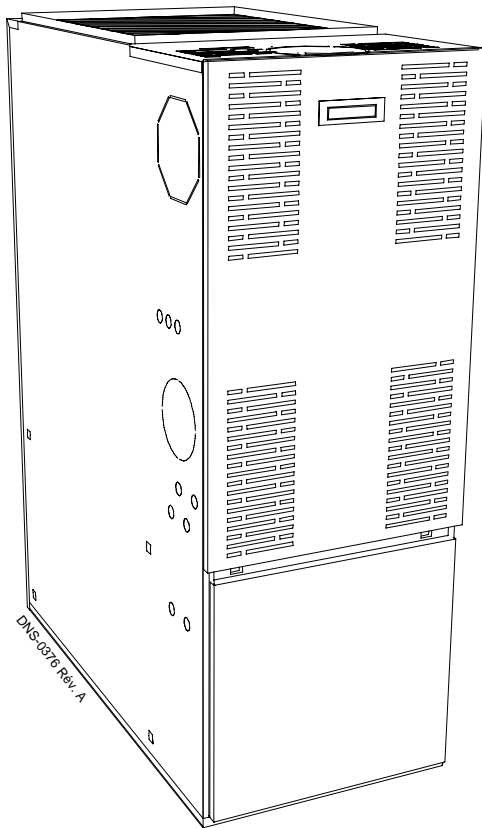


Installation Instructions and Homeowner's Manual



MULTI-POSITION WARM AIR FURNACE

Save these instructions for future reference

Models:

AMP105-IEV
AMP120-IEV

LBM105DRVB
LBM120DRVB

NOMV106D12B
NOMV156E19B

MULTI-POSITION INSTALLATIONS WITH CHIMNEY

Manufactured by :

UTC Canada Corporation
ICP Division
3400, Industrial Boulevard
Sherbrooke, Quebec J1L 1V8

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

PART 1 INSTALLATION

FOR YOUR SAFETY

DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPOURS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN THE FURNACE IS FULL OF VAPOUR OR WHEN THE COMBUSTION CHAMBER IS VERY HOT.

1.1) DANGER, WARNING AND CAUTION

The words DANGER, WARNING and CAUTION 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:



DANGER

Immediate hazards which **WILL** result in serious injury or death.



WARNING

Hazards or unsafe practices, which **CAN** result in injury or death.

CAUTION

Hazards or unsafe practices, which **CAN** result in personal injury, product and/or property damage.



WARNING

For use with grade 2 Fuel Oil maximum. Do **not** use gasoline, crankcase oil or any oil containing gasoline!



WARNING

Never burn garbage or paper in the heating system and never leave rags or paper around the unit.

CAUTION

These instructions are intended for use by qualified personnel who have been trained in installing this type of furnace. Installation of this furnace by an unqualified person may lead to equipment damage and/or hazardous conditions, which may lead to bodily harm.

IMPORTANT: All local and national code requirements governing the installation of oil burning equipment, wiring and flue connections must be followed. Some of the codes that may be applicable are:

CSA B139	Installation code for oil burning equipment
ANSI/NFPA 31	Installation of oil burning equipment
ANSI/NFPA 90B	Warm air heating and air conditioning systems
ANSI/NFPA 211	Chimneys, fireplaces, vents and solid fuel burning appliances
ANSI/NFPA 70	National electrical code
CSA C22.2 No.3	Canadian electrical code

Only the latest issues of the above codes should be used, and are available from either:

The National Fire Protection Agency
1 Batterymarch Park
Quincy, MA 02269

or

The Canadian Standards Association
178 Rexdale Blvd.
Rexdale, Ontario M9W 1R3

1.2) GENERAL

This central heating unit is a true multi-position unit, in that it can operate in four different configurations, i.e., upflow, counter flow (downflow), and horizontal (both left-to-right and right-to-left airflow).

Very few modifications are required during installation in order to change the furnace from one configuration to another. The furnace is shipped in the upflow configuration, however, instructions on how to change to the other configurations are included in this manual.

The furnace is shipped complete with burner and controls. It requires a 115VAC line voltage connection to the control panel, thermostat hook-up as shown on the wiring diagram, one or more oil line connections, suitable ductwork and connection to a properly sized vent.

The air handling capacity of this furnace is designed for cooling as well. Refer to Tables 6 & 7, p. 19 & 20 for the expected airflow.

1.3) SAFE INSTALLATION REQUIREMENTS

WARNING

Installation or repairs performed by unqualified persons can result in hazards to them and others. Installation 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 service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in death, furnace malfunction and/or property damage

WARNING

Fire hazard.

The furnace must be installed in a level position, never where it will slope toward the front.

If the furnace is not installed level, oil will drain into the furnace vestibule and create a fire hazard.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation conforms to governing local and/or national codes and ordinances

- a. This furnace is NOT approved for installation in mobile homes, trailers or recreational vehicles;
- b. Do **NOT** use this furnace as a construction heater or to heat a building under construction;
- c. There must be a sufficient supply of fresh air for combustion as well as ventilation in the area where the furnace is located;
- d. Use only the type of fuel oil approved for this furnace (see page 7 of this manual). Overfiring will result in heat exchanger failure and cause dangerous operating conditions;
- e. Visually check all oil line joints for signs of leakage;
- f. Connect furnace to the chimney;
- g. The points in Part 2 "Operation" are vital to the proper and safe operation of the heating system. Take the time to ensure that all steps were followed;
- h. Follow the regulations of the NFPA No.31 (in the USA) and CSA B-139 (in Canada) or local codes for placing and installing the oil storage tank;
- i. Follow a regular service and maintenance schedule for efficient and safe operation;
- j. Before servicing, allow furnace to cool down. Always shut off electricity and fuel to furnace when servicing. This will prevent electrical shock or burns;
- k. Seal supply and return air ducts;
- l. The vent system **MUST** be checked to determine that it is the correct type and size;
- m. Install correct filter type and size;
- n. Unit **MUST** be installed so that electrical components are protected from direct contact with water.

1.4) Safety Rules

Your unit is built to provide many years of safe and dependable service, provided it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the unit and create hazards for you, the owner.

- a. The U.S. Consumer Product Safety Commission recommends that users of oil-burning appliances install carbon monoxide detectors. There can be various sources of carbon monoxide in a building or dwelling. The sources could be gas-fired clothes dryers, gas cooking stoves, water heaters, furnaces, gas-fired fireplaces, wood fireplaces, and several other items. Carbon monoxide can cause serious bodily injury and/or death. Therefore, to help alert people to potentially dangerous carbon monoxide levels, you should have carbon monoxide detectors listed by a nationally recognised agency (ex. Underwriters Laboratories or International Approval Services) installed and maintained in the building or dwelling (see Note below).
- b. There can be numerous sources of fire or smoke in a building or dwelling. Fire or smoke can cause serious bodily injury, death, and/or property damage. Therefore, in order to alert people to potentially dangerous fire or smoke, you should have fire and smoke detectors listed by Underwriters Laboratories installed and maintained in the building or dwelling (see Note below).

NOTE: The manufacturer of your furnace does not test any detectors and makes no representations regarding any brand or type of detector.

CAUTION

Ensure that the area around the combustion air intake is free of snow, ice and debris.

1.4.1) Freezing temperatures and your building

WARNING

Freezing temperature warning.

Turn off water supply.

If your heater remains shut off during cold weather, the water pipes could freeze and burst, resulting in serious water damage.

If the structure is unattended during cold weather you should take the following precautions:

- Turn off main water supply into the structure and drain the water lines if possible. Open faucets in appropriate areas;
- Have someone check the structure frequently during cold weather to make sure it is warm enough to prevent pipes from freezing. Contact a qualified service agency, if required.

1.5) LOCATION

The unit must be installed in a location where the ambient and return air temperatures are over 15°C (60°F).

WARNING

This furnace is not watertight and is not designed for outdoor installation. This furnace shall be installed in such a manner as to protect the electrical components from water. Outdoor installation will lead to a hazardous electrical condition and to premature furnace failure.

CAUTION

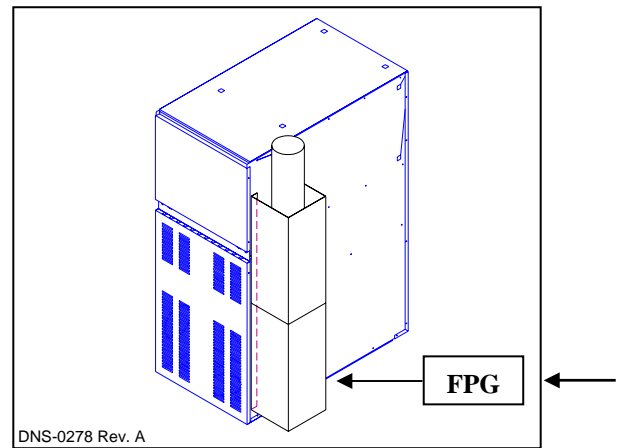
If this furnace is installed in an attic, it is important to keep insulation at least 0.3 m (12") away from any furnace openings. Some types of insulating material may be combustible.

This furnace is approved for reduced clearances to combustible construction. Therefore, it may be installed in a closet or similar enclosure. As this unit may be installed as an upflow, counter flow, or horizontal furnace, it may be located in a basement, on the same level as the area to be heated, suspended, or in a crawlspace. In any case, the unit should always be installed level.

In a basement, or when installed on the floor (as in a crawlspace), it is recommended that the unit be installed on a concrete pad that is 25.4 mm to 50.8 mm (1" to 2") thick.

When installed in the counter flow position, this furnace must not be installed on combustible flooring, unless the approved sub-base is used (Model # DFB-101). Since the flue pipe is in counter flow position, be sure that the clearances from the flue pipe to combustible construction are maintained. Also, it is recommended to use the flue pipe protection kit FPG-101 or FPG-102. Refer to Figure 1 and the installation instructions included with the kit.

FIGURE 1



When installed in an horizontal position, the furnace may be suspended by using an angle iron frame, as long as the total weight of both the furnace and the frame are included in the calculations. Other methods of suspension are acceptable. When installed in the horizontal position, this furnace must not be installed on combustible flooring, unless the approved sub-base is used (Model # HFB-101).

The required minimum clearances for this furnace in all positions are specified in Tables 8.1 and 8.2, p. 21 & 22.

The furnace should be located as closely as possible to the chimney or vent in order to keep vent connections short and direct. The furnace should also be located near the centre of the air distribution system.

1.5.1) Air for combustion and ventilation


Refer to the CAN/CSA-B139 installation code for complete regulations and for guidance on retrofit applications.

This furnace should be installed in a location in which the facilities for ventilation permit satisfactory combustion of oil, proper venting and the maintenance of ambient temperatures at safe limits under normal conditions of use. The location should not interfere with the proper circulation of air within the confined space.

When this furnace is installed in a closet or similar enclosure, 2 ventilation openings are required for combustion air. The openings should be located about 152.4 mm (6") from the top and the bottom of the enclosure at the front of the furnace. Table 1 (p. 6) indicates the minimum dimensions required for these ventilation openings.

TABLE 1

Input (BTU/h)	Width	Height
70,000 to 105,000	0.45 m (18")	0.20 m (8")
119,000 to 154,000	0.51 m (20")	0.25 m (10")

 **WARNING**

Do not block the combustion air openings in the furnace. Any blockage will result in improper combustion and may result in a fire hazard and/or cause bodily harm.

Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers, and fireplaces shall be considered in determining the adequacy of the space to provide combustion air requirements.

In unconfined spaces, in buildings of conventional frame, brick or stone construction, infiltration may be adequate to provide air for combustion, ventilation and dilution of flue gases. This determination must be made on an individual installation basis and must take into consideration the overall volume of the unconfined space, the number of windows and ventilation openings, the number of doors to the outside, internal doors which can close off the unconfined space and the overall air tightness of the building construction.

Many new buildings and homes (and older ones that have been weatherized must be considered as being of tight construction and, therefore, infiltration will not be sufficient to supply the necessary air for combustion and ventilation.

A building can be considered as being of tight construction when:

- Walls and ceilings exposed to the outside have a continuous water vapour retarder with a rating of one perm or less, openings have gaskets or are sealed and/or;
- Weather-stripping has been added on operable windows and doors, and/or;
- Caulking or sealant has been applied to areas such as joints around window and doorframes, between sole plates and floors, between wall-ceiling joints, between wall panels, at penetrations for plumbing, electrical and fuel lines and at other openings.

1.5.2) Duct recommendations

The proper sizing of warm air ducts is necessary to ensure satisfactory furnace operation. Ductwork should be in accordance with the latest editions of NFPA-90A (Installation of Air Conditioning and Ventilating Systems) and NFPA-90B (Warm Air Heating and Air Conditioning Systems) or Canadian equivalent.

The supply ductwork should be attached to the flanged opening provided at the discharge end of the furnace. See Figures 10.1 and 10.2, p. 21 & 22 for the dimensions of this opening.

Knockouts are provided on both sides of the furnace to cut the required size of opening for the installation of the return air ductwork. This can be done on either the right or the left side of the furnace. See Table 2, p. 11 for dimensions.

NOTE: THE BACK SHOULD **NOT** BE CUT OUT FOR RETURN AIR DUCTING.


Also, there is provision on this furnace for a bottom return air duct. Knockouts are provided in the floor of the furnace to facilitate the cut out requirement for the air filter rack and return ductwork. (We recommend the use of this opening for horizontal and counterflow installations).

The following recommendations should be followed when installing ductwork:

- Install locking type dampers in all branches of the individual ducts to facilitate balancing the system. Dampers should be adjusted such a way as to ensure the proper static pressure at the outlet of the furnace;
- A flexible duct connector of non-combustible material should be installed at the unit on both the supply and return air side. In applications where an extremely quiet operation is necessary, the first 3.0 m (10') of supply and return ducts should be internally lined with acoustical material (if possible);
- In cases where the return air grille is located close to the fan inlet, there should be at least one 90° turn between fan inlet and grille. Further reduction in sound level can be accomplished by installing acoustical turning vanes or lining the duct as described in item b. above;
- When a single air grille is used, the duct between grille and furnace must be the same size as the return air opening in the furnace.

CAUTION

Return air grilles and warm air registers must not be obstructed.

 **WARNING**

When supply ducts carry air circulated by the furnace, the return air shall also be handled by a duct sealed to the furnace casing and terminating outside the space where the furnace is located. Incorrect ductwork termination and sealing will create a hazardous condition which could lead to bodily harm.

When installing the furnace with cooling equipment for year round operation, the following recommendations must be followed for tandem or parallel air flow:

IMPORTANT: The dampers should be adequate to prevent cooled air from entering the furnace, and if manually operated, must be equipped with the means to prevent operation of either the cooling unit or the furnace, unless the damper is in the full cool or heat position.

- a. On tandem airflow applications, the coil is mounted after the furnace in an enclosure in the supply air stream. The furnace blower is used for both heating and cooling airflow;
- b. On parallel airflow installation, dampers must be provided to direct air over the furnace heat exchanger when heat is desired and over the cooling coil when cooling is desired.

- e. Verification that the chimney is properly lined and sized per the applicable codes. (Refer to page 3 for list).

Masonry Chimney

This furnace may be vented into an existing masonry chimney. However, it must not be vented into a chimney servicing a solid fuel-burning appliance. Before venting this furnace into a chimney, the chimney must be checked for deterioration and repaired if necessary. The chimney must be properly lined and sized per local and/or national codes.

If the furnace is vented into a common chimney, the chimney must be of sufficient area to accommodate the total flue products of all appliances vented into the chimney.

The following requirements are provided for a safe venting system:

- a. Ensure that the chimney flue is clear of any dirt or debris;
- b. Ensure that the chimney is not servicing an open fireplace;
- c. Never reduce the pipe size below the outlet size of the furnace;
- d. All pipes should be supported, using the proper clamps and/or straps. These supports should be installed at least every 1.2 m (4');
- e. All horizontal runs of pipe should have an upward slope of at least 6.4 mm per 0.3 m (1/4" of per foot);
- f. All runs of pipe should be as short as possible with as few turns as possible;
- g. Seams should be tightly joined and checked for leaks;
- h. The flue pipe must not extend into the chimney but be flush with the inside wall;
- i. The chimney must extend 0.9 m (3') above the highest point where it passes through a roof of a building and at least 0.6 m (2') higher than any portion of a building within a horizontal distance of 3.0 m (10'). It shall also be extended at least 1.5 m (5') above the highest connected equipment flue collar;
- j. Check local codes for any variances.

Factory Built Chimneys

Approved factory built chimneys may be used. Refer to chimney manufacturer's instructions for proper installation.

1.5.4) DRAFT REGULATOR

The draft regulator supplied with the furnace must be used for proper functioning. Installation instructions are included with the control.

1.5.5) BLOCKED VENT SHUT-OFF (BVSO) FOR CHIMNEY VENTING



WARNING

The coil **MUST** be installed on the air discharge side of the furnace. Under no circumstances should the airflow be such that cooled, conditioned air can pass over the furnace heat exchanger. This will cause condensation in the heat exchanger and possible failure of same, which could result in a fire hazard and/or other hazardous conditions which may lead to bodily harm. Heat exchanger failure due to improper installation may not be covered by the warranty.

1.5.3) Venting instructions (chimney installation)

Venting of the furnace must be to the outside and in accordance with local codes and/or requirements of local authorities.

OIL FIRED APPLIANCES SHALL BE CONNECTED TO FLUES HAVING SUFFICIENT DRAFT AT ALL TIMES TO ENSURE SAFE AND PROPER OPERATION OF THE APPLIANCE.

For additional venting information refer to ANSI/NFPA 211 Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances and/or the CSA B139 Installation Code.

This furnace is certified for use with a Type "L" vent (maximum flue gas temperature 302°C (575°F)). The flue pipe clearance knockout in the front top or side panel should be removed. Install the flue elbow so that it exits the furnace cabinet through that opening.

The barometric draft regulator included with the furnace, shall be installed in the same room or enclosure as the furnace, in such a manner as to prevent any difference in pressure between the regulator and the combustion air supply.

Pre-installation vent system inspection

Before this furnace is installed, it is strongly recommended that any existing vent system be completely inspected.

On any chimney or vent, this should include the following:

- a. Inspection for any deterioration in the chimney or vent. If deterioration is discovered, the chimney must be repaired or the vent replaced;
- b. Inspection to ascertain that the vent system is clear and free of obstructions. Any blockages must be removed before installing this furnace;
- c. Cleaning the chimney or vent if previously used for venting a solid fuel burning appliance or fireplace;
- d. Confirming that all unused chimney or vent connections are properly sealed;



WARNING

It is imperative that this device be installed by a qualified agency.

This device is designed to detect the insufficient evacuation of combustion gases in the event of a vent blockage. In such a case the thermal switch will shut down the oil burner. The device will then need to be re-armed MANUALLY.

It is also essential that the BVSO be maintained annually. For more details refer to the instructions supplied with the device itself, as well as Section 3. of this manual.

Refer to Figures 2 to 7, wiring diagrams and the detailed instructions supplied with the BVSO for the installation and wiring procedures. The length of wires supplied with the unit is such that the safety device must be installed between the flue outlet of the appliance and the draft regulator, as indicated in the instructions.

CAUTION

A positive pressure venting system (Sealed Combustion System or Direct Vent) **MUST NOT** use the BVSO. Follow the instructions supplied with the venting system.

FIGURE 2
Blocked Vent Shut-Off device wiring
Installation shown: Upflow with vertical exhaust

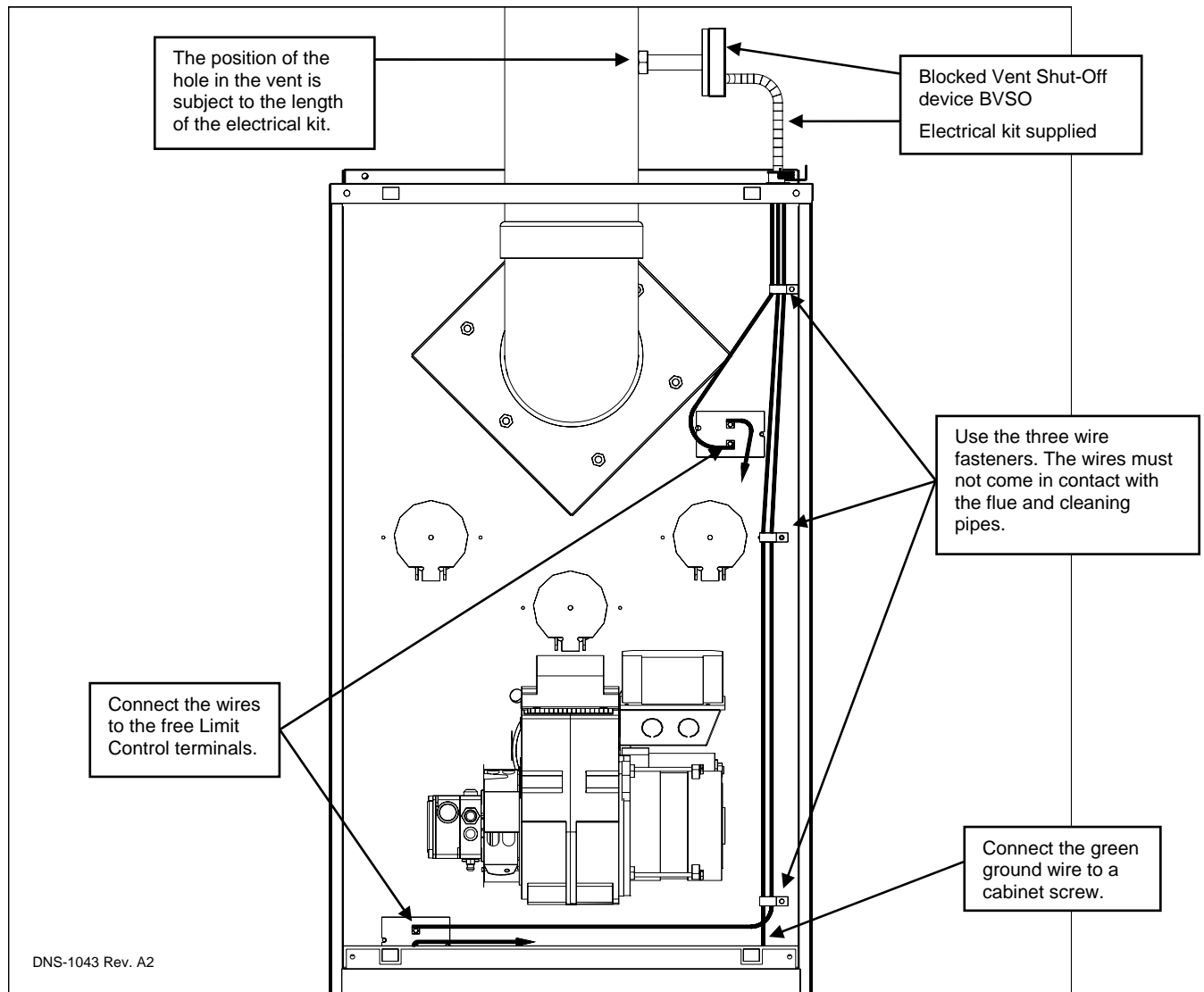
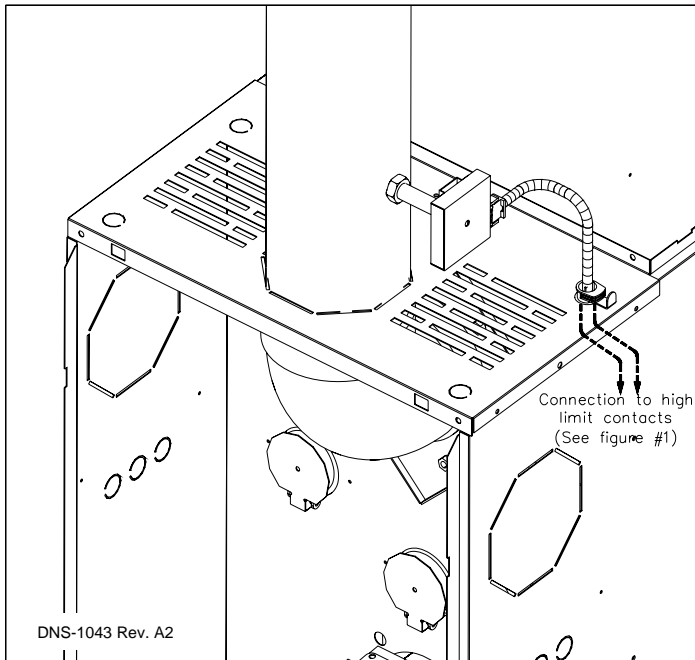


FIGURE 4

**Blocked Vent Shut-Off device wiring
Installation: Upflow with vertical exhaust**



**Blocked Vent Shut-Off device wiring
Installation: Upflow with horizontal exhaust**

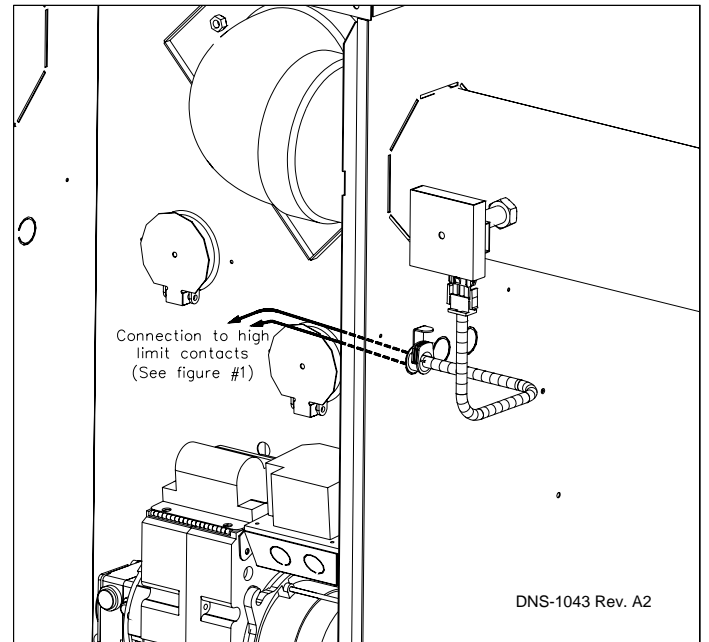


FIGURE 5

**Blocked Vent Shut-Off device wiring.
Installation: Horizontal with horizontal exhaust**

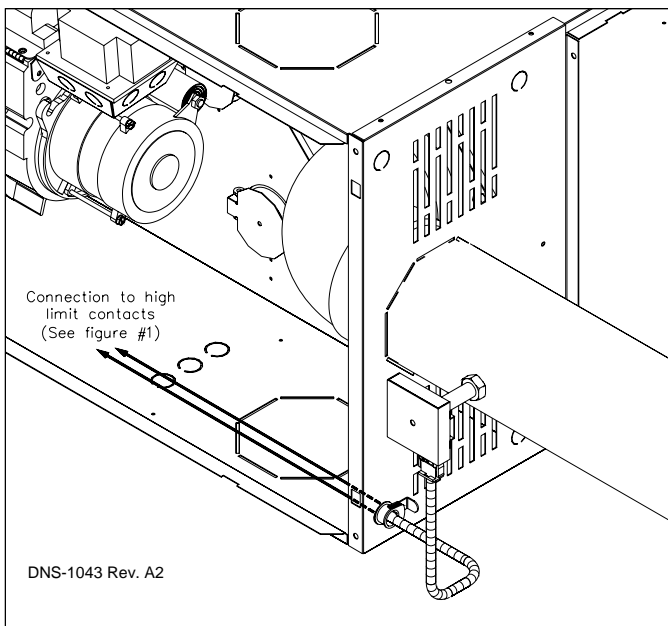


FIGURE 6

**Blocked Vent Shut-Off device wiring
Installation: Horizontal with vertical exhaust**

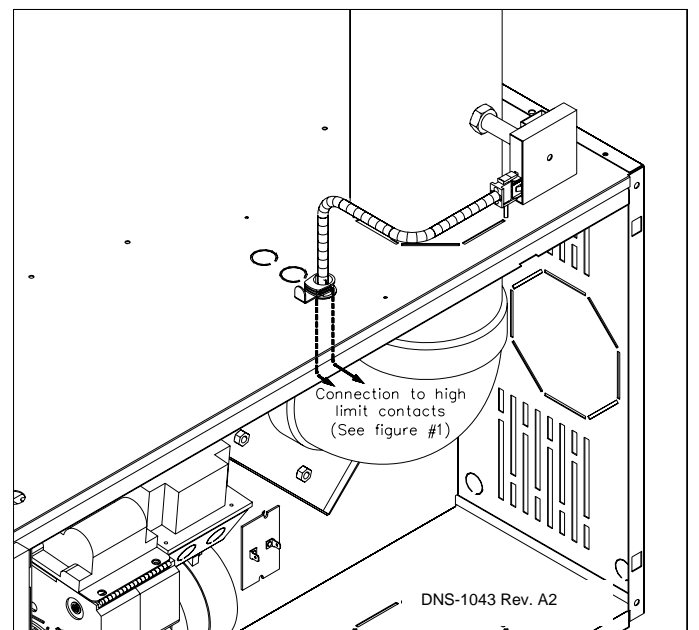
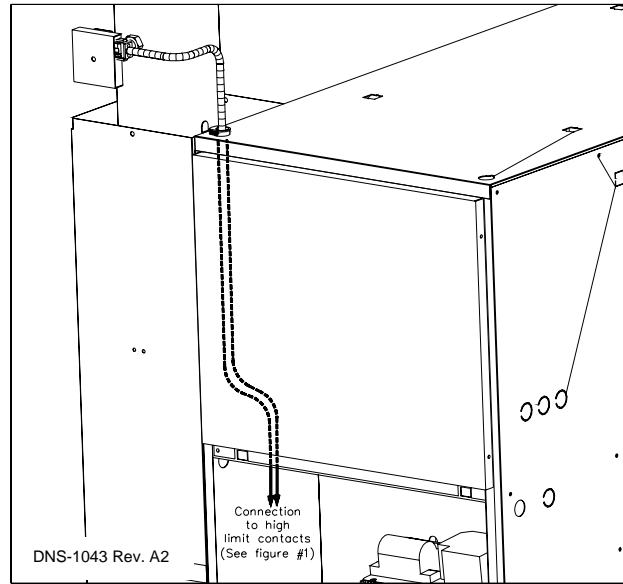


FIGURE 7

**Blocked Vent Shut-Off device wiring
Installation: Downflow**



1.5.6) Oil burner

This furnace is equipped with a high pressure atomizing retention head type burner for use with not heavier than grade 2 Fuel Oil. The mounting flange is fixed to the burner air tube and no adjustment is required for insertion length.

CAUTION

NEVER use the "interrupted ignition" function if a Honeywell R7184 series combustion relay is installed on the burner.

Oil Connections

Complete instructions for installation of the fuel oil piping will be found in the oil burner installation instructions included with the furnace.

Oil line entry holes are located in the side panels. Two holes are provided on each side, so that a two-pipe system can be used if desired.

A 10 micron (or less) oil filter should be used with all oil burners, installed as closely as possible to the burner.

1.5.7) 120V Wiring

The appliance must be installed in accordance with the current ANSI/NFPA 70 National Electrical Code, CSA C22.1 Canadian Electrical Code Part 1 and/or local codes.

The control system depends on the correct polarity of the power supply. Connect "HOT" wire (H) and "NEUTRAL" wire (N) as shown in Figure 11, p. 23.

A separate line voltage supply should be used with fused disconnect switch or circuit breaker between the main power panel and the unit.



WARNING

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. A green ground screw is provided in the control box for this connection.

Use only copper wire for 115V supply service to the unit.

Metallic conduit (where required/used) may terminate at the side panel of the unit. It is not necessary to extend the conduit inside the unit from the side panel to the control box.

When replacing any original furnace wiring, use only 105°C, 16 AWG copper wires.

1.5.8) 24V Wiring

Instructions for wiring thermostat (field supplied) are packed in the thermostat box. Make thermostat connections as shown in Figures 8 and 9 (p. 11). Thermostat wire connections at R and W are the minimum required for oil heating operation.

FIGURE 8
24 VAC Oil Furnace Wiring with Air Conditioner

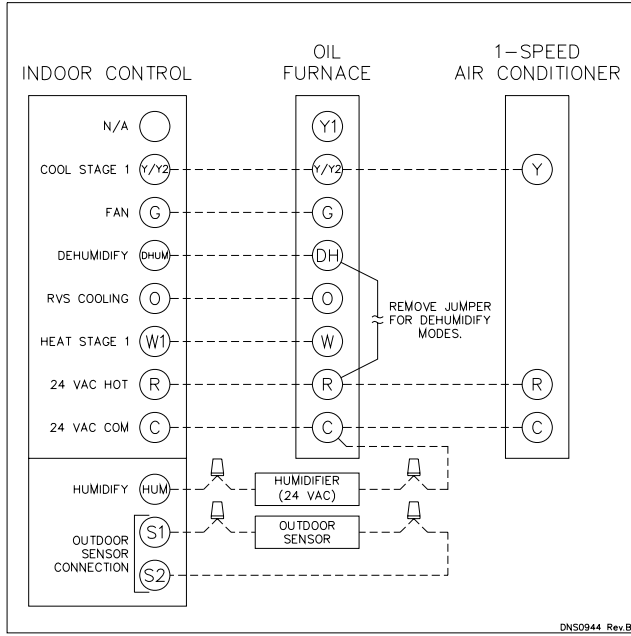
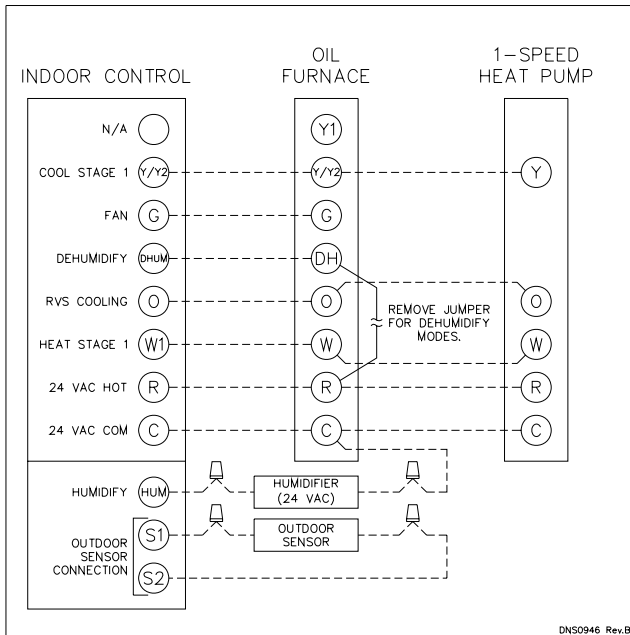


FIGURE 9
24 VAC Oil Furnace Wiring with Heat Pump



1.5.9) Accessory installation

General

When installing optional accessories on this appliance, follow manufacturer's Installation Instructions included with accessory.

Auxiliary terminals

The HUM 120 VAC terminals on the electronic control board are tied directly to the #8 pin of the 9-pin connector and provide a 120 VAC signal whenever the burner is energized (see Figure 11 p. 23). The 120 VAC and neutral terminals can be used for accessory wiring. See Electronic Air Cleaner and Humidifier sections for further information.

Electronic Air Cleaner

When adding an electronic air cleaner to this unit, use an Airflow Sensor kit. As the air cleaner is connected to constant 120 VAC power, the airflow sensor turns on the electronic air cleaner when the furnace blower is operating.

Humidifier / Humidistat

A 24 VAC signal can be connected, sourced from the W and C terminals on the electronic control board or a 120 VAC signal from the HUM 120 VAC or N terminals, when a heat source must be used (see Figures 8 and 9 on this page).

Dehumidification capability with standard Humidistat

Dehumidification on systems using a variable speed motor is better than on most other systems. If this feature is required, the terminals on the electronic control board permit the wiring of a standard humidistat. Refer to Figures 8 and 9 on this page for wiring instructions.

A furnace equipped with a variable speed motor will detect the opening of the humidistat contact and reduce the airflow to 85% of nominal cooling airflow. This will increase its capacity to dehumidify up to the point where the humidistat detects an acceptable level of humidity in the air. At that point the unit return to 100% of its cooling airflow.

To activate this mode, remove the jumper between DH and R of the electronic board and wire in a standard humidistat on these terminals.

1.5.10) Air filter

An external filter rack is provided as standard equipment with this furnace. The filter rack can be installed on the right or left side panel, or on the bottom of the furnace to accommodate the return air ductwork. A sufficient clearance should be provided for air filter access. Refer to Table 2 for filter rack flange dimensions for return air duct.

TABLE 2

Furnace Model	Air Filter Size	Flange Opening
AMP, LBM & NOMV (105 / 106)	16" x 24"	15" x 23"
AMP, LBM & NOMV (120 / 156)	18" x 30"	17" x 29"

1.5.9) Horizontal or downflow installation

1. On horizontal installations, determine which “side” will become the “top”, when the unit is laid down. Remove the flue pipe clearance knockout from the top front of that side panel. Install the flue elbow so that it exits the cabinet of the furnace through that opening;
2. On counterflow Installations, the flue pipe must exit the cabinet through one of the side panel openings (as above), then extended up the side of the furnace. Ensure that adequate clearances to combustibles are observed. It may be necessary to install a sheet-metal shield on an adjacent wall to prevent any possibility of a fire hazard;
3. Remove the burner by loosening the mounting nuts and turn the oil burner slightly counter clockwise to unlock the burner flange. Avoid putting undue strain on burner wiring. It may be necessary to disconnect the burner wiring in some cases;
4. To reinstall the burner, insert the burner and the burner flange screws and turn the burner clockwise to lock it; then tighten the nuts.

IMPORTANT: The burner must always be installed in the upright position with the ignition control on top.



DANGER

Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes it to abnormal conditions, contaminated combustion air and the lack of air filters. Failure to follow this warning can lead to premature furnace failure and/or vent failure, which could result in a fire hazard and/or bodily harm.

PART 2 START-UP

2.1) OPERATIONAL CHECKLIST

- 1=>Has the blower wheel support been removed?
- 2=>Has the electrical wiring been completed according to Figure 11, p. 23?
- 3=>Has the access blower door been secured in place?
- 4=>Is the valve on the oil line open?
- 5=>Has the "RESET BUTTON" on the Primary Control been pushed?
- 6=>Are the flame observation door and the two cleanout access doors located at the front of the unit closed?
- 7=>Is the room thermostat in the heating mode and set above room temperature?
- 8=>Set the main electrical switch to the "ON" position and the burner should start.

CAUTION

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

2.2) COMBUSTION CHECK

In order to obtain optimum performance from the oil burner, the following set-up procedures must be followed by referring to the Technical Specifications, Table 5 on p. 19 in this manual:

1. A test kit to measure the smoke, flue draft and over-fire draft should be used in order to obtain the proper air band setting. Although all of the above measurements are required for optimum set-up and efficiency, the most important reading that must be taken is the smoke number in the flue pipe.
 2. The proper smoke number, as established by way of engineering tests, is between 0 and 1. This degree of smoke emission is commonly referred to as a "trace". It is recommended that a Bacharach True Spot Smoke Test kit or equivalent be used;
 3. On chimney installations, a barometric draft regulator (supplied with the furnace) must be installed as closely to the breech of the furnace as possible, in order to ensure proper draft through the furnace. The barometric damper must be mounted with the hinge pins in a horizontal position and the face of the damper vertical for proper functioning, (see instructions included with damper). After the furnace has been firing for at least five minutes, the draft regulator should be set to between -0.025" W.C. and -0.035" W.C.;
 4. The overfire draft, which is taken through the observation door located in the centre of the front panel above the burner, is a measurement that is necessary to determine if there is a blockage in the heat exchanger or the flue pipe. Refer to the Technical Specifications in this manual for overfire pressure values. A high pressure condition may be caused by excessive combustion air due to the air band being too wide open or a lack of flue draft (chimney effect) or some other blockage, such as soot in the secondary section of the heat exchanger or the use of an oversize nozzle input or high pressure pump;
 5. CO₂ and flue temperature instruments will enable you to obtain the data that are required to determine the true efficiency of the furnace. Although this information is nice to have, it is not essential in the basic set up of the furnace. The proper procedure for performing this operation is as follows:
 - a. Pierce a 9/32" hole into the flue pipe just before the draft regulator. Start the appliance and proceed with the smoke test at that location and adjust the burner to a setting of between a "trace" and #1 smoke after 5 to 10 minutes of operation;
 - b. Take a CO₂ reading and mark it down;
 - c. Open the burner air shutter to get 1.5% CO₂ less than the previous reading noted in b. above and take a smoke test on this condition;
 - d. The new smoke reading should give you a ZERO or "trace" smoke reading.
 6. A 10 micron (or less) oil filter should be installed as closely to the burner as possible with all oil burners, but it is essential for burners with a low firing rate. We recommend the use of a low pressure drop oil filter with a capacity greater than that of the fuel pump;
 7. On a new installation, the air trapped in the oil line leading from the tank to the nozzle must be thoroughly purged in order to prevent excessive after drip. The oil pump is equipped with a special fitting that facilitates the purging of any air between it and the tank. The proper procedure for performing this operation is as follows:
 - a. Place a piece of 1/4" dia. clear plastic tubing over the purge fitting on the oil pump;
 - b. Start the oil burner, then open the purge fitting and allow the burner to run until the purge tube is completely free of air bubbles;
 - c. At this point tighten the purge fitting, which will allow the oil to run to the nozzle and fire the burner. If the purging takes longer than 15 seconds and no flame has been established the burner will stop. Push the reset button on top of the Primary Control to restart the burner.
- For detailed information on the operation of the Primary Control refer to the instructions included with the furnace or the burner.

- After all the set up procedures mentioned above have been completed, the burner should be fired and an inspection mirror should be used to observe the flame pattern at the tip of the nozzle. Any irregularities such as burning to one side or pulsating flame patterns should be corrected by changing the nozzle.

2.3) SEQUENCE OF OPERATION

Using schematic diagram in Figure 11, p. 23, follow the sequences of operation through the different modes.

NOTE: ECM variable speed motors deliver infinitely variable CFMs. At start-up the motor increases its speed gradually, in order to lower noise perception. ECM motors ramp down in the same gradual fashion as they do on start-up. ECMs are energized by 120V, whenever power is available to the furnace control. However, they operate only when 24V motor control signals are received.

2.3.1) Oil fired heating mode

- The thermostat closes R to W.
- Burner motor fan pre-purges the combustion chamber for 10 to 15 seconds, establishing the combustion air pattern. During this time a spark is also established. The fan starts at 13% of nominal heating for a period equivalent to the "Pre-Run Delay". Refer to Tables 6 & 7, p. 19 & 20.
- The solenoid valve opens and a flame is established. A short time after that, the ignition transformer ceases sparking.
- After the "Pre-Run Delay" the blower slightly increases its speed for a period of time equivalent to the "Short-Run Delay". Refer to Tables 6 & 7, p. 19 & 20.
- After the "Short-Run Delay" the blower increases its speed in order to reach the CFMs indicated in Tables 6 & 7, p. 19 & 20.
- The call for heat is satisfied.
- The solenoid valve closes, the burner motor stops and the flame extinguishes.
- The blower slows down gradually to 38% of nominal CFMs for a period of 3 minutes and then stops.

2.3.2) Cooling mode

NOTE: On units using a 2-stage compressor, the terminal Y1 must be used. Once the Y1 terminal on the electronic control receives a 24 V signal, the airflow is reduced by 55% percent. If a single stage compressor is used, do not use the Y1 terminal.

- The R - G and R - Y/Y2 thermostat contacts close. The R-Y/Y2 circuit starts the outdoor unit, and the R - G circuit starts the blower at cooling speed. Refer to Tables 6 & 7, p. 19 & 20.
- When the call for cooling is satisfied, the R - G and R - Y/Y2 thermostat contacts open. The cooling unit stops and furnace blower gradually slows down to 50% of nominal CFMs for a period of 3 minutes.

2.3.3) Continuous Blower Mode

- When the R - G thermostat contacts close, the blower functions at 64%, 75% or 86% of cooling airflow, depending on the adjustment of the DIP switches. Refer to Tables 6 & 7, p. 19 & 20.
- When the R - G thermostat contacts open, the blower stops immediately.

2.3.4) Heat Pump – Heating / Cooling Mode

NOTE 1: A dual-fuel thermostat is required when a variable speed furnace is used with a heat pump. See dual-fuel thermostat Installation Instructions for interface connections. The interface prevents simultaneous operation of both the furnace and heat pump and prevents direct transition from heat pump to furnace operation.

NOTE 2: On units using 2-stage compressors, terminal Y1 must be used. When Y1 on the electronic control board receives a 24 V signal, the airflow is cut by 55%. If a single stage compressor is used, do NOT use terminal Y1.

a. Cooling Mode

- The thermostat contacts R - G, R - Y/Y2 and R - O close. The R - Y/Y2 circuit starts-up the outdoor cooling unit, the R - O maintains the reversing valve in the cooling mode and the R - G circuit starts-up the blower at cooling speed. Refer to Tables 6 & 7, p. 19 & 20.
- When the call for cooling is satisfied, the R - G, R - Y/Y2 and R - O contacts open. The cooling unit stops and the furnace blower slows down gradually to 50% of nominal CFMs for a period of 3 minutes.

b. Heating Mode Thermo Pump

- The thermostat contacts R - G and R - Y/Y2 close. The R - G circuit starts-up the blower at heating speed by way of the Thermo Pump. Refer to Tables 6 & 7, p. 19 & 20.
- When the call for heat is satisfied, the thermostat contacts open and the furnace blower gradually reduces its speed to 50% of nominal CFMs for a period of 3 minutes.

2.3.5) Defrost Mode

When the R - W and R - Y/Y2 circuits are closed by the thermostat and the heat pump, the electronic control starts-up the burner and the blower in the oil heating mode during defrost.

2.4) FAN ADJUSTMENT CHECK

This furnace is equipped with an ECM variable speed motor. The blower is adjusted at the factory to deliver the required oil heating airflow at 0.75 USGPH and 3.0 tons of cooling on models with a maximum input of 105,000 BTU/H. The same applies to units with 0.85 USGPH input, 5 tons of cooling and a maximum input of 154,000 BTU/H.

Refer to Tables 3A to 4D, p. 15 for information on how to adjust the DIP switches for other blower speeds for heating and cooling.

2.5) LIMIT CONTROL CHECK

After the furnace has been in operation for at least 15 minutes, restrict the return air supply by blocking the filters or closing the return registers and allow the furnace to shut down on High Limit. The burner will shut off but the main blower should continue to run.

Remove the restriction and the burner should come back on in a few minutes.

2.6) BVSO PERFORMANCE TEST

The purpose of the following test is to check that the electrical outlet on the furnace, designated to the BVSO, is functional.

1. Start up the burner;
2. Remove the three-pole plug from the BVSO outlet on the furnace;
3. The burner must shut-off immediately, while the blower continues to run to the end of the cool-down cycle.

If the test is not in line with the above, call a QUALIFIED SERVICE TECHNICIAN.

TABLE 3

DIP SWITCH ADJUSTMENT CHART for INPUT of 0.50 to 0.75 USGPH

OIL HEATING MODE				CFM ADJUSTMENT in all MODES					HEAT PUMP and COOLING MODE							
TABLE 3A				TABLE 3B				TABLE 3C			TABLE 3D					
SW1 - HEAT			INPUT USGPH	SW4 - DELAY			INPUT USGPH	SW3 - ADJUST			HEATING CFM* % Increase or Decrease	COOLING CFM* % Increase or Decrease	SW2 - COOL			A / C Size (ton)
DIP SWITCH POSITION				DIP SWITCH POSITION				DIP SWITCH POSITION					DIP SWITCH POSITION			
1	2	POS.		1	2	POS.		1	2	POS.			1	2	POS.	
OFF	OFF	A	0,75	OFF	OFF	A	0,75	OFF	OFF	A	0%	0%	OFF	OFF	A	3,0
ON	OFF	B	0,65	ON	OFF	B	0,65	ON	OFF	B	+13%	+10%	ON	OFF	B	2,5
OFF	ON	C	0,50	OFF	ON	C	0,50	OFF	ON	C	-15%	-10%	OFF	ON	C	2,0
ON	ON	D	ALL	ON	ON	D	ALL	ON	ON	D	N / A	0%	ON	ON	D	1,5

*Refer to Table 6, p. 19

TABLE 4

DIP SWITCH ADJUSTMENT CHART for INPUT of 0.85 to 1.10 USGPH

OIL HEATING MODE				CFM ADJUSTMENT in all MODES					HEAT PUMP and COOLING MODE							
TABLE 4A				TABLE 4B				TABLE 4C			TABLE 4D					
SW1 - HEAT			INPUT USGPH	SW4 - DELAY			INPUT USGPH	SW3 - ADJUST			HEATING CFM* % Increase or Decrease	COOLING CFM* % Increase or Decrease	SW2 - COOL			A / C Size (ton)
DIP SWITCH POSITION				DIP SWITCH POSITION				DIP SWITCH POSITION					DIP SWITCH POSITION			
1	2	POS.		1	2	POS.		1	2	POS.			1	2	POS.	
OFF	OFF	A	0,85	OFF	OFF	A	0,85	OFF	OFF	A	0%	0%	OFF	OFF	A	5,0
ON	OFF	B	1,00	ON	OFF	B	1,00	ON	OFF	B	+13%	+10%	ON	OFF	B	4,0
OFF	ON	C	1,10	OFF	ON	C	1,10	OFF	ON	C	-15%	-10%	OFF	ON	C	3,5
ON	ON	D	ALL	ON	ON	D	ALL	ON	ON	D	N / A	0%	ON	ON	D	3,0

*Refer to Table 7, p.20

PART 3 MAINTENANCE

This furnace should never be operated without an air filter. Disposable filters should be replaced at least once a year. If the furnace is equipped to provide cooling as well, filters should be replaced a minimum of twice a year.

WARNING

Before performing any service functions, make sure that all utilities are turned "OFF" upstream from the appliance, unless operations specifically require the power to be on. Failure to comply with this warning will cause a fire hazard and/or bodily harm.

For optimal performance, the oil burner nozzle should be replaced at least once a year. Contact a qualified service technician for the installation.

The procedure for nozzle installation and/or replacement is outlined in the oil burner Instruction Manual that was supplied with the furnace.

After replacement of the nozzle, the burner should be adjusted in accordance with the "COMBUSTION CHECK" outlined in Section 2.2 of this manual.

3.1) HEAT EXCHANGER CLEANING

Ordinarily, it is not necessary to clean the heat exchanger or flue pipe every year, but it is advisable to have a qualified service technician check the unit before each heating season to determine whether cleaning or replacement of parts is necessary.

If cleaning is necessary, the following steps should be taken:

1. Turn "OFF" all utilities upstream from the furnace;
2. Disconnect the flue pipe;
3. Remove the radiator baffle;
4. Disconnect the oil line and remove the oil burner from the furnace;
5. Open the two cleanout doors located in the upper part of the front panel of the furnace;
6. Clean the secondary tubes and the primary cylinder with a stiff brush and a vacuum cleaner;
7. Before reassembly, the heat exchanger and combustion chamber should be inspected to determine if replacement is required;
8. After cleaning, replace the radiator baffle, flue collar plate, oil burner and close the two clean out access doors. Reconnect the flue pipe and oil line;
9. Readjust burner for proper operation.

3.2) BLOWER REMOVAL

To remove the blower from the furnace:

1. Turn "OFF" all utilities upstream from the furnace;
2. Remove the burner access door and blower door;
3. Remove the blower retaining screw (on the blower partition panel);
4. Remove the control box cover and disconnect the thermostat and power wires from the board;
5. Slide the blower on the rails toward the front of the unit;
6. Reverse the above steps to reinstall the blower. Refer to the wiring diagram Figure 11, p. 23 in this manual, or the diagram located on the inside of the blower door to properly rewire the unit.

CAUTION

Be sure that the blower is adequately supported when sliding it off the mounting rails, especially in the horizontal or counterflow positions, in order to prevent dropping it and injuring yourself or damaging the blower!

3.3) BLOCKED VENT SHUT OFF (BVSO) CLEANING

For continued safe operation, the Blocked Vent Shut-Off System (BVSO) is required to be inspected and maintained annually by a qualified agency.

1. Disconnect the power to the appliance;
2. Remove the two screws holding on the BVSO assembly cover;
3. Remove the cover;
4. Remove the two screws holding the thermal switch to the assembly base;
5. Without removing the electrical wires, remove the thermal switch and remove any build-up from the thermal switch surface;

CAUTION

Do not dent or scratch the surface of the thermal switch. If the thermal switch is damaged, replacement is required.

6. Clear and remove any build-up or obstruction inside the heat transfer tube;
7. Re-mount the thermal switch to the assembly base;
8. Re-attach the assembly cover with the screws removed in step 2;
9. Re-establish power to the appliance.

PART 4 INFORMATION

Model: _____ Serial number: _____

Furnace installation date: _____

Service telephone – Day: _____ Night: _____

Dealer name and address: _____

START-UP TEST RESULTS

Nozzle: _____ Pressure: _____ lb/psi

Burner adjustments: Primary air _____

Fine air _____

Drawer Assembly _____

CO₂: _____ % Smoke scale: _____ (Bacharach)

Gross stack temperature: _____ °F

Ambient temperature: _____ °F

Chimney draft: _____ "W.C.

Overfire draft: _____ "W.C.

Tests performed by: _____

TABLE 5
Technical Specifications

Model : AMP, LBM & NOMV	105 / 106			120 / 156		
RATING AND PERFORMANCE						
Firing rate (USGPH)	0.5	0.65	0.75	0.85	1.00	1.10
Input (BTU/h)	70000	91000	105000	119000	140000	154000
Heating capacity (BTU/h)	57000	74000	85000	97000	115000	126000
AFUE % (Upflow position)	82.0	82.0	81.5	83.0	83.0	82.5
Heating temperature rise	13°C - 29°C (55 - 85°F)			13°C - 29°C (55 - 85°F)		
Flue draft minimum (W.C.)	-0.06 to -0.025			-0.06 to -0.025		
Overfire pressure draft (W.C.)	range +0.010 to +0.025			max +0.025		
RIELLO BURNER; MODEL 40	F3 - TUBE INSERTION 3 9/16			F5 - TUBE INSERTION 3 9/16		
Nozzle (Delavan)	0.40 - 70A	0.50 - 70W	0.65 - 70W	0.75 - 70B	0.85 - 70W	1.00 - 70W
Pump pressure (PSIG)	160	170	135	130	140	125
Combustion air adjustment (turbulator/damper)	0 / 3	0 / 3.5	0 / 4	0 / 3	0 / 3.5	0 / 4
ELECTRICAL SYSTEM						
Volts - Hertz - Phase	115 - 60 - 1			115 - 60 - 1		
Operating voltage range	104 - 132			104 - 132		
Rated current (Amps)	10.3			15.7		
Minimum ampacity for wire sizing	12.2			18.1		
Max. wire length (ft.)	26			26		
Max. fuse size (Amps)	15			20		
Control transformer	40 VA			40 VA		
External control power available	Heating	40 VA			40 VA	
	Cooling	30 VA			30 VA	
BLOWER DATA*						
Motor (HP)	1/2 HP ECM 2.3			1.0 HP ECM 2.3		
Blower wheel size	10" x 10"			12" x 10"		
Filter size	16" x 24"			18" x 30"		
Maximum cooling capacity, tons @ 0.5" W.C.	3 tons			5 tons		
*Dip switches on the electronic board must be adjusted according to heat input and cooling capacity. Refer to air flow tables in the Instruction Manual.						

TABLE 6
Air Flow Data, Models 105 / 106

OIL HEATING MODE				
24 VAC input (R) on W only				
SW1- HEAT DIP switch position	HEAT INPUT (USGPH)	CFM with SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	0,75	1260	1425	1070
B (1=ON, 2=OFF)	0,65	1050	1190	895
C (1=OFF, 2=ON)	0,50	850	960	725
D (1=ON, 2=ON)	Same value as DIP switch position A			

CONTINUOUS FAN				
24 VAC input (R) on G only				
SW2- COOL DIP switch position	A/C size (TON)	CFM with SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	3,0	785	905	670
B (1=ON, 2=OFF)	2,5	655	755	560
C (1=OFF, 2=ON)	2,0	525	605	445
D (1=ON, 2=ON)	1,5	395	455	335

COOLING OR HEAT PUMP HEATING MODE				
24 VAC input (R) to G, Y/Y2 and O (for cooling)				
SW2- COOL DIP switch position	A/C size (TON)	CFM with SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	3,0	1050	1155	945
B (1=ON, 2=OFF)	2,5	875	965	790
C (1=OFF, 2=ON)	2,0	700	770	630
D (1=ON, 2=ON)	1,5	525	580	475

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.

The CFMs shown are reduced by 55% if there is 24 VAC input to Y1 (Slow speed of 2-speed compressor)

DELAY PROFILE FOR OIL HEATING MODE				
SW4- DEALY DIP switch position	HEAT INPUT (USGPH)	PreRun On-Delay CFM Level - Time	ShortRun On-Delay CFM Level - Time	Off-Delay CFM Level - Time
A (1=OFF, 2=OFF)	0,75	13% - 45 sec.	19% - 30 sec	38% - 3 min.
B (1=ON, 2=OFF)	0,65	13% - 45 sec.	19% - 60 sec	38% - 3 min.
C (1=OFF, 2=ON)	0,50	13% - 60 sec.	13% - 60 sec	38% - 3 min.
D (1=ON, 2=ON)	All	13% - 30 sec.	100% - 0 sec	100% - 2 min.

PreRun and ShortRun are the periods of time when the the blower starts at very low CFM to minimize the distributon of cool air in the system and then runs up to normal speed.
Off Delay is the time required to cool down the heat exchanger with low CFMs, to minimize cool draft in the air distribution system.

DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE				
No adjustment required	A/C size	PreRun On-Delay CFM Level - Time	ShortRun On-Delay CFM Level - Time	Off-Delay CFM Level - Time
-	All	No delay	No delay	100% - 90 sec.

PreRun and ShortRun are the periods of time when the the blower starts at very low CFM to minimize the distributon of cool air in the system and then runs up to normal speed.
Off Delay is the time required to cool down the coil (heating mode) with low CFMs, to mimimize cool draft in the air distribution system.

TABLE 7
Air Flow Data, Models 120 / 156

OIL HEATING MODE 24 VAC input (R) on W only				
SW1- HEAT DIP switch position	HEAT INPUT (USGPH)	CFM avec SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	0,85	1450	1640	1235
B (1=ON, 2=OFF)	1,00	1700	1920	1445
C (1=OFF, 2=ON)	1,10	1850	2090	1575
D (1=ON, 2=ON)	Same value as DIP switch position A			

CONTINUOUS FAN 24 VAC input (R) on G only				
SW2- COOL DIP switch position	A/C size (TON)	CFM with SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	5,0	1315	1510	1115
B (1=ON, 2=OFF)	4,0	1050	1210	895
C (1=OFF, 2=ON)	3,5	920	1055	780
D (1=ON, 2=ON)	3,0	790	905	670

COOLING OR HEAT PUMP HEATING MODE* 24 VAC input (R) to G, Y/Y2 and O (for cooling)				
SW2- COOL DIP switch position	A/C size (TON)	CFM with SW3-ADJ DIP switch position A	CFM with SW3-ADJ DIP switch position B	CFM with SW3-ADJ DIP switch position C
A (1=OFF, 2=OFF)	5,0	1750	1925	1575
B (1=ON, 2=OFF)	4,0	1400	1540	1260
C (1=OFF, 2=ON)	3,5	1225	1350	1105
D (1=ON, 2=ON)	3,0	1050	1155	945

In Cooling - Dehumidification mode, with no 24 VAC input to DH, the CFMs are reduced by 15%.
The CFMs shown are reduced by 55% if there is 24 VAC input to Y1 (Slow speed of a 2-speed compressor)

DELAY PROFILE FOR OIL HEATING MODE				
SW4- DELAY DIP switch position	HEAT INPUT (USGPH)	PreRun On-Delay CFM Level - Time	ShortRun On-Delay CFM Level - Time	Off-Delay CFM Level - Time
A (1=OFF, 2=OFF)	0,85	13% - 45 sec.	44% - 30 sec	38% - 3 min.
B (1=ON, 2=OFF)	1,00	13% - 30 sec.	44% - 30 sec	38% - 3 min.
C (1=OFF, 2=ON)	1,10	13% - 30 sec.	50% - 30 sec	38% - 3 min.
D (1=ON, 2=ON)	All	13% - 30 sec.	100% - 0 sec	100% - 2 min.

PreRun and ShortRun are the periods of time when the the blower starts at very low CFM to minimize the distribution of cool air in the system and then runs up to normal speed.
Off Delay is the time required to cool down the heat exchanger with low CFM, to minimize cool draft in the air distribution system.

DELAY PROFILE FOR COOLING OR HEAT PUMP HEATING MODE				
No adjustment required	A/C size	PreRun On-Delay CFM Level - Time	ShortRun On-Delay CFM Level - Time	Off-Delay CFM Level - Time
-	All	No delay	No delay	100% - 90 sec.

PreRun and ShortRun are the periods of time when the the blower starts at very low CFM to minimize the distribution of cool air in the system and then runs up to normal speed.
Off Delay is the time required to cool down the coil (heating mode) with low CFM, to minimize cool draft in the air distribution system.

FIGURE 10.1
Model : AMP, LBM & NOMV (105 / 106)

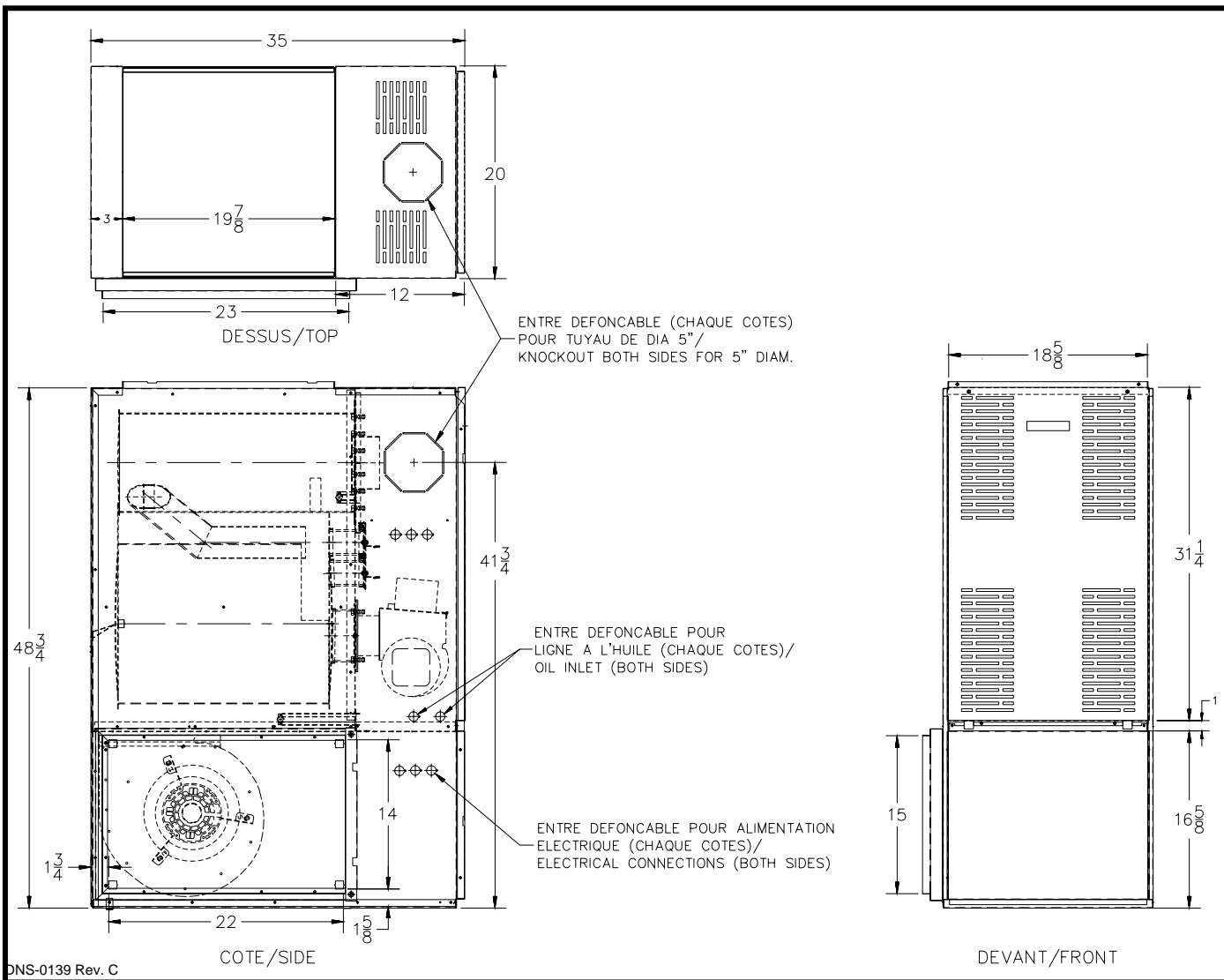


TABLE 8.1
Minimum clearances - combustible materials - Models: AMP, LBM & NOMV (105 / 106)

LOCATION	APPLICATION	UPFLOW	DOWNFLOW	HORIZONTAL
SIDES	FURNACE	0"	2"	2"
	SUPPLY PLENUM WITHIN 6 ft. OF FURNACE	1"	2"	1"
BACK	FURNACE	0"	1"	0"
TOP	FURNACE OR PLENUM	2"	2"	2"
	HORIZONTAL WARM AIR DUCT WITHIN 6 ft. OF FURNACE	2"	2"	3"
BOTTOM	FURNACE (COMBUSTIBLE FLOOR WITH SUBBASE†)	0"	0" *	0" **
FLUE PIPE	HORIZONTALLY OR BELOW FLUE PIPE	4"	4"	4"
	VERTICALLY ABOVE FLUE PIPE	9"	9"	9"
FRONT	FURNACE	8"	8"	24"

† When used with floor base *DFB-101 or **HFB-101

FIGURE 10.2
Model: AMP, LBM & NOMV (120 / 156)

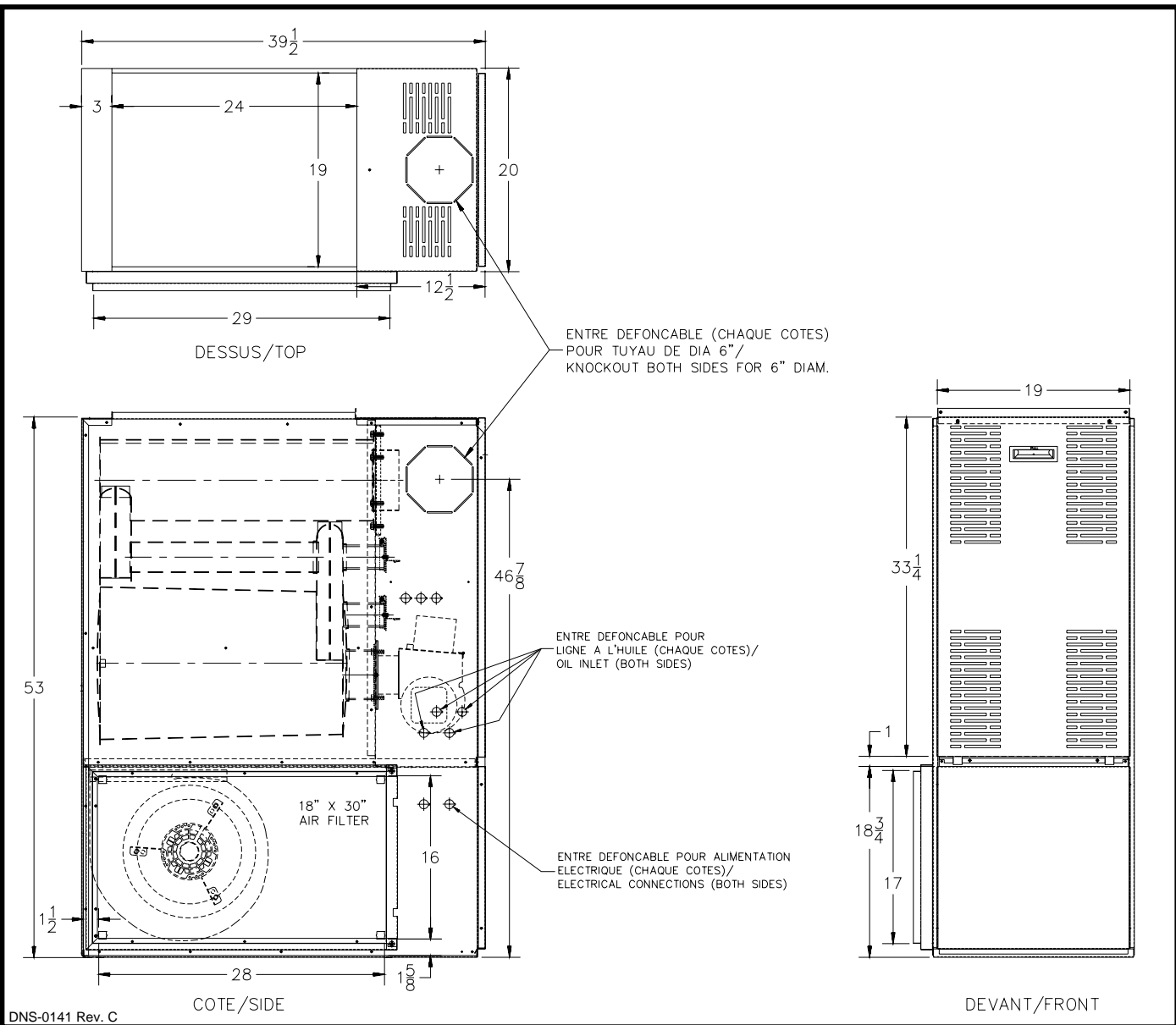


TABLE 8.2
Minimum clearances - combustibile materials - Models: AMP, LBM & NOMV (120 / 156)

LOCATION	APPLICATION	UPFLOW	DOWNFLOW	HORIZONTAL
SIDES	FURNACE	1"	2"	2"
	SUPPLY PLENUM WITHIN 6 ft. OF FURNACE	1"	2"	1"
BACK	FURNACE	0"	1"	0"
TOP	FURNACE OR PLENUM	2"	2"	2"
	HORIZONTAL WARM AIR DUCT WITHIN 6 ft. OF FURNACE	2"	2"	3"
BOTTOM	FURNACE (COMBUSTIBLE FLOOR WITH SUBBASE†)	0"	0" *	0" **
FLUE PIPE	HORIZONTALLY OR BELOW FLUE PIPE	4"	4"	4"
	VERTICALLY ABOVE FLUE PIPE	9"	9"	9"
FRONT	FURNACE	8"	8"	24"

† When used with floor base *DFB-101 or **HFB-101

