

# installation operation and service instructions

## GCS16-2553/2753/3003 Units

ROOFTOP UNITS  
Slab Condensing Coil  
502,872M  
2/93  
Supersedes 502,797M

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.



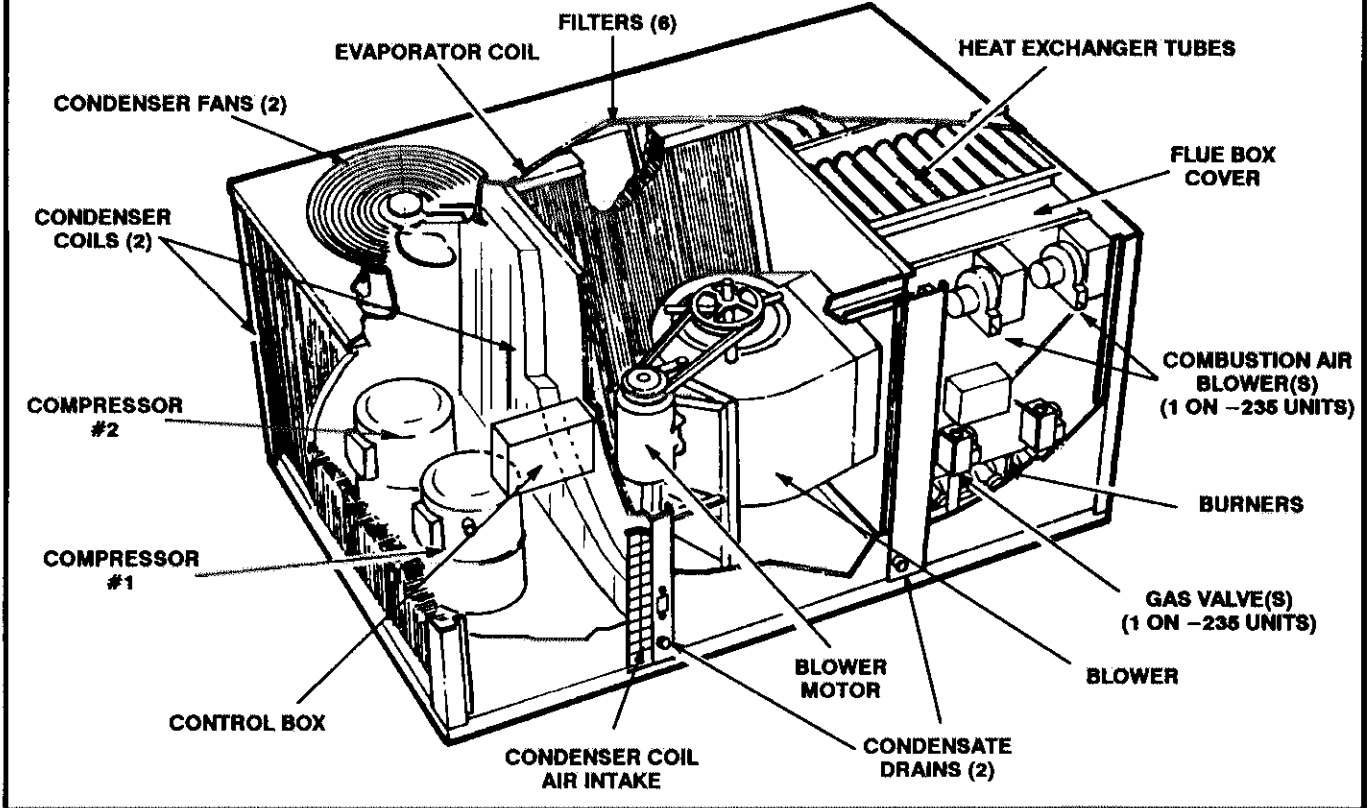
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

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

### WHAT TO DO IF YOU SMELL GAS:

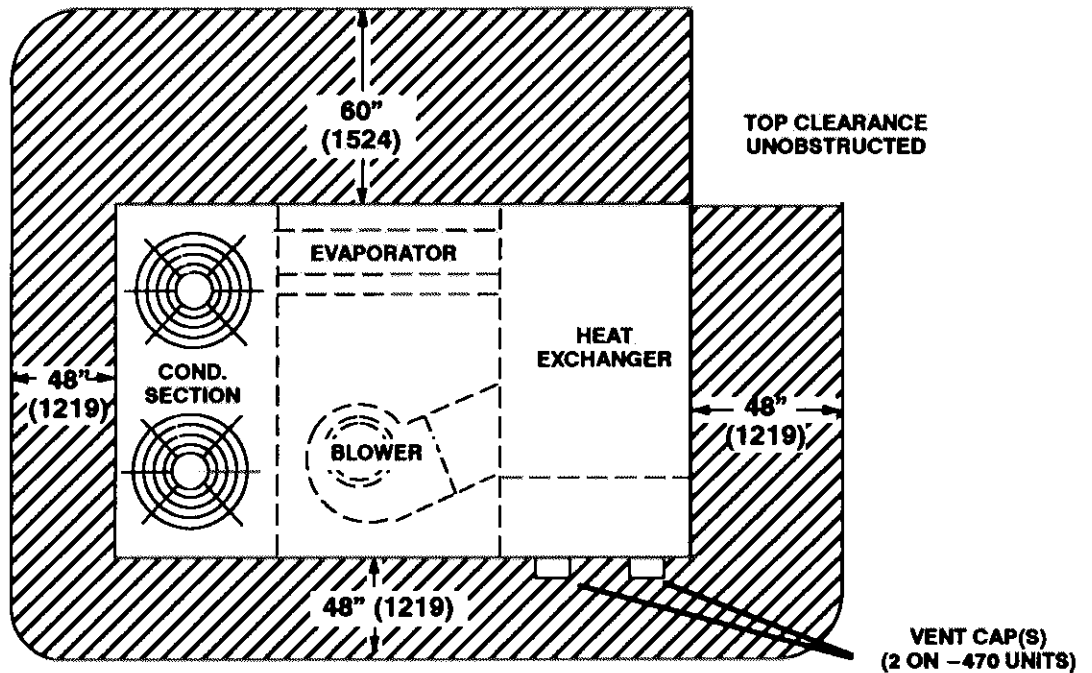
- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

**GCS16-2553/2753/3003 PARTS ARRANGEMENT  
(GCS16-2553-470 Shown)**



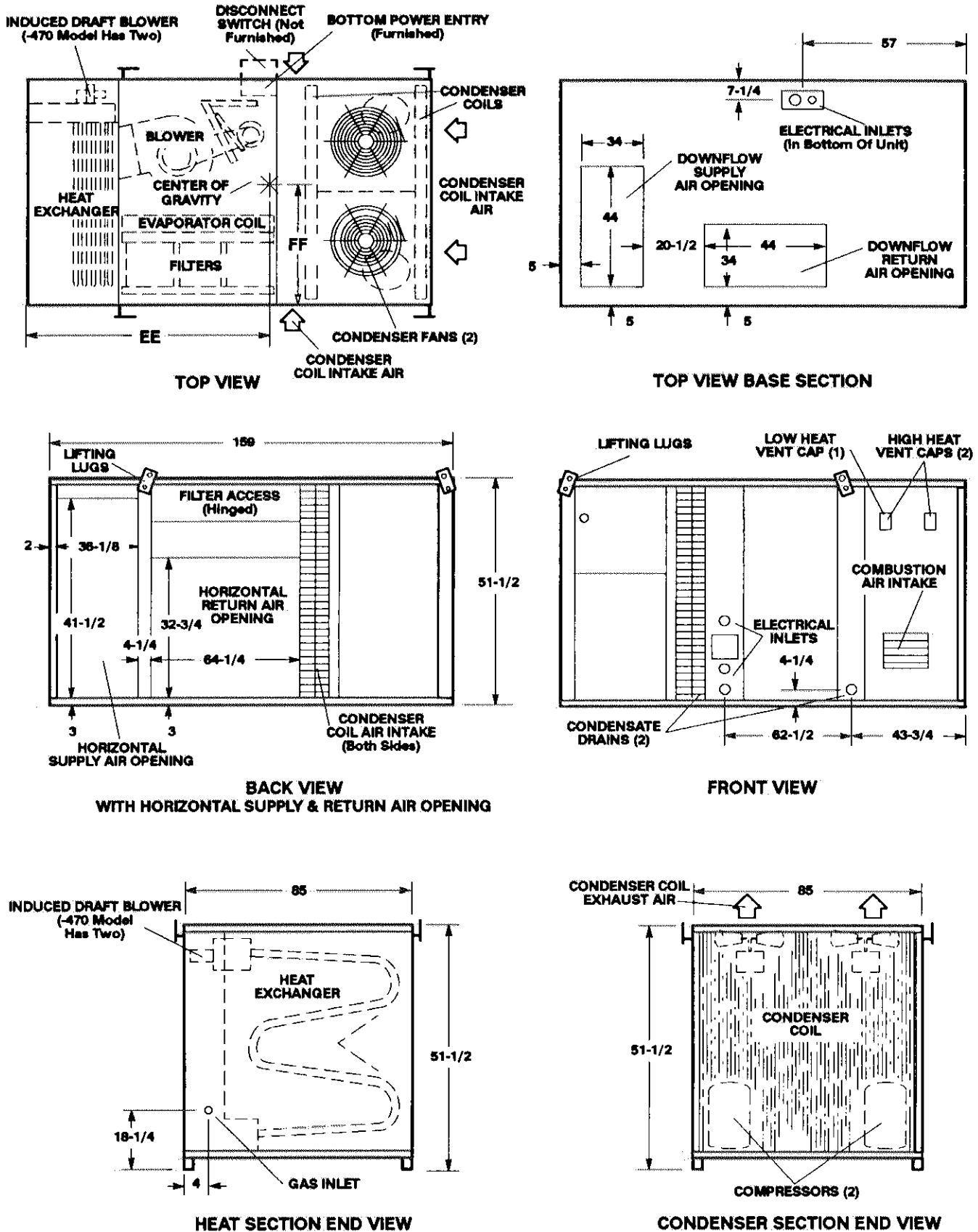
**FIGURE 1**

**SERVICE CLEARANCES GCS16-2553/2753/3003 - In. (mm)**



**FIGURE 2**

**GCS16-2553, 2753 & 3003 UNIT DIMENSIONS - In. (-235 Shown)**



**FIGURE 3**

## I—SHIPPING AND PACKING LIST

### Package 1 of 1 contains:

1— Assembled unit

## II—SHIPPING DAMAGE

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

## III—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.

See figure 1 for parts arrangement, figure 2 for service clearances and figure 3 for unit dimensions.

## IV—REQUIREMENTS

### **IMPORTANT**

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

The GCS16 unit is American Gas Association (A.G.A.) certified for outdoor installations only at the clearances to combustible materials listed on unit nameplate and in figure 2.

GCS16 unit may be installed on wood flooring or on class A, class B, or class C roof covering material with horizontal discharge. GCS16 unit with horizontal or bottom discharge may be installed on non-combustible flooring without a roof mounting frame.

GCS16 unit may be installed on wood flooring, class A, class B, or class C roofing material with bottom discharge when installed on a roof mounting frame RMF16.

Adequate clearance shall be provided around air openings into vestibule area. Provisions shall be made for proper operation and for combustion and ventilation air supply. GCS16 unit vent system must be installed as received and no alterations or adjustments should be made (See section VII). Unit must be adjusted within the temperature rise range listed on the unit nameplate. When installed, the unit must be electrically wired and grounded in accordance with local codes or, in the absence of local codes, with the current National Electric Code, ANSI/NFPA 70.

The current American National Standard (ANSI—Z233.1) National fuel Gas Code is Available from:

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

The current National Electric Code (ANSI/NFPA 70) is available from:

National Fire Protection Association  
470 Atlantic Avenue  
Boston, MA 02210

The GCS16 unit is Canadian Gas Association (C.G.A.) certified combination heating/cooling for outdoor installations and non-residential use only at the clearances to combustible materials as listed on the unit nameplate and in figure 2.

Installation of C.G.A. certified units must conform with current standard CAN/CGA1—B149.1 "Installation Code for Natural Gas Burning Appliances and Equipment" or, CAN/CGA1—B149.2 "Installation Code for Propane Gas Burning Appliances and Equipment," and applicable local codes. Authorities having jurisdiction should be consulted before installation. Adequate clearance shall be provided around air openings into the vestibule area. Provisions shall be made for proper operation and for combustion air and ventilation air supply. GCS16 unit vent system must be installed as received and no alterations or adjustments should be made (See section VII). Unit must be adjusted for the temperature rise range listed on unit nameplate.

The unit must be wired and electrically grounded in accordance with local codes or, in the absence of local codes, current C.S.A. Standard C22.1 Canadian Electrical Code Part 1. Installation of combination heating/cooling units (GCS16) must also conform with current C.S.A. Standard B52 "Mechanical Refrigeration Code."

*NOTE—The efficiency rating of this furnace is a product thermal efficiency rating determined under continuous operating conditions independent of any installed system.*

### **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

## V—UNIT SUPPORT

### A—Roof Mounting with Lennox RMF16 – Downflow Discharge Application

- 1— The RMF16 roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2— The RMF16 roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3— Duct must be attached to the roof mounting frame and not to the GCS16 unit: Supply and return plenums must be installed before setting the unit.

### B—Roof Mounting with Installer's Frame – Downflow Applications

Many types of roof frames can be used to mount the GCS16 unit, depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 1— The GCS16 base is fully enclosed and insulated, so an enclosed frame is not required.
- 2— The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3— Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended frame height is 14" (356mm).
- 4— Duct must be attached to the roof mounting frame and not to the GCS16 unit: Supply and return plenums must be installed before setting the unit.
- 5— Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

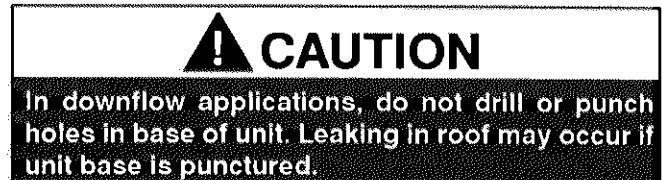
*NOTE—When installing a GCS16 unit on a combustible surface for downflow discharge applications, the Lennox RMF16 roof mounting frame is required.*

### C—Horizontal Discharge Applications

- 1— Specified installation clearances must be maintained when mounting GCS16 units. Refer to figure 2.
- 2— Top of support slab should be at least 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 3— Horizontal discharge kit (LB-55756BE) is required when GCS16-2553/2753/3003 units are installed in horizontal discharge applications.
- 4— Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

## VI—DUCT CONNECTION

All exterior ducts, joints, openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.



## VII—INSTALL VENT CAP

Install vent cap(s) (shipped in vestibule area) using three screws provided. See figure 4.

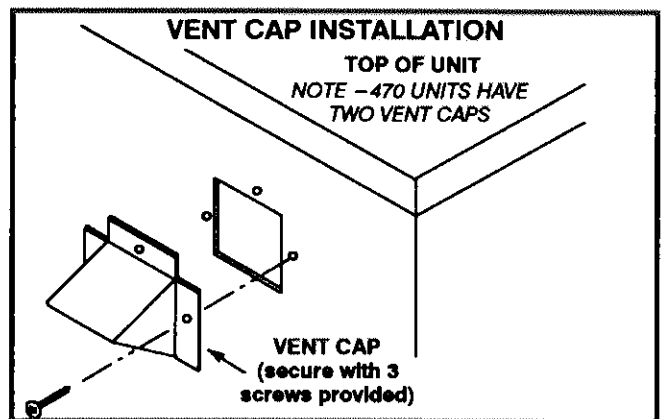


FIGURE 4

## VIII—CONDENSATE DRAINS

Make drain connection to the 1" N.P.T. drain nipple provided on unit. A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 5. It is sometimes acceptable to drain condensate onto the roof or grade; however, an elbow should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to figure 1 and 3 for condensate drain location.

*NOTE—Units are supplied with dual condensate drains. If only one drain is used, the unused drain line must be capped.*

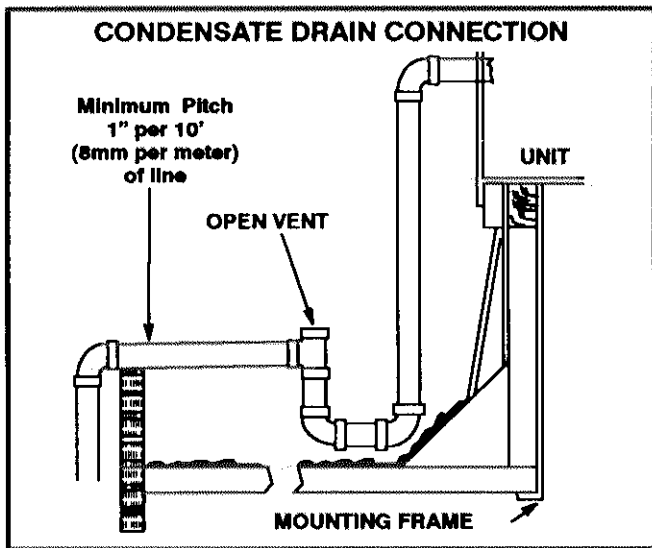


FIGURE 5

### IX—CONNECT GAS PIPING

Before connecting piping, check with gas company or authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5" w.c. (125Pa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. Gas pipe connection for low heat is 3/4" pipe and for high heat pipe connection is 1" (25.4mm) pipe. For natural gas units, operating pressure at the unit gas connection must be a minimum of 5.5" w.c. (1.37Pa) and a maximum of 13.5" w.c. (3.36Pa). For LP gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.73Pa) and a maximum of 13.5" w.c. (3.36Pa).

When making piping connections a drip leg should be installed on vertical pipe runs to serve as a trap for sediment or condensate. A 1/8" N.P.T. plugged tap in field piping accessible for test gauge connection must be provided upstream of gas supply connection to the unit. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 6. Compounds used on threaded joints of gas piping shall be resistant to the action of liquified petroleum gases.

### X—PRESSURE TEST GAS PIPING

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14" w.c. or 3.5kPa). See figure 7.

If the test pressure is equal to or less than 0.5 psig (14" w.c. or 3.5kPa), close the main manual shut-off valve before pressure testing to isolate the furnace from the gas supply system.

*NOTE—Codes may require that manual main shut-off valve and union (furnished by installer) be installed in gas line external to unit. Union must be of the ground joint type.*

After all connections have been made, check all piping connections for gas leaks. Use a soap solution or other preferred means. Do not use matches candles or other sources of ignition to check for gas leaks.

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

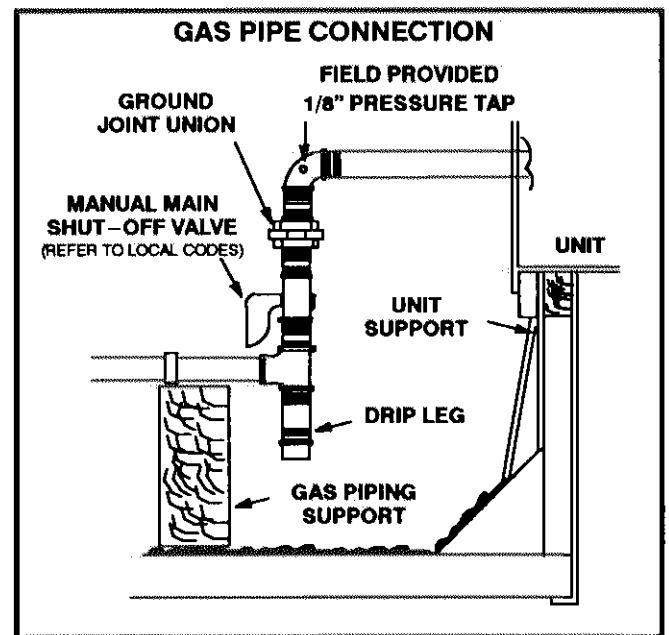


FIGURE 6

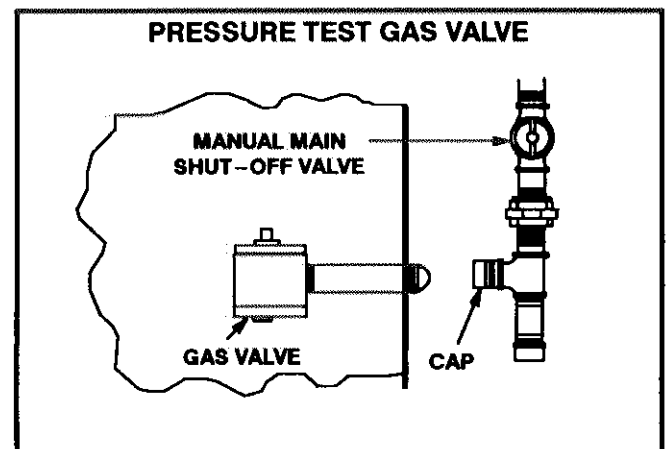


FIGURE 7

## **XI—ELECTRICAL CONNECTIONS —POWER SUPPLY**

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1— All units are factory wired. For 208V supply, disconnect the orange wire (230V) at control power transformers (T1, T12 and T18). Reconnect the red wire (208V). Tape the exposed end of the 230V orange wire.
- 2— The unit is provided with power entry knockouts through the base and the blower section mullion (see figure 3).
- 3— Remove necessary electrical knockouts in unit. It may be necessary to punch larger holes for power wiring (refer to current NEC requirements).
- 4— Install adequate disconnect switch external to unit in accordance with local or national codes as applicable.

## **XII-ELECTRICAL CONNECTIONS-CONTROL WIRING**

### **A—Thermostat Location**

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1.5m) above above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

### **B—Control Wiring**

- 1— Route thermostat cable or wires from subbase through knockout provided in unit. See figures 8, 9, 10, and wiring diagram on unit. For thermostat wire runs up to 60 feet (18 m), use 18 gauge wire. For 60 (18 m) to 90 (27m) foot runs, use 16 gauge wire.
- 2— Install thermostat assembly in accordance with instructions provided with thermostat.

*IMPORTANT—Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.*

### **C—Cycle Control**

The factory-installed cycle control shown in figure 11 is used with electro-mechanical thermostats only. Some solid state control systems and thermostats have built-in delays to prevent compressor short cycling. When these systems are used, the standard cycle control in the unit is removed. The field-installed control or thermostat should provide a minimum one minute "on" delay and a minimum four minute "run" time. Remove cycle control kit as follows:

- 1— Disconnect cycle control jack J17 from unit plug P16 and cycle control plug P17 from unit jack J16.
- 2— Connect unit plug P16 to unit jack J16 unless a temperature control system is used. When a temperature control system is used the control module is inserted between J16/P16 (where the cycle control was located).

*NOTE — Wiring diagrams affixed to the panel during cold outdoor temperatures may require additional adhesive to hold in place.*

*IMPORTANT — Follow instructions furnished with the control for proper jack/plug connections. Failure to do so could result in control damage.*

# TYPICAL GCS/CHA16-2553/2753/3003 UNIT DIAGRAM

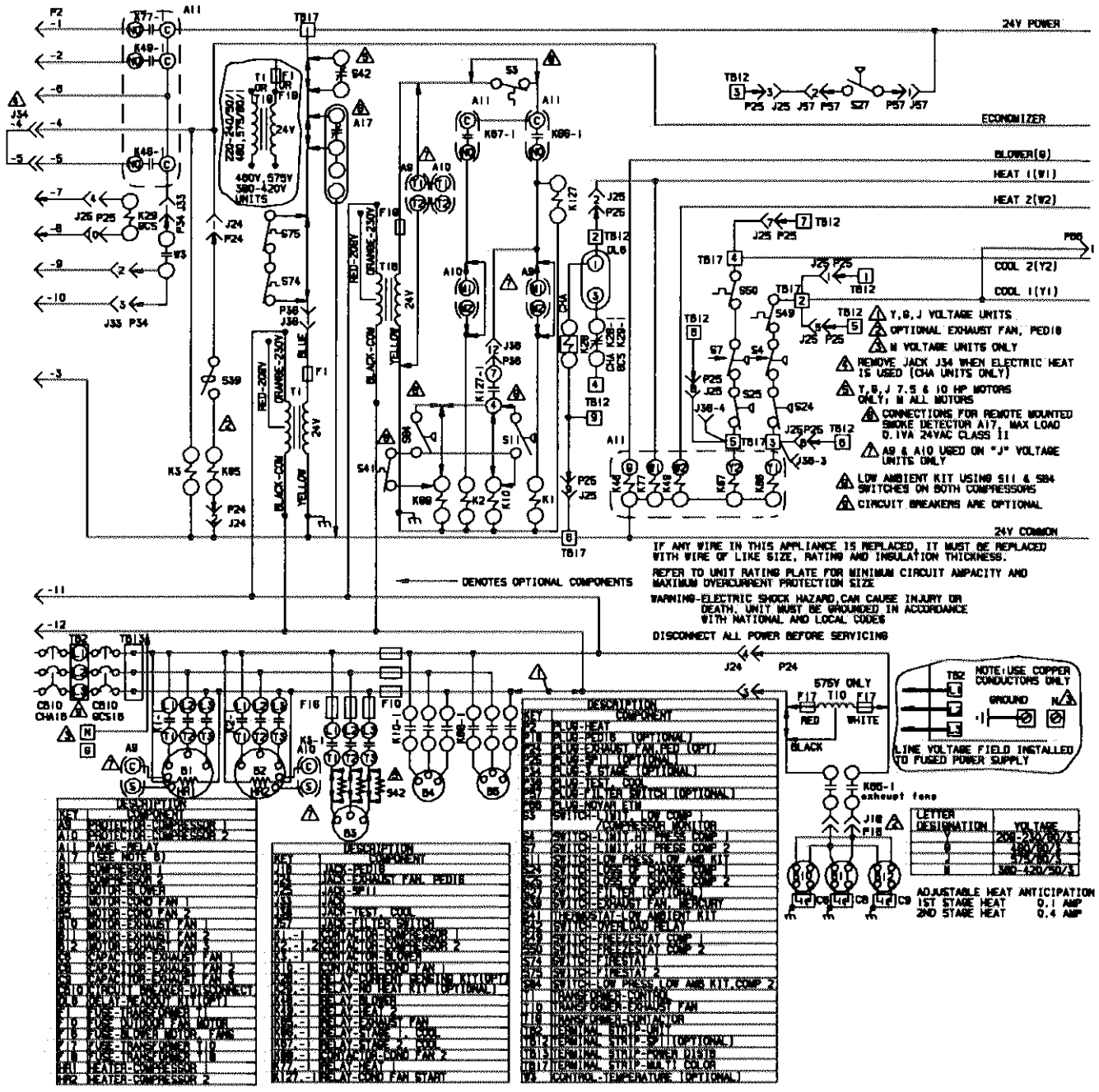
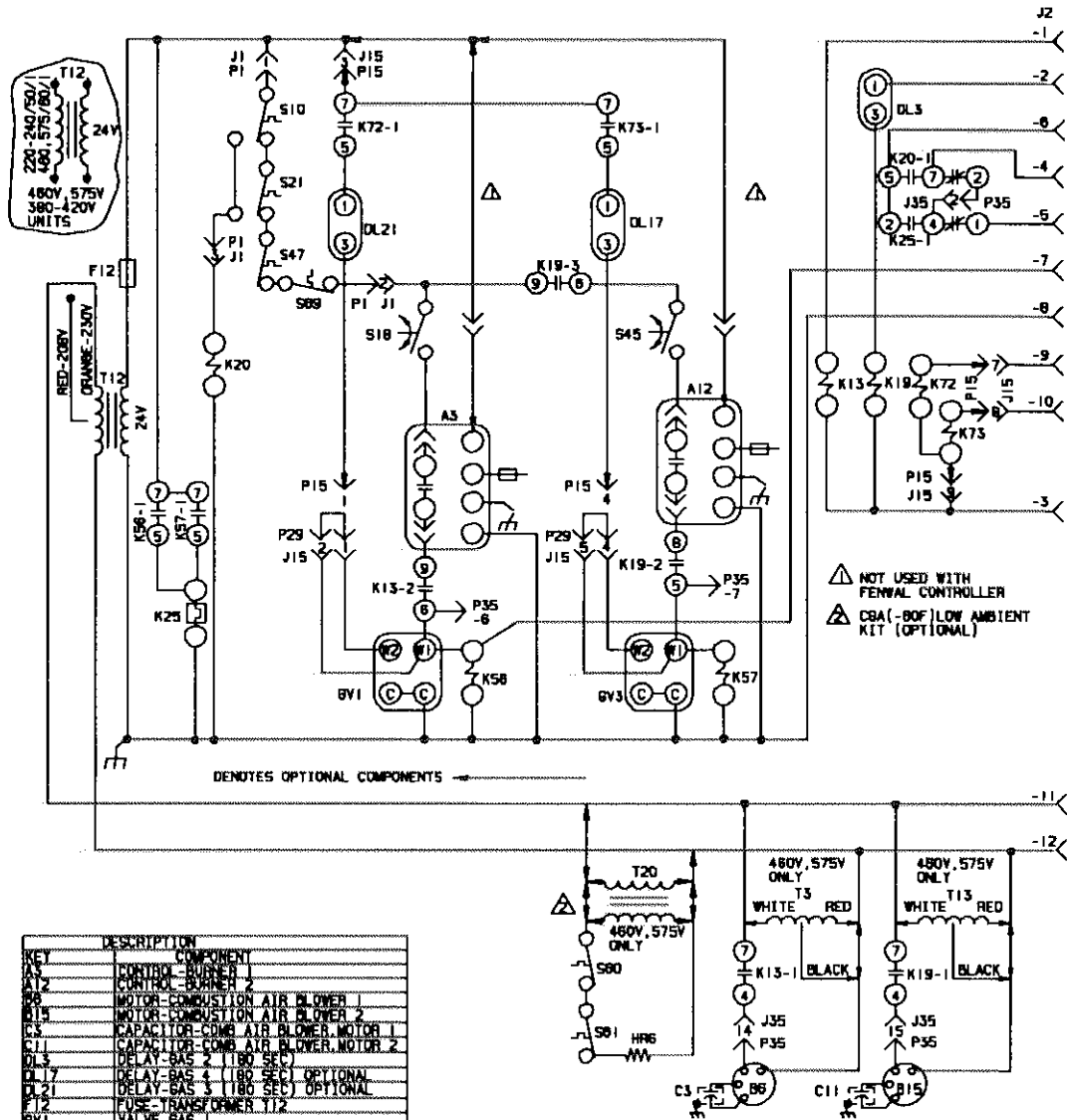


FIGURE 8



# TYPICAL GCS16-2553, 2753 & 3003 TWO-STAGE GAS HEAT WIRING DIAGRAM



KEY	DESCRIPTION	COMPONENT
K1	CONTROL BURNER 1	
K2	CONTROL BURNER 2	
A3	MOTOR-COMBUSTION AIR BLOWER 1	
A12	MOTOR-COMBUSTION AIR BLOWER 2	
C1	CAPACITOR-COMB AIR BLOWER MOTOR 1	
C2	CAPACITOR-COMB AIR BLOWER MOTOR 2	
DL3	DELAY-BAS 2 (180 SEC)	
DL7	DELAY-BAS 4 (180 SEC) OPTIONAL	
DL21	DELAY-BAS 3 (180 SEC) OPTIONAL	
T12	TRANSFORMER-T12	
GV1	VALVE-GAS 1	
GV2	VALVE-GAS 2	
GV3	VALVE-GAS 3	
P15	HEATER -60 LOW AMBIENT CONTROL	
J1	JACK-GAS LIMIT	
J2	JACK-UNIT	
J15	JACK-GAS	
K19-1	JACK-TEST HEAT	
K19-1,2	RELAY-COMBUSTION AIR BLOWER	
K19-1,2,3	RELAY-STAGE 2, HEAT	
K20-1	RELAY-LIMIT BLOWER	
K25-1	RELAY-BLOWER DELAY	
K25-1	RELAY-HEAT BLOWER 1	
K25-1	RELAY-HEAT BLOWER 2	
K25-1	RELAY-GAS 3 OPTIONAL	
K25-1	RELAY-GAS 4 OPTIONAL	
P1	PLUG-GAS LIMIT	
P15	PLUG-BAS 3	
P29	PLUG-TEST HEAT	
P35	PLUG-TEST HEAT PRIMARY GAS	
S10	SWITCH-LIMIT BLOWER	
S21	SWITCH-COMB AIR BLOWER PROVE	
S47	SWITCH-LIMIT SEP GAS HEAT	
S48	SWITCH-LIMIT COMB AIR BWR PROVE 1	
S49	SWITCH-LIMIT COMB AIR BWR PROVE 2	
S47	SWITCH-FLAME BLOWOFF BURNER	

KEY	DESCRIPTION	COMPONENT
S50	THERMISTAT -10 CL -20 DP -60 LOW AMB KIT	
S51	THERMISTAT -75 DP -80 LOW AMB KIT	
S59	SWITCH-FLAME BLOW OUT 2	
T13	TRANSFORMER-COMB AIR BLOWER 1	
T12	TRANSFORMER-GAS CONTROL	
T13	TRANSFORMER-COMB AIR BLOWER 2	
T20	TRANSFORMER-LOW AMBIENT KIT	

**LENNOX** Combustion Inc. WIRING DIAGRAM  
**COMBINATION UNIT-ROOFTOP**  
 GAS HEAT FOR  
 GCS16-2553, 2753, 3003  
 HEATING SECTION-A9

FIGURE 9

# TYPICAL GCS16-2553, 2753 & 3003 SINGLE-STAGE GAS HEAT WIRING DIAGRAM

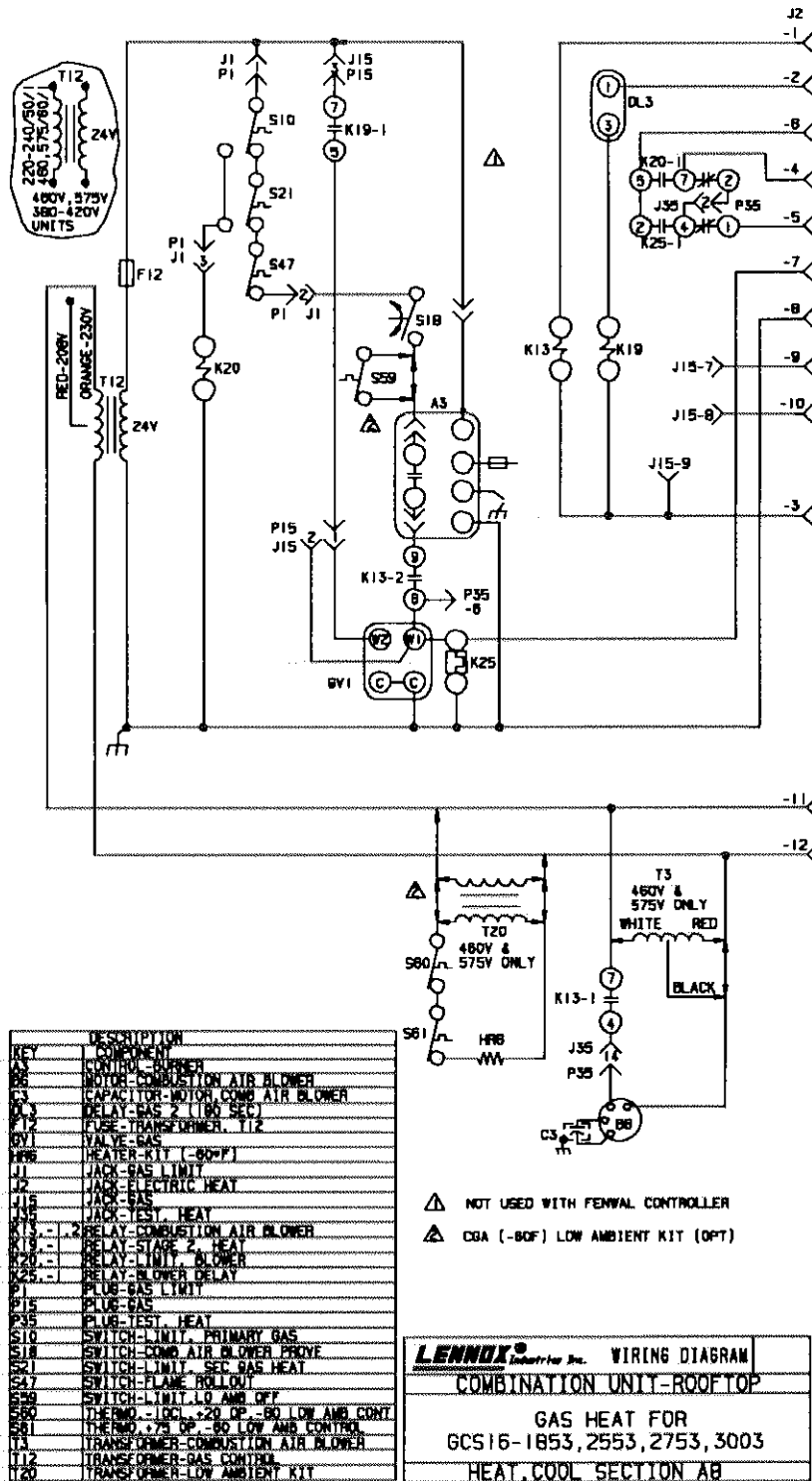


FIGURE 10

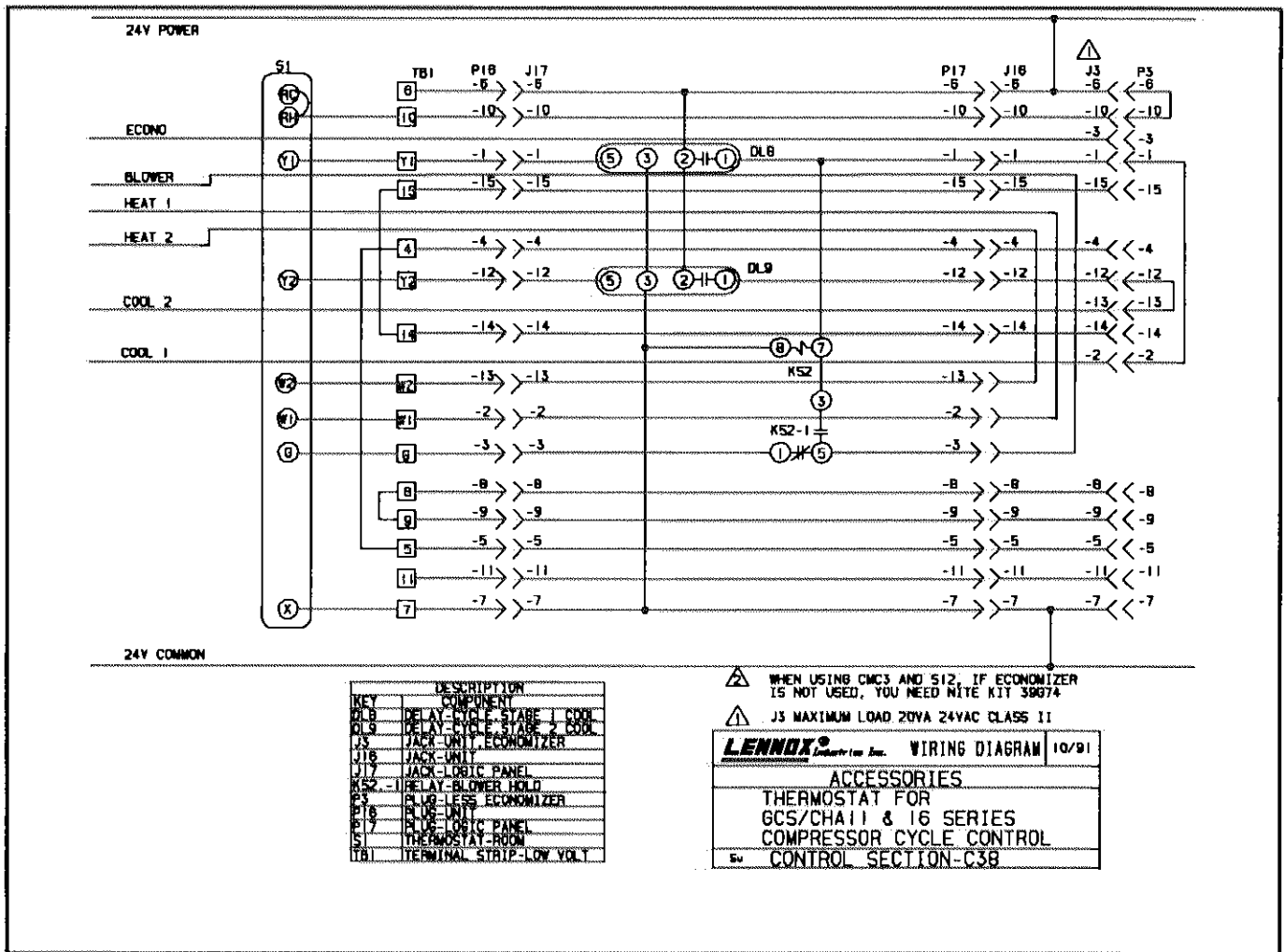


FIGURE 11

## START-UP — OPERATION — ADJUSTMENTS

### I-COOLING START-UP

**IMPORTANT**—The crankcase heaters must be energized for 24 hours before attempting to start compressors. Set thermostat levers so there is no demand to prevent compressors from cycling. Apply power to unit.

#### A—Preliminary Checks

- 1— Make sure that unit is installed in accordance with the installation instructions and applicable codes.
- 2— Inspect all electrical wiring, both field and factory installed, for loose connections. Tighten as required.
- 3— Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.
- 4— Check voltage at disconnect switch. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.
- 5— Refer to unit diagram located on inside of unit control box cover and figures 8 and 9 for unit wiring.

6— Adjust blower belt (See section C—Blower Belt Adjustment).


7— Make sure filter is in place before start-up.


#### B—Start-Up


- 1— Set fan switch to AUTO or ON and move system selection switch to cool. Adjust thermostat to a setting below room temperature to bring on all compressors. Compressors will start and cycle on demand from thermostat.
- 2— Each refrigerant circuit is separately charged with R-22 refrigerant. See unit rating plate for correct amount of charge.
- 3— Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

## II—HEATING START—UP

FOR YOUR SAFETY READ BEFORE LIGHTING

<b>! WARNING</b>	
	Danger of explosion. Can cause injury or product or property damage. 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.

<b>! WARNING</b>	
	Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power

<b>! WARNING</b>	
	Electric shock hazard. Can cause injury or death. Do not use this furnace if any part has been under water. 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.

### LIGHTING INFORMATION AND OPERATION

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.

<b>! WARNING</b>	
	Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

### Unit Operation

This unit is equipped with an automatic spark ignition system. There is no pilot. In case of safety shutdown, move thermostat system switch to OFF and return the thermostat switch to HEAT.

### A—Placing Unit In Operation:

<b>! WARNING</b>	
	Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.

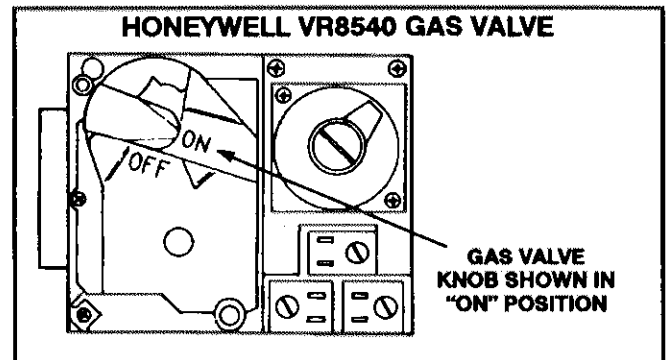





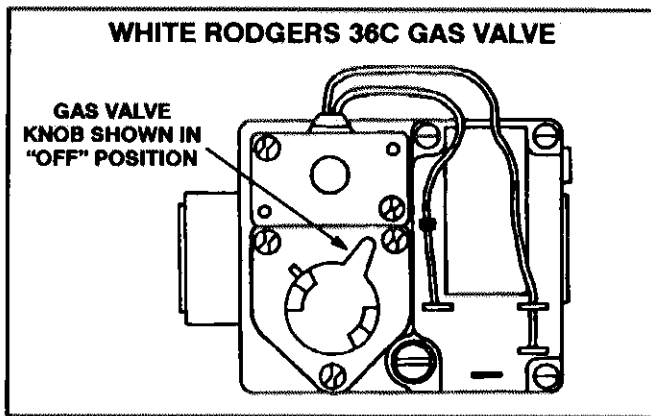
FIGURE 11

### Gas Valve Operation for Honeywell VR8540 Series Gas Valve (Figure 11)

- 1— Set thermostat to lowest setting.
- 2— Turn off all electrical power to appliance.
- 3— This appliance is equipped with an ignition device which automatically lights burner. Do not try to light burner by hand.
- 4— Remove heat section access panel.
- 5— Turn knob(s) on gas valve(s) clockwise  until it stops and release. Knob(s) will pop up.



*NOTE* — GCS16—2553/2753/3003—470 units are equipped with two gas valves.

- 6— Wait five 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.
- 7— Turn knob(s) on gas valve(s) counterclockwise  until it stops. Depress knob(s) and turn counterclockwise  to ON. Knob(s) will remain depressed.
- 8— Replace heat section access panel.
- 9— Turn on electrical power to unit.
- 10— Set thermostat to desired setting.
- 11— The combustion air blower will start. The burners will light within 40 seconds.
- 12— If unit does not light first time (gas line not fully purged) it will attempt up to two more ignitions before locking out.
- 13— If lockout occurs, repeat steps 1 through 10.
- 14— If appliance still will not operate, follow the instructions "To Turn Off Gas to Unit" and call your service technician or gas supplier.




**FIGURE 12**



**Gas Valve Operation for White Rodgers 36C Series Gas Valve (Figure 12)**


- 1 – Set thermostat to lowest setting.
- 2 – Turn off all electrical power to appliance.
- 3 – This appliance is equipped with an ignition device which automatically lights burner. Do not try to light burner by hand.
- 4 – Remove heat access panel.
- 5 – Turn knob(s) on gas valve(s) clockwise  until it stops. Depress knob(s) and turn clockwise  to OFF.

*NOTE – GCS16 – 2553/2753/3003 – 470 units are equipped with two gas valves.*

- 6 – Wait five 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.
- 7 – Turn knob(s) on gas valve(s) counterclockwise  until it stops. Allow knob(s) to pop up and continue to ON position.
- 8 – Replace heat section access panel.
- 9 – Turn on electrical power to unit.
- 10 – Set thermostat to desired setting.
- 11 – The combustion air blower will start. The burners will light within 40 seconds.
- 12 – If unit does not light first time (gas line not fully purged) it will attempt up to two more ignitions before locking out.
- 13 – If lockout occurs, repeat steps 1 through 10.
- 14 – If appliance still will not operate, follow the instructions "To Turn Off Gas to Unit" and call your service technician or gas supplier.

**B – To Turn Off Gas To Unit**

- 1 – Set thermostat to lowest setting.
- 2 – Turn off all electrical power and gas supply to unit if service is to be performed.
- 3 – Remove heat section access panel.
- 4 – Turn knob(s) on gas valve(s) clockwise  until it stops. Depress knob(s) and turn clockwise  to OFF.

*NOTE – Honeywell VR8540 series valves – Turn knob(s) on gas valve(s) clockwise  to OFF and release. Knob(s) will pop up.*

- 5 – Replace heat section access panel.

### III—BLOWER OPERATION AND ADJUSTMENTS

#### A—Blower Operation

- 1— Blower operation is manually set at the thermostat subbase fan switch. With fan switch in ON position, blowers will operate continuously.
- 2— With fan switch in AUTO position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in OFF position.

#### B—Determining Unit Air Volume

- 1— The following measurements must be made with a dry indoor coil. Run blower without a cooling demand. Air filters must be in place when measurements are taken.
- 2— Measure static pressure external to unit (from supply to return).
- 3— Measure the indoor blower wheel RPM.
- 4— Refer to unit nameplate to determine the blower motor horse power.
- 5— Referring to tables 2 and 3, use the static pressure and RPM readings to determine unit air volume.
- 6— The air volume can be adjusted at the motor pulley (see section C—Blower Belt Adjustment).

#### Determining Unit Air Volume (Alternative Method)

Air volume may also be determined by measuring pressure drop across the indoor coil.

- 1— Remove lifting lug bolt located on the blower side of unit above condensate drain. Use an awl or screw driver to open a hole in the insulation.
- 2— Insert the negative or low pressure hose of draft gauge 1 inch (25.4mm) past the insulation.
- 3— Remove filter access panel and insert other hose through hole provided on the left rear panel above filter and connect to positive or high pressure side of draft gauge.

4— Turn on blower and compare draft gauge reading to table 1.

5— Adjust blower speed as required (see section C—Blower Belt Adjustment).

**TABLE 1  
DRAFT GAUGE READINGS**

AIR VOLUME (CFM)	DRY COIL IN. WATER	*WET COIL IN. WATER
6000	.19	.24
7000	.20	.30
8000	.25	.38
9000	.32	.45
10000	.38	.52
11000	.43	.60
12000	.48	.68

*NOTE—These are pressure drops across the indoor coil and not total system resistance.*

\* All cooling stages must be in operation.

#### C—Blower Belt Adjustment

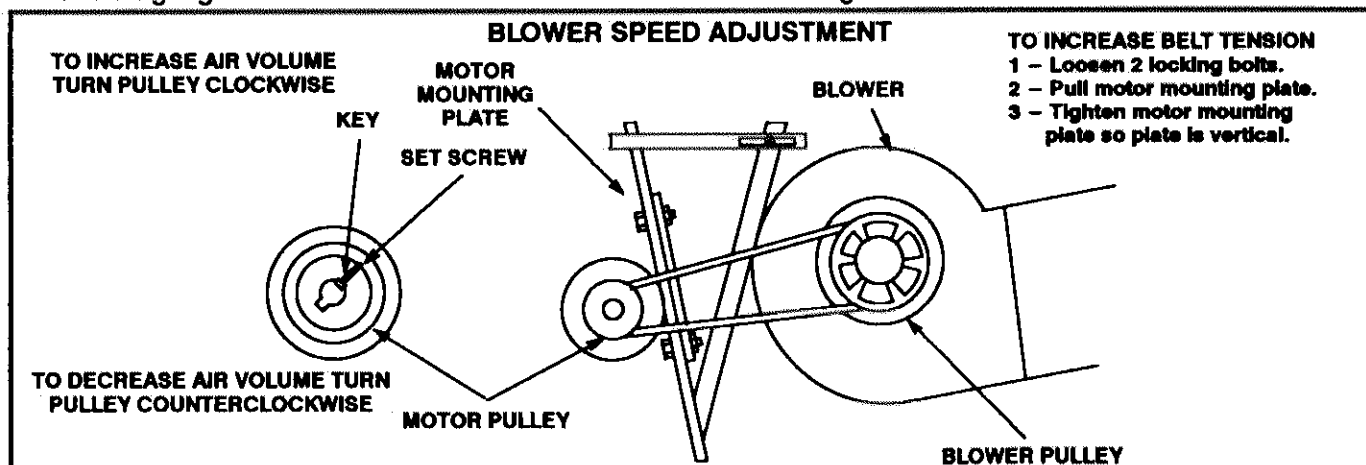
Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained.

*Important—Tension new belt after a 24–48 hour period of operation. This will allow belts to stretch and seat grooves. To increase belt tension, loosen 2 locking bolts and pull mounting plate. Tighten motor mounting plate in vertical position.*

#### Adjusting Unit Air Volume

The air volume can be changed by using the following procedure.

- 1— Remove the blower belts.
- 2— Loosen the set screws on motor pulley and remove key as shown in figure 13.
- 3— Turn pulley clockwise to increase air volume and counterclockwise to decrease air volume. One half turn changes blower speed approximately 20 RPM.  
*NOTE—The pulley is factory set at 3 turns open.*
- 4— Replace the key and tighten the set screw. Replace and tighten the blower belts.



**FIGURE 13**

**TABLE 2  
GCS16-2553-235 & GCS16-2753-235 BLOWER PERFORMANCE**

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																											
	.30		.40		.50		.60		.70		.80		.90		1.00		1.10		1.20		1.30		1.40		1.50			
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6000	445	1.45	470	1.60	490	1.70	515	1.85	540	2.05	560	2.15	585	2.35	605	2.50	625	2.65	645	2.80	665	2.95	685	3.15	700	3.25	710	3.50
6250	455	1.55	480	1.75	500	1.85	525	2.05	550	2.20	570	2.35	595	2.55	615	2.70	635	2.85	655	3.05	670	3.15	690	3.35	710	3.50	710	3.50
6500	465	1.70	490	1.90	510	2.00	535	2.20	560	2.40	580	2.55	600	2.70	620	2.85	640	3.05	660	3.20	680	3.40	700	3.60	715	3.70	715	3.70
6750	475	1.85	500	2.05	520	2.20	545	2.40	570	2.60	590	2.75	610	2.90	630	3.10	650	3.25	670	3.45	685	3.60	705	3.80	725	4.00	725	4.00
7000	485	2.00	510	2.20	530	2.35	555	2.55	575	2.75	600	2.95	620	3.15	640	3.30	660	3.50	675	3.65	695	3.85	715	4.05	730	4.10	730	4.10
7250	495	2.20	520	2.40	545	2.60	565	2.75	585	2.95	610	3.15	630	3.35	650	3.55	665	3.70	685	3.90	705	4.10	720	4.30	740	4.50	740	4.50
7500	505	2.35	530	2.55	555	2.80	575	2.95	600	3.20	620	3.40	640	3.60	655	3.75	675	3.95	695	4.20	710	4.35	730	4.55	745	4.75	745	4.75
7750	520	2.60	545	2.80	565	3.00	585	3.20	610	3.45	630	3.65	650	3.85	665	4.00	685	4.25	705	4.45	720	4.65	740	4.85	755	5.05	755	5.05
8000	530	2.80	555	3.00	575	3.20	600	3.45	620	3.70	640	3.90	660	4.10	675	4.30	695	4.50	710	4.70	730	4.95	745	5.10	765	5.35	765	5.35
8250	545	3.05	565	3.25	590	3.50	610	3.70	630	3.95	650	4.15	665	4.35	685	4.55	705	4.80	720	5.00	740	5.25	755	5.45	770	5.65	770	5.65
8500	555	3.25	580	3.50	600	3.75	620	3.95	640	4.20	660	4.45	675	4.60	695	4.85	715	5.10	730	5.30	750	5.55	765	5.75	790	6.00	790	6.00
8750	570	3.55	590	3.75	610	4.00	630	4.20	650	4.45	670	4.70	690	4.95	705	5.15	725	5.40	740	5.65	755	5.85	775	6.10	790	6.35	790	6.35
9000	580	3.75	605	4.05	625	4.30	645	4.55	660	4.75	680	5.00	700	5.25	715	5.45	735	5.75	750	5.95	765	6.20	785	6.45	800	6.70	800	6.70
9250	595	4.10	615	4.35	635	4.60	655	4.85	675	5.10	690	5.30	710	5.60	725	5.80	745	6.10	760	6.30	775	6.55	790	6.75	810	7.10	810	7.10
9500	605	4.35	625	4.60	645	4.85	665	5.15	685	5.40	700	5.65	720	5.95	735	6.15	755	6.45	770	6.65	785	6.90	800	7.15	815	7.40	815	7.40
9750	620	4.70	640	4.95	660	5.25	675	5.45	695	5.75	715	6.05	730	6.25	745	6.50	765	6.80	790	7.05	795	7.30	810	7.55	825	7.80	825	7.80
10,000	630	5.00	650	5.25	670	5.55	690	5.85	705	6.05	725	6.40	740	6.60	760	6.95	775	7.20	790	7.45	805	7.70	820	7.95	835	8.20	835	8.20

NOTE — All data is measured external to the unit with dry coil and air filters in place. See Page 23 for Accessory Air Resistance data. Shaded areas represent optional 7.12 hp drive kit.

**TABLE 3  
GCS16-2553-470 & GCS16-2753-470 BLOWER PERFORMANCE**

Air Volume (cfm)	STATIC PRESSURE EXTERNAL TO UNIT — Inches Water Gauge																										
	.30		.40		.50		.60		.70		.80		.90		1.00		1.10		1.20		1.30		1.40		1.50		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM
6000	450	1.50	470	1.60	495	1.75	520	1.90	545	2.10	570	2.25	590	2.45	615	2.65	635	2.80	655	3.00	675	3.20	695	3.45	715	3.65	
6250	460	1.60	480	1.75	505	1.90	530	2.05	555	2.25	580	2.45	600	2.60	620	2.80	640	3.00	660	3.15	680	3.40	700	3.60	720	3.85	
6500	470	1.75	495	1.90	515	2.05	540	2.25	565	2.45	585	2.60	610	2.80	630	3.00	650	3.20	670	3.40	690	3.60	710	3.85	725	4.00	
6750	480	1.90	505	2.10	525	2.25	550	2.40	575	2.60	595	2.80	615	3.00	640	3.20	660	3.40	675	3.55	695	3.80	715	4.05	735	4.25	
7000	490	2.10	515	2.25	540	2.45	560	2.60	585	2.85	605	3.00	625	3.20	645	3.40	665	3.60	685	3.80	705	4.05	725	4.30	740	4.45	
7250	500	2.25	525	2.45	550	2.65	570	2.80	595	3.05	615	3.25	635	3.40	655	3.65	675	3.85	695	4.05	710	4.25	730	4.50	750	4.75	
7500	515	2.50	540	2.70	560	2.85	580	3.05	605	3.25	625	3.45	645	3.65	665	3.90	685	4.10	705	4.35	720	4.50	740	4.75	755	4.95	
7750	525	2.70	550	2.90	570	3.10	595	3.30	615	3.50	635	3.70	655	3.90	675	4.15	695	4.35	710	4.55	730	4.80	745	5.00	765	5.25	
8000	540	2.95	560	3.10	585	3.35	605	3.55	625	3.75	645	3.95	665	4.20	685	4.40	700	4.60	720	4.85	740	5.10	755	5.30	770	5.50	
8250	550	3.15	575	3.40	595	3.60	615	3.80	635	4.00	655	4.25	675	4.45	695	4.70	710	4.90	730	5.15	745	5.35	765	5.60	780	5.85	
8500	565	3.45	585	3.65	605	3.85	625	4.05	645	4.30	665	4.50	685	4.75	705	5.00	720	5.20	740	5.45	755	5.65	775	5.95	790	6.15	
8750	575	3.70	600	3.95	620	4.15	640	4.40	660	4.60	675	4.80	695	5.05	715	5.30	730	5.50	750	5.80	765	6.00	780	6.20	800	6.55	
9000	590	4.00	610	4.25	630	4.45	650	4.70	670	4.90	690	5.15	705	5.35	725	5.65	740	5.95	760	6.10	775	6.35	790	6.60	805	6.90	
9250	605	4.35	625	4.55	645	4.80	660	5.00	680	5.25	700	5.50	715	5.70	735	5.95	750	6.20	770	6.50	785	6.70	800	6.95	815	7.20	
9500	615	4.65	635	4.85	655	5.10	675	5.35	690	5.55	710	5.80	725	6.05	745	6.30	760	6.55	780	6.85	795	7.10	810	7.35	825	7.60	
9750	630	5.00	650	5.25	665	5.45	685	5.70	705	5.95	720	6.15	740	6.45	755	6.70	770	6.90	790	7.25	805	7.50	820	7.75	835	8.00	
10,000	640	5.30	660	5.55	680	5.85	700	6.10	715	6.30	730	6.55	760	6.85	765	7.05	780	7.30	800	7.65	815	7.90	830	8.15	845	8.40	

NOTE — All data is measured external to the unit with dry coil and air filters in place. See Page 23 for Accessory Air Resistance data.



## IV-HEATING OPERATION AND ADJUSTMENT

### A-Heating Sequence of Operation

- 1- When the thermostat calls for heat, the combustion air blower motor(s) start immediately.
- 2- The combustion air blower centrifugal switch checks for proper blower operation before allowing power to the gas controller. This switch is factory set and no adjustment is necessary.
- 3- After a pre-purge of 30 to 40 seconds, the spark ignitor is energized, and the low fire solenoid valve opens in the gas valve.
- 4- The left burner is lit by the spark ignitor and the flames cross light to the right burner where the flame sensor is located.
- 5- In the event that the flame is not detected after the first trial for ignition, the controller will repeat steps 3 and 4 up to two more times (depending upon controller model) before locking out.
- 6- If the thermostat calls for high heat, a bimetal actuator in the gas valve will be energized, after a time delay, and will progressively raise manifold pressure until full heat input is achieved.

*NOTE- On -470 units, the right side burner assembly will light approximately 30 seconds after left side burner assembly has ignited.*

### B-Fan Control


Fan control is not adjustable. With the fan switch in AUTO position, the blower will cycle with demand. The blower will come on 30 to 40 seconds after burners light and will cycle off 100 to 120 seconds after heat demand is satisfied.


### C-Limit Controls

Limit controls are factory set and are not adjustable. Limits are located on the division panel between the blower compartment and the heat section.

### D-Heating Adjustment

- 1- Main burners have a fixed air design and do not require adjustment.


**WARNING**



Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

- 2- Burner flames may be observed through the inspection port in the access panel. Always operate the unit with the access panel in place.
- 3- The gap on the flame sensing electrode should be between 3/32" and 5/32" (2.4 - 4 mm). Remove right burner by removing screw and sliding the burner off the orifice. The carry over slot on burner is 1/8" (3.2 mm) and it must be maintained. Clean the carry over slot using a strip of 16 gauge steel. Check gap with 1/8" (3.2mm) twist drill. Replace burner using mounting screw.

## E-Maximum Input Adjustment of Natural Gas A.G.A. Units

The maximum input may be reduced by up to 20 percent on A.G.A. units operating on natural gas only using the following procedure:

- 1- Check manifold pressure at gas valve pressure tap.
- 2- To reduce maximum input, turn regulator adjusting screw counterclockwise

*NOTE-Low fire operating pressure is fixed and not adjustable.*

## V-COOLING OPERATION AND ADJUSTMENTS

### A-Refrigerant Charge and Check

**WARNING-Do not exceed nameplate charge under any conditions.**

This unit is factory charged and requires no further adjustment; however, check charge during start-up using the approach method outlined below. The approach method compares actual liquid temperature with the outdoor ambient temperature. Thermometer wells have been provided to allow accurate liquid temperature measurement.

- 1- Attach gauge manifolds and insert thermometers in well pockets.

*NOTE-Thermometer pockets must be filled with oil for accurate reading.*

- 2- Block compressor compartment with access panel so air will not by-pass the coils.
- 3- Operate unit until system stabilizes (approximately five minutes).
- 4- Check each stage separately with all stages operating.
- 5- Compare liquid temperatures to outdoor ambient temperature.

Approach Temperature = Liquid temperature minus ambient temperature. (For best results use same thermometer for both readings).

- 6- Approach temperature should match values on the unit label (table 4). An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

**TABLE 4**

GCS16 UNIT	APPROACH TEMPERATURE	
	LIQUID TEMP. MINUS AMBIENT TEMP.	
	FIRST-STAGE	SECOND-STAGE
-2553	7°F ± 1 (3.9°C ± 0.5°C)	8°F ± 1 (4.5°C ± 0.5°C)
-2753	8°F ± 1 (4.5°C ± 0.5°C)	10°F ± 1 (5.6°C ± 0.5°C)
-3003	9°F ± 1 (5.1°C ± 0.5°C)	10°F ± 1 (5.6°C ± 0.5°C)




### B-Charging


If system is completely void of refrigerant, the recommended and most accurate method of charging is to weigh the refrigerant into the unit according to the amount shown on the nameplate. If weighing facilities are not available or if unit is just low on charge, use the procedure outlined in section A-Refrigerant Charge and Check.

## C—Compressor Controls

- 1— High Pressure Switch (S4, S7)  
Each compressor circuit is protected by a manual reset high pressure switch which cuts out at 410 psig  $\pm$  10 psig (2825 kPa  $\pm$  70 kPa).
- 2— Loss of Charge Switch (S24, S25)  
Each compressor circuit is protected by a loss of charge switch. Switch cuts out at 25 psig (172 kPa) and automatically resets at 55 psig (379 kPa).
- 3— Low Ambient Limit Switch (Compressor Monitor)(S3)  
Each compressor is protected from low ambient operation by a low ambient switch (compressor monitor). The switch locks compressors out at 40°F (4.4°C) and automatically resets at 50°F (10°C).
- 4— Freezestat (S49, S50)  
Each compressor is protected by a freezestat.
- 5— Crankcase Heater  
Crankcase heaters are provided on each compressor.

## SERVICE

 <b>WARNING</b>	
 	Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

 <b>CAUTION</b>	
Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.	

## A—Lubrication

- 1— Supply Air Blower Motor Bearings — Bearings are pre-lubricated; no further lubrication is required for 10 years of normal operation. Thereafter, clean and repack bearings with a suitable bearing grease every two years.
- 2— Blower Shaft Bearings — Bearings are pre-lubricated and sealed; no further lubrication is necessary.
- 3— Combustion Air Blower Motor Bearings — Bearings are pre-lubricated and sealed; no further lubrication is necessary.
- 4— Condenser Fan Motor Bearings — Bearings are pre-lubricated. For extended bearing life, lubricate each bearing through the oiling ports provided with a few drops of a good grade of electric motor oil or SAE10 or SAE20 non-detergent motor oil every two years.



## B—Filters

GCS16 unit is equipped with pleated 2" (51mm) throw-away type filters. Permanent 1" (25.4mm) foam filters are acceptable replacements. Filters should be checked and replaced when necessary. If permanent foam filters are used as a replacement, they should be checked and cleaned periodically with warm water and a mild detergent.

*NOTE—Filters must be U.L.C. certified or equivalent for use in Canada.*

## C—Burners

- 1— Periodically examine burner flames for proper appearance during the heating season. Use inspection port in the front of the heating compartment access panel.
- 2— Before each heating season examine the burners for any deposits or blockage which may have occurred.
- 3— Clean burners as follows:
  - a— Turn off both electrical power and gas supply to unit.
  - b— Remove heating access panel to burner compartment.
  - c— Remove burner mounting screws and lift burners from orifices.
  - d— Clean as necessary and replace burners and secure with mounting screws. Make sure that burner heads line up correctly. Spark gaps on ignitor and flame sensing electrode must be properly set. Refer to Heating Adjustment section. Replace heating access panel.

 <b>WARNING</b>	
	Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

- e— Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in heating access panel to check flame.

## D—Combustion Air Blower(s)

A combustion air blower motor centrifugal switch, S18 (and S45 on -470 units) checks combustion air blower operation before allowing power to the gas controller. Gas controller will not operate if blower is obstructed.

Under normal operating conditions, the combustion air blower wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the blower wheel can be determined by looking through the vent opening.

### **Cleaning Combustion Air Blower(s) and Vent Cap(s)**

- 1– Shut off power supply and gas to unit.
- 2– Remove three screws retaining vent cap(s) and combustion air blower(s) to top panel. Clean vent cap(s) as necessary.
- 3– Remove three screws holding blower housing(s) to blower box(s) and four wires attached to motor(s). Take care not to lose the three 1/4" (6.4mm) spacers between the blower housing(s) and the blower box(s). These must be reinstalled to obtain proper operation.
- 4– Clean blower wheel(s) with a small brush and wipe off any dust from housing(s). Clean accumulated dust from front of blower box(s). See figure 14.
- 5– Replace combustion air blower motor(s) by reversing this procedure. It is recommended that the combustion air blower gasket(s) be replaced during reassembly.
- 6– Clean combustion air supply louver(s) located on the front of heating access panel.

### **E–Flue Passageway and Flue Collector**

- 1– Remove combustion air blower assembly(ies), blower box(es) and flue cover(s) as one piece.
- 2– Remove flue collector baffle(s). Clean with a wire brush as required.
- 3– Pull tube baffles from heat exchanger(s) and clean tubes with a wire brush.
- 4– Reinsert tube baffles by gently bending them to lock tab against tube outlets. Reassemble the unit. The flue collector cover gasket(s) and combustion air blower gasket(s) should also be replaced during reassembly.

### **F–Evaporator Coil**

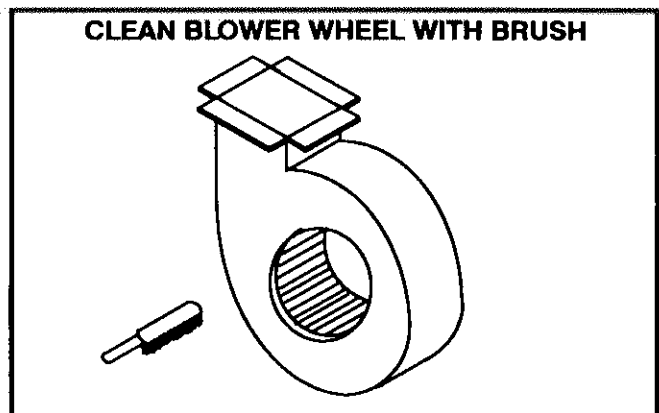
Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters, return air ducts wet.

### **G–Condenser Coil**

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

### **H–Supply Air Blower Wheel**

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.



**FIGURE 14**

## GCS16 REPAIR PARTS LISTING

The following repair parts are available through Lennox dealers. When ordering parts, include the complete model number listed or the A.G.A./C.G.A. rating plate – e.g. GCS16–2753–470–1Y

### Heat Section Parts

Heat Exchanger  
Combustion Air Blower Wheel  
Burner Assembly  
Combustion Air Blower Scroll  
Burner Manifold Assembly  
Main Burner Orifices  
Ignition Electrode Assembly  
Ignition Lead  
Sensor Lead  
Flue Baffle  
Combustion Air Blower Motor (B6, B15)  
Gas Valve (GV1, GV2)  
Limit Control (S10)  
Auxiliary Limit Control (S21)  
Flame Roll-out Switch (S47)

### Cooling Parts

Compressor (B1, B2)  
Indoor Blower Motor (B3)  
Condenser Fan Motor (B4, B5)  
Low Ambient Switch Limit/Compressor Monitor (S3)  
High Pressure Switch (S4, S7)  
Low Pressure Switch (S24, S25)  
Blower Wheel  
Condenser Fan Blade  
Condenser Fan Mounting Bracket  
Distributor Assembly  
Expansion Valve  
Fan Grille

### Electrical Control Parts

Burner Control 1, 2 (A3, A12)  
Panel, Relay (A11)  
Smoke Detector Opt (A17)  
Motor, Exhaust Fan 1, 2, 3 (B10, B11, B12)  
Capacitor CAB (C3, C11)  
Capacitor, Exhaust Fan 1, 2, 3 (C6, C8, C9)  
Delay, Gas 2, 4, 3 (DL3, DL17, DL21)  
Delay–gas 3, 4 opt (DL21, DL17)  
Fuse, Control Transformer (F1)  
Fuse, Outdoor Fan Motor (F10)  
Fuse Transformer F12, F18  
Blower Fuse (F16)  
Heater Kit Opt (HR6)  
Compressor Contactor (K1, K2)  
Blower Contactor (K3)  
Stage 2 Heat Relay (K19)  
Limit Blower Relay (K20)  
Blower Delay Relay (K25)  
Condenser Fan Contactor (K10, K68)  
Relay, No Heat Opt (K29)  
Relay CAB (K13, K19)  
\*Blower Relay (K46)  
\*Heat 1 Relay (K77)  
\*Pilot Relay Circuit Board Assembly

\*Heat 2 Relay (K49)  
Heat Blower Relay (K56, K57)  
\*Exhaust Fan Relay (K65)  
\*Cool 1 Relay (K66)  
\*Cool 2 Relay (K67)  
Relay, gas 3, 4 (K73, K73)  
Limit, Low Compressor (S3)  
CAB Pressure Switch (S18, S45)  
Exhaust Fan Switch (S39)  
Overload Relay (S42)  
Flame Roll-Out Switch (S47)  
Compressor Freezestat (S49, S50)  
Switch, limit, low amb off (S59)  
Thermostat, low amb (S60)  
Switch, limit high amb off (S61)  
High Voltage Terminal Block (TB2)  
Terminal Block, Readout Opt (TB12)  
Distribution Terminal Block (TB13)  
Terminal Block, Low Volt (TB17)  
Transformer (Control) T1  
Transformer (T3) (460 and 575V combustion air blower only)  
Exhaust Fan Transformer 575V (T10)  
Transformer (gas control) T12  
Transformer (contactor) T18  
Control, Temp Opt (W3)  
Crankcase Heater