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# installation, operation, and maintenance instructions

## DOWNFLOW GAS-FIRED NATURAL-DRAFT FURNACE

# 396JAZ

Series A  
Sizes 045  
thru 095

Cancels: 40396DP24-A

II 396J-45-1  
8/1/89

### (FOR USE IN CALIFORNIA ONLY)

**NOTE:** Read the entire instructions before starting the installation.

### INTRODUCTION

Before installing the furnace, refer to "Procedures for Natural-Draft Gas-Fired Furnaces" (packaged with the furnace) 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. 54-1988/ANSI Z223.1-1988.

Reference should also be made to the regulations of the serving gas supplier and the local building, heating, plumbing, or other codes in effect in the area in which the installation is made. In the absence of local codes, the installation must conform with the National Fuel Gas Code, ANSI Z223.1-1988.

### SAFETY CONSIDERATIONS

Installation and servicing of 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 No. 54-1988/ANSI Z223.1-1988, National Fuel Gas Code. Wear safety glasses and work gloves. Have a fire extinguisher available during startup and adjustment procedures and service calls.

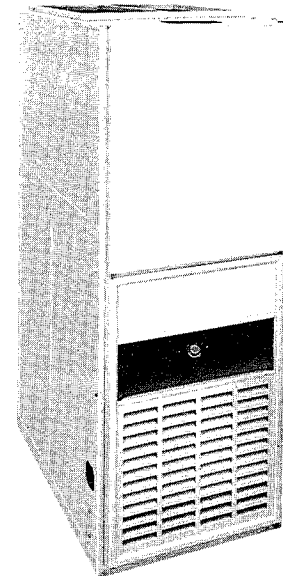
Recognize safety information: This is the safety-alert symbol  $\Delta$ . When you see this symbol on the furnace and in instructions or manuals, be alert to the potential for personal injury.

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

**TABLE I—CLEARANCES FROM COMBUSTIBLE MATERIALS (In Inches)**

SIZES	045 thru 095
Sides—Single-Wall Vent	1
Type B-1 Double-Wall Vent	1
Back	0
Top of Plenum	1
Vent Connector—Single-Wall	6
Type B-1 Double-Wall	1
Front*	6
Service	30

\*The 6-inch front clearance is needed for combustion-air entry and drafthood relief.



A78593

**Figure 1—Model 396J**

death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

Each furnace is shipped from the factory completely assembled with multispeed direct-drive blower and wired ready for downflow indoor heating installation only. All sizes feature a printed-circuit board control center with easy-to-read, 24-volt terminal strip to ensure proper connections.

**NOTE:** The furnaces covered by these instructions are design-certified for use with the vent damper specified on the furnace rating plate. See instructions packaged with the vent damper for its installation.

Installation comprises the following:

- \*I. Inspection
- \*II. Location, Ventilation, and Air for Combustion
- \*III. Gas Piping
- \*IV. Venting
  - V. Supply-Air Plenum Installation
- VI. Electrical
- VII. Sequence of Operation
- VIII. Filter
- IX. Startup and Adjustment
- X. Care and Maintenance

\*To perform these sections (or installation steps), refer to the appropriate sections of "Procedures for Natural-Draft Gas-Fired Furnaces" booklet packaged with this unit.

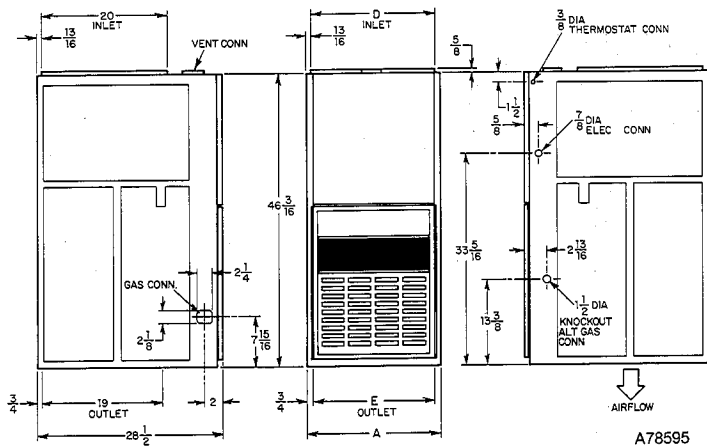


Figure 2—Dimensional Drawing

TABLE II—DIMENSIONS (In Inches)

SIZE	A	D	E	Vent Connection
036045	17-1/2	15-7/8	16	4
048065	17-1/2	15-7/8	16	5
048080	21	19-3/8	19-1/2	5
060095	24-1/2	22-13/16	23	6

TABLE III—RATINGS AND PERFORMANCE

SIZE	Input Btuh*	Capacity Btuh†	Temp Rise Range	Heating		Cooling		PSC Motor HP	Approx Shipping Weight
				Ext Static Pressure	CFM	Ext Static Pressure	CFM		
036045	60,000	48,000	30—60	0.12	1080	0.50	1205	1/3	157
048065	80,000	64,000	30—60	0.12	1240	0.50	1630	1/2	170
048080	100,000	81,000	40—70	0.15	1165	0.50	1620	1/2	187
060095	120,000	97,000	40—70	0.20	1830	0.50	2075	1/2	227

\*The above gas input and capacity ratings are certified for elevations to 2000 feet. For elevations above 2000 feet, reduce input and capacity 4% for each 1000 feet above sea level.

†Capacity and AFUE are determined in accordance with U.S. Government DOE test procedures.

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

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

**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. A failure to follow this warning can cause electrical shock, fire, personal injury, or death.

**CAUTION:** Do not install furnace in a damp, corrosive, or contaminated atmosphere. Make sure all combustion and circulating air requirements listed in "Procedures for Natural-Draft Gas-Fired Furnaces" are followed, in addition to all local codes and ordinances.

Do not use this furnace during construction when adhesives, sealers and/or new carpets are being installed. If the 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 the heat exchangers and metal vent system. Some of these compounds are panching and dry wall adhesives, paints, thinners, masonry cleaning materials, and many other solvents commonly used in the construction process.

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 downflow subbase. This furnace is for installation in alcoves, attics, basements, indoor and outdoor closets, or utility rooms. This furnace line is *not* A.G.A. design certified for installation in a mobile home, recreation vehicle, or outdoors.

For accessory installation details, refer to the applicable installation literature. Terminals EAC-1 and EAC-2, in the control box, are for direct connection of an electronic air cleaner.

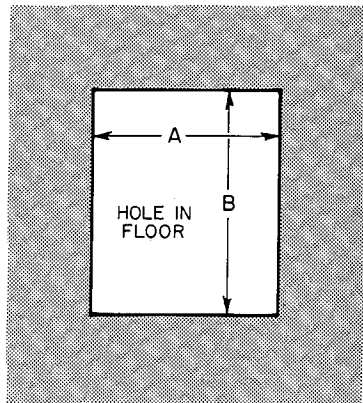
## V. SUPPLY-AIR PLENUM INSTALLATION

### A. Installation on a concrete slab

1. See Figure 2 for dimensions and location of supply-air opening in furnace bottom.
2. Construct hole in floor per dimensions in Figure 3 and Table IV.
3. Place plenum and furnace as shown in Figure 4.

### B. Installation on a combustible floor

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



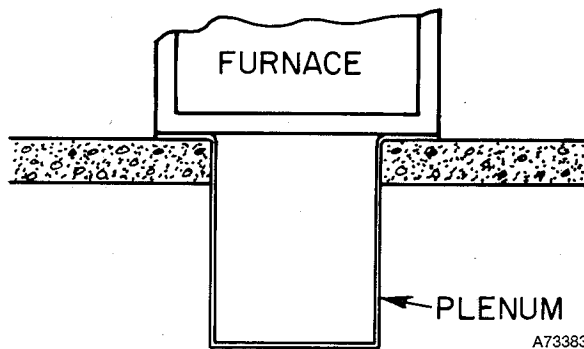
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Figure 3—Floor Opening for Concrete Slab

TABLE IV—OPENING DIMENSIONS

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

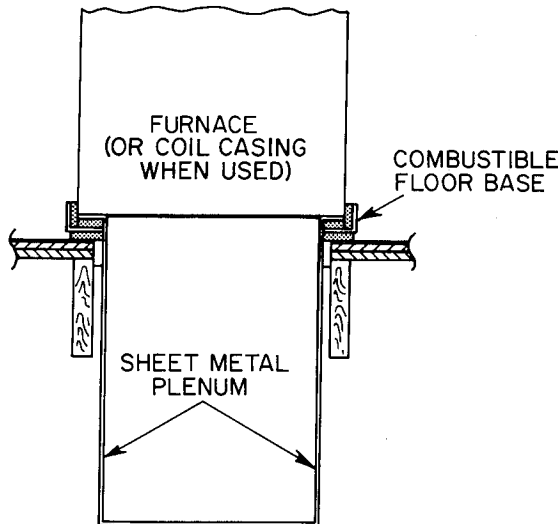
\*These dimensions apply when a Model 518C or 519D Evaporator Coil casing is to be installed.



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Figure 4—Furnace on a Concrete Slab

3. Assemble and install downflow subbase per instructions packaged with subbase.
4. When completed, downflow subbase, plenum, and furnace (or coil casing when used) should be installed as shown in Figure 5.



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Figure 5—Furnace, Plenum, and Subbase Installed on a Combustible Floor

## VI. ELECTRICAL CONNECTIONS

### A. 115-Volt Wiring

**NOTE:** Refer to "Procedures for Natural-Draft Gas-Fired Furnace Installations" (packaged with the equipment) for additional information.

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

See Figure 8 for wiring diagram showing the proper field 115- and 24-volt wiring.

Use a separate fused branch electrical circuit for this furnace. A disconnecting means must be located within sight from, and readily accessible to, the furnace. In some areas, the unit door switch may qualify as the disconnecting means.

**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 follow this warning can result in an electrical shock, fire, or death.

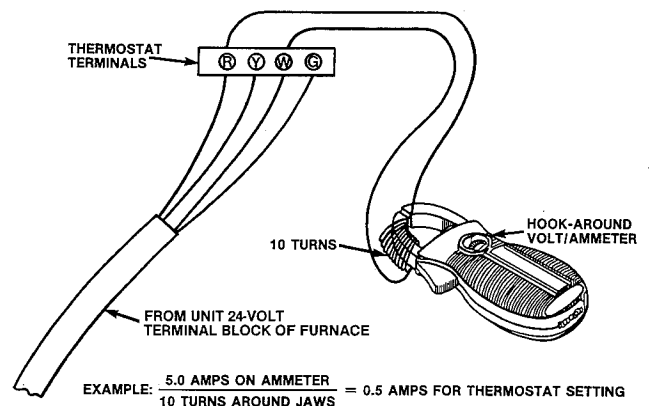
If 115-volt wiring to the unit is encased in a nonmetallic sheath, connect the incoming ground wire to the grounding wire inside the furnace J-box. If metallic conduit is used, it will serve as the ground.

### B. 24-Volt Wiring

Make field 24-volt connections at the 24-volt terminal strip. See Figure 8.

**NOTE:** Use AWG No. 18 "color-coded" copper thermostat wire for lengths up to 100 ft. Above 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 electrical components in the R-W circuit. Accurate amp draw readings can be obtained at thermostat subbase terminals R & W. Figure 6 illustrates an easy method for obtaining the actual amp draw.



A80201

Figure 6—Amp Draw Check With Ammeter

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 exposed to cold-air infiltration, drafts from windows, doors, or other openings leading to the outside, or exposure to air currents from warm- or cold-air registers; or to exposure where the natural circulation of the air is cut off—such as behind doors, above or below mantels, shelves, etc.

The thermostat should not be exposed to heat from nearby fireplaces, radios, televisions, lamps, or rays from the sun. Nor should the thermostat be mounted on a wall containing pipes or warm-air ducts, or a chimney or vent that could affect its operation and prevent it from properly controlling the room temperature. 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 printed-circuit control center. This will aid the installer and serviceman when installing and servicing the unit. See Figure 7. A 24-volt terminal board is marked for easy connection of field wiring.

## VII. SEQUENCE OF OPERATION

**NOTE:** See Figure 9 for heating/cooling wiring diagram.

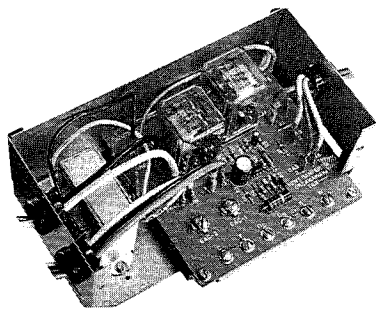
### A. Heating

Gas and electrical supplies must be turned on at the furnace.

**NOTE:** When power is applied to heat relay coil 2A in the control circuit, the normally closed contacts in the blower circuit will open.

#### 1. White Rodgers 36E Gas Valve (IID Models)

When the thermostat "calls for heat," the control circuit is closed between terminals R and W. Power from transformer



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Figure 7—Printed-Circuit Control Center

TRAN through fusible link FL (flame roll-out protection device), limit switches LS & ALS, blocked vent shut-off system switch BVSS, time-delay relay of igniter/lockout control ILO, and the cold contact of safety pilot SP energizes the "pick" solenoid coil of the pilot valve portion of automatic gas valve GV and high-voltage producing portion of the igniter/lockout control ILO.

The pilot valve portion of automatic gas valve GV has a "pick" solenoid coil and latching "hold" device. Terminal 5 of the "pick" coil must be energized to open the pilot valve, but only terminal 4 of the "hold" device must be energized to keep it open. The "hold" device in this gas valve is an internal pressure switch in series with the "pick" solenoid coil.

The igniter/lockout control ILO provides high-voltage electrical energy to safety pilot SP to cause sparking at its electrode. The pilot valve opens, permitting gas flow to safety pilot burner SP where the gas is ignited.

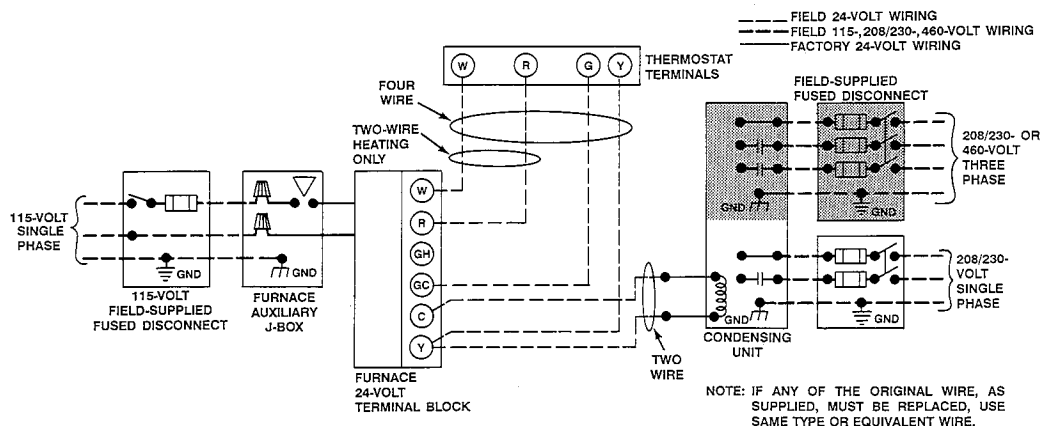
When the pilot flame is established, safety pilot SP switches its contacts in approximately 40 to 60 seconds, energizing the main valve portion of automatic gas valve GV and deenergizing igniter/lockout control ILO and terminal 5 of automatic gas valve GV. The "hold" device in the automatic gas valve GV energizes the pilot solenoid coil to hold the pilot valve open.

If the pilot flame is not established within approximately five minutes after closing the circuit between terminals R and W, the absence of power at terminal 6 of igniter/lockout control ILO will cause the time-delay relay in igniter/lockout control ILO to open, deenergizing the pilot valve portion of automatic gas valve GV. No further attempt will be made to ignite the pilot or main burner flames until the igniter/lockout control ILO is electrically reset. It can be reset by removing power for 30 seconds to terminal 5 of igniter/lockout control ILO. Power at terminal 5 can be removed by setting room thermostat below room temperature, or turning off electrical supply to furnace.

The main valve portion of automatic gas valve GV has a time-delayed operator that opens within 6 to 15 seconds after it is energized, permitting gas flow to the main burners where the gas is ignited by safety pilot SP.

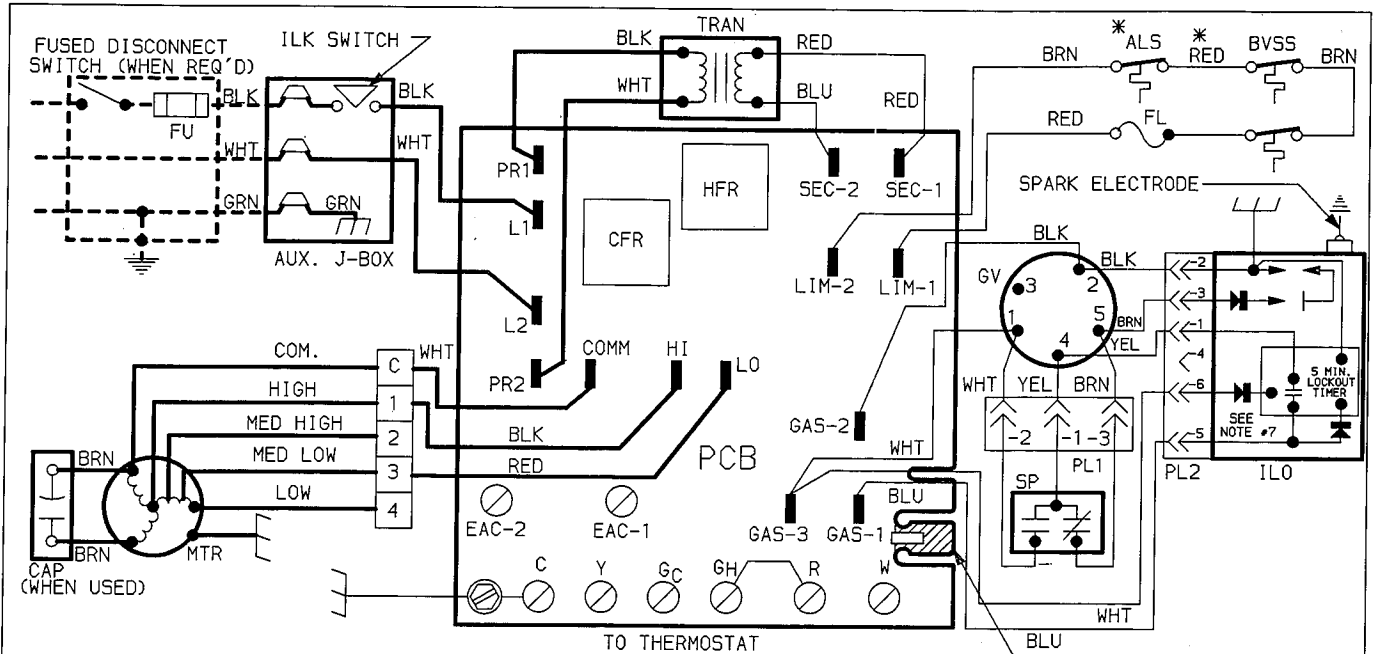
#### 2. Blower Circuit

With power through the solid-state time-delay circuit on printed-circuit board PCB and heat relay HFR, blower motor MTR is energized on heating speed approximately 75 seconds after gas valve GV has been energized (or the pilot flame has been proven in the case of IID systems).



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Figure 8—Heating and Cooling Application Wiring Diagram



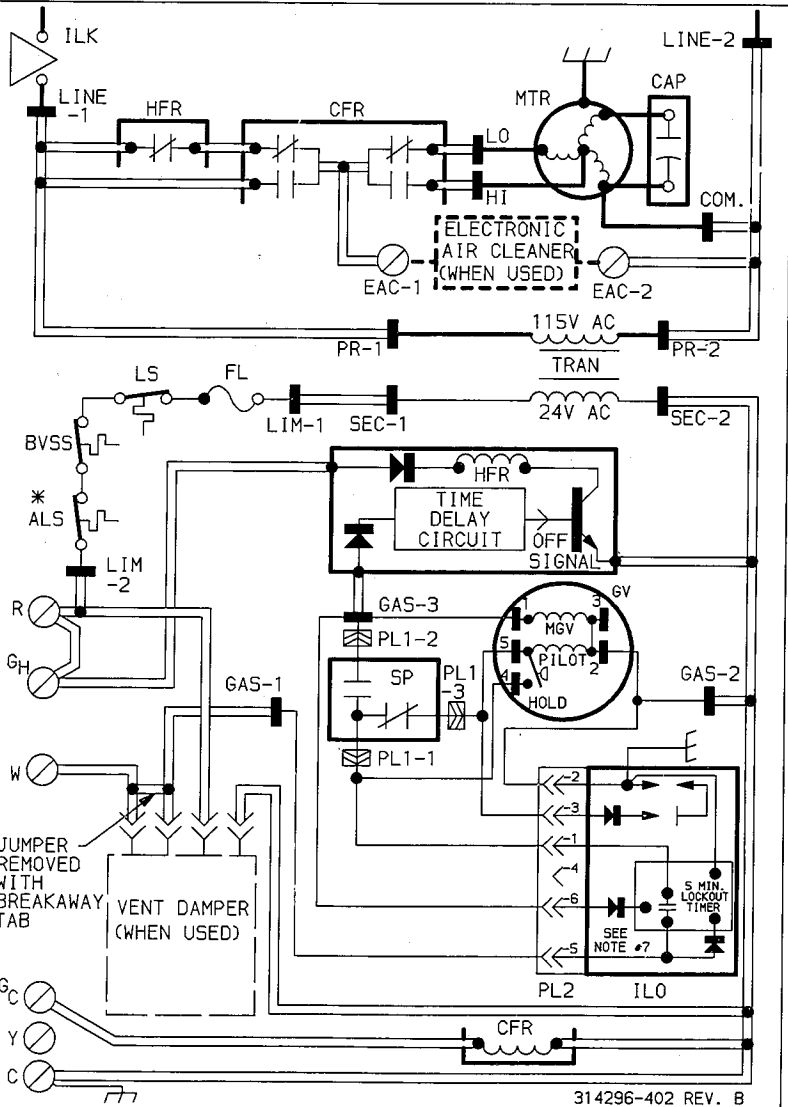
BREAKAWAY TAB REMOVED WHEN CONNECTING VENT DAMPER (SEE INSTALLATION INSTRUCTIONS)

**NOTES:**

- \* DOWNFLOW FURNACES ONLY
- 1. HEATING FAN RELAY CONTACT IS NORMALLY CLOSED UNTIL 115V AC IS APPLIED TO FURNACE.
- 2. TO CHANGE MOTOR SPEED, MOVE RED WIRE TO DESIRED SPEED SETTING.
- 3. IF ANY OF ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH AWM (105°C) WIRE OR ITS EQUIVALENT.
- 4. MOTOR IS THERMALLY OVERLOAD PROTECTED.
- 5. FACTORY SPEED SELECTION IS FOR AVERAGE CONDITIONS, SEE INSTALLATION INSTRUCTIONS FOR OPTIMUM SPEED SELECTION. MOTOR MAY BE 3 OR 4 SPEED.
- 6. SYMBOLS ARE ELECTRICAL REPRESENTATION ONLY.
- 7. LOCKOUT OCCURS IN 5 MINUTES, IF PILOT IS NOT PROVED.

**LEGEND**

- ALS AUXILIARY LIMIT SWITCH, MANUAL-RESET (SPST-NC)
- BVSS BLOCKED VENT SHUTOFF SWITCH, MANUAL-RESET (SPST-NC)
- CAP RUN CAPACITOR
- CFR COOLING FAN RELAY (DPDT)
- FL FUSIBLE LINK
- FU FIELD FUSE
- GV GAS VALVE
- HFR HEATING FAN RELAY (SPST-NC)
- ILK SWITCH, BLOW DOOR INTERLOCK (SPST-NO)
- ILO IGNITER/LOCKOUT CONTROL (SPST-NO)
- LS LIMIT SWITCH, AUTO.-RESET (SPST-NC)
- MTR MOTOR, BLOWER
- PCB PRINTED CIRCUIT BOARD
- PL1 3-CIRCUIT PLUG CONNECTOR (SP)
- PL2 6-CIRCUIT PLUG CONNECTOR (ILO)
- SP SAFETY PILOT (FLAME SENSING)
- TRAN TRANSFORMER
- FIELD SPLICE
- PLUG RECEPTACLE
- JUNCTION
- UNMARKED TERMINAL
- TERMINAL PCB FACTORY CONN.
- FACTORY WIRING (115V AC)
- FACTORY WIRING (24V AC)
- FIELD WIRING (115V AC)
- CONDUCTOR ON PRINTED CIRCUIT BOARD
- SCREW TERMINAL FOR FIELD WIRING
- FIELD GROUND
- EQUIP. GROUND



314296-402 REV. B

**Figure 9—Unit Wiring Diagram**

### 3. Limit Control

If the furnace overheats for any reason, limit control LS opens, breaking the circuit to automatic gas valve. The gas valve closes immediately, stopping gas flow to the main burners and the pilot. In addition, blower motor MTR continues to operate because heat relay HFR is deenergized to cool down the furnace.

Manual reset auxiliary limit switch ALS is located on the top right-hand corner of the furnace. In the event of blower motor failure, this switch breaks the electrical circuit to the gas valve, stopping gas flow to the main burners. The switch must be manually reset after the blower motor has been replaced.

Fusible link FL is provided in the transformer TRAN secondary circuit as safety shut-off protection from flame roll-out overheating conditions in the vestibule area of the furnace. Should this condition exist, the fuse opens and deenergizes gas valve GV and heat relay HFR, stopping the gas flow to the burners and starting blower motor MTR.

When the thermostat is satisfied, the circuit between R and W is broken, deenergizing automatic gas valve GV, pilot SP, and the solid-state time-delay circuit on printed-circuit board. The gas flow stops immediately to the pilot and main burners. After approximately 105 seconds, heat relay HFR is energized and blower motor MTR stops.

### 4. Blocked Vent Shut-off System Switch

The purpose of this control is for shutdown of the furnace during a totally blocked vent condition.

During a totally blocked vent condition, temperature in the drafthood relief opening will rise causing blocked vent shut-off system switch BVSS to open, breaking the circuit to gas valve GV. The gas valve closes immediately, stopping gas flow to the main burners and pilot, and the blower will run continuously.

The furnace will remain in this mode until the blocked vent shut-off system switch BVSS is manually reset. Investigate and correct cause of blocked vent before resetting this control.

#### B. Vent Damper (When Used)

With gas and electrical power supplied to the furnace, the vent damper motor is deenergized and the vent damper is closed until the thermostat "calls for heat."

On a "call for heat" by the thermostat, the vent damper motor is energized and the damper opens. When the vent damper reaches the full-open position, the damper motor is deenergized and a circuit is completed to gas valve GV via the igniter/lockout control ILO and the pilot SP. At this time the pilot gas valve is energized. When the pilot flame is proven by pilot safety switch SP, the main gas valve is energized and the main burners are ignited; the vent damper will remain open until the thermostat is satisfied.

When the thermostat is satisfied, it will deenergize gas valve GV and stop the gas flow. The vent damper motor will energize and close the damper. When the vent damper reaches the full-closed position, the damper motor is deenergized and will remain so until the next "call for heat" by the thermostat.

#### C. Cooling

When the thermostat "calls for cooling," power from transformer TRAN energizes the condensing unit contactor, cooling fan relay coil CFR, closing its contacts and energizing blower motor MTR on its cooling speed. It continues to operate until the thermostat is satisfied.

When the thermostat is satisfied, the circuit to terminal Gc is broken, deenergizing cooling fan relay coil CFR which, in

turn, opens its contacts, stopping blower motor MTR.

### VIII. 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 Figure 10.

**⚠ WARNING:** Never operate the unit without a filter or with the filter access door removed. A failure to follow this warning can cause a fire, personal injury, or death.

### IX. STARTUP AND ADJUSTMENT

In addition to the following information, refer to "Procedures for Natural-Draft Gas-Fired Furnaces" packaged with the unit.

**NOTE:** There is a switch located in the blower compartment that breaks the electrical power supply when the blower access door is removed. Be sure the blower access door is properly installed.

**⚠ CAUTION:** This furnace is equipped with a fusible link in the vestibule area that will melt if a flame roll-out overheating condition is caused by inadequate combustion-air supply or improper venting practices. 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).

**NOTE:** The gas valve regulator has been nominally-set at 3.5 in. wc for natural gas. Refer to "Procedures for Natural-Draft Gas-Fired Furnace Installations" for readjusting when checking input.

#### A. Adjustment of Blower Speed

**⚠ WARNING:** Disconnect the electrical power before changing the speed tap. A failure to follow this warning can cause personal injury.

To change motor speed taps, remove the motor tap lead (See Table V.) and relocate it on the desired terminal on the plug-in terminal block/speed selector located on the blower.

**⚠ CAUTION:** When adjusting the blower speed, make certain that the temperature rise across the heat exchanger is not less/greater than that specified on the rating plate.

TABLE V—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.

#### B. Automatic Gas 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 room temperature and observing that the main burners light on "call for heat" and go off when the pointer is moved below room temperature setting.

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

**⚠ CAUTION:** Be sure to follow startup and pilot safety check procedures as outlined in "Procedures for Natural Draft Gas Fired Furnaces" packaged with the furnace.

## X. 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 anything on, 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.

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

For continuing high performance, and to minimize possible 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, contact your Dealer for maintenance.

**⚠ 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. A failure to follow this warning can cause personal injury.

The minimum maintenance that should be performed on the 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 (when oil ports are provided) as necessary.
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.

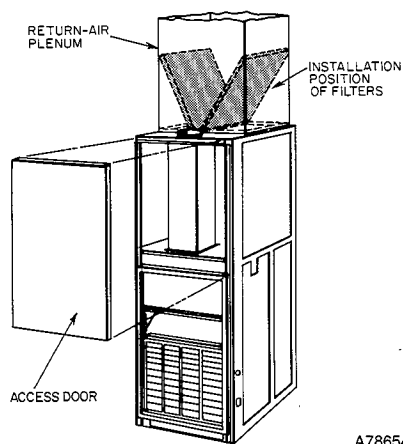


Figure 10—Position of Filters

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

### A. Air Filter

Each furnace accommodates two filters which can be installed above the furnace in the return-air plenum. See Figure 10.

To clean or replace the filters when located above the furnace, proceed as follows:

1. Disconnect electrical power before removing access door.
2. Remove upper access door.
3. Reach up behind top plate, tilt filters toward center of return-air plenum, remove filters, and replace or clean as needed.
4. Some furnaces are equipped with permanent, washable filters. Clean those filters as follows:
  - a. Clean with tap water.
  - b. Rinse and let dry. No oiling or coating of filters is recommended.
  - c. Reinstall filters with cross-hatch binding facing blower.

### B. Blower Motor Wheel

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

When oil ports are provided, 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).

Remember to disconnect electrical supply before removing access doors.

Clean and lubricate as follows:

1. Remove upper access door.
2. Loosen screw in vent pipe enclosure front and remove vent enclosure front by sliding forward (toward front of unit).
3. Disconnect vent pipe at first joint above unit and swing vent pipe assembly to side, supported by suitable means (block of wood, etc.).
4. Slide vent pipe upward through rectangular opening in top plate and remove vent pipe from furnace.
5. Remove four screws in vent pipe enclosure back, and remove enclosure back by tilting top toward blower and sliding bottom toward front of furnace.
6. Disconnect electrical plugs from numbered side of speed selector. Note location of wires for reassembly.
7. Remove screws holding blower assembly against blower deck and slide blower assembly out of furnace.
8. Squeeze side tabs of speed selector and pull it from blower housing.
9. When applicable, loosen screw in strap holding capacitor to blower housing and slide capacitor out from under strap.
10. Mark blower wheel, motor, and motor support in relation to blower housing before disassembly, to insure proper reassembly.
11. Loosen setscrew holding blower wheel onto motor shaft.
12. Remove bolts holding motor mount to blower housing and slide motor and mount out of housing. Some motors have a ground wire attached to blower housing;



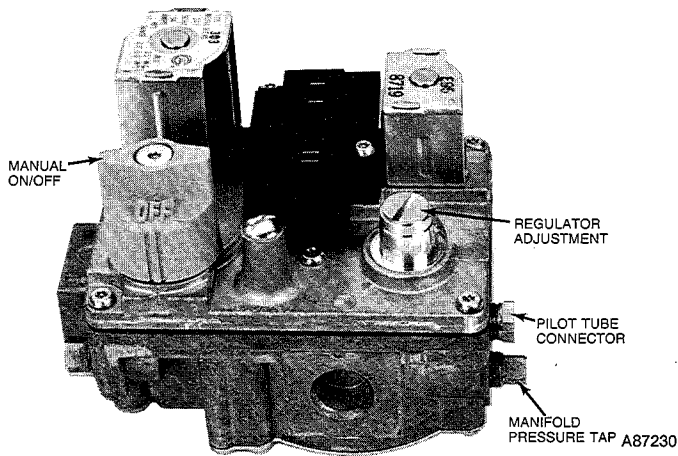


Figure 11—White Rodgers Model 36E Gas Valve

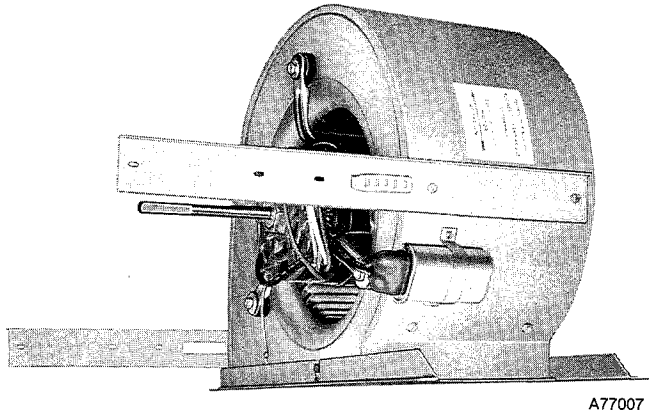


Figure 12—Dual Blower With Left-Hand Housing and Wheel Removed

- disconnect it also.
13. Lubricate motor (when oil ports are provided).
    - a. Remove dust caps or plugs from oil ports located at each end of motor.
    - b. Use good grade of SAE 20 nondetergent motor oil and put one teaspoon, 5cc, 3/16 oz., or 16 to 25 drops in each oil port. **Do not** over oil.
    - c. Allow time for total quantity of oil to be absorbed by each bearing.
    - d. After oiling motor, be sure to wipe excess oil from motor housing.
    - e. Replace dust caps or plugs in oil ports.
  14. Remove blower wheel from housing.
    - a. Mark blower wheel orientation and cutoff location to insure proper reassembly.
    - b. Remove screws holding cutoff plate and remove cutoff plate from housing.
    - c. Lift blower wheel from housing through opening.
  15. Clean blower wheel and motor by using vacuum with soft brush attachment. Care must be exercised not to disturb balance weights (clips) on blower wheel vanes. Also do not drop or bend wheel, as balance will be affected.
  16. Reassemble blower by reversing procedures 14a thru 14c. Be sure wheel is positioned for proper rotation.
  17. Reassemble motor and blower by reversing procedures 8 thru 12. If motor has ground wire, be sure it is connected as before. Be sure the blower wheel setscrew is on the flat of the motor shaft when tightening the setscrew.

18. Reinstall blower assembly in furnace.
19. Reinstall vent enclosure back.
20. Reinstall vent pipe through opening in top plate, secure to drafthood and connect remainder of vent pipe assembly.
21. Reinstall vent enclosure front, and secure with screw.
22. Connect electrical leads to Molex speed selector. Please note that connections are polarized for assembly—**do not force**.
23. Reinstall access door.
24. Turn on electrical power and check for proper rotation and speed changes between heating and cooling.

### C. Cleaning Heat Exchanger

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

1. Turn off gas supply to furnace.
2. Turn off electrical supply to furnace.
3. Remove access doors.
4. Remove vent pipe enclosure front and vent pipe.
5. Remove draft diverter. Screws are located inside draft diverter opening.
6. Remove outlet and lower chokes (located across heat exchanger outlets). See Figure 13.
7. Remove flue baffles from flue outlets of heat exchangers.
8. Remove secondary-air shield and burners. To remove pilot burner, disconnect pilot supply tube at gas valve.
9. Clean flue ways with brush and/or vacuum. Check heat exchanger for leaks and cracks. Replace if necessary.
10. Using vacuum cleaner with soft brush attachment, clean burners. After cleaning, reinstall burners and secondary-air shield.
11. Replace flue baffles and chokes. Be sure all screws are in place and tight. Lower choke **must** be installed across the lower part of the heat exchangers.
12. Replace draft diverter and connect vent pipe. Be sure screws are replaced and tight.
13. Turn on electricity.
14. Turn on gas. Check for gas leaks.

**WARNING:** Never use a match or other open flame to check for gas leaks. Use a soap-and-water solution. A failure to follow this warning can cause an explosion, fire, personal injury, or death.

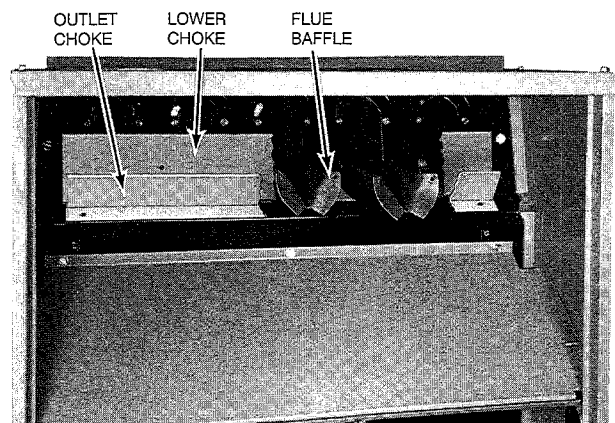


Figure 13—Removing Baffles and Chokes



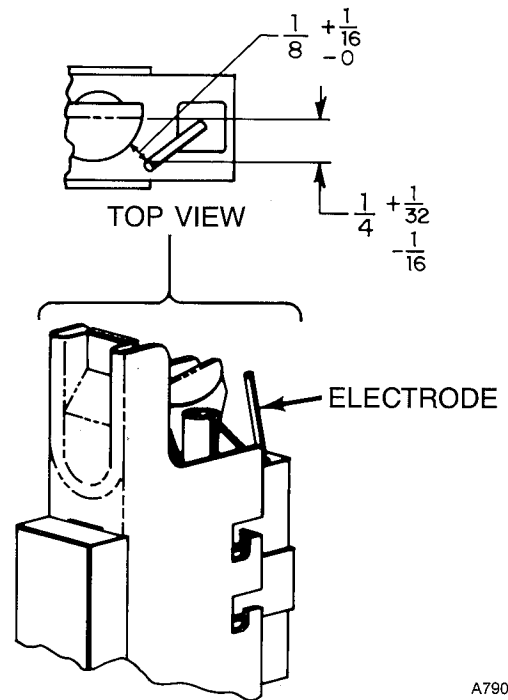
#### D. Pilot

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 flame sensing element and to light the burners. Remove the accumulation of soot and carbon from the flame sensing element.

#### E. 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 any screws or 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 one complete operating cycle.



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**TABLE VI—TROUBLE ANALYSIS CHART**

**⚠WARNING:** To avoid possibility of fire, explosion, electric shock, personal injury or death, turn off gas and power supply to unit before servicing (unless specific test requires gas and electric supplies).

SYMPTOM	CAUSE	REMEDY
Furnace will not operate	No 115-volt power to furnace	Connect to power supply. Check fuse, wiring, or circuit breaker.
	Blower door not in place.	Install furnace blower door.
	Defective blower door switch	Replace switch.
Pilot will not ignite	Blocked vent shut-off system switch open	Check for vent blockage and proper installation of vent pipe.
	No spark at electrode	Readjust, if necessary, so that gap between electrode tip and pilot burner is as shown in Figure 14.
		Clean dirt or moisture accumulation from electrode ceramic with cloth.
		Cracked ceramic—replace pilot electrode assembly.
		Check for loose or broken wiring at and between igniter/lockout control and electrode. Replace wire or tighten connection as necessary.
		Check fuse or circuit breaker for 115-volt supply to furnace.
		Check blower access panel for proper installation.
	Spark shorting out to main burner	Check 24-volt input to igniter/lockout control. If you read 24 volts and above steps have been completed, replace igniter/lockout control.
		Reset igniter/lockout control.
	No gas at pilot burner	Reset igniter/lockout control.
		Clean pilot orifice.
		Check voltage to terminals 3 and 5 of gas valve.
Check for proper opening of pilot valve, broken wires, or loose connections. If no deficiency is found, replace gas valve.		
Burners will not ignite	Reset igniter/lockout control.	
	No 115-volt power to furnace	Connect to power supply. Check fuse, wiring, or circuit breaker.
	No 24-volt power to control circuit	Replace transformer.
	Miswired or loose connections	Check all wiring and all wirenut connections.
	No gas at main burners	Check voltage to terminals 1 and 2 of gas valve.
	Miswired or loose connections	Check for proper opening of main gas valve, broken wires, or loose connections. If no deficiency is found, replace gas valve.
		Check all wiring and all wirenut connections.
Blower operates continuously	Dirty pilot—yellow flame	Clean pilot orifice.
	Thermostat fan switch in ON position	Move thermostat fan switch to AUTO position.
	Fusible link blown (flame roll-out protection device)	Correct combustion air, vent system and/or heat exchanger blockage—replace fuse link with identical part.
	Dirty filter causing limit operation	Clean or replace dirty air filter—reinstall.
	Defective heat relay system	Replace printed-circuit board.
Inadequate heating	Blocked vent shut-off system switch open	Check for vent blockage and proper installation of vent pipe.
	Furnace undersized for application	Replace with proper size furnace.
		Gas input to furnace too low
	Limit switch cycles main burners	Clean or replace dirty air filter—reinstall.
		Increase blower speed.
	Manual reset limit switch contacts open	Open registers—ductwork restricted.
	Manual reset switch contacts open (Burner on time must be 4½ minutes minimum.)	Blower motor failure—replace motor
	Thermostat anticipator set too low	Check and adjust thermostat anticipator to proper setting.
Replace with proper size furnace.		
Aldehyde odors, (CO), sooting flame—floating flame	Incomplete combustion—poor flame characteristics	Check thermostat circuit amps and set anticipator accordingly. See Figure 6.
		Adjust air shutter on burners to provide soft blue flame. Check all screws around flue outlets and burner compartment. Tighten.
		See "Section II, Location & Air for Combustion & Ventilation" (Procedures for Natural-Draft Gas-Fired Furnaces).
		Replace cracked heat exchanger.
		Furnace overfired—reduce input, check orifices and manifold pressure.
		Check vent for restriction.

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