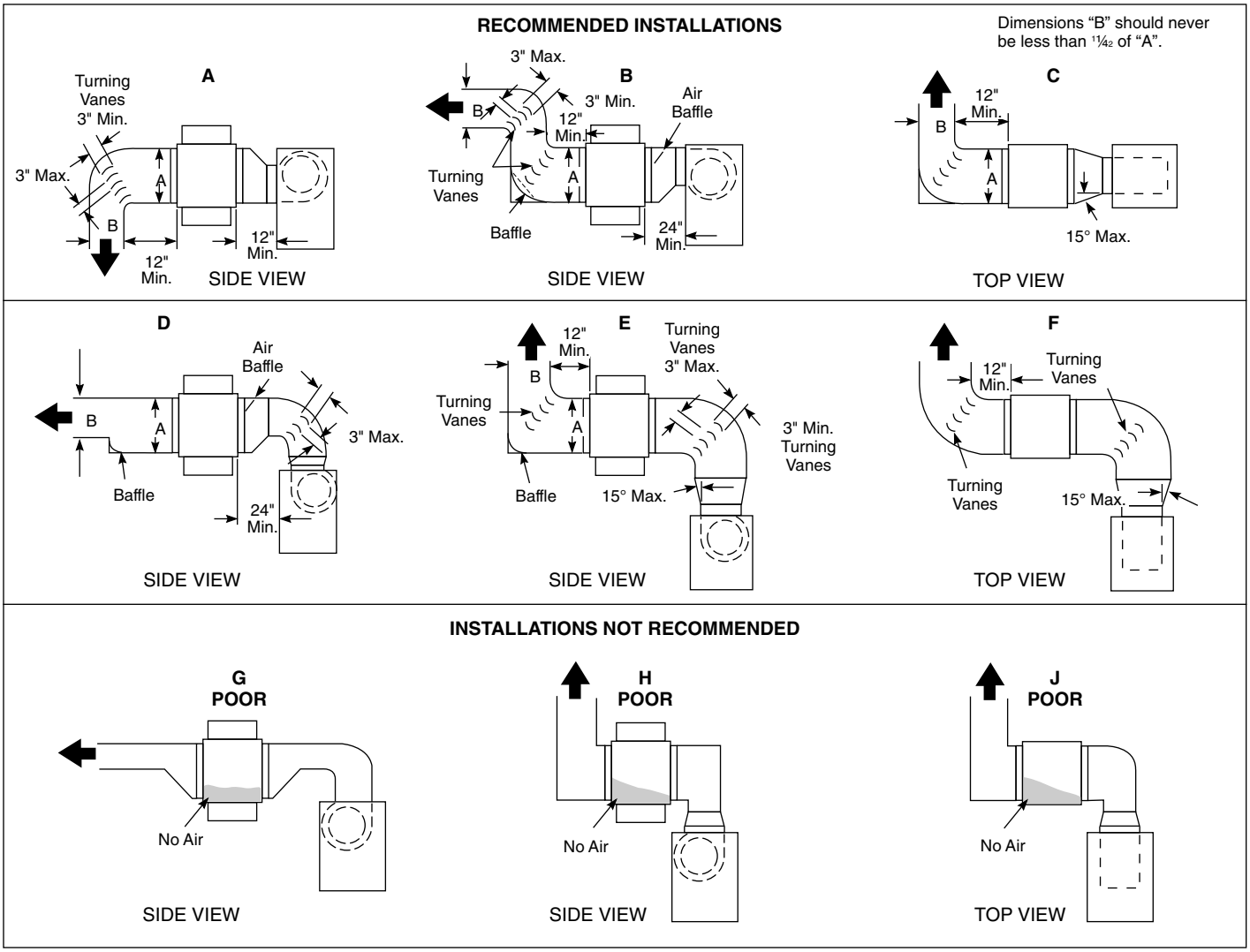
IMPORTANT

To prevent premature heat exchanger failure, observe heat exchanger tubes by looking at the heat exchanger through field installed access openings in connecting ductwork. If the bottom of the tubes become red while blower and duct furnace are in operation, additional baffles must be inserted between blower and duct furnace to assure uniform air flow across the heat exchanger.

1. Provide uniform air distribution over the heat exchanger. Use turning vanes where required (see Figure 5.1) to obtain uniform air distribution. Avoid installing as in “G”, “H” & “J” of Figure 5.1.
2. A bottom, horizontal discharge type blower should be installed at least 12" from the furnace (See “A”, Figure 5.1).
3. A top, horizontal discharge type blower should be installed at least 24" from the furnace (See “B”, Figure 5.1). Provide air baffle at top of duct to deflect air down to the bottom of heat exchanger.

INSTALLATION

Figure 5.1 - Typical Duct & Airflow Installation



INSTALLATION

Venting

⚠ WARNING

1. Gas fired heating equipment must be vented - do not operate unvented.
2. A built-in power exhauster is provided - additional external power exhausters are not required or permitted.
3. If you are replacing an existing heater, it may be necessary to resize the venting systems. Improperly sized venting systems can result in vent gas leakage or the formation of condensate. Refer to the National Fuel Gas Code ANSI Z223.1 or CSA B149.1 latest edition. Failure to follow these instructions can result in injury or death.
4. Under no circumstances should two sections of double wall vent pipe be joined together within one horizontal vent system due to the inability to verify complete seal of inner pipes.

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. Vent connectors serving Category I appliances shall not be connected into any portion of mechanical draft systems operating under positive pressure.

General Venting Instructions

1. Installation of venting must conform with local building codes, or in the absence of local codes, with 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.
2. All vertically vented units are Category I. All horizontally vented units are Category III. The installation must conform to the requirements from Table 6.2 in addition to those listed below.
3. For units vented as Category I, refer to Table 6.1 for vent sizing. Vent sizing for units vented as Category III are covered in a later section on page 7. Do not use a vent pipe smaller than the size of the outlet or vent transition of the appliance. The pipe should be suitable corrosion resistant material. Follow the National Fuel Gas Code for minimum thickness and composition of vent material. The minimum thickness for connectors varies depending on the pipe diameter.

Table 6.1 - Vertical Category I Vent Sizing Requirements

Model Size	Vent Connector Diameter	Minimum Vent Pipe Diameter
75-125	4"	4"
150-175	4"	5" ①
200	6"	6"
225-400	6”	6”

① Requires a 4" to 5" adapter for the larger vent pipe diameter.

4. For Category I vent systems 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 vertical vent as close to the unit as possible. A minimum of 12" straight pipe is recommended from the power exhauster outlet before turns in the vent system. Fasten individual lengths of vent together with at least three corrosion-resistant sheet-metal screws.
5. It is recommended that vent pipes be fitted with a tee with a drip leg and a clean out cap to prevent any moisture in the vent pipe from entering the unit. The drip leg should be inspected and cleaned out periodically during the heating season.
6. The National Fuel Gas Code requires a minimum clearance of 6 inches from combustible materials for single wall vent pipe. The minimum distance from combustible materials is based on the combustible material surface not exceeding 160°F. Clearance from the vent pipe (or the top of the unit) may be required to be greater than 6 inches if heat damage other than fire (such as material distortion or discoloration) could result.
7. Avoid venting through unheated space. When venting does pass through an unheated space, insulate runs greater than 5 feet to minimize condensation. Inspect for leakage prior to insulating and 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 and provide a drip leg with a clean out cap as shown in Figure 7.1.

Table 6.2 - 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.

8. When the vent passes through a combustible wall or floor, 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 appliance and where the vent pipe passes through the wall or floor, 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 6 inches of clearance. Any material used to close the opening must be noncombustible.
9. Do NOT use dampers or other devices in the vent pipes.
10. Precautions must be taken to prevent degradation of building materials by flue products.
11. For category I vent systems the outlet of the vent should extend as shown in Figure 7.1 and Table 7.1 if the following conditions are met:
    - Vent diameter is less than 12 inches, vent is of double wall construction and is a listed product, and the vent does not terminate within 2' of a vertical wall or similar obstruction.
    - For vents that have a diameter of 12 inches or larger, constructed of single wall, or terminate within 2' of a vertical wall or similar obstruction, the vent pipe shall extend at least 2' higher than any portion of a building within a horizontal distance of 10' (refer to Figure 7.1).
12. Use a listed vent terminal to reduce downdrafts and moisture in vent.
13. For instructions on common venting refer to the National Fuel Gas Code.
14. The vent must terminate no less than 5' above the vent connector for Category I vent systems.
15. A unit located within an unoccupied attic or concealed space shall not be vented with single wall vent pipe.
16. Single wall vent pipe must not pass through any attic, inside wall, concealed space, or floor.
17. Do NOT vent this appliance into a masonry chimney.
18. When condensation may be a problem, the venting system shall not terminate over public walkways or over an area where condensation or vapor could create a nuisance or hazard or could be detrimental to the operation of regulator relief openings or other equipment.
19. In cold ambient conditions, such as Canada, the following items are recommended for proper operation and equipment life:
    - The vent pipe must not pass through an unheated space or interior part of an open chimney unless the vent pipe is insulated.
    - Where the vent pipe may be exposed to extreme cold, or come into contact with snow or ice, the entire vent must be insulated or double wall (includes outdoors). It is preferred that the double wall vent is one continuous piece but a joint is allowed outside the building.
    - The heater system shall be checked at least once a year by a qualified service technician.

INSTALLATION

Figure 7.1 - Vertical Category I Vent System

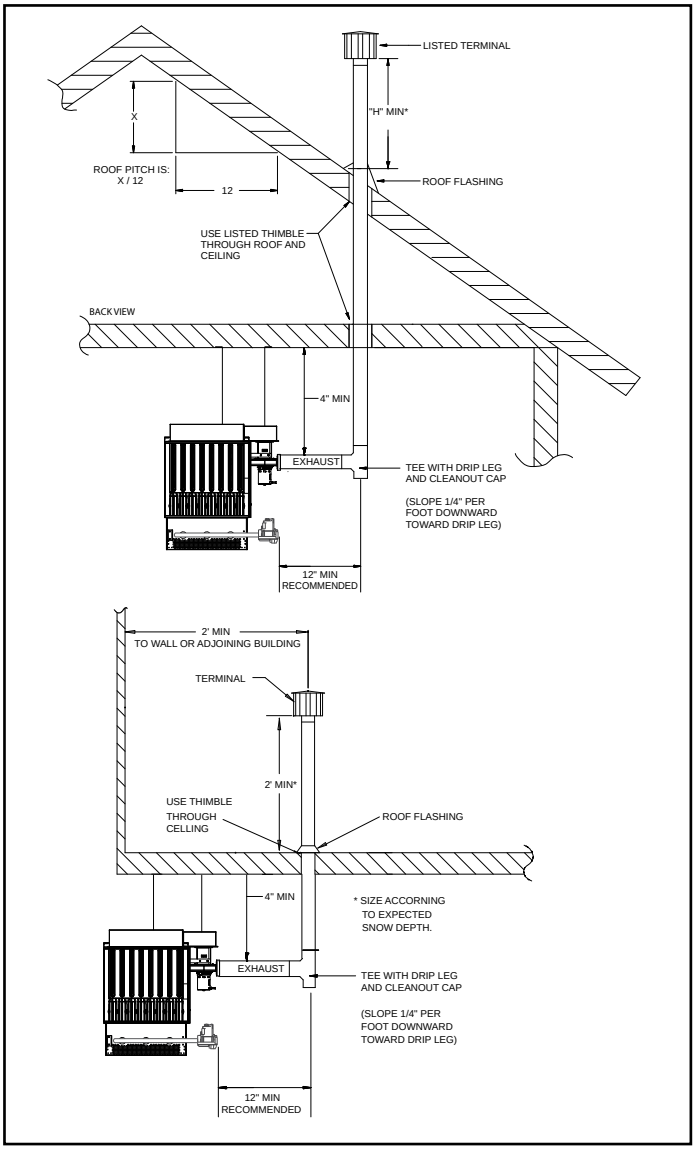


Table 7.1 - Minimum Height from Roof to Lowest Discharge Opening

Rise X (in)	Roof Pitch	Min Height H (ft) ①
0-6	Flat to 6/12	1.00
6-7	6/12 to 7/12	1.25
7-8	7/12 to 8/12	1.50
8-9	8/12 to 9/12	2.00
9-10	9/12 to 10/12	2.50
10-11	10/12 to 11/12	3.25
11-12	11/12 to 12/12	4.00
12-14	12/12 to 14/12	5.00
14-16	14/12 to 16/12	6.00
16-18	16/12 to 18/12	7.00
18-20	18/12 to 20/12	7.50
20-21	20/12 to 21/12	8.00

① Size according to expected snow depth.

Additional Requirements for Horizontally Vented Category III Units

1. Seal the joints with a metallic tape or silastic suitable for temperatures up to 350°F. (3M tapes 433 or 363 are acceptable.) Wrap tape two full turns around the vent pipe.
2. Refer to Table 7.2 for total minimum and maximum vent lengths making the vent system as straight as possible. The equivalent length of a 90° elbow is 5 feet for 4" diameter and 7 feet for 6" diameter.

Table 7.2 - Horizontal Category III Vent Sizing Requirements

Model Size	Vent Connector Diameter	Minimum Vent Pipe Diameter	Maxium Vent Length
75	4"	4"	48'
100-175	4"	4"	55'
200	6"	5" ①	70'
225	6"	6"	70'
250-300	6"	6"	63'
350-400	6"	6"	70'

① Unit can be vented with 5" diameter pipe if a 6" to 5" reducer is used. Otherwise, use 6" pipe.

3. The vent terminal must be a Gary Steel 1092.
4. The vent must extend a minimum of 12" beyond the exterior wall surface as shown in Figure 7.2. The vent must be supported as shown in Figure 7.3. Precautions must be taken to prevent degradation of building materials by flue products.
5. The vent system shall terminate at least 3 feet above any forced air inlet (except direct vent units) located within 10 feet, and at least 4 feet below, 4 feet horizontally from, or 1 foot above any door, window, or gravity air inlet into any building. The bottom of the vent terminal shall be located above the snow line or at least 1 foot above grade; whichever is greater. When located adjacent to public walkways the vent system shall terminate not less than 7 feet above grade.
6. The venting system must be exclusive to a single unit, and no other unit is allowed to be vented into it.
7. Horizontally vented units must use single wall vent pipe although one continuous section of double wall vent pipe may be used with the vent system. Under no circumstances should two sections of double wall vent pipe be joined together within one vent system due to the inability to verify complete seal of inner pipes.

Figure 7.2 - Horizontal Venting

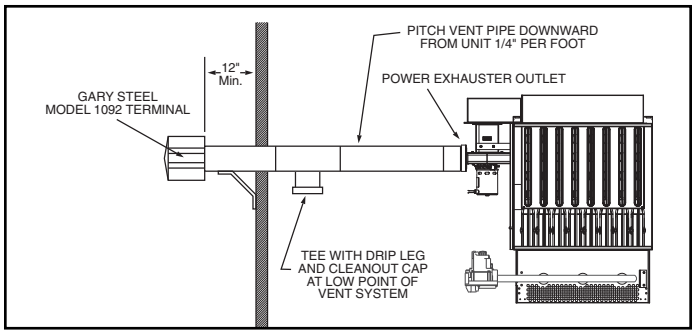
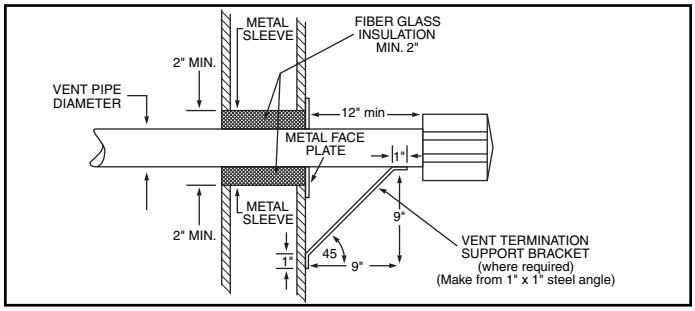


Figure 7.3 - Venting Through Combustible Walls



Gas Connections

⚠ WARNING

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
2. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).
3. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input, or 5% below the minimum rated input of duel rated units.

⚠ CAUTION

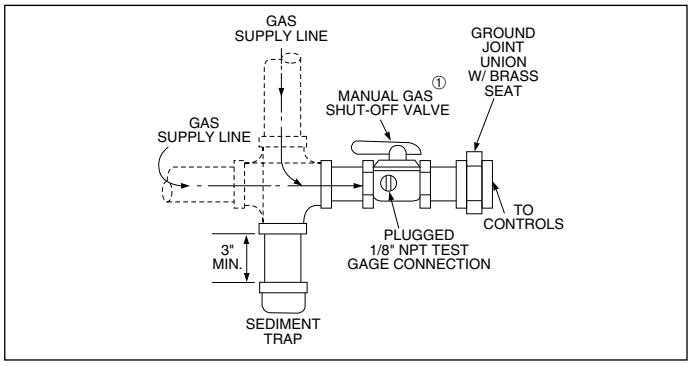
Purging of air from gas lines should be performed as described in ANSI Z223.1 - latest edition "National Fuel Gas Code", or in Canada in CAN/CGA-B149 codes.

IMPORTANT

To prevent premature heat exchanger failure, the input to the appliance, as indicated on the serial plate, must not exceed the rated input by more than 5%.

1. Installation of piping must conform with local building codes, or in the absence of local codes, with 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.
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 10.1 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 8.1. 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 8.1 allows for a 0.3" W.C. pressure drop in the supply pressure from the building main to the unit. The inlet pressure to the unit must be 6-7" W.C. for natural gas and 11-14" W.C. for propane gas. When sizing the inlet gas pipe diameter, make sure that the unit supply pressure can be met after the 0.3" W.C. has been subtracted. If the 0.3" W.C. pressure drop is too high, refer to the Gas Engineer's Handbook for other gas pipe capacities.
3. The gas piping to the unit can enter the unit from the side of the unit or from below. Install a ground joint union with brass seat and a manual shut-off valve external of the unit casing, and adjacent to the unit for emergency shut-off and easy servicing of controls, including a 1/8" NPT plugged tapping accessible for test gauge connection (See Figure 8.1).
4. Provide a sediment trap before each unit in the line where low spots cannot be avoided. (See Figure 8.1).
5. When Pressure/Leak testing, pressures above 14" W.C. (1/2 psi), close the field installed shut-off valve, disconnect the appliance and its combination gas control from the gas supply line, and plug the supply line before testing. When testing pressures 14" W.C. (1/2 psi) or below, close the manual shut-off valve on the appliance before testing.

Figure 8.1 - Recommended Sediment Trap/Manual Shut-off Valve Installation - Side or Bottom Gas Connection



① Manual shut-off valve is in the "OFF" position when handle is perpendicular to pipe.

Table 8.1 - Gas Pipe Capacities

Gas Pipe Capacities (Up to 14" W.C. Gas Pressure through Schedule 40 Pipe)
Cubic Feet per Hour with Pressure Drop of 0.3" W.C.
Natural Gas - Specific Gravity - 0.60
Propane Gas - Specific Gravity - 1.50

Length Of Pipe (feet)	Pipe Diameter											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
10	132	83	278	175	520	328	1050	662	1600	1008	3050	1922
20	92	58	190	120	350	221	730	460	1100	693	2100	1323
30	73	46	152	96	285	180	590	372	890	561	1650	1040
40	63	40	130	82	245	154	500	315	760	479	1450	914
50	56	35	115	72	215	135	440	277	670	422	1270	800
60	50	32	105	66	195	123	400	252	610	384	1150	725
70	46	29	96	60	180	113	370	233	560	353	1050	662
80	43	27	90	57	170	107	350	221	530	334	990	624
90	40	25	84	53	160	101	320	202	490	309	930	586
100	38	24	79	50	150	95	305	192	460	290	870	548
125	34	21	72	45	130	82	275	173	410	258	780	491
150	31	20	64	40	120	76	250	158	380	239	710	447

INSTALLATION / START-UP PROCEDURE

Electrical Connections

⚠ WARNING

1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
4. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage.

⚠ CAUTION

Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than rated voltage.

1. Installation of wiring must conform with local building codes, or in the absence of local codes, with the National Electric Code ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance to this code. In Canada, wiring must comply with CSA C22.1, Part 1, Electrical Code.
2. All duct furnaces are provided with a wiring diagram located on the inside door of the electrical junction box. Refer to this wiring diagram for all wiring connections. For factory installed options and field installed accessory wiring, refer to Set A and Set B on the provided wiring diagram.
3. The power supply to the duct furnace should be protected with a fused disconnect switch.
4. Refer to Table 9.1 to determine the amp draw of the duct furnace by adding the amp draw for the control transformer (includes ignition controllers, gas valves, control relays, and amplifiers) and power exhauster together, based on the voltage and model size. Size the disconnect switch to cover the amp draw of the unit.
5. Refer to the unit dimensional drawing on page 15 for the electrical knockout locations.

Table 9.1 - Unit Amps

Digit 14		Control Step Down Transformer Amp Draw					Power Exhauster Amp Draw	
Supply Voltage		Digit 15 - Transformer					Model Size	
		0 ①	1	2	3	4	75-175	200-400
A	115/60/1	0	0.35	0.65	1.3	2.17	1.4	2.4
B	208/60/1	0	0.19	0.36	0.72	1.2	0.7	1.4
C	230/60/1	0	0.17	0.33	0.65	1.09	0.6	1.3
D	208/60/3	0	0.19	0.36	0.72	1.2	0.7	1.4
E	230/60/3	0	0.17	0.33	0.65	1.09	0.6	1.3
F	460/60/3 ④	0	0.09	0.16	0.33	0.54	0.30 ②	0.65 ③
G	575/60/3 ④	0	0.07	0.13	0.26	0.43	0.24 ②	0.52 ③

① Unit controls amp draw is included in master unit amp draw.
② Requires a 250 VA transformer.
③ Requires a 500 VA transformer.
④ For Digits F (460V) and G (575V), amp draw shown is on primary (line) side of required step-down transformer.

START-UP PROCEDURE

IMPORTANT

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

1. Turn off power to the unit at the disconnect switch. Check that fuses or circuit breakers are in place and sized correctly. Turn all hand gas valves to the “OFF” position.
2. Check that the supply voltage matches the unit supply voltage listed on the serial plate. Verify that all wiring is secure and properly protected. Trace circuits to insure that the unit has been wired according to the wiring diagram.
3. Check to insure that the venting system is installed and free from obstructions.
4. Check to see that there are no obstructions to the intake and discharge of the duct furnace.
5. Perform a visual inspection of the unit to make sure no damage has occurred during installation.
6. Turn on power to the unit at the disconnect switch. Check to insure that the voltage between terminals 1 and 2 is 24V.
7. Check the thermostat, ignition control, gas valve, power exhauster motor, and supply fan blower motor for electrical operation. If these do not function, recheck the wiring diagram. Check to insure that none of the Gas Control Options & Accessories (see page 14) have tripped.
8. Recheck the gas supply pressure at the field installed manual-shut-off valve. The inlet pressure should be 6"-7” W.C. on natural gas and 11"-14” W.C. on propane gas. If inlet pressure is too high, install an additional pressure regulator upstream of the combination gas control.
9. Open the field installed manual gas shut-off valve.
10. Open the manual main gas valve on the combination gas control. Call for heat with the thermostat. On a call for heat, the power exhauster relay will energize the power exhauster motor. Once the power exhauster motor has reached full speed, the differential pressure switch will close. Once closed, the ignition controller will attempt to light the pilot. If the pilot does not light, purge the pilot line. If air purging is required, disconnect the pilot line at outlet of pilot valve. In no case should the line be purged into heat exchanger. Check the pilot flame length (See Pilot Burner Adjustment).
11. Once the pilot has been established, check to make sure that the main gas valve opens. Check the manifold gas pressure (See Main Burner Adjustment) and flame length (See Air Shutter Adjustment) while the circulating air blower is operating.
12. Check to insure that gas controls sequence properly (See Control Operating Sequence). Verify if the unit has any additional control devices and set according to the instructions in the Gas Controls Options.
13. Once proper operation of the duct furnace has been verified, remove any jumper wires that were required for testing.
14. Close the electrical compartment door.

START-UP PROCEDURE

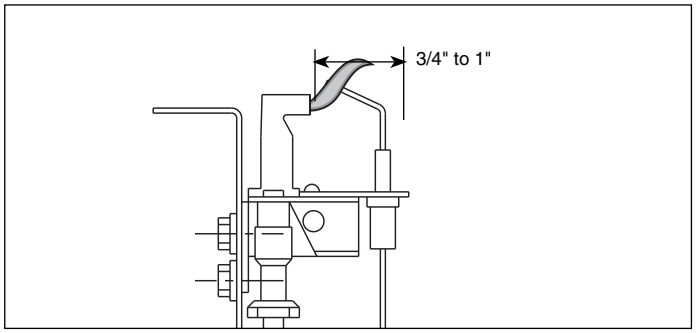
Pilot Burner Adjustment

The pilot burner 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. If the pilot flame is too long or large, it is possible that it may cause soot and/or impinge on the heat exchanger causing failure. 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.

To Adjust the Pilot Flame

1. Create a call for heat from the thermostat.
2. Remove the cap from the pilot adjustment screw. For location, see the combination gas control literature supplied with unit.
3. Adjust the pilot length by turning the screw in or out to achieve 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 (See Figure 10.1).
4. Replace the cap from the pilot adjustment screw.

Figure 10.1 - Correct Pilot Flame

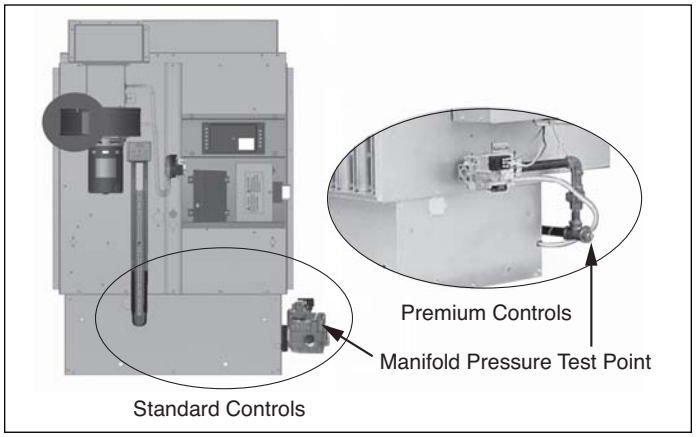


Main Burner Adjustment

The gas pressure regulator (integral to the combination gas control) is adjusted at the factory for average gas conditions. It is important that gas be supplied to the duct furnace in accordance with the input rating on the serial plate. Actual input should be checked and necessary adjustments made after the duct furnace is installed. Over-firing, a result of too high an input, reduces the life of the appliance and increases maintenance. Under no circumstances should the input exceed that shown on the serial plate.

Measuring the manifold pressure is done at the tee in the manifold for premium gas controls (Digit 13=0, 1, 2, or 3) or at the pressure tap on the gas valve for standard gas controls (Digit 13=4)." (See Figure 10.2).

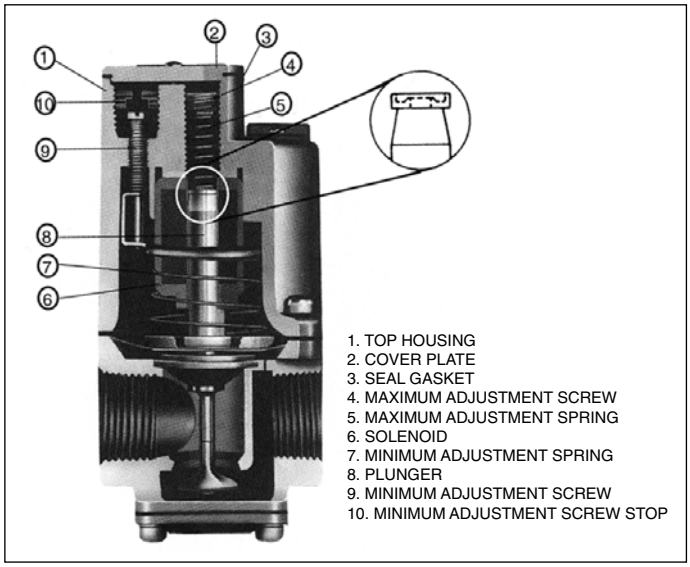
Figure 10.2 - Manifold Pressure Test Points



To Adjust the Manifold Pressure

1. Move the field installed manual shut-off valve to the “OFF” position.
2. Remove the 1/8" pipe plug in the pipe tee or gas valve and attach a water manometer of “U” tube type which is at least 12" high.
3. Move the field installed manual gas shut-off valve to the “ON” position.
4. Create a high fire call for heat from the thermostat.
5. Determine the correct high fire manifold pressure. For natural gas 3.5” W.C., for propane gas 10” W.C. Adjust the main gas pressure regulator spring to achieve the proper manifold pressure (for location, see the combination gas control literature supplied with unit).
6. If the unit has Electronic Modulation gas controls (determine from the Model Identification Digit 12), the low fire gas pressure needs to be adjusted. Using Figure 10.3 for item number locations, this is accomplished as follows:
   a. Disconnect power.
   b. Remove all wires from Maxitrol Amplifier terminal “3” or duct furnace terminal “43” (if available).
   c. Turn on power at the disconnect switch.
   d. Remove the maximum adjustment screw (4), spring (5), and plunger (8). A small magnet is useful for this purpose. CAUTION - The plunger is a precision part. Handle carefully to avoid marring or picking up grease and dirt. Do not lubricate.
   e. Using minimum adjusting screw (9), adjust low fire manifold pressure to 0.56" W.C. for natural gas and 1.6" W.C. for propane gas.
   f. Replace plunger and spring retainer, spring, and maximum adjusting screw in proper order.
   g. Using maximum adjustment screw (4), adjust high fire manifold pressure to 3.5" W.C. for natural gas and 10" W.C. for propane gas.
   h. Disconnect power.
   i. Replace cover plate (2) and re-install all wires from Maxitrol amplifier terminal “3” or duct furnace terminal “43”.
7. After adjustment, move the field installed manual shut-off valve to the “OFF” position and replace the 1/8" pipe plug.
8. After the plug is in place, move the field installed manual shut-off valve to the “ON” position and recheck pipe plugs for gas leaks with soap solution.

Figure 10.3 - Maxitrol Modulating Valve Adjustments



Air Shutter Adjustment

Proper operation provides a soft blue flame with a well-defined inner core. A lack of primary air will reveal soft yellow-tipped flames. Excess primary air produces short, well-defined flames with a tendency to lift off the burner ports. For both natural and propane gas, the air shutters can be adjusted to control the burner flame height. The air shutters can be accessed by reaching behind the gas valve in Figure 10.3. The larger models may require the removal of the manifold (see Manifold Assembly Removal).

Natural Gas Flame Control

Control of burner flames on duct furnaces utilizing natural gas is achieved by resetting the primary air shutters (See Figure 19.1) to either increase or decrease primary combustion air. Prior to flame adjustment, operate duct furnace for about fifteen minutes. The main burner flame can be viewed after loosening and pushing aside the gas designation disc on the side of the burner box.

To increase primary air, loosen the air shutter set screws and move the air shutters closer to the manifold until the yellow-tipped flames disappear. (See Figure 19.1 for air shutter and heat exchanger support locations.) To decrease primary air, move the air shutters away from the manifolds until flames no longer lift from burner ports, but being careful not to cause yellow tipping. Retighten set screws after adjustment.

Propane Gas Flame Control

An optimum flame will show a slight yellow tip. Prior to flame adjustment, operate furnace for at least fifteen minutes. Loosen air shutter set screws and move the air shutters away from the manifold to reduce the primary air until the yellow flame tips appear. Then increase the primary air until yellow tips diminish and a clean blue flame with a well defined inner cone appears.

Table 11.1 - Manifold Pressure and Gas Consumption

Model Size	Type of Gas	Natural	Propane	
	Btu/Cu. Ft.	1040	2500	
	Specific Gravity	0.60	1.53	
High Fire Manifold Pressure Inches of Water Column		3.5	10	No. of Orifices
75	Cfh Orifice Drill Size	72.1 20	30.0 37	1
100	Cfh Orifice Drill Size	96.1 30	40.0 45	2
125	Cfh Orifice Drill Size	120.2 25	50.0 42	2
150	Cfh Orifice Drill Size	144.2 30	60.0 45	3
175	Cfh Orifice Drill Size	168.3 27	70.0 43	3
200	Cfh Orifice Drill Size	192.3 23	80.0 40	3
225	Cfh Orifice Drill Size	216.3 20	90.0 37	3
250	Cfh Orifice Drill Size	240.4 25	100.0 42	4
300	Cfh Orifice Drill Size	288.7 20	120.0 37	4
350	Cfh Orifice Drill Size	336.5 27	140.0 43	6
400	Cfh Orifice Drill Size	384.6 23	160.0 40	6

IMPORTANT

To prevent premature heat exchanger failure, with all control systems, a blower starting mechanism must be provided so that the blower is running or energized within 45 seconds of the gas control operation.

Control Operating Sequence

Indoor power vented duct furnaces are supplied with intermittent pilot systems with continuous retry as standard. On mechanical modulation systems the main burner is turned off 100% when the thermostat is satisified, but the pilot remains lit. For intermittent pilot systems, except mechanical modulation both the main burner and pilot burner are turned off 100% when the thermostat is satisfied. Intermittent pilot systems, for both natural and propane gas, the ignition controller is 100% shut-off with continuous retry. On a call for heat, the system will attempt to light the pilot for 70 seconds. If the pilot is not sensed for any reason, the ignition control will wait for approximately six minutes with the combination gas control closed and no spark. After six minutes, the cycle will begin again. After three cycles, some ignition controllers lockout for approximately one hour before the cycle begins again. This will continue indefinitely until the pilot flame is sensed or power is interrupted to the system.

NOTE: Gas Control Options (see page 14) could change the listed sequence of operation based on their function. The descriptions given are for the basic duct furnace.

Single-Stage Gas Controls

Utilizes a single-stage combination gas, an ignition control, and a single-stage low voltage thermostat.

1. The thermostat calls for heat.
2. The power exhauster relay is energized starting the power exhauster motor. Once the motor has reached full speed, the differential pressure switch closes. The power exhauster relay pre-purge timer closes after 20 to 40 seconds energizing the gas control circuit.
3. The pilot valve opens and the spark ignitor sparks in an attempt to light the pilot. (If the unit was not provided with a time delay relay, the blower starts at this time.)
4. Once the pilot is lit, the flame sensor proves the pilot and stops the spark ignitor from sparking.
5. The main gas valve is opened and the main burner is lit to 100% full fire.
6. If the unit was provided with a time delay relay, the blower starts after 30 to 45 seconds.
7. The unit continues to operate until the thermostat is satisfied, at which time both the main and pilot valves close 100%. (If the unit was not provided with a time delay relay, the blower stops at this time).
8. If the unit was provided with a time delay relay, the blower stops after 30 to 45 seconds.

Two-Stage Gas Controls

Utilizes a two-stage combination gas control, an ignition control, and a two-stage low voltage thermostat. The unit fires at 50% fire on low stage and 100% fire on high stage.

1. The thermostat calls for low stage heat.
2. The power exhauster relay is energized starting the power exhauster motor. Once the motor has reached full speed, the differential pressure switch closes. The power exhauster relay pre-purge timer closes after 20 to 40 seconds energizing the gas control circuit.
3. The pilot valve opens and the spark ignitor sparks in an attempt to light the pilot. (If the unit was not provided with a time delay relay, the blower starts at this time.)
4. Once the pilot is lit, the flame sensor proves the pilot and stops the spark ignitor from sparking.
5. The main gas valve is opened and the main burner is lit to 50% fire.
6. If the unit was provided with a time delay relay, the blower starts after 30 to 45 seconds.
7. If the temperature at the thermostat continues to fall, the thermostat will call for high stage heat.
8. The main gas valve is opened completely and the main burner is lit to 100% full fire.
9. The unit continues to operate until the high stage of the thermostat is satisfied, at which time the main valve closes to 50% fire.
10. The unit continues to operate until the low stage thermostat is satisfied, at which time both the main and pilot valves close 100%. (If the unit was not provided with a time delay relay, the blower stops at this time.)
11. If the unit was provided with a time delay relay, the blower stops after 30 to 45 seconds.

Mechanical Modulating Gas Controls (Natural Gas Only)

	Dial Number									
	Lo	1	2	3	4	5	6	7	8	Hi
Discharge Air Temp. (°F)	58	62	65	69	72	76	79	83	86	90

Utilizes a mechanical modulating gas control and an ignition control. The mechanical modulating gas control is designed for use in constant blower applications. The discharge air temperature is maintained by setting the control dial of the modulating gas valve in one of ten positions. A hydrostatic sensing bulb located in the discharge air stream controls the gas flow between 40% through 100% full fire. When the discharge air hydrostatic sensing bulb is satisfied, the modulating valve closes completely, but the pilot remains lit.
This control cannot be used with a room override thermostat.

1. Power is supplied to the unit through either an exhaust fan interlock contact or a start/stop switch.
2. The power exhauster relay is energized starting the power exhauster motor. Once the motor has reached full speed, the differential pressure switch closes. The power exhauster relay pre-purge timer closes after 20 to 40 seconds energizing the gas control circuit.
3. The pilot valve opens and the spark ignitor sparks in an attempt to light the pilot. (If the unit was not provided with a time delay relay, the blower starts at this time.)
4. Once the pilot is lit, the flame sensor proves the pilot and stops the spark ignitor from sparking.
5. The hydrostatic sensing bulb, integral to the mechanical modulating gas valve, calls for heat. The main gas valve is opened and the main burner is lit. The burner modulates between 40% through 100% fire based on the call for heat.
6. If the unit was provided with a time delay relay, the blower starts after 30 to 45 seconds.
7. The unit continues to operate until the hydrostatic sensing bulb is satisfied, at which time the main valve closes 100%, but the pilot remains lit.
8. The unit blower (and pilot) continues to operate until either an exhaust fan interlock contact or a start/stop switch is opened. If the unit was provided with a time delay relay, the blower stops after 30 to 45 seconds.

START-UP PROCEDURE

Electronic Modulating Gas Controls

Single Furnace

Utilizes an electronic modulating/regulating gas control, combination gas valve, an ignition control, modulating amplifier, and either a modulating room thermostat or modulating duct thermostat with remote temperature set point adjuster. The thermostat controls can modulate the gas flow between 40% through 100% full fire. When the thermostat is satisfied, the amplifier cuts power to the combination gas valve which prevents gas flow to both the main and pilot burners.

When duct sensing is utilized, a room override thermostat can be added. When calling for heat, the room override thermostat provides full fire operation until the space temperature is satisfied. Control is then returned to the duct sensing control. In this situation, either the duct sensor or the room override thermostat can call for heat.

1. The thermostat calls for heat.
2. The power exhauster relay is energized starting the power exhauster motor. Once the motor has reached full speed, the differential pressure switch closes. The power exhauster relay pre-purge timer closes after 20 to 40 seconds energizing the gas control circuit.
3. The pilot valve opens and the spark ignitor sparks in an attempt to light the pilot. (If the unit was not provided with a time delay relay, the blower starts at this time.)
4. Once the pilot is lit, the flame sensor proves the pilot and stops the spark ignitor from sparking.
5. The main gas valve is opened and the main burner is lit to 100% full fire.
6. If the unit was provided with a time delay relay, the blower starts after 30 to 45 seconds.
7. The modulating gas valve can be controlled by either an electronic modulating room or duct thermostat. The thermostat can modulate the firing rate between 40% through 100% full fire. The call for heat is created by a resistance signal (8000 to 12000 ohms) in the thermostat. The amplifier converts this resistance into a DC voltage (0 to 12 volts DC with 0 volts high fire and 12 volts low fire). The output voltage is applied to the modulating gas valve to control the gas flow to the main burner. As the temperature drops, the voltage drops causing the modulating valve to open further. If the discharge air temperature increases, the voltage increases causing the modulating valve to close allowing less gas flow to the main burner. For further information regarding the operation of the electronic modulating system, consult the literature provided with the unit.
8. The unit continues to operate in this manner until the thermostat is satisfied, at which time both the main and pilot valves close 100%. (If the unit was not provided with a time delay relay, the blower stops at this time.)
9. If the unit was provided with a time delay relay, the blower stops after 30 to 45 seconds.

Electronic Modulating Gas Controls - Master/Slave

One Master furnace is provided with up to three Slave furnaces that utilize electronic modulating/regulating gas controls, combination gas valves, ignition controls, one multiple furnace modulating amplifier, and either a modulating room thermostat or modulating duct thermostat with remote temperature adjuster. The thermostat controls can modulate the gas flow of all the furnaces between 40% through 100% full fire. The amplifier sends a signal to all of the gas valves so that they modulate at the same percentage. When the thermostat is satisfied, the amplifier cuts power to the combination gas valves which prevents gas flow to both the main and pilot burners.

When duct sensing is utilized, a room override thermostat can be added. When calling for heat, the room override thermostat provides full fire operation until the space temperature is satisfied. Control is then returned to the duct sensing control. In this situation, either the duct sensor or the room override thermostat can call for heat.

The sequence of operation for Electronic Modulating Gas Controls - Master/Slave is the same as Electronic Modulating Gas Controls - Single Furnace.

Electronic Modulating Gas Controls - Building Management Control (0-10Vdc or 4-20 mA Signal)

Utilizes an electronic modulating/regulating gas control, combination gas valve, an ignition control, modulating signal conditioner, and an inverted (0 Vdc or 4 mA being high fire and 10 Vdc or 20 mA being low fire) 0-10 Vdc or 4-20 mA input signal provided by a Building Management System (BMS). The signal conditioner can modulate the gas flow between 40% through 100% full fire. When the BMS thermostat (field supplied) is satisfied, the BMS heat contact (field supplied) opens to cut power to the combination gas valve which prevents gas flow to both the main and pilot burners.

1. The BMS thermostat (field supplied) calls for heat and closes the BMS heat contact (field supplied).
2. The power exhauster relay is energized starting the power exhauster motor. Once the motor has reached full speed, the differential pressure switch closes. The power exhauster relay pre-purge timer closes after 20 to 40 seconds energizing the gas control circuit.
3. The pilot valve opens and the spark ignitor sparks in an attempt to light the pilot. (If the unit was not provided with a time delay relay, the blower starts at this time.)
4. Once the pilot is lit, the flame sensor proves the pilot and stops the spark ignitor from sparking.
5. The main gas valve is opened and the main burner is lit to 100% full fire.
6. If the unit was provided with a time delay relay, the blower starts after 30 to 45 seconds.
7. The modulating gas valve is controlled by the BMS thermostat. The thermostat can modulate the firing rate between 40% through 100% full fire by modulating the input signal between either 0-10 Vdc or 4-20 mA (The signal conditioner can accept a 0-10 Vdc signal when all the dip switches are in the “OFF” position and 4-20 mA signal when all the dip switches are in the “ON” position). The signal conditioner converts the input signal into a DC voltage (0 to 12 volts DC with 0 volts high fire and 12 volts low fire). The output voltage is applied to the modulating gas valve to control the gas flow to the main burner. As the temperature drops, the voltage drops causing the modulating valve to open further. If the discharge air temperature increases, the voltage increases causing the modulating valve to close allowing less gas flow to the main burner. For further information regarding the operation of the electronic modulating system, consult the literature provided with the unit.
8. The unit continues to operate in this manner until the thermostat is satisfied, at which time the BMS heat contact opens resulting in both the main and pilot valves closing 100%. (If the unit was not provided with a time delay relay, the blower stops at this time.)
9. If the unit was provided with a time delay relay, the blower stops after 30 to 45 seconds.

Variable Air Movement Applications

When the air mover supplied by others can provide variable air movement (i.e. 2-speed or variable frequency drive units), the allowable minimum CFM of the duct furnace can be 66% of the minimum listed CFM in Table 16.1 if the unit is applied as follows:

1. The unit is provided with 2-stage, mechanical modulation, or electronic modulating gas controls. (see Model Identification).
2. The unit is provided with a factory installed discharge air controller.
3. The system does not include a room thermostat.

The factory installed discharge air thermostat will prevent the unit from firing above the allowable 100°F rise when the unit is at or above the minimum CFM by monitoring the discharge air and going to low fire. A room thermostat, because it is located remote from the unit, could cause the unit to over-fire.

OPTIONS

Gas Control Options

The unit must be reviewed to determine if any of the listed gas control options were supplied.

① Time Delay Relay

The Time Delay Relay is factory installed in the duct furnace electrical junction box. The standard duct furnace is provided for instantaneous fan operation. On a call for heat, the blower is energized at the same time as the gas controls. The optional time delay relay allows the gas controls to operate for approximately 30 seconds before the blower starts. This allows the heat exchanger a warm up period so that the initial delivered air coming out of the ductwork is not cool. The time delay relay also keeps the motor running for approximately 30 seconds after the call for heat has been satisfied to remove the residual heat from the heat exchanger.

② Low Gas Pressure Switch

The low gas pressure switch is factory installed in the duct furnace above the gas train. The switch monitors the gas pressure upstream of all the gas controls and shuts off the electric supply to the ignition controller and combination gas valve if low gas pressure is experienced. This will shut off all gas flow to the burner. The switch has an automatic reset so that if the gas pressure is interrupted and then is returned, the switch will automatically allow the unit to operate when gas conditions are returned to the allowable range of the pressure switch. The pressure switch range is 2" to 14" W.C. and should be set to insure that the minimum inlet gas pressure is available (6" W.C. for natural gas, 11" W.C. for propane gas).

③ High Gas Pressure Switch

The high gas pressure switch is factory installed in the duct furnace above the gas train. The switch monitors the gas pressure downstream of all the gas controls and shuts off the electric supply to the ignition controller and combination gas valve if high gas pressure is experienced right before the manifold. This will shut off all gas flow to the burner. The switch has a manual reset so that if the gas pressure is too high, a service person must check the unit to make sure that none of the gas controls have been damaged by the high gas pressure and then reset the switch to allow the unit to operate when gas conditions are returned to the allowable range of the pressure switch. The pressure switch range is 2" to 16" W.C. and should be set to insure that the maximum manifold gas pressure is not exceeded (3.5" W.C. for natural gas, 10" W.C. for propane gas).

④ Supply Air Fire Stat

The fire stat is factory installed in the duct furnace electrical junction box with the sensor in the discharge air stream. In case of elevated temperatures in the supply air, the manual reset switch shuts down the entire unit. If the limit temperature is exceeded, a service person must inspect the unit for the cause of the high discharge temperature, take corrective action, and then reset the switch.

⑤ Timed Freeze Protection

The timed freeze protection system is factory installed in the duct furnace electrical junction box with the sensor (30°-75°F adjustable) factory installed in discharge air stream. On initial start-up, the timed delay in the system allows the unit to go through the normal ignition sequence. The timed delay is an automatic reset switch and adjustable for 1-10 minutes. In the event that the unit fails to fire after this period, the discharge air sensor will sense the cold air and will shut down the entire unit.

⑥ Air Flow Proving Switch

The air flow proving switch is factory installed in the duct furnace electrical junction box. The air flow proving switch monitors the pressure differential between the duct furnace and the atmosphere. The purpose of the air flow proving switch is to cut power to the gas controls if a positive pressure is not measured by the switch. This could be caused by a lack of air movement through the heat exchanger.

NOTE: The air flow proving switch will prevent any heat exchanger warm-up (the unit should not be equipped with a time delay relay) because the gas controls can not be energized until air flow is proven.

Setting the Air Flow Proving Switch

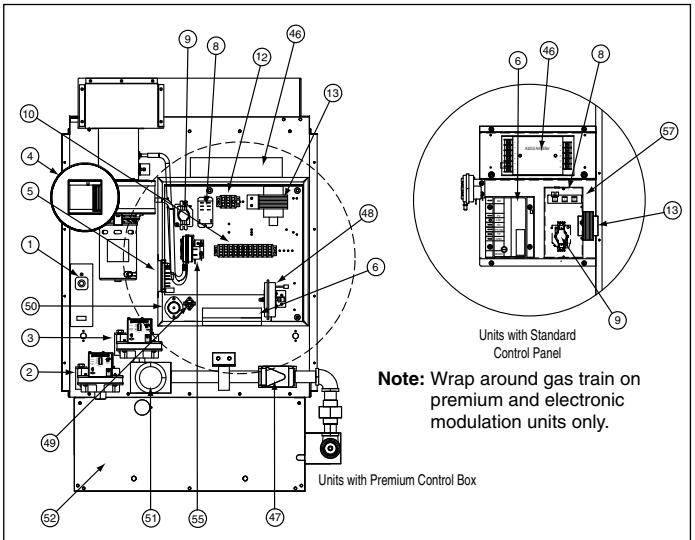
The range of the air flow proving switch is adjustable between 0.17" to 5.0" W.C.

1. Set the thermostat so that there is a call for heat. This should fire the burner and the blower should start.
2. Turn the set screw of the pressure switch clockwise until it stops. This will set the pressure at 5.0" W.C.
3. Turn the screw counter-clockwise until the gas controls light and then one additional full turn (This is approximately 0.25" W.C.). This will allow for dirty filters or any other slight static pressure increases in the system.

⑦ Manual Reset High Limit

The manual reset high limit switch is factory installed in place of the standard automatic reset high limit switch located in the duct furnace electrical junction box. In case of a failure of the blower motor, blockage of the inlet air, etc., the manual reset switch prevents the unit from cycling on the high limit. If the limit temperature is exceeded, a service person must inspect the unit for the cause of the high discharge temperature, take corrective action, and then reset the switch.

Figure 14.1 - Location of Gas Control Options



1. Discharge Thermostat
2. Low Gas Pressure Switch
3. High Gas Pressure Switch
4. Power Exhauster
5. Timed Freeze Protection
6. Ignition Controller
8. Control Relay
9. Time Delay Relay
10. Furnace Low Voltage Terminal Strip
12. Furnace Supply Power Terminal Strip
13. Control Step Down Transformer
46. Electronic Modulating Amplifier
47. Electronic Modulating Gas Valve
48. Air Flow Proving Switch
49. High Limit Switch
50. Supply Air Fire Stat
51. Main Gas Valve
52. Burner Box
55. Differential Pressure Switch
57. Control Terminal Board

DIMENSIONAL DATA

Figure 15.1 - Indoor Power Vented Duct Furnace Dimensions

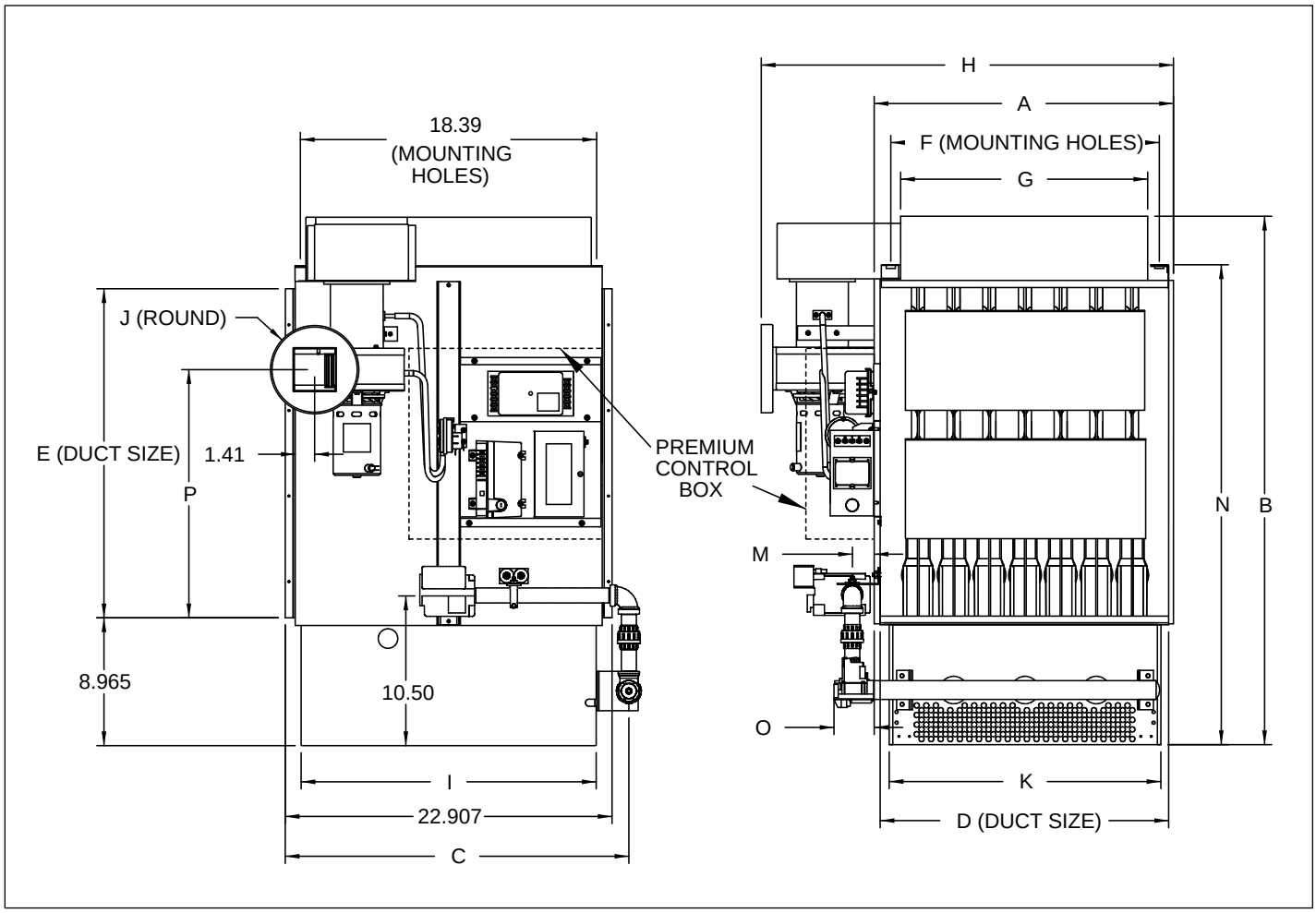


Table 15.1 - Indoor Power Vented Duct Furnace Dimensions

(All Dimensions in inches)		Model Size					
Dimensions		**75**	**100/125**	**150/175**	**200/225**	**250/300**	**350/400**
A		15.41	17.90	22.16	24.29	27.33	38.83
B		33.05	33.05	33.05	37.05	37.05	37.05
C (standard)		22.43	22.43	22.43	24.09	24.09	24.09
D		15.21	17.70	21.96	24.09	27.13	38.63
E		19.07	19.07	19.07	23.07	23.07	23.07
F		14.09	16.59	20.85	22.98	26.01	37.51
G		12.65	15.14	19.41	21.60	24.60	36.14
H		23.75	26.26	30.51	32.78	35.79	47.32
I		17.83	17.83	17.83	20.68	20.68	20.68
J		4	4	4	6	6	6
K		14.55	17.04	21.31	23.26	26.44	37.80
M		2.01	2.01	2.01	1.94	1.94	1.94
N		29.65	29.65	29.65	33.65	33.65	33.65
O (max. approx.) (standard)		5.6	5.6	5.6	6.8/6.2	6.2	8.3/8.6
P		14.03	14.03	14.03	17.40	17.40	17.40
Gas Connection Pipe Size (max. std.)		1/2	1/2	1/2	1/2 / 3/4	3/4	3/4
Gas Connection Pipe Size (max. prem.)		3/4	3/4	3/4	3/4	3/4	3/4
Approx. Weight	**Unit Shipping**	101#	125#	152#	187#	225#	296#
	Unit Net	85#	107#	133#	167#	193#	263#

PERFORMANCE

Table 16.1 - Air Temperature Rise - Power Vented Indoor Duct Furnaces ① ②

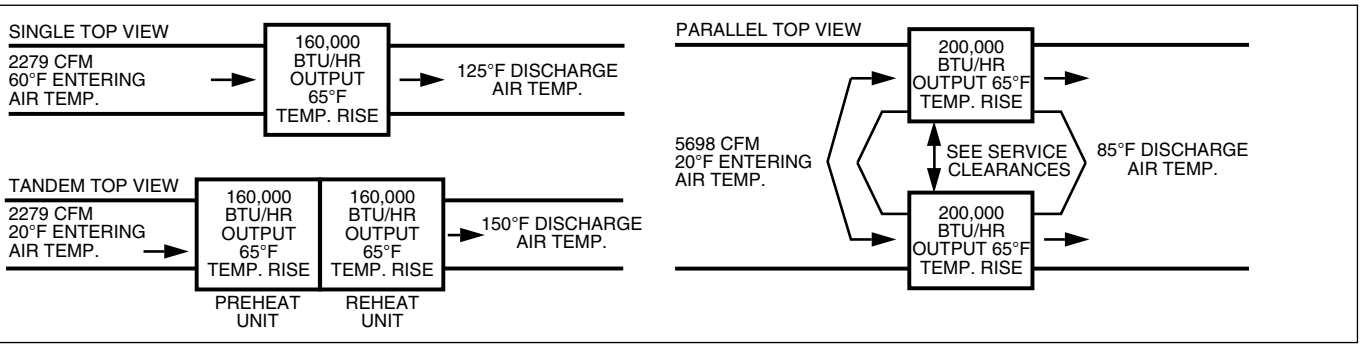
Model Size	Btu/Hr			Air Temperature Rise Through Unit (°F)											
			20 ③	40 ③	50 ③	60	65	70	75	80	85	90	95	100 ④
	Input	Output	Max	CFM										Min
75	75,000	60,000	2778	1389	1111	926	855	794	741	694	654	617	585	556
100	100,000	80,000	3704	1852	1481	1235	1140	1058	988	926	871	823	780	741
125	125,000	100,000	4630	2315	1852	1543	1425	1323	1235	1157	1089	1029	975	926
150	150,000	120,000	5556	2778	2222	1852	1709	1587	1481	1389	1307	1235	1170	1111
175	175,000	140,000	6481	3241	2593	2160	1994	1852	1728	1620	1525	1440	1365	1296
200	200,000	160,000	7407	3704	2963	2469	2279	2116	1975	1852	1743	1646	1559	1481
225	225,000	180,000	8333	4167	3333	2778	2564	2381	2222	2083	1961	1852	1754	1667
250	250,000	200,000	9259	4630	3704	3086	2849	2646	2469	2315	2179	2058	1949	1852
300	300,000	240,000	11111	5556	4444	3704	3419	3175	2963	2778	2614	2469	2339	2222
350	350,000	280,000	11111⑤	6481	5185	4321	3989	3704	3457	3241	3050	2881	2729	2593
400	400,000	320,000	11111⑤	7407	5926	4938	4558	4233	3951	3704	3486	3292	3119	2963

① Ratings are shown for elevations up to 2000 feet. For higher elevations, the input rating should be reduced at the rate of 4% per 1000 feet elevation above sea level. For Canada, in elevations between 2000 and 4500 feet, the unit must be derated to 90% of the rating listed above.
② Units approved for use in California by CEC.
③ Power vented indoor duct furnaces are supplied with a factory installed air baffle. For applications where an air tempature rise less than 60°F is desired, it is recomended to remove this baffle to reduce system pressure drop.
④ For Variable Air Movement Applications, see page 13.
⑤ The maximum CFM for the 350 and 400 results in a 23°F and a 27°F air temperature rise (respectively) based on the maximum unit pressure drop.

Air Temperature and External Static Pressure Limits

The maximum allowable discharge air temperature is 150°F. The maximum allowable air temperature rise for all Power Vented Units is 100°F. All duct furnaces are designed for a maximum allowable static pressure of 3.0" W.C. on the heat exchanger.

Figure 16.1 - Recommended Unit Configurations



PRESSURE DROP CURVES

Figure 17.1 - Indoor Duct Furnace Without Baffle Pressure Drop vs CFM curves

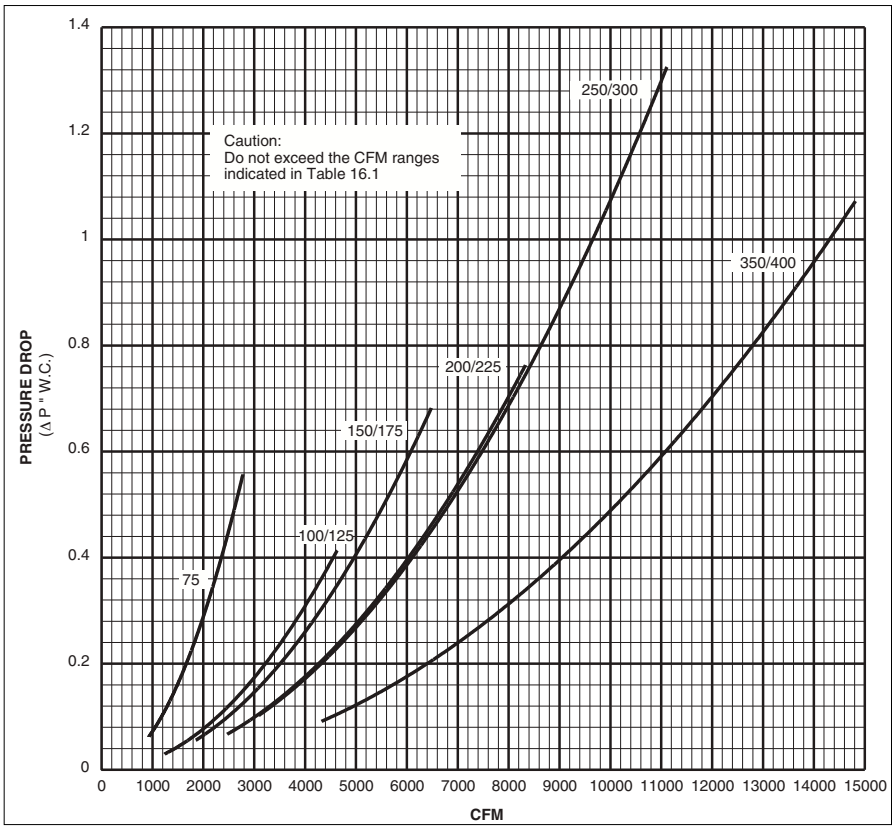
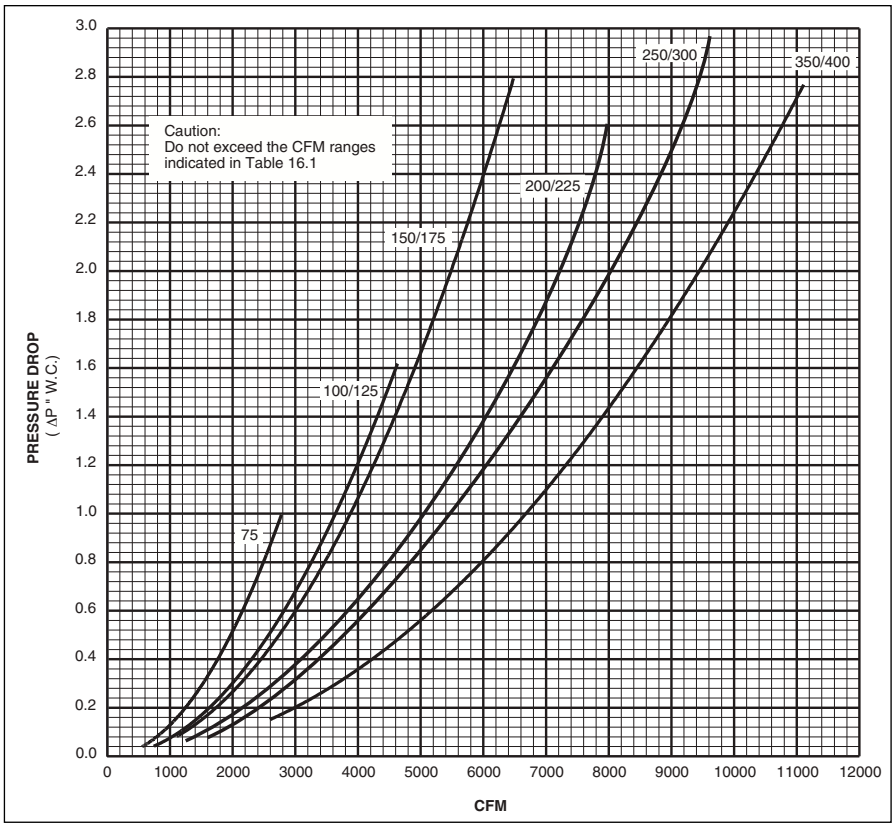


Figure 17.2 - Indoor Duct Furnace With Baffle Pressure Drop vs CFM curves



⚠ WARNING

When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the appliance for complete appliance model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at the owner's risk.

⚠ CAUTION

Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.

IMPORTANT

To check most of the Possible Remedies in the troubleshooting guide listed in Table 20.1, refer to the applicable sections of the manual.

All installation and service of these units must be performed by a qualified installation and service agency. All heating equipment should be serviced before each heating season to assure proper operations. The following items may be required to have more frequent service schedule based on the environment in which the unit is installed, and the frequency of the equipment operation.

Before any service, BE SURE TO TURN OFF GAS AT THE MANUAL SHUT-OFF VALVE AHEAD OF THE COMBINATION GAS CONTROL AND TURN OFF ALL ELECTRIC POWER TO THE HEATER AND AIR MOVING SYSTEM.

Blower Assembly

The blower assembly includes the bearings, drive sheaves and belts.

Blower bearings should be checked and lubricated based on the blower manufacturer's recommendations. Bearings should also be checked for any unusual wear and replaced if needed.

Drive sheaves should be checked at the same time the bearings are inspected. Check to make sure the sheaves are in alignment and are securely fastened to the blower and motor shafts.

Belt tension should be rechecked shortly after the unit has been installed to check for belt stretching. After the initial start-up, monthly checks are recommended.

Filters

If the unit is supplied with a dirty filter switch and light, clean or replace the filters any time the dirty filter light comes on.

Units which do not have a dirty filter warning light should have the filters checked monthly. Clean or replace if necessary. In dirty atmospheres, filter maintenance may be required more often.

Duct Furnace

When providing annual maintenance for the duct furnace, keep the unit free from dust, dirt, grease and foreign matter. Pay particular attention to:

1. The exhaust vent piping and vent terminal.
2. The burner ports and pilot burner orifices (avoid the use of hard, sharp instruments capable of damaging surfaces for cleaning these ports). To check the burner port and pilot burner orifice, see Burner and Pilot Assembly Removal.
3. The air shutters and main burner orifices (avoid the use of hard, sharp instruments capable of damaging surfaces for cleaning these orifices). To check the air shutters and main burner orifices, see for Manifold Assembly Removal.

The heat exchanger should be checked annually for cracks and discoloration of the tubes. If a crack is detected, the heat exchanger should be replaced before the unit is put back into service. If the tubes are dark gray, airflow across the heat exchanger should be checked to insure that a blockage has not occurred or the blower is operating properly.

Power Exhauster Motor

The power exhaust motor bearings have been lubricated for long life and do not require additional lubrication. In dirty atmosphere, it may be desirable to clean the motors and blower housing and blow out the cooling air passages of the motor with compressed air.

Electrical Wiring

The electrical wiring should be checked annually for loose connections or deteriorated insulation.

Gas Piping & Controls

The gas valves and piping should be checked annually for general cleanliness and tightness.

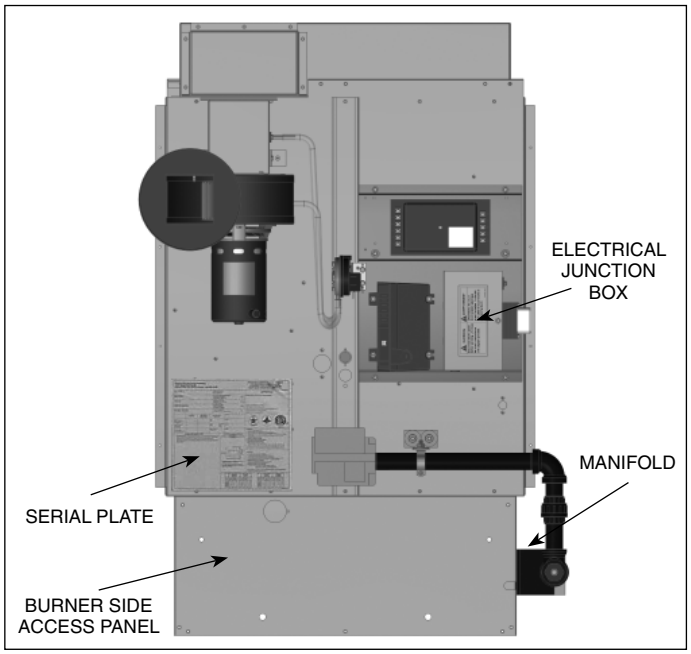
The gas controls should be checked to insure that the unit is operating properly.

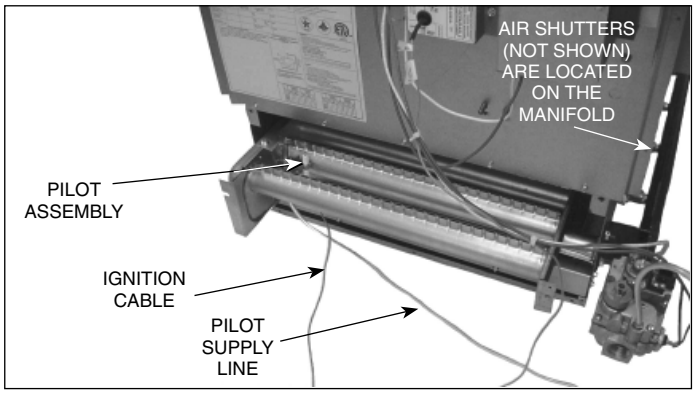
Manifold Assembly Removal

To remove the manifold

1. Shut off gas and electric supply.
2. Disconnect gas manifold at ground union joint.
3. Remove the two screws holding the manifold to the heat exchanger support.
4. Slide the manifold through the manifold bracket.
5. Clean the orifices and adjust the air shutters as necessary.
6. Follow steps 3-6 in reverse order to install the manifold assembly.
7. Turn on the electric and gas supply.
8. Check the ground joint union for leaks with a soap solution. Tighten if necessary.

Figure 19.1 - Manifold Assembly Removal





Burner and Pilot Assembly Removal

To remove the burner

1. Shut off gas and electric supply.
2. Disconnect the pilot supply line from the gas valve.
3. Disconnect the ignition cable from the ignition controller (located in the electrical junction box). Feed the cable through the bushing in the bottom of the electrical junction box.
4. Remove the screws holding the burner side access panel. Attached to the panel are the burner retaining pins that align the burner.
5. Slide the burner assembly out. The pilot is attached to the burner assembly.
6. Examine the burner and pilot assembly for cleanliness and/or obstructions as necessary (see Duct Furnace for cleaning instructions).
7. Replace the burner assembly in reverse order. In replacing the burner, be certain that the rear burner slots are located properly on the burner retaining pins. Do not force the burner side access panel, it will not fit if the burner is not properly aligned.
8. Reconnect the ignition cable and pilot gas supply line.
9. Turn on the electric and gas supply.

SERVICE & TROUBLESHOOTING

Table 20.1 - Troubleshooting

Trouble	Possible Cause	Possible Remedy
Power Exhauster Motor will not start	**1.** Power supply is off. **2.** No 24V power to thermostat. **3.** Thermostat malfunction. **4.** Defective power exhauster relay. **5.** Defective power exhauster motor.	**1.** Turn on main power. **2.** Check control transformer. **3.** Check/replace thermostat. **4.** Replace power exhauster relay. **5**. Replace power exhauster motor.
Pilot does not light/stay lit	**1.** Main gas is off. **2.** Power supply is off. **3.** Air in gas line. **4.** Dirt in pilot orifice. **5.** Gas pressure out of proper range. **6.** Pilot valve does not open. a. Defective ignition controller. b. Defective gas valve. **7.** No spark at ignitor. a. Loose wire connections. b. Pilot sensor is grounded. c. Defective ignition controller. **8.** Safety device has cut power. **9.** Excessive drafts. **10.** Pilot orifice fitting leak.	**1.** Open manual gas valve. **2.** Turn on main power. **3.** Purge gas line. **4.** Check for plugged pilot orifice and clean with compressed air if necessary. **5.** Adjust to a maximum of 14" W.C. Minimum for Natural Gas - 6" W.C. Minimum for Propane Gas - 11" W.C. **6.** Check wiring for 24 volts to valve. a. Replace ignition controller. b. Replace gas valve. **7.** a. Check all ignition controller wiring. b. Replace sensor if cracked or worn. c. Replace ignition controller. **8.** Check all safety devices (High limit, air flow proving switch, differential pressure switch, gas pressure switches, etc.) Determine and correct problem. Reset if necessary. **9.** Find source and re-direct airflow away from unit. **10.** Tighten pilot orifice. Flame impingment on pilot sensor may cause pilot sensor to become inoperative.
Main burners do not light (Pilot is lit)	**1.** Defective valve. **2.** Loose wiring. **3.** Defective pilot sensor. **4.** Defective ignition controller. **5.** Improper thermostat wiring.	**1.** Replace valve. **2.** Check wiring to gas valve. **3.** Replace pilot sensor. **4.** Replace ignition controller. **5.** Verify wiring compared to wiring diagram.
Lifting Flames (See Figure 21.1)	**1.** Too much primary air. **2.** Main pressure set too high. **3.** Orifice too large.	**1.** Reduce primary air. **2.** Adjust to a maximum of 14" W.C. **3.** Check orifice size with those listed on the serial plate.
Yellow Tipping (With propane gas, some yellow tipping is always present.)	**1.** Insufficient primary air. **2.** Dirty orifice. **3.** Misaligned orifice.	**1.** Increase primary air. **2.** Check orifices and clean with compressed air if necessary. **3.** Check manifold, replace if necessary.
Flashback	**1.** Too much primary air. **2.** Main pressure set too high. **3.** Orifice too large.	**1.** Reduce primary air. **2.** Adjust to a maximim of 14” W.C. **3.** Check orifice size with those listed on the serial plate.
Floating Flames (See Figure 21.2)	**1.** Insufficient primary air. **2.** Main pressure set too high. **3.** Orifice too large. **4.** Blocked vent.	**1.** Increase primary air. **2.** Adjust to a maximum of 14" W.C. **3.** Check orifice size with those listed on the serial plate. **4.** Clean/correct venting system.
Flame Rollout (See Figure 21.3)	**1.** Main pressure set too high. **2.** Orifice too large. **3.** Blocked vent.	**1.** Adjust to a maximum of 14" W.C. **2.** Check orifice size with those listed on the serial plate. **3.** Clean/correct venting system.

SERVICE & TROUBLESHOOTING

Trouble	Possible Cause	Possible Remedy
Not Enough Heat	**1.** Unit cycling on high limit. a. Obstructions/leaks in duct system. b. Main pressure set too high. c. Blower motor not energized. d. Loose belt e. Blower speed too low. f. Blocked/damaged venting system. g. Air distribution baffle removed (high temperature rise units only). h. Defective high limit switch. **2.** Main pressure set too low. **3.** Too much outside air. **4.** Thermostat malfunction. **5.** Gas controls wired incorrectly. **6.** Unit undersized.	**1.** a. Clean/correct duct system. b. Adjust to a maximum of 14" W.C. c. Check/correct to insure blower motor operates within 45 seconds of when - gas controls are energized. d. Adjust belt tension. e. Check/correct blower drive settings for proper rpm. f. Check/correct venting system. g. Replace air distribution baffle. h. Replace high limit switch. **2.** Adjust main gas pressure. Minimum for Natural Gas — 6" W.C. Minimum for Propane Gas — 11" W.C. **3.** Adjust outside air damper to decrease outside air percentage (if possible). **4.** Check/replace thermostat. **5.** Check unit wiring against the wiring diagram. **6.** Check design conditions. If unit is undersized, an additional unit(s) or other heat source must be added.
Too Much Heat	**1.** Thermostat malfunction. **2.** Gas controls do not shut-off. a. Gas controls wired incorrectly. b. Short circuit. **3.** Main gas pressure set too high. **4.** Defective gas valve.	**1.** Check/replace thermostat. **2.** a. Check unit wiring against the wiring diagram. b. Check for loose or worn wires. **3.** Adjust to a maximum of 14" W.C. **4.** Replace gas valve.

① Automatic Reset High Limit

The duct furnace comes standard with an automatic reset high limit switch that will shut-off the gas should the discharge air temperature become excessive. See Figure 14.1, indicator ⑦ for the location of either the standard automatic or optional manual reset high limit switch. The switch should operate only when something is seriously wrong with the unit operation. Anytime the switch operates, correct the difficulty immediately or serious damage may result. If the switch cuts off the gas supply during normal operation, refer to the “Not Enough Heat” section of Service & Troubleshooting.

Figure 21.1
Lifting Flame Condition

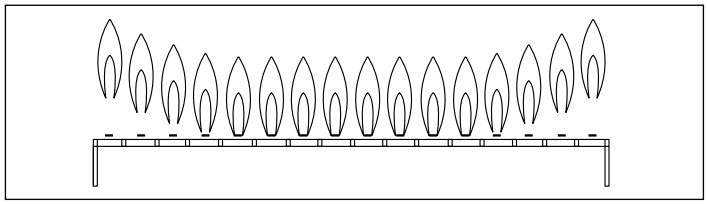


Figure 21.2
Floating Flame Condition

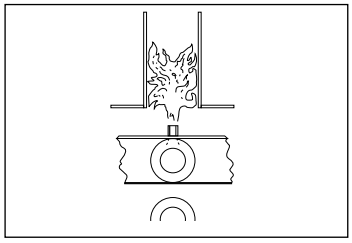
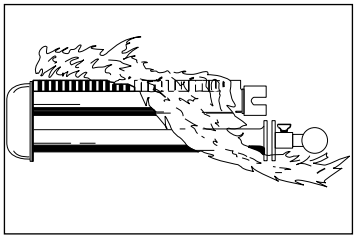


Figure 21.3
Flame Rollout Appearance



REPLACEMENT PARTS ORDERING

Ordering

When servicing, repairing or replacing parts on these units, locate the serial plate of the unit and always give the complete Model Number and Serial Number from the serial plate. The serial plate is located on the door of the electrical control box or on the side of unit. The Modine Manufacturing Company part number for some common replacement parts are listed on the sample serial plate For a complete description of the model number, see Model Identification.

MODEL IDENTIFICATION

Indoor Power Vented Duct Furnace Model Nomenclature

1	2	3	4 5 6	7	8	9	10	11	12	13	14	15
PT	UC	V	MBH	HE	DS	AS	ATR	GT	GV	SS	SV	TR

1 - Product Type (PT)
D - Indoor HVAC Unit

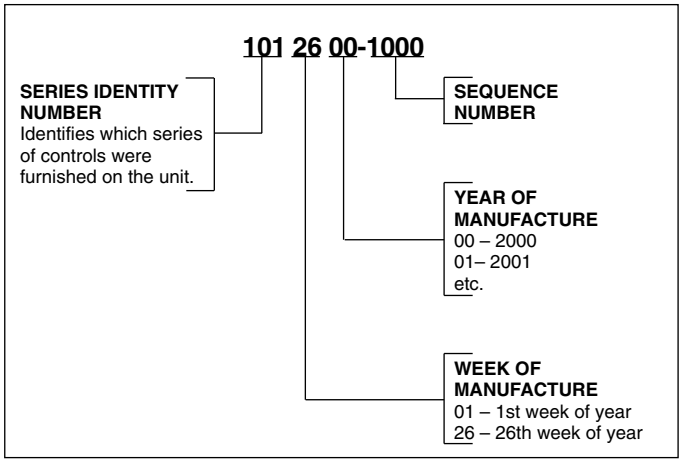
2 - Unit Configuration (UC)
F - Furnace

3 - Venting (V)
P - Power

4,5,6- Furnace Input Rating (MBH)
75 - 75,000 Btu/Hr Input
100 - 100,000 Btu/Hr Input
125 - 125,000 Btu/Hr Input
150 - 150,000 Btu/Hr Input
175 - 175,000 Btu/Hr Input
200 - 200,000 Btu/Hr Input
225 - 225,000 Btu/Hr Input
250 - 250,000 Btu/Hr Input
300 - 300,000 Btu/Hr Input
350 - 350,000 Btu/Hr Input
400 - 400,000 Btu/Hr Input

7 - Heat Exchanger/Burner/Drip Pan Material (HE)
A - Aluminized Steel
S - 409 Stainless Steel Heat Exchanger/Burner
T - 409 Stainless Steel Heat Exchanger/Burner/Drip Pan

Figure 22.1 - Serial Number Designations



8 - Development Sequence Designation (DS)
F - Single Stage
M - 2-stage or Modulating

9 - Access Side (AS)
R - Right Hand
L - Left hand

10 - Air Temperature Rise (ATR)
N - Not Used

11- Gas Type (GT)
N - Natural with ignition controller
P - Propane with ignition controller

12 - Gas Valve (GV)
1 - Single Stage
2 - Two Stage
3 - Mechanical Modulation
4 - Electronic Modulation Input
5 - Electronic Modulation Master
6 - Electronic Modulation Slave
7 - Electronic Modulation 0-10 Vdc External Input
8 - Electronic Modulation 4-20mmA External Input

13 - Additional Safety Switches (SS)
4 - No Switches (Standard)
0 - No Switches (Premium)
1 - Low Gas Pressure Switch (Premium)
2 - High Gas Pressure Switch (Premium)
3 - High and Low Gas Pressure Switch (Premium)

14 - Supply Voltage (SV)
A - 115/60/1
B - 208/60/1
C - 230/60/1
D - 200-208/60/3
E - 230/60/3
F - 460/60/3
G - 575/60/3

15 - Transformer (TR)
1 - 40 VA
2 - 75 VA
3 - 150 VA
4 - 250 VA
0 - None

COMMERCIAL WARRANTY

Seller 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 Seller, but does not cover labor of any kind and materials not furnished by Seller, 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 Seller in any way so as, in the judgment of Seller, 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 SELLER'S WARRANTY OF ITS PRODUCTS TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP, AS LIMITED HEREIN, SHALL BE IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES, EITHER EXPRESS 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 PRODUCT DESCRIPTION CONFIRMED BY BUYER AND SELLER AS OF THE DATE OF FINAL AGREEMENT.**

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 SELLER 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 SELLER'S printed instructions, or if the serial number has been altered, defaced or removed.

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 SELLER, ANY COMPONENT WHICH SHALL, WITHIN THE APPLICABLE WARRANTY PERIOD DEFINED HEREIN AND UPON PRIOR WRITTEN APPROVAL, BE RETURNED TO SELLER WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF SELLER 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 SELLER. 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 SELLER.

These warranties are issued only to the original owner-user and cannot be transferred or assigned. No provision is made in these warranties for any labor allowance or field labor participation. Seller will not honor any expenses incurred in its behalf with regard to repairs to any of Seller's products. No credit shall be issued for any defective part returned without proper written authorization (including, but not limited to, model number, serial number, date of failure, etc.) and freight prepaid.

OPTIONAL SUPPLEMENTAL WARRANTY

Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years on certain compressors. Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years or nine (9) years on certain heat exchangers.

EXCLUSION OF CONSUMABLES & CONDITIONS BEYOND SELLER'S CONTROL

The above referenced warranty shall not be applicable to any of the following items: refrigerant gas, belts, filters, fuses and other items consumed or worn out by normal wear and tear or conditions beyond Seller's control, including (without limitation as to generality) polluted or contaminated or foreign matter contained in the air or water utilized for heat exchanger (condenser) cooling or if the failure of the part is caused by improper air or water supply, or improper or incorrect sizing of power supply.

Component Applicable Models	**"APPLICABLE WARRANTY PERIOD"**
Heat Exchangers Gas-Fired Units except PSH/BSH	TEN YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN ONE HUNDRED TWENTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
Heat Exchangers Low Intensity Infrared Units **Compressors** Condensing Units for Cassettes	FIVE YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN SIXTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
Burners Low Intensity Infrared Units **Other** Components excluding Heat Exchangers, Coils, Condensers, Burners, Sheet Metal	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 SELLER, WHICHEVER OCCURS FIRST
Heat Exchangers/Coils Indoor and Outdoor Duct Furnaces and System Units, PSH/BSH, Steam/Hot Water Units, Oil-Fired Units, Electric Units, Cassettes, Vertical Unit Ventilators **Compressors** Vertical Unit Ventilators **Burners** High Intensity Infrared Units **Sheet Metal Parts** All Products	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 SELLER, WHICHEVER OCCURS FIRST

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

Commercial Products Group
Modine Manufacturing Company
1500 DeKoven Avenue
Racine, WI 53403
Phone: 1.800.828.4328 (HEAT)
www.modine.com

Litho in USA