

installation operation and service instructions

78RGF Series Units

GAS UNITS
502,841M
11/92

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE



⚠ WARNING



If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

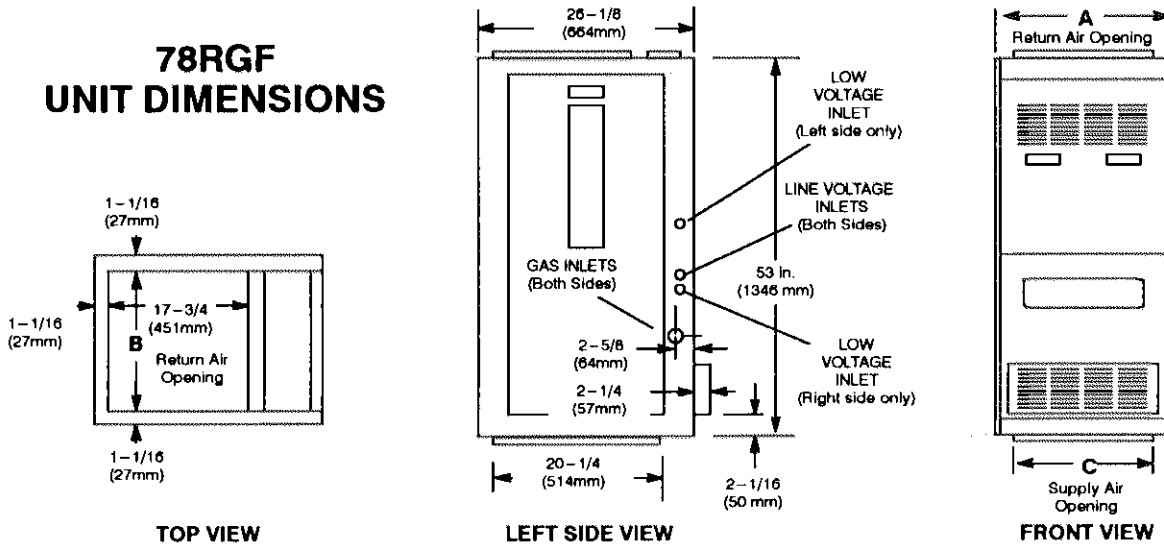
WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Extinguish any open flames.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

TABLE OF CONTENTS

Unit Dimensions	Page 1
Start-Up and Performance Check List	Page 1
Requirements	Page 2
General	Page 3
Combustion, Dilution and Ventilation Air	Page 3
Installation	Page 5
Gas Piping	Page 7
Electrical	Page 9
Start-Up and Adjustments	Page 12
Service	Page 15
Parts Identification	Page 17
Repair Parts	Page 18
Troubleshooting	Page 19

78RGF UNIT DIMENSIONS



Model No.	A	B	C
78RGF3-50 78RGF3-75	16-1/4 in. (413mm)	14 in. (356mm)	12 in. (305mm)
78RGF4-100	21-1/4 in. (540mm)	19 in. (483mm)	17 in. (432mm)
78RGF5-100 78RGF5-125	26-1/4 in. (667mm)	24 in. (610mm)	22 in. (559mm)

START-UP AND PERFORMANCE CHECK LIST

Job Name _____ Job No. _____ Date _____
 Job Location _____ City _____ State _____
 Installer _____ City _____ State _____
 Unit Model No. _____ Serial No. _____ Serviceman _____

HEATING SECTION

Electrical Connections Tight? <input type="checkbox"/> Supply Voltage _____ Blower Motor Amps _____ Blower Motor H.P. _____ Blower Motor Lubrication O.K.? <input type="checkbox"/> Gas Piping Connections Tight & Leak-Tested? <input type="checkbox"/> Fuel Type: Natural Gas? <input type="checkbox"/> LP/Propane Gas? <input type="checkbox"/> Furnace Btu Input _____ Line Pressure _____ Regulator Pressure _____ w.c. — Nat.: _____ w.c. — LP/Propane	Air Shutters Properly Adjusted (If Installed)? <input type="checkbox"/> Flue Connections Tight? <input type="checkbox"/> Proper Draft? <input type="checkbox"/> Fan Control Setting (45 Seconds Fixed On) _____ Fan Control Off Setting _____ Temperature Rise _____ Filter Clean & Secure? <input type="checkbox"/> Vent Clear? <input type="checkbox"/>
--	---

THERMOSTAT

Calibrated? Heat Anticipator Properly Set? Level?

I—REQUIREMENTS

Installation of Lennox gas central furnaces must conform with local building codes or, in the absence of local codes, with the current National Fuel Gas Code (ANSI—Z223.1).

The National Fuel Gas Code is available from:

American National Standards Institute, Inc.
1430 Broadway
New York, NY 10018

These units are A.G.A. (American Gas Association) certified.

Air supply for combustion and ventilation must conform to the methods outlined in the current National Fuel Gas Code.

⚠ WARNING

Product contains fiberglass wool.

Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)

Fiberglass wool may also cause respiratory, skin, and eye irritation.

To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown below, or contact your supervisor.

Lennox Industries Inc.
P.O. Box 799900
Dallas, TX 75379-9900

The furnace is certified for installation clearances to combustible material as listed on the appliance rating plate and in table 1:

TABLE 1

Clearances	Location	Inches (mm)
Service access	Front	36 in. (914mm)
To combustible materials	Top, side and rear	1 in. (25mm)
	Flue	*6 in. (152mm)
From draft hood relief opening	Front	6 in. (152mm)

NOTE—Service access clearance must be maintained.

** Clearance is 1" (25mm) for type B1 vent.*

Accessibility and service clearances must take precedence over fire protection clearances.

Vent installations shall be in accordance with the current GAMA/A.G.A. venting tables manual (502,567M), or applicable provisions of local building codes. Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

NOTE—For installation on combustible floors, appliance shall not be installed directly on carpeting, tile, or other combustible material other than wood flooring.

For installation in a residential garage, unit must be installed so that burner(s) and ignition source are located no less than 18 in. (457 mm) above floor. Furnace must be located or protected to avoid physical damage by vehicles.

Unit must be adjusted to obtain a temperature rise within the range specified on appliance rating plate.

The draft hood shall be installed in the same atmospheric pressure zone as the combustion air inlet to the furnace. 78RGF unit must be installed so that electrical components are protected from water.

When furnace is used in conjunction with cooling units, it shall be installed in parallel with, or on the upstream side of, cooling units to avoid condensation in the heating element. With a parallel flow arrangement, damper (or other means to control the flow of air) shall be adequate to prevent chilled air from entering the furnace and, if manually operated, must be equipped with means to prevent operation of either unit, unless damper is in the full "heat" or "cool" position.

When installed, furnace must be electrically grounded in accordance with local codes or, in the absence of local codes, with the current National Electric Code, ANSI/NFPA No. 70. The National Electric Code (ANSI/NFPA No. 70) is available from:

National Fire Protection Association
470 Atlantic Avenue
Boston, MA 02210

Field wiring connection with unit must meet or exceed specifications of type T wire and withstand a 63°F (17°C) temperature rise. When furnace is installed so that supply ducts carry air circulated by furnace to areas outside space containing furnace, return air shall be handled by a duct(s) sealed to the furnace casing and terminating outside space containing furnace.

78RGF units are Canadian Gas Association (C.G.A.) certified. This furnace is certified for installation clearances to combustible material as listed on appliance rating plate and in table 1. Accessibility and service clearances must take precedence over fire protection clearances.

Installation of C.G.A. certified units must conform with current Standard CAN/CGA—B149.1 "Installation Code for Natural Gas Burning Appliances and Equipment" and CAN/CGA—B149.2 "Installation Code for Propane Gas Burning Appliances and Equipment," local plumbing or waste water codes and other applicable local codes. Authorities having jurisdiction should be con-

sulted before installation. Adequate clearance shall be made around air openings into the vestibule area. Provisions shall be made for proper operation and for combustion air and ventilation air supply according to the current CAN/CGA–B149 standards.

All electrical wiring and grounding for the unit must be in accordance with the current regulations of the Canadian Electrical Code Part I (C.S.A. Standard C22.1) and/or local codes.

NOTE — 78RGF series units must not be used as a “construction heater” at any time during any phase of construction. Very low return air temperatures, harmful vapors and misplacement of the filters will damage the unit and its efficiency.

II—GENERAL

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

A—Shipping and Packing List

- 1—Additive Base (if ordered)
- 1—Thermostat (if ordered)
- 1—Rubber grommet (for electrical make-up)

B—Shipping Damage

Check unit for shipping damage. Receiving party should contact last carrier immediately if any shipping damage is found.

III—COMBUSTION, DILUTION & VENTILATION AIR

Until recently, there was no problem in bringing in sufficient amounts of outdoor air for combustion — infiltration provided all the air that was needed and then some. In today's homes built with energy conservation in mind, tight construction practices make it necessary to bring in air from outside for combustion. Consideration must also be given to the use of exhaust fans, appliance vents, chimneys and fireplaces because they force additional air that could be used for combustion out of the house. Unless outside air is brought into the home for combustion, negative pressure (pressure outside is greater than inside pressure) will build to the point that a down draft can occur in the furnace vent pipe or chimney. Combustion gases enter the living space creating a potentially dangerous situation.

In the absence of local codes concerning air for combustion and ventilation, this section outlines guidelines and recommends procedures for installing 78RGF furnaces in a manner that ensures efficient and safe operation. Special consideration must be given to combustion air needs as well as requirements for exhaust vents and gas piping.

A portion of this information has been reprinted with permission from the National Fuel Gas Code (ANSI—Z223.1). This reprinted material is not the complete and official position of the ANSI on the referenced subject, which is represented only by the standard in its entirety.

In Canada, refer to the standard CAN/CGA—B149.1 and —B149.2 installation codes.

Combustion Air Requirements

⚠ CAUTION

Insufficient combustion air can cause headaches, nausea, dizziness or asphyxiation.

All gas-fired appliances require air to be used for the combustion process. If sufficient amounts of combustion air are not available, the furnace or other appliance will operate in an inefficient and unsafe manner. Enough air must be provided to meet the needs of all fuel-burning appliances, as well as appliances such as exhaust fans which force air out of the home. When fireplaces, exhaust fans, or clothes dryers are used at the same time as the furnace, much more air is required to ensure proper combustion and to prevent a down-draft situation. Insufficient amounts of air also cause incomplete combustion which can result in carbon monoxide. The requirements for providing air for combustion and ventilation depend largely on whether the furnace is installed in an unconfined or confined space.

Unconfined Space

An unconfined space is an area such as a basement or large equipment room with a volume greater than 50 cubic feet per 1,000 Btu per hour of the combined input rating of all appliances installed in that space. This space also includes adjacent rooms which are not separated by a door. Though an area may appear to be unconfined, it might be necessary to bring in outdoor air for combustion if the structure does not provide enough air by infiltration. If the furnace is located in a building of tight construction with weather stripping and caulking around the windows and doors, follow the procedures outlined for using air from the outside for combustion and ventilation.

Confined Space

A confined space is an area with volume less than 50 cubic feet per 1,000 Btu per hour of the combined input rating of all appliances installed in that space. This definition includes furnace closets or small equipment rooms.

When the furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air must be handled by ducts which are sealed to the furnace casing and which terminate outside the space containing the furnace. This is especially important when the furnace is mounted on a platform in a confined space such as a closet or small equipment room. Even a small leak around the base of the unit at the platform or at the return air duct connection can cause a potentially dangerous negative pressure condition. Air for combustion and ventilation can be brought into the confined space either from inside the building or from outside.

Air from Inside

If the confined space housing the furnace adjoins space categorized as unconfined, air can be brought in by providing two permanent openings between the two spaces. Each opening must have a minimum free area of 1 square inch per 1,000 Btu per hour of total input rating of all gas-fired equipment in the confined space. Each opening must be at least 100 square inches. One opening shall be within 12 inches of the top of the enclosure and one opening within 12 inches of the bottom. See figure 1.

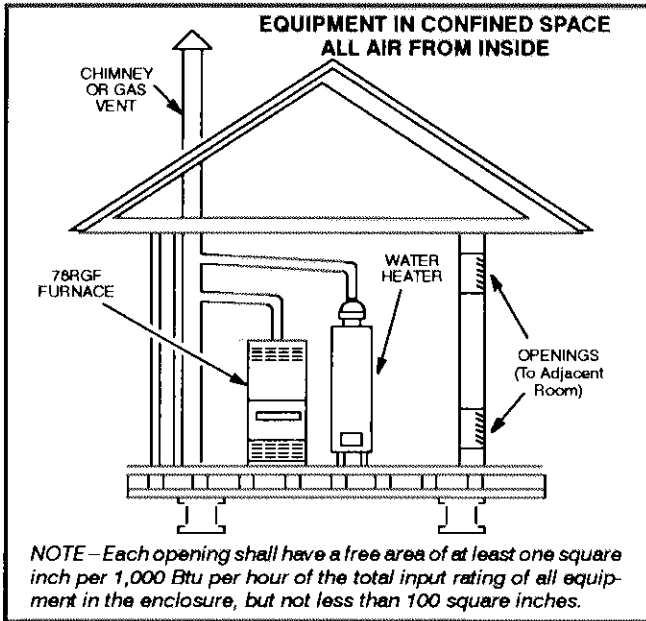


FIGURE 1

Air from Outside

If air from outside is brought in for combustion and ventilation, the confined space must have two permanent openings. One opening shall be within 12 inches of the top of the enclosure and one within 12 inches of the bottom. These openings must communicate directly or by ducts with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors or indirectly through vertical ducts. Each

opening shall have a minimum free area of 1 square inch per 4,000 Btu per hour of total input rating of all equipment in the enclosure. See figures 2 and 3. When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu per total input rating of all equipment in the enclosure. See figure 4.

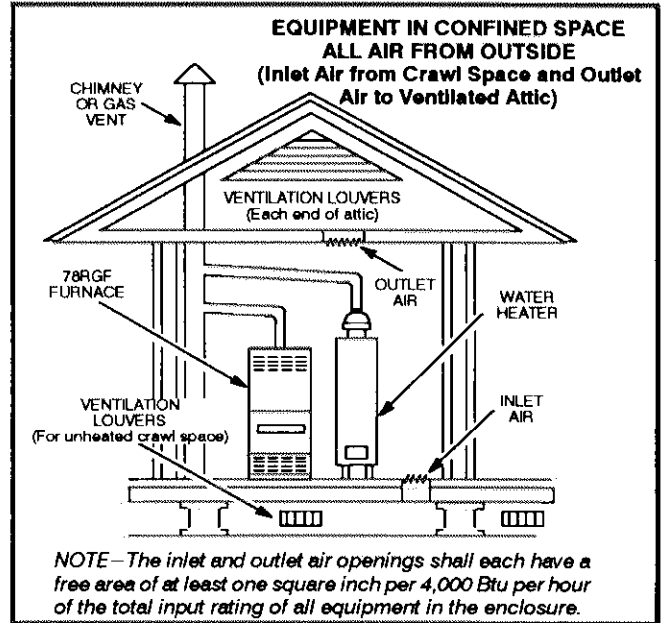


FIGURE 2

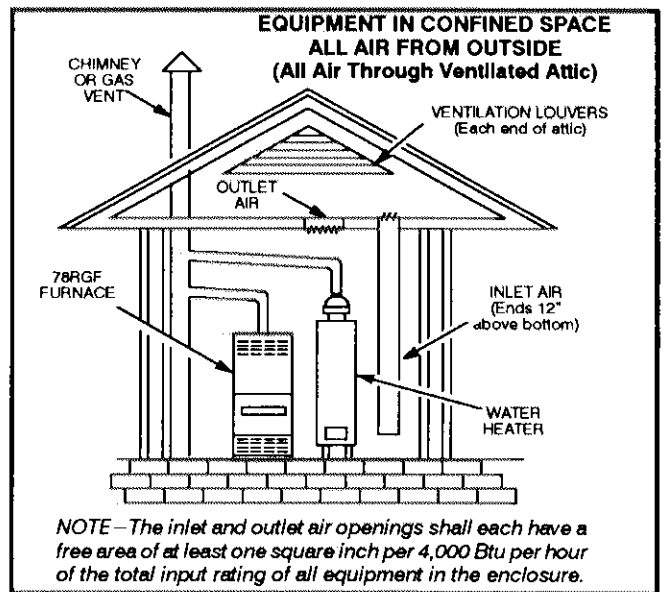


FIGURE 3

When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be no less than 3 inches. In calculating free area, the blocking effect of louvers, grilles, or screens must be consid-

ered. If the design and free area of protective covering is not known for calculating the size opening required, it may be assumed that wood louvers will have 20 to 25 percent free area and metal louvers and grilles will have 60 to 75 percent free area. Louvers and grilles must be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

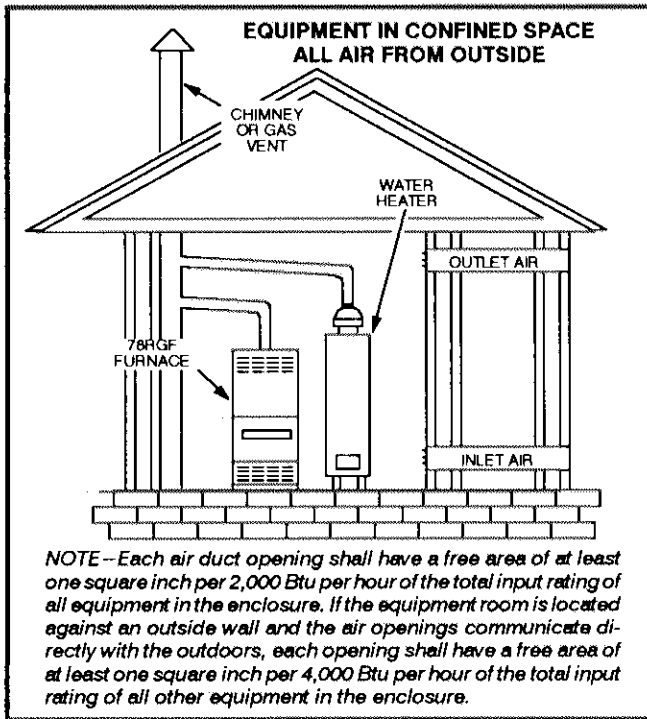


FIGURE 4

IV—INSTALLATION

SETTING EQUIPMENT

The 78RGF series units can be installed in three different ways: on non-combustible flooring, on combustible floor using an additive base, or on a reverse-flow cooling cabinet. Do not drag unit across floor.

A—Installation on Non-Combustible Flooring

- 1— Cut floor opening keeping in mind the clearances listed on the unit rating plate. Also, keep in mind gas supply and electrical supply, vent connections and sufficient installation and service clearances. See table 2 for correct floor opening size.

**TABLE 2
NONCOMBUSTIBLE FLOOR**

UNIT	Front to Rear		Side to Side	
	In	mm	In	mm
3-50, 3-75	20-1/2	520	12-1/4	311
4-100	20-1/2	520	17-1/4	438
5-100, 5-125	20-1/2	520	22-1/4	565

NOTE—Floor opening dimensions listed are 1/4" (6mm) larger than unit openings.

- 2— Flange warm air plenum and lower into opening.
- 3— Set unit over plenum.
- 4— Check to see that an adequate seal is made.

B—Installation on Combustible Flooring

- 1— When unit is installed on a combustible floor, an additive base (ordered separately) must be installed between the furnace and the floor. See table 3 for opening size to cut in the floor.

**TABLE 3
ADDITIVE BASE FLOOR OPENING**

UNIT	Front to Rear		Side to Side	
	In	mm	In	mm
3-50, 3-75	22-7/8	581	14-5/8	371
4-100	22-7/8	581	19-5/8	498
5-100, 5-125	22-7/8	581	24-5/8	625

NOTE—Floor opening dimensions listed are 1/4" (6mm) larger than unit openings.

- 2— After opening is cut, set the additive base into opening.
- 3— Check fiberglass strips on additive base to make sure they are properly glued and positioned.
- 4— Lower supply air plenum into additive base until plenum flanges seal against fiberglass strips.
- 5— Set unit on additive base so unit flanges drop into plenum. Refer to figure 5.

NOTE—Be careful not to damage fiberglass strips. Check for tight seal.

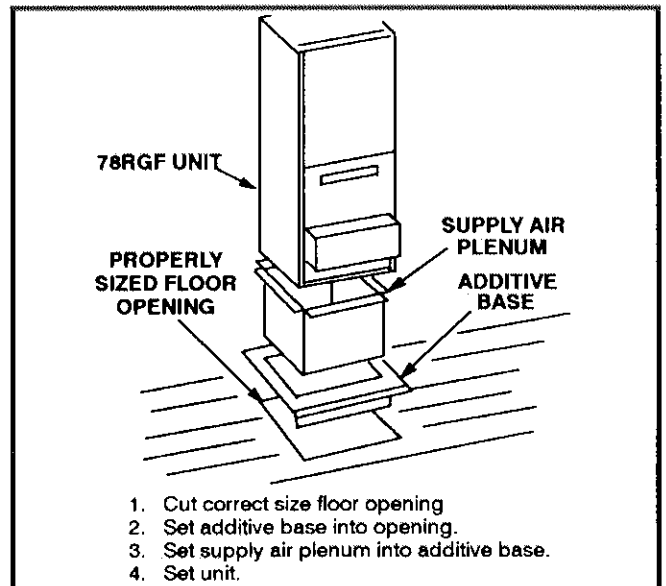


FIGURE 5

C—Installation on Cooling Cabinet

- 1— Refer to reverse flow coil installation instructions for correctly sized opening in floor and installation of cabinet.

- 2– When cooling cabinet is in place, install furnace so flanges drop inside cabinet opening.
- 3– Seal cabinet and check for air leakage.

RETURN AIR PLENUM

Use the following steps when installing return air plenum:

- 1– Bottom edge of plenum should be flanged with a hemmed edge. See figure 6.
- 2– Fiberglass sealing strips should be used between plenum and the unit cabinet to ensure a tight seal.
- 3– In all cases, the plenum should be secured to the top flanges of the furnace using sheet metal screws. See figure 6.

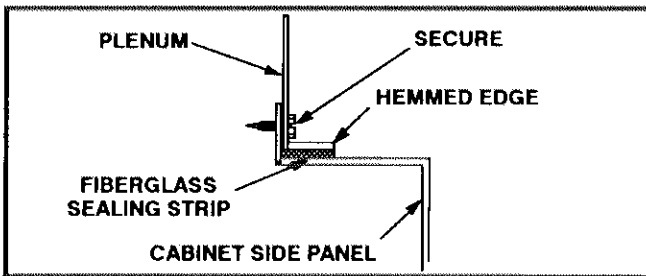


FIGURE 6

⚠ WARNING

Do not put sheet metal screws into top of furnace. Sheet metal screws must be installed into flange of furnace. Note warning stickers on unit. Misplacement of screws may prevent normal maintenance of filters.

- 4– In closet installations, it may be necessary to install sheet metal screws from the inside. If this is the case, make plenum with a removable front to install screws as shown in figure 7.

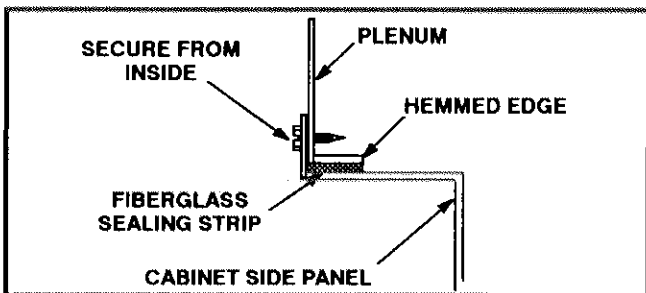


FIGURE 7

D–Duct System

Size and install the supply and return air duct system using industry–approved standards that result in a quiet and low–static system with uniform air distribution.

C.G.A. certified units require a removable access panel in supply air duct. Access panel should be large enough to permit inspection of heat exchanger for leaks after installation (either by smoke or reflected light). Access panel must not allow leaks in supply air duct system.

E–Venting

78RGF furnaces must be vented in compliance with all local codes, the current GAMA/A.G.A. venting tables manual (502,567M) in the U.S.A. and the current standards of CAN/CGA–B149.1 and –B149.2 in Canada and these instructions.

The 78RGF gas furnace must not be connected to a chimney servicing a separate appliance to burn solid fuel.

General Venting Recommendations and Requirements For Using Masonry Chimney

Any masonry chimney used for venting a 78RGF gas furnace must be lined, and must be sized and installed per all applicable local building codes or, in the absence of local codes, the current National Fuel Gas Code (ANSI–Z223.1) in the U.S.A. and the current standards of CAN/CGA–B149.1 and –B149.2 in Canada. The effective area of the chimney serving a single appliance must be no less than the effective area of the draft hood outlet. The chimney must extend vertically at least 5 feet above the flue collar.

Masonry chimneys serving fireplaces cannot be used for venting purposes unless the fireplace opening is permanently sealed. See figure 8.

When inspection reveals that an existing chimney is not safe for the intended purpose, it shall be rebuilt to conform to nationally recognized standards, lined or relined with suitable materials or replaced with a gas vent or chimney suitable for venting 78RGF series units. The chimney passageway must be checked periodically to ensure that it is clear and free of obstructions.

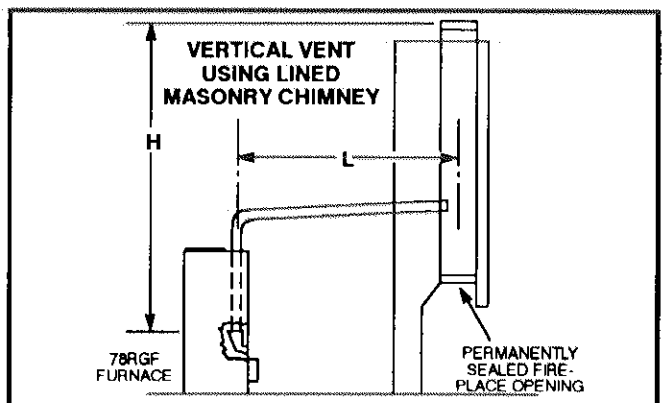


FIGURE 8

Removal of Unit from Common Venting System

In the event that an existing furnace is removed from a venting system commonly run with separate gas appliances, the venting system is likely to be too large to properly vent the remaining attached appliances. The following test should be conducted while each appliance in operation and the other appliances not in operation remain connected to the common venting system. If the venting system has been installed improperly, the system must be corrected as outlined in the previous section.

- 1- Seal any unused openings in the common venting system.
- 2- Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- 3- Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- 4- Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.
- 5- Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
- 6- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
- 7- If improper venting is observed during any of the above tests, the common venting system must be corrected.

F-Horizontal Venting

This furnace is design certified by the American Gas Association for horizontal venting through an outside wall only with the use of a Field Controls Company Model #SWG-5L side wall venting kit available from Lennox Dealer Service Center. No other Field brand venting kit or any other manufacturer's venting kit is acceptable. Horizontal venting of this furnace without the use of the above stated kit is prohibited. See figure 9 for field wiring of side wall horizontal venting kit.

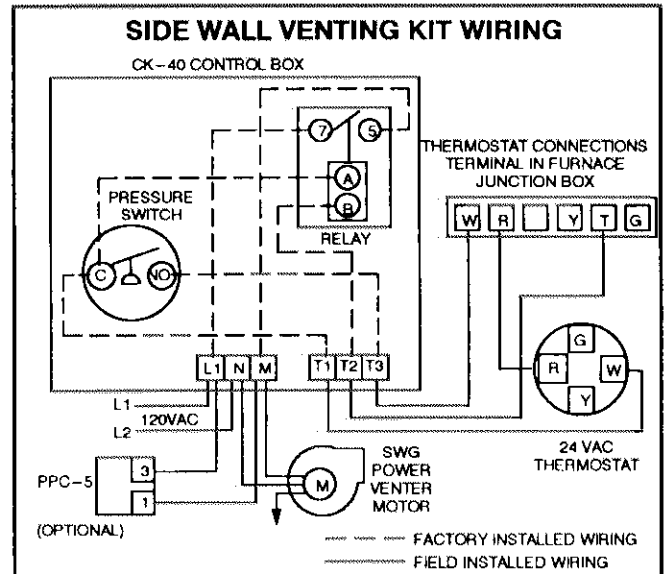


FIGURE 9

V-GAS PIPING

Gas Supply

- 1- This unit is shipped standard for left side installation of gas piping. Simply connect gas supply to piping assembly.
- 2- A piping hole is also fabricated in the right side of the unit for alternate piping arrangements.
- 3- When connecting gas supply, factors such as length of run, number of fittings and furnace rating must be considered to avoid excessive pressure drop. Table 4 lists recommended pipe sizes for typical applications.
- 4- Gas piping must not run in or through air ducts, clothes chutes, chimneys or gas vents, dumb waiters or elevator shafts.
- 5- Piping should be sloped 1/4 inch per 15 feet upward toward the meter from the furnace. The piping must be supported at proper intervals (every 8 to 10 feet) using suitable hangers or straps. A drip leg should be installed in vertical pipe runs to the unit.
- 6- In some localities, codes may require installation of a manual main shut-off valve and union (furnished by installer) external to the unit. Union must be of the ground joint type.

▲ IMPORTANT

Compounds used on threaded joints of gas piping must be resistant to the actions of liquified petroleum gases.

TABLE 4

Nominal Iron Pipe Size (Inches)	Internal Diameter (Inches)	Length of Pipe (Feet)									
		10	20	30	40	50	60	70	80	90	100
1/4	.364	43	29	24	20	18	16	15	14	13	12
3/8	.493	95	65	52	45	40	36	33	31	29	27
1/2	.622	175	120	97	82	73	66	61	57	53	50
3/4	.824	360	250	200	170	151	138	125	118	110	103
1	1.049	680	465	375	320	285	260	240	220	205	195
1-1/4	1.380	1,400	950	770	660	580	530	490	460	430	400
1-1/2	1.610	2,100	1,460	1,180	990	900	810	750	690	650	620
2	2.067	3,950	2,750	2,200	1,900	1,680	1,520	1,400	1,300	1,220	1,150
2-1/2	2.469	6,300	4,350	3,520	3,000	2,650	2,400	2,250	2,050	1,950	1,850
3	3.068	11,000	7,700	6,250	5,300	4,750	4,300	3,900	3,700	3,450	3,250
4	4.026	23,000	15,800	12,800	10,900	9,700	8,800	8,100	7,500	7,200	6,700

NOTE—Capacity given in cubic feet of gas per hour and based on 0.60 specific gravity gas.

NOTE—Installer must provide a 1/8" N.P.T. plugged tap in the field piping upstream of the gas supply connection to the unit. Tap must be accessible for test gauge connection. See figure 10.

NOTE—In case emergency shutoff is required, shut off main manual gas valve and disconnect main power to unit. These devices should be properly labeled by the installer.

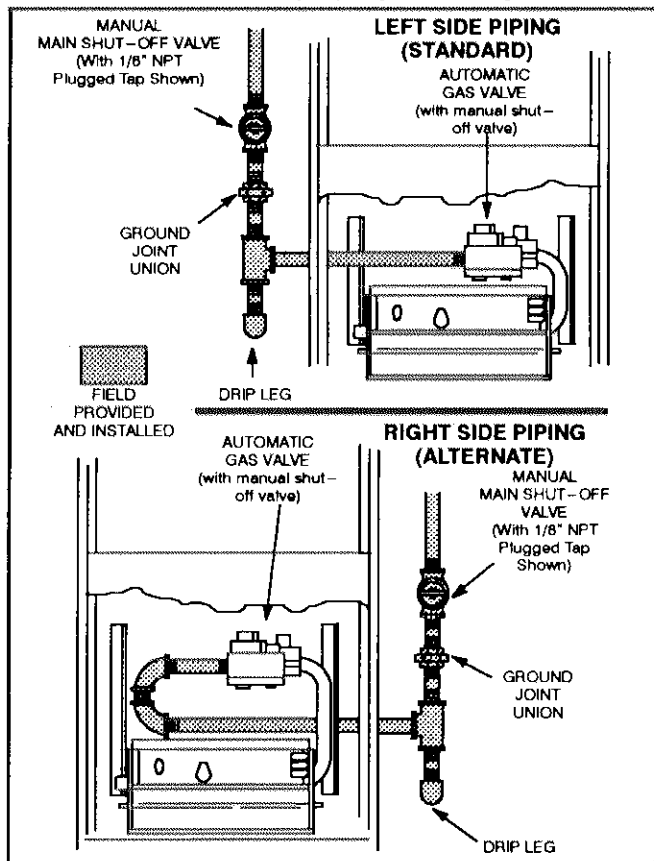


FIGURE 10

High Altitude Derate

A.G.A. certified units must be derated when installed at an elevation of 2,000 ft. (610 m) or more above sea level. If unit is installed at an altitude higher than 2,000 ft. (610 m), unit must be derated 4% for each 1,000 ft. (305 m) above sea level.

C.G.A. certified units used in high altitude applications are equipped with modifications that eliminate the need for manifold pressure adjustment to obtain proper heat input. Check unit rating plate to make sure unit is a high altitude unit.

Leak Check

After gas piping is completed, carefully check all piping connections (factory and field) for gas leaks. Use a leak detecting solution or other preferred means.

NOTE—This is the only permissible field derate for this appliance.

CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

NOTE—In case emergency shutdown is required, shut down main manual gas valve and disconnect main power to unit. These devices should be properly labeled by the installer.

⚠ IMPORTANT

When testing pressure of gas lines, gas valve must be disconnected and isolated. See figure 11. Gas valves can be damaged if subjected to more than 1/2 psig (3.48 kPa).

The furnace must be isolated from the gas supply system by closing its individual manual shut-off valve during any pressure testing of the gas supply system at pressures equal to or less than 1/2 psig (3.48 kPa).

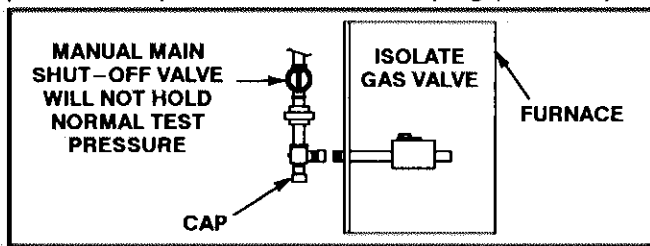


FIGURE 11

VI-ELECTRICAL

Refer to figure 12 for thermostat wiring, figure 13 for BCC2 location, figure 14 for point to point field wiring and figure 15 for schematic wiring diagram and troubleshooting.

- 1- Select fuse and wire size according to blower motor amps.
- 2- Snaphole plugs are provided on both sides of cabinet to facilitate wiring.
- 3- Install room thermostat according to instructions provided with thermostat.

- 4- Install a separate fused disconnect switch near the unit so power can be turned off for servicing.
- 5- Route thermostat wire as shown in figure 12. Keep wire away from draft hood and flue pipe. Do not route wire across draft hood.
- 6- Complete wiring connections to equipment using wiring diagrams provided with unit and in figures 13 and 15. Use 18 gauge wire or larger for thermostat connections.
- 7- Electrically ground unit in accordance with local codes or, in the absence of local codes, in accordance with the current National Electric Code (ANSI/NFPA No. 70) and in Canada with the current Canadian Electric Code part 1 (CSA standard C22.1).
- 8- A 120 volt accessory terminal (ACC) is provided on the BCC2 blower control center. Any accessory rated up to 1 amp can be connected to this terminal and the neutral leg of the accessory can be attached to any free 120 volt neutral terminal on the BCC2 blower control center. The accessory terminal is energized whenever the blower is in operation. See figure 13. A troubleshooting flowchart for the BCC2 blower control is located at the end of this manual.
- 9- The continuous fan (CF) 120 volt terminal is used with an optional continuous low fan kit that is available from Lennox. The kit allows the furnace blower to run continuously on low speed.

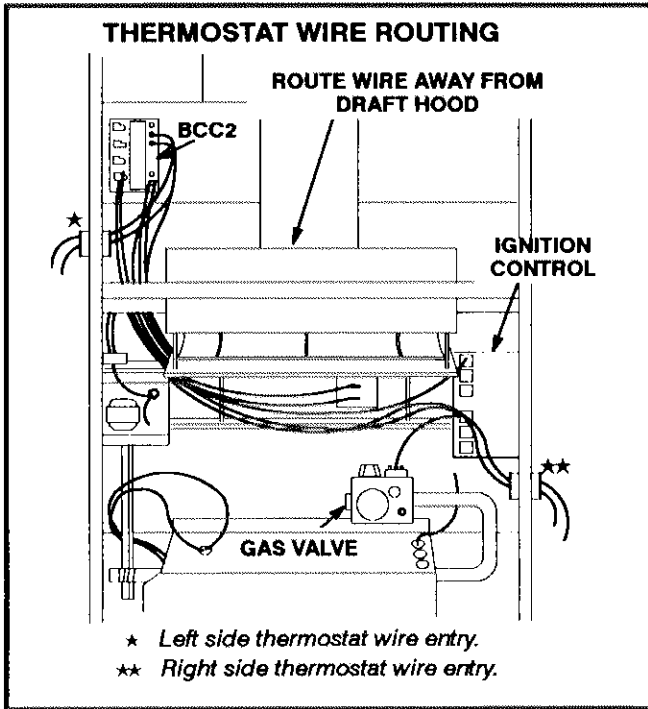


FIGURE 12

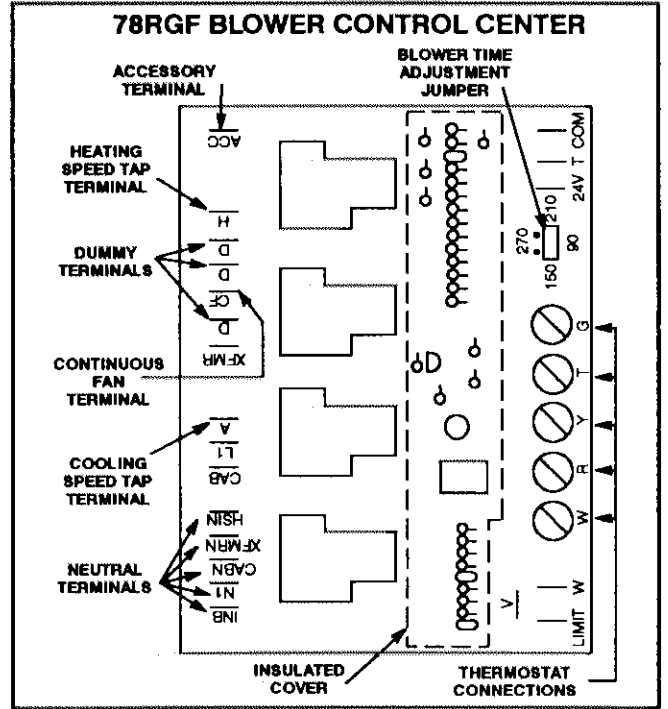


FIGURE 13

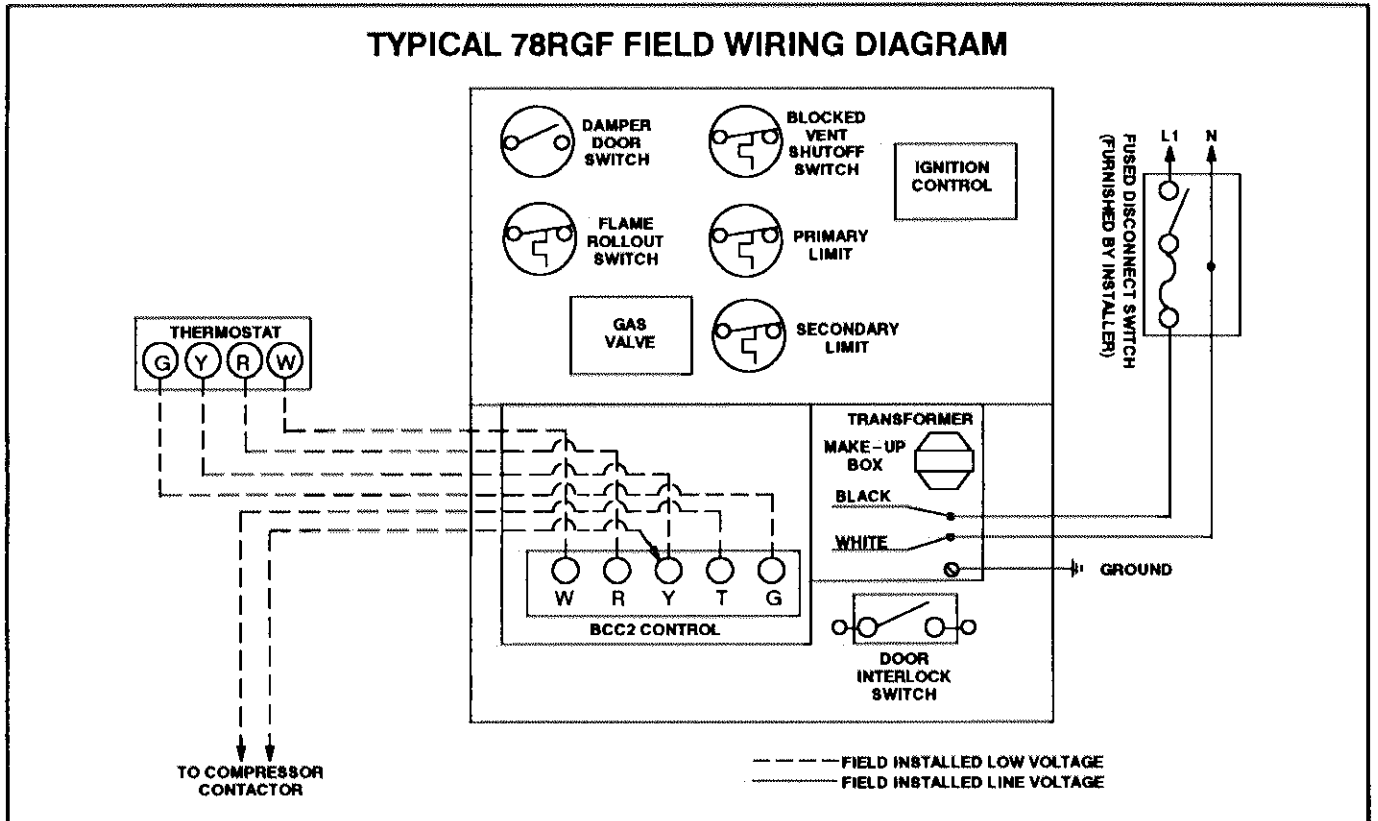


FIGURE 14

TYPICAL 78RGF SERIES UNIT

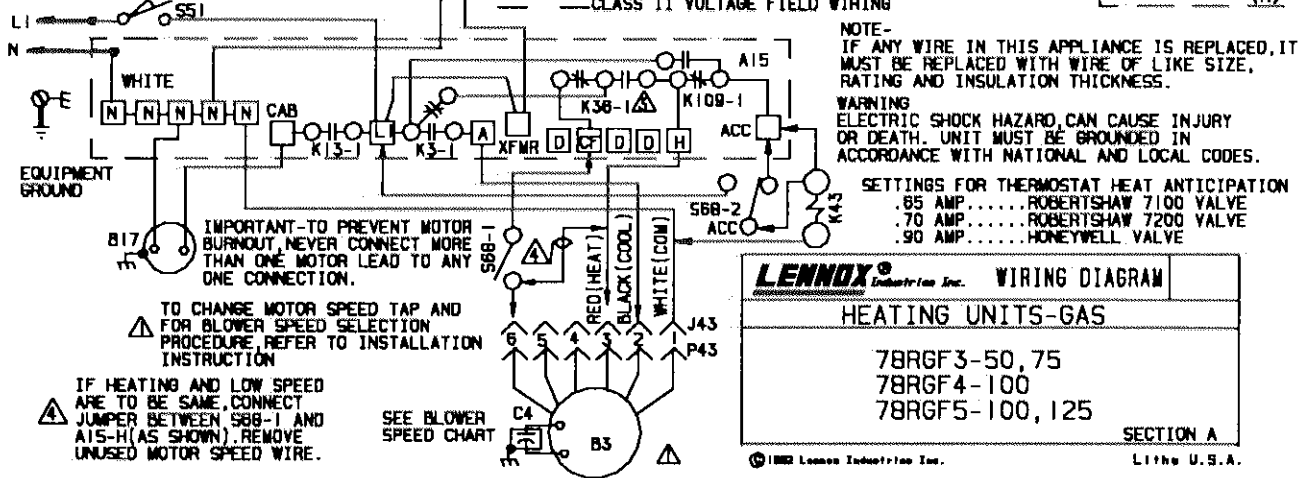
KEY	DESCRIPTION COMPONENT
A3	CONTROL BURNER IGNITION
A15	CONTROL BLOWER, BCC2
B3	MOTOR, BLOWER
B17	MOTOR, DAMPER
C4	CAPACITOR, BLOWER MOTOR
GV1	VALVE, GAS
J35	JACK TEST
J43	JACK, BLOWER MOTOR
J43	JACK, BLOWER
K3-1	RELAY, BLOWER
K15-1	RELAY, COMBUSTION AIR
K38-1	RELAY, HEAT BLOWER
K43-1	RELAY, ECONOMIZER
K109-1	RELAY, ACCESSORY
P35	PLUG TEST
P43	PLUG, BLOWER MOTOR
S10	LIMIT, PRIMARY GAS
S21	LIMIT, SECONDARY GAS
S47	SWITCH, FLAME ROLL OUT
S51	SWITCH, DOOR INTERLOCK
S62	SWITCH, BLOCKED VENT
S64	SWITCH, DAMPER PROVE
S68-1,2	SWITCH, 3 ϕ SPEED ON-OFF
T1	TRANSFORMER, CONTROL

UNIT	FACTORY CONNECTED SPEED TAPS		MOTOR SPEEDS AVAILABLE
	COOL	HEAT	
02/3-50	2	4	4*
03-5	2	5	4
03-125, 03/4, 04	2	4	4
04/5, 05	3	6	5

SPEED TAPS	HI ← → LO					
	2	3	4	5	6	5
	2	3	4	5	6	5

* DO NOT USE LOW SPEED TAP FOR HEATING ON 02/3-50

← DENOTES OPTIONAL COMPONENTS



LENNOX
 Industries Inc. WIRING DIAGRAM
 HEATING UNITS-GAS

78RGF3-50, 75
 78RGF4-100
 78RGF5-100, 125

SECTION A

FIGURE 15

VII—START—UP AND ADJUSTMENTS

A—Start—Up

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠ WARNING

Do not use this furnace if any part has been underwater. Immediately call a qualified service technician to inspect the furnace and to replace any part of the control system and any gas control which has been under water.

⚠ WARNING

If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠ CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

To place 78RGF furnace into operation:

78RGF units are equipped with an intermittent pilot ignition system. Do not attempt to manually light pilots on these furnaces. Each time thermostat calls for heat, the pilot will be automatically lit. The pilot goes out when there is no demand for heat.

⚠ WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Gas Valve Operation (Figures 17–19)

- 1— **STOP!** Read the safety information at the beginning of this section.
- 2— Set thermostat to lowest setting. See figure 16.

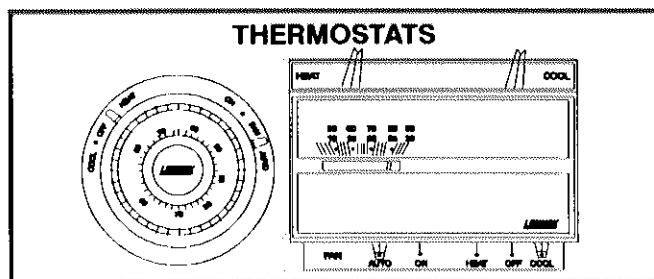
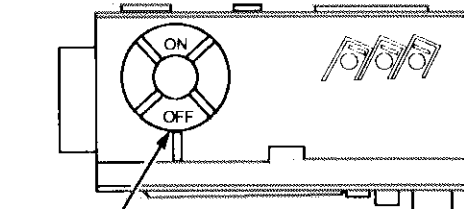


FIGURE 16

- 3— Turn off all electrical power to appliance.
- 4— This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- 5— Remove lower access panel.
- 6— On Robertshaw 7100D and Honeywell VR8204 gas valves, turn knob on gas valve clockwise to OFF. Units with Robertshaw 7200 gas valve, depress lever and move to OFF position. Do not force. See figures 17 through 19.
- 7— Wait fifteen (15) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.

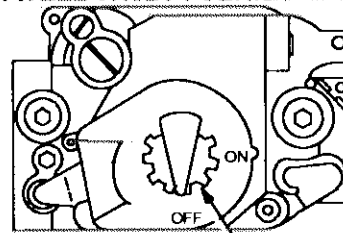
ROBERTSHAW 7100DER GAS VALVE



GAS VALVE KNOB SHOWN
IN OFF POSITION

FIGURE 17

HONEYWELL VR8204 SERIES GAS VALVE



GAS VALVE SHOWN IN OFF POSITION

FIGURE 18

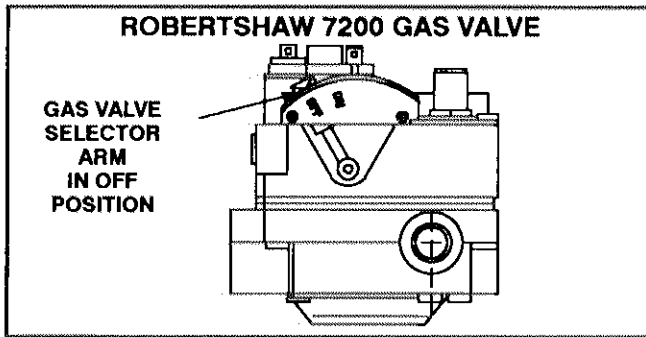


FIGURE 19

- 8– On Robertshaw 7100D and Honeywell VR8204 gas valves, turn knob on gas valve counterclockwise to ON. Units with Robertshaw 7200 gas valve, depress lever and move to ON position. Do not force.
- 9– Replace lower access panel.
- 10– Turn on all electrical power to unit.
- 11– Set thermostat to desired setting.
NOTE—When unit is initially started, steps 1 through 11 may need to be repeated to purge air from pilot line.
- 12– If the appliance still will not operate, follow the instructions "To Turn Off Gas To Unit" and call your service technician or gas supplier.

To Turn Off Gas To Unit

- 1– Set thermostat to lowest setting.
- 2– Turn off all electrical power to unit if service is to be performed.
- 3– Remove lower access panel.
- 4– On Robertshaw 7100D and Honeywell VR8204 gas valves, turn knob on gas valve clockwise to OFF. Units with Robertshaw 7200 gas valve, depress lever and move to OFF position. Do not force.
- 5– Replace lower access panel.

B—Adjustments

Limit Control

Limit Control—Factory set at 90 seconds: No adjustment necessary. If nuisance tripping of limit control occurs, fan may need to run longer. See Fan Control section below.

Fan Control

The fan on time of 45 seconds is not adjustable. Fan off time (time that the blower operates after the heat demand has been satisfied) can be adjusted by moving the jumper on the BCC2 blower control center. The unit is shipped with a factory fan off setting of 90 seconds. Fan off time will affect comfort and is adjustable to satisfy individual applications. See figure 20.

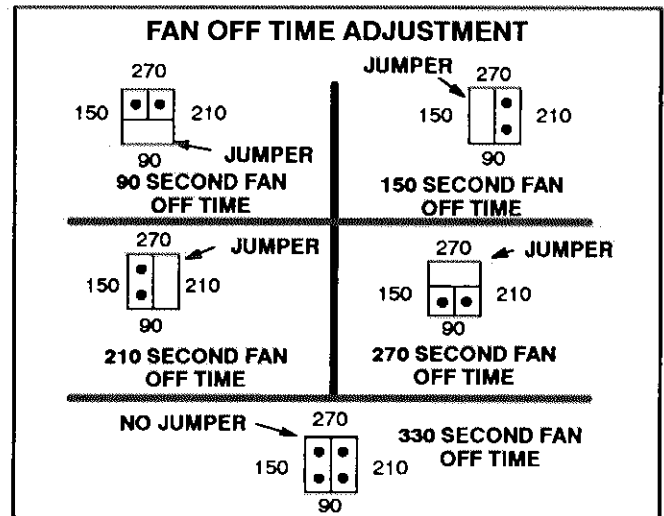


FIGURE 20

Gas Flow

To check for proper gas flow to combustion chamber, determine Btu input from appliance rating plate. Divide this input rating by the Btu per cubic foot of available gas. Result is the required number of cubic ft. per hour. Determine the flow of gas through gas meter for two minutes and multiply by 30 to get the hourly flow of gas to burner.

Gas Pressure

- 1– Check gas line pressure with unit firing at maximum rate. A minimum of 4.5 in. w.c. for natural gas or 10.5 in. w.c. for LP/propane gas should be maintained. See figure 21 for gas pressure adjustment screw location.
- 2– After line pressure has been checked and adjusted, check regulator pressure. Correct manifold pressure for LP/propane gas is 9.5 in. w.c. Correct regulator pressure for natural gas at altitudes below 2000 ft. is 3.5 in. w.c. C.G.A. certified units used in high altitude applications are equipped with modifications that eliminate the need for manifold pressure adjustment, which is 3.5 in. w.c. to obtain proper heat input.

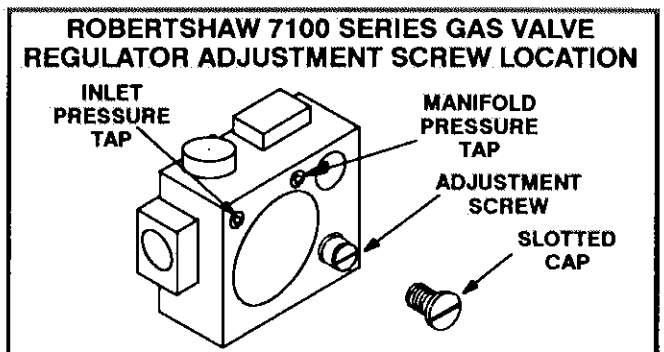


FIGURE 21

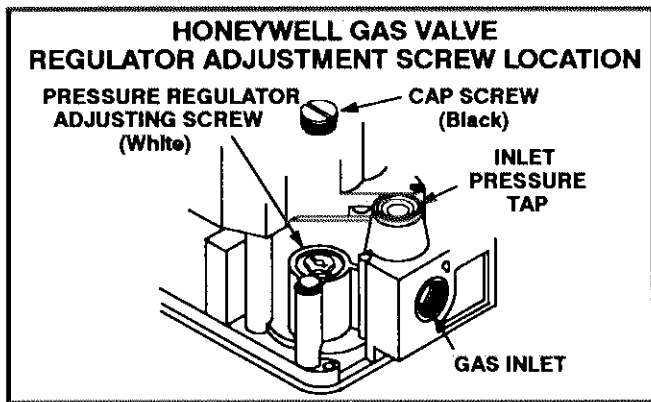


FIGURE 22

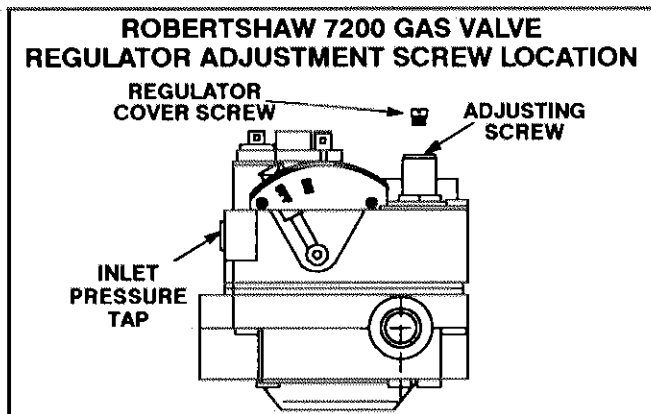


FIGURE 23

Temperature Rise

Check temperature rise and, if necessary, adjust blower speed to maintain temperature rise within range shown on unit rating plate.

Thermostat Adjustment

Set thermostat heat anticipation according to the information listed on the wiring diagram on the unit.

Electrical

- 1- Check all wiring for loose connections.
- 2- Check for correct voltage at unit (unit operating).
- 3- Check amp-draw on blower motor.
Motor Nameplate _____ Actual _____

Flue and Chimney

- 1- Check flue pipe, chimney and all connections for tightness and to make sure there is no blockage.
- 2- Check unit for proper draft.

Blower Speeds

Blower speed tap selection is accomplished by changing the taps at the harness connector at the blower motor. Disconnect harness connector from motor to expose speed selectors. See figure 24 and unit wiring diagram.

- 1- Turn off electrical power to furnace.
- 2- Remove filter access panel.
- 3- Lift left side filter over left support angle. For easy handling, hold filter at center bottom.
- 4- Rotate filter sideways and pull it through the blower access panel opening.
- 5- Grasp blower motor harness connector located on back on motor. Depress lock tab and pull connector from motor.
- 6- Pull harness connector and wires through blower access panel opening.
- 7- Select desired speeds for heating and cooling. (White = common, Red = heating, Black = cooling)
- 8- Depress harness connector tab to release wire terminal. Select connector location for new speed (refer to unit wiring diagram). Insert wire terminal until it is securely in place. See figure 24.
- 9- Replace harness connector to motor until it is securely in place.

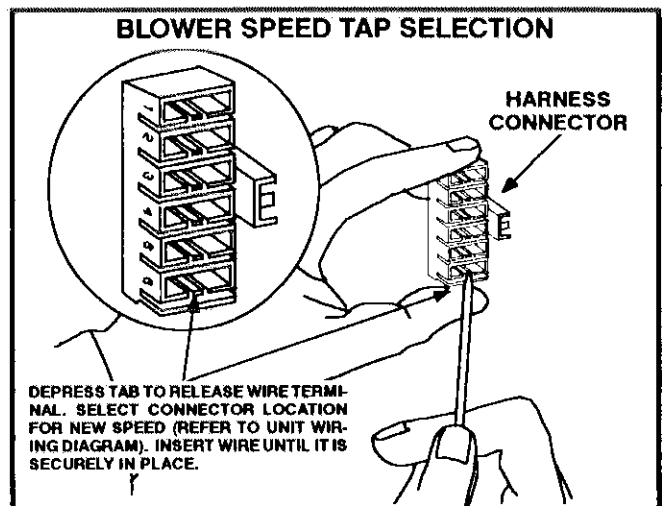


FIGURE 24

Failure to Operate

If unit fails to operate check the following:

- 1- Is thermostat calling for heat?
- 2- Is main disconnect switch closed?
- 3- Is there a blown fuse?
- 4- Is filter dirty or plugged? Dirty or plugged filters will cause unit to go off on limit control.
- 5- Is gas turned on at meter?
- 6- Is manual main shut-off valve open?
- 7- Is internal manual shut-off valve open?

After items 1 through 7 have been checked and unit still will not start, manually reset vent safety shut-off switch located at the right side of draft hood. If unit operation resumes and then cuts out again, inspect furnace vent system for proper sizing and installation. Also, check for vent blockage and for proper draft. If unit still does not start, reset roll-out switch on burner box. See figure 27. If unit starts and cuts out, check heat section for blockage.

Pilot and Burner Flame

After the 78RGF unit has been installed and wired, the pilot flame should be checked and adjusted to insure proper unit operation. Use the following procedure to adjust the pilot flame.

Pilot Flame Adjustment

- 1- Turn off power to the unit.
- 2- Disconnect wire from MV terminal on the gas valve.
- 3- On Robertshaw 7100 and Honeywell VR8204 gas valves, turn knob on gas valve counterclockwise to **ON**. Units with Robertshaw 7200 gas valve, depress lever and move to **ON** position. Do not force.
- 4- Restore power to unit.
- 5- Set thermostat to call for heat.

At this point the pilot valve portion of the gas valve will be energized after a call for heat is initiated. Pilot will then light. Examine the pilot flame to determine that it is a soft, stable flame that surrounds the flame sensor. See figure 25. If the flame does not look like this, the pilot needs adjustment.

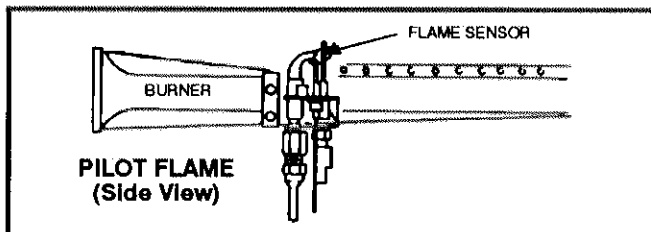


FIGURE 25

- 6- Identify the gas valve being used and locate the pilot adjustment screw. On some gas valves the actual adjustment screw is under a cap. See figures 26, 27, and 28 for pilot adjustment screw locations.
- 7- Turn the pilot adjustment screw until the pilot flame is soft and stably surrounds the flame sensor.
- 8- Take a microamp reading of the flame signal coming from the flame sensor. The normal range is 0.80 to 1.20 microamps with a minimum of 0.70 microamps.
- 9- After correct pilot flame has been obtained, adjust thermostat to stop the call for heat.
- 10- Turn off power to unit.
- 11- Reconnect MV wire to MV terminal on gas valve.
- 12- Restore power to unit and assure normal operation.

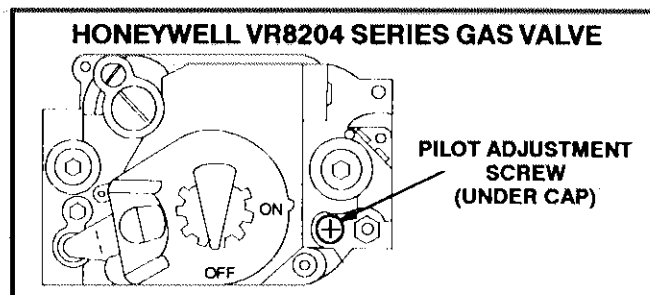


FIGURE 26

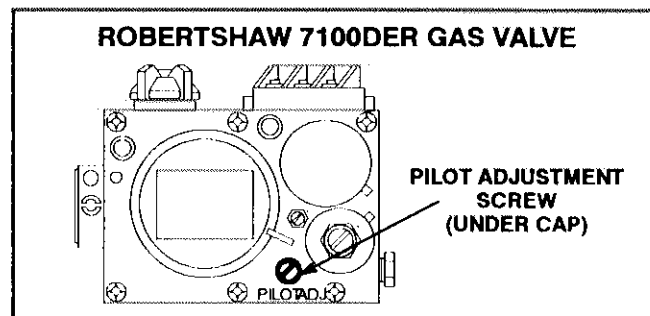


FIGURE 27

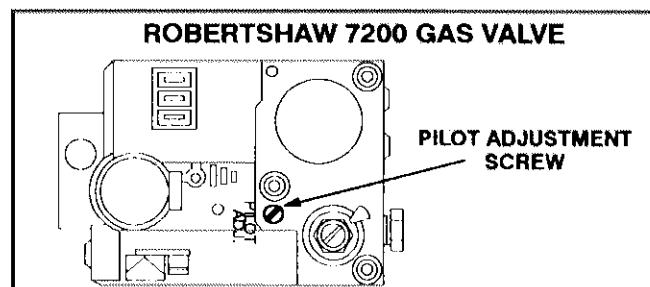


FIGURE 28

Burner Flame

Start burner and allow to operate for a few minutes to establish normal burning conditions. Check burner flame by observation. Flame should be predominantly blue in color, strong in appearance and should rise directly from the burner ports in the heat exchanger. Check to see that flame is burning from all continuous ribbon ports and that flame does not impinge on the sides of the heat exchanger. Refer to figure 29.

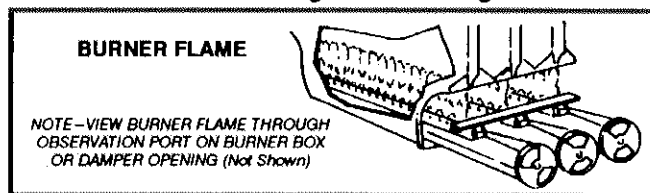


FIGURE 29

CAUTION

Check pilot flame and burner flame periodically to ensure proper operation.

VIII—SERVICE

⚠ WARNING

Disconnect power before servicing unit.

At the beginning of each heating season, the system should be checked as follows:

Blower

Check and clean blower wheel for any debris. Blower motor is prelubricated for extended bearing life. No further lubrication is needed.

Filters

78RGF series units are equipped with permanent internal filters which should be inspected monthly and cleaned when necessary to assure proper furnace operation. See table 5 for filter sizes. Use the following procedure and figure 30 to clean filter.

TABLE 5

MODEL NO.	FILTER SIZE
3-50, 3-75	20 X 10 X 1
4-100	20 X 12 X 1
5-100, 5-125	20 X 14 X 1

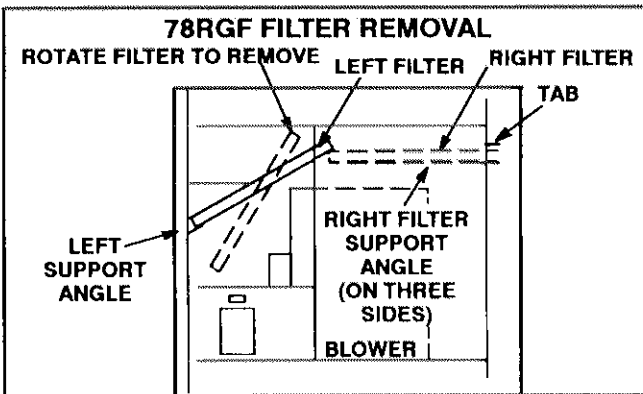


FIGURE 30

- 1— Turn off electric power to furnace.
- 2— Remove upper access panel.
- 3— Remove blower access panel.
- 4— Lift left side filter over left support angle. For easy handling, hold filter at center bottom.
- 5— Rotate filter sideways and pull it through the blower access panel opening.
- 6— Pull the second filter out the same way as the first.
- 7— Wash filters with warm water and mild detergent. When dry, filters should be sprayed with filter handicoater before replacing. Filter Handicoater is RP products coating no. 418 and is available as Lennox part no. P-8-5069.
- 8— Right filter should be under tab of right filter support angle.
- 9— Left filter must rest against top edge of right filter.

⚠ WARNING

Blower door must be securely in place when blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

Flue and Chimney

Check flue pipe, chimney and all connections for tightness and to make sure there is no blockage.

Cleaning Heat Exchanger and Burners

NOTE—Use papers or protective covering in front of furnace while cleaning furnace.

To clean heat exchanger:

- 1— Turn off both electrical and gas power supplies to furnace. Refer to figures 35 and 36 during disassembly and reassembly procedures.
- 2— Remove burner and upper access panel, flue pipe and draft hood.
- 3— Disconnect supply gas piping.
- 4— Remove screws holding burner box damper in place and remove burner box damper assembly and damper prove switch cover.
- 5— Remove screws securing removable burner box top.
- 6— Remove screws holding gas manifold in place and pull burners from heat exchanger.
- 7— Remove baffles inside top opening of heat exchanger by twisting tabs too align with slots in baffles.
- 8— Insert a 2 ft. (600 mm) steel rod that has a 20 in. (508 mm) length of chain attached to one end into top opening of heat exchanger. See figure 31.

CLEANING HEAT EXCHANGER

Connect chain to rod and drop chain down through top of heat exchanger. Connect at bottom to another rod. Move rods up and down, back and forth to clean heat exchanger.

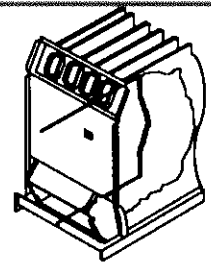


FIGURE 31

- 9— Shake rod to drop chain through the clamshell into burner cavity in bottom of heat exchanger.
- 10— Attach bottom of chain to another 2 ft. (600 mm) rod.
- 11— Push and pull the rods back and forth and up and down with a vigorous motion. The chain will dislodge the soot and scale deposits inside the heat exchanger. Repeat for each clamshell.
- 12— With a shop vacuum or rags, clean out soot and scale deposits from bottom of heat exchanger.

To clean burners:

- 13— Clean top of burner ports with wire brush. See figure 32.
- 14— Clean burner ports by inserting a cleaning tool (made from a piece of sheet metal cut to fit the burner ports) and work in and out of each port. See figure 33.
- 15— Clean inside of each burner with a bottle cleaning brush. See figure 34.

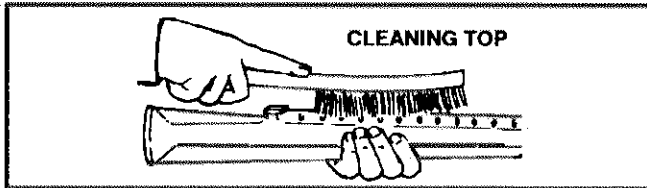


FIGURE 32

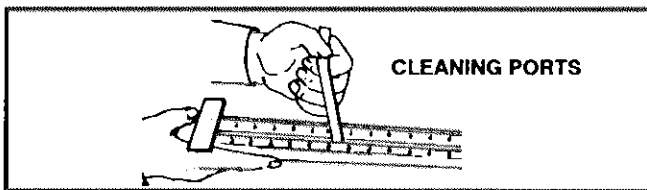


FIGURE 33

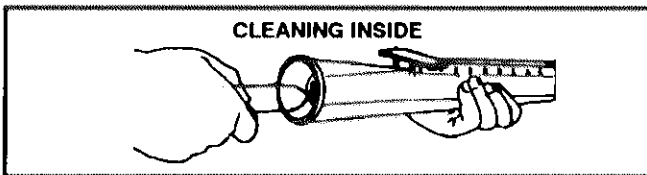


FIGURE 34

- 16— Replace burners making sure to fully engage in rear receiving slot in heat exchanger. Resecure gas manifold and supply piping.
- 17— Reinstall baffles inside top opening of heat exchanger twisting tabs to secure baffles.
- 18— Resecure damper assembly, damper prove switch cover and burner box top. Carefully open damper by hand to ensure that the damper spring closes damper correctly and that the damper prove switch is engaged when damper is open.

⚠ CAUTION

Use extreme care when opening damper door to prevent permanent damage to the damper motor.

- 19— Before replacing draft hood, flue pipe and access panels, inspect draft hood gasket. Replace if necessary.
- 20— Carefully check all piping connections (factory and field) for gas leaks. Use a leak detecting solution or other preferred means.
- 21— Turn on gas and electrical supply.

⚠ CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

IX—REPAIR PARTS LIST

The following repair parts are available through independent Lennox dealers. When ordering parts, include the complete furnace model number listed on the A.G.A. or C.G.A. rating plate — Example: 78RGF5—125.

CABINET PARTS

Upper and lower access panels
Top strip
Control box cover

ELECTRICAL PARTS

Transformer
Blower Control Center (BCC2)
Door Interlock Switch

BLOWER PARTS

Blower wheel
Motor
Motor mounting frame
Blower housing cut-off plate
Motor capacitor

HEATING PARTS

Heat exchanger
Draft hood
Main burners
Main burner orifices
Pilot burner
Gas manifold
Gas valve
Flame sensor
Ignition control
Ignition cable
Igniter
Vent pipe extension Pilot Mounting bracket
Pilot orifice
Main burner with pilot mount
Flue baffles
Pilot/electrode assembly
Safety Limit control
Safety Flame roll-out switch
Blocked vent shut-off switch
Damper motor
Damper switch
Couplings
Damper spring
Grommets

78RGF PARTS IDENTIFICATION

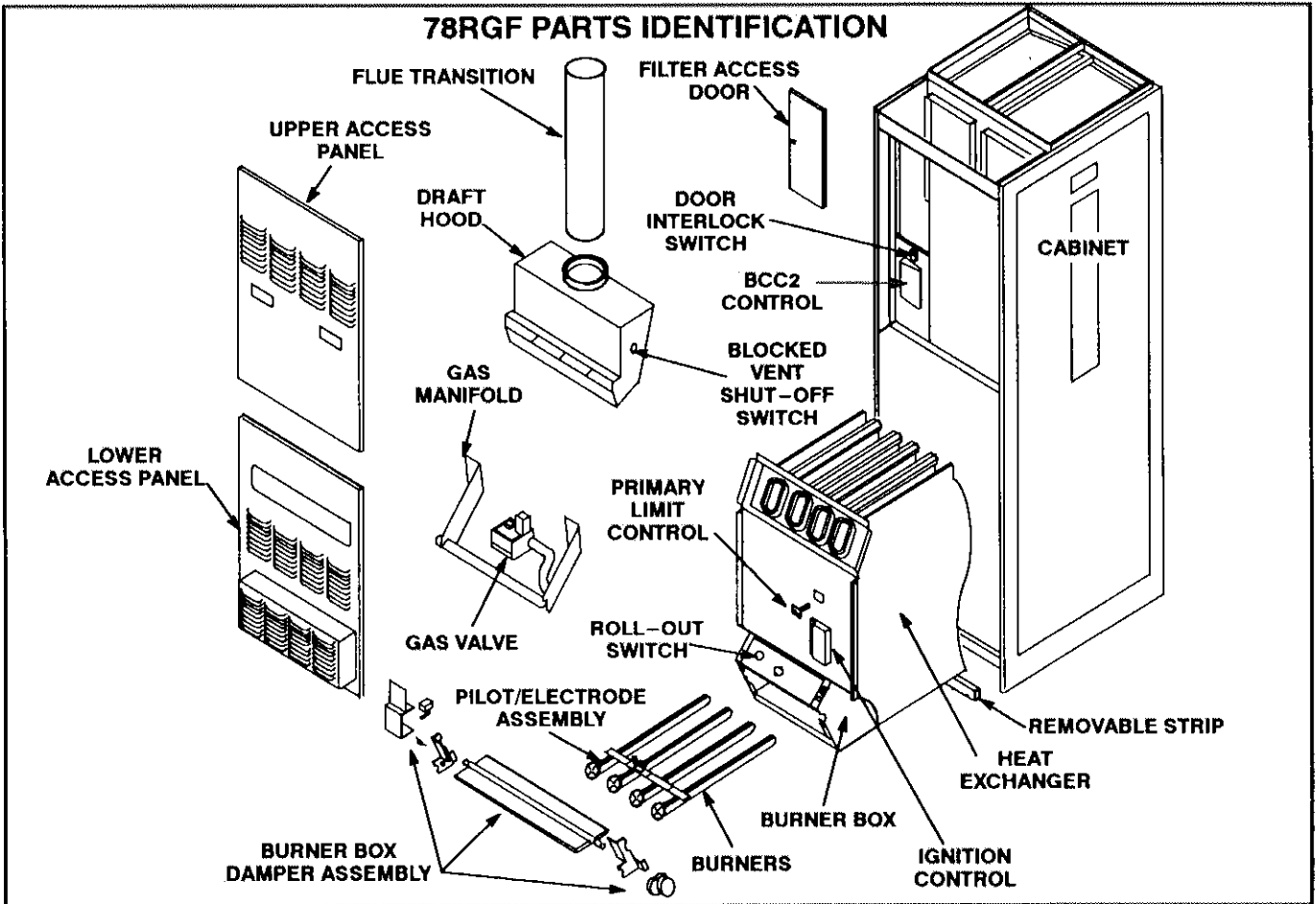


FIGURE 35

DAMPER BOX PARTS ARRANGEMENT (78RGF Units Shown)

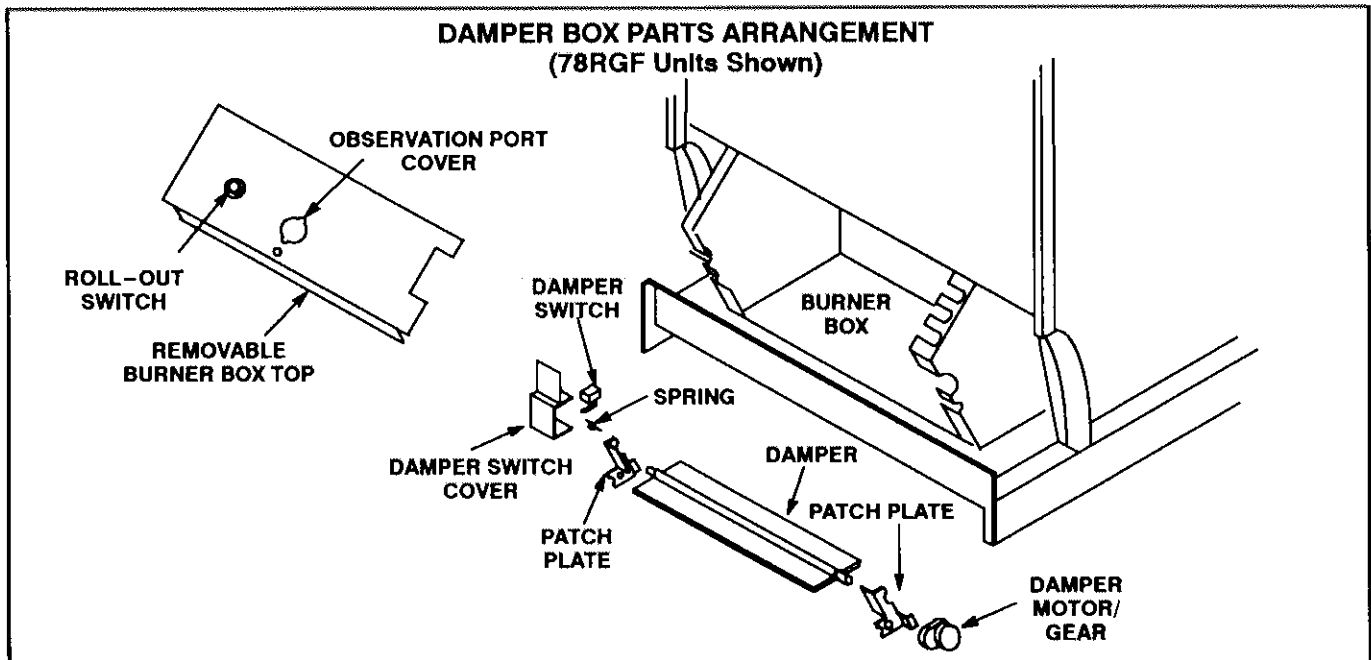


FIGURE 36

BCC2 TROUBLESHOOTING FLOWCHART

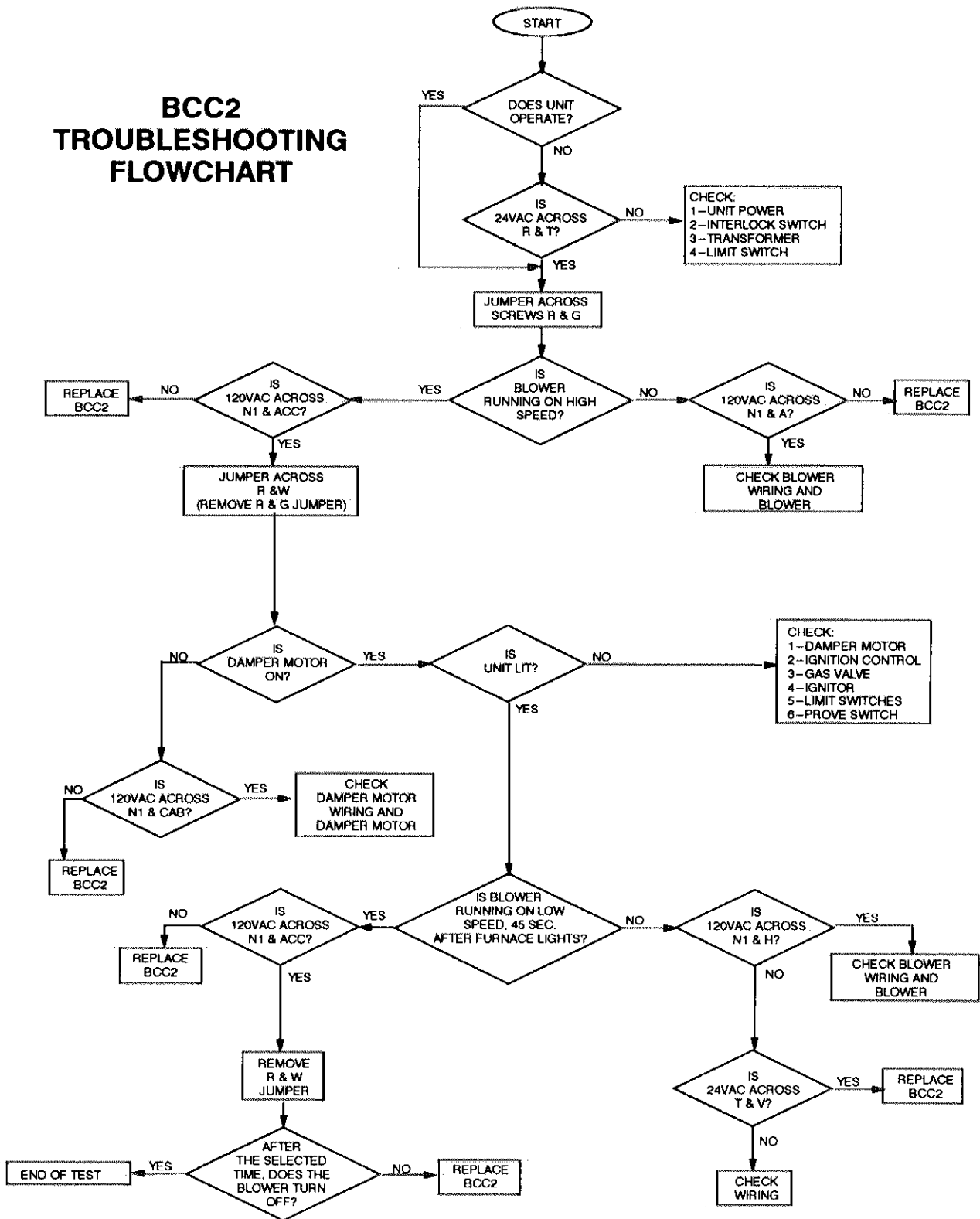


FIGURE 37