

service and maintenance procedures

PLUS 80 2-STAGE GAS-FIRED INDUCED-COMBUSTION FURNACES

**330JAV
331JAV
Series A**

Cancels: New

SP04-31
8-95

NOTE: Read the entire instruction manual before performing any service or maintenance.

These procedures are for size 60,000 through 120,000 Btuh units.

Index	Page
SAFETY CONSIDERATIONS.....	1-2
ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS PROCEDURE	2
CARE AND MAINTENANCE.....	2-7
Air Filter Arrangement.....	2-3
Blower Motor and Wheel.....	3-4
Cleaning Heat Exchanger.....	4-5
Electrical Controls and Wiring	5-6
Troubleshooting	7-10
Unit Wiring Diagram.....	8
Service Label	9
Troubleshooting Guide	10

SAFETY CONSIDERATIONS

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

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

Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code 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 Gas Installation Codes and Amendment No. 1. Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

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

Understand the signal words DANGER, WARNING, and 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 which **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.

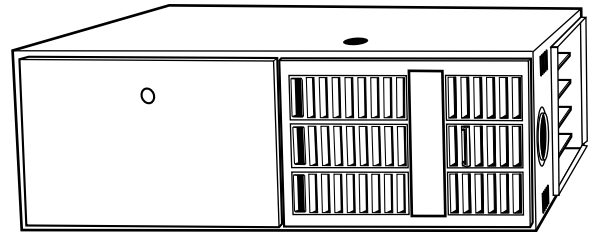


Fig. 1—Model 330JAV Horizontal

A95137

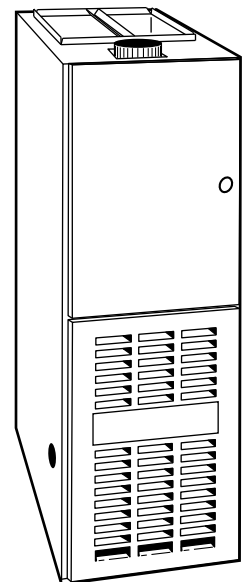


**Fig. 2—Model 331JAV
Downflow**

A94086

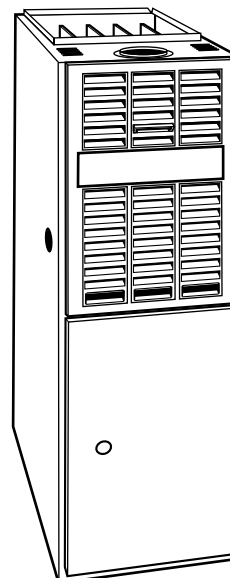


Fig. 3—Model 330JAV Upflow

A94085

⚠

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. A FAILURE TO FOLLOW THIS WARNING COULD RESULT IN POSSIBLE DAMAGE TO THIS EQUIPMENT, SERIOUS PERSONAL INJURY, OR DEATH.

⚠

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

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

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

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, 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: Turn off the gas and electrical supplies to the unit before performing any maintenance or service on it. 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 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 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—DOWNFLOW FILTER SIZE INFORMATION (IN.)

FURNACE CASING WIDTH	FILTER 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

TABLE 2—UPFLOW/HORIZONTAL FILTER SIZE INFORMATION (IN.)

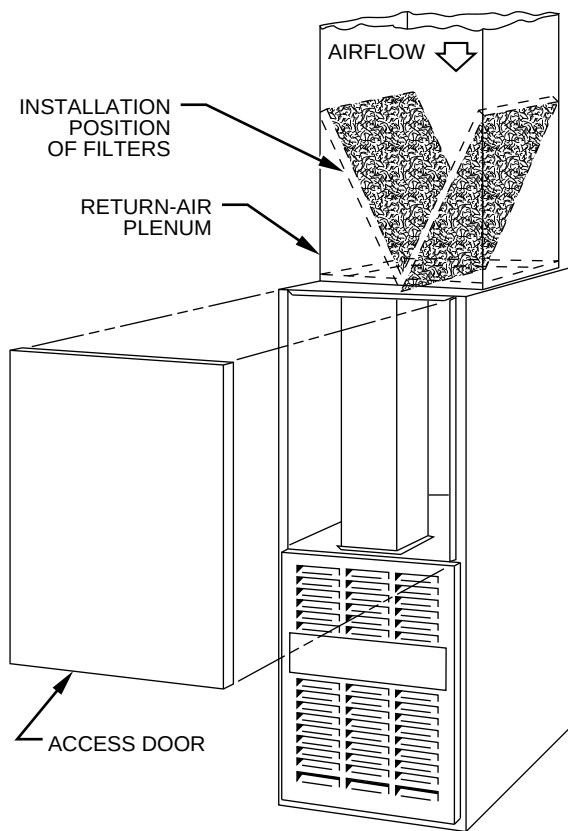
FURNACE CASING WIDTH	FILTER SIZE†		FILTER TYPE
	Side Return	Bottom Return	
14-3/16	(1) 16 X 25 X 1*	(1) 14 X 25 X 1	Cleanable
21	(1) 16 X 25 X 1	(1) 20 X 25 X 1*	Cleanable
24-1/2	(2) 16 X 25 X 1*	(1) 24 X 25 X 1	Cleanable

* 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(s) or with filter access door removed. A failure to follow this warning could result in fire, personal injury, or death.



A88486

Fig. 4—Downflow Filter Arrangement

1. Downflow

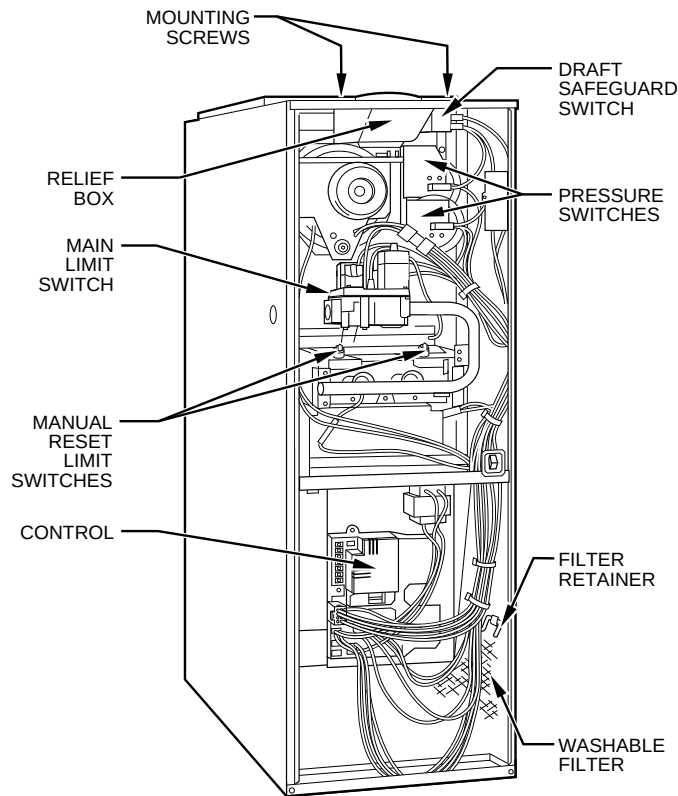
Each furnace requires 2 filters which are installed in the return-air duct. (See Fig. 4.) To remove filters for cleaning or replacement, proceed as follows:

- a. Turn off electrical supply before removing blower access door.
- b. Remove blower access door.
- c. Reach up behind top plate, tilt filters toward center of return-air plenum, remove filters. Replace filters if torn or damaged.
- d. Furnaces are equipped with permanent, washable filters.
- e. Clean filters by spraying tap water through filter from opposite direction of airflow.
- f. Rinse and let dry. Oiling or coating of filters is not recommended or required.
- g. Reinstall filters.
- h. Replace blower access door and turn on electrical supply to furnace.

2. Upflow/Horizontal.

Each furnace requires 1 or 2 filters which are installed in the blower compartment. (See Fig. 5.) To remove filters for cleaning or replacement, proceed as follows:

- a. Turn off electrical supply before removing blower and control access doors.
- b. Release filter retainer from clip at front of furnace casing. (See Fig. 5.) For side return, clips may be used on either or both sides of the furnace.
- c. Slide filter out.
- d. Clean filters by spraying tap water through filter from opposite direction of airflow.
- e. Rinse and let dry. Oiling or coating of filter is not recommended or required.



A95386

Fig. 5—Model 330JAV Upflow

f. Place filter in furnace.

g. Replace blower and control access doors and turn on electrical supply 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.

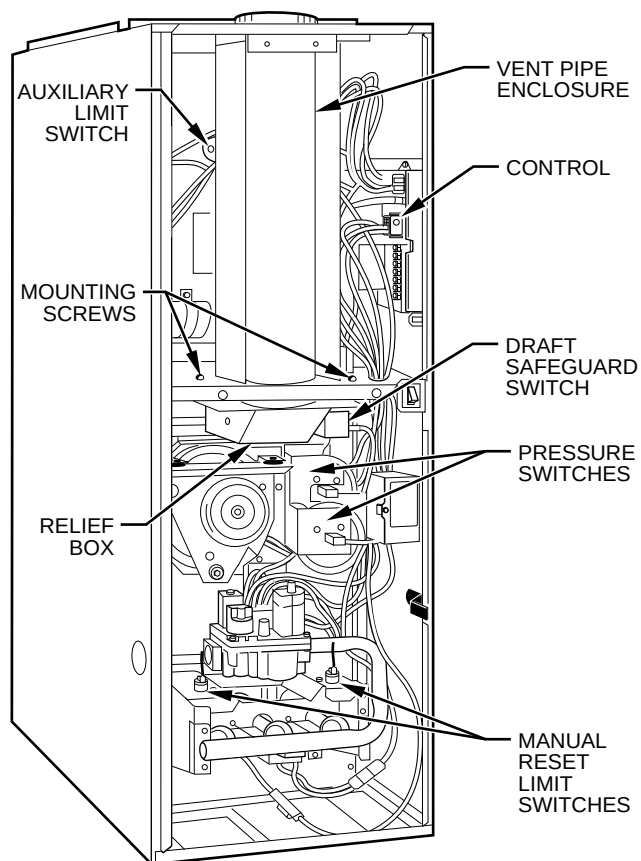
The following steps should be performed by a qualified service technician:

The motors have prelubricated sealed bearings and require no lubrication.

Remember to disconnect the electrical supply before removing access doors.

Clean as follows:

1. Remove blower access door.
2. Disconnect vent pipe on downflow furnace only.
 - a. Remove vent pipe enclosure.
 - b. Disconnect vent pipe and remove short piece of pipe from furnace.
 - c. Disconnect wires from auxiliary limit on blower housing (if present).
3. Disconnect blower electrical leads from control. (See Fig. 5 and 6.) Note location of wires for reassembly.
4. Remove control and bracket assembly.
5. Remove screws holding blower assembly to blower deck and slide blower assembly out of furnace.
6. Loosen a screw in strap holding motor capacitor to blower housing and slide capacitor out from under strap.
7. Mark blower wheel, motor, and motor support in relation to blower housing before disassembly to ensure proper reassembly.
8. Loosen setscrew holding blower wheel on motor shaft.



A93394

Fig. 6—Model 331JAV Downflow

9. Remove bolts holding motor and motor mount to blower housing and slide motor and mount out of housing. (Do not remove motor belly band unless replacing motor.) Disconnect ground wire attached to blower housing before removing motor.
10. 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.
11. Clean blower wheel and motor using a vacuum with soft brush attachment. Do not remove or disturb balance weights (clips) on blower wheel blades.

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

12. Reinstall blower wheel by reversing items 10 a. through c. Be sure wheel is positioned for proper rotation.
13. Reassemble motor and blower by reversing items 5 through 9. 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 wires must exit the motor below horizontal centerline of the motor after the blower assembly has been reinstalled in the furnace. This applies to upflow and downflow installations.

14. Reinstall blower assembly in furnace.
15. Reinstall control. (See item 12 for reassembly of vent pipe and flue enclosure for downflow furnaces.)

16. Connect blower electrical leads to control. Please note that connections are polarized for assembly. DO NOT FORCE.

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 gas and power to furnace to OFF.
2. Remove control and blower access doors.
3. Remove vent pipe enclosure on downflow furnace only and disconnect vent pipe from relief box.
4. Remove 2 screws that secure relief box. (See Fig. 5 or 6.)
5. Disconnect wires to the following components. Mark wires to aid in reconnection of:
 - a. Draft safeguard switch.
 - b. Inducer motor.
 - c. Pressure switch(es).
 - d. Limit overtemperature switch(es).
 - e. Gas valve.
 - f. Hot surface ignitor.
 - g. Flame-sensing electrode.
 - h. Wiring connectors leading to control.
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. 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.
 - (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.) Remove cell outlet plates. IMPORTANT: Replace screws in center panel before cleaning.
 - (3.) 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. 7.)
 - (4.) 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.

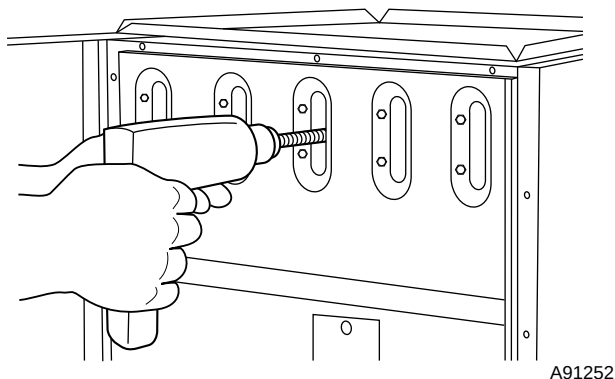


Fig. 7—Cleaning Heat Exchanger Cell

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

NOTE: Be very careful when removing the burner assembly to avoid breaking the ignitor. See Fig. 8 for the correct ignitor location.

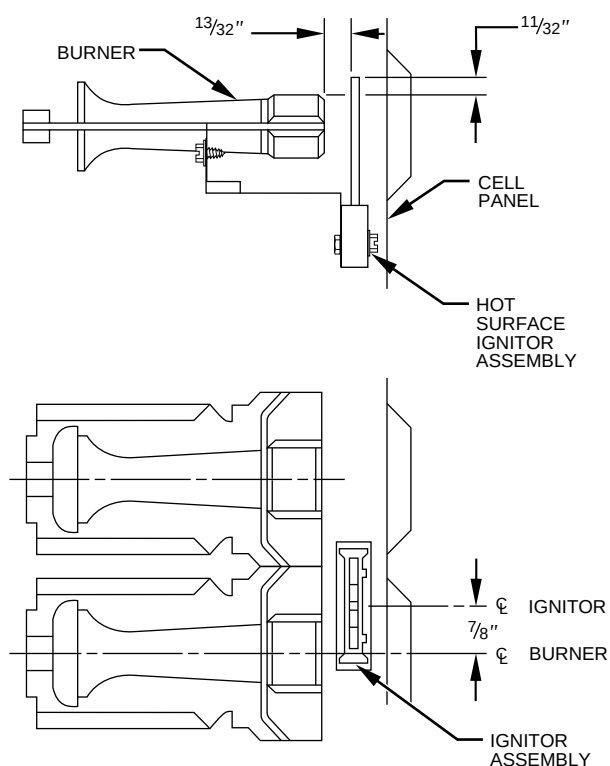


Fig. 8—Position of Ignitor to Burner

- (6.) **IMPORTANT:** Replace screws in center panel and cells before cleaning.
- (7.) 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.
- (8.) Repeat foregoing procedures until each cell in furnace has been cleaned.
- (9.) Using vacuum cleaner, remove residue from each cell.
- (10.) Using vacuum cleaner with soft brush attachment, clean burner assembly.
- (11.) Reinstall cell outlet plates and screws **FIRST**; then, 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 switches.
 - d. Limit overtemperature switch(es).
 - e. Gas valve.
 - f. Hot surface ignitor.
 - g. Flame-sensing electrode.
 - h. Wiring connectors leading to control.
13. Reconnect vent pipe to relief box. When applicable replace vent pipe enclosure.
14. Replace blower door only.
15. Turn power and gas to ON.
16. Set thermostat and check furnace for proper operation.
17. Verify blower airflow and speed changes between heating and cooling.
18. Check for gas leaks.
19. Replace control door.

⚠	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.
---	---

D. Electrical Controls and Wiring

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

The electrical ground and polarity for 115-v wiring must be maintained properly. Refer to Fig. 9 and 10 for field wiring information and to Fig. 11 for unit wiring information. If the polarity is NOT correct, the furnace control will display rapid flashing on the status LED and prevent heat operation. The control system also requires an earth ground for proper operation of the microprocessor.

With power disconnected to unit, check all electrical connections for tightness. Tighten all screws on electrical connections. If any smoky or burned connections are noticed, disassemble the connection, clean all parts and stripped 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 1 complete operating cycle.

The 24-v circuit contains an automotive-type, 3-amp fuse located on the main control. Any 24-v electrical shorts during installation, service, or maintenance could cause this fuse to blow. If fuse replacement is required, use **ONLY** a 3-amp fuse. The control will display code 24 when the fuse needs replacement.

The control in this furnace is equipped with an LED status light to aid in installation, servicing, and troubleshooting. It can be viewed through the sight glass or window on the 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 is the number of long flashes.) Refer to the service label on the blower compartment door for code explanations and useful troubleshooting suggestions. (See Fig. 12.)

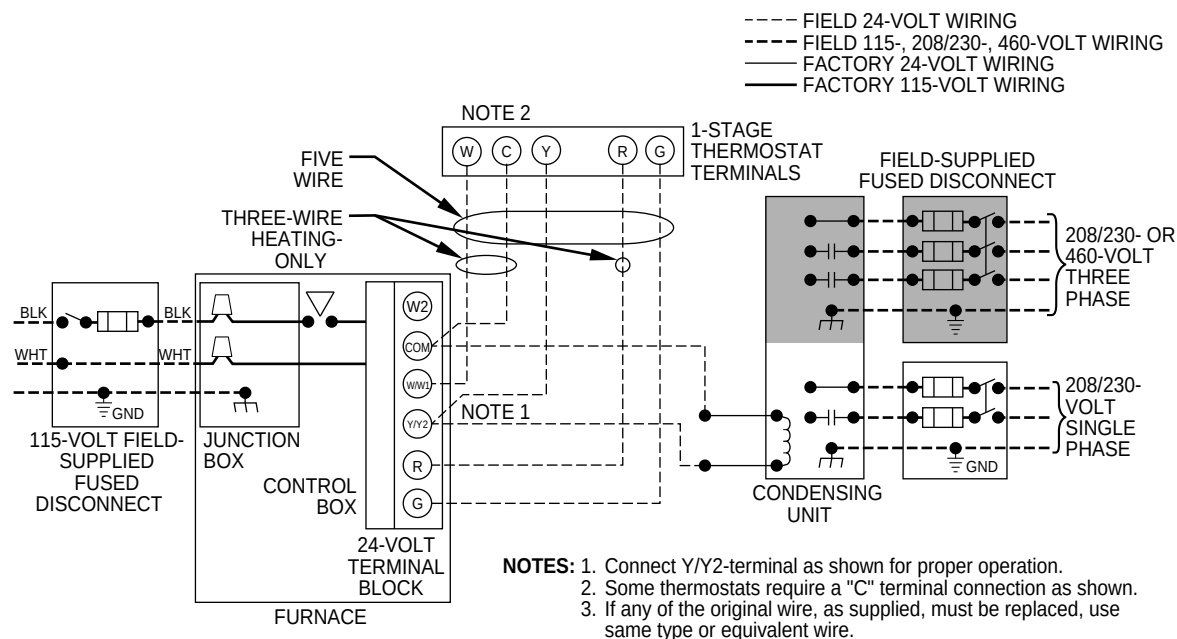


Fig. 9—Heating and Cooling Application Wiring Diagram for Single-Stage Thermostats and Single-Speed Condensing Units

A95236

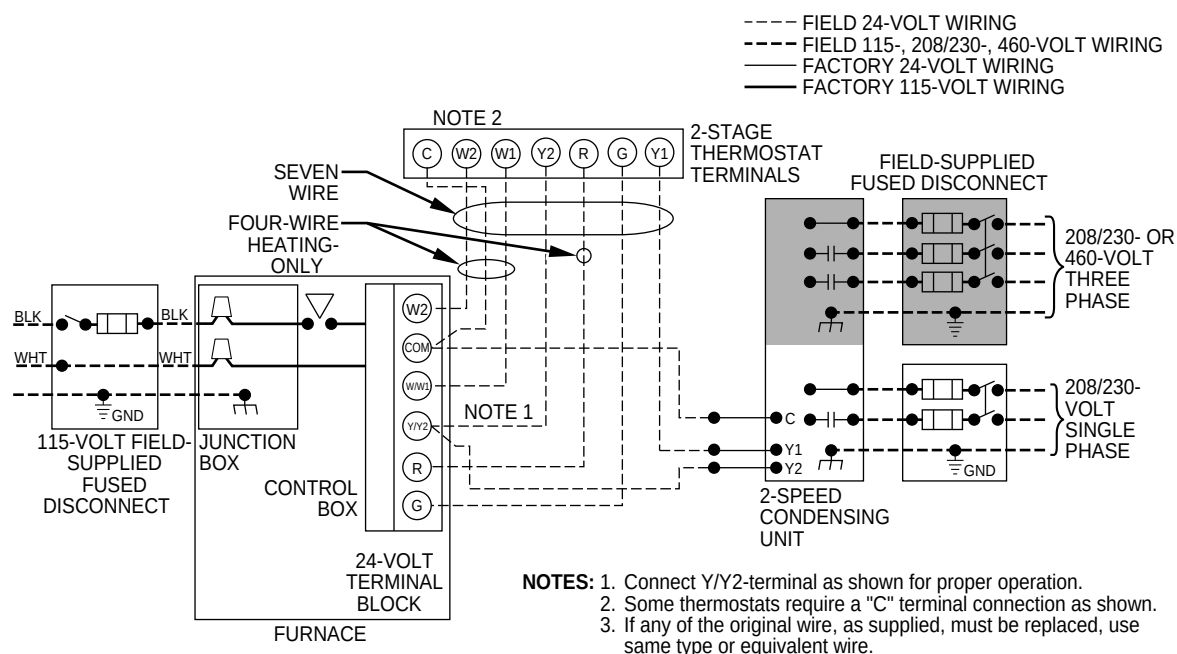


Fig. 10—Heating and Cooling Application Wiring Diagram for 2-Stage Thermostats and/or 2-Speed Condensing Units

A95332

It is important to note that the power to the furnace must not be interrupted and the furnace blower door must not be removed until the LED status code(es) is recorded. When power to the control is interrupted, the status memory is erased.

The control will store up to 5 previous codes but will not store non-current codes longer than 48 hr. 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. 5 and 6.) (Do not leave red wire disconnected for longer than 4 sec 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.

Use any recorded fault codes, the service label, and the troubleshooting diagram on the following pages to diagnose and correct any problem condition.

E. Troubleshooting

Refer to the service label. (See Fig. 12.) Page 10 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. More information is available in a separate Troubleshooting Guide for 2-stage Gas-Fired Induced-Combustion Furnaces.

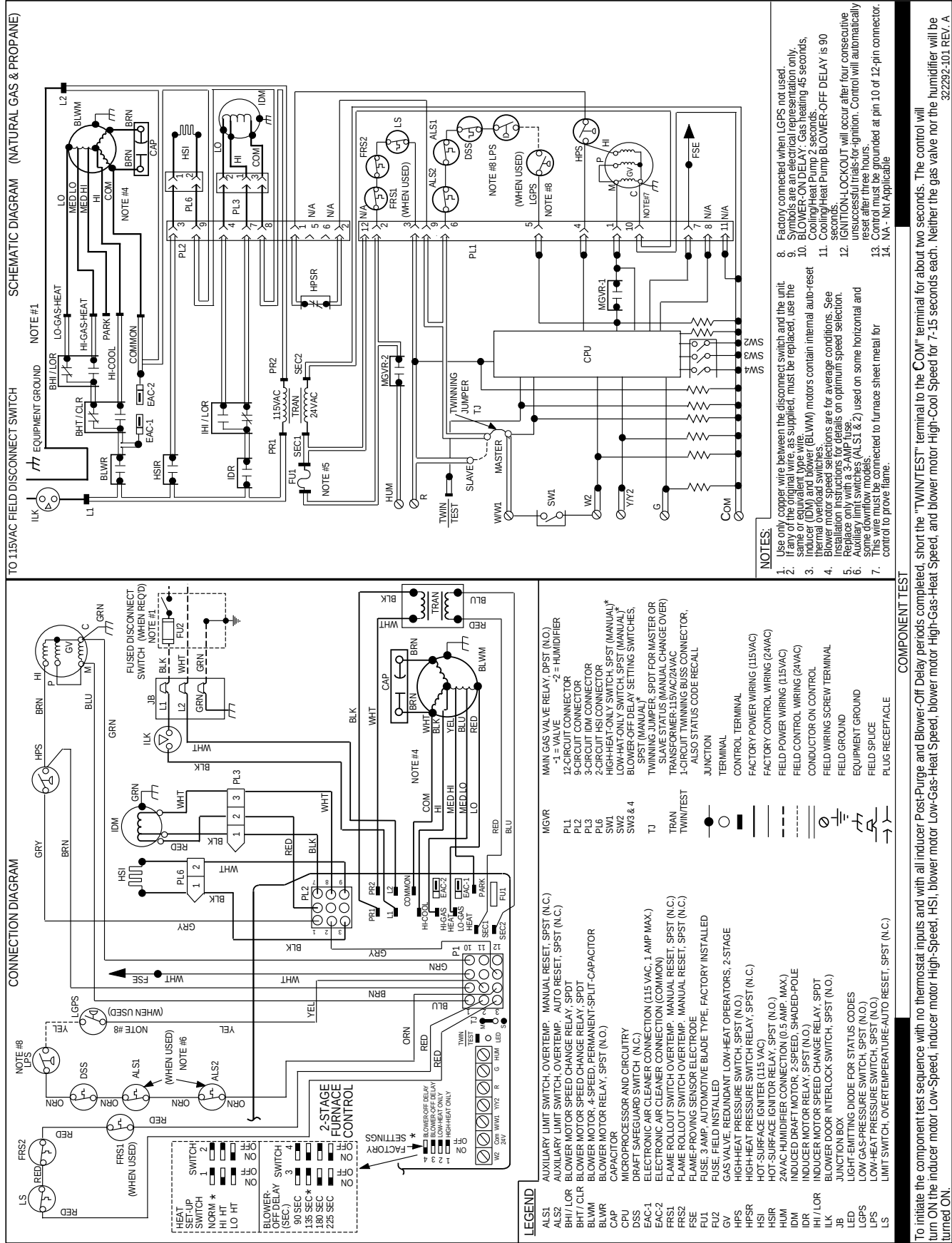


Fig. 11—Unit Wiring Diagram

WARNING

Service should be performed only by qualified persons.

SERVICE

If status code recall is needed, do not remove power or blower door.

LED CODE	STATUS
CONTINUOUS OFF	Check for 115V at L1 and L2, and 24V at SEC1 and SEC2.
CONTINUOUS ON	Control has 24V power.
RAPID FLASHING	Line voltage polarity reversed. If twinned, 24V power to one furnace may be out of phase with power to other furnace.

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 - Blower runs for 90 seconds, if unit is powered up during a call for heat (R-W/W1 closed). Note: 2-sec. ON-delay.

13 LIMIT OR FLAME ROLL-OUT (FRS) SWITCH LOCKOUT - Auto-reset after three hours. FRS switch requires manual-reset.
Check for: - 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: - Mis-wired gas valve - Defective control (valve relay)

22 ABNORMAL FLAME-PROVING SIGNAL - Flame is proved while gas valve is de-energized. Inducer will run until fault is cleared.
Check for: - Leaky gas valve - Stuck-open gas valve

23 LOW- OR HIGH-HEAT 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 HIGH-HEAT PRESSURE SWITCH OR RELAY DID NOT CLOSE OR REOPENED
Check for: - Control relay may be defective - Refer to #32

32 LOW-HEAT PRESSURE, DRAFT SAFEGUARD, OR AUX-LIMIT (DOWNFLOW ONLY*) SWITCH DID NOT CLOSE OR REOPENED
Check for: - Proper vent sizing (and condensate pitch with side-wall vent)
 - Low inducer voltage (115v) * Blower motor and capacitor
 - Defective inducer motor - Defective pressure switch
 - Excessive wind - Restricted vent
 - Inadequate combustion air supply
 - Disconnected or obstructed pressure tubing

33 LIMIT OR FLAME ROLL-OUT (FRS) SWITCH IS OPEN - FRS switch requires manual-reset.
Check for: - Inadequate combustion air supply (FRS switch only)
 - Dirty filter or restricted duct system - Loose blower wheel
 - Defective switch or connections
 - Blower motor or capacitor failure

34 IGNITION-PROVING FAULT - Control will retry three times before lockout #14.
Check for: - Oxide buildup on flame-proving sensor (clean with fine sandpaper).
 - Proper flame-proving microamps (0.5 minimum)
 - Proper control ground continuity
 - Flame-proving sensor must be ungrounded
 - Smooth flame carryover and ignition - Manual valve(s) OFF

43 LOW-HEAT PRESSURE, DRAFT SAFEGUARD, OR AUXILIARY LIMIT SWITCH OPEN WHILE HIGH-HEAT PRESSURE SWITCH IS CLOSED
Check for: - Disconnected or obstructed pressure tubing
 - Defective pressure switch (stuck open)
 - Refer to #32 and #33

45 REPLACE CONTROL

320893-101 REV. A

Fig. 12—Service Label

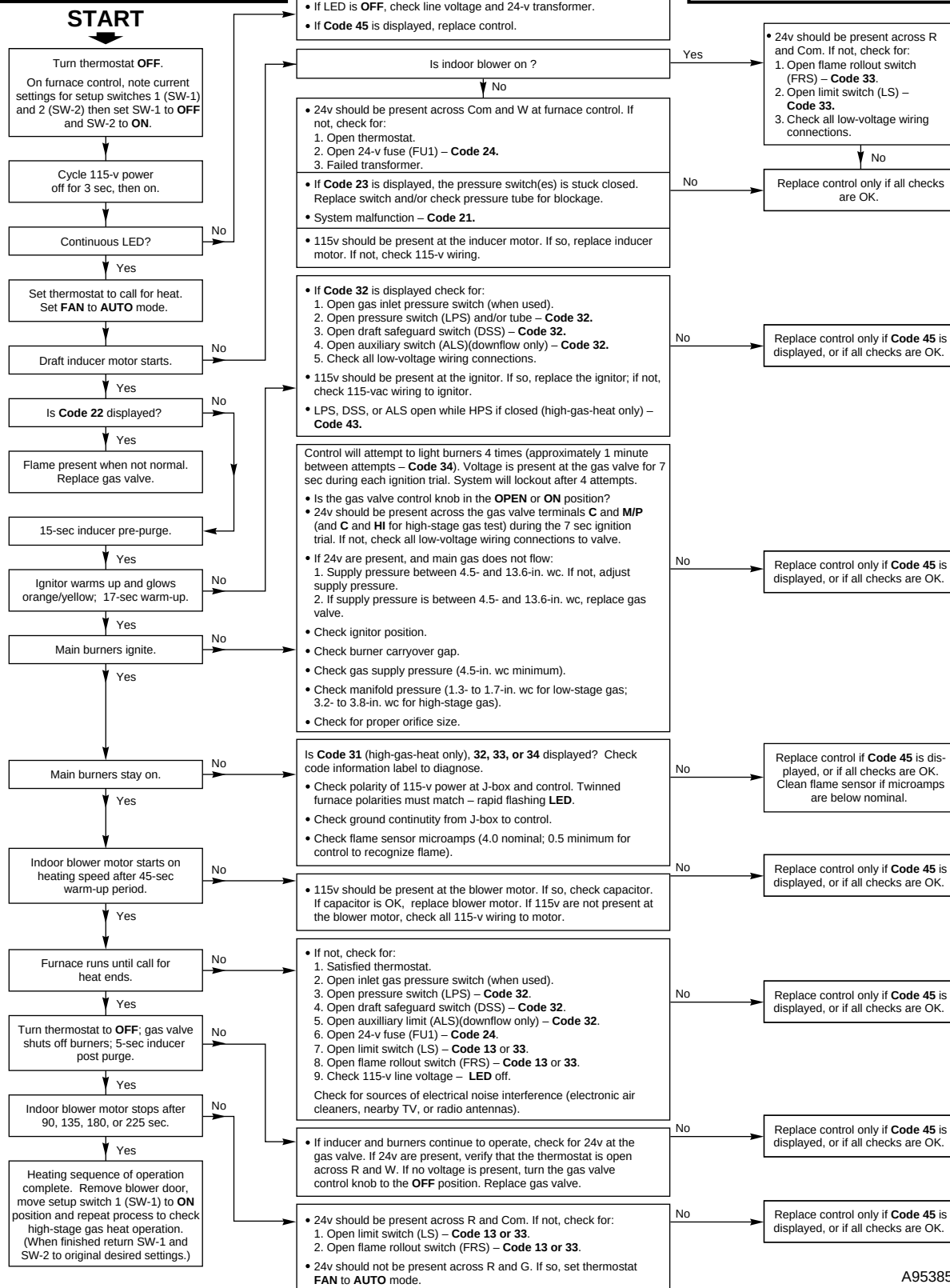
A94169

1. Refer to information label on blower compartment door for procedure for use of LED status codes and problem solving suggestions.
2. LED indicator is viewed through window in blower compartment door.
3. If 115-vac power is de-energized or interrupted during a call for heat, the indoor blower will run for 90 sec before a gas heating cycle begins – **Code 12**.
4. After replacing any component, verify correct operating sequence.

! WARNING

ELECTRICAL SHOCK HAZARD

ONLY QUALIFIED AND TRAINED
SERVICE PERSONNEL SHOULD
PERFORM THIS PROCEDURE



A95385

SERVICE TRAINING

Packaged Service Training programs are an excellent way to increase your knowledge of the equipment discussed in this manual, including:

- Unit Familiarization
- Maintenance
- Installation Overview
- Operating Sequence

A large selection of product, theory, and skills programs is available, using popular video-based formats and materials. All include video and/or slides, plus companion book.

Classroom Service Training plus "hands-on" the products in our labs can mean increased confidence that really pays dividends in faster troubleshooting, fewer callbacks. Course descriptions and schedules are in our catalog.

CALL FOR FREE CATALOG 1-800-962-9212

☐ Packaged Service Training

☐ Classroom Service Training

A94328

