

INSTALLATION AND SERVICING INSTRUCTIONS AND USER'S INFORMATION MANUAL

****INSTALLER — AFFIX THIS INSTRUCTION
PACKET ADJACENT TO THE FURNACE.**

****HOMEOWNER — RETAIN THESE
INSTRUCTIONS FOR FUTURE REFERENCE.**

INSTRUCTIONS D'ENTRETIEN ET INSTALLATION ET MANUEL DE L'USAGER

****INSTALLATEUR -- PLACEZ LA POCHETTE
D'INSTRUCTIONS À COTÉ DU GÉNÉRATEUR
D'AIR CHAUD.**

****PROPRIÉTAIRE -- CONSERVEZ CES
INSTRUCTIONS POUR Y RÉFÉRER PLUS TARD.**

LITERATURE BOOKLET NO. 20553001

ISSUE 0351

Owner Record

Furnace Model # _____ Serial # _____ Installation Date _____

INSTALLED BY:

Dealer _____

Address _____

Telephone # _____ License # _____

Contact Person _____

Other Equipment Installed:

Equipment Type _____

Model # _____ Serial # _____ Installation Date _____

Equipment Type _____

Model # _____ Serial # _____ Installation Date _____

Equipment Type _____

Model # _____ Serial # _____ Installation Date _____

WHEN FRENCH IS REQUIRED!

ATTENTION: MR. INSTALLER OR HOMEOWNER

TO OBTAIN INSTALLATION INSTRUCTIONS, USER'S INFORMATION MANUAL AND FURNACE MARKINGS IN FRENCH CONSULT WITH YOUR DEALER OR LOCAL DISTRIBUTOR:

HAVE AVAILABLE THE MODEL NO. AND SERIAL NO. LOCATED ON THE UNIT RATING PLATE TO INSURE THE CORRECT FRENCH INSTRUCTION PACKET.

POUR OBTENIR DE LA DOCUMENTATION EN FRANÇAIS!

À L'ATTENTION DE L'INSTALLATEUR OU DU PROPRIÉTAIRE

POUR OBTENIR LES INSTRUCTIONS D'INSTALLATION, LE MANUEL DE L'USAGER ET LES MARQUAGES EN FRANÇAIS, CONSULTEZ VOTRE MARCHAND OU LE DISTRIBUTEUR DE VOTRE RÉGION:

AYEZ EN MAIN LE MODELE ET LE NUMÉRO DE SÉRIE INDICQUÉS SUR LA PLAQUE SIGNALÉTIQUE DE L'APPAREIL POUR OBTENIR LA POCLETTE D'INSTRUCTIONS EN FRANÇAIS APPROPRIÉE.

USER'S INFORMATION MANUAL

Gas-Fired Furnace

READ ALL INSTRUCTIONS IN THIS MANUAL AND RETAIN THIS AND ALL ADDITIONAL INSTRUCTIONS FOR FUTURE REFERENCE.

Congratulations...

...you have one of the most modern gas furnaces made. Your unit has been carefully selected to keep you warm and comfortable during the winter months. It will deliver superb performance with only minimal help from you.

To keep your operating costs low and to eliminate unnecessary service calls, we have provided a few guidelines. These guidelines will help you understand how your gas furnace operates and how to maintain it so you can get years of safe and dependable service.



GAMA Certified

The Gas Appliance Manufacturers Association (GAMA) symbol verifies that Annual Fuel Utilization Efficiency (AFUE) ratings for our gas furnaces have been derived from U.S. Government standard tests.

CSA International Design Certified

The CSA International symbols on each nameplate is your assurance that your furnace design meets nationally recognized standards for safety and performance.



⚠ WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury death or property damage.

- **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**

- **What to do if you smell gas:**
 - **Do not try to light any appliance.**
 - **Do not touch any electrical switch; do not use any phone in your building.**
 - **Leave the building immediately.**
 - **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.**
 - **If you cannot reach your gas supplier, call the fire department.**

- **Installation and service must be performed by a qualified installer, service agency or the gas supplier.**

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For your safety - Read before operating

Here are a few "Do's and Don'ts"

- **Do** become familiar with the User's Instruction Manual and Installation Instructions.
- **Do** check to see that your home has adequate insulation, weatherstripping, caulking, and storm windows. Elimination of infiltration of outside air and drafts can save up to 40% of your fuel bill.
- **Do** consider adding a humidifier to your heating system. Higher indoor humidity slows evaporation of perspiration, making the home seem warmer.
- **Don't** waste fuel by setting your thermostat too high. Energy conservation experts recommend a daytime thermostat setting of 68°F, with a lower setting at night.
- **Don't** turn off the furnace when you expect to be away for more than a day. Instead, lower the thermostat setting a few degrees. You can then restore normal comfort level quickly and save fuel too.
- **Don't** block registers with furniture.
- **Don't** put a lamp, TV, or radio too near your thermostat. This will cause it to give a false reading.

⚠ WARNING

If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury, or loss of life.

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 the furnace area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle to the lowest point. Refer to **"What to do if you smell gas"** on page 1 if the odor of gas is present.

Use only your hand to adjust the gas control switch; **never use tools**. If the switch will not move by hand, don't try to repair it, call a qualified service technician. **Force or attempted repair may result in a fire or explosion.**

Do not use this furnace if any part has been under water. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. A qualified service agency should be contacted to inspect the furnace and to replace all gas controls, control system parts, electrical parts that have been wet or the furnace if deemed necessary.

⚠ WARNING

The furnace area must be kept clear and free of combustible materials, gasoline, and other flammable vapors and liquids. Failure to do so could cause actions that may result in property damage, personal injury, or loss of life.

Operating Your Furnace

Lighting 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 knob to "OFF" (see Figure 1).

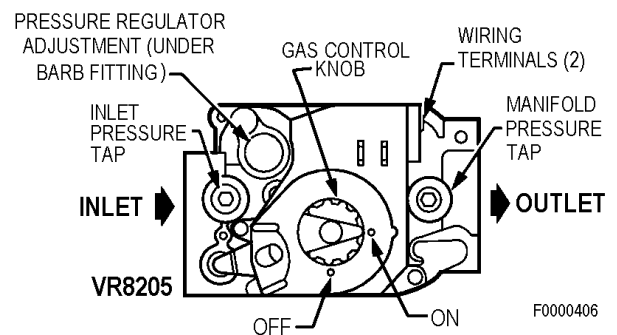


Figure 1

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 1. If you don't smell gas, continue to next step.
8. Move the gas control knob to "ON".
9. Replace the burner compartment access panel.
10. Turn on all electric power to the furnace.

- Set the thermostat to the desired setting.
- If the furnace will not operate, follow the instructions in **"To Turn Off Gas to Furnace"** and call your service technician or gas supplier.

To Turn Off Gas to Furnace

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

Temperature Control

There are many types and styles of thermostats. Yours may look different from the one pictured in Figure 2, depending on the type of thermostat and whether cooling was installed with the system. However, almost all thermostats perform the same basic functions described in the following section.

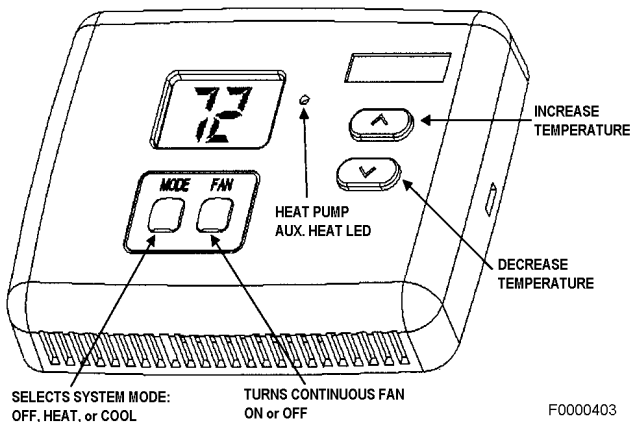


Figure 2

Thermostat Operation

There are four (4) buttons on the thermostat (see Figure 2). One button controls the heating and cooling (if applicable) functions. Another button is for "FAN" operation, either continuous or automatic. The remaining two buttons set the temperature range for the heating temperature and the cooling temperature desired.

To put the system into operation, push the button to either "HEAT" or "COOL" position. After you have chosen the type of operation you desire, set the thermostat to the temperature you would like the system to maintain.

Fan Operation

You may wish to increase your comfort by setting your system for continuous air circulation of the indoor air. The fan switch on the thermostat permits you to do this.

With the switch in the "ON" position the fan will operate continuously. "AUTO" position gives fan operation only when the unit is in either heating or cooling.

What to do if your unit is not heating properly

If your furnace is operating but fails to provide complete comfort, check the following before calling for service:

- Be sure the thermostat setting is correct.
- Check to see if the filter is clean.
- Be sure air can circulate freely throughout your home. Do not block supply registers or return grilles with furniture or rugs.

And if you also have cooling...

- Keep surface of the outdoor coil free from dirt, lint, paper, or leaves.
- Check and clean indoor coil, if necessary. (This check should be made at the start of each cooling season by your service technician).

What to do if your unit fails to operate

- Be sure the main switch that supplies power to the furnace is in the "ON" position.
- Replace any burned-out fuses or reset circuit breakers.
- Be sure the thermostat is properly set.
- If the furnace still does not start, call your service technician.

WARNING

Should the gas supply fail to shut off or if overheating occurs, shut off the gas valve to the furnace before shutting off the electrical supply.

Maintenance Of Your Furnace

⚠ WARNING

Always shut off all power to the unit before attempting any of the following maintenance procedures. Failure to do so may result in personal injury.

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 who has specialized tools and training. (See "Servicing the Furnace" section of the Installation and Servicing part of this booklet.) **Personal injury can result if you are not qualified to do this work.** Please call your dealer when service is needed.

Cleaning

The cabinet of the furnace can be cleaned with soap and water. Grease spots can be removed with a household cleaning agent. The cabinet can be kept attractive by polishing with automotive wax at least twice a year.

Installations Around Insulation

Insulating materials may be combustible. Therefore, a furnace installed in an attic or other insulated space must be kept free and clear of insulating materials. Make sure to examine the furnace area when the furnace is installed or additional insulation has been added.

Periodic Inspections

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 affect upon the metals used to construct your appliance.

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 inspection and planned maintenance will assure many years of economical performance from your gas furnace.

Combustion Air

⚠ WARNING

Adequate combustion and ventilation air must reach your gas furnace to provide for proper and safe operation. Do not block or obstruct air openings on the furnace, air openings communicating with the area in which the furnace is installed and the spacing around the furnace. Any obstruction of this airflow can cause an unsafe condition which may result in death or permanent injury.

Furnaces located in a closet, alcove, or utility room must have provision for adequate air supply by means of upper and lower grilles in the door, or by the introduction of outside air, or both. National Fuel Gas Code, ANSI Z223.1 (latest edition), CAN/CGA B149.1 & .2 Installation Codes (latest edition), and local requirements are generally alike. However, local codes take precedence.

Venting and Furnace Support

Venting of this furnace must comply with our published instructions. Be sure the installer has followed these requirements. If not, you should request the installer to comply as soon as possible.

For your safety, please note the following:

1. This is a category IV furnace and is dual certified as a direct vent furnace (two pipe system) using outside air for combustion or as a non-direct vent furnace (one pipe system) using air from inside the structure for combustion. The vent - air intake system must be with schedule 40 PVC, CPVC or ABS pipe including all elbows and vent terminals. All pipe and fittings must conform to the American Society for Testing and Material (ASTM), and American National Standards Institute (ANSI) Standards.

Common venting with other condensing appliances or non-condensing appliances is not allowed.

⚠ WARNING

In all direct vent (two pipe) instances, the vent outlet shall be installed so as to be in the same atmospheric pressure zone as the combustion air intake.

2. This furnace is not designed for use with a vent damper. Use of such a device will not improve the efficiency of this furnace and can cause an unsafe condition which may result in death or permanent injury.

The vent-air intake system from your furnace may rise vertically and terminate above the roof or horizontally through the outside wall.

Make sure all air intake and flue product carrying areas external to the furnace (i.e., vent terminal) are clear and free of obstructions. The vent-air intake system and condensate drain system is in place, is physically sound without holes or excessive deterioration, and is installed in accordance with the installation instructions.

Check to see that the furnace cabinet is sound and firmly supported, without sagging. There should be no cracks or gaps between the furnace and the base or floor, which would permit entry of unfiltered air.

It is important that the outside area where the vent terminates is kept clear of any obstructions which might block or impede the venting of the furnace. Should venting become blocked at anytime, your furnace is equipped with a special safety control to prevent operation of the furnace until the condition has been corrected. Contact your dealer if you desire more information about this safety feature.

Should any unusual conditions be observed during your inspections, call an authorized service dealer immediately.

For proper venting terminations, see the Installation Instructions furnished with the furnace.

Return Air

Ascertain that all return air duct connections are tight and sealed to the furnace cabinet and that all return air grilles or registers are located outside the space containing the furnace.

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, permanent filter, electronic or high efficiency media air cleaner. Consult filter/cleaner manufacturer for maintenance service and static pressure drop for air moving requirements.

Permanent filters may be replaced with disposable filters. Refer to Table 1 when selecting the proper size and quantity of disposable filter.

If your air distribution system has a central return air filter-grille, you do not need a filter in your furnace.

Table 1 EXTERNAL FILTER RACK SIZE

* SIDE RETURN	BOTTOM/END RETURN
15 ½ X 25	12 X 25
15 ½ X 25	15 ½ X 25
15 ½ X 25	19 X 25

*NOT FOR USE WITH COUNTER (DOWN) FLOW MODELS

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.

Rollout Switch

This unit is equipped with a manual reset high temperature sensor or rollout switch. In the unlikely event of a sustained main burner flame rollout, the rollout switch will shut off the flow of gas by closing the main 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.

Lubrication

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

Burner Flame

While the furnace is in operation, observe the main burner flames. Compare these observations to Figure 3 to determine if proper flame adjustment is present. If your observations indicate improper flame adjustment, call your authorized service dealer for service.

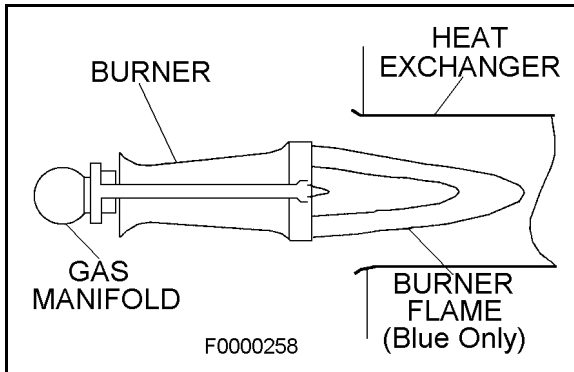


Figure 3

Do not attempt to adjust flame! Your service representative will perform this adjustment correctly.

Warranty Procedure

When warranty parts are required:

1. Be prepared to furnish the following information:
 - a. Purchaser's name
 - b. Complete model number, serial number, and date of installation.
 - c. An accurate description of the problem or defective parts.
2. Contact your dealer or distributor.

Keep this User's Information Manual (including Warranty) and proof of purchase for your records. Your warranty is determined from your date of installation. If proof of your date of installation is not supplied, the warranty will be based on the manufacture date code.

Failure to follow the correct warranty procedure could result in disallowance of warranty claim.

PARTS REPLACEMENT INFORMATION GUIDE

CASING GROUP

- Top Panel
- Front Door
- Blower Door
- Burner Access Door
- Control Access Door

GAS CONTROL GROUP

- Manifold
- Burner
- Shield Top & Bottom
- Orifice
- Ignitor
- Gas Valve
- Sensor

BLOWER GROUP

- Blower Housing
- Blower Motor
- Blower Wheel
- Capacitor
- Blower Support Leg

ELECTRICAL GROUP

- Limit Switch
- Control Board
- Transformer
- Rollout Switch
- Door Interlock Switch
- Auxiliary Limit Switch (when used)

HEAT EXCHANGER GROUP

- Primary Heat Exchanger
- Condensing Heat Exchanger
- Burner Box Panel
- Burner Inlet Plate
- Flue Box

INDUCER GROUP

- Pressure Switch
- Inducer Blower & Motor
- Inducer Blower Switch
- Pressure Switch Tubering

CONDENSATE DISPOSAL GROUP

- Condensate Trap
- Condensate Hoses

TO OBTAIN INFORMATION ON PARTS: Consult your installing dealer or classified section of your local telephone directory under the "Heating Equipment" or "Air Conditioning Contractors & Systems" headings for dealer listing or see the first page of the installation instruction section of this manual for the name and address to contact.

Have available the Model No. and Serial No. located on the unit rating plate to insure correct replacement part.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause personal injury or property damage. Consult a qualified installer, service agency, or your local gas supplier for information or assistance.

AFFIX LABEL HERE



**INSTALLATION INSTRUCTIONS
UPFLOW OR LEFT HORIZONTAL
GAS-FIRED CONDENSING
WARM AIR FURNACE**




Issue 0351


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RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE



⚠ WARNING
If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.



Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Installation and service must be performed by a qualified installer, service agency or the gas supplier. Installation by an unqualified person may lead to equipment damage and/or a hazardous condition which may cause bodily injury and harm and, as such, at the sole discretion of the manufacturer, the entire warranty may be voided and be of no further force and effect.



⚠ DANGER
Electric Shock Hazard
Turn Off All Power Before Servicing.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Extinguish any open flame.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

SAFETY

The following is a list of safety precautions and their locations in this manual.

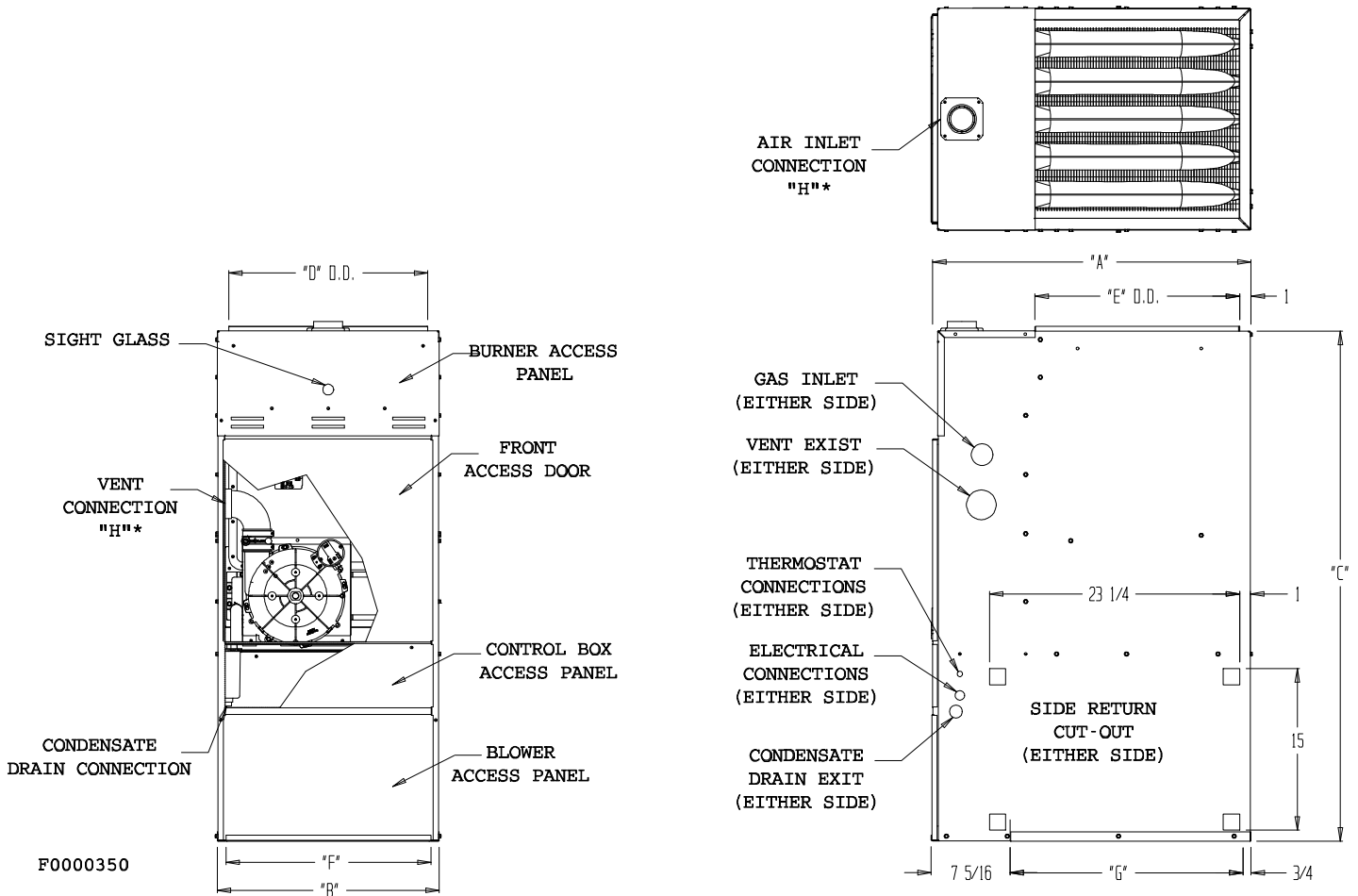
These safety rules and precautions must be followed when installing this furnace.

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 *The Location/Placement Section on page 6* of these instructions.
3. Provide adequate combustion and ventilation air to the furnace space as specified in *Air for Combustion and Ventilation section on page 8* of these instructions.
4. Combustion products must be discharged outdoors. This furnace requires a special vent system with adequate clearances around the vent-air intake terminal (s), as specified in *Venting on page 12* of these instructions.
5. As a TYPE FSP CATEGORY IV furnace the combustion air connections, the flue gas connection, the vent-air intake terminal and condensate trap and drain system must be as specified in the *Venting section starting on page 12* of these instructions. Venting and drain materials must be as specified and are to be supplied by the installer. The vent outlet shall be installed so as to be in the same atmospheric pressure zone as the combustion air intake.
6. 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 *The Gas Connection section on page 19* of these instructions.
7. 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 *Furnace Specifications on page 3* of these instructions. See furnace rating plate.
8. 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 *page 11* for Ducting.
9. A gas-fired furnace for installation in a residential garage must be installed as specified in *The Location / Placement section on page 6* of these instructions.
10. The furnace is not to be used for temporary heating of buildings or structures under construction. As noted on page 6 under Introduction.

FURNACE SPECIFICATIONS

MODEL	UNIT DIMENSIONS			DUCT SUPPLY OPENING		DUCT RETURN OPENING		AIR INLET & VENT CONNECTION DIA.*	MAX. OVER CURRENT PROTECTION	MAX. UNIT AMPS	ELECTRICAL SUPPLY MIN. WIRE SIZE(AWG)	TEMPERATURE RISE RANGE	NET WEIGHT LBS
	LENGTH	WIDTH	HEIGHT	D	E	F	G						
	A	B	C										
E050U2	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	5.7	14	40-70	131
E050U3	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	9.2	14	35-65	131
E075U2	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	6.5	14	45-75	140
E075U3	29 1/2	13 1/2	47 3/8	11 1/2	18 15/16	12	21 5/8	2	15	9.2	14	40-70	140
E100U3	29 1/2	17	47 3/8	15	18 15/16	15 1/2	21 5/8	2	15	8.4	14	40-70	167
E100U4	29 1/2	17	47 3/8	15	18 15/16	15 1/2	21 5/8	2	15	10.6	14	40-70	167
E125U5	29 1/2	20 1/2	47 3/8	18 1/2	18 15/16	19	21 5/8	2	20	12.7	12	45-75	193

* SEE TABLES 3 AND 4 ON PAGES 15 AND 16 FOR ALLOWABLE MAX VENT AND AIR INLET LENGTHS AND DIAMETERS.



FURNACE BLOWER SPECIFICATIONS AND AIR FLOW DATA

MODEL	BLOWER SPEED	EXTERNAL STATIC (IN. W.C.)									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
E050U2 (10 X 6 WHEEL) (1/4 HP MOTOR)	LOW	677	665	646	618	582	538	486	425	357	280
	MED*	857	848	828	798	757	706	644	572	490	397
	HIGH	1111	1081	1047	1008	966	920	870	815	757	695
E050U3 (10 X 6 WHEEL) (1/3 HP MOTOR)	LOW	614	622	621	610	590	561	522	474	417	350
	MED*	966	975	972	956	928	888	835	770	693	603
	HIGH	1324	1330	1317	1286	1236	1167	1080	974	850	707
E075U2 (10 X 6 WHEEL) (1/4 HP MOTOR)	LOW	1111	1087	1048	995	928	846	751	640	516	377
	MED*	1180	1164	1132	1083	1018	937	840	726	596	450
	HIGH	1284	1259	1222	1172	1110	1035	948	848	736	611
E075U3 (10 X 6 WHEEL) (1/3 HP MOTOR)	LOW	961	969	964	946	915	871	813	743	659	562
	MED*	1458	1405	1345	1278	1205	1125	1038	944	843	735
	HIGH	1571	1544	1502	1446	1376	1291	1192	1078	950	807
E100U3 (10 X 9 WHEEL) (1/3 HP MOTOR)	LOW	1018	1017	1005	980	944	896	836	765	681	586
	MED*	1312	1294	1262	1216	1157	1084	998	898	784	657
	HIGH	1600	1571	1526	1463	1383	1286	1172	1040	892	726
E100U4 (12 X 9 WHEEL) (1/2 HP MOTOR)	LOW	1223	1211	1194	1171	1142	1107	1067	1021	970	913
	MED*	1513	1493	1466	1433	1393	1347	1295	1236	1170	1098
	HIGH	1825	1801	1767	1724	1672	1610	1539	1459	1369	1270
E125U5 (12 X 12 WHEEL) (3/4 HP MOTOR)	LOW	1410	1394	1368	1332	1287	1232	1167	1092	1007	912
	MED	1853	1799	1742	1680	1614	1544	1470	1391	1309	1222
	HIGH*	2427	2331	2232	2131	2028	1922	1814	1703	1590	1474

NOTES:

1. Air flow values in cubic feet per minute (CFM).
2. Data taken without filters in place or A/C evaporator in place.
3. Factory setting for cooling is High Speed and heating is indicated by "**".

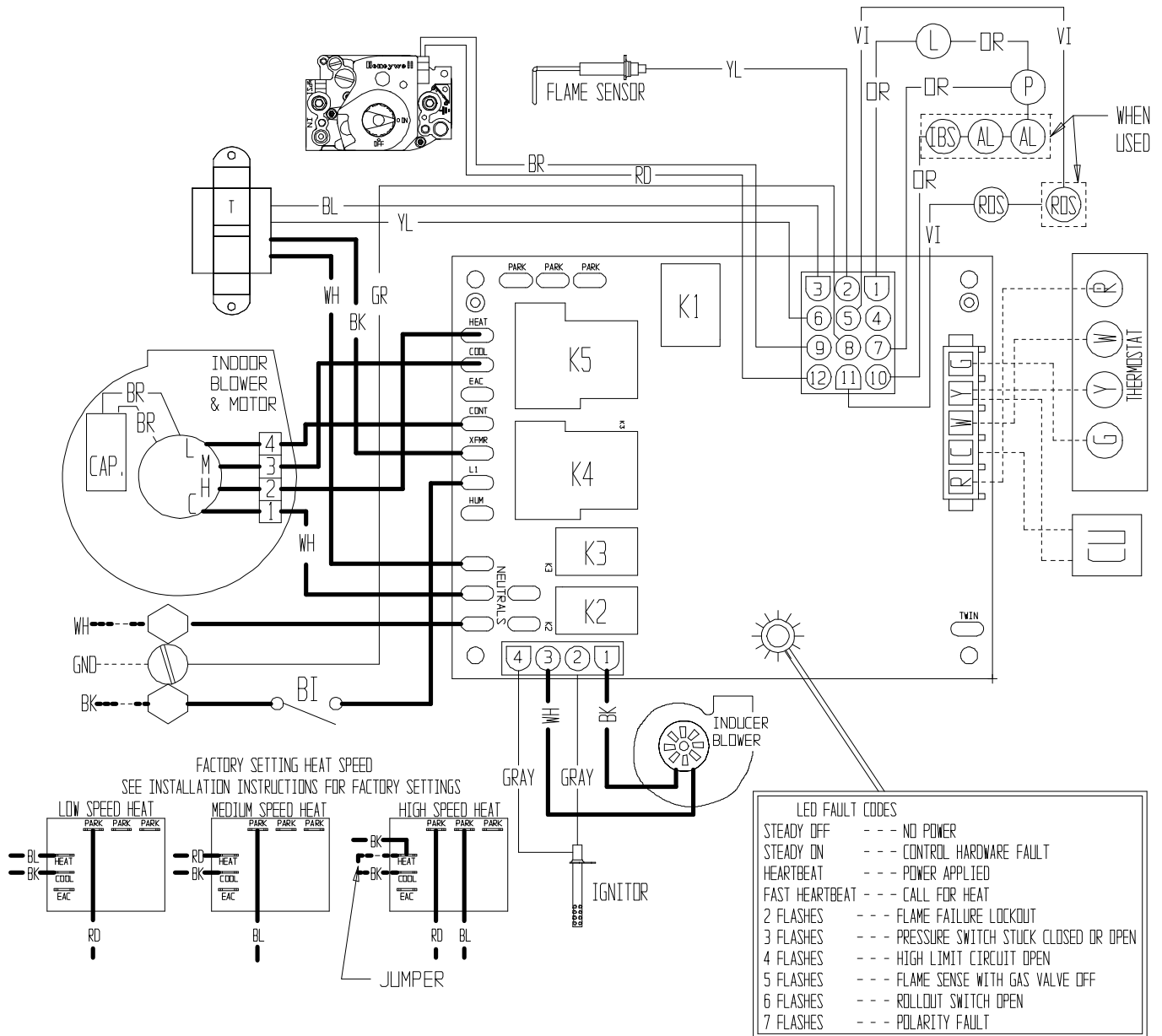
⚠ WARNING

When operating the furnace in the heating mode, the static pressure and the temperature rise (supply air temperature minus return air temperature) must be within those limits specified on the rating label. Failure to follow this warning could lead to severe furnace damage.

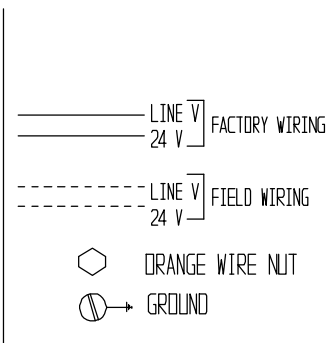
⚠ WARNING

Turn OFF all gas and electrical power to furnace before performing any maintenance or service on unit. (Unless specific test requires gas and electrical supplies.) Failure to take this precaution may result in personal injury due to electrical shock or uncontrolled gas leakage.

FURNACE WIRING SPECIFICATIONS



F0000398



LEGEND

BK	BLACK	L	LIMIT
BL	BLUE	P	PRESSURE SWITCH
BR	BROWN	RDS	ROLL OUT SWITCH *
GR	GREEN	BI	BLOWER INTERLOCK
OR	ORANGE	CU	CONDENSING UNIT
RD	RED	*	MANUAL RESET
VI	VIOLET	AL	AUXILIARY LIMIT
WH	WHITE	T	TRANSFORMER
YL	YELLOW	F1	LOW VOLT. FUSE
		IL	IN LINE CONNECTION
		IBS	INDUCER BLOWER SWITCH

NOTES:

- (1) MAKE FIELD POWER SUPPLY CONNECTIONS TO BLACK AND WHITE WIRES CAPPED WITH ORANGE WIRE NUTS.
- (2) WARNING---UNIT MUST BE GROUNDED. WIRING MUST CONFORM TO N.E.C. AND LOCAL CODES.
- (3) IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED WITH THE FURNACE, MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 C AND BE A MINIMUM OF 16 GA. AWG COPPER STRAND WIRE.
- (4) CONNECT REQUIRED MOTOR LEAD TO HEAT TERMINAL ON CIRCUIT BOARD TO DELIVER A TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING LABEL. CONNECT UNUSED LEADS TO THE PARK TERMINALS.
- (5) SET THE HEAT ANTICIPATOR ON THE THERMOSTAT AT 0.25 AMPS.
- (6) LOW VOLT. FUSE 5 AMP AUTOMOTIVE TYPE LITTLEFUSE 257005 OR BUSS AT C5.

F0000399

⚠ WARNING

The furnace cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. The unit must also be electrically grounded in accordance with local codes, or in the absence of local codes, with the latest edition of the (U.S.) National Electrical Code ANSI/NFPA No. 70 or CSA Standard C22.1; Part 1 Canadian Electrical Code, if an external electrical source is utilized. **DO NOT** use gas piping as an electrical ground.

INTRODUCTION

This furnace is design certified by CSA International as a category IV furnace and is dual certified as direct vent furnace (two pipe system) using outside air for combustion or as a non-direct vent furnace (one pipe system) using air from inside the structure for combustion.

It is shipped as a packaged unit, complete with burners and controls, and requires a line voltage (115V) connection to the junction box, a thermostat hook-up as per the wiring diagram, a gas line connection, a condensate drain connection, ducting and flue piping. **This furnace can be installed in either upflow or horizontal (left) airflow positions at no time should this unit be operated on its back. The design of this furnace is NOT CSA Certified for installation in recreation vehicles, in manufactured (mobil) homes, outdoors or for temporary construction heating.**

This furnace has been designed to interface with split system cooling equipment (approved by a nationally recognized testing laboratory) so as to provide "year round air conditioning". The blower has been sized for both heating and cooling and the furnace controls include a cooling fan relay.

The furnace installation must conform with local building codes or in the absence of local codes, with the latest edition of the (U.S.) National Fuel Gas Code ANSI Z223.1 (NFPA-54) or Canadian Natural Gas and Propane Installation Codes CSA B149.1.

For complete information on installation standards consult the (U.S.) National Fuel Gas Code, obtainable from the National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269 or the American Gas Association, 1515 Wilson Boulevard Arlington, VA 22209 or the Canadian installation codes obtainable from Canadian Standards Association, 178 Rexdale Boulevard, Etobicoke, Ontario, Canada M9W 1R3.

This furnace is designed for minimum continuous return-air temperature of 60°F dB or intermittent operation down to 55°F dB such as when used with a night setback thermostat. Return-air must not exceed a maximum continuous temperature of 85°F dB.

These instructions are written for individual residential installation only. For multi-unit installation or commercial applications, please contact manufacturer for recommendations.

LOCATION / PLACEMENT

Site Selection: This furnace may be located in an attic, closet, basement, crawl space, alcove or suspended from the ceiling of a utility room or basement. Select a location that will meet all requirements for safety, clearances, ventilation and combustion air, ductwork design, gas piping, electrical wiring and venting.

Clearances: The following minimum clearances, or greater, must be provided between the furnace and adjacent construction.

TABLE 1 MINIMUM INSTALLATION CLEARANCES

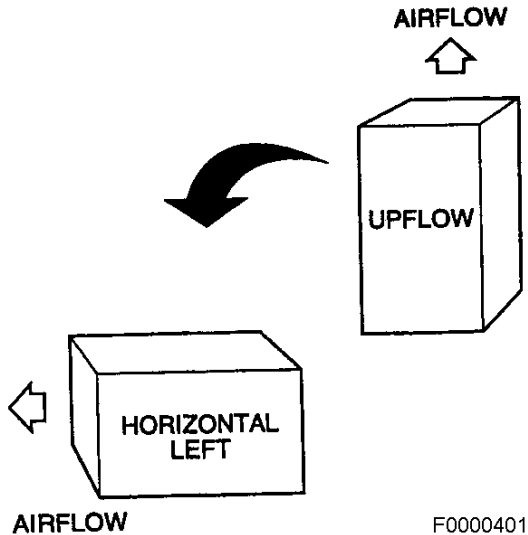
"UPFLOW" POSITION			"HORIZONTAL (LEFT)" POSITION	
Suitable for alcove or closet installation† on combustible flooring at minimum clearance from adjacent construction not less than the following:			Suitable for attic, alcove or closet installation† on combustible flooring at minimum clearance from adjacent construction not less than the following: * Line contact only permissible between lines formed by intersection of the top and two sides of the furnace jacket and building joist, studs, or framing.	
Top	Sides	Back	Front	Vent
2"	1"	1"	3"	0"

† For closet installation see Air for Combustion and Ventilation.

⚠ WARNING

Failure to comply with all of the clearances will create a fire hazard.

INSTALLATION POSITIONS



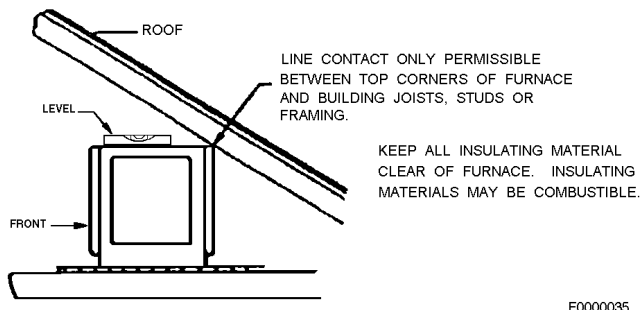
The furnace should not be connected to an operational chimney. The furnace should also be located as near to the center of the air distribution system as possible, and should be installed level.

This furnace may be installed on non-combustible or on wood flooring, however, it **must not be installed directly on carpeting, tile or any other combustible material.**

In a horizontal position, line contact with combustibles is only permissible between lines formed by the intersection of the furnace top, the front and back sides, and building joists, studs or framing (See Figure 1).

Figure 1

HORIZONTAL LINE CONTACT



Furnace must not lean back. It must be level or tilt up to 2° to the front. (See Figure 1.)

A clearance of at least 30" should be provided at the front of the unit for servicing. For attic installations, the passageway and servicing area adjacent to the furnace should be floored.

⚠ WARNING

If furnace is tilted back condensate will collect in the secondary heat exchanger which will result in improper combustion, fire hazard, or other unsafe conditions which could result in property damage, personal injury or death.

If the furnace is to be installed in a crawl space, consult local codes. (Use of a concrete pad 1" to 2" thick is recommended.)

If the furnace is to be suspended from the ceiling, it will be necessary to use steel pipe straps around each end of the furnace. These straps should be attached to the furnace with sheet metal screws and to the rafters with bolts. The furnace may also be suspended by using an angle iron frame bolted to the rafters. (See Table on page 3 for size and weight of furnace.) Care must be taken to allow for service access.

If a furnace is to be installed in a residential garage, it must be installed so the burners and the ignition source are located not less than 18" above the floor and the furnace must be located or protected to avoid physical damage by vehicles.

⚠ WARNING

If this furnace is installed in a garage and/or any unconditioned space, where local plumbing code would require potable water supply piping to be protected; a thermostatically controlled heat tape must be installed along the entire length of the condensate drain in the unconditioned space. Any blockage of the condensate drain will result in improper combustion, fire hazard, or other unsafe conditions which could result in property damage, personal injury or death.

⚠ WARNING

Do not place combustible material on the furnace jacket. Failure to comply with this warning will create a fire hazard.

⚠ 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 would lead to a hazardous electrical condition and to premature furnace failure.

AIR FOR COMBUSTION AND VENTILATION

Contaminated Combustion Air:

If the furnace is to be installed in a structure defined as having contaminated combustion air, the furnace must use the direct vent (two pipe) configuration using non-contaminated outside air for combustion. Allowing exposure to substances containing chlorine or fluoride could harm the furnace and void the warranty.

Substances to avoid include, but are not limited to:

- 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
- Unrefined gases

⚠ WARNING

Contaminated combustion air may cause premature failure of the heat exchanger that may lead to a hazardous condition and/or bodily harm, or loss of life.

Adequate Ventilation and Combustion Air:

This section is provided to give guidelines for the introduction of air for ventilation and combustion air. The total quantity of air provided to the installation area must equal the requirements of all gas appliances in the area.

Adequate facilities for providing air for combustion and ventilation must be provided in accordance with the latest edition of the National Fuel Gas Code ANSI Z223.1/NFPA54 or CSA B149.1 Natural Gas and Propane Installation Codes, or applicable provisions of the local building codes.

The furnace shall be installed in a location in which the facilities for ventilation permits satisfactory combustion of gas, proper venting and maintenance of ambient temperature at safe limits under normal conditions of use. The furnace shall be located so as not to interfere with proper circulation of air.

In addition to air needed for combustion, ventilation in the form of process air must be provided as required for: cooling of equipment or material, controlling dew point, heating, drying, oxidation or dilution, safety exhaust and odor control. Air must be supplied for ventilation, including all air required for comfort and proper working conditions for personnel. **Direct venting (two pipe)**

allows for the combustion air to be supplied directly to the furnace from the outdoors. Ventilation needs only to be considered when furnace is installed as direct vent (two pipe). Non-direct venting (one pipe) requires both combustion and ventilation air requirements from the furnace location.

For purposes of this instruction the following definitions apply:

Confined Space:

A space whose volume is less than 50 cubic feet per 1000 Btu/hr of the aggregate input rating of all appliances installed in that space.

Unconfined Space:

A space whose volume is not less than 50 cubic feet per 1000 Btu/hr of the aggregate input rating of all appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

If the installation area meets the definition of "Unconfined Space" and does not have additional air requirements as described, the furnace may be installed without making special provisions for combustion and ventilation air.

⚠ CAUTION

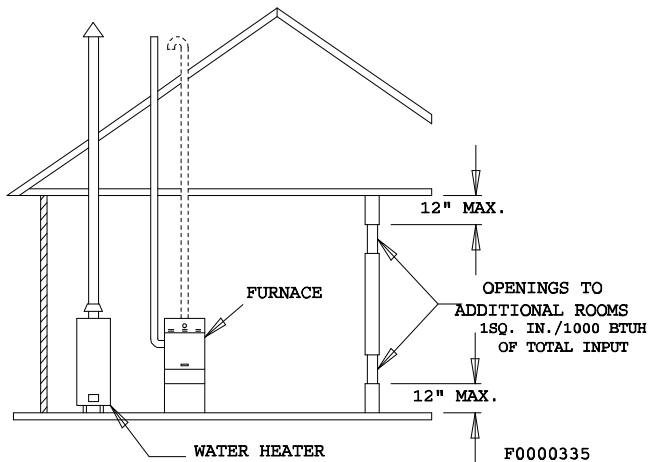
Whenever this furnace is installed in an area along with one or more gas appliances, the total Btu/hr input of all appliances must be included when determining the free area requirements for combustion and ventilation air openings.

⚠ WARNING

Do not block the combustion or ventilation air openings in the furnace. Any blockage will result in improper combustion and may result in a fire hazard or unsafe condition.

If ventilation and/or combustion air must be supplied to the "Confined Space" from inside the building structure, two permanent openings to an additional room of sufficient volume as to combine the volumes of the spaces to meet the criteria for an "Unconfined Space" must be created. Each opening must have a free area of not less than one square inch per 1000 Btu per hour of total input of all appliances within the "Confined Space" (but not less than 100 square inches). These openings must be located 12 inches from the top and bottom of the furnace area respectively and must be at least 3 inches long on the smaller side of the opening (See Figure 2). Neither opening can be blocked at any time.

Figure 2 **CONFINED SPACE / INDOOR AIR**

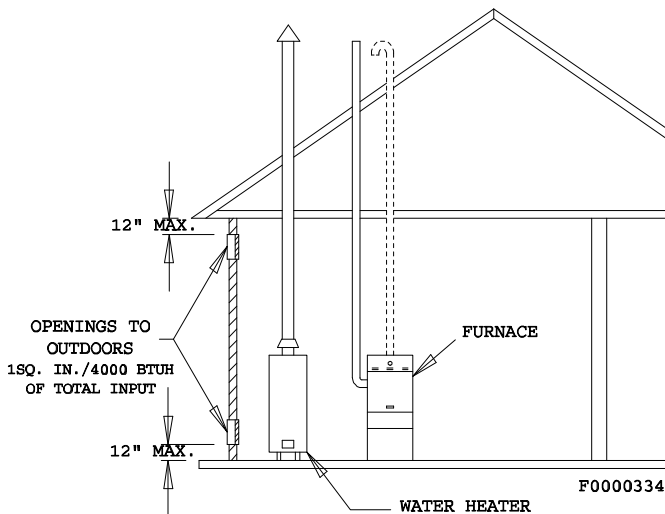


TOTAL INPUT (Btuh)	MIN. FREE AREA (Sq. In.)	ROUND DUCT (Dia. In.)
40,000	100	12
60,000	100	12
80,000	100	12
100,000	100	12
120,000	120	13
140,000	140	14
160,000	160	15

EXAMPLE:
 50,000 Btuh Furnace & 10,000 Btuh Water Heater = 60,000 Btuh Total Input = 12" Dia. Round Duct.

If ventilation and/or combustion air must be supplied to the "Confined Space" from outside the building structure, two permanent openings to the outdoors must be created. Each opening must have a free area of not less than one square inch per 4000 Btu per hour of total input of all appliances within the "Confined Space". These openings must be located 12 inches from the top and bottom of the furnace area respectively (See Figures 3, 4, and 5). Neither opening can be blocked at any time.

Figure 3 **CONFINED SPACE / OUTDOOR AIR**



TOTAL INPUT (Btuh)	MIN. FREE AREA (Sq. In.)	ROUND DUCT (Dia. In.)
40,000	10	4
60,000	15	5
80,000	20	5
100,000	25	6
120,000	30	6
140,000	35	7
160,000	40	8

EXAMPLE:
 50,000 Btuh Furnace & 10,000 Btuh Water Heater = 60,000 Btuh Total Input = 5" Dia. Round Duct.

Figure 4
CONFINED SPACE / OUTDOOR AIR
FROM ATTIC

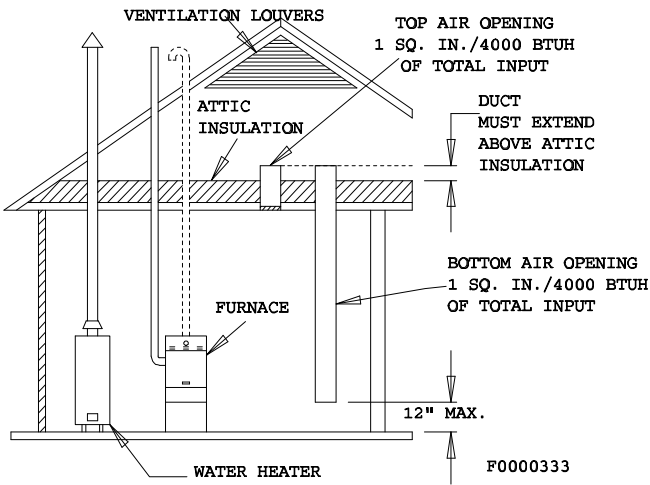
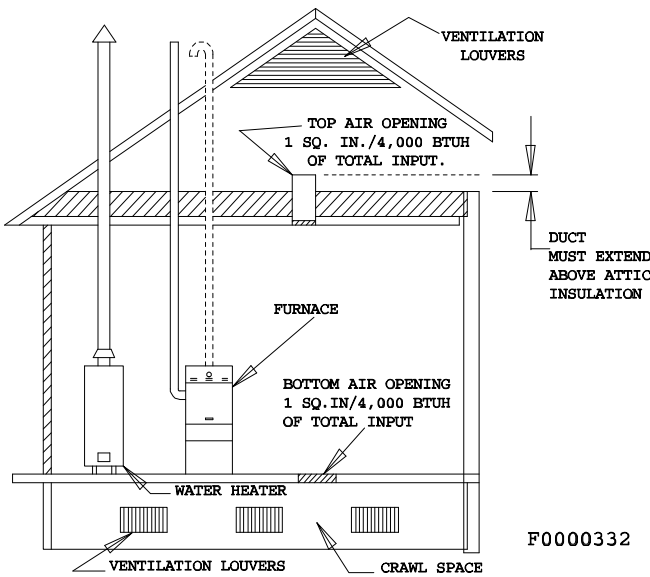
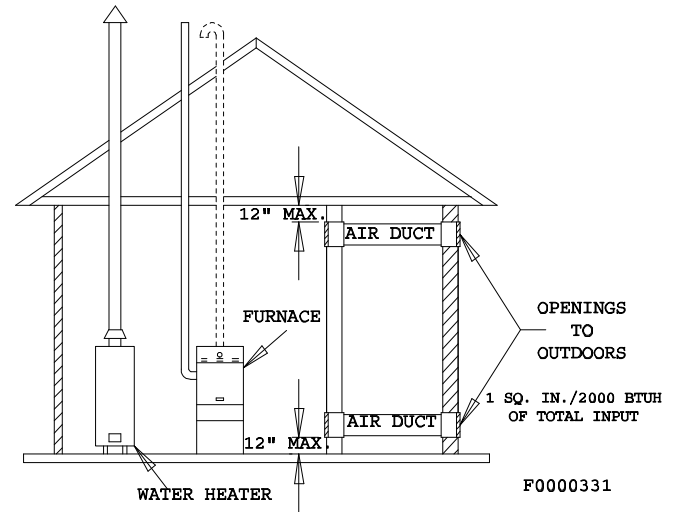


Figure 5
CONFINED SPACE / OUTDOOR AIR
FROM ATTIC & CRAWL SPACE



When horizontal ducts are used to supply air from the outdoors, they must be of the same cross sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts must not be less than 3 inches. Each opening must have a free area of not less than one square inch per 2,000 Btu per hour of total input of all appliances within the "Confined Space". These openings must be located 12 in. from the top and bottom of the furnace area. Neither opening can be blocked at any time (See Figure 6).

Figure 6
CONFINED SPACE / OUTDOOR
AIR THROUGH HORIZONTAL DUCTS



WARNING
 Furnaces installed with combustion air drawn from a heated space which includes exhaust fans, fireplaces, or other devices that may produce a negative pressure should be considered confined space installations.

CAUTION
 For an attic installation it is important to keep insulation 12" or more away from any furnace openings. Some types of insulating materials may be combustible.

DUCTING

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

Ductwork Recommendation:

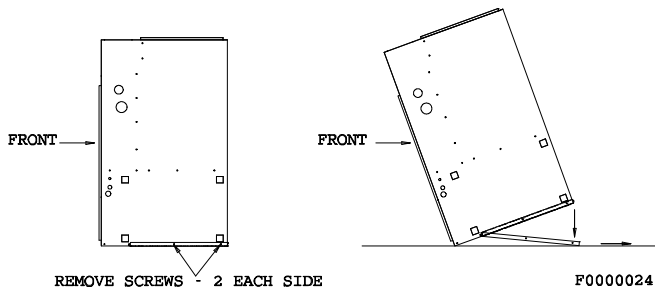
The supply duct work should be attached to the flanged opening provided at the discharge end of the furnace. See page 3 "Furnace Specifications" for the dimensions of this opening.

A left, right, or bottom return air opening must be used as determined by the layout of the installation. An externally mounted air filter is required.

This furnace has a two piece bottom panel. For bottom or end duct return, remove the back portion of the bottom panel by removing the four (4) screws - two (2) on each side toward the back of the furnace (See Figure 7). Tilt furnace toward the front, the back portion of the panel will drop down. Then the back portion can be removed by pulling toward the back of the furnace.

Figure 7

BOTTOM PANEL REMOVAL



Knockouts are provided on both sides of the furnace to facilitate the cutout required to the return air ductwork. **Furnace cutouts must be the full size specified by the corner markers. Undersized cutouts will adversely affect the airflow capability of the furnace and could cause overheating of the heat exchanger.**

The following recommendations should be followed when installing the ductwork:

1. Install locking-type dampers in all branches of the individual ducts to balance out the system. Dampers should be adjusted to impose the proper static at the outlet of the furnace.
2. Noncombustible flexible duct connectors are recommended to connect both the supply and return ducts to the furnace.
3. In cases where the return air grille is located close to the blower inlet, there should be at least one 90° air turn between blower and return grille. Further reduction in sound can be accomplished by installing acoustical air turning vanes and/or lining the inside of the duct with acoustical material.
4. It is recommended that the supply duct be provided with a removable access panel. This opening shall be accessible when the furnace is installed and shall be of such a size that the heat exchanger can be

viewed for possible openings using light assistance or a probe can be inserted by sampling the air stream. The access panel shall be designed so as to prevent leaks when locked in position. If an air conditioning coil is installed, the access panel to the coil can be used for this purpose.

⚠ WARNING

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

⚠ CAUTION

Air openings, intake and outlet pipes, return air grilles and warm air registers must not be obstructed.

Filters:

Air filters **must** be used in every installation. For side return installations, air filters **must** be installed external to the furnace casing. An external filter rack kit with filter (parts No. 20069901 or Cat. No. 68L75 for 12 / 15½" x 25" sizes and 20069902 or Cat. No. 68L76 for 15½ / 19" x 25" sizes) is available as an optional accessory.

For bottom (end) return installations, the above optional external rack may be used, if the unit was not provided with a internal filter. Minimum filter size and suggested filter materials are shown in Table 2. (If different type filter is used, it must be an equivalent high airflow capacity.)

Table 2 EXTERNAL FILTER RACK SIZE

MODEL	SIDE RETURN	BOTTOM/END RETURN
050-2 050-3 075-2 075-3	15 ½ X 25	12 X 25
100-3 100-4	15 ½ X 25	15 ½ X 25
125-5	15 ½ X 25	19 X 25

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

1. In series flow 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.
2. In parallel flow installation, dampers must be provided to direct air over the furnace heat exchanger when heat is desired and over the cooling when cooling is desired. At no time may the evaporator coil be located on the return air side of the heat exchanger.

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

⚠ WARNING

The coil **MUST** be installed on the air discharge side of the furnace. Under no circumstances should the air flow 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 the heat exchanger that could lead to a fire hazard and/or hazardous conditions that may lead to bodily harm. Heat exchanger failure due to improper installation will not be covered by warranty.

VENTING

Venting for this category IV furnace must be with schedule 40 PVC, CPVC or ABS pipe including all elbows and vent terminals. All pipe and fittings must conform to the American Society for Testing and Material (ASTM), and American National Standards Institute (ANSI) Standards. PVC primer and solvent cement used to secure all PVC joints must conform to ASTM D2564.

Common venting with other condensing appliances or non-condensing appliances is not allowed.

4. Do not terminate within 4' horizontally from any electric meter, gas meter, regulator or any relief equipment. These distances apply to U.S. installations. In Canada, the Canadian Fuel Gas Code takes precedence over this requirement.
5. Vent pipe systems (2 pipe or 1 pipe) termination clearances will follow the direct vent termination clearances as shown in Figure 8.

⚠ WARNING

In all direct vent (two pipe) instances, the vent outlet shall be installed so as to be in the same atmospheric pressure zone as the combustion air intake.

⚠ WARNING

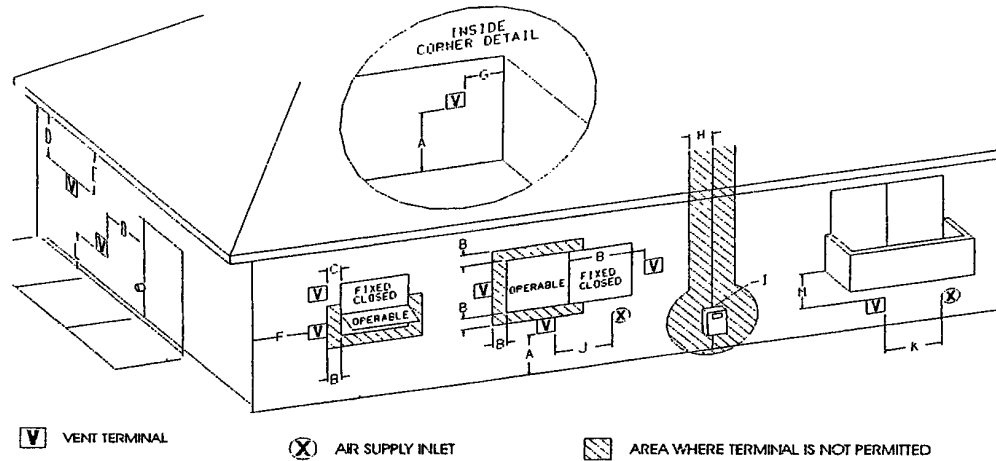
Failure to terminate vent runs above the annual snow accumulation level may result in nuisance furnace shutdown and/or hazardous condition that may lead to bodily harm or loss of life.

All combustion air and exhaust piping must be installed in accordance with local codes and these instructions. For additional venting information refer to ANSI/NFPA 211 Chimney, Fireplaces, Vents and Solid Fuel Burning Appliances or Canadian equivalent.

1. Determine termination location based on clearances provided in Figure 8 and the appropriate termination spacing shown in Figures 10, 11, 12, 14, and 15.
2. Ensure all vent and air termination remain at least 12" above ground or normally expected snow accumulation height.
3. The vent for this appliance shall not terminate
 - a) Over public walkways; or
 - b) Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
 - c) Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

Figure 8

VENT TERMINATION CLEARANCES



	Canadian Installations ¹	US Installations ²
A= Clearance above grade, veranda, porch, deck, or balcony	12 inches (30 cm)	12 inches (30 cm)
B= Clearance to window or door that may be opened	6 inches (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 inches (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 inches (91 cm) for appliances > 100,000 Btuh (30 kW)	6 inches (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 inches (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 inches (30 cm) for appliances > 50,000 Btuh (15 kW)
C= Clearance to permanently closed window	*	*
D= Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61 cm) from the center line of the terminal	*	*
E= Clearance to unventilated soffit	*	*
F= Clearance to outside corner	*	*
G= Clearance to inside corner	*	*
H= Clearance to each side of center line extended above meter/regulator assembly	3 feet (91 cm) within a height 15 feet (4.5 m) above the meter/regulator assembly	*
I= Clearance to service regulator vent outlet	3 feet (91 cm)	*

	Canadian Installations	US Installations ²
J= Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	6 inches (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 12 inches (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 inches (91 cm) for appliances > 100,000 Btuh (30 kW)	6 inches (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 inches (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 inches (30 cm) for appliances > 50,000 Btuh (15 kW)
K= Clearance to a mechanical air supply inlet.	6 feet (1.83 m)	3 feet (91 cm) above if within 10 feet (3 m) horizontally
L= Clearance above paved sidewalk or 7 feet (2.13 m) † paved driveway located on public property		*
M= Clearance under veranda, porch, deck, or balcony	12 inches (30 cm) ‡	*

1 In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code
 2 In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code
 † A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
 ‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.
 * For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, the following statement shall be included:
 "Clearance in accordance with local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions."

Horizontal (Side Wall) Vent Termination:

To prevent blockage of the combustion air and exhaust vent by snow, vent termination must be made 12" (in.) above the anticipated maximum snow accumulation level (See Figure 10).

A minimum of 4' (ft.) clearance must be provided from electric meters, gas meters, regulators and relief equipment. In Canada refer to the current Canadian Fuel Gas Code.

Terminations must terminate not less than one-foot above, below or horizontal from any inlet to building.

Do not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard. Inlet and outlet pipes may not be vented directly above each other.

Figure 10
HORIZONTAL VENT TERMINATION

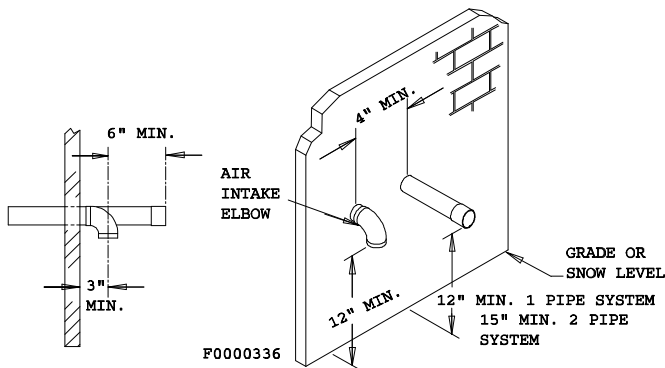
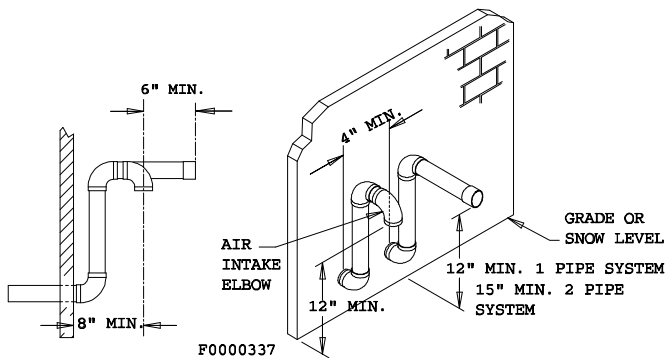


Figure 11
ALTERNATE HORIZONTAL VENT TERMINATION



NOTE: If exhaust vent pipe is extended more than 24", insulate the vent pipe between the two outside 90° elbows with closed cell insulation.

The optional concentric vent termination kit (2" diameter Part No. 20280901 / Cat. No. 87L83 or 3" diameter Part No. 20280902 / Cat. No. 87L84) may also be used for horizontal (side wall) vent termination. **2" diameter concentric vent approved for use with 50 and 75 models only.** Special consideration for this termination system should be given to: 1) possible damage from the vapors to plants/shrubs, other equipment and building materials, 2) possible damage to the terminal from foreign objects, 3) wind effects that may cause recirculation of flue products, debris or light snow, and 4) visible vent vapor.

The concentric vent kit has complete installation instructions.

Figure 12
CONCENTRIC VENT HORIZONTAL TERMINATION

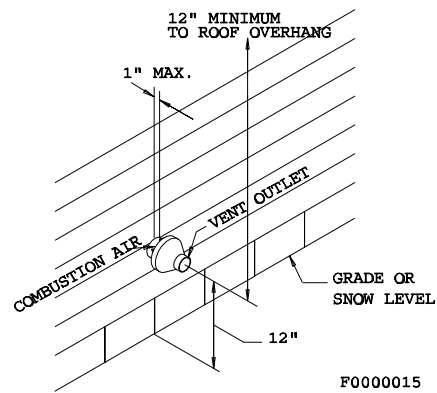
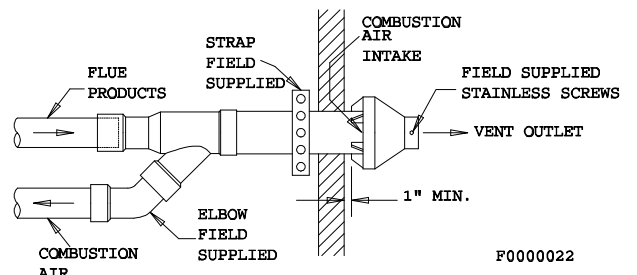


Figure 13
CONCENTRIC VENT HORIZONTAL MOUNTING



Vertical Vent Termination:

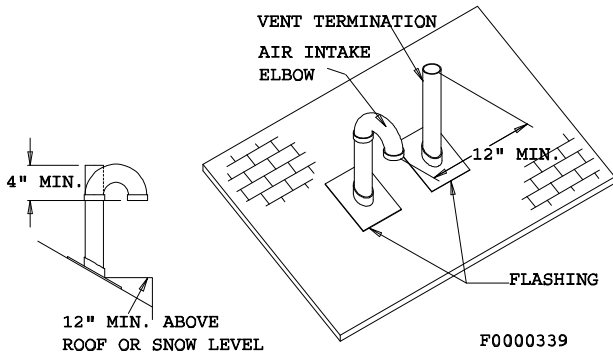
The vertical vent terminations should be sealed with a plumbing roof boot or equivalent flashing.

The inlet of the intake pipe and the end of the exhaust vent must terminate no less than 12" (in.) above the roof or snow accumulation level, and 12" (in.) away from a vertical wall or other protrusion (See Figure 14). In all venting configurations it is required to use terminations specified. The intake elbow is field supplied.

The vertical vent system can be installed through an existing chimney provided that:

- No other appliance is vented into the chimney.**
- The vent system does not terminate within the chimney and the termination clearances shown in Figure 14 are maintained.
- Both the air intake and exhaust vent run the length of the chimney.
- The top of the chimney is sealed and weather proofed.

Figure 14
VERTICAL VENT TERMINATION



The optional concentric vent termination kit (2" diameter Part No. 20280901/Cat. No. 87L83 or 3" diameter Part No. 2028902/Cat. No. 87L84) may also be used for vertical vent termination. Special consideration for this termination system should be given to: 1) possible damage from vapors to roof over hangs, other equipment and building materials, 2) possible damage to the termination from foreign objects, 3) wind effects that cause recirculation of flue products, debris or light snow and 4) visible vent vapor effects on surrounding windows and other openings. The concentric vent kit has complete installation instructions.

Figure 15
CONCENTRIC VENT VERTICAL TERMINATION

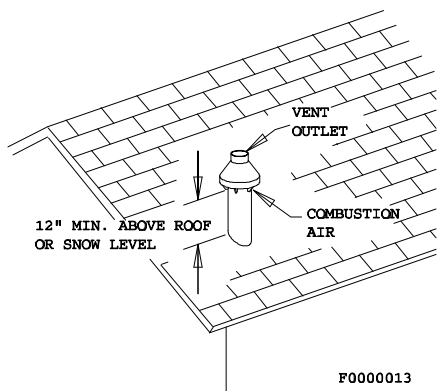
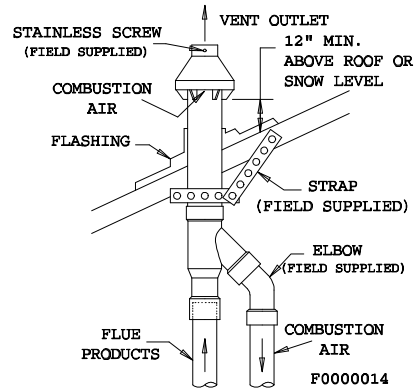


Figure 16
CONCENTRIC VENT VERTICAL MOUNTING



Allowable Vent Lengths:

The minimum allowable vent system for either 2" diameter or 3" diameter venting is 5 ft. and one (1) elbow.

Concentric vent kit terminated systems must use Direct Vent (2 pipe) System allowable max vent lengths for the appropriate diameter pipe.

Refer to Tables 3 and 4 for the proper pipe diameters and maximum allowable vent lengths.

TABLE 3

Allowable Max Vent Lengths for 2" Diameter Venting

APPLICATION	* Allowable Max Vent Lengths of 2" dia. PVC, ABS or CPVC SCH 40 Pipe					
	Elbows Allowed	1	2	3	4	5
Models 50 / 75 with Direct Exhaust (1 Pipe) System		60	58	55	53	50
Models 50 / 75 with Direct Vent (2 Pipe) System		60	58	55	53	50
Models 100 with Direct Exhaust (1 Pipe) System		35	30	24	18	12
Models 100 with Direct Vent (2 Pipe) System		35	30	24	18	12
Models 125 with Direct Exhaust (1 Pipe) System		20	15	9	4	--
Models 125 with Direct Vent (2 Pipe) System		20	15	9	4	--

* Notes:

- Vent system begins at outside of furnace casing.
- Two 45° elbows are equivalent to one 90° elbow.
- Do not include termination tee and elbow in calculation of vent length.
- This table is applicable for elevations up to 2,000 ft. For higher elevations decrease vent pipe lengths by 8% per 1,000 ft. of altitude.
- Concentric Vent Kit terminated systems must use Direct Vent Lengths.
- 2" concentric Vent Kit approved for use with 50/75 models only.

TABLE 4

Allowable Max Vent Lengths for 3" Diameter Venting

APPLICATION	* Allowable Max Vent Lengths of 3" dia. PVC, ABS or CPVC SCH 40 Pipe				
	Elbows Allowed	1	2	3	4
Models 50 / 75 with Direct Exhaust (1 Pipe) System	80	76	73	70	65
Models 50 / 75 with Direct Vent (2 Pipe) System	80	76	73	70	65
Models 100 with Direct Exhaust (1 Pipe) System	65	61	58	55	50
Models 100 with Direct Vent (2 Pipe) System	65	61	58	55	50
Models 125 with Direct Exhaust (1 Pipe) System	65	61	58	55	50
Models 125 with Direct Vent (2 Pipe) System	65	61	58	55	50

Notes:

1. Vent System begins at outside of furnace casing.
2. Two 45° elbows are equivalent to a 90° elbow.
3. Do not include termination tee and elbow in calculation of vent length.
4. This table is applicable for elevations up to 2,000 ft. For higher elevations decrease vent pipe lengths by 8% per 1,000 ft. of altitude.
5. Concentric Vent Kit terminated systems must use Direct Vent lengths.
6. All models are factory shipped equipped for 2" diameter venting. Conversion to 3" diameter venting require field supplied fittings.

Flue Pipe Installation:

NOTE: Make sure of alignment and fit, before gluing pieces in place!!

The flue may exit the cabinet either through the right or the left side panel, depending on the requirements of the installation. If the unit is installed in a horizontal-left discharge position, it is required to exit through the right side panel, so the flue is pointing straight up when the unit is installed. See Figures 17 and 18 for configurations.

1. Install factory supplied 2" diameter street sweep (long radius) elbow onto inducer outlet (See Figure 17 and 18). Face elbow at appropriate casing side and secure using attached pipe clamp.
2. Using 2" diameter SCH 40 PVC (ABS or CPVC) pipe, install a short piece of pipe into the elbow. The pipe should be long enough to leave approximately one inch (1") protruding out of the casing side minimum for connection to another fitting. Transitions must be mounted to allow condensate to flow to inducer outlet coupling (See Figures 17 and 18).
3. 2" diameter connections are made directly to the supplied 2" diameter street sweep elbow. 3" diameter connections require 2" to 3" transition. **Transition to be located within 12 linear inches of cabinet.** The 2" to 3" transitions must be mounted to allow condensate to flow to inducer outlet coupling (See Figures 17 and 18).

4. All pipe should be supported using clamps and/or straps. These supports should be at least every four (4) feet, or as required by local codes.
5. All horizontal vent runs must be sloping upwards to obtain 1/4" (in.) rise per foot of pipe from the furnace to the vent terminal. This insures proper drainage of the condensate back to the condensate drain. Failure to maintain this rise will cause condensate to accumulate in the pipe.
6. Direct Vent (two pipe) units may have either a 90° elbow or a straight coupling attached to the air inlet plate. **Do not seal the top joint of the fitting.** This joint must be left unglued to facilitate unit access during any required maintenance.
7. Joints in PVC should be sealed with PVC cement and checked for leaks. ABS or CPVC venting should use sealant as specified by the pipe manufacturer.
8. Check all local codes for any variance.

Figure 17

UPFLOW VENT OPTIONS

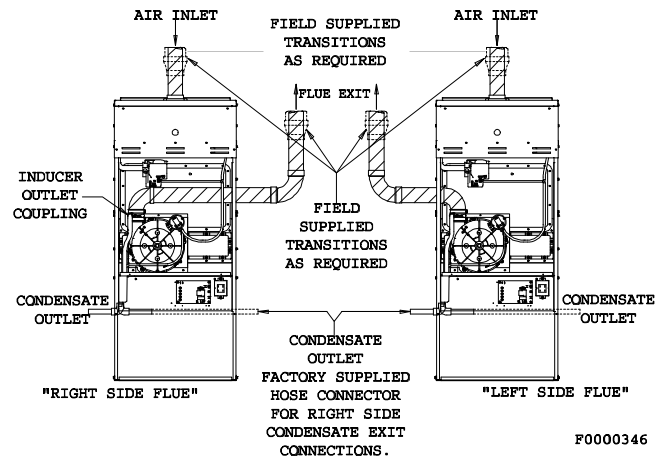
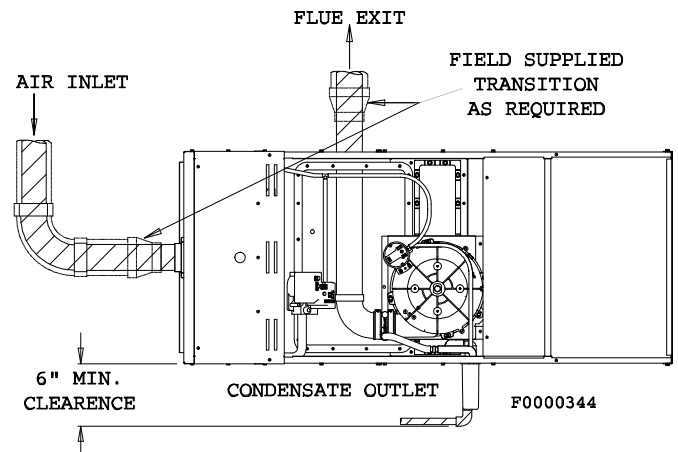


Figure 18

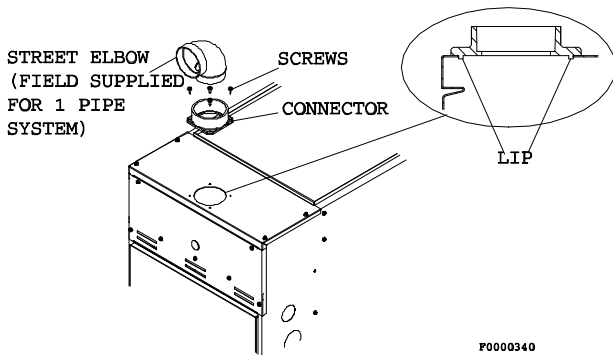
LEFT HORIZONTAL VENTING



Installation of Air Inlet Connector:

The *air inlet connector* must be installed on the top panel of the furnace (See Figure 19). The connector and mounting screws are shipped in the vestibule of the furnace. The air inlet connector is placed over the hole pattern in the top panel and the lip on the bottom of the connector must fit into the hole on the top panel. The connector is then secured to the top panel using the four (4) No. 10 x 5/8 sheet metal screws. The screws should be tightened securely, so the lip of the connector is seated properly in the hole in order to prevent air leakage. When installing furnace as non-direct vent (one [1] pipe), a field supplied PVC street elbow must be attached to the air inlet connector with the elbow open end facing front (Figure 19). When installing furnaces as direct vent (two [2] pipe), air inlet piping must match vent pipe in length and configuration. 2" diameter connections are made directly to the supplied air inlet connector. 3" diameter connections require 2" to 3" transition. **Transition to be located within 12 linear inches of cabinet.**

**Figure 19
AIR INLET CONNECTOR ASSEMBLY**



CAUTION

Terminate the combustion air intake in the same pressure zone as the vent outlet and as far as possible from the air conditioning unit or heat pump, swimming pools, swimming pool pumping units and dryer vents.

To "Convert" from Upflow to Horizontal (Left) Airflow:

This furnace is shipped for installation in the upflow configuration, but may be installed in a horizontal right-to-left airflow direction. The changes needed to "convert" to the horizontal position are:

1. Disconnect hoses from condensate trap, remove fastening screws and remove trap as shown in Figure 21.

2. Remove horizontal condensate opening knockout from left side of cabinet as shown in Figure 22
3. Remove inducer to condensate trap hose from unit as shown in Figure 20. Resize this hose by removing approximately 4" from straight end as shown in Figure 23. Attach supplied 1/2" hose coupling to cut end. Connect supplied 1/2" hose with formed elbow to 1/2" coupling to condensate trap as shown in Figure 22. Re-attach hose to drain connection at inducer outlet (See Figure 23).
4. Remove secondary heat exchanger drain hose from unit see Figure 21. Resize hose by removing approximately 2.5" from secondary heat exchanger end and 1" from the trap end, (See Figure 22). Attach supplied 1/2" street elbow to re-sized hose (See Figure 23).
5. Connect secondary heat exchanger drain hose from secondary heat exchanger drain to condensate trap (See Figure 23).
6. Connect pressure switch hose to condensate trap (See Figure 23).
7. Cover original condensate trap opening in blower partition panel with cover plate and mounting screws from accessory part bag.

**Figure 20
CONDENSATE TRAP HOSE CONNECTIONS**

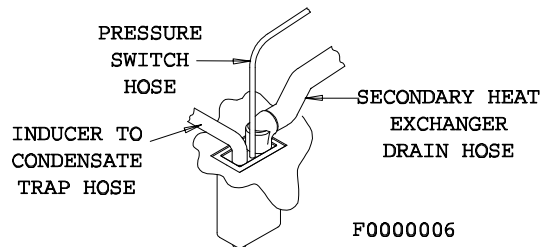


Figure 21

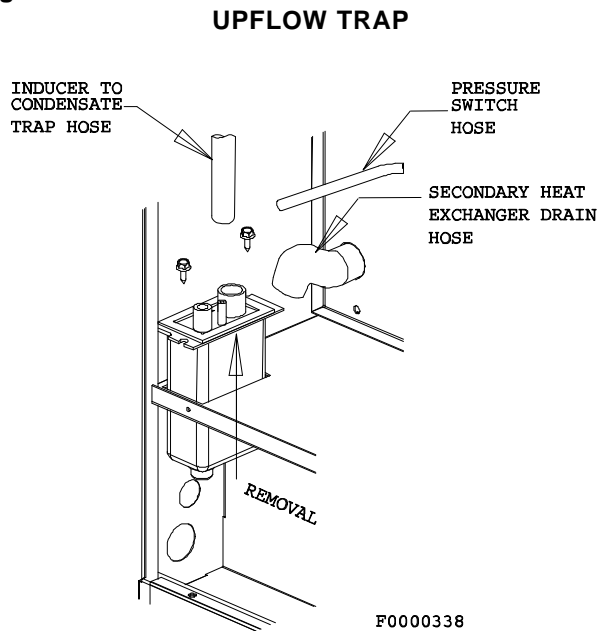


Figure 22

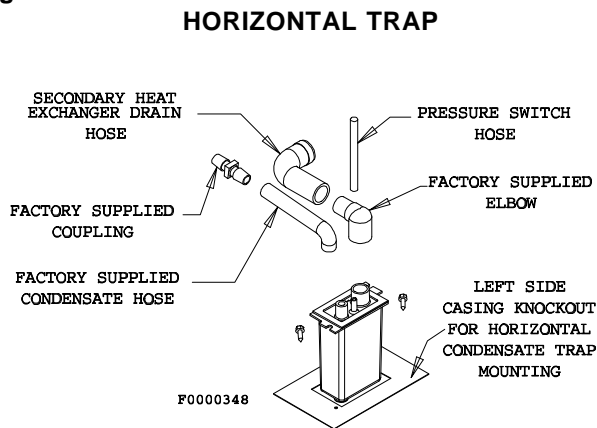
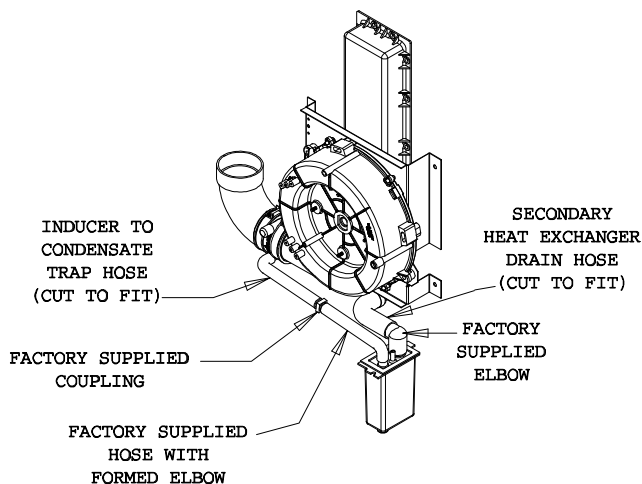


Figure 23

HORIZONTAL LEFT CONDENSATE TUBING



Condensate Disposal Drain:

This furnace must use the condensate trap supplied with the unit (See Figures 17 and 18) for proper drain installation. The drain must terminate at a floor drain, sewer system, or drain vent for proper condensate removal. Drain installation must conform to local building codes.

In addition, the trap must be filled with water on the initial start-up of the unit. Installation location may require that the trap be filled at the beginning of each heating season. Filling the trap should be accomplished by: 1) disconnecting the inducer outlet coupling hose from the inducer outlet coupling, 2) pouring approximately 12 oz. of tap water into the inducer outlet coupling hose and 3) reconnecting the inducer outlet coupling hose to the inducer outlet coupling.

When terminating the condensate disposal into a condensate pump, the condensate drain should not be submerged into the pump.

Do not connect the condensate drain to a positive pressure such as an A/C coil drain. If connecting to a common A/C coil drain special pressure relieving means must be taking. (ie. atmospheric vent install between the two traps).

In addition, if this unit is placed in an unconditioned space such as an attic or crawlspace where local plumbing code would require potable water supply piping to be protected; **a thermostatically controlled heat tape must be installed along the entire length of condensate drain in the unconditioned space.**

⚠ WARNING

Failure to install a heat tape on condensate drain lines in unconditioned spaces could lead to nuisance furnace shut-down, water damage, and/or a hazardous condition which may lead to bodily harm, or loss of life.

ELECTRICAL CONNECTIONS

When installed, the furnace must be electrically grounded in accordance with local codes or, in the absence of local codes, with the (U.S.) National Electrical Codes, ANSI/NFPA 70 or CSA Standard C22.1; Part 1 Canadian Electrical Code. For proper installation refer to furnace rating label for electrical ratings and for the field wiring of this unit refer to furnace wiring specifications on page 5 or alternately from the wiring diagram on page 31. In all instances, other than wiring for the thermostat, the wiring to be done and any replacement of wire shall conform with the temperature limitation for Type T wire [63°F rise (35°C)].

The electrical connections and the thermostat connections are made at the openings on either side panel of the unit in the control box area. Either side may be used as convenient, but the provided hole plugs must be inserted in the unused holes.

The control system depends on the correct polarity of the power supply. Connect "Hot" (H) wire and "Ground" (G) wire as shown in furnace wiring specification on wiring diagram. Use reference Table on page 3 (Furnace Specifications), for over current protection, max unit amp

rating and wire size. Use copper wire only for 115V-supply service to unit. When replacing any original internal wiring, use only 105°C, 16 AWG copper wire.

Instructions for wiring the thermostat are packed in the thermostat (field supplied) box. Make the thermostat connections as shown in furnace wiring specifications at the 24-volt terminal board located in the control box.

When installing optional accessories to this appliance, follow the manufacturer's installation instructions included with the accessory.

WARNING

The unit cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or approved conduit when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground. Failure to follow this warning can result in an electrical shock, fire, bodily harm, or loss of life.

GAS CONNECTIONS

Gas piping shall be of such size and so installed as to provide a supply of gas sufficient to meet maximum demands without undue loss of pressure between the gas meter and the furnace. It is recommended that the gas line to the furnace shall be a separate line direct from the meter, unless the existing gas line is of ample capacity. Refer to gas pipe capacity table in the National Fuel Gas Code ANSI Z223.1/NFPA54 or the CSA B149.1 Natural Gas and Propane Installation Codes.

If local codes allow the use of a flexible gas appliance connector, always use a new listed connector. Do not use a connector which has previously serviced another appliance.

Use a join compound (pipe dope) that is resistant to the action of liquefied petroleum gases or any other chemical constituents of the gases to be conducted through the piping.

For proper furnace operation the maximum gas supply pressure is 14" w.c. and the minimum gas supply pressure is 4.5" w.c. - natural (11" w.c. - LP) as shown on rating label.

Before any system of gas piping is finally put into service, it should be carefully tested to determine if it is gas tight. Check all piping for leaks. The piping must stand a pressure of six (6) inches of mercury (3 PSIG) for a period of ten (10) minutes or as required by local authority.

WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

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. A fire or explosion may result causing property damage, personal injury or loss of life.

WARNING

The furnace and its individual shutoff valve must be **disconnected** from the supply piping system during any pressure testing of that system at test pressures in excess of 1/2 PSIG (3.5kPa or 14"w.c.).

The furnace must be **isolated** from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at pressures equal to or less than 1/2 PSIG (3.5kPa or 14"w.c.). Failure to follow the above procedures could lead to a hazardous condition and bodily harm.

Figure 25

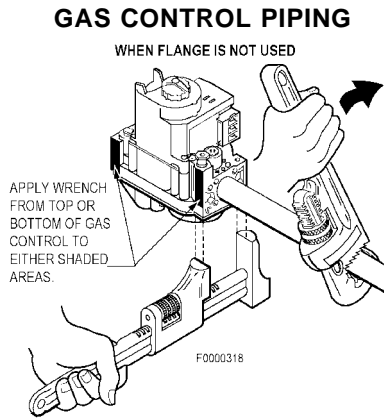
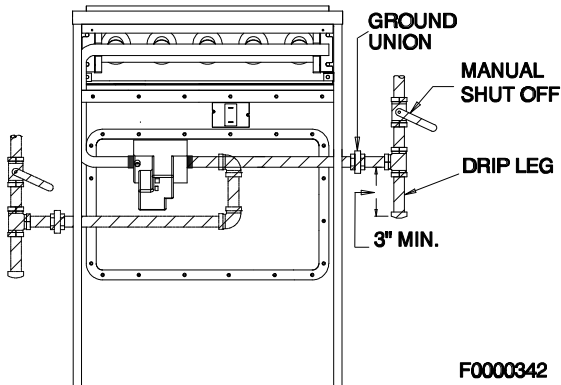


Figure 26

TYPICAL GAS SERVICE CONNECTION



This furnace is manufactured for use with Natural gas and must be converted using the proper LP conversion kit for use with LP (Propane) gas. For LP (Propane) gas, a tank regulator is required to reduce supply pressure to 12"-13"w.c. For manifold pressure see Table 6.

A main manual shut off valve must be used in the gas piping. The shut off type and location must follow local codes and should always be in an accessible but protected location. In the absence of local codes the recommended methods for installing the gas piping to the furnace are shown by the cross hatched piping in Figure 26.

The gas valve contains two threaded ports for a 1/8" NPT tap in order to test incoming gas pressure and outgoing manifold pressure (See Figure 27).

CAUTION

Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

WARNING

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion.

UNIT SEQUENCE OF OPERATION

Here's How Your Heating System Works:

Call For Heat

The thermostat calls for heat by energizing the "W" terminal. The control checks to see the limit circuit is closed and pressure switch is open. If the limit circuit is open, the control responds per the Open Limit section following. If the pressure switch is closed, the control will flash "3" on the LED and wait indefinitely for the pressure switch to open. If the pressure switch is open, the control proceeds to pre-purge.

Pre-Purge

The control energizes the induced draft motor and waits for the pressure switch to close. The control flashes "3" on the LED while the pressure switch is open. If the pressure switch does not close within 60 seconds of the inducer energizing, the control will de-energize the inducer for 300 seconds, and then re-energize the inducer. This cycle shall continue as long as a call for heat exists until the pressure switch is proven.

When the pressure switch is proven closed, the control begins the pre-purge time. If flame is present any time while in pre-purge, the control will flash "5" on the LED and go into soft lockout. The control runs the inducer for a 15 second pre-purge time, then proceeds to the ignition trial period.

Ignition Trial Period

The control energizes the HSI for a 7 second warmup period (12 seconds on retries) main gas valve. The inducer remains energized. If flame has not been sensed within the 7 second ignition trial, the control de-energizes the gas and HSI outputs and proceeds with ignition retries. If flame is not established after three (3) trials for ignition, the control will flash "2" on the LED and goes into lockout.

Blower On Delay

The control waits for 30 seconds from the time the gas valve opened and then energizes the indoor blower heat speed. The gas valve and inducer remain energized. The control proceeds to steady heat mode.

Steady Heat

Control inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established, and the thermostat call for heat remains. When the thermostat call for heat is removed, the control de-energizes the gas valve and begins post-purge and blower off delay time.

Open Limit

Any time the limit switch is open, the control de-energizes the gas valve and runs the indoor blower motor on heat speed. While the limit switch is open, the control flashes "4" on the LED. Check for a restriction in the duct

system (i.e. dirty filters, blocked ductwork, closed registers.....) .

When the switch re-closes, the control runs the indoor blower through the selected fan off delay. If the call for heat is still present when the limit switch closes, the control will begin an ignition sequence while the blower off delay continues. **Note:** Cycling on the limit is an abnormal condition and a corrective action must be taken. Failure to correct this condition could damage the heat exchangers and void the warranty.

Post Purge

The inducer output remains on for a 15 second post-purge period after the thermostat is satisfied.

Blower Off Delay

The indoor blower motor is de-energized after a delay time as selected by the movable shunt. The off delay may be set at 60, 90, 120, or 180 seconds. The default setting is 180 seconds. The factory is 90 seconds. Blower timing begins when the thermostat is satisfied or heat cycle is interrupted. If the thermostat calls for heat while in the blower off delay, the control immediately restarts the ignition sequence while the blower off delay continues.

⚠ WARNING

Should overheating occur, or the gas supply fail to shut OFF, turn OFF the manual gas valve to the appliance BEFORE turning OFF the electrical supply. A failure to adhere to this warning can result in a fire or explosion and bodily harm.

Call for Cool

For cooling operation, when the inside temperature exceeds the thermostat setting, the thermostat will turn ON the cooling system.

When the thermostat calls for cooling, power from the transformer energizes the fan control board (for blower operation) and the outdoor condensing unit (for air conditioning).

The fan control board will automatically turn on the blower and condensing unit. The air moving over the indoor coil by the blower is cooled (and dehumidified) and passes through the ducts to the room registers.

When the thermostat is satisfied, the fan control board is de-energized and the condensing unit is shut-off. The blower will continue to operate for an additional 30 seconds for added cooling efficiency.

Call for Fan

When the thermostate calls for continuous fan (G) without a call for heat or cool, the indoor blower is immediately energized on the COOL speed.

A call for COOL or HEAT has priority over continuous fan operation.

STARTUP AND OPERATIONAL CHECKOUT

⚠ WARNING

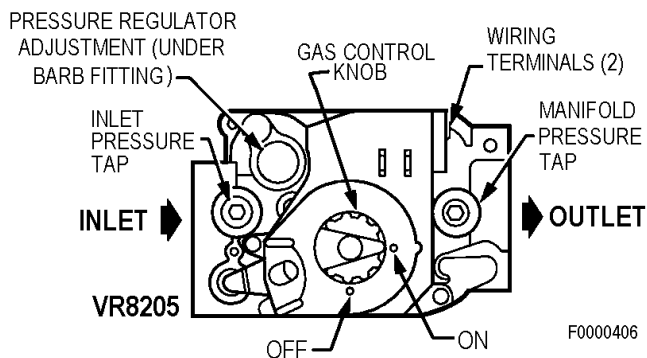
Do not use this furnace as a construction heater. Use of this furnace as a construction heater exposes the furnace to abnormal conditions, contaminated combustion air and the lack of air filters. Failure to follow this warning can lead to premature furnace failure and/or vent failure which could result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

The automatic gas valve controls the flow of gas to the main burners. The control circuit built into the automatic valve body has 2 positions: "OFF" and "ON" (Figure 27). To shut off gas manually: Switch from "ON" to "OFF" position. When in "OFF" position, the main burners are extinguished.

This furnace is equipped with an automatic hot-surface ignition control and does not require the manual lighting for furnace operation.

Figure 27

GAS CONTROL DIAGRAM



⚠ WARNING

Do not attempt to manually light the burners. Failure to follow this warning can lead to electrical shock that could result in bodily harm.

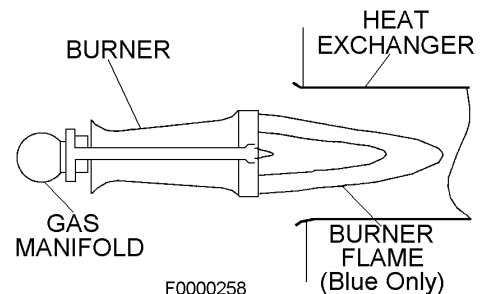
After the ductwork connections have been made, gas piping and electrical wiring completed and the furnace has been properly vented, the unit should be started and adjusted for proper operation. Check off the following steps as they are completed.

1. Be sure all electrical power is OFF.
2. Check all wiring using proper wiring diagram on inside of the control box cover.
3. Turn ON the electrical power.
4. Set the ignition system control switch in the "ON" position.

5. Set the thermostat above room temperature.
6. The hot-surface ignitor will heat-up to an "orange" glow, the main burners will ignite.

Figure 28

TYPICAL FLAME APPEARANCE (MAIN BURNERS)



7. Recheck for leaks in the manual shut off valve, gas control valve and gas connections using a soap solution.

⚠ WARNING

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion.

⚠ CAUTION

Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

Direct Vent (2 Pipe) Manifold Pressure Check:

The burner box static pressure varies with the different inlet vent pipe lengths and ambient air conditions. Therefore, the gas valve regulator must be able to reference the burner box pressure to maintain a constant manifold setting. The reference tube vent port on the gas valve has a barbed fitting. Connect this port, using a tee fitting, to the burner box and pressure switch, as seen in Figure 29.

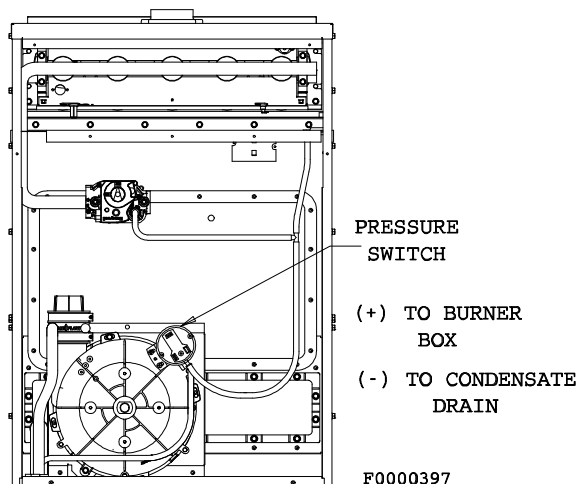
When setting or checking the gas valve outlet manifold pressure, the manometer must be connected to the gas valve outlet pressure tap and the burner box pressure hose, as seen in Figure 29.

The actual manifold pressure will be higher than the reading indicated if the burner box hose is not connected. The difference will be equal to the burner box static pressure.

Example:

- 3.50"w.c. Gas valve outlet pressure tap reading
- .15"w.c. Burner box inlet pressure (hose not connected)
- 3.65"w.c. Actual manifold pressure instead of the desired 3.5"w.c.

Figure 29
CHECKING DIRECT VENT MANIFOLD PRESSURE WITH BURNER BOX REFERENCE



Manifold Pressure Adjustment:

The burner box pressure hose does not have to be connected in order to set the manifold pressure if the burner access panel is removed or no inlet air piping is attached to furnace.

Turn OFF the gas and electrical before preceeding! Remove the manifold pressure tap pipe plug from the gas valve and install a pressure tap and connect it to a manometer as described in the previous section. Turn on the gas and electrical supplies, then measure the manifold pressure **with the furnace in operation.**

Remove the vent port barb fitting to access the screw for input adjustment (Figure 27 Pressure Regulator). **Turn regulator-adjusting screw IN to increase pressure, OUT to decrease pressure.** Replace the vent port barb fitting. Measure the manifold pressure.

For Natural gas, best results are obtained with a manifold pressure of 3.2" to 3.5"w.c. For units that have been converted to LP (Propane) gases, a manifold pressure of 10"w.c. is necessary. After proper adjustment, turn OFF gas, replace manifold pressure tap pipe plug and turn ON gas.

⚠ WARNING

At higher altitudes and varying heating values, manifold pressure or orifice changes maybe required. Consult Tables 7 and 8 for appropriate values. Failure to follow this warning could lead to a hazardous furnace operating condition and result in serious bodily injury or loss of life.

Determining Furnace Input - Natural Gas ONLY:

NOTE: All access doors must be in place when checking gas input.

1. Turn OFF all other gas appliances (except for pilot burners) served by the same gas meter.
2. With furnace operating in full heat cycle, note how many seconds it takes for one full revolution of the smallest dial on the meter. Typically, this will be a 1/2 - or - 1 - cubic foot test dial.
3. Using the number of seconds for one revolution and the size of the meter dial, determine the cubic foot per hour of gas flow by using the formula provided below or Table 5.

$$\text{Cubic Ft/Hr} = \frac{\text{Number of Dial Revolutions} \times \text{Cubic Foot/Revolution} \times 3600}{\text{Time (in seconds) Required for Number of Timed Revolutions}}$$

TABLE 5
Gas Rate (Cubic Feet per Hour)

Seconds for One Revolution	TEST DIAL			Seconds for One Revolution	TEST DIAL		
	1/2 Cubic Feet	1 Cubic Foot	2 Cubic Feet		1/2 Cubic Feet	1 Cubic Foot	2 Cubic Feet
10	160	360	720	36	50	100	200
12	150	300	600	38	47	95	190
14	129	257	514	40	45	90	180
16	113	225	450	42	43	86	172
18	100	200	400	44	41	82	164
20	90	180	360	46	39	78	156
22	82	164	325	48	37	75	150
24	75	150	300	50	36	72	144
26	69	138	276	52	35	69	138
28	64	129	258	54	34	67	134
30	60	120	240	56	32	64	128
32	56	113	226	58	31	62	124
34	53	106	212	60	30	60	120

4. Calculate the furnace input using the following formula:

$$\text{BTUH} = \text{Cubic Ft/Hr} \times \text{BTU/Cubic Foot}$$

The local gas supplier should be able to provide the heating value of the gas, in BTU/cubic foot. If a specific value is not available, use 1000 BTU/cubic foot for Natural gas or 2500 BTU/cubic foot for Propane (LP).

⚠ WARNING

Furnace input should be maintained within ± 2% of the value on the rating plate or appropriate altitude derate. Adjust manifold pressure or change orifices size if required.

5. Calculate the unit's actual input rate.

Example: If the heating value of the natural gas is 1015 Btu/cu. and it takes 60 seconds to burn 2 cu. ft. of gas then:

$$\text{Input} = \frac{1015 \text{ Btu/cu. ft.} \times 1 \text{ rev} \times 2 \text{ cu. ft./rev.} \times 3600}{60 \text{ sec.}}$$

Input = 121,800 Btu/hr.

Burner Orifice Sizing:

The furnace is supplied with standard orifices for the gas shown on the rating plate. Table 6 shows combinations of heating values and specific gravities for various gases, from which proper input can be obtained.

If changing orifices is required, remove the manifold from the furnace (following the instructions found on page 26) and replace orifices as required by Table 6, the altitude derating section of this instruction or as local code dictates.

**TABLE 6
Burner Orifice Selection**

Type of Gas@Manifold Press. (Heating Value-Specific Gravity) Btu per Cu. Ft.	Orifice Size (Drill #)
Natural Manifold Press.= 3.5"w.c. 800-0.6 900-0.6 1000-0.6 1100-0.6	40 41 42 43
Propane Manifold Press.= 10"w.c. 2500-1.53	54

After securing the manifold assembly, replace all other components and/or wiring, being sure that all connections and screws are tightened properly.

Altitude Derating:

The following information is provided as guidelines for altitude derating and is not meant to supersede any state or local codes. Local codes have priority over any others and in some case might limit your options in dealing with an altitude derate situation.

NOTE: In Canada for altitudes up to 4500 ft. (1372 m) see the rating label on this furnace for proper manifold pressure and orifice size. Certification for installations at altitudes over 4500 ft. (1372 m) is the jurisdiction of local authorities.

Check with your local gas company to find out if the gas supply in your area is derated. Gas deration negates the necessity of performing any adjustment on the furnace.

If your gas supply is not derated, regardless of the type of gas used, installation of this furnace at elevations above 2,000 ft. requires an input reduction at the rate of four percent (4%) for each 1,000 ft. above sea level.

Unless an orifice change is specified by an applicable code, or the furnace is to be installed above 6,999 feet, the recommended method of altitude derating this furnace is to appropriately lower your manifold pressure. The appropriate manifold pressures based on the elevation and the heating value can be found in Table 7.

**TABLE 7
High Altitude Manifold Pressure Derate**
(with standard 42 orifice Natural / 54 orifice LP sizes)

Altitude (Feet)	*Heating Value of Natural Gas (BTU/FT3)					LP Propane
	900	950	1000	1050	1100	2500
0-999	4.32	3.88	3.50	3.16	2.84	10
1000-1999	4.32	3.88	3.50	3.16	2.84	10
2000-2999	3.67	3.29	2.97	2.68	2.41	8.46
3000-3999	3.38	3.04	2.74	2.47	2.22	7.74
4000-4999	3.11	2.79	2.52	2.27	2.04	7.05
5000-5999	2.88	2.58	2.33	2.10	1.89	6.40
6000-6999	2.64	2.37	2.14	1.93	1.73	5.77

* Heating-Value based on atmospheric pressure of 30 inhg and 60°F temperature.

If local codes require an orifices change or if the furnace installation is above 6,999 feet. The appropriate orifice size based on the elevation and the heating value can be found in Table 8. Sizing of the orifice must be based on the previously mentioned 4% derate for each 1,000 feet for installations at/or above 2,000 feet rule and the orifices must be drilled in such a way as to assure concentricity. **Hand drilling of orifices is unacceptable.**

**TABLE 8
High Altitude Orifice Size Derate**

Altitude (Feet)	*Heating Value of Natural Gas (BTU/FT3)					LP Propane
	900	950	1000	1050	1100	2500
2000-2999	N.C.	N.C.	43	43	44	N.C.
3000-3999	N.C.	N.C.	43	44	44	N.C.
4000-4999	43	43	44	44	45	55
5000-5999	43	44	44	45	46	55
6000-6999	44	44	45	46	47	55
7000-7999	44	45	46	47	48	56
8000-8999	45	46	47	48	48	56
9000-9999	46	47	48	48	49	56
10000-10999	47	48	49	49	50	57

* Heating-Value based on atmospheric pressure of 30 inhg and 60°F temperature.

⚠ CAUTION

At elevations above 4,500 feet a change to the pressure switch is required. Use the proper pressure switch kit shown in Table 9.

TABLE 9
High Altitude Pressure Switch Kits

MODEL	KIT NUMBER	CAT. NUMBER
50	20274505	89L38
100		
75	20274508	39M50
125	20274506	89L39

⚠ WARNING

Hand drilling of orifices is never acceptable since it could lead to delayed ignition, overfiring, improper combustion, flashback and flame rollout. All these conditions could lead to a fire hazard and bodily harm, or loss of life.

Blower Adjustment Checkout:

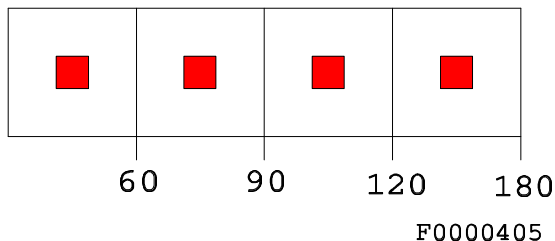
Prior to any blower adjustment, electrical service must be turned OFF.

This furnace is equipped with a 3 speed direct drive motor to deliver a temperature rise within the range specified on the rating label, between the return and supply plenums, at the external duct static pressure noted on the rating label.

Adjust the blower speed so that the temperature rise is within the rise specified on the rating plate. Consult the wiring diagram for speed changes on the direct drive motor.

To adjust blower "OFF" time for heating, set the movable shunt on the control board as shown (see Figure 30) to obtain the desired timing.

Figure 30
BLOWER "DELAY OFF" TIME ADJUSTMENT



Limit Control Checkout:

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 main burners will shut OFF and the main blower and combustion blower should continue to run. Remove the restriction and the burners should come back on in a few minutes.

Flame Rollout Switch:

This unit is equipped with a manual reset flame-rollout switch that protects against improper venting of the flue gases from the heat exchanger due to blockage causes heat (or flames) to "rollout" into the burner box from the heat exchangers, this safety device will activate and shut off power to the automatic gas valve before there is damage to the furnace. The loss of power to the gas valve will shut off the gas burners. Should this occur, it will be necessary to determine the cause of the rollout, correct the condition that caused it, and reset the flame-rollout switch.

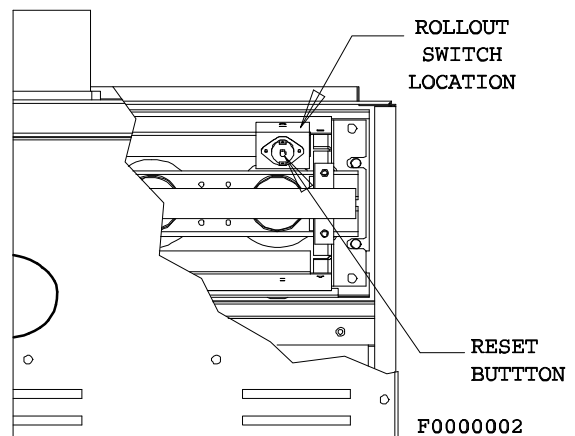
⚠ WARNING

The furnace should be allowed to cool-off before attempting to reset the switch. Failure to follow these instructions could result in injury due to burns!

The switch is located behind the burner access door. Removing the burner access panel from the furnace, and reset by pushing in the button in the middle of the switch (between the two wire connections - See Figure 31). Very little force is required to push the reset button, and a "click" should be heard when the switch resets.

Figure 31

FLAME ROLLOUT SWITCH



Blocked Vent & Drain Pressure Switch:

This furnace is equipped with one pressure switch that performs several safety functions. The pressure switch is located in the vestibule of the unit (See Figure 32). The pressure switch will turn the burners OFF in the event of a blocked air inlet or a blocked flue outlet condition. The pressure switch will also turn OFF the burners in the event of a blocked drain condition. The pressure switch also insures that the unit has combustion air flowing through the unit prior to initiating the ignition sequence.

Pressure Switch Check:

To check the operation of the pressure switch combustion air control, remove the inlet pipe from the air inlet connector and remove the street sweep elbow from the induced draft motor vent outlet coupling. Place the furnace into operation. Gradually cover up the air inlet; the main burners should shut OFF. Remove the restriction and the unit should relight. Repeat the procedure, restricting the vent coupling outlet. Replace the vent piping and reseal the opened joints as required. To check the operation of the blocked drain, place the unit into operation and gradually pinch the tube running from the condensate trap to the pressure switch closed. The unit should shut OFF. Release the restriction on the tubing and the unit should relight.

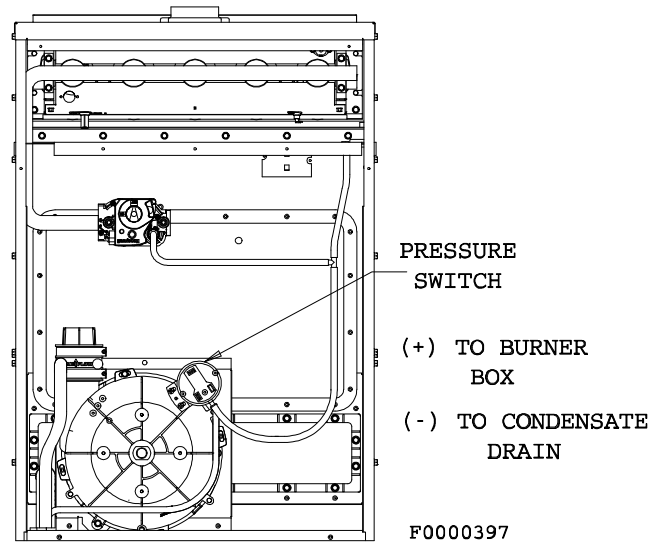
The operational checkout is now complete. Be sure to adjust the thermostat to the desired setting and inform the homeowner how to operate the furnace system before leaving the job site.

⚠ WARNING

If the pressure switch activates to shut the furnace down, the vent and drain systems must be checked and cleared. Failure to do so may result in serious bodily harm or nuisance furnace shutdown and/or a hazardous condition that may lead to property damage, personal injury or death.

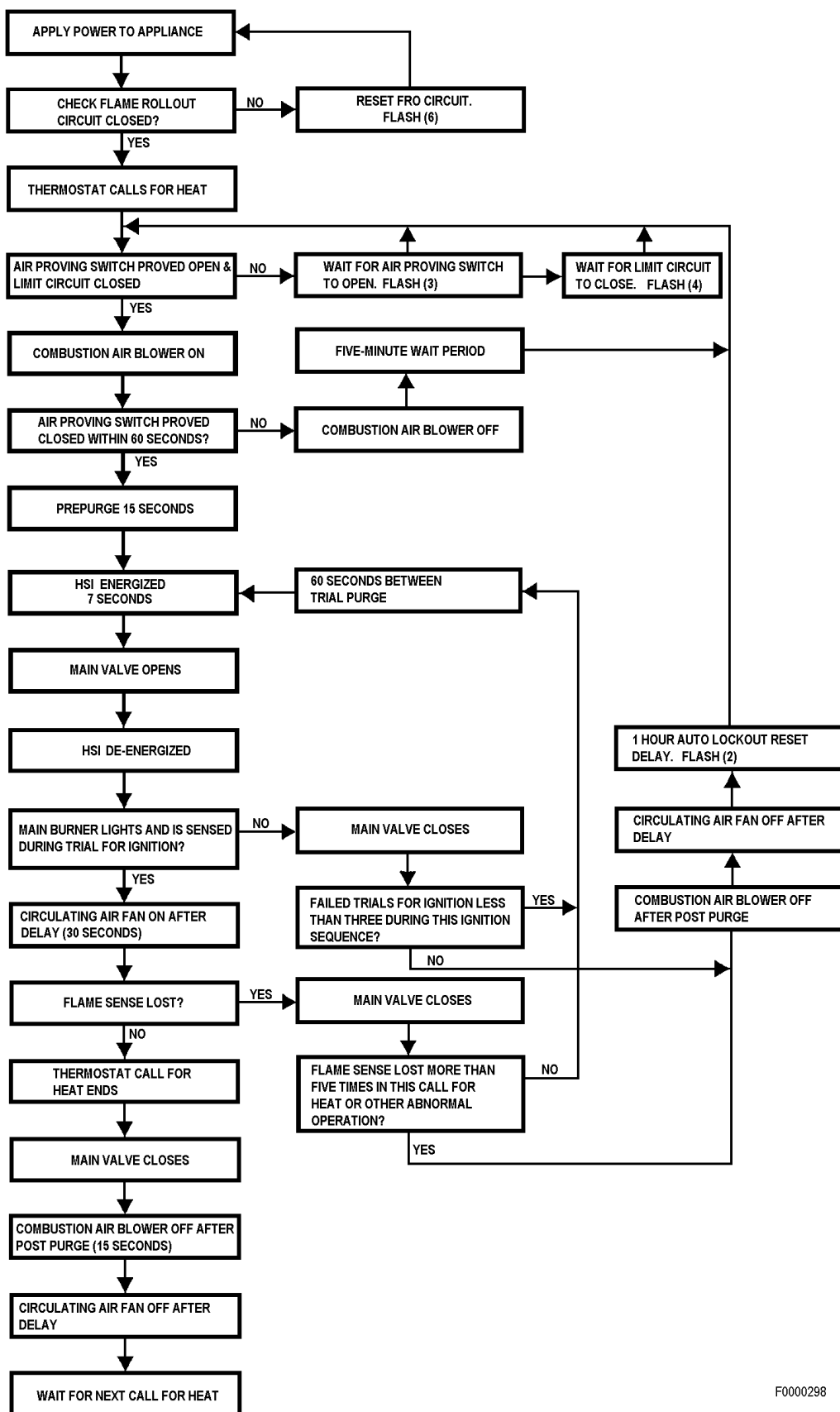
Figure 32

PRESSURE SWITCH LOCATION AND CONNECTION



SEQUENCE OF OPERATION

DIRECT IGNITION SYSTEM CONTROL



F0000298

SERVICING THE FURNACE

⚠ CAUTION

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death or property damage.

- Before servicing, disconnect all electrical power to furnace.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing.

⚠ WARNING

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you are at all uncertain, contact your dealer for qualified maintenance and service since improper service could lead to furnace shutdown or a hazardous condition which could lead to an unsafe condition and bodily harm.

Combustion Component Check:

The heat exchanger, gas burners and venting system must be checked each year, prior to the heating season, by a qualified dealer/serviceman.

The following procedures should be performed:

1. Remove the burner/manifold assembly from the furnace, follow the instructions found on this page.
2. Place the burner/manifold assembly on a flat work area and vacuum the burners. It might be necessary to use a soft bristly brush to remove dirt and then vacuum.
3. Remove the burner opening inlet plate and the flue collector box. This will expose both the burner and flue openings of the primary heat exchangers.
4. Vacuum the length of each heat exchanger tube using a straight attachment into the burner openings and the flue openings.
5. Replace the flue collector box, burner opening inlet plate, and burner/manifold assembly. Insure that all gaskets are properly positioned and that no leaks exist.
6. Reattach all wiring and piping as per the wiring diagram and installation instructions.

7. Turn on utilities and check for leaks using soapy water and a brush.
8. A visual check of the main burner should be made at the beginning of each heating season.
9. Check the input rate and adjust if necessary.
10. Perform a safety check of the limit control and pressure switch.
11. Check the air filter, clean and/or replace as necessary.
12. Periodic cleaning of condensing coil and drain lines maybe necessary for proper operation.
13. Replace the appropriate access panels or door.

⚠ WARNING

Never use an open flame when testing for gas leaks! Use of an open flame could lead to a fire or explosion!

⚠ CAUTION

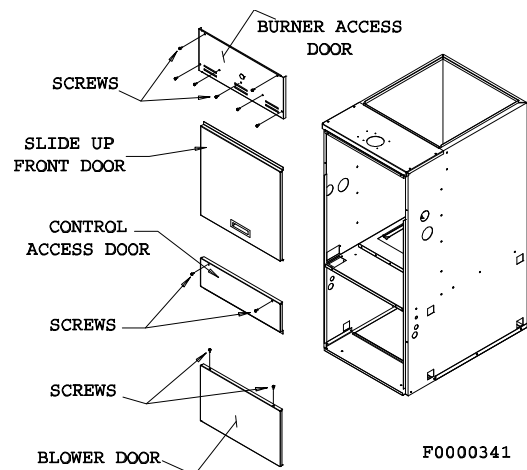
Many soaps used for leak testing are corrosive to certain metals. Piping must be rinsed thoroughly with clean water after leak check has been completed.

Manifold (or Burner/Manifold) Removal/Replacement:

1. Make sure that all utilities (gas and electricity) are turned off upstream of the furnace.
2. Remove the access door by sliding the door straight up, swinging the bottom of the door away from the furnace, and pulling the door down and out of the furnace (See Figure 33).
3. Disconnect the gas line from the gas valve. Be sure that a wiring diagram is available, or be ready to mark any wires that are disconnected. Unplug the three connectors from the gas valve.

Figure 33

FURNACE PANEL REMOVAL



4. Remove the burner access panel by removing the seven (7) No. 10 sheet metal screws that secure the panel to the cabinet. Be careful **not** to damage the rubber seal strips that are attached to the cabinet (behind the access panel).
5. Remove the No. 10 sheet metal screws that secure the manifold seal plate and gasket to the bottom of the burner box. The plate and gasket are assembled onto the manifold pipe and will not come completely loose, but will slide down the manifold pipe in order to provide clearance for manifold removal.
6. Disconnect wires from rollout switch.
7. Remove manifold or burner/manifold assembly.

Manifold ONLY

- a. Remove the No. 10 screws that secure the manifold pipe to both legs of the manifold assembly. **The manifold pipe must be supported during this step, or it could fall and damage the furnace or cause bodily injury!**
- b. Slide the manifold pipe (with valve and orifice) forward, out of the furnace.

Burner/Manifold Assembly

- a. Remove the No. 10 screws that secure the burner/manifold assembly legs to the furnace. **The manifold pipe must be supported during this step, or it could fall and damage the furnace or cause bodily injury!**
 - b. Slide the burner/manifold assembly forward, out of the furnace until the assembly is clear of the manifold retention pins.
 - c. Rotate the assembly slightly, in order for the legs to clear the sides of the cabinet, and remove through the front of the furnace.
8. To reinstall the manifold pipe or burner/manifold assembly, reverse the above steps. When replacing the manifold seal plate to the bottom of the burner box, be sure the gasket is not torn so a proper seal is achieved. Also insure that the sealing strips for the burner access panel are in position and undamaged, in order to prevent air leaks around the door.

Blower Removal/Replacement:

Removal

1. Turn OFF all electrical power to the furnace.
2. Remove the control box access panel and blower access panel.
3. Unplug wires from the blower assembly to the control box.
4. Remove the four (4) screws securing the control box in the unit (two (2) in the cabinet at the sides of the blower door opening and two (2) at the top rear of the control box). **Be sure to support the control box so that it does not fall!**
5. Rotate the control box out of the cabinet and support it so that no strain is placed on any wiring. It may be

necessary to disconnect the electrical supply and thermostat wiring from the control board.

6. Remove the blower retaining screws from the front of each blower leg (See Figure 34). These are the two (2) screws located in the blower compartment that secure the blower legs to the blower partition panel.
7. Slide the blower forward about two (2) inches. This will disengage the rear of the blower legs from the blower partition. Rotate the front of the blower down to clear the control box mounting tabs on the underside of the blower partition, and continue sliding the blower forward until it is out of the unit. Take care to clear the control box mounting tabs.

Replacement

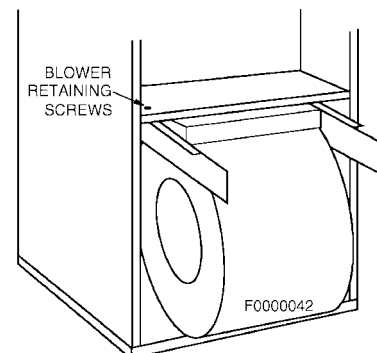
1. Place the blower in the blower opening of the unit.
2. Slide the blower back, into the unit, taking care to clear the control box mounting tabs.
3. When the blower is about halfway into the cabinet, rotate the rear of the blower UP so that the rear of the blower legs engage the side rails in the blower partition.
4. Continue sliding the blower into the unit until the front of the blower housing is behind the control box mounting tabs. Rotate the front of the blower UP until the legs lie flat against the bottom of the blower partition, then slide blower fully into position. The rear of the blower should be against the stop in the partition and the rear of the blower legs should be under the partition.
5. Reattach the two (2) blower securing screws, the control box, any disconnected wiring, the blower access panel, and the control box access panel.

Lubricating Motors:

Direct drive motor and blower assemblies are factory lubricated and normally do not require oiling. If oiling is required lubrication of the blower motor is to be preformed only by a qualified service agency.

Figure 34

BLOWER REMOVAL AND REPLACEMENT



TROUBLE SHOOTING With LED Indicator Assistance

LED Flash Code	Indicates	Check/Repair
OFF	Control not powered or control failure.	<ol style="list-style-type: none"> 1. Line voltage input power at L1 and L2 connectors on (IFC) Board. 2. Low voltage (24Vac) power at 24VAC and COM on (IFC) board. 3. Fuse open on (IFC) board. 4. System wiring harness in good condition and securely connected at both ends. 5. Control not functioning, replace.
"Heartbeat"	Normal Operation (Standby).	
Fast "Heartbeat"	Call for heat.	
2 Flashes	Ignition re-try or recycle error.	<ol style="list-style-type: none"> 1. Gas supply off or supply pressure too low to operate appliance. 2. Damaged or broken HSI element. 3. Appliance power supply not properly earth grounded. 4. Flame sense rod contaminated, grounded to appliance chassis, or in incorrect location. 5. HSI element or flame sense wiring not properly connected. 6. Gas valve stuck, replace. 7. Move gas control switch to ON.
3 Flashes	Pressure switch closed when should be open—system waits until pressure switch opens, then proceeds with ignition sequence. Pressure switch, or IBS aux. limit was still open 60 seconds after the inducer was energized. System is in 5-minute delay mode, with inducer OFF. After 5-minute delay, new ignition sequence is initiated.	<ol style="list-style-type: none"> 1. Pressure switch stuck closed. 2. Pressure switch captured or out of calibration, replace. 3. Inducer and inducer wiring not connected. 4. Low line voltage power supply. 5. Obstructions or restrictions in appliance air intake or exhaust flue system that prevent proper combustion air flow. 6. Circulating air blower not operating. 7. Open auxiliary temperature limit.
4 Flashes	Limit circuit open. The heat speed circulating air fan will be energized. System waits for limit string to close, then initiates a new ignition sequence.	<ol style="list-style-type: none"> 1. Open high temperatures limit. 2. Open manual reset flame rollout switch in the limit circuit. 3. Limit and rollout switch circuit wiring in good condition and securely connected. 4. Circulating air fan wiring and operation. 5. Dirty air filters. 6. Blower speed too low. 7. Registers closed. 8. Furnace not operating in specified rise range. 9. Furnace not operating at specified firing rate.
5 Flashes	Flame signal sensed out of proper sequence (with flame signal still present). Combustion blower energized. The heat speed circulation air fan will be energized after the selected heat fan on delay. System waits for flame signal to disappear, then goes to Soft Lockout.	<ol style="list-style-type: none"> 1. Flame at main burner. 2. Flame sense ground to chassis.
6 Flashes	Flame rollout circuit open. The heat speed circulating air fan and combustion air blower will be energized.	<ol style="list-style-type: none"> 1. Open manual reset Flame rollout switch. 2. Rollout switch circuit wiring in good condition and securely connected. 3. Furnace not operating in specified rise range. 4. Furnace not operating at specified firing rate.
7 Flashes	Line input voltage Polarity reversed into furnace on IFC. 24VAC phase fault on Twinned furnaces.	<ol style="list-style-type: none"> 1. Line voltage power supply correct and properly connected to IFC. 2. Appliance chassis earth grounded to Green (earth ground) conductor of line voltage power supply. 3. Confirm Twinned Furnaces are on same phase.
Steady ON	Control board fault hard lockout.	<ol style="list-style-type: none"> 1. System wiring harness in good condition and securely connected at both ends. 2. All components functioning properly (i.e. inducer, blower, ignitor....). 3. Replace IFC control board.

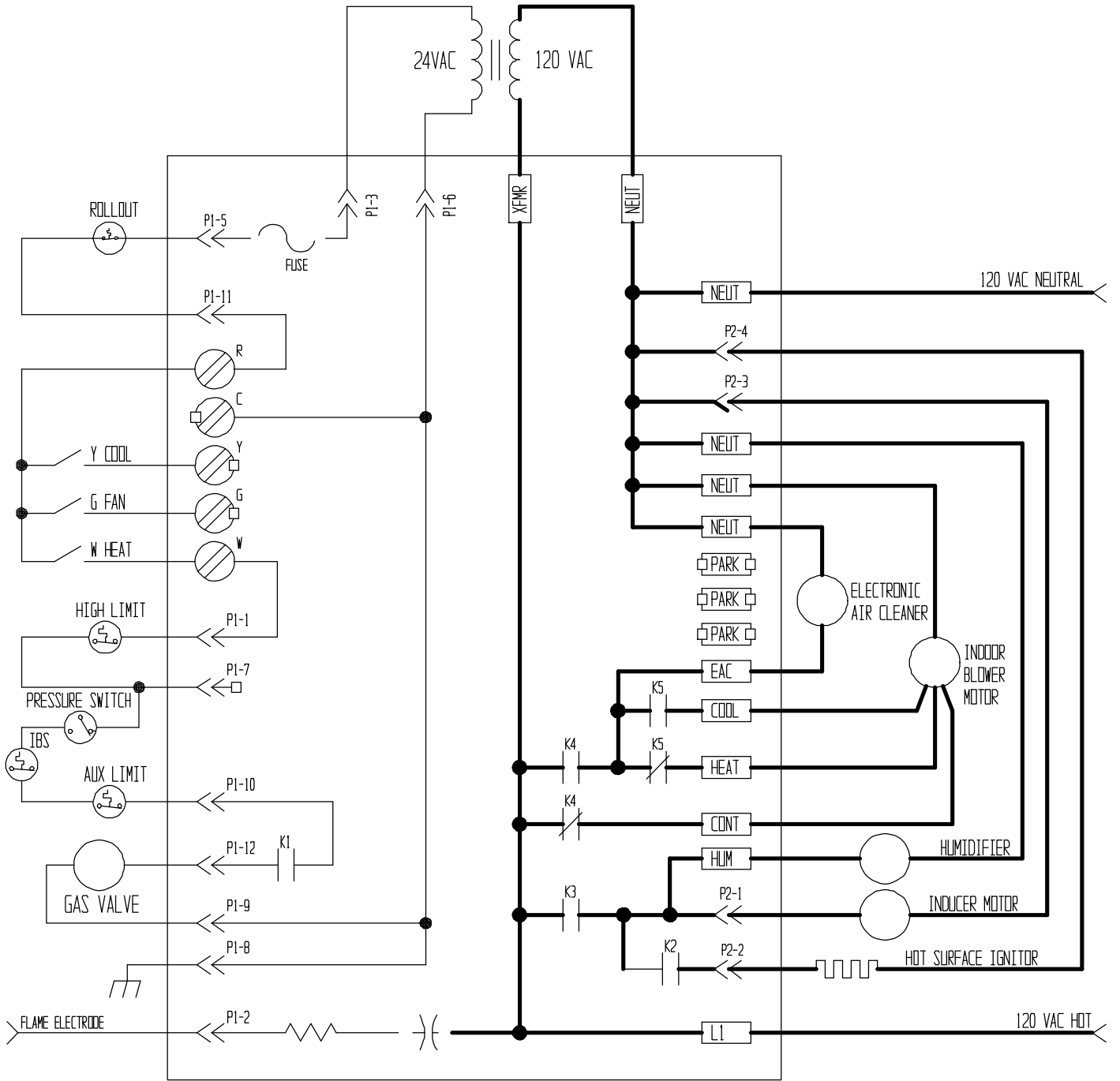
Soft Lockout

The control shall not initiate a call for heat or call for continuous fan while in lockout. A call for cooling operates as normal. The control will still respond to an open limit and desired flame. Lockout shall automatically reset after 1 hour. Lockout may be manually reset by removing power from the control for more than 1 second or removing the thermostat call for heat for more than 1 and less than 20 seconds.

Hard Lockout

If the control detects a fault on the control board, the status LED will be energized steady-ON and the control will lockout as long as the fault remains. A hard lockout will automatically reset if the hardware fault clears.

WIRING DIAGRAM



F0000400

NOTES