

Service and Maintenance Instructions

HSI Mid-Efficiency
Induced-Combustion Furnaces
Sizes 050 thru 155
Series C

GB1AAV
GB3AAV

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

These procedures are for size 45,000 through 155,000 Btuh input units.

Index

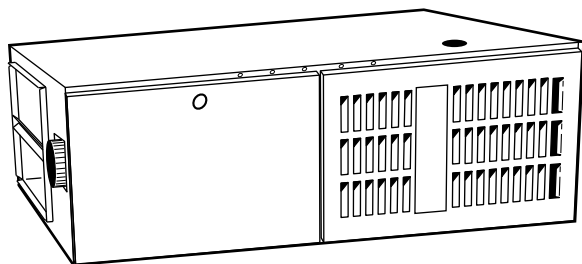
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SAFETY CONSIDERATIONS

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

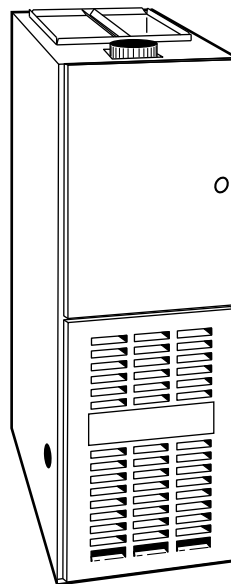
Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the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

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



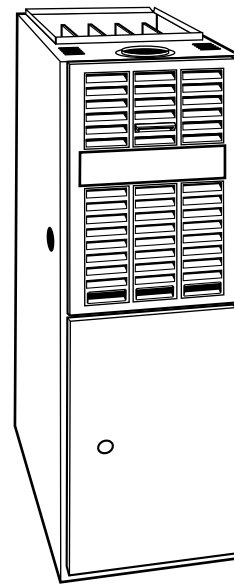
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Fig. 1—Model GB3AAV Horizontal



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**Fig. 2—Model GB3AAV
Downflow**



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**Fig. 3—Model GB1AAV
Upflow**

Recognize safety information. This is the safety-alert symbol . 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 a hazard 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. NOTE is used to highlight suggestions that **will** result in enhanced installation, reliability, or operation.

 **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.

CARE AND MAINTENANCE

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.

 **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.

A failure to follow this warning could result in corrosion of the heat exchanger, fire, personal injury, or death.

 **WARNING:** Turn off the gas and electrical supplies to the unit before performing any maintenance or service. Follow the operating instructions on label attached to furnace. A 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 air filter each month or more frequently if required. Replace if torn.
2. Check blower motor and wheel for cleanliness each heating and cooling season. Clean and lubricate as necessary.
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.

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

A. Air Filter Arrangement

The air filter arrangement may vary depending on the application. Refer to Table 1 or 2 for filter size information.

Table 1—Filter Size Information for Downflow/Horizontal Furnaces (In.)

FURNACE CASING WIDTH	FILTER QUANTITY AND SIZE	FILTER TYPE
14-3/16	(2) 14 X 20 X 1	Cleanable
17-1/2	(2) 14 X 20 X 1	Cleanable
21	(2) 16 X 20 X 1	Cleanable
24-1/2	(2) 16 X 20 X 1	Cleanable

Table 2—Filter Size Information for Upflow Furnaces (In.)

FURNACE CASING WIDTH	FILTER QUANTITY AND SIZE		FILTER TYPE
	Side Return	Bottom Return	
14-3/16	(1) 16 X 25 X 1*	(1) 14 X 25 X 1	Cleanable
17-1/2	(1) 16 X 25 X 1*	(1) 16 X 25 X 1	Cleanable
21	(1) 16 X 25 X 1	(1) 20 X 25 X 1*	Cleanable
24-1/2	(2) 16 X 25 X 1*	(1) 24 X 25 X 1	Cleanable

* Factory provided with the furnace. Filters may be field modified as required by cutting and folding the frame as indicated on the filter.

 **WARNING:** Never operate unit without a filter or with filter access door removed. A failure to follow this warning could result in fire, personal injury, or death.

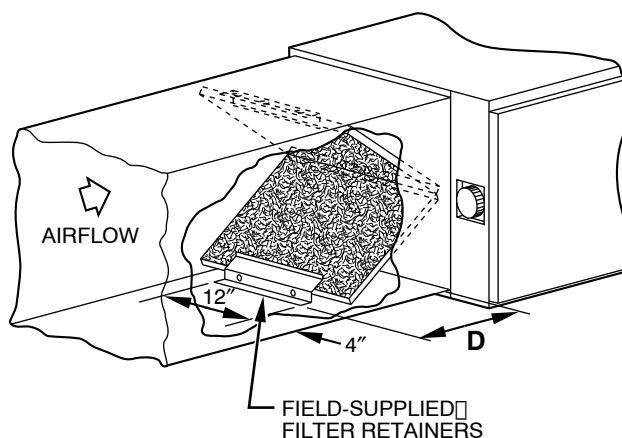


Fig. 4—Horizontal Filter Arrangement

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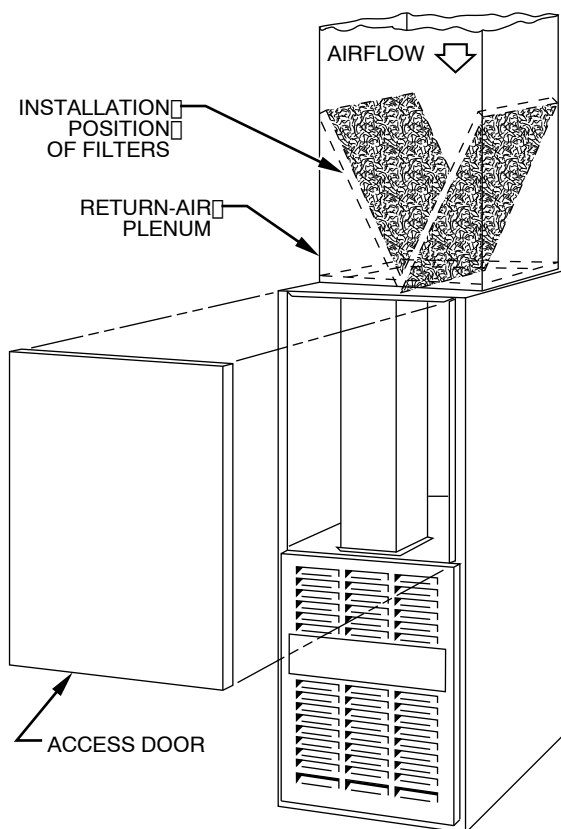


Fig. 5—Downflow Filter Arrangement

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1. Downflow/Horizontal

Each furnace requires 2 filters which are installed in the return-air duct. (See Fig. 4 and 5.) To remove filters for cleaning or replacement, proceed as follows.

- Disconnect electrical power before removing blower access door.
- Remove 2 screws from front of door and remove blower access door.
- Reach up behind top plate, tilt filters toward center of return-air plenum, remove filters, and clean as needed. Replace if torn.
- Furnaces are equipped with permanent, washable filters. Clean filters with tap water. Spray water through filter in opposite direction of airflow.
- Rinse and let dry. Oiling or coating of filters is not recommended or required.
- Reinstall filters.
- Replace access door.
- Restore electrical power to furnace.

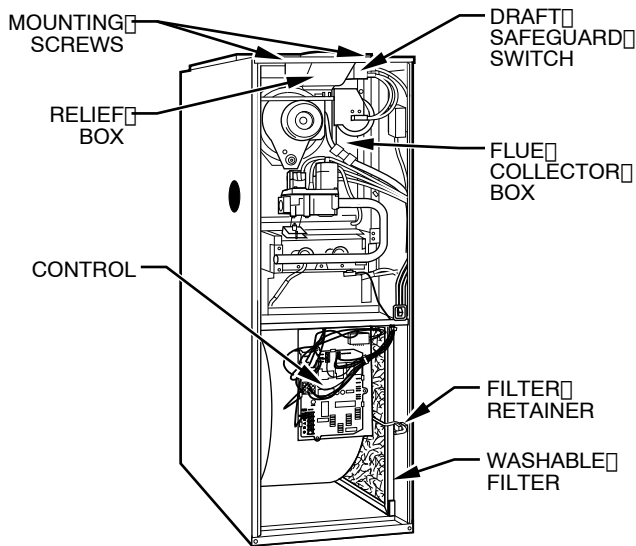


Fig. 6—Model GB1AAV Upflow

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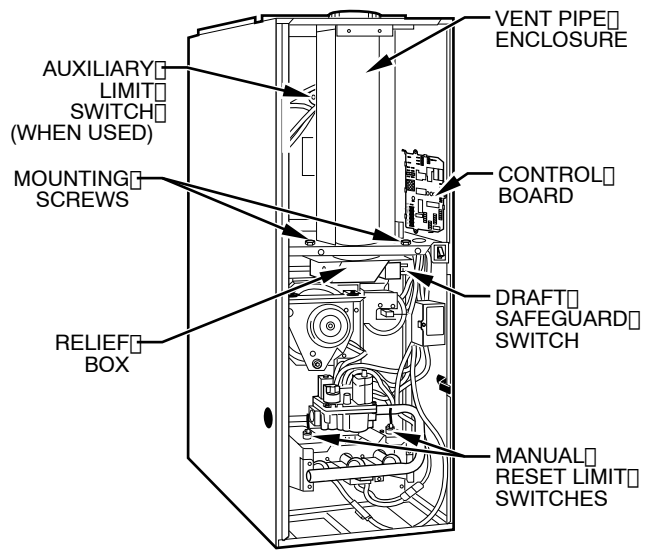


Fig. 7—Model GGB3AAV Downflow

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2. Upflow

Each furnace requires 1 or 2 filters which are installed in the blower compartment. (See Fig. 6.) To remove filters for cleaning or replacement, proceed as follows.

- Disconnect electrical power before removing access doors.
- Remove blower and control access doors.
- Release filter retainer from clip at front of furnace casing. (See Fig. 6.) For side return, clips may be used on either or both sides of the furnace.
- Slide filter out.
- Furnaces are equipped with permanent, washable filters. Clean filters with tap water. Spray water through filter in opposite direction of airflow.
- Rinse and let dry. Oiling or coating of filter is not recommended or required.
- Reinstall filter.
- Replace access doors.
- Restore electrical power to furnace.

B. Blower Motor and Wheel

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

The following steps 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 those motors with oil ports, 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 the electrical supply before removing access doors.

Clean and lubricate as follows.

- Remove 2 screws from blower access door (downflow/horizontal furnace only) and remove blower access door.
- Remove vent pipe enclosure (downflow/horizontal furnace only) and disconnect short piece of vent pipe from relief box.
- Disconnect wires from auxiliary limit on blower housing (downflow/horizontal furnace only).
- Remove control box.
- Remove electrical leads from numbered side of blower speed selector. (See Fig. 6 or 7.) Note location of wires for reassembly.
- Remove screws holding blower assembly to blower deck and slide blower assembly out of furnace.
- Squeeze side tabs of blower speed selector and pull it out of blower housing.
- Loosen screw in strap holding motor capacitor to blower housing and slide capacitor out from under strap.
- Mark blower wheel, motor, and motor support in relation to blower housing before disassembly to ensure proper reassembly.
- Loosen setscrew holding blower wheel on motor shaft.
- 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 (when oil ports are provided).
 - a. Remove dust caps or plugs from oil ports located at each end of motor.
 - b. Use a good grade of SAE 20 nondetergent motor oil and put 1 teaspoon, 5 cc, 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. Wipe excess oil from motor housing.
 - e. Replace dust caps or plugs on oil ports.
13. Remove blower wheel from housing.
 - a. Mark cutoff location to ensure proper reassembly.
 - b. Remove screws holding cutoff plate and remove cutoff plate from housing.
 - c. Lift blower wheel from housing through opening.
14. Clean blower wheel and motor using a vacuum cleaner with soft brush attachment. Do not remove or disturb balance weights (clips) on blower wheel blades. The blower wheel should not be dropped or bent as balance will be affected.
15. Reinstall blower wheel by reversing steps 13 a. through c. Be sure wheel is positioned for proper rotation.
16. Reassemble motor and blower by reversing steps 5 through 11. If motor has ground wire, be sure it is connected as before.

⚠ CAUTION: Be sure the motor is properly positioned in the blower housing. The motor oil ports must be at a minimum of 45° above the horizontal centerline of the motor after the blower assembly has been reinstalled in the furnace.

17. Reinstall blower assembly in furnace. Connect electrical leads to speed selector. Please note that connections are polarized for assembly. DO NOT FORCE.
18. Reinstall control box.
19. Reconnect wires to auxiliary limit switch on blower housing (downflow/horizontal furnace only).
20. Reinstall vent pipe and enclosure (downflow/horizontal furnace only).
21. Turn on electrical power and check for proper rotation and speed changes between heating and cooling.
22. Replace blower access door. Secure with 2 screws (downflow/horizontal furnace only).

C. Cleaning Heat Exchanger

The following steps should be performed by a qualified service technician.

NOTE: Deposits of soot and carbon indicate the existence of a problem which needs to be corrected. Take action to correct the problem. If it becomes necessary to clean the heat exchanger because of carbon deposits, soot, etc., proceed as follows.

1. Turn off gas and electrical power to furnace.
2. Remove 2 screws from front of blower access door (downflow/horizontal furnace only) and remove control and blower access doors.
3. Remove vent pipe enclosure (downflow/horizontal furnace only) and disconnect vent pipe from relief box.
4. Remove 2 screws that secure relief box. (See Fig. 6 or 7.)
5. Disconnect wires to the following components.
 - a. Draft safeguard switch
 - b. Inducer motor
 - c. Pressure switch
 - d. Limit overtemperature switch(es)
 - e. Gas valve
 - f. Hot surface ignitor
 - g. Flame-sensing electrode
 - h. Two wiring connectors leading to control box
6. Remove 8 screws that secure flue collector box to center panel. Be careful not to damage sealant.
7. Remove complete inducer assembly from furnace, exposing flue openings.
8. Clean cells using field-provided small wire brush, steel spring cable, reversible electric drill, and vacuum cleaner.
 - a. Assemble wire brush and steel spring cable.
 - (1.) Use 48 in. of 1/4-in. diameter high-grade steel spring cable (commonly known as drain clean-out or Roto-Rooter cable).
 - (2.) Use 1/4-in. diameter wire brush (commonly known as 25-caliber rifle cleaning brush).

NOTE: The items needed in steps (1.) and (2.) can usually be purchased at local hardware stores.

- (3.) Insert twisted wire end of brush into end of steel 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 heat exchanger cell.
 - (1.) Attach variable-speed, reversible drill to end of steel 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 36 in. of cable into 2 upper passes of cell. (See Fig. 8.)

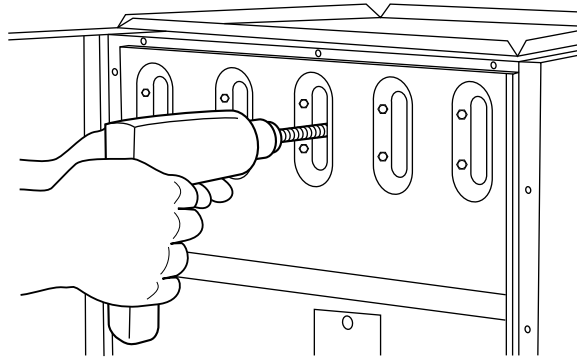


Fig. 8—Cleaning Heat Exchanger Cell

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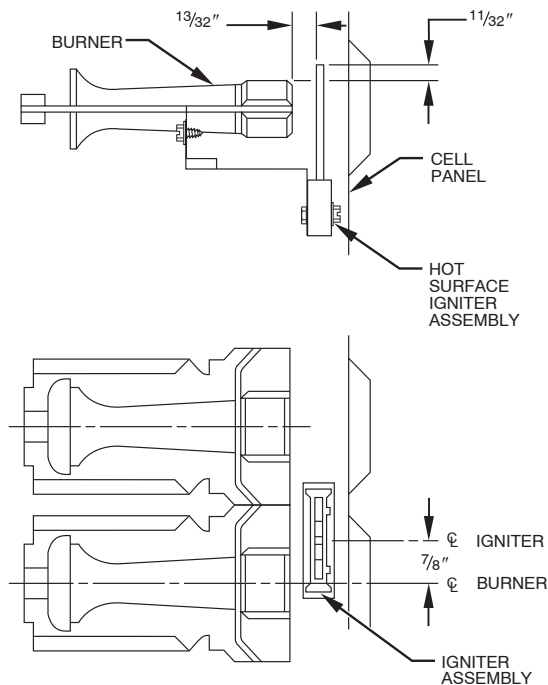


Fig. 9—Position of Ignitor to Burner

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- (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.) Remove burner assembly and cell inlet plates.

⚠ CAUTION: Be very careful when removing the burner assembly to avoid breaking the ignitor. See Fig. 9 for the correct ignitor location.

- (5.) Replace screws in center panel and cells before cleaning.
- (6.) 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.
- (7.) Repeat foregoing procedures until each cell in furnace has been cleaned.
- (8.) Remove residue from each cell using vacuum cleaner.
- (9.) Clean burner assembly using vacuum cleaner with soft brush attachment.
- (10.) Reinstall cell inlet plates and burner assembly. Care must be exercised to center the burners in the cell openings.

9. After cleaning flue openings, check sealant on flue collector to ensure that it has not been damaged. If new sealant is needed, contact your dealer or distributor.
10. Clean and replace flue collector assembly, making sure all 8 screws are secure.
11. Reinstall relief box.
12. Reconnect wires to the following components.
 - a. Draft safeguard switch
 - b. Inducer motor
 - c. Pressure switch
 - d. Limit overtemperature switch(es)
 - e. Gas valve
 - f. Hot surface ignitor
 - g. Flame-sensing electrode
 - h. Two wiring connectors leading to control box
13. Reconnect vent pipe to relief box. Replace vent pipe enclosure (downflow/horizontal furnace only).
14. Replace blower access door only.
15. Turn on electrical power and gas.
16. Set thermostat and check furnace for proper operation.

⚠ 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 could result in fire, personal injury, or death.

17. Check for gas leaks.
18. Replace control access door on upflow furnace.
19. On downflow/horizontal furnaces, remove blower access door, replace control access door first, then replace blower access door and secure with 2 screws in front of door.

D. Electrical Controls and Wiring

⚠ CAUTION: There may be more than 1 electrical supply to the unit. Check accessories and cooling unit for additional electrical supplies.

The electrical ground and polarity for 115-v wiring must be maintained properly. Refer to Fig. 10 for field wiring information and to Fig. 12 for unit wiring information.

NOTE: If the polarity is not correct, the STATUS LED on the control center will flash rapidly and prevent the furnace from operating. The control system also requires an earth ground for proper operation of the control board and flame sensing.

The 24-v circuit contains an automotive-type, 3-amp fuse located on the control board. (See Fig. 10.) Any direct shorts of the 24-v wiring during installation, service, or maintenance will cause this fuse to blow. If fuse replacement is required, use **ONLY** a fuse of identical size.

With power to the unit disconnected, check all electrical connection for tightness. Tighten all screws on electrical connection. 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.

The control will store up to 5 previous codes but will store no non-current code longer than 48 hrs. To retrieve previous codes, if present, no thermostat inputs to the control must be present and all time delays must expire. Remove 1 of the red main limit wires 1 to 4 sec until the LED light goes out, then reconnect it. (See Fig. 12.) Do not leave red wire disconnected for longer periods of time as the control will assume an overtemperature condition exists and will respond with indoor blower operation. This places the control in the status recall mode and displays the first code stored in memory. Record the code and repeat the disconnect and reconnect of the red wire, recording each code until code 11 is displayed indicating no additional faults. After the last code is displayed or after 2 minutes in the code recall mode, the control will return to normal standby mode.

E. Troubleshooting

Refer to the service label. (See Fig. 13.) Page 9 contains a troubleshooting guide. This guide can be a useful tool in isolating furnace operation problems. Beginning with the word "Start," answer each question and follow the appropriate arrow to the next item.

The guide will help to identify the problem or failed component. After replacing any component, verify correct operation sequence.

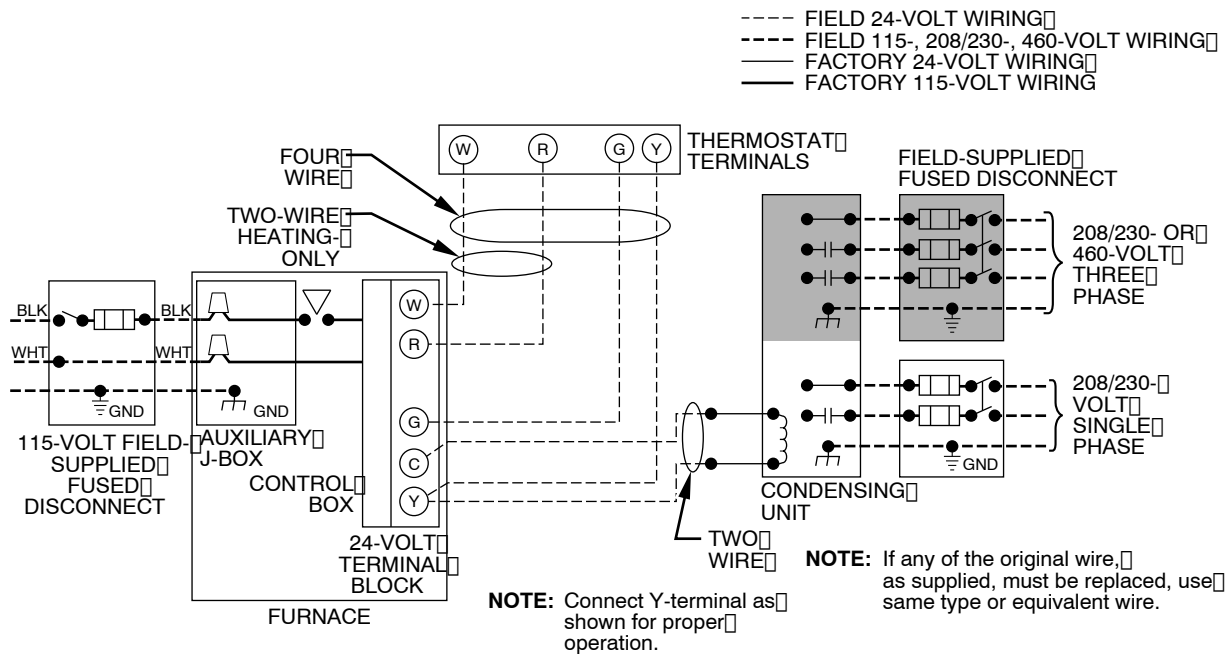


Fig. 10—Heating and Cooling Application Wiring Diagram

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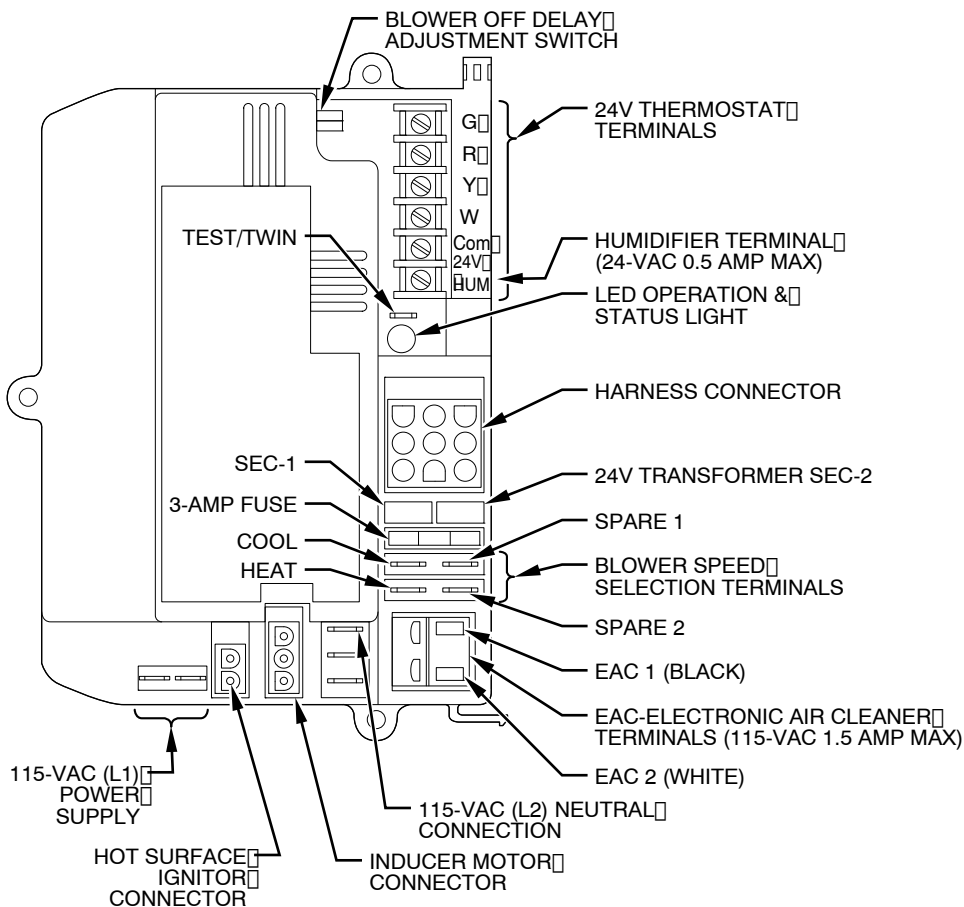
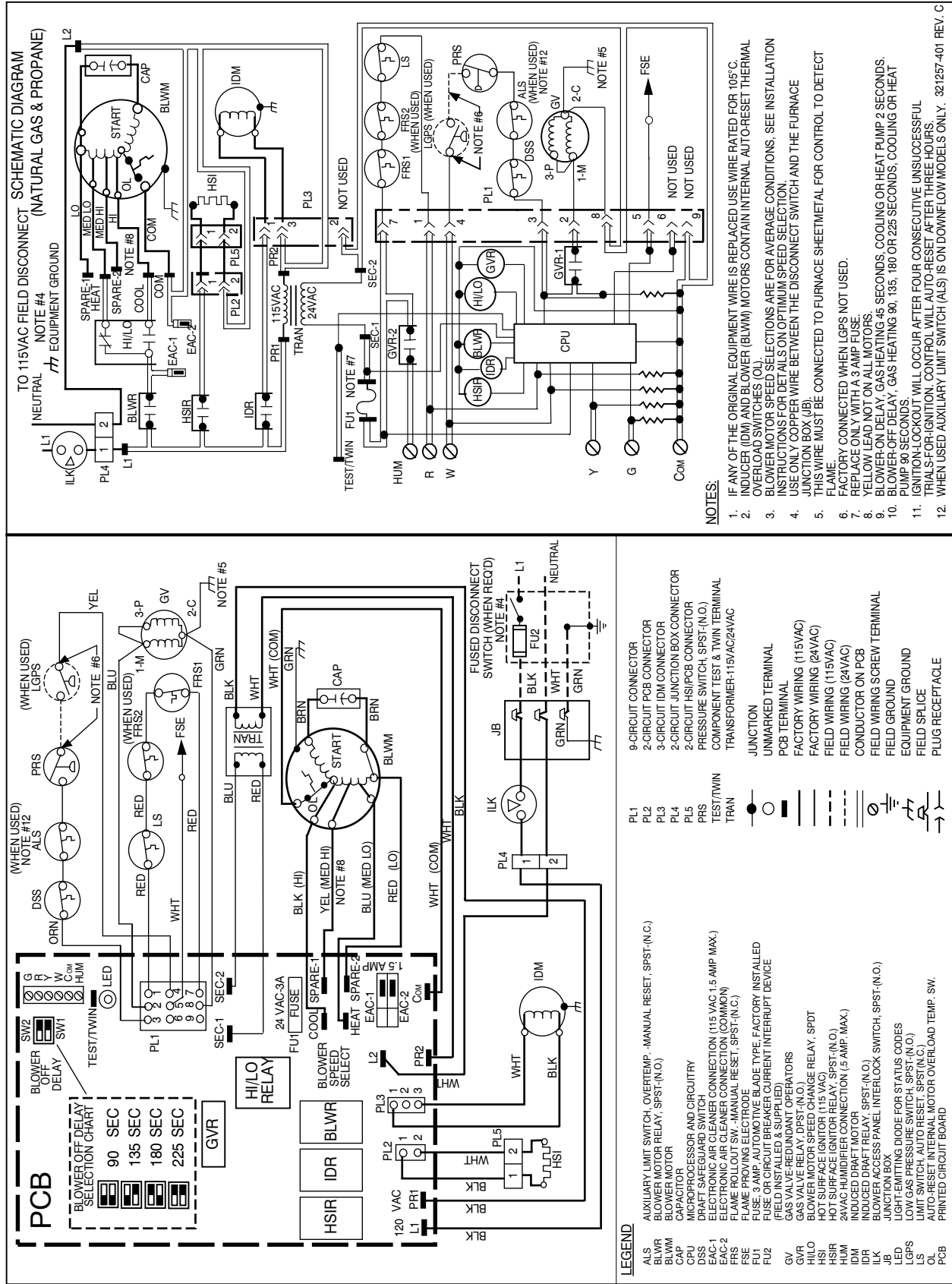


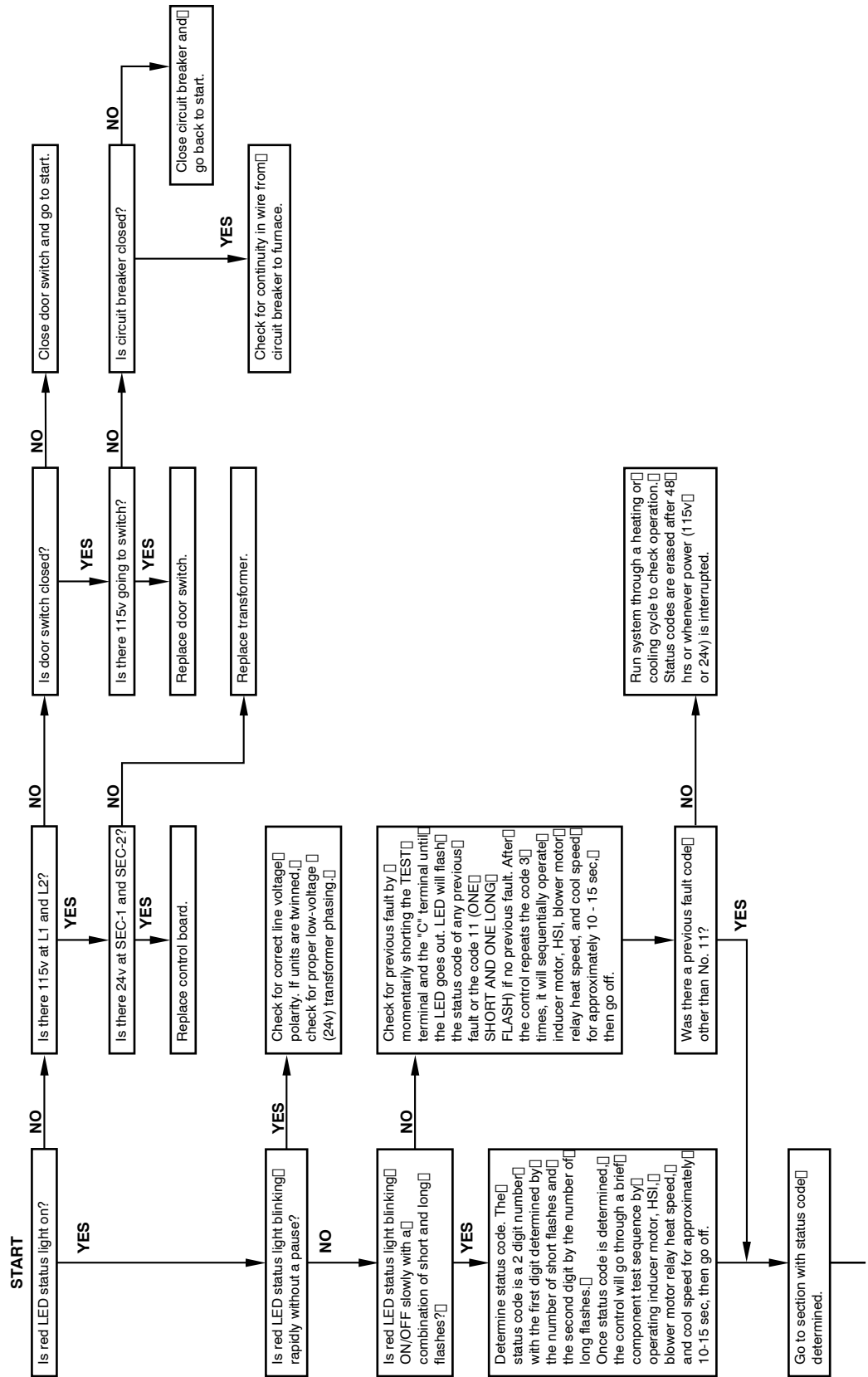
Fig. 11—Control Board

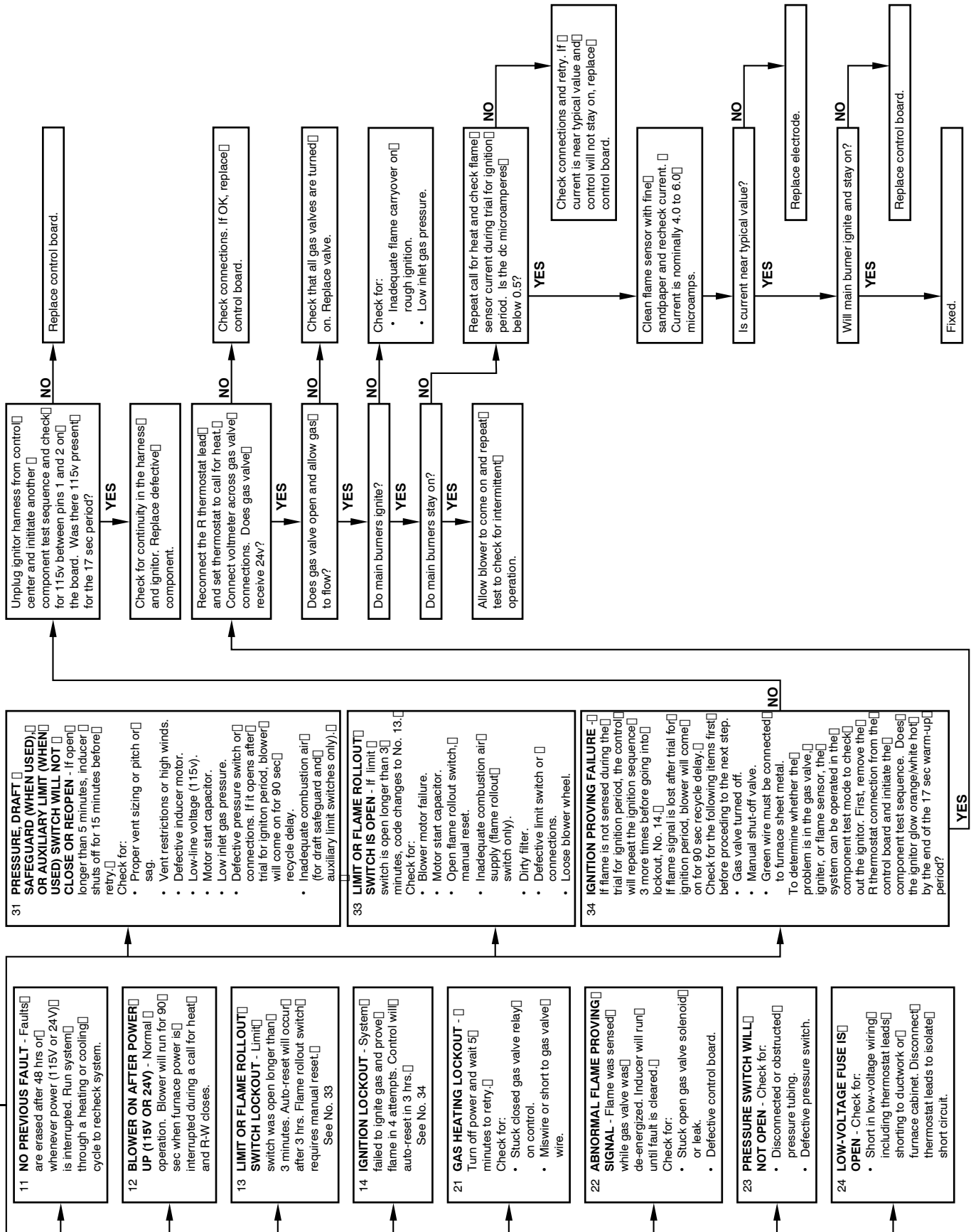
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→ Fig. 12—Unit Wiring Diagram

TROUBLESHOOTING GUIDE





SERVICE

LED CODE

CONTINUOUS OFF -

CONTINUOUS ON -

RAPID FLASHING -

Check for 115VAC at L1 and L2, and 24VAC at SEC-1 and SEC-2.

Control has 24V power.

Line voltage (115V) polarity reversed. If twinned, refer to twinning kit instructions.

STATUS

EACH OF THE FOLLOWING STATUS CODES IS A TWO DIGIT NUMBER WITH THE FIRST DIGIT DETERMINED BY THE NUMBER OF SHORT FLASHES AND THE SECOND DIGIT BY THE NUMBER OF LONG FLASHES.

11 NO PREVIOUS CODE

- Stored status codes are erased when power (115V or 24V) to control is interrupted or 48 hours after each fault is cleared.

12 BLOWER ON AFTER POWER UP (115V or 24V)

- Blower runs for 90 seconds, if unit is powered up during a call for heat (R-W closed).

13 LIMIT OR FLAME ROLL-OUT SWITCH LOCKOUT

- Auto reset after three hours. Flame roll-out switch requires manual reset. Refer to #33.

14 IGNITION LOCKOUT

- Control will auto-reset after three hours. Refer to #34.

21 GAS HEATING LOCKOUT

- Control will NOT auto reset.

Check for:

- Stuck gas valve relay on control or miswire to gas valve circuit.

22 ABNORMAL FLAME-PROVING SIGNAL

- Flame is proved while gas valve is de-energized. Inducer will run until fault is cleared. Check for:

- Stuck-open gas valve or leaky gas valve.

23 PRESSURE SWITCH DID NOT OPEN

Check for:

- Obstructed pressure tubing.

- Defective pressure switch (stuck closed).

24 SECONDARY VOLTAGE FUSE IS OPEN

Check for:

- Short circuit in secondary voltage (24V) wiring.

31 PRESSURE, DRAFT SAFEGUARD, OR AUXILIARY-LIMIT (when used) SWITCH DID NOT CLOSE OR REOPENED

- If open longer than five minutes, inducer shuts off for 15 minutes before retry. Check for:

- Proper vent sizing and condensate pitch.

- Vent restriction or high winds.

- Defective inducer motor or start capacitor.

- Defective pressure switch or connections. If it opens after trial for ignition period, blower will come on for 90 second recycle delay.

- Inadequate Combustion air supply.

- Low inducer voltage.

- Disconnected or obstructed pressure tubing.

33 LIMIT OR FLAME ROLL-OUT SWITCH IS OPEN

- If open longer than three minutes, code changes to #13. Check for:

- Defective blower motor or start capacitor.

- Loose blower wheel.

- Inadequate Combustion air supply Flame Roll-out Switch only.

- Open Flame Roll-out and switch, manual reset.

- Dirty filter or restricted duct system.

- Defective switch or connections.

34 IGNITION PROVING FAILURE

- Control will try three more times before a lockout #14 occurs. If flame signal lost after trial for ignition period, blower will come on for 90 second recycle delay. Check for:

- Oxide buildup on flame sensor (clean with fine sandpaper).

- Proper flame sense microamps (.5 microamps D.C. minimum).

- Gas valve turned off.

- Manual shut-off valve.

- Low inlet gas pressure.

- Green wire **MUST** be connected to furnace sheet metal.

- Inadequate flame carryover or rough ignition.

COMPONENT TEST

To initiate the component test sequence, shut OFF the room thermostat or disconnect the "R" thermostat lead. Briefly short the TEST terminal to the 'C' terminal. Status LED will flash code and then turn on the inducer motor, hot surface igniter, blower motor-heat speed, and blower motor-cool speed for 10-15 seconds each.

The diagram shows a control unit with a STATUS LED and a TEST terminal. Below these are terminals labeled HUM, C, W, Y, R, and G. The STATUS LED is represented by a sun-like symbol. The TEST terminal is a small rectangle. The terminals HUM, C, W, Y, R, and G are represented by circles with a diagonal line through them.

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Fig. 13—Service Label

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