



installation, start-up, and operating instructions

VARIABLE-CAPACITY 4-WAY MULTIPOISE CONDENSING GAS FURNACE

355MAV Series B

Cancels: II 355M-40-1

II 355M-40-2
6-15-94



A93040

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

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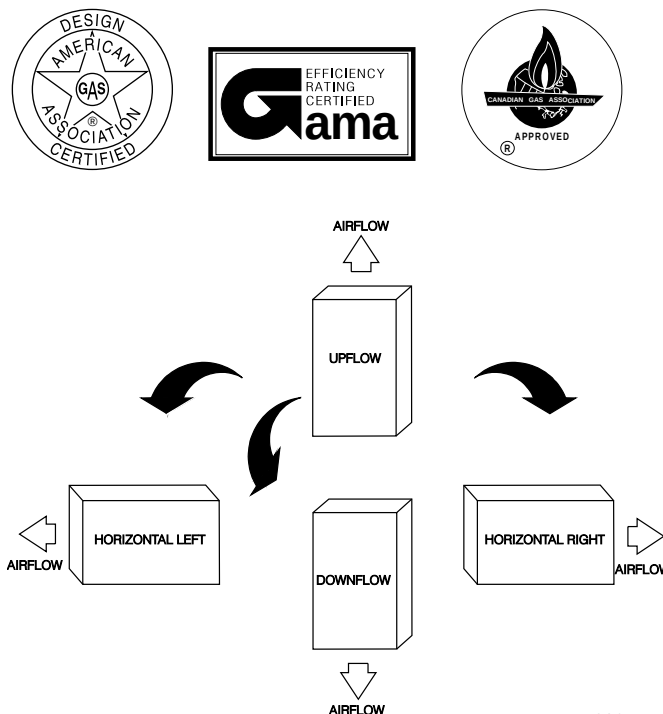


Fig. 1—Multipoise Orientations

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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

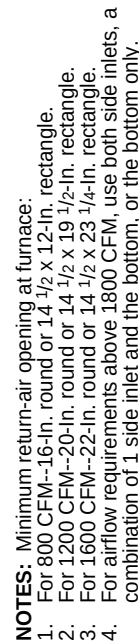


Fig. 2—Dimensional Drawing

* These dimensions reflect the wider casing for the Trophy (96.6 percent AFUE) furnace.

UNIT SIZE	A	D	E
042040*	24-1/2*	22-7/8*	23*
042060	17-1/2	15-7/8	16
042080	21	19-3/8	19-1/2
060100	21	19-3/8	19-1/2

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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 or elevation.

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).

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 (including roofing materials).

Special venting system required. In Canada use certified venting system specified 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	BOTTOM	SIDES	BACK	FRONT	VENT	
	1	0	0	0	3	0	UPFLOW
	1	++	0	0	3	0	DOWNFLOW
	1	0+	1*	0	3	0	HORIZONTAL

++ For installation on combustible floors only when installed on special base No. KGASB0201ALL.

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

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.

+ 120,000 BTU Input Furnaces require 1 inch bottom clearance to combustible materials.

Fig. 3—Clearances to Combustibles

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

Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code (NFGC) NFPA No. 54-1992/ANSI Z223.1-1992. In Canada, refer to the current edition of the National Standard of Canada CAN/CGA-B149.1- and .2-M91 Natural Gas and Propane Installation Codes (NSC-NGPIC). Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

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 words DANGER, WARNING, and 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 which **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 which **will** result in enhanced installation, reliability, or operation.

INTRODUCTION

The 355MAV Multipoise Condensing Gas-Fired 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 with the drain and pressure tubes connected for UPFLOW applications. Minor modifications are required when used in DOWNFLOW, HORIZONTAL RIGHT, or HORIZONTAL LEFT (supply-air discharge direction) applications as shown in Fig. 1. See details in Applications section.

These furnaces are shipped with the following materials to assist in proper furnace installation. These materials are shipped in the main blower compartment.

Installer Packet includes:

Installation, Start-Up, and Operating Instructions
Service and Maintenance Instructions
User's Information Manual
Warranty Certificate

Loose Parts Bag includes:

	Quantity
Pressure tube extension	1
Collector box or condensate trap extension tube	1
Inducer housing drain tube	1
1/2-in. CPVC street elbow	2
Drain tube coupling	1
Drain tube coupling grommet	1
Vent and combustion-air pipe support	2
Combustion-air pipe perforated disk assembly	1

Before installing the furnace in the United States, refer to the current edition of the NFGC. For further information, the NFGC 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.

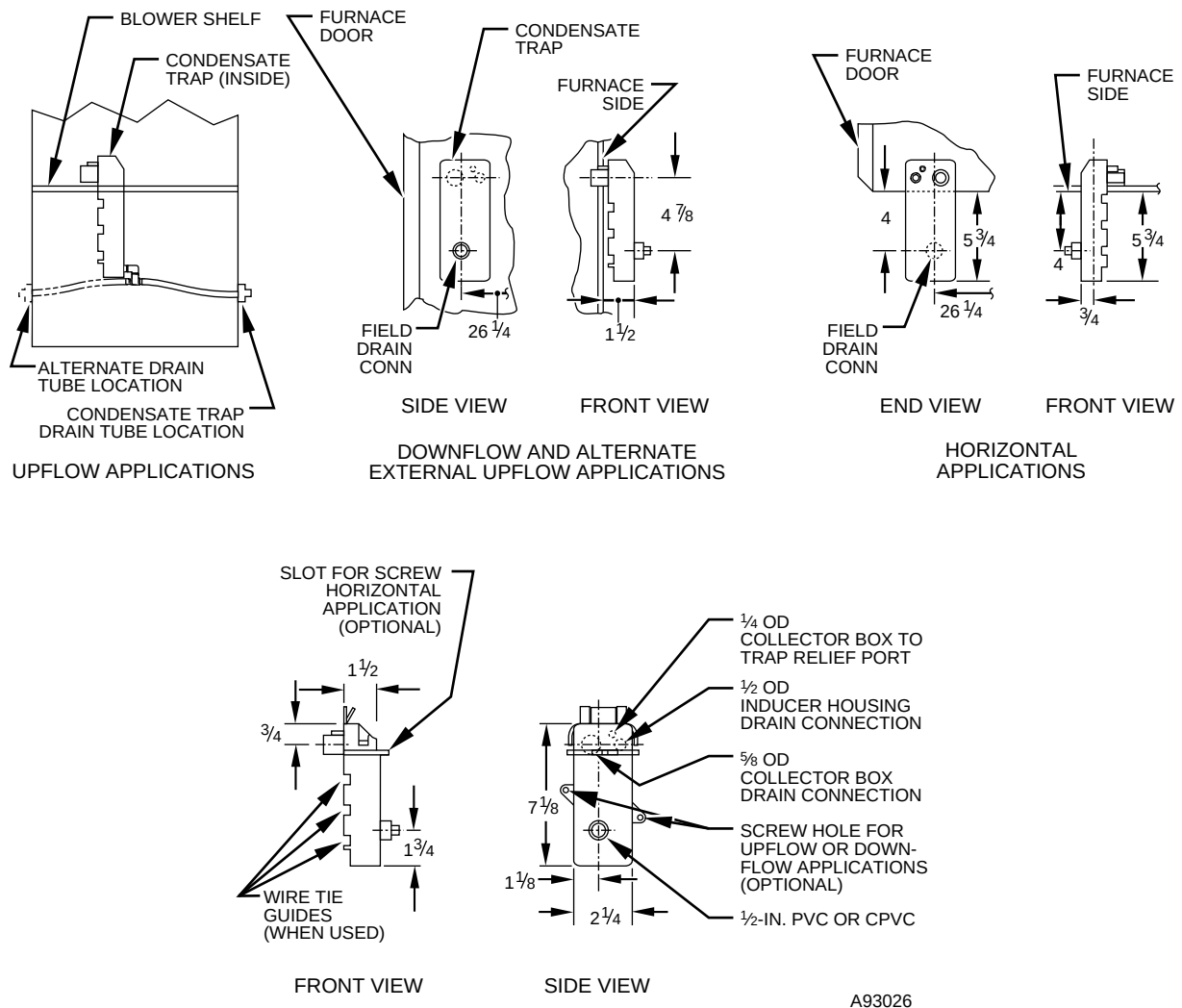


Fig. 4—Condensate Trap

Before installing the furnace in Canada, refer to the current edition of the NSCNGPIC. Contact Standards Department of Canadian Gas Association, 55 Scarsdale 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 NFGC.

Canadian installations must be made in accordance with NSCNGPIC 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. We require 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, or 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.

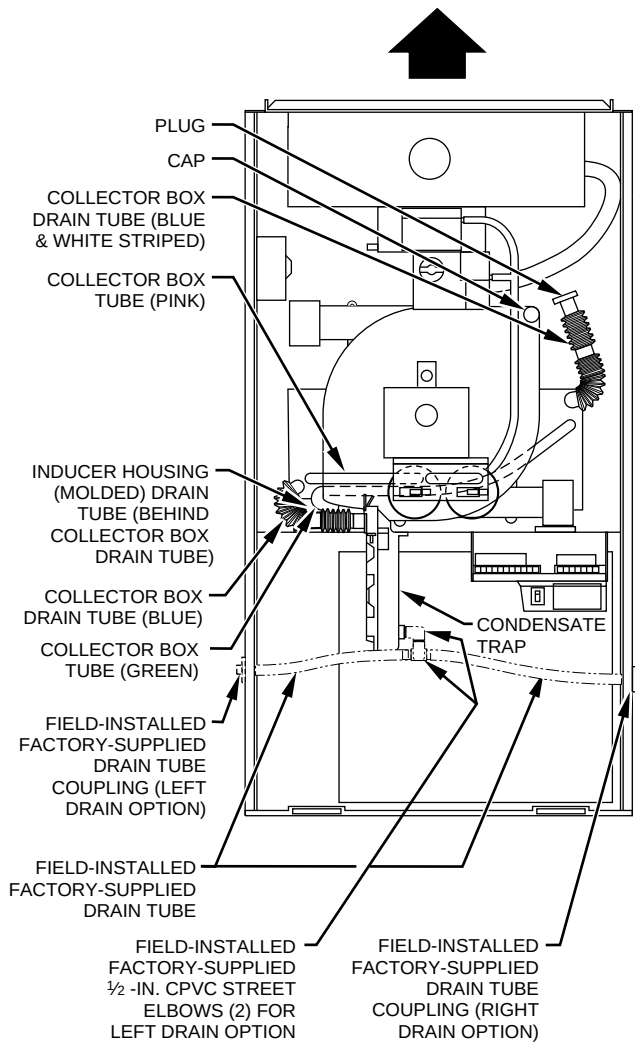
APPLICATIONS

I. GENERAL

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. 5. See appropriate application instructions for these procedures.

II. 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.



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Fig. 5—Factory-Shipped Upflow Tube Configuration (Shown With Blower Access Panel Removed)

A. Condensate Trap Location (Factory-Shipped Orientation)

The condensate trap is factory installed in the blower shelf and factory connected for UPFLOW applications. A factory-supplied tube is used to extend the condensate trap drain connection to the desired furnace side for field drain attachment. See Condensate Trap Tubing (Factory-Shipped Orientation) section for drain tube extension details.

B. Condensate Trap Tubing (Factory-Shipped Orientation)

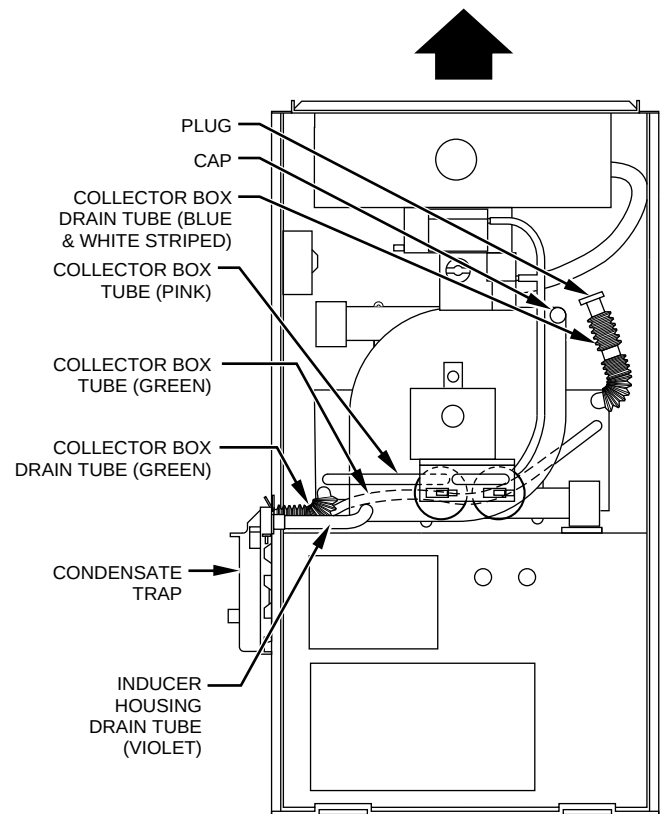
NOTE: See Fig. 5 or tube routing label on main furnace door to confirm location of these tubes.

1. Collector Box Drain, Inducer Housing Drain, Relief Port, and Pressure Switch Tubes

These tubes should be factory attached to condensate trap and pressure switch ready for use in UPFLOW applications. These tubes can be identified by their connection location and also by a color label on each tube. These tubes are identified as follows: collector box drain tube (blue label), inducer housing drain tube (violet label or molded), relief port tube (green label), and pressure switch tube (pink label).

2. Condensate Trap Drain Tube

The condensate trap drain connection must be extended for field attachment by doing the following:



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Fig. 6—Alternate Upflow Tube Configuration and Trap Location

- a. Determine location of field drain connection. (See Fig. 2 or 5.)

NOTE: If internal filter is used, drain tube should be located to opposite side of casing of return duct attachment to assist in filter removal.

- b. Remove and discard casing drain hole plug button from desired side.
- c. Install drain tube coupling grommet (factory supplied in loose parts bag) in selected casing hole.
- d. Slide drain tube coupling (factory supplied in loose parts bag) through grommet so long end of coupling faces blower.
- e. Cement 2 factory-supplied 1/2-in. street CPVC elbows to rigid drain tube connection on condensate trap. (See Fig. 5.) These elbows must be cemented together and cemented to condensate trap drain connection.

NOTE: Failure to use CPVC elbows may allow drain to kink, preventing draining.

- f. Connect larger diameter drain tube and clamp (factory supplied in loose parts bag) to condensate trap and clamp securely.
- g. Route tube to coupling and cut to appropriate length.
- h. Attach tube to coupling and clamp securely.

C. Condensate Trap Location (Alternate Upflow Orientation)

An alternate location for the condensate trap is the left-hand side of casing. (See Fig. 2 and 6.)

NOTE: If the alternate left-hand side of casing location is used, the factory-connected drain and relief port tubes must be disconnected and modified for attachment. See Condensate Trap Tubing (Alternate Upflow Orientation) section for tubing attachment.

To relocate condensate trap to the left-hand side, perform the following:

1. Remove 3 tubes connected to condensate trap.
2. Remove trap from blower shelf by gently pushing tabs inward and rotating trap.
3. Remove casing hole filler cap from casing hole. (See Fig. 2 or 6.)
4. Install casing hole filler cap into blower shelf hole where trap was removed.
5. Install condensate trap into left-hand side casing hole by inserting tube connection stubs through casing hole and rotating until tabs snap into locking position.

D. Condensate Trap Tubing (Alternate Upflow Orientation)

NOTE: See Fig. 6 or tube routing label on main furnace door to confirm location of these tubes.

1. Collector Box Drain Tube
Connect collector box drain tube (blue label) to condensate trap.

NOTE: On 17-1/2-in. wide furnaces ONLY, cut tube between corrugated sections to prevent kinks.

2. Inducer Housing Drain Tube
 - a. Remove and discard LOWER (molded) inducer housing drain tube which was previously connected to condensate trap.
 - b. Use inducer housing drain extension tube (violet label and factory supplied in loose parts bag) to connect LOWER inducer housing drain connection to the condensate trap.
 - c. Determine appropriate length, cut, and connect tube.
 - d. Clamp tube to prevent any condensate leakage.
3. Relief Port Tube
 - a. Connect relief port tube (green label) to condensate trap.
 - b. Use small diameter tube (factory supplied in loose parts bag) to extend this tube if required.
 - c. Determine appropriate length, cut, and connect tube.

E. Condensate Trap Field Drain Attachment

Refer to Condensate Drain section for recommendations and procedures.

F. Pressure Switch Tubing

The LOWER collector box pressure tube (pink label) is factory connected to the pressure switch and should not require any modification.

NOTE: See Fig. 5 or 6 or tube routing label on main furnace door to check for proper connections.

G. Upper Collector Box and Inducer Housing (Unused) Drain Connections

UPPER COLLECTOR BOX DRAIN CONNECTION

Attached to the UPPER collector box drain connection is a factory-installed corrugated, plugged tube (blue and white striped label). This tube is plugged to prevent condensate leakage in this application. Ensure this tube is plugged.

NOTE: See Fig. 5 or 6 or tube routing label on main furnace door to check for proper connections.

UPPER INDUCER HOUSING DRAIN CONNECTION

Attached to the UPPER (unused) inducer housing drain connection is a cap and clamp. This cap is used to prevent condensate leakage in this application. Ensure this connection is capped.

NOTE: See Fig. 5 or 6 or tube routing label on main furnace door to check for proper connections.

H. Condensate Trap Freeze Protection

Refer to Condensate Drain Protection section for recommendations and procedures.

III. 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.

A. Condensate Trap Location

The condensate trap must be removed from the factory-installed blower shelf location and relocated in selected application location as shown in Fig. 2, 7, or 8.

To relocate condensate trap from the blower shelf to desired location, perform the following:

1. Remove 3 tubes connected to condensate trap.
2. Remove trap from blower shelf by gently pushing tabs inward and rotating trap.
3. Remove casing hole filler cap from casing hole. (See Fig. 2, 7, or 8.)
4. Install casing hole filler cap into blower shelf hole where trap was removed.
5. Install condensate trap into desired casing hole by inserting tube connection stubs through casing hole and rotating until tabs snap into locking position.

B. Condensate Trap Tubing

NOTE: See Fig. 7 or 8 or tube routing label on main furnace door to check for proper connections.

1. Collector Box Drain Tube
 - a. Remove factory-installed plug from LOWER collector box drain tube (blue and white striped label).
 - b. Install removed clamp and plug into UPPER collector box drain tube (blue label) which was connected to condensate trap.
 - c. Connect LOWER collector box drain connection to condensate trap.
- (1.) Condensate Trap Located on Left Side of Casing
 - (a.) Connect LOWER collector box drain tube (blue and white striped label) to condensate trap. Tube does not need to be cut.
 - (b.) Clamp tube to prevent any condensate leakage.
- (2.) Condensate Trap Located on Right Side of Casing
 - (a.) Install drain tube coupling (factory supplied in loose parts bag) into collector box drain tube (blue and white striped label) which was previously plugged.
 - (b.) Connect larger diameter drain tube (factory supplied in loose parts bag) to drain tube coupling, extending collector box drain tube for connection to condensate trap.
 - (c.) Route extended collector box drain tube between gas valve and inlet housing as shown in Fig. 8.

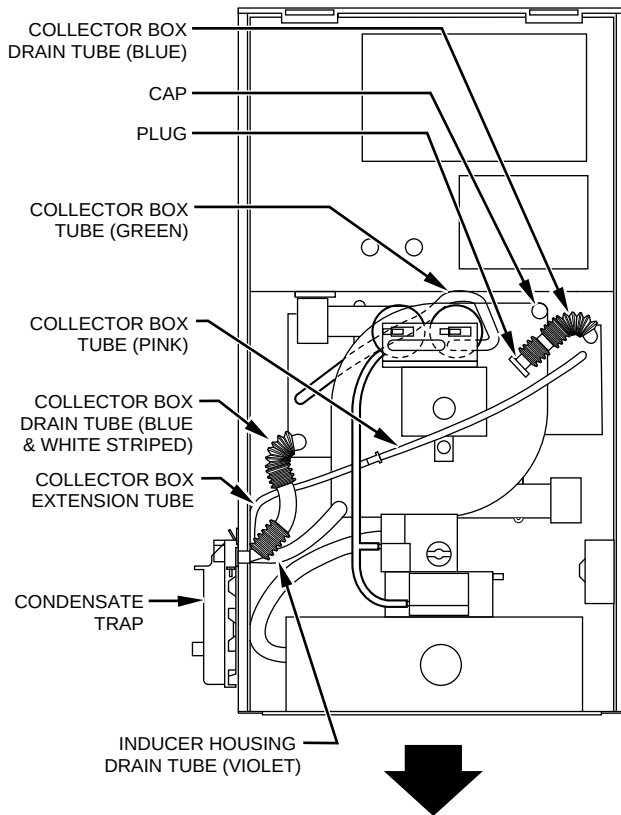


**Fig. 7—Downflow Tube Configuration
(Left-Hand Trap Installation)**

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- (d.) Determine appropriate length and cut.
- (e.) Connect to condensate trap.
- (f.) Clamp tube to prevent any condensate leakage.

2. Inducer Housing Drain Tube

- a. Remove factory-installed cap and clamp from LOWER inducer housing drain connection.
- b. Remove and discard UPPER (molded) inducer housing drain tube which was previously connected to condensate trap.
- c. Install cap and clamp on UPPER inducer housing drain connection where molded drain tube was removed.
- d. Use inducer housing drain tube (violet label and factory supplied in loose parts bag) to connect LOWER inducer housing drain connection to the condensate trap.
- e. Connect inducer housing drain connection to condensate trap.

(1.) Condensate Trap Located on Left Side of Casing

- (a.) Determine appropriate length and cut.
- (b.) Connect tube to condensate trap.
- (c.) Clamp tube to prevent any condensate leakage.

(2.) Condensate Trap Located on Right Side of Casing

- (a.) Route inducer housing drain tube (violet label) between gas valve and inlet housing behind collector box drain tube.
- (b.) Determine appropriate length and cut.
- (c.) Connect tube to condensate trap.
- (d.) Clamp tube to prevent any condensate leakage.

3. Relief Port Tube

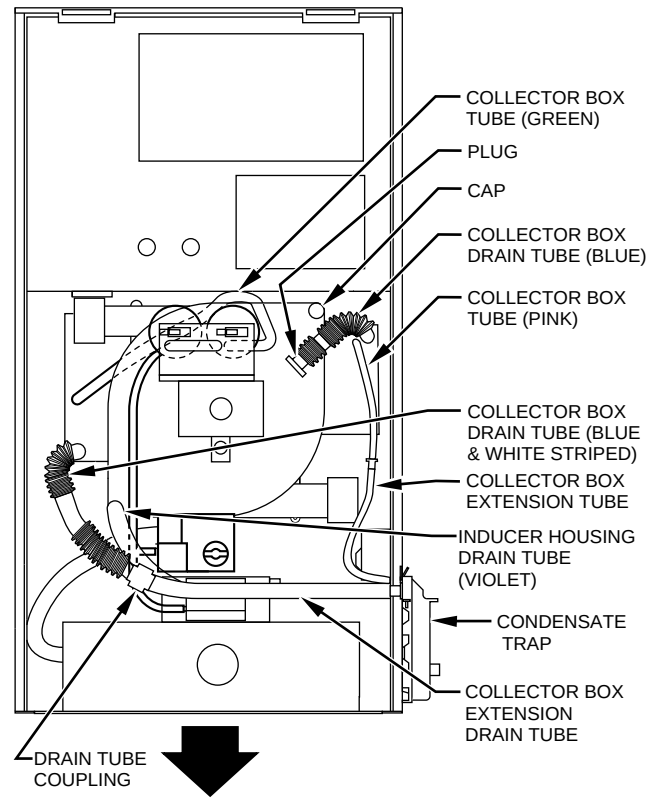


**Fig. 8—Downflow Tube Configuration
(Right-Hand Trap Installation)**

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Refer to Pressure Switch Tubing section for connection procedure.

C. Condensate Trap Field Drain Attachment

Refer to Condensate Drain section for recommendations and procedures.

D. Pressure Switch Tubing

One collector box pressure tube (pink label) is factory connected to the pressure switch for use when furnace is installed in UPFLOW or HORIZONTAL LEFT applications. This tube MUST be disconnected and used for the condensate trap relief port tube. The other collector box pressure tube (green label) which was factory connected to the condensate trap relief port connection MUST be connected to the pressure switch in DOWNFLOW or HORIZONTAL RIGHT applications.

NOTE: See Fig. 7 or 8 or tube routing label on main furnace door to check for proper connections.

Relocate tubes as described below.

- 1. Disconnect collector box pressure tube (pink label) attached to pressure switch.
- 2. Use small diameter tube (factory supplied in loose parts bag) to extend collector box pressure tube (green label) which was previously connected to condensate trap relief port connection.
- 3. Connect collector box pressure tube (green label) to pressure switch connection labeled COLLECTOR BOX.
- 4. Use remaining small diameter tube (factory supplied in loose parts bag) to extend collector box pressure tube (pink label) which was previously connected to pressure switch.
- 5. Route this extended tube (pink label) to condensate trap relief port connection.
- 6. Determine appropriate length, cut, and connect tube.

7. Clamp tube to relief port connection.

E. Condensate Trap Freeze Protection

Refer to Condensate Drain Protection section for recommendations and procedures.

IV. 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 an attic application or over a finished ceiling.

NOTE: In Canada, installations shall be in accordance with current NSCNGPIC and/or local codes.

NOTE: The auxiliary junction box (J-box) **MUST** be relocated to opposite side of furnace casing. (See Fig. 9.) See Electrical Connection section for J-box relocation.

A. Condensate Trap Location

The condensate trap must be removed from the factory-installed blower shelf location and relocated in selected application location as shown in Fig. 2 or 9.

To relocate condensate trap from the blower shelf to desired location, perform the following:

1. Remove 3 tubes connected to condensate trap.
2. Remove trap from blower shelf by gently pushing tabs inward and rotating trap.

3. Remove casing hole filler cap from casing hole. (See Fig. 2 or 9.)
4. Install casing hole filler cap into blower shelf hole where trap was removed.
5. Install condensate trap into casing hole by inserting tube connection stubs through casing hole and rotating until tabs snap into locking position.

B. Condensate Trap Tubing

NOTE: See Fig. 9 or tube routing label on main furnace door to check for proper connections.

1. Collector Box Drain Tube
 - a. Install drain tube coupling (factory supplied in loose parts bag) into collector box drain tube (blue label) which was previously connected to condensate trap.
 - b. Connect large diameter drain tube and clamp (factory supplied in loose parts bag) to drain tube coupling, extending collector box drain tube.
 - c. Route extended tube (blue label) to condensate trap and cut to appropriate length.
 - d. Clamp tube to prevent any condensate leakage.
2. Inducer Housing Drain Tube
 - a. Remove and discard LOWER (molded) inducer housing drain tube which was previously connected to condensate trap.
 - b. Use inducer housing drain extension tube (violet label and factory supplied in loose parts bag) to connect LOWER inducer housing drain connection to the condensate trap.
 - c. Determine appropriate length, cut, and connect tube.

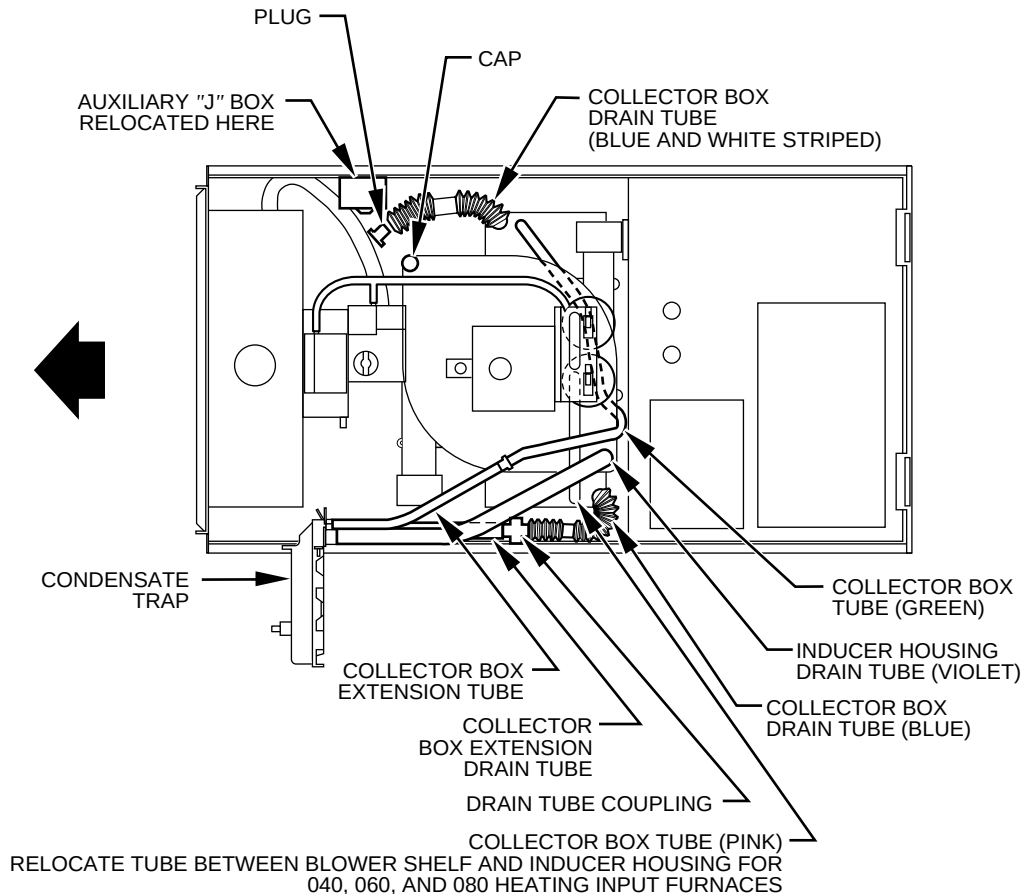
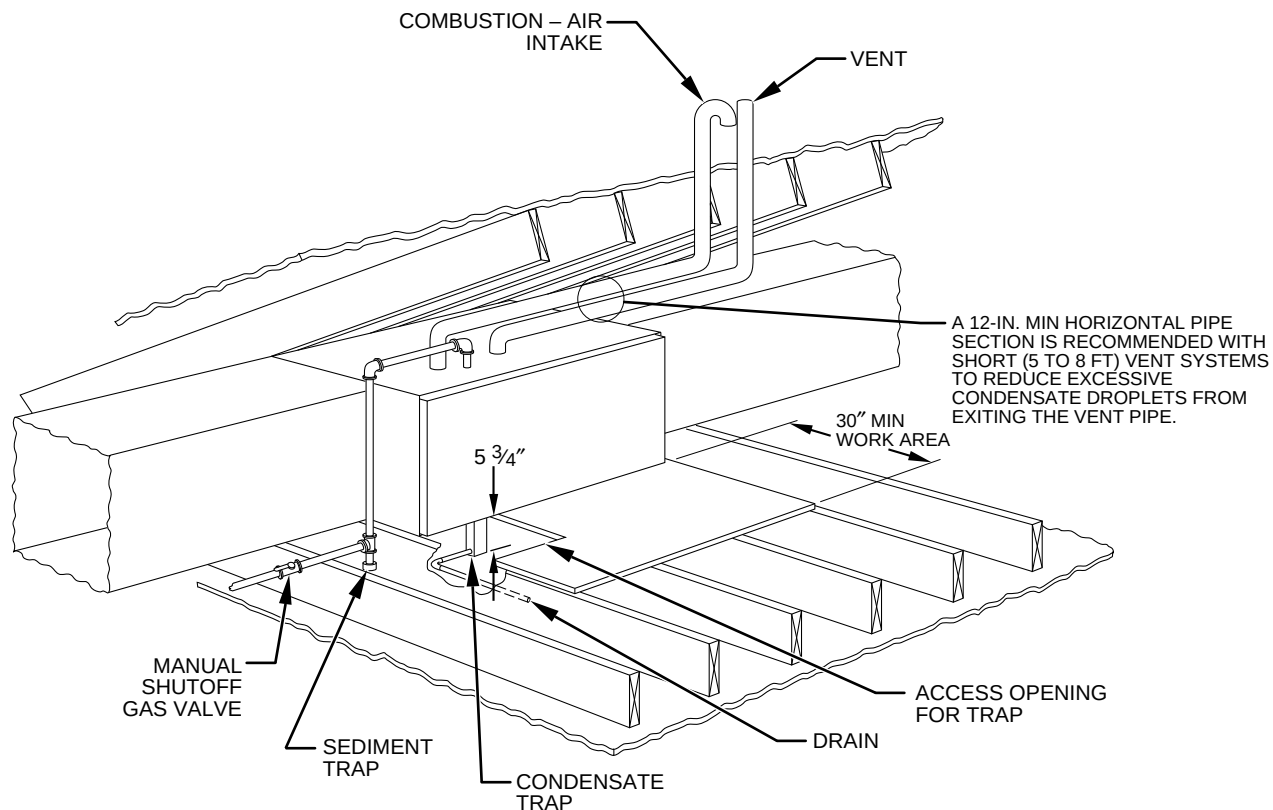


Fig. 9—Horizontal Left Tube Configuration



NOTE: LOCAL CODES MAY REQUIRE A DRAIN PAN UNDER THE FURNACE AND CONDENSATE TRAP WHEN A CONDENSING FURNACE IS INSTALLED ABOVE FINISHED CEILINGS.

Fig. 10—Attic Location and Working Platform

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d. Clamp tube to prevent any condensate leakage.

3. Relief Port Tube

- Use small diameter tube (factory supplied in loose parts bag) to extend collector box tube (green label) which was previously connected to the condensate trap.
- Route extended collector box pressure tube to relief port connection on the condensate trap.
- Determine appropriate length, cut, and connect tube.
- Clamp tube to prevent any condensate leakage.

C. Condensate Trap Field Drain Attachment

Refer to Condensate Drain section for recommendations and procedures.

D. Pressure Switch Tubing

The LOWER collector box pressure tube (pink label) is factory connected to the pressure switch and should not require any modification.

NOTE: See Fig. 9 or tube routing label on main furnace door to check for proper connections.

E. Condensate Trap Freeze Protection

Refer to Condensate Drain Protection section for recommendations and procedures.

F. Construct a Working Platform

Construct working platform where all required furnace clearances are met. (See Fig. 3 and 10.)

CAUTION: The condensate trap **MUST** be installed below furnace. See Fig. 4 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 5.)

NOTE: A 12-in. minimum horizontal pipe section is recommended with short (5 to 8 ft) vent systems. This recommendation is to reduce excessive condensate droplets from exiting the vent pipe. (See Fig. 10 or 29.)

V. 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 application or over a finished ceiling.

NOTE: In Canada, installations shall be in accordance with current NSCNGPIC Installation Codes and/or local codes.

A. Condensate Trap Location

The condensate trap must be removed from the factory-installed blower shelf location and relocated in selected application location as shown in Fig. 2 or 11.

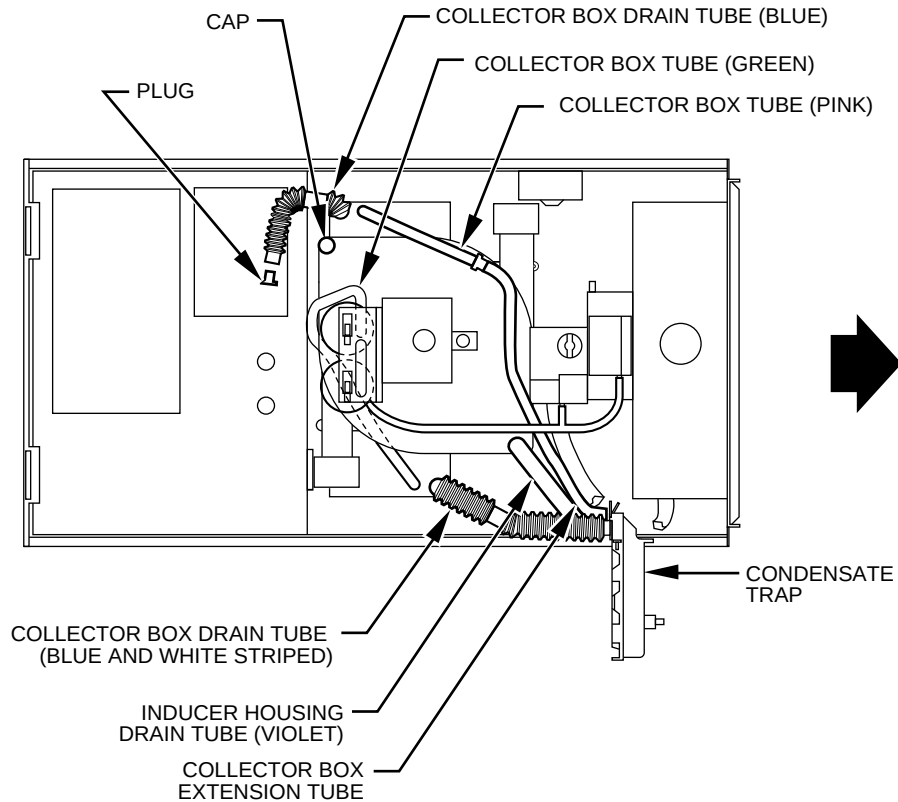


Fig. 11—Horizontal Right Tube Configuration

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To relocate condensate trap from the blower shelf to desired location, perform the following:

1. Remove 3 tubes connected to condensate trap.
2. Remove trap from blower shelf by gently pushing tabs inward and rotating trap.
3. Remove casing hole filler cap from casing hole. (See Fig. 2 or 11.)
4. Install casing hole filler cap into blower shelf hole where trap was removed.
5. Install condensate trap into casing hole by inserting tube connection stubs through casing hole and rotating until tabs snap into locking position.

B. Condensate Trap Tubing

NOTE: See Fig. 11 or tube routing label on main furnace door to check for proper connections.

1. Collector Box Drain Tube
 - a. Remove factory-installed plug from LOWER collector box drain tube (blue and white striped label).
 - b. Install removed clamp and plug into UPPER collector box drain tube (blue label) which was previously connected to condensate trap.
 - c. Connect LOWER collector box drain tube (blue and white striped label) to condensate trap. Tube does not need to be cut.
 - d. Clamp tube to prevent any condensate leakage.
2. Inducer Housing Drain Tube
 - a. Remove factory-installed cap and clamp from LOWER inducer housing drain connection.
 - b. Remove and discard UPPER (molded) inducer housing drain tube which was previously connected to condensate trap.

- c. Install cap and clamp on UPPER inducer housing drain connection where molded drain tube was removed.
- d. Use inducer housing drain extension tube (violet label and factory supplied in loose parts bag) to connect LOWER inducer housing drain connection to condensate trap.
- e. Determine appropriate length, cut, and connect tube to condensate trap.
- f. Clamp tube to prevent any condensate leakage.

3. Relief Port Tube

Refer to Pressure Switch Tubing section for connection procedure.

C. Condensate Trap Field Drain Attachment

Refer to Condensate Drain section for recommendations and procedures.

D. Pressure Switch Tubing

One collector box pressure tube (pink label) is factory connected to the pressure switch for use when furnace is installed in UPFLOW or HORIZONTAL LEFT applications. This tube **MUST** be disconnected and used for the condensate trap relief port tube. The other collector box pressure tube (green label) which was factory connected to the condensate trap relief port connection **MUST** be connected to the pressure switch in DOWNFLOW or HORIZONTAL RIGHT applications.

NOTE: See Fig. 11 or tube routing label on main furnace door to check for proper connections.

Relocate tubes as described below.

1. Disconnect collector box pressure tube (pink label) attached to pressure switch.
2. Use small diameter tube (factory supplied in loose parts bag) to extend collector box pressure tube (green label) which was previously connected to condensate trap relief port connection.

3. Connect collector box pressure tube (green label) to pressure switch connection labeled COLLECTOR BOX.
4. Use remaining small diameter tube (factory supplied in loose parts bag) to extend collector box pressure tube (pink label) which was previously connected to pressure switch.
5. Route this extended tube (pink label) to condensate trap relief port connection.
6. Determine appropriate length, cut, and connect tube.
7. Clamp tube to relief port connection.

E. Condensate Trap Freeze Protection

Refer to Condensate Drain Protection section for recommendations and procedures.

F. Construct a Working Platform

Construct working platform where all required furnace clearances are met. (See Fig. 3 and 10.)

CAUTION: The condensate trap **MUST** be installed below furnace. See Fig. 4 for dimensions. The drain connection to condensate trap must also be properly sloped to an open drain.

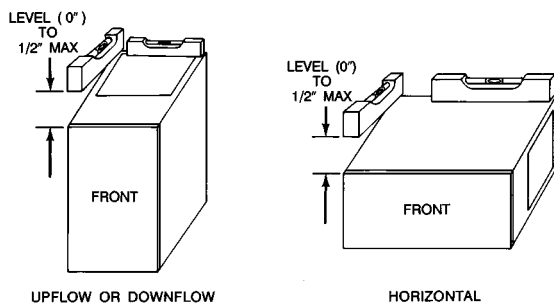
NOTE: Combustion-air and vent pipes are restricted to a minimum length of 5 ft. (See Table 5.)

NOTE: A 12-in. minimum horizontal pipe section is recommended with short (5 to 8 ft) vent systems. This recommendation is to reduce excessive condensate droplets from exiting the vent pipe. (See Fig. 10 or 29.)

LOCATION

I. 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.

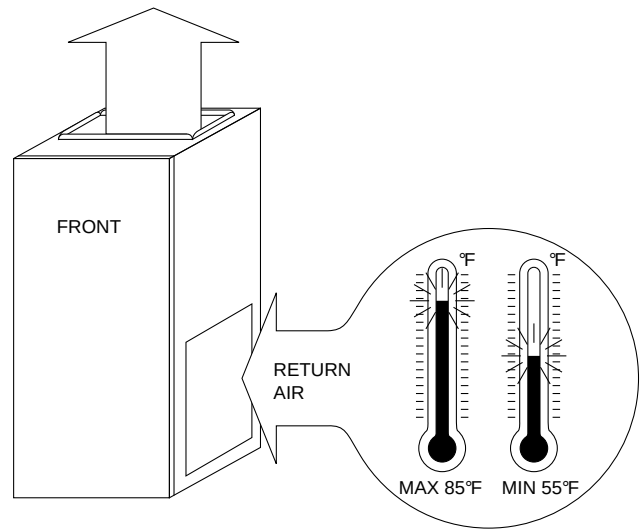


A93025

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.

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 5.



A93042

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 exchangers, motors, and controls.

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 units clearance to combustibles label. (See Fig. 3.) Locate furnace where available electric power and gas supplies meet specifications on furnace rating plate.

II. LOW-FIRE ONLY INSTALLATION

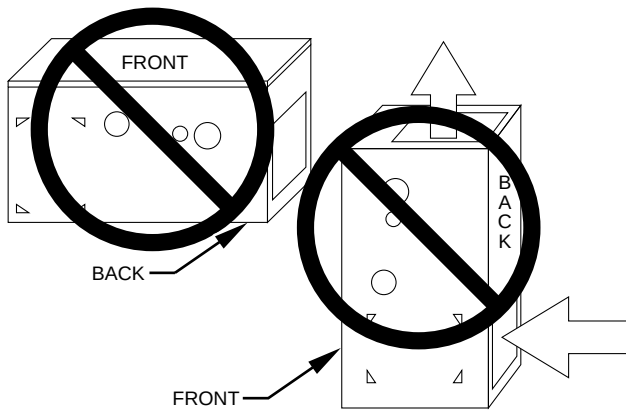
This 355MAV furnace can be installed to operate in the low-fire only heating mode when sized using the low-fire heating capacity. This is accomplished by placing setup switch SW-2 in the ON position to provide only low-fire-heat operation. See Fig. 25 and Table 9. With this setup, high-fire operation will not occur.

When the model no. on the furnace rating plate is followed by an asterisk (*), the furnace has an alternate low-fire only efficiency rating as listed in the GAMA and CEC directories. This alternate rating will be listed as the furnace model number followed by an (-L) suffix.

CAUTION: The furnace can operate in the high-fire mode when certain fault conditions occur. The following precautions should be taken:

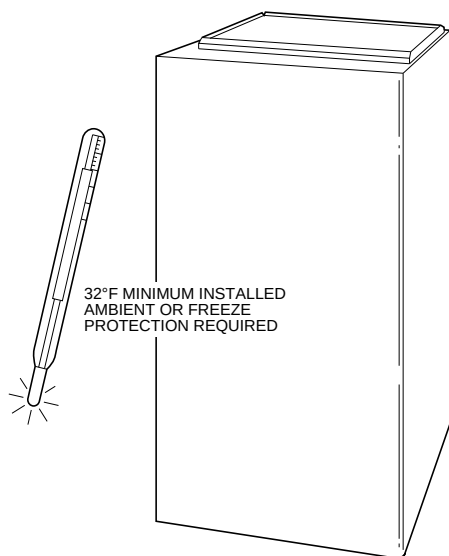
1. Size gas piping based on the high-fire input.
2. Check the high-fire input and adjust it per the main literature instructions.

NEVER assume the high-fire input rate is not important for low-fire-only installation.



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.



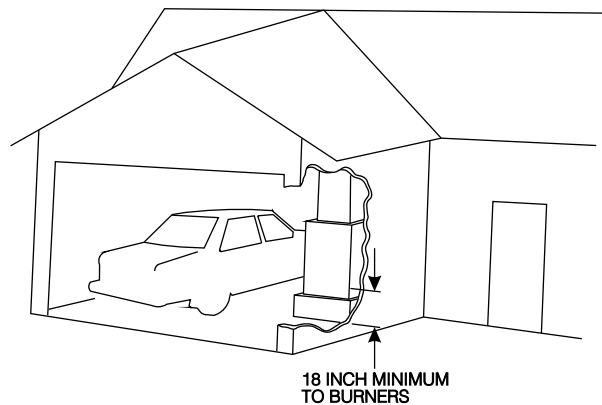
A93058

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.

III. 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.

IV. HAZARDOUS LOCATIONS



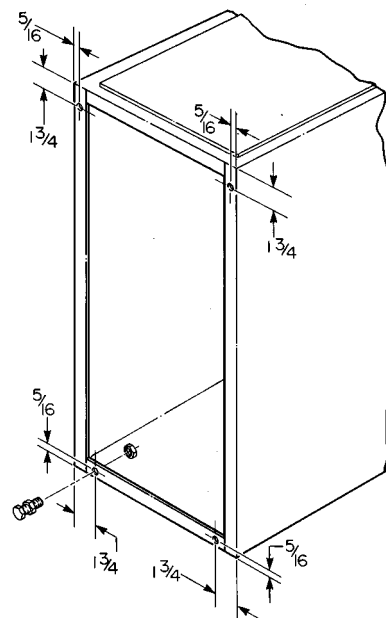
A93044

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.

INSTALLATION

I. 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

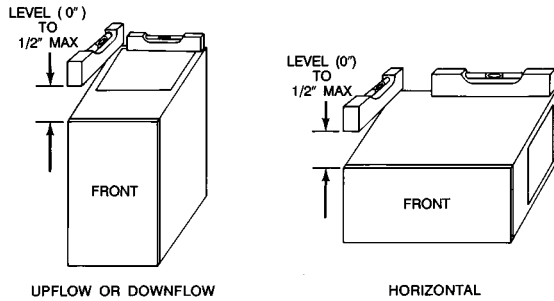
Fig. 12—Leveling Legs

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.

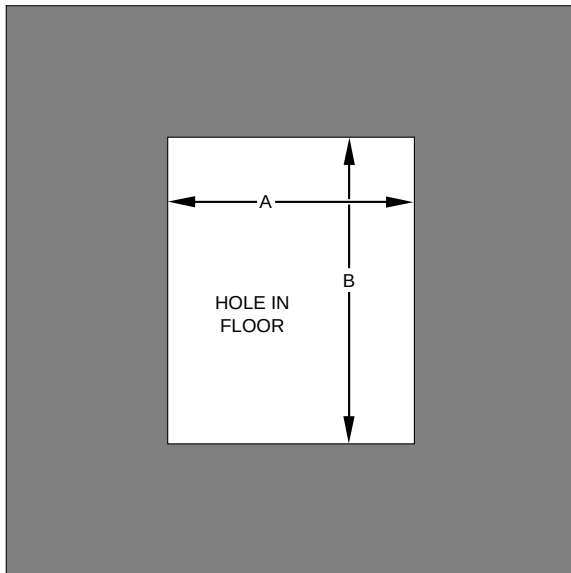
NOTE: Bottom closure must be used when leveling legs are used. See Bottom Closure Panel section.



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.

II. INSTALLATION ON A CONCRETE SLAB

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



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.

Fig. 13—Floor Opening in Concrete Slab

III. INSTALLATION ON A COMBUSTIBLE FLOOR (DOWNFLOW APPLICATIONS)

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.)

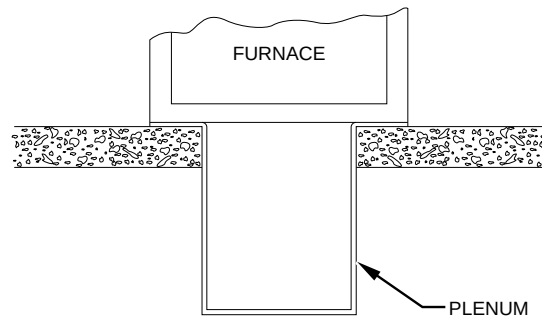


Fig. 14—Furnace on a Concrete Slab (Non-Garage Installation)

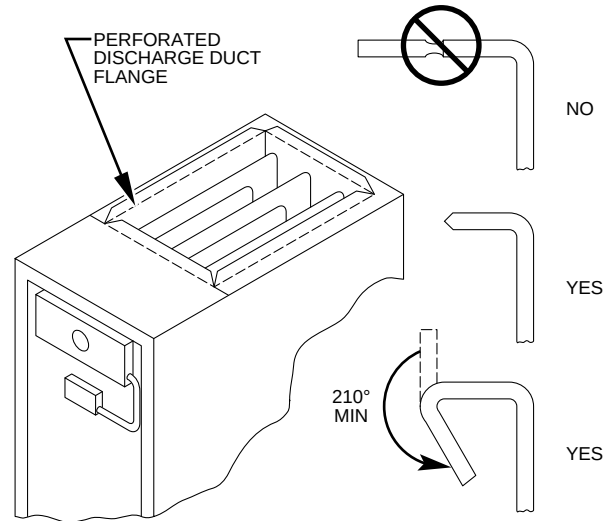


Fig. 15—Duct Flanges

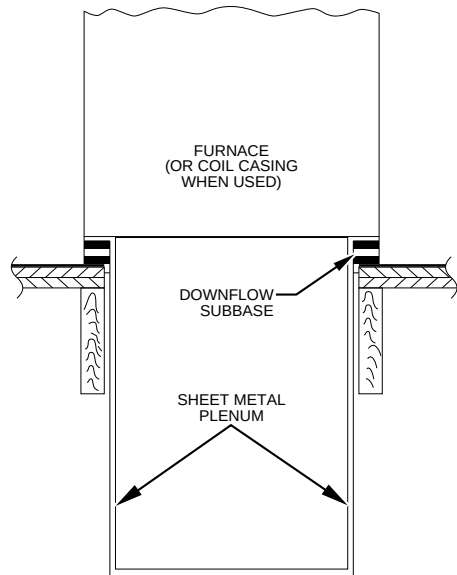
WARNING: Do not bend duct flanges inward as shown in Fig. 15. This will affect airflow across heat exchangers and may cause limited cycling or premature heat exchanger failure. Remove duct flange completely or bend it inward a minimum of 210° as shown in Fig. 15.

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

IV. INSTALLATION IN HORIZONTAL APPLICATIONS

These furnaces can be installed horizontally in either horizontal left or right discharge position. In a crawlspace, 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. (See Fig. 17.) Cut hanger bolts (4 each 3/8-in. all-thread rod) to desired length. Use 1 X 3/8-in. flat washers, 3/8-in. lockwashers, and 3/8-in. nuts on hanger rods as shown in Fig. 17. Dimples are provided for hole locations. (See Fig. 2.)

CAUTION: The entire length of furnace **MUST** be supported when furnace is used in a horizontal position to ensure proper draining.



V. FILTER ARRANGEMENT



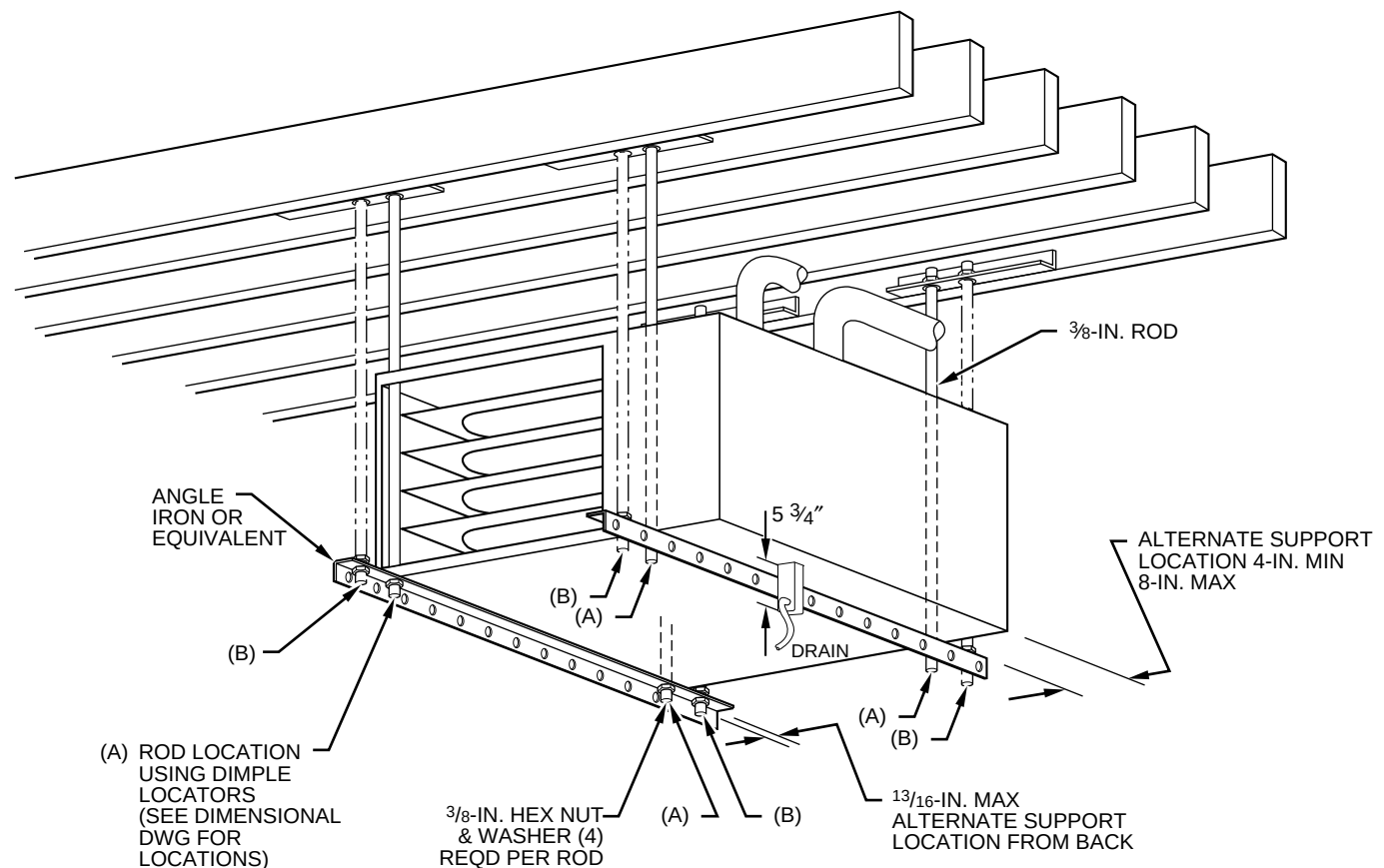
CAUTION: Never operate unit without a filter or with blower access panel removed.

Factory-supplied washable framed filters are shipped in blower compartment. Determine location for filter and relocate filter retaining wire if necessary. See Table 1 to determine correct filter size for desired filter location. Table 1 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 1—FILTER INFORMATION

FURNACE CASING WIDTH (IN.)	FILTER SIZE (IN.)*		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.



(A) PREFERRED ROD LOCATION

(B) ALTERNATE ROD LOCATION

NOTES: 1. A 1 in. clearance minimum between top of furnace and combustible material.

2. The entire length of furnace must be supported when furnace is used in horizontal position to ensure proper drainage.

Fig. 17—Crawlspace Horizontal Application

A93304

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 configurations. Install filter(s) as shown in Fig. 18.

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 inlet is used.

VI. BOTTOM CLOSURE PANEL

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

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.
4. Reinstall front filler panel and screws.

VII. GAS PIPING

Gas piping must be installed in accordance with national and local codes. Refer to current edition of NFGC. Canadian installations must be made in accordance with NSCNGPIC and all authorities having jurisdiction. Gas supply line should be a separate line running directly from meter to furnace, if possible. Refer to Table 2 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.

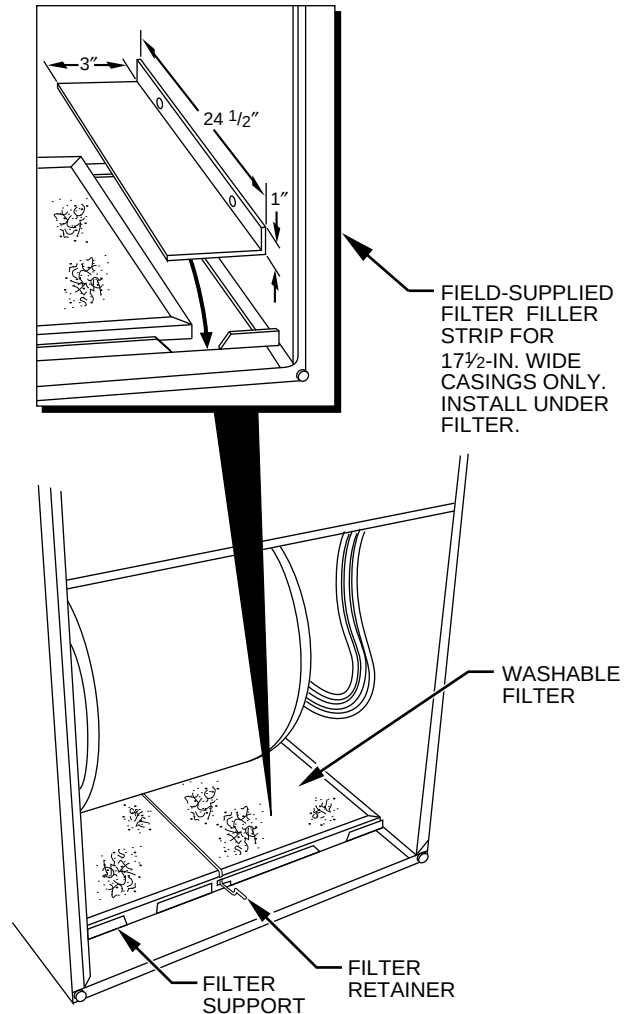


Fig. 19—Bottom Filter Arrangement

A93321

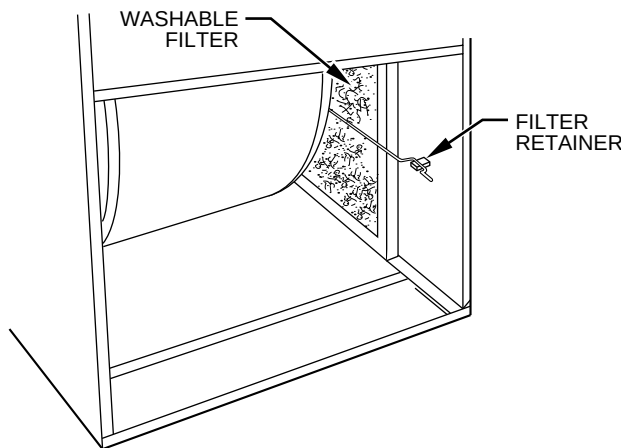


Fig. 18—Filter Installed for Side Inlet

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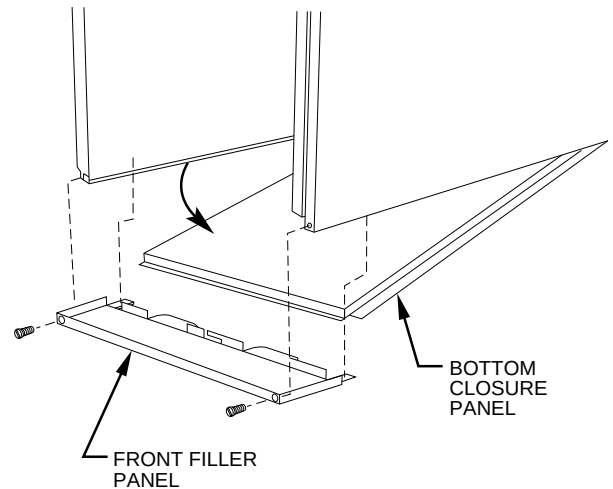


Fig. 20—Removing Bottom Closure Panel

A93047

TABLE 2—MAXIMUM CAPACITY OF PIPE*

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

* Cubic ft of gas per 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 10-2 NFPA 54-1992.

CAUTION: Connect gas pipe to furnace using a backup wrench 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.

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.

Install a sediment trap in riser leading to furnace. Trap can be installed by connecting a tee to riser leading to furnace so 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 shut-off valve. (See Fig. 21.)

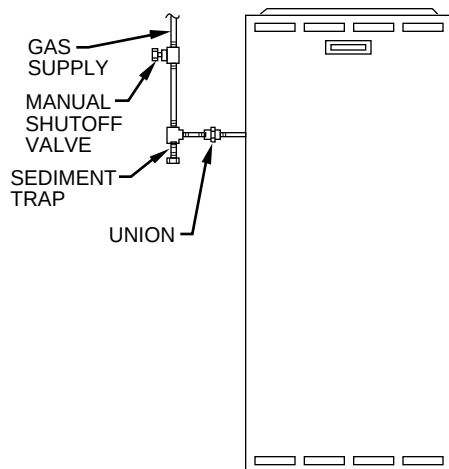


Fig. 21—Typical Gas Pipe Arrangement

A93324

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 shut-off 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 shut-off valve.

NOTE: The gas valve inlet press tap connection 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. (See Fig. 45.) 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 NSCNGPIC. 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 shut-off 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.

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 lock out. Control is grounded through green wire routed to gas valve and burner box screw.

I. 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 Table 3 for equipment electrical specifications.

Make all electrical connections in accordance with NEC 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 Canadian Electrical Code CSA C22.1 or subauthorities having jurisdiction.

Use a separate, fused branch electrical circuit containing a properly sized fuse or circuit breaker for this furnace. See Table 3 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.

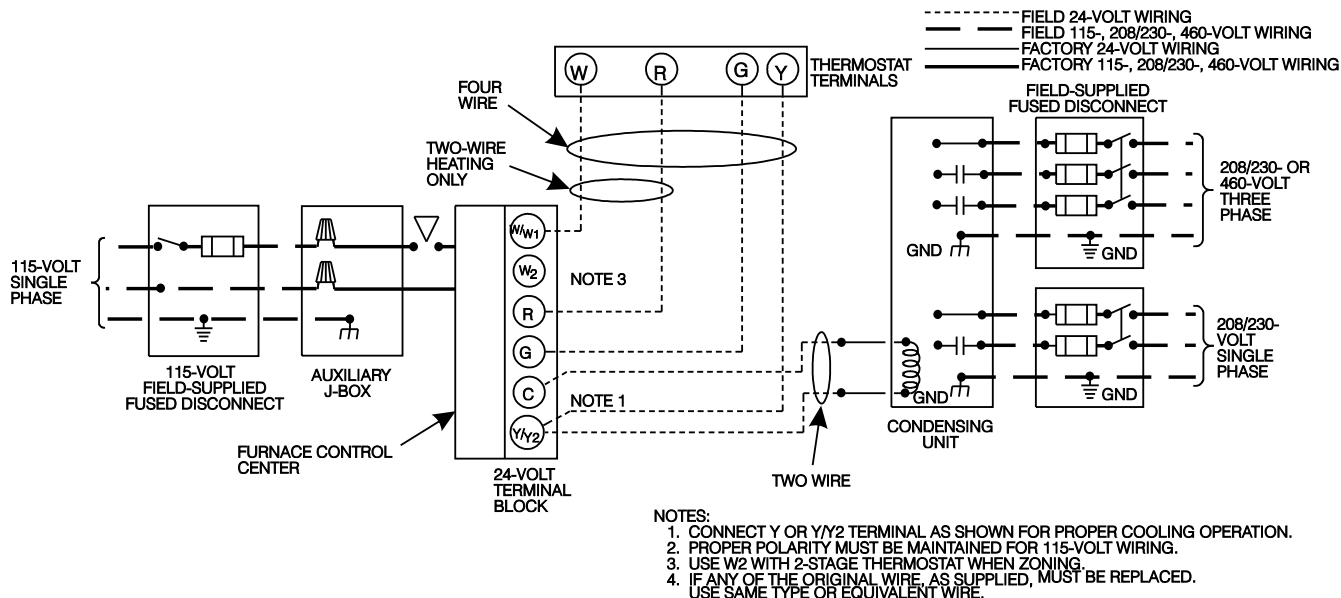
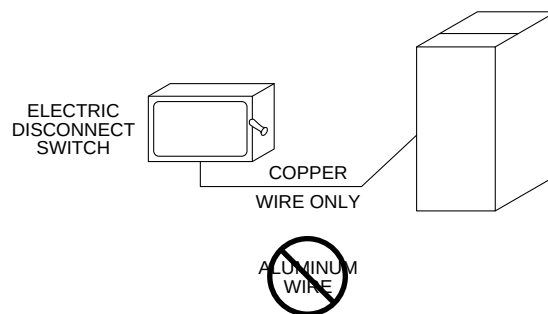


Fig. 22—Heating and Cooling Application Wiring Diagram

A93049

WARNING: The cabinet MUST have an uninterrupted or unbroken ground according to NEC ANSI/NFPA 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.



Make all electrical connections in accordance with the current edition of the NEC 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 Canadian Electrical Code CSA C22.1 or authorities having jurisdiction.

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.

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

A93033

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).

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.

II. 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

III. ACCESSORIES

1. Electronic Air Cleaner (EAC)

The control center EAC terminals are energized with 115v (1.5-amp maximum) during blower operation.

TABLE 3—ELECTRICAL DATA

UNIT SIZE	VOLTS—HERTZ—PHASE	OPERATING VOLTAGE RANGE		MAXIMUM UNIT AMPS	UNIT AMPACITY†	MINIMUM WIRE SIZE	MAXIMUM WIRE LENGTH (FT)‡	MAXIMUM FUSE OR CKT BKR AMPS**
		Maximum*	Minimum*					
042040	115—60—1	127	104	9.0	12.0	14	30	15
042060	115—60—1	127	104	9.0	12.0	14	30	15
042080	115—60—1	127	104	9.0	12.0	14	30	15
060100	115—60—1	127	104	13.9	18.1	12	32	20

* Permissible limits of voltage range at which unit will operate satisfactorily.

† Unit ampacity = 125 percent of largest operating component's full load amps plus 100 percent of all other potential operating components' (EAC, humidifier, etc.) full load amps.

‡ 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.

- a. Two extension leads are connected to the control center EAC terminals to assist field installation of an EAC. (See Fig 25.) To use these leads, precede with the following:

- (1.) Strip EAC power lead insulation approximately 1/4-in.
- (2.) Insert stripped end into factory supplied black lead's butt connector and crimp to secure.
- (3.) Strip EAC neutral lead insulation approximately 1/4-in.
- (4.) Insert stripped end into factory supplied white lead's butt connector and crimp to secure.

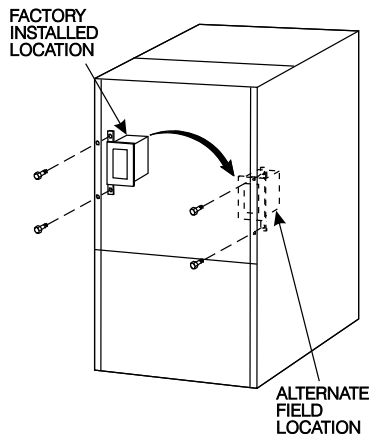


Fig. 24—Relocating J-Box

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NOTE: If desired, cut butt connectors off factory leads and strip insulation approximately 1/4-in and use field supplied wire nuts to connect.

- b. An alternate method to attach EAC lead to control center is the following procedure:

- (1.) Remove 2 screws securing the control box to furnace blower shelf.
- (2.) Remove and discard 2 factory supplied leads from control center EAC terminals.
- (3.) Strip EAC power leads insulation approximately 1/8-in.

NOTE: The control center EAC terminals are sized for 12 gage maximum, solid or stranded wire.

- (4.) Route EAC leads through right-hand wire grommet.
- (5.) Insert EAC stripped leads into control center EAC terminals by depressing terminals arm with a screw-driver or finger. (See Fig 26.)
- (6.) Reinstall control box to furnace blower shelf using 2 screws removed earlier.

2. Humidifier (HUM)

Screw terminals (HUM and Com) are provided for 24-v humidifier connection. (See Fig. 23.) HUM terminal is energized with 24v (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.

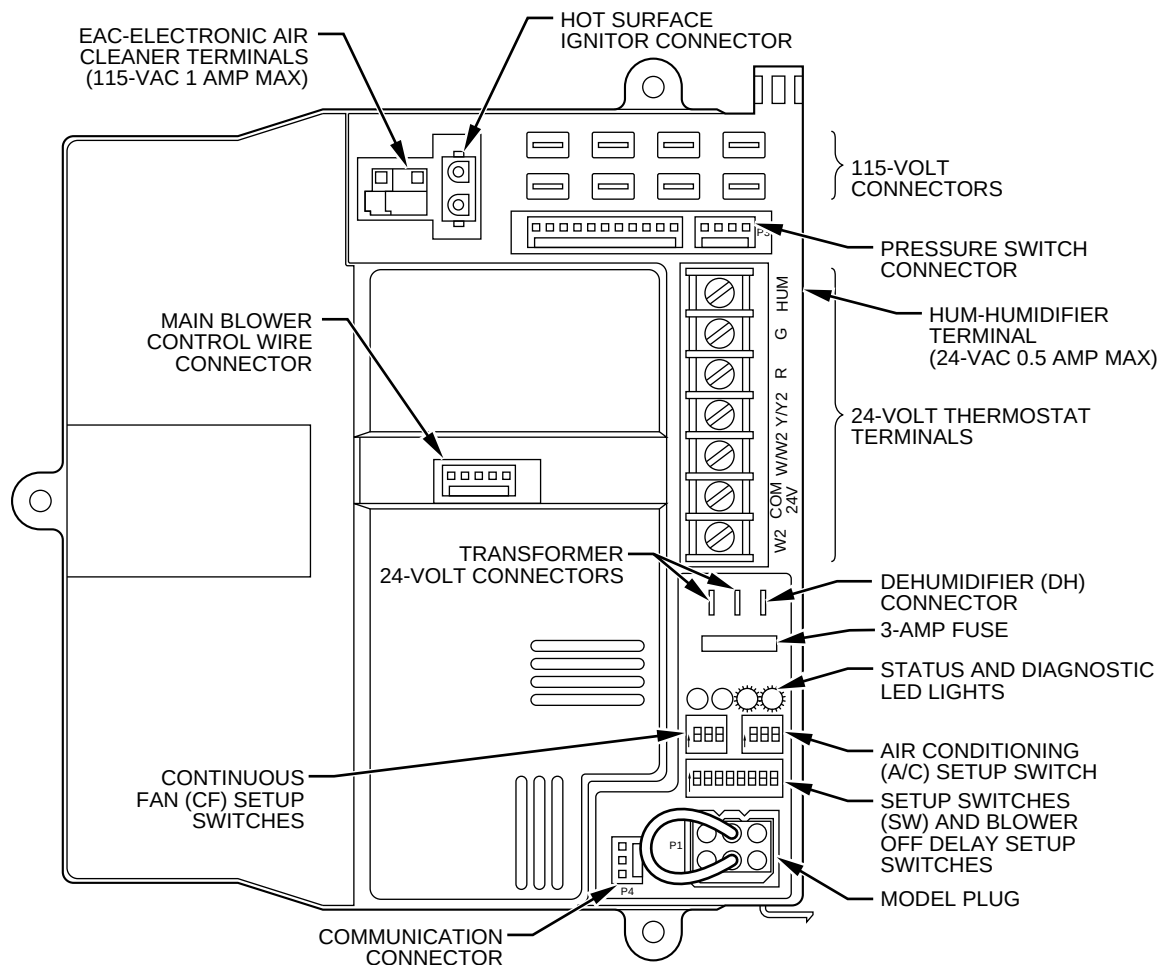


Fig. 25—Control Center

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3. Dehumidification (DH)

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

DIRECT VENTING

The 355MAV Furnaces 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.

I. 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. Determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
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 operates 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 NFGC or Section 5 of NSCNGPIC.

II. COMBUSTION-AIR AND VENT PIPING

A. General

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), F628 (schedule-40 ABS), or F891 (PVC-DWV cellular core). Pipe cement and primer must conform to ASTM standards D2564 (PVC) or D2235 (ABS). See Table 5 for maximum pipe lengths and Fig. 31, 32, 33, 34, and 35 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 allows proper drainage of vent condensate.

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

TABLE 4—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
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 (windows or doors which can be opened) or combustion-air opening	1	1
For furnaces with an input capacity greater than 100,000 Btuh—from any non-mechanical air supply (windows or doors which can be opened) 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

* Horizontal distance.

† 18 in. above roof surface in Canada.

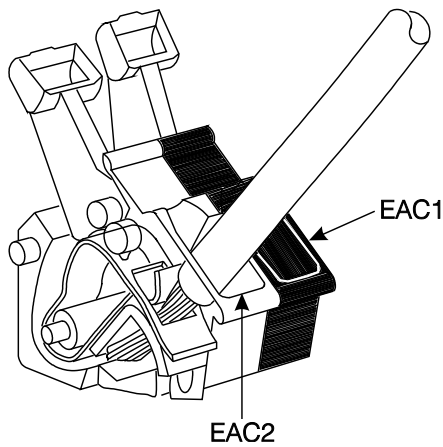
‡ 36 in. to electric meter in Canada only.

NOTES:

1. If installing 2 adjacent 355MAV Furnaces, refer to Multiventing and Vent Terminations section for proper vent configurations.
2. When locating combustion-air and vent terminations, consideration must be given to prevailing winds, location, and other conditions which may cause recirculation of the appliance's own flue products or the flue products of adjacent vents. Recirculation can cause poor combustion, inlet condensate problems, and accelerated corrosion of heat exchangers.

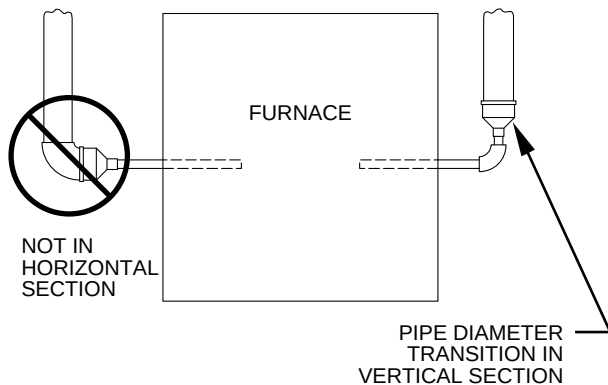
Furnace combustion-air and vent pipe connections must be attached as shown in Fig 28. Combustion-air intake plug fitting and inducer housing alternate vent cap may need to be relocated in some applications.

	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.
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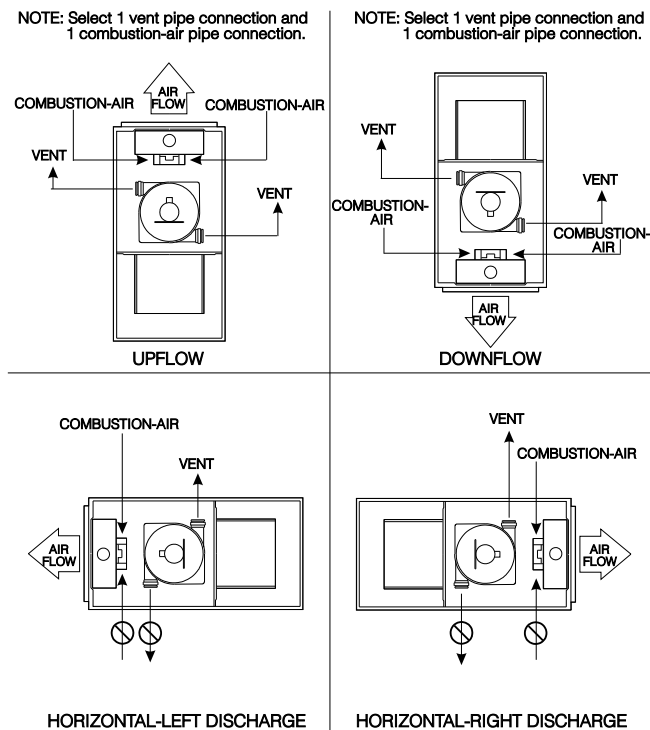
A93053

Fig. 26—EAC Terminals on Control Center



A93034

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



A93083

Fig. 28—Combustion-Air and Vent Pipe Connections

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 6 with Armaflex-type insulation.

CAUTION: Combustion air must not be taken from inside structure because that air is frequently 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. 31, 32, 33, 34, or 35. Failure to follow this warning could result in property damage, personal injury, or death.

NOTE: The minimum combustion-air and vent pipe length (each) for these furnaces is 5 ft. Short pipe lengths (5-8 ft) may discharge water droplets. These droplets may be undesirable, and a 12-in. minimum horizontal pipe section is recommended, as shown in Fig. 29, to reduce excessive droplets from exiting vent pipe outlet.

B. Combustion-Air and Vent Pipe Diameter

Determine combustion-air and vent pipe diameter.

1. Using Table 5, determine preliminary combustion-air pipe diameter.
2. Using Table 5, determine preliminary vent pipe diameter.
3. Use largest diameter pipe determined in 1. and 2. above for both pipes.

NOTE: Do not count elbows or pipe sections in terminations or within furnace. See shaded areas in Fig. 31, 32, 33, 34, and 35.

EXAMPLE:

An 042080 size furnace located in Indianapolis, elevation 650 ft above sea level, could be installed in an application requiring 3 elbows and 17 ft of vent pipe, along with 5 elbows and 16 ft of combustion-air pipe. Table 5 indicates this application would allow a 1-1/2-in. diameter vent pipe, but require a 2-in. diameter combustion-air pipe (2-in. pipe is good for 20 ft with 3 elbows, but 10 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 not allowed with 5 elbows, and 2-in. pipe is good for 68 ft with 5 elbows.

C. Combustion-Air and Vent Pipe Attachment

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

1. Attach combustion-air pipe as follows:
 - a. Determine location of combustion-air intake pipe connection to combustion-air intake housing as shown in Fig. 28 for application.
 - b. Reposition combustion-air intake housing plug fitting in appropriate unused intake housing connection.
 - c. Insert perforated disk assembly (factory supplied) in intake housing where combustion-air intake pipe will be connected.
 - d. Install pipe support (factory supplied in loose parts bag) into selected furnace casing combustion-air pipe hole. Pipe support should be positioned to bottom of casing hole.
 - e. Insert 2-in. diameter pipe into intake housing.

NOTE: A 2-in. diameter pipe must be used within the furnace casing. Make all pipe diameter transitions outside furnace casing.

- f. Drill a 1/8-in. hole in 2-in. combustion-air pipe using hole in intake housing as a guide.
- g. Install a field-supplied No. 6 or No. 8 sheet metal screw into combustion-air pipe.

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

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.

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.

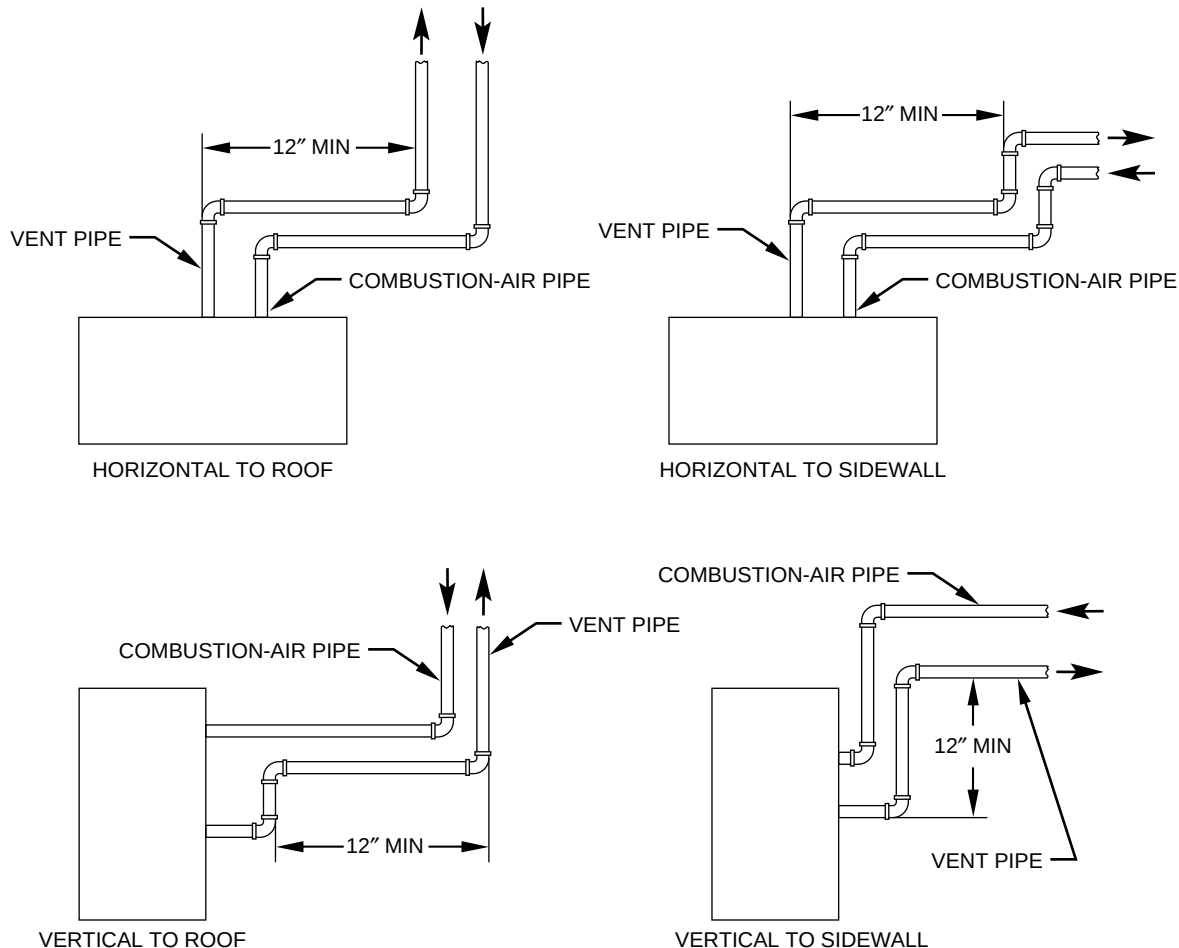
A plugged drain connection has been provided on this fitting for use when moisture is found in combustion-air intake pipe and combustion box.

NOTE: Moisture in combustion-air intake may be result of improper termination. Ensure combustion-air intake pipe is similar to that shown in Fig. 31, 32, 33, 34, or 35 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. 30.)

2. Attach vent pipe as follows:

- a. Determine location of vent pipe connection to inducer housing as shown in Fig. 28 for application.



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

Fig. 29—Short Vent (5 to 8 Ft) System

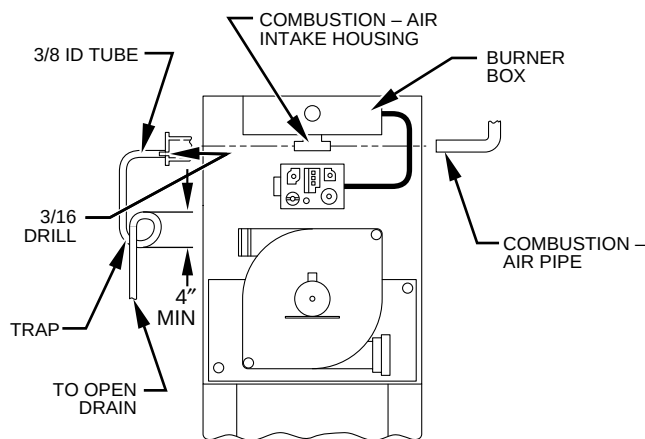


Fig. 30—Intake Housing Plug Fitting Drain A93035

- b. Reposition neoprene inducer housing outlet cap and clamp to appropriate unused inducer housing connection. Tighten clamp.

WARNING: Inducer housing outlet cap must be installed and fully seated against inducer housing. Clamp must be tightened to prevent any condensate leakage. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

- c. Install pipe support (factory supplied in loose parts bag) into selected furnace casing vent pipe hole. Pipe support should be positioned to bottom of casing hole.
- d. Insert 2-in. diameter pipe into inducer housing through neoprene coupling and clamp in inducer housing. Tighten clamp.

WARNING: Vent pipe must be installed and fully seated against inducer housing. Clamp must be tightened to prevent any condensate leakage. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

NOTE: A 2-in. diameter pipe must be used within the furnace casing. Make all pipe diameter transitions outside furnace casing.

3. Working from furnace to outside, cut pipe to required length(s).
4. Deburr inside and outside of pipe.
5. Chamfer outside edge of pipe for better distribution of primer and cement.
6. Clean and dry all surfaces to be joined.
7. Check dry fit of pipe and mark insertion depth on pipe.

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

8. 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.
9. While cement is still wet, twist pipe into socket with 1/4 turn. Be sure pipe is fully inserted into fitting socket.
10. Wipe excess cement from joint. A continuous bead of cement will be visible around perimeter of a properly made joint.

11. Handle pipe joints carefully until cement sets.
12. 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.
13. Slope combustion-air and vent pipes toward furnace a minimum of 1/4 in. per linear ft with no sags between hangers.
14. Use appropriate methods to seal openings where vent and combustion-air pipes pass through roof or side wall.

III. 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. 31, 32, 33, 34, or 35. 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., and 2-1/2 in. diameter pipe systems when single penetration of wall or roof is 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 is desired.

NOTE: Shaded parts in Fig. 31, 32, 33, 34, and 35 are considered to be terminations. These components should NOT be counted when determining pipe diameter. Roof termination is preferred since it is less susceptible to damage, has reduced chances to intake contaminants, and has less visible vent vapors. (See Fig. 31 or 32.) Sidewall termination may require sealing or shielding of building surfaces with a corrosive resistance material due to corrosive combustion products of vent system.

A. Extended Exposed Sidewall Pipes

Sidewall combustion-air and vent pipe terminations may be extended beyond area shown in Fig. 34 or 35 in outside ambient by insulating pipes as indicated in Table 6.

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.
3. Determine required insulation thickness for exposed pipe lengths.

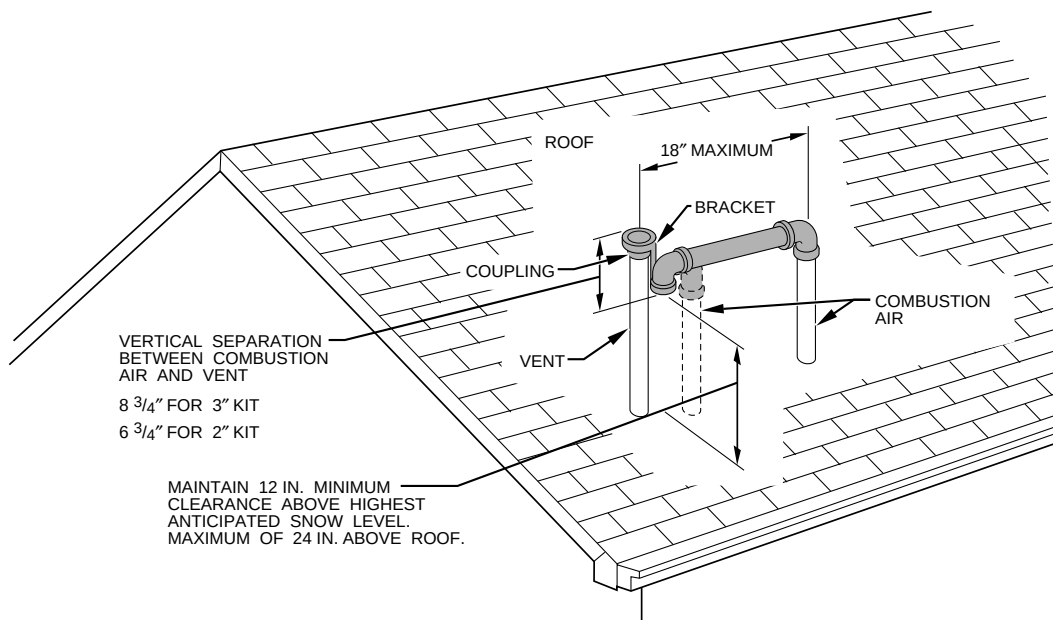
NOTE: Pipe length (ft) specified for maximum pipe lengths located in unconditioned spaces cannot exceed total allowable pipe length as specified in Table 5.

B. Two-Pipe Termination Kit

1. Determine location for termination.

Consideration of the following should be made when determining an appropriate location for termination kit.

 - a. Comply with all clearance requirements as stated in Table 4.
 - 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 (such as inside building corners) or accumulation of airborne leaves or light snow, or allow recirculation of flue gases.



A87224

Fig. 31—Roof Termination (Preferred)

- d. Termination kit should be positioned where it will not be damaged by 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. 31.

For applications using combustion-air pipe option, indicated by dashed lines in Fig. 31, 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. 34 or 35.

For applications using vent pipe option indicated by dashed lines in Fig. 34, rotate vent elbow 90° from position shown in Fig. 34.

4. Disassemble loose pipe fittings. Clean and cement using same procedures as used for system piping.
5. Check required dimensions as shown in Fig. 31, 34, or 35.

C. Concentric Vent/Air Termination Kit

1. Determine location for termination.
Consideration of the following should be made when determining an appropriate location for termination kit.
 - a. Comply with all clearance requirements as stated in Table 4.
 - 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 (such as inside building corners) or accumulation of airborne leaves or light snow, or allow recirculation of flue gases.
 - d. Termination kit should be positioned where it will not be damaged by or subjected to foreign objects, such as stones, balls, etc.

- e. Termination kit should be positioned where vent vapors are not objectionable.

2. Cut one 4-in. diameter hole for 2-in. kit, or one 5-in. diameter hole for 3-in. kit.
3. Loosely assemble concentric vent/air termination components together using instructions in kit.
4. Slide assembled kit with rain shield REMOVED through hole.

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

Roof terminations—Locate assembly through roof to appropriate height as shown in Fig. 32.

Sidewall terminations—Locate assembly through sidewall with rain shield positioned no more than 1-in. from wall as shown in Fig. 33.

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

IV. MULTIVENTING AND VENT TERMINATIONS

When 2 or more 355MAV Furnaces are vented near each other, each furnace must be individually vented. NEVER common vent or breach vent 355MAV furnaces. When 2 or more 355MAV furnaces are vented near each other, 2 vent terminations may be installed as shown in Fig. 36, 37, 38, 39, or 40, but next vent termination must 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. 36, 37, 38, 39, and 40 represents distance between pipes or rain shields, as touching or 2-in. maximum separation.

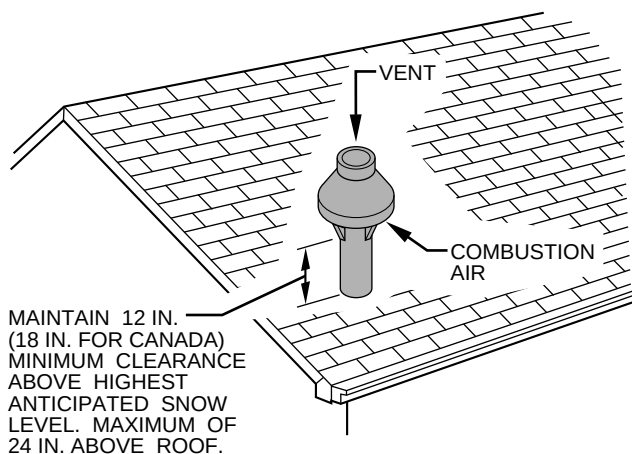
CONDENSATE DRAIN

I. GENERAL

Condensate trap is shipped installed in the blower shelf and factory connected for UPFLOW applications. Condensate trap must be RELOCATED for use in DOWNFLOW and HORIZONTAL applications.

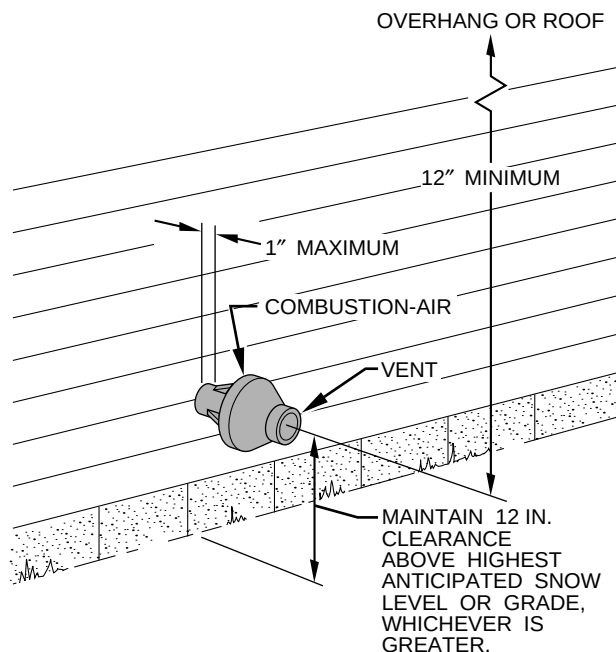
Condensate trap MUST be used for all applications.

An external trap is not required when connecting the field drain to this condensate trap.



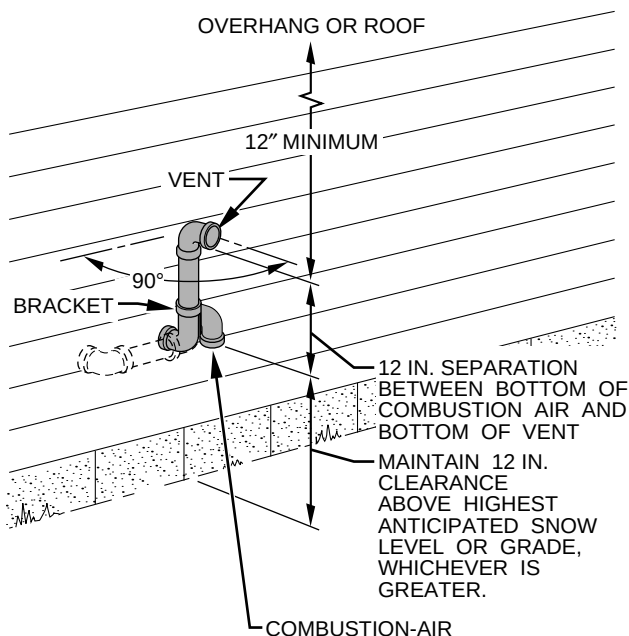
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Fig. 32—Concentric Vent and Combustion-Air Roof Termination (Preferred)



A93055

Fig. 33—Concentric Vent and Combustion-Air Side Termination



A87225

Fig. 34—Sidewall Termination of 12 in. or More

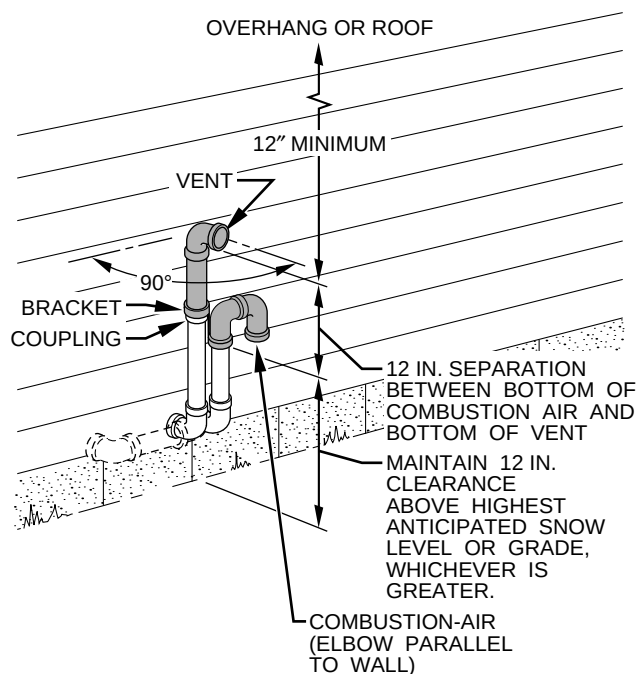
The field drain connection (condensate trap or drain tube coupling) is sized for 1/2-in. CPVC, 1/2-in. PVC, or 5/8-in. ID tube connection.

Drain pipe and fittings must conform to ANSI standards and ASTM D1785 or D2846. CPVC or PVC cement and primer must conform to ASTM D2564 or F493. In Canada, use CSA or ULC certified schedule 40 CPVC or PVC drain pipe, fittings, and cement.

When a condensate pump is required, select a pump which is approved for condensing furnace applications. To avoid condensate spillage, select a pump with an overflow switch.

II. APPLICATION

The furnace, A/C, and humidifier drains may be combined and drained together. The A/C drain must have an external, field-



A87226

Fig. 35—Sidewall Termination of Less than 12 in.

supplied trap prior to the furnace drain connection. All drain connections (furnace, A/C, or humidifier) must be terminated into an open or vented drain as close to the respective equipment as possible to prevent siphoning of the equipment's drain.

See Fig. 41 for example of possible field drain attachment using 1/2-in. CPVC or PVC tee for vent and A/C or humidifier drain connection.

Outdoor draining of the furnace is permissible if allowed by local codes. Caution should be taken when freezing ambient may freeze drain pipe and prohibit draining.

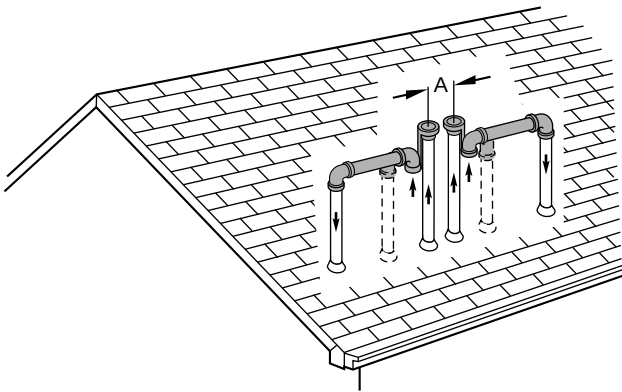


Fig. 36—Rooftop Termination
(Dimension "A" is Touching or 2-In. Maximum Separation)

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WARNING: Caution should be taken to prevent draining where slippery conditions may cause personal injuries. Excessive condensate draining may cause saturated soil conditions which may result in damage to plants.

III. CONDENSATE DRAIN 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 itself 3 times.
2. Locate heat tape between sides of condensate trap back. (See Fig. 42.)
3. Use wire ties to secure heat tape in place. Wire ties can be positioned in notches of condensate trap sides. (See Fig. 42.)

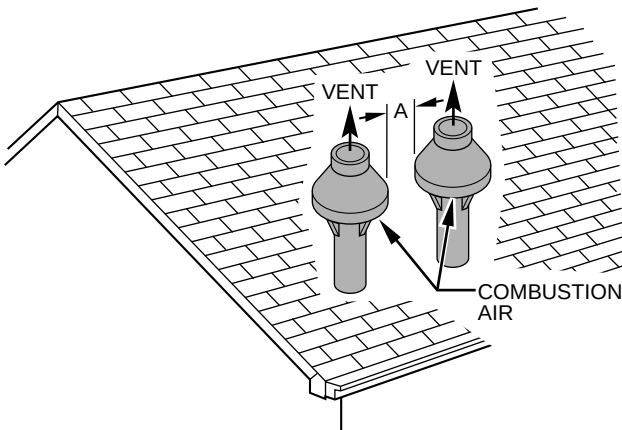


Fig. 37—Concentric Vent and Combustion-Air Roof Termination
(Dimension "A" is Touching or 2-In. Maximum Separation)

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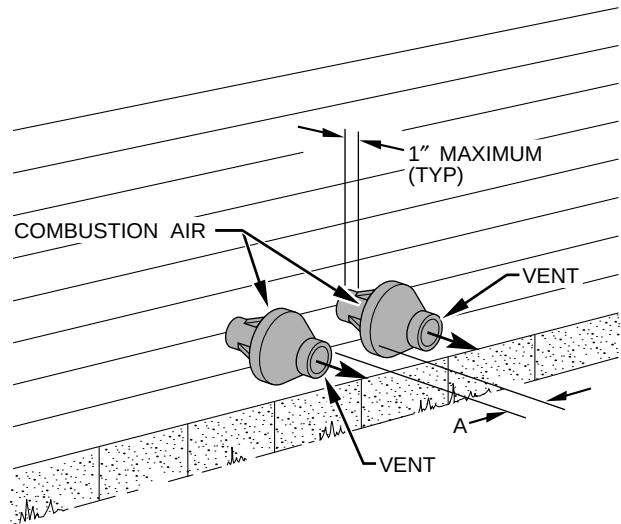


Fig. 38—Concentric Vent and Combustion-Air Termination
(Dimension "A" is Touching or 2-In. Maximum Separation)

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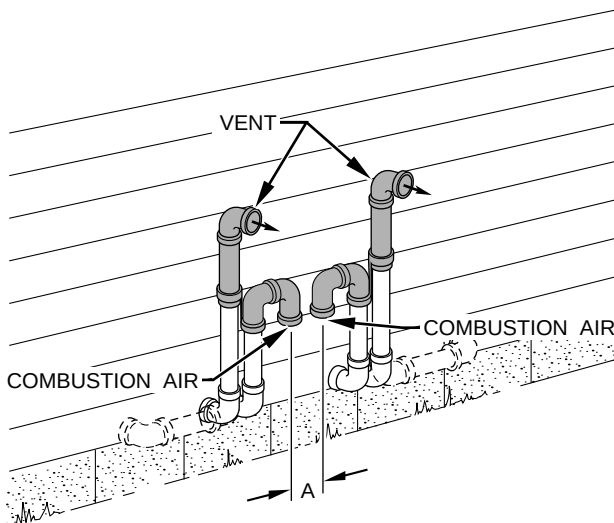


Fig. 39—Sidewall Termination of 12 in. or Less
(Dimension "A" is Touching or 2-In. Maximum Separation)

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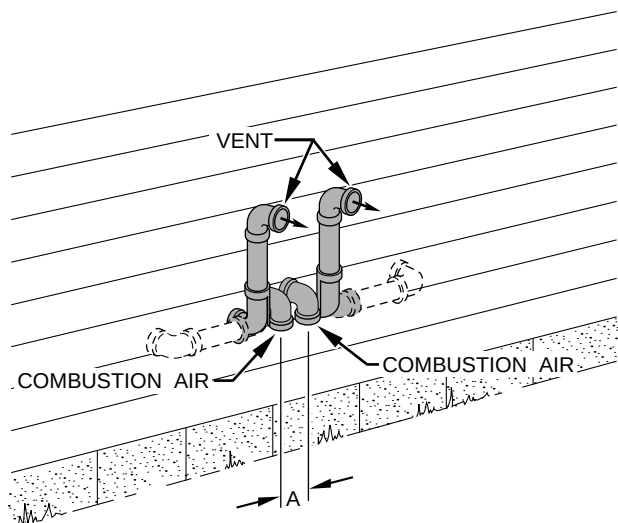


Fig. 40—Sidewall Termination of More Than 12 in.
(Dimension "A" is Touching or 2-In. Maximum Separation)

A85183

TABLE 5—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	042040	2 Pipe or 2-In. Concentric	1-1/2	50	45	40	35	30	25
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	50	45	40	35	30	25
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	30	25	20	15	10	5
			2	70	70	70	70	70	70
2001 to 3000	042040	2 Pipe or 2-In. Concentric	1-1/2	45	40	35	30	25	20
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	45	40	35	30	25	20
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	26	21	16	11	6	NA
			2	70	70	70	70	70	70
3001 to 4000	042040	2 Pipe or 2-In. Concentric	1-1/2	42	37	32	27	22	17
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	42	37	32	27	22	17
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	25	20	15	10	5	NA
			2	70	70	70	70	70	70
4001 to 5000†	042040	2 Pipe or 2-In. Concentric	1-1/2	40	35	30	25	20	15
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	40	35	30	25	20	15
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	23	18	13	8	NA	NA
			2	70	70	70	70	70	68
5001 to 6000†	042040	2 Pipe or 2-In. Concentric	1-1/2	37	32	27	22	17	12
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	37	32	27	22	17	12
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	22	17	12	7	NA	NA
			2	70	70	70	70	68	63
6001 to 7000†	042040	2 Pipe or 2-In. Concentric	1-1/2	33	28	23	18	13	8
			2	70	70	70	70	70	70
	042060	2 Pipe or 2-In. Concentric	1-1/2	33	28	23	18	13	8
			2	70	70	70	70	70	70
	042080	2 Pipe or 2-In. Concentric	1-1/2	20	15	10	5	NA	NA
			2	70	70	68	67	62	57
7001 to 8000†	042040	2 Pipe or 2-In. Concentric	1-1/2	32	27	22	17	12	7
			2	66	65	63	62	60	59
	042060	2 Pipe or 2-In. Concentric	1-1/2	32	27	22	17	12	7
			2	66	65	63	62	60	59
	042080	2 Pipe or 2-In. Concentric	1-1/2	18	13	8	NA	NA	NA
			2	66	65	63	62	57	52
8001 to 9000†	042040	2 Pipe or 2-In. Concentric	1-1/2	29	24	19	14	9	NA
			2	66	65	63	62	60	59

ALTITUDE	UNIT SIZE	TERMINATION TYPE	PIPE DIAMETER (IN.)*	NUMBER OF 90° ELBOWS					
				1	2	3	4	5	6
8001 to 9000†	042040	2 Pipe or 2-In. Concentric	1-1/2	30	25	20	15	10	5
			2	62	60	58	56	55	53
	042060	2 Pipe or 2-In. Concentric	1-1/2	30	25	20	15	10	5
			2	62	60	58	56	55	53
	042080	2 Pipe or 2-In. Concentric	1-1/2	17	12	7	NA	NA	NA
			2	62	60	58	56	51	46
	060100	2 Pipe or 2-In. Concentric	2	27	22	17	12	7	NA
			2-1/2	62	60	58	56	55	53
9001 to 10000†	042040	2 Pipe or 2-In. Concentric	1-1/2	27	22	17	12	7	NA
			2	57	55	53	51	49	47
	042060	2 Pipe or 2-In. Concentric	1-1/2	27	22	17	12	7	NA
			2	57	55	53	51	49	47
	042080	2 Pipe or 2-In. Concentric	1-1/2	15	10	5	NA	NA	NA
			2	57	55	53	51	46	41
	060100	2 Pipe or 2-In. Concentric	2	24	19	14	9	NA	NA
			2-1/2	57	55	53	51	49	47

* Disk usage—Unless otherwise stated, use perforated disk assembly (factory supplied in loose parts bag).

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

NA—Not Allowed; pressure switch will not make.

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

UNIT SIZE	WINTER DESIGN TEMPERATURE (°F)	MAXIMUM PIPE DIAMETER	INSULATION THICKNESS (IN.)†				
			0	3/8	1/2	3/4	1
042040	20	2	21	37	42	50	57
	0	2	10	22	25	30	35
	-20	2	5	14	17	21	25
042060	20	2	30	55	61	70	70
	0	2	16	33	38	46	53
	-20	2	9	23	26	33	38
042080	20	2	37	65	70	70	70
	0	2	20	39	45	55	63
	-20	2	11	27	31	39	45
060100	20	2-1/2	41	70	70	70	70
	0	2-1/2	21	42	48	59	68
	-20	2-1/2	11	28	33	41	49

* 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 5.

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

4. Wrap field drain pipe with remaining heat tape, approximately 1 wrap per ft.
5. When using field-supplied heat tape, follow heat tape manufacturer's instructions for all other installation guidelines.

SEQUENCE OF OPERATION

⚠	CAUTION: Furnace control must be grounded for proper operation, or control will lock out. Control is grounded through green wire routed to gas valve and burner box screw.
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Using schematic diagram (see 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 operates for 60 sec when power is restored before heating cycle is resumed.

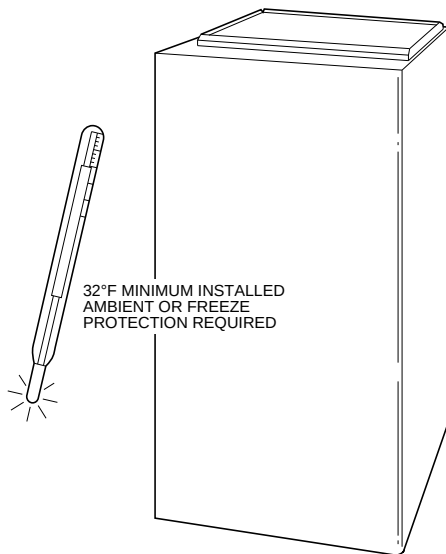
I. SELF-TEST MODE

The control center goes through a brief self-test whenever the 115-v or 24-v power is interrupted. The self-test takes approximately 2 sec to complete. After power is restored, the red (microprocessor) LED briefly comes on. Then the green LED comes on for 1 sec, followed by 1 sec where both the yellow and green LED's are lit. During this time, the microprocessor is checking itself.

II. HEATING MODE

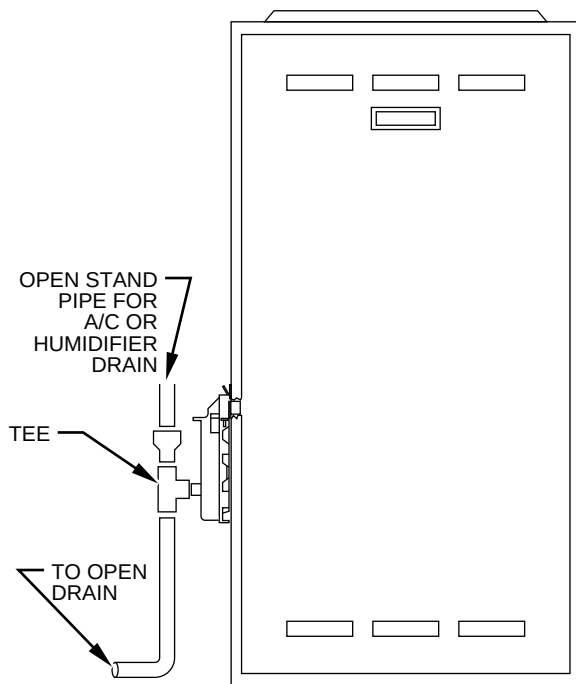
When the thermostat "calls for heat," R-W/W1 circuit closes.

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.



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

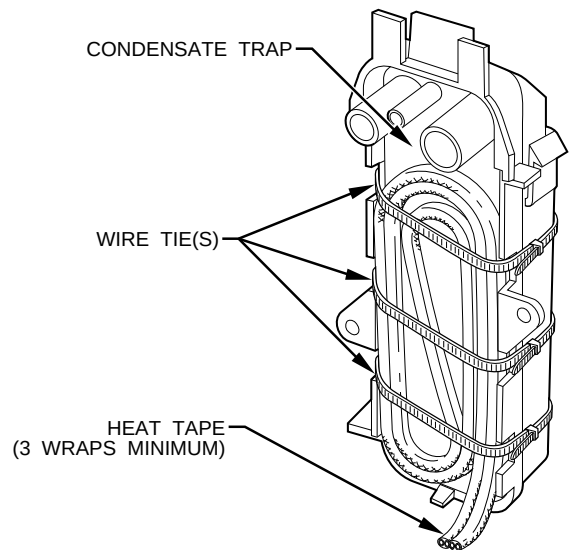


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Fig. 41—Example of Field Drain Attachment

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

2. **Humidifier (HUM)**—The HUM terminal is energized whenever 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.



A93036

Fig. 42—Condensate Trap Heat Tape

4. **Ignition sequence**—After the HSI ignitor warm-up period is 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 remains energized for 16 minutes before high heat is initiated, providing the thermostat is still "calling for heat."

After the initial cycle, the microprocessor evaluates the length of the low- and high-heat operating times and calculates 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 repeats 3 additional times before a lockout occurs. Lockout automatically resets after 3 hrs, or can be manually reset by turning 115v or 24v off (not at thermostat) for 3 sec minimum, then turning on again.

6. **Inducer speed reduction**—If cycle starts in low heat, the inducer speed reduces 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 starts 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 starts 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.

8. **Electronic Air Cleaner**—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 reduces its speed to the low-heat RPM. The blower and EAC remain operating 90, 135, 180, or 225 sec (depending on blower off time selection). The furnace is factory set for a 90 sec blower off delay.

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

III. HEAT MODE—TWO STAGE

The control center provides 2-stage heating using a single-stage thermostat. The control center maximizes 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 is energized and when R-W/W1 signal is received, low heat is 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 operates as stated above.

To allow for greater comfort, a 2-stage thermostat control is recommended when zone systems are used.

IV. 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 bypassed and the motors operate at full speed with high-heat operation. The heat exchangers, motors, and electronics can be overstressed 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 activates 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 allows 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:

When the thermostat "calls for heat", the R-W/W-1 circuits close.

1. **Prepurge period**—The inducer motor is turned on IMMEDIATELY operating at maximum speed, closing the low- and high-pressure switches. Prepurge begins 25 sec after high-pressure switch closes.
2. **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 occurs.
3. **Electronic Air Cleaner**—The EAC-1 terminal does not operate in emergency heat mode.
4. **Humidifier**—The HUM terminal is energized when the inducer prepurge period is completed.
5. **Ignitor warm up**—The HSI is energized for a 17 sec warm-up period after the prepurge period is completed.
6. **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 only operates in high heat.

7. **Flame sensing**—When burner flame is sensed, the control center holds the gas valve open. If burner flame is not sensed, the control center de-energizes the gas valve and the ignition sequence is repeated.

8. **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 stops immediately.

9. **Post purge**—Post purge does NOT occur. The inducer stops immediately.

V. COOLING MODE

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

1. **Cooling unit**—The cooling unit starts 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 starts 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 RPM to provide the selected cooling airflow.

NOTE: In the cooling mode, the microprocessor adjusts 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 operates in the continuous fan speed and indoor coil freeze-up may occur.

3. **Electronic Air Cleaner**—The EAC-1 terminal is energized whenever the blower operates.
4. **Cooling unit**—The cooling unit stops 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 remains operating for 90 sec.

VI. HEAT PUMP 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, adjusts 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 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 continues to increase its speed until the high-pressure switch closes before the 25 sec prepurge period begins.

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 de-energizes the gas valve and the ignition sequence is repeated.

7. **Blower off period**—Ten seconds after gas valve is energized, the blower stops for 25 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 starts 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**—The EAC-1 terminal is energized whenever the blower operates.
10. **Inducer speed reduction**—If cycle starts in low heat, the inducer speed reduces 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 changes its speed to the cooling RPM.
 - b. **R-W/W1 with R-Y/Y2 and R-G signals terminated**—The blower continues to operate completing a normal blower off delay.
12. **Post purge**—The inducer continues operating for 15 sec after the gas valve is de-energized.

VII. CONTINUOUS FAN MODE

1. **Operating with continuous fan only.**
 - a. **"Call for continuous fan"**—From the thermostat closing R-G circuit.
 - b. **Blower on**—The blower starts immediately.

NOTE: The blower starts 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 is the same as the low-heat speed unless it is field adjusted to another desired airflow. See Continuous Fan Setup Switches section for details.

- c. **Electronic Air Cleaner**—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 except blower on delay is 10 sec less than the heat mode. After "call for cool" (R-Y/Y2) is terminated, the blower remains operating at cool speed for 90 sec before resuming continuous fan speed.
3. **Operating with continuous fan (R-G) and "call for cool" (R-Y/Y2) is received**—See Cooling Mode above. After "call for cool" (R-Y/Y2) is terminated, the blower remains operating at cool speed for 90 sec before resuming continuous fan speed.

VIII. COMPONENT TEST

All components are functionally operated except the gas valve with the component test feature.

This feature helps diagnose a system problem in the case of a component failure.

NOTE: Setup switch SW-1 MUST be in OFF position or fault code 22 (setup error) will occur.

NOTE: NO thermostat signal may be present at control center, and all blower time delay off periods must be completed.

To initiate the component test feature, proceed with the following:

1. Leave 115-v power to furnace turned on.
2. Remove main furnace door.
3. Remove blower access panel.
4. Turn setup switch SW-6 to ON position.
5. Manually close the blower access panel door switch.



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, transformer, inducer motor, and main blower motor. Caution must be taken when manually closing this switch for service purposes. Failure to follow this warning could result in personal injury or death.

6. When above items have been completed, the following will occur:
 - a. Green LED lights for 1 sec, followed by both the green and yellow LEDs which light for another 1 sec. During this period, the control is checking itself out.
 - b. Inducer motor operates for 20 sec at low speed, operates 20 sec at high speed, then turns off.
 - c. Hot surface ignitor is energized for 15 sec, then de-energized.
 - d. Main blower motor operates for 20 sec at low speed, operates at high speed for 20 sec, then turns off.
 - e. After component operation test is completed, 1 or more fault codes (11, 22, 41 or 42) will flash. See service label on back of main furnace door for explanation of codes.

NOTE: To repeat component test, turn setup switch SW-6 to OFF and then back to ON.

7. Remove device used to manually close blower panel access door switch and turn setup switch SW-6 to OFF position.
8. Replace blower access panel and check LED status through sight glass.
9. Reinstall main furnace door if all LEDs are off, indicating the furnace is ready to operate when a signal from the thermostat is received.

START-UP PROCEDURES

I. 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 flashes rapidly and furnace does 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 panel must be in place to complete 24-v electrical circuit to furnace.

TABLE 7—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	042060	042080	060100
Default	1200 or 2000	OFF	OFF	OFF	3 Tons 1200 CFM	3 Tons 1200 CFM	3 Tons 1200 CFM	5 Tons 2000 CFM
1-1/2	600	ON	OFF	OFF	X	X	X	—
2	800	OFF	ON	OFF	X	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.

CAUTION: These furnaces are equipped with a manual reset limit switch in burner box. This switch opens 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.

II. SELECT SETUP SWITCH POSITIONS

A. 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:

1. Remove main furnace door and blower access panel.
2. Locate the A/C setup switches on the control center. (See Fig 25.)
3. Determine the air conditioning tonnage used.
4. Use Table 7 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.

5. Replace main furnace door and blower access panel.

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

B. 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:

1. Remove main furnace door and blower access panel.
2. Locate the CF setup switches on the control center. (See Fig 25.)
3. Determine the desired continuous fan airflow.
4. Use Table 8 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.

5. Replace main furnace door and blower access panel.

C. 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.

1. Remove main furnace door and blower access panel.
2. Locate setup switches on the control center. (See Fig. 25.)
3. See Table 9 for setup switch description.
4. Replace main furnace door and blower access panel.

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 allows 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.

III. PRIME CONDENSATE TRAP WITH WATER.

CAUTION: Condensate trap must be PRIMED or proper draining may not occur. The condensate trap has 2 internal chambers which can ONLY be primed by pouring water into the inducer drain side of condensate trap.

1. Remove upper inducer housing drain connection cap. (See Fig. 43.)
2. Connect field-supplied 1/2-in. ID tube to upper inducer housing drain connection.
3. Insert field-supplied funnel into tube.
4. Pour 1 quart of water into funnel/tube. Water should run through inducer housing, overflow condensate trap, and flow into open field drain. (See Fig. 44.)
5. Remove funnel and tube from inducer housing and replace drain connection cap and clamp.

IV. PURGE GAS LINES

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

TABLE 8—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.

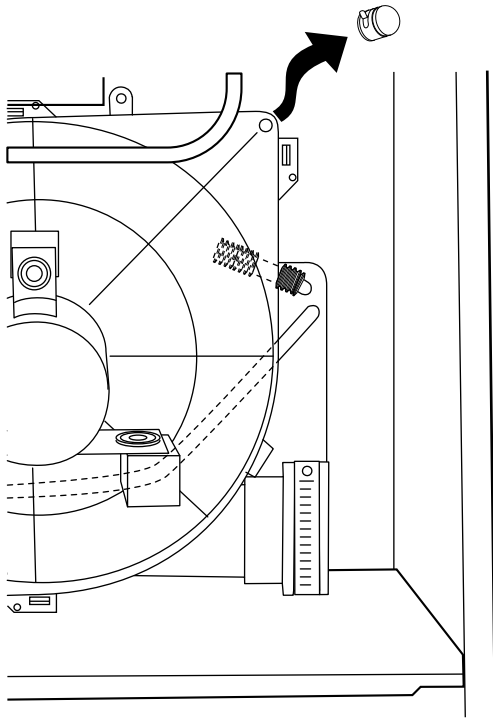


Fig. 43—Inducer Housing Drain Tube

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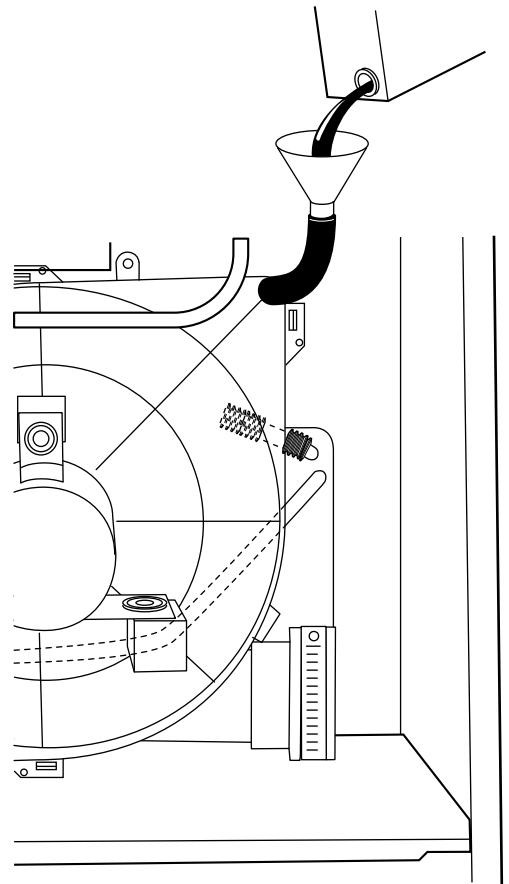


Fig. 44—Filling Condensate Trap

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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. Failure to follow this warning could result in fire, explosion, personal injury, or death.

V. ADJUSTMENTS

A. Set Gas Input Rate

There are 2 methods of adjusting gas input rate. The preferred method is by using Table 11 and following instructions in item 1. The second method is by clocking the gas meter as outlined in item 2. Item 2 must be used for altitudes above 2000 ft.

1. Determine natural gas orifice size and manifold pressure for correct input by using Table 11.
 - a. Obtain average yearly heat value for local gas supply.
 - b. Obtain average yearly specific gravity for local gas supply.
 - c. Verify the furnace model. Table 11 can only be used for model 355MAV Furnaces.
 - d. Find natural gas heat value and specific gravity in Table 11.
 - e. 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 = 1010 Btu/cu ft

Specific gravity = 0.62

Therefore: Orifice No. 44* with manifold pressure 3.3-in. wc for high heat and 1.4-in. wc for low heat.

* Furnace is shipped with No. 45 orifices. In this example all main burner orifices must be changed and the manifold pressure adjusted.

- f. Check and verify orifice size in furnace. NEVER ASSUME THE ORIFICE SIZE; ALWAYS CHECK AND VERIFY.
- g. Proceed to item 3. to adjust manifold pressure.
- h. Check input rate by clocking meter as described in item 2.

2. Determine natural gas input rate by clocking gas meter and adjusting manifold pressure per item 3.

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.

- a. 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.

- b. Turn off all other gas appliances and pilots.
- c. Start furnace and let run for 3 minutes.
- d. Measure time (in sec) for gas meter test dial to complete 1 revolution.

TABLE 9—SETUP SWITCH DESCRIPTION

SETUP SWITCH NO.	NORMAL POSITION	DESCRIPTION OF USE
SW-1 (FLT)	OFF	Turn switch to 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 5 percent more airflow in low-heat mode only.
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, and 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 10	Adjust switches to provide desired heating mode blower off delay time, 90, 135, 180, or 225 sec.

TABLE 10—BLOWER OFF DELAY SETUP SWITCH POSITION

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

- e. Refer to Table 12 for cubic ft of gas per hr.
- f. Multiply gas rate (cu ft/hr) by 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 = 1010 Btu/cu ft
 Time for 1 revolution of 2-cu-ft dial = 72 sec
 Gas rate = 100 cu ft/hr (from Table 12)
 Btu heating input = 100 X 1010 = 101,000 Btuh
 In this example, the orifice size and manifold pressure adjustment is within ± 2 percent of the furnace input rate.

- g. 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 adjusted altitude rating, adjust the manifold pressure (see item 3) and replace the main burner orifices as needed. Refer to NFGC 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.

- h. Proceed to item 3. to adjust manifold pressure.

3. Adjust gas input.

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

- Remove burner enclosure front and caps that conceal adjustment screws for gas valve regulator. (See Fig. 45.)
- Turn setup switch SW-2 on control center to ON position. (See Fig. 25.) This will keep furnace locked in low-heat operation.
- 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.
- Turn setup switch SW-2 to OFF position after low fire adjustment.
- Jumper R-W2 on control center thermostat connections. (See Fig. 25.) This will keep furnace locked in high heat operations.
- 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.

- Remove jumper R-W2 after high heat adjustment.
- Replace burner enclosure front and measure adjusted gas input rate using method outlined in item 2.
- Replace caps that conceal gas valve regulator adjustment screws.

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

- Look through sight glass in burner enclosure and check burner flame. The burner flame should be clear blue, almost transparent. (See Fig. 46.)

B. Set Temperature Rise

CAUTION: Temperature rise must be within limits specified on unit rating plate. Recommended operation is at midpoint of rise or above. Failure to follow this caution may result in condensing or overheating the heat exchangers. Furnace must operate within range of temperature rise specified on the unit rating plate. Determine 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.

**TABLE 11—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															
	0.58		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	3.8/1.6	42	3.2/1.4	42	3.3/1.4	42	3.4/1.5	41 42	3.2/1.4 3.6/1.5	41 42	3.3/1.4 3.7/1.5	41 42	3.4/1.4 3.8/1.6
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 42	3.2/1.3 3.5/1.5	41 42	3.3/1.4 3.6/1.5
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 42	3.2/1.3 3.5/1.5
905	43 44	3.3/1.3 3.7/1.5	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 44	3.2/1.3 3.7/1.5	43 44	3.3/1.4 3.8/1.6	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	43 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6	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	43 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6	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	43 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6	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 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6	43	3.4/1.5	43	3.5/1.5
995	44 45	3.2/1.3 3.8/1.6	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6	43	3.4/1.4
1010	45	3.7/1.6	44 45	3.2/1.3 3.8/1.6	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5	44	3.6/1.5	43 44	3.2/1.4 3.7/1.6	43 44	3.3/1.4 3.8/1.6
1025	45 46	3.6/1.5 3.8/1.6	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 44	3.2/1.4 3.7/1.6
1040	45 46	3.5/1.5 3.7/1.6	45 46	3.6/1.5 3.8/1.6	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 46	3.4/1.4 3.6/1.5	45 46	3.5/1.5 3.7/1.6	45 46	3.6/1.5 3.8/1.6	45	3.8/1.6	44	3.2/1.3	44	3.3/1.4	44	3.4/1.4	44	3.5/1.5
1070	45 46	3.3/1.4 3.5/1.5	45 46	3.4/1.4 3.6/1.5	45 46	3.5/1.5 3.7/1.6	45 46	3.7/1.5 3.8/1.6	45	3.8/1.6	44	3.2/1.4	44	3.3/1.4	44	3.4/1.4
1085	45 46 47	3.2/1.4 3.4/1.4 3.8/1.6	45 46	3.3/1.4 3.5/1.5	45 46	3.4/1.5 3.6/1.5	45 46	3.6/1.5 3.7/1.6	45	3.7/1.5	45	3.8/1.6	44	3.2/1.4	44	3.3/1.4
1100	46 47	3.3/1.4 3.7/1.6	45 46	3.2/1.4 3.4/1.4	45 46	3.4/1.4 3.5/1.5	45 46	3.5/1.5 3.6/1.5	45 46	3.6/1.5 3.8/1.6	45	3.7/1.6	45	3.8/1.6	44	3.2/1.4

- 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.)

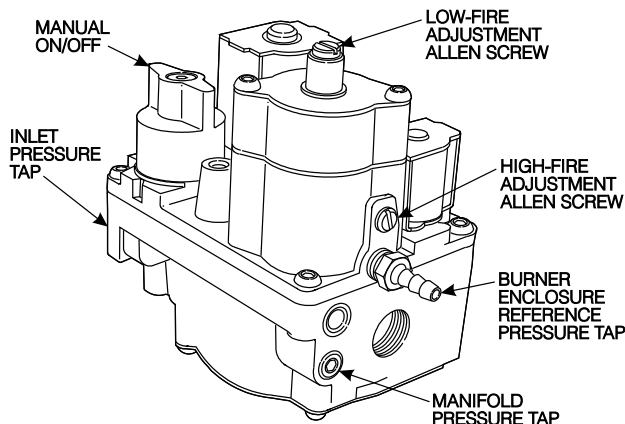


Fig. 45—Redundant Automatic Gas Valve

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- 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:

- Check gas input for low- and high-heat operation.
- Check derate for altitude if applicable.
- Check all return and supply ducts for excessive restrictions causing static pressure greater than 0.5-in. wc.
- Ensure bypass humidifier switch (BPH) setup switch SW-3 on control center is in ON position when a bypass humidifier is used. (See Fig. 25 for switch location.)
- Check Troubleshooting Guide for Gas-Fired Condensing Furnaces.

C. Set Thermostat Heat Anticipator

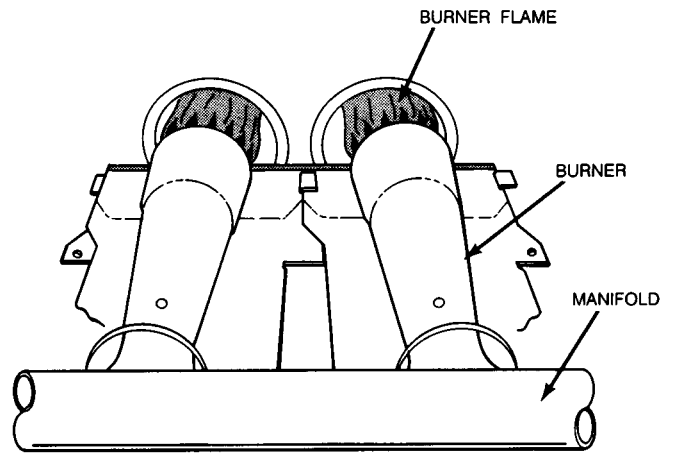
The thermostat heat anticipator must be set to match the amp draw of the components in the R-W/W1 circuit. Accurate amp draw measurements can be obtained at the thermostat subbase terminals R and W.

Fig. 47 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.

- 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.

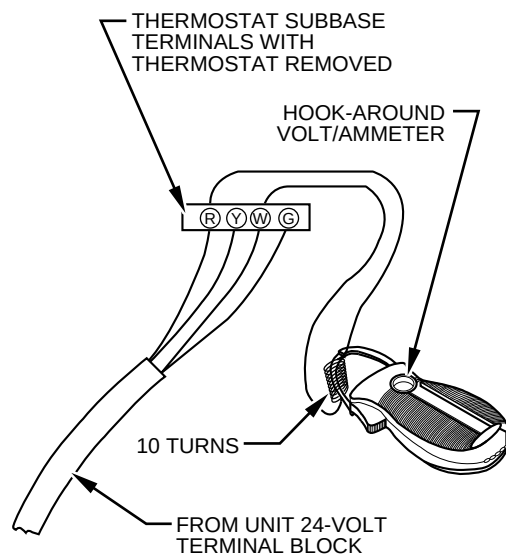
TABLE 12—GAS RATE CU FT/HR

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



A89020

Fig. 46—Burner Flame



EXAMPLE: $\frac{5.0 \text{ AMPS ON AMMETER}}{10 \text{ TURNS AROUND JAWS}} = 0.5 \text{ AMPS FOR THERMOSTAT SETTING}$

A80201

Fig. 47—Amp Draw Check with Ammeter

CHECK SAFETY CONTROLS

I. CHECK PRIMARY LIMIT CONTROL

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

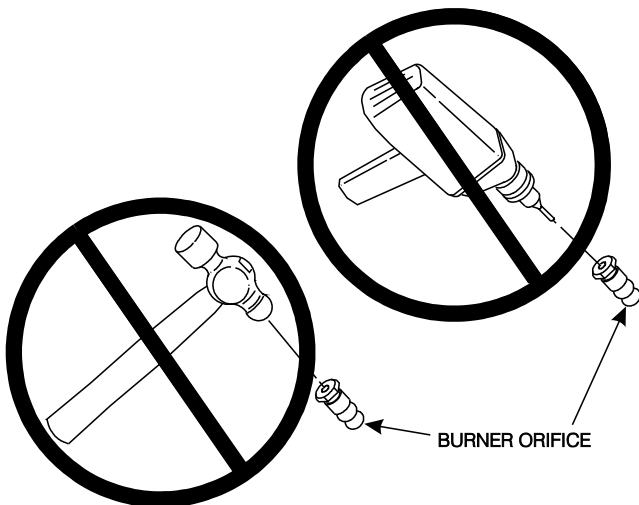
1. The recommended method of checking this limit control is to gradually block off the return air after the furnace has been operating for a period of at least 5 minutes.
2. As soon as the limit control has shut off the burners, a 33 fault will appear on the control center.
3. The return-air opening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

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.

II. CHECK PRESSURE SWITCH

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

1. Turn off 115-v power to furnace.



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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 burners and heat exchangers, causing failures.

2. 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.

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

2. Remove control access door and disconnect inducer motor 12-pin wire harness at inducer motor.
3. Turn on 115-v power to furnace.
4. 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.
5. Turn off 115-v power to furnace.
6. Reconnect inducer motor wire harness. Reinstall furnace access door.
7. Turn on 115-v power to furnace.
8. Reset thermostat to desired temperature.

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 Manual 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
_____ Condensate Trap Primed before Start-Up
_____ Heat Tape Installed if Required

CHECKLIST—START-UP

_____ 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