MULTI POSITION SINGLE STAGE GAS FURNACES

Service Manual

N9MP1, N9MP2 & *9MPD
“A1 & A2”

This manual supports condensing gas furnaces manufactured in 2001

Manufactured by:

International Comfort Products

Part Number
440 08 2001 02

4/2002

N9MP1 – Indoor combustion air (1 pipe only)

N9MP2 – Direct Vent ONLY (2 pipe only)

***9MPD – Dual Certified Venting (1 or 2 pipes)**

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

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1. 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 our new multi-position furnaces, both Direct Vent (2 pipe Only), Indoor combustion (1 pipe Only) and Dual Certified (1 or 2 pipe) 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.

⚠ WARNING

The information contained in this manual is intended for use by a qualified service technician who is familiar with the safety procedures required in installation and repair and who is equipped with the proper tools and test instruments.

Installation or repairs made by the unqualified persons can result in hazards subjecting the unqualified person making such repairs to the risk of injury or electrical shock which can be serious, or even fatal not only to them, but also to persons being served by the equipment.

If you install or perform service on equipment, you must assume responsibility for any bodily injury or property damage which may result to you or others. We will not be responsible for any injury or property damage arising from improper installation, service and/or service procedures.

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

MODEL NUMBER IDENTIFICATION GUIDE

*	9	M P	D	0 75	B	1 2	A	1

Brand Identifier
T = Tempstar
C = Comfortmaker
H = Heil
A = Arcoaire
X = Evaluation

Brand Identifier
8 = Non-Condensing, 80+% Gas Furnace
9 = Condensing, 90+% Gas Furnace

Installation Configuration
UP = Upflow DN = Downflow UH = Upflow/Horizontal
HZ = Horizontal DH = Downflow/Horizontal
MP = Multiposition, Upflow/Downflow/Horizontal

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

Input (Nominal MBTUH)

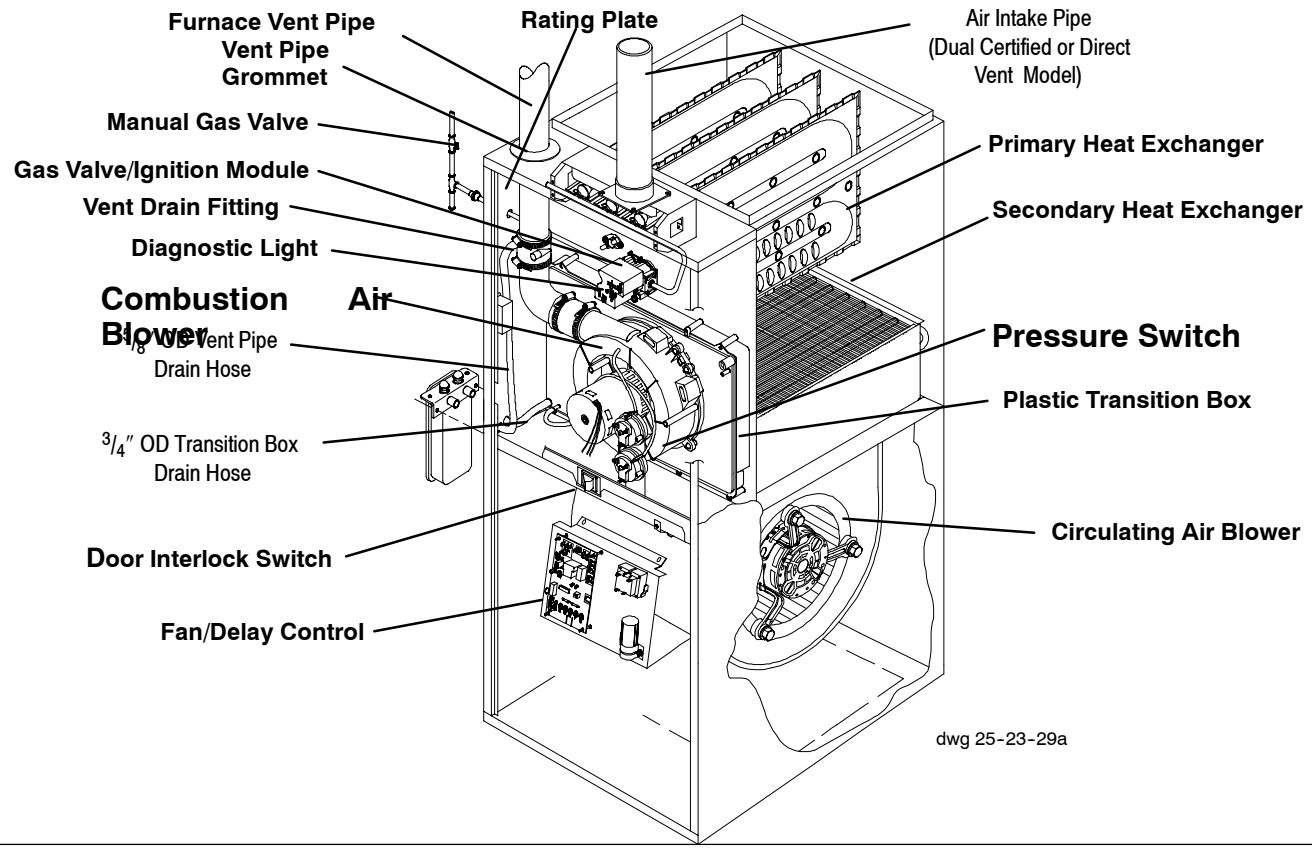
Cabinet Width
B = 15.5″ Wide
F = 19.1″ Wide
J = 22.8″ Wide
L = 24.5″ Wide

Cooling Airflow
08 = 800 CFM
12 = 1200 CFM
14 = 1400 CFM
16 = 1600 CFM
20 = 2000 CFM

Marketing Digit
Denotes minor change

Engineering Rev.
Denotes minor changes

Figure 1 **Component Locations for Four Position Furnaces**



3. FURNACE THEORY OF OPERATION

The high efficiencies and lower profile (compared to previous 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 pervious 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 whole 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. In order to extract the maximum amount of heat possible from the flue gasses, a secondary heat exchanger (condenser) is connected to the outlet of the primary heat exchanger. This condenser removes additional heat from the flue gasses, causing their temperature to drop below dew point. This results in the forming of condensation (water) which then must be routed to a drain.

4. The placement of the secondary heat exchanger at the outlet of the primary heat exchanger creates additional resistance to the flow of gasses.

5. To overcome the resistance to convective flow of the Primary and Secondary heat exchangers requires the use of an Induced Draft Combustion Blower Assembly.

6. The Combustion Blower Assembly is mounted on the outlet side of the Secondary heat exchanger, This blower creates a partial vacuum (negative pressure) within the heat exchangers drawing the flue products out of the furnace.
7. 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.

4. ELECTRICAL SUPPLY

⚠ WARNING

Electrical shock hazard.

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

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

SUPPLY CIRCUIT

The furnace cannot be expected to operate correctly unless it is properly connected (wired) to an adequately sized (15 amp.) single branch circuit.

SUPPLY VOLTAGE

Supply voltage to the furnace should be a nominal 115 volts. It MUST be between 97 volts and 132 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

Grounding of the electrical supply to ALL FURNACES IS REQUIRED for safety reasons.

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

Polarity may be verified as follows:

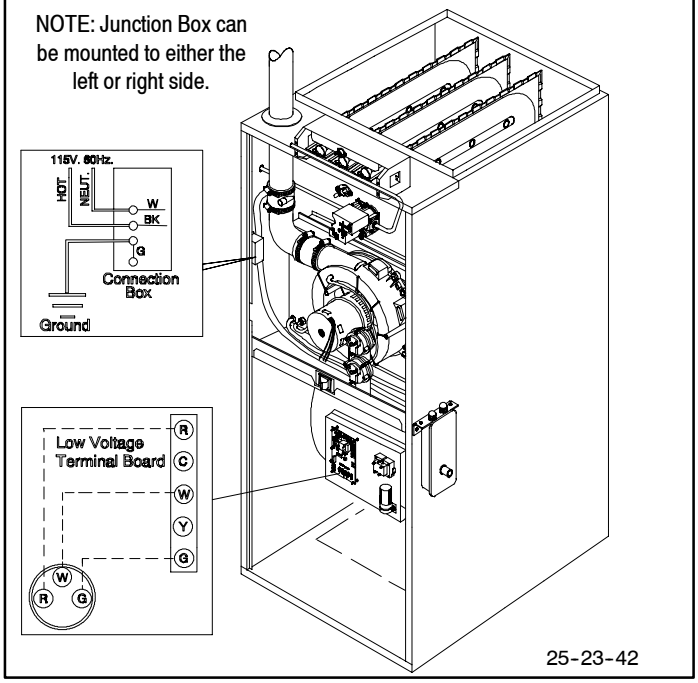
1. Turn the power supply "**ON**".
2. Using a **Voltmeter** check for voltage between the **Hot** (Black) and **Neutral** (White) wire of supply circuit.

POLARITY

CORRECT POLARITY of the line voltage supply to all furnaces is also required for safety reasons.

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.)

Figure 2 **Electrical Connections**

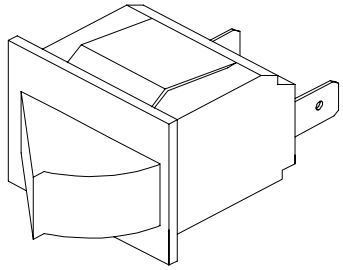


5. INTERLOCK SWITCH

The blower compartment door of all models is equipped with an interlock switch. 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 voltage is essential to insure that furnace components are not "HOT" when switch is open. (See *Checking Grounding and Polarity*)

Figure 3 Typical Interlock Switch



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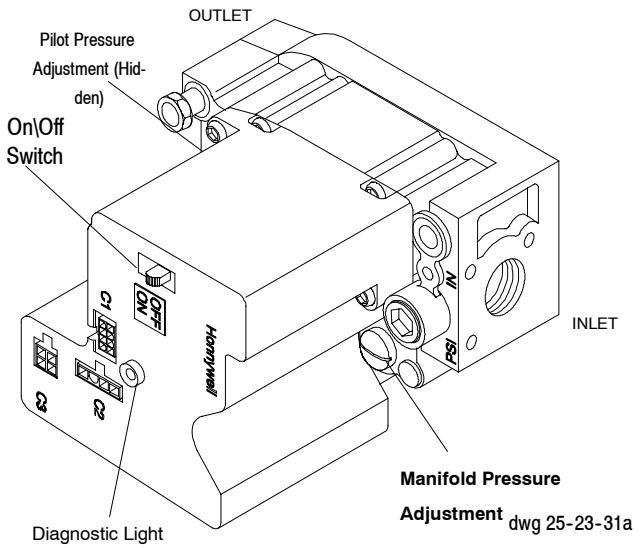
6. GAS SUPPLY

Figure 4 Typical Gas Valve Honeywell



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.

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 a minimum of 4.5″ W.C. (Water Column). 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.

Table 1 Gas Pressures Below 2000′

Gas Type	Supply Pressure			Manifold Pressure
	Recommended	Max.	Min.	
Natural	7″	14″	4.5″	3.5″
LP	11″	14″	11″	10″

Important Note:

- **With Propane gas, the rated input is obtained when the BTU content is 2,500 BTU per cubic foot and manifold pressure set at 10″ W.C.**
- **If Propane gas has a different BTU content, orifices MUST be changed by licensed Propane installer.**
- **Measured input can NOT exceed rated input.**
- **Any major change in gas flow requires changing burner orifice size**.

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.

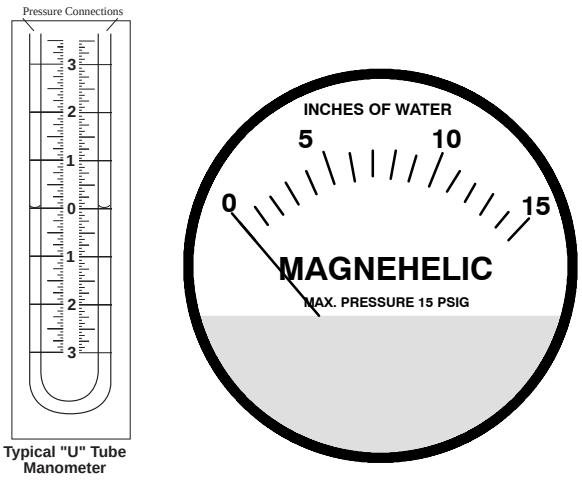
⚠ WARNING

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 5 Gas Pressure Testing Devices



CHECKING MANIFOLD PRESSURE

1. Connect a manometer or Magnehelic gauge (0–12″ W.C. range) to the pressure tap on the "OUTLET" side of the gas valve.
2. Turn gas "ON", fire the furnace, and remove adjustment cover (screw–cap).
3. Turn adjustment screw clockwise (IN) to INCREASE pressure, and counterclockwise (OUT) to DECREASE pressure.
4. At altitudes **BELOW 2,000′** set manifold pressure to 3.5″ W.C. for Natural Gas, and 10″ W.C. for L.P. Gas.
5. For **Natural Gas** units **ABOVE 2,000′**, set manifold pressure according to **TABLE 2**.
6. For **L.P. Gas** units **ABOVE 2,000′**, insure that orifice size has been changed (per *"National Fuel Gas Code"* – Appendix "F") if gas supply has not already been de–rated for altitude by the gas supplier.
7. For ALL UNITS ABOVE 8,000′, contact the factory for SPECIFIC de–rating information.

MANIFOLD PRESSURE AND ORIFICE SIZE FOR HIGH ALTITUDE APPLICATIONS

Table 2 NATURAL GAS

Heat Value Btu/Cu.Ft.	Elevation Above Sea Level						
	0-1999 (″ -wc)	2000-2999 (″ -wc)	3000-3999 (″ -wc)	4000-4999 (″ -wc)	5000-5999 (″ -wc)	6000-6999 (″ -wc)	7000-7999 (″ -wc)
800	3.5	3.5	3.5	3.5	3.5	3.5	3.5
850	3.5	3.5	3.5	3.5	3.5	3.5	3.5
900	3.5	3.5	3.5	3.5	3.5	3.5	3.4
950	3.5	3.5	3.5	3.5	3.3	3.2	3.1
1000	3.5	3.4	3.3	3.2	3.0	2.9	2.8
1050	3.2	3.1	3.0	2.9	2.7	2.6	2.5
1100	2.9	2.8	2.7	2.6	2.5	2.4	2.3
Orifice Size	#42	#42	#42	#42	#42	#42	#42

"CLOCKING" GAS METER (NATURAL GAS)

1. Check with gas supplier to obtain ACTUAL BTU content of gas.
2. Turn "OFF" gas supply to ALL other gas appliances.
3. Time how many seconds it takes the smallest (normally 1 cfh) dial on the gas meter to make one complete revolution.
4. Calculate input rate by using ACTUAL BTU content of gas in formula shown in example.

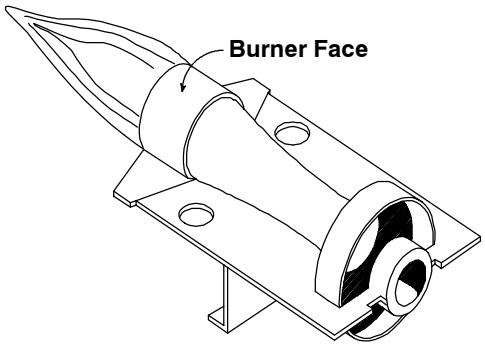
Example			
Natural Gas BTU Content	No. of Seconds Per Hour	Time Per Cubic Foot in Seconds	BTU Per Hour
1,000	3,600	48	75,000
1,000 x 3,600 ÷ 48 = 75,000 BTUH			

7. BURNERS

Burners used in this series of furnace are of the "INSHOT" type. Their operation can be compared to that of a torch in that they produce a hard, sharp, somewhat noisy flame. Noise should not be an issue, however, because of the closed compartment design. In order to insure that the burners are operating properly, and at their design noise level, proper adjustment of the gas (manifold) pressure is essential. See page 6 for further information on manifold pressure adjustments.

The burners used in this series ARE NOT EQUIPPED WITH AIR SHUTTERS, as none are required. Proper operation (flame characteristics) is obtained by insuring that the orifice size, and manifold pressure are correct for the fuel being used and the altitude of the installation.

Figure 6 **Main Burner**



8. L.P. PRESSURE SWITCH

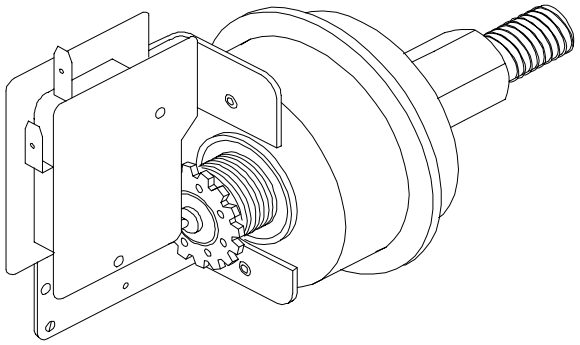
Models converted to operate on L.P. Gas will be installed with an L.P. Pressure Switch. If so equipped, the switch will be located in the gas supply line (in a "Tee" fitting), just ahead of the gas valve.

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 (vent) 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.

On some models, it is located (electrically) between the Furnace (vent) pressure switch and the gas Valve.

Figure 7 **Typical L.P. Pressure Switch**



9. HIGH ALTITUDE OPERATION

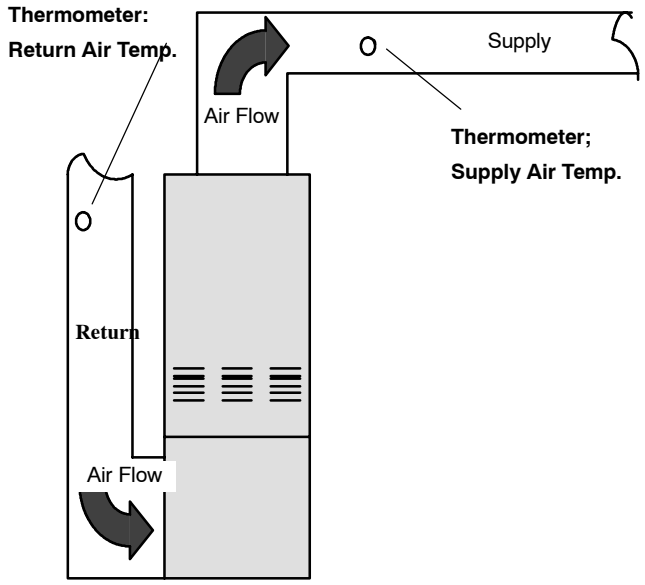
These furnaces are designed to operate in the majority of the country without modifications. At altitudes over 2,000′ above sea level, however, certain measures need to be taken to insure continued, safe reliable operation. For example, units must be de-rated for altitude (by adjusting manifold pressure 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.

ALL UNITS must have a high altitude pressure switch installed at altitudes above 4,000′ above sea level.

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 *), and pressure switches (Page **) to obtain specific information for you particular installation altitude.

10. CHECKING TEMPERATURE RISE

Figure 8 Checking Temperature Rise



The furnace is designed to operate within a certain specified range of temperature rise.

Operating the furnace outside the specified range may result in lower efficiency and/or comfort levels, as well as premature combustion component failures.

Simply stated, the temperature rise through the furnace is the difference in temperature between the return air, and the supply air.

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

ALLOWABLE TEMPERATURE RISE ALL MODELS

Model	Range
50 Mbtu	35°F - 65°F
75, 100 & 125 Mbtu	40°F - 70°F

Operate the furnace for 15 minutes before taking temperature readings. Subtract the return air temperature from the supply air temperature. The result is the temperature rise. Compare with the allowable rise listed for the model (size) you are checking.

Temperature Rise can be checked by placing a thermometer in the return air duct within 6′ of furnace. Place a second thermometer in the supply duct at lease two (2) ft. away from the furnace. (This will prevent any false readings caused by radiation from the furnace heat exchanger) Make sure that the FILTER IS CLEAN and that ALL REGISTERS AND/OR DAMPERS ARE OPEN.

If the rise is not within the specified range, it will be necessary to change the heating blower speed. **If the rise is too high**, it will be necessary to **increase the blower speed**. **If the rise is too low**, it will be necessary to **reduce the blower speed**.

Example:

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

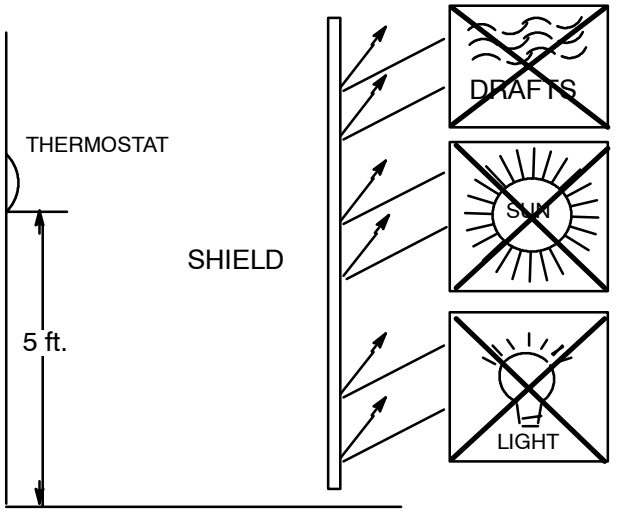
Solution: Increase Blower Speed

11. 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. 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.

Figure 9 Thermostat Location



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 of 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.

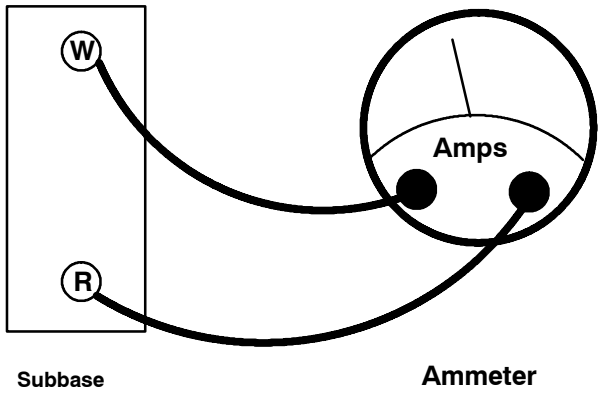
HEAT ANTICIPATORS

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.

Figure 10 **Measuring Current Draw**



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 10**) 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 meter 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.

If an ammeter is not available, a setting of 0.30 amps may be used for models equipped with the HONEYWELL SV9541M Gas Valve/Ignition Control. They should, however, provide satisfactory operation in most cases.

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.

12. 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 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.

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 HONEYWELL ST9160B electronic Fan Timer/Furnace Control, 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)

13. TWINNING KITS

Some installations may require a Heating capacity or Airflow 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) furnaces to be controlled by the same room thermostat. When Twinned, the circulating (conditioned air) blowers of BOTH furnaces will operate simultaneously.

Models equipped with a HONEYWELL ST9160B series Fan Timer/Furnace Control may be twinned using a model NAHA003WK01 twinning kit.

To assist troubleshooting efforts of "Twinned" installations, "TYPICAL" control wiring diagrams are provided on pages ** through **.

14. 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 switches. 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.

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

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

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

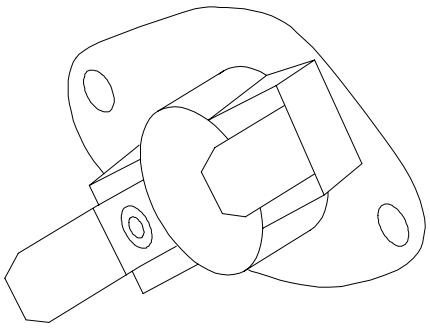
MAIN LIMIT SWITCH

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, combustion blower, and/or 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 8 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.)

Figure 11 **Typical Limit Switch**



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.

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.

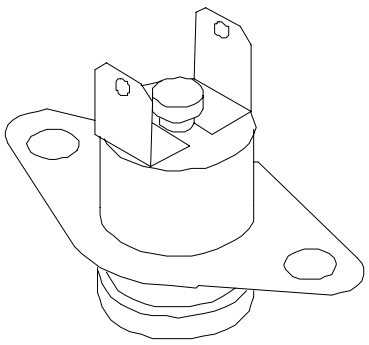
If, however, the switch is found to be opening prematurely, then it should be replaced. When replacing ANY limit switch, use ONLY a switch of EXACTLY the same temperature setting. Use of a different temperature limit switch can create a dangerous situation. Some of the main limit switches used in this 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 the burner box.

This switch may be of the manual type, depending upon the particular model and/or family. Different temperature (OPENING) settings are also used on different models. When replacing this switch, be absolutely certain the correct one is used.

Figure 12 **Typical Roll Out Limit Switch**



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.

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

MANUAL RESET SWITCH MODELS

Furnace models which are equipped with a Honeywell ST9160 Fan timer/furnace control use a manual reset roll out switch. 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, (Depending upon the particular model) the combustion blower and/or circulating blower will be energized continuously.

AUXILIARY LIMIT SWITCHES

All models are equipped with one (1) additional (AUXILIARY) limit switch mounted on the blower deck. Its purpose is to monitor return air temperature, and interrupt burner operation when a temperature is sensed which could result in the filter surface(s) exceeding allowable temperatures. Depending upon the particular model, the combustion blower, and/or circulating blower may be energized continuously while the auxiliary limit switch remains open.

This control is an “Automatic” reset control which will reset itself when the temperature drops to a safe level. See the Tech. Service Data Sheet for the model you are servicing, to obtain its specific auxiliary limit switch setting.

15. PRESSURE SWITCHES

Transition Pressure Switch

This switch is designed to monitor a blockage of the condensate drain line. It uses a single tap (port) "Normally Open" pressure switch (wired in series with the furnace air proving (pressure) switch. The switch "Closes" at a (negative) pressure setting for the switch associated with that particular model furnace (See unit specitications).

Under normal operating conditions, sufficient pressure is developed by the exhaust (combustion) blower to close the switch, and permit the burner to operate. As the condensate drain begins to back–up, however, the pressure begins to reduce. When the pressure drops sufficiently, burner operation will be prevented until the condition is corrected.

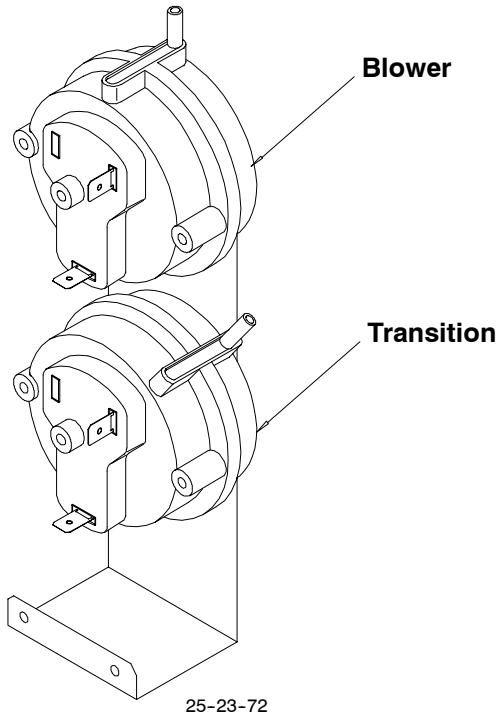
Blower Pressure Switch

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.

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.

All models installed at altitudes of 4,000′ above sea level or higher require replacing the standard pressure switch with a high altitude pressure switch. The different pressure switch settings allow continued SAFE, RELIABLE, high altitude operation.

Figure 13 **Pressure Switches**



HIGH ALTITUDE PRESSURE SWITCHES - ALL MODELS

Model	Max. Close	Open	Part #
Upflow	-1.40″ W.C.	-1.18 ± 0.10″ W.C.	
Downflow			

CHECK CURRENT TECHNICAL SUPPORT MANUAL FOR PART NOS.

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 one of the heat exchangers, 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 **Table 3** and the switch setting(s) listed above for the model family you are servicing.

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.

Table 3 lists approximate operating pressures for Direct Vent (I.E. Two Pipe) installations of models in this series. They were obtained in a test lab, under controlled conditions using two (2) specific vent lengths. They are included in this manual to provide you with a "Barometer" to gauge our 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:

Table 3	APPROXIMATE OPERATING PRESSURES (″ OF W.C.)		
Model	**Vent Length**	**@Blower**	**@ Transition**
50 Mbtu	Short - (5′ No. Elbows)	-1.80	-2.60
	Long - (40′ + 5 90° Elbows)	-1.30	-2.30
75 Mbtu	Short - (5′ No. Elbows)	-1.80	-2.60
	Long - (40′ + 5 90° Elbows)	-1.30	-2.30
100 Mbtu	Short - (5′ No. Elbows)	-1.80	-2.60
	Long - (40′ + 5 90° Elbows)	-1.70	-2.50
125 Mbtu	Short - (5′ No. Elbows)	-1.80	-2.60
	Long - (40′ + 5 90° Elbows)	-1.70	-2.50

Lower (Lesser) Negative Pressures

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

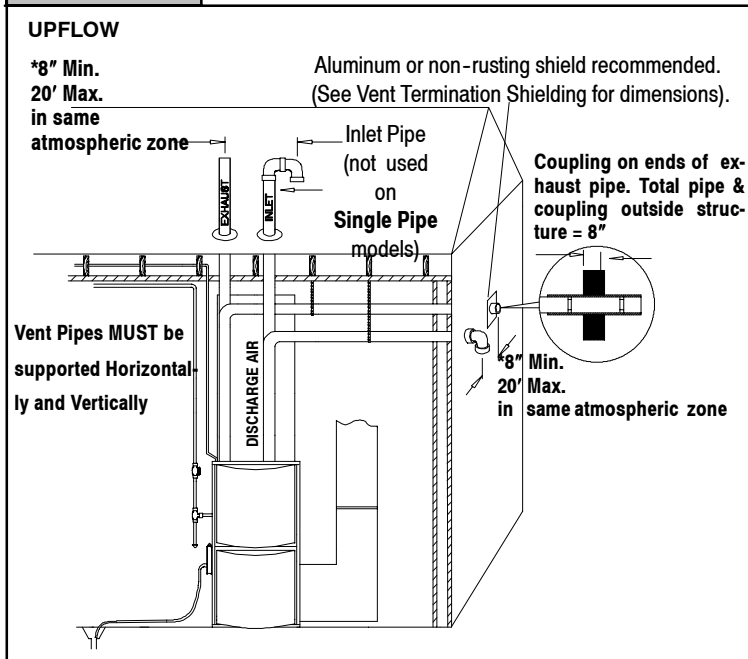
1. Restriction on the **Outlet** side of the combustion blower. (I.E. Blocked Flue, Vent too long, Heat Exchanger leak, etc.)
2. Leak (lack of restriction) on the **Inlet** side of the combustion blower.

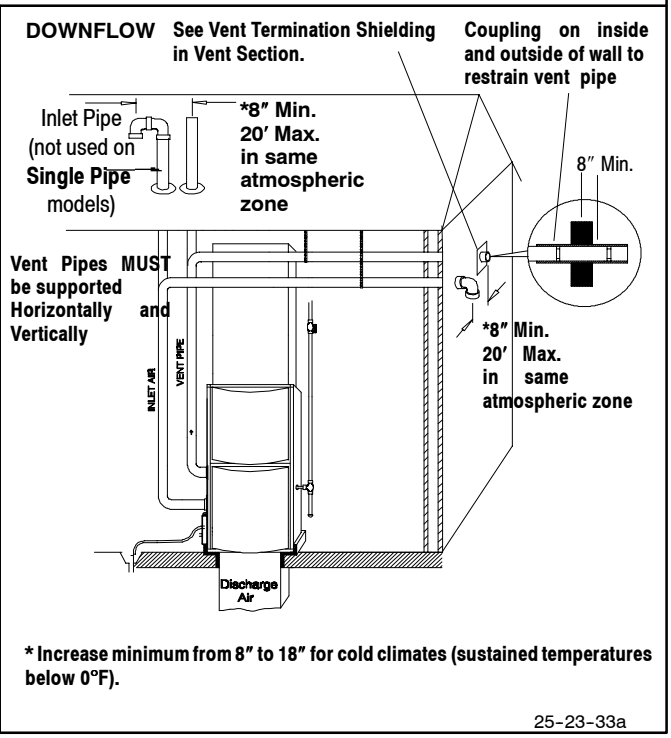
Higher (Greater) Negative Pressures

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)

Figure 14 **Typical Vent/Combustion Air Piping Installation**





16. VENT/COMBUSTION AIR PIPING

Vent and combustion air piping are an extremely important part of the total furnace installation. Improperly installed or inadequately sized vent and/or combustion air 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 vent and/or combustion air piping. Anytime these type problems arise, a thorough inspection of the vent and/or combustion air piping should be conducted.

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

Direct VENT (ONLY) models require a combustion air inlet to bring in **all air for combustion from outside** the structure.

DUAL CERTIFIED models require a combustion air inlet pipe to bring in all air for combustion from outside the structure **only** when installed as a Direct Vent Furnace (I.E. Two Pipe Installation)

Consult the appropriate Venting tables and/or piping chart for the model (series) you are servicing.

17. STANDARD VENT TERMINATION

Vent/Combustion Air Piping Charts

Dual Certified Models ONLY - Non-Direct Vent Installation

Single Piping Chart

Table 4	Pipe Diameter Table Single Piping ONLY
50,000 & 75,000 Btuh Furnaces	
40′ & (5) 90° elbows with 2″ PVC pipe or **70**′ & (5) 90° elbows with 3″ PVC pipe or	
100,000 Btuh Furnace	
70′ & (5) 90° elbows with 3″ PVC pipe	
125,000 Btuh Furnace	
40′ & (5) 90° elbows with 3″ PVC pipe	
Elbows are DWV Long Radius Type for 2″ and 3″ vents.	

If more than five elbows are required, reduce the length of both the inlet and exhaust pipes 5′ for each additional elbow used.

NOTE: It is allowable to use larger diameter pipe and fitting than shown in the tables but **not** smaller diameters than shown.

All Series (Models) - Direct Vent Installation

Dual Piping Chart

Table 5	Pipe Diameter Table Dual Piping ONLY
50,000 & 75,000 Btuh Furnaces	
40′ & (5) 90° elbows with 2″ PVC pipe or **70**′ & (5) 90° elbows with 3″ PVC pipe or	
100,000 Btuh Furnace	
70′ & (5) 90° elbows with 3″ PVC pipe	
125,000 Btuh Furnace	
40′ & (5) 90° elbows with 3″ PVC pipe	
Elbows are DWV Long Radius Type for 2″ and 3″ vents.	

If more than five elbows are required, reduce the length of both the inlet and exhaust pipes 5′ (1.5m) for each additional elbow used.

*** Feet of pipe is whichever pipe run is the longest, either inlet *or* outlet side.**

Figure 15 Standard Termination Rooftop Termination

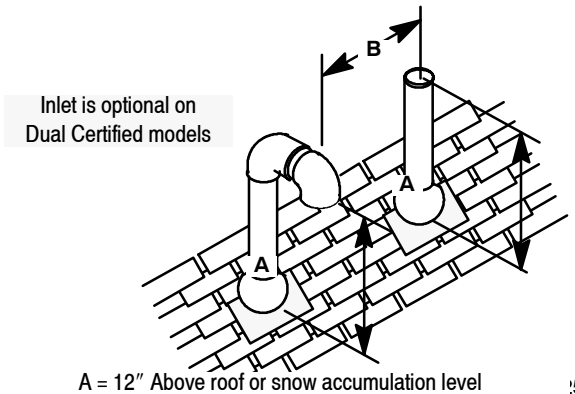


Figure 16 Sidewall Termination 12″ or More Above Snow Level or Grade Level

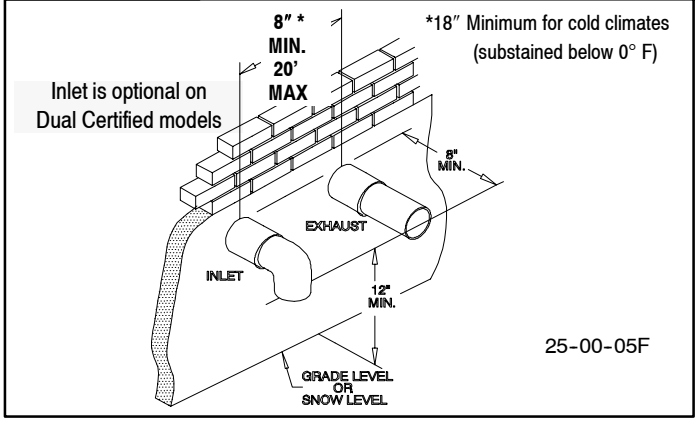
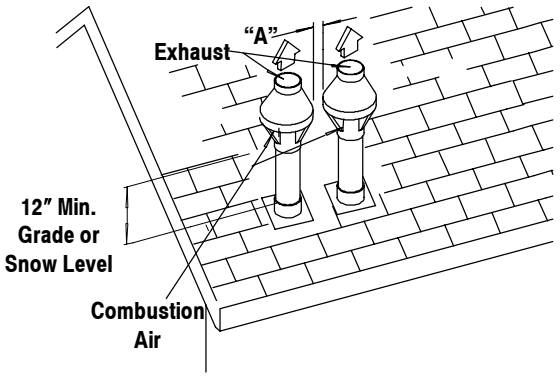
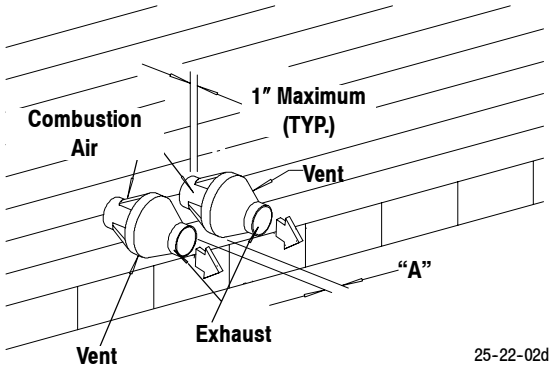


Figure 17 Concentric Vent and Combustion-Air Roof Termination



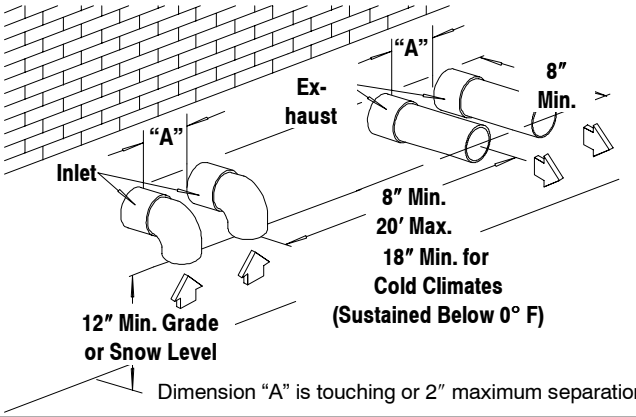
Dimension "A" is touching or 2″ maximum separation.

Figure 18 Concentric Vent and Combustion-Air Sidewall Termination



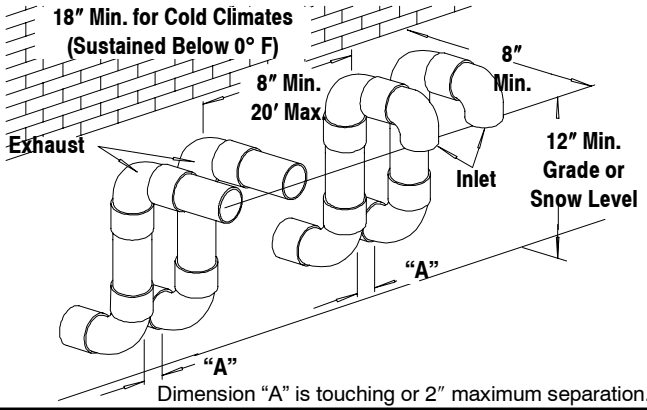
Dimension "A" is touching or 2″ maximum separation.

Figure 19 Sidewall Inlet Vent and Exhaust-Air Termination



Dimension "A" is touching or 2″ maximum separation.

Figure 20 Sidewall Inlet Vent and Exhaust-Air Termination with Exterior Risers



Dimension "A" is touching or 2″ maximum separation.

Figure 21 Rooftop Inlet Vent and Exhaust-Air Termination

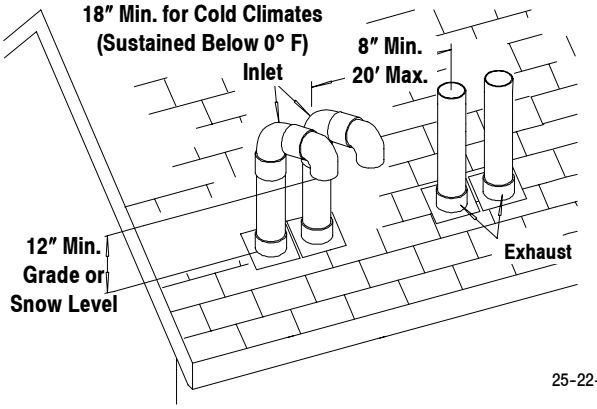
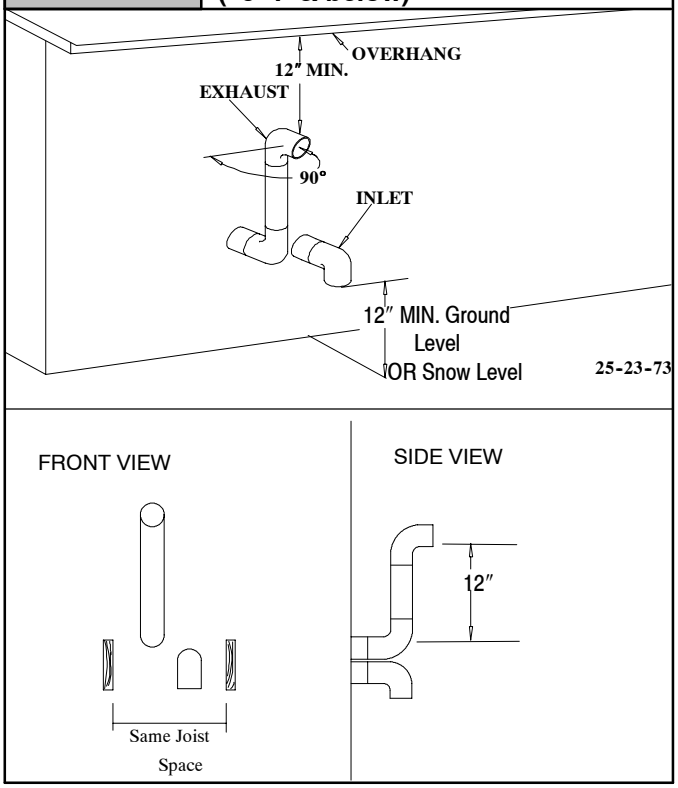


Figure 22 **Recommended Alternate Installation for Sustained Cold Weather (-0° F & below)**

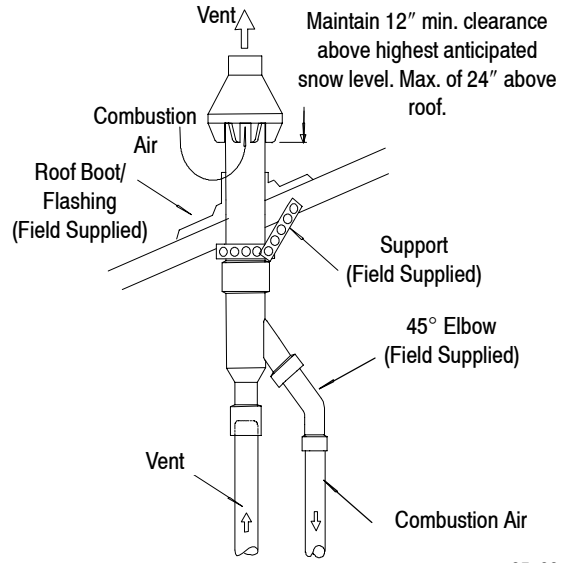


18. CONCENTRIC VENT TERMINATION

Vent/Combustion Air Piping Charts

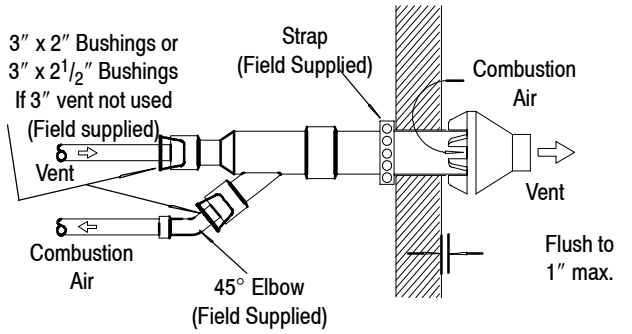
Table 6	Concentric Termination Kit NAHA001CV & NAHA002VC Venting Table Dual Piping ONLY
50,000 & 75,000 Btuh Furnaces	
NAHA002CV - 35′ & (4) 90° elbows with 2″ PVC pipe **NAHA001CV - 65**′ & (4) 90° elbows with 3″ PVC pipe	
100,000 Btuh Furnace	
NAHA001CV - 65′ & (4) 90° elbows with 3″ PVC pipe	
125,000 Btuh Furnace	
NAHA001CV - 35′ & (4) 90° elbows with 3″ PVC pipe	
1. Do not include the field supplied 45° elbow in the total elbow count. **2. If more than four elbows are required, reduce the length of both the inlet and the exhaust pipes five feet for each additional elbow used.** **3. Elbows are DWV long radius type for 2″ and 3″ vents.**	

Figure 23 **Concentric Vent Roof Installation**



Note:
Support must be field installed to secure termination kit to structure.

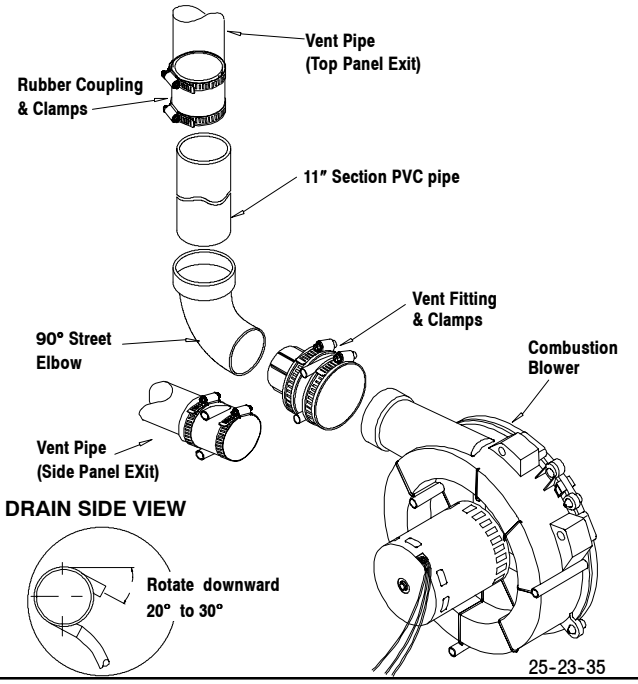
Figure 24 **Concentric Vent Sidewall Attachment**



Note:
Securing strap must be field installed to prevent movement of termination kit in side wall.

19. EXHAUST BLOWER

Figure 25 **Exhaust Blower**



20. CONDENSATE DRAIN TRAP

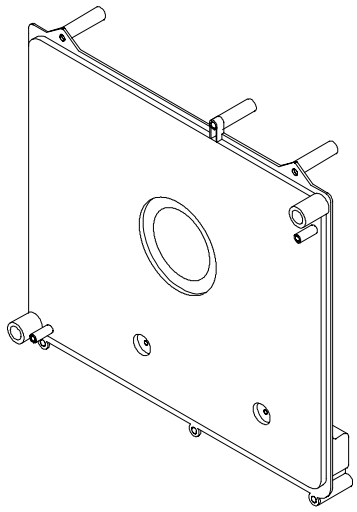
The removal of additional heat from the flue products which takes place in the secondary heat exchanger (condenser) causes them to drop below their dew point resulting in condensation. This condensation (water) then must be drained from the furnace, and routed to a remote drain, or condensate pump.

The combustion blower creates a negative pressure in excess of 2″ W.C. while operating. Without a condensate drain trap of sufficient depth, condensate would be held in the furnace, (because of this negative pressure), and not be able to drain. **Figure 26** shows the transition assembly, which is mounted between the combustion blower and the front partition.

The condensate drain trap supplied with the furnace MUST be used. The drain line between the condensate drain trap and the drain location must be constructed of $^{3}/_{4}$″ PVC or CPVC pipe.

In standard **Upflow, Counterflow and/or horizontal installations**, the external drain trap provides sufficient depth (4″) to insure proper drainage of condensate from the furnace. Additional traps are NOT required, and should NOT be used. The use of additional traps will PREVENT proper drainage of condensate from the furnace. Care should be taken with the routing of the condensate drain hose, to eliminate all dips or sagging tubing which can create another trap, and cause drainage problems.

Figure 26 (Transition Assembly)



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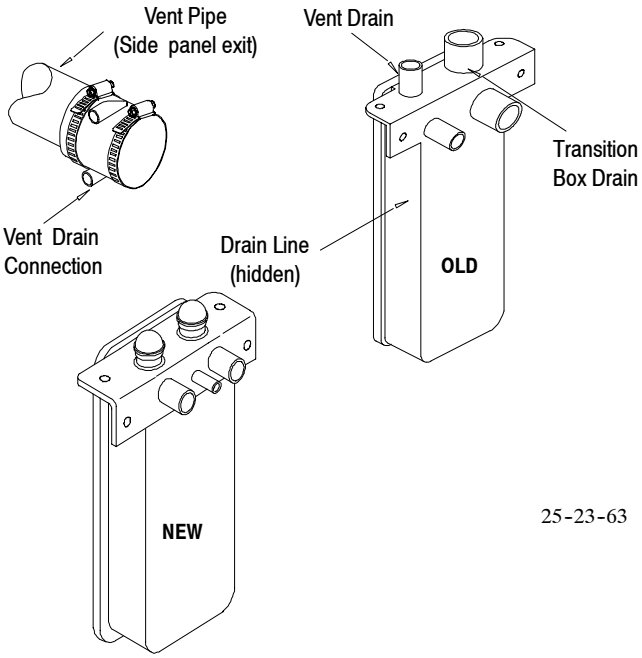
NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° downward slope.(See **Figure 27**)

Floats and/or condensate sensors are NOT used in the drain trap. If the drain line becomes clogged, the condensate level will rise higher in the external trap. When the level rises sufficiently, the furnace will begin to "Cycle" (On and Off) on the pressure switch. If the condensate level rises high enough in the trap, the pressure switch may not close at all, and water may be heard "Paddling" inside the combustion blower.

Figure 27 Condensate Drain Trap



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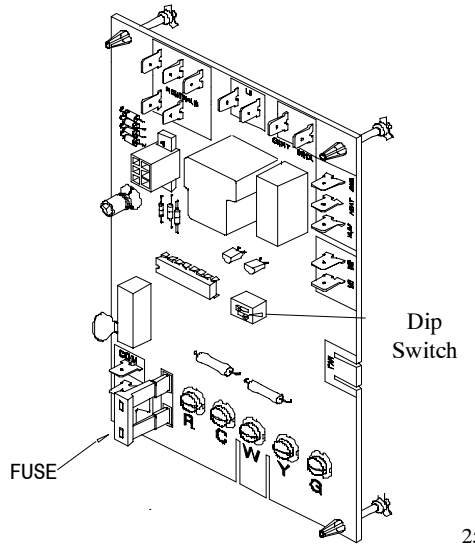
21. HONEYWELL ST9160B Series FAN TIMER/FURNACE CONTROL

Figure 28 Honeywell ST9160B



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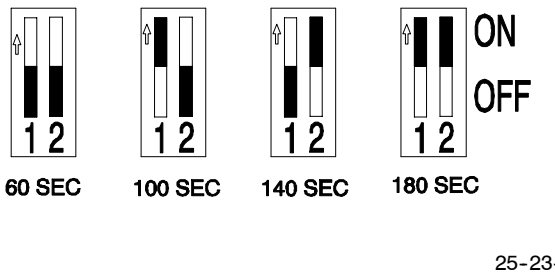
The Honeywell ST9160B Electronic Fan Timer/Furnace Control contains NO USER SERVICEABLE COMPONENTS. It is, as its name implies, a fan timer and a furnace control of sorts. In addition to controlling the fan operation for heating, it also takes the place of the blower relay, the combustion air relay and/or the system relay.

The ST9160B is used in models equipped with the SV9541M GAS VALVE/IGNITION CONTROL. It provides the power source to begin the ignition sequence through a monitored safety circuit. It also serves as a low voltage terminal strip. Accessory terminals for connecting a Humidifier and/or Electronic Air cleaner are also provided, as well as a Continuous fan terminal which allows for continuous fan operation at a speed other than either the heating or cooling speed.

The control provides a fixed (non-adjustable) 60 second "ON" and 60 second "OFF" delay for the circulating blower in COOLING and a 30 second "ON" delay for the circulating blower in HEATING.

The ST9160B control also provides an adjustable HEATING "OFF" delay for the circulating blower which can be field adjusted to 60, 100, 140, or 180 seconds.

Figure 29 **Heating "OFF" Delay DIP switch Setting**



Setting "OFF" and "ON"

Setting the ST9160B Heating Fan "OFF" Delay is accomplished by the positioning of "DIP" switches. The label on the back of the furnace door indicates how to position these switches to obtain the desired setting. (See **Figure 29**)

The **ST9160B Heating "OFF" delay** can be set to (60. 100, 140, or 180). The control was shipped out in the 140 position. This may be satisfactory for some installations, but not for others.

The **Heating "ON" delay is fixed at 30 seconds is not adjustable.**

The "OFF" delay should be set as long as possible without creating "COLD AIR" complaints at the end of the cycle.

Troubleshooting

The operation of the HONEYWELL ST9160B series FAN TIMER/FURNACE CONTROL (as well as the operation of the furnace in general) can be verified in a few minutes by using two (2) jumper wires (to jumper terminals of the low voltage terminal strip) and the "TEST SEQUENCE" below.

22. ST9160B TESTING SEQUENCE

If furnace successfully passes this testing sequence, it can be assumed that there are no problems with the ST9160B FAN TIMER/FURNACE CONTROL. If it does not, however, it does not necessarily mean that there are problems with the control. Any malfunctions should be thoroughly investigated before replacing and components.

CHECKING **COOLING** FUNCTIONS

1. JUMPER "Y" & "G" TO "R"
2. CHECK COOLING FAN DELAY "ON"
3. CHECK COOLING SPEED FAN OPERATION
4. REMOVE JUMPER
5. CHECK COOLING FAN "OFF" DELAY

CHECKING **HEATING** FUNCTIONS

1. JUMPER "W" TO "R"
2. CHECK COMBUSTION BLOWER START-UP
3. CHECK IGNITION SYSTEM ACTIVATION
4. WHEN MAIN BURNER LIGHTS, CHECK HEATING FAN "ON" DELAY
5. CHECK HEATING SPEED FAN OPERATION
6. REMOVE JUMPER
7. CHECK POST PURGE DELAY
8. CHECK HEATING FAN "OFF" DELAY

23. ST9160B - UNIQUE CONTROL FUNCTIONS/RESPONSES

There are some unique responses from these controls that differ from what one would normally expect, and may be somewhat confusing. (See **Figure 28**) Specifically, these are as follows:

Energizing the "G" terminal of this control will cause the blower to run on the HEATING speed. (With most other furnaces, the blower relay is energized via the "G" terminal normally causing the blower to run on the cooling speed.)

Energizing the "G" & "Y" terminals (together) will cause the blower to run on the COOLING speed. It is important that you take note of this, since control wiring improperly connected can cause perceived as well as real equipment problems.

For example, in the past, the "Y" terminal in nearly all furnaces was simply a binding post. There was no electrical connection between this terminal and the rest of the furnace. Consequently, many installers would not use this terminal to connect the "Y" signal from the thermostat, but would run it directly from the thermostat to the condensing unit, the run the "Common" signal back to the furnace "C" terminal.

This method of wiring will result in improper operation from this control. The control MUST receive a "Y" signal in order for it to energize the "COOL" terminal, bringing on the blower in the cooling speed. If it is wired as above, the condensing unit will come on, but the blower will run on the HEATING speed.

"NO TERMINALS" ENERGIZED (on low voltage terminal strip) – If a speed tap wire has been connected to the "CONT." (continuous) terminal, (operational terminal provided on the ST9160B series controls) the blower will run on this speed. Maximum allowable connected load for this terminal is 8.0 FLA.

The "CONTINUOUS" terminal of the ST9160B control is energized **ONLY** when there is NO OTHER CALL FOR OPERATION of any kind. If there is a call for HEAT, COOL, or "FAN ON", this terminal is DE–ENERGIZED. The purpose of this terminal is to provide a means of air circulation during "OFF CYCLES" at a different speed than either heating or cooling. **The use of this terminal is operational, and there will be no speed tap wires connected to this terminal when the furnace is shipped.**

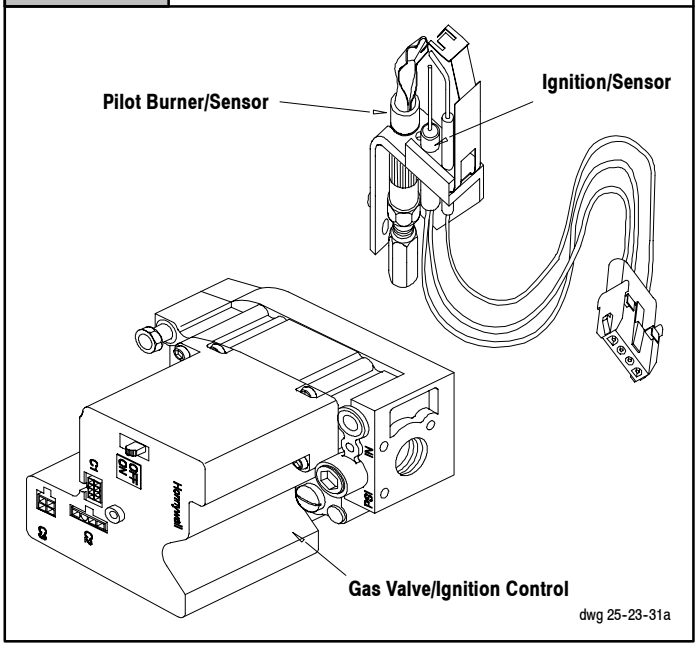
"CONTINUOUS" fan should not be confused with "FAN ON" which is obtained by switching the fan selector switch on the thermostat sub–base to "**FAN ON**", (energizing the "**G**" terminal) which causes the blower to run on the "**HEATING**" **speed.**

The **ST9160B Electronic Air Cleaner** terminal (**EAC**) IS **ONLY** energized in conjunction with the HEATING and COOLING speed terminals. **The maximum allowable connected load to the HUM terminal is 0.8 (eight tenths) Amp.***

*The combined connected loads of the EAC and HUM terminals cannot exceed a total of 0.8 (eight tenths) amp.

24. HONEYWELL SV9541M GAS VALVE/IGNITION CONTROL

Figure 30 **Honeywell ST9541M Ignition System**



The system consists basically of only two (2) components. The Ignition System Control and the Pilot Hardware. The operate on Two (2) 24 volt power circuits received from the ST9160B Fan Timer/Furnace Control. One is the power supply to the ignitor, the second is to activate the ignition sequence.

The Ignition System Control manages the ignition sequence, and the flow of gas to the pilot and main burners. It is in essence a combination Gas Valve and Ignition control.

It contains sophisticated electronic components (internally) and has NO USER SERVICEABLE COMPONENTS. Should a problem be verified internally within the device, IT IS NOT REPAIRABLE, and must be replaced.

The Pilot Hardware includes the pilot burner, the hot surface element that lights the pilot burner, the flame rod that senses pilot flame, and the cable that attaches to the system control.

The hot surface element is made of tough *break resistant* ceramic composite material. It operates on 24 Volts A.C. The Igniter/Flame Rod assembly can be replaced independently from the pilot burner assembly.

The system operation is quite simple, and forgiving (I.E. nuisance lockouts are eliminated)

25. HONEYWELL SV9541M SYSTEM OPERATION

Connecting the furnace to the line voltage supply with the blower door interlock switch closed provides 24 volts to power the system. (This is accomplished by the connections from terminals [pins] #4 & #2 from the ST9160B fan timer to terminals #1 & #3 of the SV9541M gas valve.)

When the thermostat calls for heat, (the combustion blower starts, causing the pressure switch to close completing the circuit to the ignition system control) there will be approximately a two (2) second delay, while the ignition system control runs a self check.

Part of the self check is to see if a flame signal is detected. If a flame signal is detected upon a call for heat (and naturally there shouldn't be), the ignition system control will energize the electronic fan timer output (causing the conditioned air blower to start after the fixed 60 second "ON" delay) and will keep the valve and ignitor to circuit off.

Assuming that no flame signal is detected upon the call for heat, (Normal operation), the ignition system control will power the ignitor circuit (24 volts) causing the ignitor to heat up.

If the ignitor circuit is not proven (I.E. the ignitor is missing, broken, or the connections are loose) their will be no response from the ignition system control. (Lockout)

Once the ignitor circuit has been proven, and the ignitor begins to heat up, the pilot valve will be energized allowing gas to flow to the pilot burner.

With the ignitor now hot, and gas flowing to the pilot , the pilot should light, and the sensor should sense flame.

If no flame is sensed, (I.E. no gas, pilot not lit, flame not enveloping sensor, etc.) the ignitor will stay on, and the pilot valve will remain open until it does sense flame, or until the call for heat is satisfied. THE SYSTEM WILL NOT LOCK OUT under this condition.

Assuming that the pilot does light, and flame is sensed, (normal operation) the ignition system control will turn the ignitor off, while energizing the main valve. This will allow the pilot to light the main burner. It will also energize the electronic fan timer output (causing the conditioned air blower to start after the fixed 60 second "ON" delay).

If a flame outage (I.E. loss of gas supply, blown out, etc.) should occur during a run cycle (Main burner operation), the ignition system immediately de–energize the main valve and re–power the ignitor circuit placing the system back in to the "Trial For Ignition" mode.

As previously, it will remain in this "Trial For Ignition" mode (Ignitor powered and pilot valve open) either until the pilot lights and flame is sensed, or until the call for heat ends.

The SV9541M system **is not sensitive** to furnace grounding or line voltage polarity. Accordingly, you cannot experience a lockout due to those reasons.

Assuming that the main burner did not experience any problems during the run cycle (normal operation) it would continue to operate as long as the call for heat remained.

Once the call for heat ended, the ignition system control would immediately close the main and pilot valves, and de–energize the electronic fan timer output.

De–energizing the electronic fan timer output causes the "OFF" delay timing to begin, and when the pre–selected time (90, 100, 140, or 180 seconds) expires, the blower will turn off.

TROUBLESHOOTING

Malfunctions of the HONEYWELL SV9541M "Smart Pilot" system may be easily diagnosed using a voltmeter and a spare igniter/flame rod assembly.

The igniter itself can also be checked using an Ohmmeter. Resistance of a "Good" igniter should be 10 Ohms or less.

See trouble shooting flow chart and the sequence of operation flow chart on pages 36 and 37 of this manual for additional information on the operation and troubleshooting of this system.

26. CHECKING FLAME CURRENT

The Honeywell SV9541Q Ignition system used in this furnace series proves (verifies) flame via the Flame Rectification method.

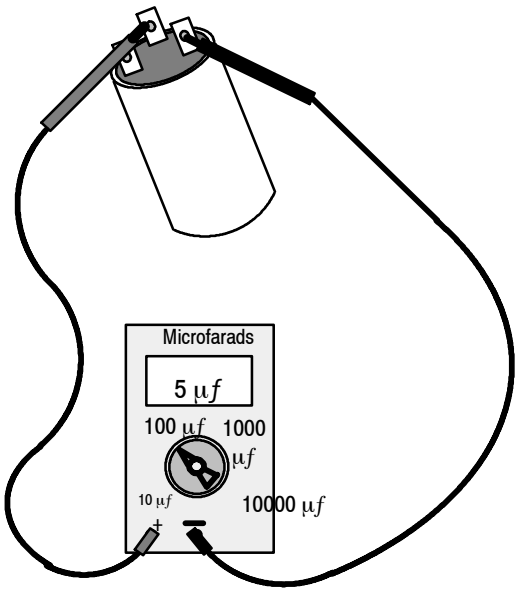
Flame Rectification is a process of converting Alternating Current (A.C.) into Direct Current (D.C.) During the ignition sequence, an alternating current (A.C.) Voltage is applied to the Flame probe.

When the burner lights the flame conducts an electrical current between the flame probe and the burner ground. Due to the difference in size between the flame probe 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. Flame Sensor kit is available from outside vendors.

27. CAPACITORS

Figure 31 **Checking Capacitor**



Capacitors are used for both the circulating (conditioned air) blower motor and the exhaust (combustion) blower. Before replacing one of these motors (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 (through a resistor) before testing. A 20,000 Ohm 2 Watt resistor can be used for this purpose.

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.

28. 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.

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. is to prevent wide swings in room temperature during furnace 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:

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

EXAMPLE: using a 75 Mbtu furnace of this series 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.

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

Checking the blower performance data for this model, (see Figure 36) 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.

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 Figure 36) for this model 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 7 — Blower Performance Data 75,0000 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

CHANGING BLOWER SPEED

The procedure for changing blower speeds (if needed) is shoun in **Table 8.**

⚠ WARNING

Electrical shock hazard.

Turn OFF power to furnace before changing speed taps.

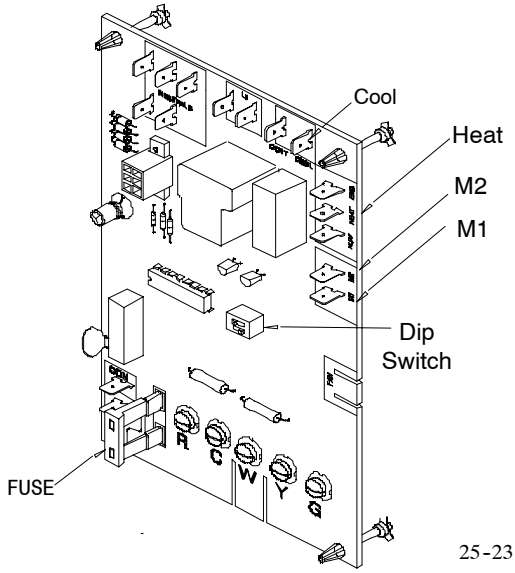
Failure to do so can result in death and/or personal injury.

Table 8 — 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.

Figure 32 **Honeywell ST9160B**



HONEYWELL ST9160B

HEATING SPEED

Should it be necessary to change blower speeds to obtain proper temperature rise, simply take the appropriate speed tap wire, and plug it on to the terminal marked “HEAT”.

COOLING SPEED

When the proper speed has been determined, simply plug it on to the terminal of the control marked “COOL”.

“UNUSED” TERMINALS

There are two (2) terminals (marked “UNUSED MOTOR LEADS” on the Honeywell ST9160B which has no internal connection to the control. Their purpose is to provide a place to connect. “UNUSED” speed tap wires to keep them out of the way and prevent them from shorting out against the furnace casing, or each other.

29. BLOWER ROTATION

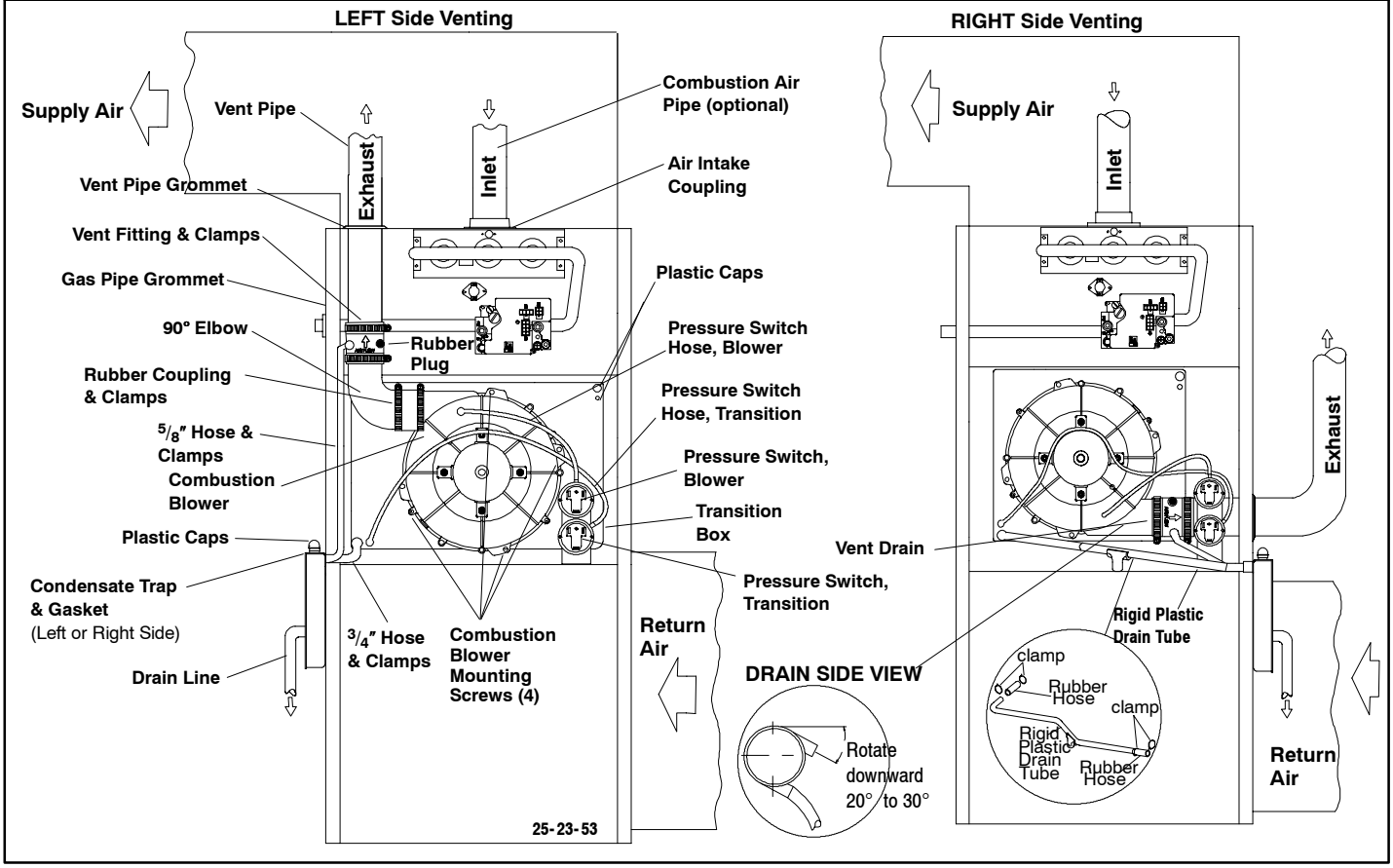
- The startup of a furnace will involve a cycle or two of the furnace to properly prime the condensate trap with water. Until the trap is fully primed, some condensate will be pulled into the combustion blower. The furnace may cycle on the pressure switch connected to the plastic transition box due to condensate buildup. After the trap is primed, the condensate will start draining from the furnace. The combustion blower will clear out any remaining condensate in the blower housing through the vent fitting downstream of the blower. Note that the condensate trap can also be primed by pouring water into the vent drain side of the trap. Remove the small plastic cap and clamps from the unused drain stub on the vent drain side of the condensate trap. Connect a section of the $^{5}/_{8}$″ OD hose with a funnel to the drain stub and pour eight (8) ounces of water into the trap. Remove the hose and replace the plastic cap and clamp. This will prime both the vent and the transition sides of the trap.

- The startup of a furnace will have “milky or oily”. looking condensate coming from the furnace. This is residual drawing lube in the secondary heat exchanger that is being washed out by the condensate. The condensate will clear up as the furnace operates. Poisonous carbon monoxide gas hazard.

- The use of a vent tee at the outlet of the condensate trap is not required if the condensate drain line from the trap to the open drain is properly sloped ($^{1}/_{4}$″ per foot downward slope). Do not trap the drain line in any other location than at the condensate trap.

- The combustion blowers and blower gaskets are different on some of the furnace models. There are two part numbers of the combustion blower for the 2-stage furnace models. (See the *Tech. Manual* for the correct part number for the furnace.) Besides the part number difference, the 50M, 75M and 100M BTUH models use the shaded pole motor version with the $1^{7}/_{8}$″ diameter back plate with a raised lip. The blower gasket is approximately $2^{3}/_{4}$″ outside diameter and is positioned into the recessed opening in the transition. The 125M BTUH models use the PSC motor version with the 2″ diameter back plate with no lip. The blower gasket is approximately $3^{1}/_{4}$″ outside diameter and is positioned on the flat surface of the transition. A mismatch of blower backplated and/or gaskets can cause the furnace to cycle on the pressure switch or to not operate. This could be misread as a condensate drainage problem.

Figure 33 **Upflow Installations (Dual Certified *9MPD(A1) Models)**



Upflow Installations - (Dual Certified *9MPD) (See Figure 33)

Mount the condensate drain trap in a vertical position to either the left or right side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

Plug the right drain stub of the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

For left side venting, remove vent fitting assembly from combustion blower. Remove 90° elbow and rubber tubing from the vent fitting by loosening the clamp on the vent fitting. Securely attach vent fitting to combustion blower.

NOTE: The vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

This configuration allows left side venting from the furnace. If right side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

Plug the upper drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose with the 90° bend to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

For left side mounted condensate trap, connect the $^{3}/_{4}$″ OD rubber hose to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

For right side mounted condensate trap, the rigid plastic drain tube MUST be used. Cut two 2″ long sections from the $^{3}/_{4}$″ OD rubber hose. Connect the plastic drain tube to the drain stub on the bottom of the plastic transition box and to the stub on the condensate trap using the two hose sections and $^{3}/_{4}$″ clamps.

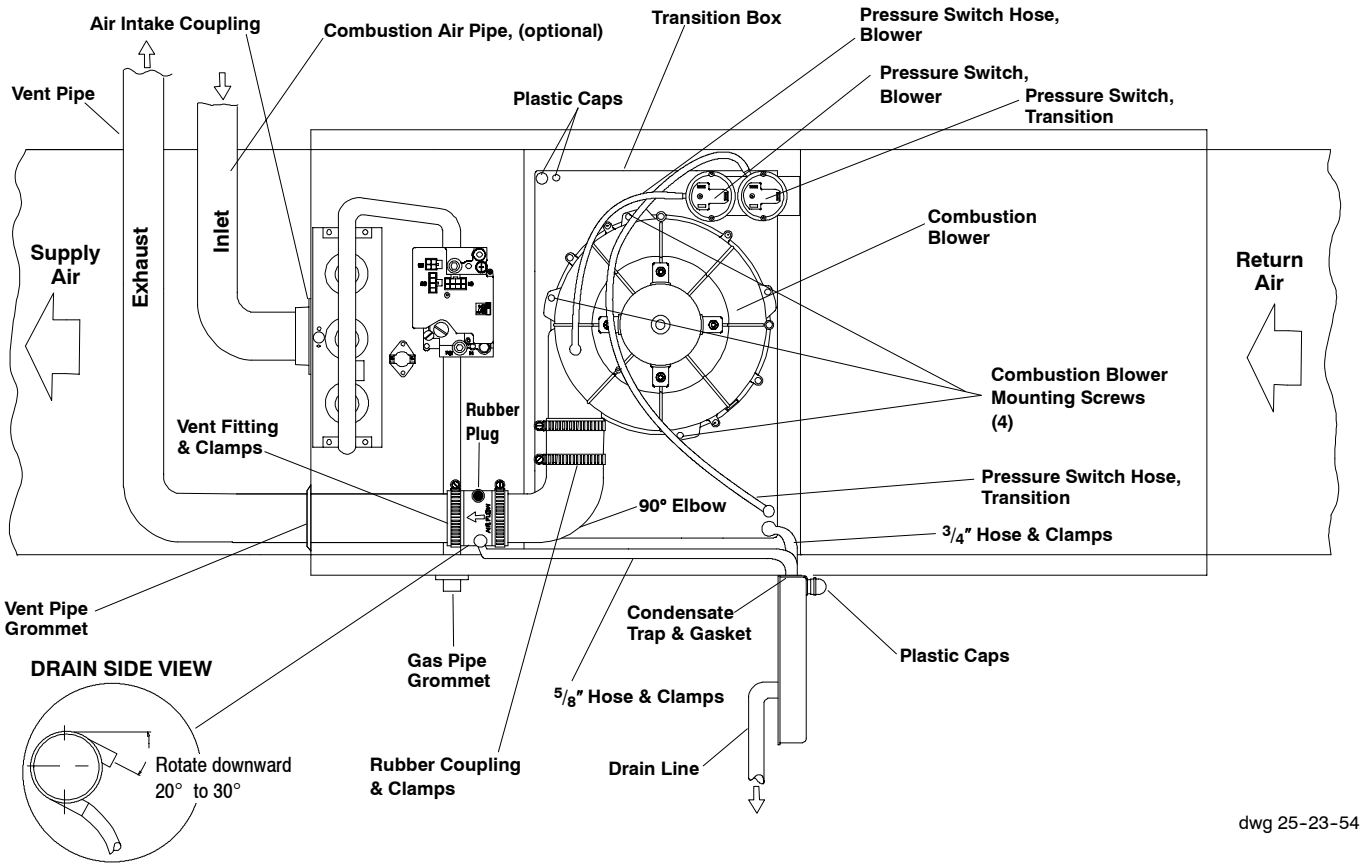
NOTE: The support leg on the plastic drain tube MUST be positioned on the blower partition.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the left drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the small drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 34 **Horizontal Left Installations (Dual Certified *9MPD(A1) Models)**



Horizontal Left Installations - (Dual Certified *9MPD) (See Figure 34)

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stub to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the left side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the left side. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Connect the vent fitting and the 90° elbow to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20 to 30° downward slope.

Plug the upper drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

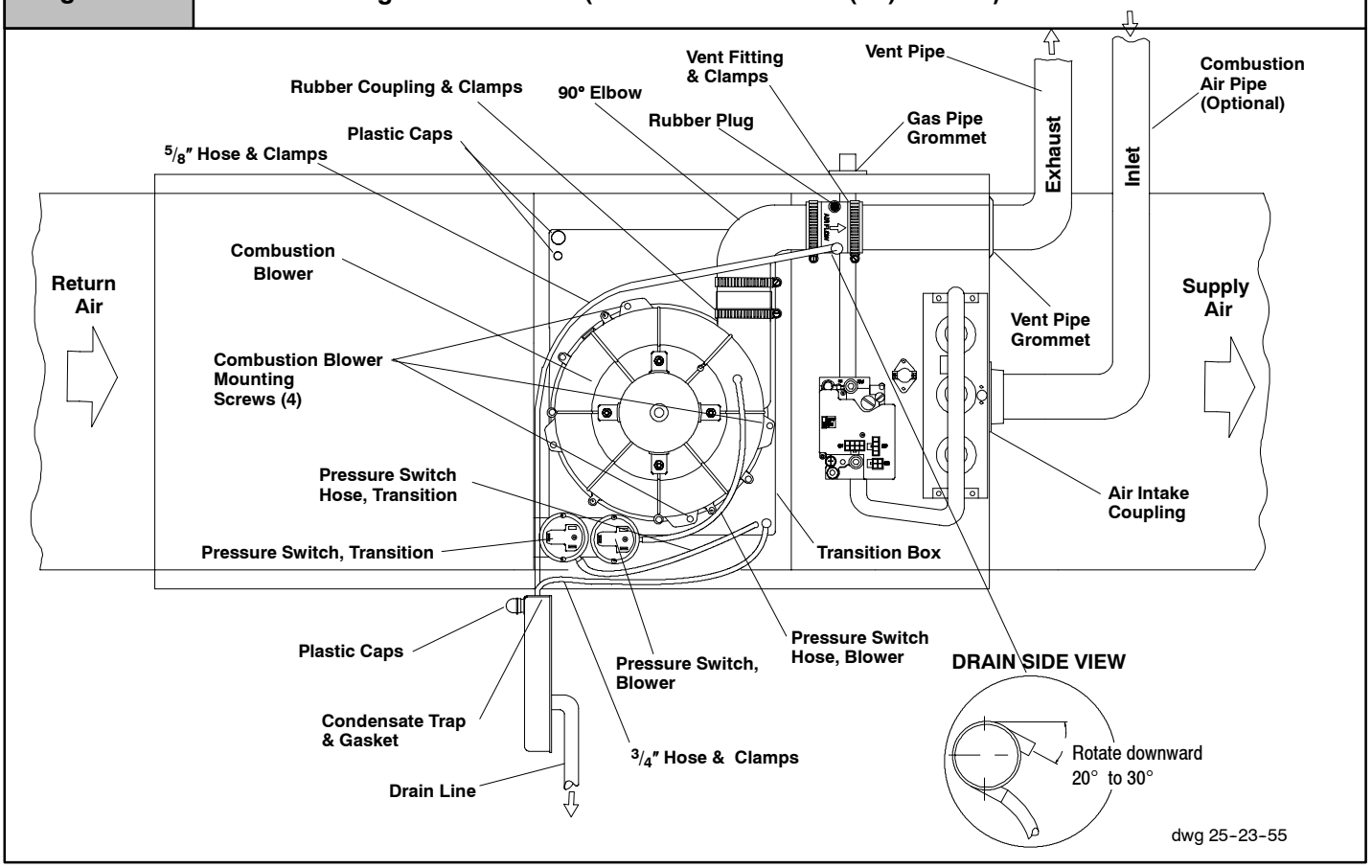
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the small drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the lower drain stub on the vent fitting. Cut off excess hose and discard. Connect the hose to the drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 35 **Horizontal Right Installations (Dual Certified *9MPD(A1) Models)**



Horizontal Right Installations - (Dual Certified *9MPD) (See Figure 35)

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stub to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the right side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the right side. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Connect the vent fitting and the 90° elbow to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the upper drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. NOTE: Failure to correctly install the pressure switch hose to the transition can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

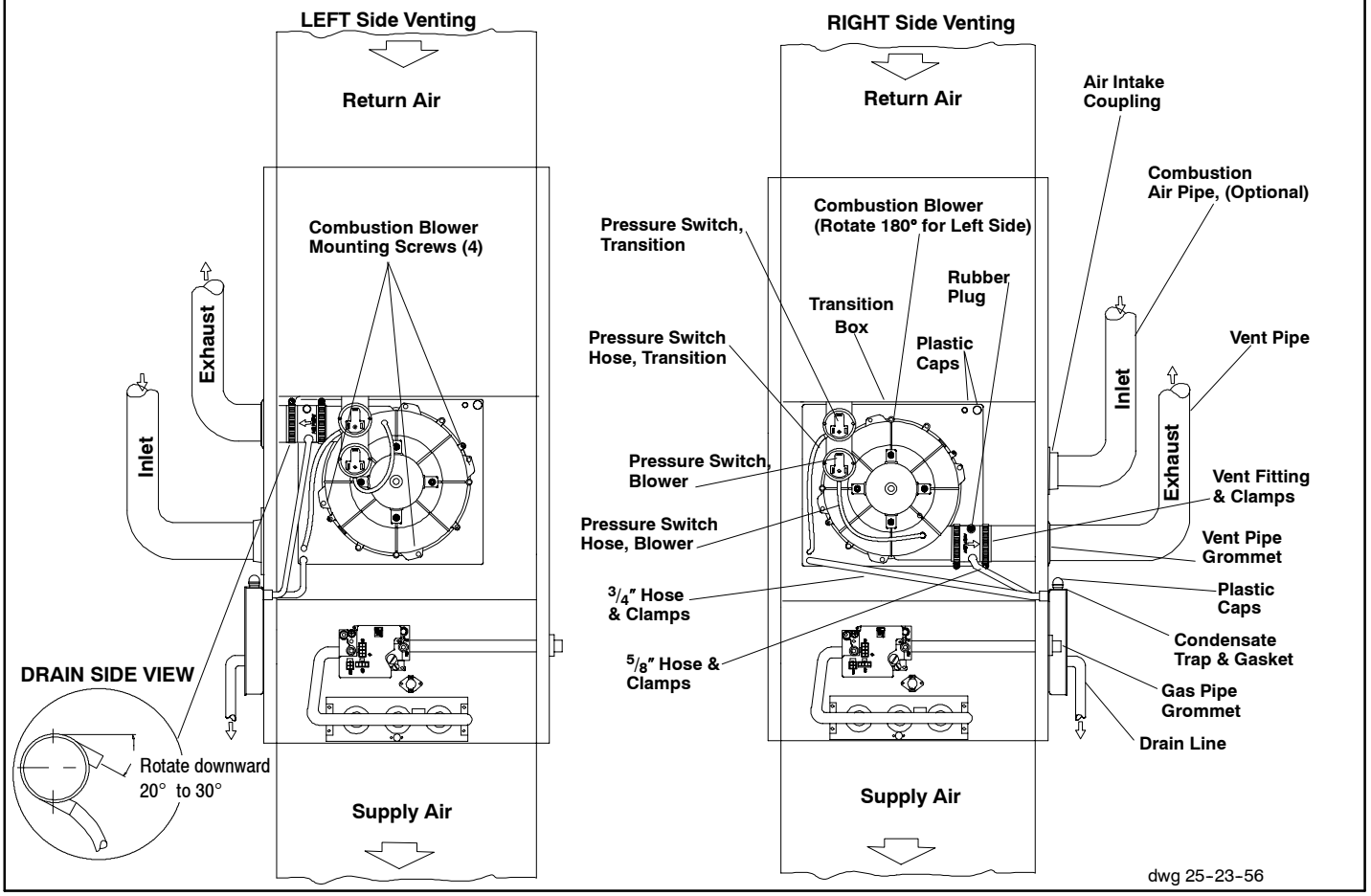
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 36 **Downflow Installations (Dual Certified *9MPD(A1) Models)**



Downflow Installations - (Dual Certified *9MPD Models) (See Figure 36)

Mount the condensate drain trap in a vertical position to either the right or left side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

This configuration allows right side venting from the furnace. If the left side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

For right side venting, remove vent fitting assembly from combustion blower. Remove 90° elbow and rubber tubing from the vent fitting by loosening the clamp on the vent fitting. Securely attach vent fitting to combustion blower.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the upper drain stub of the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. **NOTE:** Failure to correctly install the pressure switch hose to the transition box can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

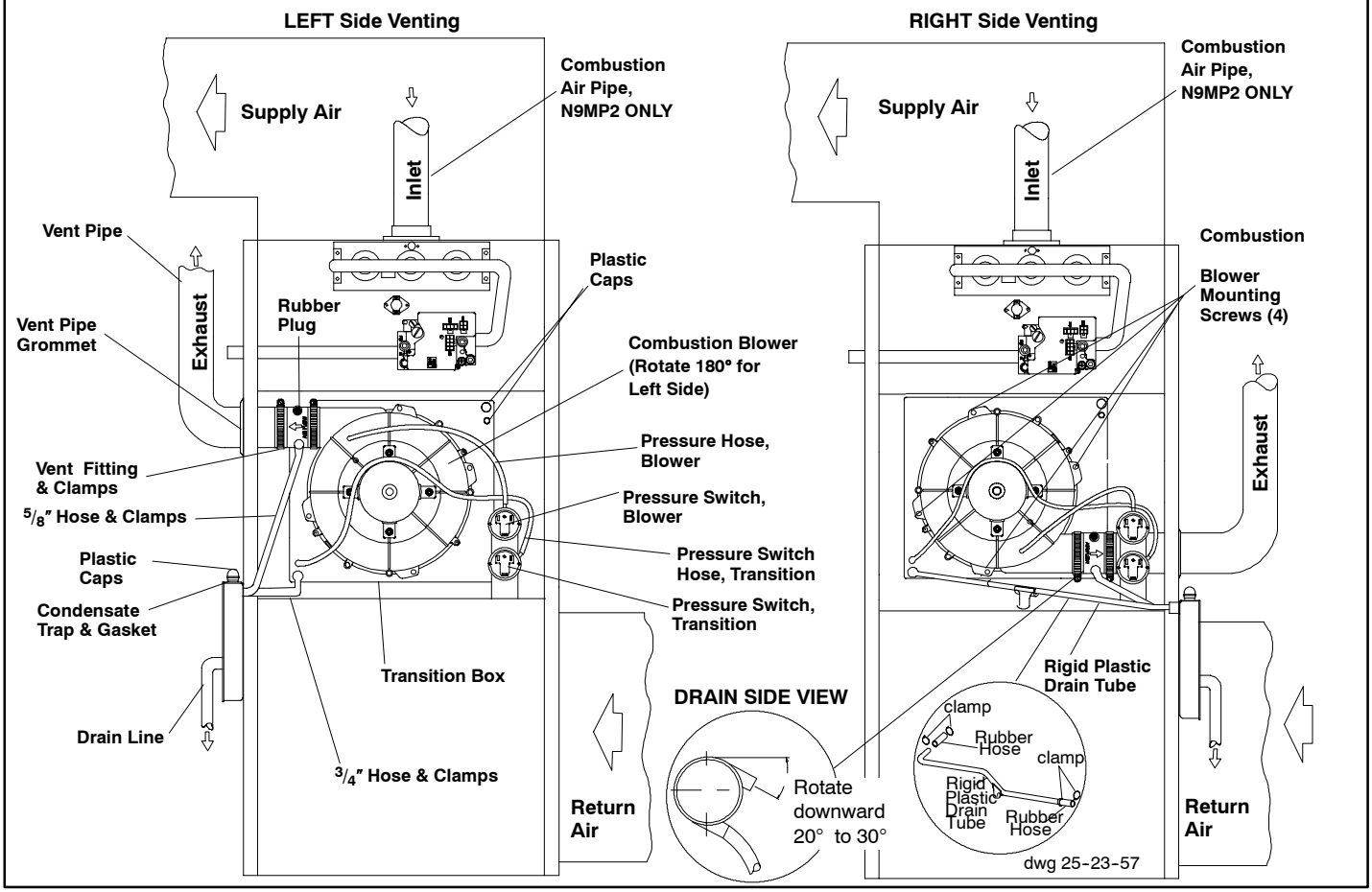
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the left drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 37 **Upflow Installations (Single Pipe & Direct Vent N9MP1 & N9MP2(A1) Models)**



Upflow Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 37)

Mount the condensate drain trap in a vertical position to either the left or right side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

This configuration allows left side venting from the furnace. If right side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

Plug the upper drain stub of the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

For left side mounted condensate trap, connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

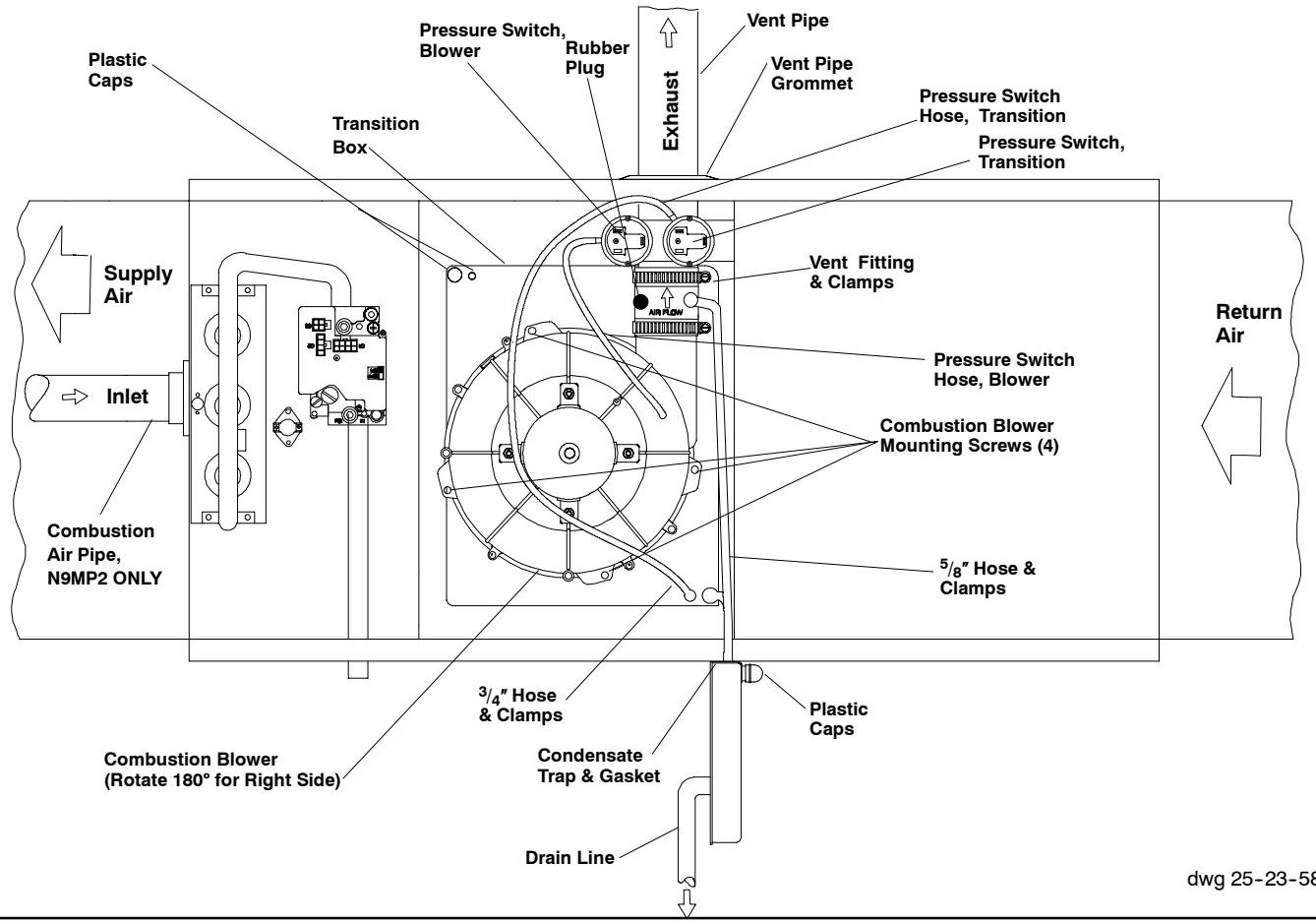
For right side mounted condensate trap, the rigid plastic drain tube MUST be used. Cut two 2″ long sections from the $^{3}/_{4}$″ OD rubber hose. Connect the plastic drain tube to the drain stub on the bottom of the plastic transition box and to the stub on the condensate trap using the two hose sections and $^{3}/_{4}$″ clamps.
NOTE: The support leg on the plastic drain tube MUST be positioned on the blower partition.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 38 **Horizontal Left Installations (Single Pipe & Direct Vent N9MP1 & N9MP2(A1) Models)**



Horizontal Left Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 38)

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stubs to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the left side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the left side. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Relocate the combustion blower on the plastic transition box. Remove the four(4) screws that secure the blower to the transition box. Rotate the blower 180° so the blower snout is pointing up and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the left drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

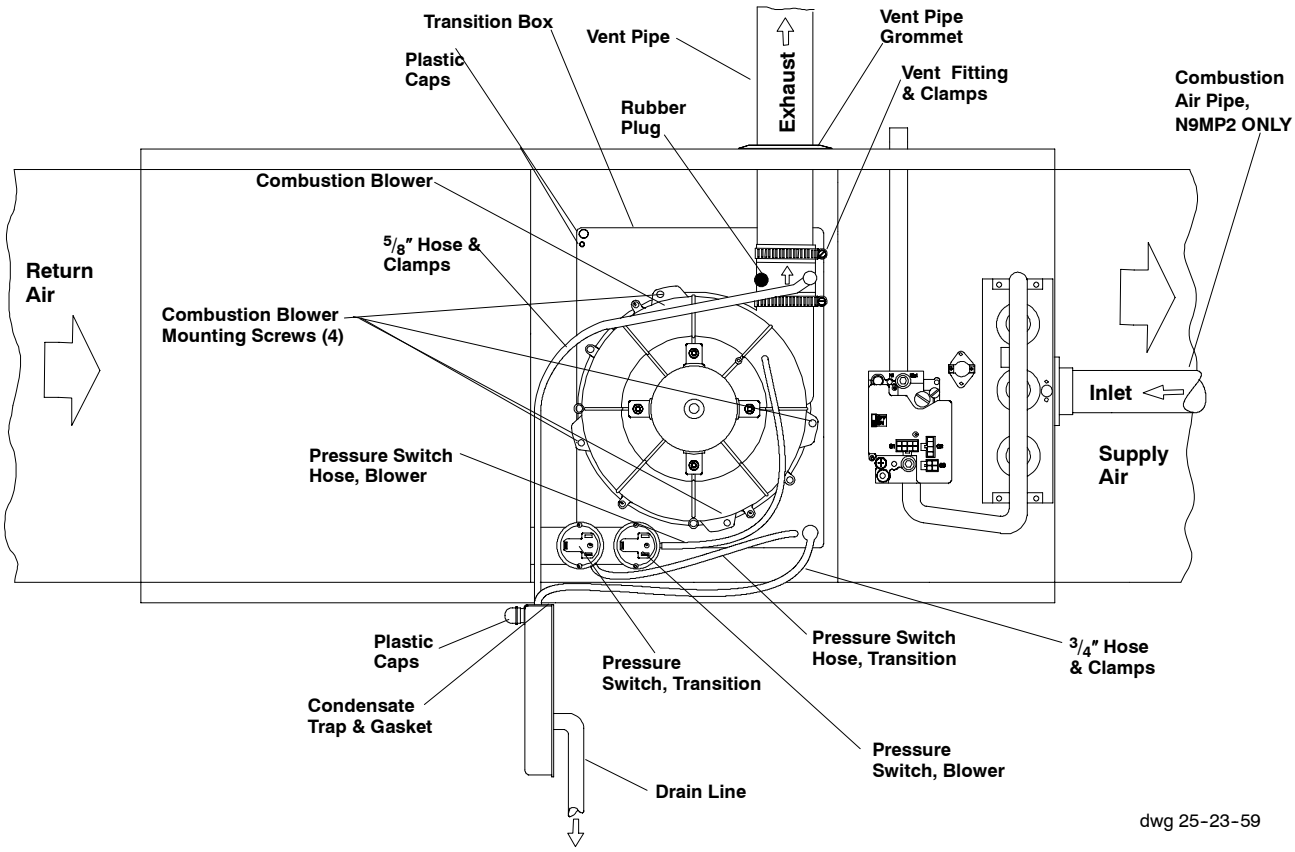
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the right drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 39 **Horizontal Right Installations (Single Pipe & Direct Vent N9MP1 & N9MP2(A1) Models)**



Horizontal Right Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 39)

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stub to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the right side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the right side. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe.

Plug the left drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. NOTE: Failure to correctly install the pressure switch hose to the transition can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

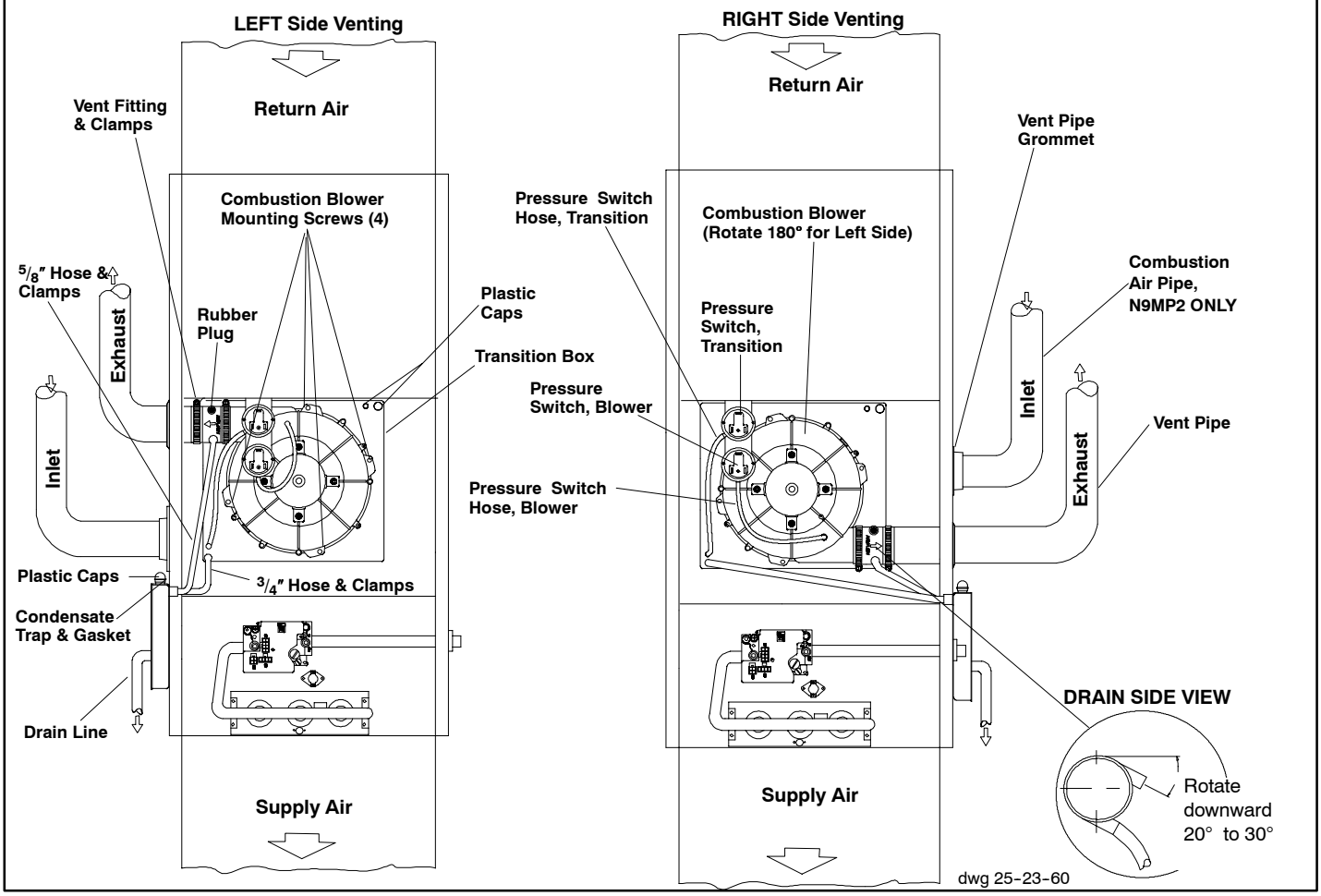
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the right stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 40 **Downflow Installations (Single Pipe & Direct Vent N9MP1 & N9MP2(A1) Models)**



Downflow Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 40)

Mount the condensate drain trap in a vertical position to either the right or left side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel. Drill two $^{7}/_{64}$″ diameter holes in the casing using the condensate trap as the template.

Ensure that the vent fitting and the 90° elbow is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

This configuration allows right side venting from the furnace. If the left side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower transition box. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

Plug the upper drain stub on the vent fitting with the rubber plug. Use a blunt pointed screwdriver to push the plug into the stub.

Remove the pressure switch hose from the upper stub on the plastic transition.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower drain stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box.
NOTE: Failure to correctly install the pressure switch hose to the transition can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

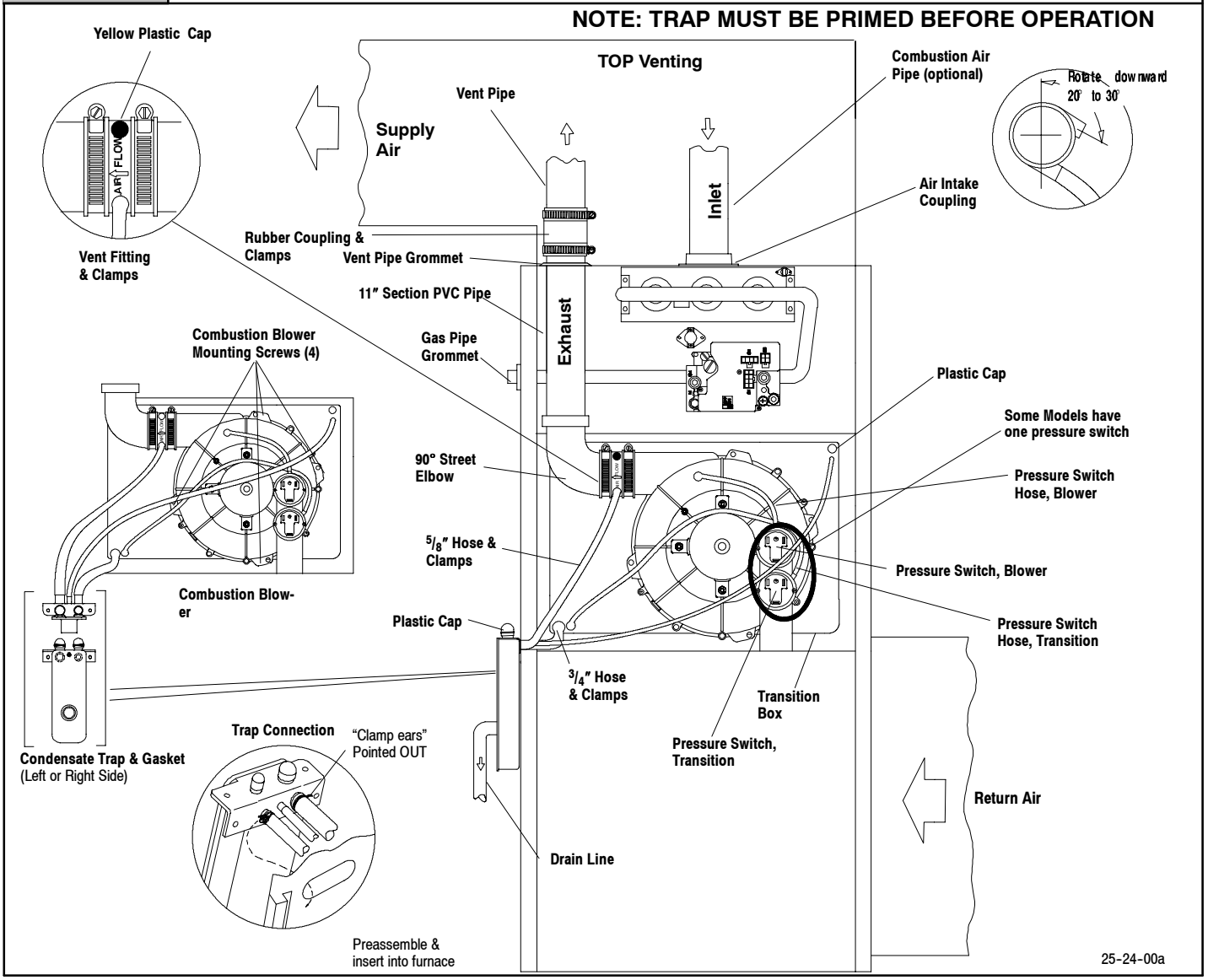
Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the lower stub on the vent fitting and secure with a $^{3}/_{4}$″ clamp.

Route the hose to the smaller stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 41 **Upflow Installations (Dual Certified *9MPD-A2 Models)**



Upflow Installations - (Dual Certified *9MPD)(See Figure 41)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 41).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Mount the condensate drain trap in a vertical position to either the left or right side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Ensure that the vent fitting and the 90° street elbow are securely attached to the combustion blower using the clamps.

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

Glue the 11″ section of PVC pipe to the 90° street elbow after checking the fit up. (Follow the procedures outlined in the *Joining Pipe and Fittings* section of this manual, page 30.) The PVC pipe will extend through the top panel about $1^1/_2$″. Connect the rubber coupling to the end of the 11″ section of PVC pipe using the clamp.
Note: There will be some misaligment of the PVC pipe inside the furnace. The rubber coupling will straighten out the misalignment at the vent pipe connection at the top of the furnace.

For left side venting, remove 90° street elbow from the vent fitting by loosening the clamp on the vent fitting. Securely attach vent fitting to combustion blower.

NOTE: For left side venting, the vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

This configuration allows left side venting from the furnace. If right side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

NOTE: For right side venting, the vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 5° to 10° downward slope. (See **Figure 41**)

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

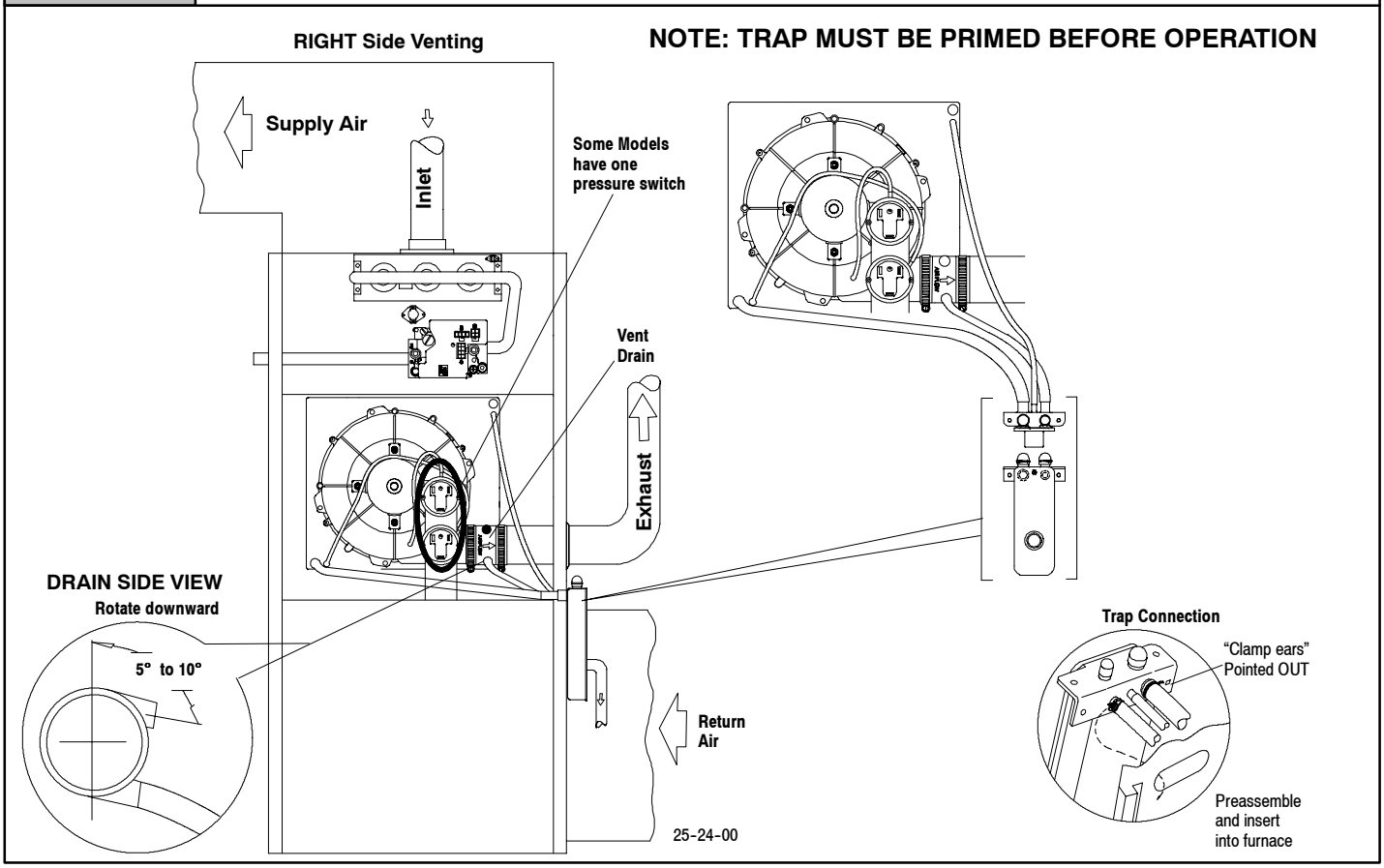
For left side mounted condensate trap, connect the $^3/_4$″ OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^3/_4$″ clamp.

Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^3/_4$″ clamp.

For right side mounted condensate trap, connect the $^3/_4$″ OD rubber hose with the 90° bend to the bottom of the plastic transition box and secure with a $^3/_4$″ clamp.

Route the hose to the large drain stub on the condensate pump. Cut off excess hose and discard. Connect the hose to the drain stub on the condensate trap and secure with a $^3/_4$″ clamp.

Figure 42 **Upflow Installations (Dual Certified *9MPD-A2 Models)**



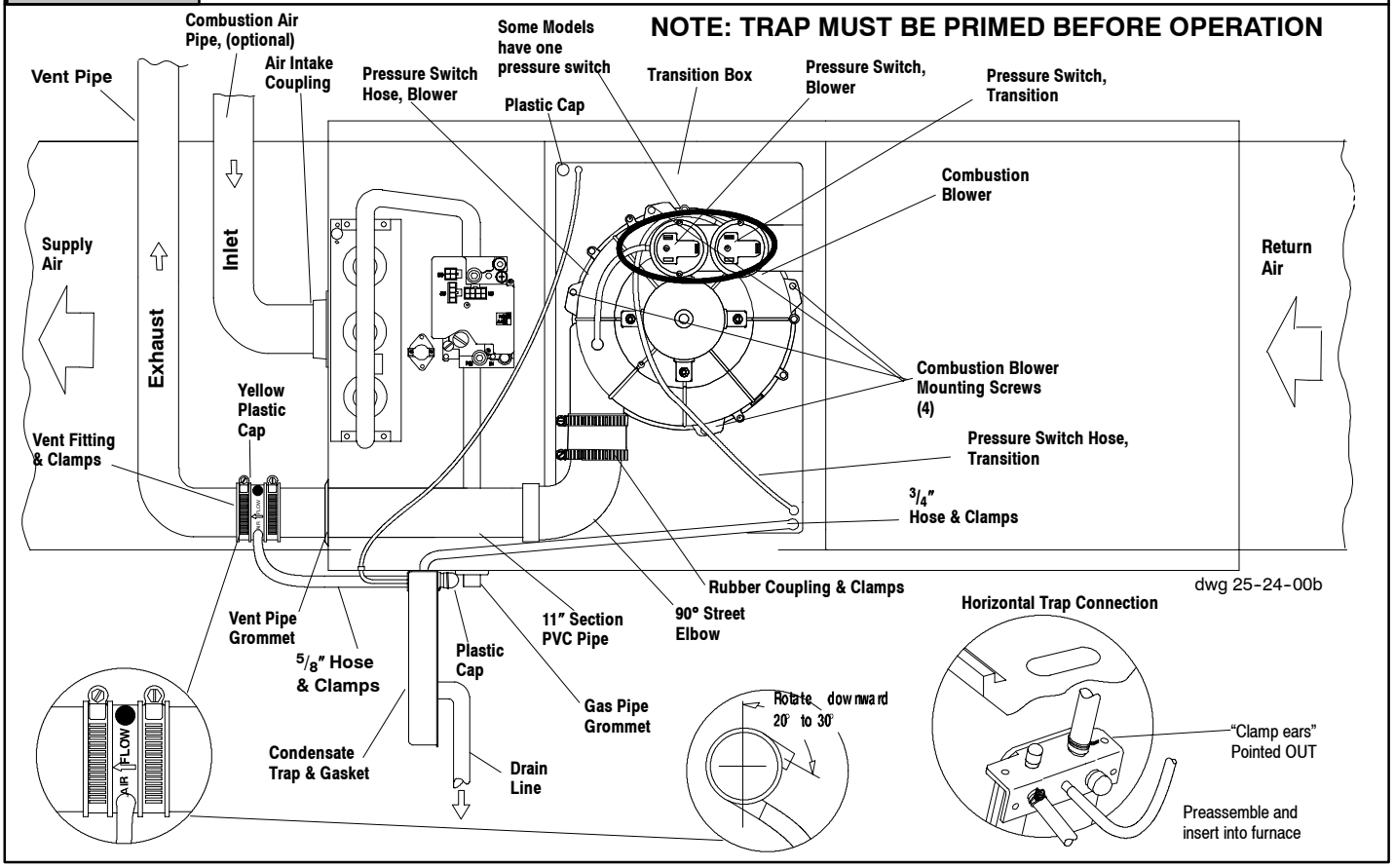
For left or right side mounted condensate trap, the pressure tap on the condensate trap MUST be connected to the unused pressure tap located on the upper right hand corner of the plastic transition box. Remove the plastic caps from the pressure taps on the condensate trap and the plastic transition and connect with the $^5/_{16}$″ OD rubber hose. (See **Figure 41** and **Figure 42**)

Connect the $^5/_8$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^5/_8$″ clamp.

Route the hose to the small drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^5/_8$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 43 **Horizontal Left Installations (Dual Certified *9MPD-A2 Models)**



Horizontal Left Installations - (Dual Certified *9MPD) (See Figure 43)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 43).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Relocate the plastic cap and clamp on the condensate drain trap from the vertical transition drain stub to the horizontal transition drain stub. Secure the clamps tightly to prevent condensate leakage. Do not change the cap and clamp on the vent drain stub.

Mount the condensate drain trap in a vertical position to the left side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the left side. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Remove the 90° street elbow and vent fitting from the combustion blower by loosening the clamps on the vent fitting. Connect the 90° street elbow to the combustion blower using the rubber coupling and clamps. Glue the 11″ section of PVC pipe to the 90° street elbow after checking the fit up. (Follow the procedures outlined in the *Joining Pipe and Fittings* section of this manual, page 30.) The PVC pipe will extend through the top panel about $1^{1}/_{2}$″. Connect the vent fitting to the end of the 11″ section of PVC pipe using the clamp.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20 to 30° downward slope.

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the horizontal drain stub on the condensate trap. Cut off excess hoses and discard. Connect the hose to the drain stub on the condensate trap and secure with a $^{5}/_{8}$″ clamp.

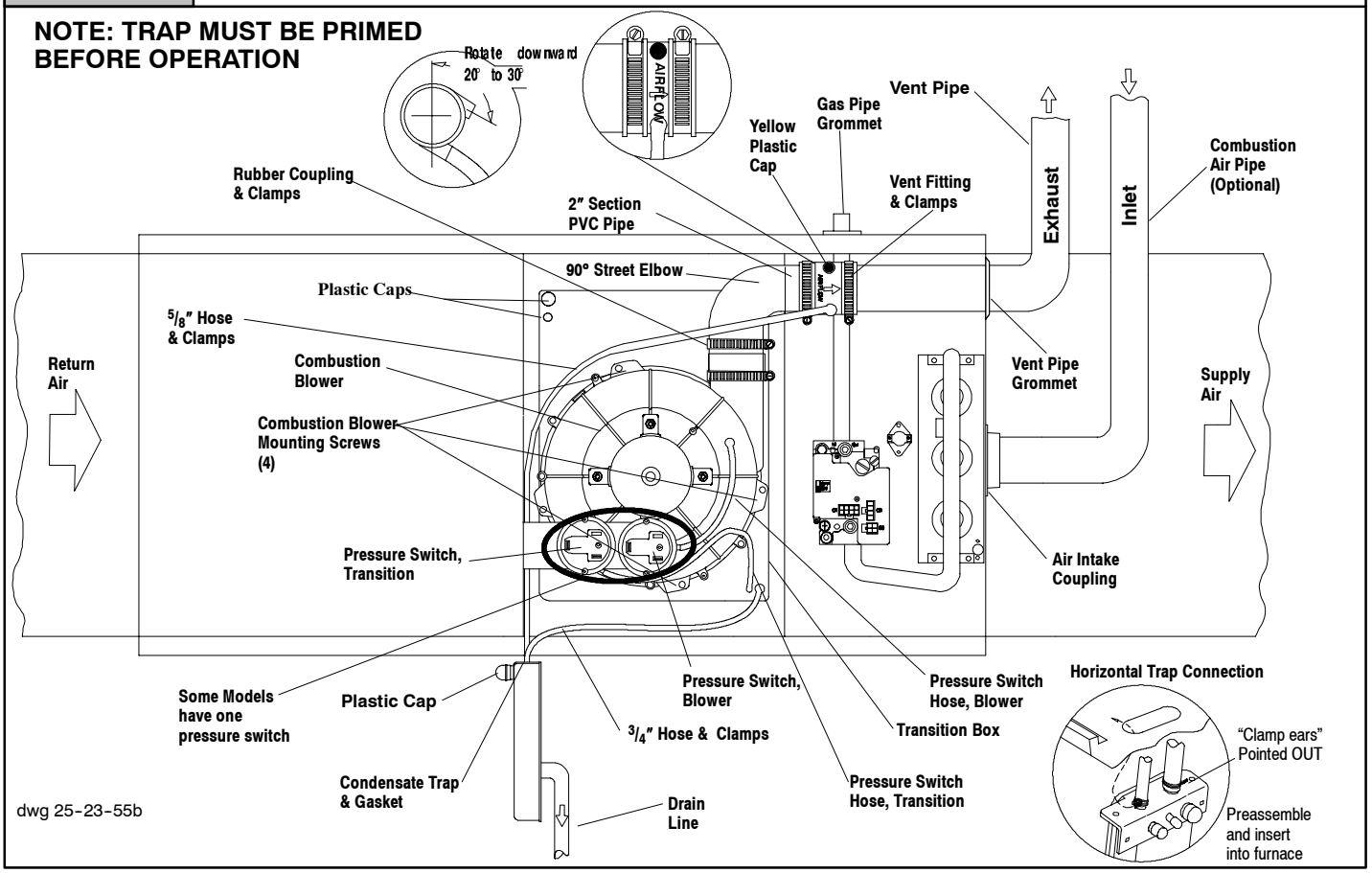
Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^{3}/_{4}$″ clamp.

Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^{3}/_{4}$″ clamp.

The pressure tap on the condensate trap MUST be connected to the unused pressure tap located on the top of the plastic transition box. Remove the plastic caps from the pressure taps on the condensate trap and the plastic transition and connect with the $^{5}/_{16}$″ OD rubber hose.
NOTE: This will require drilling a $^{5}/_{16}$″ OD hole in the furnace casing next to the condensate trap.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 44 **Horizontal Right Installations (Dual Certified *9MPD-A2 Models)**



Horizontal Right Installations - (Dual Certified *9MPD) (See Figure 44)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 44).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stub to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the right side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the right side. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Remove the 90° street elbow and vent fitting from the combustion blower by loosening the clamps on the vent fitting. Connect the 90° street elbow to the combustion blower using the rubber coupling and clamps. Cut a 2″ section of PVC pipe from the PVC pipe provided with the furnace. Glue the 2″ section of PVC pipe to the 90° street elbow after checking the fit up. (Follow the procedures outlined in the *Joining Pipe and Fittings* section of this manual, page 30.) Connect the vent fitting to the end of the 2″ section of PVC pipe using the clamp.

NOTE: The vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. Ensure that the hose is routed above the stub on the transition box so that condensate does not collect in the hose. NOTE: Failure to correctly install the pressure switch hose to the transition can adversely affect the safety control operation.

Connect the $^3/_4$″ OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^3/_4$″ clamp.

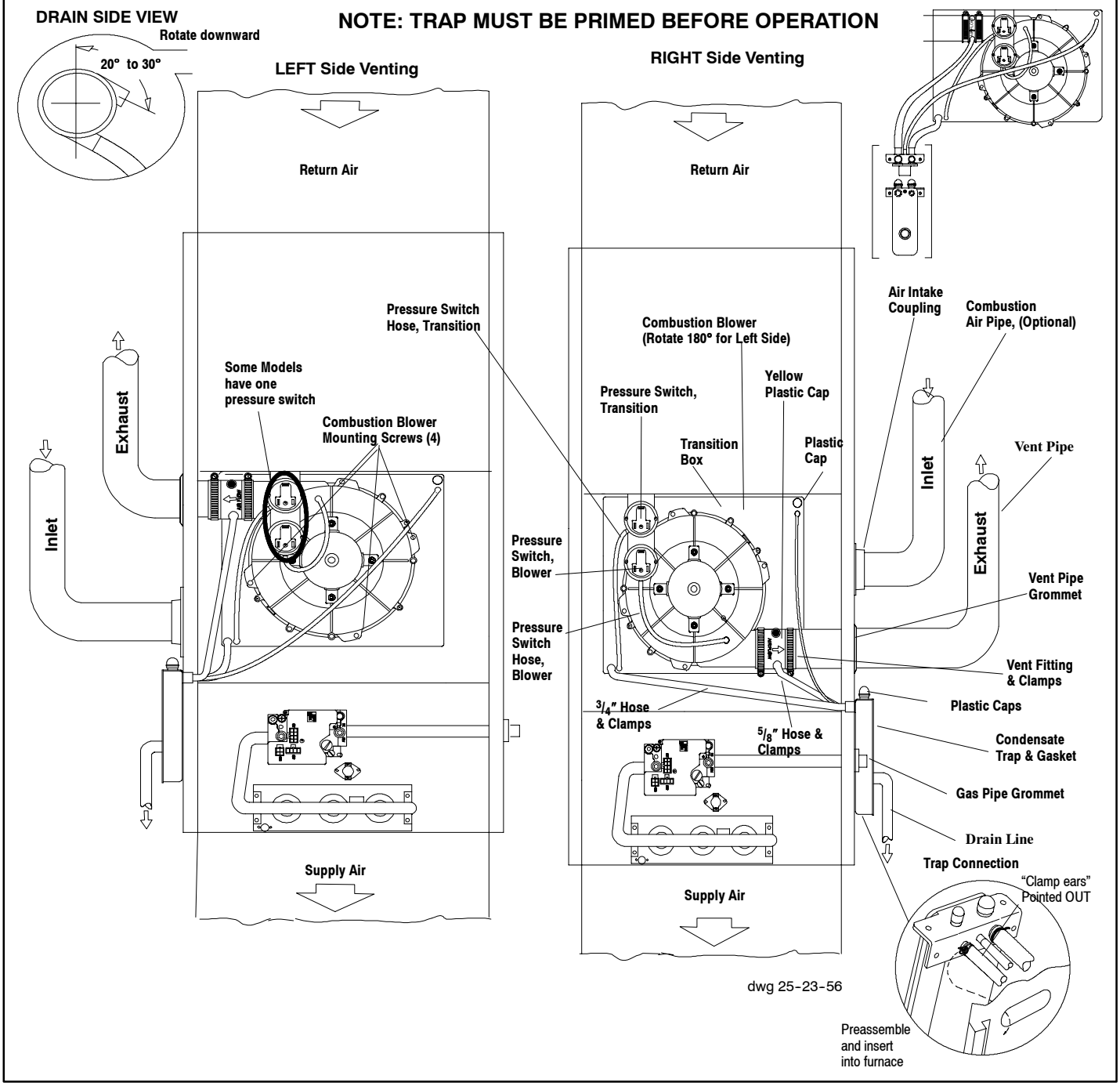
Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^3/_4$″ clamp.

Connect the $^5/_8$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^5/_8$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^5/_8$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 45 **Downflow Installations (Dual Certified *9MPD-A2 Models)**



Downflow Installations - (Dual Certified *9MPD Models) (See Figure 45)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 45).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Mount the condensate drain trap in a vertical position to either the right or left side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace

side panel and relocated to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

For both right and left side vent, remove the 90° street elbow from the vent fitting by loosening the clamp on the vent fitting.

Ensure that the vent fitting is securely attached to the combustion blower using the rubber coupling and clamps.

This configuration allows right side venting from the furnace. If the left side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. **NOTE:** Failure to correctly install the pressure switch hose to the transition box can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^{3}/_{4}$″ clamp.

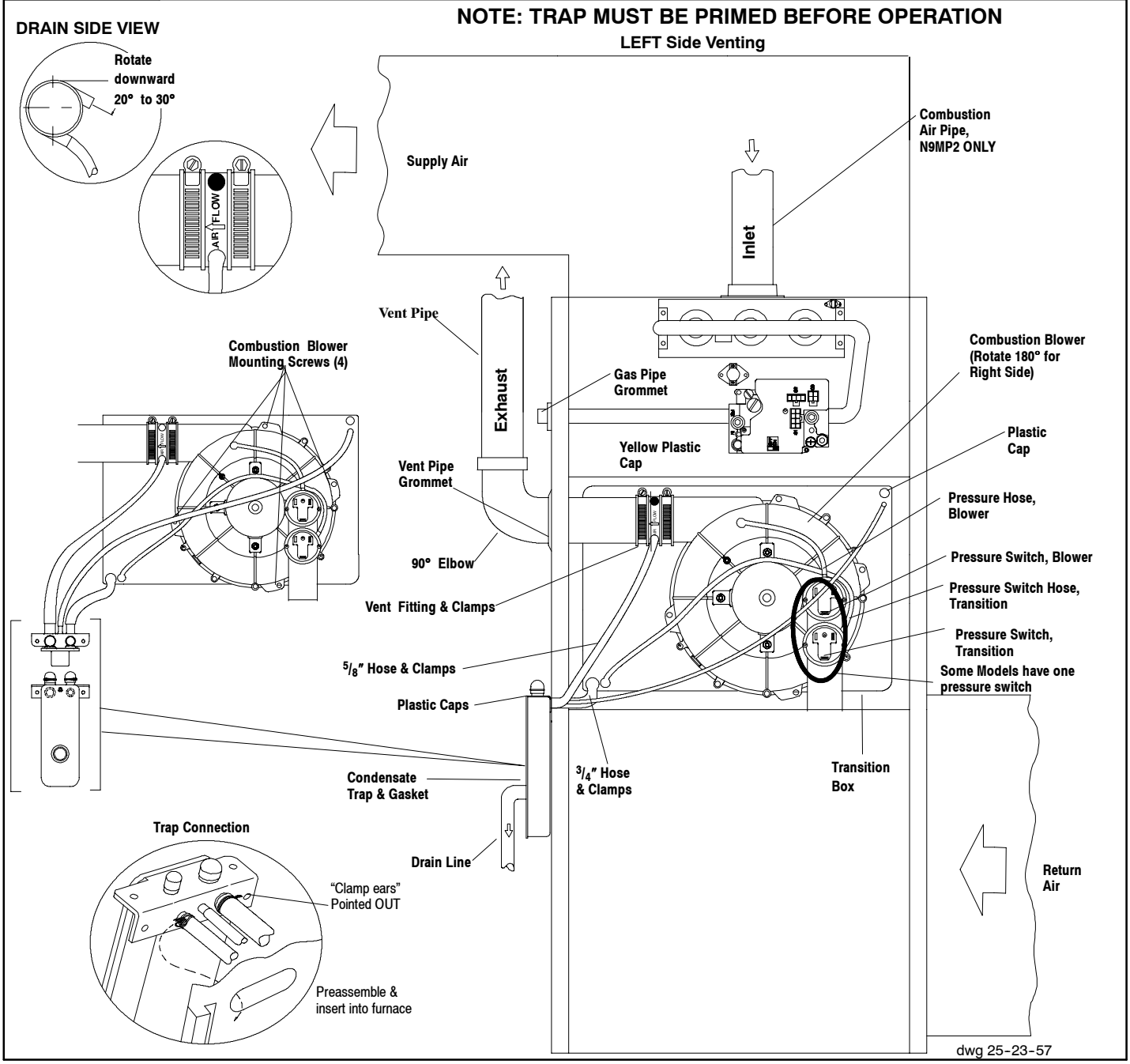
Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

Route the hose to the smaller stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

For left side or right side mounted condensate trap, the pressure tap on the condensate trap MUST be connected to the unused pressure tap located on the top of the plastic transition box. Remove the plastic caps from the pressure tap on the condensate trap and the plastic transition and connect the $^{5}/_{16}$″ OD rubber hose. (See **Figure 45**)

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 46 **Upflow Installations (Single Pipe & Direct Vent N9MP1 & N9MP2-A2 Models)**



Upflow Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 46)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 46).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Mount the condensate drain trap in a vertical position to either the left or right side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel.

NOTE: All gaskets and seals must be in place for sealed combustion applications.

Ensure that the vent fitting is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: For left side venting, the vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

This configuration allows left side venting from the furnace. If right side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

NOTE: For right side venting, the vent fitting MUST be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 5° to 10° downward slope. (See **Figure 46)**

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

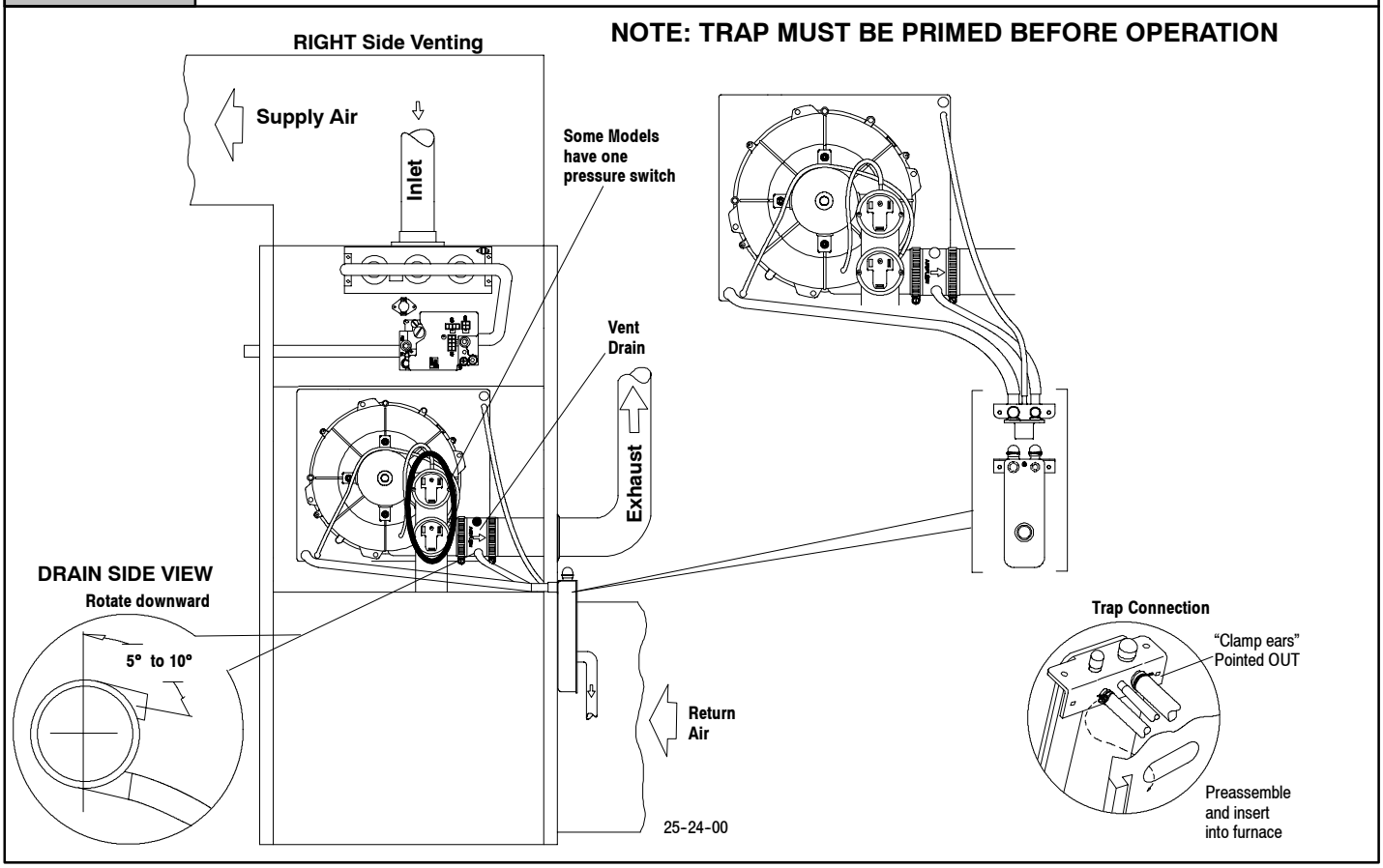
For left side mounted condensate trap, connect the $^3/_4$″ OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^3/_4$″ clamp.

Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^3/_4$″ clamp.

For right side mounted condensate trap, connect the $^3/_4$″ OD rubber hose with the 90° bend to the bottom of the plastic transition box and secure with a $^3/_4$″ clamp.

Route the hose to the large drain stub on the condensate pump. Cut off excess hose and discard. Connect the hose to the drain stub on the condensate trap and secure with a $^3/_4$″ clamp.

Figure 47 **Upflow Installations (Single Pipe & Direct Vent N9MP1 & N9MP2-A2 Models)**



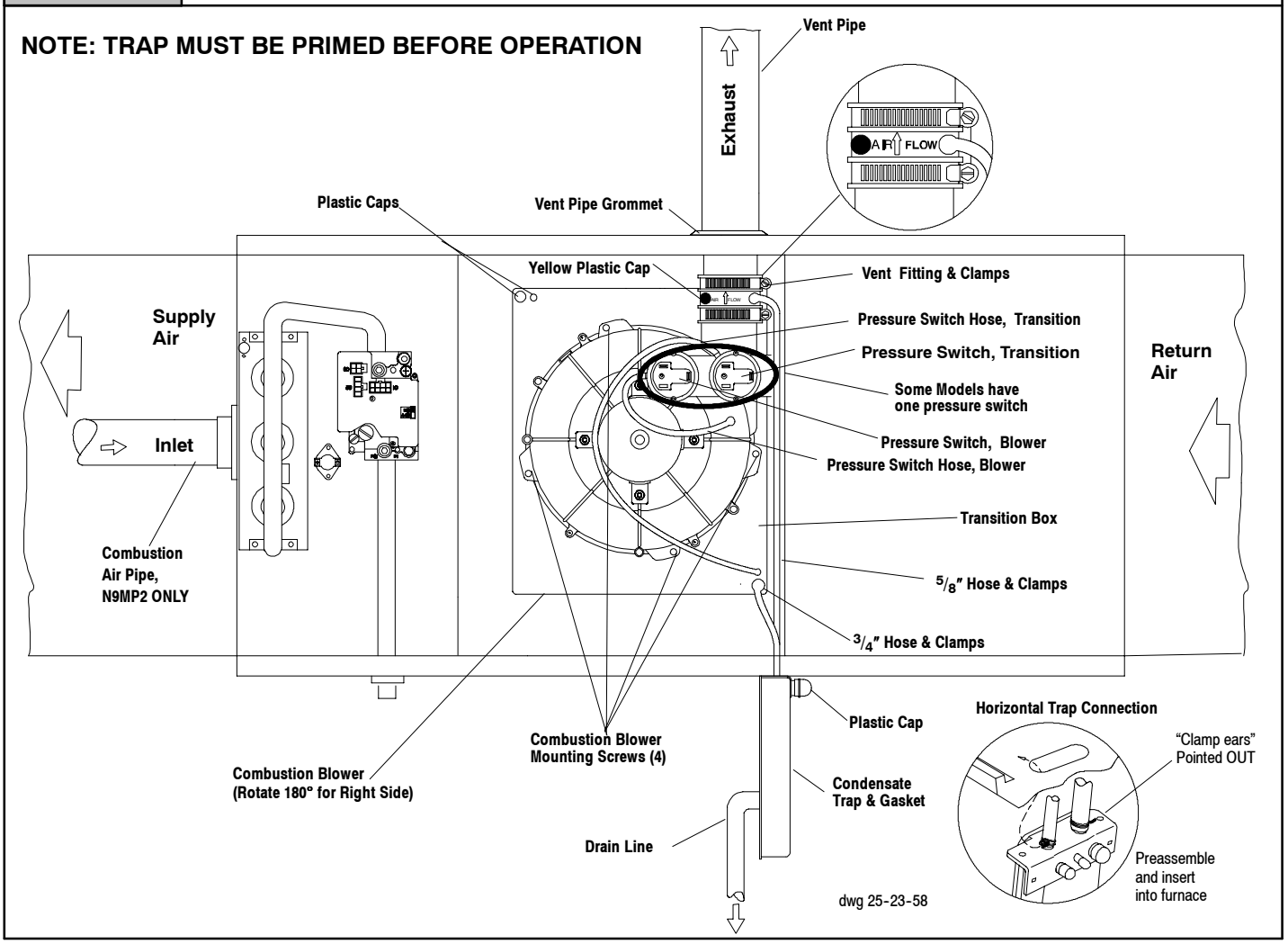
For left side or right side mounted condensate trap, the pressure tap on the condensate trap MUST be connected to the unused pressure tap located on the upper right hand corner of the plastic transition box. Remove the plastic caps from the pressure taps on the condensate trap and the plastic transition and connect with the $^5/_{16}$″ OD rubber hose. (See **Figure 46** and **Figure 47**)

Connect the $^5/_8$″ OD rubber hose with the 90° bend to the lower drain stub on the vent fitting and secure with a $^5/_8$″ clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^5/_8$″ clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 48 **Horizontal Left Installations (Single Pipe & Direct Vent N9MP1 & N9MP2-A2 Models)**



Horizontal Left Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 48)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 48).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stubs to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the left side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the left side. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Relocate the combustion blower on the plastic transition box. Remove the four(4) screws that secure the blower to the transition box. Rotate the blower 180° so the blower snout is pointing up and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

Ensure that the vent fitting is securely attached to the combustion blower using the rubber coupling and clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe.

Plug the left drain stub on the vent fitting with the yellow plastic cap.

Connect the $^{3}/_{4}$" OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^{3}/_{4}$" clamp.

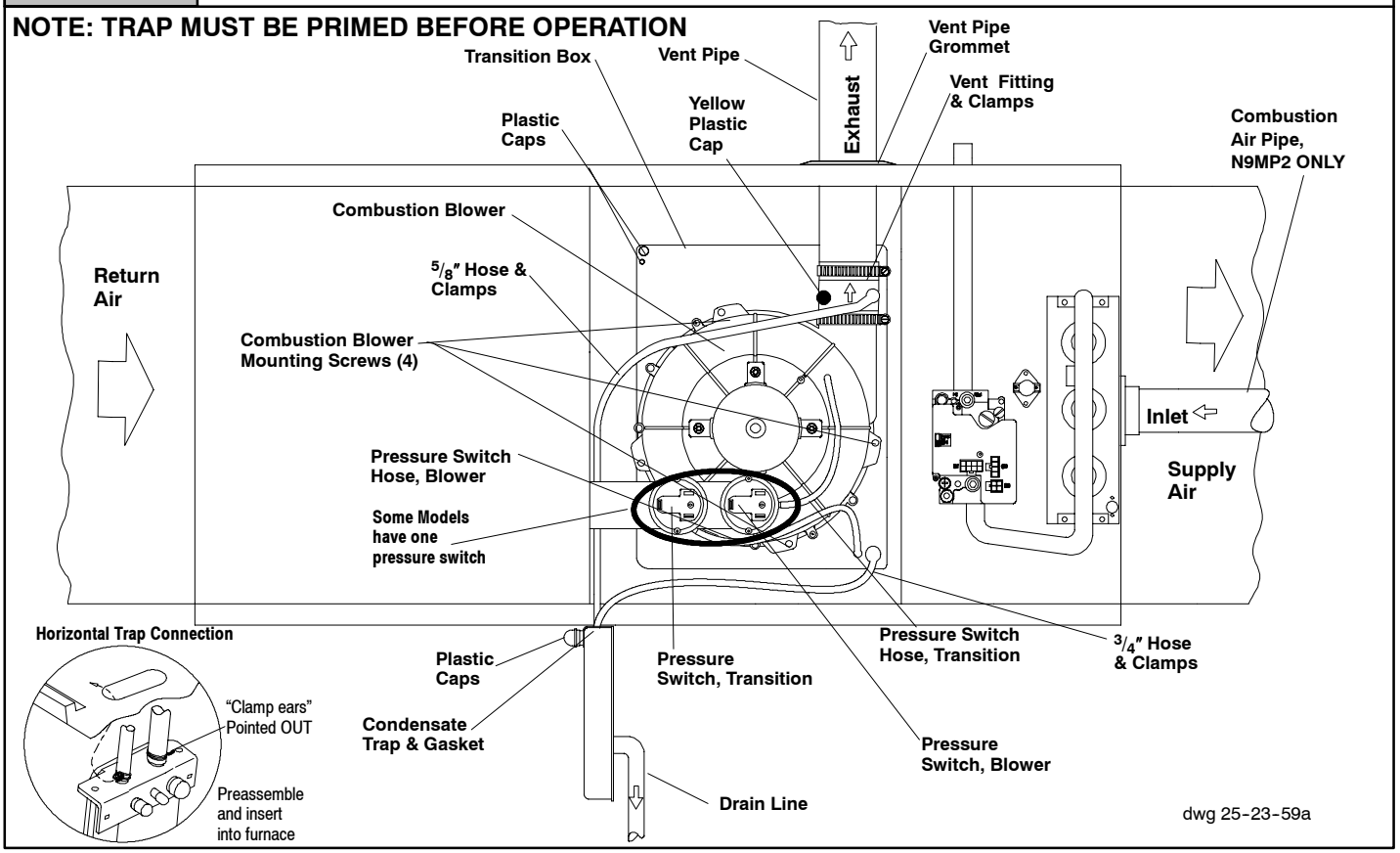
Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^{3}/_{4}$" clamp.

Connect the $^{5}/_{8}$" OD rubber hose with the 90° bend to the right drain stub on the vent fitting and secure with a $^{5}/_{8}$" clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the vent fitting and secure with a $^{5}/_{8}$" clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 49 **Horizontal Right Installations (Single Pipe & Direct Vent N9MP1 & N9MP2-A2 Models)**



Horizontal Right Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 49)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 49).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Relocate the plastic caps and clamps on the condensate drain trap from the vertical drain stub to the horizontal drain stubs. Secure the clamps tightly to prevent condensate leakage.

Mount the condensate drain trap in a vertical position to the right side of the furnace using the two screws and gasket that are provided. Note: The condensate trap will be located under the furnace in a vertical position when the furnace is placed horizontally on the right side. If needed, remove the hole plugs from the furnace side panel and relocate to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Ensure that the vent fitting is securely attached to the combustion blower using the clamps.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe.

Plug the left drain stub on the vent fitting with the yellow plastic cap.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. Ensure that the hose is routed above the stub on the transition box so that condensate does not collect in the hose. NOTE: Failure to correctly install the pressure switch hose to the transition can adversely affect the safety control operation.

Connect the $^{3}/_{4}$" OD rubber hose with the 90° bend to the large drain stub on the condensate trap and secure with a $^{3}/_{4}$" clamp.

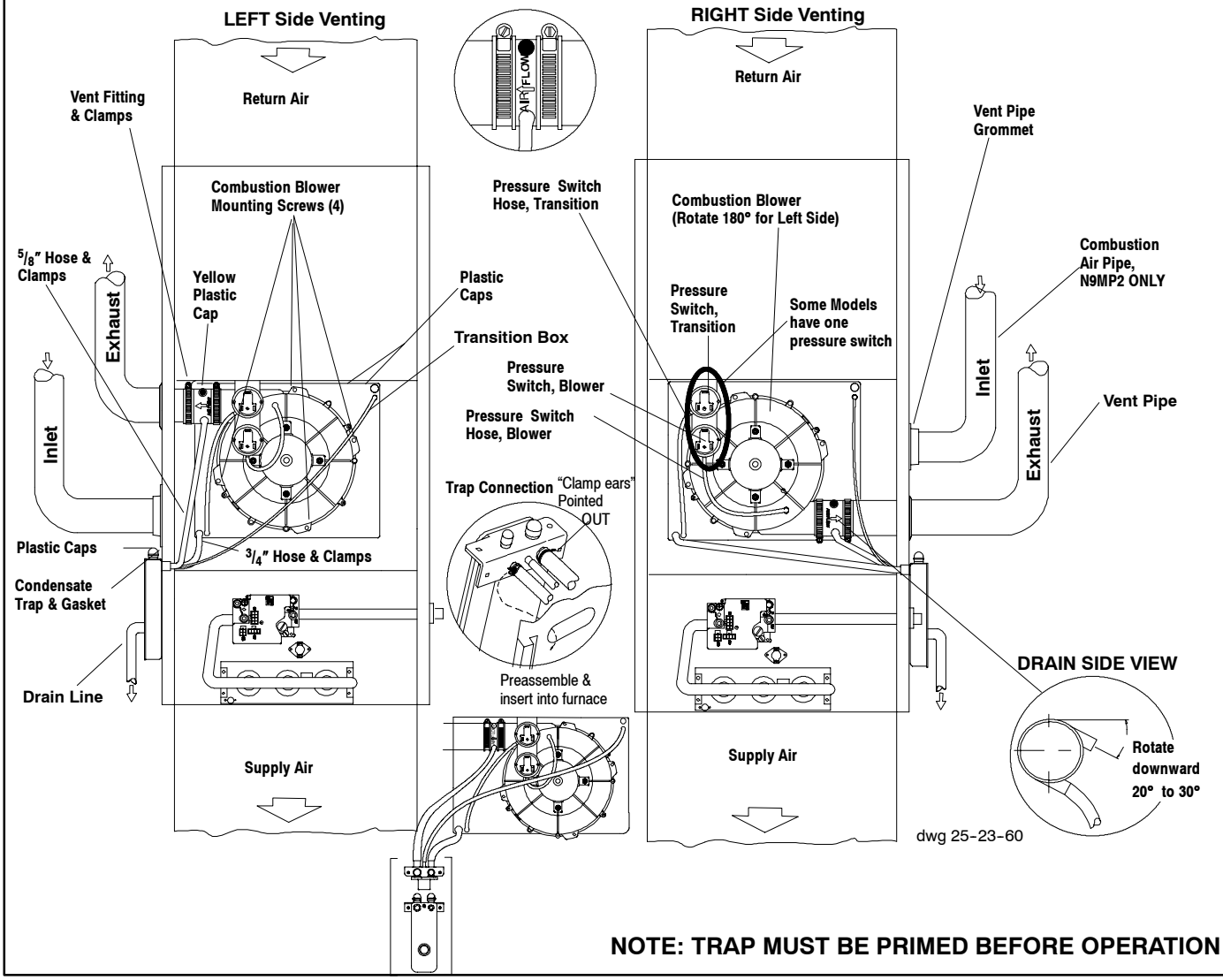
Route the hose to the drain stub on the bottom of the plastic transition box. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^{3}/_{4}$" clamp.

Connect the $^{5}/_{8}$" OD rubber hose with the 90° bend to the right stub on the vent fitting and secure with a $^{5}/_{8}$" clamp.

Route the hose to the smaller drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$" clamp.

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

Figure 50 **Downflow Installations (Single Pipe & Direct Vent N9MP1 & N9MP2-A2 Models)**



Downflow Installations - (Single Pipe & Direct Vent N9MP1 & N9MP2 Models) (See Figure 50)

Note: For easier installation of the drain hoses and clamps to the condensate trap, follow the directions outlined below except do not make any clamp connections to any of the drain stubs and hoses until the hose routing and lengths have been determined. Remove the condensate trap and drain hoses from the furnace and secure the drain hoses to the drain stubs on the trap with the hose clamps (position the clamps as shown in **Figure 50).** Install the condensate trap/hose assembly to the furnace casing. Hook one side of the "clamp ears" on the drain stub through the hole in the casing and push the condensate trap into position. Secure with the two screws. Reconnect the drain hoses to the stubs on the vent fitting and the plastic transition and secure with the clamps.

Mount the condensate drain trap in a vertical position to either the right or left side of the furnace using the two screws and gasket that are provided. If needed, remove the hole plugs from the furnace side panel and relocated to the open set of holes in the opposite side panel.
NOTE: All gaskets and seals must be in place for sealed combustion applications.

Ensure that the vent fitting is securely attached to the combustion blower using the rubber coupling and clamps.

This configuration allows right side venting from the furnace. If the left side venting is required, the combustion blower must be relocated on the plastic transition box. Remove the four(4) screws that secure the blower to the transition. Rotate the blower 180° and secure with the four(4) screws. Use caution to not over tighten the screws to prevent stripping out of the plastic mounting holes.

NOTE: The vent fitting **MUST** be installed with the airflow marking arrow pointed toward the vent pipe, with the drain stub at a 20° to 30° downward slope.

Plug the upper drain stub on the vent fitting with the yellow plastic cap.

Remove the pressure switch hose from the upper stub on the plastic transition box.

Relocate the plastic caps on the stubs of the plastic transition box from the lower stubs to the upper stubs and secure tightly with the clamps.

Route the pressure switch hose to the lower stub on the plastic transition box. Cut off excess hose and discard. Connect the pressure switch hose to the lower stub on the plastic transition box. **NOTE:** Failure to correctly install the pressure switch hose to the transition box can adversely affect the safety control operation.

Connect the $^{3}/_{4}$″ OD rubber hose with the 90° bend to the drain stub on the bottom of the plastic transition box and secure with a $^{3}/_{4}$″ clamp.

Route the hose to the large drain stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the transition and secure with a $^{3}/_{4}$″ clamp.

Connect the $^{5}/_{8}$″ OD rubber hose with the 90° bend to the left drain stub on the vent fitting and secure with a $^{5}/_{8}$″ clamp.

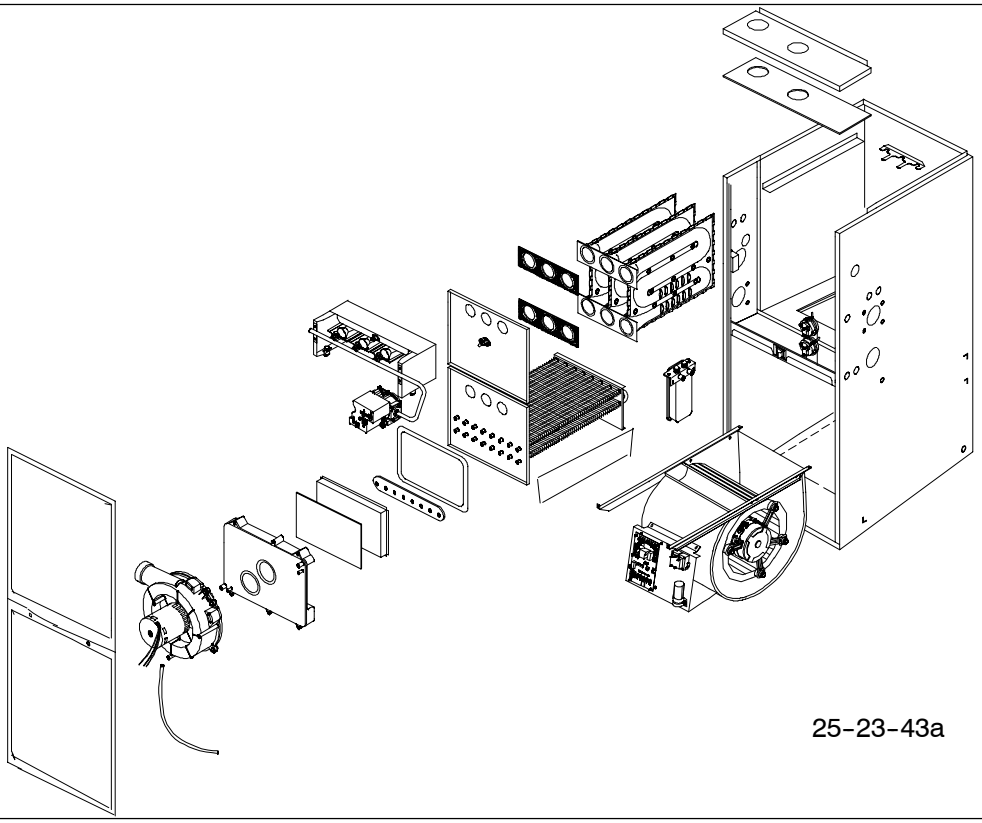
Route the hose to the smaller stub on the condensate trap. Cut off excess hose and discard. Connect the hose to the drain stub on the trap and secure with a $^{5}/_{8}$″ clamp.

For left side or right side mounted condensate trap, the pressure tap on the condensate trap MUST be connected to the unused pressure tap located on the top of the plastic transition box. Remove the plastic caps from the pressure tap on the condensate trap and the plastic transition and connect the $^{5}/_{16}$″ OD rubber hose. (See **Figure 50**)

NOTE: Ensure hoses maintain a downward slope to the condensate trap with no kinking or binding for proper condensate drainage.

30. HEAT EXCHANGER REMOVAL/REPLACEMENT

Figure 51 "Exploded" Parts View – Typical Four Position Furnaces



Secondary Heat Exchanger

1. Turn "OFF" electrical power and gas supply to furnace.
2. Disconnect vent pipe to furnace at flexible coupling.
3. Remove combustion blower.
4. Remove machine screws securing transition assembly to furnace front partition.
5. Remove the collector box.
6. Loosen the four(4) screws on the manifold or as an alternative the four(4) screws on the manifold bracket.
7. Move the manifold bracket and valve up enough so the secondary heat exchanger will clear the flange on the baffle.
8. Remove machine screws securing secondary heat exchanger inlet flange to lower partition.
9. Remove screws around perimeter of lower partition.
10. Removed screws securing secondary heat exchanger to the supports.
11. Coil can now be removed from furnace.
12. Reverse procedure to reinstall, making sure that any gaskets that have been torn during disassembly are replaced with new ones.

Primary Heat Exchanger

1. Turn "OFF" electrical power and gas supply to furnace.
2. Disconnect vent pipe to furnace at flexible coupling.
3. Disconnect combustion air inlet pipe at top panel (if needed).
4. Remove furnace top panel.
5. Disconnect gas piping to furnace at gas valve. Note: Before performing next step, insure that the wiring diagram is available and readable, or tag all wires first.
6. Disconnect tubing and wiring to pressure switch, limit switches, and gas valve.
7. Remove screws securing burner box to front partition.
8. Remove combustion blower.
9. Remove machine screws securing transition assembly to furnace partition.
10. Remove the collector box.
11. Remove machine screws securing secondary heat exchanger inlet flange to lower partition.
12. Remove screws around perimeter of both the upper and lower partitions (leaving the screws across the center of the two panels in place).
13. Primary Heat Exchanger can now be removed with both upper and lower partitions attached.
14. Reverse procedure to reinstall, making sure that any gaskets that have been torn during disassembly are replaced with new ones.
15. After reassembly, turn the gas supply on, and check for leaks. All leaks must be repaired immediately.
16. Perform an operational check of the furnace.

HONEYWELL SV9541M "SMART VALVE" Sequence of Operation

The following is the normal operating sequence for the control system.

Cooling (Y) Request:

24 VAC signals applied to Y & G terminals of EFT (electronic fan timer) control.

- Cool motor speed energized after 6 second Cool Fan On Delay time.

Y & G signals removed from EFT.

- Cool motor speed de-energized after 60 second Cool Fan Off Delay time.

Circulating Fan (G) Request:

24 VAC signals applied to G terminals of EFT control.

- Heat motor speed energized without delay.

G signal removed from EFT.

- Heat motor speed de-energized without delay.

Heating (W) Request:

24 VAC signals applied to W terminal of EFT control.

- Inducer motor turns on.
- The gas valve solenoid energizes.
- Following a 3 second prepurge delay, the pilot valve opens and the ignitor begins to warm up.
- After the pilot lights, the main burners energize and light.
- Timed from the opening of the main gas valve, the control will delay 30 seconds before switching the fan to Heat speed.

W signal removed from EFT.

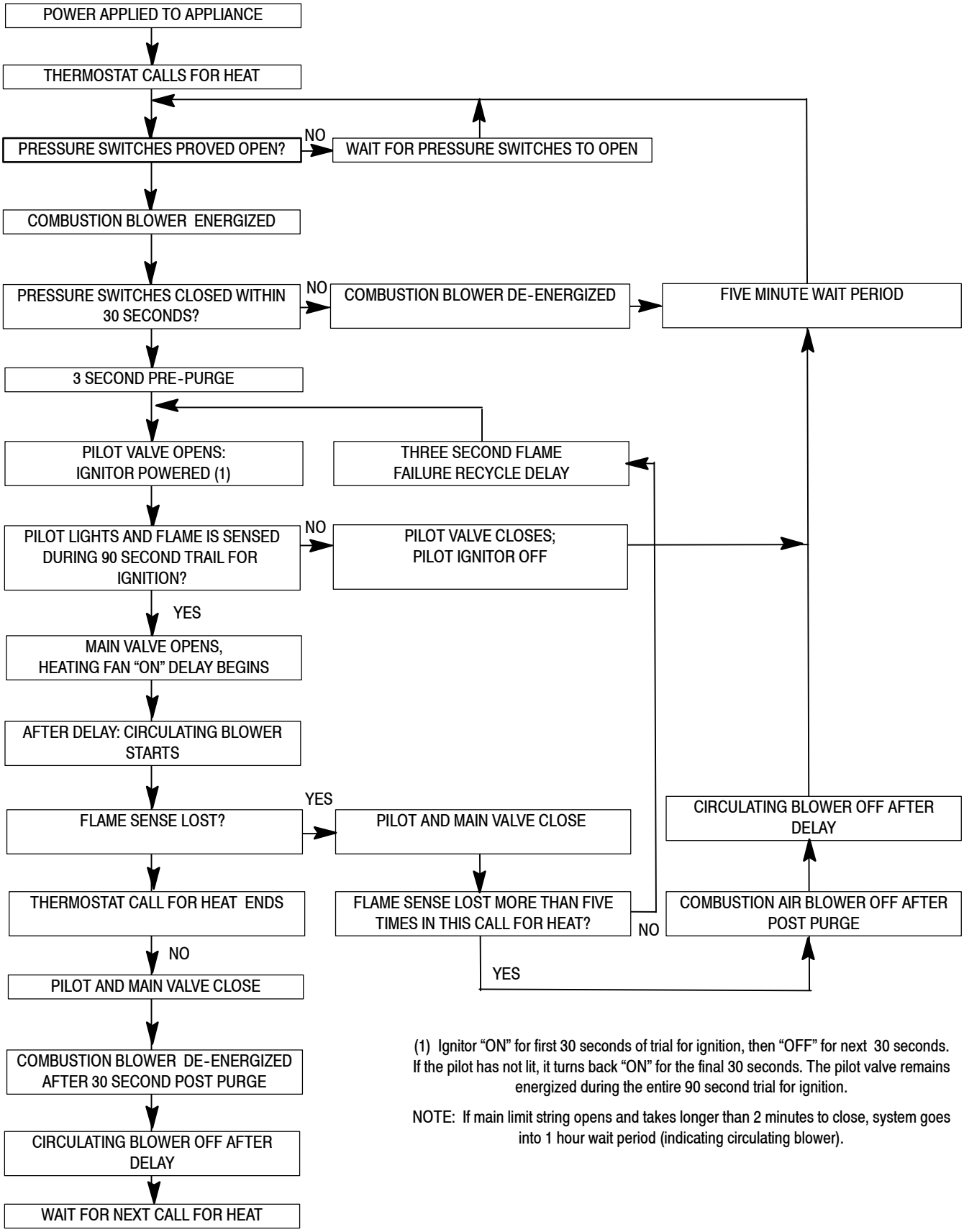
- The gas valve de-energizes and the main burners go out.
- The inducer runs at its present speed for a 30 second postpurge period.
- Timed from the gas valve de-energizing, the Heat fan speed de-energizes after the selected Heat Fan Delay time expires.

Heating Request with Gas Supply Line Shut Off:

24 VAC signals applied to W terminal of EFT control.

- Inducer motor turns on.
- The gas valve solenoid energizes.
- Following a 3 second prepurge delay, the pilot valve opens and the ignitor begins to warm up.
- The ignitor glows red-hot for 30 seconds, then turns off.
- The igniter stays off for 25 seconds, then begins to warm-up again.
- The igniter glows red-hot for 30 seconds, then turns off.
- The pilot valve closes 3 seconds after the igniter de-energizes.
- The inducer de-energizes 5 seconds after the pilot valve closes.
- The SmartValve proceeds to soft lockout and flashes error code 6.
- The control exits soft lockout after 5 minutes and begins another ignition sequence.

HONEYWELL SV9541M "SMART VALVE" Sequence of Operation



(1) Ignitor "ON" for first 30 seconds of trial for ignition, then "OFF" for next 30 seconds. If the pilot has not lit, it turns back "ON" for the final 30 seconds. The pilot valve remains energized during the entire 90 second trial for ignition.

NOTE: If main limit string opens and takes longer than 2 minutes to close, system goes into 1 hour wait period (indicating circulating blower).

HONEYWELL SV9541 "SMART VALVE" Trouble shooting

The 6 + X designation indicates a combination of flash codes: 6 flashes shows the control is in soft lockout, followed by X flashes to indicate the reason the control went into soft lockout. Last status code indicates repair to address first

LED STATUS	INDICATES	CHECK/REPAIR
Off	No power to system control.	Line voltage input at L1 and Neutral connectors on ST9160B Fan Timer. Low voltage (24V) power at 24 VAC and COM terminals on ST9160B System wiring harness is in good condition and securely connected.
Heartbeat Bright – Dim	Normal indication whenever the system is powered, unless some abnormal event has occurred.	Not Applicable – Normal Operation (stand by or call for heat)
2 Flashes	Pressure switches closed when it should be open (i.e. when call for heat begins). (Combustion blower is not energized until pressure switches opens)	Pressure switches stuck closed (system will wait for pressure switch to open). Pressure switches miswired or jumpered.
3 Flashes	Pressure switches , open when they should be closed (i.e. longer than 30 seconds after combustion blower/ inducer is energized). System goes into 5-minute delay period, with combustion blower/inducer off. At end of the 5-minute delay, another cycle will begin.	Ignition system control switch must be in the ON position. Pressure switches operation, tubing, and wiring. Restrictions in furnace air intake or vent piping.
4 Flashes	Main Limit or Roll Out Switch is open. Combustion blower is energized, Circulating blower is energized heat speed.	Main limit switch. Manual reset burner rollout switch. Limit and rollout switch wiring is in good condition and securely connected. Duct restriction/overfire.
5 Flashes	Flame signal sensed out of proper sequence. Combustion blower is energized, Circulating blower is energized heat speed after the "ON" delay.	Flame at pilot burner.
6 Flashes + 1 Flash	Soft Lockout. Failed to light pilot during 90 sec. trial for ignition Combustion air blower is de-energized, Circulating blower is de-energized after the "OFF" delay. After 5-minute delay time, control system will reset and initiate a new ignition sequence,	Gas supply off or pressure too low or high for appliance to operate. Damaged or broken HIS element Flame sense rod contaminated or in incorrect position. Pilot burner located in incorrect position. Pilot burner lead wires are in good condition and popery connected. Pressure switches operation, tubing, and wiring.
6 Flashes + 2 Flashes	Soft Lockout. Last failure was Flame Sense lost during run. Maximum recycle count exceeded Combustion air blower is de-energized, Circulating blower is de-energized after the "OFF" delay. After 5-minute delay time, control system will reset and initiate a new ignition sequence,	Gas supply off or pressure too low or high for appliance to operate. Flame sense rod contaminated or in incorrect position. Pilot burner located in incorrect position. Pilot burner lead wires are in good condition and properly connected. Cycling, pressure switch Condensate drain blocked Pressure switches operation, tubing, and wiring.

HONEYWELL SV9541 "SMART VALVE" Trouble shooting continued

LED STATUS	INDICATES	CHECK/REPAIR
6 Flashes + 3 Flashes	Soft Lockout. Last failure was pressure switch Maximum recycle count exceeded Combustion air blower is de-energized, Circulating blower is de-energized after the "OFF" delay. After 5-minute delay time, control system will reset and initiate a new ignition sequence,	Ignition system control switch must be in the ON position. Pressure switches operation, tubing, and wiring. Restrictions in furnace air intake or vent piping. High winds blowing against vent.
6 Flashes + 4 Flashes	Soft Lockout. Last failure was limit circuit opened during run. Combustion air blower is de-energized, Circulating blower is de-energized after the "OFF" delay. After 5-minute delay time, control system will reset and initiate a new ignition sequence,	Main limit switch. Limit and rollout switch wiring is in good condition and securely connected. Restriction in duct work. Dirty filter Overfire
7 Flashes	Soft Lockout. Blower failure (typical) Limit trip took longer than 2 minutes to reset. System will start a new ignition sequence after 1 hour, if call for heat still present.	Dead blower. Blocked duct work.

SV9541M ELECTRICAL VARIATION
SINGLE STAGE

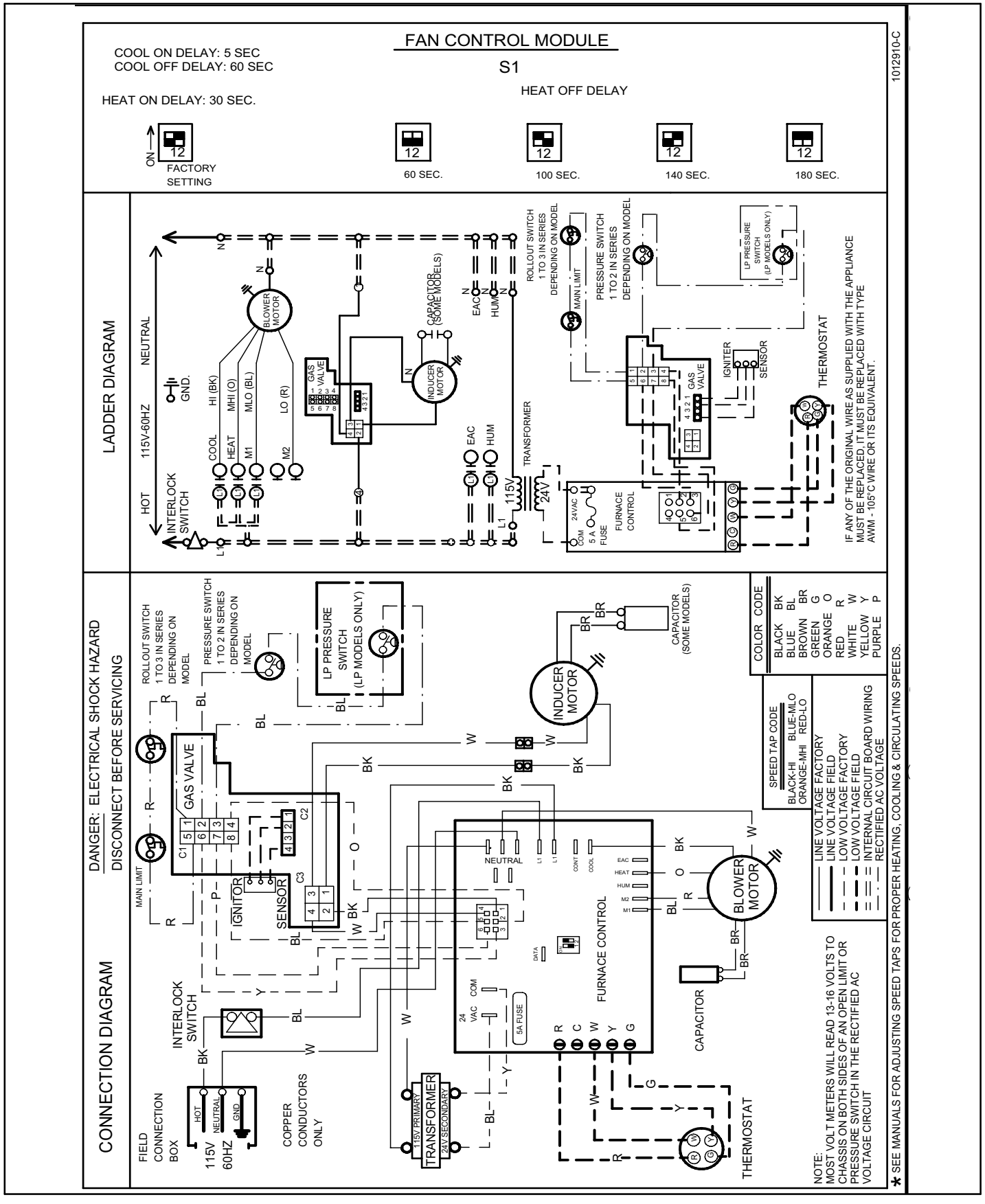
Connector (Pin #)	Description	Voltage Signal	When Signal is Present
Neutrals (5-1/4″ QC's)	Neutral	0 VAC (Neutral and earth ground should be at the same potential)	Always present
L1 (2-1/4″ QC's)	Line Voltage	115 VAC	Present when blower door interlock switch is closed.
HEAT (1/4″ QC's)	Fan power	*115 VAC	Present when Heat fan speed is on (Open Limit mode)
COOL (1/4″ QC's)	Fan power	*115 VAC	Present when Cool fan speed is on (Cool (Y) mode).
EAC (1/4″ QC's)	Electronic Air-Cleaner power	115 VAC	Present when High Heat or Cool fan speed is on.
CONSTANT FAN (1/4″ QC's)	Continuous Fan power	*115 VAC	Present when other fan speeds is off.
HUM (1/4″ QC's)	Humidifier power	115 VAC	Present when the Heat speeds is on.
P1 (pin 1)	Line Voltage	115 VAC	Present when the door interlock switch is closed.
P1 (pin 2)	Data Line	Non-periodic 1/2 wave rectified AC (measures as an unstable AC voltage bouncing between 12 VAC and 16 VAC	Present when the door interlock switch is closed.
P1 (pin 3)	C (xfmr common)	0 VAC	Always present
P1 (pin 4)	Neutral	0 VAC	Always present
P1 (pin 5)	24 VAC	24 VAC	Present when the door interlock switch is closed.
P1 (pin 6)	R	24 VAC	Present when the door interlock switch is closed.
C1 (pin 1)	Limit return	1/2 wave rectified AC	Present when the door interlock switch is closed. This voltage decreases when a limit switch is open.
C1 (pin 2)	Pressure Switch supply	1/2 wave rectified AC	Present when the door interlock switch is closed. This signal is the same as the C1 (pin 1)
C1 (pin 3)	Pressure Switch return	1/2 wave rectified AC	Present when the door interlock switch is closed. This AC voltage decreases when the Low Pressure Switch closes.
C1 (pin 4)	Data Line	Non-periodic 1/2 wave rectified AC	Present when the door interlock switch is closed. Same signal as P1 (pin 5).
C1 (pin 5)	Limit Supply	1/2 wave rectified AC	Present when the 24 VAC transformer is powered.
C1 (pin 6)	C (xfmr common)	0 VAC	Always present
C1 (pin 7)	R	24 VAC	Present when the door interlock switch is closed.
C1 (pin 8)	24 VAC	24 VAC	Present when the door interlock switch is closed.
C2 (pin 1)	HSI return	24 VAC (with igniter present)	Present when HSI is not turned on. When HSI is on, this signal is 0 VAC to 10 VAC depending on input line voltage potential.
C2 (pin 2)	HSI supply	24 VAC	Present when the door interlock switch is closed.
C2 (pin 3)	Not connected	0 VAC	Not connected
C2 (pin 4)	Flame sense	>80 VAC	Present when the door interlock switch is closed.
C3 (pin 1)	Inducer supply	115 VAC	Present when the inducer draft blower motor is on (Heat modes, Open Limit mode).
C3 (pin 2)	L1	115 VAC	Present when the door interlock switch is closed.
C3 (pin 3)	Inducer return	0 VAC	Always present (neutral connection).
C3 (pin 4)	L2 (neutral)	0 VAC	Always present

* With a motor tap connected, voltage appears at "unpowered" fan terminals whenever the motor is running due to feedback through the motor windings.

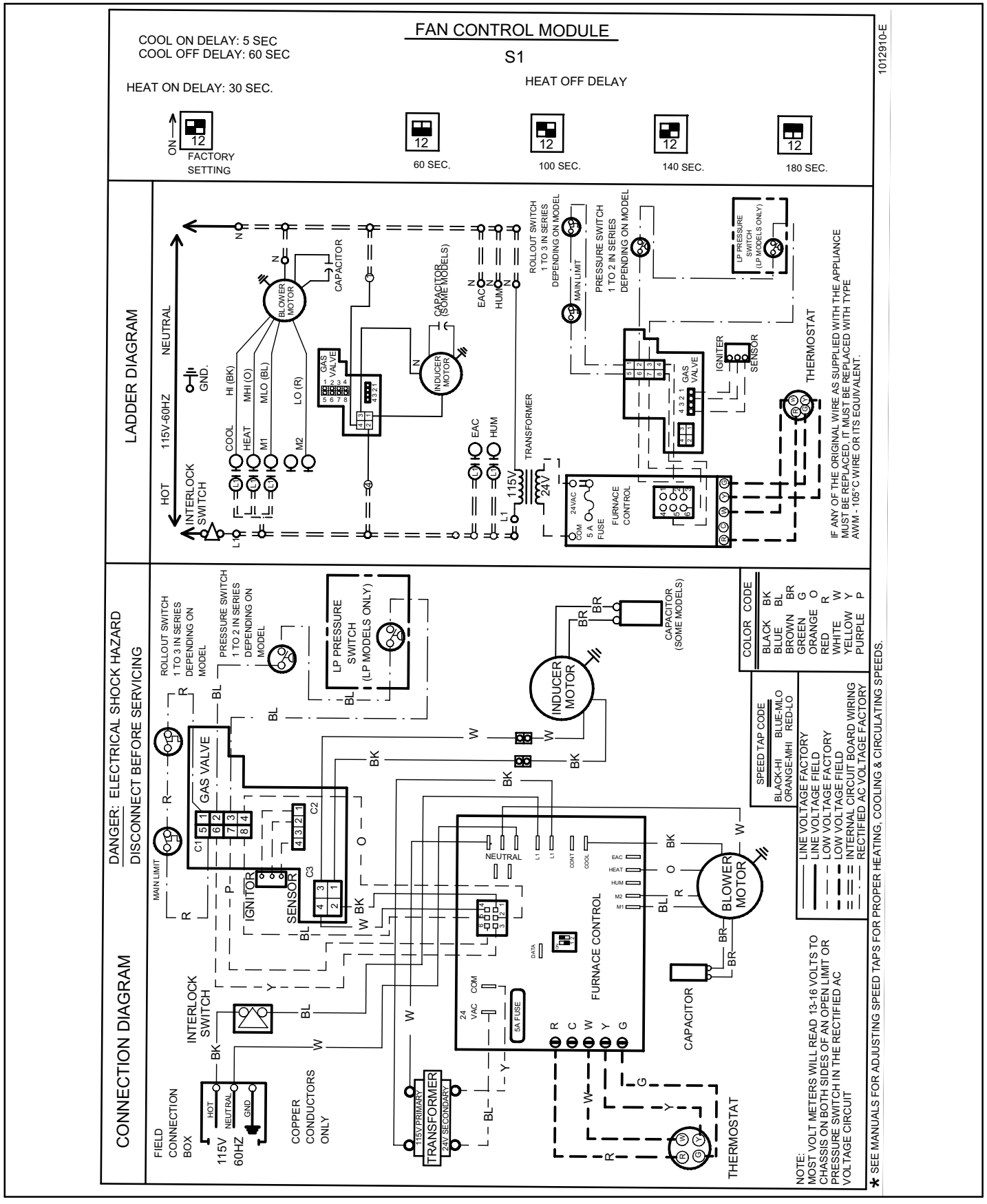
** Voltage appears on the "unpowered" inducer terminal whenever the inducer motor is running due to feedback through the motor windings.

NOTE1: Using a Fluke 79 digital Multi-Meter (DMM), 1/2 wave rectified AC voltage typically measures about 14 VAC. The Fluke 79 is not a "true" RMS meter.

Wiring Diagram (90+ Single Stage Furnaces)(A1)



Wiring Diagram (90+ Single Stage Furnaces)(A2)



Manufacturers Number (Mfr No -See Rating Plate**)** **ALL Models**		
Specifications		
General Gas Type	Nat	LP
Transformer Size (VA) T'stat Heat Anticipator	40 .10	40 .10
Gas & Ignition Gas Valve Regulation Type Manifold Press. (Inch's WC)	HW SV9541M SNAP 3.5	HW SV9541M SNAP 10.0
Pilot Orifice Size	.018	.011
Ignition Type/Series	HW HSP	HW HSP
Fan Controls Fan Control (Type) Fan Control On (Timed-secs) Off	HW ST9160 30 60,100,140,180	HW ST9160 30 60,100,140,180
Gas Conversion Kits All Models Nat to LP NAHF002LP *1009509 LP to Nat NAHF002NG *1009510 *Order from Service Parts		

Specifications										
	***9MP1050B12A1** ***9MP2050B12A1**		***9MP1075B12A1** ***9MP2075B12A1**		***9MP1100F14A1** ***9MP2100F14A1**		***9MP1100J20A1** ***9MP2100J20A1**		***9MP1125J20A1** ***9MP2125J20A1**	
General Input (Btuh) Output (Btuh) Temp. Rise (°F)	50,000 45,500 35-65		75,000 68,000 40-70		100,000 91,000 40-70		100,000 96,500 40-70		125,000 113,750 40-70	
Electrical (Volts/Hz/FLA)	115/60/9.8		115/60/8.9		115/60/9.0		115/60/10.5		115/60/11.2	
Gas & Ignition Gas Type Std. Main Orifices (No/Size)	Nat. 2/42	L.P. 2/54	Nat. 3/42	L.P. 3/54	Nat. 4/42	L.P. 4/54	Nat. 4/42	L.P. 4/54	Nat. 5/42	L.P. 5/54
Combustion Flue Outlet Size (Inches) Std. Outlet Temp (° F)	2 <140		2 <140		3 <140		3 <140		3 <140	
@ Blower / @ Transition Box Std. Pressures (″ of WC) 5′ No Elbows 40′ +5-90° DWV Elbows	 -1.80 / -2.60 -1.30 / -2.30		 -1.80 / -2.60 -1.30 / -2.30		 -1.80 / -2.60 -1.70 / -2.50		 -1.80 / -2.60 -1.70 / -2.50		 -1.80 / -2.60 -1.70 / -2.50	
Limits & Controls Rollout Switch (°F) Limit Control Setting (°F)	300 240		300 210		300 230		300 220		300 190	
Std. Transition Pressure Sw. (Part No) Blower Switch Pressure (Close) Blower Switch Pressure (Open) Transition Switch Pressure (Close) Transition Switch Pressure (Open)	1013518 0.95 0.80 2.00 1.80		1013518 0.95 0.80 2.00 1.80		1013518 0.95 0.80 2.00 1.80		1013518 0.95 0.80 2.00 1.80		1013166 1.30 1.10 1.80 1.60	
High Altitude Pressure Sw. (Part No) Blower Switch Pressure (Close) Blower Switch Pressure (Open) Transition Switch Pressure (Close) Transition Switch Pressure (Open)	1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013157 0.85 0.70 1.70 1.50	
Blower Data Type & Size Motor Amps/Rpm Motor Type/H.p. Cap. Mfd/Volts Filter Type Cool Cap. (Tons) @ .5″ W.C. L, ML, MHi & Hi	11-8 10/850 PSC/$1/2$ 7.5/370 16x25x1 $1\frac{1}{2}$,2,$2\frac{1}{2}$,3		11-8 8.0/1050 PSC/$1/2$ 7.5/370 16x25x1 $1\frac{1}{2}$,2,$2\frac{1}{2}$,3		11-10 10/1050 PSC/$1/2$ 10/370 16x25x1 $1\frac{1}{2}$,2,3,$3\frac{1}{2}$		11-10 13/900 PSC/$3/4$ 40/370 16x25x1 $3\frac{1}{2}$,4,$4\frac{1}{2}$,5		11-10 13/900 PSC/$3/4$ 40/370 16x25x1 $3\frac{1}{2}$,4,$4\frac{1}{2}$,5	

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

Specifications (N9MP1)(A2)

	N9MP1050B12	N9MP1075B12	N9MP1080F16	N9MP1100F14	N9MP1100J20	N9MP1125J20
General						
Gas Type	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP
Input (Btuh)	50,000	75,000	80,000	100,000	100,000	125,000
Output (Btuh)	45,500	68,000	72,000	91,000	96,500	113,750
Transformer Size (VA)	40	40	40	40	40	40
T'stat Heat Anticipator	.10	.10	.10	.10	.10	.10
Temp. Rise (°F)	35-65	40-70	35-65	40-70	40-70	40-70
Electrical (Volts/Hz/FLA)	115/60/9.8	115/60/8.9	115/60/9.0	115/60/9.0	115/60/10.5	115/60/11.2
Gas & Ignition						
Gas Type	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.
Gas Valve	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M
Regulation Type	SNAP	SNAP	SNAP	SNAP	SNAP	SNAP
IgnitionType/Series	HW HSP	HW HSP	HW HSP	HW HSP	HW HSP	HW HSP
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
Std. Main Orifices (No/Size)	2/42 / 2/54	3/42 / 3/54	4/44 / 4/55	4/46 / 4/54	4/42 / 4/54	5/42 / 5/54
Pilot Orifice Size	.018 / .011	.018 / .011	.018 / .011	.018 / .011	.018 / .011	.018 / .011
Fan Controls						
Fan Control (Type)	HW ST9160	HW ST9160	HW ST9160	HW ST9160	HW ST9160	HW ST9160
Fan Control On	30	30	30	30	30	30
(Timed-secs) Off	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180
Combustion						
Flue Outlet Size (Inches)	2	2	2	3	3	3
Std. Outlet Temp (°5' No Elbows	<140	<140	<140	<140	<140	<140
Blower Pressure 5' No Elbows (" WC)	--	--	--	-1.8	-1.8	-1.8
Blower Pressure 40' +5-90° DWV Elbows (" WC)	--	--	--	-1.7	-1.7	-1.7
Transition Bx Pressure 5' No Elbows (" WC)	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Transition Bx Pressure 40' +5-90° DWV Elbows (" WC)	-2.3	-2.3	-2.5	-2.5	-2.5	-2.5
Limits & Controls						
Rollout Switch (°F)	300	300	300	300	300	300
Limit Control Setting (°F)	240	210	230	230	220	190
Standard Pressure Sw. (Part No)	1013802	1013802	1013811	1013801	1013802	1013166
Blower Switch Pressure (Close) (" WC)	--	--	--	--	--	-1.3
Blower Switch Pressure (Open) (" WC)	--	--	--	--	--	-1.1
Transition Switch Pressure (Close) (" WC)	-2.2	-2.2	-1.8	-2.3	-2.2	-1.8
Transition Switch Pressure (Open) (" WC)	-2.0	-2.0	-1.6	-2.1	-2.0	-1.6
High Altitude Pressure Sw. (Part No)	1013803	1013803	1013812	1013803	1013803	1013157
Blower Switch Pressure (Close) (" WC)	--	--	--	--	--	-0.9
Blower Switch Pressure (Open) (" WC)	--	--	--	--	--	-0.7
Transition Switch Pressure (Close) (" WC)	-2.0	-2.0	-1.5	-2.0	-2.0	-1.7
Transition Switch Pressure (Open) (" WC)	-1.8	-1.8	-1.3	-1.8	-1.8	-1.5
Long Vent Kit (Part No)	--	--	--	NAHA001LV	NAHA002LV	--
Pressure Switch (Part No)	--	--	--	1013518	1013515	--
Blower Switch Pressure (Close) (" WC)	--	--	--	-1.0	-1.0	--
Blower Switch Pressure (Open) (" WC)	--	--	--	-0.8	-0.8	--
Transition Switch Pressure (Close) (" WC)	--	--	--	-2.0	-1.7	--
Transition Switch Pressure (Open) (" WC)	--	--	--	-1.8	-1.5	--
High Altitude Long Vent Kit (Part No)	--	--	--	NAHA003LV		--
Pressure Switch (Part No)	--	--	--	1013165		--
Blower Switch Pressure (Close) (" WC)	--	--	--	-0.7		--
Blower Switch Pressure (Open) (" WC)	--	--	--	-0.6		--
Transition Switch Pressure (Close) (" WC)	--	--	--	-1.4		--
Transition Switch Pressure (Open) (" WC)	--	--	--	-1.2		--
Blower Data						
Type & Size	11-8	11-8	11-10	11-10	11-10	11-10
Motor Amps/Rpm	10/850	8.0/1050	10/1050	10/1050	13/900	13/900
Motor Type/H.p.	PSC/1/2	PSC/1/2	PSC/1/2	PSC/1/2	PSC/3/4	PSC/3/4
Cap. Mfd/Volts	7.5/370	7.5/370	10/370	10/370	40/370	40/370
Filter Type	16x25x1	16x25x1	16x25x1	16x25x1	16x25x1	16x25x1
Cool Cap. (Tons) @ .5" W.C. L, ML, MHi & Hi	1 1/2,2,2 1/2,3	1 1/2,2,2 1/2,3	2 1/2,3,3 1/2,4	1 1/2,2,3,3 1/2,	3 1/2,4,4 1/2,5	3 1/2,4,4 1/2,5
Gas Conversion Kits						
Nat to LP	NAHF002LP (*1009509)		NAHF003LP (*1013815)	NAHF002LP (*1009509)		
LP to Nat	NAHF002NG (*1009510)		NAHF003NG (*1013816)	NAHF002NG (*1009510)		
*Order from Service Parts						

Manufacturers Number (Mfr No -See Rating Plate**)** **ALL Models**		
Specifications		
General Gas Type	Nat	LP
Transformer Size (VA) T'stat Heat Anticipator	40 .10	40 .10
Gas & Ignition Gas Valve Regulation Type Manifold Press. (Inch's WC)	HW SV9541M SNAP 3.5	HW SV9541M SNAP 10.0
Pilot Orifice Size	.018	.011
Ignition Type/Series	HW HSP	HW HSP
Fan Controls Fan Control (Type) Fan Control On (Timed-secs) Off	HW ST9160 30 60,100,140,180	HW ST9160 30 60,100,140,180
Gas Conversion Kits All Models Nat to LP NAHF002LP *1009509 LP to Nat NAHF002NG *1009510 *Order from Service Parts		

Specifications										
	***9MPD050F12A1**		***9MPD075F12A1**		***9MPD100J14A1**		***9MPD100J20A1**		***9MPD125L20A1**	
General Input (Btuh) Output (Btuh) Temp. Rise (°F)	50,000 46,000 35-65		75,000 69,000 40-70		100,000 92,000 40-70		100,000 92,000 40-70		125,000 115,000 40-70	
Electrical (Volts/Hz/FLA)	115/60/9.8		115/60/8.9		115/60/9.0		115/60/10.5		115/60/11.2	
Gas & Ignition Gas Type Std. Main Orifices (No/Size)	Nat. 2/42	L.P. 2/54	Nat. 3/42	L.P. 3/54	Nat. 4/42	L.P. 4/54	Nat. 4/42	L.P. 4/54	Nat. 5/42	L.P. 5/54
Combustion Flue Outlet Size (Inches) Std. Outlet Temp (° F)	2 <140		2 <140		3 <140		3 <140		3 <140	
@ Blower / @ Transition Box Std. Pressures (″ of WC) 5′ No Elbows 40′ +5-90° DWV Elbows	 -1.80 / -2.60 -1.30 / -2.30		 -1.80 / -2.60 -1.30 / -2.30		 -1.80 / -2.60 -1.70 / -2.50		 -1.80 / -2.60 -1.70 / -2.50		 -1.80 / -2.60 -1.70 / -2.50	
Limits & Controls Rollout Switch (°F) Limit Control Setting (°F)	300 260		300 240		300 220		300 220		300 190	
Std. Transition Pressure Sw. (Part No) Blower Switch Pressure (Close) Blower Switch Pressure (Open) Transition Switch Pressure (Close) Transition Switch Pressure (Open)	1013515 0.95 0.80 1.70 1.50		1013515 0.95 0.80 1.70 1.50		1013515 0.95 0.80 1.70 1.50		1013515 0.95 0.80 1.70 1.50		1013166 1.30 1.10 1.80 1.60	
High Altitude Pressure Sw. (Part No) Blower Switch Pressure (Close) Blower Switch Pressure (Open) Transition Switch Pressure (Close) Transition Switch Pressure (Open)	1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013165 0.70 0.55 1.40 1.20		1013157 0.85 0.70 1.70 1.50	
Blower Data Type & Size Motor Amps/Rpm Motor Type/H.p. Cap. Mfd/Volts Filter Type Cool Cap. (Tons) @ .5″ W.C. L, ML, MHi & Hi	11-8 10/850 PSC/$1/2$ 7.5/370 16x25x1 $1\frac{1}{2}$,2,$2\frac{1}{2}$,3		11-10 8.0/1050 PSC/$1/2$ 7.5/370 16x25x1 $1\frac{1}{2}$,2,$2\frac{1}{2}$,3		11-10 10/1050 PSC/$1/2$ 10/370 16x25x1 $1\frac{1}{2}$,2,3,$3\frac{1}{2}$		11-10 13/900 PSC/$3/4$ 40/370 16x25x1 $3\frac{1}{2}$,4,$4\frac{1}{2}$,5		11-10 13/900 PSC/$3/4$ 40/370 16x25x1 $3\frac{1}{2}$,4,$4\frac{1}{2}$,5	

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

Specifications (*9MPD)(A2)

	*9MPD050F12A	*9MPD075F12A	*9MPD080J16A	*9MPD100J14A	*9MPD100J20A	*9MPD125L20A
General						
Gas Type	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP	Nat./ LP
Input (Btuh)	50,000	75,000	80,000	100,000	100,000	125,000
Output (Btuh)	46,000	69,000	73,600	92,000	92,000	115,000
Transformer Size (VA)	40	40	40	40	40	40
T'stat Heat Anticipator	.10	.10	.10	.10	.10	.10
Temp. Rise (°F)	35-65	40-70	35-65	40-70	40-70	40-70
Electrical (Volts/Hz/FLA)	115/60/9.8	115/60/8.9	115/60/9.0	115/60/9.0	115/60/10.5	115/60/11.2
Gas & Ignition						
Gas Type	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.	Nat. / L.P.
Gas Valve	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M	HW SV9541M
Regulation Type	SNAP	SNAP	SNAP	SNAP	SNAP	SNAP
IgnitionType/Series	HW HSP	HW HSP	HW HSP	HW HSP	HW HSP	HW HSP
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
Std. Main Orifices (No/Size)	2/42 / 2/54	3/42 / 3/54	4/44 / 4/55	4/42 / 4/54	4/42 / 4/54	5/42 / 5/54
Pilot Orifice Size	.018 / .011	.018 / .011	.018 / .011	.018 / .011	.018 / .011	.018 / .011
Fan Controls						
Fan Control (Type)	HW ST9160	HW ST9160	HW ST9160	HW ST9160	HW ST9160	HW ST9160
Fan Control On	30	30	30	30	30	30
(Timed-secs) Off	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180	60,100,140,180
Combustion						
Flue Outlet Size (Inches)	2	2	2	3	3	3
Std. Outlet Temp (°5' No Elbows	<140	<140	<140	<140	<140	<140
Blower Pressure 5' No Elbows (" WC)	--	--	--	-1.8	-1.8	-1.8
Blower Pressure 40' +5-90° DWV Elbows (" WC)	--	--	--	-1.7	-1.7	-1.7
Transition Bx Pressure 5' No Elbows (" WC)	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Transition Bx Pressure 40' +5-90° DWV Elbows (" WC)	-2.3	-2.3	-2.5	-2.5	-2.5	-2.5
Limits & Controls						
Rollout Switch (°F)	300	300	300	300	300	300
Limit Control Setting (°F)	260	240	220	220	220	190
Standard Pressure Sw. (Part No)	1013802	1013802	1013812	1013802	1013802	1013166
Blower Switch Pressure (Close) (" WC)	--	--	--	--	--	-1.3
Blower Switch Pressure (Open) (" WC)	--	--	--	--	--	-1.1
Transition Switch Pressure (Close) (" WC)	-2.2	-2.2	-1.5	-2.2	-2.2	-1.8
Transition Switch Pressure (Open) (" WC)	-2.0	-2.0	-1.3	-2.0	-2.0	-1.6
High Altitude Pressure Sw. (Part No)	1013803	1013803	1013813	1013803	1013803	1013157
Blower Switch Pressure (Close) (" WC)	--	--	--	--	--	-0.9
Blower Switch Pressure (Open) (" WC)	--	--	--	--	--	-0.7
Transition Switch Pressure (Close) (" WC)	-2.0	-2.0	-1.2	-2.0	-2.0	-1.7
Transition Switch Pressure (Open) (" WC)	-1.8	-1.8	-1.0	-1.8	-1.8	-1.5
Long Vent Kit (Part No)	--	--	--	NAHA002LV		--
Pressure Switch (Part No)	--	--	--	1013518		--
Blower Switch Pressure (Close) (" WC)	--	--	--	-1.0		--
Blower Switch Pressure (Open) (" WC)	--	--	--	-0.8		--
Transition Switch Pressure (Close) (" WC)	--	--	--	-2.0		--
Transition Switch Pressure (Open) (" WC)	--	--	--	-1.8		--
High Altitude Long Vent Kit (Part No)	--	--	--	NAHA003LV		--
Pressure Switch (Part No)	--	--	--	1013165		--
Blower Switch Pressure (Close) (" WC)	--	--	--	-0.7		--
Blower Switch Pressure (Open) (" WC)	--	--	--	-0.6		--
Transition Switch Pressure (Close) (" WC)	--	--	--	-1.4		--
Transition Switch Pressure (Open) (" WC)	--	--	--	-1.2		--
Blower Data						
Type & Size	11-8	11-10	11-10	11-10	11-10	11-10
Motor Amps/Rpm	10/850	8.0/1050	10/1050	10/1050	13/900	13/900
Motor Type/H.p.	PSC/1/2	PSC/1/2	PSC/1/2	PSC/1/2	PSC/3/4	PSC/3/4
Cap. Mfd/Volts	7.5/370	7.5/370	10/370	10/370	40/370	40/370
Filter Type	16x25x1	16x25x1	16x25x1	16x25x1	16x25x1	16x25x1
Cool Cap. (Tons) @ .5" W.C. L, ML, MHi & Hi	1 1/2,2,2 1/2,3	1 1/2,2,2 1/2,3	2 1/2,3,3 1/2,4	1 1/2,2,3,3 1/2	3 1/2,4,4 1/2,5	3 1/2,4,4 1/2,5
Gas Conversion Kits						
Nat to LP	NAHF002LP (*1009509)		NAHF003LP (*1013815)	NAHF002LP (*1009509)		
LP to Nat	NAHF002NG (*1009510)		NAHF003NG (*1013816)	NAHF002NG (*1009510)		
*Order from Service Parts						

CIRCULATION AIR BLOWER DATA

For 050 Models 3 Ton Units

External Static Pressure Inches of W.C.	Speed Tap	CFM			
		Low	Med L	Med H	Hi
	0.1	826	1083	1301	1408
	0.2	804	1050	1242	1347
	0.3	770	1028	1195	1295
	0.4	735	985	1153	1237
	0.5	698	952	1093	1183
	0.6	657	909	1040	1118
	0.7	---	863	935	1053
	0.8	----	812	865	976
	0.9	---	---	802	887
	1.0	---	---	720	787

For 075 Models 3 Ton Units

External Static Pressure Inches of W.C.	Speed Tap	CFM			
		Low	Med L	Med H	Hi
	0.1	706	917	1163	1368
	0.2	677	875	1120	1319
	0.3	636	840	1076	1263
	0.4	595	812	1031	1202
	0.5	546	766	987	1148
	0.6	490	702	889	1077
	0.7	---	630	821	989
	0.8	---	550	750	914
	0.9	---	462	676	833
	1.0	---	---	601	747

For 100 Models 3.5 Ton 19″ & 22 3/4″ Units

External Static Pressure Inches of W.C.	Speed Tap	CFM			
		Low	Med L	Med H	Hi
	0.1	700	912	1209	1550
	0.2	660	884	1171	1492
	0.3	616	843	1139	1434
	0.4	575	790	1088	1378
	0.5	528	735	1040	1317
	0.6	472	677	979	1247
	0.7	---	608	909	1161
	0.8	---	528	827	1058
	0.9	---	---	733	932
	1.0	---	---	624	778

For 080 Models 4 Ton 19″ & 22 3/4″ Units

External Static Pressure Inches of W.C.	Speed Tap	Low	Med L	Med H	Hi
	0.1	823	1109	1527	1850
	0.2	795	1087	1482	1791
	0.3	747	1056	1426	1720
	0.4	677	1016	1382	1648
	0.5	617	970	1317	1575
	0.6	544	854	1245	1485
	0.7	---	763	1154	1401
	0.8	---	652	1043	1284
	0.9	---	---	905	1161
	1.0	---	---	737	1028

For 100 Models 5 Ton 22 3/4″ Units

External Static Pressure Inches of W.C.	Speed Tap	CFM			
		Low	Med L	Med H	Hi
	0.1	1682	1870	2081	2263
	0.2	1654	1826	2031	2193
	0.3	1597	1775	1963	2165
	0.4	1547	1719	1899	2056
	0.5	1498	1653	1825	1978
	0.6	1428	1583	1737	1854
	0.7	1355	1503	1650	1757
	0.8	1267	1392	1548	1644
	0.9	----	1266	1428	1515
	1.0	----	----	----	1351

For 125 Models 5 Ton Units

External Static Pressure Inches of W.C.	Speed Tap	CFM			
		Low	Med L	Med H	Hi
	0.1	1720	1910	2127	2315
	0.2	1686	1881	2087	2268
	0.3	1644	1833	2024	2201
	0.4	1600	1777	1961	2131
	0.5	1533	1720	1891	2029
	0.6	1494	1647	1804	1948
	0.7	1413	1571	1708	1820
	0.8	1306	1470	1604	1730
	0.9	----	1349	1484	1614
	1.0	----	----	1328	1430

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