



MODINE

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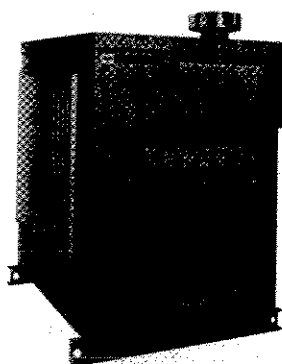
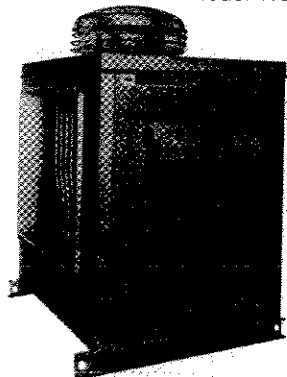


INSTALLATION AND SERVICE MANUAL weatherproof gas-fired duct furnaces models WDG/WDP

Figure 1

Model WDG

Model WDP



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.

FOR YOUR SAFETY

If you smell gas:

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

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 IPI), in New York by the MEA division, and for use in Minneapolis.

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

Inspection on Arrival

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

General Information

Installation must comply with ANSI Z223.1 – latest edition (CAN/CGA-B149 codes in Canada).

Before installation review all applicable local codes and ANSI Z223.1 – latest edition, "National Fuel Gas Code", (or CAN/CGA-B149 codes in Canada). This standard is also known as NFPA No. 54 published by the National Fire Protection Association.

1. All installation and service of this unit must be performed by a qualified installation and service agency only (as defined in ANSI Z223.1-latest edition, CAN/CGA-B149 codes in Canada).
2. Design of this unit is A.G.A. or C.G.A. certified with controls as furnished. For replacement parts submit the complete model, control code and serial number shown on rating plate attached to unit. Modine reserves the right to substitute other authorized controls as replacements.
3. Information on controls is supplied separately.
4. Modine duct furnaces use a single burner for natural and propane gases.

NOMENCLATURE

Model WDG Weatherproof Duct Furnaces – Model WDG weatherproof duct furnaces are **gravity vented** duct furnaces designed for outdoor installation for use with heating/ventilating/air conditioning and make-up air systems. These units require an external vent cap which is shipped separately. This factory supplied vent cap must be field installed before operating the unit. Do not substitute any other vent cap for those supplied by the duct furnace manufacturer.

Model WDP Weatherproof Duct Furnaces – Model WDP weatherproof duct furnaces are **power vented** duct furnaces designed for outdoor installation for use with heating/ventilating/air conditioning and make-up air systems. These units do not require any external venting nor is any external venting allowed. All venting is accomplished with the use of a built-in power venter which is matched to each unit. Do not attempt to modify the venting system in any manner.

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

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

The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve.
4. Check 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 gas. The maximum inlet pressure is 14" W.C. If supply pressure exceeds 14" W.C., install an additional pressure regulator upstream of the combination gas valve.** The pilot flame must be adjusted, as described on page 7, or a pilot pressure regulator must be applied. 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", or CAN/CGA-B149 codes.
5. The maximum allowable temperature rise through these units is 85°F for models WDG/WDP 150, 200, 225, 250 and 400. For all other models the maximum allowable temperature rise is 100°F. The maximum final air temperature allowable is 150°F. Do not exceed any of these temperature limits. Adjust the air throughput within the range shown on the rating plate.
6. Duct furnace must be installed on the positive pressure side of the air-circulating blower.
7. Do not install in potentially explosive or flammable atmospheres laden with grain dust, sawdust, or similar air-borne materials. In such applications a blower type heater installed in a separate room with ducting, including appropriate back flow prevention dampers, to the dust-laden room is recommended.
8. Installation of units in high humidity or salt water atmospheres will cause accelerated corrosion resulting in a reduction of the normal life span of the units.

9. To prevent premature heat exchanger failure do not locate ANY gas-fired unit in areas where chlorinated, halogenated or acid vapors are present in the atmosphere.
10. To prevent burned-out heat exchanger, or definitely shorter equipment life, provide uniform and sufficient air distribution over heat exchanger.
11. Duct furnace is designed for installation on non-combustible surfaces with a minimum of 6" clearance from the rear and 24" clearance from the sides to combustible material. Minimum clearance to combustibles is 0.0" from bottom of unit mounting rail, or 3" from bottom sheet metal of unit casing.
12. Units are designed for outdoor installation only. **Do not locate units indoors.**
13. Do not locate units under overhangs.
14. Do not modify or block combustion or ventilation air openings, the venting system on gravity vented models or the exhaust openings on power vented models.
15. Allow 48" clearance on controls side (front) of unit for removal and service of burner. Consideration must also be given for service access at the rear of the unit and a minimum clearance of 24" is recommended.
16. Installation must conform to local building codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 – latest edition. In Canada install in accordance with CAN/CGA-B149.1, "Installation Code for Natural Gas Burning Appliances and Equipment" or CAN/CGA-B149.2, "Installation Code for Propane Burning Appliances and Equipment."
17. Lifting holes are provided in the mounting rails of the duct furnace. When lifting the unit, use spreader bars between the lifting cables as shown in Figure 2 to insure that no damage will occur to the sheet metal parts of the duct furnace.

CAUTION: If the unit is lifted by means of a forklift, it is absolutely necessary that the unit be supported by the shipping pallet or a similar pallet. DO NOT ATTEMPT TO LIFT THE DUCT FURNACE BY PLACING THE FORKS DIRECTLY UNDER THE DUCT FURNACE. THE UNIT MUST ALWAYS BE SUPPORTED BY A PALLET.
18. 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.
19. Consult piping, electrical, and venting instructions in this manual before final installation.
20. All literature shipped with your unit, including vendor instructions, should be kept for future use for servicing or service diagnosis. Do not discard any literature shipped with your unit.

Locating Furnace

CAUTION

Units are designed for outdoor installation only.
DO NOT LOCATE UNITS INDOORS

Units must not be installed where they may be exposed to potentially explosive, flammable or corrosive atmosphere.

To prevent premature heat exchanger failure do not locate ANY gas-fired unit in areas where they may be exposed to chlorinated, halogenated or acid vapors.

1. When locating the furnace, consider general space and heating requirements, availability of gas and electrical supply.
2. Units are designed for installation on non-combustible surfaces with a minimum clearance to combustibles of 6" from the rear of the unit and 24" from the sides. Minimum clearance to combustibles is 0.0" from bottom of unit mounting rail, or 3" from bottom sheet metal of unit casing.
3. Allow 48" clearance on the control side (front) of the unit for service and removal of the burner. A minimum clearance of 24" at the rear of the unit is recommended for service access.
4. Adequate space must be provided for installation of leaktight access panels on both the upstream and downstream sides of the unit in the connecting ductwork for heat exchanger inspection access.
5. Unit must be installed on the positive pressure side of the air circulating blower.
6. Do not modify or block combustion or ventilation air openings, the venting system on gravity vented models or the exhaust openings on power vented models.
7. Do not locate units under overhangs.
8. Units installed downstream from refrigeration systems, or exposed to inlet air temperatures of 40° or less, may experience condensation and therefore provisions should be made to dispose of the condensate.

It is also important to attach a condensate drain connection when units are used with roof curbs, and the bottom of the unit is exposed to the interior of the building. Connection of a drain line will prevent condensate from dripping into the building.

If a drain flange is attached to the piercing of the bottom pan, an additional hole(s) is required to be pierced or drilled in the duct furnace cabinet for ventilation purposes. This additional field supplied hole(s) must have a free area of 1 sq. inch minimum and must be located within a distance of 6" measured up from the bottom of the unit.

If a ventilation hole is added (required when a drain connector is used) the hole should be fitted with a 90° downturn elbow to prevent snow or rain from entering the unit.

9. 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. (Check with a spirit level.) Clearances to combustibles as specified above must be strictly maintained.
10. 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.

Lifting Units

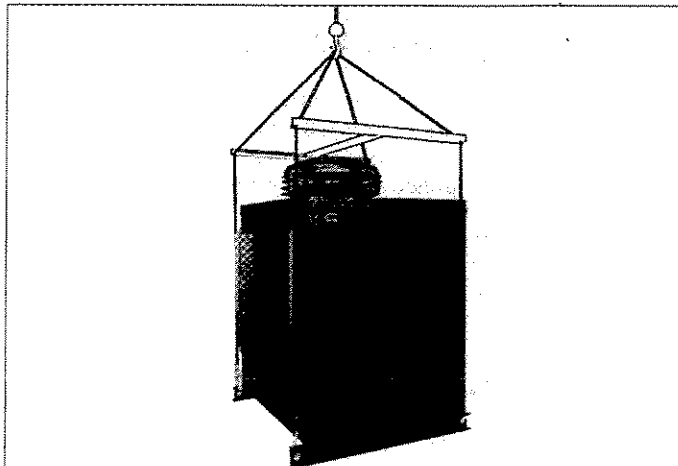
1. Lifting holes are provided in the mounting rails of the duct furnace. When lifting the unit, use spreader bars between the lifting cables as shown in Figure 2 to insure that no damage will occur to the sheet metal parts of the duct furnace.



CAUTION

If the unit is lifted by means of a forklift, it is absolutely necessary that the unit be supported by the shipping pallet or a similar pallet. DO NOT ATTEMPT TO LIFT THE DUCT FURNACE BY PLACING THE FORKS DIRECTLY UNDER THE DUCT FURNACE. THE UNIT MUST ALWAYS BE SUPPORTED BY A PALLET.

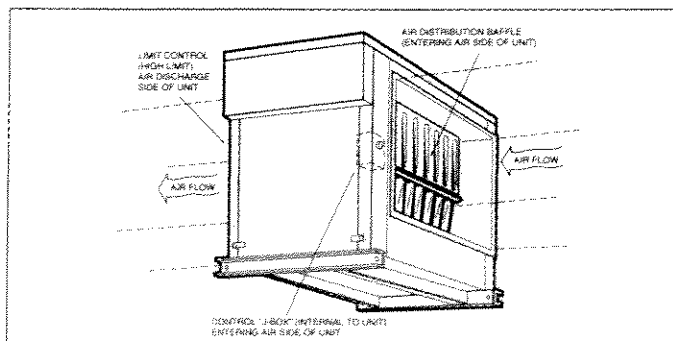
Figure 2 – Lifting Units



Installing Units

1. Select proper direction of airflow. The air distribution baffle (if used) must face the air inlet direction. (See figure 3). If it is necessary to reverse the airflow the following steps must be followed.
 - A. Relocate the air distribution baffle to the new air inlet side.
 - B. Note position of limit control capillary and reposition on new downstream side of heat exchanger. Thread capillary through grommet and position it making sure it does not come in contact with the heat exchanger. Do not crimp or put sharp bends in tube.
 - C. Remove junction box from right hand corner post and install it on left hand corner post with the holes provided. It is not necessary to remove any wires or components from junction box to do this. The junction box must be located on the air inlet side of the unit.
2. Provide airtight 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 weathertight to prevent rain and snow from entering the ductwork.

Figure 3 – Furnace direction



INSTALLATION

3. 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 exchangers due to poor air distribution or lack of sufficient air (cfm).
4. **Provide uniform air distribution over the heat exchanger.** Use turning vanes where required (see Figure 4) to obtain uniform air distribution. Avoid installing as in G, H & J of Figure 4.

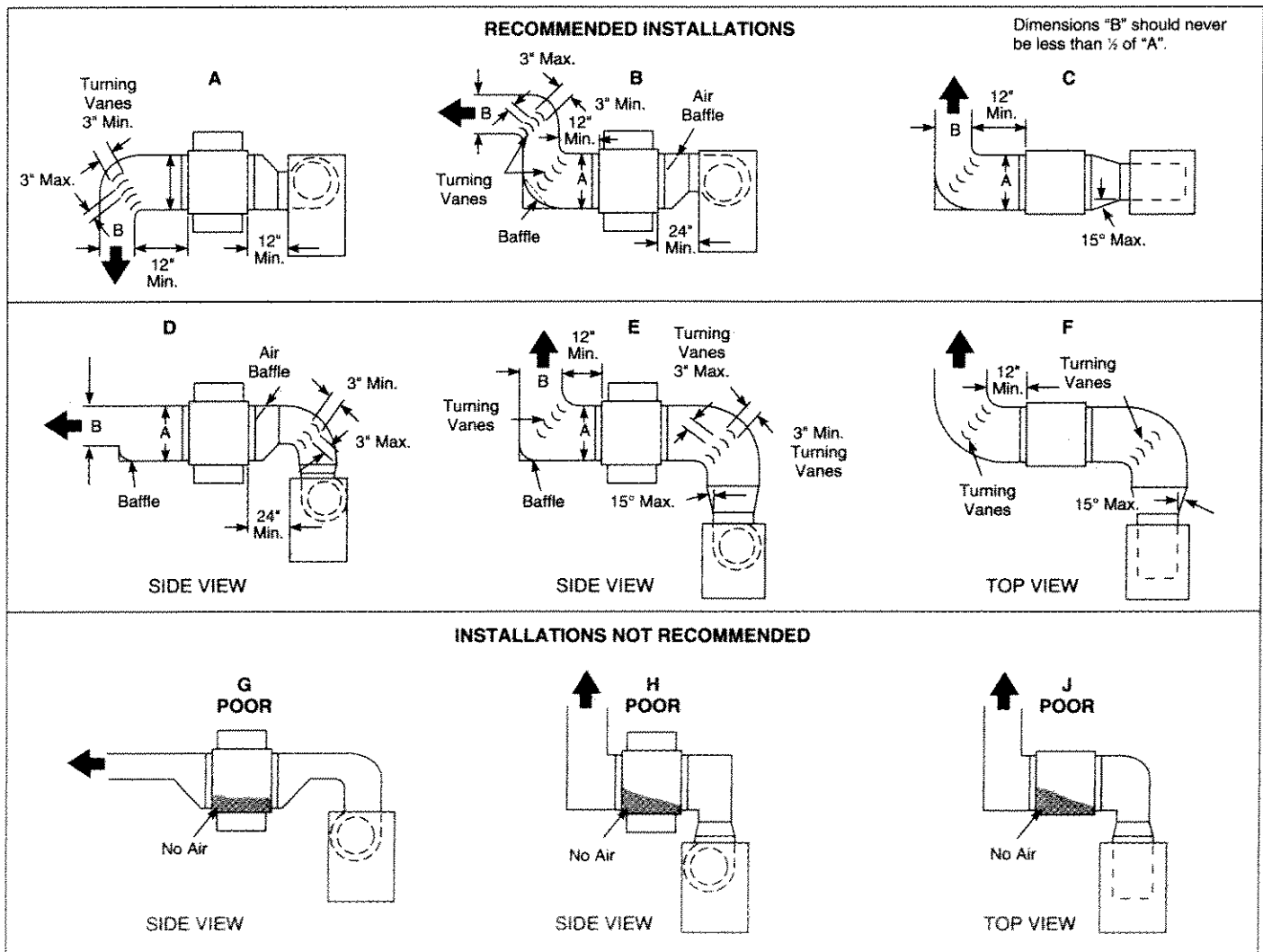
CAUTION

Check for red heat exchanger tubes by looking at heat exchanger through field installed access openings in connecting ductwork. If bottom of tubes become 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.

5. A bottom, horizontal discharge type blower should be installed at least 12" from the furnace. (See "A", Figure 4).
6. A top, horizontal discharge type blower should be installed 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.
7. **Burned-out heat exchanger, or definitely shorter equipment life, will result from not providing uniform air distribution, a major cause of furnace failure.**
8. When a fan switch is installed with the furnace, it **must** be adjusted to start the blower motor **30 seconds** after burner ignition.

NOTE: WDG/WDP weatherproof duct furnaces are designed for installation on non-combustible surfaces with a minimum clearance to combustibles of 6" from the rear of the unit and 24" from the sides of the unit. Minimum clearance to combustibles is 0.0" from bottom of unit mounting rail, or 3" from bottom sheet metal of unit casing.

Figure 4 – Typical Installations



INSTALLATION

Venting

CAUTION

Do not operate gravity vented duct furnaces without the vent cap fastened securely in place.
Do not substitute any other vent cap for those provided by the duct furnace manufacturer.

Proper and safe venting practice must be followed in accordance with the standards of the National Fire Protection Association – NFPA 54 or ANSI Z223.1 – latest edition, “National Fuel Gas Code,” or CAN/CGA-B149 codes in Canada for installation of gas appliances. The following suggestions should be observed.

1. Consult local codes for venting regulations.
2. Do not modify or obstruct the vent cap in any manner on gravity vented models or the exhaust openings on power vented models.
3. Gravity vented models are shipped with the vent cap in a separate carton. The vent cap must be field installed on the unit with sheet metal screws before the unit is operated.
4. Do not add any vents other than those supplied by the manufacturer to either the gravity vented or power vented weatherproof duct furnaces.
5. Do not install units in locations where the flue products can be drawn into adjacent building openings such as windows, fresh air intakes, etc.

Piping

CAUTION

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

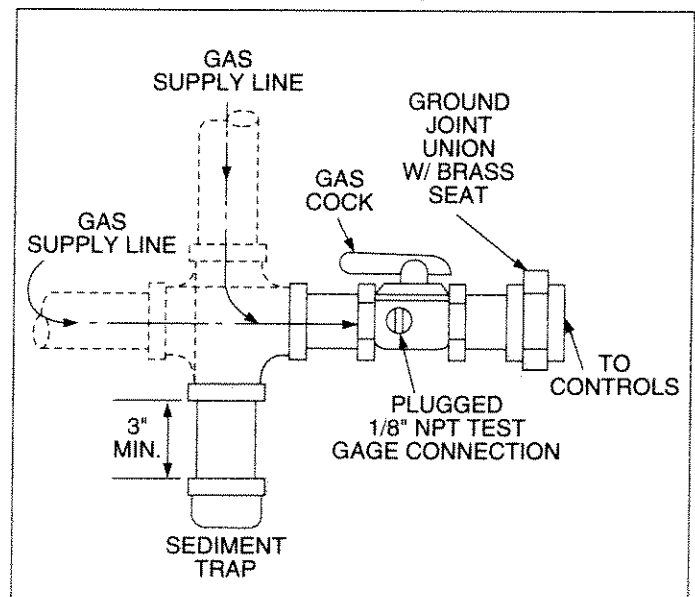
When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).

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

1. Installation of piping must be in accordance with local codes, and ANSI Z223.1–latest edition, “National Fuel Gas Code,” (CAN/CGA-B149 codes 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 6 to determine the cubic feet per hour (cfh) for the type of gas and size of unit to be installed. Using this cfh value and the length of pipe necessary, determine the pipe diameter from Table 1. Where several units are served by the same main, the total capacity, cfh and length of main must be considered. Avoid pipe sizes smaller than 1/2". Table 1 allows for the usual number of fittings with a resistance of .03" water pressure drop. Where the gas supplied has a specific gravity other than 0.60, apply the multiplying factor as given in Table 2.
3. After threading and reaming the ends, inspect piping and remove loose dirt and chips.

4. Support piping so that no strains are imposed on unit or controls.
5. Use two wrenches when connecting field piping to unit.
6. Provide a drip pocket before each unit and in the line where low spots cannot be avoided. (See Figure 5).
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 must 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. To check for gas leaks in lines, use soap solution.
13. 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 5).
14. Allow at least 5 feet of piping between any high pressure regulator and unit control string.

Figure 5 - Recommended Piping to Control



INSTALLATION

Table 1 – Gas Pipe Capacities

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

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

Table 2 – Specific Gravity Conversion Factors

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

Example: For gas with specific gravity of .55, a 1" pipe will handle 1.04 x 200 cfh with a 0.03" W.C. drop for 75 ft. of pipe length.

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

Electrical Connections

⚠ CAUTION

Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage. All Modine duct furnaces are supplied with either a 115/25V, 208V/25V or 230/25V control transformer and 25V controls. If control voltage is supplied from a source other than the control transformer provided on the unit, the primary wires of the factory mounted transformer must be insulated to prevent possible shorting.

All field installed wiring must be done in accordance with the National Electrical Code (in Canada in accordance with CSA C22.1 Electrical Code). See wiring diagram shipped with unit. For optional wiring diagrams see Bulletin 5-430.

The power supply to these duct furnaces should be protected with a fused disconnect.

⚠ WARNING

ALL UNITS MUST BE WIRED STRICTLY IN ACCORDANCE WITH WIRING DIAGRAM FURNISHED WITH THE UNIT AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL 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.

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

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

OPERATION

CAUTION

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

Check gas supply pressure at unit upstream from the combination gas control. The maximum inlet pressure should be 6" W.C. on natural gas and 11" W.C. on propane gas. The maximum inlet pressure is 14" W.C. If inlet pressure exceeds 14" W.C., adjust pressure regulator upstream of the combination gas valve. Purging of gas piping should be performed as described in ANSI Z223.1— latest edition, or in Canada in CAN/CGA-B149 codes.

The pilot flame must be adjusted as described below. Purging of air from gas lines, piping, and lighting the pilot should be performed as described in ANSI Z223.1-latest edition "National Fuel Gas Code" (CAN/CGA-B149 in Canada).

Be sure no obstructions block air intake and discharge of duct furnace.

Prior to Operation

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

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

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

Figure 6 – Duct Furnace Cutaway

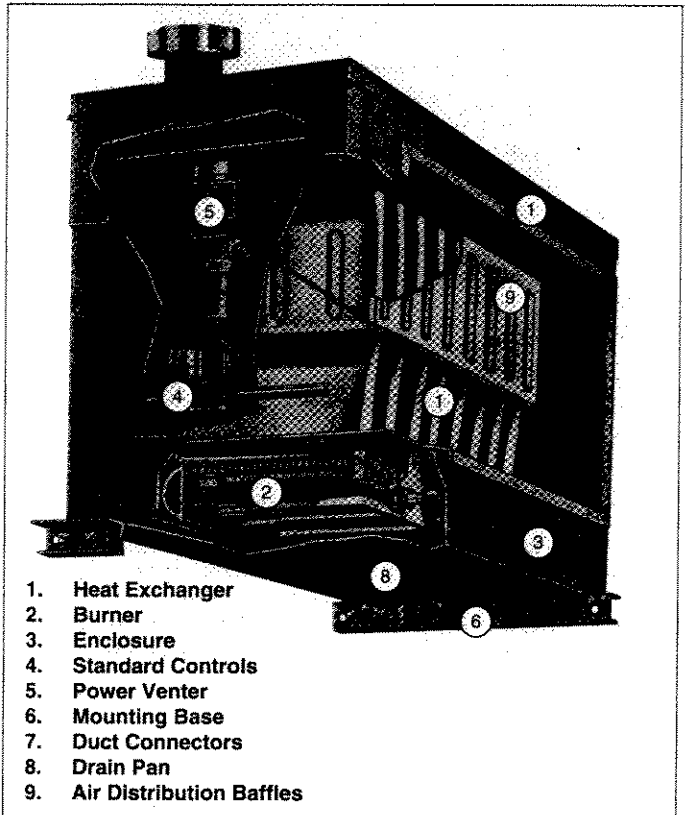
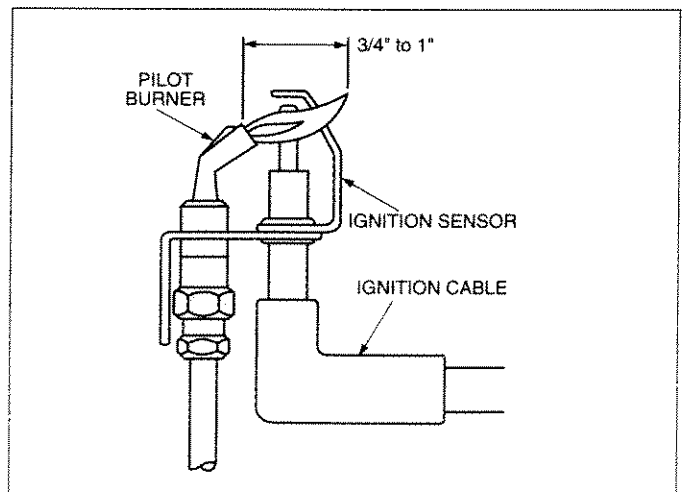


Figure 7 – Correct Pilot Flame
(Honeywell IPI Pilot Assembly shown)



OPERATION

Natural Gas Flame Control

Control of burner flames on duct furnaces utilizing natural gas is achieved by resetting the primary air shutters (Figure 19) to either increase or decrease primary combustion air. Prior to flame adjustment, operate furnace for about fifteen minutes. Operation can be viewed after loosening and pushing aside the red gas designation disc on side of burner box.

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. Proper operation with natural gas provides a soft blue flame with a well-defined inner core.

To increase primary air, loosen the air shutter set screws and move the air shutters away from the mixer tubes until yellow-tipped flames disappear. See Figure 19. 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 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 wing nuts and push shutters forward to reduce primary air until yellow flame tips appear. See Figure 15. Then increase primary air until yellow tips diminish and a clean blue flame with a well-defined inner cone appears.

Checking input Rate

CAUTION

Check the gas inlet pressure at the unit upstream of the combination gas control. The maximum inlet pressure should be 6" W.C. on natural gas and 11" W.C. on propane gas. The maximum inlet pressure is 14" W.C. If inlet pressure exceeds 14" W.C., adjust pressure regulator upstream of the combination gas valve. Purging of gas piping should be performed as described in ANSI Z223.1— latest edition, or in Canada in CAN/CGA-B149 codes.

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

Input Adjustments

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

Input can be determined by the meter-timing method provided other gas equipment connected to the meter is off during the test. If this is not possible, use the pressure method.

(A) Meter Timing Method

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

2. Start the heater and determine the number of seconds it takes to consume 1 cu. ft. of gas. Two basic formulas are useful:

$$F1 = 3600 C/T$$

$$F2 = F1/C$$

where:

F1 = input to heater, Btu/Hr.

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

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

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

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

These are representative values:

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

3. If the seconds for 1 cu. ft. are more (input less) than shown in Table 5 for model being tested, locate the combination gas control and pressure regulator adjustment screw (see Figure 8). Remove the cap screw from the pressure regulator and make one clockwise turn at a time on the adjustment screw until the correct time is obtained. If the seconds are less (input greater) than indicated in the table, follow the same procedure in a **counter-clockwise** direction.

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

For example, if the input to the heater is 100,000 Btu/Hr. and the heating value of the gas is 1000 Btu per cu. ft., then, by the second formula, the input is 100 cu. ft. per hr. Table 4 indicates the time for one revolution of various size meter dials with various input rates. If a 1 cu. ft. meter dial is used, we proceed down the cu. ft. column to 100 cu. ft. per hr. and then horizontally to the left to determine a time of 36 seconds for one revolution of the dial. Similarly, if the 1/2 cu. ft. dial is used, we determine a time of 18 seconds for one revolution at the required input.

CHECKING INPUT RATE

Table 3 – Meter-Timing Gas

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

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

Table 4 – Pilot Orifice Sizes

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

Figure 8 – Dials of Typical Gas Meter



Table 5 – Orifice Drill Sizes with Decimal Equivalents

Drill Size	Dia. Decimal Equivalent	Drill Size	Dia. Decimal Equivalent
49	.0730	30	.1285
45	.0820	28	.1405
43	.0890	27	.1440
42	.0935	26	.1470
40	.0980	25	.1495
37	.1040	23	.1540
32	.1160	20	.1610

Table 6 – Manifold Pressure and Gas Consumption ①

Model Size	Type of Gas	Natural	Propane	No. of Orifices	Model Size	Type of Gas	Natural	Propane	No. of Orifices
	Btu/Cu. Ft.	1040	2500			Btu/Cu. Ft.	1040	2500	
	Specific Gravity	0.60	1.53			Specific Gravity	0.60	1.53	
Manifold Press. in. of H ₂ O		3.5	10		Manifold Press. in. of H ₂ O		3.5	10	
WDG/WDP 75	Cfh	72.1	30	2	WDG/WDP 225	Cfh	216.3	90	4
	SEC/Cu. Ft.	49.9	120			SEC/Cu. Ft.	16.6	40	
	Orifice Drill Size	32	49			Orifice Drill Size	28	43	
WDG/WDP 100	Cfh	96.1	40	2	WDG/WDP 250	Cfh	240.4	100	4
	SEC/Cu. Ft.	37.5	90			SEC/Cu. Ft.	14.9	36	
	Orifice Drill Size	30	45			Orifice Drill Size	25	42	
WDG/WDP 125	Cfh	120.2	50	2	WDG/WDP 300	Cfh	288.4	120	5
	SEC/Cu. Ft.	30.0	72			SEC/Cu. Ft.	12.5	30	
	Orifice Drill Size	25	42			Orifice Drill Size	26	43	
WDG/WDP 150	Cfh	144.2	60	2	WDG/WDP 350	Cfh	336.0	140	6
	SEC/Cu. Ft.	24.9	60			SEC/Cu. Ft.	10.7	25.7	
	Orifice Drill Size	20	37			Orifice Drill Size	27	43	
WDG/WDP 200	Cfh	192.3	80	4	WDG/WDP 400	Cfh	385.0	160	6
	SEC/Cu. Ft.	18.7	45			SEC/Cu. Ft.	9.3	22.5	
	Orifice Drill Size	30	45			Orifice Drill Size	23	40	

① The gases are based on average standards.

CHECKING INPUT RATE

(B) Manifold Pressure Method

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

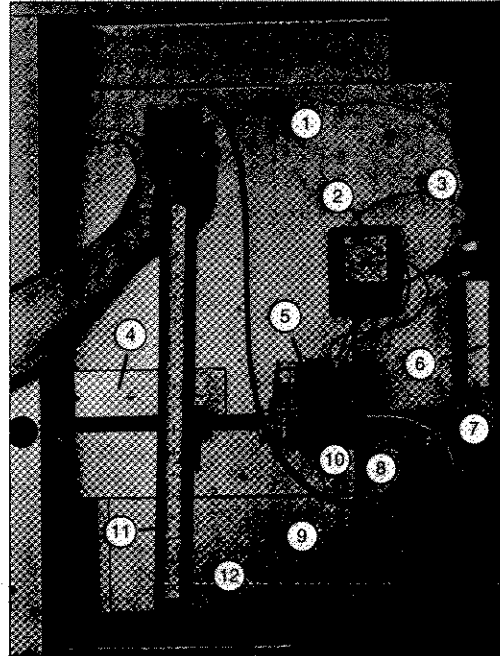
1. Determine correct manifold pressure from Table 6.
2. Locate combination gas control.
3. Move gas control knob (or lever) to off.
4. Remove the 1/8" pipe plug in outlet pressure tap in combination gas control (see Figure 9) and attach water manometer of "U" tube which is at least 12" high.
5. Follow lighting instructions and turn thermostat up to get unit to fire.
6. If manifold pressure as indicated by "U" tube is less than 1/2" higher or lower than indicated in Table 6, adjust regulator as described under "Meter-Timing Method," Step 3.

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

After adjustment move gas control knob (or lever) to off and replace 1/8" pipe plug. After the plug is in place, follow the lighting instructions to put unit back in service. Recheck pipe plugs for gas leaks with soap solution.

FIGURE 17

Checking manifold pressure with "U" tube
(gravity vented unit shown)



1. Overheat Control Capillary Tube
2. Ignition Controller
3. 25V Control Transformer
4. Serial/Rating Plate
5. Main Gas Valve
6. Power Junction Box
7. Ground Union Joint
8. Pilot Tube
9. High Tension Lead (for spark ignitor)
10. Burner Box Retaining Screws
11. Manometer
12. Burner Box Assembly

DIMENSIONAL DATA

Figure 10

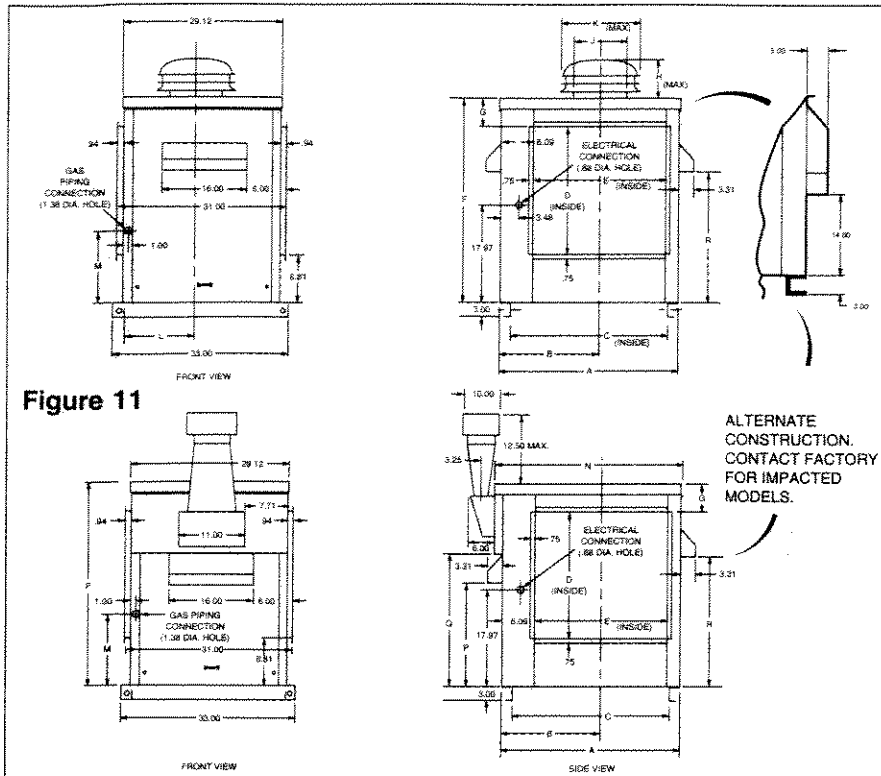


Figure 12

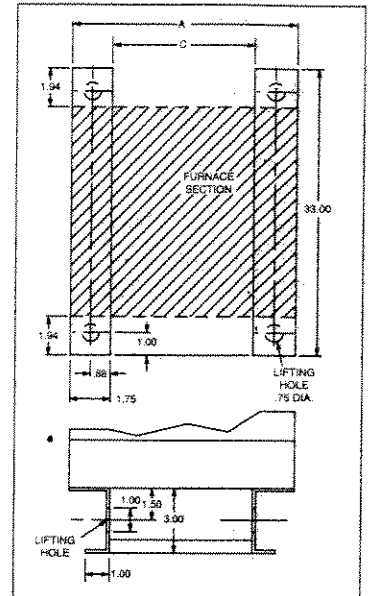


Figure 11

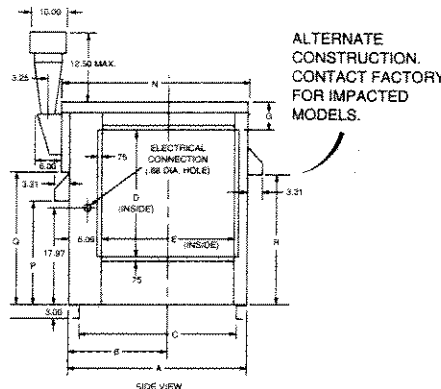
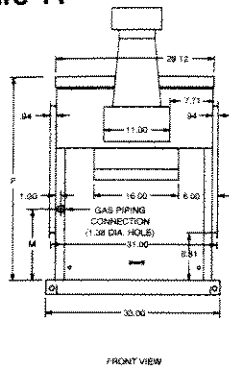


Table 7 – Dimensional Data With Minimum Clearance to Combustibles - Models WDG and WDP (All dimensions in inches) ①

Model	WDG 75 WDP 75	WDG 100 WDP 100	WDG 125, 150 WDP 125, 150	WDG 200 WDP 200	WDG 225, 250 WDP 225, 250	WDG 300 WDP 300	WDG 350, 400 WDP 350, 400
A	28.62	28.62	28.62	33.12	36.12	41.12	47.25
B	15.97	15.97	16.12	18.38	19.88	22.38	25.44
C	25.00	25.00	25.00	29.50	32.50	37.50	43.63
D	15.18	19.18	24.00	24.00	24.00	24.00	24.00
E	19.75	19.75	20.06	24.56	27.56	32.56	38.69
F	35.44	35.44	38.00	38.00	38.00	38.00	38.00
G	10.91	6.91	5.19	5.19	5.19	5.19	5.19
H	7.94	7.94	8.25	10.50	10.50	23.62	②
J	6.94	6.94	7.94	9.94	9.94	12.94	12.94
K	11.75	11.75	15.12	19.12	19.12	21.12	21.12
L	14.56	14.56	13.25	13.25	13.25	13.25	13.25
M	13.12	13.12	13.09	13.09	13.09	13.09	13.09
N	29.62	29.62	29.62	34.12	37.12	42.12	48.25
P	16.19	16.19	18.81	18.81	18.81	18.81	18.81
Q	23.38	23.38	26.00	26.00	26.00	26.00	26.00
R	21.88	21.88	24.50	24.50	24.50	24.50	14.00
Gas Pipe Connection	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Minimum Clearance to Combustibles	Sides	24	24	24	24	24	24
	Rear ③	6	6	6	6	6	6
	Front	48	48	48	48	48	48
	Top ③	—	—	—	—	—	—
	Bottom ③	0	0	0	0	0	0
Approx. Weight ④	Model	WDG	WDP	WDG	WDP	WDG	WDP
	Shipping	265#	284#	265#	284#	284#	304#
	Net	185#	204#	185#	204#	198#	218#

① All dimensions are in inches. All dimensions are for reference only. As Modine Manufacturing Company has a continuous project improvement program, it reserves the right to change design and specifications without notice.

② The maximum height to the top of the vent cap is 23.62" on 400 and 11.62" on the 350 size furnaces.

③ The minimum clearance to combustibles at the rear of the unit is 6", however, it is recommended that a clearance of at least 12" be maintained for service access. No minimum clearance to combustibles is given for the top of the unit because the unit should not be mounted under overhangs or obstructions. Minimum clearance to combustibles is 0.0" from bottom of unit mounting rail, or 3" from bottom of sheet metal of unit casing.

④ Because of the many different available options and controls the weights shown are approximate weights only and are provided for determining roof support and lifting requirements. The weights for gravity vented units do not include the vent cap which is shipped separately.

PERFORMANCE AND SELECTION

The performance ratings shown below are applicable to the following models:

WDG – Weatherproof Gravity Vented Duct Furnace WDP – Weatherproof Power Vented Duct Furnace

Table 8 – Air Temperature Rise - Duct Furnace ① ②

Model Number	Btu/hr		Air Temperature Rise Through Unit (Degree F)																
	Input	Output	Without Air Baffle ③								With Air Baffle ③								
			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
WDG/WDP 75	75,000	60,000	2778	2222	1852	1587	1389	1235	1111	1010	926	855	794	741	694	654	617	585	556
WDG/WDP 100	100,000	80,000	3704	2963	2469	2116	1852	1646	1481	1347	1235	1140	1058	988	926	871	823	780	741
WDG/WDP 125	125,000	100,000	4630	3704	3086	2646	2315	2058	1852	1684	1543	1425	1323	1235	1157	1089	1029	975	926
WDG/WDP 150	150,000	120,000	5556	4444	3704	3175	2778	2469	2222	2020	1852	1709	1587	1481	1389	1307			
WDG/WDP 200	200,000	160,000	7407	5926	4938	4233	3704	3292	2963	2694	2469	2279	2116	1975	1852	1743			
WDG/WDP 225	225,000	180,000	8333	6667	5556	4762	4167	3704	3333	3030	2778	2564	2381	2222	2083	1961	1852	1754	1667
WDG/WDP 250	250,000	200,000	9259	7407	6173	5291	4630	4115	3704	3367	3086	2849	2646	2469	2315	2179			
WDG/WDP 300	300,000	240,000	11111	8889	7407	6349	5556	4938	4444	4040	3704	3419	3175	2963	2778	2614	2469	2339	2222
WDG/WDP 350	350,000	280,000	12963	10370	8642	7407	6481	5761	5185	4714	4321	3989	3704	3457	3241	3050	2881	2729	2593
WDG/WDP 400	400,000	320,000	14815	11852	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 feet above sea level. Does not apply in Canada - See rating plate.

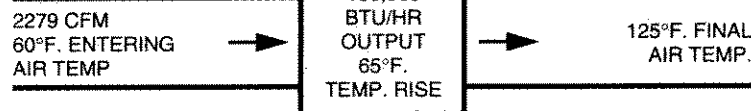
② Units approved for use in California by CEC when equipped with intermittent pilot ignition gas controls.

③ When high rates of CFM are used, the air distribution baffle may be removed to lessen the pressure drop through the duct furnace

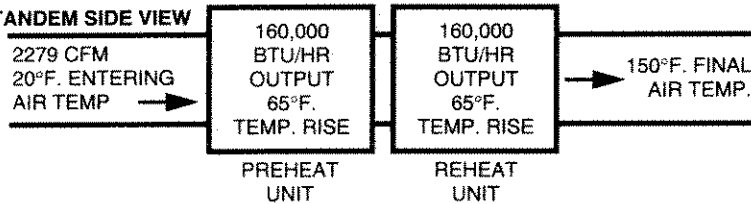
FINAL AIR TEMPERATURE

The maximum allowable final air temperature is 150 degrees F.
The maximum allowable air temperature rise is shown in Table 8.

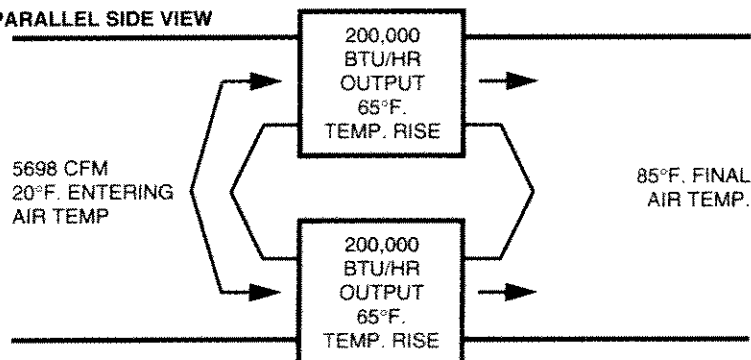
SINGLE SIDE VIEW



TANDEM SIDE VIEW



PARALLEL SIDE VIEW



PERFORMANCE AND SELECTION

Unit Selection

Selecting Model and Pressure Drop

Caution: Do not provide less than the minimum CFM throughput shown in Table 8.

Selecting Model

To select the proper Modine weatherproof duct furnace, use the following procedure:

1. Determine the required Btu/Hr output.
2. Determine the required temperature rise through the duct furnace.
3. Choose either a gravity vented or power vented duct furnace which satisfies the requirements in steps 1 and 2. (See Table 8.)

Determining Duct Furnace Pressure Drop

To determine pressure drop of duct furnace proceed in the following manner:

1. Before you arrive at this step you will already have gone through the model selection procedures outlined above.

Note 1: Air distribution baffle must be used when temperature rise is greater than 55°F. Pressure drop is read from Curve 2a. If temperature rise is less than 55°F, the air distribution baffle may be removed. In this case, pressure drop is taken from Curve 2b. For model size 75 and 100, use Curve 2c for both units with and without distribution baffle.

2. Using the Btu/Hr and temperature rise determined previously, enter Curve 2a, 2b or 2c (See Note 1) at desired CFM and follow up the curve until the CFM intersects with the curve for the duct furnace being used. Move horizontally across to the left and read pressure drop.
3. To determine temperature rise at CFM's different from those listed in Table 8 on page 12, use Curves 1a or 1b on page 13.

Model and Pressure Drop Selection

1. Required Btu/Hr output=240,000 Btu/Hr

From Table 8, select a WDG300 or WDP300 depending on venting type required.

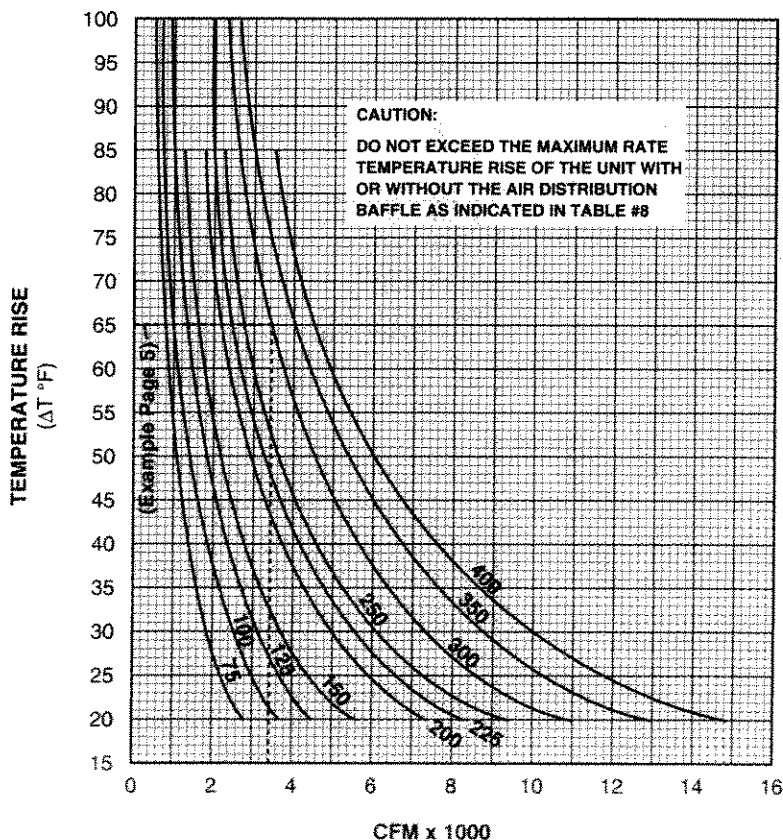
Input=300,000 Btu/Hr

Output=240,000 Btu/Hr

2. Required temperature rise through duct furnace=65°F. Based upon this requirement and, again referring to Table 8, the required CFM through the unit is 3419 CFM.
3. Proceed to either Curve 2a or 2b, page 14. For this example the temperature rise is 65°F. Since the temperature rise is over 55°F, use Curve 2a. Locate the pressure drop curve for a 300 size duct furnace and find the point where this curve intersects the 3419 CFM line. The pressure drop is read to the left of this point and is approximately 0.15" W.C. for this example.

Selection Curves

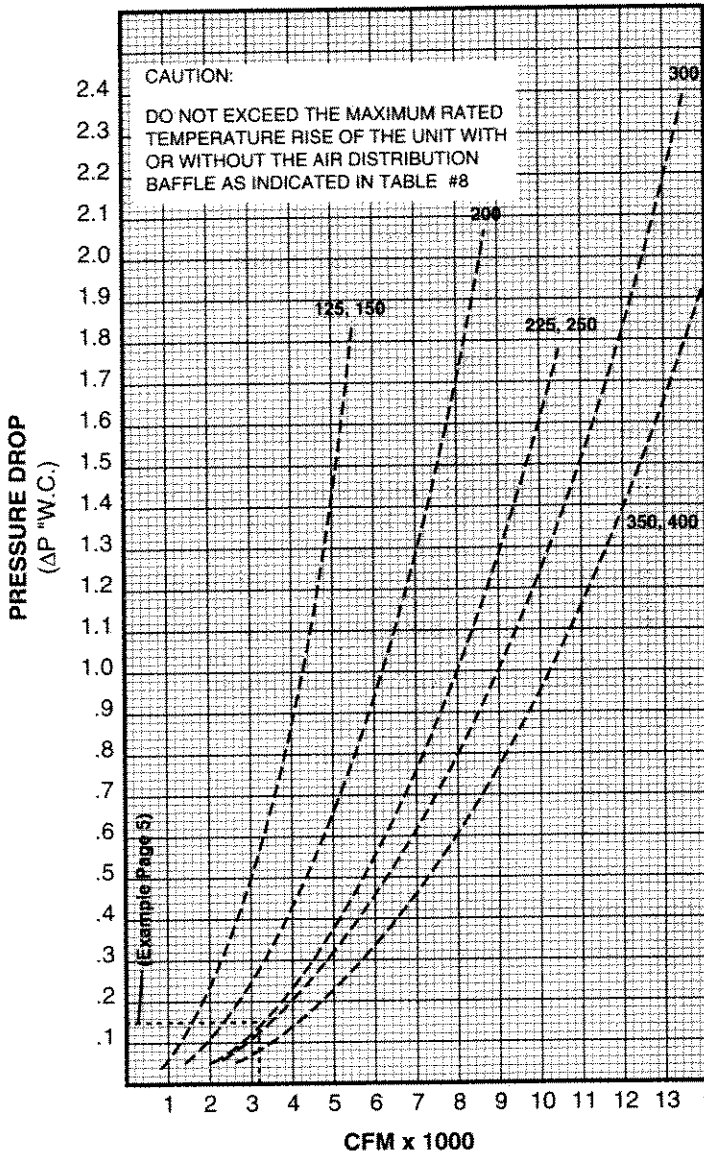
Curve 1 – Temperature Rise vs. CFM



PERFORMANCE AND SELECTION

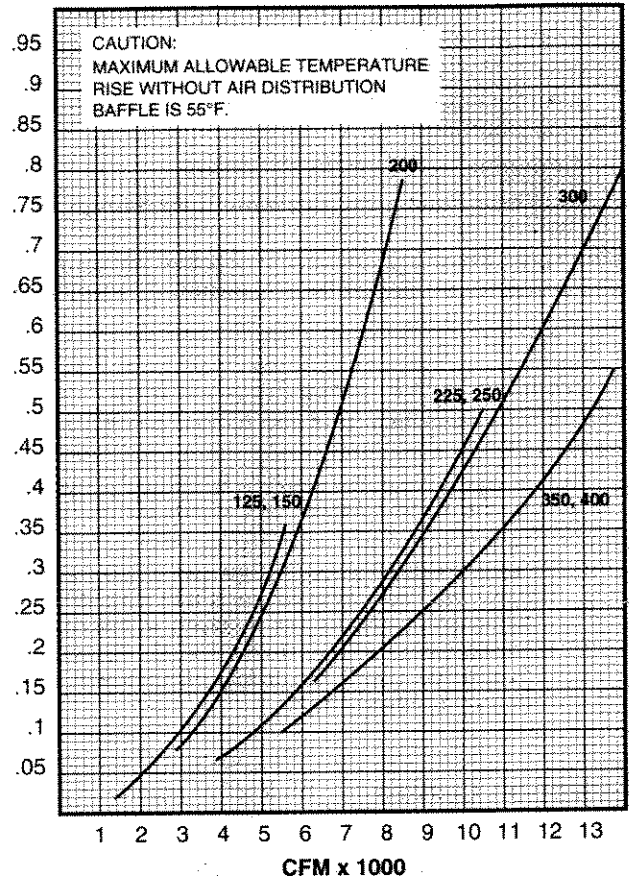
Curve 2a – Pressure Drop vs. CFM

(with air distribution baffle, see Note 1, Page 13)



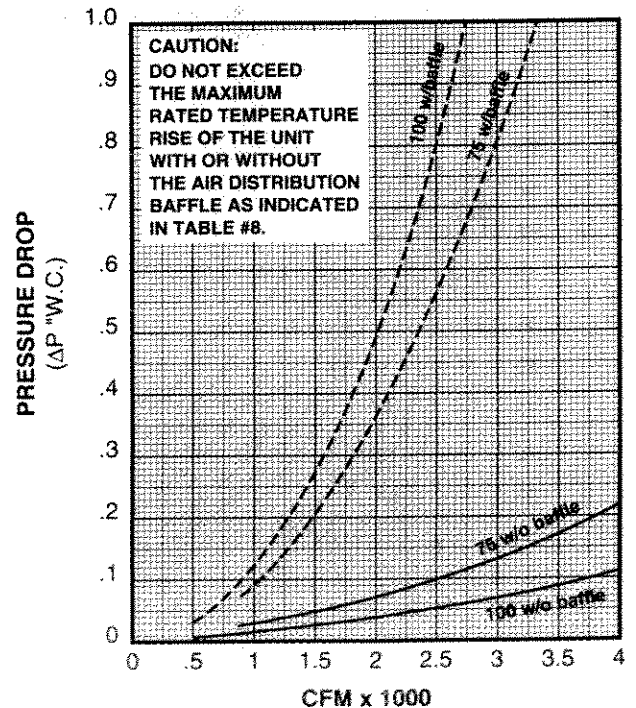
Curve 2b – Pressure Drop vs. CFM

(without air distribution baffle, see Note 1, Page 13)



Curve 2c – Pressure Drop vs. CFM

(with and without air distribution baffle, see Note 1, Page 13)



OPERATING

Control Operating Sequence

All Modine Weatherproof Duct Furnace/make-up Air Systems are supplied with intermittent pilot ignition systems. These systems are offered with 100% Shut-Off with Continuous Retry for operation on natural gas, and 100% Shut-Off with Lockout for units operating on propane gas. On all systems both the main burner gas and pilot gas are turned off 100% when the thermostat is satisfied.

Upon a call for heat from the thermostat the ignition control system will be turned on. Sparking will start at the pilot at the same time the first operator of the gas valve opens to allow gas to flow to the pilot burner. The pilot should be established and proven in a few seconds. As soon as the pilot is proven the sparking will stop and the second operator of the gas valve will open allowing gas flow to the main burner.

On systems utilizing 100% Shut-Off with continuous retry the ignition system will attempt to light the pilot for 90 seconds once there is a demand for heat. If the pilot is not established and proven for any reason, the retry module will wait for a predetermined time with the gas valve closed and no spark. After the predetermined time lapses, the cycle will begin again. The time lapses between cycles is at pre-programmed intervals (approximately 6 minutes).

This will continue indefinitely until the pilot is lit or power is interrupted to the system.

On systems utilizing 100% Shut-Off with lockout the ignition system will attempt to light the pilot for 90 seconds once there is a demand for heat. If the pilot is not established and proven within this time period, for any reason, the system will lockout, the pilot gas valve will be shut off and the sparking discontinued. The system will not attempt to relight until power has been interrupted to the controls and the controls are reset via the thermostat.

When the thermostat has been satisfied, power is turned off to the ignition system and the gas valve, so both main gas and pilot are turned off. The system is now ready for another call for heat from the thermostat.

Table 9 below lists the various control options available by group type. Control codes 30 and 31 are the standard controls and function as described above for 100% shut-off with continuous retry. The optional controls always include intermittent pilot ignition, but in addition allow other control features to be incorporated, such as two-stage, mechanical modulation, electronic modulation.

Table 9 - Control Options

Control System Description	Control Code	Service Voltage	Thermostat Voltage	Type of Gas
SINGLE-STAGE CONTROLS				
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	115V	25V	natural
	31	208V/230V	25V	natural
Single Stage, Intermittent Pilot Ignition, 100% Shut-Off with Lockout - Utilizes a single-stage combination gas control and an ignition control (lockout). Pilot is automatically lit on a call for heat.	78	115V	25V	propane
	79	208V/230V	25V	propane
TWO-STAGE CONTROLS				
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	115V	25V	natural
	64	208V/230V	25V	natural
Two-stage, Intermittent Pilot Ignition, 100% Shut-Off with Lockout - Utilizes a two-stage combination gas control (which fires at 50% or 100% of full-rated input) and an ignition control (lockout). Pilot is automatically lit on a call for heat.	95	115V	25V	propane
	96	208V/230V	25V	propane
MECHANICAL MODULATING CONTROLS				
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 when there is power to the unit. Modulation range is between 50% and 100% fire; gas control shuts off below 50% fire.	59	115V	25V	natural
	60	208V/230V	25V	natural
Mechanical Modulation with Automatic Pilot Ignition, 100% Shut-Off with Lockout - Utilizes a modulating combination gas control and an ignition control (lockout). Pilot is automatically lit when there is power to the unit. Modulation range is between 50% and 100% fire; gas control shuts off below 50% fire.	76	115V	25V	propane
	77	208V/230V	25V	propane
ELECTRONIC MODULATING CONTROLS				
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	115V	25V	natural
	44	208V/230V	25V	natural
Electronic Modulation with Intermittent Pilot Ignition, 100% Shut-Off with Lockout - For use with room sensing or duct sensing with remote temperature set-point adjustment. Includes combination gas control, ignition control (lockout), 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.	37	115V	25V	propane
	38	208V/230V	25V	propane

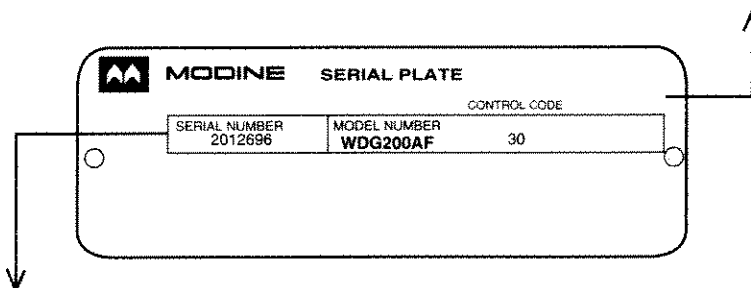
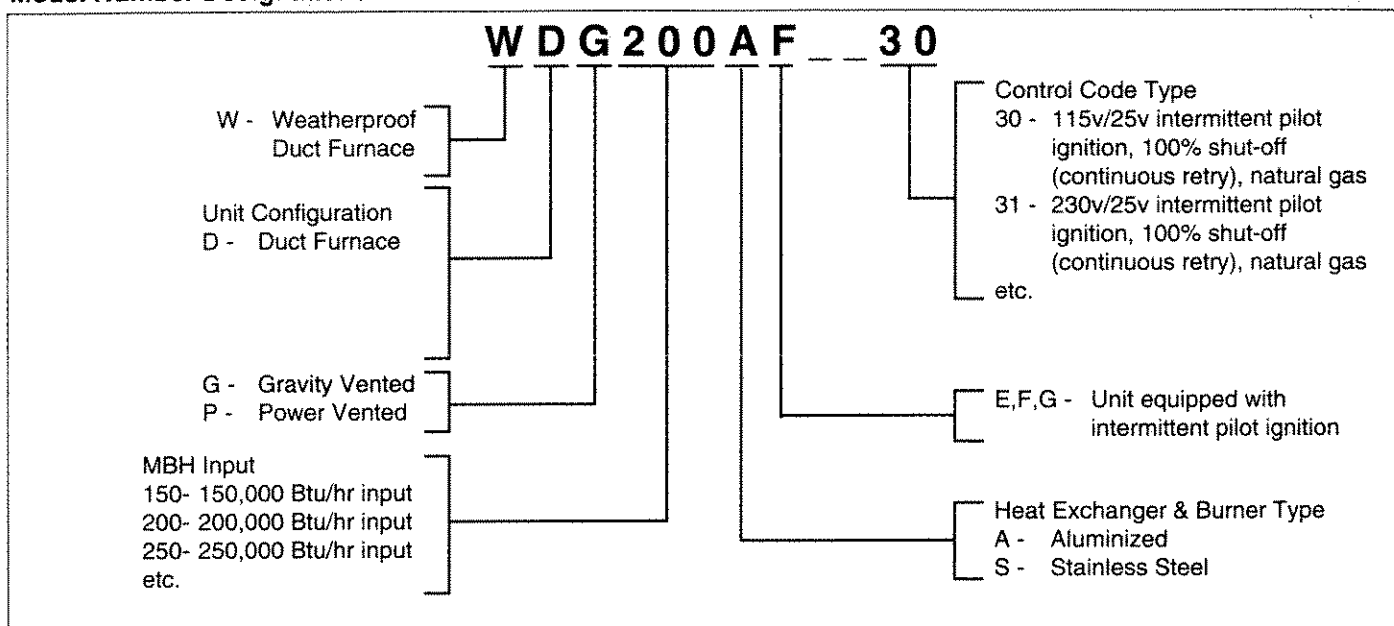
SERVICE INSTRUCTIONS

Model Identification

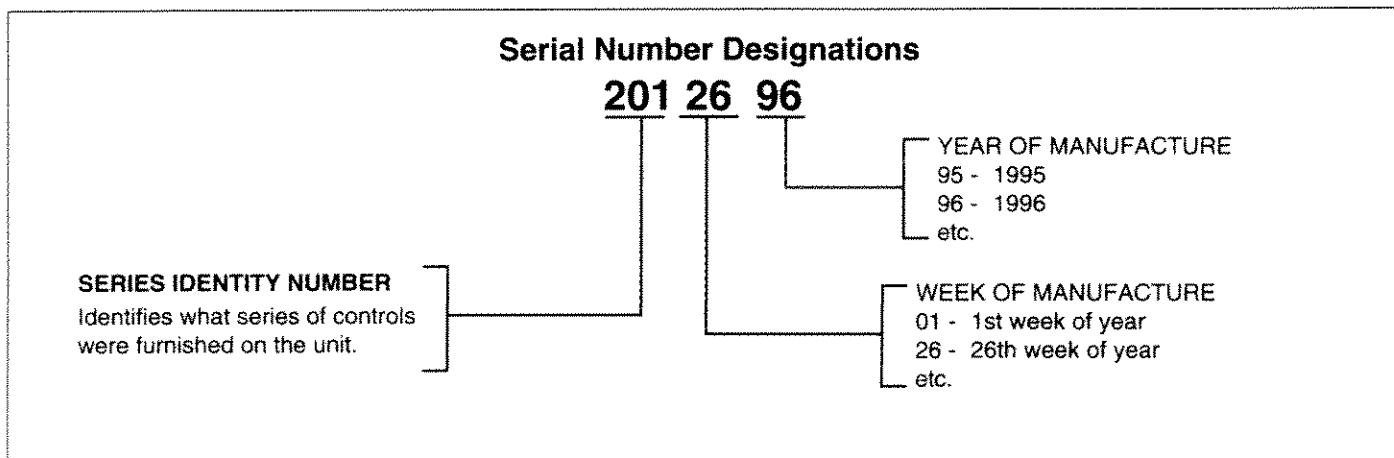
Modine weatherproof duct furnace/make-up air units are A.G.A. or C.G.A. design certified.

When servicing, repairing or replacing parts on these units, always give the complete **Model Number**, **Control Number**, and **Serial Number** from the Serial Plate. The examples below show what these numbers indicate.

Model Number Designations



Serial Number Designations



SERVICE INSTRUCTIONS

Overheat Control (High-Limit Switch)

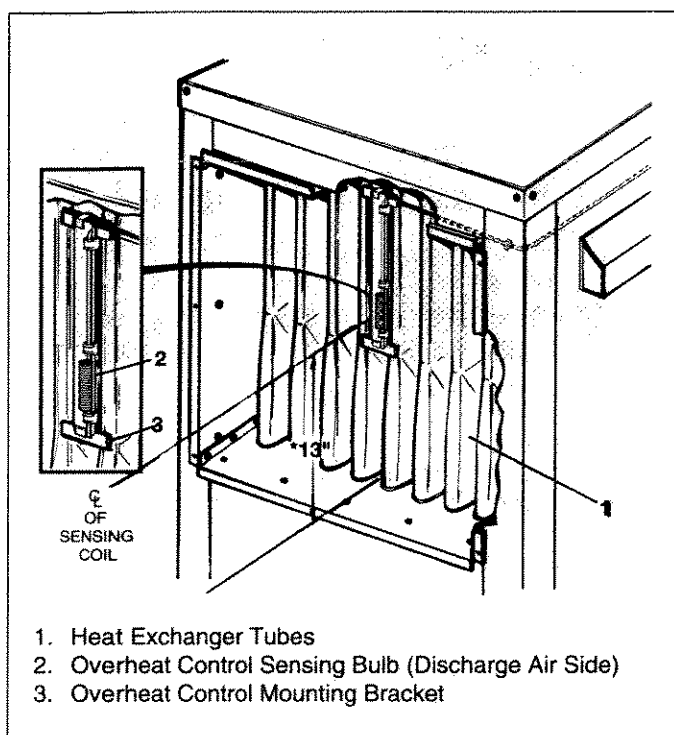
Important Note:

The limit control (overheat switch) on this duct furnace will shut off the gas should discharge air temperature become excessive. (See Figure 14).

This overheat control should operate only when something is seriously wrong with the unit. Anytime this control operates, correct the difficulty immediately or serious damage may result. If the overheat 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.

FIGURE 14



3. Check to be sure duct blower motor is operating.
4. Check blower belts and pulleys for tightness or damage.
5. Check blower speed to assure proper rpm. Check for restrictions in ducts and for dirty filters.
6. Check to make sure the venting system is not damaged or blocked.
7. Check to be certain air distribution baffle is in place if required.
8. If items 1-7 do not solve the problem, check overheat control switch and replace if necessary.

Access to the temperature sensing bulb of the high limit control, which is positioned between two heat exchanger tubes at the center of the furnace can be made through the downstream 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.

Note: To prevent unnecessary rapid cycling and damage to capillary tube of the high limit control, make sure the capillary tube does not touch the heat exchanger.

General Maintenance

1. Service air moving components annually
 - a. 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. Combustion air intake openings.
 - b. Burner ports, pilot burner and main burner orifices (avoid use of hard, sharp instruments capable of damaging surfaces, for cleaning these ports).
 - c. Primary air shutters.
3. Check on wiring for possible loose connections or deteriorated insulation.
4. Controls – See control instruction sheets furnished separately with unit.

SERVICE INSTRUCTIONS

To Remove Burner (See Figure 15)

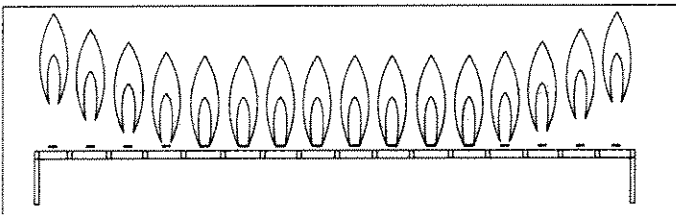
1. Shut off gas and electric supply.
2. Remove front access panel.
3. Disconnect pilot supply line (9) and ignition cable (11) at the controls.
4. Disconnect gas manifold at ground joint union (12) and remove burner box retaining screws (14). Pull burner box assembly (10) completely out of unit before attempting to remove burner from burner box assembly.
5. Pull the burner assembly retaining pins (15) out of each side of the burner and lift burner out.
6. Examine the burner ports for cleanliness and/or obstruction. If cleaning is required, brush burner ports with a stiff brush. Do not use a wire brush. After brushing, the burner may be blown clear of impurities by using a low pressure air hose and blowing out each burner mixing tube.
7. Replace the burner in reverse order as described in step 5. In replacing the burner be certain that the slots at the rear of the burner are located properly on their shoulder rivets and that the retaining pins are put back into their proper location.
8. Replace the burner box assembly in reverse order of steps 1 through 4. Make sure all gas and electrical connections are tight and secure.

SERVICE DIAGNOSIS

Combustion Diagnosis

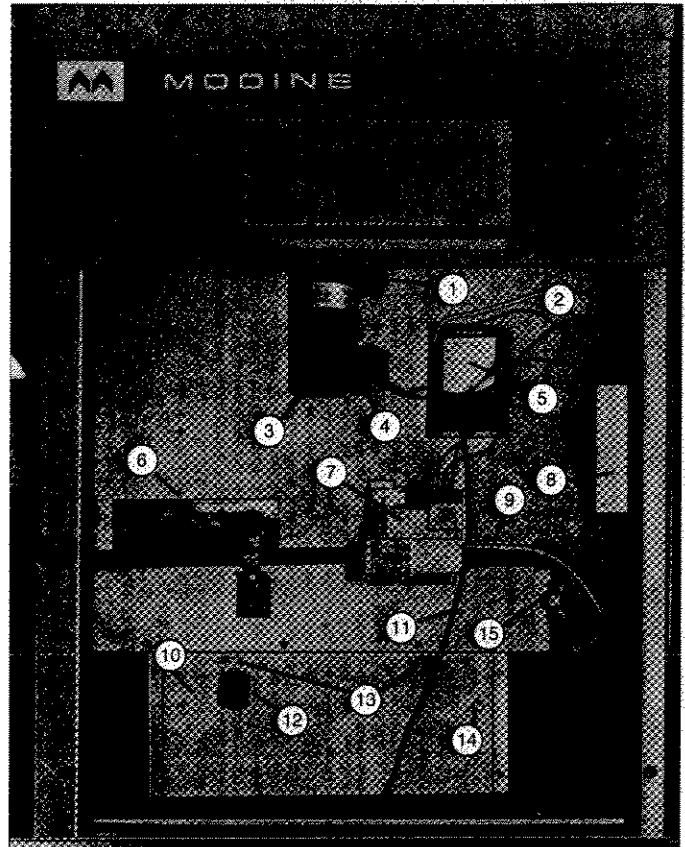
To realize full gas heating value requires periodic inspections with proper combustion control corrections as outlined and illustrated here.

Figure 16 – Lifting Flame Condition



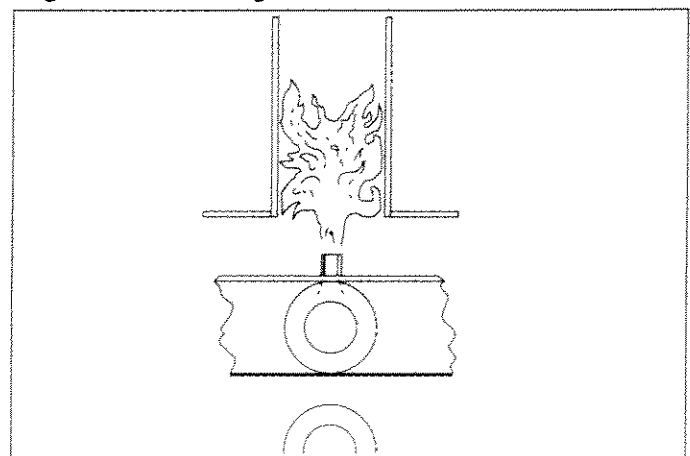
1. **Lifting Flames (Figure 16)**. Lifting flames rise unevenly above the burner port and may occur on few or all the ports. Sometimes the flames drop and lift intermittently. Lifting can be eliminated by reducing primary air. If flame cannot be adjusted properly, check input rate to heater and manifold gas pressure; reduce if necessary. Check the orifice size with those listed in Table 6 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 not objectionable.
3. **Flashback**. Flashback occurs when air-gas mixture ignites inside the burner to burn near the orifice. Flashback on ignition or during burner operation usually can be eliminated by reducing primary air. The burner may also be operating below its rated capacity. Check input rate and adjust to correct value shown in Table 6.

Figure 15 – (Power Vented Unit Shown)



1. Power Venter Motor Junction Box
2. 25V Control Transformer
3. Power Venter Motor
4. Power Venter Centrifugal Switch J-Box
5. Ignition Controller
6. Serial/Rating Plate
7. Main Gas Valve
8. Power Junction Box
9. Pilot Tube
10. Burner Box Assembly
11. High Tension Lead (for spark ignitor) Ignition Cable
12. Gas Designation Disk
13. Burner Box Retaining Screws
14. Burner Retaining Pins
15. Ground Joint Union

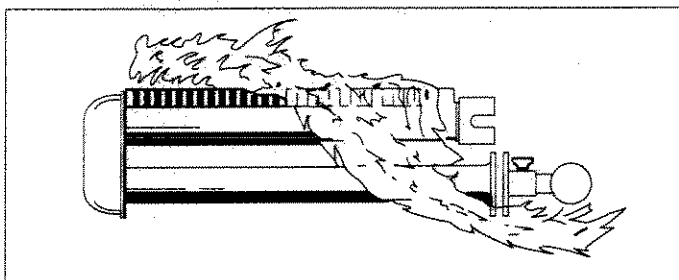
Figure 17 – Floating Flame Condition



SERVICE DIAGNOSIS

4. **Floating Flames.** (Figure 17) 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. Check input rate and reduce if necessary. Soot or dust may be blocking the flue. Check flue and clear any blockage. Adjust primary air to get rid of yellow tipping that may produce soot to block flueways. Make sure combustion air inlet openings are not blocked.

Figure 18 – Flame Rollout Appearance



5. **Flame Rollout.** (Figure 18) Flames rolling out of the burner box assembly when the burner is turned on can create a fire hazard, 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 burner box assembly. Basic cause is lack of combustion air that may be due to overfiring, poor draft, flue blockage or blocked combustion air openings.

Effect of Pilot Operation on Safety Controls

A weak pilot flame may cause poor ignition or reduce contact on pilot flame sensor to the point where the automatic controls become inoperative, thereby shutting off the gas supply to the main burners. This may result from a plugged pilot orifice, dirty pilot valve or poor adjustment.

If Pilot Does Not Light

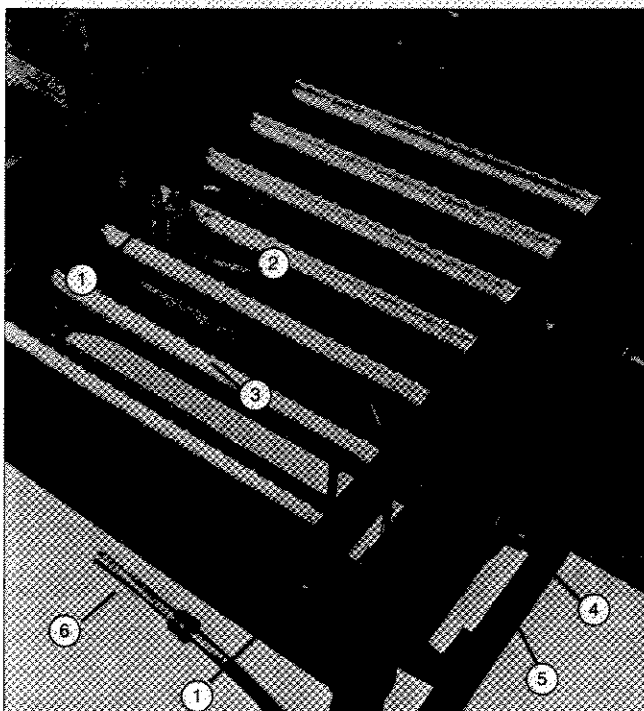
1. Check power or gas supply to be sure it is on.
2. Check wiring.
3. Check overheat control for continuity.
4. Check main gas valve solenoid and connections.
5. If unit is power vented, check power venter to see if it is running and check centrifugal switch and connections in power venter to make sure it is functioning properly.
6. Check for plugged pilot orifice.
7. Check for air in pilot line.
8. Check connections to spark electrode.

If Main Burners Do Not Come On

1. Check to make sure pilot is lit and a good pilot flame has been established. Go through checks for "Pilot Does Not Light" if pilot flame is not present.
2. Check pilot flame sensing probe and connections.
3. Check wiring to ignition controller.
4. Check main gas valve solenoid and connections.

If the problem cannot be solved for "Pilot Does Not Light" and/or "Main Burners Do Not Come On" after following the above check-out procedures, consult your local gas company.

Figure 19 –Pilot and Burner Assembly



1. Pilot Assembly for Intermittent Pilot Ignition
2. High Tension Lead (for spark ignition)
3. Burner Tube
4. Main Burner Orifice with Primary Air Adjustment Shutter
5. Main Burner Gas Manifold
6. Pilot Tube
7. Burner Box Assembly

If No Heat Is Problem

1. Check electrical and gas supplies to unit.
2. Check thermostat connections.
3. Check overheat control for continuity.
4. On power vented units check power venter operation and centrifugal switch connections.
5. Inspect blower section for loose or broken belts, damaged motor, etc.
6. Review checks for "No Pilot" or "Main Burner Does Not Come On".

If Not Enough Heat Is Problem

1. Check for dirty filters.
2. Check blower drive settings for proper rpm.
3. Check maximum setting of outdoor damper. Too much outside air may be the problem.
4. Check for obstructions or leaks in duct system.
5. Check belt tension adjustment.
6. Check gas supply pressure to unit gas controls.

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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.

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

Heat Exchangers

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

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

SHALL BE LIMITED TO TEN YEARS FROM DATE OF SHIPMENT FROM MODINE.

Heat Exchanger (Condenser) for models listed below, and Burners and Sheet Metal for all models

Models PSH, BSH, DJ, DJE, WDG, WDP, WGD, WPD, WBG, WBP, WGB, WPB, WSG, WSP, WGS, WPS, DHE, DHP, L, RH, RS, PAB, PBH, GLW, HE, VE PTE, POH, HS, V, PT, VSS, PTS and GHS units.

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

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

All Modine Heating Products

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

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

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

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



MODINE



Heating Division

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