

Installation, Start-Up and Service Instructions For Sizes 040-100

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

INTRODUCTION

Before installing the furnace, refer to "Procedure for Downflow Condensing Furnaces" (packaged with the equipment) for information concerning combustion, venting, piping, and other standard installation practices. Further reference is made to the current edition of the National Fuel Gas Code NFPA No. 54, TIA-54-1984-1/ANSI Z223.1-1984, Z223.1a-1987.

Each Model 58DX is shipped from the factory completely assembled with a multispeed direct-drive blower and wired ready for an indoor heating installation. The furnace features a blower control center with easy-to-read, low-voltage terminal strip to ensure proper connections.

The output capacity and any representations of efficiency for this furnace are based on standard Department of Energy test procedures.

The installed operation may vary, depending on installation, weather, and other factors.

→ The design of the downflow gas-fired furnace is A.G.A. certified for installation on noncombustible flooring. The furnace may be installed on combustible flooring when installed with the accessory floor base. This furnace is for installation in alcoves, basements, closets, or utility rooms. This furnace line is **not** A.G.A. certified for installation in a mobile home, recreation vehicle, or outdoors.

Installation requires the following:

- *I. Inspection
- *II. Furnace Location
- *III. Gas Piping
- *IV. Combustion-Air and Vent Piping
- *V. Condensate Piping
- VI. Supply-Air Plenum Installation
- VII. Electrical
- VIII. Sequence of Operation
- IX. Filter
- X. Startup and Adjustment
- XI. Care and Maintenance

*For these sections (or installation steps), refer to the appropriate sections of "Procedures for Downflow Condensing Furnaces" booklet packaged with this unit.

→ **Table 1—Opening Dimensions**

Furnace Width	A	B	
		Furnace	Furnace & Coil*
17½	16⅞	19⅞	19⅞
21	19⅞	19⅞	19⅞
24½	23⅞	19⅞	19⅞

*These dimensions apply when a Model 28RC or 28RD Evaporator Coil casing is to be installed.

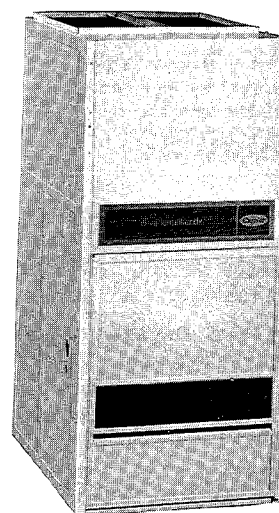
For accessory installation details, refer to the applicable installation literature.

NOTE: Remove all shipping brackets and materials before operating the furnace.

VI. SUPPLY-AIR PLENUM INSTALLATION

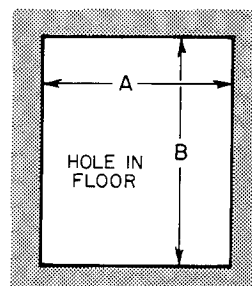
A. Installation on a concrete slab

1. See Fig. 5 for dimensions and location of supply-air opening in furnace bottom.
2. Construct hole in floor per dimensions in Fig. 2 and Table 1.
3. Place plenum and furnace as shown in Fig. 3.



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Fig. 1—Model 58DX

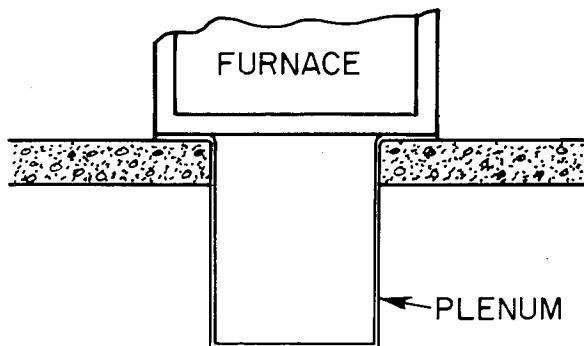


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Fig. 2—Floor Opening for Concrete Slab

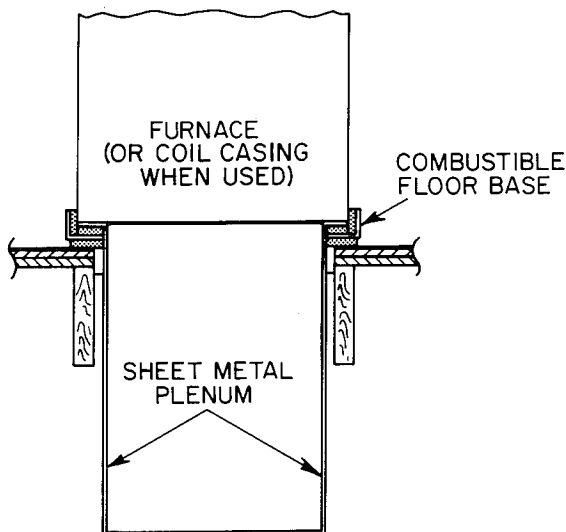
B. Installation on a combustible floor

1. Read Installation Instructions packaged with combustible floor base.
2. Cut and frame hole in floor per dimensions in Table 1 of Installation Instructions packaged with combustible floor base. If this requires cutting of a floor joint, tie ends of cut joist into adjacent joists so that proper floor support will be maintained.



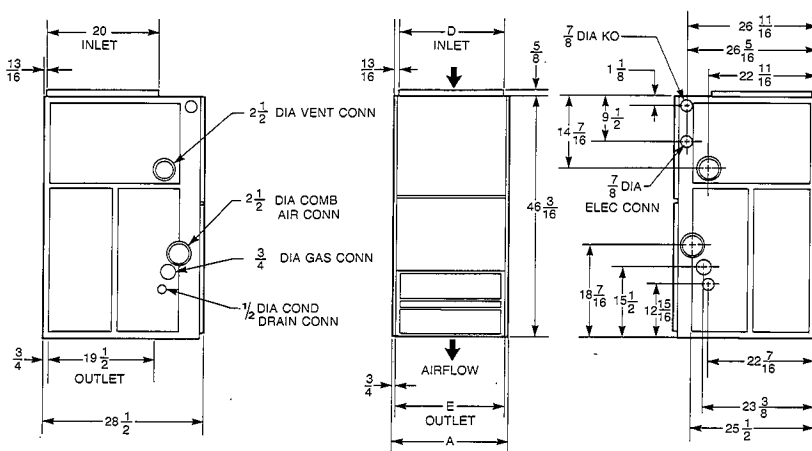
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Fig. 3—Furnace on a Concrete Slab



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Fig. 4—Furnace, Plenum, and Base Installed on a Combustible Floor



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Fig. 5—Dimensional Drawing

3. Assemble and install combustible floor base per instructions packaged with base.
4. When completed, combustible floor base, plenum, and furnace (or coil casing when used) should be installed as shown in Fig. 4.

VII. ELECTRICAL CONNECTIONS

A. Line-Voltage Wiring

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

⚠ CAUTION

Do not connect aluminum wire between the disconnect switch and the furnace.

See Fig. 6 for a wiring diagram showing the proper field high- and low-voltage wiring. Make all electrical connections in accordance with the National Electrical Code and any local codes or ordinances that might apply.

Use a separate, fused branch electrical circuit containing a properly sized fuse or HACR-type circuit breaker for this furnace. A disconnecting means must be located within sight of, and readily accessible to, the furnace. The blower door switch may be acceptable in some areas as a disconnecting means.

Line voltage must enter the auxiliary J-box on the right-hand side of the furnace.

⚠ WARNING

The cabinet must have an uninterrupted or unbroken ground according to National Electrical Code. ANSI/NFPA 70-1987, 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. A failure to adhere to this warning can result in an electrical shock, fire, or death.

Table 2—Dimensions (In Inches)

Size	A	D	E
040	17½	15⅞	16
060	17½	15⅞	16
080	21	19⅞	19½
100	24½	22⅞	23

Table 3—Clearances (In Inches)

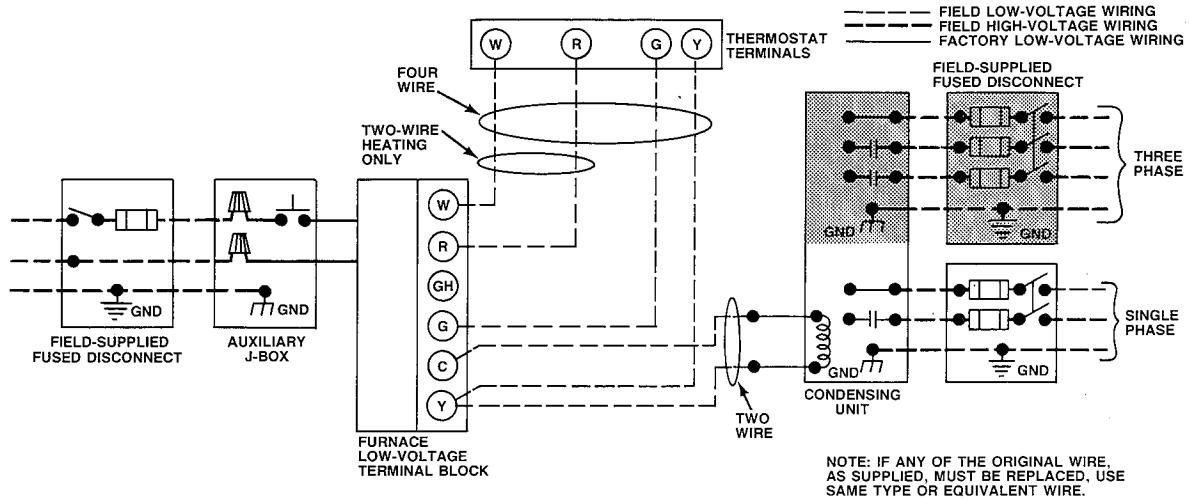
SIZE	040, 060, 080, & 100
Sides	0
Back	0
Top of Plenum	1
Vent Connector	0
Front—Casing	3
Service	30

→ Table 4—Ratings and Performance

SIZE	Input Btuh*	Capacity Btuh	Temperature Rise Range	Heating		Cooling		Motor HP & Type	Approx Shipping Weight
				Ext Static Pressure	Cfm	Ext Static Pressure	Cfm		
040	44,000	41,000	20—50	0.10	1335	0.5	1275	1/8 PSC	179
060	66,000	62,000	40—70	0.12	1330	0.5	1185	1/8 PSC	187
080	88,000	82,000	40—70	0.15	1615	0.5	1570	1/2 PSC	202
100	110,000	103,000	35—65	0.20	2000	0.5	2065	3/4 PSC	241

*Gas input ratings are certified for elevations to 2000 feet. For elevations above 2000 feet, reduce ratings 4% for each 1000 feet above sea level.

†Determined by U.S. Government tests.



→ Fig. 6—Heating and Cooling Application Wiring Diagram

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If line-voltage wiring to the unit is encased in a nonmetallic sheath, connect the incoming ground wire to the grounding wire inside the furnace J-box. If properly grounded metallic conduit is used, it will serve as the furnace ground.

B. Low-Voltage Wiring

Make field low-voltage connections at the low-voltage terminal strip. See Fig. 6.

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.

IMPORTANT: The thermostat heat anticipation must be set to match the amp draw of the gas valve and other electrical components in the R-W circuit. The amp reading should be taken after the blower has started. The room thermostat should be located where it will be in the natural circulation path of room air. Avoid locations where the thermostat would be:

1. Exposed to cold-air infiltration.
2. Exposed to drafts from windows, doors, or other openings leading to the outside.
3. Exposed to air currents from warm- or cold-air registers.
4. Located behind doors, above or below shelves, mantels, or any other location where the natural circulation of air is cut off.
5. Exposed to heat from fireplaces, radios, televisions, lamps, or the rays of the sun.
6. Located on a wall containing pipes or warm-air ducts, or flue or vent pipes.
7. Located on a wall that is inadequately sealed from the attic, crawlspace, or basement.

Any hole in the plaster or panel through which the wires pass from the thermostat should be adequately sealed with

suitable material to prevent drafts from affecting the thermostat.

C. Blower Control Center

Each furnace features a blower control center. This device will aid the installer and service technician when installing or servicing the unit. A low-voltage terminal board is marked for easy connection of field wiring. See Fig. 7.

The blower control center features an adjustable blower-off timing device. The “off” timing delay can be varied over a range of 80 to 240 seconds by turning the “off” timing adjustment control in the direction indicated on the label attached to the side of the control box. After a change in adjustment, the time-delay circuit must be energized at least 4 minutes. To saturate the solid-state circuit so that

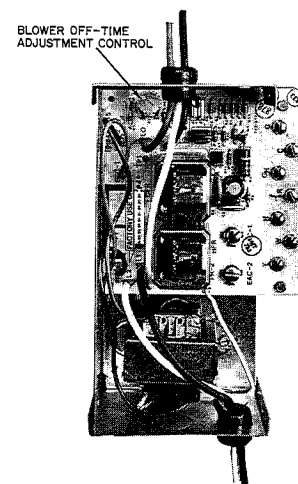
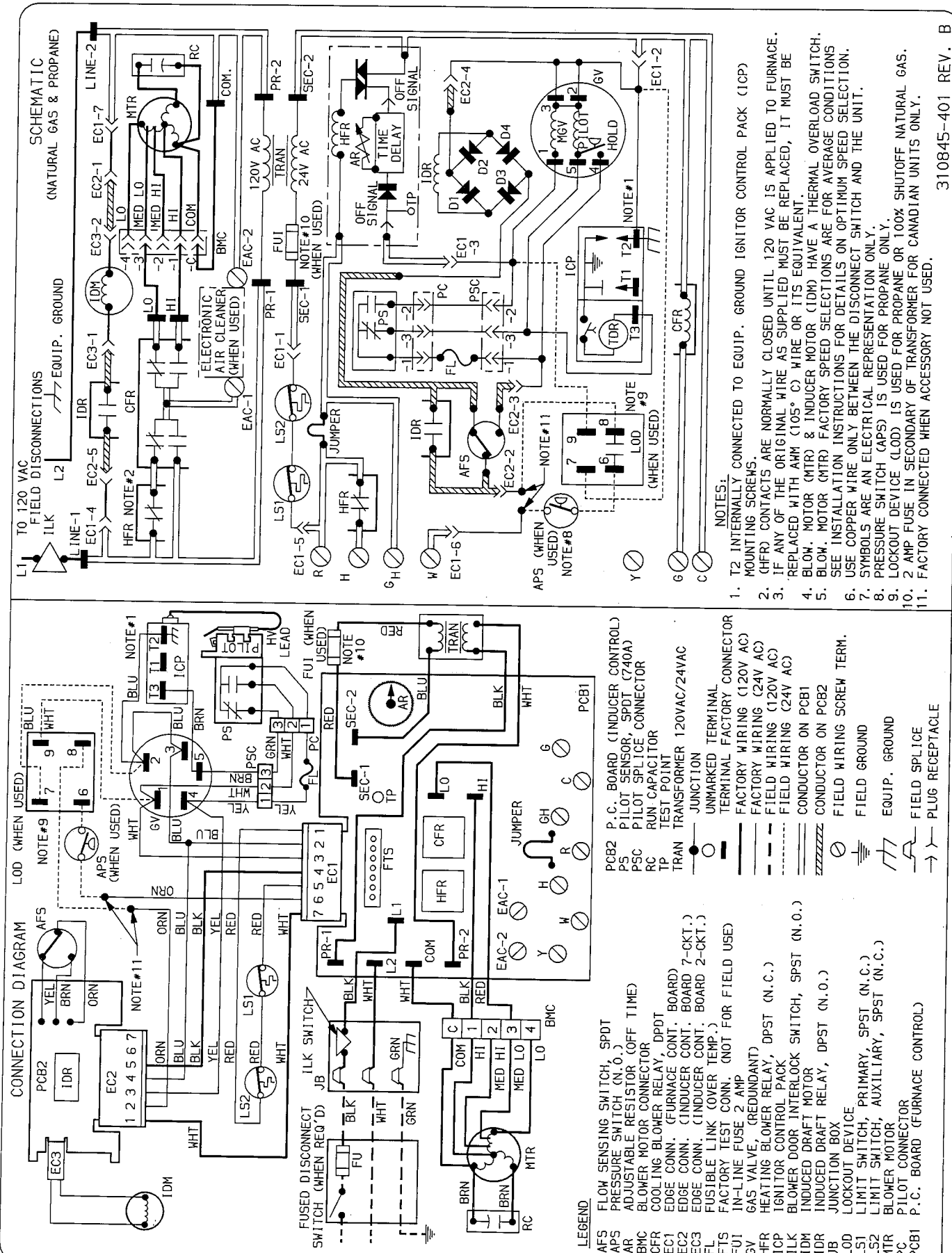


Fig. 7—Blower Control Center

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→ Fig. 8—Wiring Diagram

the "off" time delay will be the same as during normal furnace operation, the "off" timing adjustment is set at the factory for a delay of approximately 240 seconds. See Fig. 7. The on-time delay is not adjustable (60 seconds).

VIII. SEQUENCE OF OPERATION

Heating Cycle

The control circuit of the furnace shown in the schematic wiring diagram, Fig. 8, results in the following sequence of operation for the heating cycle:

1. When the blower door is in place, 120 VAC is supplied through blower door interlock switch ILK. Transformer TRAN is energized, supplying 24 VAC to heating blower relay HFR, which opens normally-closed blower relay contacts HFR, which opens normally-closed blower relay contacts HFR in the low-speed circuit of blower motor MTR.
2. The wall thermostat "calls for heat," closing the R and W circuit. This closed circuit supplies power to the 24-VAC safety circuit containing automatic reset limit switch LS1 and manual reset auxiliary limit switch LS2. If blower compartment or filters overheat, LS2 will break electrical circuit to gas valve and must be manually reset after cause of overheat condition is corrected.
3. The inducer motor relay coil IDR is energized. Inducer motor relay contacts in the 120 VAC circuit close, starting inducer motor IDM. Simultaneously, another set of contacts in inducer motor relay IDR close in the 24 VAC circuit, and lock in inducer motor relay coil IDR. The coil is locked in until the R and W circuit or safety circuit opens.
4. As inducer motor IDM comes up to speed, flow sensing switch AFS actuates energizing the PILOT solenoid coil of gas valve GV and the time-delay relay in spark generator ICP through fusible link FL.
5. When the PILOT solenoid coil of gas valve GV is energized, gas flows to the pilot. The internal pressure switch within gas valve GV senses the pilot gas pressure and closes, completing the HOLD circuit. The normally open time-delay relay ICP closes after a 10-second purge delay, energizing spark generator ICP. The pilot gas is ignited by a spark produced by spark generator ICP.
6. After a short time delay, during which the pilot flame heats up flame sensing contacts PS, the normally closed contacts PS open. The PILOT solenoid coil remains energized through the HOLD circuit. Spark generator ICP shuts off within a few seconds after flame is sensed at the spark electrode. The normally open flame-sensing switch contacts PS close 5 to 20 seconds later, energizing the MGV solenoid coil. Six to 15 seconds later, the MGV solenoid opens, allowing gas to flow to the main burners. The gas is immediately ignited by the pilot flame.
7. Simultaneously, time-delay circuit AR in the blower control center is energized. Approximately 50 seconds after gas valve GV opens, heating relay coil HFR is deenergized, closing the 120 VAC contacts of heating relay HFR and starting blower motor MTR on heating speed. The H terminal is energized with 24 VAC when the blower motor operates on heating speed. Electronic air cleaner terminals EAC are energized with 120 VAC whenever the blower is operating on either heating or cooling speed.
8. When the thermostat is satisfied, the R and W circuit is broken, deenergizing gas valve GV, inducer motor relay IDR, and the solid-state time-delay circuit on the

main printed-circuit board. Gas flow to the pilot and main burners immediately stops. After approximately 80 to 240 seconds (depending on the blower off-time adjustment), heating relay HFR is energized and blower motor MTR stops.

NOTE: After a brief interruption of either the electric or gas supply, the furnace will not resume operation until the contacts of pilot-flame sensing switch PS move from the normally open position to the normally closed position.

Cooling Cycle

1. The wall thermostat "calls for cooling."
2. The R, G, and Y circuits are energized. Simultaneously, the R and Y circuit starts the outdoor condensing unit, and the R and G circuit energizes cooling relay coil CFR. Normally open cooling contacts CFR close, energizing the cooling speed of motor MTR and opening the normally closed contacts of cooling relay CFR. The EAC terminals are energized with line voltage whenever the blower is operating on either heating or cooling speed.

IX. FILTER ARRANGEMENT

The two factory-supplied filters are shipped in the blower compartment. After the return-air duct has been connected to the furnace, install the filters in a V-formation inside the return-air plenum. See Fig. 9.

⚠ WARNING

Never operate the unit without a filter or with the filter access door removed. A failure to adhere to this warning can cause a fire, physical injury, or death.

X. STARTUP AND ADJUSTMENT

In addition to the following information, refer to "Procedures for Downflow Condensing Furnaces."

NOTE: The furnace blower access panel must be in place to complete the 120-volt circuit to the furnace.

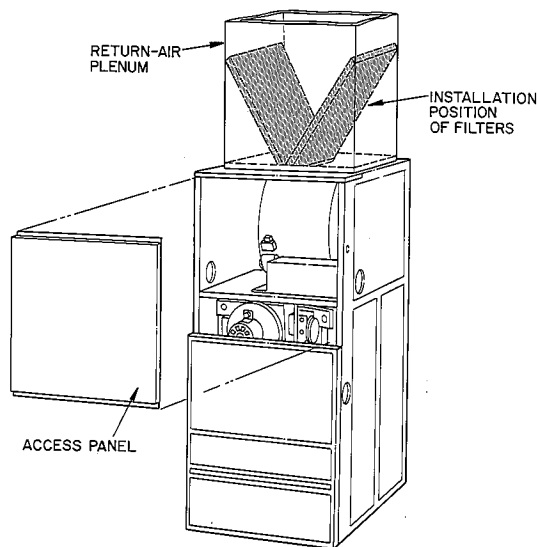


Fig. 9—Position of Filters

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⚠ CAUTION

This furnace is equipped with a fusible link in the burner enclosure. This link will melt if an over-heating condition caused by an inadequate combustion-air supply or improper venting practices develops. DO NOT jumper this fuse. Correct the condition and replace the fuse with an identical part.

The gas service pressure must not exceed 0.5 psig (14 in. wc) for natural gas.

→ **NOTE:** The gas valve regulator has been nominally-set at 3.5 in. wc for natural gas. Refer to "Procedures for Down-flow Condensing Furnaces" for readjusting and checking input.

⚠ CAUTION

The unit must not be installed, operated, and then turned off and left turned off, in an unoccupied structure during cold weather when the temperature drops to 32 F and below. Freezing condensate left in the furnace will damage the equipment.

A. When winterizing the furnace, it is necessary to proceed as follows:

1. Mix a solution of equal amounts of ethylene glycol (Prestone II antifreeze coolant or equivalent) and water.
 2. Turn off electrical supply to furnace.
 3. Remove control and blower access panels.
 4. Disconnect drain tube from bottom of inducer outlet elbow.
 5. Insert funnel in drain tube and pour antifreeze/water solution into furnace until it is visible at point where condensate enters open drain.
- 6. Reconnect drain tube to outlet elbow.
7. Replace control access panel.

B. Adjustment of Blower Speed

⚠ CAUTION

Disconnect the electrical power before changing the speed tap. A failure to adhere to this warning can cause personal injury.

To change motor speed taps, remove the motor tap lead (See Table 5.) and relocate it on the desired terminal on the plug-in terminal block/speed selector located on the blower housing. Check the temperature rise. It must be within the limits specified on the unit rating plate.

→ **Table 5—Speed Selector**

Speed	Tap No.*
Common	C
Hi	1
Med-Hi	2
Med-Low	3
Low	4

*White wire from control box to common; black wire from control box to cooling speed selection; red wire from control box to heating speed selection.

C. Automatic Gas Control Valve

These units are equipped with an automatic gas control valve. If not already checked when lighting the main

burner, check the proper operation of this valve by moving the room thermostat pointer above and below the room temperature and observe that the main burners light when the pointer is above and go off when the pointer is below the room temperature setting.

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

XI. CARE AND MAINTENANCE

⚠ CAUTION

Because of possible damage to the equipment or personal injury, maintenance should be performed by qualified persons only.

⚠ WARNING

Never store any flammables, chloride, or halogen-containing compounds near, or in contact with, the furnace. A failure to adhere to this warning can cause a fire, personal injury, or death.

For continuing high performance, and to minimize equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your local Dealer as to the proper frequency of maintenance and the availability of a maintenance contract.

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you do not possess these skills and tools, contact your Dealer for maintenance.

⚠ WARNING

Turn off gas and electrical supply to the unit before performing any maintenance or service on the unit. Follow the relighting instructions attached to the furnace. A failure to adhere to this warning can cause personal injury.

The minimum maintenance that should be performed on this equipment is as follows:

1. Check and clean or replace air filter each month or as required.
2. Check blower motor and wheel for cleanliness and lubrication each heating and cooling season. Clean and lubricate as necessary. (See Section XI B.)
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.
4. Check for proper condensate drainage.
5. Check for blockages of combustion-air and vent pipes.

⚠ WARNING

As with any mechanical equipment, personal injury can result from sharp metal edges, etc.; therefore, be careful when removing parts.

A. Air Filter

Remember to disconnect electrical power before removing access panels. To clean or replace the air filter, proceed as follows:

1. Remove blower access panel.
2. Reach up behind top plate, tilt filters toward center of return-air plenum, remove filters. See Fig. 9.
3. Clean filter with cold tap water. Spray in direction opposite to airflow.
4. Rinse and let dry. DO NOT oil or coat filter.
5. Place dry filter in furnace with cross-sectional binding facing blower.

B. Blower Motor and Wheel

For long life, economy, and high efficiency; clean accumulated dirt and grease from blower wheel and motor annually.

The following steps should be performed by a qualified serviceperson.

Lubricate motor every 5 years if motor is used on intermittent operation (thermostat FAN switch in AUTO position), or every 2 years if motor is in continuous operation (thermostat FAN switch in ON position).

Remove to disconnect electrical supply before removing access panels.

Clean and lubricate as follows:

1. Remove access panels.
2. Remove vent pipe enclosure from top side of blower shelf and position out of way.
3. Note location of wires for reassembly, then remove electrical leads from numbered side of blower speed selector. See Table 5.
4. Loosen hose clamps on outlet elbow and remove elbow.
5. Loosen hose clamp on extension pipe outside of furnace and remove pipe.
6. Remove screws securing blower assembly to blower shelf and slide blower assembly out of furnace.
7. Squeeze side tabs of blower speed selector and pull from blower housing bracket.
8. Loosen screw in strap holding motor capacitor to blower housing and slide capacitor from strap.
9. Mark blower wheel location on shaft and motor support location on motor before disassembly, to insure proper reassembly.
10. Loosen setscrew holding blower wheel on motor shaft.
11. Remove bolts holding motor mount to blower housing and slide motor and mount out of housing. Disconnect ground wire attached to blower housing before removing motor.
12. Lubricate motor.
 - a. Remove dust caps or plugs from oil ports located at each end of motor. If motor does not have these caps or plugs, bearings are sealed and need no further lubrication.
 - b. Use a good grade of SAE 20 nondetergent motor oil and add one teaspoon (5 cc, $\frac{3}{16}$ oz, or 16 to 25 drops) in each oil port. The use of other types or grades of oil will damage the motor. Excessive oiling can cause premature bearing failures.
 - c. Allow time for total quantity of oil to be absorbed by each bearing.
 - d. After oiling motor, wipe excess oil from motor housing.
 - e. Replace dust caps or plugs on oil ports.
13. Remove blower wheel from housing.
 - a. Mark blower wheel orientation and cutoff plate location to insure proper reassembly.
 - b. Remove screws securing cutoff plate and remove cutoff plate from housing.

c. Remove blower wheel from housing.

14. Clean blower wheel and motor by using a vacuum with soft brush attachment. Be careful not to disturb balance weights (clips) on blower wheel vanes. Do not drop or bend wheel because balance will be affected.
15. Reassemble blower by reversing steps 13a through c. Be sure wheel is positioned for proper rotation and motor oiling plugs are pointed up when motor is installed.
16. Reassemble motor and blower by reversing steps 7 through 11. If motor has ground wire, be sure it is reconnected. Be sure wheel is centered in blower housing. Spin blower wheel to check clearance.
17. Reinstall blower assembly in furnace.
18. Reinstall outlet elbow and extension pipe. Be sure connections are tight and leak proof.
19. Reinstall vent pipe enclosure.
20. Connect electrical leads to blower speed selector. Note that connections are polarized for correct assembly—DO NOT force.
21. Turn on electrical power and check for proper rotation and speed changes between heating and cooling; operate unit 5 minutes and carefully check for condensate leaks.

C. Cleaning Heat Exchangers

If it becomes necessary to clean the heat exchangers, proceed as follows:

1. Turn off gas and electrical supplies to furnace.
2. Remove control and blower access panels.
3. Loosen hose clamps on combustion-air pipe and move air pipe aside.
4. Using backup wrench, disconnect gas supply at ground joint union. Remove gas pipe from valve.
5. Disconnect pilot leads at 3-circuit connector outside of burner enclosure.
6. Disconnect high-voltage lead at spark generator.
7. Disconnect electrical wires from gas valve.
8. Disconnect pressure tubing from right-hand side of burner enclosure and bottom of gas valve.
9. Remove burner enclosure front.
10. Remove diffuser from inside top of burner enclosure. Remove screws that secure burner enclosure to cell panel. These screws are located inside the burner enclosure.
11. Using care not to damage cell inlet panel gasket, remove gas control assembly from furnace.
12. Remove vent pipe enclosure.
13. Loosen hose clamps at vent pipe connection.
14. Loosen hose clamp and remove drain tube from inducer outlet elbow.
15. Disconnect edge connector from inducer control box.
16. Loosen hose clamp and remove drain tube from inducer housing.
17. Remove mounting screws securing inducer assembly to collector box; remove inducer assembly with outlet elbow.
18. Remove all old sealant from parts.
19. Remove screws securing intake (upper) coupling box and remove from furnace. Remove all old sealant from parts.
20. Remove screws securing primary (lower) coupling box and remove box. Clean old sealant from parts.
21. Loosen hose clamp and remove $\frac{7}{8}$ -in. drain tube from trap.

22. Hold bucket under $\frac{7}{8}$ -in. drain tube.
23. Using garden hose, flush each cell of the condensing heat exchanger with water. Use care not to spray water on to interior surfaces of control compartment. Dry all surfaces.
24. Using field-provided small wire brush, steel "snake" cable, reversible electric drill, and vacuum cleaner; clean primary heat exchanger cells.
25. Connect $\frac{7}{8}$ -in. drain tube to trap and tighten hose clamp.

D. Reassemble Furnace

1. Apply sealant releasing agent (Pam) to flange of intake coupling box.
2. Apply a generous bead ($\frac{3}{16}$ -in. dia) of G.E. RTV 162, 122, or Dow-Corning RTV 738 sealant (NO substitute is permissible) to flange of coupling box over releasing agent. Your Distributor should have G.E. RTV 162, 122, or Dow-Corning RTV 738 sealants in stock.
3. Being careful not to smear sealant, position intake coupling box so that slot is on left-hand side and install coupling box.
4. Repeat steps 1 thru 3 to install primary coupling box. Position box so tallest end is toward right-hand side of casing.
5. Apply sealant releasing agent (Pam) to collector box.
6. Apply $\frac{1}{8}$ -inch diameter bead of G.E. RTV 162, 122, or Dow-Corning RTV 738 sealant to back of inducer housing. Apply sealant around inlet air opening. (The sealant should be about $\frac{1}{4}$ -inch from the edge of the inlet air opening.)
7. Using stainless steel screws, install inducer assembly on collector box and support bracket to coupling box.
8. Connect drain tube from collector box to inducer outlet elbow.
9. Connect small drain tube from top of trap to fitting on bottom of inducer housing.
10. Reconnect vent pipe. Be sure clamps are tight.
11. Reinstall vent pipe enclosure.
12. Check condition of gasket on cell inlet panel of burner enclosure. Replace gasket if necessary. See Fig. 10.
13. Install gas control assembly in furnace.
14. Install burner enclosure front.
15. Reconnect pilot leads at 3-circuit connector.
16. Reconnect high-voltage lead to spark generator.
17. Refer to furnace wiring diagram and connect wires to gas valve.

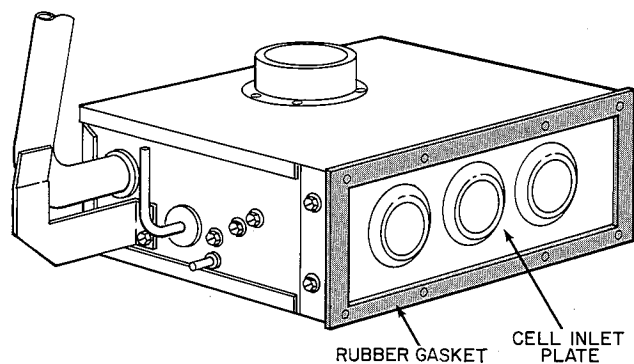


Fig. 10—Burner Closure

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18. Reconnect pressure tubes to gas valve and burner enclosure. Be sure tubes are not kinked.
19. Using backup wrench, install gas pipe in gas valve.
20. Reconnect gas pipe at ground joint union.
21. Reconnect combustion-air pipe. Tighten hose clamps.
22. Turn on gas and electrical supplies.

⚠ WARNING

Never use matches, candles, flame, or other sources of ignition to check for gas leakage. Use a soap-and-water solution. A failure to adhere to this warning can cause a fire, personal injury, or death.

23. Check for gas leaks.
24. Check furnace operation through two complete operating cycles.
25. Check pilot tube and gas valve manifold connection for gas leaks while furnace is in operation.
26. After condensate starts to drain, check for condensate leaks.
27. Replace control and blower access panels.

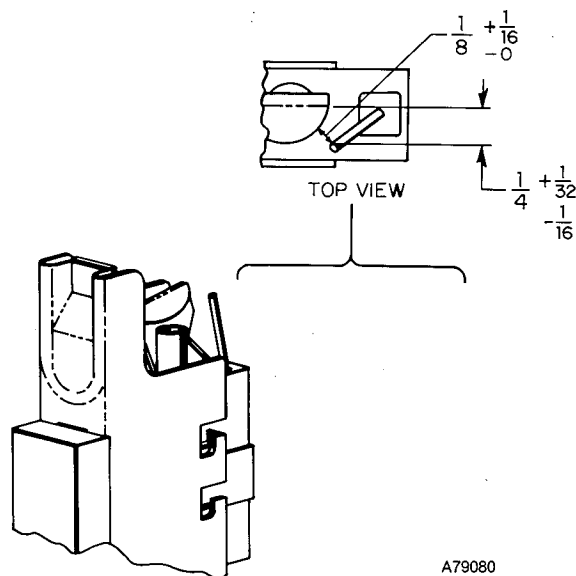
E. Pilot

Check the pilot and clean if necessary at the beginning of each heating season. The pilot flame should be high enough for proper impingement of the safety element and to light the burners. Remove any accumulation of soot and carbon from the safety element. Check spark electrode gap. See Fig. 11 for proper spark gap.

F. Electrical Controls and Wiring

NOTE: There may be more than one electrical supply to unit.

With power disconnected to unit, check all electrical connections for tightness. Tighten all screws on electrical connections. If any smoky or burned connections are noticed, disassemble the connection, clean all parts, strip wire, and reassemble properly and securely. Electrical controls are difficult to check without proper instrumentation; therefore, reconnect electrical power to unit and observe unit through two complete operating cycles.



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Fig. 11—Position of Electrode to Pilot