



# Installation Guide and Owner's Manual



High efficiency multiposition  
CONDENSING GAS FURNACE

## MODELS:

<b>C45-1-X</b>	<b>C45-1-D</b>	<b>C45-2-D</b>	<b>C45-2-V</b>
<b>C60-1-X</b>	<b>C60-1-D</b>	<b>C60-2-D</b>	<b>C60-2-V</b>
<b>C75-1-X</b>	<b>C75-1-D</b>	<b>C75-2-D</b>	<b>C75-2-V</b>
<b>C90-1-X</b>	<b>C90-1-D</b>	<b>C90-2-D</b>	<b>C90-2-V</b>
<b>C105-1-X</b>	<b>C105-1-D</b>	<b>C105-2-D</b>	<b>C105-2-V</b>
<b>C120-1-X</b>	<b>C120-1-D</b>	<b>C120-2-D</b>	<b>C120-2-V</b>



**ATTENTION:** Do not tamper with the unit or its controls. Call a qualified service technician.

**INSTALLER / SERVICE TECHNICIAN:** Use the information in this manual for the installation / servicing of the furnace and keep the document near the unit for future reference.

**These instructions must be read and understood completely before attempting installation.**

**Gas furnace manufactured on or after May 1, 2017 are not permitted to be used in Canada for heating of buildings or structures under construction.**

**HOMEOWNER:** PLEASE Keep this manual near the furnace for future reference.

**Manufactured by:**  
Industries Dettson Inc.  
Sherbrooke (Québec) Canada  
[www.dettson.com](http://www.dettson.com)



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## REQUIRED NOTICE FOR MASSACHUSETTS INSTALLATIONS IMPORTANT

The Commonwealth of Massachusetts requires compliance with regulation 248 CMR as follows:

**5.08: Modifications to NFPA-54, Chapter 10. Revise 10.8.3 by adding the following additional requirements:**

For all side wall horizontally vented gas fuelled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

### **Installation of Carbon Monoxide Detectors**

At the time of installation of the side wall horizontal vented gas fuelled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery backup is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gas fitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fuelled equipment. It shall be the responsibility of the property owner to secure the services of qualified license professionals for the installation of hard wired carbon monoxide detectors.

In the event that the side wall horizontally vented gas fuelled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery backup may be installed on the next adjacent floor level.

In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirement; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

**APPROVED CARBON MONOXIDE DETECTORS:** Each carbon monoxide detector as required in accordance with the above provision shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

**SIGNAGE:** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fuelled heating appliance or equipment. The sign shall read, in print size no less than in-half (1/2) inch in size, "gas vent directly below. Keep clear of all obstruction".

**INSPECTION:** the state of local gas inspector of the side wall horizontally vented gas fuelled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2) (a) 1 through 4:

**EXEMPTION:** the following equipment is exempt from 248 CMR 5.08(2) (a) 1 through 4:

The equipment listed in Chapter 10 entitled "equipment not required to be vented" in the most current edition of NFPA 54 as adopted by the board; and

Product approved side wall horizontally vented gas fuelled equipment installed in a room or structure separate from the dwelling, building or structure in whole or in part for residential purposes.

### **MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED**

When the manufacturer of product approved side wall horizontally vented gas equipment provides a venting system design or venting system component with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

Detailed instructions for the installation of the venting system design or the venting system components; and a complete parts list for the venting system design or venting system.

### **MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED**

When the manufacturer of product approved side wall horizontally vented gas fuelled equipment does not provide the parts or venting the flue gases, but identifies "special venting system", the following requirements shall be satisfied by the manufacturer:

The referenced "special venting system" shall be product approved by the board, and the instruction for that system shall include a parts list and detailed installation instructions.


A copy of all installation instructions for all product, approved side wall horizontally vented gas fuelled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.


For questions regarding these requirements, please contact the Commonwealth of Massachusetts board of State Examiners of Plumbers and Gas Fitters, 239 Causeway Street, Boston, MA, 02114, tel.: 617 727-9952.

## 1- SAFETY REGULATION

### 1.1- SAFETY LABELING AND WARNING SIGNS

The words DANGER and WARNING are used to identify the levels of seriousness of certain hazards. It is important that you understand their meaning. You will notice these words in the manual as follows:

	<b>DANGER</b>
Immediate hazards that <u>WILL</u> result in death, serious bodily injury and/or property damage	


	<b>WARNING</b>
Hazards or unsafe practices that <u>CAN</u> result in death, bodily injury and/or property damage.	

NOTE: is used to highlight suggestions which will result in enhanced installation, reliability or operation.

### 1.2- IMPORTANT INFORMATION

	<b>DANGER</b>
Non-observance of the safety regulations outlined in this manual will potentially lead to consequences resulting in death, serious bodily injury and/or property damage.	

- ⇒ It is the homeowner's responsibility to engage a qualified technician for the installation and subsequent servicing of this furnace;
- ⇒ Before calling for service, be sure to have the information page of your manual (last page of your manual) close by in order to be able to provide the contractor with the required information, such as the model and serial numbers of the furnace.


	<b>WARNING</b>
Installations and repairs performed by unqualified persons can result in hazards to them and to others. Installations must conform to local codes or, in the absence of same, to codes of the country having jurisdiction.	
The information contained in this manual is intended for use by a qualified technician, familiar with safety procedures and who is equipped with the proper tools and test instruments	


### 1.3- DETECTION SYSTEMS


oil or gas fired heaters are used. Carbon monoxide can cause bodily harm or death. For this reason, approved carbon monoxide detectors shall be installed in your residence and properly maintained to warn of dangerously high carbon monoxide levels.

Fire can cause bodily harm or death. For this reason, approved smoke detectors should be installed in your residence and be properly maintained, to warn early on, of a potentially dangerous fire. Also, the house should be equipped with approved and properly maintained fire extinguishers.

Your unit is equipped with safety devices that can prevent it from functioning when anomalies are detected such as a blocked venting system.

	<b>WARNING</b>
<b>CARBON MONOXIDE POISONING/COMPONENT DAMAGE HAZARD</b>	
Failure to follow this warning could result in personal injury or death and unit component damage.	
Corrosive or contaminated air may cause failure of parts containing flue gas, which could leak into the living space. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products. Do not install furnace in a corrosive or contaminated atmosphere. Make sure all combustion and circulating air requirements are met, in addition to all local codes and ordinances.	

	<b>WARNING</b>
<b>FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISONING HAZARD</b>	
Failure to follow this warning could result in dangerous operation, personal injury, death, or property damage. Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified service agency must use only factory authorized and listed kits or accessories when modifying this product.	

	<b>WARNING</b>
<b>FIRE, EXPLOSION, AND CARBON MONOXIDE POISONING HAZARD</b>	
Failure to follow this warning could result in personal injury, death, or property damage.	
Never operate a furnace without a filter or filtration device installed. Never operate a furnace with filter or filtration device access doors removed.	

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

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

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit.

## CAUTION

### INJURY HAZARD

Ignoring this warning could result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts, and servicing furnaces

1. Use only with type of gas approved for this furnace. Refer to the furnace rating plate.
2. Install this furnace only in a location and position as specified in section 2.3-Location.
3. Provide adequate combustion and ventilation air to the furnace space as specified in section 7-Venting.
4. Combustion products must be discharged outdoors. Connect this furnace to an approved vent system only, as specified in section 7-Venting of these instructions.
5. Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in section 5-Gas piping.
6. Always install furnace to operate within the furnace's intended temperature rise range with a duct system which has an external static pressure within the allowable range, as specified in section 4-Duct installation. See also furnace rating label.
7. When a furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace. See section 4-Duct installation.
8. A gas fired furnace for installation in a residential garage must be installed as specified in the warning box below:



## WARNING

### FIRE, INJURY OR DEATH HAZARD

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

When the furnace is installed in a residential garage, the burners and ignitions sources must be located at least 18 in. (457 mm) above the floor. The furnace must be located or protected to avoid damage by vehicles. When the furnace is installed in a public garage, airplane hangar, or other building having a hazardous atmosphere, the furnace must be installed in accordance with the NFPA 54/ANSI Z223.1-2009 or CAN/CSA B149.2-2010.

Do not install the furnace on its back or hang furnace with control compartment facing downward. Safety control operation will be adversely affected. Never connect return air duct to the back of the furnace.

9. The furnace is factory shipped for use with natural gas. A CSA (A.G.A. and C.G.A.) listed accessory gas conversion kit is required to convert furnace for use with propane gas. Refer to parts lists at the end of the manual for the proper conversion kit for your furnace.
10. See Table 1: Minimum clearance to combustible material for all units for required clearances to combustible construction.
11. Maintain a 1" (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36" (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.
12. These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring.

13. Gas furnace manufactured on or after May 1, 2017 are not permitted to be used in Canada for heating of buildings or structures under construction.

## WARNING

### Frozen and burst water pipe hazard

Failure to protect against the risk of freezing may result in property damage. Special precautions MUST be made if installing furnace in an area which may drop below freezing. This can cause improper operation or damage to equipment. If furnace environment has the potential of freezing, the drain trap and drain line must be protected

## CAUTION

### Property damage hazard

Failure to follow this caution may result in burst water pipes and/or property damage. If a condensate pump is installed, a plugged condensate drain or a failed pump may cause the furnace to shut down. Do not leave the home unattended during freezing weather without turning off water supply and draining water pipes or otherwise protecting against the risk of frozen pipes.

Ensure all condensate drain connections are secured and liquid tight. Use the furnished tube clamps and verify tightness.

## CAUTION

### FURNACE CORROSION HAZARD

Failure to follow this caution may result in furnace damage. Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodine. These elements can corrode heat exchangers and shorten furnace life. Air contaminants are found in aerosol spray, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products.



## WARNING

### CARBON MONOXIDE POISONING HAZARD

Failure to follow this warning could result in personal injury or death. The operation of exhaust fans, kitchen ventilation fans, clothes dryers, attic exhaust fans or fireplaces could create a NEGATIVE PRESSURE CONDITION at the furnace. Make-up air MUST be provided for the ventilation devices, in addition to that required by the furnace.





## WARNING

### CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death. The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1. Seal any unused openings in venting system;
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, NFPA 54/ANSI Z223.1-2009 and these instructions. In Canada, refer to CAN/CSA-B149.1-2010. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies, which could cause an unsafe condition
3. As far as practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building.
4. Close fireplace dampers.
5. Turn on clothes dryers and any appliance not connected to the venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they are operating at maximum speed. Do not operate a summer exhaust fan.
6. Follow the lighting instructions. Place the appliance being inspected into operation. Adjust the thermostat so appliance is operating continuously.
7. Test for spillage from draft hood equipped appliances at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
8. If improper venting is observed during any of the above tests, the venting system must be corrected in accordance with the National Fuel Gas Code, NFPA 54/ANSI Z223.1-2009. In Canada, refer to CAN/CSA-B149.1-2010.
9. After it has been determined that each appliance connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-fired burning appliance to their previous conditions of use.

conversion kit is used. Refer to the furnace rating plate for conversion kit information.

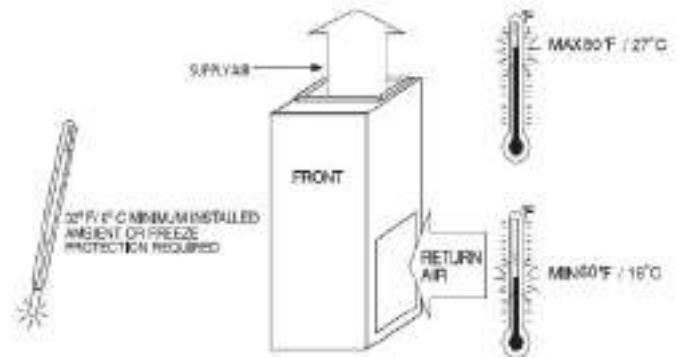
This Category IV furnace is approved for installation in Manufactured/Mobile housing. The furnace must be installed in accordance with the instruction provided in this manual. A manufactured home installation must conform with the *Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280*, or when this Standard is not applicable, *The Standard for Manufactured Home Installations (Manufactured Home Sites, Communities and Set-Ups), ANSI/NCS A225.1, and/or MH Series Mobile Homes, CAN/CSA-Z240*. **Follow all national and local codes and standards in addition to these instructions.** The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes.

This furnace is designed for minimum continuous return air temperature of 60 °F (16 °C) or intermittent operation down to 55 °F (13 °C) such as when used with a night setback thermostat. Return air temperature must not exceed 80 °F (27 °C). Failure to follow these return air temperature limits may affect reliability of heat exchangers, motors, and controls (Figure 1 : Freeze protection and return air temp).

The furnace should be sized to provide 100 % of the design heating load requirement plus any margin that occurs because of furnace model size capacity increments. Heating load estimates can be made using approved methods available from Air Conditioning Contractors of America (Manual J); American Society of Heating, Refrigerating, and Air Conditioning Engineers; or other approved engineering methods. Excessive over sizing of the furnace could cause the furnace and/or vent to fail prematurely.

## 2.1- CODES AND STANDARDS

Figure 1 : Freeze protection and return air temp



**Follow all national and local codes and standards in addition to these instructions.** The installation must comply with regulations of the serving gas supplier, local building, heating, plumbing, and other codes. In absence of local codes, the installation must comply with the national codes listed below and all authorities having jurisdiction. In the United States and Canada, follow all codes and standards for the following:

### 2.1.1- Safety

**USA:** National Fuel Gas Code (NFGC) NFPA 54-2009/ANSI Z223.1-2009 and the Installation Standards, Warm Air Heating and Air Conditioning Systems ANSI/NFPA 90B

**CANADA:** National Standard of Canada, Natural Gas and Propane Installation Code (NSCNGPIC) CAN/CSA B149.1-2010

### 2.1.2- General installation

**USA:** NFGC and the NFPA 90B. For copies, contact the National Fire Protection Association Inc., Battery march Park, Quincy, MA 02269; or for only the NFGC contact the American Gas Association, 400 N. Capitol, N.W., Washington DC 20001



## WARNING

### CARBON MONOXIDE POISONING HAZARD

For all venting configurations for this appliance and other gas appliances placed into operation for the structure, provisions for adequate combustion air and ventilation must be provided in accordance with:

**U.S.A. Installations:** Section 9.3 NFPA 54/ANSI Z223.1 1-2009, Air for Combustion and Ventilation and applicable provisions of the local building codes.

**Canadian Installations:** Part 8 of CAN/CSA-B149.1-10. Venting Systems and Air Supply for Appliances and all authorities having jurisdiction.

## 2- INTRODUCTION

This 4-way multi-positioning Category IV condensing furnace is CSA design certified as a direct vent (2 pipes) or non-direct vent (1 pipe). The furnace is factory shipped for use with natural gas. The furnace can be converted in the field for use with propane gas when a factory supplied

**CANADA:** NSCNGPIC. For a copy, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3, Canada

**2.1.3- Combustion and air ventilation**

**USA:** Section 9.3 of the NFPA54/ANSI Z223.1-2009 Air for Combustion and Ventilation

**CANADA:** Part 8 of the CAN/CSA B149.1-2010, Venting Systems and Air Supply for Appliances

**2.1.4- Duct systems**

**USA and CANADA:** Air Conditioning Contractors Association (ACCA) (Manual D), Sheet Metal and Air Conditioning Contractors National Association (SMACNA), or American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

**2.1.5- Acoustical lining and fibrous glass duct**

**USA and CANADA:** current edition of SMACNA, NFPA 90B as tested by UL Standard 181 for Class I Rigid Air Ducts.

**2.1.6- Gas piping and pipe pressure testing**

**USA:** NFPA 54/ANSI Z223.1-2009 NFGC; Chapters 5, 6, 7, and 8 and national plumbing codes.

**CANADA:** CAN/CSA-B149.1-2010, Parts 4, 5, 6, and 9.

**IN THE STATE OF MASSACHUSETTS:**

- ⇒ This product must be installed by a licensed plumber or gas fitter.
- ⇒ When flexible connectors are used, the maximum length shall not exceed 36". (914 mm).
- ⇒ When lever type gas shutoffs are used they shall be "T" handle type.
- ⇒ The use of copper tubing for gas piping is not approved by the state of Massachusetts.

**2.1.7- Electrical connections**

**USA:** National Electrical Code (NEC) ANSI/NFPA 70-2011

**CANADA:** CAN/CSA-B149.1-2010, Parts 4, 5, 6, and 9.

**2.2- ELECTROSTATIC DISCHARGE**

**CAUTION**

**FURNACE RELIABILITY HAZARD**

Failure to follow this caution may result in unit component damage. Electrostatic discharge can affect electronic components. Take precautions during furnace installation and servicing to protect the furnace electronic control. Precautions will prevent electrostatic discharges from personnel and hand tools which are held during the procedure. These precautions will help to avoid exposing the control to electrostatic discharge by putting the furnace, the control, and the person at the same electrostatic potential.

- 1) Disconnect all power to the furnace. Multiple disconnects may be required. DO NOT TOUCH THE CONTROL OR ANY WIRE CONNECTED TO THE CONTROL PRIOR TO DISCHARGING YOUR BODY'S ELECTROSTATIC CHARGE TO GROUND.
- 2) Firmly touch the clean, unpainted, metal surface of the furnace chassis which is close to the control. Tools held in a person's hand during grounding will be satisfactorily discharged.
- 3) After touching the chassis, you may proceed to service the control or connecting wires as long as you do nothing to recharge your body with static electricity (for example; DO NOT

move or shuffle your feet, do not touch ungrounded objects, etc.).

- 4) If you touch ungrounded objects (and recharge your body with static electricity), firmly touch a clean, unpainted metal surface of the furnace again before touching control or wires.
- 5) Use this procedure for installed and uninstalled (ungrounded) furnaces.
- 6) Before removing a new control from its container, discharge your body's electrostatic charge to ground to protect the control from damage. If the control is to be installed in a furnace, follow items 1 through 4 before bringing the control or yourself in contact with the furnace. Put all used and new controls into containers before touching ungrounded objects.
- 7) An ESD service kit (available from commercial sources) may also be used to prevent ESD damage.

**2.3- LOCATION**

**2.3.1- General**

These furnaces are shipped with materials to assist in proper furnace installation. These materials are shipped in the main blower compartment. See Table 2: for loose parts bag contents. This furnace must:

- ⇒ Be installed so the electrical components are protected from water;
- ⇒ Not be installed directly on any combustible material other than wood flooring;
- ⇒ Be located close to the chimney or vent and attached to an air distribution system. Refer to section 4-Duct installation;
- ⇒ Be provided ample space for servicing and cleaning. Always comply with minimum fire protection clearances shown in Table 1: Minimum clearance to combustible material for all units or on the furnace rating label.
- ⇒ Install the furnace with a correct slope if installed in other position than upflow. If installed upflow, make sure the furnace is leveled to ensure proper drainage of condensate.

**Table 1: Minimum clearance to combustible material for all units**

Position	Clearance in (mm)
Rear	0
Front	0
Required for service (front)	*24" (610)
All sides of supply plenum	*1"(25)
Sides	0
Vent	0
Top of furnace	1"

\*See local buildings codes.

**Table 2: Furnished parts list**

Quantity	Description
1	Plastic cap 5/8"
6	Plastic cap 1/2"
10	Screw TEKS HEX WSH #8-18 x 1/2
1	2" PVC pipe (Length = 1.5" OR 6.75")
1	Drain trap
1	Drain trap gasket
2	Gasket wall pipe flange
2	Wall pipe flange
1	Clear PVC tube 5/8" ID x 24"
1	Clear PVC tube 1/2" ID x 24"
1	Square PVC tube 3/16" ID x 8"
1	Brown wire (only used in Downflow and horizontal configuration)

The following types of furnace installations may require OUTDOOR AIR for combustion due to chemical exposures:

- ⇒ Commercial buildings
- ⇒ Buildings with indoor pools
- ⇒ Laundry rooms
- ⇒ Hobby or craft rooms, and
- ⇒ Chemical storage areas

If air is exposed to the following substances, it should not be used for combustion air and outdoor air may be required for combustion:

- ⇒ Permanent wave solutions
- ⇒ Chlorinated waxes and cleaners
- ⇒ Chlorine based swimming pool chemicals
- ⇒ Water softening chemicals
- ⇒ De-icing salts or chemicals
- ⇒ Carbon tetrachloride Halogen type refrigerants
- ⇒ Cleaning solvents (such as perchloroethylene)
- ⇒ Printing inks, paint removers, varnishes, etc.
- ⇒ Hydrochloric acid
- ⇒ Cements and glues
- ⇒ Antistatic fabric softeners for clothes dryers
- ⇒ Masonry acid washing materials

All fuel burning equipment must be supplied with air for fuel combustion. Sufficient air must be provided to avoid negative pressure in the equipment room or space. A positive seal must be made between the furnace cabinet and the return air duct to prevent pulling air from the burner area.

Place the unit so that proper venting can be achieved, with a minimum number of elbows, in accordance with the instructions in this manual. The furnace should be located as close to the chimney (vertical venting) or to the outside vent wall (horizontal venting) as possible.

When installing the furnace, provisions must be made to insure the supply of adequate combustion and ventilation air in accordance with the air for combustion and ventilation section of the National Fuel Gas Code, NFPA 5/ANSI Z223.1-2002, or latest edition, or applicable provisions of the local building code.

**Figure 2 : Installation in a garage**

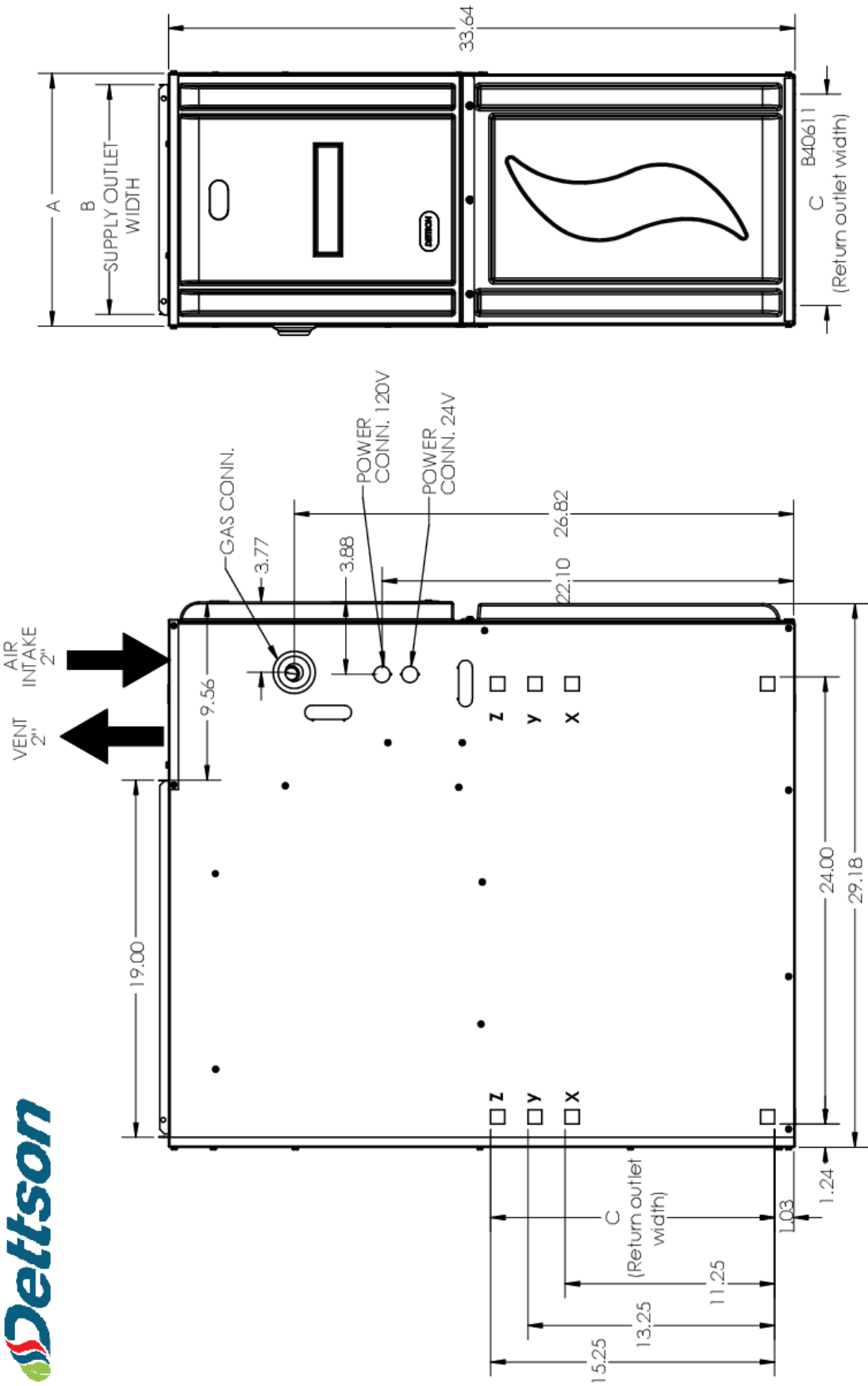


### 2.3.2- Location relative to cooling equipment

The cooling coil can either be installed in the supply air duct or in the return air duct. If the cooling coil is installed in the supply air duct, it must be at a minimum of 6" over the furnace heat exchanger.



Figure 3 : Dimensional drawing



Air return	
Position	Furnace size
X	15 @ 45 000
Y	60 @ 75 000
Z	90 @ 120 000

Furnace size	A (Cabinet width)	B (Supply outlet width)	C (Return outlet width)	Filter size
15k	13.500	12.500	11.250	13 x 24
30k	13.500	12.500	11.250	13 x 24
45k	13.500	12.500	11.250	13 x 24
60k	15.750	14.750	13.250	15 x 24
75k	15.750	14.750	13.250	15 x 24
90k	21.188	20.000	15.250	17 x 24
105k	21.188	20.000	15.250	17 x 24
120k	21.188	20.000	15.250	17 x 24

### 3- INSTALLATION

The furnace is factory built for upflow position. In this position, the drain trap can be installed on right or left side depending on air return duct. When installing the furnace in the upflow position, make sure it is leveled.

**To ensure proper drainage of the condensate when installed in position other than upflow, tilt the furnace from level position to a minimum slope of 1/2" higher at back to front.**

When installing the furnace in other orientation than the upflow position, simply configure the condensate tubing accordingly with the instructions provided in this section of the manual.

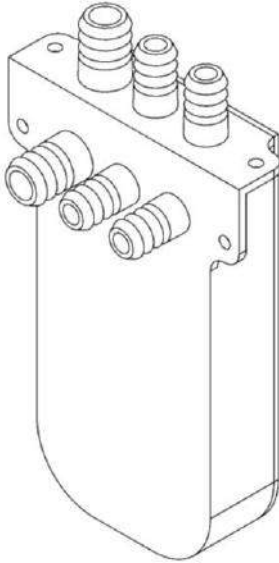
#### CAUTION

##### PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in water spillage and/or property damage.

For any position other than upflow, the multiposition pressure switch must be connected pneumatically to the condensate box and electrically to the control to allow the furnace to stop in the event of drain blockage.

Figure 4 : Drain trap



#### 3.1- UPFLOW ORIENTATION

In the upflow orientation, the drain trap (Figure 4 : Drain trap) can be installed to the right or to the left of the furnace. The condensate drain hoses must be routed from the trap through the furnace casing. Remove the knock out parts of metal and install the hoses to the drain trap. The condensate hoses can be routed through the left or right.

Figure 5 : Left side condensate drain connection

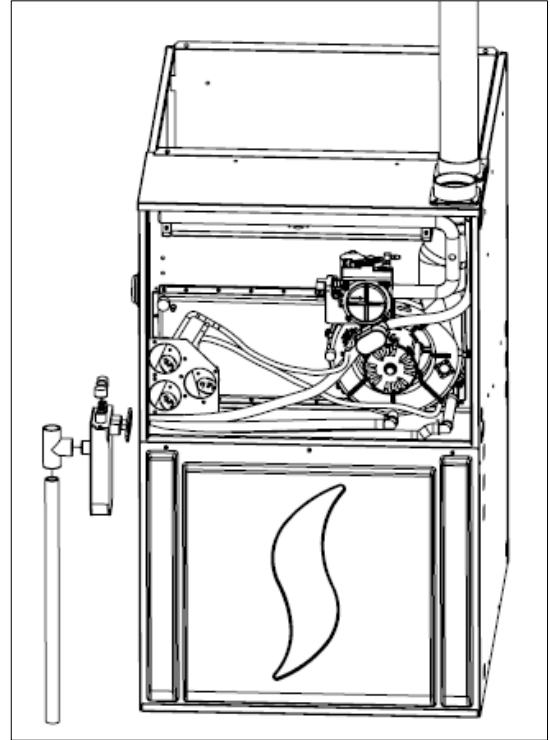
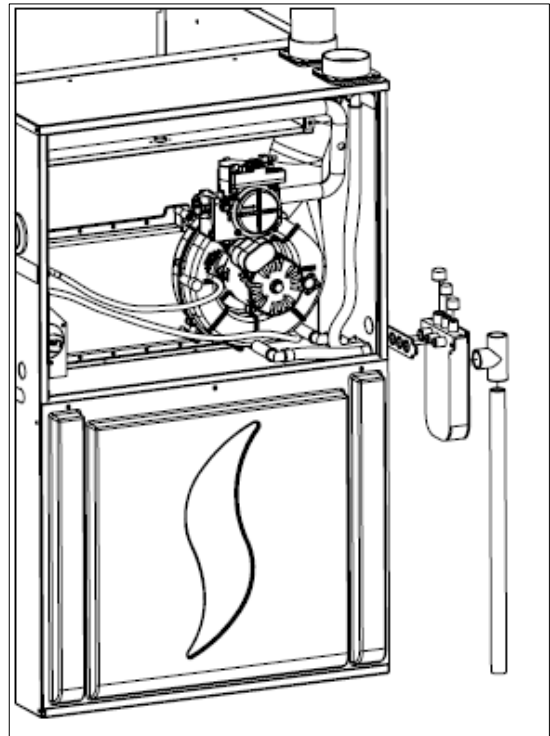


Figure 6 : Right side condensate drain connection



##### 3.1.1- Right side condensate drain trap connection

1. Remove the oblong knock-out from the right side of the casing.
2. Place the drain trap gasket on drain trap, in a way that the holes are aligned.
3. Install the drain trap on the right side, the three outlet stub of the drain trap toward the interior of the furnace.

The three outward stubs ends are now inside the furnace.

4. Screw in place the drain trap with two head tapping screws on the right side of the furnace.
5. Connect the outlet drain from the drain trap to an additional condensate piping using a 1/2" tee for an adequate drainage of the condensate. **DO NOT vent using the remaining 3 outlet stubs.** Such a drain shall be in compliance with local building codes or to a condensate pump approved for the use with acidic furnace condensate.
6. Prime the drain trap with water. This will ensure proper furnace drainage at startup and will avoid any recirculation of flue gas.
7. On the remaining 3 outlet stub, connect black vinyl cap (1x5/8" and 2x1/2"). Those cap are furnished in the loose part bag.

### 3.1.2- Left side condensate drain trap connection

1. Remove the oblong knock-out from the left side of the casing.
2. Place the drain trap gasket on drain trap.
3. Install the drain trap on the side, the three outlet stubs of the drain trap toward the interior of the furnace. The three outward stubs are now inside the furnace.
4. Connect each of condensate tubes to a stubs. Use de furnished 1/2" and 5/8" hoses to cut the appropriate length to get to the drain trap. The condensate hose from the condensate box is 5/8" and it must be connected to the 5/8" stub of the drain trap. The condensate hoses from the ID blower and the vent flange are 1/2" and are connected to the 1/2" stubs of the drain trap.
5. Ensure the hoses are adequately connected to the stubs.
6. Screw in place the drain trap with two head tapping screws on the side of the furnace.
7. Connect the outlet drain from the drain trap to an additional condensate piping using a 1/2" tee for an adequate drainage of the condensate. **DO NOT vent using the remaining three outlet stubs.** Such a drain shall be in compliance with local building codes or to a condensate pump approved for the use with acidic furnace condensate.
8. Prime the drain trap with water. This will ensure proper furnace drainage at start up and will avoid any recirculation of flue gas.
9. On the remaining 3 outlet stub, connect black vinyl cap (1x5/8" and 2x1/2"). Those cap are furnished in the part bag.

## 3.2- DOWN FLOW ORIENTATION

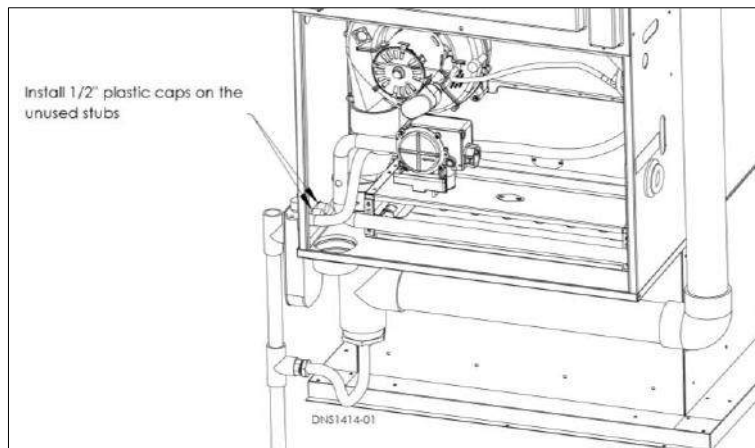
To install the furnace in down flow position, the following steps are required for proper operation.

**NOTE:** It is STRONGLY RECOMMENDED to use the optional downflow base to ensure the 1" clearance around the supply duct going through the floor and the proper slope of the furnace for condensate drainage. Also, the base allows sufficient spacing for the venting and the drain trap.

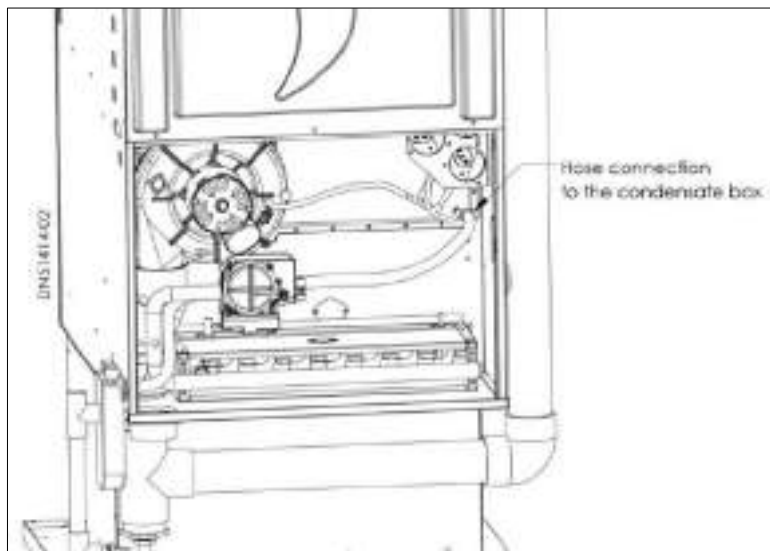
### 3.2.1- Down flow condensate drain trap connection

1. Remove all PVC tubes from the ID blower, condensate box and vent collector and block the stub openings with furnished 5/8" & 1/2" black caps.
2. Remove the knock-out from the bottom left side of the casing.
3. Place the drain trap gasket on drain trap.
4. Install the drain trap on the bottom left side, the three outlet stubs ends of the drain trap directed toward the interior of the furnace. The three outward stubs ends now penetrate inside the furnace.
5. Screw in place the drain trap with 2 Tek tapping screws to the side of the furnace.
6. Install two 1/2" black plastic caps on the 1/2" stub of the drain trap. See Figure 7 : Unused stub on drain trap.
7. Cut the required length of furnished 5/8" clear PVC tube and connect one end on the port on the lower right side of the condensate box.(Figure 8 : Condensate box)
8. Connect the other end to 5/8" stub of the drain trap and secure the hose on the gas manifold with a tie wrap.
9. Connect the outlet from the drain trap to the condensate drain piping with a tee. **DO NOT vent using the remaining 3 outlet stubs.** Such a drain shall be in compliance with local building codes or to a condensate pump approved for the use with acidic furnace condensate.
10. The venting should be drained using a PVC 636 tee. Connect this tee to a P-trap and connect it to your condensate drain. Commercially available condensate trap exist for use with IPEX system 636.
11. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

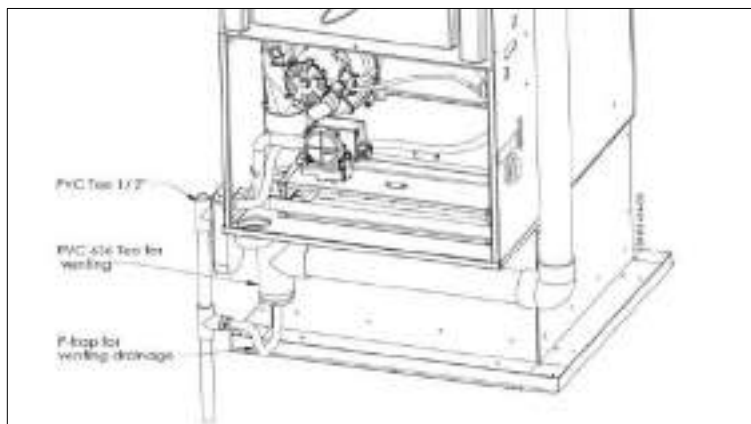
**Figure 7 : Unused stub on drain trap**



**Figure 8 : Condensate box**



**Figure 9 : Down flow orientation**



### 3.2.2- Down flow venting drainage

All furnaces with horizontal exhaust vent piping must have a PVC 636 drain tee assembly and trap installed in the exhaust pipe as close to the furnace as possible. See Figure 9 : Down flow orientation. Commercially available condensate trap exist for use with IPEX system 636.

### 3.2.3- Multiposition pressure switch connection downflow

The 3/16 stub just beside the drain of the condensate box **must be drilled or cut open**. The black squared PVC tubing of the pressure switch (-0.2 in w.c.) must be connected to this stub. This tubing is furnished with the furnace. See Figure 10 : Condensate pressure switch.

The pressure switch must now be electrically connected in series with the low fire pressure switch (top) with the brown jumper. See Figure 14 : Pressure switch assembly and wiring diagrams.

## 3.3- HORIZONTAL RIGHT ORIENTATION

### 3.3.1- Horizontal right condensate drain connection

1. Remove all PVC tubes from the ID blower, condensate box and vent collector and block the stub openings with furnished 5/8" & 1/2" black caps.
2. Remove the knock-outs from the bottom middle side of the casing.
3. Place the drain trap gasket on the drain trap.
4. Screw in place the drain trap with 2 Tek tapping screws to the side of the furnace.
5. Install two 1/2" black plastic caps on the unused stub openings on the drain trap inside the furnace. See Figure 11 : Unused stub in the horizontal right position.
6. Connect a piece of 5/8" PVC tube to the bottom left of the condensate box and route with an elbow to the drain trap. See Figure 12 : Horizontal Right Drain connection of the condensate box.
7. Connect the outlet from the drain trap to the condensate drain piping using a 1/2" PVC tee. **DO NOT vent using the remaining 3 outlet stubs.** Such a drain shall be in compliance with local building codes or to a condensate pump approved for use with acidic furnace condensate.
8. Make sure the unused stubs ends of the drain trap are plugged with furnished plastic caps.

**NOTE :** The drain trap must be vertical.

### 3.3.2- Horizontal right vent drainage

All furnaces with horizontal exhaust vent piping must have a PVC 636 drain tee assembly and trap installed in the exhaust pipe as close to the furnace as possible. See Figure 13 : Horizontal Right Drain Trap position.

### 3.3.3- Multiposition pressure switch connection (horizontal)

The 3/16 stub just beside the drain of the condensate box must be drilled or cut open. The tubing of the pressure switch (-0.2 nearest to the ID blower) must be connected to this stub.

The pressure switch must now be electrically connected in series with the low fire pressure switch (top) with the brown jumper. See Figure 14 : Pressure switch assembly and wiring diagrams.

## 3.4- HORIZONTAL LEFT ORIENTATION

### 3.4.1- Horizontal left condensate drain connection

1. Remove the knock-outs from the bottom middle side of the casing.
2. Drill open the new bottom stub of the ID blower (if not already open). Be sure to remove all debris.
3. Reroute the ID blower drain tube from the bottom of the ID blower casing to one of the 1/2" stub. **Do not screw the drain trap to the furnace casing.**
4. Block the other open ID blower drain with a 1/2" black cap.
5. Reroute the condensate box drain tube from the bottom of the condensate box through the casing.
6. Block the other opening of the condensate box with a 5/8" black cap.
7. Reroute the vent collector drain tube to one of the 1/2" stubs.
8. Apply the neoprene gasket around the 5/8" and 1/2" tubes at the point where they cross the furnace casing to seal the passage.
9. Plug the 5/8" and 1/2" tubes to the drain trap. The drain trap must be vertical.
10. Connect the outlet from the drain trap to the condensate drain piping using a 1/2" PVC tee. Such a drain shall be in compliance with local building codes or to a condensate pump approved for use with acidic furnace condensate.
11. Make sure the unused stub ends of the drain trap are plugged with furnished plastic caps.

### 3.4.2- Multiposition pressure switch connection horizontal

The 3/16" stub just beside the drain of the condensate box must be drilled or cut open. The tubing of the pressure switch (-0.2 nearest to the ID blower) must be connected to this stub.

The pressure switch must now be electrically connected in series with the low fire pressure switch (top) with the brown jumper. See Figure 14 : Pressure switch assembly and wiring diagrams



Figure 10 : Condensate pressure switch

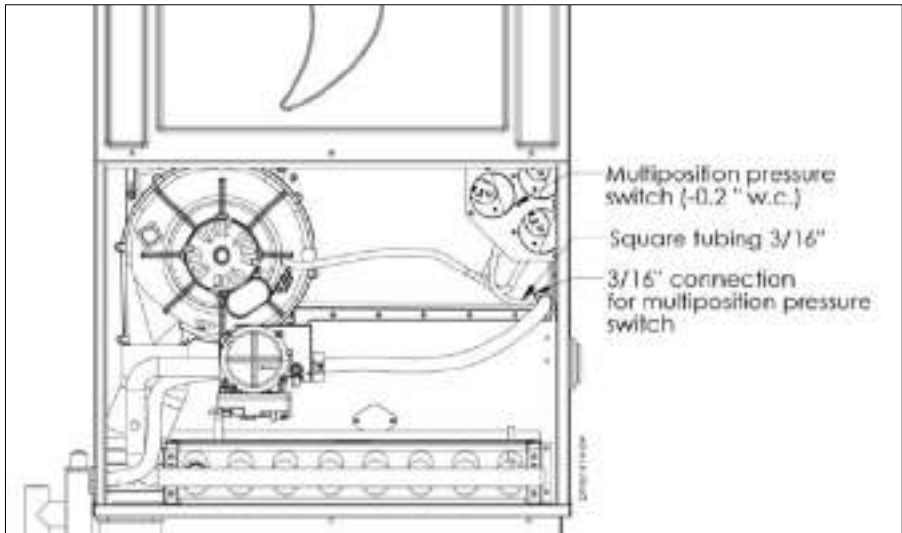


Figure 11 : Unused stub in the horizontal right position

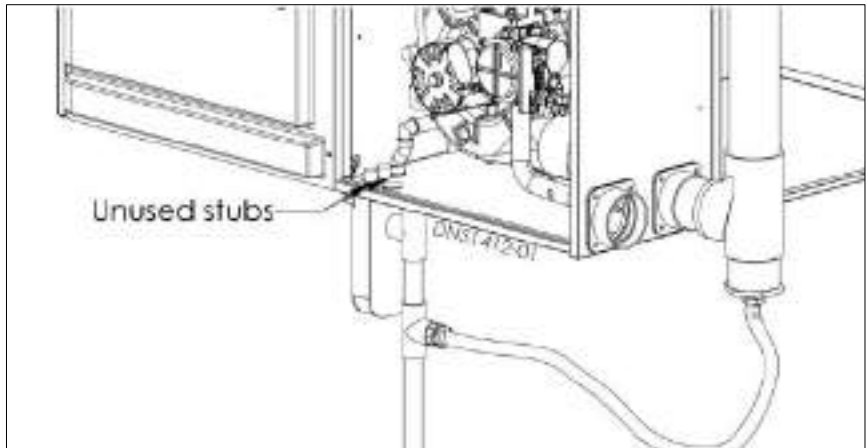


Figure 12 : Horizontal Right Drain connection of the condensate box

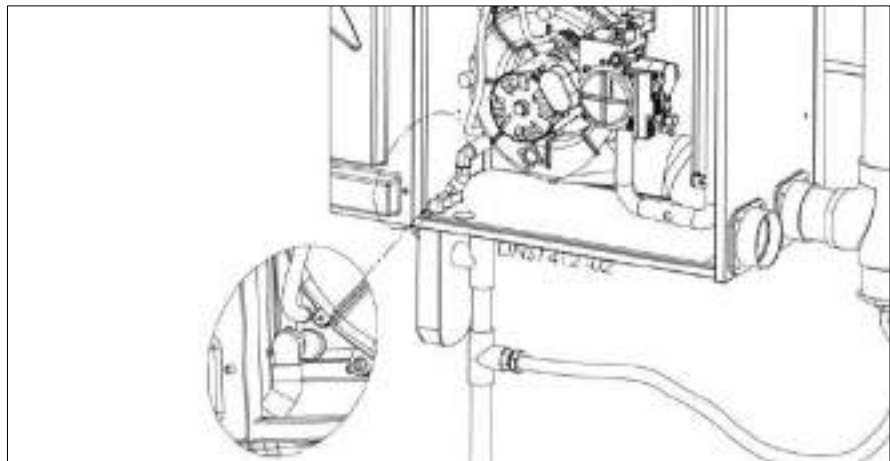


Figure 13 : Horizontal Right Drain Trap position

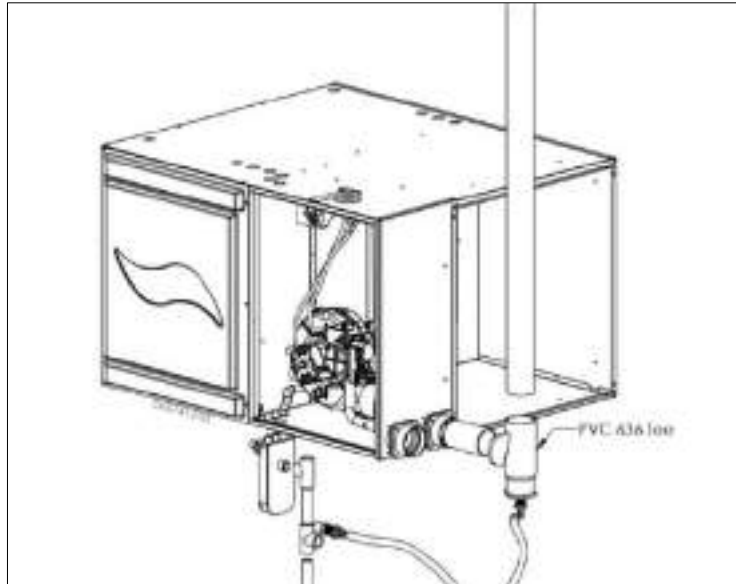


Figure 14 : Pressure switch assembly

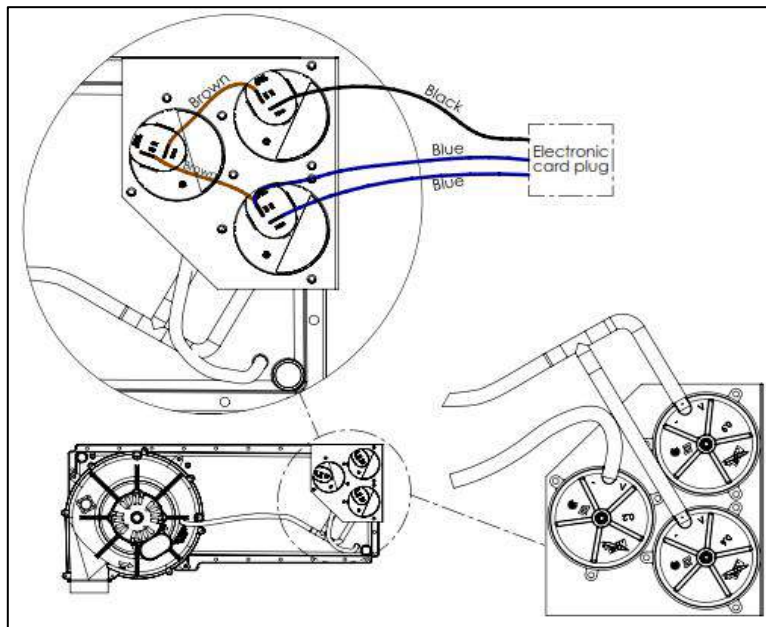


Figure 15 : Horizontal Left condensate drain connection (1)

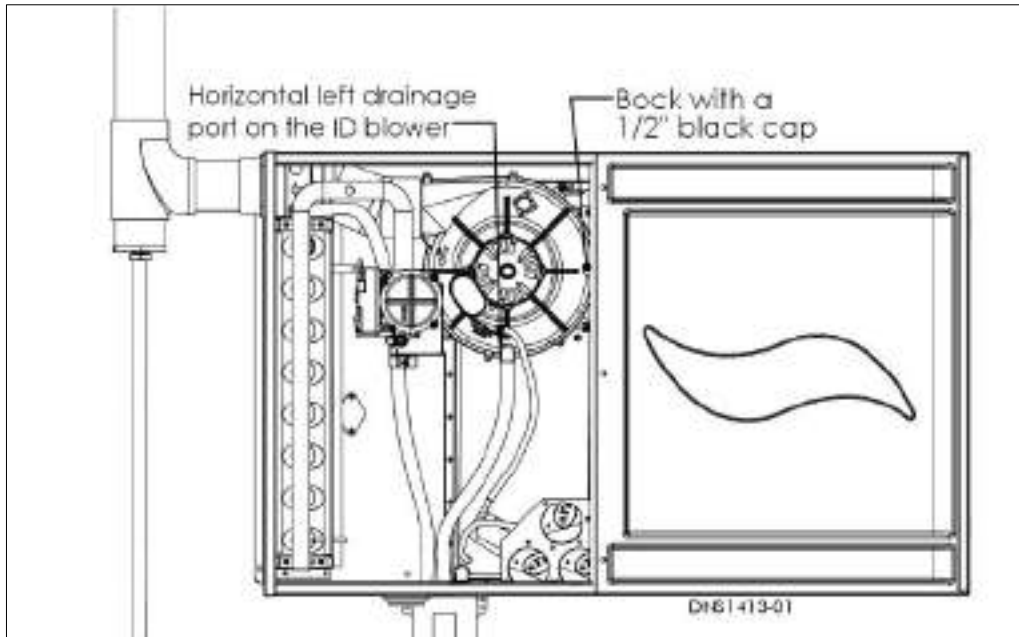
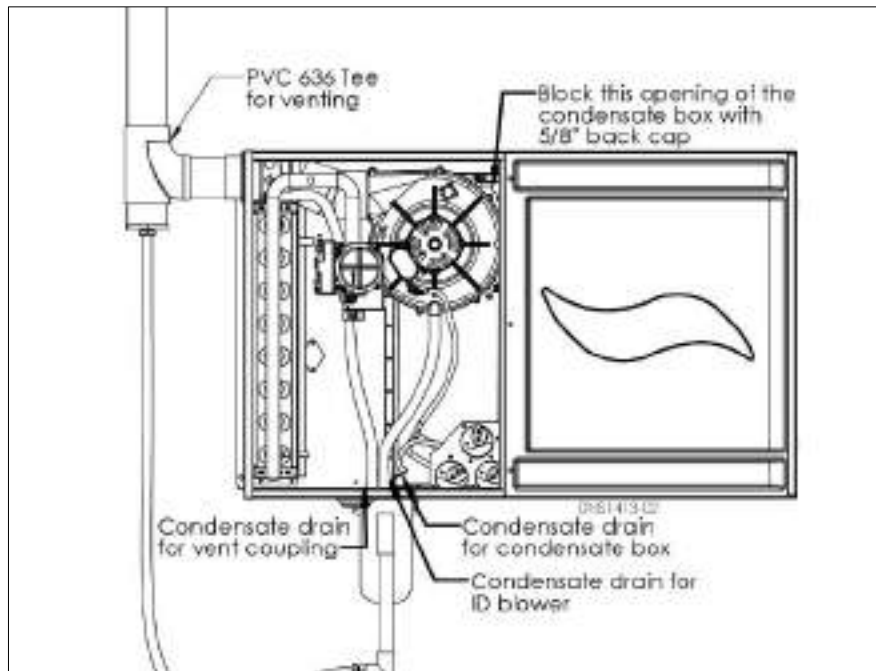


Figure 16 : Horizontal left condensate drain connection (2)



## 4- DUCT INSTALLATION

### 4.1- GENERAL REQUIREMENTS

The duct system should be designed and sized according to accepted national standards such as those published by: Air Conditioning Contractors Association (ACCA), Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) or consult *The Air Systems Design Guidelines* reference tables available from your local distributor.

The duct system should be sized to handle the required system design CFM at the design external static pressure. The furnace airflow rates are

provided at the end of this manual. When a furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall also be handled by duct(s) sealed to the furnace casing and terminating outside the space containing the furnace.

Secure ductwork with proper fasteners for type of ductwork used. Seal supply and return duct connections to furnace with code approved tape or duct sealer.

Ductwork passing through an unconditioned space should be insulated to enhance system performance. When air conditioning is used, a vapour barrier is recommended.

Maintain a 1 in. (25 mm) clearance from combustible materials to supply air ductwork for a distance of 36 in. (914 mm) horizontally from the furnace. See NFPA 90B or local code for further requirements.

**NOTE:** Flexible connections can be used between ductwork and furnace to prevent transmission of vibration.

Proper airflow is necessary for the correct operation of this furnace. If ductwork is not sized properly, the furnace can operate erratically.

Installer should size the ducts according to industry standards and methods. The total static pressure drop of the supply and return ducts should not exceed 0.3" w.c. if this furnace is installed with traditional ductwork.

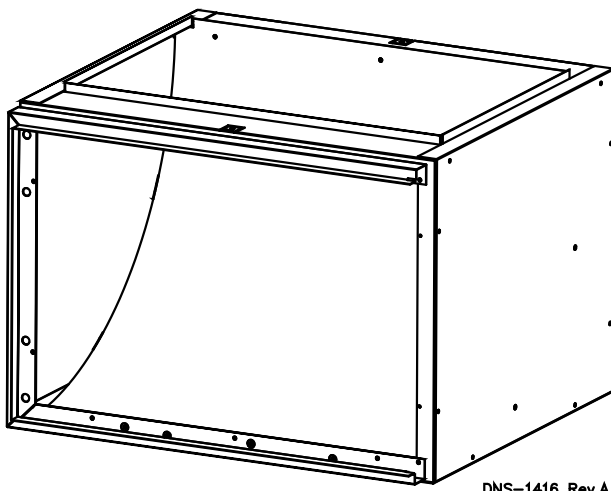
CFM Tables are provided at the end of this manual to help installer size the ducts.

## 4.2- RETURN AIR CONNECTIONS

The return air duct must be connected to the bottom, left side or right side. If necessary (depending on your filter restriction), provision should be made for a double return.

**NOTE:** In downflow configuration, side return air is not permitted, it must be connected to bottom.

Figure 17 : Return air base



### 4.2.1- Bottom return air inlet

In Upflow orientation, for the bottom inlet, installer can use a return air base. This base allows the connection of the duct on the side with a bottom inlet. See Part list - Options for the part number corresponding to your furnace.

Cut a rectangular opening on the bottom plate of the furnace. To know what dimension to be used, refer to the input of the furnace as showed on Figure 3 : Dimensional drawing. Install the return air inlet as per local codes.

### 4.2.2- Side return air inlet

Remove 4 knock-outs on the side of the furnace on 8 knock-outs available. Use the knock-outs related to the furnace size as shown on Figure 3 : Dimensional drawing. This concerns the width of the return outlet. Install the return air inlet as per local codes.

## 4.3- FILTER ARRANGEMENT

There are no provisions for an internal filter rack in these furnaces. An external filter is required.

Dettson doesn't provide any air filter or filter rack.

## 4.4- SUPPLY AIR DUCTS

The supply air duct must be connected **ONLY** to the furnace supply outlet air duct flanges or air conditioning coil casing (when used). **DO NOT** cut main furnace casing side to attach supply air duct, humidifier, or other accessories. All accessories **MUST** be connected to duct external to furnace main casing.

**NOTE:** Many states, provinces and localities are considering or have implemented standards and/or restrictions on duct sizing practices, ductwork leakage, and/or ductwork thermal, airflow and electrical efficiencies. **CONSULT LOCAL CODE OFFICIALS** for ductwork design and performance requirement in your area.

### 4.4.1- Duct work acoustical treatment

Metal duct systems that do not have a 90 degree elbow and 10 ft. (3 M) of main duct to the first branch take-off may require internal acoustical lining. As an alternative, fibrous ductwork may be used if constructed and installed in accordance with the latest edition of SMACNA construction standard on fibrous glass ducts. Both acoustical lining and fibrous ductwork shall comply with NFPA 90B as tested by UL Standard 181 for Class 1 Rigid air ducts.

## 5- GAS PIPING

### 5.1- GENERAL

Gas piping must be installed in accordance with national and local codes. Refer to current edition of NFGC in the U.S.A.

Refer to current edition of CAN/CSA B149.1 in Canada.

Installations must be made in accordance with all authorities having jurisdiction.

**NOTE:** Use a back-up wrench on the inlet of the gas valve when connecting the gas line to the gas valve.

#### In the state of Massachusetts:

1. Gas supply connections **MUST** be performed by a licensed plumber or gas fitter.
2. When flexible connectors are used, the maximum length shall not exceed 36 in. (915 mm).
3. When lever handle type manual equipment shutoff valves are used, they shall be "T" handle valves.
4. The use of copper tubing for gas piping is **NOT** approved by the state of Massachusetts.

Report to Table 3: Maximum capacity of pipe in Ft<sup>3</sup> of gas/hr for recommended gas pipe sizing. Support all gas piping with appropriate straps, hangers, etc. Use a minimum of 1 hanger every 6 ft (1.8 m). Joint compound (pipe dope) should be applied sparingly and only to male threads of joints. Pipe dope must be resistant to the action of propane gas.

An accessible manual equipment shut off valve **MUST** be installed external to furnace casing.

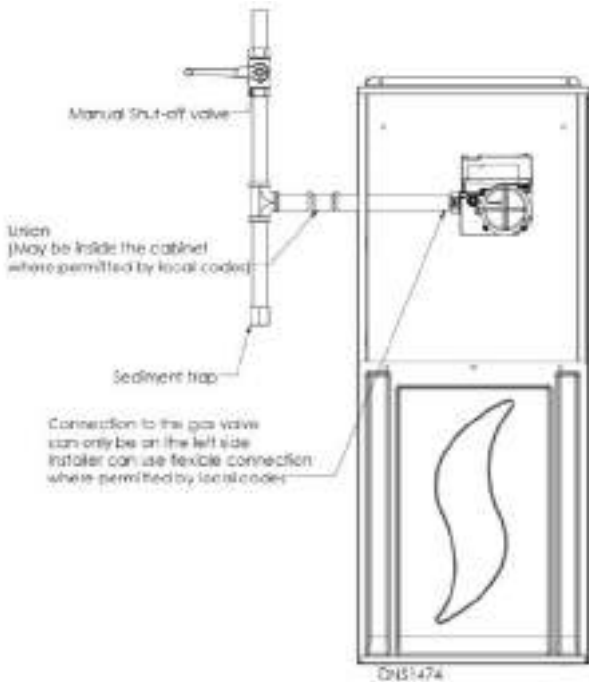
Install a sediment trap in riser leading to furnace as shown in Figure 18 : Typical gas pipe arrangement. Connect a capped nipple into lower end of tee. Capped nipple should extend below level of furnace gas controls. Place a ground joint union between furnace gas control valve and exterior manual equipment gas shutoff valve (for ridged black pipe).

**Table 3: Maximum capacity of pipe in Ft<sup>3</sup> of gas/hr**

Nominal Iron pipe size in. (mm)	Internal dia. in. (mm)	Length of pipe - FT (M)				
		10 (3.0)	20 (6.0)	30 (9.1)	40 (12.1)	50 (15.2)
1/2 (13)	0.622 (158)	175	120	97	82	73
3/4 (19)	0.824 (20.9)	360	250	200	170	151
1 (25)	1.049 (26.6)	680	465	375	320	285
1-1/4 (32)	1.380 (35.0)	1400	950	770	660	580
1-1/2 (39)	1.610 (40.9)	2100	1460	1180	990	900

\* Cubic feet of gas per hr for gas pressures of 0.5 psig (14 in. w.c)  
 (Based on a 0.60 specific gravity gas)  
 Ref: Table 6.2 of NFPA54/ANSI Z223.1-2009

**Figure 18 : Typical gas pipe arrangement**



Piping should be pressure and leak tested in accordance with the current addition of the NFGC in the United States, local, and national plumbing and gas codes before the furnace has been connected. Refer to current edition of NSCNPGIC in Canada. After all connections have been made, purge lines and check for leakage at furnace prior to operating furnace.

**NOTE:** The furnace gas control valve inlet pressure tap connection is suitable to use as test gauge connection providing test pressure.

**Table 4 : Gas pressure**

Gas Pressure (psig)	in w.c.	Natural gas	Propane
Maximum		10.5 (0.38)	13.0 (0.47)
Minimum		4.5 (0.16)	11.0 (0.40)

If pressure exceeds 0.38 psig (10.5 in. W.C.), gas supply pipe must be disconnected from furnace and capped before and during supply pipe pressure test. If test pressure is equal to or less than 0.38 psig (10.5 in. W.C.), turn off electric shutoff switch located on furnace gas control valve and accessible manual equipment shutoff valve before and during supply pipe pressure test. After all connections have been made, purge lines and check for leakage at furnace prior to operating furnace.

The gas supply pressure shall be within the maximum and minimum inlet supply pressures marked on the rating plate with the furnace burners and in Table 4 : Gas pressure.

**5.2- GAS VALVE AND PROPANE CONVERSION KIT**

To convert from natural to L.P. gas, installer should use the appropriate conversion kit. Please refer to part list at the end of this manual.

**5.2.1- 2 stage propane conversion kit**

1. Remove both regulator cover screws.
2. Remove both regulator adjustment screws (beneath the cover screws).
3. Remove both Natural Gas regulator springs from regulator sleeves.
4. Insert the L.P. regulator springs (provided in the conversion kit) into the regulator sleeves.
5. Replace the High regulator adjustment screw and adjust approximately 12 turns to the bottom stop.
6. Replace the Low regulator adjustment screw and adjust approximately 8 turns to the bottom stop.
7. Adjust both outlet pressures.
8. Replace both regulator cover screws.
9. Attach the WARNING label (provided in the kit) to the gas valve where it can be readily seen. Also attach the small round L.P. labels to the top of the regulator cover screws.
10. Change the orifice of the manifold, they are provided in the conversion kit.
11. Conversion back to Natural Gas use may be made at a later date by retaining the Natural Gas springs (remove in step 3, above) and the orifice and following the same procedure (except for burner pressures).

**5.2.2- Single stage propane conversion kit**

1. Remove regulator cover screw.
2. Remove regulator adjustment screw (beneath the cover screw)
3. Remove Natural Gas regulator spring from regulator sleeve.
4. Insert the L.P. regulator spring (provided in the conversion kit) into the regulator sleeve.
5. Replace the regulator adjustment screw. Then adjust the outlet pressure.
6. Replace the regulator cover screw.
7. Attach the WARNING label (provided in the kit) to the gas valve where it can be readily seen. Also attach the small round L.P. label to the top of the regulator cover screw.
8. Change the orifice of the manifold, they are provided in the conversion kit.
9. Conversion back to Natural Gas use may be made at a later date by retaining the Natural Gas spring and orifice and following the same procedure (except for burner pressure).

**5.3- GAS PIPE GROMMET**

For direct vent (2 pipes) applications, the hole for the gas pipe on the cabinet must be sealed to prevent air leakage. Install the grommet in the hole, then insert the gas pipe and apply fillet paste.

**6- ELECTRICAL CONNECTIONS**

**WARNING**

**FIRE HAZARD**

Failure to follow this warning could result in personal injury, death, or property damage.

Do not connect aluminium wire between disconnect switch and furnace. Use only copper wire.

Check all factory and field electrical connections for tightness.

Supplied field wiring shall conform to the limitations of 63°F (33°C) rise.

## 6.1- 120 V WIRING

Furnace must have a 120 V power supply properly connected and grounded.

**NOTE:** Proper polarity must be maintained for 120 V wiring. If polarity is incorrect, control LED status indicator light will flash rapidly and furnace will **NOT** operate.

Verify that the voltage, frequency, and phase correspond to that specified on unit rating plate. Also, check to be sure that service provided by utility is sufficient to handle load imposed by this equipment. Refer to rating plate or Table 5 : Electrical data **Erreur ! Source du renvoi introuvable.** for equipment electrical specifications.

### U.S.A. Installations:

Make all electrical connections in accordance with the current edition of the National Electrical Code (NEC) ANSI/NFPA 70 and any local codes or ordinances that might apply.

### Canada Installations:

Make all electrical connections in accordance with the current edition of the Canadian Electrical Code CSA C22.1 and any local codes or ordinances that might apply.

Use a separate, fused branch electrical circuit with a properly sized fuse or circuit breaker for this furnace. See Table 5 : Electrical data for fuse specifications. A readily accessible means of electrical disconnect must be located within sight of the furnace.

**Table 5 : Electrical data**

Single Stage X13 motor						
Unit size	Volt-Hertz-Phase	Operating voltage range		Maximum unit amps	Unit ampacity	Maximum Fuse of CKT BKR Amp
		max.	min.			
45000	120-60-1	127	104	10.2	11.9	15
60000	120-60-1	127	104	10.2	11.9	15
75000	120-60-1	127	104	11.4	13.5	15
105000	120-60-1	127	104	13.9	16.6	20
120000	120-60-1	127	104	13.9	16.6	20
Single Stage PSC motor						
Unit size	Volt-Hertz-Phase	Operating voltage range		Maximum unit amps	Unit ampacity	Maximum Fuse of CKT BKR Amp
		max.	min.			
45000	120-60-1	127	104	13.4	15.9	20
60000	120-60-1	127	104	13.4	15.9	20
75000	120-60-1	127	104	13.1	15.5	20
105000	120-60-1	127	104	16.4	19.7	20
120000	120-60-1	127	104	16.4	19.7	20
Two Stage ECM motor						
Unit size	Volt-Hertz-Phase	Operating voltage range		Maximum unit amps	Unit ampacity	Maximum Fuse of CKT BKR Amp
		max.	min.			
45000	120-60-1	127	104	10.7	12.7	15
60000	120-60-1	127	104	12.6	15	15
75000	120-60-1	127	104	12.6	15	15
105000	120-60-1	127	104	15.8	19	20
120000	120-60-1	127	104	15.8	19	20
Two stage PSC motor						
Unit size	Volt-Hertz-Phase	Operating voltage range		Maximum unit amps	Unit ampacity	Maximum Fuse of CKT BKR Amp
		max.	min.			
45000	120-60-1	127	104	12.8	15.3	20
60000	120-60-1	127	104	12.8	15.3	20
75000	120-60-1	127	104	12.5	15.0	15
105000	120-60-1	127	104	15.8	19.1	20
120000	120-60-1	127	104	15.8	19.1	20

## 6.2- 24 V WIRING

Make field 24 V connections at the 24 V terminal strip. **Connect terminal Y/Y2** for proper cooling operation. Use only AWG No. 18, color-coded, copper thermostat wire.

**NOTE:** Use AWG No. 18 color coded copper thermostat wire for lengths up to 100ft. (30.5m). For wire lengths over 100 ft., use AWG No 16 wire.

The 24V circuit contains an automotive type, 3 amp fuse located on the control board. Any 24V direct shorts during installation, service or maintenance could cause this fuse to blow. If fuse replacements is required use **ONLY** a 3 amp fuse. Refer to wiring diagrams for the location of the fuse.

## 6.3- FUSE

The 24 V circuit contains an automotive type, 3-amp fuse located on the control. Any direct shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use **ONLY** a 3 amp.

## 6.4- THERMOSTATS

### Thermostats and Control Settings for Two Stage Furnaces.

A single stage or two stage heating and single stage or two stage cooling thermostat may be used with the furnace. Consult the thermostat installation instructions for specific information about configuring the thermostat.

### Thermostats and Control Settings for Single Stage furnaces.

A single stage heating and single stage or two stage cooling thermostat may be used with the furnace. Consult the thermostat installation instructions for specific information about configuring the thermostat.

## 6.5- ALTERNATE POWER SUPPLY

The furnace is designed to operate on utility generated power which has a smooth sinusoidal waveform. If the furnace is to be operated on a generator or other alternate power supply must produce a smooth sinusoidal waveform for compatibility with the furnace electronics. The alternate power supply must generate the same voltage, phase, and frequency (Hz) as shown on the furnace rating plate.

Power from an alternate power supply that is non-sinusoidal may damage the furnace electronics or cause erratic operation.

Contact the alternate power supply manufacturer for specifications and details.



Figure 19 : Wiring diagram single stage PSC (CXX-1-D)

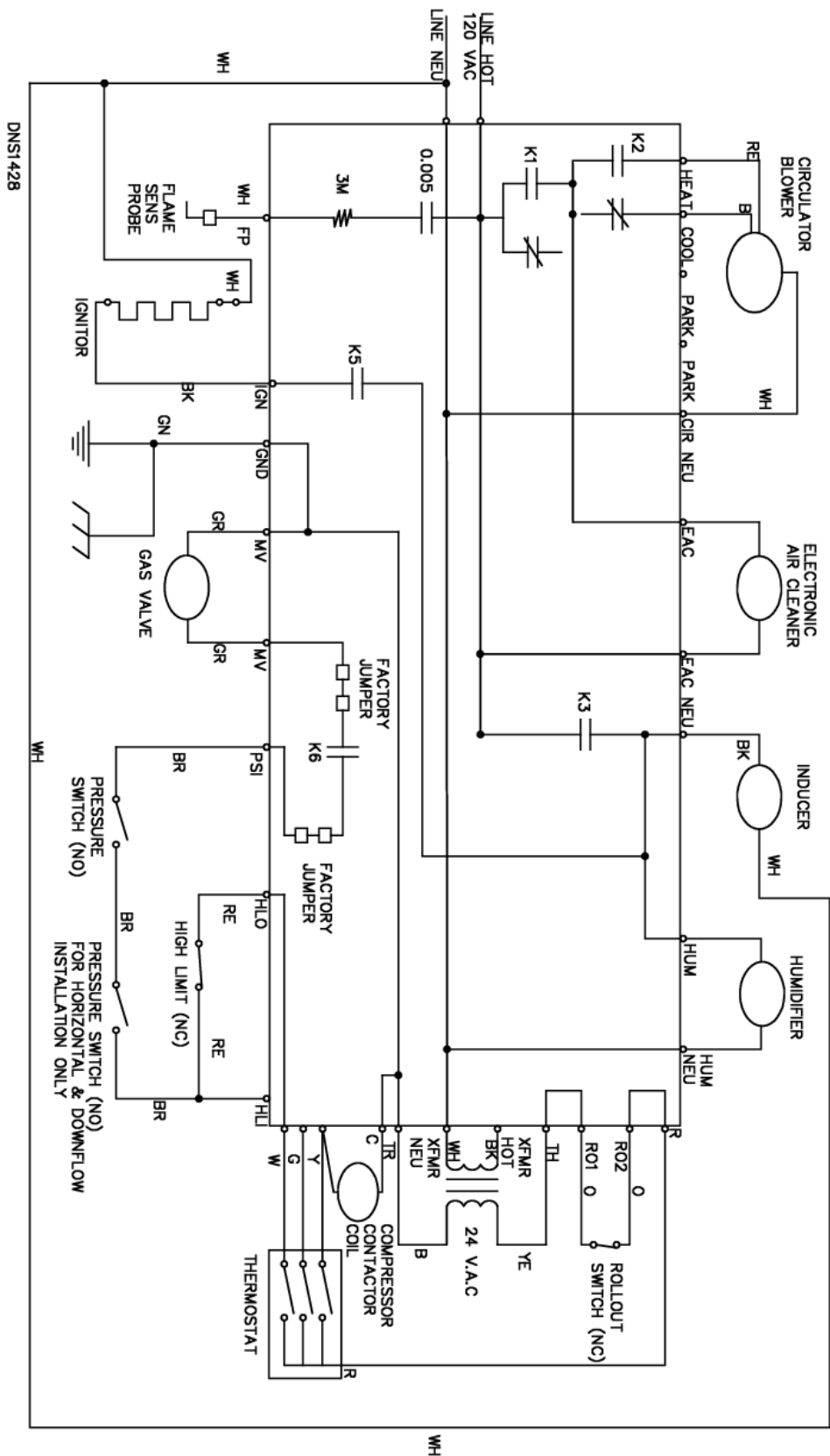


Figure 20 : Wiring diagram two stage PSC (CXX-2-D)

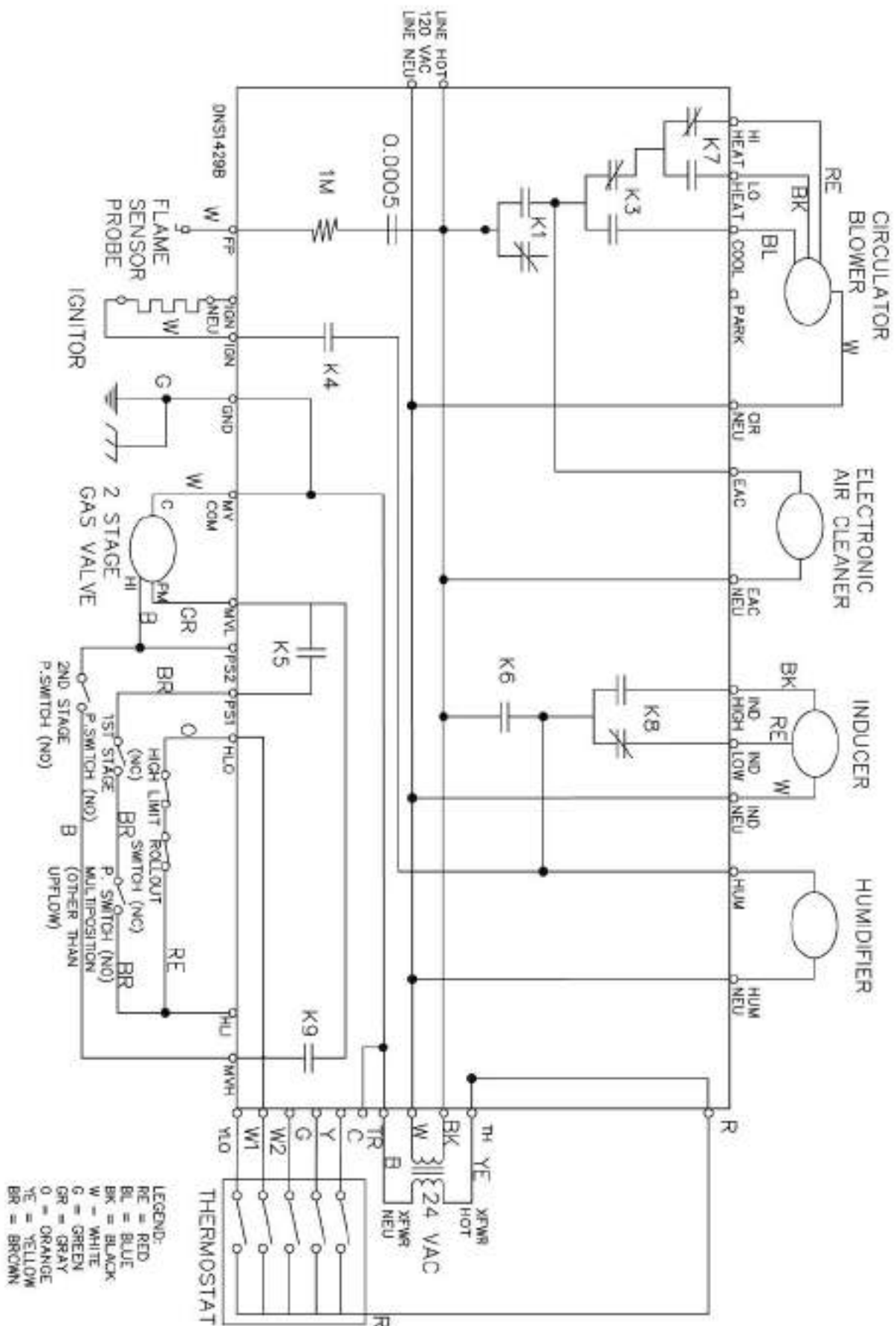
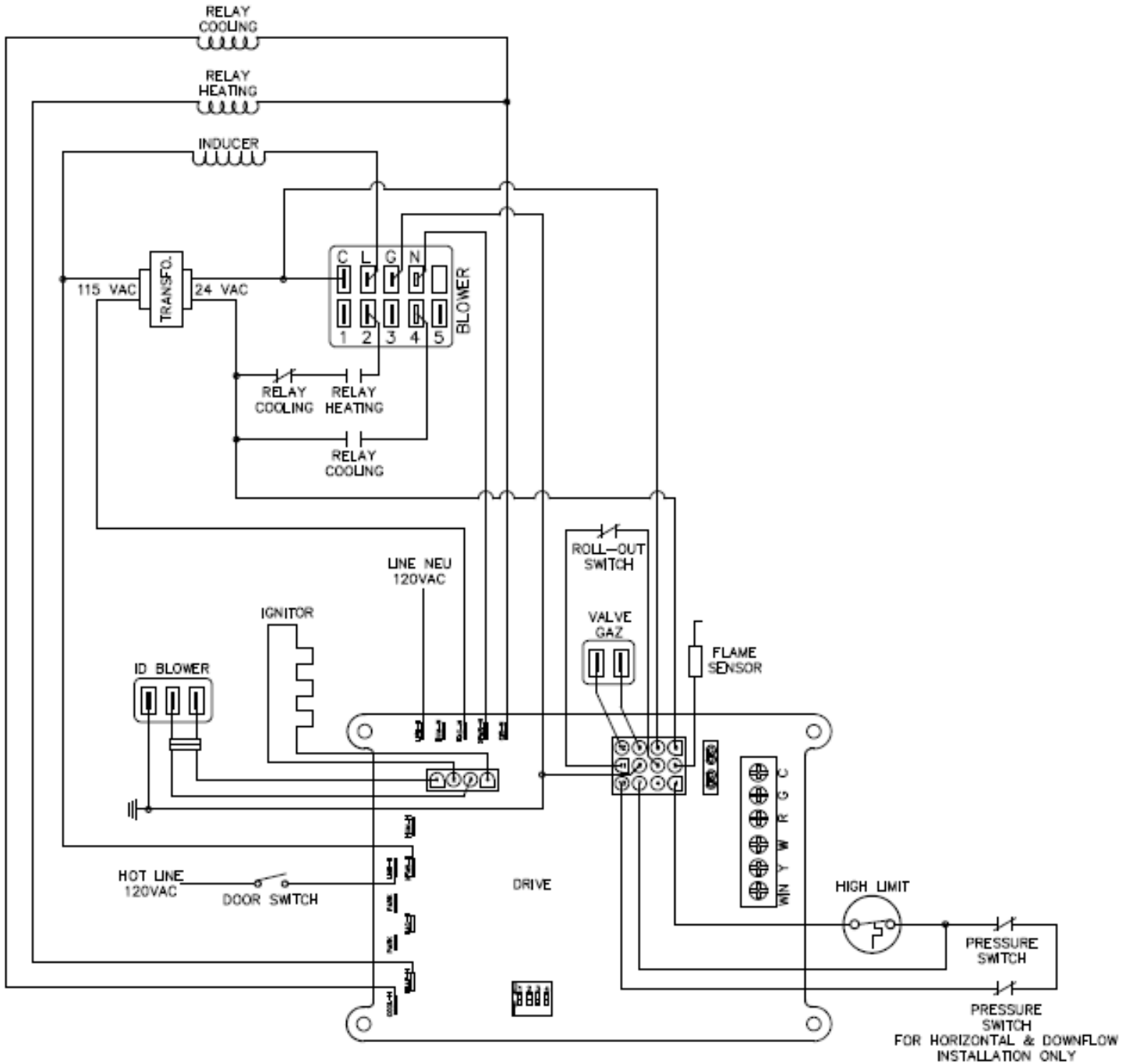




Figure 22 : Wiring diagram single stage ECM (CXX-1-X)



## 7- VENTING AND COMBUSTION AIR PIPING

### 7.1- INTRODUCTION

#### 7.1.1- Direct vent (2 pipe applications)

When this furnace is installed as a direct vent (2 pipe) furnace; no special provisions for air for combustion are required. However, other gas appliances installed in the space with the furnace may require outside air for combustion. Follow the guidelines below to insure that other gas appliances have sufficient air for combustion.

Direct vent installations require a dedicated combustion air and venting system. All air for combustion is taken from outside and all combustion products are discharged to the outdoors.

Therefore, no ventilation or combustion air openings are required.

In Canada, refer to manufacturer's instructions for supporting ULC S636 venting.

In a direct vent (2 pipes) system, all air for combustion is taken directly from outdoor atmosphere, and all flue products are discharged to outdoor atmosphere. Combustion air and vent pipes must terminate either through the roof or sidewall. See **Erreur ! Source du renvoi introuvable.** for references to clearances required by National code authorities.

#### TERMINATION REQUIREMENTS FOR THE PROVINCE OF ALBERTA AND SASKATCHEWAN:

The Provinces of Alberta and Saskatchewan require a minimum unobstructed distance of 4 ft. (1.2 M) from the foundation to the property line of the adjacent lot for vent termination of any appliance with an input over 35,000 BTU/h. If there is less than 4 ft. (1.2 M) of unobstructed distance to the property line of the adjacent lot, no type of vent termination is permitted for appliances with inputs greater than 35,000 BTU/h. There are no additional restrictions on unobstructed distances greater than 8 ft. (2.4 M).

All single, two pipe and concentric vents may be used, providing all other Codes and manufacturer's requirements in these instructions are adhered to.

If the unobstructed distance from the foundation to the property line of the adjacent lot is no less than 4 ft. (1.2 M) and no greater than 8 ft. (2.4 M), it will be necessary to re-direct the flue gas. In this situation, a concentric vent kit cannot be used.

A 2 pipe system (or single pipe system when permitted) that redirects the flue gas away by use of an elbow or tee, certified to ULC S636 from the adjacent property line must be used.

#### 7.1.2- Non direct vent (1 pipe) applications

When the furnace is installed as a non-direct vent (1 pipe) furnace, it will be necessary to ensure there is adequate air for combustion. Other gas appliances installed with the furnace may also require air for combustion and ventilation in addition to the amount of combustion air and ventilation required for the furnace.

When the furnace is installed using the ventilated combustion air option, the attic or crawlspace must freely communicate with the outdoors to provide sufficient air for combustion. The combustion air pipe cannot be terminated in attics or crawlspaces that uses ventilation fans designed to operate during the heating season. If ventilation fans are present in these areas, the combustion pipe must terminate outdoors as a direct vent (2 pipe) system.

All air for combustion is piped directly to the furnace from a space that is well ventilated with outdoor air (such as an attic, crawlspace or equipment closet) and the space is well isolated from the living space or garage. In addition, other gas appliances installed in the space with the furnace may require outside air for combustion.

Provisions for adequate combustion, ventilation, and dilution air must be provided in accordance with:

U.S.A. Installations: Section 5.3 of the NFPA 54/ANSI Z223.1-2009, Air for Combustion and Ventilation and applicable provisions of the local building codes.

Canada: Part 8 of the CAN/CSA-B149.1-2010, Venting Systems and Air Supply for Appliances.

### 7.2- SPECIAL VENTING REQUIREMENTS FOR INSTALLATIONS IN CANADA

The special vent fittings and accessory concentric vent termination kits and accessory external drain trap have been certified to ULC S636 for use with Royal Pipe, IPEX PVC and CPVC vent components.

In Canada, S636 certified primers and cements must be used and be of the same manufacturer of the S636 venting system- **do not mix primers and cements from one manufacturer with a vent system from a different manufacturer.** Follow the manufacturer's instructions in the use of primer and cement and never use primer or cement beyond its expiration date.

Safe operation, as defined by ULC S636, of the vent system is based on following the vent system manufacturer installation instructions, and proper use of required primers and cements.

All fire stop and roof flashing used with this system must be UL listed material.

Acceptability under Canadian standard CAN/CSA B149 requires full compliance with all installation instructions.

The authority having jurisdiction (gas inspection authority, municipal building department, fire department, etc.) should be consulted before installation to determine the need to obtain a permit.

### 7.3- GENERAL

If this furnace replaces a furnace that was connected to a vent system or chimney, the vent or vent connectors of other remaining appliances may need to be re-sized. Vent systems or vent connectors of other appliance must be sized to the minimum size allowable.

An abandoned masonry chimney may be used as a raceway for properly insulated and supported combustion-air (when applicable) and vent pipes. Each furnace must have its own set of combustion air and vent pipes and be terminated individually.

A furnace shall not be connected to a chimney flue serving a separate appliance designed to burn solid fuel.

Other gas appliances with their own venting system may also use the abandoned chimney as a raceway providing it is permitted by local code, the current edition of the National Fuel Gas Code, and the vent or liner manufacturer's installation instructions. Care must be taken to prevent the exhaust gases from one appliance from contaminating the combustion air of other gas appliances.

### 7.4- CONNECTING TO FURNACE

Do not common vent with any other appliance. Do not install in the same chase or chimney with a metal or high temperature plastic pipe from another gas or fuel-burning appliance unless the required minimum clearances to combustibles are maintained between the approved PVC pipe and other pipes. Clean and deburr all pipe cuts. The shavings must not allowed to block the exhaust, inlet or condensate drain pipes.

A 2" diameter PVC pipe is supplied with your furnace. Depending of your cabinet size, this pipe length is either 1.5" or 6.75". Connect this piece of PVC to the rubber coupling over the induce draft blower. If this piece is not installed properly, flue gases will circulate in the cabinet and cause burner to shut off.

The exhaust pipe connection is a 2" female PVC pipe fitting extending through the back right side of the furnace top plate. (See Figure 23 : Vent coupling and adapter with gasket.) When 2" pipe is used, connect it directly to this fitting. When 3" pipe is used, connect a 2" to 3" coupling to

this fitting with a short piece of 2" PVC pipe. The inlet combustion air connection is at the front right side of the top plate.

All exhaust piping must be installed in compliance with Part 7, "Venting of Equipment," of the latest edition of the National Fuel Gas Code NPFA 54, 90A and 90B ANSI Z223.1-, local codes or ordinances and these instructions:

1. Provide the space with sufficient air for proper combustion, ventilation, and dilution of flue gases using permanent horizontal or vertical duct(s) or opening(s) directly communicating with the outdoors or spaces that freely communicate with the outdoors.
2. Insulate all vent runs through unconditioned spaces where below freezing temperatures are expected with 1" thick medium density, foil faced fiberglass or equivalent Rubatex/Armaflex insulation. (In Canada per the vent manufacturer's instructions)
3. For runs where condensate could collect and freeze, wrap the vent pipe with self-regulating, 3 or 5 Watt heat tape. The heat tape must be U.L./CSA listed and installed per the manufacturer's instructions.
4. All piping between the furnace and the roof or outside wall penetration is either 2" or 3"

#### 7.4.1- Combustion air piping

Use a 90° elbow or two medium-radius sweep elbows to keep the inlet downward and prevent the entry of rain. The inlet opening of the combustion air termination must be a minimum of 12" above the anticipated level of snow accumulation.

Install termination as follow:

1. Install a 2" coupling to the combustion air pipe at the outside wall to prevent the termination from being pushed inward.
2. Cut the needed length of 2" PVC pipe and connect this to the coupling.
3. Attach the termination in the final length of 2" PVC pipe with PVC cement.

**NOTE:** Furnaces may have a drain tee assembly and trap installed in the combustion air pipe as close to the furnace as possible. This is to drain any water that may enter the combustion air pipe to prevent it from entering the furnace vestibule area.

#### 7.4.2- Exhaust vent piping

The rubber coupling that attaches to the vent pipe adapter must be used. The adapter seals the vent pipe to the casing and reduces the strain the inducer and the elbow (when present).

It is necessary to properly seal on either side of the adapter with an appropriate adhesive. This is to prevent any condensate leakage.

The exhaust vent must terminate **at least 12" above** the combustion air termination inlet. The maximum length of the exposed vent pipe above the roof is 30".

**NOTE:** The combustion air and exhaust terminations must be at least 12" above grade. Use alternate horizontal terminations when termination locations are limited and higher snow levels are anticipated.

**NOTE:** Ensure the location of the combustion air inlet with respect to the exhaust vent terminal complies with Figure 24 : Direct Venting.

Figure 23 : Vent coupling and adapter with gasket

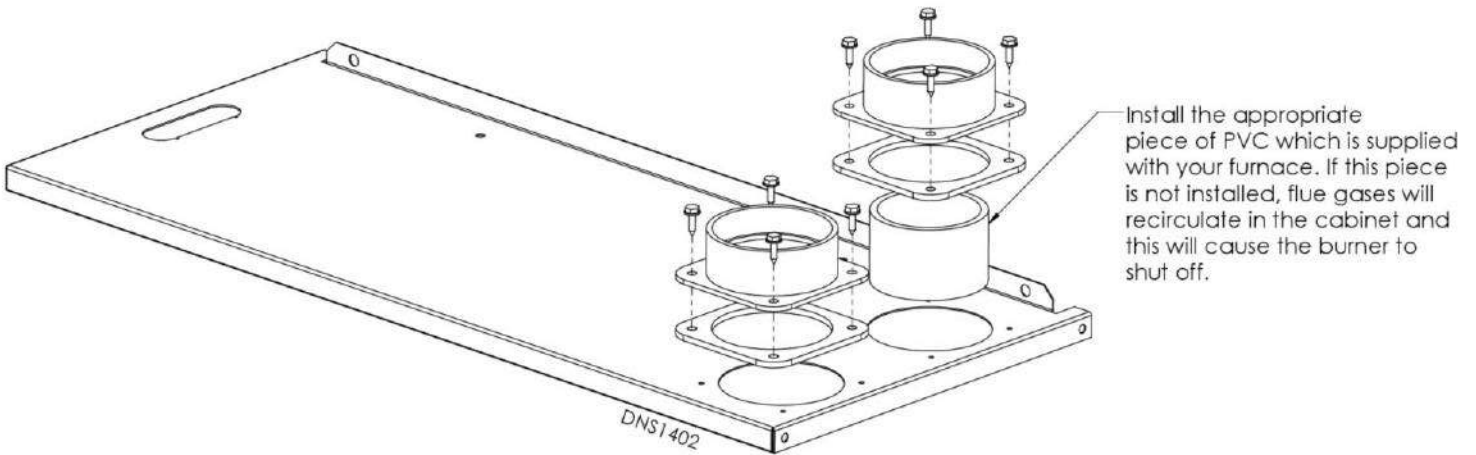
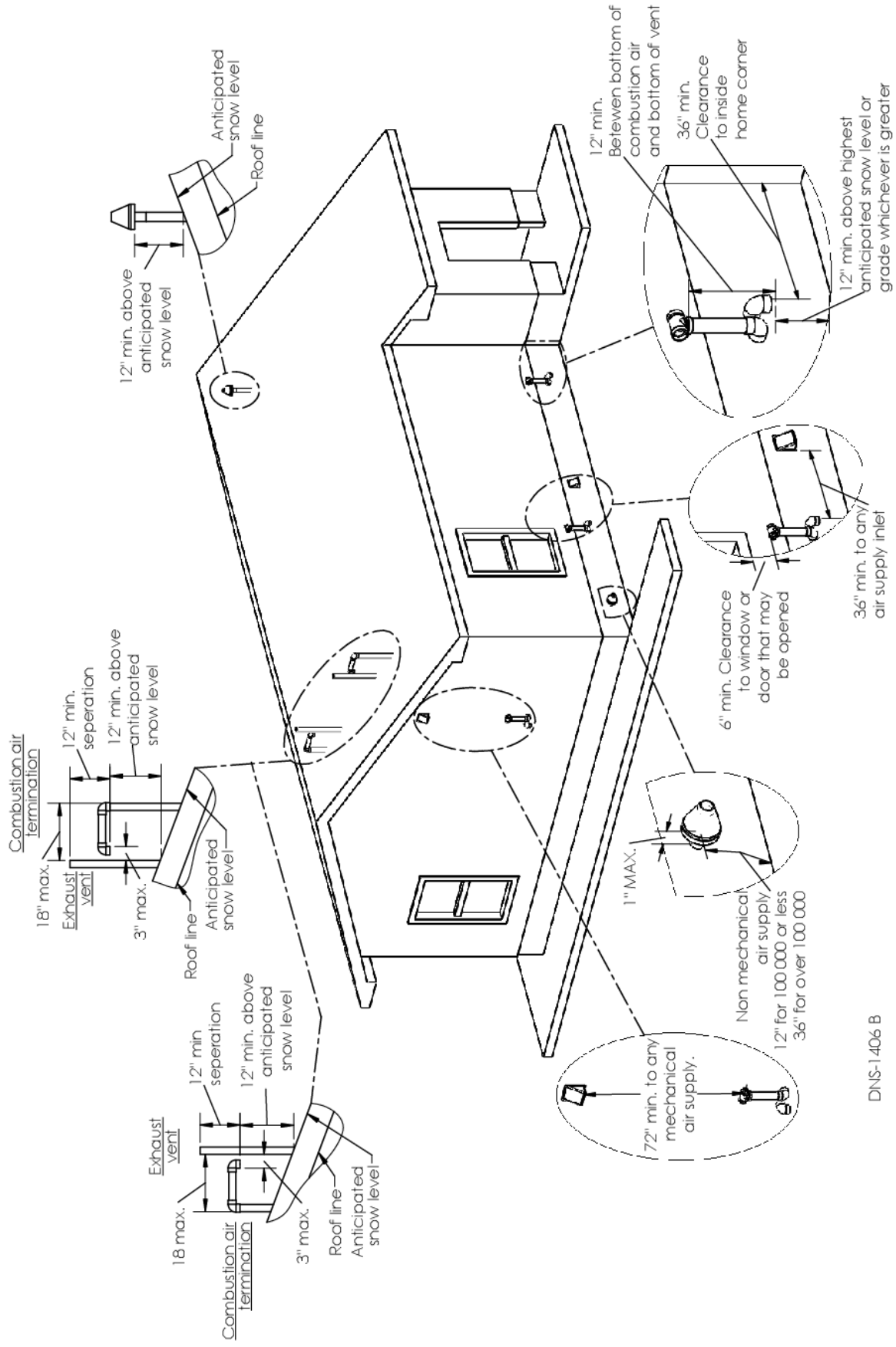
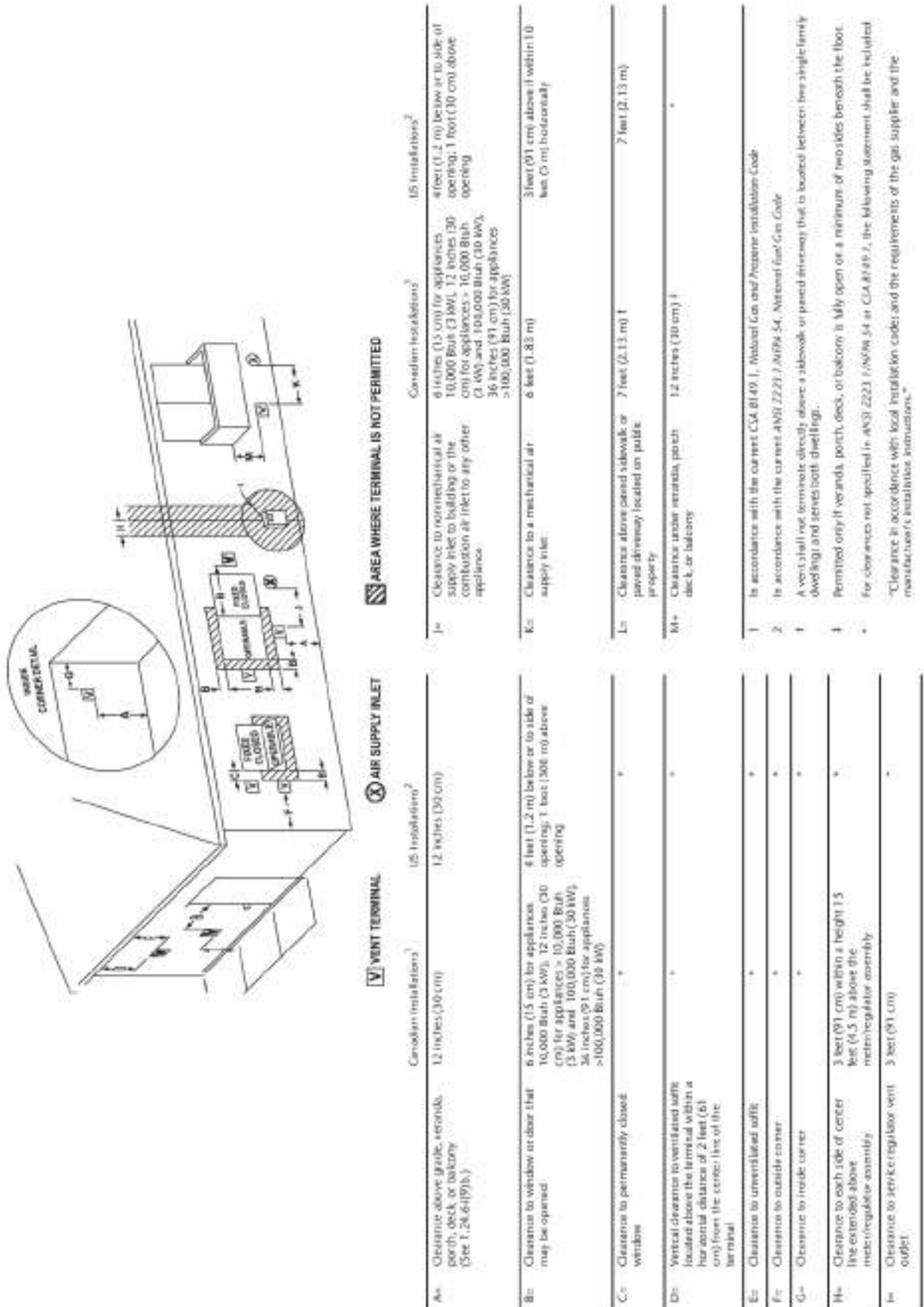


Figure 24 : Direct Venting



DNS-1406 B

Figure 25 : Other than direct vent clearance





**Table 6 : Maximum equivalent straight vent length (two stage and modulating)**

Altitude (ft)	Unit size (Btu/hr)*	Vent pipe diameter (in.)	
		2"	3" and 4"
0 to 4500 ft	15,000	300	N/A
	30,000	180	N/A
	45,000	70	90
	60,000	70	90
	75,000	70	90
	105,000	15	80
	120,000	10	65

**Table 7: Maximum equivalent straight vent length (single stage)**

Altitude (ft)	Unit size (Btu/hr)*	Vent pipe diameter (in.)	
		2"	3" and 4"
0 to 4500 ft	45,000	70	90
	60,000	45	90
	75,000	30	90
	105,000	N/A	70
	120,000	N/A	40

**Table 8: Deduction for fitting**

Type of elbow	Equivalent Length (ft.)
45° Standard	5
45° Long sweep	2½
90° Standard	10
90° Long sweep	5
Tee	1.5

**Table 9: Approved combustion air and vent pipe, fitting and cement materials (U.S.A. Installation)**

ASTM SPECIFICATION (MARKED ON MATERIAL)	MATERIAL	PIPE	FITTINGS	SOLVENT CEMENT AND PRIMERS	DESCRIPTION
D1527	ABS	PIPE	-	-	Schedule-40
D1765	PVC	PIPE	-	-	Schedule-40
D2235	For ABS	-	-	Solvent Cement	For ABS
D2241	PVC	PIPE	-	-	SDR-21 & SDR-26
D2466	PVC	-	Fittings	-	Schedule-40
D2468	ABS	-	Fittings	-	Schedule-40
D2564	For ABS	-	-	Solvent Cement	For PVC
D2661	ABS	PIPE	Fittings	-	DWV at Schedule-40 IPS Sizes
D2665	PVC	PIPE	Fittings	-	DWV at Schedule-40 IPS Sizes
F438	CPVC	-	Fittings	-	Schedule-40
F441	CPVC	PIPE	-	-	Schedule-40
F442	CPVC	PIPE	-	-	SDR
F493	For CPVC	-	-	Solvent Cement	For CPVC
F628	ABS	PIPE	-	-	Cellulare Core DWV at Schedule-40 IPS sizes
F656	For PVC	-	-	Primer	For PVC
F891	PVC	PIPE	-	-	Cellulare Core Schedule-40 & DWV

## 7.6- COMBUSTION AIR AND VENT PIPING INSULATION GUIDELINES

The vent pipe may pass through unconditioned areas.

1. Using winter design temperature (used in load calculations), find appropriate temperature for your application and furnace model.
2. Determine the amount of total and exposed vent pipe.
3. Determine required insulation thickness for exposed pipe length(s).
4. When combustion air inlet piping is installed above a suspended ceiling, the pipe **MUST** be insulated with moisture resistant insulation such as Armaflex™ or other equivalent type of insulation.
5. Insulate all vent runs through unconditioned spaces where below freezing temperatures are expected with 1" thick medium density, foil faced fiberglass or equivalent Rubatex/Armaflex insulation.
6. For horizontal runs where water may collect, wrap the vent pipe with self-regulating, 3 or 5 Watt heat tape. The heat tape must be U.L./CSA. listed and installed per the manufacturer's instructions.
7. Insulate combustion air inlet piping when run in warm, humid spaces.
8. Install the insulation per the insulation manufacturer's installation instructions.

**NOTE:** Pipe length specified for maximum pipe lengths located in unconditioned spaces cannot exceed total allowable pipe length as calculated from Table 6, Table 7 and Table 8.

9. Apply the wall pipe flange gaskets to the vent wall pipe and combustion air wall pipe flanges.

**NOTE:** The vent wall pipe flange and the combustion air wall pipe flange have the same ID.

10. **For the exhaust vent, place the wall pipe flange over the 2" diameter pipe provided. Take good care to glue the piece of PVC to the wall pipe flange to avoid any condensate leakage.**
11. **Align the pipe on the rubber coupling with drain and tighten the clamp around the rubber coupling.**
12. Align the screw holes in the plastic wall pipe flange with the dimples in the casing.
13. Pilot drill the screw holes for the flange in the casing and attach the vent wall pipe flange to the furnace with sheet metal screws
14. Repeat step 12 and 13 for the air combustion wall pipe flange and secure to the top casing.
15. Install the remaining vent and combustion air pipes. It is recommended that all pipes be cut, prepared, and preassembled before permanently cementing any joint.
16. Working from furnace to outside, cut pipe to required length(s).
17. Deburr inside and outside of pipe.
18. Chamfer outside edge of pipe for better distribution of primer and cement.
19. Clean and dry all surfaces to be joined.
20. Check dry fit of pipe and mark insertion depth on pipe.
21. Insert the combustion air pipe into the adapter.
22. Seal around the combustion air pipe with silicone or foil tape.
23. After pipes have been cut and preassembled, apply generous layer of cement primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply approved cement to end of pipe and fitting socket (over primer). Apply cement in a light, uniform

coat on inside of socket to prevent build-up of excess cement. Apply second coat.

24. While cement is still wet, twist pipe into socket with 1/4" turn. Be sure pipe is fully inserted into fitting socket.
25. Wipe excess cement from joint. A continuous bead of cement will be visible around perimeter of a properly made joint.
26. Handle pipe joints carefully until cement sets.
27. Horizontal portions of the venting system shall be supported to prevent sagging. Support combustion air piping and vent piping a minimum of every 5 ft. (1.5 M) [3 ft. (.91 M) for SDR-21 or -26 PVC] using perforated metal hanging strap or commercially available hangars designed to support plastic pipe.
28. Prevent condensate from accumulating in the pipes by sloping the combustion air piping and vent piping downward towards furnace a minimum of 1/4" per linear ft. with no sags between hangers.
29. Complete the vent and combustion air pipe installation by installing the required termination elbows. See **Erreur ! Source du renvoi introuvable.**Figure 24 : Direct Venting.
30. Use appropriate methods to seal openings where combustion air pipe and vent pipe pass through roof or sidewall.

## 7.7- INSTALLING THE VENT TERMINATION

A roof termination of any type will require a 4" (102 mm) flashing for a 2" (51 mm) concentric vent or a 5" diameter (127 mm) flashing for a 3" (76 mm) concentric vent kit. For two-pipe or single pipe vent systems, a flashing for each pipe of the required diameter will be necessary. It is recommended that the flashing be installed by a roofer or competent professional prior to installing the concentric vent. The terminations can be installed on a flat or pitched roof.

### 7.7.1- Concentric vent

Single or multiple concentric vent must be installed as shown in Figure 24 : Direct Venting. Maintain the required separation distance between vents or pairs of vents and all clearance as shown in Figure 25 : Other than direct vent clearance.

Cut one 4 in. (102 mm) diameter hole for 2 in. (51 mm) kit, or one 5 in. (127 mm) diameter hole for 3 in. (76 mm) kit in the desired location. Loosely assemble concentric vent/combustion air termination components together using instructions in kit. Slide assembled kit with rain shield REMOVED through hole in wall or roof flashing.

**NOTE:** Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

### 7.7.2- Two pipes termination

Two pipes vent must be installed as shown in Figure 24 : Direct Venting. Maintain the required separation distance between vents or pairs of vents and all clearance. Cut the required number of holes in the roof or sidewall for vent and combustion air pipes. Sidewall holes for two pipes vent terminations should be side-by-side, allowing space between the pipes for the elbows to fit on the pipes. Holes in the roof for two pipe terminations should be spaced no more than 18" (457 mm) apart. Termination elbows will be installed after the vent and combustion air pipe is installed.

### 7.7.3- Sidewall termination

Determine an appropriate location for termination kit using Figure 24 : Direct Venting and Figure 25 : Other than direct vent clearance.

1. Cut one 4" diameter hole for 2" kit, or one 5" diameter hole for 3" kit.
2. Loosely assemble concentric vent/combustion air termination components together using instructions in kit.

3. Slide assembled kit with rain shield REMOVED through hole (**NOTE:** Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole).
4. Locate assembly through sidewall with rain shield positioned no more than 1" (25 mm) from wall.
5. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.
6. Cut 2 holes, 1 for each pipe, of appropriate size for pipe size being used.
7. Loosely install elbow in bracket and place assembly on combustion-air pipe.
8. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.

## 8- START UP, ADJUSTMENT AND SAFETY CHECK

1. Furnace must have a 120 V power supply properly connected and grounded (**NOTE:** Proper polarity must be maintained for 120 V wiring. Control status indicator light flashes rapidly and furnace does not operate if polarity is incorrect.)
2. Thermostat wire connections at terminals R, W/W1, G, Y/Y2, etc. must be made at 24 V terminal block on furnace control
3. Natural gas service pressure must not exceed 0.38 psig (10.5 in. w.c.), but must be no less than 0.16 psig (4.5-in. w.c.). Propane service pressure must not exceed 0.47 psig (13 in. w.c.) but must be no less than 0.40 psig (11 in. w.c.)
4. Blower door must be in place to complete 120 V electrical circuit to furnace.

### 8.1- TO START THE FURNACE

This appliance is equipped with a hot surface ignition device. This device lights the main burners each time the room thermostat calls for heat. See the lighting instructions on the furnace.

During initial start-up, it is not unusual for odour or smoke to come out of any room registers. To ensure proper ventilation, it is recommended to open windows and doors before initial firing.

The furnace has a negative pressure switch that is a safety during a call for heat. The induced draft blower must pull a negative pressure on the heat exchanger to close the negative pressure switch. The induced draft blower must maintain at least the negative pressure switch set point for the furnace to operate. If the induced draft blower fails to close or maintain the closing of the negative pressure switch, an error code would result.

1. Remove the burner compartment control access door.
2. **IMPORTANT:** Be sure that the manual gas control has been in the "OFF" position for at least five minutes. Do not attempt to manually light the main burners.
3. Set the room thermostat to its lowest setting and turn off the furnace electrical power.
4. Turn the gas control knob to the "ON" position.
5. Replace the burner compartment control access door.



### WARNING

Failure to replace the burner door can cause products of combustion to be released into the conditioned area resulting in personal injury or death.

6. Turn on the manual gas stop.
7. Turn on the furnace electrical power.

8. Put thermostat to "Heat" mode and set the room thermostat at least 10°F above room temperature to light the main burners.
9. After the burners are lit, set the room thermostat to a desired temperature. **UNIT OPERATION HAZARD**

These furnaces are equipped with a manual reset limit switch in burner assembly. This switch opens and shuts off power to the gas valve if an overheat condition (flame rollout) occurs in burner assembly. Correct inadequate combustion-air supply or improper venting condition before resetting switch. **DO NOT jumper this switch.**

Before operating furnace, check flame rollout manual reset switch for continuity. If necessary, press de button to reset switch.

### 8.3- SETUP SWITCHES

The furnace control has setup switches that may be set to meet the application requirements. To set these setup switches for the appropriate requirement:

1. Turn off electrical power.
2. Remove upper door.
3. Locate setup switches on furnace control.
4. Configure the set-up switches as necessary for the application.
5. Replace upper door and turn on electrical power.

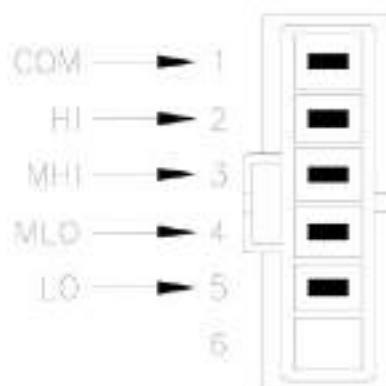
### 8.4- SINGLE STAGE MOTOR (CXX-1-D AND CXX-1-X)

#### 8.4.1- Selecting the blower speed on PSC motor

Furnaces with model number CXX-1-D are equipped with a multi-speed circulator blower. This blower provides ease in adjusting blower speeds. See airflow tables in annexe for the relation between CFM and external static pressure applicable to your model. The cooling and heating blower speeds are shipped with the suggested fan speed describe in Table 10 : Suggested fan speed on single stage furnace. These blower speeds are set for a temperature rise of 55°F at normal static pressure. Blowers should be adjusted by the installer to match the installation requirements so as to provide the correct heating temperature rise and cooling load. To adjust the circulator blower speed, proceed as follow:

1. Turn off the power to the furnace
2. Select the heating and cooling blower speeds that match the installation requirements from the airflow tables in annexe.
3. Relocate the desired motor leads to the desired speed **on the motor**. The red wire locate the heating speed and the blue wire locate de cooling speed.

Figure 26 : PSC motor connection



4. If heating and cooling speeds are the same, a jumper wire must be used between the heat and cool terminal **on the control board**. The unused leads must be connected to the "PARK" terminal on the control board.
5. Turn on power to the furnace.

- Verify proper temperature rise. Excessive temperature rise can cause limit switch tripping.

**Table 10 : Suggested fan speed on single stage furnace**

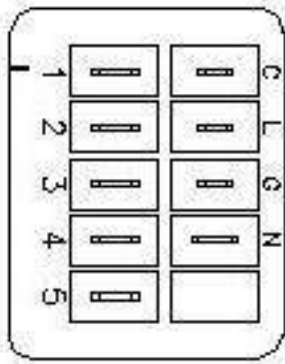
INPUT	HEATING	COOLING
45,000	LOW	MED-HIGH
60,000	MED-LOW	MED-HIGH
75,000	MED-LOW	MED-HIGH
105,000	HIGH	MED-HIGH
120,000	HIGH	MED-HIGH

#### 8.4.2- Selecting the blower speed on ECM motor (X13)

Furnaces with model number CXX-1-X are equipped with a fixed torque ECM motor. This motor provides ease in adjusting the blower speeds. The cooling and heating blower speeds are shipped with the suggested fan speed. Blowers should be adjusted by the installer to match the installation requirements so as to provide the correct heating temperature rise and cooling load. To adjust the circulator blower speed, proceed as follow:

- Turn off the power to the furnace
- Select the heating and cooling blower speeds that match the installation requirements from the tables below.
- Relocate the desired motor leads to the desired torque tap on the motor. The red wire locate the heating speed and the blue wire locate de cooling speed. Use Figure 27 : X13 motor connections and Table 11 : C45-1-X Motor Tap estimated CFM to Table 15 : C120-1-X Motor Tap estimated CFM.
- If heating and cooling speeds are the same, a jumper wire must be used between the heat and cool terminal **on the control board**. The unused leads must be connected to the "PARK" terminal on the control board.
- Turn on power to the furnace.
- Verify proper temperature rise. Excessive temperature rise can cause limit switch tripping.

**Figure 27 : X13 motor connections**



**Table 11 : C45-1-X Motor Tap estimated CFM**

Tap #	Torque (%)	CFM
5	100	1210
4	72	1015
3	50	780
2	40	610
1	33	490

**Table 12 : C60-1-X Motor Tap estimated CFM**

Tap #	Torque (%)	CFM
5	100	1350
4	72	1200
3	50	1090
2	40	830
1	33	560

**Table 13 : C75-1-X Motor Tap estimated CFM**

Tap #	Torque (%)	CFM
5	100	1545
4	72	1440
3	50	1265
2	40	810
1	33	560

**Table 14 : C105-1-X Motor Tap estimated CFM**

Tap #	Torque (%)	CFM
5	100	1800
4	72	1735
3	50	1600
2	40	1400
1	33	800

**Table 15 : C120-1-X Motor Tap estimated CFM**

Tap #	Torque (%)	CFM
5	100	1910
4	72	1800
3	50	1600
2	40	1400
1	33	800

### 8.4.3- Option switches – Single stage PSC and single stage x13

The option switches on the control are used to determine the length of the cool delay-to-fan-off, heat delay-to-fan-on and heat delay-to-fan-off periods. The following table shows the time periods that will result from the various switch positions.

**Table 16 : Option switches positions**

COOL delay to fan-off:	Set switch #1	
45 sec.*	On	
90 sec.	Off	
HEAT delay to fan-on:	Set switch #2	
30 sec.*	On	
45 sec.	Off	
HEAT delay to fan-off:	#3	#4
60 sec.	On	On
90 sec.	Off	On
120 sec.	On	Off
180 sec.*	Off	Off

\* Factory setting

### 8.4.4- Heat mode

In a typical system, a call for heat is initiated by closing the thermostat contacts. This starts the control's heating sequence. The inducer blower and optional humidifier are energized and the igniter is powered within one second. The controller has an adaptive algorithm that adjusts the duration of the igniter warm-up, to extend igniter life. Upon initial application of power, the warm-up time is 17 seconds. The igniter on-time will then be increased or decreased depending on whether or not flame is achieved. The warm-up time is limited to a maximum of 21 seconds. During the first 64 warm-up periods following power-up, the warm-up time may not be less than 17 seconds.

Upon a call for heat, if the warm-up time has not been locked, it will be decreased by one second. This reduction of the igniter on time will continue until flame fails to be achieved (resulting in a retry).

In the event of a retry, the warm-up time will be increased by two seconds and locked in at that duration. Once the warm-up time is locked, it remains fixed until another call for heat results in a retry, in which case the warm-up time is again increased by two seconds and remains locked.

In the event of two successive retry attempts, the warm-up time will be unlocked and set to 21 seconds. If flame is then achieved, the warm-up time will begin adapting again with the next call for heat. If, however, this third attempt fails to achieve flame, the control will go into system lockout.

At the end of the igniter warm-up time, both valves in the manifold gas valve are opened. Flame must be detected within 4 seconds.

If flame is detected, the delay-to-fan-on period begins. After the delay-to-fan-on period ends, the optional electronic air cleaner is energized and the circulator fan is energized at heat speed. When the thermostat is satisfied, the gas valve is de-energized. After proof of flame loss, the heat delay-to-fan-off period begins and the inducer blower remains energized to purge the system for 15 seconds. When the purge is complete, the inducer blower and humidifier are de-energized. After the delay-to-fan-off period ends, the circulator fan and electronic air cleaner are de-energized.

If flame is not detected, both valves are de-energized, the igniter is turned off, and the control goes into the "retry" sequence. The "retry" sequence provides a 60 seconds wait following an unsuccessful ignition attempt (flame not detected). After this wait, the ignition sequence is restarted with an additional 2 seconds of igniter warm-up time. If this ignition attempt is unsuccessful, one more retry will be made before the control goes into system lockout.

If flame is detected, then lost, the control will repeat the initial ignition sequence for a total of four "recycle". After four unsuccessful "recycle" attempts, the control will go into system lockout.

If flame is established for more than 10 seconds after ignition, the controller will clear the ignition attempt (or retry) counter. If flame is lost after 10 seconds, it will restart the ignition sequence. This may occur a maximum of five times before system lockout.

During burner operation, a momentary loss of power of 50 milliseconds or longer will de-energize the main gas valve. When power is restored, the gas valve will remain de-energized and a restart of the ignition sequence will begin immediately. A momentary loss of gas supply, flame blowout, or a shorted or open condition in the flame probe circuit will be sensed within 2.0 seconds. The gas valve will de-energize and the control will restart the ignition sequence. Recycles will begin and the burner will operate normally if the gas supply returns, or the fault condition is corrected, before the last ignition attempt. Otherwise, the control will go into system lockout.

If the control has gone into system lockout, it may be possible to reset the control by a momentary power interruption of one second or longer. Refer to SYSTEM LOCKOUT FEATURES.

### 8.4.5- Cool mode

In a typical system, a call for cool is initiated by closing the thermostat contacts. This energizes the control and the compressor. The cool delay-to-fan-on period begins. After the delay period ends, the optional electronic air cleaner is energized, and the circulator fan is energized at cool speed. After the thermostat is satisfied, the compressor is de-energized and the cool mode delay-to-fan-off period begins. After the delay-to-fan off period ends, the circulator fan and electronic air cleaner (optional) are de-energized.

### 8.4.6- Manual fan on mode

If the thermostat fan switch is moved to the ON position, the circulator fan (cool speed) and optional electronic air cleaner are energized. When the fan switch is returned to the AUTO position, the circulator fan and electronic air cleaner (optional) are de-energized.

### 8.4.7- System lockout features

When system lockout occurs, the gas valve is de-energized, the circulator blower is energized at heat speed, and, if flame is sensed, the inducer blower is energized. The diagnostic indicator light will flash or glow continuously to indicate system status. (System lockout will never override the precautionary features.)

**To reset the control after system lockout**, do one of the following:

1. Interrupt the call for heat or cool at the thermostat for at least one second but less than 20 seconds (if flame is sensed with the gas valve de-energized, interrupting the call for heat at the thermostat will not reset the control).
2. Interrupt the 24 VAC power at the control for at least one second. You may also need to reset the flame rollout sensor switch.
3. After one hour in lockout, the control will automatically reset itself.

### 8.4.8- Diagnostic features – error code

The single stage control continuously monitors its own operation and the operation of the system. If a failure occurs, the LED will indicate a failure code as shown below. **If the failure is internal to the control, the light will stay on continuously. In this case, the entire control should be replaced, as the control is not field-repairable.**

If the sensed failure is in the system (external to the control), the LED will flash in the following flash-pause sequences to indicate failure status (each flash will last approximately 0.25 seconds, and each pause will last approximately 2 seconds).

The LED will also flash once at power-up.

**Table 17 Single stage error code**

Number of flashes	Diagnostic
1	System lockout (retries or recycles exceeded)
2	Pressure switch stuck closed
3	Pressure switch stuck open
4	Open high temperature limit switch
5	Flame rollout sensed
6	115 Volt AC power reversed/improper ground
7	Low flame sense signal

<b>Continuous flash</b>	Flame sense >5 sec. without gas valve
<b>Continuous on</b>	Internal control failure

## 8.5- 2 STAGE PSC MOTOR

### 8.5.1- Option switches – 2 stage, PSC

Option switches on this control are used to determine the length of the delay-to-fan-off periods. The following tables show the time periods that will result from the various switch positions.

When using a single stage thermostat, second stage delay is based on the setting of switch S1-1, S1-2 shown below.

**Table 18 : Option switches S1-3 & S1-4 positions**

HEAT delay to fan-off:	On "S1," set switch #:	
	3	4
90 sec.*	Off	Off
120 sec.	Off	On
150 sec.	On	Off
180 sec.	On	On

\*Factory default setting

**Table 19 : Option switches S1-1 & S1-2 positions**

2nd Stage delay for single stage thermostats		
Delay Time:	On "S1" set switch #	
	1	2
Off*	Off	Off
10 min	On	Off
Auto min	Off	On
20 min	On	On

\*Factory default-setting – two-stage thermostat

### 8.5.2- Heat mode

In a typical system, a call for first stage heat is initiated by closing the W1 thermostat contacts. The inducer blower is energized at high speed and the control waits for the low pressure switch contacts to close. The humidifier (optional) is also energized at this time. Once the low pressure switch contacts close, a 15 second pre-purge is initiated. Then the inducer changes to low speed and the 120V igniter is powered. At the end of the igniter warm-up time, the first stage of the two stage manifold gas valve is energized (low fire).

Flame must be detected within 4 seconds. If flame is detected, the 45 seconds HEAT delay-to-fan-on period begins. After the delay-to-fan-on period ends, the 50M51 control will energize the circulator fan at low heat speed. The electronic air cleaner (optional) will also energize at this time.

For a two-stage thermostat, a call for **second stage** heat (W1 and W2) after a call for first stage heat will energize the inducer at high speed and the circulator at high heat speed. The second stage pressure switch contacts will close and energize the second stage gas valve (high fire).

For a single-stage thermostat, when a call for heat occurs (W1), a 10, 20 minutes or auto mode heat staging timer will be activated (timing is selectable with option switches S1-1 and S1-2 positions). Following this delay, the second stage heat is energized as above.

The AUTO model algorithm is a method of energizing the second stage gas valve based on the recent average of the heating duty cycle. During a typical heating day, the low to high stage delay is determined by using the average calculated duty cycle from the table below.

Once the specified delay time has expired the second stage valve will be energized.

When the second stage of the thermostat is satisfied, the inducer motor is reduced to low speed and the second stage gas valve is de-energized.

The circulator will remain at high heat speed for 30 seconds following the opening of the second stage gas valve and then is reduced to low heat speed.

When the first stage of the thermostat is satisfied, the first stage gas valve is de-energized and the HEAT delay-to-fan-off begins timing. The inducer will post purge for an additional 15 seconds, then the inducer and

humidifier will turn off. Upon completion of the HEAT delay-to-fan-off period, the circulator is turned off. The electronic air cleaner on the control is also de-energized at this time.

If flame is not detected during the trial-for-ignition period or if the flame is detected/sensed and then lost before completion of 10 seconds of establishment, the gas valve is de-energized, the igniter is turned off, and the control goes into the "retry" sequence.

The "retry" sequence provides a 60 seconds wait with the inducer inter-purge following an unsuccessful ignition attempt (flame not detected). After this wait, the ignition attempt is restarted. Two retries will be attempted before the control goes into system lockout.

If flame is established for more than 10 seconds after ignition, the controller will clear the ignition attempt (or retry) counter. If flame is lost after 10 seconds, the control will restart the ignition sequence.

A momentary loss of gas supply, flame blowout, or a shorted or open condition in the flame probe circuit will be sensed within 2 seconds. The gas valve will de-energize and the control will restart the ignition sequence. Recycles will begin and the burner will operate normally if the gas supply returns, or the fault condition is corrected, before the last ignition attempt. Otherwise, the control will go into system lockout.

If the control has gone into system lockout, it may be possible to reset the control by a momentary power interruption of 10 seconds or longer.

### 8.5.3- Cool mode

In a typical single stage cooling system (Y connection), a call for cool is initiated by closing the thermostat contacts. This energizes the compressor and the electronic air cleaner (optional).

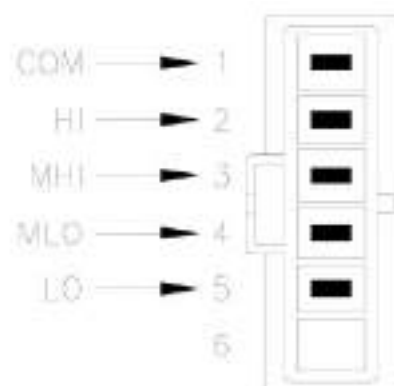
The circulator will be energized at cool speed after the COOL delay-to-fan-on period. After the thermostat is satisfied, the compressor is de-energized and the COOL delay-to-fan-off period begins. After the COOL delay-to-fan-off period ends, the circulator and the electronic air cleaner are de-energized.

### 8.5.4- Adjusting airflow

Furnaces with model number CXX-2-D are equipped with a multi-speed circulator blower. This blower provides ease in adjusting blower speeds. See airflow tables in annexe for the relation between CFM and external static pressure applicable to your model. The cooling and heating blower speed are shipped with the suggested fan speed describe in Table 20 : Suggested fan speed on 2 stage furnace. These blower speeds are set for a temperature rise of 55°F at normal static pressure. Blowers should be adjusted by the installer to match the installation requirements so as to provide the correct heating temperature rise and cooling load. To adjust the circulator blower speed, proceed as follow:

1. Turn off the power to the furnace
2. Select the heating and cooling blower speeds that match the installation requirements from the airflow tables in annexe.
3. Relocate the desired motor leads to the desire speed **on the motor**. The red wire locate the 2<sup>nd</sup> stage heating speed, the black wire locate the 1<sup>st</sup> stage heating and the blue wire locate de cooling speed.

**Figure 28 : PSC motor connection**



4. If heating and cooling speeds are the same, a jumper wire must be used between the heat and cool terminal **on the control board**. The unused leads must be connected to the "PARK" terminal on the control board.
5. Turn on power to the furnace.
6. Verify proper temperature rise. Excessive temperature rise can cause limit switch tripping.

1. Interrupt the call for heat at the thermostat for at least one second but less than 20 seconds (if flame is sensed with the gas valve de-energized, interrupting the call for heat at the thermostat will not reset the control).
2. Interrupt the 24 VAC power at the control for at least 20 seconds. You may also need to reset the flame rollout sensor switch.
3. After one hour in lockout, the control will automatically reset itself.

**Table 20 : Suggested fan speed on 2 stage furnace**

INPUT	HEATING 1 <sup>st</sup> STAGE	HEATING 2 <sup>nd</sup> STAGE	COOLING
45,000	LOW	MED-LOW	MED-HIGH
60,000	LOW	MED-LOW	MED-HIGH
75,000	LOW	MED-LOW	MED-HIGH
105,000	LOW	MED-HIGH	MED-LOW
120,000	MED-LOW	HIGH	MED-HIGH

**8.5.5- Manual fan on mode**

If the thermostat fan switch is moved to the ON position, the circulator fan (low heat speed) and the electronic air cleaner (optional) are energized. When the fan switch is returned to the AUTO position, the circulator and electronic air cleaner are de-energized.

**8.5.6- System lockout**

When system lockout occurs, the gas valve is de-energized and the low speed inducer blower and the low heat speed circulator are energized. The electronic air cleaner (optional) will also energize at this time. The diagnostic indicator light will flash to indicate the system status.

To reset the control after system lockout, do one of the following:

**8.5.7- Last fault mode**

To retrieve fault codes, push and release the "LAST ERROR" button for more than 1/5 second and less than 5 seconds. (Control will indicate this period by solid GREEN for 1/5 to 5 seconds). The LED will flash up to five stored fault codes, beginning with the most recent. If there are no fault codes in memory, the LED will flash two green flashes. The control will flash the most recent error first and the oldest error last (last in first out). There shall be 2 seconds between codes. Solid LED error codes will not be displayed.

**8.5.8- Fault code reset**

To clear the fault code memory, push and hold the "LAST ERROR" button for more than 5 seconds and less than 10 seconds. (Control will indicate this period by RAPID GREEN FLASH for 5 seconds to 10 seconds.) The LED will flash three green flashes when the memory has been cleared.

**8.5.9- Diagnostic features**

The control continuously monitors its own operation and the operation of the system. If a failure occurs, the red LED on the control will flash a failure code. If the failure is internal to the control, the light will stay on. In this case, the entire control should be replaced, as the control is not fielded repairable.

If the sensed failure is in the system (external to control), the LED will flash in the following flash-pause sequences to indicate failure status (each flash will last approximately 0.25 seconds, and each pause will last approximately 2 seconds.)

During a second-stage error condition, the red LED when in lockout will flash groups of double pulses. The red LED will flash on for approximately 1/15 second then off for 1/15 second then on for 1/15 second, then off for 3/10 second. The pause between groups of flashes is approximately 2 seconds. The diagnostics will indicate the specific fault through codes in

Table 21 : 2 stage ECM diagnostic table

Green LED Flash	Amber LED Flash	Red LED Flash	Error/Condition	Comments/Troubleshooting
		1	Flame sensed when no flame should be present	Verify the gas valve is operating and shutting down properly. Flame in burner assemble should extinguish promptly at the end of the cycle. Check orifices and gas pressure
		2	Pressure switch stuck closed/inducer error	Pressure switch stuck closes. Check switch function, verify inducer is turning off.
		3	1st-stage pressure switch stuck open/inducer error	Check pressure switch function and tubing. Verify inducer is turning on the pulling sufficient vacuum to engage switch.
		4	Open limit switch	Verify continuity through rollout switch circuit.
		5	Open rollout/open fuse detect	Verify continuity through rollout switch circuit, check fuse.
		6	1st-stage pressure switch cycle lockout	If the first stage pressure switch cycles 5 times (open, closes) during one call for heat from the thermostat the control will lockout. Check pressure switch for fluttering, inconsistent closure or poor vacuum pressure.
		7	External lockout (retries)	Failure to sense flame is often caused by carbon deposits on the flame sensor, a disconnected or shorted flame sensor lead or a poorly grounded furnace. Carbon deposits can be cleaned with emery cloth. Verify sensor is not contacting the burner and is located in a good position to sense flame. Check sensor lead for horting and verify furnace is grounded properly.
		8	External lockout (ignition recycles exceeded where flame is established and then lost)	Check items for exceeded retries listed above and verify valve is not dropping out allowing flame to be established and then lost.
		9	Grounding or Reversed polarity	Verify the control and furnace are properly grounded. Check and reverse polarity (primary) if incorrect.
		10	Module gas valve contacts energized with no call for heat	Verify valve is not receiving voltage from a short. If a valve wiring is correct and condition persists, replace module.
		11	Limit switch open - possible blower failure overheating limit	Possible blower failure, restricted air flow through appliance or duct work. Verify continuity through limit switch circuit and correct overheating cause.
		12	Module Ignitor contact failure	Fault code indicates the module ignitor contacts are not functioning properly. Replace module.
		<b>Solid</b>	Module - internal fault condition	Module contacts for gas valve not operating or processor fault. Reset control. If condition persists replace module.
		<b>Rapid</b>	Twinning error (twinning IS NOT recommended)	Check wire connections. If condition persists, replace module.
		<b>3 double</b>	2nd-stage Pressure Switch Stuck Open/Inducer Error	Check pressure switch function and tubing. Verify inducer is turning on and pulling sufficient vacuum to engage switch.
	1		Normal Operation with call for first stage heat	Normal operation - first stage
	2		Normal Operation with call for second stage heat	Normal operation - first stage
	3		W2 present with no W1	Second stage call for heat on thermostat circuit with no call for first stage. Verify dip switches are set for two stage thermostat and check thermostat first stage circuit. Configured for a multi-stage thermostat the module will not initiate heating unless first stage call from thermostat is received.
	4		Y presnet with no G call	Module will allow cooling to operate with only a "Y" signal from the thermostat but will also trigger this code. Verify thermostat is energizing both "Y" and "G" on call for cool. Check "G" terminal connections
	<b>rapid</b>		Low flame sense current	Low flame sense current is often caused by carbon deposits on the flame sensor, a poorly grounded furnace or a mis-aligned flame sense probe. Carbon deposits can be cleaned with emery cloth. Check for improve furnace and module ground. Verify sensor is located in or very near flame.
1			Standby or Call or Cool	Normal operation. Waiting for call from thermostat or receiving thermostat call for cool.




output an O signal to the motor whenever there is Y signal and run the circulator blower at a constant speed when the pump is operating.

## 8.6- 2 STAGE ECM MOTOR

### 8.6.1- Option Switch Settings - Thermostat type and heat-fan-off delay

Table 22 : DIP Switches

Thermostat Type and W2 Delay S7-1, S7-2	Switch Settings		Options	
	S7-1	S7-2	Time	
Heat Fan Off Delay S7-3, S7-4	Off	Off	Off*	
	On	Off	10 Minutes	
	Off	On	Auto	
	On	On	20 Minutes	
		S7-3	S7-4	Time
Heat Pump S5-1	Off	Off	90 Secs*	
	Off	On	120 Secs	
	On	Off	150 Secs	
	On	On	180 Secs	



### 8.6.2- Multi-stage thermostat set-up, factory default

DIP switches S7-1 and S7-2 (see table above) are set to the "Off" position from the factory for use with a multi-stage thermostat. This allows the thermostat to control staging between low and high fire.

### 8.6.3- Single stage thermostat set-up, module controls staging

DIP switches, S7-1 and S7-2 (see table above) configure for a single stage thermostat. Options include a 10 minutes delay on second stage, 20 minutes delay on second stage or an Auto setting allowing the module to calculate the time delay for second stage based on average demand.

Table 23 : Duty cycle shows how the module calculates staging based on demand.

Table 23 : Duty cycle


Average calculated Duty Cycle % Equals	or is less than	Low to High Stage Delay	Demand
0	38	12 minutes	Light
38	50	10 minutes	Light to Average
50	62	7 minutes	Average
62	75	5 minutes	Average to Heavy
75	88	3 minutes	Heavy light
88	100	1 minute	Heavy

### 8.6.4- Heat fan off delay timing

DIP switches S7-3 and S7-4 (see table above) configure the number of seconds the blower will run after the call for heat ends. Factory default is 90 seconds. Heat pump and de-humidification

Table 24 : DIP Switches

Heat Pump S5-1	Switch Settings		Options
	S5-1	S5-2	Time
De-humidifier S5-2	Off	Installed	
	On	Not Installed*	
		S5-2	Time
Heat Pump S5-1	Off	Installed	
	On	Not Installed*	



\*Factory Settings

### Heat pump systems

DIP switch S5-1 (see table above) is set to "On" from the factory for use with conventional (non-Heat Pump systems). For heat pump systems move the S5-1 DIP switch to the "Off" position. This will continuously

### 8.6.5- De-humidification connection

DIP switch S5-2 (see table above) is set to "On" from the factory for systems that do not have a dehumidification terminal connection from the thermostat. For systems using a thermostat that provides a De-Humidification option move DIP switch S5-2 to "Off".

### 8.6.6- Normal operation – heat on

When the thermostat calls for heat the module verifies the pressure switches are open and energizes the inducer (high speed) and optional humidifier contacts. When the low pressure switch contacts close a 15 second pre-purge begins. After 15 seconds the inducer switches to low speed and the 120 VAC ignitor is energized. The ignitor warms up for 17 seconds and the gas valve is energized on low fire. Flame must be detected within 4 seconds. If flame is detected, a 45 second heat, fan on time delay begins. This allows the heat exchanger to warm up before energizing the circulator on low speed and (optional) Electronic Air Cleaner contact. When the thermostat (or module) initiates second stage the inducer is energized at high speed. This closes the second stage inducer pressure switch then energizes the second stage on the gas valve and then the high heat circulator speed.

### 8.6.7- Normal operation – heat off

When the thermostat satisfies for second stage, the control will switch high speed inducer and high fire gas valve to low speed inducer and low fire gas valve. After the 30 seconds high heat fan delay the circulator will drop to low speed. When the thermostat satisfies for first stage the gas valve de-energizes and the inducer will run low speed for a 15 seconds post-purge. The circulator runs until the heat off delay ends.

**Note:** If the module is configured for a single stage thermostat and running on second stage when the call for heat ends, the circulator will drop to low speed after 30 seconds and continue until the heat off delay ends.

### 8.6.8- Cool mode

In a typical system, a call for cool is initiated by closing Y and G. This energizes the compressor and the electronic air cleaner (optional). The electronic air cleaner and the G and (Y or Y10) outputs to the Circulator motor will energize after the 5 seconds cool on delay period. After the thermostat is satisfied, the compressor is de-energized and the control starts a 60 seconds cool circulator speed off delay. After 60 seconds the circulator is de-energized.

### 8.6.9- Adjust airflow

The ECM blower can be adjusted for a range of airflow for Low Speed or High Speed cooling/heating. Refer to CFM tables in Annexe for the relation between airflow, external static pressure and dipswitch setting.

The Adjust dipswitches (S3-3 and S3-4) can also be used to increase or decrease the airflow.

Table 25 : Motor configuration settings

		A	B	C	D
COOL	S3-1	OFF	ON	OFF	ON
	S3-2	OFF	OFF	ON	ON
HEAT	S4-3	OFF	ON	OFF	ON
	S4-4	OFF	OFF	ON	ON
Delay	S4-1	OFF	ON	OFF	ON
	S4-2	OFF	OFF	ON	ON
Adjust	S3-3	OFF	ON	OFF	ON
	S3-4	OFF	OFF	ON	ON

### 8.6.10- Manual fan on mode

If the thermostat fan switch is moved to the "ON" position, the electronic air cleaner (optional) and the G circulator output to the circulator motor will be energized. When the fan switch is returned to the AUTO position, the G circulator output and the electronic air cleaner are de-energized.

### 8.6.11- System lockout

When a system lockout occurs (1 hour), the gas valve is de-energized, the low speed inducer blower is energized for the 60 seconds inter-purge period and the circulator is energized for selected heat off delay if it was previously ON. The diagnostic indicator light will flash the fault that is present (refer to diagnostic table).

**To reset the control after system lockout, do one of the following:**

### 8.6.12- System reset

Remove 24 VAC power to the control for twenty (20) seconds or longer to reset the control.

### 8.6.13- Thermostat reset

Remove the call for heat from the thermostat for a period of between (1) second and less 20 seconds. If flame is sensed with the gas valve de-energized, interrupting the call for heat at the thermostat will not reset the control.

### 8.6.14- Auto restart

After one (1) hour of internal or external lockout, the control will automatically reset itself and go into an auto restart purge for 15 seconds.

### 8.6.15- Diagnostic features

The control continuously monitors its own operation and the operation of the system. If a failure occurs the diagnostic indicator LED (DSI) will flash a "RED" failure code. If a failure is internal to the control the "RED"

indicator will stay on continuously. In this case, the entire control should be replaced as the control is not field-repairable. If the LED is continuously OFF, there may be no power to the control or a failure within the control. If the sensed failure is in the system (external to the control), the LED will flash RED in the sequence listed in the Diagnostic Table. The LED will also indicate "System Status" as per the Amber and Green LED signatures listed in the Diagnostic Table. The LED will flash one RED flash at power up.

### 8.6.16- Fault code retrieval

To retrieve fault codes, push and release the "LAST ERROR" button for more than 1/5 seconds and less than 5 seconds. (Control will indicate this period by solid GREEN for 1/5 seconds. to 5 seconds). The LED will flash up to five stored fault codes, beginning with the most recent. If there are no fault codes in memory, the LED will flash two green flashes. The control will flash the most recent error first and the oldest error last (last in first out). There shall be 2 seconds between codes. Solid LED error codes will not be displayed.

**NOTE: These error codes may be different from furnace label or furnace manual.**

### 8.6.17- CFM indicator

The LED (DS2) CFM flashes when the blower motor is running. The flashing indicates the motor CFM (cubic feet per minute) air flow designated by the furnace manufacturer. Consult Table 26: 2 stage ECM diagnostic table

**Table 26: 2 stage ECM diagnostic table**

Green LED Flash	Amber LED Flash	Red LED Flash	Error/Condition	Comments/Troubleshooting
		1	Flame sensed when no flame should be present	Verify the gas valve is operating and shutting down properly. Flame in burner assemble should extinguish promptly at the end of the cycle. Check orifices and gas pressure
		2	Pressure switch stuck closed/inducer error	Pressure switch stuck closes. Check switch function, verify inducer is is turning off.
		3	1st-stage pressure switch stuck open/inducer error	Chck pressure switch function and tubing. Verify inducer is turning on the pulling sufficient vacuum to engage switch.
		4	Open limit switch	Verify continuity through rollout switch circuit.
		5	Open rollout/open fuse detect	Verify continuity through rollout switch circuit, check fuse.
		6	1st-stage pressure switch cycle lockout	If the first stage pressure switch cycles 5 times (open, closes) during one call for heat from the thermostat the control will lockout. Check pressure switch for fluttering, inconsistent closure or poor vacuum pressure.
		7	External lockout (retries)	Failure to sense flame is often caused by carbon deposits on the flame sensor, a disconnected or shorted flame sensor lead or a poorly grounded furnace. Carbon deposits can be cleaned with emery cloth. Verify sensor is not contacting the burner and is located in a good position to sense flame. Check sensor lead for horting and verify furnace is grounded properly.
		8	External lockout (ignition recycles exceeded where flame is established and then lost)	Check items for exceeded retries listed above and verify valve is not dropping out allowing flame to be established and then lost.
		9	Grounding or Reversed polarity	Verify the control and furnace are properly grounded. Check and reverse polarity (primary) if incorrect.
		10	Module gas valve contacts energized with no call for heat	Verify valve is not receiving voltage from a short. If a valve wiring is correct and condition persists, replace module.
		11	Limit switch open - possible blower failure overheating limit	Possible blower failure, restricted air flow through appliance or duct work. Verify continuity through limit switch circuit and correct overheating cause.
		12	Module Ignitor contact failure	Fault code indicates the module ignitor contacts are not functioning properly. Replace module.
		<b>Solid</b>	Module - internal fault condition	Module contacts for gas valve not operating or processor fault. Reset control. If condition persists replace module.
		<b>Rapid</b>	Twinning error (twinning IS NOT recommended)	Check wire connections. If condition persists, replace module.
		<b>3 double</b>	2nd-stage Pressure Switch Stuck Open/Inducer Error	Check pressure switch function and tubing. Verify inducer is turning on and pulling sufficient vacuum to engage switch.
	1		Normal Operation with call for first stage heat	Normal operation - first stage
	2		Normal Operation with call for second stage heat	Normal operation - second stage
	3		W2 present with no W1	Second stage call for heat on thermostat circuit with no call for first stage. Verify dip switches are set for two stage thermostat and check thermostat first stage circuit. Configured for a multi-stage thermostat the module will not initiate heating unless first stage call from thermostat is received.
	4		Y presnet with no G call	Module will allow cooling to operate with only a "Y" signal from the thermostat but will also trigger this code. Verify thermostat is energizing both "Y" and "G" on call for cool. Check "G" terminal connections
	rapid		Low flame sense current	Low flame sense current is often caused by carbon deposits on the flame sensor, a poorly grounded furnace or a mis-aligned flame sense probe. Carbon deposits can be cleaned with emery cloth. Check for improve furnace and module ground. Verify sensor is located in or very near flame.
1			Standby or Call or Cool	Normal operation. Waiting for call from thermostat or receiving thermostat call for cool.

## 8.7- SAFETY CHECK

### 8.7.1- Prime condensate trap with water

Failure to follow this caution may result in intermittent unit operation or bad performance. Condensate trap must be PRIMED or proper draining may not occur. The condensate trap has two internal chambers which can ONLY be primed by pouring water into the side or top drain inlet of condensate trap.

### 8.7.2- Check safety controls

The flame sensor, gas valve, and pressure switch were all checked in the Start-up procedure section as part of normal operation.

1. Check Main Limit Switch
  - a. This control shuts off combustion system and energizes air-circulating blower motor, if furnace overheats. By using this method to check limit control, it can be established that limit is functioning properly and will operate if there is a restricted return air supply or motor failure. If limit control does not function during this test, cause must be determined and corrected.
  - b. Run furnace for at least 5 minutes.
  - c. Gradually block off return air with a piece of cardboard or sheet metal until the limit trips.
  - d. Unblock return air to permit normal circulation.
  - e. Burners will re-light when furnace cools down.
  - f. Check Pressure Switch(es)
  - g. This control proves operation of the draft inducer blower.
  - h. Turn off 115 V power to furnace.
  - i. Disconnect inducer motor lead wires from wire harness.
  - j. Turn on 115 V power to furnace.
  - k. Set thermostat to "call for heat" and wait 1 minute. When pressure switch is functioning properly, hot surface igniter should **NOT** glow and control diagnostic light flashes a status code 32. If hot surface igniter glows when inducer motor is disconnected, shut down furnace immediately.
  - l. Determine reason pressure switch did not function properly and correct condition.
  - m. Turn off 115 V power to furnace.
  - n. Reconnect inducer motor wires, replace blower door, and turn on 115 V power.
  - o. Blower will run for 90 seconds before beginning the call for heat again.
  - p. Furnace should ignite normally.

### 8.7.3- Checklist

1. Put away tools and instruments. Clean up debris.
2. Verify that blower and control doors are properly installed.
3. Cycle test furnace with room thermostat.
4. Check operation of accessories per manufacturer's instructions.
5. Review Owner's Manual with owner.
6. Attach literature packet to furnace.

## 9- OPERATING YOUR FURNACE

These furnaces are equipped with an ignition device which automatically lights the burners. **Do not try to light the burners by hand.**

**Before operating**, smell around furnace area for gas. Be sure to smell near floor because some gas is heavier than air and will settle to the lowest point. See **WHAT TO DO IF YOU SMELL GAS** if the odour of gas is present. Use only your hand to turn the gas control knob; **never use tools**. If the knob will not turn by hand, don't try to repair it. Call a qualified service technician. **Force or attempted repair may result in a fire or explosion.**

### 9.1- START UP INSTRUCTIONS

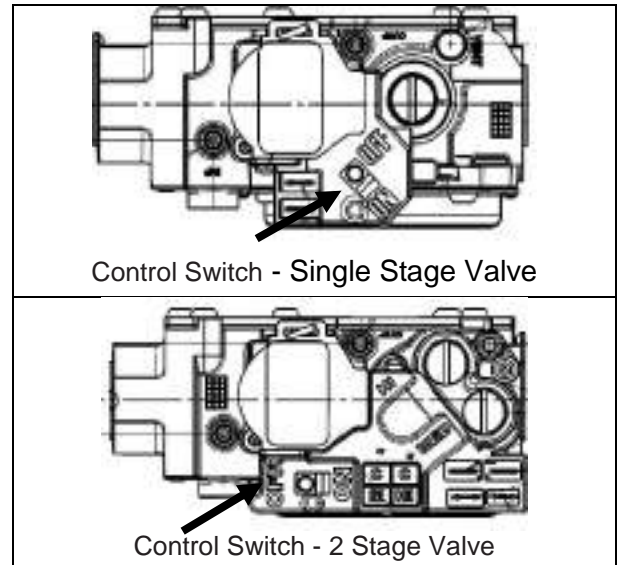
1. **STOP!** Read the previous safety information.
2. Set the thermostat to the lowest setting.
3. Turn off all electric power to the furnace.

4. Remove the burner compartment access panel.
5. This appliance is equipped with an automatic ignition device.

**Do not try to light the burners by hand.**

6. Move the gas control switch to "OFF" (see Figure 29).

Figure 29 : Control Switch



7. Wait 5 minutes to clear out any gas, then smell for gas (including at the bottom of the unit near the ground). If you smell gas, stop and follow the directions in **WHAT TO DO IF YOU SMELL GAS** on page 44. If you don't smell gas, continue to next step.
8. Move the gas control knob or switch to "ON".
9. Replace the burner compartment access panel.
10. Turn on all electric power to the furnace.
11. Set the thermostat to the desired setting.
12. If the furnace will not operate, follow the instructions found below in to turn off Gas to Furnace and call your service technician or gas supplier.

## 9.2- SHUTTING DOWN THE FURNACE

To shut down the furnace, set the thermostat to the "OFF" position.

### 9.2.1- To turn off gas to furnace

1. Set the thermostat to the lowest setting.
2. Turn off all electric power to the furnace if service is to be performed.
3. Remove the burner compartment access panel.
4. Move the gas control knob or switch to "OFF" (see Figure 29). Do not force.
5. Replace the burner compartment access panel.

## 10- MAINTENANCE OF YOUR FURNACE

There are routine maintenance steps you should take to keep your furnace operating efficiently. This maintenance will assure longer life, lower operating costs, and fewer service calls.

In addition to the maintenance procedures listed in this manual, there are also other service and maintenance procedures that require the skills of a service person that has specialized tools and training. **Personal injury can result if you are not qualified to do this work.** Please call your dealer when service is needed.

Your gas furnace is designed to give many years of efficient, satisfactory service. However, the varied air pollutants commonly found in most areas can affect longevity and safety. Chemicals contained in everyday household items such as laundry detergents, cleaning sprays, hair sprays, deodorizers, and other products which produce airborne residuals may have an adverse effect upon the metals used to construct

your appliance. The cabinet of the furnace can be cleaned with soap and water. Grease spots can be removed with a household cleaning agent.

It is important that you conduct periodic physical inspections of your appliance, paying special attention to the gas burner and the flue outlet from the furnace. These components are located at the front of the unit. A flashlight will be useful for these inspections. Make one inspection prior to the beginning of the heating season and another during the middle.

Should you observe unusual amounts of any of the following conditions, it is important that you call your authorized dealer at once to obtain a qualified service inspection:

- Rust, flakes, or other deposits
- Coatings
- Corrosion

Even if no unusual rust or other conditions are observed, it is **recommended that the furnace be inspected and serviced at least once per year by a qualified service technician.** Regular inspections and planned maintenance will assure many years of economic performance from your gas furnace.

### 10.1- CLEANING/REPLACING THE FILTER

It is very important to clean or replace the air filter regularly.

Dirty filters are the most common cause of inadequate heating or cooling performance and can sharply increase the operational costs of your unit. In some cases, they can double the cost. **The air filter should be inspected at least every 6 weeks and cleaned or replaced as required.**

Your furnace may use either a disposable filter or a cleanable filter. The type of filter may be indicated on a label attached to the filter. If a disposable filter is used, replace with the same type and size. To remove excess dirt from a cleanable filter, shake filter and/or use a vacuum cleaner. Wash filter in soap or detergent water and replace after filter is dry.

Cleanable filters do not need to be oiled after washing. Cleanable filters may be replaced with disposable filters.

If your air distribution system has a central return air filter-grille, the furnace does not need a filter. Filter-grilles can be maintained the same way as cleanable filters (see above).

#### 10.1.1- Filter location

The filter on your furnace will be located in one of two different locations:

- On one side of the furnace
- On the bottom of the furnace

### 10.2- LUBRICATION

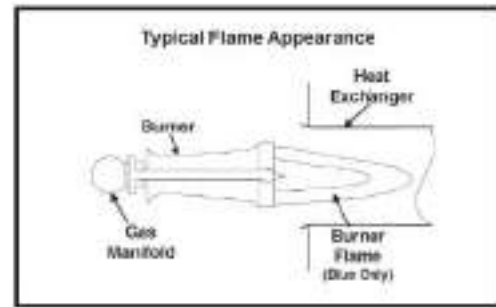
Lubrication of the bearings in the circulating air blower motor and the combustion blower motor is not recommended.

### 10.3- BURNER FLAME

While the furnace is in operation, observe the burner flames. Compare these observations to Figure 30 to determine if proper flame adjustment is present. If your observations indicate improper flame adjustment, call your authorized service dealer for service. **Do not attempt to adjust flame!**

Your service representative will perform this adjustment correctly.

Figure 30 :Typical Flame Appearance



### 10.4- CONDENSATE COLLECTION AND DISPOSAL SYSTEM

The condensate system must not be exposed to temperatures under 32°F.

Make sure the condensate drain line does not become blocked or plugged. Visual inspection of condensate flow can easily be made while the furnace is operating. Use a flashlight to illuminate discharge end of the condensate drain that is placed in the sewer opening. The furnace will not operate properly if condensate drain line becomes blocked or plugged. If this event occurs, have the furnace inspected by a qualified service technician.

### 10.5- ROLLOUT SWITCH

This unit is equipped with a manual reset high temperature sensor or rollout switch. In the unlikely event of a sustained burner flame rollout, the rollout switch will shut off the flow of gas by closing the gas valve. The switch is located inside the gas burner area. Flame rollout can be caused by blockage of the power vent system, a blocked heat exchanger, or improper gas pressure or adjustment. If this event occurs, the unit will not operate properly. The gas supply to the unit should be shut off and **no attempt should be made to place it in operation.** The system should be inspected by a qualified service technician.

### 10.6- SAFETY INTERLOCK SWITCH

The blower compartment door on your high efficiency gas furnace is equipped with a safety interlock switch that will automatically shut off your complete system (including blower) once the door is removed. This is for your personal safety. Be sure to check your furnace for proper operation once the door or panel has been replaced. If the system does not operate once the panel has been replaced, try removing and replacing it once again. If the furnace still does not operate, call your dealer for service.

### 10.7- REPAIR PARTS

The repair parts are available from your local distributor. When ordering parts: include the complete furnace model number and serial number which are printed on the rating plate located on the furnace. For part numbers refer to Dettson.com. and part list tables at the end of this manual.

Figure 31 : Part list 1 Stage PSC

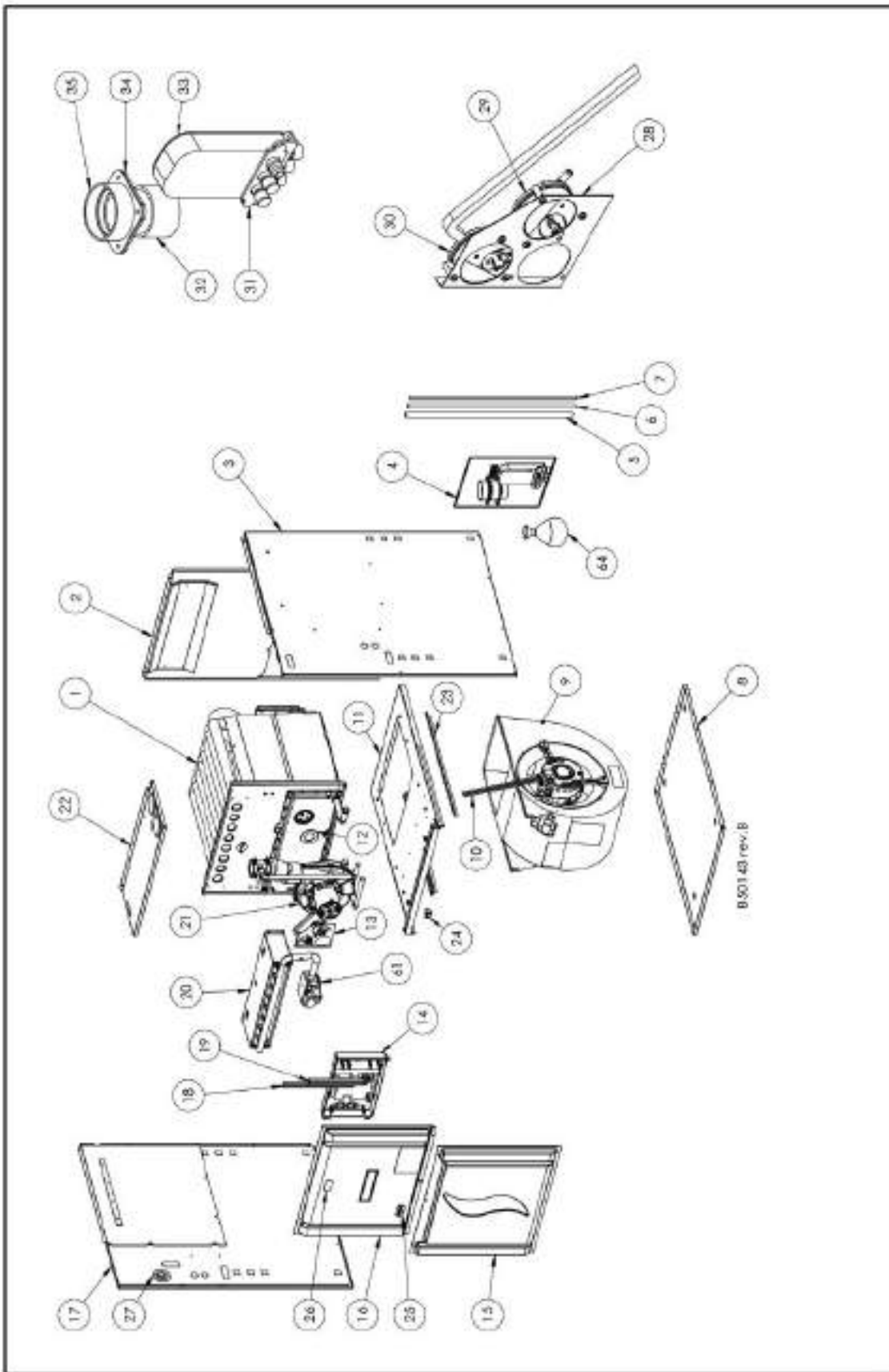
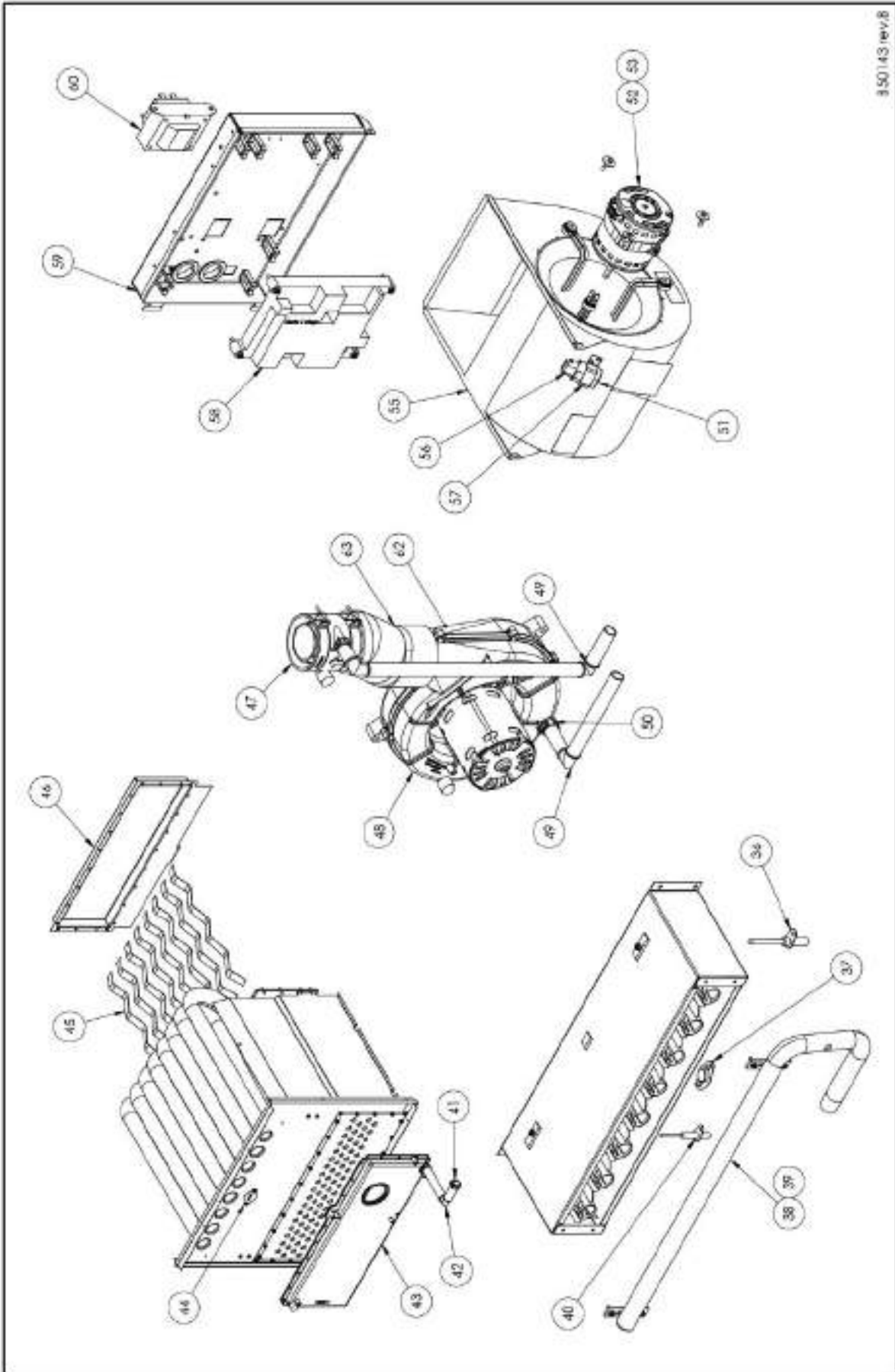


Figure 32 : Part list 1 Stage PSC continued



350143 rev.8



Table 27 : Part list 1 Stage PSC

#	Description	C45-1-D	C60-1-D	C75-1-D	C105-1-D	C120-1-D
1	Heat exchanger assembly	N/A	N/A	N/A	N/A	N/A
2	Rear panel assembly	B40511-01	B40511-02	B40511-03	B40511-03	B40511-03
3	Right panel assembly	B40510-33	B40510-33	B40510-33	B40510-33	B40510-33
4	Part Bag	B40569-01	B40569-02	B40569-02	B40569-02	B40569-02
5	Hose 5/8	B30157-34	B30157-34	B30157-34	B30157-34	B30157-34
6	Hose 1/2	B30157-38	B30157-38	B30157-38	B30157-38	B30157-38
7	Hose 3/16	B30157-40	B30157-40	B30157-40	B30157-40	B30157-40
8	Floor	B40546-01	B40546-02	B40546-02	B40546-03	B40546-03
9	Blower assembly	B40518-01	B40518-04	B40518-02	B40518-03	B40518-03
10	Electric blower kit	B40590-02	B40590-02	B40590-02	B40590-02	B40590-02
11	Separator assembly	N/A	N/A	N/A	N/A	N/A
12	Inducer restrictor	B40699	B40563-04	B40698	B40563-06	---
13	Pressure switch assembly	B40675-03	B40675-04	B40675-05	B40675-07	B40675-08
14	Control card ass.	B40697	B40697	B40697	B40697	B40697
15	lower door ass.	B40570-01	B40570-02	B40570-02	B40570-03	B40570-03
16	upper door ass.	B40571-01	B40571-02	B40571-02	B40571-03	B40571-03
17	Left pannel assembly	B40509-01	B40509-01	B40509-01	B40509-01	B40509-01
18	Electric kit inducer/blower	B40589-01	B40589-01	B40589-01	B40589-02	B40589-02
19	Elect. Kit principal harness	B40591-02	B40591-02	B40591-02	B40591-02	B40591-02
20	Complete manifold ass.	B40514-03	B40514-04	B40514-05	B40514-07	B40514-08
21	Complete ID blower assembly	B40578-04	B40578-01	B40578-01	B40578-01	B40578-01
22	Top panel assembly	B40512-01	B40512-02	B40512-02	B40512-03	B40512-03
23	Blower rail	N/A	N/A	N/A	N/A	N/A
24	Door switch	L07H001	L07H001	L07H001	L07H001	L07H001
25	Dettson observation port	B40565	B40565	B40565	B40565	B40565
26	Observation port	L04Z022	L04Z022	L04Z022	L04Z022	L04Z022
27	Grommet	G14F017	G14F017	G14F017	G14F017	G14F017
28	Pressure switch support	N/A	N/A	N/A	N/A	N/A
29	Pressure switch (multiposition)	R99F035	R99F035	R99F035	R99F035	R99F035
30	Pressure switch	R99F043	R99F042	R99F048	R99F039	R99F039
31	Drain trap gasket	B40568	B40568	B40568	B40568	B40568
32	PVC pipe	B40573-02	B40573-01	B40573-01	B40573-01	B40573-01
33	Drain trap	B40760	B40760	B40760	B40760	B40760
34	Vent flange gasket	B40567	B40567	B40567	B40567	B40567
35	Vent flange	B40533	B40533	B40533	B40533	B40533
36	Pilot 24v	R03K005	R03K005	R03K005	R03K005	R03K005
37	Roll out switch	R02N022	R02N022	R02N022	R02N022	R02N022
38	Gas manifold	B40527	B40528	B40529	B40531	B40532
39	Orifice #48 natural gas	R04I001	R04I001	R04I001	R04I001	R04I001
40	Flame detector	R03J004	R03J004	R03J004	R03J004	R03J004
41	Hose clamp 5/8"	G99Z035	G99Z035	G99Z035	G99Z035	G99Z035
42	Elbow 5/8"	G07J007	G07J007	G07J007	G07J007	G07J007
43	Condensation box	B40526-01	B40526-02	B40526-02	B40526-03	B40526-04
44	High limit	R02N026	R02N024	R02N023	R02N024	R02N024
45	Baffle	B40572	B40572	B40572	B40572	B40572
46	Smoke box	B40539-01	B40539-02	B40539-02	B40539-03	B40539-04
47	Vent coupling	B40580	B40580	B40580	B40580	B40580
48	ID blower	Z01K007	Z01K007	Z01K007	Z01K007	Z01K007
49	Elbow 1/2"	G07J006	G07J006	G07J006	G07J006	G07J006
50	Hose clamp 1/2"	G99Z034	G99Z034	G99Z034	G99Z034	G99Z034
51	Capacitor	L01I002	L01I002	L01I005	L01I003	L01I003
52	PSC motor assembly	B03684-02	B03684-03	B01891-07	B01891-08	B01891-08
53	PSC motor	L06H004	L06H004	L06I004	L06K004	L06K004



54	Belly band kit	B01889	B01889	B01889	B01889	B01889
55	Blower	Z011033	Z011035	Z011036	Z011038	Z011038
56	oval cap	L99Z007	L99Z007	L99Z007	L99Z007	L99Z007
57	Capacitor support	B01024	B01024	B01024	B01024	B01024
58	IFC 24v 1 stage	R99G013	R99G013	R99G013	R99G013	R99G013
59	Electric box	B40559	B40559	B40559	B40559	B40559
60	Transformer 120v-24v	L01F009	L01F009	L01F009	L01F009	L01F009
61	Gas valve 24v 1 stage	R01H012	R01H012	R01H012	R01H012	R01H012
62	ID blower and elbow assembly	---	B40766-01	B40766-01	B40766-01	B40766-01
63	ID blower elbow	---	B40818	B40818	B40818	B40818
64	extruded seal	B04435-01	B04435-01	B04435-01	B04435-01	B04435-01
	<b>Options</b>					
	Bottom return base	B40691-01	B40691-02	B40691-02	B40691-03	B40691-03
	Downflow base	B40632-01	B40632-02	B40632-02	B40632-03	B40632-03
	transition for A coil	B40693-01	B40693-02	B40693-02	B40693-03	B40693-03
	Conversion kit for propane	B40574-07	B40574-10	B40574-13	B40574-19	B40574-22
	Orifice #56 propane	R04I002	R04I002	R04I002	R04I002	R04I002
	Replacement kit for drain trap	K01021	K01021	K01021	K01021	K01021

Figure 33 : Part list 1 stage ECM

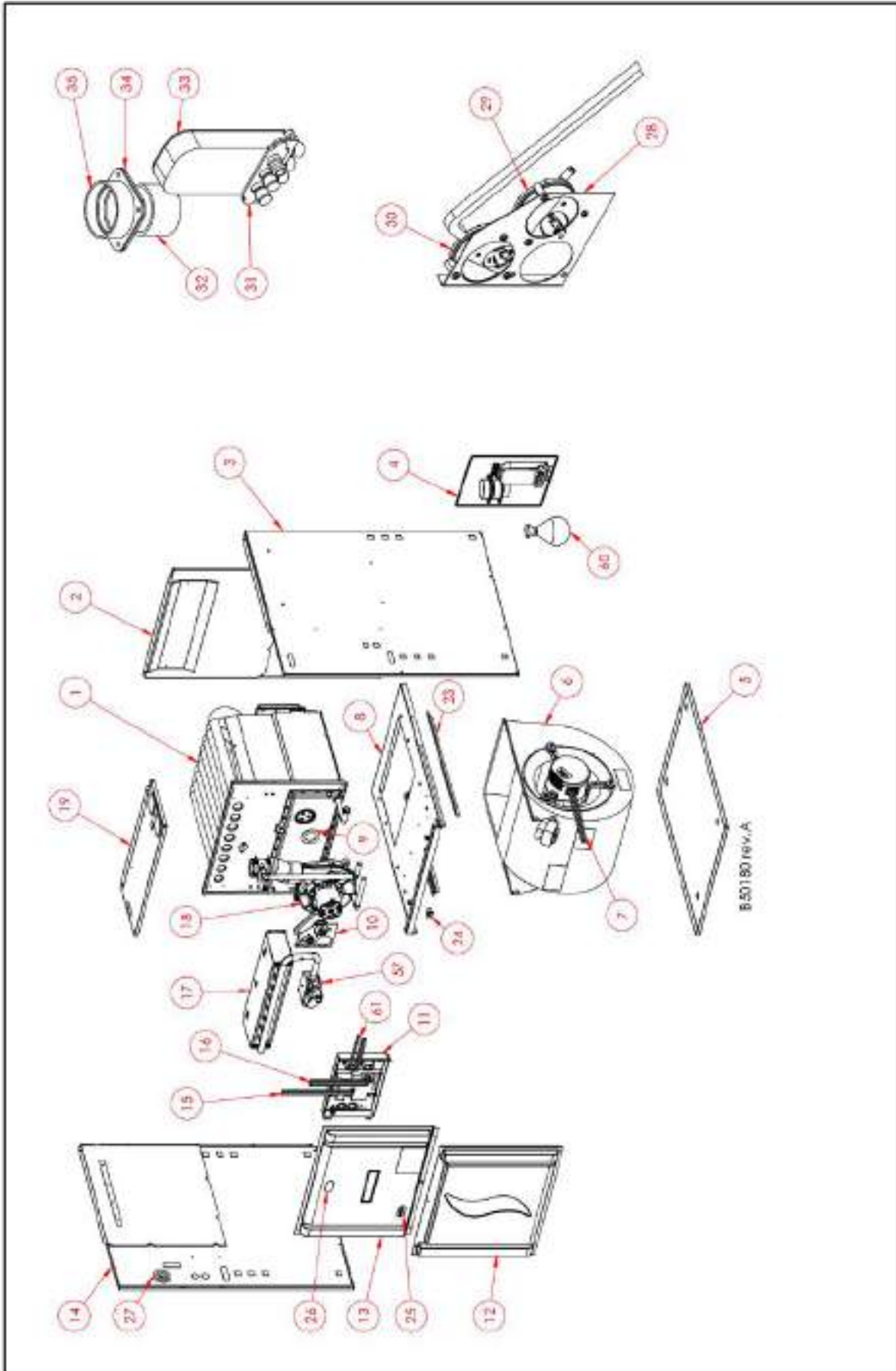
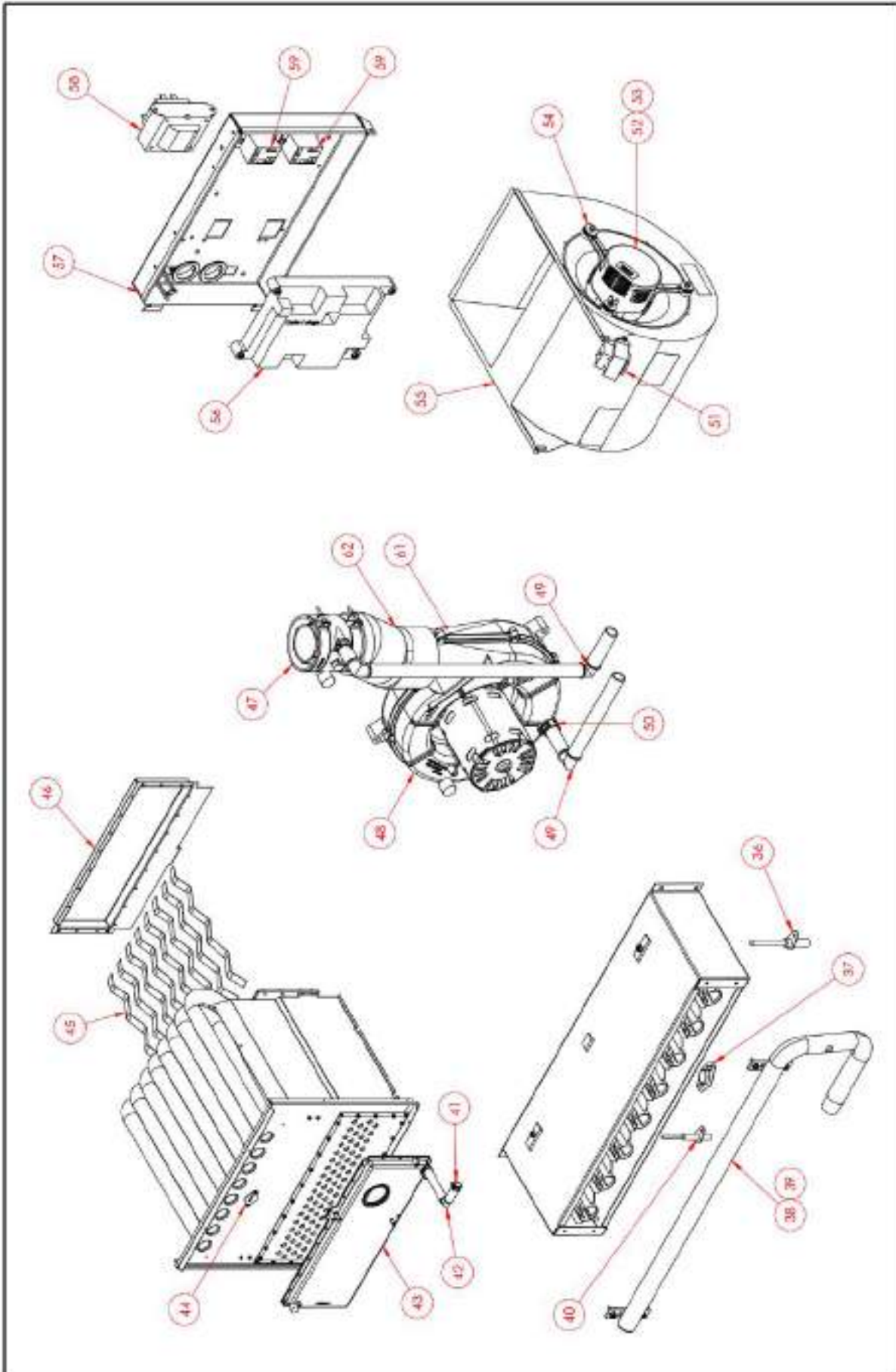


Figure 34 : Part list 1 stage ECM continued



**Table 28 : Part list 1 stage ECM**

#	Description	C45-1-X	C60-1-X	C75-1-X	C105-1-X	C120-1-X
1	Heat exchanger assembly	N/A	N/A	N/A	N/A	N/A
2	Rear pannel assembly	B40511-01	B40511-02	B40511-02	B40511-03	B40511-03
3	Right panneal assembly	B40510-33	B40510-33	B40510-33	B40510-33	B40510-33
4	Part bag	B40569-01	B40569-02	B40569-02	B40569-02	B40569-02
5	Floor	B40546-01	B40546-02	B40546-02	B40546-03	B40546-03
6	Blower ass	B40815-01	B40815-02	B40815-03	B40815-05	B40815-06
7	Electric blower kit	B40826	B40826	B40826	B40826	B40826
8	Divider assembly	N/A	N/A	N/A	N/A	N/A
9	Blower restrictor	B40699	B40563-04	B40698	B40563-06	---
10	Pressure switch assembly	B40675-03	B40675-04	B40675-05	B40675-07	B40675-08
11	Electric box assembly	B40813	B40813	B40813	B40813	B40813
12	Lower front door assembly	B40570-13	B40570-14	B40570-14	B40570-15	B40570-15
13	Upper front door assembly	B40571-01	B40571-02	B40571-02	B40571-03	B40571-03
14	Left pannel assembly	B40509-01	B40509-01	B40509-01	B40509-01	B40509-01
15	Ignitor/blower induc elect kit	B40589-01	B40589-01	B40589-01	B40589-02	B40589-02
16	Main harness elec. Kit	B40825-02	B40825-02	B40825-02	B40825-02	B40825-02
17	Gas manifold ass	B40514-03	B40514-04	B40514-05	B40514-07	B40514-08
18	ID blower assembly	B40578-04	B40578-01	B40578-01	B40578-01	B40578-01
19	Top pannel assembly	B40512-01	B40512-02	B40512-02	B40512-03	B40512-03
20	Blower rail	N/A	N/A	N/A	N/A	N/A
21	Door switch	L07H001	L07H001	L07H001	L07H001	L07H001
22	Dettson observation port	B40565	B40565	B40565	B40565	B40565
23	Observation port	L04Z022	L04Z022	L04Z022	L04Z022	L04Z022
24	Grommet	G14F017	G14F017	G14F017	G14F017	G14F017
25	Pressure switch support	N/A	N/A	N/A	N/A	N/A
26	Pressure switch (multiposition)	R99F035	R99F035	R99F035	R99F035	R99F035
27	Pressure switch	R99F043	R99F042	R99F048	R99F039	R99F039
28	Drain trap gasket	B40568	B40568	B40568	B40568	B40568
29	PVC pipe	B40573-02	B40573-01	B40573-01	B40573-01	B40573-01
30	Drain trap	B40760	B40760	B40760	B40760	B40760
31	Vent flange gasket	B40567	B40567	B40567	B40567	B40567
32	Vent flange	B40533	B40533	B40533	B40533	B40533
33	Pilot 24v	R03K005	R03K005	R03K005	R03K005	R03K005
34	Roll out switch	R02N022	R02N022	R02N022	R02N022	R02N022
35	Manifold	B40527	B40528	B40529	B40531	B40532
36	Orifice #48 nat. Gas	R04I001	R04I001	R04I001	R04I001	R04I001
37	Flame sensor	R03J004	R03J004	R03J004	R03J004	R03J004
38	Spring hose clamp 5/8"	G99Z035	G99Z035	G99Z035	G99Z035	G99Z035
39	Elbow 5/8"	G07J007	G07J007	G07J007	G07J007	G07J007
40	Condensation box	B40526-01	B40526-02	B40526-02	B40526-03	B40526-04
41	High limit	R02N026	R02N024	R02N023	R02N024	R02N024
42	Baffle	B40572	B40572	B40572	B40572	B40572
43	Smoke box	B40539-01	B40539-02	B40539-02	B40539-03	B40539-04
44	Vent fitting drain	B40580	B40580	B40580	B40580	B40580
45	ID blower	Z01K007	Z01K007	Z01K007	Z01K007	Z01K007
46	Elbow 1/2"	G07J006	G07J006	G07J006	G07J006	G07J006
47	Spring hose clamp 1/2"	G99Z034	G99Z034	G99Z034	G99Z034	G99Z034
48	Inductor	B03141-02	B03141-01	B03141-01	B03141	B03141
49	X13 motor ass (with prog)	B40814-01	B40814-02	B40814-03	B40814-05	B40814-06
50	X13 motor (with prog)	B40806-02	B40806-01	B40807-01	B40808-01	B40808-02
51	Belly band	B01889	B01889	B01889	B01889	B01889

52	Blower	Z01I033	Z01I035	Z01I036	Z01I038	Z01I038
53	IFC 24V 1 stage	R99G013	R99G013	R99G013	R99G013	R99G013
54	Control board support	B40559	B40559	B40559	B40559	B40559
55	Transfo 120v-24v	L01F009	L01F009	L01F009	L01F009	L01F009
56	Relay 120Vac	L01H011	L01H011	L01H011	L01H011	L01H011
57	Gas valve	R01H012	R01H012	R01H012	R01H012	R01H012
58	ID blower and elbow ass	---	B40766-01	B40766-01	B40766-01	B40766-01
59	Kit ID blower elbow	---	B40818	B40818	B40818	B40818
60	Extruded seal kit	B04435-01	B04435-01	B04435-01	B04435-01	B04435-01
61	Electric kit relay	B40824	B40824	B40824	B40824	B40824
	<b>Options</b>					
	Bottom return base	B40691-01	B40691-02	B40691-02	B40691-03	B40691-03
	Downflow base	B40632-01	B40632-02	B40632-02	B40632-03	B40632-03
	transition for A coil	B40693-01	B40693-02	B40693-02	B40693-03	B40693-03
	Conversion kit for propane	B40574-07	B40574-10	B40574-13	B40574-19	B40574-22
	Orifice #56 propane	R04I002	R04I002	R04I002	R04I002	R04I002
	Replacement kit for drain trap	K01021	K01021	K01021	K01021	K01021

Figure 35 : Part list 2 Stage PSC

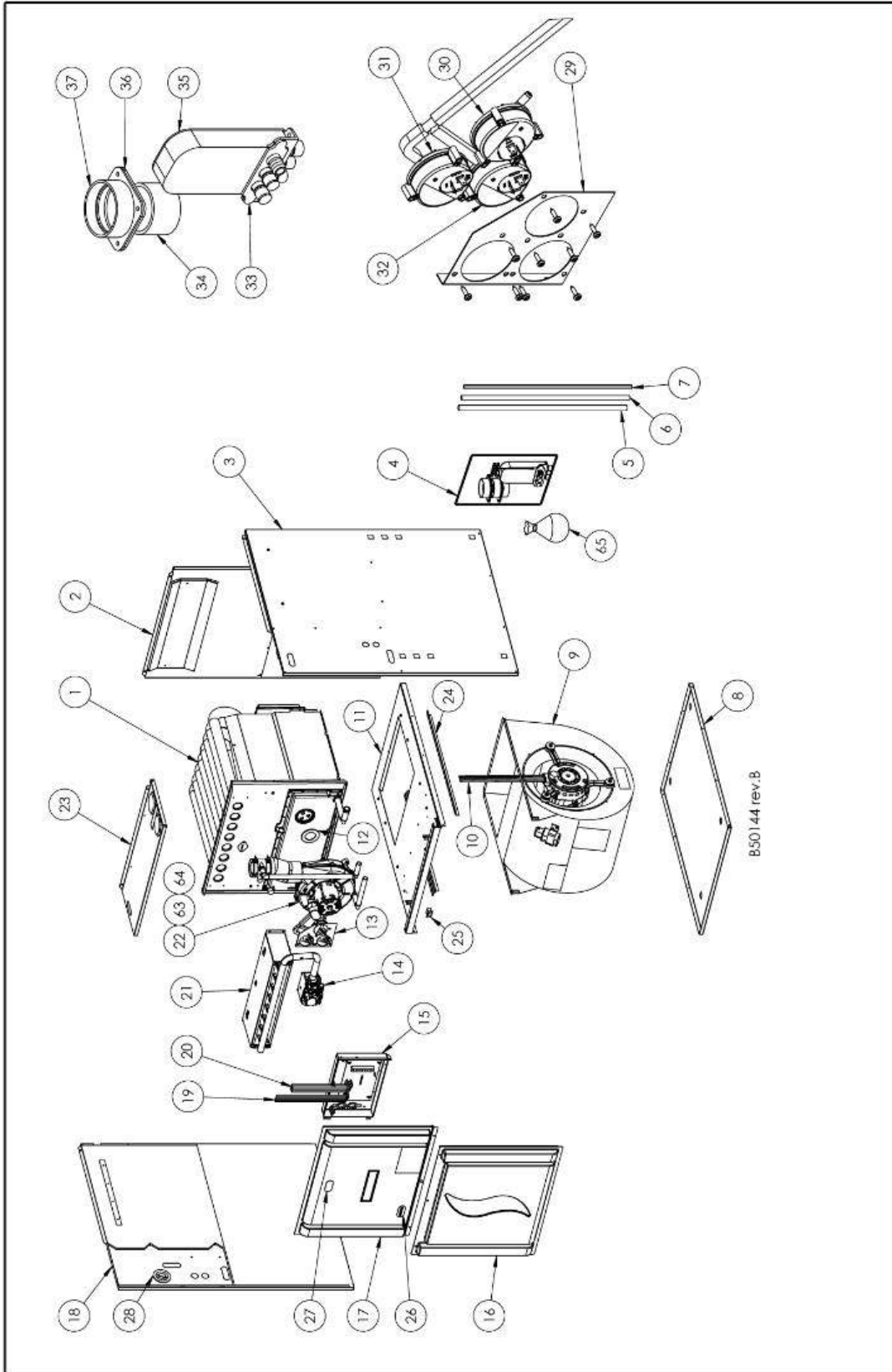
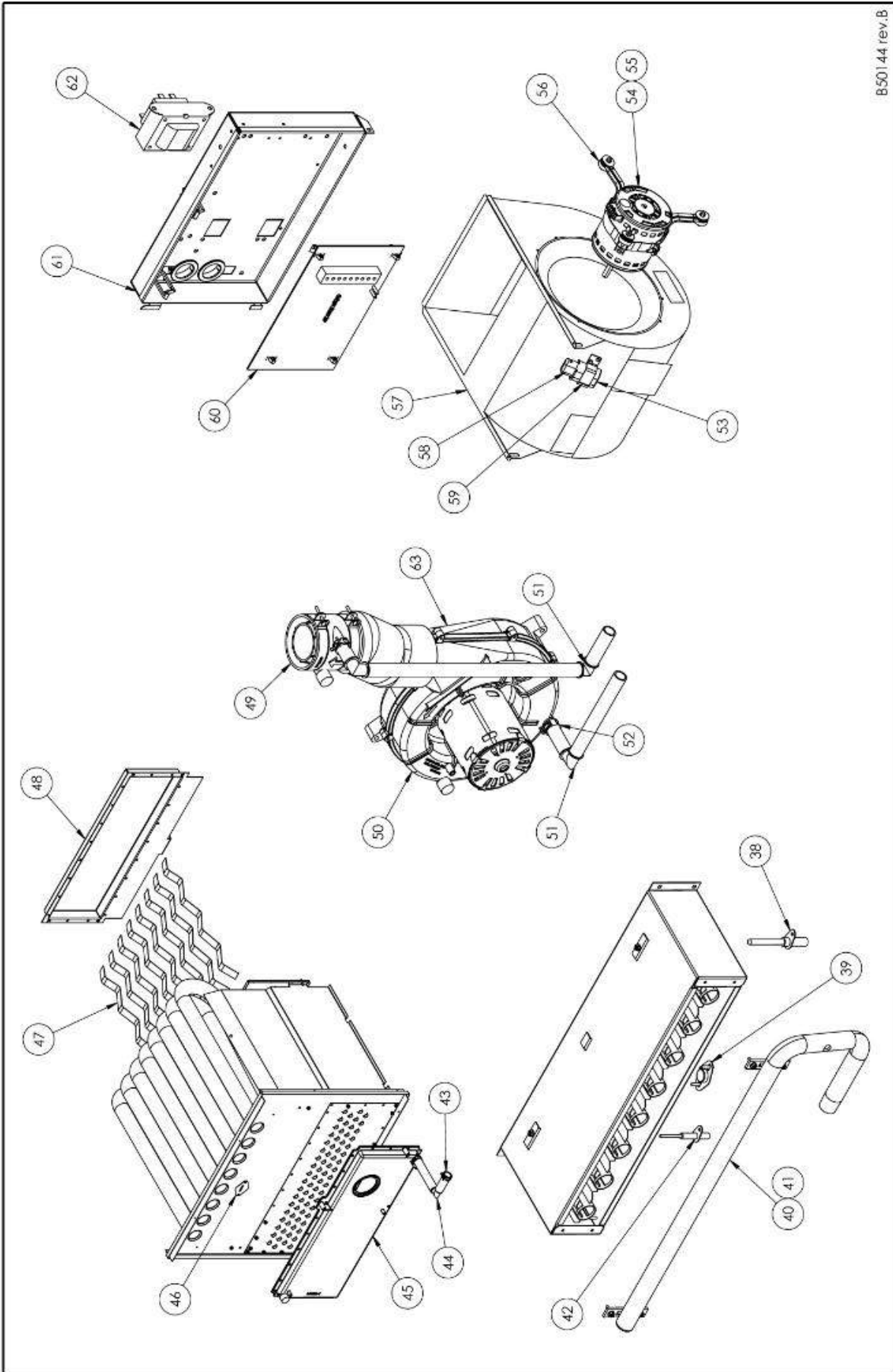


Figure 36 : Part list 2 stage PCS continued



B.501.44 rev.B

Table 29 : Part list 2 Stage PSC

#	Description	C45-2-D	C60-2-D	C75-2-D	C105-2-D	C120-2-D
1	Heat exchanger assembly	N/A	N/A	N/A	N/A	N/A
2	Back panel assembly	B40511-04	B40511-04	B40511-04	B40511-05	B40511-05
3	Right panel assembly	B40510-34	B40510-34	B40510-34	B40510-34	B40510-34
4	Part bag	B40569-01	B40569-01	B40569-01	B40569-02	B40569-02
5	Hose 5/8	B30157-34	B30157-34	B30157-34	B30157-34	B30157-34
6	Hose 1/2	B30157-38	B30157-38	B30157-38	B30157-38	B30157-38
7	Hose 3/16	B30157-40	B30157-40	B30157-40	B30157-40	B30157-40
8	Floor	B40546-01	B40546-01	B40546-01	B40546-02	B40546-02
9	Blower assembly	B40518-01	B40518-01	B40518-01	B40518-04	B40518-02
10	Electric kit blower	B40594-01	B40594-01	B40594-01	B40594-01	B40594-01
11	Separator assembly	N/A	N/A	N/A	N/A	N/A
12	ID blower restrictor	B40563-01	B40563-02	B40699	B40563-04	B40698
13	Pressure switch assembly	B40675-09	B40675-10	B40675-11	B40675-12	B40675-13
14	Gas valve	R01I003	R01I003	R01I003	R01I003	R01I003
15	Electric box assembly	B40696	B40696	B40696	B40696	B40696
16	Lower door assembly	B40570-04	B40570-04	B40570-04	B40570-05	B40570-05
17	Upper door assembly	B40571-01	B40571-01	B40571-01	B40571-02	B40571-02
18	Left panel assembly	B40509-02	B40508-02	B40509-02	B40509-02	B40509-02
19	Electric kit inducer/blower	B40592-01	B40592-01	B40592-01	B40592-01	B40592-01
20	Electric kit principal harness	B40593-01	B40593-01	B40593-01	B40593-01	B40593-01
21	Complete manifold assembly	B40514-01	B40514-02	B40514-03	B40514-04	B40514-05
22	Id blower assembly	B40578-05	B40578-05	B40578-05	B40578-02	B40578-02
23	Top panel assembly	B40512-01	B40512-01	B40512-01	B40512-02	B40512-02
24	Blower rail	N/A	N/A	N/A	N/A	N/A
25	Door switch	L07H001	L07H001	L07H001	L07H001	L07H001
26	Observation port Dettson	B40565	B40565	B40565	B40565	B40565
27	Observation port	L04Z022	L04Z022	L04Z022	L04Z022	L04Z022
28	Grommet	G14F017	G14F017	G14F017	G14F017	G14F017
29	Pressure switch support	N/A	N/A	N/A	N/A	N/A
30	Pressure switch (multiposition)	R99F035	R99F035	R99F035	R99F035	R99F035
31	Pressures switch (high fire)	---	---	R99F043	R99F042	R99F048
32	Pressures switch (low fire)	---	---	R99F039	R99F050	R99F050
33	Drain trap gasket	B40568	B40568	B40568	B40568	B40568
34	PVC pipe	B40573-02	B40573-02	B40573-02	B40573-01	B40573-01
35	Drain trap	B40760	B40760	B40760	B40760	B40760
36	Vent flange gasket	B40567	B40567	B40567	B40567	B40567
37	Vent flange	B40533	B40533	B40533	B40533	B40533
38	Pilot 24v	R03K005	R03K005	R03K005	R03K005	R03K005
39	Roll out switch	R02N022	R02N022	R02N022	R02N022	R02N022
40	Gas manifold	B40576	B40577	B40527	B40528	B40529
41	Orifice #48 natural gas	R04I001	R04I001	R04I001	R04I001	R04I001
42	Flame detector	R03J004	R03J004	R03J004	R03J004	R03J004
43	Hose clamp 5/8"	G99Z035	G99Z035	G99Z035	G99Z035	G99Z035
44	Elbow 5/8"	G07J007	G07J007	G07J007	G07J007	G07J007
45	Condensation box	B40526-01	B40526-01	B40526-01	B40526-02	B40526-02
46	High limit	R02N027	R02N026	R02N026	R02N024	R02N023
47	Baffle	B40572	B40572	B40572	B40572	B40572
48	Smoke Box	B40539-01	B40539-01	B40539-01	B40539-02	B40539-02
49	Vent coupling	B40580	B40580	B40580	B40580	B40580
50	ID blower (2 Stage)	Z01K006	Z01K006	Z01K006	Z01K006	Z01K006
51	Elbow 1/2"	G07J006	G07J006	G07J006	G07J006	G07J006
52	Hose clamp 1/2"	G99Z034	G99Z034	G99Z034	G99Z034	G99Z034
53	Capacitor	L01I002	L01I002	L01I002	L01I002	L01I005



54	PSC motor assembly	B03684-02	B03684-02	B03684-02	B03684-03	B01891-07
55	PSC motor	L06H004	L06H004	L06H004	L06H004	L06I004
56	Belly band kit	B01889	B01889	B01889	B01889	B01889
57	Blower	Z01I033	Z01I033	Z01I033	Z01I035	Z01I036
58	Oval cap	L99Z007	L99Z007	L99Z007	L99Z007	L99Z007
59	Capacitor support	B01024	B01024	B01024	B01024	B01024
60	IFC 24v 2 Stages	R99G015	R99G015	R99G015	R99G015	R99G015
61	Electrical box	B40559	B40559	B40559	B40559	B40559
62	Transformer 120v-24v	L01F009	L01F009	L01F009	L01F009	L01F009
63	ID blower and elbow assembly	---	---	---	B40766-02	B40766-02
64	ID blower elbow	---	---	---	B40818	B40818
65	Extruded seal	B04435-01	B04435-01	B04435-01	B04435-01	B04435-01
	<b>Options</b>	<b>C45-2-D</b>	<b>C60-2-D</b>	<b>C75-2-D</b>	<b>C105-2-D</b>	<b>C120-2-D</b>
	Bottom return base	B40691-01	B40691-02	B40691-02	B40691-03	B40691-03
	Downflow base	B40632-01	B40632-02	B40632-02	B40632-03	B40632-03
	transition for A coil	B40693-01	B40693-02	B40693-02	B40693-03	B40693-03
	Conversion kit for propane	B40574-08	B40574-11	B40574-14	B40574-20	B40574-23
	Orifice #56 propane	R04I002	R04I002	R04I002	R04I002	R04I002
	Replacement kit for drain trap	K01021	K01021	K01021	K01021	K01021

Figure 37 : Part list 2 Stage ECM

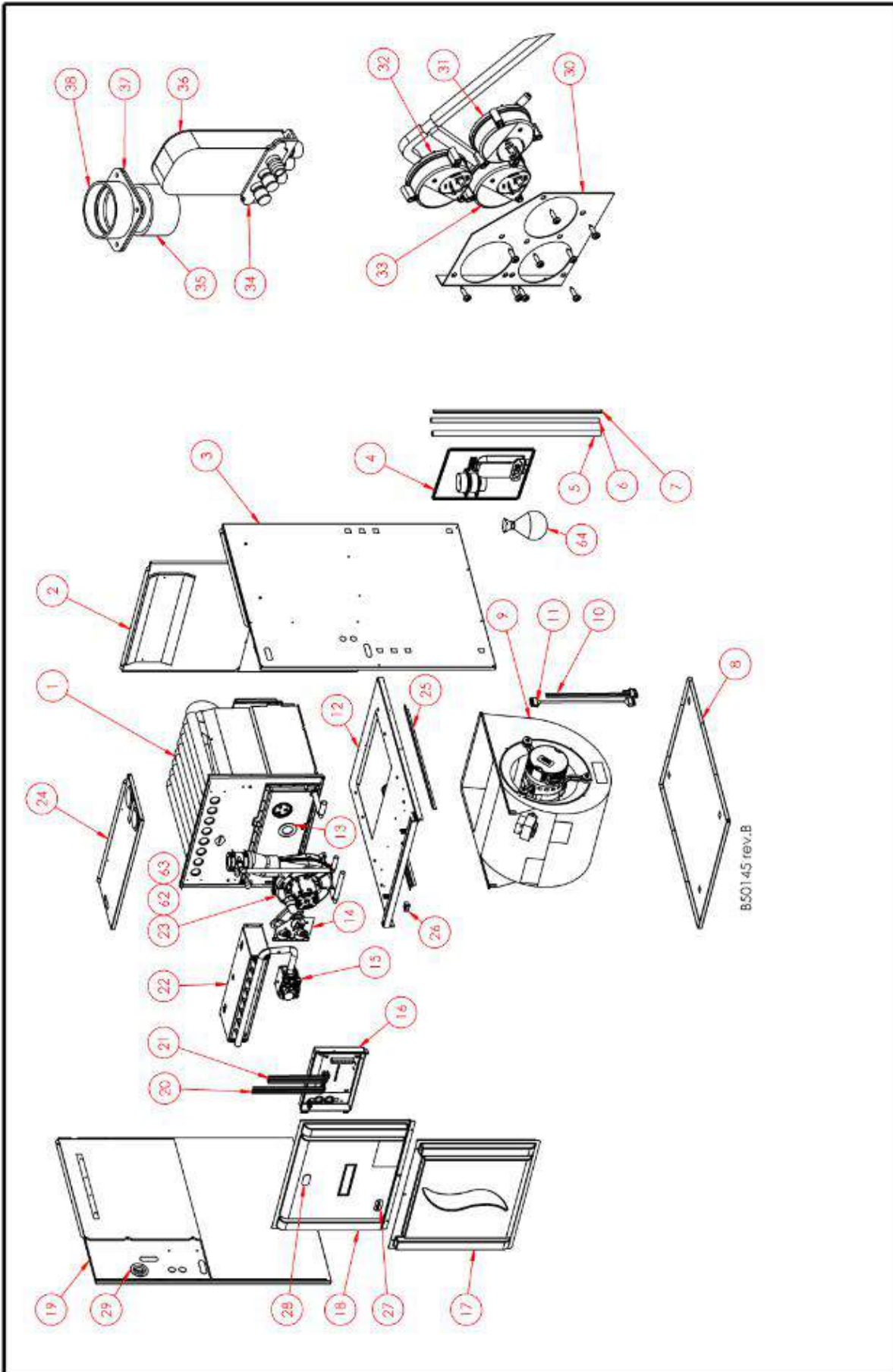
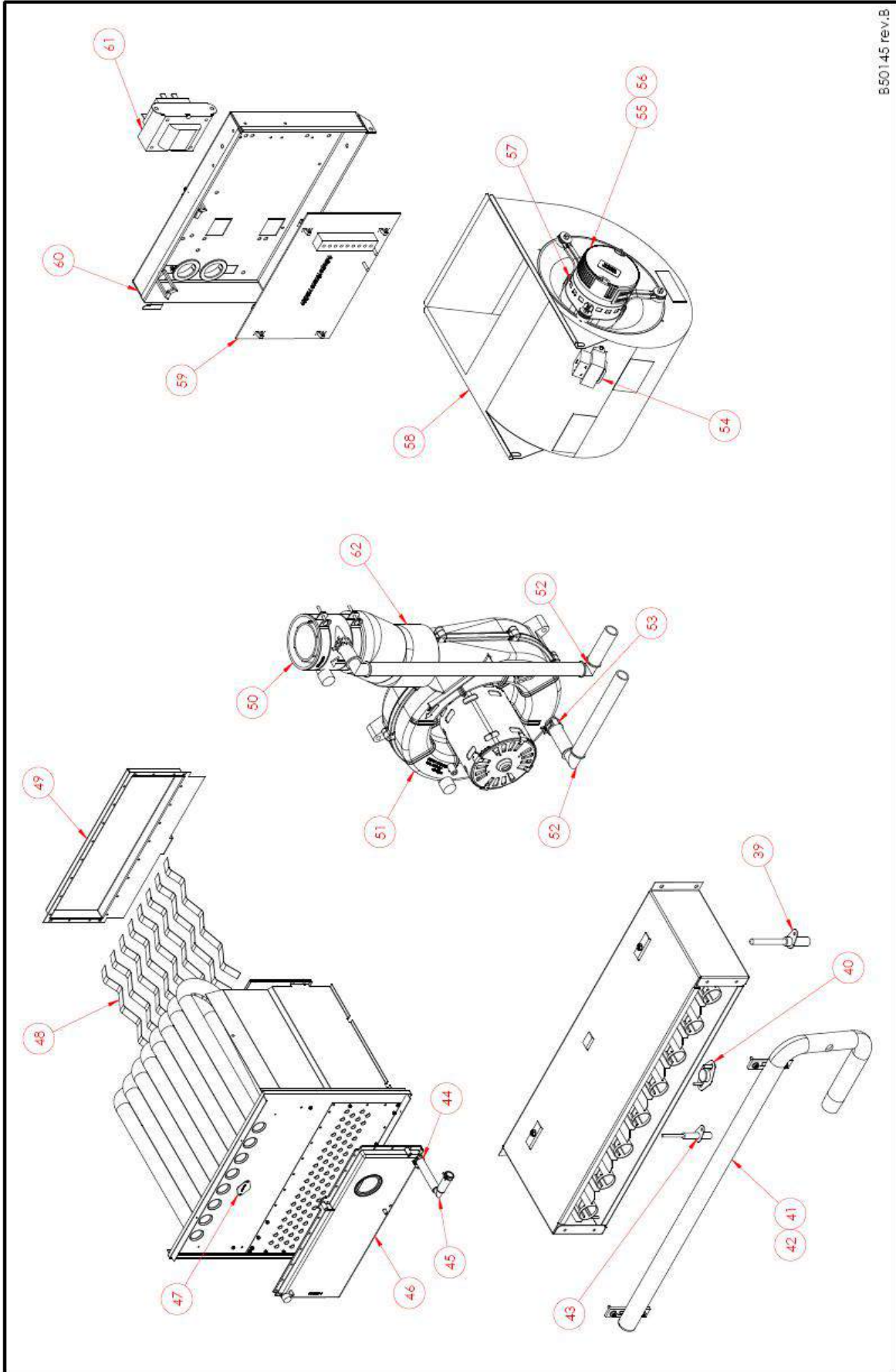


Figure 38 : Part list 2 Stage ECM continued



B50145 rev.B

Table 30 : Part list 2 Stage ECM

#	Description	C45-2-V	C60-2-V	C75-2-V	C105-2-V	C120-2-V
1	Heat exchanger assembly	N/A	N/A	N/A	N/A	N/A
2	Back panel assembly	B40511-04	B40511-05	B40511-05	B40511-06	B40511-06
3	Right panel assembly	B40510-34	B40510-34	B40510-34	B40510-34	B40510-34
4	Bag part	B40569-01	B40569-02	B40569-02	B40569-02	B40569-02
5	Hose 5/8	B30157-34	B30157-34	B30157-34	B30157-34	B30157-34
6	Hose 1/2	B30157-38	B30157-38	B30157-38	B30157-38	B30157-38
7	Hose 3/16	B30157-40	B30157-40	B30157-40	B30157-40	B30157-40
8	Floor	B40546-01	B40546-02	B40546-02	B40546-03	B40546-03
9	Blower assembly	B40604-03	B40604-04	B40604-05	B40604-07	B40604-08
10	Electrical kit blower	B40581-01	B40581-01	B40581-01	B40581-02	B40581-02
11	Electronic kit blower	B03242-04	B03242-04	B03242-04	B03242-05	B03242-05
12	Separator assembly	N/A	N/A	N/A	N/A	N/A
13	Blower restrictor	B40699	B40563-04	B40698	B40563-06	---
14	Pressure switch assembly	B40675-19	B40675-20	B40675-21	B40675-23	B40675-24
15	Gas valve	R01I003	R01I003	R01I003	R01I003	R01I003
16	Electric box assembly	B40695	B40695	B40695	B40695	B40695
17	Lower door assembly	B40570-07	B40570-08	B40570-08	B40570-09	B40570-09
18	Upper door assembly	B40571-01	B40571-02	B40571-02	B40571-03	B40571-03
19	Left panel assembly	B40509-02	B40509-02	B40509-02	B40509-02	B40509-02
20	Electrical kit inducer/blower	B40592-01	B40592-01	B40592-01	B40592-02	B40592-02
21	Electrical kit principal harness	B40593-01	B40593-01	B40593-01	B40593-02	B40593-02
22	Complete manifold assembly	B40514-03	B40514-04	B40514-05	B40514-07	B40514-08
23	ID blower assembly	B40578-05	B40578-02	B40578-02	B40578-02	B40578-02
24	Top panel assembly	B40512-01	B40512-02	B40512-02	B40512-03	B40512-03
25	Blower rail	N/A	N/A	N/A	N/A	N/A
26	Blower switch	L07H001	L07H001	L07H001	L07H001	L07H001
27	Observation port Dettson	B40565	B40565	B40565	B40565	B40565
28	Observation port	L04Z022	L04Z022	L04Z022	L04Z022	L04Z022
29	Grommet	G14F017	G14F017	G14F017	G14F017	G14F017
30	Pressure switch support	N/A	N/A	N/A	N/A	N/A
31	Pressure switch (multiposition)	R99F035	R99F035	R99F035	R99F035	R99F035
32	Pressure switch (high fire)	R99F043	R99F042	R99F048	R99F039	R99F041
33	Pressure switch (low fire)	R99F039	R99F050	R99F050	R99F050	R99F050
34	Drain trap gasket	B40568	B40568	B40568	B40568	B40568
35	PVC pipe	B40573-02	B40573-01	B40573-01	B40573-01	B40573-01
36	Drain trap	B40760	B40760	B40760	B40760	B40760
37	Vent flange gasket	B40567	B40567	B40567	B40567	B40567
38	Vent flange	B40533	B40533	B40533	B40533	B40533
39	Pilot 24v	R03K005	R03K005	R03K005	R03K005	R03K005
40	Roll out switch	R02N022	R02N022	R02N022	R02N022	R02N022
41	Gas manifold	B40527	B40528	B40529	B40531	B40532
42	Orifice #48 natural gas	R04I001	R04I001	R04I001	R04I001	R04I001
43	Flame dectector	R03J004	R03J004	R03J004	R03J004	R03J004
44	Hose clamp 5/8"	G99Z035	G99Z035	G99Z035	G99Z035	G99Z035
45	elbow 5/8"	G07J007	G07J007	G07J007	G07J007	G07J007
46	Condensation box	B40526-01	B40526-02	B40526-02	B40526-03	B40526-04
47	High limit	R02N026	R02N024	R02N023	R02N024	R02N024
48	Baffle	B40572	B40572	B40572	B40572	B40572
49	Smoke box	B40539-01	B40539-02	B40539-02	B40539-03	B40539-04
50	Vent coupling	B40580	B40580	B40580	B40580	B40580
51	ID blower 2 Stage	Z01K006	Z01K006	Z01K006	Z01K006	Z01K006
52	Elbow 1/2"	G07J006	G07J006	G07J006	G07J006	G07J006
53	Hose clamp 1/2"	G99Z034	G99Z034	G99Z034	G99Z034	G99Z034

54	Inductor	B03141-02	B03141-01	B03141-01	B03141	B03141
55	Motor assembly ECM 5.0	B03240-12	B03716-02	B03716-03	B03241-09	B03241-10
56	Motor ECM 5.0	B03811-25	B03812-09	B03812-10	B03813-15	B03813-16
57	Belly band	B01889	B01889	B01889	B01889	B01889
58	Blower	Z011033	Z011035	Z011036	Z011038	Z011038
59	IFC 24v 2 Stages	R99G016	R99G016	R99G016	R99G016	R99G016
60	Electric box	B40559	B40559	B40559	B40559	B40559
61	Transformer 120v-24v	L01F009	L01F009	L01F009	L01F009	L01F009
62	ID blower and elbow assembly	---	B40766-02	B40766-02	B40766-02	B40766-02
63	ID blower elbow	---	B40818	B40818	B40818	B40818
64	Extruded seal	B04435-01	B04435-01	B04435-01	B04435-01	B04435-01
	<b>Options</b>	<b>C45-2-V</b>	<b>C60-2-V</b>	<b>C75-2-V</b>	<b>C105-2-V</b>	<b>C120-2-V</b>
	Bottom return base	B40691-01	B40691-02	B40691-02	B40691-03	B40691-03
	Downflow base	B40632-01	B40632-02	B40632-02	B40632-03	B40632-03
	transition for A coil	B40693-01	B40693-02	B40693-02	B40693-03	B40693-03
	Conversion kit for propane	B40574-08	B40574-11	B40574-14	B40574-20	B40574-23
	Orifice #56 propane	R04I002	R04I002	R04I002	R04I002	R04I002
	Replacement kit for drain trap	K01021	K01021	K01021	K01021	K01021

**Table 31 : CFM for 45,000 BTU PSC motor**

Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
HIGH	1120	1095	1045	1020	970	915	845	780	710	640
MED-HI	1047	1045	980	940	880	835	775	715	665	585
MED	935	950	910	865	820	780	730	670	600	565
LOW	930	925	875	835	800	760	710	660	605	545

**Table 32 : CFM in heating for 45,000 BTU 2 stage ECM motor**

1st stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	505	495	485	475	470	465	460	450	450	445
B	620	600	590	585	580	580	570	570	560	555
C	545	535	530	525	520	515	505	500	495	495
D	440	430	420	415	410	405	400	400	395	385
2nd stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	730	715	705	690	690	685	680	670	670	665
B	915	890	865	850	845	845	840	835	830	810
C	740	725	710	700	700	690	685	685	680	670
D	655	640	635	630	625	620	615	605	600	590

**Table 33 : CFM in cooling for 45,000 BTU 2 stage ECM motor**

1st stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	893	895	880	880	860	860	860	845	835	820
B	695	680	680	670	670	665	660	655	650	645
C	520	510	505	490	485	480	475	470	470	475
D	365	360	360	355	355	350	345	335	325	310
2nd stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1086	1075	1060	1025	990	960	925	895	860	820
B	870	850	840	840	830	825	820	810	805	795
C	670	655	655	655	635	635	635	630	625	615
D	460	455	450	445	440	440	440	435	425	420

Table 34 : CFM for 60,000 BTU PSC motor

Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
HIGH	1374	1372	1370	1305	1230	1155	1085	1005	945	860
MED-HI	1198	1195	1134	1085	1025	975	925	875	814	740
MED	1155	1150	1100	1050	1000	955	905	860	795	725
LOW	1026	1005	980	945	905	865	820	780	720	655

Table 35 : CFM in heating for 60,000 BTU 2 stage ECM motor

1st stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	644	645	635	625	620	605	605	595	585	575
B	815	810	810	800	795	790	780	770	765	755
C	735	735	725	720	715	705	695	690	680	675
D	676	670	670	670	665	655	650	650	635	630
2nd stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1027	1025	1020	1010	1000	1000	990	980	975	975
B	1263	1252	1255	1250	1240	1235	1225	1215	1205	1165
C	1154	1150	1130	1130	1120	1120	1115	1105	1095	1090
D	1083	1080	1080	1075	1065	1065	1060	1055	1050	1040

Table 36 : CFM in cooling for 60,000 BTU 2 stage ECM motor

1st stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1308	1300	1295	1295	1280	1280	1265	1250	1230	1230
B	1083	1080	1070	1065	1050	1045	1050	1040	1035	1035
C	892	890	870	860	860	850	835	835	825	820
D	725	720	690	675	665	655	645	635	630	610
2nd stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1500	1500	1500	1500	1475	1445	1415	1370	1330	1285
B	1390	1374	1375	1370	1360	1350	1340	1325	1285	1255
C	1148	1145	1145	1135	1130	1125	1115	1110	1105	1095
D	901	900	890	885	880	870	860	855	845	835

Table 37 : CFM for 75,000 BTU PSC motor

Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
HIGH	1617	1615	1540	1440	1355	1280	1204	1182	1060	980
MED-HI	1675	1670	1590	1480	1382	1300	1219	1192	1065	982
MED	1500	1496	1388	1289	1188	1133	1087	1083	1015	975
LOW	1272	1197	1148	1108	1042	967	913	824	777	749

Table 38 : CFM in heating for 75,000 BTU 2 stage ECM motor

1st stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	996	995	985	985	985	980	985	975	985	980
B	1025	1020	1100	1280	1280	1260	1235	1210	1160	1150
C	1151	1145	1105	1100	1105	1110	1105	1105	1110	1100
D	917	915	915	920	925	925	925	925	925	920
2nd stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1280	1278	1275	1265	1235	1195	1170	1150	1105	1075
B	1303	1298	1295	1220	1150	1090	1050	1035	1010	970
C	1220	1216	1210	1225	1215	1165	1145	1115	1080	1040
D	1172	1170	1150	1125	1065	1045	1015	985	945	910

Table 39 : CFM in cooling for 75,000 BTU 2 stage ECM motor

1st stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1244	1240	1225	1215	1210	1200	1195	1180	1155	1105
B	1072	1060	1030	1010	1020	1020	1010	1010	1005	1010
C	851	845	830	840	840	830	830	830	835	835
D	659	655	650	650	650	650	650	650	650	645
2nd stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1500	1500	1500	1500	1470	1415	1365	1325	1270	1215
B	1444	1440	1430	1420	1390	1350	1295	1250	1220	1165
C	1082	1075	1070	1070	1070	1075	1080	1075	1080	1090
D	690	690	690	695	690	690	690	695	695	695



Table 40 : CFM for 105,000 BTU PSC motor

Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
HIGH	1748	1740	1615	1515	1430	1355	1285	1195	1110	1030
MED-HI	1700	1655	1550	1435	1360	1285	1230	1150	1080	990
MED	1415	1405	1325	1240	1180	1135	1070	1005	930	845
LOW	1165	1130	1065	1025	975	935	870	830	775	705

Table 41 : CFM in heating for 105,000 BTU 2 stage ECM motor

1st stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1257	1255	1230	1225	1220	1220	1215	1210	1205	1205
B	1499	1490	1475	1465	1460	1465	1460	1450	1445	1420
C	1375	1350	1340	1345	1345	1345	1340	1340	1335	1325
D	1155	1135	1130	1130	1125	1125	1125	1120	1115	1115
2nd stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1765	1760	1750	1720	1725	1705	1665	1620	1565	1525
B	1873	1854	1850	1830	1775	1700	1660	1610	1555	1515
C	1888	1874	1860	1825	1770	1705	1655	1610	1555	1520
D	1655	1645	1650	1650	1650	1640	1625	1605	1555	1515

Table 42 : CFM in cooling for 105,000 BTU 2 stage ECM motor

1st stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1539	1537	1525	1530	1500	1520	1515	1500	1500	1495
B	1325	1305	1300	1300	1315	1320	1310	1310	1305	1305
C	1155	1145	1120	1120	1125	1115	1115	1115	1115	1110
D	948	940	935	930	930	930	935	930	925	920
2nd stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1887	1885	1880	1835	1770	1710	1665	1610	1550	1510
B	1690	1665	1660	1660	1655	1645	1630	1585	1450	1505
C	1466	1460	1455	1450	1450	1450	1445	1450	1450	1445
D	1230	1230	1210	1215	1220	1225	1230	1230	1220	1225

Table 43 : CFM for 120,000 BTU PSC motor

Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
HIGH	1917	1915	1910	1830	1750	1675	1600	1520	1440	1350
MED-HI	1893	1890	1885	1800	1735	1670	1600	1520	1430	1350
MED	1746	1745	1675	1605	1540	1470	1390	1335	1275	1210
LOW	1608	1600	1555	1500	1445	1390	1350	1310	1250	1210

Table 44 : CFM in heating for 120,000 BTU 2 stage ECM motor

1st stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1664	1637	1590	1570	1560	1550	1525	1490	1450	1385
B	2046	1993	1960	1880	1820	1770	1720	1675	1625	1570
C	1912	1864	1795	1780	1730	1675	1630	1575	1525	1475
D	1475	1455	1440	1425	1425	1425	1395	1385	1370	1325
2nd stage - Heating										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	2030	2026	1985	1905	1850	1790	1750	1705	1625	1580
B	2020	2019	1955	1920	1850	1780	1730	1700	1615	1565
C	2030	2021	1955	1920	1850	1780	1730	1700	1615	1565
D	2033	2019	1950	1920	1865	1780	1730	1710	1615	1565

Table 45 : CFM in cooling for 120,000 BTU 2 stage ECM motor

1st stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	1949	1899	1840	1805	1760	1695	1640	1590	1550	1500
B	1475	1460	1445	1430	1420	1410	1395	1385	1375	1335
C	1285	1280	1255	1240	1230	1220	1205	1190	1175	1170
D	1068	1050	1050	1045	1040	1035	1020	1010	1000	985
2nd stage - Cooling										
Motor speed	Static pressure									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
A	2131	2069	2030	1930	1875	1800	1760	1695	1640	1570
B	1911	1865	1800	1775	1735	1685	1640	1590	1545	1475
C	1691	1655	1620	1605	1580	1560	1555	1515	1460	1405
D	1380	1365	1355	1350	1340	1335	1315	1310	1290	1280