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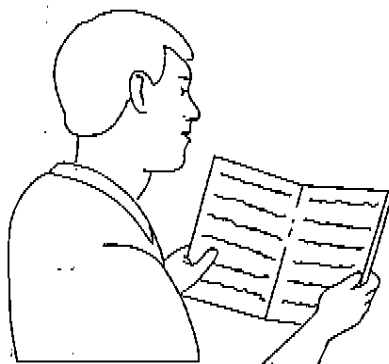
installation, start-up and operating instructions

VARIABLE-CAPACITY 4-WAY MULTIPOISE CONDENSING GAS FURNACE

355MAV

Series A

Cancels: New

II 355M-40-1
6-15-93

A93040

NOTE: Read the entire instruction manual before starting the installation.

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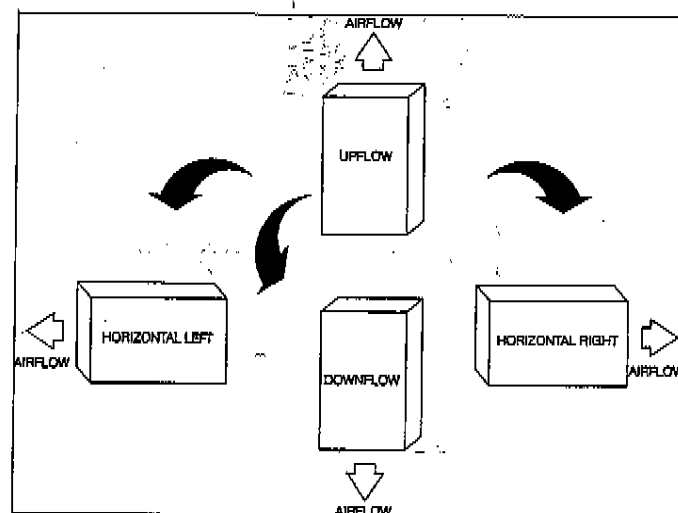


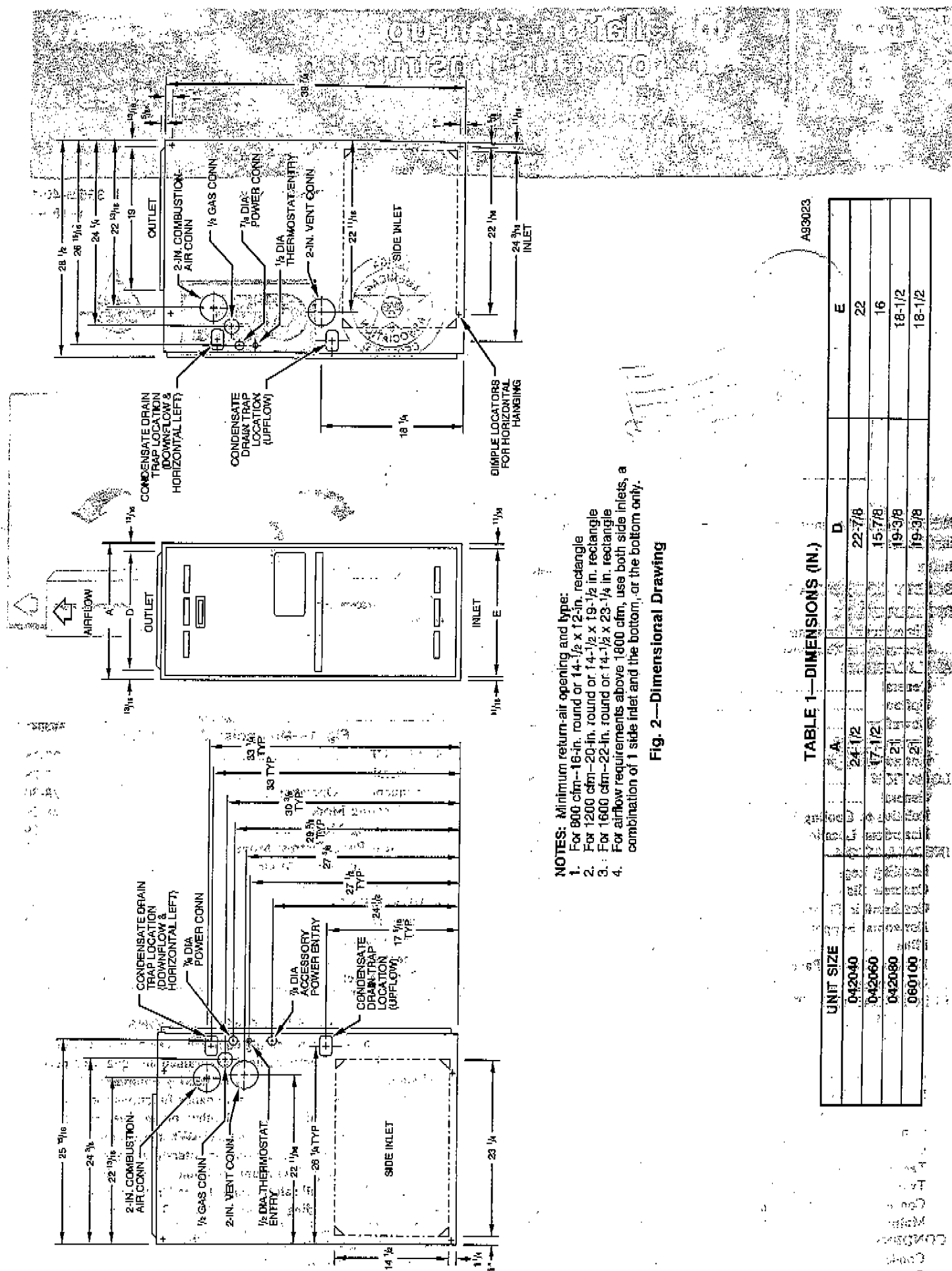
Fig. 1—Multipoise Orientations

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SAFETY CONSIDERATIONS

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment. Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, tags, and labels attached to or shipped with unit and other safety precautions that may apply. Follow all safety codes. In the United States, follow all safety codes including National Fuel Gas Code NFPA No. 54-1992/ANSI Z223.1-1992. In Canada, refer to current edition of National Standard of Canada CAN/CGA-B149 Installation Codes. Wear safety glasses and work gloves. Have fire extinguisher available during start-up, adjustment procedures and service calls.



NOTES: Minimum return-air opening and type:

1. For 800 cfm—16-in. round or 14-1/2 x 12-in. rectangle
2. For 1200 cfm—20-in. round or 14-1/2 x 19-1/2 in. rectangle
3. For 1600 cfm—22-in. round or 14-1/2 x 23-1/4 in. rectangle
4. For airflow requirements above 1800 cfm, use both side inlets, a combination of 1 side inlet and the bottom, or the bottom only.

Fig. 2—Dimensional Drawing

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TABLE 1—DIMENSIONS (IN.)

UNIT SIZE	A	D	E
042040	24-1/2	22-7/8	22
042060	27-1/2	15-7/8	16
042080	29-1/2	19-3/8	18-1/2
060100	31-1/2	19-3/8	18-1/2

Recognize safety information. This is the safety-alert symbol . When you see this symbol on unit or in instructions and manuals, be alert to potential for personal injury.

Understand the signal word DANGER, WARNING, or CAUTION. These words are used with safety-alert symbol. DANGER identifies most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices which would result in minor personal injury or product and property damage. NOTE is used to highlight suggestions that will result in enhanced installation, reliability, or operation.

INTRODUCTION

The and 355MAV Multipoise Condensing Gas Furnaces are A.G.A./C.G.A. certified for natural and propane gases and for installation in alcoves, attics, basements, closets, utility rooms, crawlspaces and garages. These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring. In downflow installations, accessory floor base must be used when installed on combustible materials and wood flooring. The design of this furnace line is not A.G.A./C.G.A. certified for installation in mobile homes, recreation vehicles, or outdoors. These furnaces are suitable for installation in a residence built on site or a manufactured residence completed at final site.

These furnaces are shipped in the UPFLOW orientation and can be used in UPFLOW, DOWNFLOW, HORIZONTAL RIGHT, or HORIZONTAL LEFT (supply-airflow direction) applications with minor modifications as shown in Fig. 1. See details under Section 1—Applications.

Before installing this furnace, refer to current edition of National Fuel Gas Code NFPA 54-1992/ANSI Z223.1-1992 which is available from National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269, American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209, or from Literature Distribution, catalog number 858-232. In Canada, contact Standards Department of Canadian Gas Association, 55 Scarisdale Road, Don Mills, Ontario, Canada M3B 2R3. Installations must comply with regulations of serving gas supplier and local building, heating, plumbing, or other codes in effect in area in which installation is made. In absence of local codes, installation must conform with National Fuel Gas Code, NFPA No. 54-1992/ANSI Z223.1-1992. Canadian installations must be made in accordance with CAN/CGA-B149 Installation Codes and all authorities having jurisdiction. These instructions cover minimum requirements for a safe installation 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. BDP requires these instructions as a minimum for a safe installation.



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

WARNING: Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, local gas supplier, your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

For accessory installation details, refer to applicable installation literature.

1. APPLICATIONS

A. General

These furnaces are shipped in the UPFLOW position. Some assembly and modifications are required for furnaces installed in any of the 4 applications shown in Fig. 1. All drain and pressure tubes are connected as shown in Fig. 4. Some assembly and modifications are required. See appropriate application instructions for these procedures.

B. Upflow Applications

An upflow furnace application is where furnace blower is located below combustion and controls section of furnace and conditioned air is discharged upwards.

CONDENSATE TRAP LOCATION

The condensate trap is factory shipped in the combustion and controls section. To install condensate trap, select 1 of 2 available locations as shown in Fig. 2 or 6.

Insert trap in appropriate hole. Note furnace casing will be positioned between top tabs. Rotate trap downwards until lower tab latches in furnace casing. If desired, trap can be attached to furnace casing after it is installed. Using holes in trap as a guide, drill and install field-supplied screws. Note that screw attachment is only an option and not required.

CONDENSATE TRAP TUBING

1. Collector Box Drain Tubing

The collector box drain tube (blue) is factory assembled to both collector box drain connections. This tube can be identified by corrugated ends, approximately 5 in. long on each end with a section of straight tube in center.

- Cut straight section of tube approximately 1 in. from UPPER corrugated connection.
- After condensate trap is installed, determine proper length of tube to connect LOWER collector box drain connection to LARGER 5/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut straight section of tube to appropriate length and discard excess.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- Connect tube to condensate trap and clamp to prevent leakage. (Clamp located on straight section of tube.)
- Remove collector box tube plug from inducer housing. (See Fig. 4 for factory shipped location.) Insert plug in open end of tube and gently push center of plug into tube until tube is flush with shoulder on plug.
- Clamp plug to prevent leakage. (Extra clamp located on straight section of tube.)

This unit complies with CAN/CGA 2.3 M86, CAN/CSA C22.2 No. 0-M91, CSA C22.2 No. 3-1988 standards.

This appliance is equipped only for altitudes 0 - 2,000 ft (0-610 m) for use with natural gas and propane. A conversion kit, supplied by the manufacturer, shall be used to convert to the alternate fuel.

This direct-vent, forced-air furnace is for indoor installation in a building constructed on site. For installation in alcove or closet at minimum clearances from combustible material as shown below, minimum front clearance for service is 30 inches (762 mm).

Upflow furnace only: For installation on combustible flooring.

Downflow furnace only: For installation on non-combustible floors only. For installation on combustible floors only when installed on special base No. KGASB0201ALL.

Horizontal position: Line contact is permissible only between lines formed by intersections of top and two sides of furnace jacket, and building joists, studs, or framing.

This furnace is for use with schedule-40 PVC, PVC-DWV, or ABS-DWV pipe, and must not be vented in common with other gas-fired appliances. Construction through which vent/air intake pipes may be installed is maximum 24 inches (600 mm), minimum 3/4 inches (19 mm) thickness.

Special venting system required. In Canada use certified venting system provided by furnace manufacturer. See Installation Instructions provided with furnace. Flue gas temperature 131°F (55°C) vent pressure positive.

MINIMUM CLEARANCE TO COMBUSTIBLE MATERIAL

INCHES

TOP	SIDES	BACK	FRONT	VENT
1	0	0	3	0
1	0	0	3	0
1	1*	0	3	0

UPFLOW

DOWNFLOW

HORIZONTAL

* Clearance shown is for air inlet and air outlet end.

Fig. 3—Clearances to Combustibles

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g. Position plugged tube behind inducer housing assembly.

NOTE: When condensate trap is installed on right-hand side, the collector box drain tube (blue) MUST be routed through clamp provided. (See Fig. 6.)

WARNING: Failure to route tube through clamp may interfere with blower access panel door switch operation. Failure to follow this warning could result in electrical shock, personal injury, or death.

2. Inducer Housing Drain Tubing

The inducer housing drain tube (violet) is factory assembled to both inducer housing drains. This tube has 1 corrugated section and a straight section.

- Disconnect UPPER inducer housing drain connection.
- After condensate trap is installed, determine proper length of tube to connect LOWER inducer housing drain connection to SMALLER 3/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tubes or furnace operation may be affected and lockout will occur.

- Remove cap and clamp from inducer housing. See Fig. 4 for factory shipped location. Install on UPPER inducer housing drain connection to prevent leakage.

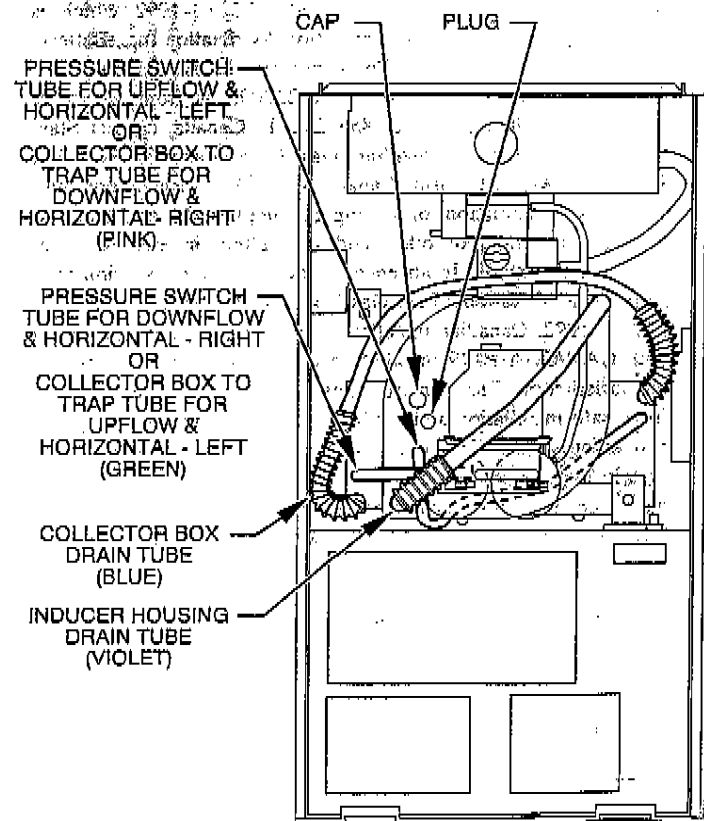


Fig. 4—Factory Shipped Tube Arrangement

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WARNING: When condensate trap is installed on right-hand side, route inducer drain tube behind clamped, collector box tube (blue). (See Fig. 6.) Failure to route tube through clamp may interfere with blower access panel door switch operation. Failure to follow this warning could result in electrical shock, personal injury, or death.

3. Collector Box to Trap Relief Port Tubing

The collector box to condensate trap relief port tube (green) is shipped from the factory attached to the inducer housing post as shown in Fig. 4. This tube **MUST** be relocated to the condensate trap.



WARNING: Failure to connect and clamp relief port tube properly to the condensate trap could result in intermittent operation and flue product leakage, and cause personal injury or death.

- Disconnect the green 3/8-in. OD tube from the inducer housing post.
- Reroute tube from between the inducer housing and blower shelf to left-hand side of inducer housing, between collector box drain and pressure tubes.
- After trap is installed, determine proper length of tube to connect to condensate trap.

NOTE: If additional tube length is required, use factory-supplied tube in installer packet.

- Cut tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.



WARNING: When condensate trap is installed on right-hand side, route relief port tube behind clamped collector box tube (blue). (See Fig. 6.) Failure to route tube through clamp may interfere with blower access panel door switch operation. Failure to follow this warning could result in electrical shock, personal injury, or death.

PRESSURE SWITCH TUBING

The pressure switch tube (pink) is factory assembled for upflow applications and should not require any modifications. See Fig. 6 to check routing of pressure switch tubing connections.

CONDENSATE TRAP FREEZE PROTECTION

Refer to Section 6—Condensate Trap Freeze Protection section for recommendations and procedures.

CONDENSATE TRAP DRAIN

Refer to Section 6—Condensate Drain section for recommendations and procedures.

C. Downflow Applications

A downflow furnace application is where furnace blower is located above combustion and controls section of furnace and conditioned air is discharged downwards.

CONDENSATE TRAP LOCATION

The condensate trap is factory shipped in combustion and controls section. To install condensate trap, select 1 of 2 available locations as shown in Fig. 2 or 7. Insert trap in appropriate hole. Note

furnace casing will be positioned between top tabs. Rotate trap downwards until lower tab latches in furnace casing. If desired, trap can be attached to furnace casing after it is installed. Using holes in trap as a guide, drill and install field-supplied screws. Note that screw attachment is only an option and not required.

CONDENSATE TRAP TUBING

1. Collector Box Drain Tubing

The collector box drain tube (blue) is factory assembled to both collector box drain connections. This tube can be identified by corrugated ends, approximately 5 in. long on each end, with a section of straight tube in center.

- Cut straight section of tube approximately 1 in. from UPPER corrugated connection.
- After condensate trap is installed determine proper length of tube to connect LOWER collector box drain connection to LARGER 5/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut straight section of tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp (clamp located on straight section of tube) to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- Remove collector box tube plug from inducer housing. (See Fig. 4 for factory shipped location.) Insert plug in open end of tube and gently push center of plug into tube until tube is flush with shoulder on plug.
- Clamp plug to prevent leakage. (Extra clamp located on straight section of tube.)
- Position plugged tube behind inducer housing assembly.

NOTE: When condensate trap is installed on right-hand side, the collector box drain tube **MUST** be routed behind the inducer housing and gas valve as shown in Fig. 7.

2. Inducer Housing Drain Tubing

The inducer housing drain tube (violet) is factory assembled to both inducer housing drains. This tube has 1 corrugated section and a straight section.

- Disconnect both ends of inducer housing drain tube (violet).
- After condensate trap is installed, connect corrugated end to LOWER inducer housing drain connection.
- Determine proper length of tubing to connect LOWER inducer housing drain connection to SMALLER 3/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- Remove cap and clamp from inducer housing (See Fig. 4 for factory shipped location) and install on UPPER inducer housing drain connection to prevent leakage.

NOTE: When condensate trap is located on right-hand side, route collector box and inducer housing drain tubes behind gas valve. (See Fig. 7.)

3. Collector Box to Trap Relief Port Tubing

The collector box to condensate trap relief port tube (pink) is shipped from the factory attached to the pressure switch as shown in Fig. 4. This tube **MUST** be relocated to the condensate trap.

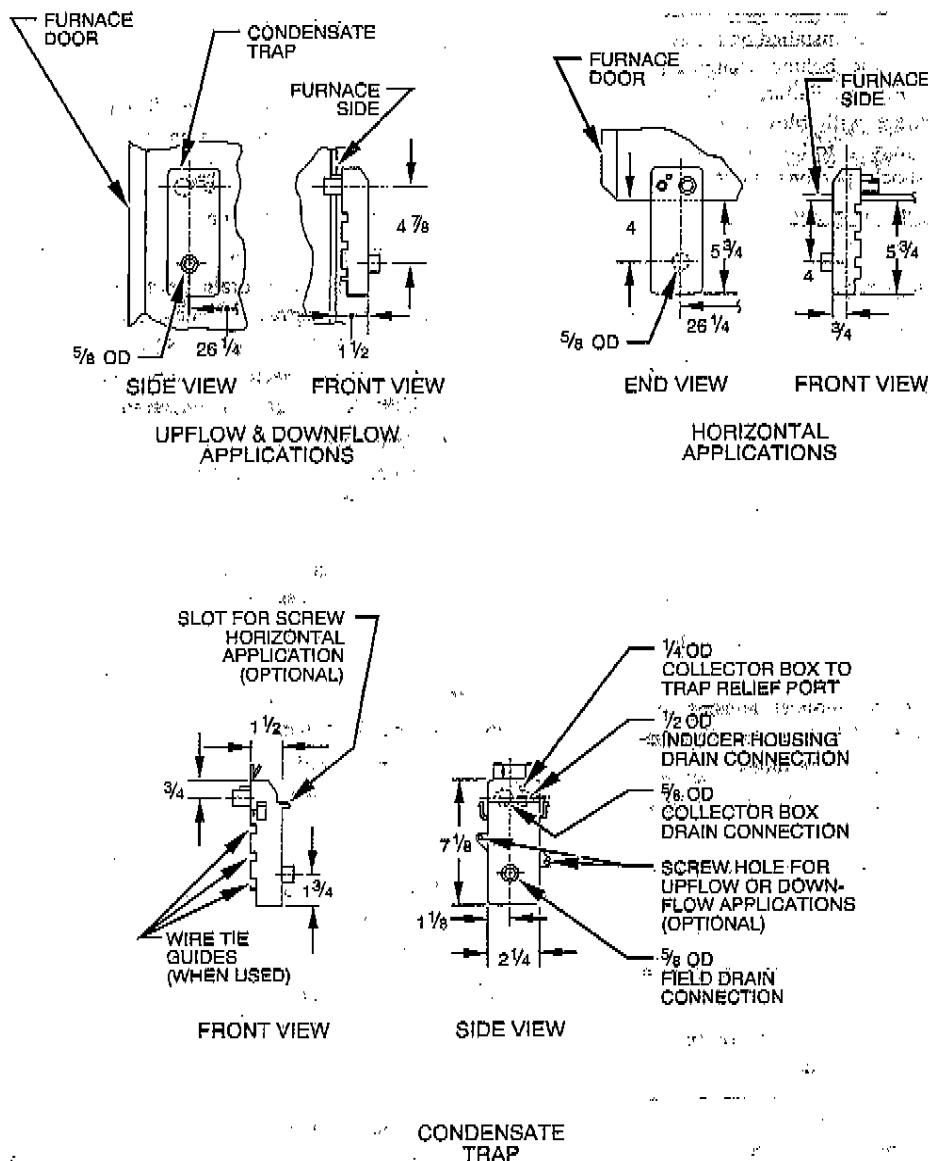


Fig. 5—Condensate Trap

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WARNING: Failure to connect and clamp relief port tube properly to the condensate trap could result in intermittent operation and flue product leakage, and cause personal injury or death.

- a. Disconnect the 3/8-in. OD tube (pink) from the pressure switch.

NOTE: This is NOT tube connecting burner box and gas valve to the pressure switch.

- b. Determine proper length of tube to connect to condensate trap after trap has been installed.

NOTE: If additional tube length is required, use factory-supplied tube in installer packet.

- c. Cut tube to appropriate length and discard excess.
- d. Relocate clamp to condensate trap connection.
- e. Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

PRESSURE SWITCH TUBING

The pressure switch tube (green) is shipped from the factory assembled as shown in Fig. 4 and **REQUIRES** modifications. See Fig. 7 for proper location of pressure switch tubing connections.

1. Remove collector box pressure tube (green) from inducer housing-POST.

NOTE: This is NOT tube connecting burner box and gas valve to pressure switch or tube removed earlier from the pressure switch and connected to the condensate trap relief port.

2. Connect tube to pressure switch and clamp to prevent leakage. (See Fig. 7.)

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

CONDENSATE TRAP FREEZE PROTECTION

Refer to Section 6—Condensate Trap Freeze Protection section for recommendations and procedures.

CONDENSATE TRAP DRAIN

Refer to Section 6—Condensate Drain section for recommendations and procedures.

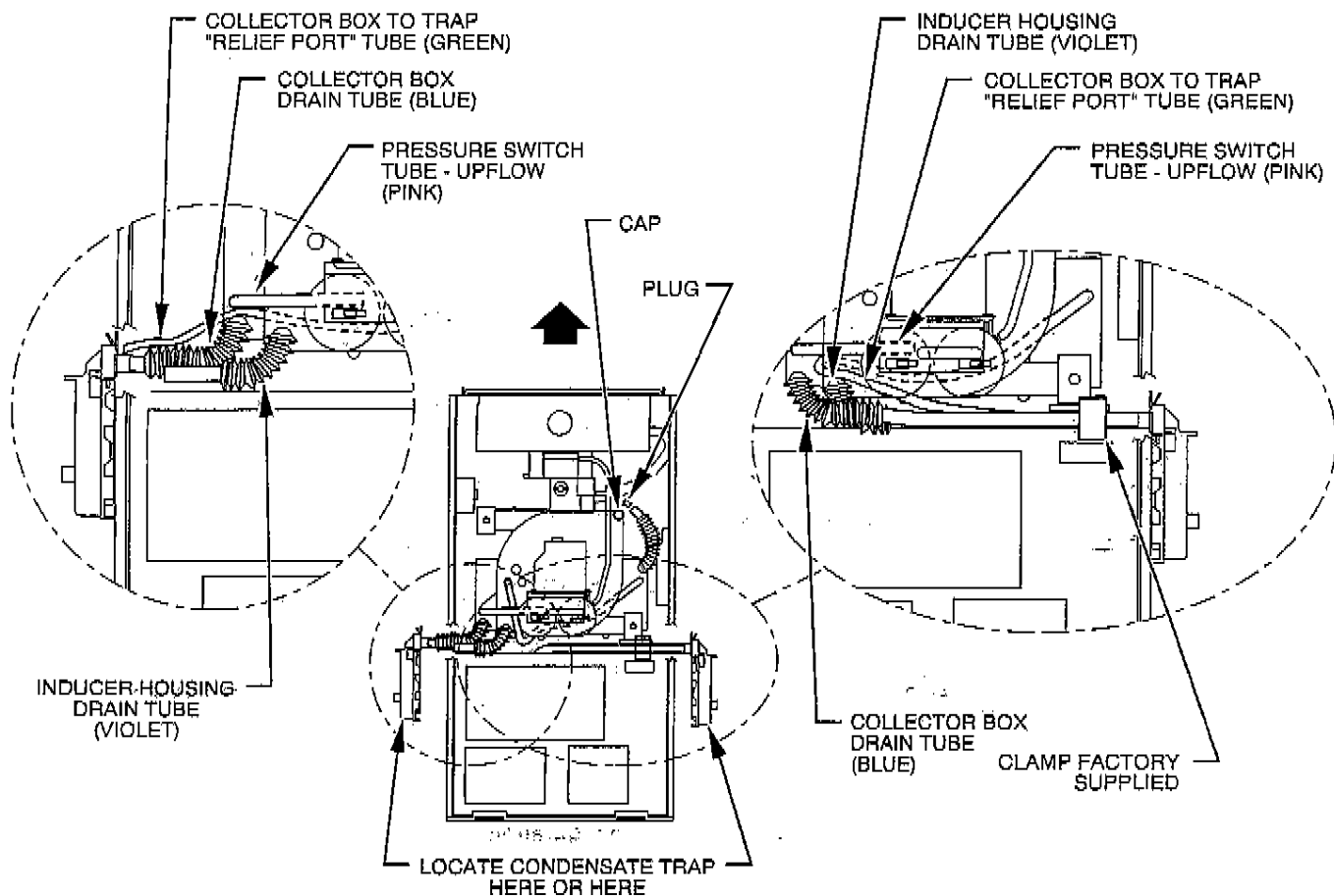


Fig. 6—Upflow Tube Configuration

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D. Horizontal Left (Supply-Air Discharge) Applications

A horizontal left furnace application is where furnace blower is located to the right of combustion and controls section of furnace and conditioned air is discharged to the left.

CAUTION: Local codes may require a drain pan under entire furnace and condensate trap when a condensing furnace is used in attic applications.

NOTE: In Canada, installation shall be in accordance with current CAN/CGA-B149 Installation Codes and/or local codes.

CONDENSATE TRAP LOCATION

The condensate trap is factory shipped in combustion and controls section of unit. Install condensate trap in location shown in Fig. 2 or 8.

NOTE: The auxiliary junction box (J-Box) MUST be relocated to opposite side of furnace casing. (See Fig. 8.) See Electrical Connection section for J-Box relocation. Insert trap in appropriate hole by positioning drain tube stubs in hole and rotating downward until latches engage in furnace casing. If desired, trap can be attached to furnace casing after it is installed. Using slotted tab in trap as a guide, drill and install field-supplied screw. Note that screw attachment is only an option and not required.

CONDENSATE TRAP TUBING

1. Collector Box Drain Tubing

The collector box drain tube (blue) is factory assembled to both collector box drain connections. This tube can be identified by corrugated ends, approximately 5 in. long on each end, with a section of straight tube in center.

- Cut straight section of tube approximately 1 in. from UPPER corrugated connection.
- After trap is installed, determine proper length of tube to connect LOWER collector box drain connection to LARGER 5/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut straight section of tube to appropriate and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage. Clamp located on straight section of tube.
- Remove collector box tube plug from inducer housing. See Fig. 4 for factory shipped location. Insert plug in open end of tube and gently push center of plug into tube until tube is flush with shoulder on plug.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- Clamp plug to prevent leakage. (Extra clamp located on straight section of tube.)
- Position plugged tube behind inducer housing assembly.

2. Inducer Housing Drain Tubing

The inducer housing drain tube (violet) is factory assembled to both inducer housing drains. This tube has 1 corrugated section end and a straight section.

- Disconnect UPPER inducer housing drain connection.
- After trap is installed, determine proper length of tube to connect LOWER inducer housing drain connection to SMALLER 3/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut tube to appropriate length and discard excess.

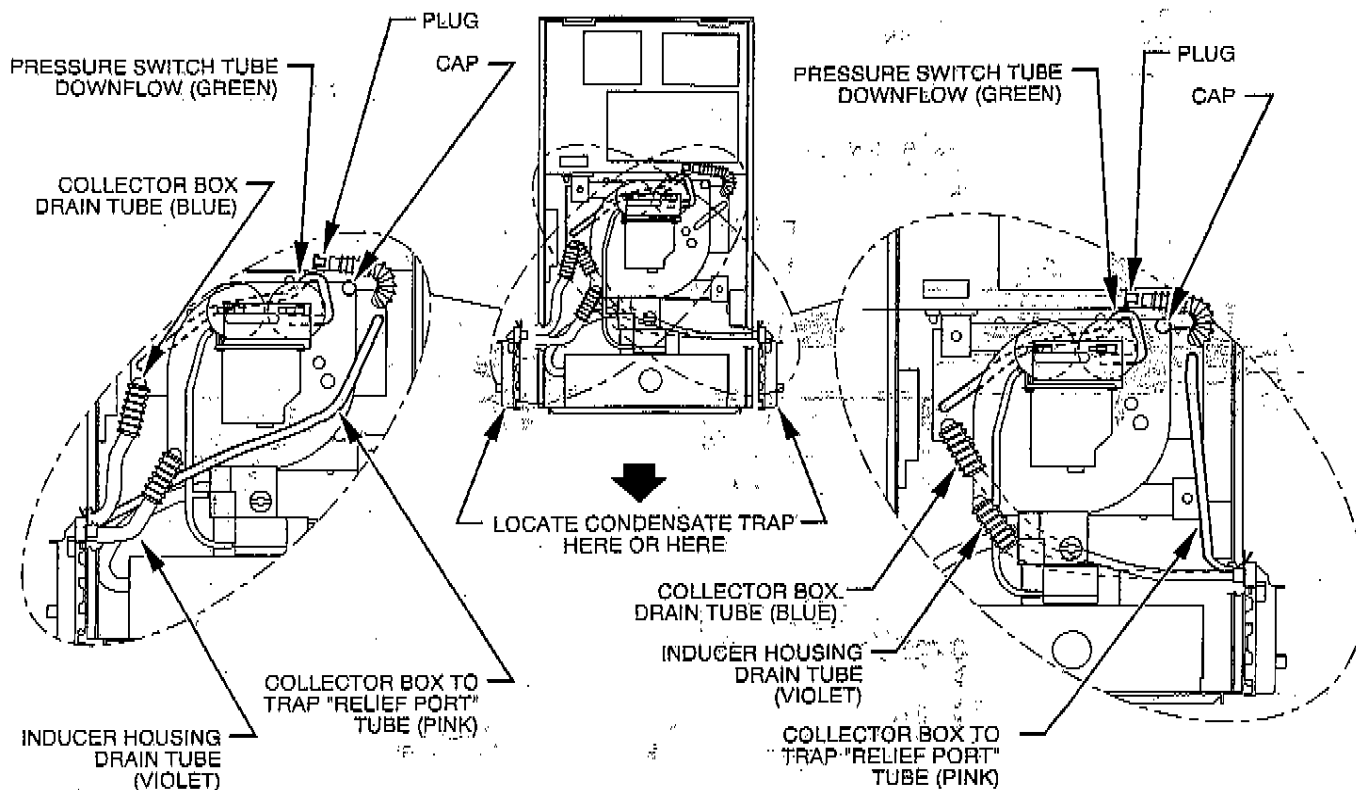


Fig. 7—Downflow Tube Configuration

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- d. Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

3. Collector Box to Trap-Relief Port Tubing

The collector box to condensate trap relief port tube (green) is shipped from the factory attached to the inducer housing post as shown in Fig. 4. This tube **MUST** be relocated to the condensate trap.

WARNING: Failure to connect and clamp this tube properly to the condensate trap could result in intermittent operation and flue product leakage, and cause personal injury or death.

- Disconnect the 3/8-in. OD tube (green) from the inducer housing post.
- Reroute tube from between the inducer housing and blower shelf to bottom side of the inducer housing between the collector box drain and the pressure switch tube.

NOTE: If additional tube length is required, use factory-supplied tube in installer packet.

- Determine proper length of tube to connect to condensate trap after trap is installed.
- Cut tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

PRESSURE SWITCH TUBING

The pressure switch tubes connections are shipped from the factory assembled for the horizontal left application and should not require any modifications. See Fig. 8 to check routing and connection location of pressure switch tubes.

CONDENSATE TRAP FREEZE PROTECTION

Refer to Section 6—Condensate Trap Freeze Protection section for recommendations and procedures.

CONDENSATE TRAP DRAIN

Refer to Section 6—Condensate Drain section for recommendations and procedures.

CONSTRUCT A WORKING PLATFORM

Construct working platform where all required furnace clearances are met. (See Fig. 3 and 9.)

CAUTION: The condensate trap **MUST** be installed below furnace. See Fig. 5 for dimensions. The drain connection to condensate trap must also be properly sloped to an open drain.

NOTE: Combustion-air and vent pipes are restricted to a minimum length of 5 ft. (See Table 7.)

NOTE: A 12-in. minimum horizontal pipe section is recommended with short (5 to 8 ft) vertical vent systems. This recommendation is to reduce excessive condensate droplets from exiting the vent pipe. (See Fig. 9.)

E. Horizontal Right (Supply-Air Discharge) Applications

A horizontal right furnace application is where furnace blower is located to the left of combustion and controls section of furnace and conditioned air is discharged to the right.

CAUTION: Local codes may require a drain pan under entire furnace and condensate trap when a condensing furnace is used in attic applications.

NOTE: In Canada, installation shall be in accordance with current CAN/CGA-B149 Installation Codes and/or local codes.

CONDENSATE TRAP LOCATION

The condensate trap is factory shipped in combustion and controls section of unit. Install condensate trap in location shown in Fig. 2 or 10. Insert trap in appropriate hole by positioning drain tube stubs in hole and rotating downward until latches engage in furnace casing. If desired, trap can be attached to furnace casing after it is installed. Using slotted tab in trap as a guide, drill and install field-supplied screw. Note that screw attachment is only an option and not required.

CONDENSATE TRAP TUBING

1. Collector Box Drain Tubing

The collector box drain tube (blue) is factory assembled to both collector box drain connections. This tube can be identified by corrugated ends that are approximately 3 in. long, with a section of straight tube in center.

- Cut straight section of tube approximately 1 in. from UPPER corrugated connection.
- After trap is installed, determine proper length of tube to connect LOWER collector box drain connection to LARGER 5/8-in. OD tube connection on condensate trap. (See Fig. 5.)

- Cut straight section of tube to appropriate length and discard excess.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- Connect tube to condensate trap and clamp to prevent leakage. Clamp is located on straight section of tube.
- Remove collector box tube plug from inducer housing. See Fig. 4 for factory shipped location. Insert plug in open end of tube and gently push center of plug into tube until tube is flush with shoulder on plug.
- Clamp plug to prevent leakage. (Extra clamp located on straight section of tube.)
- Position plugged tube behind inducer housing assembly.

2. Inducer Housing Drain Tubing

The inducer housing drain tube (violet) is factory assembled to both inducer housing drains. This tube has 1 corrugated section and a straight section.

- Disconnect both ends of inducer housing drain tube (violet).
- After trap is installed, connect corrugated end to LOWER inducer housing drain connection.
- Determine proper length of tube to connect LOWER inducer housing drain connection to SMALLER 3/8-in. OD tube connection on condensate trap. (See Fig. 5.)
- Cut tube to appropriate length and discard excess.
- Connect tube to condensate trap and clamp to prevent leakage.

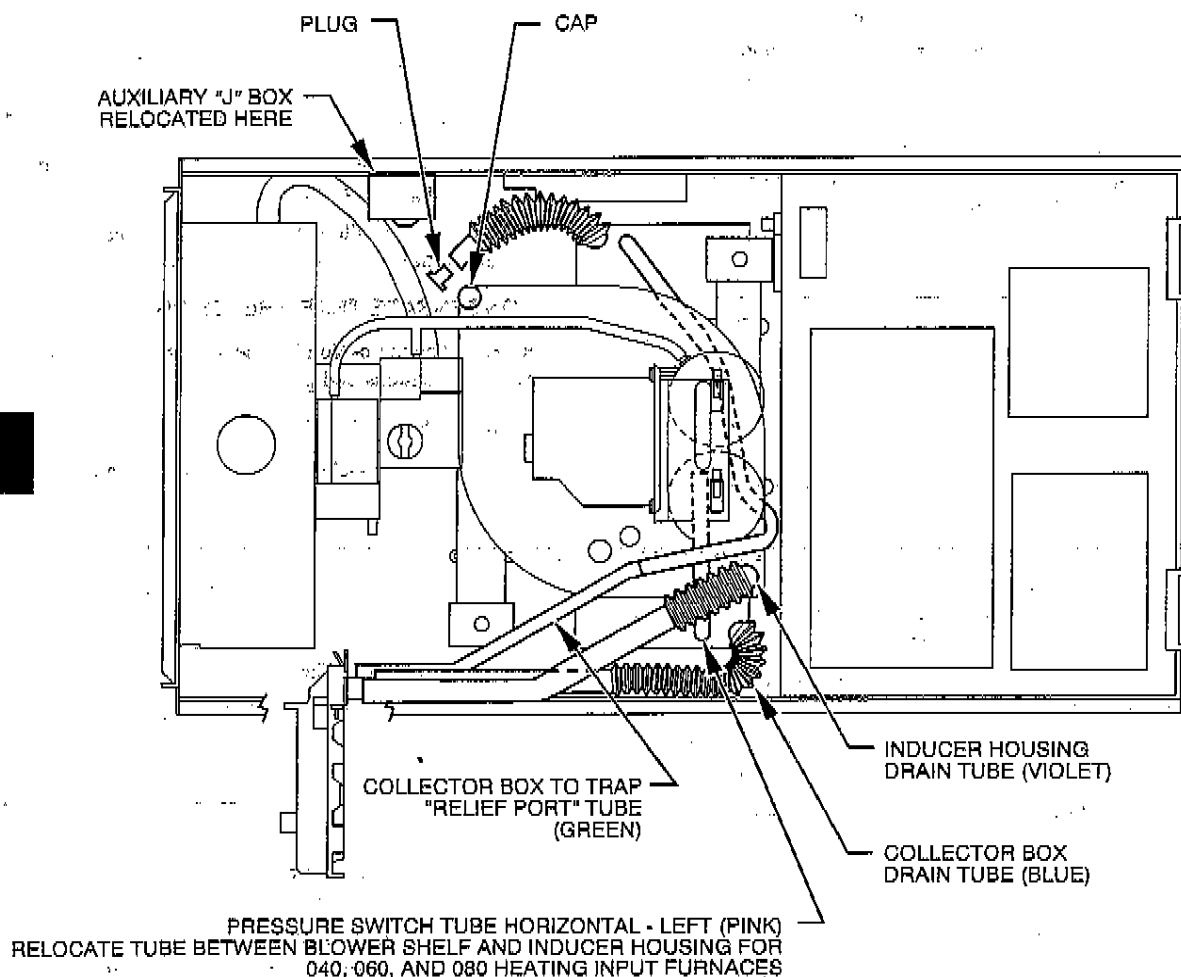


Fig. 8—Horizontal Left Tube Configuration

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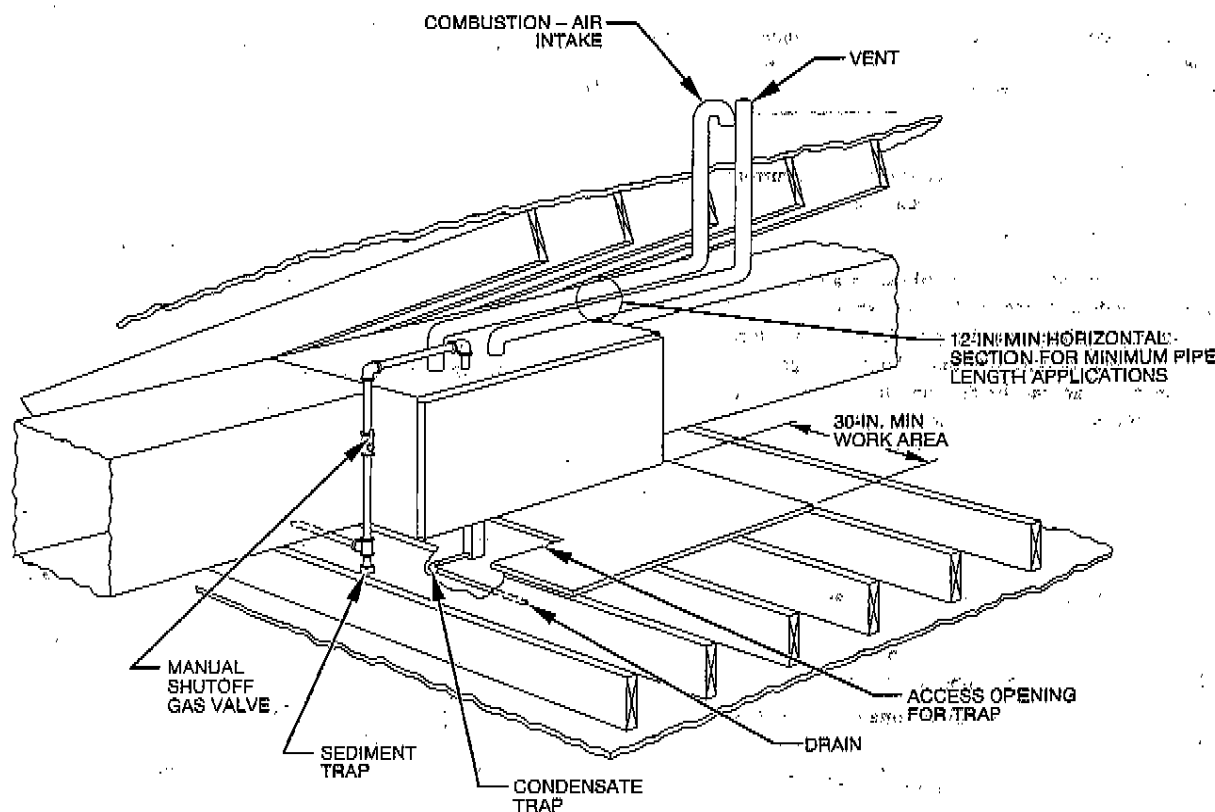


Fig. 9—Attic Location and Working Platform

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

- f. Remove cap and clamp from inducer housing. See Fig. 4 for factory location. Install on UPPER inducer housing drain connection to prevent leakage.

3. Collector Box to Trap Relief Port Tubing

The collector box to condensate trap relief port tube (pink) is shipped from the factory attached to the pressure switch as shown in Fig. 4. This tube **MUST** be relocated to the condensate trap.

WARNING: Failure to connect and clamp the relief port tube properly to the condensate trap could result in intermittent operation and flue product leakage may occur, and cause personal injury or death.

- a. Disconnect the 3/8-in. OD tube (pink) from the pressure switch.

NOTE: This is NOT tube connecting burner box and gas valve to pressure switch.

- b. After trap is installed, determine proper length of tube to connect to condensate trap.

NOTE: If additional tube length is required use factory-supplied tube in installer packet.

- c. Cut tube to appropriate length and discard excess.
- d. Relocate clamp to condensate trap connection.
- e. Connect tube to condensate trap and clamp to prevent leakage.

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

PRESSURE SWITCH TUBING

The pressure switch tubing is shipped from the factory assembled as shown in Fig. 4, and **REQUIRES** modifications. See Fig. 10 for proper location of pressure switch tubing connections.

1. Remove the collector box pressure tube (green) from inducer housing, POST.

NOTE: This is NOT tube connecting burner box and gas valve to the pressure switch or tube removed earlier from the pressure switch and connected to the condensate trap-relief port.

2. Connect tube to pressure switch and clamp to prevent leakage. (See Fig. 10.)

NOTE: Do not allow kinks, traps, or sags in tube or furnace operation may be affected and lockout will occur.

CONDENSATE TRAP FREEZE PROTECTION

Refer to Section 6—Condensate Trap Freeze Protection section for recommendations and procedures.

CONDENSATE TRAP DRAIN

Refer to Section 6—Condensate Drain section for recommendations and procedures.

CONSTRUCT A WORKING PLATFORM

Construct working platform where all required furnace clearances are met. (See Fig. 3 and 9.)

CAUTION: The condensate trap **MUST** be installed below furnace. See Fig. 5 for dimensions. The drain connection to condensate trap must also be properly sloped to an open drain.

NOTE: Combustion-air and vent pipes are restricted to a minimum length of 5 ft. (See Table 7.)

NOTE: A 12-in. minimum horizontal pipe section is recommended with short (5 to 8 ft) vertical vent systems. This recommendation is to reduce excessive condensate droplets from exiting the vent pipe. (See Fig. 9.)

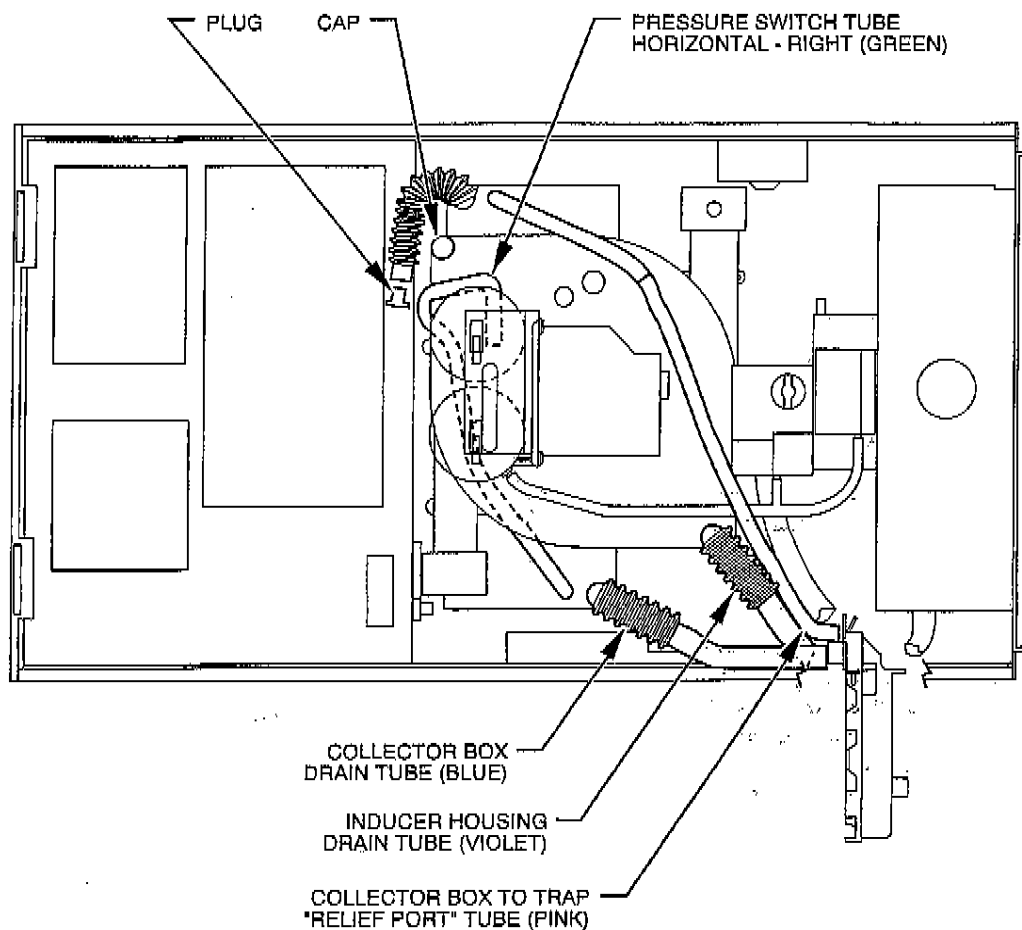


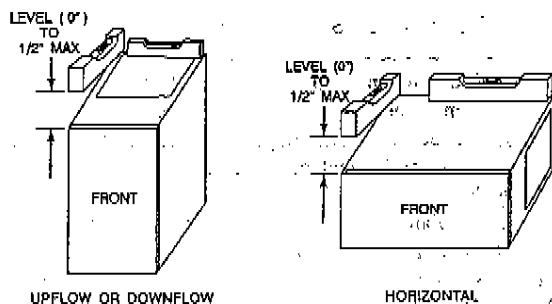
Fig. 10—Horizontal Right Tube Configuration

A93354

II. LOCATION

A. General

When a furnace is installed so that supply ducts carry air to areas outside the space containing the furnace, return air must also be handled by ducts sealed to furnace casing. The ducts terminate outside the space containing the furnace to ensure there will not be a negative pressure condition within equipment room or space. Furnace may be located in a confined space without special provisions for dilution or ventilation air. This furnace must be installed so electrical components are protected from water.



A93025

NOTE: For proper furnace operation, install furnace so that it is level or pitched forward within 1/2 in. to ensure proper condensate drainage from secondary heat exchangers.

NOTE: These furnaces are designed for a minimum continuous return-air temperature of 60°F or intermittent operation down to 55°F such as when used with a night setback thermostat. Return-air temperature must not exceed a maximum of 85°F. Failure to follow these return-air temperature limits may affect reliability of heat exchanger, motors, and controls.

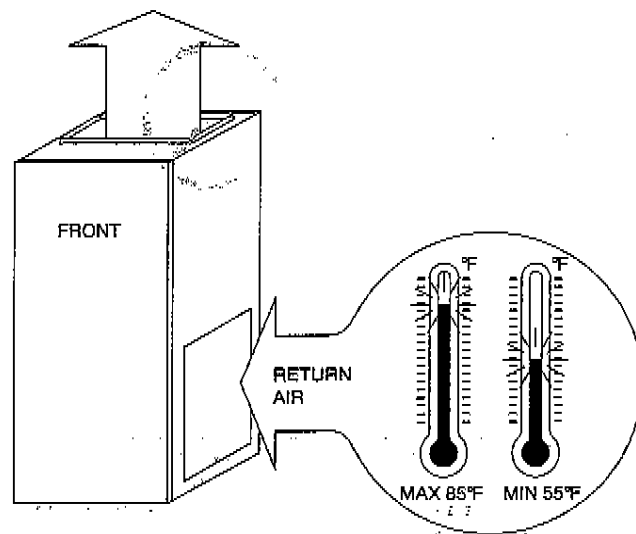


Fig. 11—Return-Air Temperature

A93042

Locate furnace as close to center of air distribution system as possible.

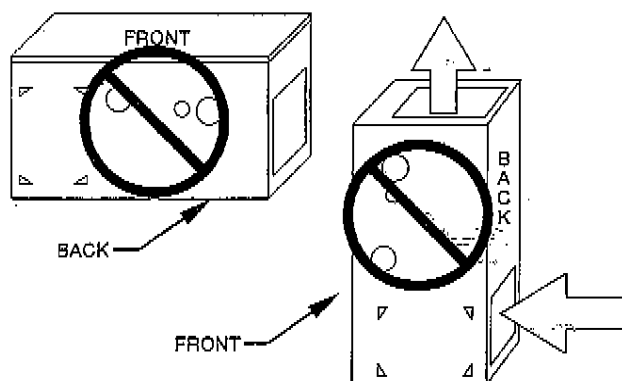
Locate furnace so combustion-air pipe lengths are not exceeded. Refer to Table 7—Maximum Allowable Pipe Length.

CAUTION: If these furnaces are used during construction when adhesives, sealers, and/or new carpets are being installed, make sure all combustion and circulating air requirements are followed. If operation of furnace is required during construction, use clean outside air for combustion and ventilation. Compounds of chlorine and fluorine, when burned with combustion air, form acids which will cause corrosion of heat exchangers. Some of these compounds are found in paneling, dry wall adhesives, paints, thinners, masonry cleaning materials, and many other solvents commonly used in construction process.

Provide ample space for servicing and cleaning. Always comply with minimum fire protection clearances shown on unit's clearance to combustibles label. (See Fig. 3.) Locate furnace where available electric power and gas supplies meet specifications on furnace rating plate.

B. Furnace Location Relative to Cooling Equipment.

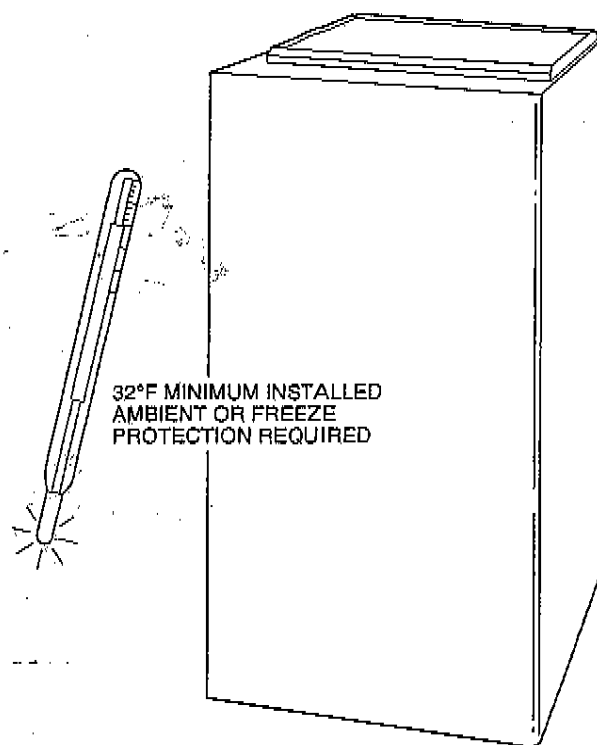
The cooling coil must be installed parallel with or on downstream side of furnace to avoid condensation in heat exchanger. When installed parallel with a furnace, dampers or other means used to control flow of air must prevent chilled air from entering furnace. If dampers are manually operated, they must be equipped with a means to prevent operation of either unit unless damper is in full-heat or full-cool position.



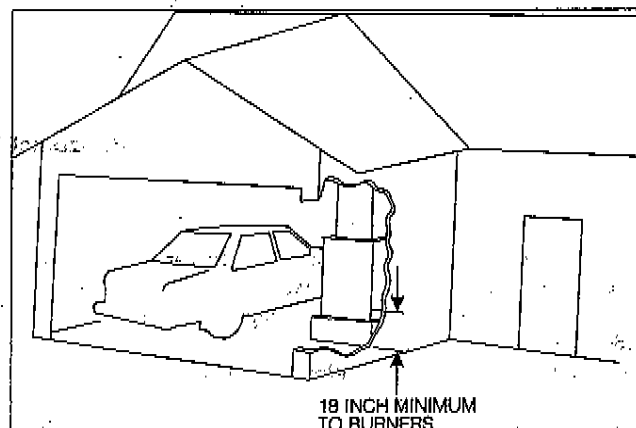
A93043

WARNING: Do not install furnace on its back. Safety control operation will be adversely affected. Never connect return-air ducts to back of furnace. Failure to follow this warning could result in fire, personal injury, or death.

CAUTION: If these furnaces are installed in an unconditioned space where ambient temperatures may be 32°F or lower, freeze protection measures must be taken.



A93058



A93044

HAZARDOUS LOCATIONS

WARNING: When furnace is installed in a residential garage, it must be installed so that burners and ignition sources are located a minimum of 18 in. above floor. The furnace must be located or protected to avoid physical damage by vehicles. When furnace is installed in a public garage, airplane hangar, or other building having a hazardous atmosphere, unit must be installed in accordance with requirements of National Fire Protection Association, Inc.

III. INSTALLATION

CONDENSATE TRAP FREEZE PROTECTION

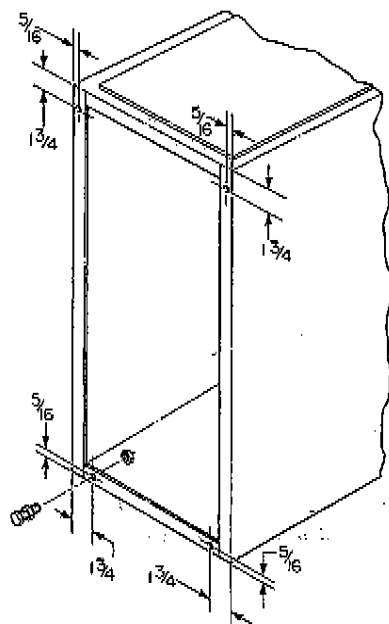
Refer to Section 6—Condensate Trap Freeze Protection section for recommendations and procedures.

CONDENSATE TRAP DRAIN

Refer to Section 6—Condensate Drain section for recommendations and procedures.

A. Leveling Legs (If Desired)

When furnace is used in upflow position with side inlet(s), leveling legs may be desired. (See Fig. 12.) Install field-supplied corrosion-resistant 5/16-in. machine bolts and nuts.

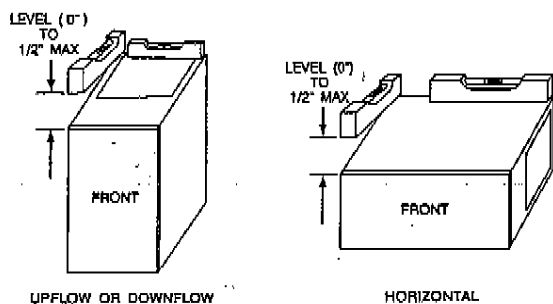


A89014

Fig. 12—Leveling Legs

NOTE: The maximum length of bolt should not exceed 1-1/2 in.

1. Position furnace on its back, locate and drill a 5/16-in. diameter hole in each bottom corner of furnace. (See Fig. 12.) Holes in bottom closure panel may be used as guide locations.
2. For each hole, install nut on bolt and then install bolt and nut in hole. (Install flat washer if desired.)
3. Install another nut on other side of furnace base. (Install flat washer if desired.)
4. Adjust outside nut to provide desired height, and tighten inside nut to secure arrangement.



A93025

NOTE: For proper furnace operation, install furnace so that it is level or pitched forward within 1/2 in. to ensure proper condensate drainage from secondary heat exchangers.

NOTE: Bottom closure must be used when leveling legs are used. See Bottom Closure Panel section.

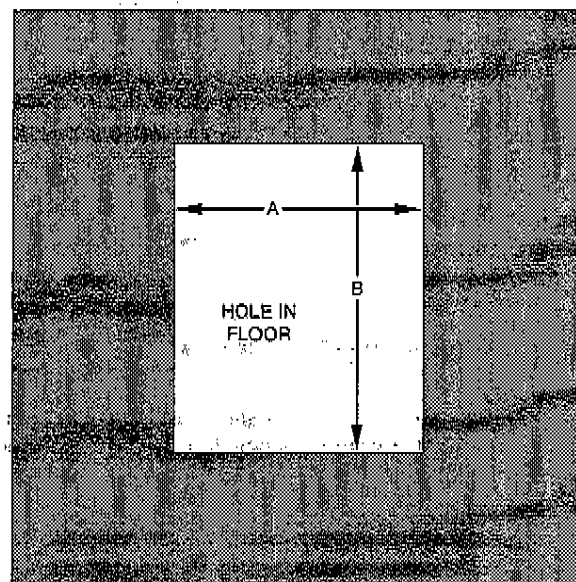
B. Installation on a Concrete Slab

1. Construct hole in floor per dimensions in Fig. 13 and Table 2.
2. Place plenum and furnace as shown in Fig. 14.

TABLE 2—OPENING DIMENSIONS (IN.)

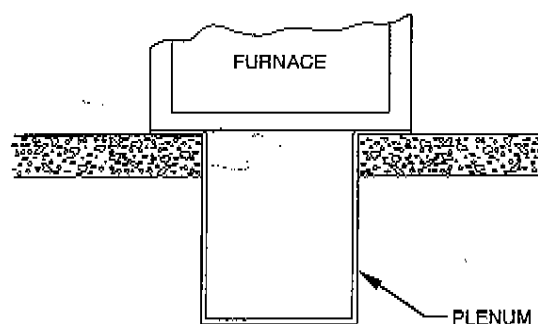
FURNACE CASING WIDTH	A	B	
		Heat Only	Heat/Cool*
17-1/2	16-7/16	19-5/8	19-7/16
21	19-7/8	19-5/8	19-7/16
24-1/2	23-7/16	19-5/8	19-7/16

* These dimensions apply when a model CB or CD Evaporator Coil casing is to be installed.



A73382

Fig. 13—Floor Opening in Concrete Slab



A73383

Fig. 14—Furnace on a Concrete Slab (Non-Garage Installation)

C. Installation on Combustible Floor

1. Cut and frame hole in floor per dimensions in Installation Instructions packaged with downflow subbase kit.

NOTE: Remove furnace perforated, discharge duct flanges when they interfere with mating flanges on coil on downflow subbase. To remove furnace perforated, discharge duct flange, use wide duct pliers or duct flange tool to bend flange back-and-forth until it breaks off. Be careful of sharp edges. (See Fig. 15.)

WARNING: Do not bend duct flanges inward as shown in Fig. 15. This will affect air flow across heat exchangers and may cause limited cycling or premature heat exchanger failures. Remove duct flange completely or bend it inward a minimum of 210° as shown in Fig. 15.

2. When complete, downflow subbase, plenum, and furnace (or coil casing when used) should be installed as shown in Fig. 16.

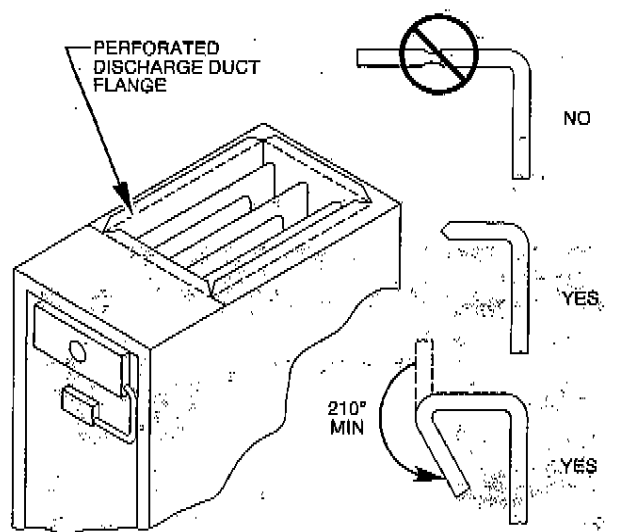
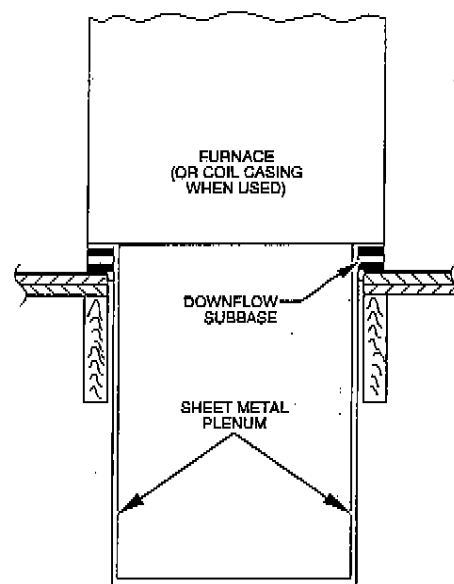


Fig. 15—Duct Flanges

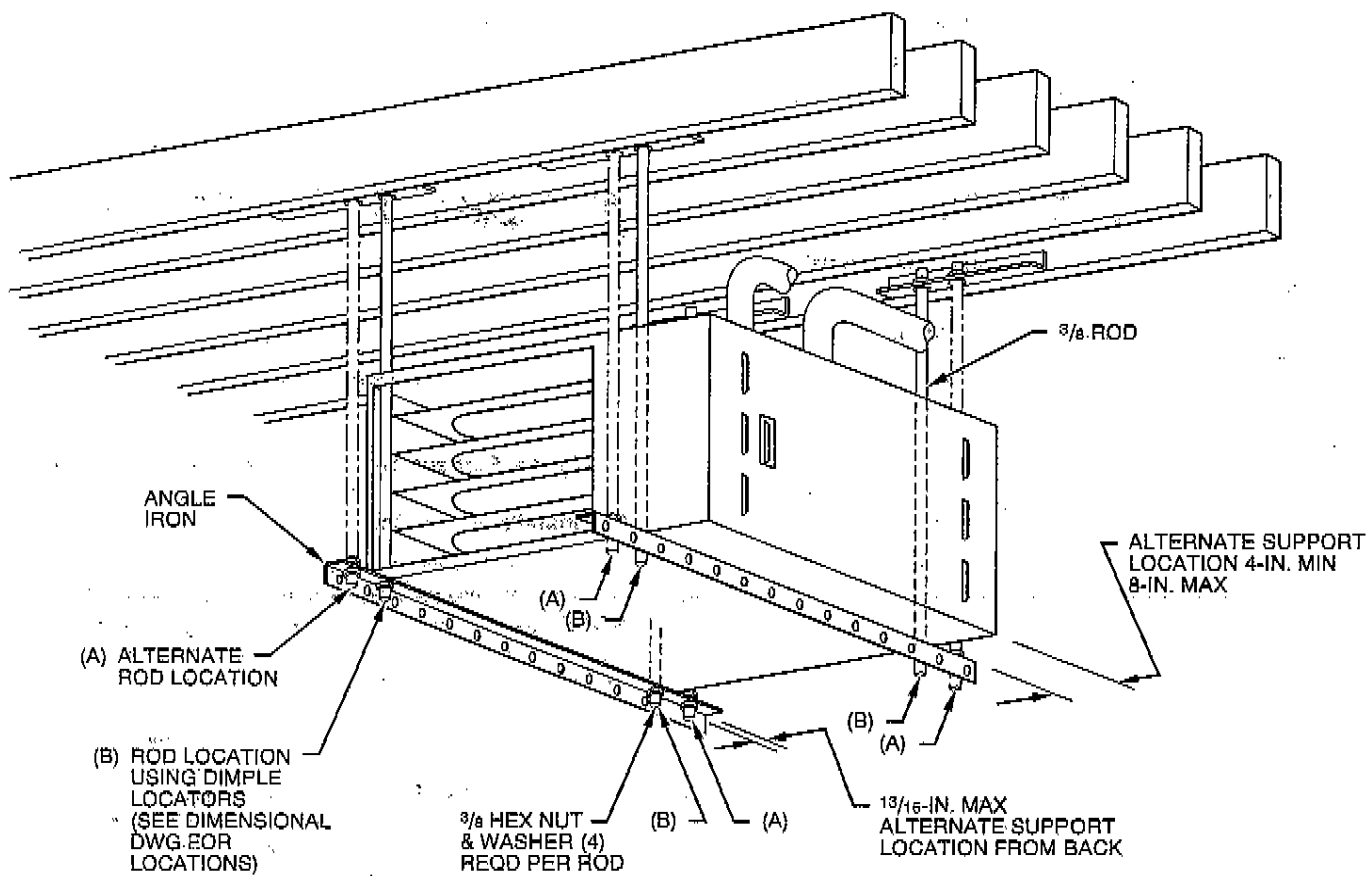
A93029



A78651

Fig. 16—Furnace, Plenum, and Subbase Installed on a Combustible Floor

NOTE: These furnaces can be installed horizontally in either horizontal left or right discharge position. In a crawl space, furnace can either be hung from floor joist or installed on suitable blocks or pad. Furnace can be suspended from each corner by hanger bolts (4 each 3/8-in. all-thread rod) cut to desired length, 1 by 3/8 flat washer, 3/8 lockwasher, and 3/8 nut. Dimples are provided for hole locations. (See Fig. 2.)



NOTE: 1-in. clearance minimum between top of furnace and combustible material

Fig. 17—Crawlspace Horizontal Application

A93323

D. Filter



CAUTION: Never operate unit without a filter or with blower access panel removed.

FILTER ARRANGEMENT

Factory-supplied washable framed filters are shipped in blower compartment. Determine location for filter and relocate filter retaining wire if necessary. See Table 3 to determine correct filter size for desired filter location. Table 3 indicates filter size, location, and quantity shipped with this furnace. See Fig. 2 for location and size of bottom and side return-air openings.

TABLE 3—FILTER INFORMATION (IN.)

FURNACE CASING WIDTH	FILTER SIZE *		FILTER TYPE FRAMED
	Side Return	Bottom Return	
17-1/2	(1) 16 X 25 X 1†	(1) 16 X 25 X 1	Cleanable
21	(1) 16 X 25 X 1	(1) 20 X 25 X 1†	Cleanable
24-1/2	(2) 16 X 25 X 1†	(1) 24 X 25 X 1	Cleanable

* Filters can be field modified by cutting frame as marked and folding to desired size. Alternate sizes can be ordered from your distributor or dealer.
† Factory provided with furnace.



CAUTION: Air delivery above 1800 CFM requires that both sides, a combination of 1 side and bottom, or bottom only of furnace be used for return air.

NOTE: Side return-air openings can ONLY be used in UPFLOW installed applications. Install filter(s) as shown in Fig. 18.

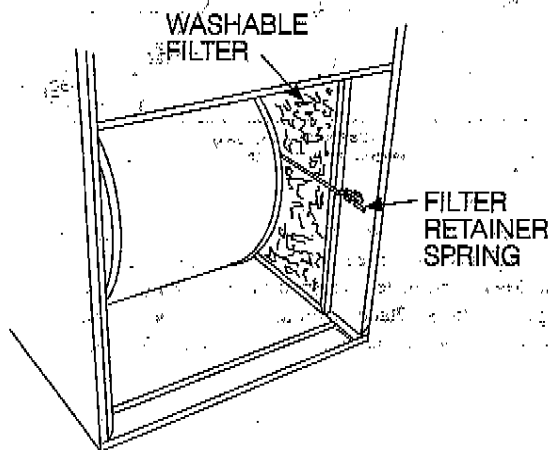


Fig. 18—Filter Installed for Side Inlet

For bottom return-air applications, filter may need to be cut to fit some furnace widths. Install filter as shown in Fig. 19.

NOTE: Remove and discard bottom closure panel when bottom return-air opening is used.

E. Bottom Closure Panel

These furnaces are shipped with bottom closure panel installed in bottom return-air opening. This panel MUST be in place when side return air is used.

Removal of Bottom Closure Panel – To remove bottom closure panel, perform following:

1. Tilt or raise furnace and remove 2 screws holding front filler panel. (See Fig. 20.)
2. Rotate front filler panel downward to release holding tabs.
3. Remove bottom closure panel.

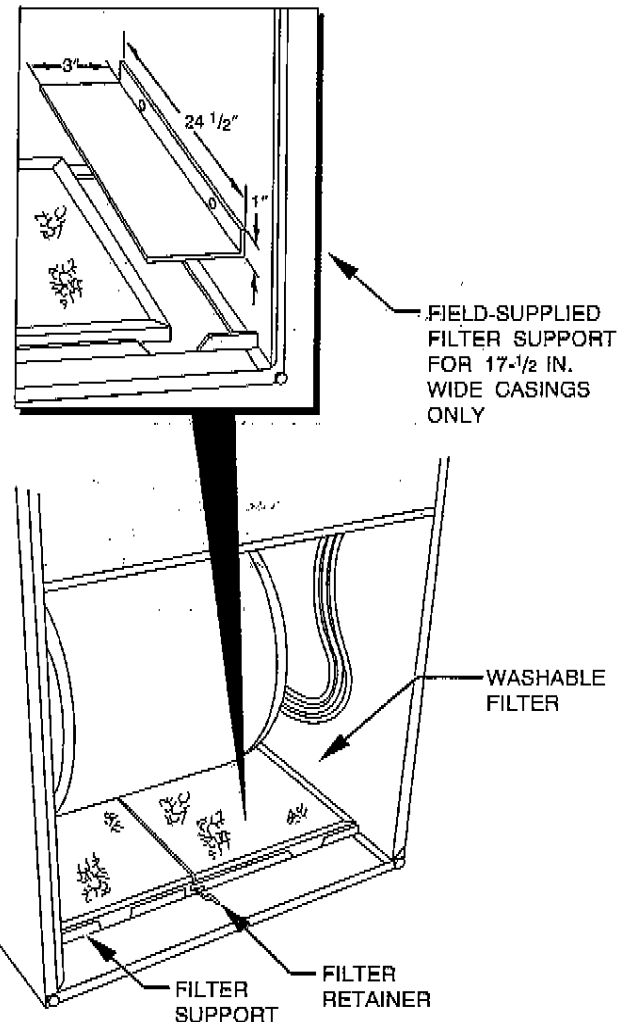


Fig. 19—Bottom Filter Arrangement

A93321

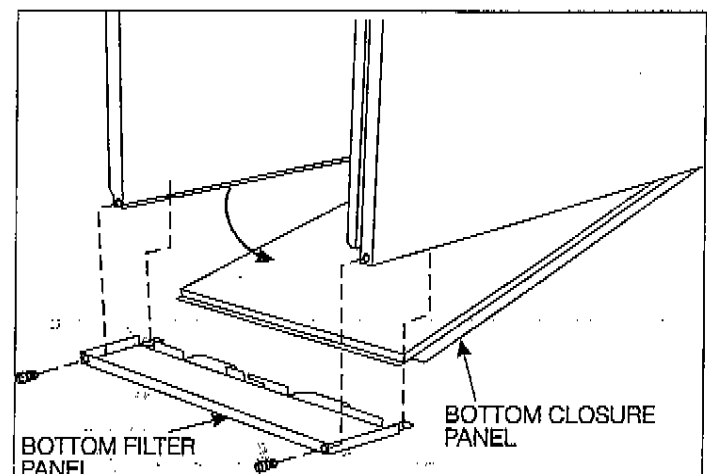


Fig. 20—Removing Bottom Closure Panel

A93047

4. Reinstall front filler panel and screws.

F. Gas Piping

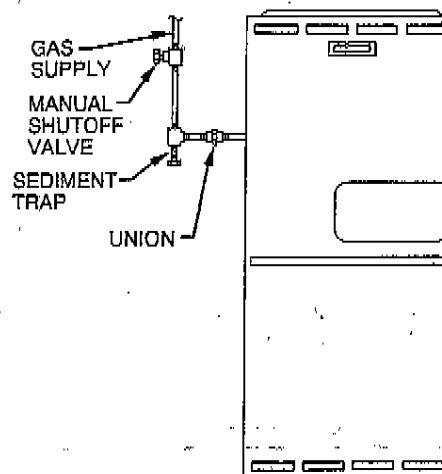
Gas piping must be installed in accordance with national and local codes. Refer to current edition of National Fuel Gas Code. Canadian installations must be made in accordance with CAN/CGA-B149 Installation Codes, and all authorities having jurisdiction. Gas supply line should be a separate line running directly from meter to furnace, if possible. Refer to Table 4 for recommended gas pipe sizing. Risers must be used to connect to

furnace and to meter. Support all gas piping with appropriate straps, hangers, etc. Use a minimum of 1 hanger every 6 ft. Joint compound (pipe dope) should be applied sparingly and only to male threads of joints. Pipe dope must be resistant to propane gas.

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

WARNING: Gas valve knob **MUST** be facing forward or tilted upward. Failure to follow this warning could result in property damage or death.

WARNING: Never purge a gas line into a combustion chamber. Never use matches, candles, flame, or other sources of ignition for purpose of checking leakage. Use a soap-and-water solution to check for leakage. A failure to follow this warning could result in fire, explosion, personal injury, or death.



A93048

Fig. 21—Typical Gas Pipe Arrangement

WARNING: Use proper length of pipe to avoid stress on gas control manifold. Failure to follow this warning could result in a gas leak resulting in fire, explosion, personal injury, or death.

TABLE 4—MAXIMUM CAPACITY OF PIPE*

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

* Cubic ft of gas per hr 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). Ref: Table C-4 NFPA 54-1992.

Install a sediment trap in riser leading to furnace. Trap can be installed by connecting a tee to riser leading to furnace, so that straight-through section of tee is vertical. Then connect a capped nipple into lower end of tee. Capped nipple should extend below level of gas controls. Place a ground joint union between gas control manifold and manual gas shutoff valve. (See Fig. 21.)

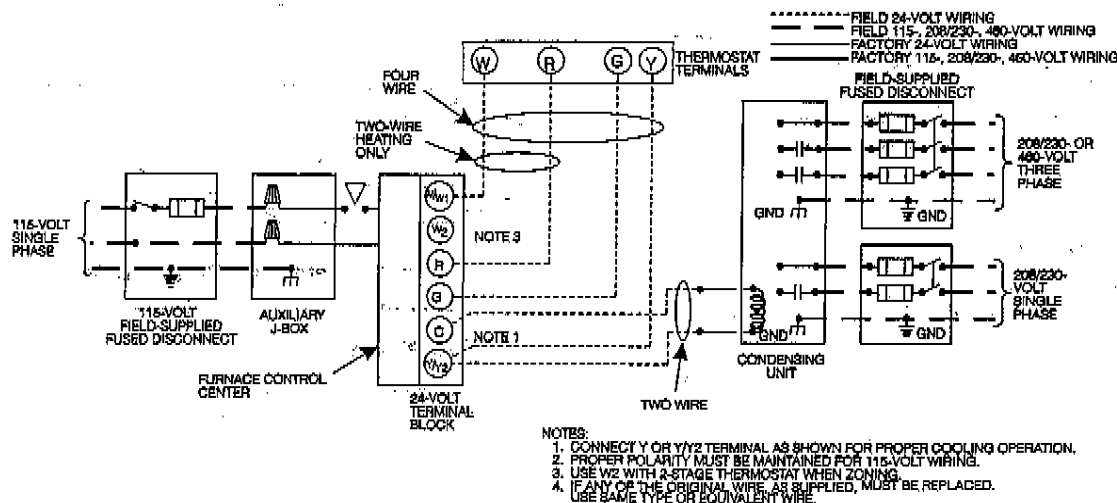


Fig. 22—Heating and Cooling Application Wiring Diagram

A93049

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

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** be installed immediately upstream of gas supply connection to furnace and downstream of manual shutoff valve.

NOTE: The gas valve inlet press tap connection (See Fig. 45.) is suitable to use as test gage connection providing test pressure **DOES NOT** exceed maximum 0.5 psig (14-in. wc) stated on gas valve. Piping should be pressure tested in accordance with local and national plumbing and gas codes before furnace has been attached. In Canada, refer to current edition of National Standard of Canada CAN/CGA-B149 Installation Codes. If pressure exceeds 0.5 psig (14-in. wc), gas supply pipe must be disconnected from furnace and capped before 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 test. It is recommended that ground joint union be loosened before pressure testing. After all connections have been made, purge lines and check for leakage.

IV. ELECTRICAL CONNECTIONS

See Fig. 22 for field wiring diagram showing typical field 115-v and 24-v wiring. Check all factory and field electrical connections for tightness.

WARNING: Blower access panel door switch opens 24-v power to control center. No component operation can occur. The 115-v power is still present at control center and transformer. Do not bypass or close switch with panel removed. Failure to follow this warning could result in personal injury or death.

CAUTION: Furnace control must be grounded for proper operation or control will lockout. Control is grounded through green wire routed to gas valve and burner box screw.

A. 115-v Wiring

Before proceeding with electrical connections, make certain that voltage, frequency, and phase correspond to that specified on unit rating plate. Also, check to be sure that service provided by utility is sufficient to handle load imposed by this equipment. Refer to rating plate or to Table 5 for equipment electrical specifications.

Make all electrical connections in accordance with National Electrical Code ANSI/NFPA 70-1993 and any local codes or ordinances that might apply. For Canadian installations, all electrical connections must be made in accordance with CSA C22.1 Canadian Electrical Code, or subauthorities having jurisdiction.

ELECTRIC
DISCONNECT
SWITCH



COPPER
WIRE ONLY



A93033

CAUTION: Do not connect aluminum wire between disconnect switch and furnace. Use only copper wire.

Use a separate, fused branch electrical circuit containing a properly sized fuse or circuit breaker for this furnace. See Table 5 for wire size and fuse specifications. A disconnecting means must be located within sight from, and readily accessible to, furnace.

NOTE: Proper polarity must be maintained for 115-v wiring. If polarity is incorrect, control center fault code indicator light will flash rapidly and furnace will **NOT** operate.

WARNING: Cabinet **MUST** have an uninterrupted or unbroken ground according to National Electrical Code, ANSI/NEPA 70-1993 and Canadian Electrical Code, CSA C22.1 or local codes to minimize personal injury if an electrical fault should occur. This may consist of electrical wire or conduit approved for electrical ground when installed in accordance with existing electrical codes. Do not use gas piping as an electrical ground. Failure to follow this warning could result in electrical shock, fire, or death.

B. J-Box Relocation

1. Remove 2 screws holding auxiliary J-box. (See Fig. 24.)
2. Rotate J-box 180° and attach box to right side, using holes provided.

CAUTION: If manual disconnect switch is to be mounted on furnace, select a location where a drill or fastener will not contact electrical or gas components.

C. 24-v Wiring

Make field 24-v thermostat connections at 24-v terminal block on control center. Y wire from thermostat must be connected to Y terminal on control center, as shown in Fig. 22, for proper cooling operation. The 24-v terminal board is marked for easy connection of field wiring. (See Fig. 23.) The 24-v circuit contains a 3-amp, automotive-type fuse located on control center. (See Fig. 25.) Any electrical shorts of 24-v wiring during installation, service, or maintenance may cause fuse to blow. If fuse replacement is required, use only a fuse of identical size (3 amp).

TABLE 5—ELECTRICAL DATA

UNIT SIZE	VOLTS- HERTZ- PHASE	OPERATING VOLTAGE RANGE		MAX UNIT AMPS	MIN WIRE SIZE	MAX WIRE LENGTH (FT)†	MAX FUSE OR CKT BKR AMPS‡
		Max*	Min*				
042040	115-60-1	127	104	9.0	14	44	15
042060	115-60-1	127	104	9.0	14	44	15
042080	115-60-1	127	104	9.0	14	44	15
060100	115-60-1	127	104	13.0	12	44	20

* Permissible limits of voltage range at which unit will operate satisfactorily.† Length shown is as measured 1 way along wire path between unit and service panel for maximum 2 percent voltage drop.‡ Time-delay fuse is recommended.

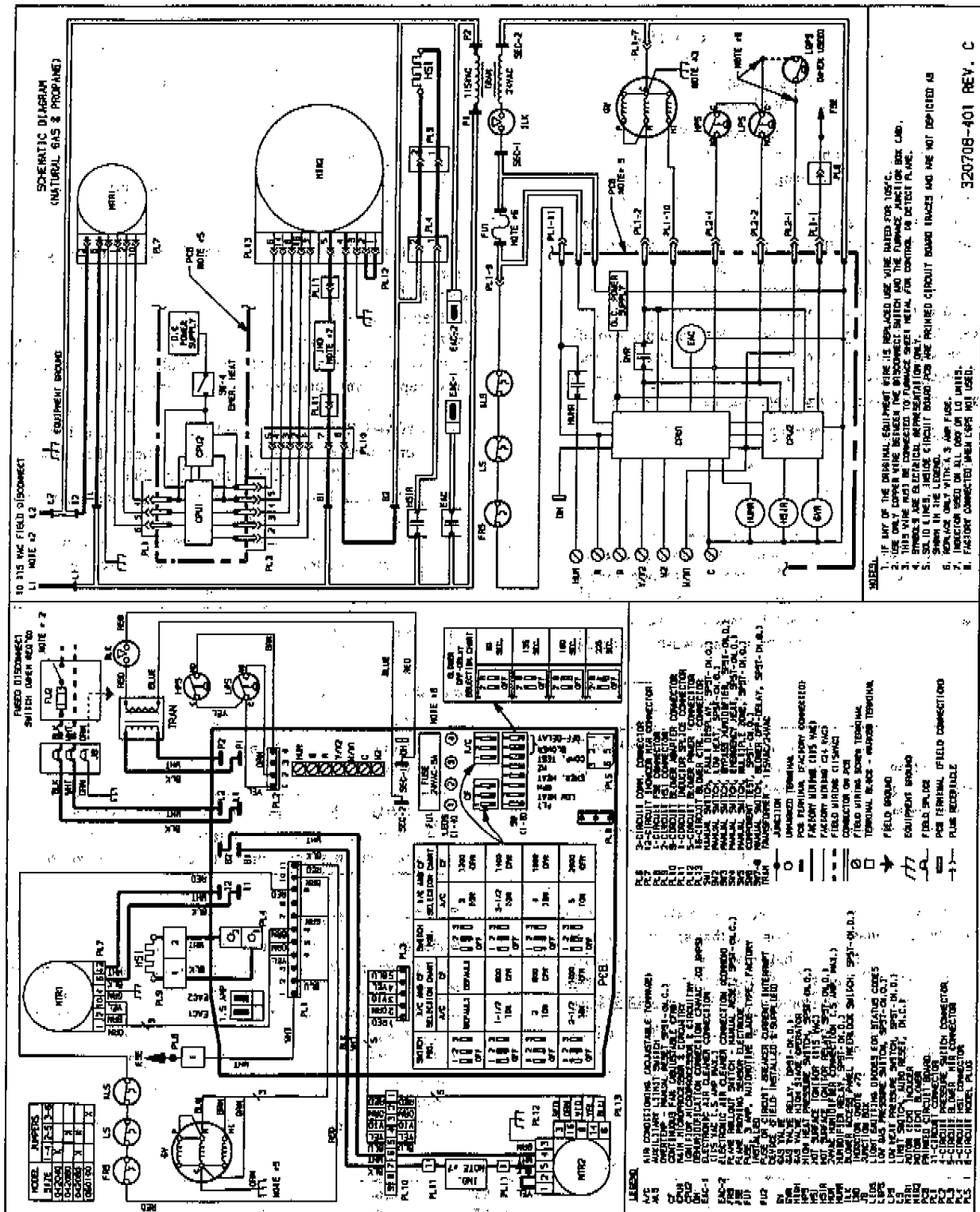


Fig. 23—Wiring Diagram

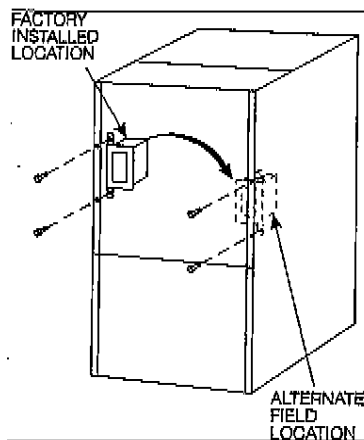


Fig. 24—Relocating J-Box

A93051

NOTE: Use AWG No. 18 color coded copper thermostat wire for lengths up to 100 ft. For wire lengths over 100 ft use AWG No. 16 wire.

D. Accessories

1. Electronic Air Cleaner (EAC)

Two spring clamp terminals (for 12 gage maximum, solid or stranded wire), marked EAC-1 and EAC-2, are provided for EAC connection. (See Fig. 25.) These terminals are energized with 115v (1.5-amp maximum) during blower motor operation. To connect EAC power leads to furnace control center, strip approximately 1/8 in. of insulation from wire. Open terminal by depressing switch arm with a screwdriver or finger, and insert wire as shown in Fig. 26.

2. Humidifier (HUM)

Screw terminals (HUM and C) are provided for 24-v humidifier connection. (See Fig. 25.) HUM terminal is energized with 24-v (0.5-amp maximum) after inducer motor prepurge period.

NOTE: A field-supplied, 115-v controlled relay connected to EAC terminals may be added if humidifier operation is desired during blower operation.

3. Dehumidification (DH)

A 1/4-in. male quick connect terminal is provided on the control center (See Fig. 25.) to attach a normally open (N/O) humidistat contact when dehumidification is desired. Connect the humidistat to the thermostat R terminal and DH terminal on the control center. A 15 percent reduction of the cooling airflow or constant fan airflow will occur when the DH terminal is energized and a "call for cooling", single- or 2-speed, is received.

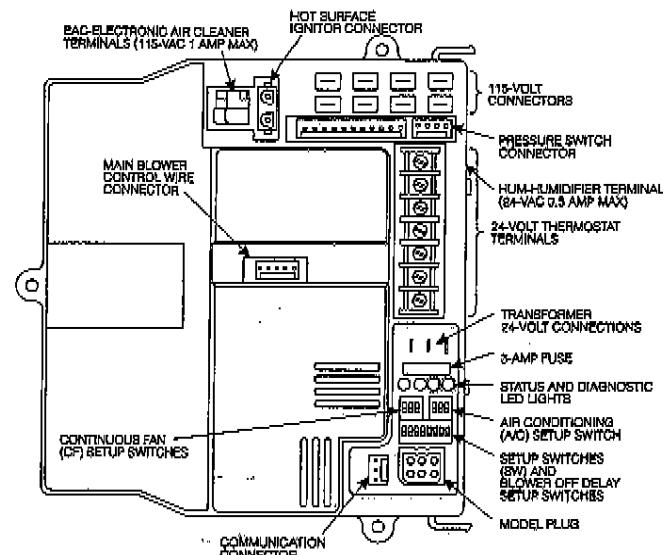
V. DIRECT VENTING

The 355MAV models require a dedicated (one 355MAV furnace only) direct-vent system. In a direct-vent system, all air for combustion is taken directly from outside atmosphere, and all flue products are discharged to outside atmosphere.

A. Removal of Existing Furnaces from Common Vent Systems

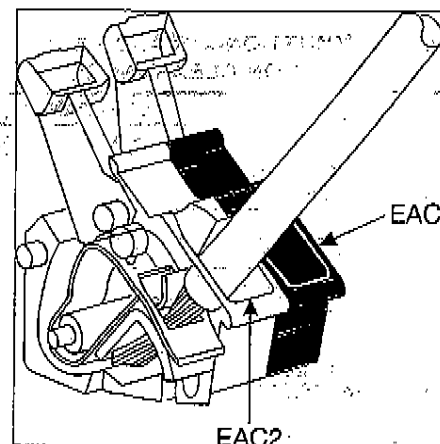
If furnace being replaced was connected to a common vent system with other appliances, these steps shall be followed with each appliance remaining connected to common vent system placed in operation, while other appliances remaining connected to common vent system are not in operation:

1. Seal any unused openings in common vent system.
2. Visually inspect vent system for proper size and horizontal pitch, and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.



A93062

Fig. 25—Control Center



A93053

Fig. 26—EAC Terminals on Control Center

3. Insofar as is practical, close all building doors and windows and all doors between space in which appliances remaining connected to common vent system are located and other spaces of building. Turn on clothes dryers and any appliance not connected to common vent system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Follow lighting instructions and place appliance in operation. Adjust thermostat so appliance will operate continuously.
5. Test for flue gas spillage at draft hood relief opening after 5 minutes of main burner operation. Use flame of a match or candle, etc.
6. After it has been determined that each appliance remaining connected to common vent system properly vents when tested as above, return doors, windows, exhaust fans, fireplace dampers, any other gas burning appliances to their previous condition of use.
7. If improper venting is observed during any of above tests, common vent system must be corrected. Vent system or vent connectors may need to be resized. For any other appliances when resizing vent systems or vent connectors, system or connector must be sized to approach minimum size as determined using appropriate table found in Part 11 of National Fuel Gas Code NFPA 54 or ANSI Z223.1-1992, or Section 5 of CAN/CGA-B149 for Canadian standards.

B. COMBUSTION-AIR AND VENT PIPING

Combustion-air and vent pipe 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), D2661 (ABS-DWV), or F628 (schedule-40 ABS). Pipe cement and primer must conform to ASTM standards D2564 (PVC) or D2235 (ABS). See Table 7 for maximum pipe lengths and Fig. 30, 31, 32, 33, and 34 for exterior piping arrangements.

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.

NOTE: Furnace combustion-air and vent pipe connections are sized for 2-in. pipe. Any pipe size change should be made outside furnace casing in vertical pipe. (See Fig. 27.) This will allow proper drainage of vent condensate.

NOTE: Vertical vent installations may require two 45° elbows instead on one 90° elbow to minimize gurgling sound from excessive condensate draining in vent pipe. (See Fig. 27.)

TABLE 6—COMBUSTION-AIR AND VENT PIPE TERMINATION CLEARANCES

LOCATION	CLEARANCE (FT)	
	U.S.A.	CANADA
Above grade level or above anticipated snow depth	1	1†
Dryer vent	3	3
From plumbing vent stack	3	3
Gas appliance vent terminal	3	3
From any mechanical fresh air intake	1	6
For furnaces with an input capacity less than 100,000 Btuh—from any non-mechanical air supply or combustion-air opening	1	1
For furnaces with an input capacity greater than 100,000 Btuh—from any non-mechanical air supply or combustion-air opening	1	3
From service regulator vent, electric and gas meters, and relief equipment	4*	6†
Above grade when adjacent to public walkway	7	7

If installing 2 adjacent 355MAV furnaces, refer to Multi-Venting and Vent Terminations of 355MAV furnaces for proper vent configurations.

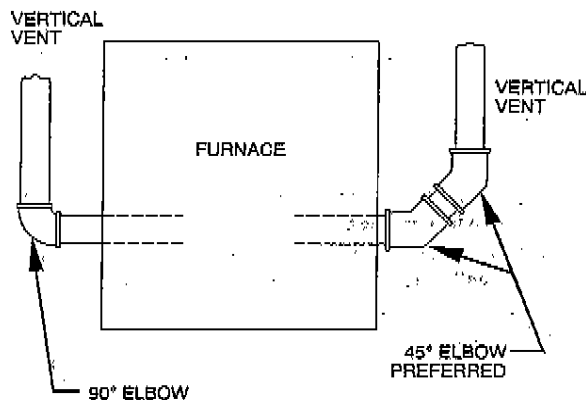
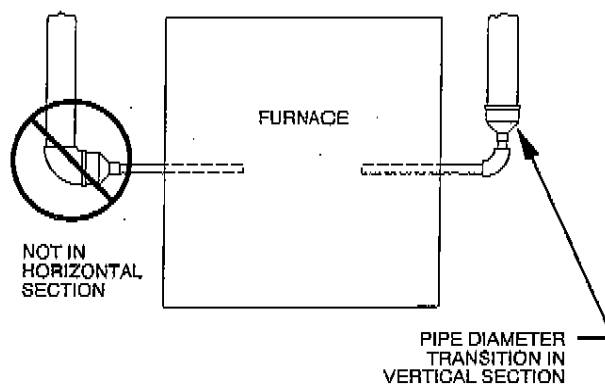
* Horizontal distance.

†36 in. to electric meter in Canada only.

‡18 in. above roof surface in Canada.

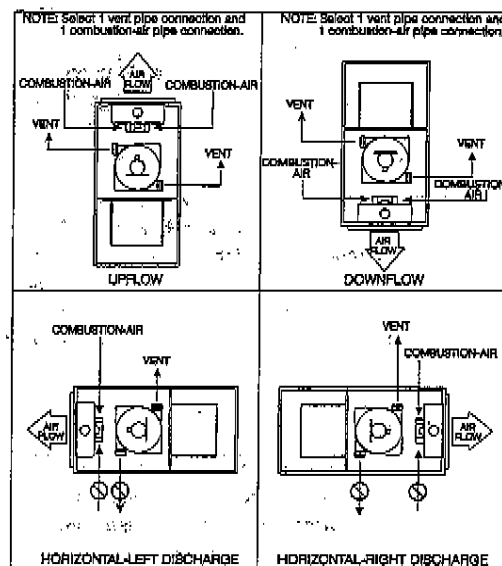
Combustion-air and vent pipes must terminate together in same atmosphere pressure zone, either through roof or sidewall (roof termination preferred), using 1 of 4 accessory termination kits. See Table 6 for required clearances.

Furnace combustion-air and vent pipe connections must be attached as shown in Fig 28. Combustion-air intake plug fitting and inducer housing tuning valve may need to be relocated in some applications.



A83034

Fig. 27—Combustion-Air and Vent Pipe Diameter Transition Location and Elbow Configuration



A93083

Fig. 28—Combustion-Air and Vent Pipe Connections



CAUTION: When combustion-air pipe is installed above a suspended ceiling, pipe must be insulated with 3/8-in. thick Armaflex-type insulation. Combustion-air pipe should also be insulated when it passes through warm, humid space.

CAUTION: When vent pipe is exposed to temperatures below freezing, such as when it passes through an unheated space or when a chimney is used as a raceway, pipe must be insulated as shown in Table 8 with Armaflex-type insulation.

CAUTION: Combustion air must not be taken from inside 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, adhesives, paint, and other household products. 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. Avoid breathing in vapor or allowing contact with skin or eyes. Failure to follow this warning could result in fire, property damage, personal injury, or death.

WARNING: All combustion-air and vent pipes must be airtight and watertight. Pipes must also terminate exactly as shown in Fig. 30, 31, 32, 33, and 34. Failure to follow this warning could result in property damage, personal injury, or death.

COMBUSTION-AIR INTAKE HOUSING PLUG FITTING

The combustion-air intake plug fitting must be installed in unused combustion-air intake housing. This fitting must be attached by using RTV sealant, or by drilling a 1/8-in. hole in fitting, using hole in intake housing as a guide. Install a field-supplied No. 6 or No. 8 sheet metal screw.

NOTE: DO NOT OVERTIGHTEN SCREW. Breakage to intake housing or fitting may cause air leakage to occur.

A plugged drain connection has been provided on this fitting for use when moisture is found in combustion-air intake pipe and combustion box.

NOTE: Moisture in combustion-air intake may be result of improper termination. Ensure combustion-air intake pipe is similar to that shown in Fig. 30, 31, 32, 33, or 34 so it will not be susceptible to areas where light snow or other sources of moisture could be pulled in.

If use of this drain connection is desired, drill out fitting's tap plug with a 3/16-in. drill, and connect a field-supplied 3/8-in. tube. This tube should be routed to open condensate drain for furnace and A/C (if used), and should be trapped. (See Fig. 29.)

Combustion-air intake pipe must be connected as shown in Fig. 28 for application. Insert 2-in. pipe into appropriate opening of combustion-air intake housing. Drill a 1/8-in. hole in pipe using hole in combustion-air intake housing as a guide. Install a field-supplied No. 6 or No. 8 sheet metal screw.

NOTE: Do not attach combustion-air intake pipe permanently to combustion-air intake housing since it may be necessary to remove pipe for service of ignitor or flame sensor.

Vent pipe must be connected as shown in Fig. 28 for application. Locate tuning valve to unused pipe opening. See details below. Locate neoprene coupling and clamp on appropriate vent pipe inducer housing connection. Insert 2-in. vent pipe through coupling and bottom it in inducer housing. Tighten clamp securely to pipe and inducer housing.

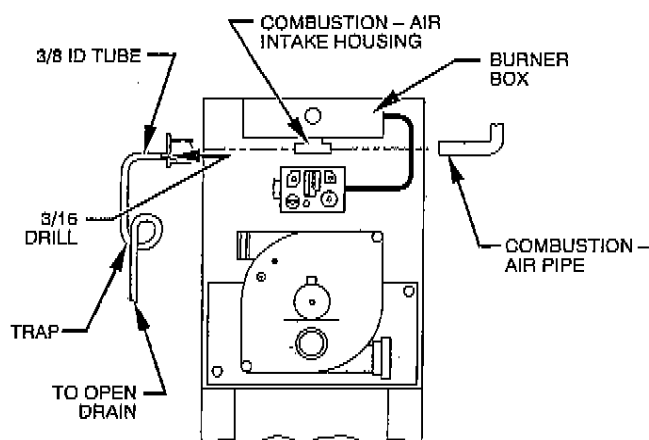


Fig. 29—Intake Housing Plug Fitting Drain A83035

TUNING VALVE

Tuning valve is factory located in left inducer housing vent connection. If tuning valve needs to be relocated, turn it COUNTER-CLOCKWISE until tabs on inducer housing hit tuning valve stops. Pull tuning valve out of inducer housing and insert it in unused inducer housing opening. Install it by aligning tabs on inducer housing with slots in tuning valve. Slide tuning valve into inducer housing opening and turn CLOCKWISE until tabs engage on notches. See Section 6—Start-Up procedures for adjustment of tuning valve.

COMBUSTION-AIR AND VENT PIPE DIAMETER

Determine combustion-air and vent pipe diameter.

1. Using Table 7, determine preliminary combustion-air pipe diameter.
2. Using Table 7, determine preliminary vent pipe diameter.
3. Use largest diameter pipe determined in (1) and (2) above for both pipes.

NOTE: Shaded parts in Fig. 30, 31, 32, 33, and 34 are considered to be termination. These components should NOT be counted when determining pipe diameter.

EXAMPLE: An 080 size furnace located in Indianapolis, elevation 650 ft above sea level, could be installed in an application requiring 3 elbows and 26 ft of vent pipe, along with 5 elbows and 22 ft of combustion-air pipe. Table 7 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 30 ft with 3 elbows, but 20 ft with 5 elbows). Therefore, 2-in. diameter pipe must be used for both vent and combustion-air pipes since larger required diameter must always be used for both pipes. If same installation were in Albuquerque, elevation 5250 ft above sea level, installation would require 2-in. vent pipe and combustion-air pipe. At 5001- to 6000-ft elevation, 1-1/2 in. pipe is only good for 9 ft with 5 elbows, and 2-in. pipe is good for 70 ft with 5 elbows.

COMBUSTION-AIR AND VENT PIPE ATTACHMENT

1. Attach combustion-air pipe to intake housing and secure with screw as stated above.

NOTE: All pipe joints must be water tight except attachment of combustion-air pipe to inlet housing connection, since it may be necessary to remove pipe for servicing.

2. Working from furnace to outside, cut pipe to required length(s).
3. Deburr inside and outside of pipe.
4. Chamfer outside edge of pipe for better distribution of primer and cement.
5. Clean and dry all surfaces to be joined.

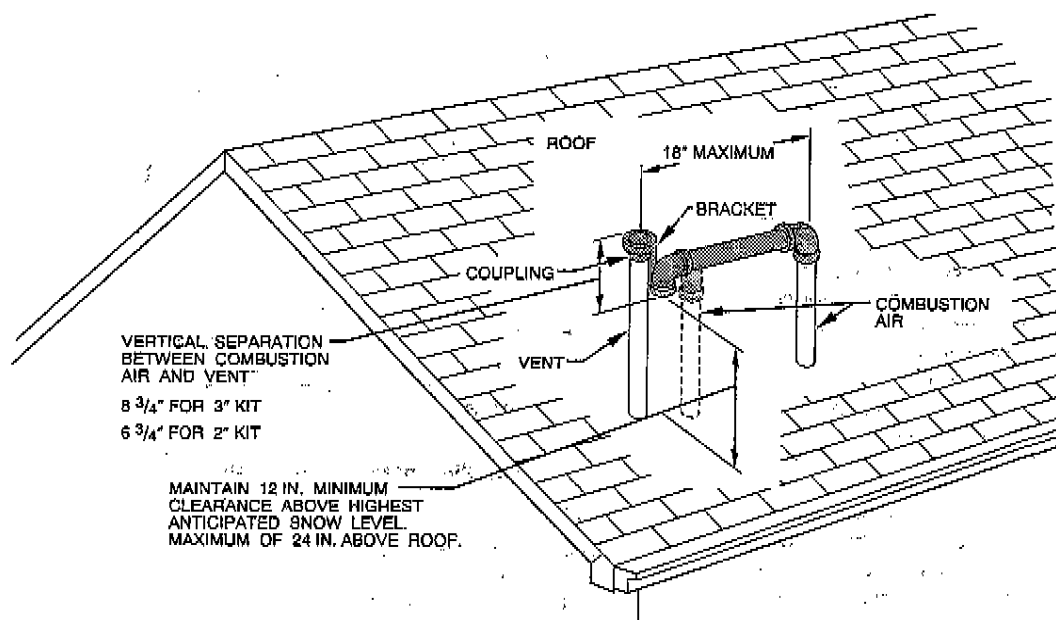


Fig. 30-Roof Termination (Preferred)

A87224

6. Check dry fit of pipe and mark insertion depth on pipe.

NOTE: It is recommended that all pipes be cut, prepared, and preassembled before permanently cementing any joint.

7. After pipes have been cut and preassembled, apply generous layer of cement primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply approved cement to end of pipe and fitting socket (over primer). Apply cement in a light, uniform coat on inside of socket to prevent buildup of excess cement. Apply second coat.
8. While cement is still wet, insert pipe into socket with a 1/4 turn twist. Be sure pipe is fully inserted into fitting socket.
9. Wipe excess cement from joint. A continuous bead of cement will be visible around perimeter of a properly made joint.
10. Handle pipe joints carefully until cement sets.
11. Support combustion-air and vent piping a minimum of every 5 ft (3 ft for SDR-21 or -26 PVC) using perforated metal hanging strap.
12. Slope combustion-air and vent pipes toward furnace a minimum of 1/4 in. per linear ft with no sags between hangers.
13. Use appropriate methods to seal openings where vent and combustion-air pipes pass through roof or side wall.

C. Concentric Vent and Combustion-Air Termination Kit Installation

NOTE: If these instructions differ from those packaged with termination kit, follow kit instructions.

Combustion-air and vent pipes must terminate outside structure. A factory accessory termination kit must be installed in 1 of the installations shown in Fig. 30, 31, 32, 33, and 34. Four termination kits are available.

1. The 2-in. termination bracket kit is for 1-in., 1-1/2 in., and 2-in. diameter 2-pipe termination systems.
2. The 3-in. termination bracket kit is for 2-1/2 in. and 3-in. diameter 2-pipe termination systems.
3. The 2-in. concentric vent/air termination kit is for 1-in., 1-1/2 in., 2-in., 2-1/2 in., and 3-in. diameter pipe systems when single penetration of wall or roof are desired.

4. The 3-in. concentric vent/air termination kit is for 2-1/2 in. and 3-in.-diameter pipe systems when single penetration of wall or roof are desired.

NOTE: Shaded parts in Fig. 30, 31, 32, 33, and 34 are considered to be termination. These components should NOT be counted when determining pipe diameter.

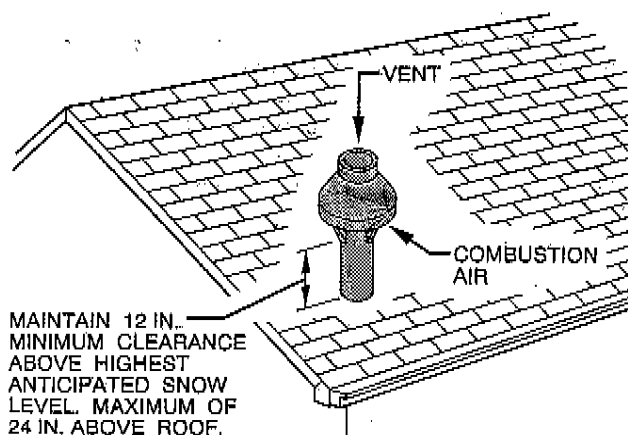
NOTE: Roof termination is preferred since it is less susceptible to damage, has reduced changes to intake contaminants, and has less visible vent vapors. See Fig. 30 or 31.

NOTE: Sidewall termination may require sealing or shielding of building surfaces with a corrosive resistance material due to corrosive combustion products of vent system.

D. Extended Exposed Sidewall Pipes

Sidewall combustion-air and vent pipe terminations may be extended beyond area shown in Fig. 32 or 33 in outside ambients by insulating pipes as indicated in Table 8.

1. Determine combustion-air and vent pipe diameters as stated above, using total pipe length and number of elbows.
2. Using Winter Design Temperature (used in load calculations), find appropriate temperature for your application and furnace model.



A93054

Fig. 31-Concentric Vent and Combustion-Air Termination, Roof Termination (Preferred)

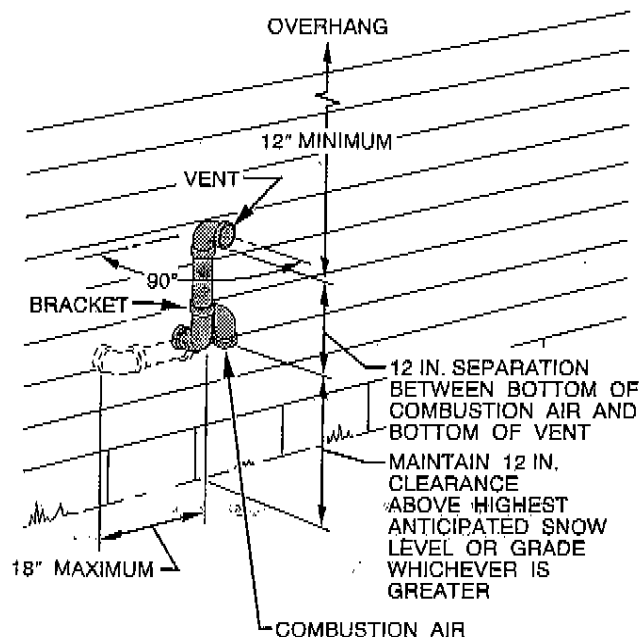


Fig. 32--Sidewall Termination (12 In. or more)

A87225

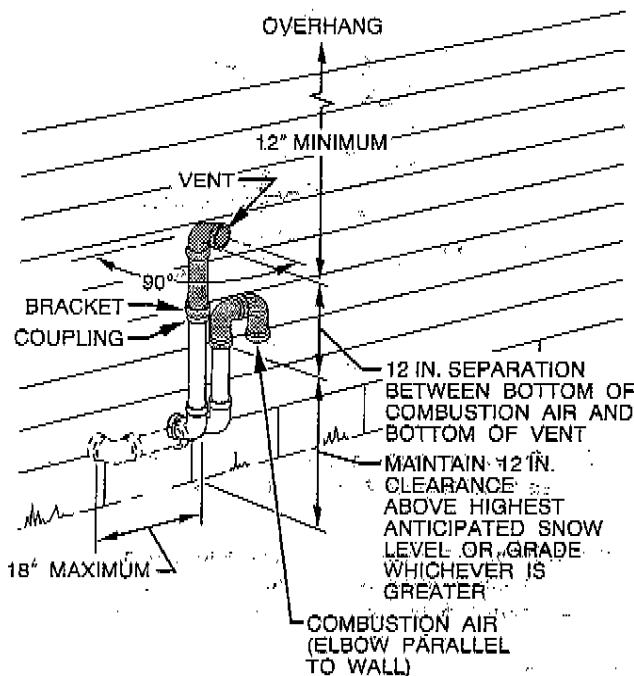


Fig. 33--Sidewall Termination (less than 12 In.)

A87226

3. Determine required insulation thickness for exposed pipe lengths.

NOTE: Pipe length (ft) specified for maximum pipe lengths located in unconditioned spaces cannot exceed total allowable pipe length as specified in Table 7.

E. Two-Pipe Termination Kit

1. Determine location for termination.

Considerations for following should be used when determining an appropriate location for termination kit.

- a. Comply with all clearance requirements as stated in Table 6.
- b. Termination kit should be positioned where vent vapors will not damage plants/shrubs or air conditioning equipment.

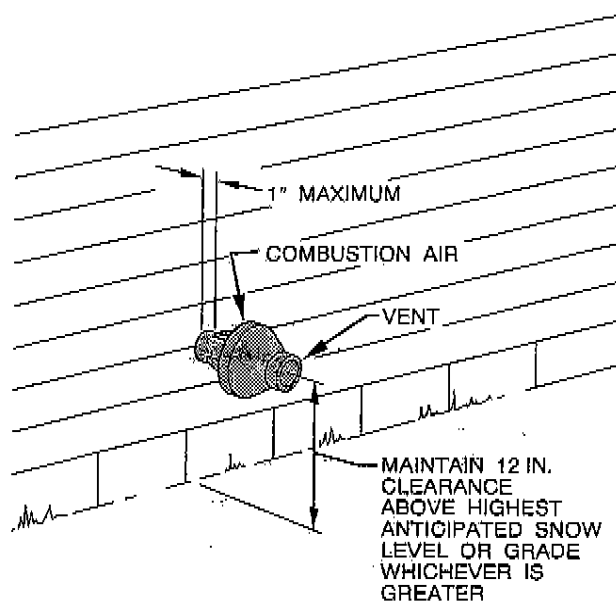


Fig. 34--Concentric Vent and Combustion-Air Side Termination

A93055

- c. Termination kit should be positioned so that it will not be affected by wind eddy, or allow recirculation of flue gases, airborne leaves, or light snow.
- d. Termination kit should be positioned where it will not be damaged or subjected to foreign objects, such as stones, balls, etc.
- e. Termination kit should be positioned where vent vapors are not objectionable.

2. Cut 2 holes, 1 for each pipe, of appropriate size for pipe size being used.
3. Loosely install elbow in bracket and place assembly on combustion-air pipe.

Roof terminations—Loosely install pipe coupling on properly cut vent pipe. Coupling must be positioned so bracket will mount as shown in Fig. 30.

For applications using combustion-air pipe option, indicated by dashed lines in Fig. 30, install 90° street elbow into 90° elbow, making U-fitting. A 180° U-fitting may be used.

Sidewall terminations—Install bracket as shown in Fig. 32 or 33.

For applications using vent pipe option indicated by dashed lines in Fig. 32, rotate vent elbow 90° from position shown in Fig. 32.

4. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.
5. Check required dimensions as shown in Fig. 30, 32, or 33.

F. Concentric Vent/Air Termination Kit

1. Determine location for termination.

Considerations for following should be used when determining an appropriate location for termination kit.

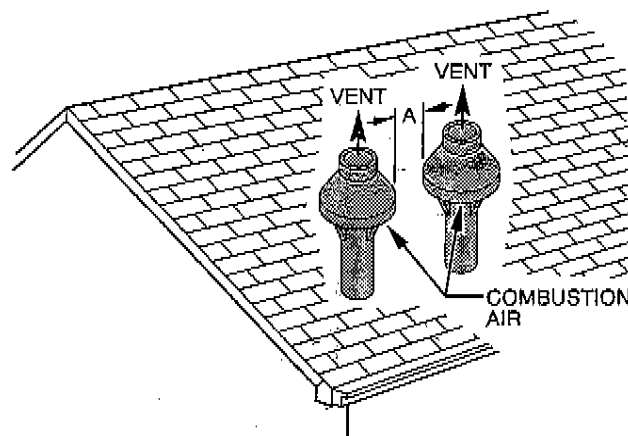
- a. Comply with all clearance requirements as stated in Table 6.
- b. Termination kit should be positioned where vent vapors will not damage plants/shrubs or air conditioning equipment.
- c. Termination kit should be positioned so it will not be affected by wind eddy, or that may allow recirculation of flue gases, airborne leaves, or light snow.

- d. Termination kit should be positioned where it will not be damaged or subjected to foreign objects, such as stones, balls, etc.
- e. Termination kit should be positioned where vent vapors are not objectionable.
2. Cut 1 hole. A 4-in. diameter hole for 2-in. kit, or a 5-in. diameter hole for 3-in. kit.
3. Loosely assemble Concentric vent/air termination components together using instructions in kit.
4. Remove rain shield and slide assembled kit thru hole.

NOTE: Do not allow insulation or other materials to accumulate inside of pipe assembly when installing it through hole.

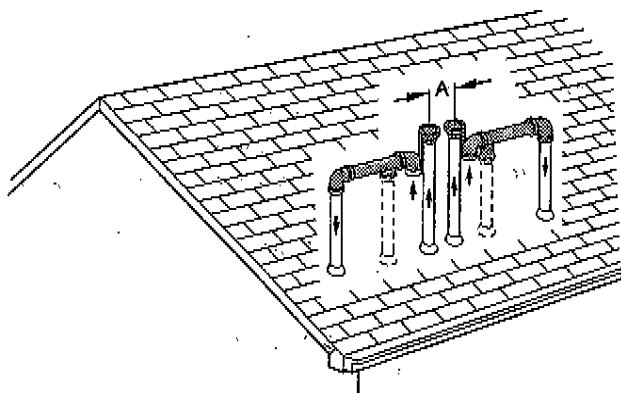
Roof terminations—Locate assembly through roof to appropriate height as shown in Fig. 31.

Sidewall terminations—Locate assembly through sidewall, with rain shield positioned no more than 1-in. from wall as shown in Fig. 34.



A93056

Fig. 36—Concentric Vent and Combustion-Air Roof Termination (Dimension A as touching or 2-in. maximum separation)



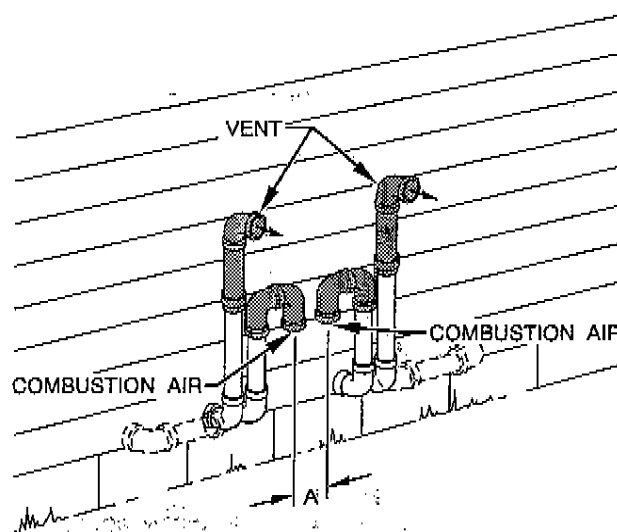
A85182

Fig. 35—Rooftop Termination (Dimension A as touching or 2-in. maximum separation)

5. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.
6. Check required dimensions as shown in Fig. 31 or 34.

G. Multiventing and Vent Terminations of 355MAV Furnace

When 2 or more direct vent furnaces are vented near each other, each furnace must be individually vented. NEVER common vent or breach vent this furnace. When 2 or more direct vent furnaces are vented near each other, 2 vent terminations may be installed as shown in Fig. 35, 36, 37, 38, or 39, but next vent termination must



A85184

Fig. 37—Sidewall Termination (12 in. or less)(Dimension A as touching or 2-in. maximum separation)

be at least 36 in. away from first 2 terminations. It is important that vent terminations be made as shown to avoid recirculation of flue gases. Dimension A in Fig. 35, 36, 37, 38, and 39 represents distance between pipes or rain shields, as touching or 2-in. maximum separation.

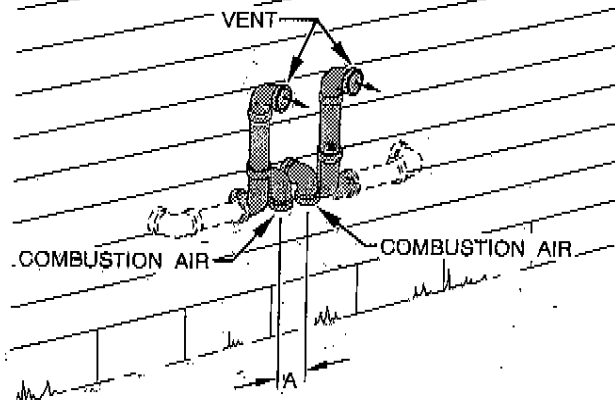


Fig. 38—Sidewall Termination (more than 12 In.) (Dimension A as touching or 2-in. maximum separation)

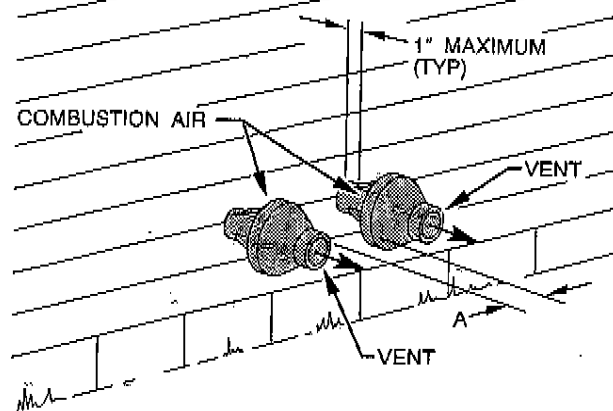


Fig. 39—Concentric Vent and Combustion Air Termination (Dimension A as touching or 2-in. maximum separation)

TABLE 7—MAXIMUM ALLOWABLE PIPE LENGTH (FT)

ALTITUDE	UNIT SIZE	TERMINATION TYPE	PIPE DIAMETER (IN.)	NUMBER OF 90° ELBOWS					
				1	2	3	4	5	6
0 TO 2000	040	2 Pipe or 2-In. Concentric	1-1/2	70	70	65	65	60	55
			2	70	70	70	70	70	70
	060	2 Pipe or 2-In. Concentric	1-1/2	70	70	65	65	60	55
			2	70	70	70	70	70	70
	080	2 Pipe or 2-In. Concentric	1-1/2	40	35	25	25	22	15
			2	70	70	70	70	70	70
2001 to 3000	040	2 Pipe or 2-In. Concentric	1-1/2	63	62	57	57	52	47
			2	70	70	70	70	70	70
	060	2 Pipe or 2-In. Concentric	1-1/2	63	62	57	57	52	47
			2	70	70	70	70	70	70
	080	2 Pipe or 2-In. Concentric	1-1/2	35	30	25	20	15	10
			2	70	70	70	70	70	70
3001 to 4000	040	2 Pipe or 2-In. Concentric	1-1/2	59	59	54	53	48	43
			2	70	70	70	70	70	70
	060	2 Pipe or 2-In. Concentric	1-1/2	59	59	54	53	48	43
			2	70	70	70	70	70	70
	080	2 Pipe or 2-In. Concentric	1-1/2	33	28	23	18	13	8
			2	70	70	70	70	70	70
4001 to 5000*	040	2 Pipe or 2-In. Concentric	1-1/2	51	46	36	31	26	17
			2	70	70	70	70	70	70
	060	2 Pipe or 2-In. Concentric	1-1/2	56	55	50	49	44	39
			2	70	70	70	70	70	70
	080	2 Pipe or 2-In. Concentric	1-1/2	31	26	21	16	11	6
			2-1/2	70	70	70	70	70	70
	100	2 Pipe or 2-In. Concentric	2	48	43	34	29	24	15
			2-1/2	70	70	70	70	70	70

ALTITUDE	UNIT SIZE	TERMINATION TYPE	PIPE DIAMETER (IN.)	NUMBER OF 90° ELBOWS					
				1	2	3	4	5	6
5001 to 6000*	040	2 Pipe or 2-In. Concentric	1-1/2	53	52	47	45	40	35
			2	70	70	70	70	70	70
	060	2 Pipe or 2-In. Concentric	1-1/2	53	52	47	45	40	35
			2	70	70	70	70	70	70
	080	2 Pipe or 2-In. Concentric	1-1/2	29	24	19	14	9	0
			2	70	70	70	70	70	70
	100	2 Pipe or 2-In. Concentric	2	45	40	31	26	21	12
			2-1/2	70	70	70	70	70	70
6001 to 7000*	040	2 Pipe or 2-In. Concentric	1-1/2	49	48	43	42	37	32
			2	70	70	68	67	66	64
	060	2 Pipe or 2-In. Concentric	1-1/2	49	48	43	42	37	32
			2	70	70	68	67	66	64
	080	2 Pipe or 2-In. Concentric	1-1/2	27	22	17	12	0	0
			2	70	70	68	67	66	64
	100	2 Pipe or 2-In. Concentric	2	42	37	28	23	18	10
			2-1/2	70	70	68	67	66	64
7001 to 8000*	040	2 Pipe or 2-In. Concentric	1-1/2	46	44	39	38	33	28
			2	66	65	63	62	60	59
	060	2 Pipe or 2-In. Concentric	1-1/2	46	44	39	38	33	28
			2	66	65	63	62	60	59
	080	2 Pipe or 2-In. Concentric	1-1/2	25	20	15	10	0	0
			2	66	65	63	62	60	59
	100	2 Pipe or 2-In. Concentric	2	39	34	26	21	16	0
			2-1/2	66	65	63	62	60	59
8001 to 9000*	040	2 Pipe or 2-In. Concentric	1-1/2	43	41	36	34	29	24
			2	62	60	58	56	55	53
	060	2 Pipe or 2-In. Concentric	1-1/2	43	41	36	34	29	24
			2	62	60	58	56	55	53
	080	2 Pipe or 2-In. Concentric	1-1/2	23	18	13	0	0	0
			2	62	60	58	56	55	53
	100	2 Pipe or 2-In. Concentric	2	36	31	23	18	13	5
			2-1/2	62	60	58	56	55	53
9001 to 10000*	040	2 Pipe or 2-In. Concentric	1-1/2	39	37	32	30	25	20
			2	57	55	53	51	49	47
	060	2 Pipe or 2-In. Concentric	1-1/2	39	37	32	30	25	20
			2	57	55	53	51	49	47
	080	2 Pipe or 2-In. Concentric	1-1/2	21	16	11	6	0	0
			2	57	55	53	51	49	47
	100	2 Pipe or 2-In. Concentric	2	33	28	20	15	10	0
			2-1/2	57	55	53	51	49	47

* Vent sizing for Canadian installations over 4500 ft (1370 m) above sea level are subject to acceptance by the local authorities having jurisdiction.

NOTES:

1. Do not use pipe size greater than those specified in table or incomplete combustion, flame disturbance, or flame sense lockout may occur.
2. Size both the combustion-air and vent pipe independently; then use the larger diameter for both pipes.
3. Assume two 45° elbows equal one 90° elbow. Long radius elbows are desirable and may be required in some cases.
4. Elbows and pipe sections within the furnace casing and at the vent termination should not be included in vent length or elbow count.
5. The minimum pipe length is 5 ft for all applications.

TABLE 8—MAXIMUM ALLOWABLE EXPOSED PIPE LENGTH (FT) WITH INSULATION IN WINTER DESIGN TEMPERATURE AMBIENT*

UNIT SIZE	WINTER DESIGN TEMPERATURE (°F)	MAX PIPE DIAMETER (IN.)	INSULATION THICKNESS (IN.)†				
			0	3/8	1/2	3/4	1
040	20	2	21	37	42	50	57
	0	2	10	22	25	30	35
	-20	2	5	14	17	21	25
060	20	2	30	55	61	70	70
	0	2	16	33	38	46	53
	-20	2	9	23	26	33	38
080	20	2	39	70	70	70	70
	0	2	22	44	50	61	70
	-20	2	13	31	36	44	52
100	20	2-1/2	46	70	70	70	70
	0	2-1/2	25	49	56	68	70
	-20	2-1/2	15	34	40	49	57

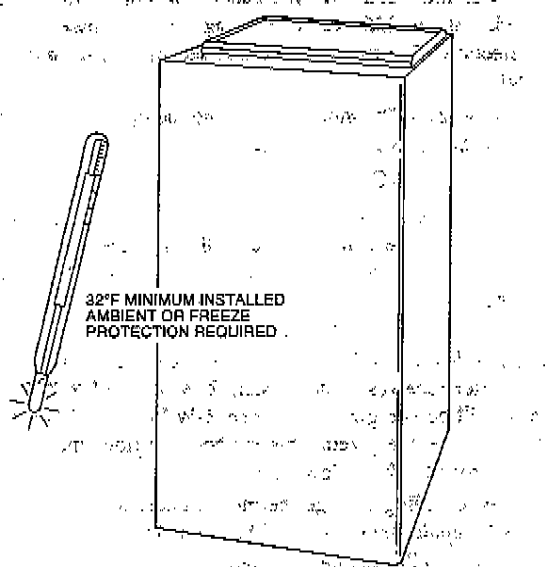
*Pipe length (ft) specified for maximum pipe lengths located in unconditioned spaces. Pipes located in unconditioned space cannot exceed total allowable pipe length as specified in Table 7.

† Insulation thickness based on R value of 3.5 per in.

VI. CONDENSATE DRAIN

A. Condensate Drain Piping

The 1/2-in. diameter schedule 40 PVC or CPVC condensate drain piping and pipe fittings must conform to ANSI standards and ASTM D1785 or D2846. Schedule 40 PVC or CPVC cement and primer must conform to ASTM D2564 or F493. In Canada, use CSA or ULC certified schedule 40 PVC or CPVC drain pipe and cement.



A93058

CAUTION: Unit must not be installed, operated, and then turned off and left turned off in an unoccupied structure during cold weather when temperature drops to 32°F and below unless drain trap and drain line have adequate freeze protection. See Service and Maintenance Instructions for winterizing procedure.

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.

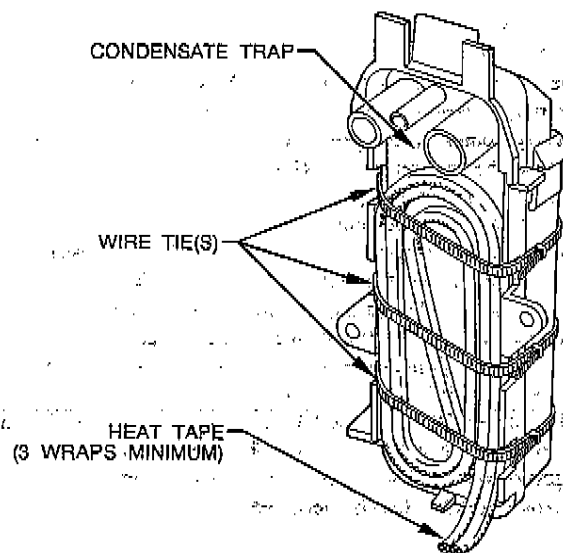
NOTE: Condensate trap is shipped with this furnace and must be used. An external trap must not be installed.

Cut and preassemble field-supplied drain piping to an open drain from condensate trap located in Section 1—Applications section.

B. Condensate Trap Freeze Protection

Freezing condensate left in condensate trap and drain line may cause cracks and possible water damage may occur. If freeze protection is required, use condensate freeze protection accessory, or equivalent 3 to 6 watt per ft at 120v and 40°F self-regulating, shielded, and waterproof heat tape. See Installation Instructions supplied with accessory or heat tape manufacturer's recommendations.

1. Fold heat tape in half and wrap on its self 3 times.
2. Locate heat tape between sides of condensate trap back. (See Fig. 40.)
3. Use wire ties to secure heat tape in place. Wire ties can be positioned in notches of condensate sides. (See Fig. 40.)
4. Wrap field drain line with remaining heat tape, approximately 1 wrap per ft.



A93036

Fig. 40—Condensate Trap Heat Tape

VII. START-UP

A. General

1. Furnace must have a 115-v power supply properly connected and grounded.

NOTE: Proper polarity must be maintained for 115-v wiring. If polarity is incorrect, control center fault indicator light will flash rapidly and furnace will not operate.

2. Thermostat wire connections at terminals R, W/W1, G, and Y/Y2 must be made at 24-v terminal block on control center.

3. Natural gas service pressure must not exceed 0.5 psig (14-in. wc), but must be no less than 0.16 psig (4.5-in. wc).
4. Blower access door must be in place to complete 24-v electrical circuit to furnace.

CAUTION: These furnaces are equipped with a manual reset limit switch in burner box. This switch will open if an overheat condition (rollout) occurs in burner enclosure. Correct inadequate combustion-air supply or improper venting condition and reset switch. **DO NOT** jumper this switch.

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

B. Sequence of Operation

CAUTION: Furnace control must be grounded for proper operation, or control will lockout. Control is grounded through green wire routed to gas valve and burner box screw.

Using schematic diagram (Fig. 23), follow sequence of operation through different modes. This furnace has a new control system. Read and follow wiring diagram carefully.

NOTE: If 115-v power supply to furnace or 24-v blower access panel switch is interrupted during a call for heat, blower will operate for 60 sec when power is restored before heating cycle is resumed.

SELF-TEST MODE

The control center will go through a brief self-test whenever the 115-v or 24-v power is interrupted. The self-test will take approximately 2 sec to complete. After power is restored, the green LED will come on for 1 sec, followed by 1 sec where both the yellow and green LEDs are lit. During this time, the microprocessor is checking itself.

HEATING MODE

When the thermostat "calls for heat," R-W/W1 circuit closes.

1. Prepurge period—The inducer motor is turned on and slowly comes up to speed. When the low-pressure switch closes, the inducer motor RPM is noted by the microprocessor, and a 25 sec prepurge period begins. The RPM is used to evaluate the vent system resistance. This evaluation is then used to determine the required RPM necessary to operate the inducer in high or low heat modes.

NOTE: The heat cycle can start in either high or low heat. If a high heat cycle is initiated, the inducer will continue increasing its speed until the high-pressure switch closes before the 25 sec prepurge period will begin.

2. Humidifier (HUM)—The HUM terminal is energized when over the inducer prepurge period is completed.
3. Ignitor warm-up—At end of prepurge period, the hot surface ignitor (HSI) is energized for a 17-sec HSI warm-up period.
4. Ignition sequence—After the HSI ignitor warm-up period has completed, gas valve opens, permitting gas flow to burners where it is ignited. After 5 sec, the HSI is de-energized and a 2 sec flame sensing period begins.

NOTE: The initial heat mode after 115-v or 24-v power interruption will be LOW HEAT. Low heat will remain energized for 16 minutes before high heat is initiated, providing the thermostat is still "calling for heat".

After the initial cycle, the microprocessor will evaluate the length of the low and high heat operating times and calculate the optimum length of low and high heat for the next heat cycle. This accommodates the heat load requirement seen as a result of the thermostat operating time.

5. Flame sensing—When burner flame is sensed, the control center holds gas valve open and begins the blower on delay period.

NOTE: Ignition sequence will repeat 3 additional times before a lockout occurs. Lockout will automatically reset after 3 hr, or can be manually reset by turning 115v or 24v off (not at thermostat) for 3 sec minimum, then on again.

6. Inducer speed reduction—If cycle starts in low heat, the inducer speed will reduce slightly after the flame sense, or 15 sec after flame sense if cycle starts in high heat. The reduction in speed is to optimize combustion for maximum efficiency.
7. Blower ON delay—The blower will start 60 sec after flame sense if cycle started in low heat or 35 sec after flame sense if cycle started in high heat.

NOTE: The blower will start at approximately 400-500 RPM. After 20 sec, the motor is turned off for 1/10 of a sec where a coast down calibration is done to evaluate the resistance of the conditioned air duct system. The microprocessor then determines the blower's RPM to provide the proper airflow for heating mode.

8. Electronic Air Cleaner (EAC)—The EAC-1 terminal is energized whenever the blower operates.
9. Blower OFF delay—When the thermostat is satisfied, the R-W signal is terminated, de-energizing the gas valve (stopping gas flow to the burners) and the HUM terminal is de-energized.

The blower will reduce its speed to the low heat RPM. The blower and electronic air cleaner will remain operating 90, 135, 180 or 225 sec (depending on the blower off time selection). The furnace is factory set for a 90 sec blower off delay.

10. Post purge—The inducer will continue operating for 15 sec after the gas valve is de-energized.

HEAT MODE—TWO STAGE

The control center will provide 2-stage heating using a single-stage thermostat. The control center will maximize comfort while optimizing efficiency to meet the demands of the conditioned area when a thermostat R-W/W1 signal is received.

If thermostat control over the control center microprocessor operation is desired, a 2-stage thermostat can be used. When the control center receives a thermostat, R-W/W1 and R-W2 signal, high heat will be energized and when R-W/W1 signal is received, low heat will be energized. This method overrides the microprocessor control of high or low heat.

NOTE: When using 2-stage thermostat operation with R-W/W1 and R-W2 signals, setup switch SW-2 **MUST** be in ON position. The heat cycle will operate as stated above.

EMERGENCY HEAT MODE

NOTE: The furnace should not be operated in emergency heat mode for extended periods of time. Operation is only recommended to provide heat until replacement components can be obtained or fault resolved.

In this mode, the microprocessor is by-passed and the motors operate at full speed with high heat operation. The heat exchangers, motors, and electronics can be over stressed and may reduce the life of the components if operated for an extended period.

NOTE: No safeties are bypassed when using emergency heat mode.

Emergency heat mode will be activated automatically if the control center's microprocessor has failed and a "call for heat" is received from the thermostat.

Emergency heat mode can also be selected using setup switch (SW-4). SW-4 should be used when a fault condition exists, or difficult to resolve problems occur. This will allow heating until the fault can be corrected.

In emergency heat mode, the normal heat mode outlined above is not followed. The following sequence will occur:

1. When the thermostat "calls for heat", the R-W/W-1 circuits close.
2. Prepurge period—The inducer motor is turned on IMMEDIATELY operating at maximum speed, closing the low and high-pressure switches. Prepurge will begin 25 sec after high-pressure switch closes.
3. Blower ON—The blower motor is turned on IMMEDIATELY and slowly increases to maximum speed as soon as a "call for heat" is received. No blower calibration will occur.
4. Electronic Air Cleaner (EAC)—The EAC-1 terminal is energized whenever the blower operates.
5. Humidifier (HUM)—The HUM terminal is energized whenever the inducer prepurge period is completed.
6. Ignitor warm-up—The HSI is energized for a 17 sec warm-up period after the prepurge period is completed.
7. Ignition sequence—After the HSI warm-up period has completed, the gas valve is energized, permitting gas flow to the burners where it is ignited. After 5 sec, the HSI is de-energized and a 2 sec flame sensing period begins.

NOTE: Emergency heat mode will only operate in high heat.

8. Flame sensing—When burner flame is sensed, the control center holds the gas valve open. If burner flame is not sensed, the control center will de-energize the gas valve and the ignition sequence is repeated.
9. Blower OFF delay—When the thermostat is satisfied, the R-W/W1 signal is terminated, de-energizing the gas valve (stopping gas flow to the burners) and the HUM terminal is de-energized. In addition, the blower will stop immediately.
10. Post purge—Post purge will NOT occur. The inducer will stop immediately.

COOLING MODE

When the thermostat "calls for cooling", the R-G and R-Y/Y2 circuits close.

1. Cooling unit—The cooling unit will start when the thermostat R-Y signal is received.
2. Blower ON—The control center starts the blower immediately when it receives an R-Y/Y2 and R-G signal. The blower will start at approximately 400–500 RPM. After 20 sec, the blower is turned off for 1/10 of a sec where a coast down calibration is done to evaluate the resistance of the conditioned air duct system. The microprocessor then determines the blower's RPM to provide the selected cooling airflow.

NOTE: In the cooling mode, the microprocessor will adjust the blower RPM to operate at 400 CFM per ton as selected on the A/C setup switches.

NOTE: If Y/Y2 thermostat lead is not connected to the furnace control center, the blower motor will operate in the continuous fan speed and indoor coil freeze-up may occur.

3. Electronic Air Cleaner (EAC)—The EAC-1 terminal is energized whenever the blower operates.
4. Cooling unit—The cooling unit will stop when the thermostat R-Y signal is terminated.
5. Blower OFF delay—When the thermostat is satisfied, the R-Y/Y2 and R-G signals are terminated, the blower will remain operating for 90 sec.

HEAT PUMP DEFROST MODE

When furnace is operating in heat pump heating mode, R-Y/Y2 and R-G circuits are closed. When heat pump defrost is required R-W/W1 circuits close starting the gas heat cycle.

1. Blower ON—The blower, currently operating in the cooling speed, will adjust to low heat speed.
2. Prepurge period—The inducer motor is turned on and slowly comes up to speed. When the low-pressure switch closes, the inducer motor's RPM is noted by the microprocessor, and a 25 sec prepurge period begins. The RPM is used to evaluate the vent system resistance. This evaluation is then used to determine the required RPM necessary to operate the inducer in high or low heat modes.

NOTE: The heat cycle can start in either high or low heat. If a high heat cycle is initiated, the inducer will continue increasing its speed until the high-pressure switch closes before the 25 sec prepurge period will begin.

3. Humidifier—The HUM terminal is energized whenever the inducer prepurge period is completed.
4. Ignitor warm up—After the prepurge period, the HSI is energized for 17 sec.
5. Ignition sequence—After the HSI warm up period is completed, the gas valve is energized, permitting gas flow to the burners where it is ignited. After 5 sec, the HSI is de-energized and a 2 sec flame sensing period begins.

6. Flame sensing—When burner flame is sensed, the control center holds the gas valve open.

If burner flame is not sensed, the control center will de-energize the gas valve and the ignition sequence is repeated.

7. Blower OFF period—When burner flame is sensed, the blower will stop for 35 sec to allow the heat exchangers to warm-up.
8. Blower ON delay—After the blower off period the blower is turned on.

NOTE: The blower will start at approximately 400–500 RPM. After 20 sec, the motor is turned off for 1/10 of a sec where a coast down calibration is done to evaluate the resistance of the conditioned air duct system. The microprocessor then determines the blower RPM to provide the proper airflow for heating mode.

9. Electronic Air Cleaner (EAC)—The EAC-1 terminal is energized whenever the blower operates.
10. Inducer speed reduction—If cycle starts in low heat, the inducer speed will reduce slightly after the flame sense, or 15 sec after flame sense if cycle starts in high heat. The reduction in speed is to optimize combustion for maximum efficiency.
11. "Call for heat terminated"—When the "call for heat" is satisfied, the R-W/W1 signal is terminated, de-energizing the gas valve (stopping gas flow to the burners) and the HUM terminal is de-energized.
 - a. R-W/W1 signal terminated with R-Y/Y2 and R-G still present—The blower will change its speed to the cooling RPM.
 - b. R-W/W1 with R-Y/Y2 and R-G signals terminated—The blower will continue to operate completing a normal blower OFF delay.

12. Post purge—The inducer will continue operating for 15 sec after the gas valve is de-energized.

CONTINUOUS FAN MODE

1. Operating with continuous fan only.

TABLE 9—AIR CONDITIONING (A/C) AIRFLOW SETUP SWITCH POSITION

AIR CONDITIONER (TONS)	CFM AIRFLOW	A/C SETUP SWITCH POSITION			ALLOWABLE FURNACE MODEL - SETUP			
		A/C-1	A/C-2	A/C-3	042040 3 Tons 1200 CFM	042060 3 Tons 1200 CFM	042080 3 Tons 1200 CFM	060100 5 Tons 2000 CFM
Default	1200 or 2000	OFF	OFF	OFF	—	—	—	—
1-1/2	600	ON	OFF	OFF	X	X	X	—
2	800	OFF	ON	OFF	X	X	X	—
2-1/2	1000	ON	ON	OFF	X	X	X	X
3	1200	OFF	OFF	ON	X	X	X	X
3-1/2	1400	ON	OFF	ON	X	X	X	X
4	1600	OFF	ON	ON	—	—	—	X
5	2000	ON	ON	ON	—	—	—	X

X—Indicates allowable selection.

a. "Call for continuous fan"—From the thermostat closing R-G circuit.

b. Blower ON—The blower will start immediately.

NOTE: The blower will start at approximately 400-500 RPM. After 20 sec, the motor is turned off for 1/10 of a sec where a coast down calibration is done to evaluate the resistance of the conditioned air duct system. The microprocessor then determines the blower RPM to provide the proper airflow for heating mode.

NOTE: The continuous fan speed will be the same as the low heat speed unless it is field adjusted to another desired airflow. See Continuous Fan setup switch section for details.

c. Electronic Air Cleaner (EAC)—The EAC-1 terminal is energized whenever the blower operates, regardless of the operating mode.

2. Operating with continuous fan (R-G) and "call for heat" (R-W/W1) is received—Same as heat pump mode above except blower on delay will be same as heat mode.

3. Operating with continuous fan (R-G) and "call for cool" (R-Y/Y2) is received—See cool mode above.

After "call for cool" (R-Y/Y2) is terminated, the blower will remain operating at cool speed for 90 sec before resuming continuous fan speed.

C. Start-Up

1. Air conditioning (A/C) setup switches

The air conditioning setup switches are used to match furnace airflow to the cooling unit used. This furnace will provide 400 CFM per selected air conditioning tonnage. To set the desired cooling airflow:

a. Remove furnace access door.

b. Locate the A/C setup switches on the control center. (See Fig. 24.)

c. Determine the air conditioning tonnage used.

d. Use Table 9 or wiring schematic to determine the proper setup position of A/C switches. (See Fig. 23.)

NOTE: Excessive airflow caused by improper A/C switch setup may cause condensate blow off in the cooling mode.

e. Replace the furnace access door.

NOTE: EAC-1 terminal is energized whenever the blower operates. HUM terminal is only energized when the gas valve is energized.

TABLE 10—CONTINUOUS FAN (CF) AIRFLOW SETUP SWITCH POSITION

CONTINUOUS FAN (CFM)	CF SETUP SWITCH POSITION			ALLOWABLE FURNACE MODEL SETUP			
	CF-1	CF-2	CF-3	042040	042060	042080	060100
Default	OFF	OFF	OFF	500	515	690	860
600	ON	OFF	OFF	X	X	X	—
800	OFF	ON	OFF	X	X	X	X
1000	ON	ON	OFF	X	X	X	X
1200	OFF	OFF	ON	X	X	X	X
1400	ON	OFF	ON	X	X	X	X
1600	OFF	ON	ON	—	—	—	X
2000	ON	ON	ON	—	—	—	X

X—Indicates allowable selection.

2. Continuous fan (CF) setup switches

The CF setup switches are used to select desired airflow when the thermostat is in the continuous fan mode. This setup feature will allow the continuous fan airflow to be adjusted. To set the desired continuous fan airflow:

a. Remove furnace access door.

b. Locate the CF setup switches on the control center. (See Fig. 25.)

c. Determine the desired continuous fan airflow.

d. Use Table 10 or wiring schematic to determine the proper setup position of CF switches. (See Fig. 23.)

NOTE: The CF switches are factory set to provide the continuous fan airflow equal to the low heat mode.

e. Replace the furnace access door.

3. Setup switches (SW)

The control center has 8 setup switches that may be set to meet the application requirements. Position these setup switches for the appropriate requirement.

a. Remove furnace access door.

b. Locate setup switches on the control center. (See Fig. 25.)

c. See Table 11 for setup switch description.

d. Replace furnace access door.

NOTE: If a bypass humidifier is used, setup switch SW-3 (BPH) should be in ON position. This prevents nuisance limit trips caused by the increased temperature in the return-air resulting from the bypass.

NOTE: If modulating dampers are used, setup switch SW-5(MZ) should be in ON position. This will allow the furnace control center to compensate for the modulating dampers. The control will re-calibrate for the new system static conditions once every minute while operating in the low heat or continuous fan modes.

4. Adjusting tuning valve

Tuning valve on the variable-capacity furnace is not necessary since the inducer motor speed is calculated at each cycle to provide the maximum efficiency.

Tuning valve should be adjusted to the maximum open position.

a. Rotate tuning valve counter clockwise until stops on tuning valve hit pins on inducer housing.

b. Rotate tuning valve clockwise 2 notches to ensure valve is locked in place and gasket is sealed.

5. Fill condensate trap with water.

a. Disconnect condensate drain tube from inducer housing (medium diameter tube on condensate drain trap). (See Fig. 41.)

b. Insert funnel into tube and pour 1 quart of water into tube. This should overflow the trap and flow into an open drain. (See Fig. 42.)

TABLE 11—SETUP SWITCH DESCRIPTION

SETUP SWITCH NO.	NORMAL POSITION	DESCRIPTION OF USE
SW-1 (FLT)	OFF	Turn switch ON for fault history display. No thermostat signal can be present for fault-history display.
SW-2 (LOW)	OFF	Turn switch to ON to lock furnace in the low heat mode only.
SW-3 (BPH)	OFF	Turn switch to ON when a bypass humidifier is used. This will compensate for the higher return-air temperature and provide 10 percent more airflow.
SW-4 (EMER HEAT)*	OFF	Turn switch to ON to bypass microprocessor control. Furnace will operate at high heat only with main blower and inducer motor operating at maximum RPM. NO safeties are bypassed.
SW-5 (MZ)	OFF	Turn switch to ON when modulating dampers are used. In this mode the main blower speed is recalculated once every minute while the furnace is in the low-heat or continuous fan mode.
SW-6 (COMP TEST)	OFF	Turn switch to ON to initiate component test. Furnace will operate inducer motor 20 sec low speed, 20 sec high speed, HSI 15 sec, blower 20 sec low speed, blower 20 sec high speed. SW-1 must be in OFF position. No thermostat signal can be present for fault history display.
SW-7 and 8 (Blower Off Delay)	See Table 12	Adjust switches to provide desired heating mode blower off delay time, 90, 135, 180 or 225 sec.

TABLE 12—BLOWER OFF DELAY SETUP SWITCH POSITION

DESIRED HEATING MODE BLOWER OFF DELAY (SEC)	SETUP SWITCH (SW-7 AND -8) POSITION	
90	SW-7 OFF	SW-8 OFF
135	ON	OFF
180	OFF	ON
225	ON	ON

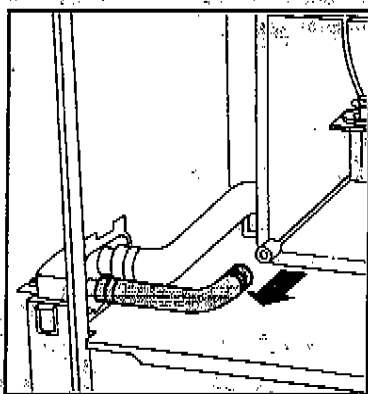


Fig. 41—Inducer Housing Drain Tube

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c. Reconnect drain tube to inducer housing.

6. Purge gas lines—If not previously done, purge the lines after all connections have been made and check for leaks.

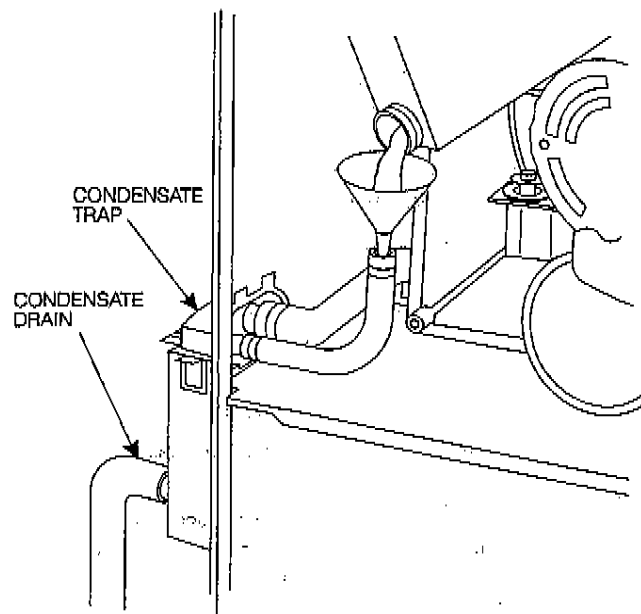


Fig. 42—Filling Condensate Trap

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WARNING: Never purge a gas line into a combustion chamber. Never use matches, candles, flame, or other sources of ignition for the purpose of checking leakage. Use a soap-and-water solution to check for leakage. A failure to follow this warning could result in fire, explosion, personal injury, or death.

7. Component test—The furnace control center allows all components, except the gas valve, to be run for a short period of time. See below for operation sequence.

This feature helps diagnose a system problem in the case of a component failure. To initiate the component-test procedure, turn setup switch SW-6 to ON position. (See Fig. 25.)

NOTE: Setup switch No. 1 MUST be in OFF position or fault code 22—setup error, will occur.

NOTE: The component-test feature will not operate if the control center is receiving any thermostat signal.

The component-test sequence is as follows:

- Setup switch 6 (SW-6) turned ON.
- The inducer motor operates for 20 sec at low speed, 20 sec at high speed, then turns off.
- The HSI is then energized for 15 sec, then turns off.
- The blower motor operates on low speed for 20 sec, then off.
- The blower motor operates on high speed for 20 sec, then turns off.
- When component test is completed, one or more fault codes 11, 22, 41 or 42 will flash. Refer to furnace Fault Code label for information regarding these codes.
- To repeat component test turn setup switch SW-6 to OFF and then back to ON.
- After component test is completed turn setup switch SW-6 to OFF position.

8. To operate furnace, follow procedures on operating instruction label attached to furnace.

9. With furnace operating, set thermostat below room temperature and observe that furnace goes off. Set thermostat above room temperature and observe that furnace restarts.

D. Adjustments

- Set gas input rate.

2. There are 2 methods of adjusting gas input rate. The preferred method is by using Table 13 and procedure a. The second method is by clocking the gas meter as outlined in procedure b. Procedure b must be used for altitudes above 2000 ft.

a. Determine natural gas orifice size and manifold pressure for correct input by using Table 13.

- (1.) Obtain average yearly heat value for local gas supply.
- (2.) Obtain average yearly specific gravity for local gas supply.
- (3.) Verify the furnace model. Table 13 can only be used for model 355MAV Furnaces.
- (4.) Find natural gas heat value and specific gravity in Table 13.
- (5.) 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: 1040 Btu/cu ft

Specific gravity 0.62

Therefore, Orifice No. 45* with manifold pressure 3.7-in. wc for high heat and 1.6-in. wc for low heat.

*The furnace is shipped with No. 44 orifices. In this example all main burner orifices must be changed and the manifold pressure adjusted.

- (6.) Check and verify orifice size in furnace. **NEVER ASSUME THE ORIFICE SIZE; ALWAYS CHECK AND VERIFY.**
- (7.) Proceed to procedure c to adjust manifold pressure.
- (8.) Check input rate by clocking meter as described in procedure b.

b. Determine natural gas input rate by clocking gas meter and adjusting manifold pressure per procedure c.

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

- (1.) Obtain average yearly heat value for local gas supply.

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

- (2.) Turn off all other gas appliances and pilots.
- (3.) Start furnace and let run for 3 minutes.
- (4.) Measure time (in sec) for gas meter test dial to complete 1 revolution.
- (5.) Refer to Table 14 for cubic ft of gas per hr.
- (6.) Multiply gas rate (cu ft/hr) X heating value (Btu/cu ft). Obtain heating value from local gas utility.

EXAMPLE :

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

Heating value of gas = 1040 Btu/cu ft

Time for 1 revolution of 2-cu-ft dial = 74 sec

Gas rate = 97 cu ft/hr (from Table 14)

Btu heating input = 97 X 1040 = 100,880 Btu/h

- (7.) Measured gas input must not exceed gas input on unit rating plate.

NOTE: High altitude: gas input on rating plate is for altitudes up to 2000 ft. Ratings for altitudes over 2000 ft must be 4 percent less for each 1000 ft above sea level. To obtain the altitude adjusted rating, adjust the manifold pressure, procedure c, and replace the main burner orifices as needed. Refer to National Fuel Gas Code Appendix F, Table F-4 for proper orifice sizing at high altitudes.

NOTE: In Canada, from 2000 to 4500 ft above sea level, derate the unit 10 percent from the Conversion Station.

- (8.) Proceed to item c. to adjust manifold pressure.

c. Adjust gas input.

NOTE: Manifold pressure must always be measured with the burner enclosure **FRON-REMOVED**. The gas meter must always be clocked with the burner enclosure **FRONT INSTALLED**. The gas valve has been nominally set at 3.5-in. wc high heat and 1.5-in. wc low heat for natural gas.

TABLE 13—MODEL 355MAV ORIFICE SIZE AND MANIFOLD PRESSURE FOR CORRECT INPUT RATE
(TABULATED DATA BASED ON ALTITUDE UP TO 2000 FT AND 20,000 BTUH HIGH HEAT/13,000 BTUH LOW HEAT PER BURNER)

GAS HEAT VALUE (BTU/CU FT)	SPECIFIC GRAVITY OF NATURAL GAS															
	0.59		0.60		0.62		0.64		0.66		0.68		0.70		0.72	
	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low	Orf No.	Heat High/Low
860	43	3.7/1.6	43	3.6/1.6	42	3.2/1.4	42	3.3/1.4	42	3.4/1.5	42	3.2/1.4	42	3.3/1.5	42	3.4/1.6
875	43	3.6/1.5	43	3.7/1.6	43	3.8/1.6	42	3.2/1.4	42	3.3/1.4	42	3.4/1.4	41	3.2/1.3	41	3.3/1.4
890	43	3.5/1.5	43	3.6/1.5	43	3.7/1.6	43	3.8/1.6	42	3.2/1.4	42	3.3/1.4	42	3.4/1.4	41	3.2/1.3
905	43	3.3/1.3	43	3.5/1.4	43	3.6/1.5	43	3.7/1.5	43	3.8/1.6	42	3.2/1.4	42	3.3/1.4	42	3.4/1.4
920	43	3.2/1.3	43	3.3/1.4	43	3.5/1.4	43	3.6/1.5	43	3.7/1.5	43	3.8/1.5	42	3.2/1.3	42	3.3/1.3
935	44	3.6/1.5	44	3.2/1.4	44	3.3/1.4	43	3.5/1.5	43	3.6/1.5	43	3.7/1.5	43	3.8/1.6	42	3.2/1.3
950	44	3.5/1.5	44	3.6/1.5	44	3.2/1.4	44	3.3/1.4	43	3.4/1.5	43	3.6/1.5	43	3.7/1.5	43	3.8/1.6
965	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	44	3.2/1.4	44	3.3/1.4	43	3.4/1.5	43	3.5/1.5	43	3.6/1.5
980	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43	3.2/1.4	43	3.3/1.4	43	3.4/1.5	43	3.5/1.5
995	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43	3.2/1.4	43	3.3/1.4	43	3.4/1.4
1010	45	3.7/1.6	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43	3.2/1.4	43	3.3/1.4
1025	45	3.6/1.5	45	3.7/1.6	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43	3.2/1.4
1040	45	3.5/1.5	45	3.6/1.5	45	3.7/1.6	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5
1055	45	3.4/1.4	45	3.5/1.5	45	3.6/1.5	45	3.7/1.6	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5
1070	45	3.3/1.4	45	3.4/1.4	45	3.5/1.5	45	3.6/1.5	45	3.7/1.6	44	3.2/1.4	44	3.3/1.4	44	3.4/1.4
1085	45	3.2/1.3	45	3.3/1.4	45	3.4/1.5	45	3.5/1.5	45	3.6/1.5	45	3.7/1.6	44	3.2/1.4	44	3.3/1.4
1100	46	3.3/1.4	45	3.2/1.4	45	3.4/1.4	45	3.5/1.5	45	3.6/1.5	45	3.7/1.6	45	3.8/1.6	44	3.2/1.4

- (1) Remove burner enclosure front and caps that conceal adjustment screws for gas valve regulators. (See Fig. 42.)
- (2) Turn setup switch SW-2 on control center to ON position. (See Fig. 25.) This will keep furnace locked in low heat operation.

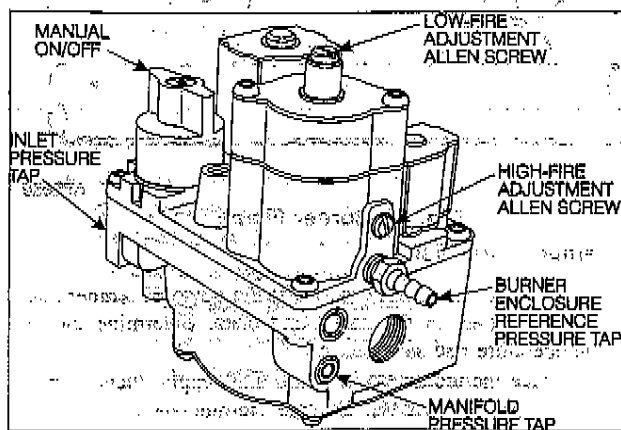


Fig. 43—Redundant Automatic Gas Valve

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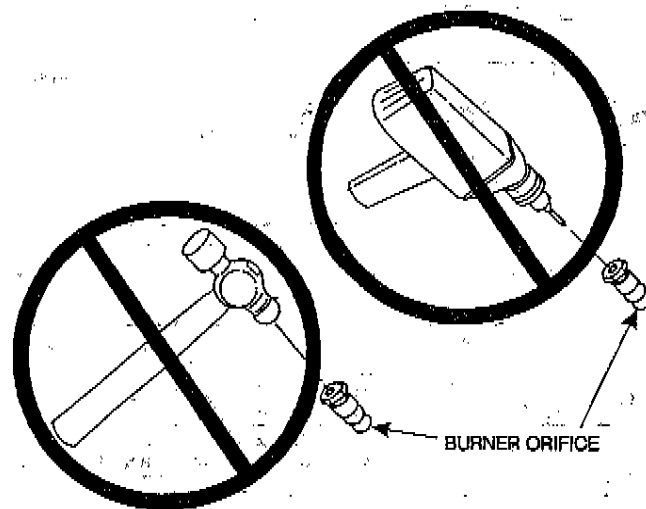
- (3) Turn low heat adjusting screw (5/64 hex Allen wrench) counterclockwise (out) to decrease input rate or clockwise (in) to increase rate. When adjusting input rate, DO NOT set manifold pressure less than 1.3-in. or more than 1.7-in. wc for natural gas. Make any major adjustments by changing main burner orifices.
- (4) Turn setup switch SW-2 to OFF position after low fire adjustment.
- (5) Jumper R-W2 on control center thermostat connections. (See Fig. 25.) This will keep furnace locked in high heat operations.
- (6) Turn high heat adjusting screw (5/64 hex Allen wrench) 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-in. or more than 3.8-in. wc for natural gas. Make any major adjustment by changing main burner orifices.

NOTE: If orifices are changed, both high heat and low heat input rate must be readjusted.

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

TABLE 14—GAS RATE CU FT/HR

SECONDS FOR 1 REVOLUTION	SIZE OF TEST DIAL			SECONDS FOR 1 REVOLUTION	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	1638	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	810	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				

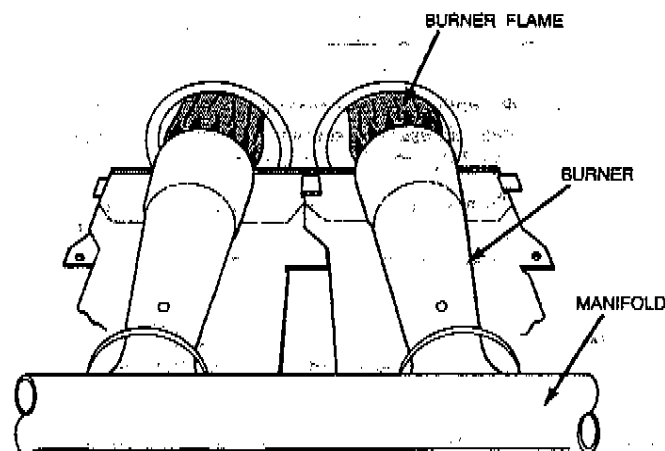


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CAUTION: DO NOT redrill orifices. Improper drilling (burrs, out-of-round holes, etc.) can cause excessive burner noise and misdirection of burner flames. This can result in flame impingement of the burners and heat exchangers causing failures.

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

- (10.) Look through sight glass in burner enclosure and check burner flame. The burner flame should be clear blue, almost transparent. (See Fig. 44.)



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Fig. 44—Burner Flame

E. Temperature Rise

The furnace must operate within the range of temperature rise specified on the unit rating plate. Determine the air temperature rise as follows:

- Place thermometers in return and supply ducts as near furnace as possible. Be sure thermometers do not see heat exchanger so that radiant heat does not affect readings. This practice is particularly important with straight-run ducts.
- When thermometer readings stabilize, subtract return-air temperature from supply-air temperature to determine air temperature rise.

NOTE: Temperature rise can be determined for low fire operation by placing setup switch SW-2 on control center in the ON position. For high heat operation, place setup switch SW-2 in the OFF position and jumper R-W2 on control center. DO NOT forget to return setup switch to OFF position and remove R-W2 jumper upon completion of testing. (See Fig. 25 for switch and terminal location.)

c. This furnace is capable of automatically providing the proper airflow to maintain the temperature rise within the range specified on the unit rating plate. If the temperature rise is outside this range, proceed as follows:

- (1.) Check gas input for low and high heat operation.
- (2.) Check derate for altitude if applicable.
- (3.) Check all return and supply ducts for excessive restrictions causing static pressure greater than 0.5-in. wc.
- (4.) Ensure bypass humidifier switch (BPH) setup switch No. 3 on control center is in ON position when a bypass humidifier is used. (See Fig. 25 for switch location.)
- (5.) Check Troubleshooting Guide for Deluxe Gas-Fired Condensing Furnaces.

F. Thermostat Heat Anticipator

The thermostat heat anticipator must be set to match the amp draw of the components in the R-W/W1 circuit. Accurate amp draw measurements can be obtained at the thermostat subbase terminals R and W.

1. Fig. 45 illustrates an easy method of obtaining thermostat amp draw measurements. The amp reading should be taken after the blower motor has started and furnace is operating in low heat.
2. To operate furnace in low heat, turn setup switch SW-2 to ON position (See Fig. 25) and connect ammeter leads across thermostat subbase R-W.
3. See the thermostat manufacturer's instructions for adjusting the heat anticipator and for varying the heating cycle length.

NOTE: When using an electronic thermostat, set the cycle rate for 3 cycles per hr.

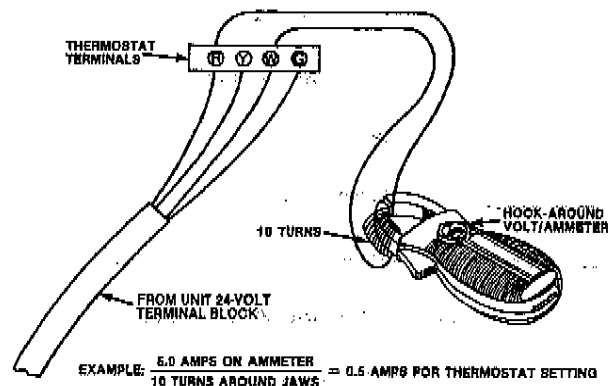
4. Return setup switch SW-2 to OFF position and replace thermostat on subbase.

G. Safety Controls

1. Check primary limit control.

This control shuts off the combustion control system and energizes the air-circulating blower motor if the furnace overheats.

- a. The recommended method of checking this limit control is to gradually block off the return air after the furnace has been operating for a period of at least 5 minutes.
- b. As soon as the limit control has shut off the burners, a 33 fault will appear on the control center.
- c. The return-air opening should be unblocked to permit normal air circulation.



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Fig. 45—Amp Draw Check with Ammeter

By using this method to check the limit control, it can be established that the limit is functioning properly and the furnace will operate safely if there is a restricted return-air supply or motor failure. If the limit control does not function during this test, the cause must be determined and corrected.

2. Check pressure switch.

This control proves operation of the draft inducer. Check switch operation as follows:

- a. Turn 115-v power to furnace to OFF.
- b. Remove control access door and disconnect inducer motor 12 pin wire harness at inducer motor.
- c. Turn 115-v power to furnace to ON.
- d. Set thermostat to "call for heat". When the pressure switches are functioning properly, fault code 42 will flash on the control center approximately 10 sec after the thermostat switch is closed. If either fault code 31 or 32 is flashed when the ICM inducer motor is disconnected, the furnace will shut itself down immediately. Determine the reason the pressure switches did not function properly and correct the condition.
- e. Turn 115-v power to furnace to OFF.
- f. Reconnect inducer motor wire harness. Reinstall furnace access door.
- g. Turn 115-v power to ON, and reset thermostat to desired temperature.

VIII. CHECKLIST

1. Put away tools and instruments. Clean up debris.
2. Verify manual reset switch has continuity.
3. Verify that blower and control access doors are properly installed.
4. Cycle test furnace with room thermostat.
5. Check operation of accessories per manufacturer's instructions.
6. Review User's Guide with owner.
7. Leave literature packet near furnace.

CHECKLIST - INSTALLATION**LOAD CALCULATION**

_____ Heating Load (Btuh)
 _____ Cooling Load (Btuh)
 _____ Furnace Model Selection

COMBUSTION AND VENT PIPING**Termination Location**

_____ Roof or Sidewall
 _____ Termination Kit — 2 Pipe or Concentric
 _____ Combustion-Air Pipe Length
 _____ Combustion-Air Pipe Elbow Quantity
 _____ Vent Pipe Length
 _____ Vent Pipe Length Quantity
 _____ Pipe Diameter Determined from Sizing Table
 _____ Pipe Sloped To Furnace
 _____ **Pipe Insulation**
 _____ Over Ceilings

_____ Low Ambient Exposed Pipes

Condensate Drain

_____ Unit Level or Pitched Forward
 _____ Internal Tubing Connections Free of Kinks and Traps
 _____ External Drain Connection Leak Tight and Sloped
 _____ Heat Tape Installed if Required

CHECKLIST—START-UP

_____ Tuning Valve Adjusted
 _____ Gas Input Rate (Set Within 2 Percent of Rating Plate)
 _____ Temperature Rise Adjusted

Thermostat Anticipator

_____ Anticipator Setting Adjusted or
 _____ Cycle Rate (3 Cycles per Hr) Selected

Safety Controls Check Operation

_____ Primary Limit
 _____ Pressure Switch