

80% SINGLE STAGE GAS FURNACES



Service Manual



***8DNL, *8MPL & *8MPN
“B”
* Denotes brand H, C, T**

This manual supports single stage “B” series and later non-condensing gas furnaces

Manufactured by:



**Part Number
441 08 2011 00**

2/2006

***8DNL - Dedicated Downflow**

***8MPL - Low NOx Model**

***8MPN - Single Stage**

*** Denotes Brand (T, C, H or N)**

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INTRODUCTION

This service manual is designed to be used in conjunction with the installation manual and/or technical support manual provided with each furnace.

These furnaces represent the very latest in high efficiency gas furnace technology. Consequently, they incorporate the use of certain controls that contain highly sophisticated electronic components which are **not user serviceable**. Therefore, it is essential that only competent, qualified, service personnel attempt to install, service, or maintain this product.


This Service manual was written to assist the professional HVAC service technician to quickly and accurately diagnose and repair any malfunction of this product.

This service manual covers the following models; *8DNL - - - - - B, *8MPL - - - - - B and *8MPN - - - - - B models. The overall operation of all of these models is essentially the same.

This manual, therefore, will deal with all subjects in a general nature (I.E. all text will pertain to all models) unless that subject is unique to a particular model or family, in which case it will be so indicated.

It will be necessary then for you to accurately identify the unit you are servicing, so you may be certain of a proper diagnosis and repair. (See Unit Identification, Page 3)

SAFETY REQUIREMENTS

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the furnace and in instructions manuals be alert to the potential for personal injury.

Understand the signal words *DANGER*, *WARNING*, or *CAUTION*. These words are used with the safety-alert symbol. *DANGER* identifies the most serious hazards, those that **will** result in severe personal injury or death. *WARNING* signifies a hazard that **could** result in personal injury or death. *CAUTION* is used to identify unsafe practices that **could** result in minor personal injury or product and property damage. *NOTE* is used to highlight suggestions that will result in enhanced installation, reliability, or operation.

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment.

Untrained service personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the unit and other safety precautions that may apply.

Follow all safety codes. In the United States, follow all safety codes including the current edition National Fuel Gas Code (NFPA) ANSI Z223.1-2002/NFPA No. 54-2002. In Canada, refer to the current edition of the National Standard of Canada Natural Gas and Propane Installation Code (NSCNGPIC) CSA B149.1-05. Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with changing residential construction practices. We require these instructions as a minimum for a safe installation.

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Lewisburg, TN 37091

UNIT IDENTIFICATION

The unit's rating plate contains important information for the service technician. It also lists the complete Model Manufacturing and Serial Numbers.

These complete numbers are required to obtain correct re-

placement parts (example, in certain model families a unit having a MARKETING REVISION of "C" is likely to be equipped with one or more different components.

MODEL NUMBER IDENTIFICATION GUIDE

*	8	M P	D	0 7 5	B	1 2	B	1
Brand Identifier T = Tempstar C = Comfortmaker H = Heil A = Arcoaire N = Non-Brand Specific (Generic)								Engineering Rev. Denotes minor changes
Brand Identifier 8 = Non-Condensing, 80+% Gas Furnace 9 = Condensing, 90+% Gas Furnace								Marketing Digit Denotes major change
Installation Configuration UP = Upflow DN = Downflow UH = Upflow/Horizontal HZ = Horizontal DH = Downflow/Horizontal MP = Multiposition, Upflow/Downflow/Horizontal								Cooling Airflow 08 = 800 CFM 12 = 1200 CFM 14 = 1400 CFM 16 = 1600 CFM 20 = 2000 CFM
Major Design Feature 1 = One (Single) Pipe N = Single Stage 2 = Two Pipe P = PVC Vent D = 1 or 2 Pipe T = Two Stage L = Low NOx V = Variable Speed								Cabinet Width B = 15.5" Wide F = 19.1" Wide J = 22.8" Wide L = 24.5" Wide
								Input (Nominal MBTUH)

FURNACE THEORY OF OPERATION

The high efficiencies and lower profile (compared to past series) of this furnace have been obtained using design techniques not typical of traditional furnace designs. A brief description of these new design techniques and the purpose they serve follows.

1. Reducing the height of the furnace while maintaining the high efficiency of previous models required maintaining the **surface area** of the heat exchanger and yet minimizing the overall size.

The design required to achieve these results is the "SERPENTINE" design, wherein the flue gasses must follow a serpent shaped passage through the heat exchanger via convection.

This "Serpentine" path is resistive to normal convective flow, and requires that a partial vacuum be created at the outlet of the heat exchanger to maintain the flow of flue products through the heat exchanger.

2. The serpentine heat exchanger design does not lend itself well to the ribbon type, or slotted port type burner found in more traditional design furnaces for the following reasons:
 - A. The secondary combustion airflows at right angles to the burner flame, making it likely to "pull" the flame off a ribbon or slotted port type burner.
 - B. The flame "height" of a ribbon or slotted port type burner would make it difficult (if not impossible) to prevent impingement of the flame on the heat exchanger surfaces while maintaining the low profile heat exchanger.

For these reasons, an "INSHOT" type burner is used in this series. The inshot burner (also called a "jet" burner) fires a flame straight out its end. This burner is designed to fire into a tube style heat exchanger, making it an ideal application in the tube-like passages of the serpentine heat exchanger.

3. To overcome the resistance to convective flow of the heat exchanger requires the use of an Induced Draft Combustion Blower Assembly.
4. The Combustion Blower Assembly is mounted on the outlet side of the heat exchanger, This blower creates a partial vacuum (negative pressure) within the heat exchanger drawing the flue products out of the furnace.
5. A pressure switch (Air Proving Switch) is used as a safety device that prevents the ignition system from firing the furnace until it senses that a proper draft has been established through the furnace.

SEQUENCE OF OPERATION - HEATING

Refer to the ignition control section for the unit you are servicing.

ELECTRICAL SUPPLY



WARNING

ELECTRICAL SHOCK HAZARD.

Failure to turn off power could result in death or personal injury.

Turn OFF electrical power at fuse box or service panel before making any electrical connections and ensure a proper ground connection is made before connecting line voltage.

SUPPLY CIRCUIT

The furnace cannot be expected to operate correctly unless it is properly connected (wired) to an adequately sized single branch circuit.

Line voltage wires should conform to temperature limitation of 63° F (35° C) rise and be sized for the unit maximum amps stated on the rating plate. Add the full load amps for potential field installed accessories that would receive power from the furnace control. Consult NEC, CEC or local codes for proper wire and circuit sizing.

SUPPLY VOLTAGE

Supply voltage to the furnace should be a nominal 115 volts. It MUST be between 104 volts and 127 volts. Supply voltage to the furnace should be checked WITH THE FURNACE IN OPERATION. Voltage readings outside the specified range can be expected to cause operating problems. Their cause MUST be investigated and corrected.

ELECTRICAL GROUND

Proper grounding of the electrical supply to the FURNACE IS REQUIRED for safety and operational reasons.

POLARITY

CORRECT POLARITY of the line voltage supply to the furnace is also required for safety and operational reasons. The furnace control MUST have proper line voltage polarity to operate properly.

CHECKING GROUNDING AND POLARITY

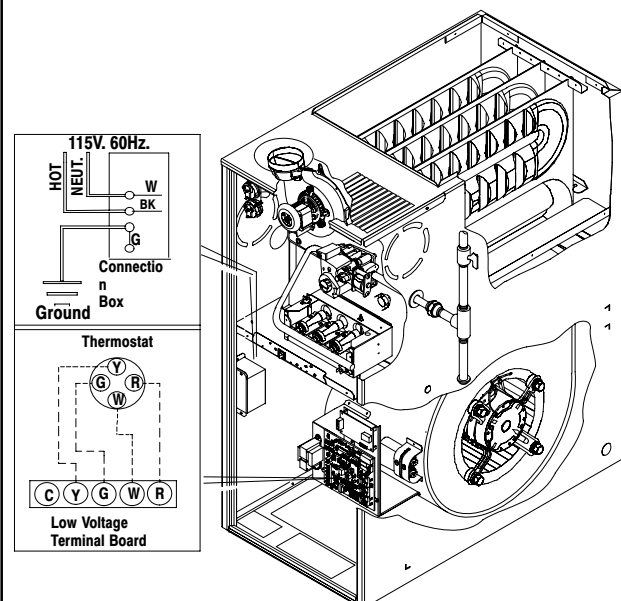
Grounding may be verified as follows:

1. Turn the power supply "OFF".
2. Using an **Ohmmeter** check for continuity between the Neutral (white) wire and Ground wire (green) of the supply circuit.
3. With the Ohmmeter set on the R x 1 scale, the reading should be **zero Ohms**.

4. A zero Ohm reading indicates that the neutral is grounded back to the main panel.
5. An alternate check would be to check for continuity from the Neutral to a cold water pipe, (Pipe must be metal, and must have a continuous, uninterrupted connection to ground) or to a continuous, uninterrupted connection to ground or to a driven ground rod.

Figure 1

Electrical Connections



NOTE: 115 VAC/60Hz/single-phase
Operating voltage range*: 127 VAC max, 104 VAC min.

* Permissible limits of voltage at which unit will operate satisfactorily

6. Any **readings other than zero Ohms** would indicate a poor ground, or no ground.

Polarity may be verified as follows:

1. Turn the power supply "ON".
2. Using a **Voltmeter** check for voltage between the **Hot** (Black) and **Neutral** (White) wire of supply circuit.
3. Reading should be **Line (Supply) Voltage**.
4. Check for Voltage between the **Neutral** (White) wire and **Ground** wire of the supply circuit.
5. Reading should be **zero Volts**. (if line voltage is read, polarity is reversed)
6. A zero Volt reading indicates there is no voltage potential on Neutral wire.
7. Double check by checking for voltage between the **Hot** (Black) wire and **Ground** wire of the supply circuit.

8. Reading should be **Line** (supply) **Voltage**. (if zero volts is read, there is no ground, or polarity is reversed.)

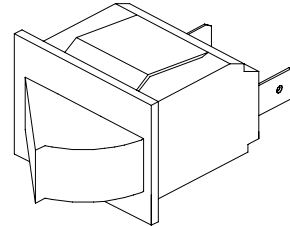
INTERLOCK SWITCH

The blower compartment door of all models is equipped with an interlock switch. (See **Figure 2**) This switch is “Normally Open” (closes when the door is on the furnace) and interrupts furnace operation when the door is open. This interlock switch is a safety device, and **SHOULD NEVER BE BY-PASSED**.

Since this is a single pole switch, (breaking only one side of the line) proper line polarity is essential to insure that furnace components are not “HOT” when switch is open. (See *Checking Grounding and Polarity*)

Figure 2

Typical Interlock Switch



10-12-96

GAS SUPPLY

An adequately sized gas supply to the furnace is required for proper operation. Gas piping which is undersized will not provide sufficient capacity for proper operation. Piping should be sized in accordance with accepted industry standards. Refer to NFGC and ANSI Z223.1 for proper gas pipe size.

NATURAL GAS

Inlet (Supply) pressure to the furnace should be checked (at the gas valve) with ALL OTHER GAS FIRED APPLIANCES OPERATING. Inlet (Supply) pressure to the furnace under these conditions **MUST** be within minimum and maximum values listed on rating plate. If the inlet pressure is less, it may be an indication of undersized piping or regulator problems.

L.P. GAS

Inlet (Supply) pressure to the furnace should be checked in the same manner as for Natural Gas, however with L.P. Gas, the inlet pressure **MUST** be a minimum of 11" W.C. If this cannot be obtained, problems are indicated in either the regulator or pipe sizing.

CHECKING INPUT (FIRING) RATE

Once it has been determined that the gas supply is correct to the furnace, it is necessary to check the input (firing) rate. This can be done in two (2) ways. First by checking and adjusting (as necessary) the manifold (Outlet) pressure. The second way is to “Clock” the gas meter.

⚠ WARNING

FIRE OR EXPLOSION HAZARD.

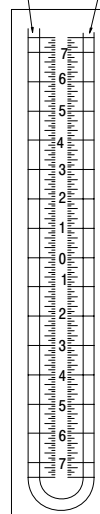
Turn OFF gas at shut off before connecting manometer.

Failure to turn OFF gas at shut off before connecting manometer can result in death, personal injury and/or property damage.

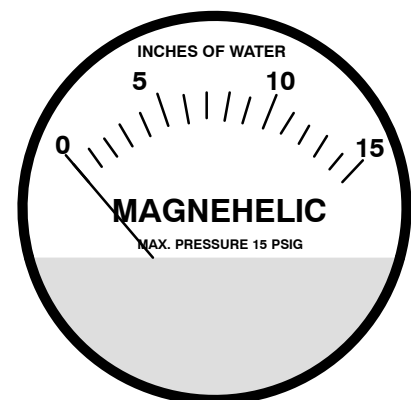
Figure 3

Gas Pressure Testing Devices

Pressure Connections



Typical “U” Tube Manometer



CHECKING MANIFOLD PRESSURE

NOTE: Make adjustment to manifold pressure with burners operating.

1. Remove the burner compartment door.
2. With gas **OFF**, connect manometer to outlet tapped opening on gas valve. Use manometer with a 0 to 15" water column range.
3. Turn gas on. Remove the blower compartment door. Operate the furnace by jumpering **R** to **W** on the furnace control board.
4. Remove manifold pressure adjustment screw cover on furnace gas control valve. Turn adjusting screw counterclockwise to decrease manifold pressure and clockwise to increase pressure.

NOTE: Adjustment screw cover **MUST** be replaced on gas control valve before reading manifold pressure and operating furnace.

5. Obtain gas heating value and installation site altitude.
6. Set manifold pressure to value shown in **Table 1** or **Table 2**.
7. When the manifold pressure is properly set, replace the adjustment screw cover on the gas control valve.
8. Remove jumper wire from thermostat connection on furnace board. Remove manometer connection from manifold pressure tap, and replace plug in valve.

9. Check for leaks at plug.
10. Replace the burner compartment and blower compartment door.

Natural Gas Input Rating Check

NOTE: The gas meter can be used to measure input to furnace. Rating is based on a natural gas BTU content of 1,000 BTU's per cubic foot. Check with gas supplier for actual BTU content.

1. Make sure burner compartment door is in place before performing the following steps.
2. Turn **OFF** gas supply to all appliances and start furnace.

Example			
Natural Gas BTU Content	No. of Seconds Per Hour	Time Per Cubic Foot in Seconds	BTU Per Hour
1,000	3,600	48	75,000
1,000 x 3,600 ÷ 48 = 75,000 BTUH			

3. Time how many seconds it takes the smallest (normally 1 cfh) dial on the gas meter to make one complete revolution. Refer to **Example**.
4. Relight all appliances and ensure all pilots are operating.

NOTE: If meter uses a 2 cubic foot dial, divide results (seconds) by two.

MANIFOLD PRESSURE AND ORIFICE SIZE FOR HIGH ALTITUDE APPLICATIONS

Table 1	NATURAL GAS MANIFOLD PRESSURE (" w.c.)													
	MEAN ELEVATION FEET ABOVE SEA LEVEL													
	0 to 2000		2001 to 3000		3001 to 4000		4001 to 5000		5001 to 6000		6001 to 7000		7001 to 8000	
HEATING VALUE at ALTITUDE BTU/CU. FT.	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure	Orifice No.	Manifold Pressure
700	--	--	--	--	--	--	--	--	--	--	--	--	41	3.7
725	--	--	--	--	--	--	--	--	--	--	41	3.7	41	3.4
750	--	--	--	--	--	--	--	--	--	--	41	3.5	42	3.6
775	--	--	--	--	--	--	--	--	41	3.6	42	3.6	42	3.3
800	--	--	--	--	--	--	41	3.6	42	3.7	42	3.4	42	3.1
825	--	--	--	--	41	3.7	41	3.4	42	3.5	42	3.2	42	2.9
850	--	--	--	--	41	3.5	42	3.6	42	3.3	42	3.0	42	2.8
875	--	--	41	3.6	42	3.6	42	3.4	42	3.1	42	2.8	42	2.6
900	--	--	42	3.7	42	3.4	42	3.2	42	2.9	42	2.7	42	2.5
925	41	3.7	42	3.5	42	3.3	42	3.0	42	2.8	42	2.5	44	3.3
950	41	3.5	42	3.3	42	3.1	42	2.9	42	2.6	42	2.4	44	3.1
975	42	3.7	42	3.2	42	2.9	42	2.7	42	2.5	44	3.2	45	3.6
1000	42	3.5	42	3.0	42	2.8	42	2.6	42	2.4	45	3.7	45	3.4
1050	42	3.2	42	2.7	42	2.5	44	3.3	45	3.6	--	--	--	--
1100	43	3.6	42	2.5	44	3.2	45	3.6	--	--	--	--	--	--

NOTE: Natural gas data is based on 0.60 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2002/NFPA 54-2002 or National Standard of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

Table 2 HEATING VALUE at ALTITUDE BTU/CU. FT.	LPG or PROPANE GAS MANIFOLD PRESSURE (" w.c.)						
	MEAN ELEVATION FEET ABOVE SEA LEVEL						
	0 to 2000	2001 to 3000	3001 to 4000	4001 to 5000	5001 to 6000	6001 to 7000	7001 to 8000
2500	10.0	10.0	9.0	10.0	9.4	8.5	10.0
Orifice Size	#54	#54	#54	#55	#55	#55	#56

NOTE: Propane data is based on 1.53 specific gravity. For fuels with different specific gravity consult the National Fuel Gas Code ANSI Z223.1-2002/NFPA 54-2002 or National Standard Of Canada, Natural Gas And Propane Installation Code CSA B149.1-05.

NOTE: The derating of these furnaces at 2% (Natural Gas) and 4% (Propane Gas) has been tested and design-certified by CSA. In Canada, the input rating must be derated 5% (Natural Gas) and 10% (Propane Gas) for altitudes of 2,000 to 4,500 above sea level. Use the 2001 to 3000 column in **Table 1** and **Table 2**.

The burner orifice part nos. are as follows:

Orifice #41	1096942	Orifice #42	1011351	Orifice #45	1011353	Orifice #46	1011744
Orifice #43	1011377	Orifice #44	1011352	Orifice #54	1011376	Orifice #55	1011354
				Orifice #56	1011355		

NOTE: The derating of these furnaces at 2% (Natural Gas) and 4% (Propane Gas) has been tested and design-certified by CSA.

In Canada, the input rating must be derated 5% (Natural Gas) and 10% (Propane Gas) for altitudes of 2,000 to 4,500 above sea level. Use the 2001 to 3000 column in **Table 1** and **Table 2**.

LP Conversion

⚠ CAUTION

CARBON MONOXIDE HAZARD.

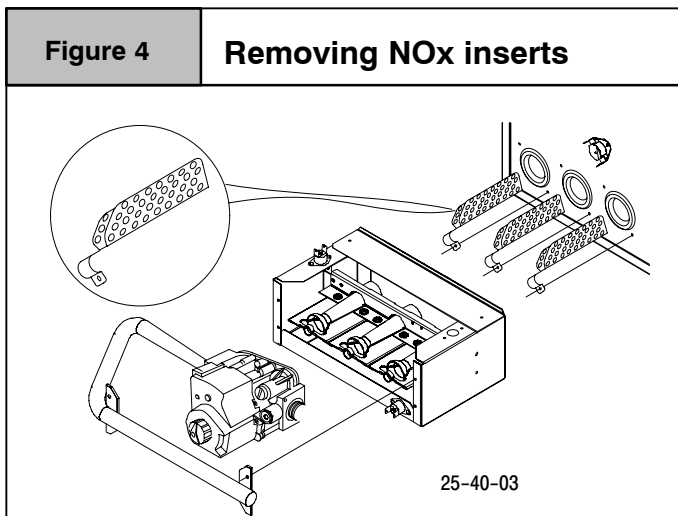
Nox inserts for use with Natural Gas units ONLY. If LP Gas is required, NOx inserts must be removed.

Failure to follow this warning can result in death, property damage and/or personal injury.

For LP conversion remove screws that secure the NOx insert and discard insert.

Reinstall screws. See **Figure 4**

NOTE: It is very important to reinstall the NOx insert mounting screws.



General Derating Rules

1. These furnaces may be used at full input rating when installed at altitudes up to 2,000'. When installed above 2,000', the input must be decreased 2% (natural) or 4% (LP) for each 1000' above sea level in the USA. In Canada, the input rating must be derated 5% (natural) or 10% (LP) for each 1000' above sea level. See **Table 1** for required high altitude input rate.
2. For operation with natural gas at altitudes above 2,000', orifice change and/or manifold pressure adjustments may be required for the gas supplied. First consult your local gas supplier, then refer to **Table 1** for required pressure change and/or orifice change for high altitudes.
3. For operation with LP gas, gas orifices **MUST** be changed and manifold pressure **MUST** be maintained as per **Table 2**. Orifices can be ordered through your distributor. (See **Figure 6**)

Elevation	*High Altitude Input Rate = Nameplate Sea Level Input Rate x (Multiplier)	
	High Altitude Multiplier	
	LP Gas* Standard Input	LP Gas* Alternate Input
2001' - 3000'	0.95	0.90
3001' - 4000'	0.93	0.86
4001' - 5000'	0.91	0.82
5001' - 6000'	0.89	0.78
6001' - 7000'	0.87	0.74
7001' - 8000'	0.85	0.70

* Based on mid-range of elevation.

Main Burner Flame Check

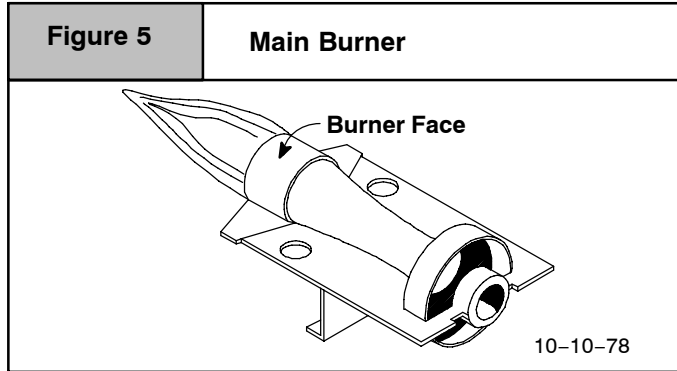
Allow the furnace to run approximately 10 minutes. Then inspect the main burner flames. See **Figure 5**.

Check for the following:

- Stable and blue flames. Dust may cause orange tips or wisps of yellow, but flames **MUST NOT** have solid, yellow tips.

- Flames extending directly from burner into heat exchanger.
- Flames do **NOT** touch sides of heat exchanger

If any problems with main burner flames are noted, it may be necessary to adjust gas pressures or check for drafts.



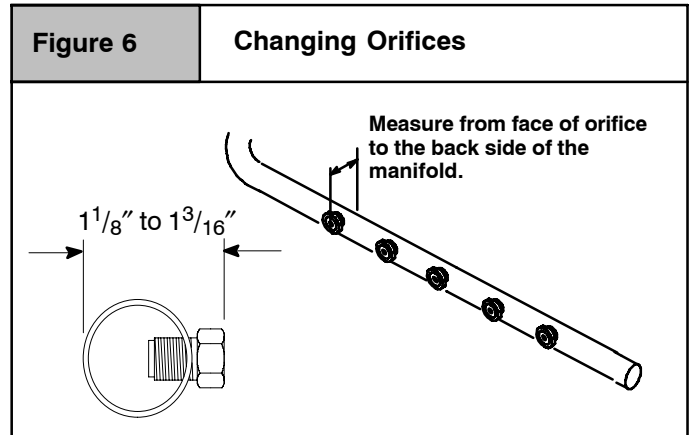
Changing Orifices for High Altitude

	WARNING
ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD	
<p>Failure to properly install orifices could result in death, personal injury and/or property damage.</p> <p>Turn OFF electric power (at disconnect) and gas supply (at manual valve in gas line) when installing orifices. Installation of orifices requires a qualified service technician.</p>	

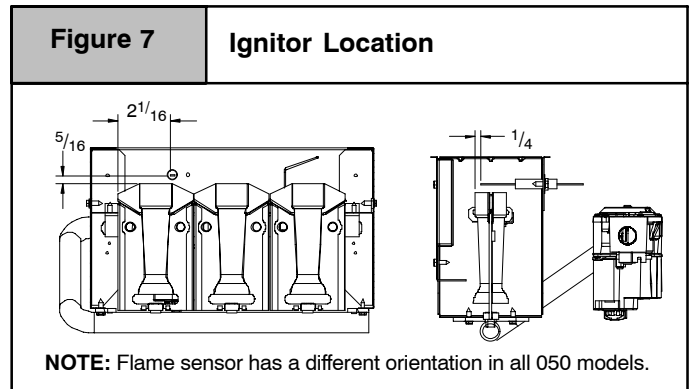
NOTE: Main burner orifices can be changed for high altitudes.

1. Disconnect gas line from gas valve.
2. Remove manifold from furnace.

3. Remove the orifices from the manifold and replace them with properly sized orifices.
4. Tighten orifices so it is seated and gas tight, approximately, $1\frac{1}{8}$ " from the face of the orifice to the back of the manifold pipe. **(See Figure 6)** Make sure orifice is installed straight so that it forms a right angle (90°) to the manifold.
5. Reinstall manifold. Ensure burners do **NOT** bind on new orifices.



NOTE: For Ignitor location see **Figure 7**.

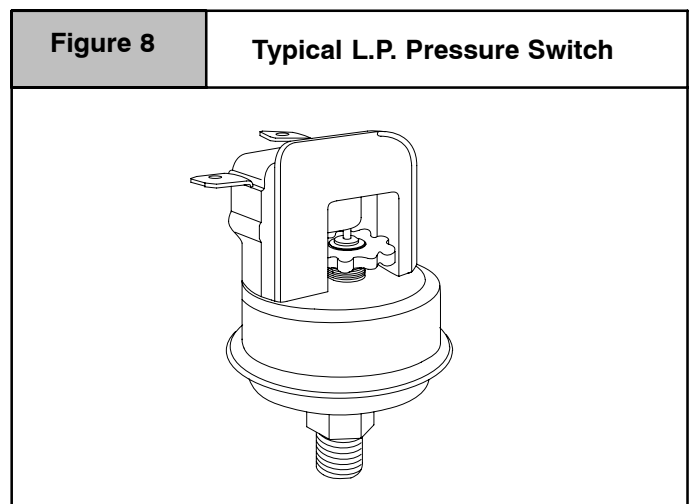


L.P. PRESSURE SWITCH

Models equipped for or converted to operate on LP Gas will be equipped with an LP Pressure Switch. If so equipped, the switch will be located in the gas supply line (in a "Tee" fitting), just ahead of the gas valve.

The purpose of this switch is to prevent furnace operating under low line (Supply) pressure conditions. Operating under low line pressure conditions, can create problems such as incomplete combustion, flashback, sooting, etc.

The switch is a "Normally Open" pressure operated switch that is wired in series with the furnace air proving pressure switch. The L.P. Pressure Switch closes when line (Supply) pressure is 8.0" W.C. or higher. the L.P. Pressure Switch Opens if line pressure falls below 6.0" + 0.6" W.C. interrupting power to the gas valve.



HONEYWELL VR8205S Gas Valve

The VR8205S Gas Valve is a REDUNDANT type valve. This means that it consists of two (2) valves (internally) with independent operators (solenoids) that both must be energized before gas can flow through the valve. This redundancy provides an added safety measure. In case one of the valves sticks open (Mechanically), the second operator will close preventing the flow of gas.

If the valve does not open, check for 24 Volts across the two

wires to the valve during a call for heat. This check **MUST** be made IMMEDIATELY following the igniter warm-up period (17 seconds). 24 Volts will be present **ONLY** for a period of 7 seconds after the igniter warm-up if flame is not proven.

If 24 Volts is present during the above check and the valve will **NOT** open, then replace the valve. If 24 Volts **IS NOT** present, problems are indicated in the control and/or wiring to the gas valve.

HIGH ALTITUDE OPERATION

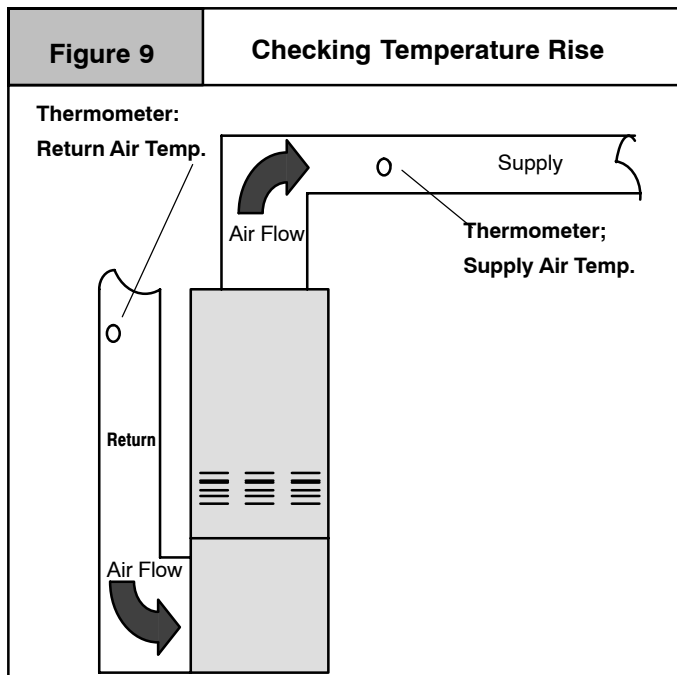
These furnaces are designed to operate in the majority of the country without modifications. At altitudes over 2,000' above sea level, however, certain measures need to be taken to insure continued, safe reliable operation. For example, units must be de-rated for altitude (by adjusting manifold pressure and/or changing orifice size) based upon the type of fuel (I.E. Natural Gas or L.P. gas), Btu content of the gas, and installed altitude.

The factory installed pressure switch need **NOT** be

changed for any furnace installation from sea level up to and including 8,000' altitude.

When servicing a unit installed at altitudes above 2,000' insure that it has been properly modified to operate at that altitude. See the sections on Gas pressure (Page 6), and pressure switches (Page 13) to obtain specific information for you particular installation altitude.

CHECKING TEMPERATURE RISE



1. Place thermometers in supply and return air registers as close to furnace as possible, avoiding direct radiant heat from heat exchangers.
2. Operate furnace continuously for 15 minutes with all registers and duct dampers open.
3. Take reading and compare with range specified on rating plate.
4. If the correct amount of temperature rise is **NOT** obtained, it may be necessary to change blower speed. A higher blower speed will lower the temperature rise. A lower blower speed will increase the temperature rise.

NOTE: BEFORE CHECKING TEMPERATURE RISE BE CERTAIN THAT MANIFOLD PRESSURE IS PROPERLY ADJUSTED.

BRANDED MODELS		DOWNFLOW MODELS	
30° – 60° F	35° – 65° F	30° – 60° F	35° – 60° F
*8MPL075B12	*8MPL050B12	*8DNL100L20	*8DNL050B12
*8MPN075B12	*8MPN050B12		*8DNL075B12
*8MPL075F16	*8MPN100F14		*8DNL075F16
*8MPN075F16	*8MPL100F20		*8DNL100F14
	*8MPN100F20		*8DNL125L20
	*8MPL100J20		
	*8MPN100J20		
	*8MPL125J20		
	*8MPN125J20		
	*8MPN150J20		

Temperature Rise Check

The blower speed **MUST** be set to give the correct air temperature rise through the furnace as marked on the rating plate. Temperature rise is the difference between supply and return air temperatures.

To check temperature rise, use the following procedure:

NON BRANDED MODELS		
25° – 55° F	30° – 60° F	35° – 65° F
N8MPL075F16	N8MPN100F14	N8MPL050B12
N8MPN075F16	N8MPL100J22	N8MPN050B12
	N8MPN100J22	N8MPL075B12
	N8MPL125J20	N8MPN075B12
	N8MPN125J20	N8MPL100F20
	N8MPL125J22	N8MPN100F20
	N8MPN125J22	

Example:

Supply Temp. 170°
 Return Temp. 70°
 Temperature Rise 100° = Too High

Solution: Increase Blower Speed

ROOM THERMOSTATS

Room thermostats are available from several different manufactures in a wide variety of styles. They range from the very simple and inexpensive Bi-metallic type to the complex and costly electronic set-back type. They are simply a switch (or series of switches) designed to turn equipment (or components) "ON" or "OFF" at the desired conditions.

An improperly operating, or poorly located room thermostat can be the source of perceived equipment problems. A careful check of the thermostat and wiring must be made then to insure that it is not the source of problems.

LOCATION

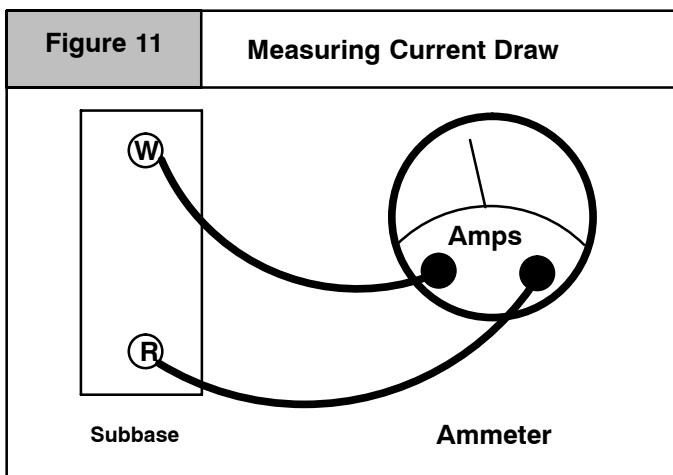
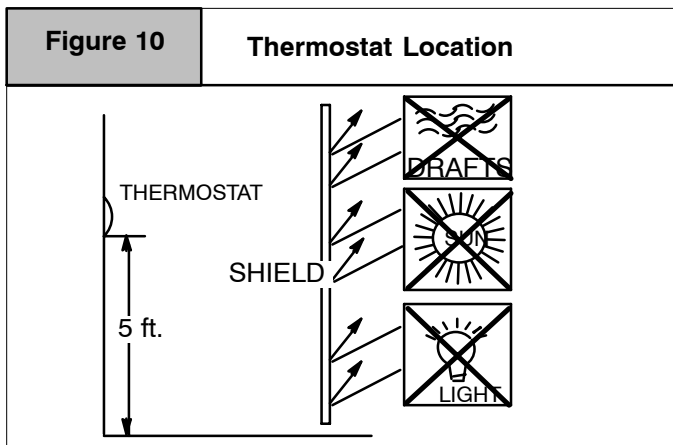
The thermostat should not be mounted where it may be affected by drafts, discharge air from registers (hot or cold), or heat radiated from the sun or appliances. Never install in alcoves, bathrooms or bedrooms.

The thermostat should be located about 5 ft. above the floor in an area of average temperature, with good air circulation. Normally, an area in close proximity to the return air grille is the best choice.

Mercury bulb type thermostats **MUST** be level to control temperature accurately to the desired set-point. Electronic digital type thermostats **SHOULD** be level for aesthetics.

HEAT ANTICIPATORS

Heat anticipators are small resistance heaters built into most electric-mechanical thermostats. Their purpose is to prevent wide swings in room temperature during furnace operation.



In order to accomplish this, the heat output from the anticipator must be the same regardless of the current flowing through it. Consequently, most thermostats have an adjustment to compensate for varying current draw in the thermostat circuit.

The proper setting of heat anticipators then is important to insure proper temperature control and customer satisfaction.

The best method to obtain the required setting for the heat anticipator, is to measure the actual current draw in the control circuit ("W") using a low range (0–2.0 Amps) Ammeter. (See **Figure 11**) After measuring the current draw, simply set the heat anticipator to match that value.

If a low range ammeter is not available, a "Clamp-on" type ammeter may be used as follows:

1. Wrap EXACTLY ten (10) turns of wire around the jaws of a clamp-on type ammeter.
2. Connect one end of the wire to the "W" terminal of the thermostat sub-base, and the other to the "R" terminal.

3. Turn power on, and wait approximately 1 minute, then read meter.
4. Divide meter reading by 10 to obtain correct anticipator setting.

Electronic thermostats do not use a resistance type anticipator. These thermostats use a microprocessor (computer) that determines a cycle rate based on a program loaded into it at the factory.

These cycle rates are normally field adjustable for different types to equipment. The method of adjustment, however, varies from one thermostat manufacturer to another. Check with the thermostat manufacturer to find out the proper way of adjusting the cycle rate.

CONTROL WIRING

Control wiring is an important part of the total equipment installation, since it provides the vital communications link between the thermostat, and the equipment. It is often overlooked as the source of equipment malfunctions. Control wiring that is either too long, undersized, or improperly connected (be it simply loose, or on the wrong terminal) can in fact be the source of many equipment problems.

ALWAYS check to make sure that the control wiring is connected to the proper terminal(s) of the equipment and thermostat you are using. Remember, also, that the thermostat terminals are not always identified alike by different thermostat manufacturers. Connections MUST be clean and tight to insure trouble-free operation.

ELECTRONIC CONTROLS used on this series of furnace RESPOND DIFFERENTLY to certain control wiring practices which have been generally accepted in the HVAC industry for many years.

For Example: For years, installers have run a wire from the "Y" terminal of the room thermostat and connected it directly to the contact on coil of a condensing unit. (not making any connection to the furnace with this wiring. Then, run the low voltage "Common" wire from the condensing unit back to the "C" terminal of the furnace.

With the electronic Furnace Control used in this series, however the "Y" terminal of the furnace does in fact serve a particular purpose. Failure to connect it will result in certain improper operation as follows:

The COOLING fan speed is energized via the "Y" terminal. **Failure to connect** the thermostat "Y" terminal to the "Y" terminal on the control will result in the **failure to energize** the **COOLING speed** on a call for cooling from the thermostat. (The HEATING speed will be energized instead via the "G" terminal)

TWINNING KITS

Some installations may require a Heating capacity or Air-flow capabilities greater than a single furnace of this series can provide. When this is necessary, furnaces may be installed in a "Twinned" configuration.

The Twinning Kit allows the two (2) identical furnaces to be

controlled by the same room thermostat. When Twinned, the circulating (conditioned air) blowers of BOTH furnaces will operate simultaneously. The kit part no. for the "B" series or later furnace is NAHA004WK.

NOTE: Furnace model *8DNL CANNOT be Twinned.

LIMIT SWITCHES

Two (2) different kinds of limit switches are used on this series of furnaces. They are the main limit and roll out limit switch. The main limit, and roll limit switches are used on ALL models.

NOTE: All limit switches are safety devices and other than for testing purposes, **should never be jumped out!**

Limit switches are "normally closed" electrical switches, designed to open when their predetermined "limit setting" has been reached.

It should also be remembered, that when a limit switch opens, it more than likely is not due to a bad switch! The

cause of the opening limit must be found and corrected, before the furnace can resume proper operation.

⚠ WARNING

FIRE HAZARD.

Failure to do so can result in death, personal injury and/or property damage.

Limit controls are factory preset and **MUST NOT** be adjusted. Use **ONLY** manufacturer's authorized replacement parts.

The specific functions of the two (2) limit switches used in this series of furnaces are as follows:

MAIN LIMIT SWITCH

There is a "Normally Closed" switch located on the front partition of the furnace. It monitors supply air temperature, and interrupts furnace (burner) operation when a supply air temperature is sensed which would result in the furnace exceeding Maximum allowable outlet air temperature. While the main limit is open, the combustion blower, and the circulating blower will be energized continuously. This control is an "Automatic" reset control, which will reset itself when the temperature sensed drops to a safe level.

If furnace (burner) cycles on this limit switch, (I.E. switch opens and closes during furnace operation) it is more than likely due to a high temperature rise through the furnace. (See checking temperature on page 10 of this manual)

High temperature rise can be caused by either OVER FIRING (high manifold pressure, incorrect orifices, etc.) or LOW AIR FLOW (dirty filter, blower speed too low, excessive static in duct system, etc.)

To verify this, the cut-out (opening) point of the switch should be checked (using a thermocouple type thermometer connected to the face of the switch) as follows:

1. Operate furnace for several minutes.
2. Block return air grille(s) to furnace.
3. Observe temperature at which switch opens (burner operation ceases).
4. Remove blockage from return grille(s).
5. Observe temperature at which switch closes (burner operation resumes).
6. Compare readings with the limit setting listed in the appropriate chart for the model you are servicing.

NON BRANDED MAIN LIMIT SWITCH

MODEL	PART #	OPEN	CLOSE
050B12B1	1320262	150° F	130° F
075B12B1	1320362	150° F	130° F
075F16B1	34335000	160° F	140° F
100F14B1	1008417	180° F	160° F
100F20B1	1008417	180° F	160° F
100J22B1	1320362	150° F	130° F
125J20B1	34335000	160° F	140° F
125J22B1	1320262	150° F	130° F

ROLL OUT LIMIT SWITCH

MODEL	PART #	OPEN	CLOSE
ALL	1013102	300° F	MANUAL

DOWNFLOW MAIN LIMIT SWITCH

MODEL	PART #	OPEN	CLOSE
050B12B1	34335001	210° F	190° F
075B12B1	34335001	210° F	190° F
075F16B1	1009169	250° F	230° F
100F14B1	1008417	180° F	160° F
100L20B1	1065294	140° F	110° F
125L20B1	1320362	150° F	130° F

BRANDED MAIN LIMIT SWITCH

MODEL	PART #	OPEN	CLOSE
050B12B1	1008417	180° F	160° F
075B12B1	1320362	150° F	130° F
075F16B1	1008417	180° F	160° F
100F14B1	34335000	160° F	140° F
100F20B1	1320362	150° F	130° F
100J20B1	1320362	150° F	130° F
125J20B1	1065294	140° F	110° F
150J20B1	1065294	140° F	110° F

ROLL OUT LIMIT SWITCH

MODEL	PART #	OPEN	CLOSE
ALL	1013102	300° F	MANUAL

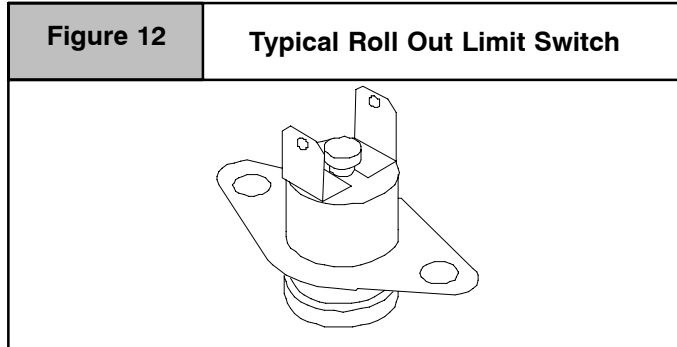
If switch is opening within the specified range, then it is simply doing its job, and the cause of the over-temperature must be determined and corrected.

If, however, the switch is found to be opening prematurely, then it should be replaced. When replacing ANY limit switch, use ONLY a switch of EXACTLY the same temperature setting. Use of a different temperature limit switch can create a dangerous situation. Some of the main limit switches used in this series are SIMILAR IN APPEARANCE. DIFFERENT TEMPERATURE SETTINGS, HOWEVER, ARE USED for different models. Be certain you have the correct control for the model you are servicing.

ROLL OUT LIMIT

A "Normally Closed" switch (wired in series with the Main Limit switch) mounted on both sides of the burner box.

This switch is a manual reset type. When replacing this switch, be absolutely certain the correct one is used.



CAUTION

NEVER use an automatic reset roll out switch to replace a manual reset type roll out switch.

Doing so may cause potentially unsafe and/or intermittent operation.

The roll out switch monitors the temperature inside the burner box, and interrupts furnace (burner) operation when its temperature indicates flame roll out has occurred.

Once the roll out switch has opened, burner operation will be prevented until the roll out switch is "Manually Reset" by pressing the red button located on the switch. While the roll out switch is open, the combustion blower and circulating blower will be energized continuously.

If the roll out switch has opened, the cause must be determined. Some possible reasons for flame roll out include a restricted primary heat exchanger or over fired furnace.

PRESSURE SWITCHES

Inducer Pressure Switch

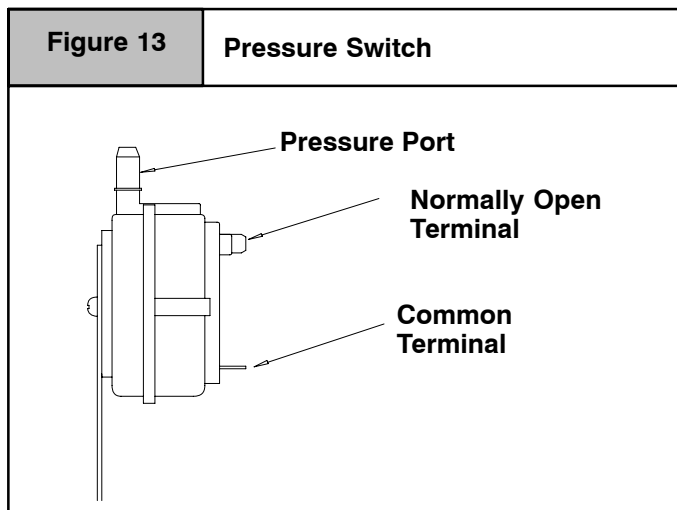
An air proving switch (pressure) switch is used on all models to insure that a draft has been established through the heat exchanger before allowing burner operation.

All models use a single tap (port) type switch. This switch senses the negative pressure created by (at) the combustion blower.

Under normal operating conditions, sufficient pressure is developed by the exhaust (combustion) blower to close the switch, and permit the burner to operate. When the pressure drops sufficiently, burner operation will be prevented until the condition is corrected.

PRESSURE SWITCH			
MODEL	PART #	OPEN " W.C.	CLOSE " W.C
ALL	1013529	-0.59	-0.69

To insure continued SAFE, RELIABLE, operation NEVER SUBSTITUTE a pressure switch with one that is similar in appearance. ONLY FACTORY PROVIDED or AUTHORIZED SUBSTITUTES ARE ACCEPTABLE.



Under normal operating conditions, sufficient negative pressure will be created to close the pressure switch, and keep it closed to keep furnace operating. Under abnormal conditions, however, such as a restricted vent pipe, or a leak in the heat exchanger, sufficient negative pressure will not be created. This will result in the switch failing to close or failing to remain closed during furnace operation.

When servicing a unit whose pressure switch will not close, or remain closed during operation, the operating pressure of that furnace should be checked and compared to approximate operating pressures listed in this manual.

It is important to remember, that greater negative pressures are created by the furnace when "HOT" (I.E. upon initial start-up) than when "COLD" (I.E. after furnaces has been in operation for a few minutes). Because of this, furnace pressure should ONLY be checked when "HOT" to insure accurate readings.

The table lists approximate operating pressures. They are included in this manual to provide you with a "Barometer" to gauge your pressures against. The pressures you obtain in the field will differ slightly from these figures based upon vent length, gas pressure, operating temperature, etc.

Major discrepancies in pressures, will normally cause problems with pressure switch operation. These Major discrepancies should be investigated as follows:

Lower (Lesser) Negative Pressures

Lower than normal negative pressures measured at the **Combustion Blower** may be caused by:

1. Restriction on the **Outlet** side of the combustion blower. (I.E. Blocked Flue, Vent too long, Heat Exchanger leak, etc.)

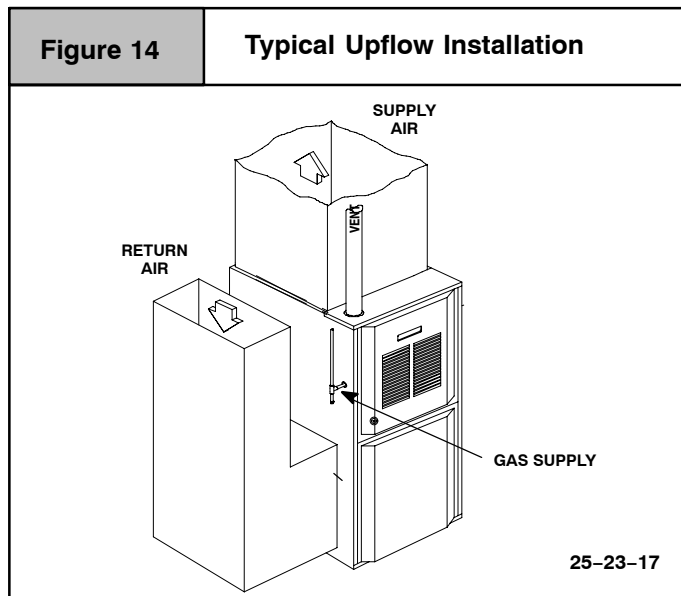
2. Leak (lack of restriction) on the **Inlet** side of the combustion blower.

Higher (Greater) Negative Pressures

Higher than normal negative pressures measured at the **Combustion Blower** may be caused by:

1. Restriction on the **Inlet** side of the combustion blower. (I.E. Plugged Heat Exchanger, air inlet orifice too small)

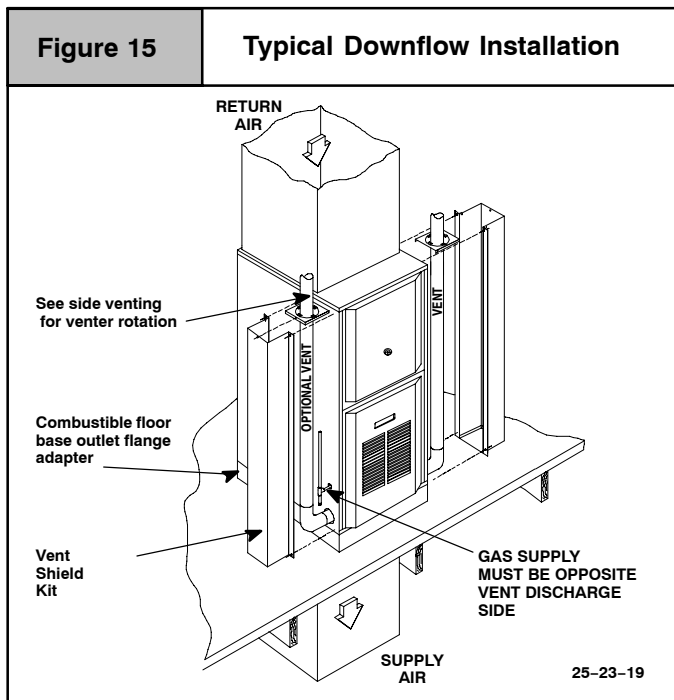
VENTING SYSTEM



Vent piping is an extremely important part of the total furnace installation. Improperly installed or inadequately sized vent piping can be the source of many perceived furnace problems.

For example, most problems associated with pressure switch operation can normally be traced to short comings in the venting system. Anytime these type problems arise, a thorough inspection of the venting system should be conducted.

ALL MODELS require a vent (exhaust) pipe to carry flue products to the outside of the structure.

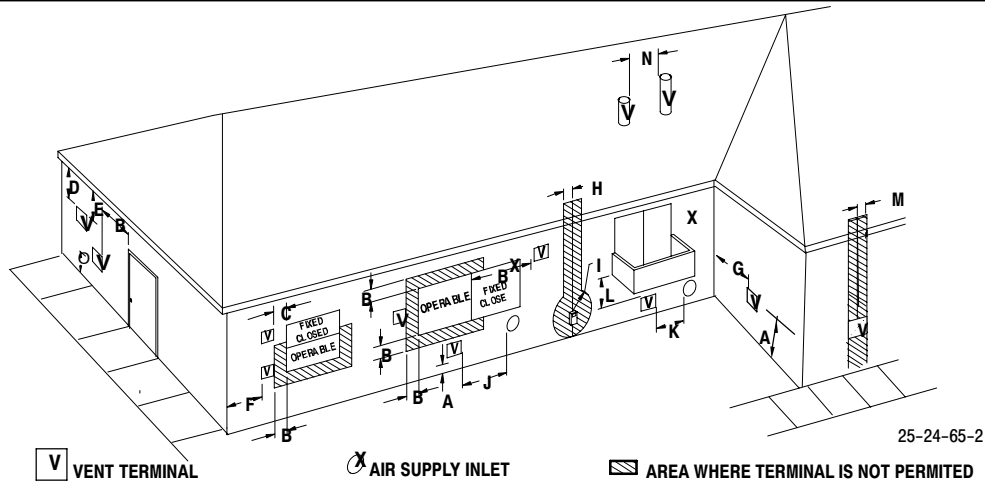


For detailed information on the installation of the venting system, please refer to Parts 10 and 13 of The National Fuel Gas Code (NFGC), ANSIZ223.1 – 2002/NFPA54 2002: and or section 7 and appendix C of the CSA B149.1–05, National Standard of Canada, Natural Gas and Propane Installation Code: The Local Building Codes; Vent Manufacture’s Instructions.

The vent system should be inspected annually. Look for rust, corrosion, water leakage, sagging pipes or broken fittings.

STANDARD VENT TERMINATION

Figure 16 Other than Direct Vent Termination Clearance



25-24-65-2

Item	Clearance Descriptions	Canadian Installation (1)	U.S. Installation (2)
A	Clearance above grade, veranda, porch, deck, balcony, or anticipated snow level	12" (30cm) #	12" (30 cm)
B	Clearance to a window or door that may be opened	6" (15 cm) for appliances ≤ 10,000 BTUH (3kW), 12" (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36" (91 cm) for appliances > 100,000 Btuh (30 kW)	4' (1.2 m) below or to the side of the opening. 1' (30 cm) above the opening.
C	Clearance to a permanently closed window	*	*
D	Vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2' (61cm) from the centerline of the terminal	*	*
E	Clearance to an unventilated soffit	*	*
F	Clearance to an outside corner	*	*
G	Clearance to an inside corner	*	*
H	Clearance to each side of the centerline extended above electrical meter or gas service regulator assembly	3' (91 cm) within 15' (4.5 m) above the meter/regulator assembly	3' (91 cm) within 15' (4.5 m) above the meter/regulator assembly
I	Clearance to service regulator vent outlet	3' (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6" (15 cm) for appliances ≤ 10,000 BTUH (3kW), 12" (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36" (91 cm) for appliances > 100,000 Btuh (30 kW)	4' (1.2 m) below or to the side of opening: 1' (30 cm) above opening.
K	Clearance to a mechanical air supply inlet	6' (1.83 m)	3' (91 cm) above if within 10' (3m) horizontally
L	Clearance under a veranda, porch, deck, or balcony	12" (30 cm) +	*
M	Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance's direct vent intake or exhaust.	*	*
N	Clearance from a plumbing vent stack	3' (91 cm)	3' (91 cm)
O	Clearance above a paved sidewalk or paved driveway located on public property.	7' (2.13 m)	7' (2.13 m)

(1.) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

(2.) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code

18" (46 cm) above roof surface

+ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

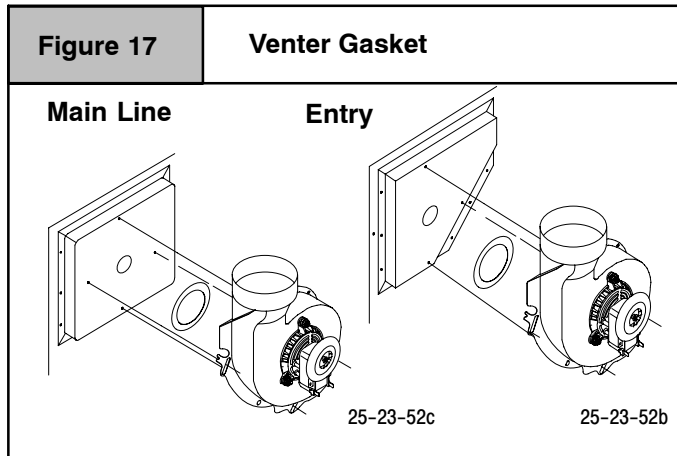
* For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearances shall be in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.

** A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

Notes:

1. The vent for this appliance shall not terminate
 - a. Over public walkways; or
 - b. Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or property damage; or
 - c. Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
2. When locating vent terminations, consideration must be given to prevailing winds, location, and other conditions which may cause recirculation of the combustion products of adjacent vents. Recirculation can cause poor combustion, inlet condensate problems, and accelerated corrosion of the heat exchangers

COMBUSTION BLOWER



All models use an induced draft exhaust (combustion) blower mounted on the outlet side of the heat exchanger. The purpose of the combustion blower is to establish a draft (flow) through the heat exchanger, to insure that all flue products are carried outside the structure via the vent pipe. The blower is made of metal, and is driven by a permanent split capacitor motor.

Figure 17 shows the two collector boxes used in the series furnace.

SEQUENCE OF OPERATION & DIAGNOSTICS

The following is the normal operating sequence.

Cooling (Y) Request:

24VAC signals applied to Y & G terminals of FCB (furnace control board)

- Cool motor speed is energized after 5 second Cool Fan On Delay time.

Y & G signals removed from FCB

- Cool motor speed is de-energized after 90 second Cool Fan Off Delay time.

Continuous Circulating Fan (G) Request:

24 VAC signal is applied to G terminal of the FCB.

- Heat motor speed is energized without delay.

G signal removed from FCB.

- Heat motor speed is de-energized after 5 second delay.

NOTE 1) Furnace de-energizes the fan during the heat exchanger warm-up period on a call for Heating that occurs during a G request unless a blower motor lead is connected to the Cont terminal on the FCB, in which case see NOTE 2).

NOTE 2) Heating or Cooling requests received during a Fan request cause the fan speed to change to the appropriate heat or cool speed after the Fan on Delay time expires. The fan returns to continuous circulating speed after the selected Fan Off Delay time expires following loss of the Heating or Cooling request.

Continuous Circulating Fan Hard-Wired (Cont) Request:

Field selected low speed motor tap installed on "CONT" terminal.

- Low speed is energized when power applied to furnace. Operates at this speed continuously while there are no other blower demands from furnace control. Fan demands from furnace control for heat, cool or "G" will override hard-wired speed tap.

NOTE 3) EAC is NOT active for hard-wired mode but IS active for fan demands from furnace control for heat, cool and "G".

Heating (W) Request:

Heating (W) Request:

- 24 VAC signal applied to W terminal of FCB.
- Inducer motor turns on and the pressure switch(es) close(s).
- Following a 15 second prepurge delay, after the pressure switches closes, the igniter begins a 17 second warm-up.
- The gas valve is energized, the main burners light and flame is sensed.
- The igniter is de-energized after the main burners ignite.
- FCB will delay blower operation for the 30 seconds timed from the opening of the gas valve.

W signal removed from FCB.

- The gas valve de-energizes and the main burners go out.
- The inducer runs for a 15 second postpurge period.
- The fan stays at Heat speed.
- The fan de-energizes after the selected Heat Fan Off Delay time expires, timed from the gas valve de-energizing.

HUMIDIFIER – The 24V HUM is energized when the pressure switch closes on a call for heat. The 115V HUM (called HUM on Control) is energized when the inducer is energized.

ELECTRONIC AIR CLEANER – EAC is energized when there is a blower speed call. It is NOT energized when blower operates in the hard-wired continuous fan mode.

NOTE 4) If a new Heating request arrives while the control is waiting in the Heat Fan Off Delay time, the FCB will wait for the selected Heat Fan Off Delay then start a new heating cycle as long as the heat call remains.

Heating Request with Gas Shut Off:

24 VAC signal applied to W terminal of FCB.

The FCB will attempt 4 cycles for ignition then go to soft lockout for 3 hours then try for ignition again as long as the heat call remains. Power reset will clear lockout.

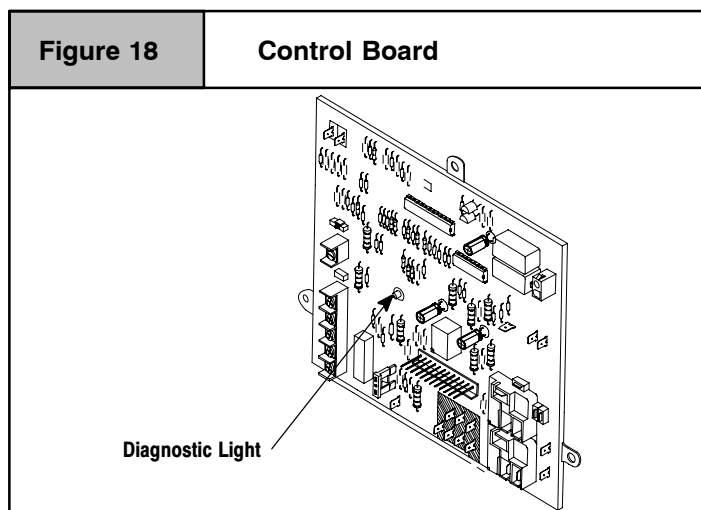
- Inducer motor turns on
- Following a 15 second prepurge delay, the igniter begins warm up.
- The igniter glows red-hot for 22 seconds, then turns off. The FCB flashes error code 6.
- The igniter stays off for 17 seconds, then begins to warm up again.
- The igniter glows red hot for 22 seconds then turns off. The FCB continues flashing error code 6.
- The igniter stays off for 17 seconds, then begins to warm up again.
- The igniter glows red hot for 22 seconds then turns off. The FCB continues flashing error code 6.
- The igniter stays off for 17 seconds, then begins to warm up again.
- The igniter glows red hot for 22 seconds then turns off. The FCB proceeds to soft lockout and stops flashing error code 6 and begins flashing error code 6 + 1.
- The inducer motor de-energizes after a 15 second post purge.

Control Board Diagnostic Codes (See Figure 18)

- OFF = 24VAC or 115VAC is off, fuse is open
- Heartbeat = Normal operation or no previous Diagnostic Code
- ON SOLID = Soft Lockout – Furnace Control Error (1 hr delay)
If code repeats immediately following power reset then replace control
- 1 Flash = Not used
- 2 Flashes = Pressure switch(es) closed when should be open
- 3 Flashes = Pressure switch open when should be closed
- 4 Flashes = Limit or roll-out switch open (less than 2 minutes)
- 5 Flashes = Flame sensed out of sequence
- 6 Flashes = Failure to ignite or flame sense lost while running
- 6 + 1 Flashes = Soft Lockout – Max trials for ignition reached (3hr delay)
- 7 Flashes = Soft Lockout – Limit or roll-out switch open longer than 2 minutes (1 hr delay)
(roll-out switch requires manual reset)
- 8 Flashes = Permanent Lockout – Gas valve relay contact stuck closed or miswired gas valve (power reset only)
- 10 Flashes = Line voltage (115VAC) polarity reversed. If twinned, refer to twinning kit instructions

* If status code recall is needed, briefly (2–3 seconds) remove then reconnect one limit switch wire (main or rollout) to display last stored status code. Do not remove power or blower door before initiating status code recall or code will be lost. Code is automatically cleared after 72 hours or upon power reset.

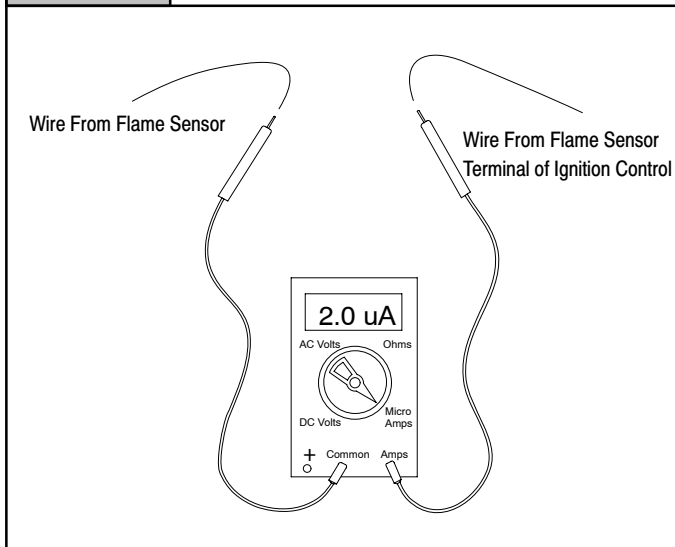
* Proper flame sense microamps: 0.7 microamps D.C. minimum, 2.0 – 4.0 microamps nominal



CHECKING FLAME CURRENT

Figure 19

Checking Flame Sensor



The ignition system used in this furnace series prove (verify) flame via the Flame Rectification method.

Flame Rectification is a process of converting Alternating Current (A.C.) into Direct Current (D.C.) During the ignition sequence, an alternating current (A.C.) Voltage is applied to the Flame sensor.

When the burner lights, the flame conducts an electrical current between the flame sensor and the burner ground. Due to the difference in size between the flame sensor and the burner ground area, this current flows mostly in one direction. This creates a pulsating Direct Current that flows back to the ignition control proving flame.

This flame current (D.C. Microamps) may be checked (while flame is present) using a D.C. Microammeter IN SERIES (see **Figure 19**) with the flame sensor circuit. Flame current should be a minimum of 0.7 UA D.C.

Lower than normal readings will not keep flame established, and may be due to flame not properly enveloping sensor, dirty sensor, low gas pressure or pilot flame, etc.

The normal current for the flame sensor of this series furnace should be a nominal value of 2.0 –4.0 UA D.C.

CAPACITORS

Capacitors are used for the circulating (conditioned air) blower motor. Before replacing this motor (assumed to be bad) the condition of its capacitor should be verified, since it, and not the motor, may be the source of the problem.

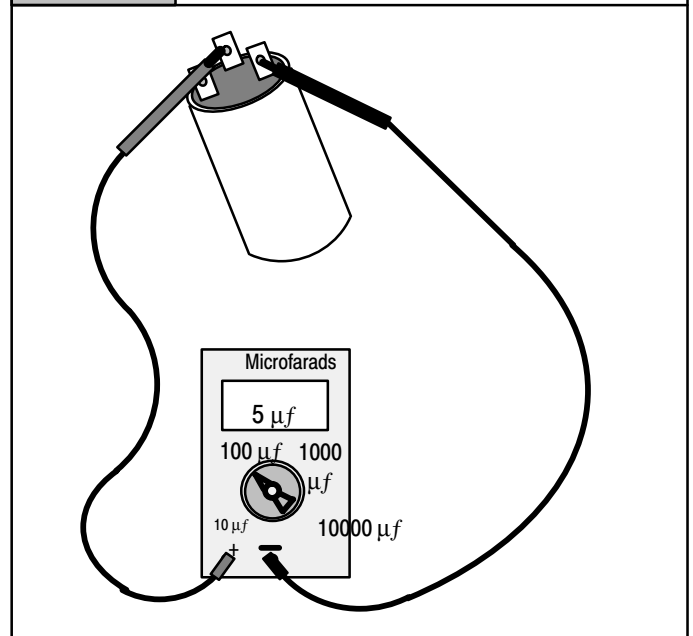
Before checking **any** capacitor, the supply power to the unit should be turned "OFF". The capacitor should then be discharged before testing. This can be done by shorting the capacitor leads together.

The condition of the capacitor should then be verified with a capacitor analyzer (one that indicated the capacitor's value in microfarads) rather than with an Ohmmeter. The reason for this, is that an Ohmmeter test can only indicate if a capacitor is "OPEN", or "SHORTED", it cannot verify if its value (microfarads) is within an acceptable range.

Capacitor should test to within 10% of its rated value. Capacitors testing outside this range should be replaced. A weak capacitor can be the cause of a motor failing to start.

Figure 20

Checking Capacitor



BLOWER ASSEMBLY

All models use a multi-speed, permanent split capacitor motor, direct-drive, blower assembly. Different size (HP) motors and/or different diameter blower wheels are used in each model to obtain the required air flow. The entire blower assembly slides out on rails for servicing after removing the

two screws at the front and disconnecting the harness connectors from the furnace control board.

SELECTING BLOWER SPEEDS

The wide variety of applications and installations of furnaces throughout the country makes it impossible to “Factory Select” blower speeds that will provide proper operation for all installations. This means then, that the blower speeds for both heating and cooling must be “Field Selected” for each particular installation to insure proper operation.

The criteria for selecting the proper blower speeds **IS NOT** “High for Cooling, Low for Heating”. Although that may be how it works out SOMETIMES, it can (in many cases) be exactly the opposite. (I.E. a Lower speed for Cooling, and a Higher speed for Heating)

The PROPER CRITERIA FOR SELECTING BLOWER SPEEDS is as follows:

HEATING

A blower speed must be selected that will provide proper temperature rise through the furnace. (See “checking temperature rise” found elsewhere in this manual), The required CFM for a particular temperature rise can also be calculated using the following formula:

$$\frac{\text{Output BTU}}{\text{Temp. Rise} \times 1.08} = \text{CFM}$$

EXAMPLE: using a 75 Mbtu furnace with an output of 67,500 Btuh and a desired temperature rise of 50° F (range of 40–70° F allowable) and a measured external static pressure of 0.2” W.C. with a dry coil.

$$\frac{67,500}{50 \times 1.08} \text{ or } \frac{67,500}{54} = 1250 \text{ CFM}$$

Checking the blower performance data for this example, (see **Table 3**) indicates that @ 0.2” W.C. E.S.P. medium-high speed will deliver 1249 CFM. Accordingly, medium speed should be used in this example for the HEATING speed.

COOLING

A blower speed must be selected that will provide proper air flow (Nominal 400 CFM per ton) for the size (capacity) air conditioning coil being used at the external static pressure of the Duct system (installation). This requires CHECKING THE EXTERNAL STATIC PRESSURE, then consulting the BLOWER PERFORMANCE DATA to determine the required speed tap. Using a manometer or magnehelic, take a pressure reading on the supply and return ductwork close to the furnace. The supply is positive while the return is negative. To find ESP add the supply and return readings together disregarding positive/negative.

EXAMPLE: The supply measurement is found to be 0.3” W.C. while the return is measured at –0.2” W.C. The ESP would be 0.5” W.C.

EXAMPLE: A 24,000 BTU (2 TON) air conditioning system, using the same 75,000 BTU furnace as in the previous example. The external static pressure is measured and found to be 0.4” W.C.

400 CFM (nominal) per TON required

400 x 2 = 800 CFM required

Checking the blower performance data (see **Table 3**) for this example indicates that @ 0.4” W.C. ESP low speed will deliver 788 CFM. Accordingly, low speed should be used in this example for the COOLING speed.

Table 3		Blower Performance Data 75,000 BTUH				
Air Delivery in Cubic Feet per Minute (CFM) (Furnace Rated @ 0.5” W.C. ESP)						
External Static Pressure Inches of W.C.	TAP	LOW	MED L	MED H	HIGH	
	.10	778	984	1263	1576	
	.20	786	1003	1249	1532	
	.30	790	1003	1244	1489	
	.40	788	1001	1215	1432	
	.50	781	982	1186	1371	
	.60	765	962	1146	1308	
	.70	743	923	1094	1229	
SAMPLE ONLY						

CAUTION				
REDUCED FURNACE LIFE HAZARD				
Failure to properly set the air temperature rise may result in reduced furnace life.				
Use ONLY the blower motor speed taps marked “Y” for YES for setting air temperature rise.				
Blower Motor Speed Taps for N8MPN/L and *8MPN/L Model Sizes				
Model Sizes	LO RED	M LO BLUE	M HI ORN	HI BLK
050B12	N	Y	Y	N
075B12	N	Y	Y	Y
075F16	N	N	Y	Y
100F14	N	N	Y	Y
100F20	N	Y	Y	Y
100J20	N	Y	Y	Y
100J22	Y	Y	Y	N
125J20	N	Y	Y	Y
125J22+	Y	Y	Y	Y
150J20√	N	Y	Y	Y

+N8MPN only

√ *8MPN only



CAUTION

REDUCED FURNACE LIFE HAZARD

Failure to properly set the air temperature rise may result in reduced furnace life.

Use **ONLY** the blower motor speed taps marked "Y" for YES for setting air temperature rise.

Blower Motor Speed Taps for *8DNL Model Sizes

Model Sizes	LO RED	M LO BLUE	M HI ORN	HI BLK
050B12	N	Y	Y	N
075B12	N	Y	Y	Y
075F16	N	N	Y	Y
100F14	N	N	Y	Y
100J20	N	Y	Y	Y
100L20	Y	Y	Y	Y
125L20	Y	Y	Y	Y

Table 4 Blower Speed Chart

Wire Color	Motor Speed
Black	High
Orange*	Med-High
Blue	Medium
Red	Low

*Med-High speed may not be provided on all models.

CHANGING BLOWER SPEEDS

1. Refer to *Furnace Wiring Diagram* for location of the heating and cooling speed taps located on the furnace control as well as location of unused blower motor speed leads. Use the chart (Table 4) to determine the blower motor speed settings.
2. Change the heat or cool blower motor speed by removing the motor lead from the "Heat" or "Cool" terminal and replace it with the desired motor speed lead from the "Unused Motor Lead" location. Connect the wire previously removed from the "Heat" or "Cool" terminal to the vacated "Unused Motor Lead" terminal.
3. If the same speed must be used for both heating and cooling, remove the undesired motor speed lead from the "Heat" or "Cool" terminal and connect that lead to the open terminal at "Unused Motor Lead" location. Attach a jumper between the "Heat" and "Cool" terminals and the remaining motor speed lead.

Note: For motors with (4) speed leads, it will be necessary to tape off the terminal of the motor speed lead removed from the "Heat" or "Cool" terminal with electrical tape since an open terminal will not be available at the "Unused Motor Lead" location.

"M1" & "M2" TERMINALS

There are two (2) terminals (marked "M1 and M2" on the Furnace Control Board, which have no internal connection to the control. Their purpose is to provide a place to connect any "UNUSED" speed tap wires to keep them out of the way and prevent them from shorting out against the furnace casing, or each other.

Continuous Fan Operation using "G"

Energizing the "G" terminal on the furnace control provides continuous fan operation. This is done by connecting the G terminal of the thermostat to the G terminal on the furnace control. When the FAN switch is turned from auto to ON the fan will operate continuously at "HEAT" speed. EAC will be energized in this mode.

NOTE: In heating, the fan will turn off during furnace ignition and warm up then restart at heating speed.

Hard Wired Continuous Fan Operation

A terminal is provided on the furnace control board located in the circulating blower compartment for operation of the continuous fan option. This connection is intended for the low speed motor tap, and has a lower contact rating (8 amps) than the heat and cool taps. When the low speed blower lead is connected to this terminal, this will provide low speed blower operation whenever the other two speeds (**Heat** or **Cool**) are not energized.

Thoroughly check the system after modification to ensure the proper operation of the circulating air blower in all modes of operation.

Separate speed selections for Heat, Cool, and Continuous Fan

Connect low speed lead from circulating motor to the "Cont." terminal at the furnace control. The appropriate motor leads should already be connected to the "Heat" and "Cool" terminals.

Heating and Continuous Blower Speed the Same

If it is necessary to operate the heating speed and continuous blower speed using the same blower speed, connect a jumper between the "Heat" and "Cont." terminals on the furnace control.

Note: There should be only **ONE** motor lead going to the "Heat" and "Cont." terminals.

Circulation Air Blower Data

*8DNL050B12

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	702	963	1260	1537
	.30	624	845	1183	1416
	.50	510	760	1088	1308
	.70	412	617	917	1111
	1.00	310	468	664	948

*8DNL100F14

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	756	1012	1372	1881
	.30	585	888	1273	1724
	.50	491	780	1176	1606
	.70	387	697	1035	1481
	1.0	255	561	873	1281

*8DNL075B12

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	634	728	975	1353
	.30	533	653	936	1307
	.50	454	559	861	1225
	.70	373	473	737	1087
	.90	255	392	605	884
1.00	232	294	529	764	

*8DNL100L20

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	1798	2024	2212	2375
	.30	1709	1896	2081	2205
	.50	1614	1774	1922	2026
	.70	1470	1614	1752	1860
	.90	1282	1428	1548	1645
1.00	1065	1263	1407	1508	

*8DNL075F16

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	648	900	1285	1789
	.30	628	916	1328	1747
	.50	611	889	1309	1680
	.70	557	843	1240	1588
	.90	485	748	1122	1452
1.00	441	680	1041	1374	

*8DNL125L20

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	1936	2165	2319	---
	.30	1845	2028	2246	2334
	.50	1728	1902	2061	2172
	.70	1536	1695	1856	1952
	.90	1331	1490	1600	1687
1.00	1215	1352	1424	1537	

* Denotes Brand

CFM – Cubic Feet per Minute airflow. Filter required for each return-air inlet. Airflow performance includes 1" washable (600 FPM max) filter media.

Circulation Air Blower Data

N8MPN/L050B12 & *8MPN/L050B12(1)(3) * Denotes Brand

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	472	704	1167	1387
	.30	365	638	1102	1288
	.50	290	572	1035	1194
	.70	209	522	939	1070
	.90	---	443	820	937
1.00	---	370	753	858	

N8MPN/L100F20 & *8MPN/L100F20(2)(3)(5)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	831	1125	1588	2216
	.30	814	1123	1588	2179
	.50	781	1117	1577	2074
	.70	717	1053	1541	1909
	.90	609	964	1373	1745
1.00	561	888	1307	1641	

N8MPN/L075B12 & *8MPN/L075B12(1)(3)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	695	963	1220	1559
	.30	644	928	1183	1463
	.50	588	873	1118	1361
	.70	540	771	1017	1239
	.90	463	675	900	1083
1.00	413	615	835	998	

***8MPN/L100J20(2)(3)** * Denotes ?Brand

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	773	1045	1469	2147
	.30	755	1037	1469	2128
	.50	712	1020	1459	2078
	.70	647	979	1424	1963
	.90	554	894	1347	1795
1.00	497	828	1262	1705	

N8MPN/L075F16 & *8MPN/L075F16(1)(3)(4)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	598	841	1427	1861
	.30	400	748	1384	1770
	.50	289	667	1343	1677
	.70	236	582	1254	1547
	.90	---	477	1129	1360
1.00	---	436	1016	1262	

N8MPN/L100J22(2)(3)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	1785	1997	2292	2519
	.30	1741	1941	2206	2410
	.50	1674	1861	2097	2284
	.70	1581	1749	1965	2121
	.90	1428	1597	1793	1928
1.00	1326	1478	1667	1814	

N8MPN100F14 & *8MPN100F14(1)(3)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	770	949	1328	1760
	.30	648	873	1235	1675
	.50	544	772	1115	1551
	.70	457	684	1036	1404
	.90	361	572	895	1215
1.00	308	507	811	1093	

N8MPN/L125J20 & *8MPN/L125J20

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	860	1158	1666	2147
	.30	836	1158	1577	2126
	.50	805	1140	1561	2148
	.70	758	1081	1516	1922
	.90	661	1009	1428	1767
1.00	614	925	1357	1663	

- NOTE: (1) Data based on Bottom Only or One Side return.
 (2) Data based on Both Sides or Bottom plus One Side
 (3) Shaded areas exceed 600 FPM (feet per minute) filter velocity with Bottom Only Return.
 (4) 075F16 Reduce airflow by 5% if Bottom Only return.
 (5) 100F20 Reduce airflow by 10% if Bottom Only return.
 (6) 125J20 Reduce airflow by 5% if Bottom Only return.
 (7) 125J22 Reduce airflow by 10% if Bottom Only return.
 (8) 150J20 Reduce airflow by 10% if Bottom Only return.

CFM – Cubic Feet per Minute airflow. Filter required for each return–air inlet. Airflow performance includes 1" washable (600 FPM max) filter media.

Circulation Air Blower Data Continued

N8MPN/L125J22 (2)(3)(7)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	1901	2121	2362	2463
	.30	1833	2033	2244	2385
	.50	1745	1936	2100	2217
	.70	1624	1773	1894	2033
	.90	1442	1569	1714	1821
1.00	1329	1455	1583	1685	

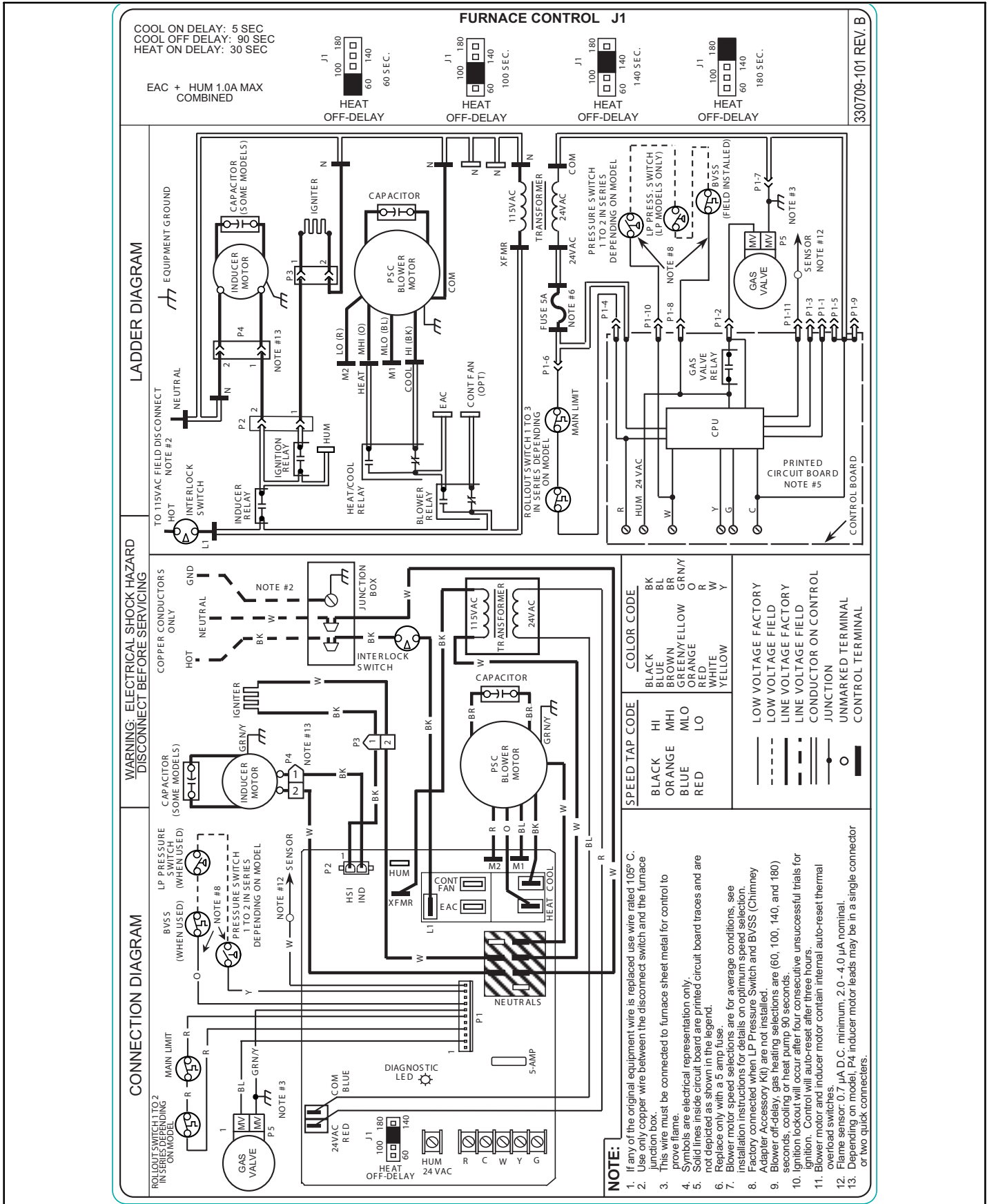
*8MPN150J20 (2)(3)(8)

External Static Pressure Inches of W.C.	Air Delivery in Cubic Feet per Minute (C.F.M.) (Furnace Rated @0.5" WC ESP)				
	TAP	LOW	MED L	MED H	HIGH
	.10	1656	1915	2168	2385
	.30	1583	1787	2090	2335
	.50	1507	1697	1997	2212
	.70	1390	1596	1856	2085
	.90	1212	1445	1654	1898
1.00	1125	1337	1561	1777	

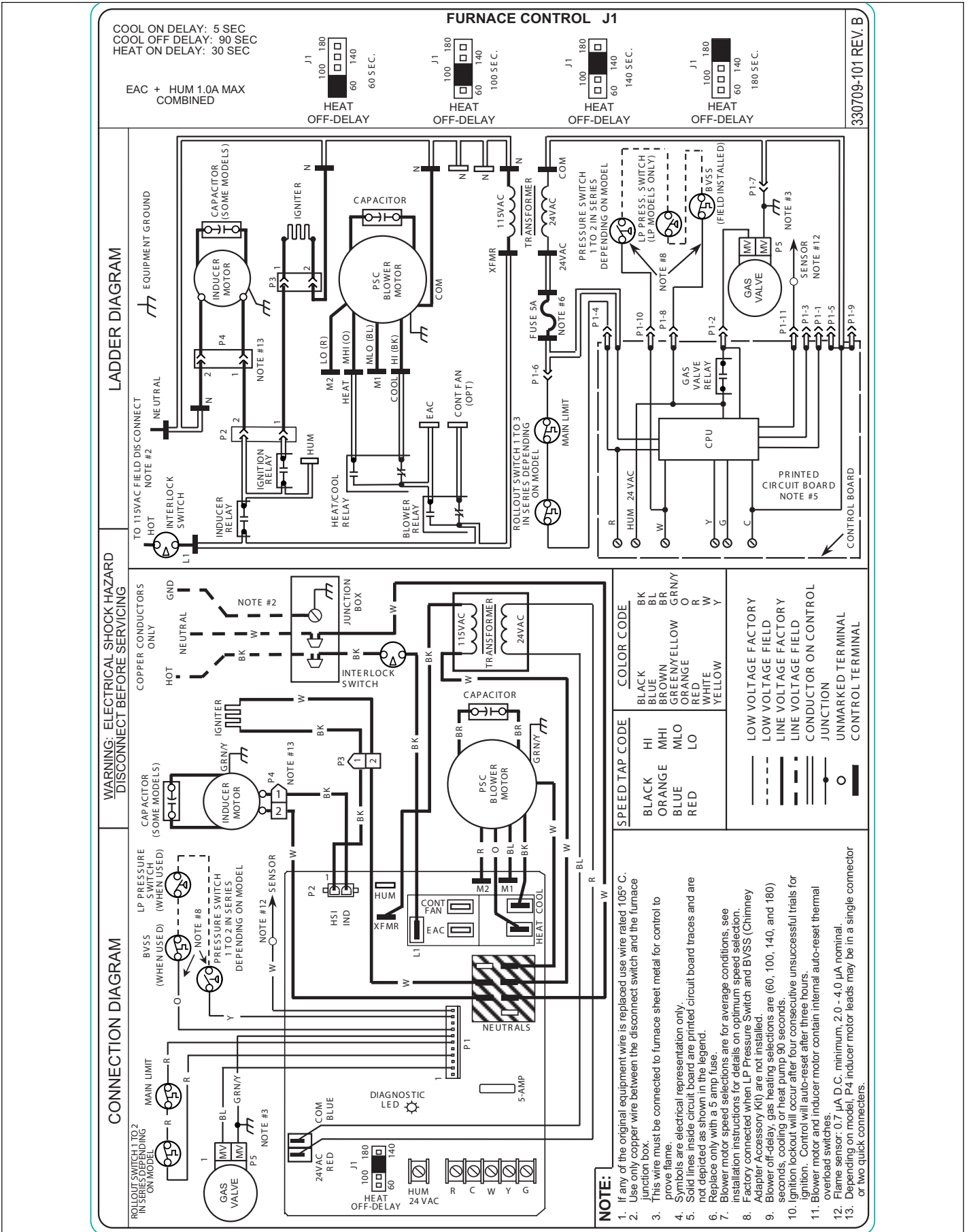
- NOTE: (1) Data based on Bottom Only or One Side return.
 (2) Data based on Both Sides or Bottom plus One Side
 (3) Shaded areas exceed 600 FPM (feet per minute) filter velocity with Bottom Only Return.
 (4) 075F16 Reduce airflow by 5% if Bottom Only return.
 (5) 100F20 Reduce airflow by 10% if Bottom Only return.
 (6) 125J20 Reduce airflow by 5% if Bottom Only return.
 (7) 125J22 Reduce airflow by 10% if Bottom Only return.
 (8) 150J20 Reduce airflow by 10% if Bottom Only return.

CFM – Cubic Feet per Minute airflow. Filter required for each return–air inlet. Airflow performance includes 1" washable (600 FPM max) filter media.

Wiring Diagram *8DNL



Wiring Diagram N8MPN/L, *8MPN/L



Model Specifications

Manufacturers Number (Mfr No -See Rating Plate)													
ALL Models													
Specifications													
	*8DNL050B12		*8DNL075B12		*8DNL075F16		*8DNL100F14		*8DNL100L20		*8DNL125L20		
General													
Input (Btuh)	50,000		75,000		75,000		100,000		100,000		125,000		
Output (Btuh)	40,000		61,000		61,000		81,000		81,000		101,000		
Temp. Rise (°F)	35-65		35-65		35-65		35-65		30-60		35-65		
Electrical (Volts/Hz)	115/60		115/60		115/60		115/60		115/60		115/60		
Rating Plate Amps	9.2		9.0		12.0		9.2		13.5		13.2		
Gas Type	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	
Transformer Size (VA)	40												
T'stat Heat Anticipator	.50												
Gas & Ignition													
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	3/#42	3/#54	4/#42	4/#54	4/#42	4/#54	5/#42	5/#54	
Gas Valve Honeywell Regulation Type)	VR 8205S SNAP												
Manifold Press. (Inch's WC)	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	
Ignition Type/Series	Hot Surface												
Combustion													
Flue Outlet Size (Inches)	4		4		4		4		4		4		
Std. Outlet Temp (°F)	<480		<480		<480		<480		<480		<480		
Limits & Controls													
Thermal Sensor (°F)	300		300		300		300		300		300		
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		
Std. Pressure Sw. (Part No)	1013529												
Press (Close)	-0.69												
Press (Open)	-0.59												
High Pressure Sw. (Part No)	1014051												
Furnace Control (Type)	Integrated												
Furnace Control On	30												
(Timed-secs) Off	60,100,140,180												
Blower Data													
Type & Size	11-8		11-8		11-10		11-10		11-10		11-10		
Motor Amps/Rpm	8/1050		8/1050		10/1050		8/900		11.9/900		11.9/900		
Motor Type/H.p.	PSC/1/2		PSC/1/3		PSC/1/2		PSC/1/2		PSC/3/4		PSC/3/4		
Cap. Mfd/Volts	7.5/370		5.0/370		10/370		7.5/370		40/370		40/370		
Filter Type (600 FPM)	Washable		Washable		Washable		Washable		Washable		Washable		
Filter Size (")	16x18x1 (2)		16x18x1 (2)		16x18x1 (2)		16x18x1 (2)		16x18x1 (2)		16x18x1 (2)		
Min. Cool Cap. (Tons)	1.5		1.5		3		2		3		3		
Max. Cool Cap. (Tons)	3		3		4		3.5		5		5		
Gas Conversion Kits													
Nat to LP NAHA001LP (1172958*)													
LP to Nat NAHA001NG (1172960*)													
* Must be ordered from Service Parts													

Manufacturers Number (Mfr No -See Rating Plate)
ALL Models (N8MPN)

Specifications

	N8MPN 050B12		N8MPN 075B12		N8MPN 075F16		N8MPN 100F14		N8MPN 100F20		N8MPN 100J22		N8MPN 125J20		N8MPN 125J22	
General																
Input (Btuh)	50,000		75,000		75,000		100,000		100,000		100,000		125,000		125,000	
Output (Btuh)	40,000		60,000		60,000		80,000		80,000		80,000		100,000		100,000	
Temp. Rise (°F)	35-65		35-65		25-55		30-60		35-65		30-60		30-60		30-60	
Electrical (Volts/Hz)	115/60		115/60		115/60		115/60		115/60		115/60		115/60		115/60	
Rating Plate Amps.	9.7		9.2		19.7		8.9		11.7		13.2		11.7		13.2	
Gas Type	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP
Transformer Size (VA)	40															
T'stat Heat Anticipator	.50															
Gas & Ignition																
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	3/#42	3/#54	4/#42	4/#54	4/#42	4/#54	4/#42	4/#54	5/#42	5/#54	5/#42	5/#54
Gas Valve Honeywell Regulation Type	VR8205S SNAP															
Manifold Press. (Inch's WC)	3.5	10.0	3.5	10.0	3.5	810.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0
Ignition Type/Series	Hot Surface															
Combustion																
Flue Outlet Size (Inches)	4		4		4		4		4		4		4		4	
Limits & Controls																
Thermal Sensor (°F)	300		300		300		300		300		300		300		300	
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List	
Std. Pressure Sw. (Part No)	1013529		1013529		1013529		1013529		1013529		1013529		1013529		1013529	
Press (Close)	-0.69		-0.69		-0.69		-0.69		-0.69		-0.69		-0.69		-0.69	
Press (Open)	-0.59		-0.59		-0.59		-0.59		-0.59		-0.59		-0.59		-0.59	
Furnace Control (Type)	Integrated															
Furnace Control On	30															
(Timed-secs) Off	60,100,140,180															
Blower Data																
Type & Size	11-8		11-8		11-10		11-10		11-10		11-10		11-10		11-10	
Motor Type/H.p.	PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ³ / ₄		PSC ¹ / ₂		PSC ³ / ₄	
Cap. Mfd/Volts	10/370		7.5/370		10/370		7.5/370		10/370		40/370		10/370		40/370	
Filter Type (600 FPM)	Washable		Washable		Washable		Washable		Washable		Washable		Washable		Washable	
Filter Size (") (Not Supplied)	14x25x1		14x25x1		16x25x1		16x25x1		16x25x1 (2)		20x25x1		20x25x1		20x25x1	
1600 CFM and over #	--		--		16x25x1 (2)		--		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)	
Min. Cool Cap. (Tons)	1.5		1.5		3		2		3		3		3		3	
Max. Cool Cap. (Tons)	3		3		4		3.5		5		5.5		5		5.5	

Gas Conversion Kits

Nat to LP NAHA001LP (1172958*)

LP to Nat NAHA001NG (1172960*)

* Must be ordered from Service Parts

Manufacturers Number (Mfr No -See Rating Plate)
ALL Models (N8MPL)

Specifications

	N8MPL 050B12		N8MPL 075B12		N8MPL 075F16		N8MPL 100F20		N8MPL 100J22		N8MPL 125J20		N8MPL 125J22	
General														
Input (Btuh)	50,000		75,000		75,000		100,000		100,000		125,000		125,000	
Output (Btuh)	40,000		60,000		60,000		80,000		80,000		100,000		100,000	
Temp. Rise (°F)	35-65		35-65		25-55		35-65		30-60		30-60		30-60	
Electrical (Volts/Hz)	115/60		115/60		115/60		115/60		115/60		115/60		115/60	
Rating Plate Amps.	9.7		9.2		9.7		11.7		13.2		11.7		13.2	
Gas Type	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP
Transformer Size (VA)	40													
T'stat Heat Anticipator	.50													
Gas & Ignition														
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	3/#42	3/#54	4/#42	4/#54	4/#42	4/#54	5/#42	5/#54	5/#42	5/#54
Gas Valve Honeywell Regulation Type	VR 8205S SNAP													
Manifold Press. (Inch's WC)	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0
Ignition Type/Series	Hot Surface													
Combustion														
Flue Outlet Size (Inches)	4		4		4		4		4		4		4	
Limits & Controls														
Thermal Sensor (°F)	300		300		300		300		300		300		300	
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List	
Std. Pressure Sw. (Part No)	1013529		1013529		1013529		1013529		1013529		1013529		1013529	
Press (Close)	-0.69		-0.69		-0.69		-0.69		-0.69		-0.69		-0.69	
Press (Open)	-0.59		-0.59		-0.59		-0.59		-0.59		-0.59		-0.59	
Furnace Control (Type)	Integrated													
Furnace Control On	30													
(Timed-secs) Off	60,100,140,180													
Blower Data														
Type & Size	11-8		11-8		11-10		11-10		11-10		11-10		11-10	
Motor Type/H.p.	PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ³ / ₄		PSC ¹ / ₂		PSC ³ / ₄	
Cap. Mfd/Volts	10/370		7.5/370		10/370		10/370		40/370		10/370		40/370	
Filter Type (600 FPM)	Washable		Washable		Washable		Washable		Washable		Washable		Washable	
Filter Size (") (Not Supplied)	14x25x1		14x25x1		16x25x1		16x25x1		20x25x1		20x25x1		20x25x1	
1600 CFM and over #	--		--		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)	
Min. Cool Cap. (Tons)	1.5		1.5		3		3		3		3		3	
Max. Cool Cap. (Tons)	3		3		4		5		5.5		5		5.5	

Gas Conversion Kits

Nat to LP NAHA001LP (1172958*)

LP to Nat NAHA001NG (1172960*)

* Must be ordered from Service Parts

Manufacturers Number (Mfr No -See Rating Plate)
ALL Models (*8MPN)

Specifications

	*8MPN 050B12		*8MPN 075B12		*8MPN 075F16		*8MPN 100F14		*8MPN 100F20		*8MPN 100J20		*8MPN 125J20		*8MPN 150J20	
General																
Input (Btuh)	50,000		75,000		75,000		100,000		100,000		100,000		125,000		150,000	
Output (Btuh)	40,000		60,000		60,000		81,000		81,000		81,000		101,000		121,000	
Temp. Rise (°F)	35-65		30-60		30-60		35-65		35-65		35-65		35-65		35-65	
Electrical (Volts/Hz)	115/60		115/60		115/60		115/60		115/60		115/60		115/60		115/60	
Rating Plate Amps.	9.7		9.0		9.7		9.2		12.0		12.0		12.0		13.5	
Gas Type	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP
Transformer Size (VA)	40															
T'stat Heat Anticipator	.50															
Gas & Ignition																
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	3/#42	3/#54	4/#42	4/#54	4/#42	4/#54	4/#42	4/#54	5/#42	5/#54	6/#42	6/#54
Gas Valve Honeywell Regulation Type	VR 8205S SNAP															
Manifold Press. (Inch's WC)	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0
Ignition Type/Series	Hot Surface															
Combustion																
Flue Outlet Size (Inches)	4		4		4		4		4		4		4		4	
Limits & Controls																
Thermal Sensor (°F)	300		300		300		300		300		300		300		300	
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List	
Auxiliary Limit (°F)	130		130		130		130		130		130		130		130	
Std. Pressure Sw. (Part No)	1013529		1013529		1013529		1013529		1013529		1013529		1013529		1013529	
Press (Close)	-0.69		-0.69		-0.69		-0.69		-0.69		-0.69		-0.69		-0.69	
Press (Open)	-0.59		-0.59		-0.59		-0.59		-0.59		-0.59		-0.59		-0.59	
Furnace Control (Type)	Integrated															
Furnace Control On	30															
(Timed-secs) Off	60,100,140,180															
Blower Data																
Type & Size	11-8		11-8		11-10		11-10		11-10		11-10		11-10		12-12	
Motor Type/H.p.	PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₂		PSC ¹ / ₄	
Cap. Mfd/Volts	10/370		7.5/370		10/370		7.5/370		10/370		10/370		10/370		40/370	
Filter Type (600 FPM)	Washable		Washable		Washable		Washable		Washable		Washable		Washable		Washable	
Filter Size (") (Not Supplies)	14x25x1		14x25x1		16x25x1		16x25x1		16x25x1		20x25x1		20x25x1		20x25x1	
1600 CFM and over#	--		--		16x25x1 (2)		--		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)	
Min. Cool Cap. (Tons)	1.5		1.5		3		2		3		3		3		3	
Max. Cool Cap. (Tons)	3		3		4		3.5		5		5		5		5	

Gas Conversion Kits
 Nat to LP NAHA001LP (1172958*)
 LP to Nat NAHA001NG (1172960*)

* Must be ordered from Service Parts

Manufacturers Number (Mfr No -See Rating Plate)
ALL Models (*8MPL)

Specifications

	*8MPL 050B12		*8MPL 075B12		*8MPL 075F16		*8MPL 100F20		*8MPL 100J20		*8MPL 125J20	
General												
Input (Btuh)	50,000		75,000		75,000		100,000		100,000		125,000	
Output (Btuh)	40,000		60,000		60,000		81,000		81,000		101,000	
Temp. Rise (°F)	35-65		30-60		30-60		35-65		35-65		35-65	
Electrical (Volts/Hz)	115/60		115/60		115/60		115/60		115/60		115/60	
Rating Plate Amps.	9.7		9.0		9.7		12.0		12.0		12.0	
Gas Type	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP	Nat	LP
Transformer Size (VA)	40											
T'stat Heat Anticipator	.50											
Gas & Ignition												
Std. Main Orifices (No/Size)	2/#42	2/#54	3/#42	3/#54	3/#42	3/#54	4/#42	4/#54	4/#42	4/#54	5/#42	5/#54
Gas Valve Honeywell Regulation Type	VR 8205S SNAP											
Manifold Press. (Inch's WC)	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0	3.5	10.0
Ignition Type	Hot Surface											
Combustion												
Flue Outlet Size (Inches)	4		4		4		4		4		4	
Limits & Controls												
Thermal Sensor (°F)	300		300		300		300		300		300	
Limit Control	See Parts List		See Parts List		See Parts List		See Parts List		See Parts List		See Parts List	
Auxiliary Limit (°F)	130		130		130		130		130		130	
Std. Pressure Sw. (Part No)	1013529		1013529		1013529		1013529		1013529		1013529	
Press (Close)	-0.69		-0.69		-0.69		-0.69		-0.69		-0.69	
Press (Open)	-0.59		-0.59		-0.59		-0.59		-0.59		-0.59	
Furnace Control (Type)	Integrated											
Furnace Control On delay	30											
(Timed-secs) Off delay	60,100,140,180											
Blower Data												
Type & Size	11-8		11-8		11-10		11-10		11-10		11-10	
Motor Amps/Rpm	10.3/1100		8/1050		10.3/1100		10/1050		11.9/900		10/1050	
Motor Type/H.p.	PSC/1/2		PSC/1/2		PSC/1/2		PSC/1/2		PSC/1/2		PSC/1/2	
Cap. Mfd/Volts	10/370		7.5/370		10/370		10/370		10/370		10/370	
Filter Type	Washable		Washable		Washable		Washable		Washable		Washable	
Filter Size (") (Not Supplied)	14x25x1		14x25x1		16x25x1		16x25x1		20x25x1		20x25x1	
1600 CFM and over#	--		--		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)		16x25x1 (2)	
Min. Cool Cap. (Tons)	1.5		1.5		3		3		3		3	
Max. Cool Cap. (Tons)	3		3		4		5		5		5	

Gas Conversion Kits

Nat to LP NAHA001LP (1172958*)

LP to Nat NAHA001NG (1172960*)

* Must be ordered from Service Parts

TROUBLESHOOTING GUIDE

SELF DIAGNOSTICS

Self Diagnostics (via an LED provided on the furnace control) assist the Technician with troubleshooting. If the LED is flashing, the trouble is LIKELY (see below) to be external to the control.

Certain failures of the furnace result in a specific Flash Sequence (see below) being displayed by the LED. The LED will Flash "ON" for approximately $\frac{1}{4}$ second, then "OFF" for approximately $\frac{1}{4}$ second a specific number of times indicating the problem area.

SELF DIAGNOSTICS

In the event of a failure, the LED may be seen flashing through the inspection window on the furnace blower door. The Flash Sequence should be noted (and recorded) BEFORE removing the blower door from the furnace. This will prevent the loss of a flash sequence created by an intermittent or sporadic condition.

Control Board Diagnostic Codes (See Figure 18)

OFF	= 24VAC or 115VAC is off, fuse is open
Heartbeat	= Normal operation or no previous Diagnostic Code
ON SOLID	= Soft Lockout – Furnace Control Error (1 hr delay) If code repeats immediately following power reset then replace control
1 Flash	= Not used
2 Flashes	= Pressure switch(es) closed when should be open
3 Flashes	= Pressure switch open when should be closed
4 Flashes	= Limit or roll-out switch open (less than 2 minutes)
5 Flashes	= Flame sensed out of sequence
6 Flashes	= Failure to ignite or flame sense lost while running
6 + 1 Flashes	= Soft Lockout – Max trials for ignition reached (3hr delay)
7 Flashes	= Soft Lockout – Limit or roll-out switch open longer than 2 minutes (1 hr delay) (roll-out switch requires manual reset)
8 Flashes	= Permanent Lockout – Gas valve relay contact stuck closed or miswired gas valve (power reset only)
10 Flashes	= Line voltage (115VAC) polarity reversed. If twinned, refer to twinning kit instructions

* If status code recall is needed, briefly (2–3 seconds) remove then reconnect one limit switch wire (main or rollout) to display last stored status code. Code is automatically cleared after 72 hours or upon power reset.

* Proper flame sense microamps: 0.7 microamps D.C. minimum, 2.0 – 4.0 microamps nominal

** Igniter should measure between 40–70 OHMS at room temperature.

*** As a matter of standard practice, Line Voltage POLARITY and GROUNDING (see Page 4) should be verified on ANY unit indicating system lockout.

NOTE: The "Problems" listed for the Flash Sequence Indications above are NOT ABSOLUTES. They are generalities, intended to steer the Technician in the right direction. Used with common sense and other established troubleshooting methods, however, should result in an accurate diagnosis of the problem.

NOTE: The flash code will be lost if the 115 VAC power is removed from the furnace.

Diagnostic Code Section

Heartbeat

NO PREVIOUS CODE - Stored codes are erased after 72 hours. Run system through a heating or cooling cycle to check system.

LED OFF

No power

- Check 5A furnace control fuse
- Check circuit breaker or fuse
- Check door switch.
- Check 115V and 24V wiring

ON Solid

CONTROL CIRCUIT LOCKOUT Auto-reset after 1 hour lockout due to:

- Flame circuit failure.
- Gas valve relay stuck open.
- Software check error.

Reset power to clear lockout. Replace control if code repeats

2 PRESSURE SWITCH DID NOT OPEN -

Check for:

- Obstructed pressure tube.
- Pressure switch stuck closed.

3 PRESSURE SWITCH DID NOT CLOSE

OR REOPENED - If open longer than 5 minutes, inducer shuts off for 15 minutes before retry. If opens during blower on delay period, blower will come on for the selected blower off-delay.

Check for:

- Proper vent sizing.
- Low inducer voltage (115V)
- Inadequate combustion air supply.
- Disconnected or obstructed pressure tubing
- Defective inducer motor.
- *LP Low pressure gas switch open
- Defective pressure switch.
- Excessive wind.
- Restricted vent.

* LP low pressure gas switch used in LP kit

- 4 LIMIT CIRCUIT FAULT - Indicates the limit, flame rollout switch is open. Blower and inducer will run until open switch remakes. If open longer than 2 minutes, code changes to lockout #7. If open less than 2 min. status code #4 continues to flash until blower shuts off. Flame rollout switch requires manual reset. Check for:
- Dirty filter or restricted duct system.
 - Loose blower wheel.
 - Defective blower motor or capacitor.
 - Inadequate combustion air supply (flame rollout switch open).
 - Restricted vent.
 - Proper vent sizing.
 - Excessive wind.

5 FLAME-PROVING SIGNAL

Flame is proved while gas valve is de-energized. Inducer will run until fault is cleared. Check for:

- Stuck open or leaky gas valve.

- 6 IGNITION PROVING FAILURE - If flame is not sensed during the trail for ignition period, the control will repeat the ignition sequence 3 more times before a lockout #6 + 1 occurs. If flame signal is lost during the blower on-delay period, blower blower will come on for the selected blower off delay. Check the following items first before proceeding to the next step
- Gas valve turned ON.
 - Open.
 - Green/Yellow wire MUST be connected to furnace sheet metal.
 - Flame sensor must not be grounded.
- To determine whether the problem is in the gas valve, igniter, or flame sensor.

6 + 1

IGNITION LOCKOUT - System failed to ignite gas and prove flame in 4 attempts. Control will auto-reset after 3 hours. See status code 6.

- 7 LIMIT CIRCUIT LOCKOUT - Lockout occurs if the limit, flame rollout is open longer than 2 minutes. Control will auto-reset after 1 hour. See code 4.

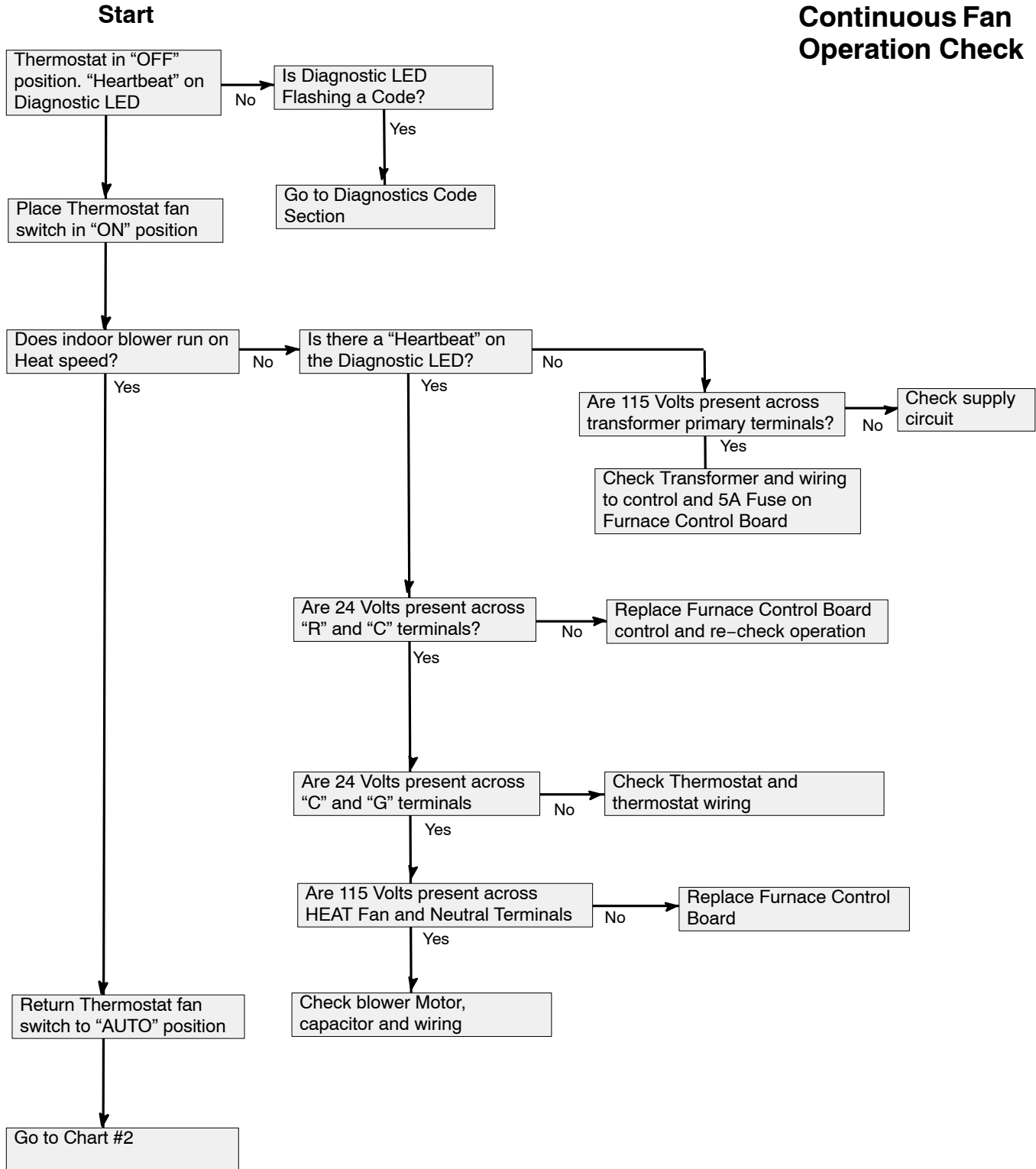
- 8 GAS HEATING LOCKOUT - Turn off power and wait 5 minutes to retry. Check for:
- Stuck closed gas valve relay on control.
 - Miswire or short to gas valve wire.

9 NOT USED ON SINGLE STAGE

- 10 Check for correct line voltage polarity. If units are twinned. Check for proper low voltage (24V) transformer phasing.

Troubleshooting Chart #1

Continuous Fan Operation Check

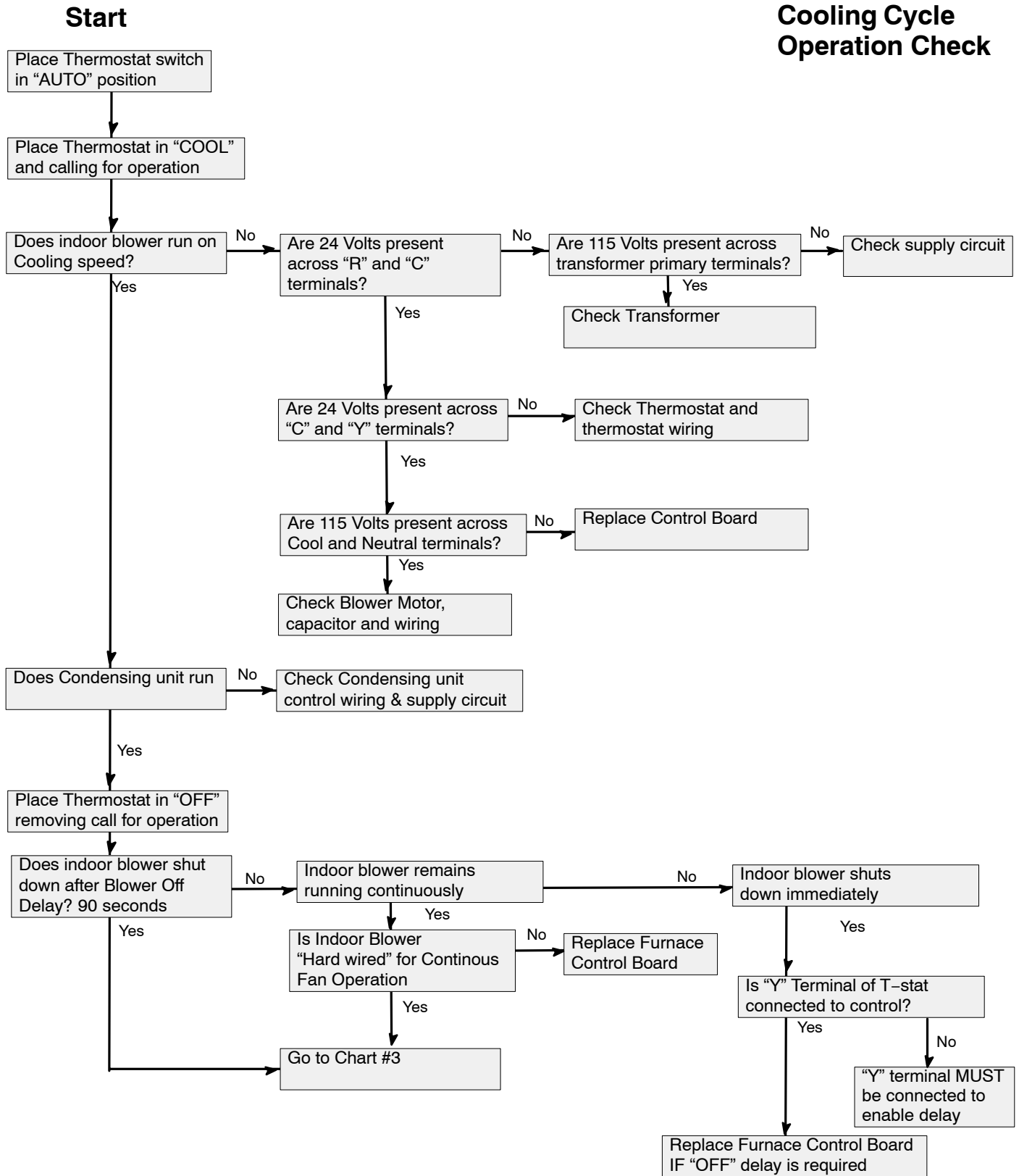


NOTE: Door switch must be taped closed to perform these checks. Remove tape when finished.

NOTE: A "Heartbeat" is defined as the diagnostics LED flashing continually from bright to dim.

Troubleshooting Chart #2

Cooling Cycle Operation Check



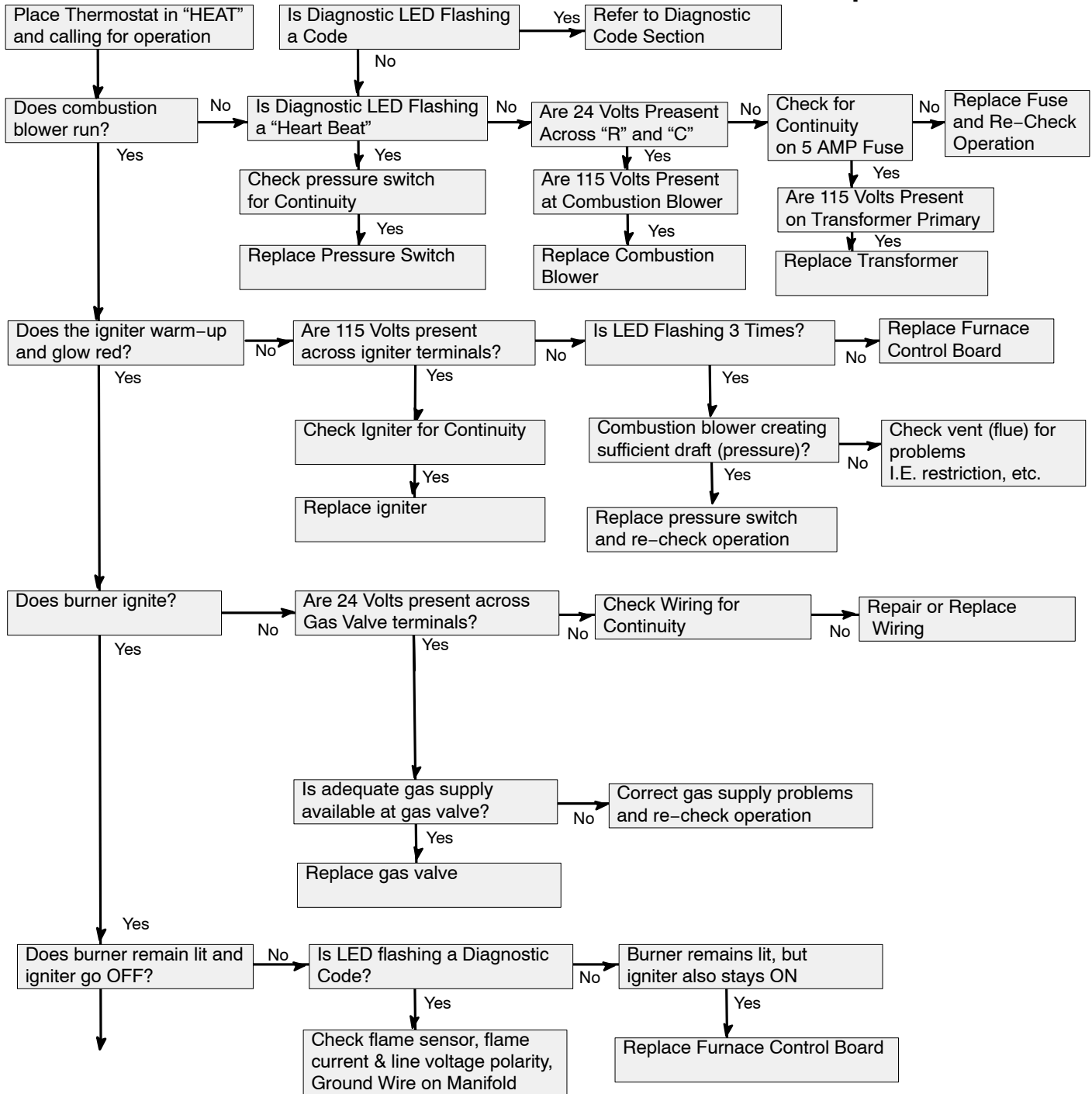
NOTE: Door switch must be taped closed to perform these checks. Remove tape when finished.

NOTE: A "Heartbeat" is defined as the diagnostics LED flashing continually from bright to dim.

Troubleshooting Chart #3

Heating Cycle Operation Check

Continued from Chart #2



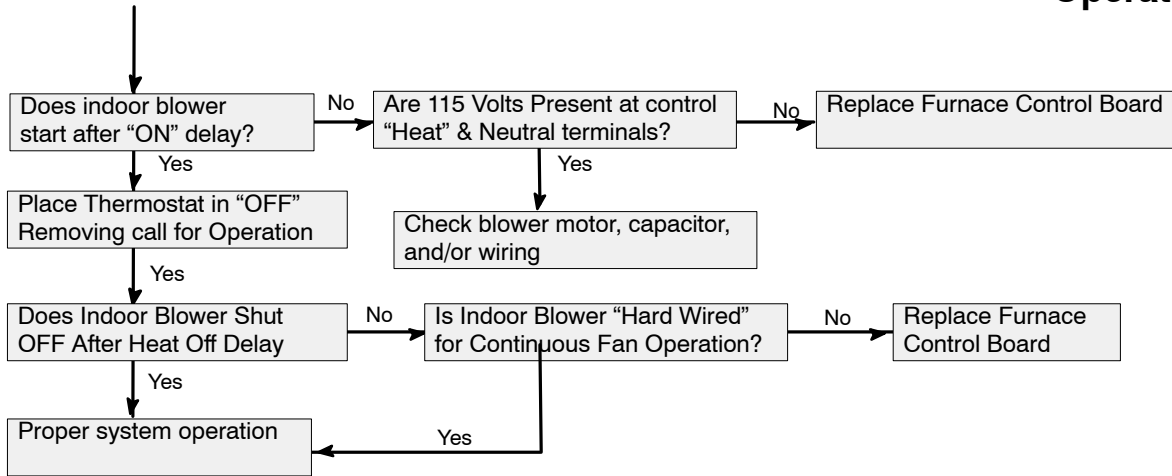
NOTE: Door switch must be taped closed to perform these checks. Remove tape when finished.

NOTE: A "Heartbeat" is defined as the diagnostics LED flashing continually from bright to dim.

Troubleshooting Chart #3

Heating Cycle Operation Check

Continued from Page 38



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