

Application Data and Installation Guidelines—Procedures

INTRODUCTION

NOTE: Read these instructions carefully and completely before installing the furnace.

→ Portions of the following instructions have been adopted in part from the National Fuel Gas Code NFPA No. 54-1988/ANSI Z223.1-1988 copyrighted by the National Fire Protection Association and American Gas Association. For further details, consult this publication or the current edition available from National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269, or American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. These instructions cover *minimum* requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept pace with changing residential construction practices. *Carrier requires these standard procedures as a minimum for a safe installation.*

Installation must comply with regulations of the local gas supplier as well as to local building, heating, plumbing, or other codes in effect in area. In the absence of local codes, installation must comply with the National Fuel Gas Code, ANSI Z223.1-1988.

Installations made in Canada must comply with CAN/CSA-B149.1 and .2 National Installation Codes for natural gas burning appliances and equipment, CSA C22.1 Electrical Code, and must be in accordance with the requirements of the provincial authorities having jurisdiction.

⚠ CAUTION

Application of this furnace should be indoors with special attention given to vent sizing and material, gas input rate, air temperature rise, and unit sizing. Improper installation or misapplication of the furnace can require excessive servicing or cause premature component failure.

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

⚠ WARNING

Never store anything on, or in contact with, the furnace, such as:

Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners, or other cleaning tools.

Soap powders, bleaches, waxes or other cleaning compounds, plastic or plastic containers, gasoline, kerosene, cigarette lighter fluid, dry-cleaning fluids, or other volatile fluids.

Paint thinners and other painting compounds, paper bags or other paper products.

A failure to adhere to this warning can cause corrosion of the heat exchanger and vent system, fire, personal injury, or death.

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INSPECTION

Available power supply must meet specifications on furnace rating plate and on all motors in the equipment.

Check the available gas supply to see that it conforms to the gas specification on the furnace rating plate.

CANADIAN INSTALLATIONS

The outlet duct shall be provided with a removable access panel. This panel shall be accessible when installed and be of a size to permit the observance of light or smoke, indicating the presence of a leak in the heat exchanger. Panel must be attached to prevent leaks.

FURNACE LOCATION

Locate the furnace as near the center of the air distribution system as possible.

This furnace may be located in a confined space without special provisions for dilution or ventilation air.

Provide ample space for servicing and cleaning. Always comply with the minimum fire protection clearances shown on the unit rating plate and in Table 1. This furnace must NOT be installed directly on carpeting, tile, or any combustible material other than wood flooring.

⚠ CAUTION

Do not install furnace in unconditioned space that could experience temperatures of 32 F or lower.

NOTE: For proper furnace operation, the furnace must be installed within 1/2 in. of level.

When furnace supply ducts deliver air to areas outside the space containing the furnace, return air ducts must also be sealed to furnace casing and must terminate outside the space containing the furnace. Otherwise, a negative pressure condition could develop within equipment room or space.

Table 1—Clearances (In Ins.)

SIZE	040, 060, 080, 100, & 120
Sides	0
Back	0
Top of Plenum	1
Vent Connector	0
Front—Casing	3
Service	30

Furnace Location Relative to Cooling Equipment—Install cooling coil in parallel with, or on downstream side of, furnace to reduce potential for condensation in heat exchanger. When a coil is installed in parallel with a furnace, dampers or other means used to control airflow must prevent chilled air from entering furnace. Form manual damper operation, equip dampers with a means of preventing operation of either unit unless damper is in the full-heat or full-cool position.

Special Locations—When installing furnace in a residential garage, protect it from physical damage by vehicles. Furnaces installed in public garages, airplane hangars, or other buildings having hazardous atmospheres must comply with requirements of the National Fire Protection Association, Inc.

GAS PIPING

Gas piping must be installed in accordance with national and local codes.

Run a separate gas supply line directly from the meter to the furnace, if possible. Table 2 shows recommended gas pipe sizing. Slope all pipe 1/4 in. in 15 ft to prevent traps.

Table 2—Maximum Capacity of Pipe*

NORMAL IRON PIPE SIZE (in.)	INTERNAL DIAMETER (in.)	LENGTH OF PIPE (ft)				
		10	20	30	40	50
1/2	0.622	175	120	97	82	73
3/4	0.824	360	250	200	170	151
1	1.049	680	465	375	320	285
1-1/4	1.380	1400	950	770	660	580
1-1/2	1.610	2100	1460	1180	990	900

*Cubic ft of gas per hour, for gas pressures of 0.5 psig (14 in. wc) or less, and a pressure drop of 0.5 in. wc (based on a 0.60 specific gravity gas).

Slope all horizontal runs away from meter and toward risers. Use risers to connect lines to furnace and meter.

Apply joint compounds (pipe dope) sparingly and only to male threads of joints. Consult local gas supplier for compound recommendations.

NOTE: Use only compounds resistant to the action of propane gas.

Install a sediment trap in the riser leading to the furnace to trap dirt and condensate. Connect a tee to the riser leading to the furnace, keeping straight-through section of tee vertical. Connect a capped nipple into lower end of tee, so that nipple extends below level of gas controls (Fig. 1).

Where a gum filter is required by local codes, install it in accordance with their requirements.

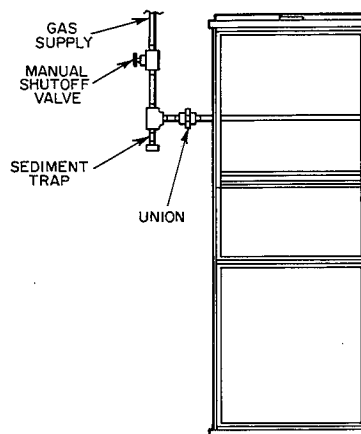
An accessible manual shutoff valve *must* be installed upstream of furnace gas controls and within 6 ft of furnace. A 1/8-in. NPT plugged tapping, accessible for test-gage connection, *must* also be installed immediately upstream of gas supply connection to furnace and downstream of manual shutoff valve.

⚠ CAUTION

Use a backup wrench when connecting the gas pipe to the furnace to avoid damaging gas controls.

⚠ WARNING

Use the proper length of pipes to avoid stress on the gas control manifold. Failure to adhere to this warning can cause a gas leak resulting in a fire, explosion, physical injury, or death.



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Fig. 1—Ground Joint Union and Sediment Trap

Table 3—Combustion-Air and Vent Terminal Clearances

LOCATION	CLEARANCE (ft)	
	USA	Canada
Above anticipated snow depth	1	1
Dryer vent	3	4
From plumbing vent stack	3	3
Gas appliance vent terminal	4	4
From any opening where vent gases could enter building	1	3
Above grade level	1	1
From combustion air opening of any appliance	—	6
From a fresh air intake	—	6
From service regulator vent	—	6
Above grade when adjacent to public walkway	7	7

Install a ground joint union between gas control manifold and manual gas shutoff valve (Fig. 1).

Protect all segments of the piping system against physical and thermal damage. Support all piping with appropriate straps or hangers (one hanger every 6 ft minimum). For pipe sizes larger than 1/2-in., follow recommendations of national codes.

⚠ CAUTION

If a flexible connector is required or allowed by the authority having jurisdiction, black iron pipe must be installed at the gas valve and extend a minimum of 2-in. outside the furnace casing.

Pressure-test piping in accordance with local and national plumbing and gas codes before attaching furnace. Crack ground joint union before pressure testing. If pressure exceeds 0.5 psig (14 in. wc), disconnect gas supply line from furnace before performing pressure test. If test pressure is equal to or less than 0.5 psig (14 in. wc), close manual shutoff valve located on gas valve before testing.

After final connection to the furnace has been made, purge lines and check for leakage with regulated gas supply pressure. In Canada, gas lines must be purged in accordance with CAN/CSA-B149 codes.

⚠ WARNING

Never purge line into combustion chamber. Never use matches, candles, flame, or other sources of ignition to check for gas leakage. Use a soap-and-water solution to check for leaks. A failure to adhere to this warning can cause a fire, explosion, physical injury, or death.

COMBUSTION-AIR AND VENT PIPING

The pipe and fittings must conform to American National Standards Institute (ANSI) standards and American Society for Testing and Materials (ASTM) standards D1785 (schedule-40 PVC), D2665 (PVC-DWV), D2241 (SDR-21 and SDR-26 PVC) or D2661 (ABS-DWV). Pipe cement and primer must conform to ASTM standards D2564 (PVC) or D2235 (ABS).

In Canada construct all combustion-air and vent pipes for this unit of CSA or ULC certified schedule-40 PVC. PVC-DWV or ABS-DWV pipe and pipe cement. SDR pipe is not approved in Canada.

See Table 4 for pipe sizing and Figs. 2, 3 and 4 for exterior piping arrangements

The accessory vent terminal kit described below must be used in constructing the vent terminal for this unit. Pipes must terminate through either roof or sidewall; roof termination is preferable. Locate sidewall terminations to prevent damage to shrubs or siding materials. Table 3 gives clearance requirements.

NOTE: When a previously common-vented system (furnace and water heater) is converted to water heater only, vent

Table 4—Maximum Allowable Pipe Length (In Ft)

Altitude (feet above sea level)	Furnace Size	Pipe Size	Number of 90 Degree Elbows				
			1	2	3	4	5
0-2000	040-GG	1-1/2	20	15	10	5	—
		2	35	35	35	35	35
	060-GG	1-1/2	10	10	5	—	—
		2	35	35	35	30	25
		2-1/2	—	—	—	35	35
2001-3000	080-GG & JG	2	10	—	—	—	—
		2-1/2	35	35	35	35	30
		3	—	—	—	—	35
	100-JG & LG	2-1/2	20	15	5	—	—
		3	35	35	35	35	35
3001-4000	120-LG†	3	35	30	30	25	20
		3	35	35*	35*	35*	35*
	040-GG	1-1/2	17	12	7	—	—
		2	31	30	30	29	29
		2-1/2	8	7	—	—	—
4001-5000	060-GG	1-1/2	8	7	—	—	—
		2	31	30	30	24	20
		2-1/2	—	—	—	29	29
	080-GG & JG	2	8	—	—	—	—
		2-1/2	31	30	30	29	24
5001-6000		3	—	—	—	—	29
	100-JG & LG	2-1/2	17	12	—	—	—
		3	31	30	30	29	29
	120-LG†	3	31	25	25	20	15
		3	31	30*	30*	29*	29*
6001-7000	040-GG	1-1/2	15	10	—	—	—
		2	28	27	26	25	24
	060-GG	1-1/2	6	5	—	—	—
		2	28	27	26	20	16
		2-1/2	—	—	—	25	24
7001-8000	080-GG & JG	2	6	—	—	—	—
		2-1/2	28	27	26	25	19
		3	—	—	—	—	24
	100-JG & LG	2-1/2	15	10	—	—	—
		3	28	27	26	25	24
8001-9000	120-LG†	3	28	22	21	17	11
		3	28	27*	26*	25*	24*
	040-GG	1-1/2	13	9	—	—	—
		2	26	25	24	23	22
	060-GG	1-1/2	5	—	—	—	—
9001-10,000		2	26	25	24	18	14
		2-1/2	—	—	—	23	22
	080-GG & JG	2	5	—	—	—	—
		2-1/2	26	25	24	23	17
		3	—	—	—	—	22
5001-6000	100-GG & LG	2-1/2	13	9	—	—	—
		3	26	25	24	23	22
	120-LG†	3	26	20	19	15	9
		3	26	25*	24*	23*	22*
	040-GG	1-1/2	11	7	—	—	—
5001-6000		2	24	22	21	19	18
	060-GG	2	24	22	21	14	10
		2-1/2	—	—	—	19	18
	080-GG & JG	2-1/2	24	22	21	19	13
		3	—	—	—	—	18
5001-6000	100-JG & LG	2-1/2	11	7	—	—	—
		3	24	22	21	19	18
	120-LG†	3	24	17	16	12	5
		3	24	22*	21*	19*	18*
		3	24	22*	21*	19*	18*

system may be drastically oversized for water heater. Consult National Fuel Gas Code, CAN/CSA-B149.1 and .2 in Canada, for proper sizing and revise vent system if necessary.

⚠ CAUTION

Combustion air must **not** be taken from inside the structure because that air frequently is contaminated by halogens, which include fluorides, chlorides, bromides, and iodides. These elements are found in aerosols, detergents, bleaches, cleaning solvents, salts, air fresheners and other household products. Vapors from these products are highly corrosive to gas-fired furnaces, even in extremely low concentrations (as low as 0.5 ppm).

Maintain a minimum of 36 in. (48 in. for Canada) between combustion-air inlet and clothes-dryer vent.

Locate combustion-air inlet as far as possible from swimming pool and swimming pool pump house.

⚠ WARNING

Solvent cements are combustible. Keep away from heat, sparks, and open flame. Use only in well ventilated areas. Do NOT breathe vapors. Avoid contact with the skin or eyes. A failure to adhere to this warning can cause a fire, property damage, physical injury, or death.

Altitude (feet above sea level)	Furnace Size	Pipe Size	Number of 90 Degree Elbows				
			1	2	3	4	5
6001-7000	040-GG	1-1/2	10	6	—	—	—
		2	22	20	19	17	16
	060-GG	2	22	20	19	12	9
		2-1/2	—	—	—	17	16
	080-GG & JG	2-1/2	22	20	19	17	11
7001-8000		3	—	—	—	—	16
	100-JG & LG	2-1/2	10	6	—	—	—
		3	22	20	19	17	16
	120-LG†	3	22	15	14	10	—
		3	22	20*	19*	17*	16*
8001-9000	040-GG	1-1/2	8	—	—	—	—
		2	19	17	15	13	11
	060-GG	2	19	17	15	8	5
		2-1/2	—	—	—	13	11
	080-GG & JG	2-1/2	19	17	15	13	6
9001-10,000		3	—	—	—	—	11
	100-JG & LG	2-1/2	8	—	—	—	—
		3	19	17	15	13	11
	120-LG†	3	19	12	10	7	—
		3	19	17*	15*	13*	11*
8001-9000	040-GG	1-1/2	6	—	—	—	—
		2	17	15	13	11	9
	060-GG	2	17	15	13	6	—
		2-1/2	—	—	—	11	9
	080-GG & JG	2-1/2	17	15	13	11	—
9001-10,000		3	—	—	—	—	9
	100-JG & LG	2-1/2	6	—	—	—	—
		3	17	15	13	11	9
	120-LG†	3	17	10	8	5	—
		3	17	15*	13*	11*	9*
9001-10,000	040-GG	2	15	12	10	7	5
	060-GG	2	15	12	10	—	—
		2-1/2	—	—	—	7	5
	080-GG & JG	2-1/2	15	12	10	7	—
		3	—	—	—	—	5
9001-10,000	100-JG & LG	3	15	12	10	7	5
	120-LG†	3	15	7	5	—	—
		3	15	12*	10*	7*	5*
		3	15	12*	10*	7*	5*
		3	15	12*	10*	7*	5*

*— Remove one combustion-air disk.

†— Long radius elbows must be used on this model.

NOTES:

1. Size both the combustion-air and vent pipe independently, then use the larger diameter for both pipes.
2. Assume two 45-degree elbows equal one 90-degree elbow. Long radius elbows are desirable. Short radius elbows may be prohibited on some models.
3. Elbows and pipe sections within the furnace casing and supplied in the vent terminal kit should not be included in count.
4. The installer may use one larger pipe size than what is specified above (up to 3-in. diameter maximum).
5. The minimum pipe length is 5-ft for all applications.

▲ WARNING

All combustion-air and vent pipes must be airtight and watertight. Pipes must terminate exactly as shown in Fig. 2 through 4. A failure to adhere to this warning can cause property damage, physical injury, or death.

Furnace is shipped from factory assembled for right-hand vent pipe connection. When left-hand vent connection is desired, interchange the neoprene vent pipe coupling with the neoprene seal cap. Both the coupling and seal cap are located on inducer outlet box.

Remove plastic plug from left-hand casing side panel and install plug in unused hole in the right-hand casing side panel.

NOTE: The unit is shipped with a 2-1/2 x 2-1/2-in. neoprene coupling. Optional couplings size 3 x 2-1/2-in. and 2-1/2 x 2-in. are available through your Distributor or branch.

1. To determine pipe diameter:
 - a. Using Table 4, determine preliminary combustion-air pipe diameter.
 - b. Using Table 4, determine preliminary vent pipe diameter.
 - c. Use largest diameter determined in (a) and (b) above for both pipes.

NOTE: Do not count the elbows to which the terminal bracket attaches or any elbow between the bracket and open end of the pipe. See shaded areas in Figs. 2 through 4. Likewise, do not count pipe sections inside furnace casing.

EXAMPLE: A 060-GG size furnace located in Indianapolis, elevation 650 ft above sea level, could be installed in an application requiring two elbows and 10 ft vent of pipe and the combustion-air pipe requires four elbows and 15 ft of pipe.

Table 4 indicates this application would allow a 1-1/2-in. diameter vent pipe, but require a 2-in. diameter combustion air pipe (1-1/2-in. pipe is good for 10 ft at two elbows, but only 5 ft at four elbows). However, use 2-in. diameter pipe for both the vent and combustion-air pipes since the larger required diameter must always be used for both pipes.

If the same installation was in Albuquerque, elevation 5250 ft above sea level, the installation would allow 2-in. vent pipe but require a 2-1/2-in. diameter combustion-air pipe (at 5,001 to 6,000 ft elevation, 2-in. pipe is good for 22 ft with two elbows, but only 14 ft with 4 elbows). In this case, use 2-1/2-in. pipe for both the vent and combustion-air pipes.

2. Attach factory-supplied flexible coupling to furnace combustion-air inlet connection and secure with clamp. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required. See Table 4.
3. Working from furnace to outside, cut PVC or ABS pipe to required length(s).
4. Deburr inside and outside of pipe.
5. Chamfer outside edge of pipe for better distribution of primer and cement.
6. Clean and dry all surfaces to be joined.
7. Check dry fit of pipe and mark insertion depth on pipe.

NOTE: All pipe should be cut, prepared and preassembled before any joint is permanently cemented.

8. After pipes have been cut and preassembled, apply generous layer of PVC or ABS primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply PVC or ABS cement (over primer) to end of pipe and

fitting socket. Apply cement in light, uniform coat on side of socket to prevent buildup of excess cement. Apply second coat of cement to end of pipe.

9. While the cement is still wet, insert pipe into socket with a 1/4-turn twist. Be sure pipe is fully inserted into fitting socket.
10. Wipe excess cement from joint. A continuous bead of cement is visible around perimeter of properly made joint.
11. Handle pipe joints carefully until cement sets.
12. Attach factory-supplied flexible coupling to furnace combustion-air inlet connection and secure with stainless steel hose clamp. Ensure that factory-supplied, perforated metal combustion-air disc is installed in the flexible coupling.
13. Support piping every 5 ft (minimum) using perforated metal hanging strap (3 ft minimum for SDR-PVC pipe). Slope combustion-air and vent pipes toward furnace a minimum of 1/4 in./lineal ft with no sags between hangers.
14. Use appropriate methods to seal openings where vent and combustion-air pipes pass through roof or sidewall.

▲ CAUTION

When the vent pipe is exposed to temperatures below freezing—that is, when it passes through an unheated space or when a chimney is used as a raceway—the pipe must be insulated with 1/2-in. thick Armaflex insulation.

▲ CAUTION

When the combustion-air pipe is installed above a suspended ceiling, the pipe must be insulated with 1/2-in. Armaflex insulation.

The combustion-air pipe should also be insulated in warm, humid spaces such as basements.

Vent Terminal Kit Installation

NOTE: If these instructions differ from those in kit, use instructions shipped with kit.

The combustion-air and vent pipes must terminate outside the structure. The factory-supplied vent termination kit (required) must be installed as shown in Fig. 2-4. Roof termination, shown in Fig. 2, is preferred.

Two termination kits are available. Use the 2-in. kit with 1-1/2- or 2-in. diameter vent pipe. The 3-in. kit can be used with 2-1/2- or 3-in. diameter pipe systems. Each kit contains extra parts.

NOTE: The shaded portion of Fig. 2 thru 4 is considered part of the vent terminal and these items are provided in the vent terminal kit. They should not be counted, therefore, in pipe diameter calculations.

ROOF TERMINATION (Preferred)

1. Remove one 90-degree elbow from elbow and bracket assembly provided in kit. Loosen screw so other elbow can turn.
2. Loosely install elbow with bracket on combustion-air pipe.
3. Loosely install pipe coupling, provided in kit, on properly cut vent pipe. Position coupling so that bracket will mount as shown in Fig. 2.
4. Disassemble loose pipe fittings. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.

5. Install bracket as shown in Fig. 2.
6. For applications using combustion-air pipe option, indicated by dashed lines in Fig. 2, install 90-degree vent street ell into 90-degree elbow, making a U-fitting. Install the open end of 90-degree vent street ell onto combustion-air pipe.

SIDEWALL VENT TERMINAL INSTALLATION

Install kit as follows when combustion-air and vent pipes exit through sidewall 12-in. or more above highest anticipated snow level and grade. See Fig. 3.

1. Loosely install elbow and bracket assembly on combustion-air and vent pipes.
2. Remove and disassemble elbow and bracket assembly.
3. Install elbows as shown in Fig. 3. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.
4. Install bracket as shown in Fig. 3.
5. Position vent-pipe assembly, maintaining a 12-in. separation between vent-pipe outlet and combustion-air inlet. Cement vent pipe in elbow as shown in Fig. 3.

ration between vent-pipe outlet and combustion-air inlet. Cement vent pipe in elbow as shown in Fig. 3.

6. For applications using vent-pipe option indicated by dashed lines in Fig. 3, rotate elbow 90 degrees from position shown in Fig. 3.

Install kit as follows when combustion-air and vent pipes exit through sidewall less than 12-in. above highest anticipated snow level or grade. See Fig. 4.

1. Remove one elbow from the elbow and bracket assembly. (The elbow remaining will be connected to combustion-air pipe.)
2. Install the 90-degree vent street ell into the 90-degree elbow remaining in elbow and bracket assembly, making a U-fitting.
3. Loosely install coupling on end of vent pipe.
4. Loosely install U-fitting and bracket as shown in Fig. 4. Position U-fitting so that open end is against building wall.

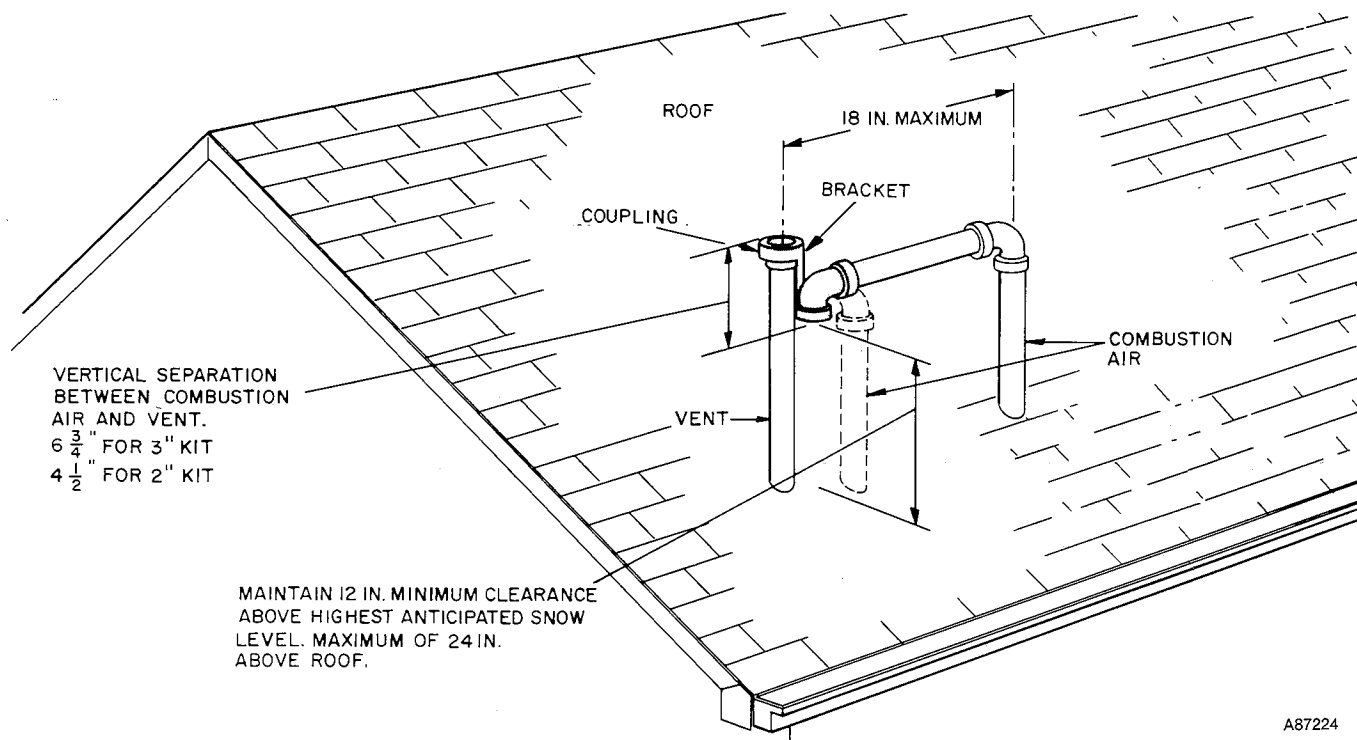


Fig. 2—Roof Termination (Preferred)

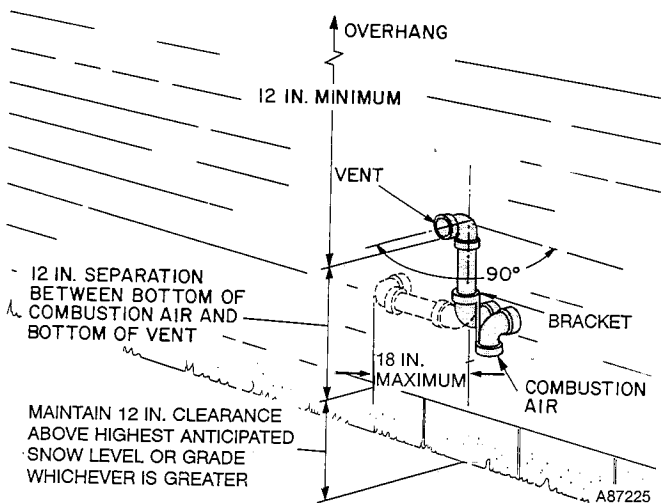


Fig. 3—Sidewall Termination
(12 in. or more above snow level and grade)

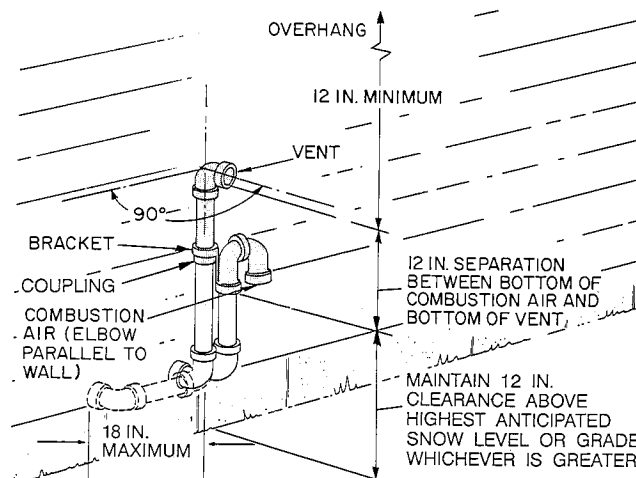


Fig. 4—Sidewall Termination
(less than 12 in. above snow level or grade)

5. Loosely install vent-pipe assembly in coupling as shown in Fig. 4.
6. Check required dimensions as shown in Fig. 4.
7. Disassemble loose pipe fittings. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.
8. Install bracket as shown in Fig. 4.

CONDENSATE DRAIN

When a condensate pump is required, select a pump that is approved for condensing furnace applications. To avoid condensate spillage, select a pump with an overflow switch. Wire the overflow switch in series with the heating contacts of the thermostat.

The 1/2-in. diameter schedule-40 PVC and CPVC condensate drain piping and fittings must conform to ANSI standards and ASTM standards D1785 (schedule-40 PVC) or D2846 (CPVC). The cement and primer must conform to ASTM D2564 (PVC) or F493 (CPVC).

In Canada, use CSA or ULC certified schedule 40 PVC or CPVC drain pipe and cement.

For proper condensate drainage, furnace must be within 1/2-in. of level. Highest corner of furnace must not be more than 1/2-in. above lowest corner.

NOTE: The furnace contains an internal condensate trap; do NOT install external trap.

1. Determine the side of furnace from which drain will exit. Cut and preassemble drain piping (field supplied) directly to an open drain. Refer to Combustion-Air and Vent Piping for instructions on preparing and cementing plastic pipe.
2. Cement elbow on pipe assembly (factory supplied) to condensate trap mounted on blower housing.
3. Using a second wrench to hold assembly, attach first section of field-supplied drain pipe to compression coupling provided.
4. When using schedule-40 PVC drain pipe, connect adapter provided to end of pipe installed in compression fitting.
5. Attach field-supplied schedule-40 PVC adapter to threaded factory adapter.
6. Cement remaining pipe joints.

START-UP ADJUSTMENT, AND SAFETY CHECK

Fill condensate trap with water.

1. Disconnect condensate drain tube from inducer outlet box.
2. Insert funnel into tube and pour one quart of water into tube. This should overflow the trap and flow into an open drain.
3. Reconnect drain tube to inducer outlet box.

Ignition system check—When all connections have been checked, start the furnace using procedure outlined on operating instruction plate attached to furnace. When starting the furnace for the first time, however, perform the following additional steps:

1. If gas supply was not purged before connecting furnace, line will be full of air. Loosen ground joint union and allow supply line to purge until gas odor is detected. *Never purge gas lines into a combustion chamber.* Immediately upon detection of gas odor, retighten union. After 5 minutes, start furnace in accordance with instructions on furnace rating plate.

2. After the pilot lights, the main burners should light in 25 to 75 seconds. If the main burners do not light within the prescribed time period check: the pilot flame, electrical supply to main gas valve, burner cross-over alignment, gas supply pressure, manifold, and orifice alignment.
3. The pilot flame should be soft blue in color and it must provide good impingement on the pilot switching element. The flame should extend above the burner carry-over port to provide proper burner ignition. When the pilot flame requires adjustment:
 - a. Locate adjustment screw marked "PILOT ADJ" on top of gas valve.
 - b. Remove cap and turn adjustment screw clockwise to decrease pilot gas flow. Turn screw counterclockwise to increase pilot gas flow.
 - c. When proper adjustment is obtained, replace screw cap.

NOTE: For ease of adjusting the pilot flame, disconnect terminal No. 1 on the gas valve. This will prevent main burner ignition and allow time to adjust the pilot. Reconnect the power lead after adjustment. Check the flame characteristics after replacing the burner enclosure front.

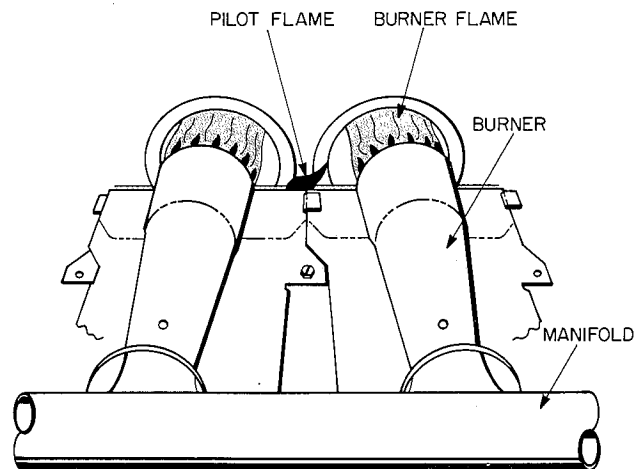


Fig. 5—Proper Pilot and Burner Flames

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Gas Input

1. Determine natural gas orifice size and manifold pressure for correct input by using Table 6. Adjust manifold pressure per step 3. For altitudes higher than 2000 ft, see step 2.

NOTE: Be sure all pressure tubing, combustion-air and vent pipes, and burner enclosure front are in place when checking input.

- a. Obtain average yearly heat value for local gas supply.
- b. Obtain average yearly specific gravity for local gas supply.
- c. Verify the furnace model. Table 6 can only be used for Model 58SX Furnaces.
- d. Check and verify orifice size in furnace. **NEVER ASSUME THE ORIFICE SIZE. ALWAYS CHECK AND VERIFY.**
- e. Find natural gas heat value and specific gravity in Table 6.

- f. Follow heat value line and specific gravity line to point of intersection to find orifice size and manifold pressure settings for proper operation at given natural gas condition.

EXAMPLE:

Heat value 1025 Btu/cu ft

Specific gravity 0.64

Therefore: Orifice No. 43*

*The furnace is shipped with No. 44 orifices. Therefore, in this example all main burner orifices must be changed.

- g. Check input rate by clocking meter as manifold pressure using procedure described in step 2.
2. Determine natural gas input rate by clocking gas meter and adjusting manifold pressure per step 3.

NOTE: Be sure all pressure tubing, combustion-air and vent pipes, and burner enclosure front are in place when checking input.

- a. Turn off all other gas appliances and pilots.
- b. Measure time (in seconds) for gas meter test dial to complete one revolution.
- c. Refer to Table 5 for cubic ft of gas per hour.
- d. Multiply gas rate. Obtain heating value from local gas utility (cu ft/hr) x heating value (Btuh/cu ft).

NOTE: Be sure heating value of gas used for calculations is correct for your altitude. Consult local gas utility for altitude adjustment of gas heating value.

- e. Measured gas input must not exceed gas input on unit rating plate.

NOTE: High altitude—Input ratings are for altitudes up to 2000 ft. Ratings for altitudes over 2000 ft must be 4% less for each 1000 ft above sea level. To obtain the altitude adjusted rating, adjust the manifold pressure and replace the main burner orifices as needed. In Canada, from 2000 to 4500 ft above sea level, derate the unit 10%.

EXAMPLE:

Btu heating input = Btu/cu ft times cu ft/hr

Heating value of gas = 1070 Btu/cu ft

Time for one revolution of 2-cu-ft dial = 72 sec

Gas rate = 100 cu ft/hr (from Table 5)

Btu heating input = 100 x 1070 = 107,000 Btuh

3. To adjust input rate:

NOTE: Manifold pressure must always be measured with the burner enclosure front removed. The gas meter must always be clocked with the burner enclosure front installed.

- a. Remove burner enclosure front and cap that conceals adjustment screw for gas valve regulator.
- b. Turn adjusting screw either counterclockwise (out) to decrease input rate or clockwise (in) to increase rate. When adjusting input rate, do NOT set manifold pressure less than 3.2 or more than 3.8 ins. wc for natural gas. Make any major adjustments by changing main burner orifices.

NOTE: If orifice hole appears damaged or it is suspected to have been redrilled, check the orifice hole with the correct size numbered drill. Never redrill an orifice. A burr-free and squarely aligned orifice hole is essential for proper flame characteristics.

- c. Replace burner enclosure front and measure adjusted gas input rate using method outlined in step 1.
- d. Replace cap that conceals gas valve regulator adjustment screw.

Table 5—Gas Rate in cu ft/hr

SECONDS FOR ONE REVOLU- TION	SIZE OF TEST DIAL			SECONDS FOR ONE REVOLU- TION	SIZE OF TEST DIAL		
	1 cu ft	2 cu ft	5 cu ft		1 cu ft	2 cu ft	5 cu ft
10	360	720	1800	50	72	144	360
11	327	655	1636	51	71	141	355
12	300	600	1500	52	69	138	346
13	277	555	1385	53	68	136	340
14	257	514	1286	54	67	133	333
15	240	480	1200	55	65	131	327
16	225	450	1125	56	64	129	321
17	212	424	1059	57	63	126	316
18	200	400	1000	58	62	124	310
19	189	379	947	59	61	122	305
20	180	360	900	60	60	120	300
21	171	343	857	62	58	116	290
22	164	327	818	64	56	112	281
23	157	313	783	66	54	109	273
24	150	300	750	68	53	106	265
25	144	288	720	70	51	103	257
26	138	277	692	72	50	100	250
27	133	267	667	74	48	97	243
28	129	257	643	76	47	95	237
29	124	248	621	78	46	92	231
30	120	240	600	80	45	90	225
31	116	232	581	82	44	88	220
32	113	225	563	84	43	86	214
33	109	218	545	86	42	84	209
34	106	212	529	88	41	82	205
35	103	206	514	90	40	80	200
36	100	200	500	92	39	78	196
37	97	195	486	94	38	76	192
38	95	189	474	96	38	75	188
39	92	185	462	98	37	74	184
40	90	180	450	100	36	72	180
41	88	176	439	102	35	71	178
42	86	172	429	104	35	69	173
43	84	167	419	106	34	68	170
44	82	164	409	108	33	67	167
45	80	160	400	110	33	65	164
46	78	157	391	112	32	64	161
47	76	153	383	116	31	62	155
48	75	150	375	120	30	60	150
49	73	147	367				

▲ CAUTION

Be sure burner enclosure front is in place after adjustments have been made.

4. Look through sight glass in burner enclosure and check burner and pilot flame. The main burner flame should be clear blue, almost transparent. The pilot flame should be well defined. See Fig. 5.

Temperature Rise—Do NOT operate furnace outside range of temperature rise specified on unit rating plate. Determine air temperature rise as follows:

1. Place thermometers in return and supply ducts as near furnace as possible. Thermometers must not "see" heating element or radiant heat may effect readings. This practice is particularly important with straight-run ducts.
2. When thermometer readings stabilize, subtract return-air temperature from supply-air temperature to determine air temperature rise.
3. Adjust temperature rise by adjusting blower speed. Increase blower speed to reduce temperature rise. Decrease blower speed to increase temperature rise.

Thermostat Heat Anticipator Adjustment—Thermostat heat anticipator must be set to match amp draw of components in R-W circuit. Accurate amp draw measurements can be obtained at thermostat subbase terminals R and W. Fig. 6 illustrates an easy method of obtaining these measurements. Amp reading should be taken after blower has started on its heating speed.

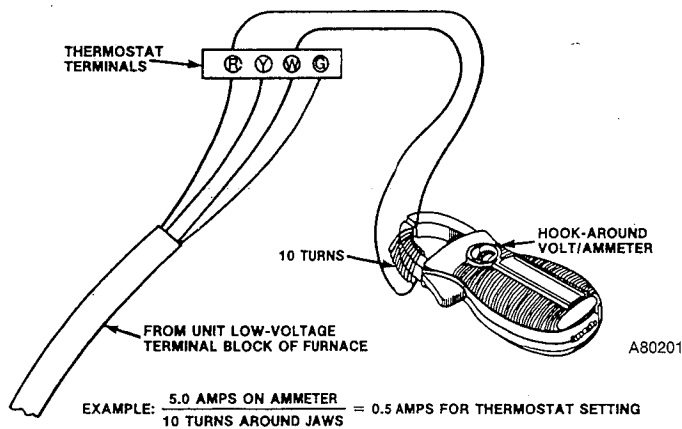


Fig. 6—Amp Draw Measurements

Safety Check of Limit Control—Control shuts off combustion gas supply and energizes circulating-air blower motor if furnace overheats.

Recommended method of checking this limit control is to gradually block off return air after furnace has been operating for at least 5 minutes. As soon as limit control functions, return-air opening should be unblocked to permit normal air circulation. By using this method to check limit control, proper functioning can be determined and furnace will fail-safe if circulating air supply is restricted or motor fails. If limit control does not function during this test, identify and correct cause of malfunction.

Safety Check of Flow-Sensing Switch—This control proves operation of draft inducer. Check switch operation as follows:

1. Turn off 115-v power to furnace.
2. Remove control access panel and disconnect inducer-motor lead wires from inducer printed-circuit board.
3. Turn on 115-v power to furnace.
4. Set thermostat to "call for heat." When flow-sensing switch is functioning properly, gas should not flow to pilot and igniter should not operate. If either pilot gas flow or igniter operation occurs when inducer motor is disconnected, shut furnace down immediately. Determine cause of malfunction and correct condition.
5. Turn off 115-v power to furnace.
6. Reconnect inducer-motor leads, reinstall control access panel, and turn on 115-v power supply.

Table 6—Model 58SX Orifice Size and Manifold Pressure For Correct Input Rate
(Tabulated data based on altitude up to 2000 feet and 22,000 Btuh per burner.)

Gas Heat Value (Btuh/cu ft)	SPECIFIC GRAVITY OF NATURAL GAS															
	0.56		0.58		0.60		0.62		0.64		0.66		0.68		0.70	
	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press	Orf No.	Manfld Press
860	41	3.2	41	3.3	41	3.4	41	3.5	41	3.7	41	3.8	39	3.4	38	3.2
	42	3.6	42	3.7	42	3.8	40	3.3	39	3.2	39	3.3	40	3.6	39	3.5
	—	—	—	—	40	3.2	—	—	40	3.4	40	3.5	—	—	40	3.7
875	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6	41	3.8	39	3.3
	—	—	42	3.6	42	3.7	42	3.8	40	3.3	39	3.2	39	3.3	40	3.6
	—	—	—	—	—	—	40	3.2	—	—	40	3.4	40	3.5	—	40
890	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6	41	3.7
	—	—	—	—	42	3.6	42	3.7	42	3.8	40	3.2	40	3.3	39	3.2
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40	3.5
905	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5	41	3.6
	—	—	—	—	—	—	42	3.6	42	3.7	42	3.8	40	3.2	40	3.3
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40
920	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4	41	3.5
	—	—	—	—	—	—	—	—	42	3.5	42	3.7	42	3.8	40	3.2
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	41
935	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3	41	3.4
	—	—	—	—	—	—	—	—	—	—	42	3.5	42	3.7	42	3.8
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40
950	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2	41	3.3
	—	—	—	—	—	—	—	—	—	—	—	—	42	3.5	42	3.6
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42
965	43	3.4	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4	41	3.2
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42	3.5
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42
980	44	3.8	43	3.5	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3	42	3.4
	43	3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	42
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	41
995	44	3.7	44	3.8	43	3.5	43	3.6	43	3.7	43	3.8	42	3.2	42	3.3
	43	3.2	43	3.4	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1010	44	3.6	44	3.7	44	3.8	43	3.5	43	3.6	43	3.7	43	3.8	42	3.2
	—	—	43	3.3	43	3.4	—	—	—	—	—	—	—	—	—	42
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1025	44	3.5	44	3.6	44	3.7	43	3.4	43	3.5	43	3.6	43	3.7	43	3.8
	—	—	43	3.2	43	3.3	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1040	44	3.4	44	3.5	44	3.6	44	3.7	43	3.4	43	3.5	43	3.6	43	3.7
	—	—	—	—	43	3.2	43	3.3	—	—	—	—	—	—	—	43
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1055	44	3.3	44	3.4	44	3.5	44	3.6	44	3.8	43	3.4	43	3.5	43	3.6
	—	—	—	—	—	—	43	3.2	43	3.3	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1070	44	3.2	44	3.3	44	3.4	44	3.5	44	3.7	44	3.8	43	3.4	43	3.5
	—	—	—	—	—	—	—	—	43	3.2	43	3.3	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1085	45	3.8	44	3.2	44	3.3	44	3.4	44	3.6	44	3.7	44	3.8	43	3.4
	—	—	—	—	—	—	—	—	—	—	43	3.2	43	3.3	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1100	45	3.7	45	3.8	44	3.2	44	3.4	44	3.5	44	3.6	44	3.7	44	3.8
	—	—	—	—	—	—	—	—	—	—	—	—	43	3.2	43	3.3

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.