

Service and Maintenance Procedures

Size 090, Series 100

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

These procedures are for size 88,000 Btuh input unit.

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REGISTERED QUALITY SYSTEM

SAFETY CONSIDERATIONS

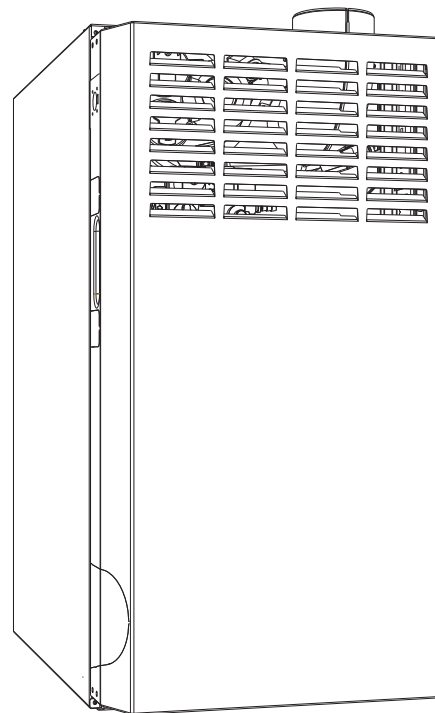
Installing and servicing heating equipment can be hazardous due to gas and electrical components. **Only trained and qualified personnel should install, repair, or service heating equipment.**

Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. Observe precautions in the literature, on tags, and 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 54-1999/ANSI Z223.1-1999. In Canada, refer to the CAN/CGA-B149.1- and .2-M95 National Standard of Canada, 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.

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 words DANGER, WARNING, CAUTION, and NOTE. 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 which **could** result in personal injury or death. CAUTION is used



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Fig. 1—Model 58CTS Multipoise

to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

WARNING

The ability to properly perform maintenance on this equipment requires certain knowledge, 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.**

CAUTION

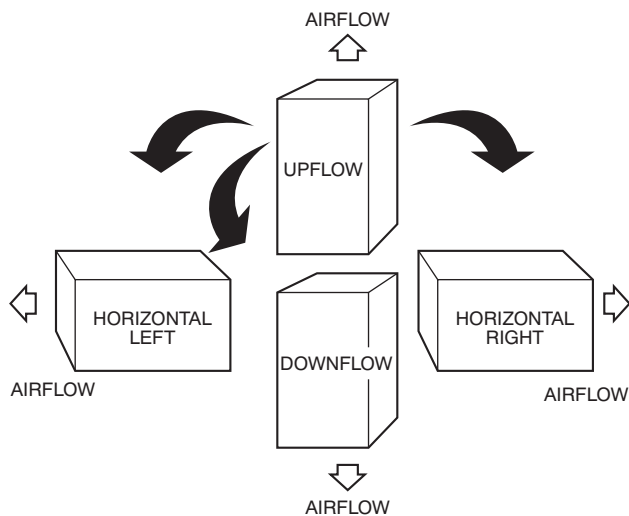
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

INTRODUCTION

Step 1—General

These instructions are written as if the furnace is installed in an upflow application. An upflow furnace application is where the blower is located below the combustion and controls section of the

furnace, and conditioned air is discharged upward. Since this furnace can be installed in any of the 4 positions shown in Fig. 2, you must revise your orientation to component location accordingly.



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Fig. 2—Multipoise Orientation

**ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS
PROCEDURE**

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions during furnace installation and servicing to protect the furnace electronic control. Precautions will prevent electrostatic discharges from personnel and hand tools which are held during the procedure. These precautions will help to avoid exposing the control to electrostatic discharge by putting the furnace, the control, and the person at the same electrostatic potential.

1. Disconnect all power to the furnace. **DO NOT TOUCH THE CONTROL OR ANY WIRE CONNECTED TO THE CONTROL PRIOR TO DISCHARGING YOUR BODY'S ELECTROSTATIC CHARGE TO GROUND.**
2. Firmly touch a clean, unpainted, metal surface of the furnace chassis which is close to the control. Tools held in a person's hand during grounding will be satisfactorily discharged.
3. After touching the chassis you may proceed to service the control or connecting wires as long as you do nothing that recharges your body with static electricity (for example; **DO NOT** move or shuffle your feet, **DO NOT** touch ungrounded objects, etc.).
4. If you touch ungrounded objects (recharge your body with static electricity), firmly touch furnace again before touching control or wires.
5. Use this procedure for installed and uninstalled (ungrounded) furnaces.
6. Before removing a new control from its container, discharge your body's electrostatic charge to ground to protect the control from damage. If the control is to be installed in a furnace, follow items 1 through 5 before bringing the control or yourself into contact with the furnace. Put all used **AND** new controls into containers before touching ungrounded objects.
7. An ESD service kit (available from commercial sources) may also be used to prevent ESD damage.

CARE AND MAINTENANCE

For continuing high performance and to minimize possible equipment failure, periodic maintenance must be performed on this equipment. Consult your local dealer about 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 the label attached to the furnace. A failure to follow this warning could result in personal injury.

The minimum maintenance 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 as necessary.
3. Check electrical connections for tightness and controls for proper operation each heating season. Service as necessary.

⚠ CAUTION

Personal injury can result from sharp metal edges, etc. Be careful when removing parts.

Step 1—Cleaning And/Or Replacing Air Filter

The air filter arrangement may vary depending on the application.

NOTE: If the filter has an airflow direction arrow, the arrow must point towards the blower.

Table 1—FILTER SIZE INFORMATION (IN.)

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

*Factory-provided with the furnace.

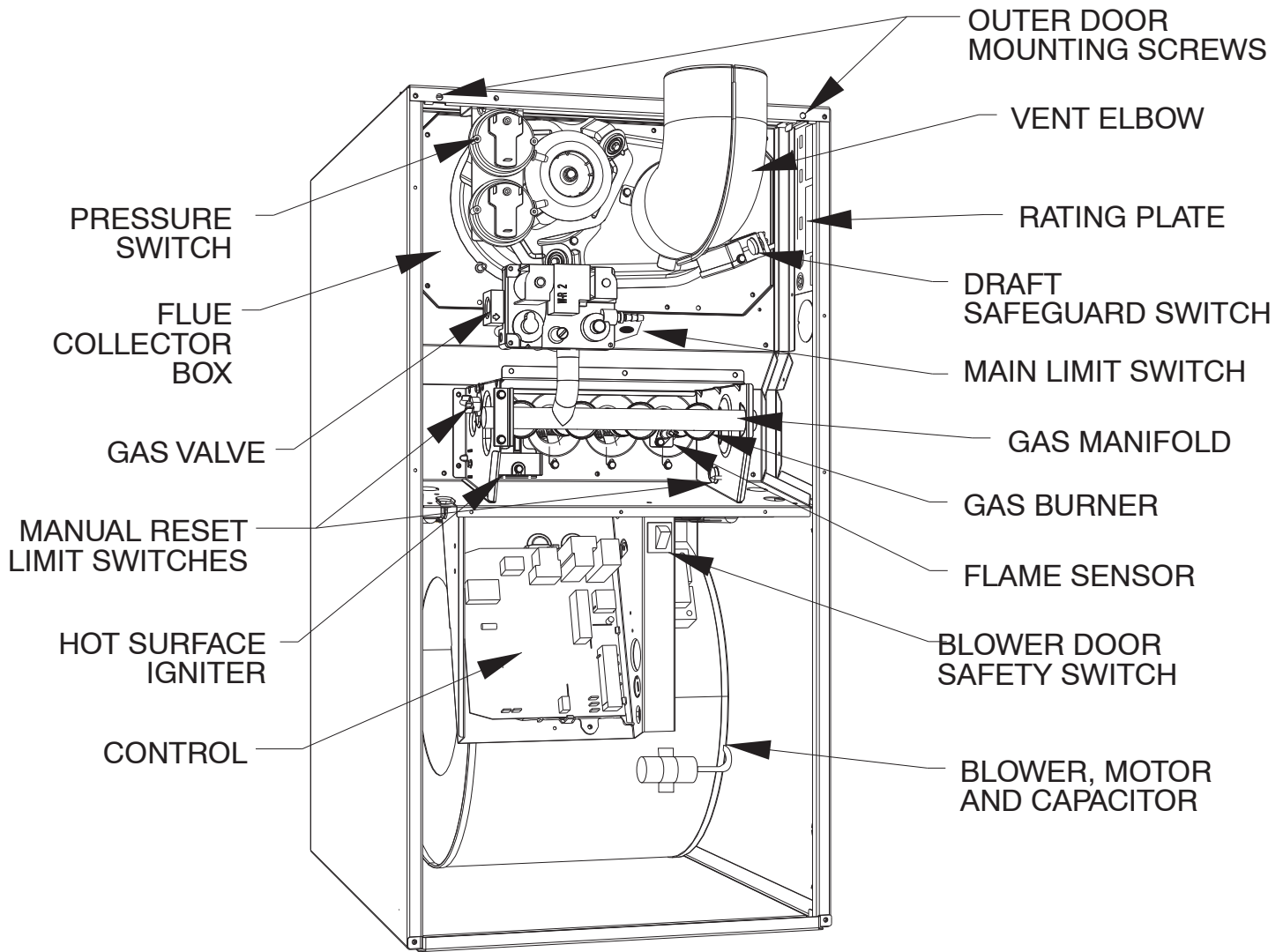
⚠ WARNING

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.

To clean or replace filter, proceed as follows:

—Filters installed in media cabinet adjacent to furnace (See Fig. 3):

- a. Turn off electrical supply to furnace before removing filter access door.
- b. Remove filter cabinet door.
- c. Slide filter out of cabinet.



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Fig. 3—Model 58CTS Upflow

- d. If equipped with permanent, washable filter, clean filter by spraying cold tap water through filter in opposite direction of airflow. Rinse filter and let dry. Oiling or coating of the filter is not recommended.
- e. If equipped with factory-specified disposable media filter, replace only with media filter having the same part number and size.
- f. Slide filter into cabinet.
- g. Replace filter cabinet door.
- h. Turn on electrical supply to furnace.

Step 2—Blower Motor and Wheel

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

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

The inducer and blower motors are pre-lubricated and require no additional lubrication. These motors can be identified by the absence of oil ports on each end of the motor.

Clean blower motor and wheel as follows:

1. Turn off electrical supply to furnace.
2. Remove 2 screws from outer door and then remove outer door.

3. Vent pipe through furnace casing installation only. For down-flow or horizontal furnaces having vent pipes within the furnace that pass in from of the blower door:
 - a. Disconnect vent connector from furnace vent elbow.
 - b. Disconnect and remove short piece of vent pipe from within furnace.
4. Remove 2 screws from blower door and remove blower door.
5. Disconnect blower leads from furnace control. Notice wire color and location for reassembly. All other factory wires can be left connected, but field thermostat connections may need to be disconnected depending on their length and routing.
6. Remove 2 screws securing control and transformer support to furnace panel.
7. Hang control and transformer support to front of furnace casing and away from blower compartment.
8. Remove 2 screws holding blower assembly to blower deck and slide blower assembly out of furnace.
9. Clean blower wheel and motor using a vacuum 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.

10. If a greasy residue is present on blower wheel, remove wheel from the blower housing and wash it with an appropriate degreaser. To remove wheel:
 - a. Mark blower wheel location on shaft before disassembly to ensure proper reassembly.
 - b. Loosen setscrew holding blower wheel on motor shaft.

NOTE: Mark blower mounting arms, motor, and blower housing so motor and each arm is positioned at the same location during reassembly.

- c. Mark blower wheel orientation and cutoff plate location to ensure proper reassembly.
- d. Remove screws securing cutoff plate and remove cutoff plate from housing.
- e. Disconnect capacitor and ground wire attached to blower housing before removing motor.
- f. Remove bolts holding motor and motor mounts to blower housing and slide motor and mounts out of housing. Motor mount belly band need not be removed unless motor is to be replaced.
- g. Remove blower wheel from housing.

⚠ CAUTION

The blower wheel should not be dropped or bent as balance will be affected.

11. Reassemble motor and blower by reversing items 9a through 9g. Be sure to reattach ground wire.
12. Reinstall blower assembly in furnace.
13. Reinstall control and transformer support assembly in furnace.
14. Reconnect blower leads to furnace control.
Refer to furnace wiring diagram, and connect thermostat leads if previously disconnected. (See Fig. 7.)

NOTE: Refer to Table 2 for motor speed lead relocation if leads were not identified before disconnection.

TABLE 2—SPEED SELECTOR

COLOR	SPEED	FACTORY-ATTACHED TO
White	Common	BLW
Black	High	COOL
Yellow (When Present)	Medium High	SPARE
Orange†	Medium	SPARE
Blue	Medium Low	HI HEAT
Red	Low	LO HEAT

† Available on 5-speed blowers only.

⚠ CAUTION

Heating air speed selection **MUST** be adjusted to provide proper air temperature rise as specified on the rating plate. Failure to adjust the heating speed may shorten heat exchanger life. Recommended operation is at the midpoint of rise range or above.

15. Downflow or horizontal furnaces with vent pipe through furnace only: Reinstall internal vent pipe by reversing items 3a and 3b.
16. Reinstall vent connector to furnace vent elbow. Securely fasten vent connector to vent elbow with 2 field-supplied, corrosion-resistant, sheet metal screws located 180° apart.

17. Turn on electrical supply. Manually close blower access door switch. Use a piece of tape to hold switch closed. Check for proper rotation and speed changes between heating and cooling by jumpering R-to-W/W1 R-to-W/W1-and-W2, and then R-to-Y on furnace control thermostat terminals.

⚠ WARNING

Blower access door switch opens 115-v power to furnace control. No component operation can occur. Caution must be taken when manually closing this switch for service purposes. Failure to follow this warning could result in electrical shock, personal injury, or death.

NOTE: If thermostat terminals are jumpered at the time blower access door switch is closed, blower will run for 90 sec before beginning a heating or cooling cycle.

18. If furnace is operating properly, REMOVE TAPE TO RE-LEASE BLOWER ACCESS DOOR SWITCH, and then replace blower access door.

Step 3—Cleaning Heat Exchanger

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

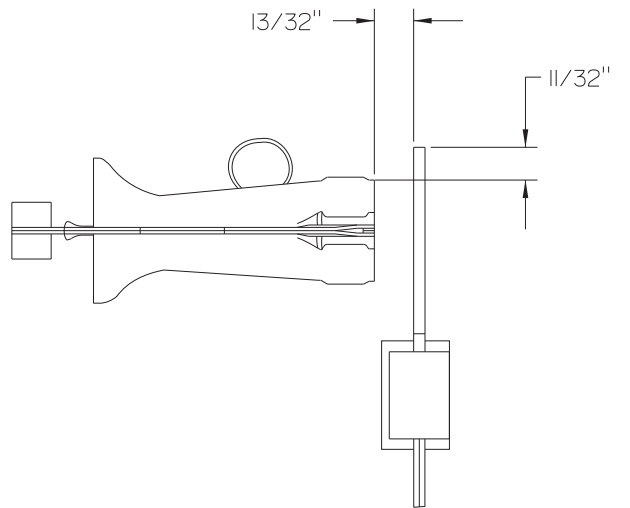
NOTE: If the heat exchangers get a heavy accumulation of soot and carbon, they should be replaced rather than trying to clean them thoroughly. A build-up of soot and carbon indicates that a problem exists which needs to be corrected, such as improper adjustment of manifold pressure, insufficient or poor quality combustion air, incorrect size or damaged manifold orifice(s), improper gas, or a restricted heat exchanger. Action must be taken to correct the problem.

If it becomes necessary to clean the heat exchangers because of dust or corrosion, proceed as follows:

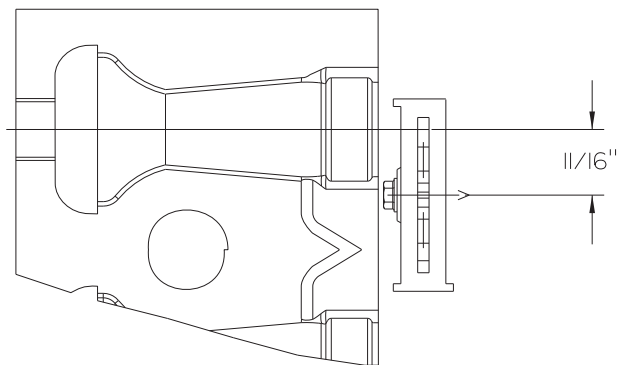
1. Turn OFF gas and electrical power to furnace.
2. Remove outer access door.
3. Disconnect vent connector from furnace vent elbow.
4. For downflow or horizontal furnace having an internal vent pipe, disconnect internal vent pipe within the casing.
5. Disconnect wires to the following components. Mark wires to aid in reconnection of:
 - a. Draft safeguard switch.
 - b. Inducer motor.
 - c. Pressure switches.
 - d. Limit overtemperature switch.
 - e. Gas valve.
 - f. Hot surface igniter.
 - g. Flame-sensing electrode
 - h. Flame rollout switches.
6. Remove screws that fasten the inducer assembly with backing plate to the cell panel. Be careful not to damage backing plate. Inducer assembly and elbow need not be removed from backing plate.
7. Remove burner, gas manifold and support assembly and NOx devices if present. Individual burners need not be removed from support assembly.

NOTE: Be very careful when removing burner assembly to avoid breaking igniter. See Fig. 4 for correct igniter location.

8. Using field-provided small wire brush, steel spring cable, reversible electric drill, and vacuum cleaner, clean cells as follows:
 - a. Assemble wire brush and steel spring cable.



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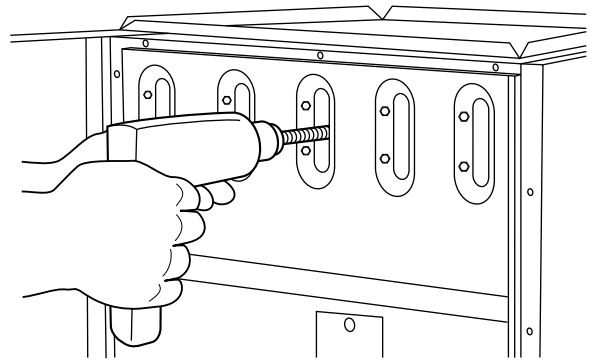
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Fig. 4—Position of Igniter to Burner

- (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 materials needed in items (1.) and (2.) can usually be purchased at local hardware stores.

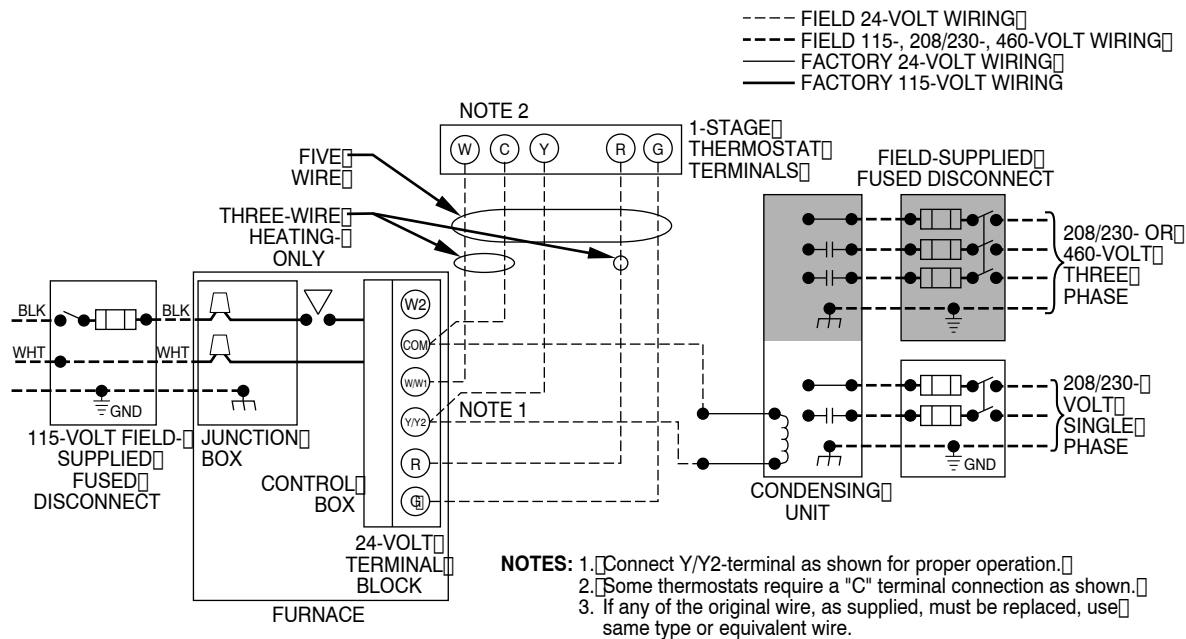
- (3.) Insert twisted wire end of brush into end of spring cable, and crimp tight with crimping tool or strike with ball-peen hammer. **TIGHTNESS IS VERY IMPORTANT.**
- (4.) Remove metal screw fitting from wire brush to allow insertion into cable.
- b. Clean each heat exchanger cell.
 - (1.) Attach variable-speed, reversible drill to end of spring cable (end opposite brush).
 - (2.) Insert brush end of cable into the outlet 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. 5.)
 - (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 burner inlet opening of cell, and proceed to clean 2 lower passes of cell in same manner as 2 upper passes.



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Fig. 5—Cleaning Heat Exchanger Cell

- (5.) Repeat foregoing procedures until each cell in furnace has been cleaned.
 - (6.) Using vacuum cleaner, remove residue from each cell.
 - (7.) Using vacuum cleaner with soft brush attachment, clean burner assembly.
 - (8.) Clean flame sensor with fine steel wool.
 - (9.) Reinstall burner assembly. Center burners in cell openings.
 9. Remove old sealant from cell panel and inducer backing plate flange and apply new sealant to flange and reinstall on cell panel, making sure all screws are secure.
- NOTE:** A releasing agent such as PAM cooking spray or equivalent (must not contain corn or canola oil, aromatic or halogenated hydrocarbons or inadequate seal may occur) and RTV sealant (G.E. 162, 6702, or Dow-Corning 738) are needed before starting installation. **DO NOT** substitute any other type of RTV sealant. G.E. 162 (P771-9003) is available through RCD in 3-oz tubes.
10. Reinstall elbow and inducer assembly.
 11. Reconnect wires to the following components (Use connection diagram on wiring label, if wires were not marked for reconnection locations.):
 - a. Draft safeguard switch.
 - b. Inducer motor.
 - c. Pressure switches.
 - d. Limit overtemperature switch.
 - e. Gas valve.
 - f. Hot surface igniter.
 - g. Flame-sensing electrode.
 - h. Flame rollout switches.
 12. Reinstall internal vent pipe, if applicable.
 13. Reinstall vent connector on furnace vent elbow. Securely fasten vent connector to vent elbow with 2 field-supplied, corrosion-resistant, sheet metal screws located 180° apart.
 14. Replace blower access door only.
 15. Set thermostat above room temperature and check furnace for proper operation.
 16. Verify blower airflow and speed changes between heating and cooling.
 17. Check for gas leaks.



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Fig. 6—Heating and Cooling Application Wiring Diagram

⚠ 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.

18. Replace outer access door.

Step 4—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 properly maintained. Refer to Fig. 6 for field wiring information and to Fig. 7 for furnace wiring information.

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

The 24-v circuit contains an automotive-type, 3-amp fuse located on the control. (See Fig. 8.) Any 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 3-amp fuse. The control LED will display status code 24 when fuse needs to be replaced.

With power to the unit disconnected, 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, and wire conductors, 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 in this furnace is equipped with a Light-Emitting Diode (LED) status code light to aid in installation, servicing, and troubleshooting. It can be viewed through the sight glass or window in blower access door. The control indicates status with

the LED on continuously, rapid flashing, or a code composed of 2 digits. The first digit is the number of short flashes, the second digit is the number of long flashes.

For an explanation of status codes, refer to service label located on blower access door or Fig. 9, and the troubleshooting guide at the end of this procedure.

The control stores 5 status codes for a period of 72 hrs.

The stored status codes will NOT be erased from the control memory, if 115- or 24-v power is interrupted.

1. To retrieve status codes, proceed with the following:

NOTE: NO thermostat signal may be present at control, and all blower-OFF delays must be completed.

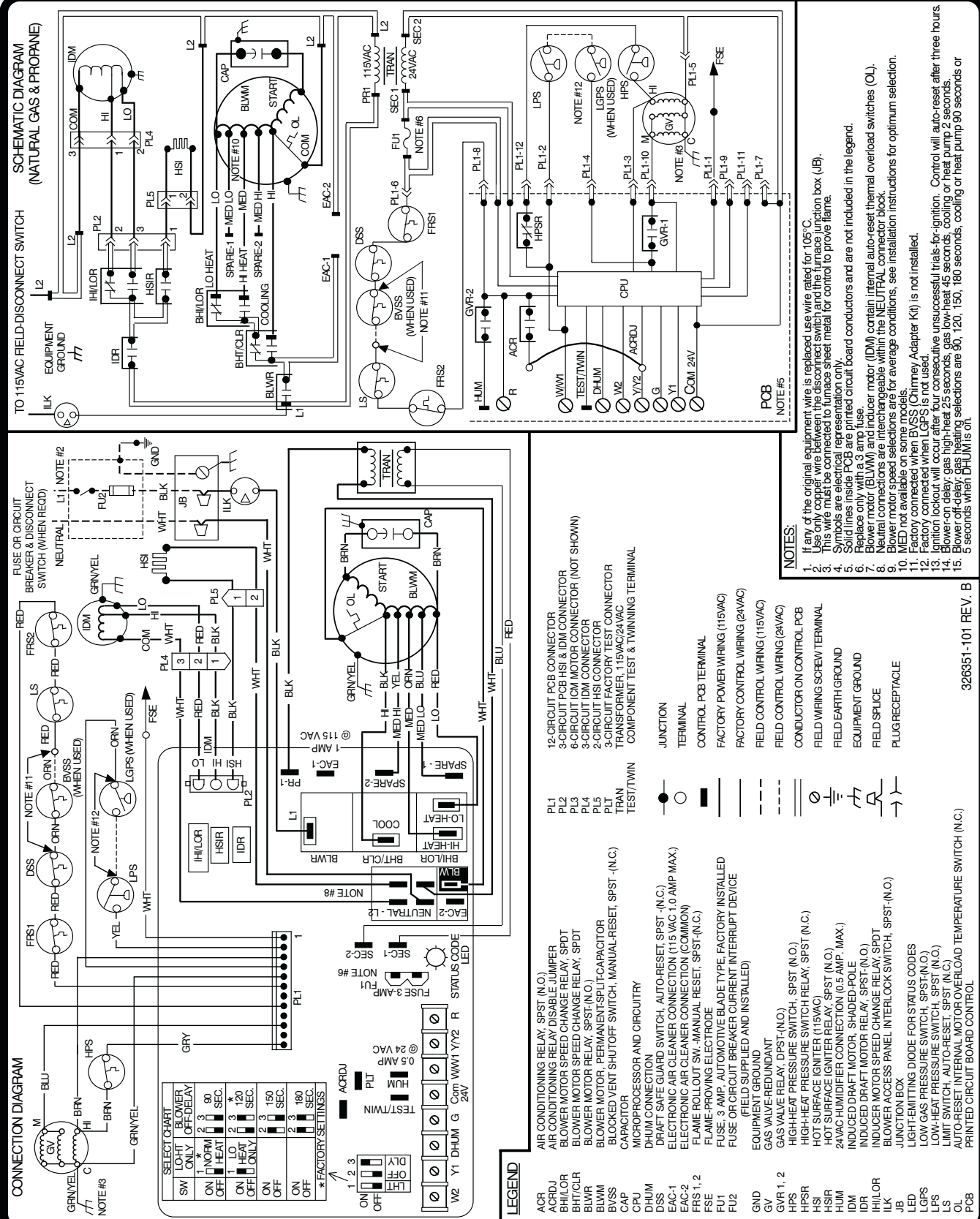
- Leave 115-v power to furnace turned on.
- Remove outer access door.
- Look into blower access door sight glass for current LED status. Removing blower access door will open blower access door switch and terminate 115-v power to control so that status code is not displayed.
- BRIEFLY remove either wire from the main limit (LS) or draft safeguard (DSS) switch until LED goes out, then reconnect it.

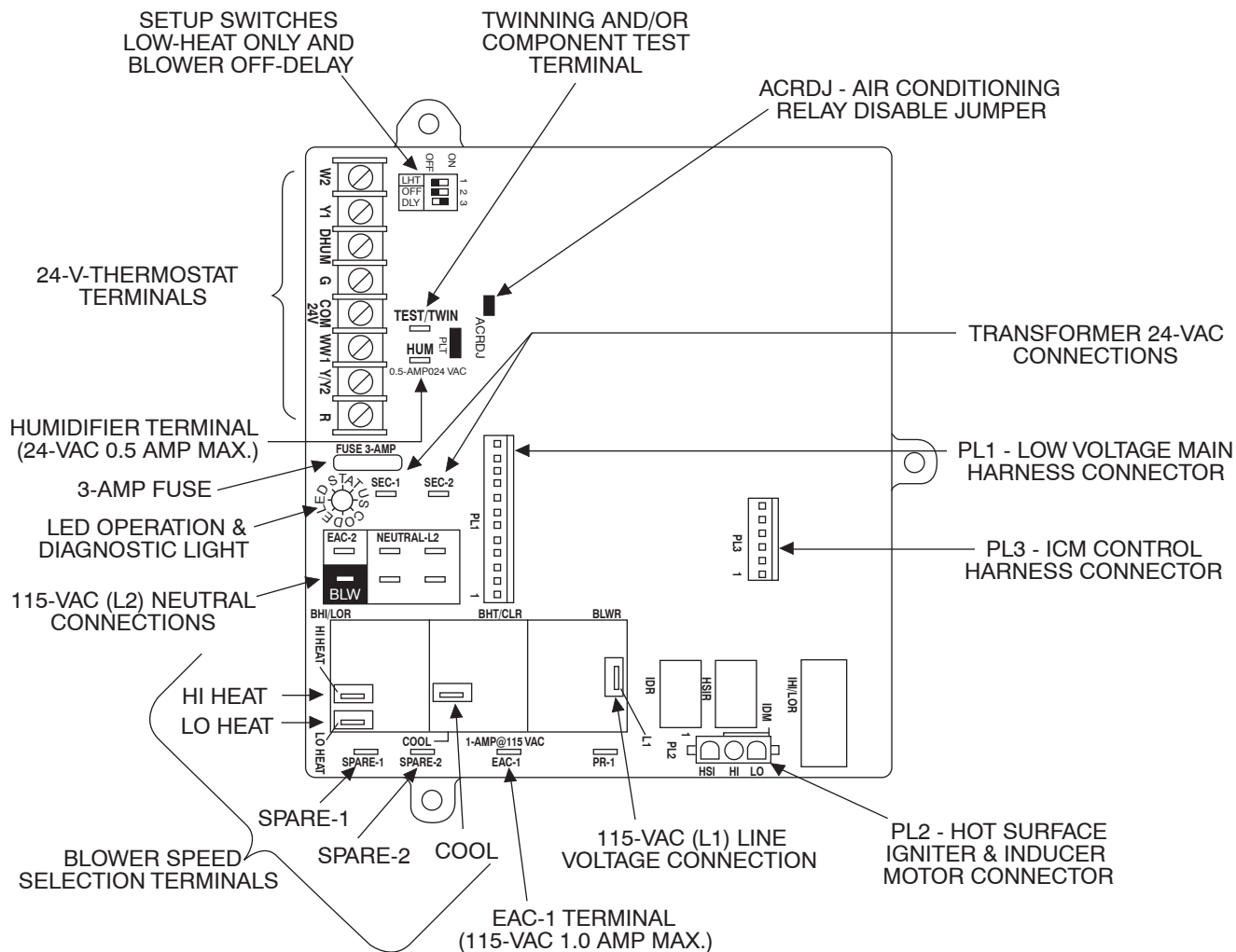
NOTE: If wire to LS or DSS is disconnected longer than 4 sec, main blower starts, and retrieval request is ignored.

- When above items have been completed, the LED flashes a status code 4 times. Record this status code for further troubleshooting.

After the LED flashes a status code four times, BRIEFLY remove wire again from LS or DSS switch until LED goes out, then reconnect it to retrieve previous status code (if available). Repeat as needed for more previous status codes.

- Operate furnace through 1 heat cycle to test for proper operation and check LED status.
- If furnace is operating properly and continuously-lit LED indicates proper operation, replace outer access door.





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Fig. 8—Furnace Control

5. Component Test can also be initiated by performing the following:
 - a. Remove outer access door.
 - b. Remove blower access door.
 - c. Manually close blower access door switch.

⚠ WARNING

Blower access door switch opens 115-v power to control. No component operation can occur. Caution must be taken when manually closing this switch for service purposes. Failure to follow this warning could result in electrical shock, personal injury, or death.

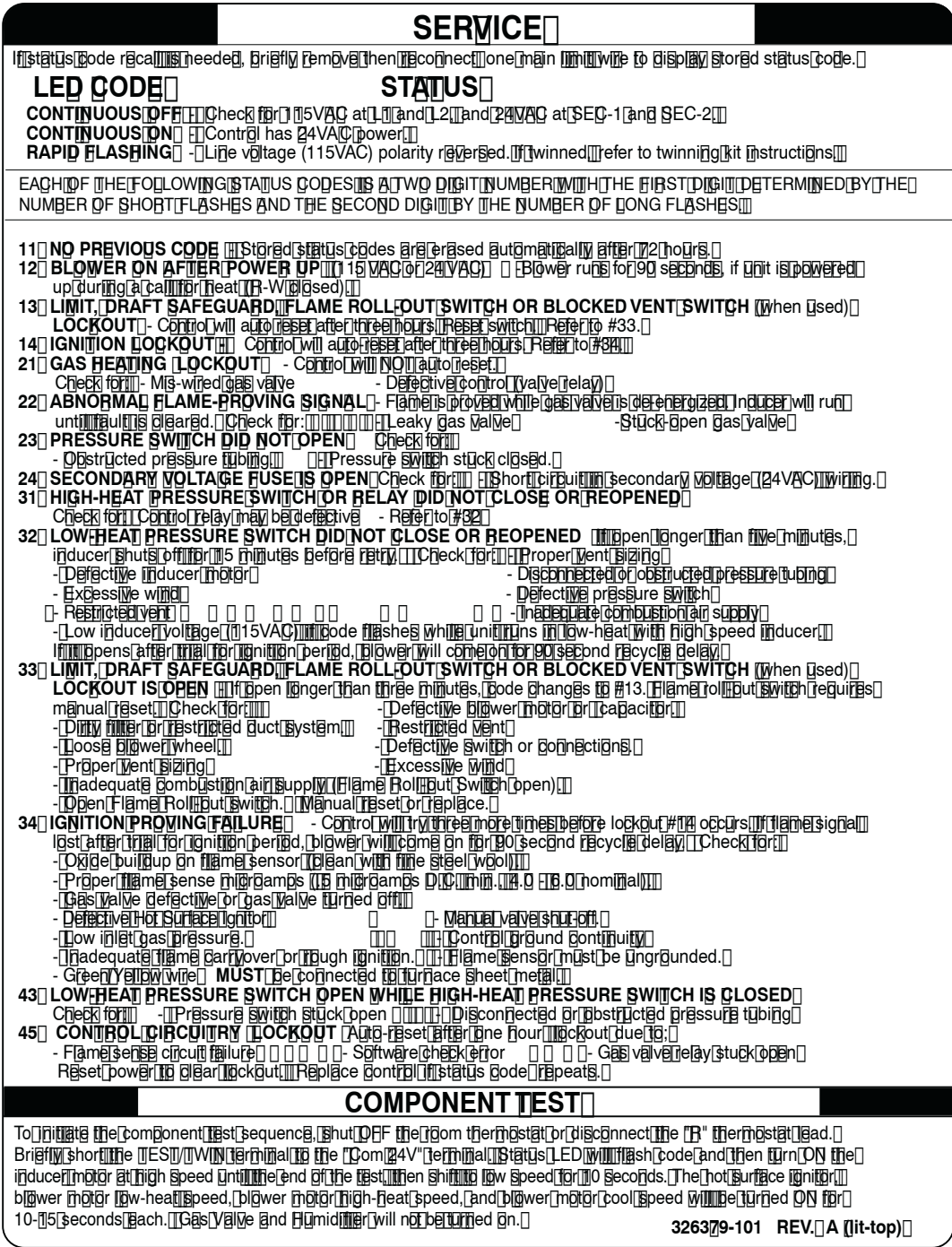
- d. BRIEFLY short (jumper) TEST/TWIN, 3/16-in. quick-connect male terminal on control (behind Com-24v terminal), and Com-24V terminal on furnace control. (See Fig. 8.)

NOTE: If TEST/TWIN to Com-24V terminals are jumpered longer than 2 sec, LED will flash rapidly, and test request will be ignored.

- e. Component Test will function as follows.
 - (1.) LED flashes a status code 4 times. Record this status code for further troubleshooting.
 - (2.) Inducer motor starts on high-speed and continues to run until step (7.) of component test sequence.

- (3.) Hot surface igniter is energized for 15 sec, then de-energized.
 - (4.) Blower operates at LO-HEAT speed for 10 sec, then turns off.
 - (5.) Blower operates at HI-HEAT speed for 10 sec, then turns off.
 - (6.) Blower operates at COOL speed for 10 sec., then turns off.
 - (7.) Inducer motor goes to low-speed.
- Items (1.) through (7.) above will assist in furnace troubleshooting since all components are functionally operated except the gas valve. This procedure is also referred to as "Component Test Sequence."

- f. Check LED status.
- g. If LED status indicates proper operation, RELEASE BLOWER ACCESS DOOR SWITCH, replace blower access door, and replace burner access door.



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Fig. 9—Service Label

WIRING DIAGRAMS

Refer to Fig. 6 and 7 for wiring diagrams.

TROUBLESHOOTING

Refer to the service label. (See Fig. 9—Service Label.)

The Troubleshooting Guide following Fig. 9 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.

Troubleshooting Guide

