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# service and maintenance procedures

## DELUXE GAS-FIRED CONDENSING FURNACES

### 398AAV 399AAV Series A

Cancels: SP05-9

SP05-13  
7-1-92


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

### SAFETY CONSIDERATIONS

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment.

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

Follow all safety codes, including NFPA 54/ANSI Z223.1-1988, National Fuel Gas Code. Wear safety glasses and work gloves. Have a 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 the unit and in instructions or manuals, be alert to the potential for personal injury.

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



**WARNING:** The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools, and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment other than those procedures recommended in the User's Manual. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN POSSIBLE DAMAGE TO THIS EQUIPMENT, SERIOUS PERSONAL INJURY, OR DEATH.



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

1. Spray or aerosol cans, rags, brooms, dust mops, vacuum cleaners, or other cleaning tools.
2. Soap, powders, bleaches, waxes or other cleaning compounds, plastic or plastic containers, gasoline, kerosene, cigarette lighter fluid, dry cleaning fluids, or other volatile fluids.
3. Paint thinners and other painting compounds, paper bags or other paper products.

Failure to follow this warning can cause corrosion of the heat exchanger, fire, personal injury, or death.

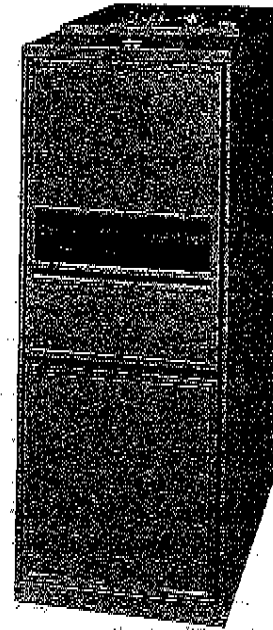


Fig. 1—Model 398AAV Upflow Furnace

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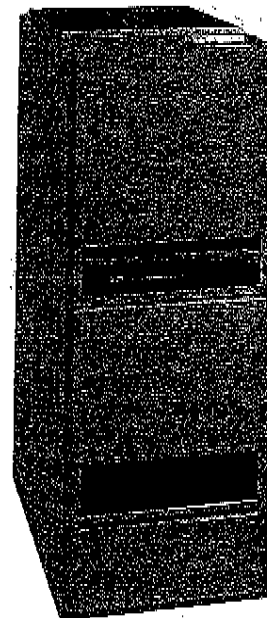


Fig. 2—Model 399AAV Downflow Furnace

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## CARE AND MAINTENANCE

For continuing high performance and to minimize possible equipment failure, it is essential that maintenance be performed annually on this equipment. Consult your local dealer for maintenance and the availability of a maintenance contract.

**WARNING:** Turn OFF the gas and electrical supplies to the unit before performing any maintenance or service. Follow the operating instructions on the label attached to the furnace. Failure to follow this warning could result in 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 as required.
2. Check blower motor and wheel for cleanliness and lubrication each heating and cooling season. Clean and lubricate as necessary. (See Step 2.)
3. Check electrical connections for tightness, and controls for proper operation each heating season. Service as necessary.
4. Check for proper condensate drainage; clean as necessary.
5. Check for blockages of combustion-air and vent pipes.

**CAUTION:** As with any mechanical equipment, personal injury could result from sharp metal edges, etc. Be careful when removing parts.

## I. AIR FILTER CLEANING AND REPLACEMENT

The air filter arrangement may vary depending on the application.

**CAUTION:** Never operate unit without a filter or with filter access door removed. Failure to follow this warning could result in a fire or personal injury.

### A. Downflow Furnaces Only

Each furnace accommodates 2 filters which are installed in the return-air duct. (See Fig. 3.) To clean or replace the filters, proceed as follows:

1. Turn OFF electrical supply to unit.
2. Remove blower access door.

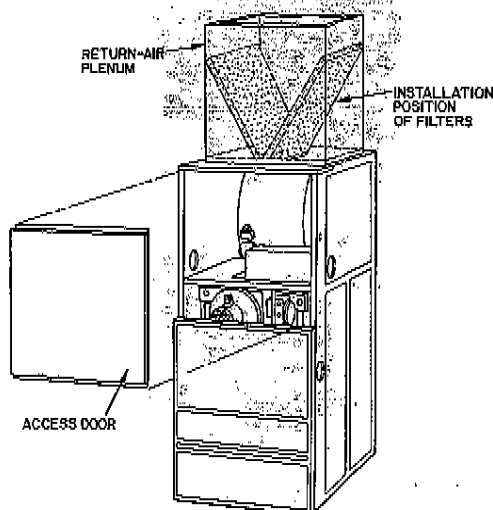


Fig. 3—Position of Filters in Downflow Furnace

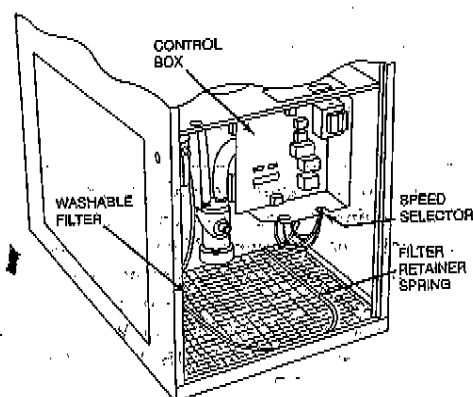
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3. Reaching up behind top plate, tilt filters toward center of return-air plenum, remove filters, and replace or clean as needed.
4. Furnaces are equipped with permanent, washable filters. Clean these filters by spraying cold tap water through filter in opposite direction of airflow.
5. Rinse filters and let dry. Oiling or coating of filters is not recommended.
6. Reinstall filters with cross-mesh binding facing blower.
7. Replace access door.
8. Turn ON electrical supply to furnace.

### B. Upflow Furnaces Only

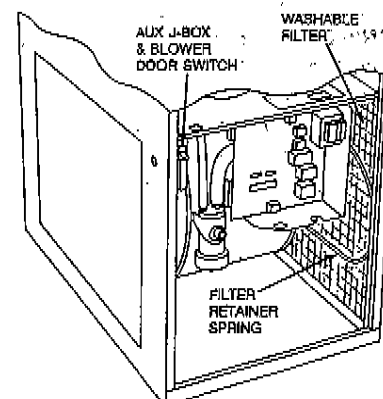
To clean or replace the air filter, proceed as follows:

1. Turn OFF electrical supply to unit.
2. Remove access doors.
3. Release filter retainer spring from behind flange of furnace casing. (See Fig. 4 and 5.)
4. Slide filter out.
5. Furnaces are equipped with permanent, washable filters. Clean filter by spraying cold tap water through filter in opposite direction of airflow.
6. Rinse filter and let dry. Oiling or coating of filter is not recommended.
7. Place filter in furnace with cross-mesh binding either up or facing blower.
8. Replace access doors.
9. Turn ON electrical supply to furnace.



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Fig. 4—Filter Installed for Bottom Inlet in Upflow Furnace



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Fig. 5—Filter Installed for Side Inlet in Upflow Furnace

## II. BLOWER MOTOR AND WHEEL MAINTENANCE

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

The following items should be performed by a qualified service technician:

Some motors have prelubricated, sealed bearings and require no lubrication. These motors can be identified by the absence of oil ports on each end of the motor. For motors with oil ports, lubricate as follows:

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

Clean and lubricate as follows:

1. Turn OFF electrical supply to unit.
  2. Remove access doors.
  3. Downflow furnace only—disconnect vent pipe, elbow, and auxiliary limit switch. (See Fig. 6.)
    - a. Remove vent pipe enclosure from top side of blower shelf and position to 1 side.
    - b. Loosen hose clamps on outlet elbow and remove elbow.
    - c. Loosen hose clamp on extension pipe outside of furnace and remove pipe.
    - d. Disconnect wires from auxiliary limit on blower housing.
  4. Note location of wires for reassembly, then remove electrical leads from numbered side of blower speed selector. (See Fig. 4 and 6.)
  5. Upflow furnaces only—remove drain trap and control box.
    - a. Remove control box from bottom side of blower shelf and position to 1 side.
    - b. Using backup wrench, disconnect drain pipe at coupling in blower compartment.
    - c. Loosen hose clamp and remove 7/8-in. diameter drain hose from drain trap.
    - d. Loosen hose clamp and disconnect 5/8-in. diameter drain hose at bottom of inducer housing located under blower shelf.
    - e. Remove screw securing drain trap assembly.
  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 before disassembly to insure proper reassembly.
  10. Loosen screw holding blower wheel on motor shaft.
- NOTE:** Mark blower mounting arms, and blower housing so each arm is positioned at the same hole location during reassembly. This will insure that oilers point up.
11. Remove bolts holding motor mount to blower housing and slide motor and mounts out of housing. Disconnect ground wire attached to blower housing before removing motor.
  12. Lubricate motor (when oil ports are provided).
    - 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 nondefergent motor oil and add 1 teaspoon (5 cc, 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 as balance will be affected.
  15. Reassemble blower by reversing items 13.a. through 13.c. Ensure wheel is positioned for proper rotation.
  16. Reassemble motor and blower by reversing items 6 through 11. If motor has ground wire, be sure it is reconnected.

**CAUTION:** Ensure the motor is properly positioned in the blower housing. The motor oil ports must be at a minimum of 30° above the horizontal centerline of the motor after the blower assembly has been reinstalled in the furnace.

17. Reinstall blower assembly in furnace.
18. Upflow furnace only—reinstall drain trap and control box.
  - a. Inspect drain trap and hoses to ensure they are not blocked or restricted. Reinstall drain trap and hoses. Be sure to tighten hose clamps.
  - b. Using backup wrench, attach drain pipe and tighten compression coupling.
  - c. Reinstall control box on bottom side of blower shelf. Be sure edge connector is connected through top of blower shelf.
19. Downflow furnace only—reconnect vent pipe, elbow, and auxiliary limit switch.
  - a. Reinstall outlet elbow and extension pipe. Be sure connections are tight and leak proof.
  - b. Reinstall vent pipe enclosure.
  - c. Reconnect red wires to auxiliary limit switch.
20. Connect electrical leads to blower speed selector. Note that connections are polarized for correct assembly—do not force.
21. Turn ON electrical supply and check for proper rotation and speed changes between heating and cooling; operate unit 5 minutes and carefully check for condensate leaks.

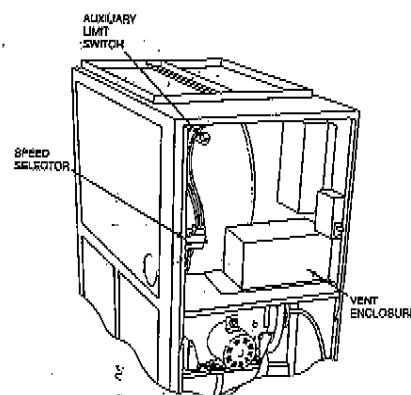


Fig. 6—Model 58DXC Downflow Furnace

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### III. CLEANING HEAT EXCHANGERS

The following items should be performed by a qualified service technician:

If it becomes necessary to clean the heat exchanger because of carbon deposits, soot, etc., proceed as follows:

**NOTE:** Deposits of soot and carbon indicate a problem exists that needs to be corrected. Action must be taken to correct the problem.

1. Turn OFF gas and electrical supplies to furnace.
2. Remove control and blower access doors.
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 hot surface ignitor and flame sensor leads at 3-circuit connector outside of burner enclosure.
6. Disconnect electrical wires from gas valve.
7. Disconnect pressure tubing from right side of burner enclosure and outlet end of gas valve.
8. Remove burner enclosure front.
9. 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.
10. Using care not to damage cell inlet panel gasket, remove gas control assembly from furnace.
11. Remove vent pipe and drain.
  - a. Upflow furnace only:
    - (1.) Loosen hose clamps at vent pipe connection; disconnect vent pipe and position to 1 side.
    - (2.) Loosen hose clamp and remove drain tube from inducer outlet box.
  - b. Downflow furnace only:
    - (1.) Remove vent pipe enclosure.
    - (2.) Loosen hose clamps at vent pipe connection.
    - (3.) Loosen hose clamp and remove drain tube from inducer outlet elbow.
12. Upflow furnace only—remove main control box.
  - a. Disconnect edge connector from main control box at blower shelf.
  - b. Remove screws securing main control box to blower shelf and position control box to 1 side.
13. Disconnect inducer motor connector from wiring harness. Disconnect wires and pressure tube from pressure switch.
14. Loosen hose clamp and remove drain tube from inducer housing.
15. Remove mounting screws securing inducer assembly to collector box and coupling box; remove inducer assembly.
16. Remove all old sealant from parts.
17. Remove coupling box(es).
  - a. Upflow furnace only:
    - (1.) Remove screws securing coupling box and remove from furnace. Remove all old sealant from parts.
    - (2.) Remove choke plate (when used) from primary heat exchanger outlet.
  - b. Downflow furnace only:
    - (1.) Remove screws securing intake (upper) coupling box and remove from furnace. Remove all old sealant from parts.

- (2.) Remove screws securing primary (lower) coupling box and remove box. Clean old sealant from parts.

18. Loosen hose clamp and remove 7/8-in. drain tube from trap.
19. Hold bucket under 7/8-in. drain tube.
20. Using garden hose, flush each cell of the condensing heat exchanger with water. Use care not to spray water onto interior surfaces of control compartment. Dry all surfaces. Be careful not to remove sealant around cell openings in cell panel.
21. Using field-provided small wire brush, steel spring cable, reversible electric drill, and vacuum cleaner, clean primary heat exchanger cells. Do not use wire brush or other sharp object to clean condensing heat exchanger. Failure of the condensing heat exchanger will occur—flush with water only.

- a. Assemble wire brush and steel spring cable.

- (1.) Use 4 ft of 1/4-in. diameter high-grade steel spring cable (commonly known as drain cleaning or Roto-Rooter cable).
- (2.) Use 1/4-in. diameter wire brush (commonly known as 25-caliber rifle cleaning brush).

**NOTE:** The materials required in items (1.) and (2.) can be purchased at local hardware stores.

- (3.) Insert twisted wire end of brush into end of spring cable, and crimp tight with crimping tool or strike with ball-peen hammer. *Tightness is very important.*
- (4.) Remove metal screw fitting from wire brush to allow insertion into cable.

- b. Clean each primary heat exchanger cell.

- (1.) Attach variable-speed, reversible drill to end of spring cable (end opposite brush).
- (2.) Insert brush end of cable into upper opening of cell and slowly rotate with drill. Do not force cable. Gradually insert at least 3 ft of cable into 2 upper passes of cell. (See Fig. 7.)



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Fig. 7—Cleaning Primary Heat Exchanger Cell

- (3.) Work cable in and out of cell 3 or 4 times to obtain sufficient cleaning. Do not pull cable with great force. Reverse drill and gradually work cable out.
- (4.) Insert brush end of cable in lower opening of cell, and proceed to clean 2 lower passes of cell in same manner as 2 upper passes.
- (5.) Repeat procedures (above) until each furnace cell has been cleaned.
- (6.) Using vacuum cleaner, remove residue from each cell.
- (7.) Using vacuum cleaner with soft brush attachment, clean burner assembly.

### IV. REASSEMBLE FURNACE (AFTER CLEANING HEAT EXCHANGERS)

1. Install choke plate (when used). Be sure choke plate bottom conforms to top flange of condensing heat exchanger.
2. Reinstall coupling box(es):

- Apply sealant releasing agent (Pam) to cell panel where coupling box flange matches. (See Fig. 8.)
- Apply a generous bead 3/16-in. dia) of G.E. RTV 122, 162, or Dow-Corning RTV 738 sealant (NO substitute is permissible) to flange of coupling box. Your distributor should have G.E. RTV 122, 162, or Dow-Corning RTV 738 sealants in stock.
- Being careful not to smear sealant, position coupling box so that slot in insulation is on left side and install coupling box.

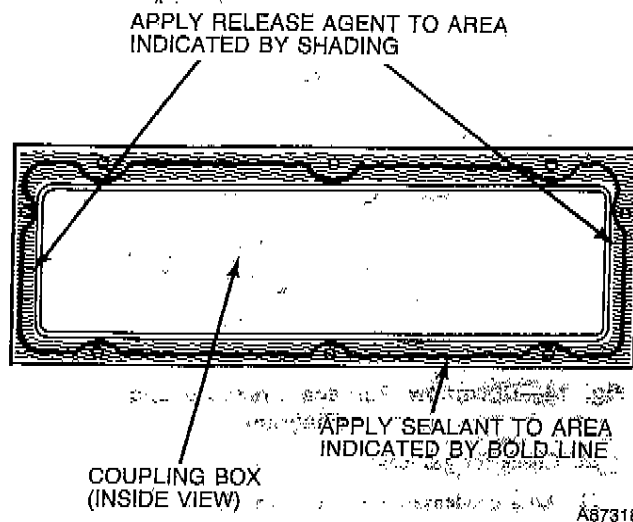
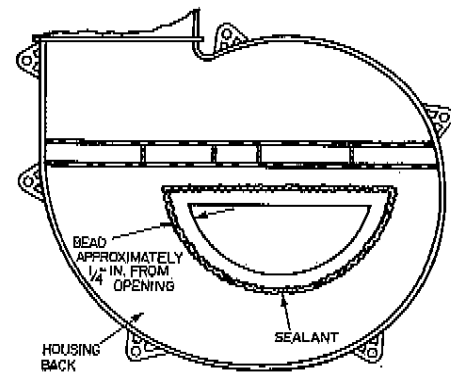


Fig. 8—Inside View of Coupling Box.

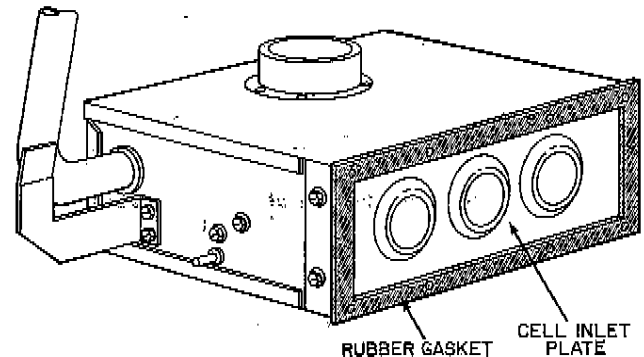
**NOTE:** Downflow furnace only—position primary (lower) coupling box so that tallest end is on right side.

- Reinstall inducer assembly.
  - Upflow furnace only—Be sure small round gasket(s) is in place between blower shelf and inducer housing.
  - Apply sealant releasing agent (Pam) to collector box. (See Fig. 9.)
  - Apply 1/8-in. diameter bead of G.E. RTV 122, 162, or Dow-Corning RTV 738 sealant to back of inducer housing. Apply sealant around inlet air opening. (The sealant should be about 1/4 in. from the edge of the inlet air opening.)
  - Install inducer assembly on collector box and support bracket to coupling box.
  - Connect inducer motor plug-in connector to wiring harness. Reconnect wires to pressure switch using furnace wiring diagram. (See Fig. 17.)
  - Reconnect pressure tubes to pressure switch. (See Fig. 13 or 14.)
- Connect small drain tube from top of trap to fitting on bottom of inducer housing. (See Fig. 13 or 14.)
- Connect 7/8-in. drain tube to trap and collector box, and tighten hose clamps. (See Fig. 13 or 14.)
- Reinstall vent pipe and drain tube.
  - Upflow furnace only:
    - Reconnect vent pipe. Be sure clamps are tight.
    - Connect drain tube from collector box to inducer outlet box.
  - Downflow furnace only:
    - Reconnect vent pipe. Be sure clamps are tight.
    - Reinstall vent pipe enclosure.
    - Connect drain tube from collector box to inducer outlet elbow.



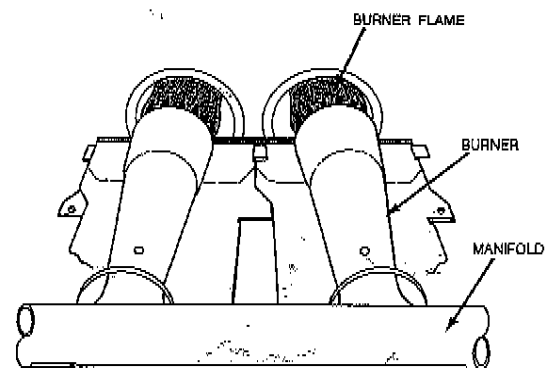
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Fig. 9—Backside of Inducer Assembly Housing



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Fig. 10—Burner Enclosure



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Fig. 11—Burner Flame

- Upflow furnace only—reinstall main control box.
  - Reinstall main control box on blower shelf.
  - Reconnect edge connector at main control box on blower shelf.
- Check condition of gasket on cell inlet panel of burner enclosure. Replace gasket if necessary. (See Fig. 10.)
- Install gas control assembly in furnace.
- Install diffuser and burner enclosure front.
- Reconnect hot surface ignitor and flame sensor leads at 3-circuit connector.
- Refer to furnace wiring diagram and connect wires to gas valve. (See Fig. 17.)
- Reconnect pressure tubes to gas valve and burner enclosure. Be sure tubes are not kinked.
- Using backup wrench, install gas pipe in gas valve.

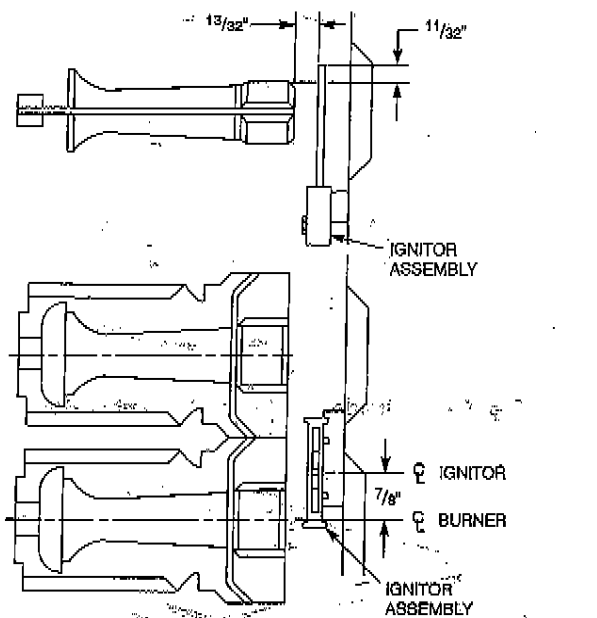
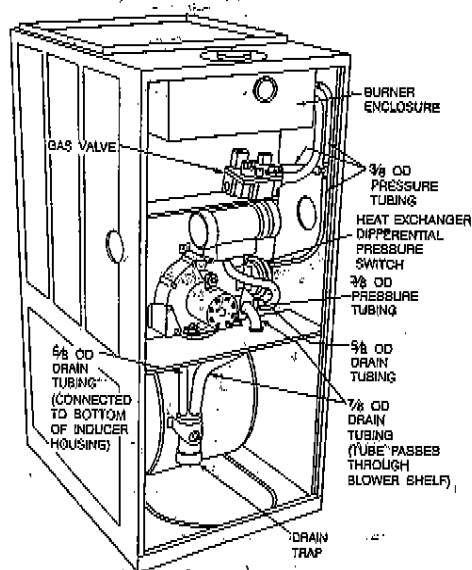


Fig. 12—Position of Ignitor to Burner

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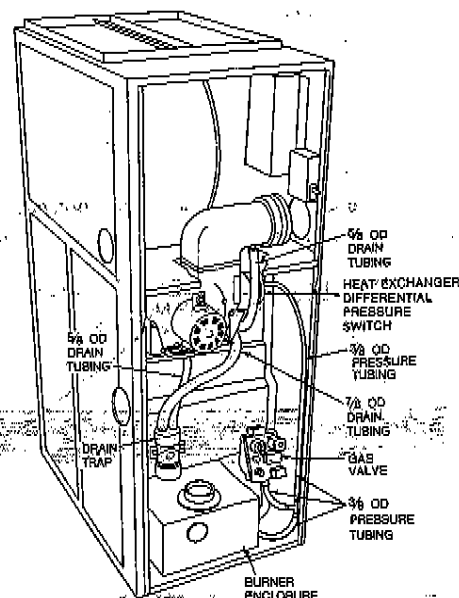
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Fig. 13—Upflow Furnace Pressure and Drain Tubing Diagram

15. Reconnect gas pipe at ground joint union.
16. Reconnect combustion-air pipe. Tighten hose clamps.
17. Replace blower door only.
18. Turn ON gas and electrical supplies.
19. Check furnace operation through 2 complete operating cycles. Look through sight-glass in burner enclosure to check burners. Burner flames should be clear blue, almost transparent. (See Fig. 11.)



**WARNING:** Never use matches, candles, flame, or other sources of ignition to check for gas leakage. Use a soap-and-water solution. Failure to follow this warning could result in a fire, personal injury, or death.



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Fig. 14—Downflow Furnace Pressure and Drain Tubing Diagram

20. Check for gas leaks.
21. After condensate starts to drain, check for condensate leaks.
22. Replace control door.

#### V. CLEAN CONDENSATE DRAINAGE SYSTEM

1. Disconnect 5/8-in. drain tube from bottom of inducer housing. (See Fig. 13 or 14.)
2. Disconnect 7/8-in. drain tube from collector box. (See Fig. 13 or 14.)
3. Disconnect condensate drain line from drain trap at compression fitting.
4. Remove two 1/4-in. screws securing strap on drain trap to:
  - a. blower housing (upflow furnaces only).
  - b. bracket from cell panel (downflow furnaces only).
5. Remove drain trap/hose assembly from furnace and flush with water until clean.
6. Flush external condensate drain line with water until clean.
7. Reassemble condensate drainage system by reversing items 1. through 5.

#### VI. HOT SURFACE IGNITOR

When removing the burner assembly, use care to avoid breaking the hot surface ignitor. See Fig. 12 for the correct ignitor location. When reinstalling ignitor, use care to insure all wiring is away from the burners and is not touching the bottom of the sheet metal enclosure.

#### VII. ELECTRICAL CONTROLS AND WIRING

**NOTE:** There may be more than 1 electrical supply to the unit.

The electrical ground and polarity for 115-v wiring must be maintained properly. Refer to Fig. 15 for field wiring information and to Fig. 17 for unit wiring information. If the polarity is not correct, the microprocessor control will shut off the gas flow shortly after completion of the ignition trial period. The control system also requires an earth ground for proper operation of the microprocessor. The 24-v circuit contains an automotive-type, 3-amp fuse (FU1) located on the main control board. (See Fig. 16.) Any direct shorts during installation, service or maintenance may cause this fuse to "blow." If fuse replacement is required, use only a fuse of identical size.

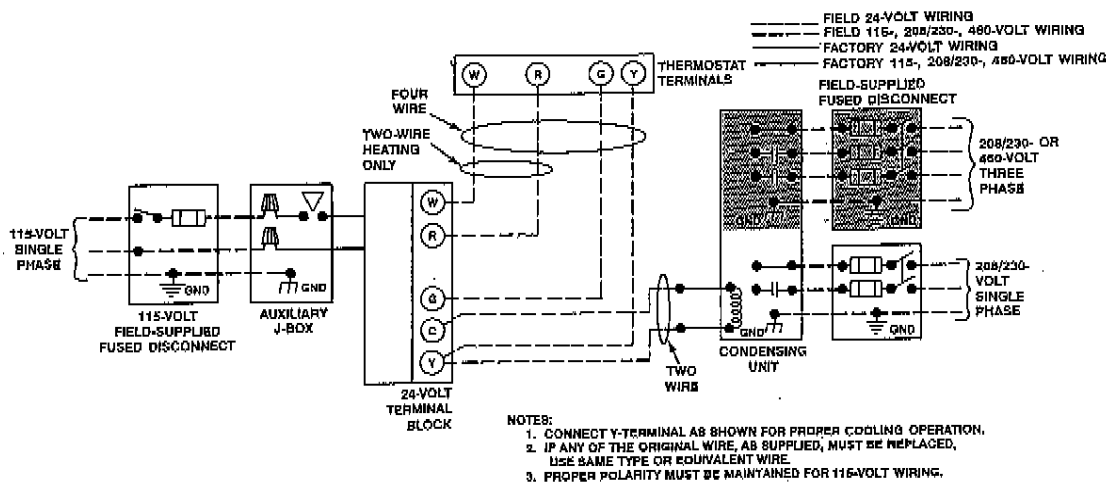


Fig. 15—Heating and Cooling Application Wiring Diagram

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With power disconnected to the unit, check all electrical connections for tightness. Tighten all screws on electrical connections. If any smoky or burned connections are found, disassemble the connection, clean all parts, strip wire, and reassemble properly and securely.

Reconnect electrical power to the unit and observe unit through 1 complete operating cycle. Electrical controls are difficult to check without proper instrumentation; if there are any discrepancies in the operating cycle, contact your dealer and request service.

#### VIII. WINTERIZING

**CAUTION:** The unit must not be installed, operated, and then turned off and left 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.

If the furnace will be off for an extended period of time in a structure where the temperature will drop to 32° F or below, winterize 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 access door.
4. Disconnect drain tube from bottom of inducer outlet box/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 box/elbow.
7. Replace control access door.

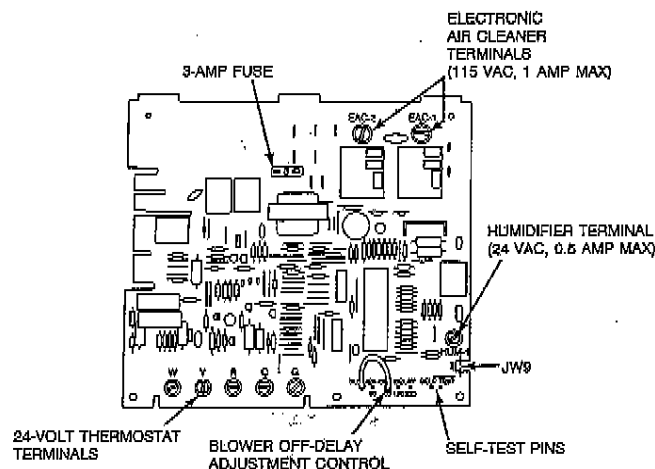


Fig. 16—Control Center

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**Fig. 17—Wiring Diagram**



# TROUBLESHOOTING GUIDE HSI CONDENSING FURNACES

