

Installation Instructions

394B&D

Size 50 thru 200
Series A

Gas-Fired Forced Air Furnace

bryant

39394D76
2/15/73

INTRODUCTION

Before installing the furnace, refer to "Procedure for Gas Furnace Installation" (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 American National Standard "Installation of Gas Appliances and Gas Piping," Z21.30.

Model 394 Gas Furnaces are shipped from the factory completely assembled and wired ready for indoor heating installation. They are manufactured with two types of blowers: belt and direct drive. The four smaller sizes, 50, 80, 100, and 125, are direct drive only. All sizes incorporate a low-voltage terminal strip for convenience of field wiring (except 50,000-Btuh unit with complete shutoff gas controls.)

This publication covers installation, start-up and maintenance. For accessory installation details, refer to applicable installation literature.

CAUTION: Do not install furnace in a corrosive or contaminated atmosphere. Make sure that all local ordinances for combustion and circulating air supply are observed.

The design of the 394B&D Upflow Gas-Fired Furnaces is A.G.A. certified for installation on combustible flooring in alcoves, basements, closets, or utility rooms.

CLEARANCE REQUIREMENTS (in inches)

| | |
|---|---|
| Sides | 1 |
| Back | 0 |
| Top of Plenum | 1 |
| Vent Connector (single wall) | 6 |
| Type B (double wall) | 1 |
| Front | 6 |
| Provide service clearance of 30 in. at front of unit. | |

Bryant Automatic Gas Control Valve

NOTE: On units equipped with an A-643 Bryant automatic gas control valve, there are three positions for the manual valve knob (OFF-PILOT-ON). There is a position stop at the PILOT position. To move the manual valve knob from the PILOT position to either ON or OFF position, the manual valve knob must be depressed.

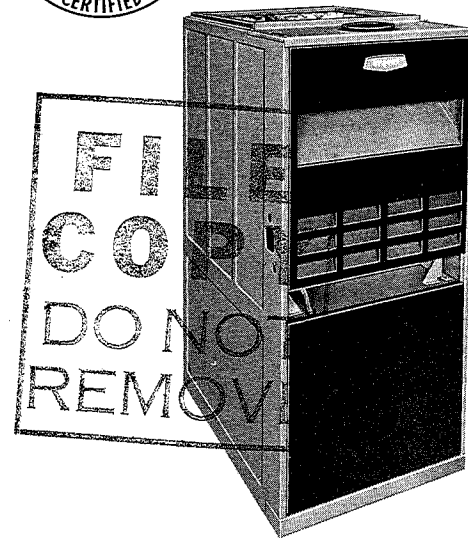
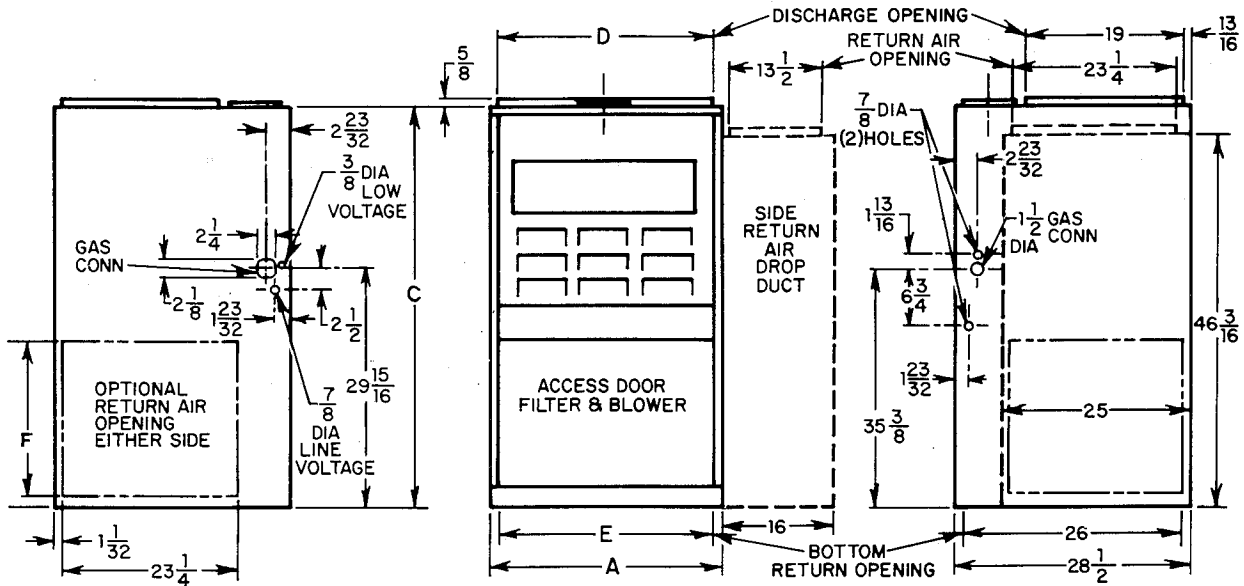


Figure 1—Model 394D

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 the room temperature setting. All Bryant automatic gas control valves have a delay when opening or closing.

Fan/Limit Control Operation

At the moment the thermostat calls for heat, the time delay mechanism of the control is energized. If, due to pilot outage, the control bimetal element does not sense a temperature change, the control will turn on the blower strictly by means of the time delay feature. If for any reason the time delay is not energized as the thermostat calls for heat, the control bimetal element will bring on the blower when it senses a temperature rise of 50 degrees Fahrenheit (standard differential) above the turn-off setting. During the blow-down period and after the thermostat is satisfied, the control will turn the blower off at the indicated setting sensed by the control bimetal element.



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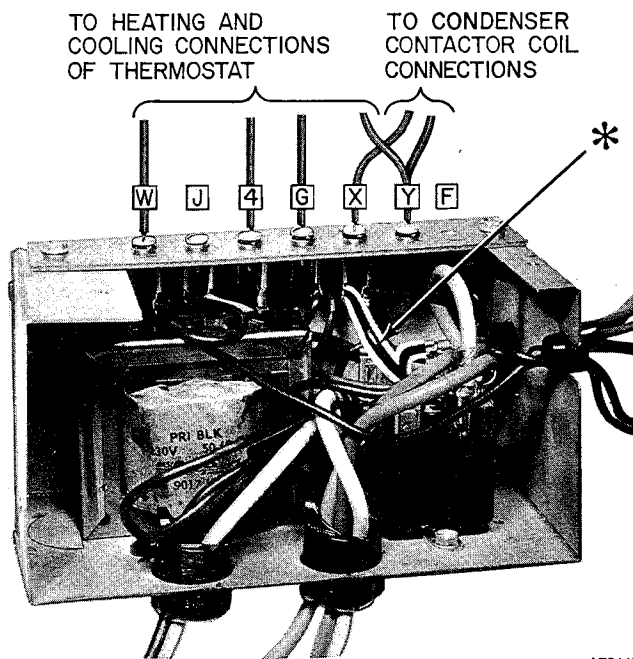
Figure 2—DIMENSIONAL DRAWING

Table I—DIMENSIONS IN INCHES

| MODEL & SIZE | A | C | D | E | F | Vent Dia |
|--------------|---------|---------|---------|----------|--------|----------|
| 394DAC000050 | 12 | 46-3/16 | 10-3/8 | 9-1/2 | 14-1/2 | 4 |
| 394DAC024050 | 12 | 46-3/16 | 10-3/8 | 9-1/2 | 14-1/2 | 4 |
| 394DAC000080 | 14-3/16 | 46-3/16 | 12-9/16 | 11-11/16 | 14-1/2 | 4 |
| 394DAC024080 | 14-3/16 | 46-3/16 | 12-9/16 | 11-11/16 | 14-1/2 | 4 |
| 394DAC036080 | 14-3/16 | 46-3/16 | 12-9/16 | 11-11/16 | 14-1/2 | 4 |
| 394DAC000100 | 17-1/2 | 46-3/16 | 15-7/8 | 15 | 14-1/2 | 5 |
| 394DAC036100 | 17-1/2 | 46-3/16 | 15-7/8 | 15 | 14-1/2 | 5 |
| 394DAC048100 | 21 | 46-3/16 | 19-5/16 | 18-1/2 | 14-1/2 | 5 |
| 394DAC000125 | 21 | 46-3/16 | 19-5/16 | 18-1/2 | 14-1/2 | 5 |
| 394DAC048125 | 21 | 46-3/16 | 19-5/16 | 18-1/2 | 14-1/2 | 5 |
| 394DAC060125 | 21 | 46-3/16 | 19-5/16 | 18-1/2 | 14-1/2 | 5 |
| 394DAC000150 | 24-1/2 | 46-3/16 | 22-7/8 | 21 | 14-1/2 | 6 |
| 394DAC060150 | 24-1/2 | 49 | 22-7/8 | 21 | 18 | 6 |
| 394BAD060150 | 24-1/2 | 49 | 22-7/8 | 21 | 18 | 6 |
| 394DAC060175 | 31-1/2 | 49 | 29-7/8 | 29 | 18 | 7 |
| 394BAD060175 | 31-1/2 | 49 | 29-7/8 | 29 | 18 | 7 |
| 394BAD060200 | 31-1/2 | 49 | 29-7/8 | 29 | 18 | 7 |

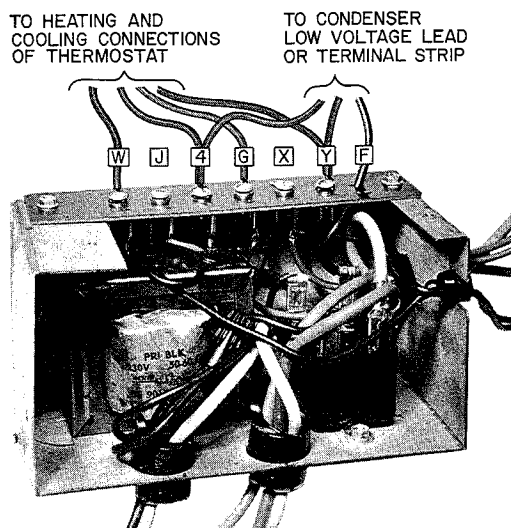
Table II—RATINGS AND CAPACITIES

| MODEL | Natural and LP | | Temp Rise Range | Heating | | Cooling | |
|--------------|----------------|-------------|-----------------|---------------------|------|---------------------|------|
| | Input Btuh | Output Btuh | | Ext Static Pressure | CFM | Ext Static Pressure | CFM |
| 394DAC000050 | 50,000 | 40,000 | 70-100 | 0.12 | 408 | — | — |
| 394DAC024050 | | | 45-100 | | 482 | 0.5 | 780 |
| 394DAC000080 | 80,000 | 64,000 | 70-100 | 0.12 | 654 | — | — |
| 394DAC024080 | | | 45-100 | | 772 | 0.5 | 790 |
| 394DAC036080 | | | 45-100 | | 772 | — | 1190 |
| 394DAC000100 | | | 70-100 | | 818 | — | — |
| 394DAC036100 | 100,000 | 80,000 | 45-100 | 0.15 | 965 | 0.5 | 1200 |
| 394DAC048100 | | | 45-75 | | 1157 | — | 1540 |
| 394DAC000125 | | | 70-100 | | 1020 | — | — |
| 394DAC048125 | 125,000 | 100,000 | 45-100 | 0.2 | 1206 | 0.5 | 1560 |
| 394DAC060125 | | | 45-75 | | 1447 | — | 2000 |
| 394DAC000150 | | | 70-100 | | 1225 | — | — |
| 394DAC060150 | 150,000 | 120,000 | 45-75 | 0.2 | 1736 | 0.5 | 2080 |
| 394BAD060150 | | | 45-100 | | 1447 | — | 2310 |
| 394DAC060175 | | | 45-100 | | 1688 | — | 2010 |
| 394BAD060175 | 175,000 | 140,000 | 45-100 | 0.5 | 1688 | 0.5 | 2290 |
| 394BAD060200 | | | 70-100 | | 1634 | 0.5 | 2460 |



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Figure 3 - Control Box, Cover Removed, No Internal Wiring Changes



NOTE:
WIRE WITH * IN FIGURE 3 IS
REMOVED AND DISCARDED WHEN
CONDENSER HAS TRANSFORMER.

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Figure 4 - Control Box, Cover Removed, Showing Internal Wiring Changes

The 175,000-Btuh belt-drive, and 200,000-Btuh units are equipped with a Honeywell fan limit control. It provides control of fan operation and high-limit temperature protection. The fan switch makes contact to start the blower motor on temperature rise to set point. The limit switch breaks the circuit to the burners when the temperature rise reaches the set point.

Thermostat Location

The room thermostat should be located where it will be in the natural circulating 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 radiators, 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 flue 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.

Set the thermostat heat anticipator as follows:

Units with Bryant A-641 or A-643 gas valve set at 0.5.

Units with Robertshaw 7000 gas valve, set at 0.3 (except 175,000- and 200,000-Btuh belt-drive units, set at 0.2.)

If additional controls are connected in the thermostat circuit, the amp draw must be added to these settings. Failure to make the settings will result in improper operation of the thermostat.

ELECTRICAL CONNECTIONS

Low-Voltage Wiring

Field low-voltage connections are made at the low-voltage terminal strip. See Figure 3. For Model 394 Furnaces used in conjunction with electric or gas air conditioning units that do not have an integral transformer, see Figure 3. If the 394 Furnace is used in conjunction with an electric or gas air conditioning unit having an integral transformer, see Figure 4.

Figure 4 shows a field-installed wire running from one side of the air conditioning transformer, through the hole marked "F" in the terminal strip, to the blower relay in the control box for the Model 394 Furnace. The wire marked * in Figure 3 is removed from the control box and discarded.

NOTE: For heating only connections. See Figure 8.

Line-Voltage Wiring

All electrical connections are to be made in accordance with the local electrical codes. A permanent, live, separately fused electric power supply, complete with manual switch, should be provided for the furnace. Field wiring connections should be made in accordance with the unit wiring diagrams.

When making aluminum conductor connections to copper conductors or terminals, use only connectors that are UL approved (marked Al/Cu with the UL symbol) for the application and wire size. Do not reduce wire size to fit connector by cutting off strands. Use proper size connector.

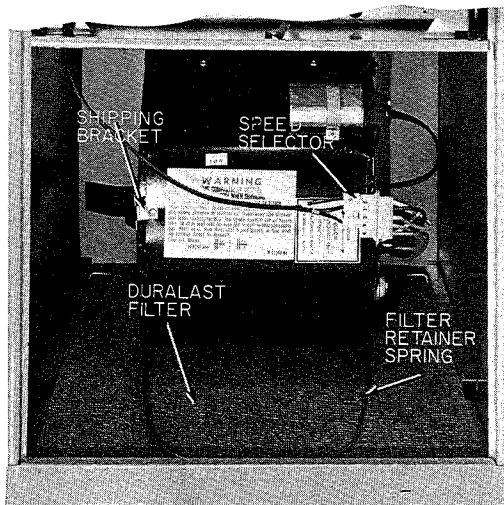
After insulation has been stripped from the aluminum conductor, coat the conductor end with corrosion inhibitor (Burndy "Penetrox A" or equivalent), and wire-brush the aluminum surface thru the inhibitor.

CAUTION: Do not wire-brush connectors and lugs. The plating will be broken.

After cleaning, recoat the aluminum conductor with inhibitor, and make connection, then coat entire connection. If applicable, wrap the connection for moisture and/or electrical protection.

Filters

The filters are factory-installed in the bottom of the furnace. This is for bottom inlet application. See Figure 5.



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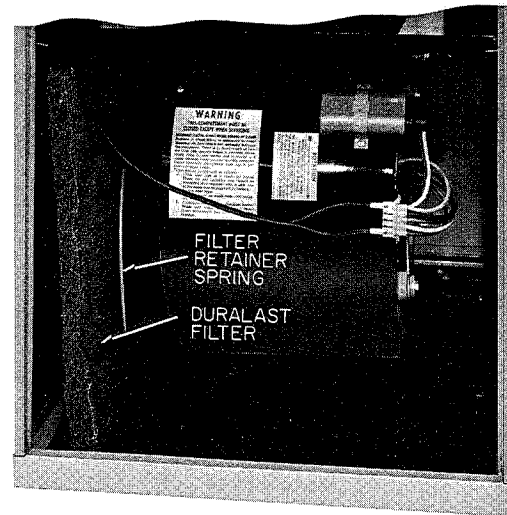
Figure 5 - Filter Installed For Bottom Inlet

For side inlet application, see Figure 2 and Table I for the opening size. Remove the filter and the retainer spring from the bottom opening. Install the retainer spring in the holes provided, one in the blower deck and the other in the retainer spring bracket. See Figure 6.

CAUTION: Be sure the filter retainer spring is behind the flange of the casing side.

When the side inlet is used, the bottom opening should be properly and permanently sealed.

NOTE: Side inlet application of the following units requires use of the appropriate optional external filter rack: 048100, 060125, 060150, 060175, and 060200. See instruction packed with filter rack for installation.



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Figure 6 - Filter Installed For Side Inlet

NOTE: Some units with direct-drive blowers have a shipping bracket. See Figure 5. This bracket should be removed and discarded. Belt-drive units have wood shipping blocks that are to be removed and discarded.

START-UP AND ADJUSTMENT

In addition to the following information, refer to "Procedures for Gas Furnace Installation" packaged with the unit.

Adjustment of Blower Speed

Four-Speed Direct Drive

To change motor speed taps, remove the motor tap lead (see Figure 5) and relocate it on the desired terminal on the plug-in terminal block/speed selector located on the blower.

Table III—SPEED SELECTOR

| Wire/Speed | Tap No. |
|---------------|---------|
| White/Common | C |
| Black/Hi | 1 |
| Blue/Med-Hi | 2 |
| Yellow/Med-Lo | 3 |
| Red/Lo | 4 |

Belt Drive

The blower speed may be changed by opening or closing the motor pulley. When adjusting blower speed, be certain that the pulleys are properly aligned.

CAUTION: When adjusting the blower speed, make certain that the temperature rise across the heat exchanger does not exceed that specified on the rating plate.

CARE AND MAINTENANCE

WARNING: Because personal injury or damage to the furnace may result, maintenance should be performed by qualified persons only.

Care of Blower and Motor

For long life, economy, and high efficiency; clean accumulated dirt and grease from blower wheel and motor annually. Also clean around bearings and shaft(s) of blower and motor. See label on blower for oiling instructions.

Belt Tension

Adjust tension on a V-belt so that the belt deflects approximately 3/4 to 1 inch when the pressure from one finger is applied midway between the blower and motor pulleys.

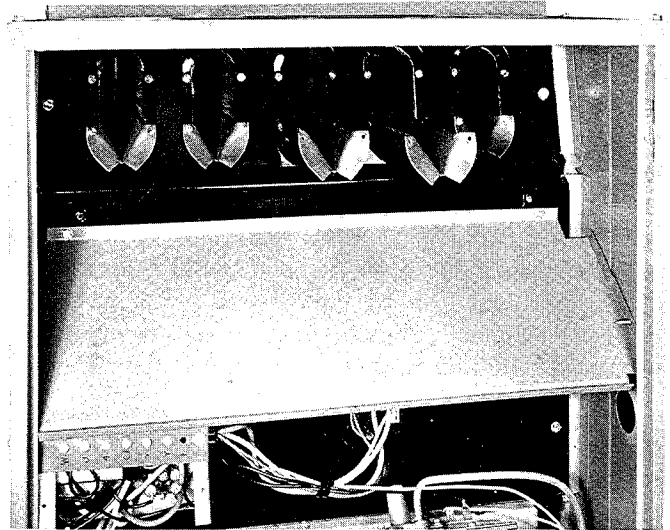
Filters

Each furnace is shipped with a Duralast permanent filter. Check every 30 to 60 days. See label on blower for cleaning method. It is not necessary to spray filter with oil.

Cleaning Heat Exchanger

If it becomes necessary to clean heat exchanger—because of carbon deposits, soot, etc.—shut off gas and electricity. Remove burners and manifold assembly. Remove vent connector and draft diverter. Remove flue baffles from upper heating element flue outlets by removing two screws that secure baffles in place. Clean flueways with brush and/or vacuum.

Replace flue baffles. Make certain that rear of baffle engages “dimple” in heating element, and tighten screws carefully. Replace draft diverter and vent connector. Replace manifold and burners. Connect gas and electricity. Test for gas leaks.



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Figure 7 - Removing Baffles

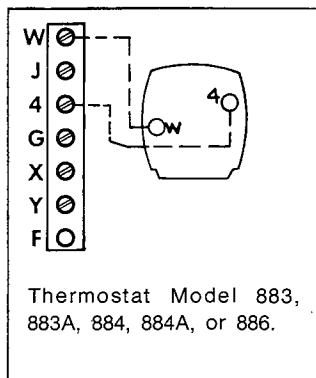
PILOT

Pilot should be checked and cleaned if necessary at the beginning of each heating season. Pilot flame should be high enough for proper impingement of the safety element and to light the burners. Remove accumulation of soot and carbon from thermocouple safety element, if used.

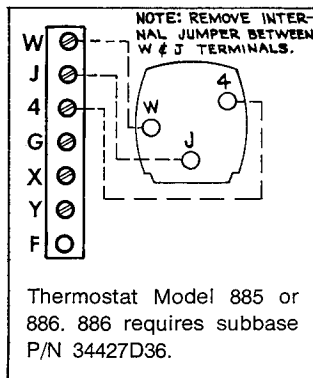
It is recommended the pilot be turned off during the summer season.

THERMOSTAT CONNECTIONS—HEATING ONLY

Units with Non 100% Shutoff Controls Natural Gas

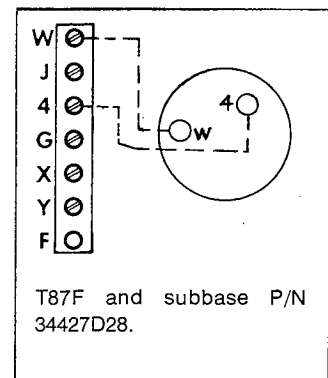


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Units with 100% Shutoff Controls Natural or LP Gas



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Figure 8 - Field Wiring Connection

LINE-TO-LINE WIRING DIAGRAMS

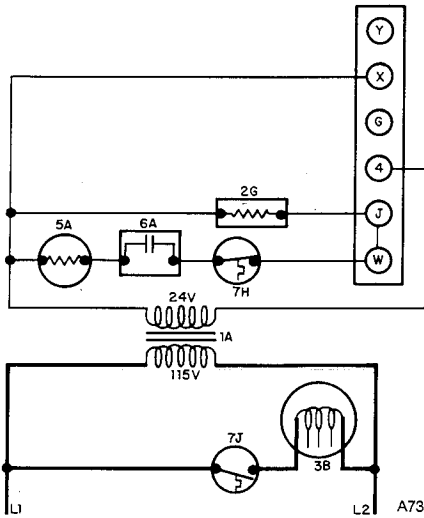


Figure 9 - Units with 1/10-, 1/6-, or 1/5-HP Direct-Drive Motor (no cooling fan relay)

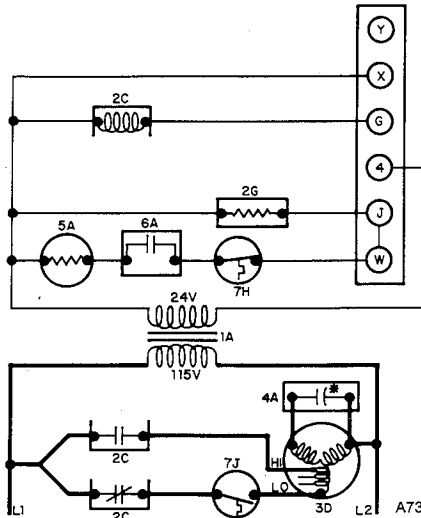


Figure 10 - Units with 1/6-, 1/3-, 1/2-, or 3/4-HP Direct-Drive Motor (cooling fan relay). No Capacitor on 1/6- and 1/3-HP Motors.

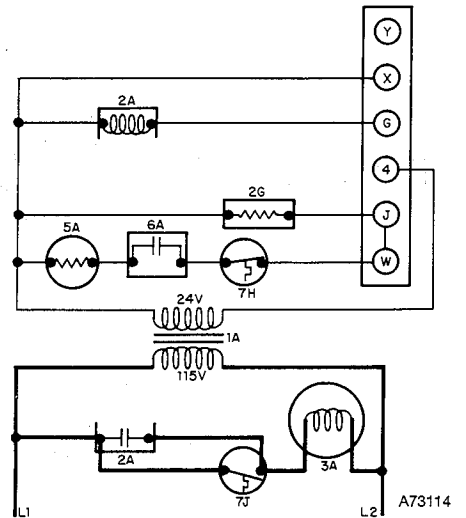


Figure 11 - Units with 3/4-HP Belt-Drive Motor (cooling fan relay)

LEGEND

- 1A-Transformer
- 2A-Cooling Fan Relay
- 2C-Cooling Fan Relay
- 2G-Heating Fan Relay
- 3A-Fan Motor SP PH
- 3B-Fan Motor SP
- 3D-Fan Motor PSC
- 4A-Capacitor (None on 1/6- & 1/3-HP Motors)
- 5A-Gas Valve
- 6A-Pilot (None on LP)
- 7H-Limit Control SPST N.C.
- 7J-Fan Control SPST N.O.

If any of the original wire, as supplied, must be replaced, use same type or equivalent wire.

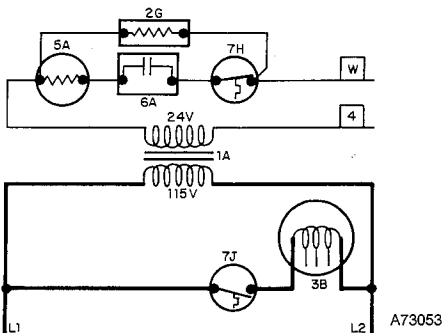


Figure 12 - 50,000-Btuh Unit with D2 or D5 controls (no cooling fan relay)

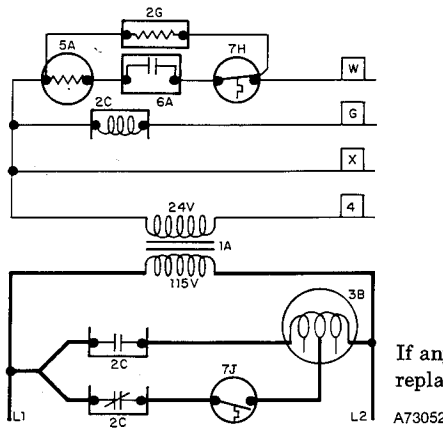


Figure 13 - 50,000-Btuh Unit with D2 or D5 Controls (cooling fan relay)

SEQUENCE OF OPERATING—HEATING

When the thermostat calls for heat, the control circuit is closed between terminals (4 and W). Power from transformer (1A) energizes automatic gas valve coil (5A) and heat assist coil (2G) simultaneously. After a short time delay, automatic gas valve (5A) opens, permitting gas to flow to the burners where it is ignited by the gas pilot. After another delay, the heating relay switches its contacts (7J), energizing blower motor (3A, 3B, or 3D) on heating speed.

When the thermostat is satisfied, the circuit between terminals (4 and W) is broken, deenergizing automatic gas valve coil (5A) and heat assist coil (2G). After a few seconds, automatic gas valve (5A) closes, stopping the flow of gas to the burners. After a longer delay, heating relay (7J) opens its contacts to stop blower motor (3A, 3B, or 3D).

If the furnace overheats for any reason, limit control (7H) will switch, breaking the circuit to automatic gas valve coil (5A). After a short delay, the gas valve closes, shutting off the flow of gas to the burners. After

an additional period of time, heating relay (7J) closes its contacts, energizing blower motor (3A, 3B, or 3D) (if not already operating) on heating speed. The furnace will continue to cycle until the fault is corrected.

The pilot (6A) must be lit, closing its contacts, before the gas valve (5A) will open. If, for some reason, the gas valve does not open when thermostat calls for heat, heat assist coil (2G) causes heating relay (7J) to close its contacts, energizing blower motor (3A, 3B, or 3D).

SEQUENCE OF OPERATION—COOLING

When the thermostat calls for cooling, power from transformer (1A) energizes cooling relay coil (2C), closing its contacts, and energizing blower motor (3A, 3B, or 3D) on its cooling speed. It continues to operate until the thermostat is satisfied.

When the thermostat is satisfied, the circuit to terminal (G) is broken, deenergizing cooling relay coil (2C) which, in turn, opens its contacts, stopping blower motor (3A, 3B, or 3D).