

# INSTALLATION INSTRUCTIONS

AGENCY REQUIRED



**RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE**

PACKAGED GAS AND COOLING UNITS  
506346-03  
7/2017  
506346-02

## LGH420, 480, 540, 600 35 THROUGH 50 TONS

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### Safety

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- The vent hood must be installed per these installation instructions.
- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filter must be removed upon construction completion.

- The input rate and temperature rise must be set per the unit rating plate.
- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

**NOTE - The Commonwealth of Massachusetts stipulates these additional requirements:**

- Gas units shall be installed by a licensed plumber or gas fitter only.
- The gas cock must be "T handle" type.

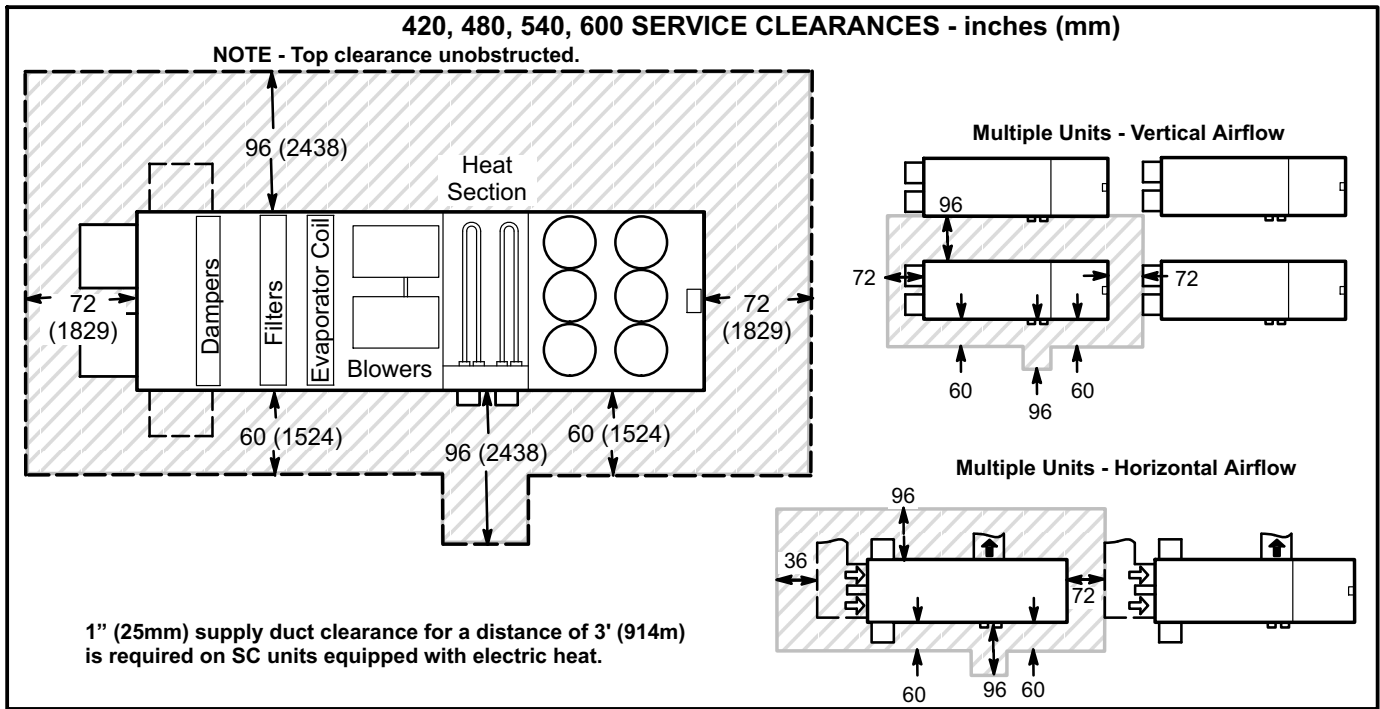
### ⚠ WARNING

**Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the gas supplier**

The unit is certified for installation on noncombustible floors only. However, it may be installed on wood flooring, or on class A, class B, or class C material covered floors when used in downflow discharge applications when mounted on an S1CURB10-E1 roof mounting frame.

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. Unit must be adjusted for the temperature rise range and within the allowable external static pressure on furnaces with a duct system as listed on unit nameplate.





**FIGURE 1**

**United States**

The unit is ETL certified for outdoor installations only at the clearances to combustible materials listed on the unit nameplate and in figure 1.

Installation of the ETL certified units must conform with local building codes. In the absence of local codes, units must be installed according to the current National Fuel Gas Code ANSI Z223.1/NFPA 54.

When installed, the unit must be electrically wired and grounded according to local codes or, in the absence of local codes, with the current National Electric Code, ANSI/NFPA 70.

The current American National Standard (ANSI-Z223.1/NFPA54) National Fuel Gas Code is available from the following address:

American National Standard Institute Inc.  
11 West 42nd Street  
New York, NY 10036

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

National Fire Protection Association  
1 Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101

Use only the type of gas approved for use with this furnace. Refer to unit nameplate.

Never test for gas leaks with an open flame. Check all connections with a commercially available soap solution made specifically for leak detection.

*NOTE - Furnace must be adjusted to obtain a temperature rise within the range(s) specified on the unit nameplate. Failure to do so may cause erratic limit operation.*

**Canada**

The unit is ETL certified for combination heating/cooling for outdoor installations and non-residential use only at the clearances to combustible materials as listed on the unit nameplate.

Installation of ETL certified units must conform with current standard CSA B149.1, "Natural Gas and Propane Installation Codes" and applicable local codes. Authorities having jurisdiction should be consulted before installation.

The unit must be wired and electrically grounded according to local codes or, in the absence of local codes, current CSA Standard C22.1 Canadian Electrical Code Part 1. Installation of combination heating/cooling units must also conform with current CSA Standard B52 "Mechanical Refrigeration Code."

## Connect Gas Piping

Two grommets are packaged with the flue exhaust and air intake hoods located in the gas heat section. Grommets are installed in the unit entry and gas heat division panel knockouts. An additional grommet is required when routing gas piping through the bottom of the unit.

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. (.12kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 6.0" w.c. (1.5kPa) and a maximum of 14" (3.50kPa) w.c. For LP/propane gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.74kPa) and a maximum of 13.5" w.c. (3.36kPa).

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 is located on gas valve for test gauge connection. Refer to Heating Start-Up section for tap location. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 2 for side entry gas supply piping.

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

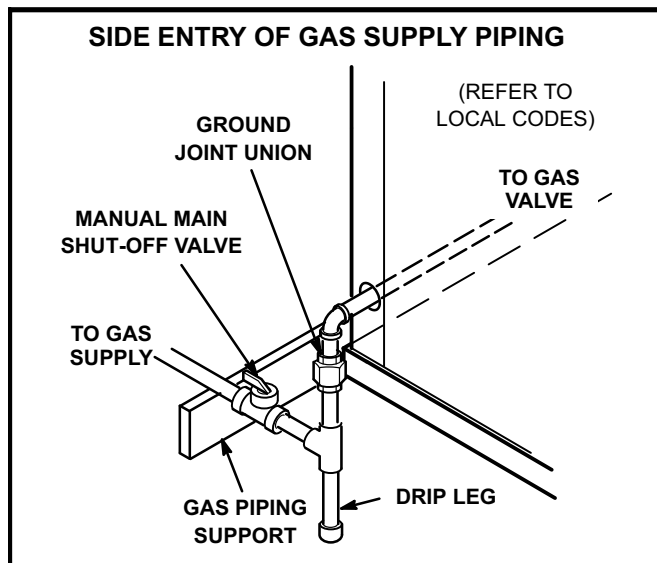


FIGURE 2

## High Altitude Derate

Locate the high altitude conversion sticker in the unit literature bag. Fill out the conversion sticker and affix next to the unit nameplate.

Refer to table 1 for high altitude adjustments.

TABLE 1  
HIGH ALTITUDE DERATE

Altitude Ft.*	Gas Manifold Pressure
2000-4500	See Unit Nameplate
4500 And Above	Derate 4% / 1000 Ft. Above Sea Level

\*Units installed at 0-2000 feet do not need to be modified.

NOTE - This is the only permissible derate for these units.

## Pressure Test Gas Piping

For natural gas units, operating pressure at the unit gas connection must be a minimum of 6.0" w.c. (1.5kPa) and a maximum of 14.0" (3.5kPa) w.c. For LP/propane gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.74kPa) and a maximum of 13.5" w.c. (3.36kPa).

When testing the pressure of gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (3.5 kPa).

## ⚠ WARNING

### FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

## Two-Stage Gas Valve Adjustment

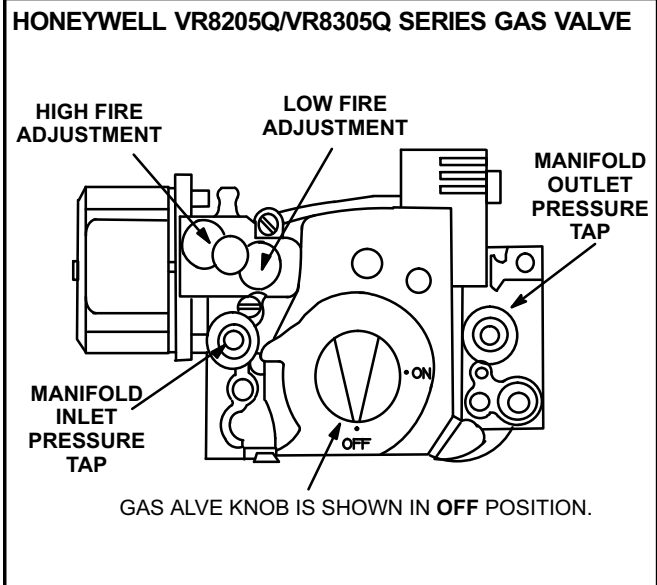
Gas manifold pressures should match pressures shown in table 2. On two stage gas valves, initiate a W2 thermostat demand to check high fire pressure before low fire pressure. See figure 3 or 4. With high fire operating, reduce the thermostat demand to W1 and check the low fire pressure. Refer to the Unit Controller manual to initiate a thermostat demand.

See Optional Modulating Gas Valve (MGV) section on units equipped with MGVs.

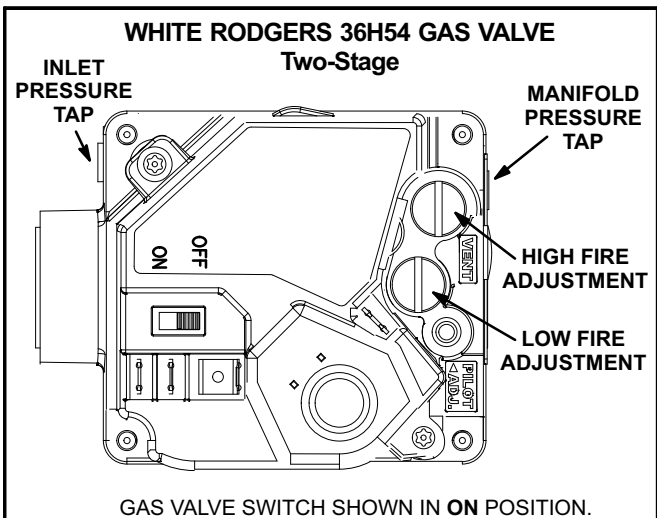
**IMPORTANT - On 2-stage gas valves do not set low fire pressure lower than the certified minimum input rating listed in table 2.**

**TABLE 2**  
**MANIFOLD INPUT PRESSURES** in.wg. (kPa)

Unit	Natural Gas		Propane (LP) Gas	
	1st Stage ± 0.2(±.05)	2nd Stage ± 0.3(±.08)	1st Stage ± 0.2(±.05)	2nd Stage ± 0.3(±.08)
420-600	1.6 (0.40)	3.7 (0.92)	5.5 (1.37)	10.5 (2.61)



**FIGURE 3**



**FIGURE 4**

## Gas Heat Operation

See the operating instruction plate on the unit for details.

## Proper Gas Flow (Approximate)

- 1- Operate unit at least 15 minutes before checking gas flow. Determine the time in seconds for **two** revolutions of gas through the meter. (Two revolutions assures a more accurate time.)
- 2- **Divide the number of seconds by two** and compare to the time in table 3. If manifold pressure is correct and rate is incorrect, check gas orifices for proper size and restriction.
- 3- Remove temporary gas meter if installed.

*NOTE-* To obtain accurate reading, shut off all other gas appliances connected to meter.

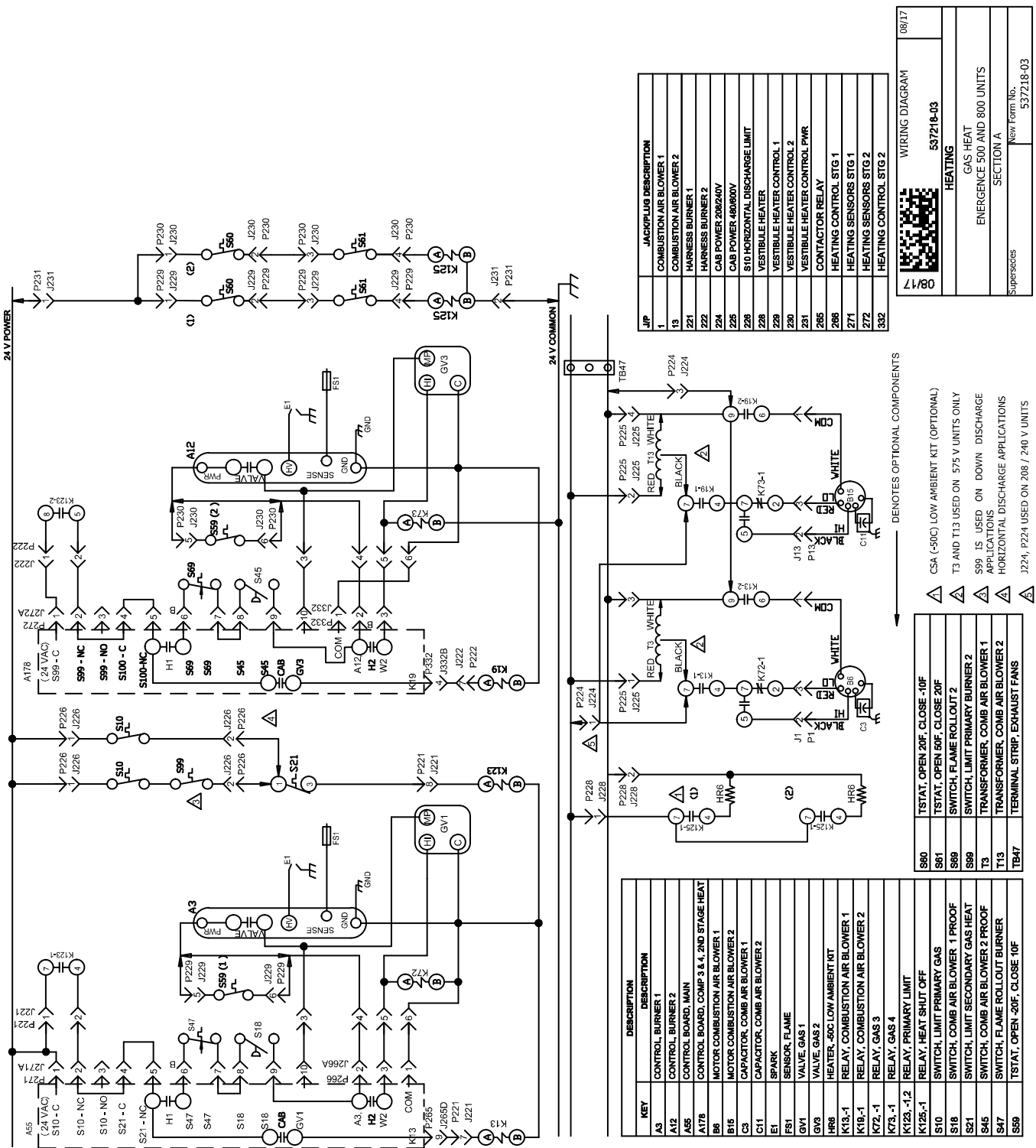
**TABLE 3**

Unit In- put Rate (Btuh)	Seconds for One Revolution			
	Natural		LP	
	2 ft <sup>3</sup> Dial	3 ft <sup>3</sup> Dial	1 ft <sup>3</sup> Dial	2 ft <sup>3</sup> Dial
325,000	22	54	27	55
500,000	14	36	28	36
525,000	13	34	17	34
800,000	9	22	11	22
Natural-1000 btu/cu ft		LP-2500 btu/cu ft		

*Note:* Table assumes standard temperature (60°F), pressure (30in.Hg.), and fuel heating values (Btuh/ft.<sup>3</sup>). Apply pressure corrections in altitudes above 2000 ft


# TYPICAL GAS HEAT SCHEMATIC

This schematic is typical. See the wiring schematic on the unit for actual unit wiring.



J/P	JACKPLUG DESCRIPTION
1	COMBUSTION AIR BLOWER 1
19	COMBUSTION AIR BLOWER 2
221	HARNESSE BURNER 1
224	HARNESSE BURNER 2
226	CAB POWER 200/240V
228	CAB POWER 480/600V
229	S10 HORIZONTAL DISCHARGE LIMIT
228	VESTIBULE HEATER
229	VESTIBULE HEATER CONTROL 1
230	VESTIBULE HEATER CONTROL 2
231	VESTIBULE HEATER CONTROL PWR
265	CONTACTOR RELAY
266	HEATING CONTROL STG 1
271	HEATING SENSORS STG 1
272	HEATING SENSORS STG 2
332	HEATING CONTROL STG 2

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WIRING DIAGRAM  
537218-03  
HEATING

GAS HEAT ENERGENCE 500 AND 800 UNITS
SECTION A
New Form No. 537218-03

KEY	DESCRIPTION
A3	CONTROL BURNER 1
A12	CONTROL BURNER 2
A65	CONTROL BOARD, MAIN
A178	CONTROL BOARD, COMP 3 & 4, 2ND STAGE HEAT
B1	MOTOR COMBUSTION AIR BLOWER 1
B2	MOTOR COMBUSTION AIR BLOWER 2
C3	CAPACITOR, COMB AIR BLOWER 1
C11	CAPACITOR, COMB AIR BLOWER 2
E1	SPARK
FS1	SENSOR, FLAME
GV1	VALVE, GAS 1
GV2	VALVE, GAS 2
HR8	HEATER, -50C LOW AMBIENT KIT
K13-1	RELAY, COMBUSTION AIR BLOWER 1
K19-1	RELAY, COMBUSTION AIR BLOWER 2
K72-1	RELAY, GAS 3
K73-1	RELAY, GAS 4
K123-1,2	RELAY, PRIMARY LIMIT
K125-1	RELAY, HEAT SHUT OFF
S10	SWITCH, LIMIT PRIMARY GAS
S18	SWITCH, COMB AIR BLOWER 1 PROOF
S21	SWITCH, LIMIT SECONDARY GAS HEAT
S45	SWITCH, COMB AIR BLOWER 2 PROOF
S47	SWITCH, FLAME ROLLOUT BURNER
S69	TSTAT, OPEN -20F, CLOSE 10F

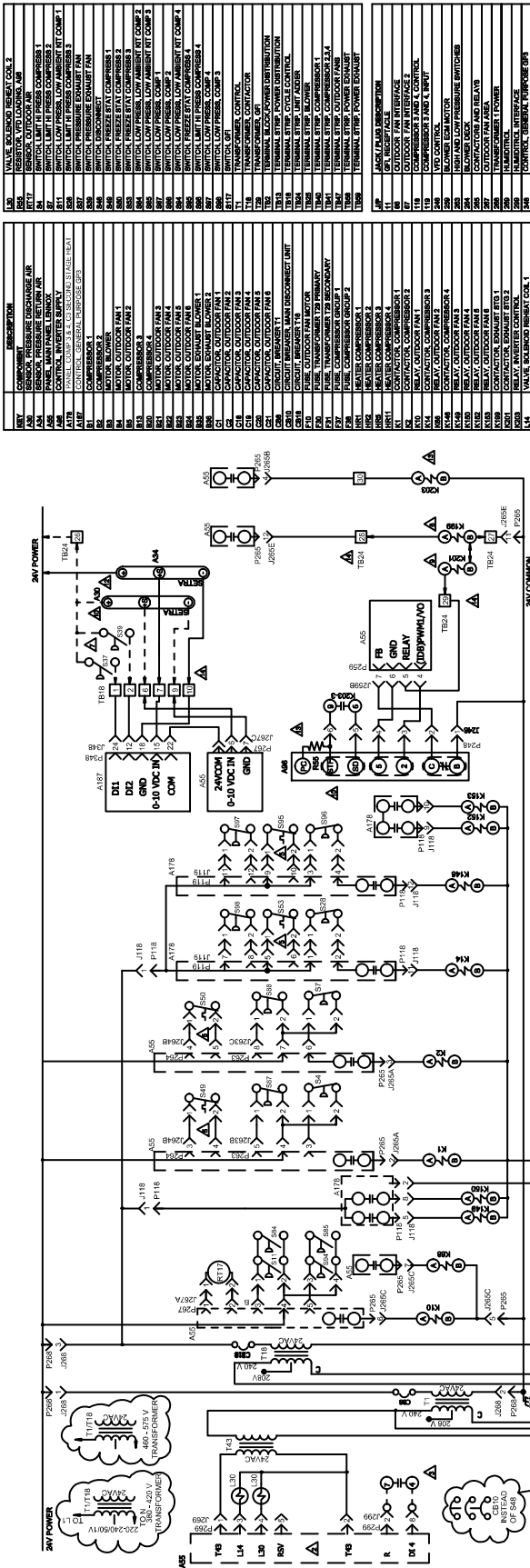
- △ CSA (-50C) LOW AMBIENT KIT (OPTIONAL)
- △ T3 AND T13 USED ON 575 V UNITS ONLY
- △ S99 IS USED ON DOWN DISCHARGE APPLICATIONS
- △ HORIZONTAL DISCHARGE APPLICATIONS
- △ J224, P224 USED ON 208 / 240 V UNITS

S60	TSTAT, OPEN 20F, CLOSE -10F
S61	TSTAT, OPEN 50F, CLOSE 20F
S69	SWITCH, FLAME ROLLOUT 2
S89	SWITCH, LIMIT PRIMARY BURNER 2
T3	TRANSFORMER, COMB AIR BLOWER 1
T13	TRANSFORMER, COMB AIR BLOWER 2
TB47	TERMINAL STRIP, EXHAUST FANS

↑ DENOTES OPTIONAL COMPONENTS

# TYPICAL UNIT SCHEMATIC

This schematic is typical. See the wiring schematic on the unit for actual unit wiring.



KEY	DESCRIPTION	DESCRIPTION
A187	INVERTER	VALVE SOLENOID INHALE COIL 2
A188	INVERTER	VALVE SOLENOID EXHALE COIL 2
A189	INVERTER	VALVE SOLENOID INHALE COIL 1
A190	INVERTER	VALVE SOLENOID EXHALE COIL 1
A191	INVERTER	VALVE SOLENOID INHALE COIL 2
A192	INVERTER	VALVE SOLENOID EXHALE COIL 2
A193	INVERTER	VALVE SOLENOID INHALE COIL 1
A194	INVERTER	VALVE SOLENOID EXHALE COIL 1
A195	INVERTER	VALVE SOLENOID INHALE COIL 2
A196	INVERTER	VALVE SOLENOID EXHALE COIL 2
A197	INVERTER	VALVE SOLENOID INHALE COIL 1
A198	INVERTER	VALVE SOLENOID EXHALE COIL 1
A199	INVERTER	VALVE SOLENOID INHALE COIL 2
A200	INVERTER	VALVE SOLENOID EXHALE COIL 2
A201	INVERTER	VALVE SOLENOID INHALE COIL 1
A202	INVERTER	VALVE SOLENOID EXHALE COIL 1
A203	INVERTER	VALVE SOLENOID INHALE COIL 2
A204	INVERTER	VALVE SOLENOID EXHALE COIL 2
A205	INVERTER	VALVE SOLENOID INHALE COIL 1
A206	INVERTER	VALVE SOLENOID EXHALE COIL 1
A207	INVERTER	VALVE SOLENOID INHALE COIL 2
A208	INVERTER	VALVE SOLENOID EXHALE COIL 2
A209	INVERTER	VALVE SOLENOID INHALE COIL 1
A210	INVERTER	VALVE SOLENOID EXHALE COIL 1
A211	INVERTER	VALVE SOLENOID INHALE COIL 2
A212	INVERTER	VALVE SOLENOID EXHALE COIL 2
A213	INVERTER	VALVE SOLENOID INHALE COIL 1
A214	INVERTER	VALVE SOLENOID EXHALE COIL 1
A215	INVERTER	VALVE SOLENOID INHALE COIL 2
A216	INVERTER	VALVE SOLENOID EXHALE COIL 2
A217	INVERTER	VALVE SOLENOID INHALE COIL 1
A218	INVERTER	VALVE SOLENOID EXHALE COIL 1
A219	INVERTER	VALVE SOLENOID INHALE COIL 2
A220	INVERTER	VALVE SOLENOID EXHALE COIL 2
A221	INVERTER	VALVE SOLENOID INHALE COIL 1
A222	INVERTER	VALVE SOLENOID EXHALE COIL 1
A223	INVERTER	VALVE SOLENOID INHALE COIL 2
A224	INVERTER	VALVE SOLENOID EXHALE COIL 2
A225	INVERTER	VALVE SOLENOID INHALE COIL 1
A226	INVERTER	VALVE SOLENOID EXHALE COIL 1
A227	INVERTER	VALVE SOLENOID INHALE COIL 2
A228	INVERTER	VALVE SOLENOID EXHALE COIL 2
A229	INVERTER	VALVE SOLENOID INHALE COIL 1
A230	INVERTER	VALVE SOLENOID EXHALE COIL 1
A231	INVERTER	VALVE SOLENOID INHALE COIL 2
A232	INVERTER	VALVE SOLENOID EXHALE COIL 2
A233	INVERTER	VALVE SOLENOID INHALE COIL 1
A234	INVERTER	VALVE SOLENOID EXHALE COIL 1
A235	INVERTER	VALVE SOLENOID INHALE COIL 2
A236	INVERTER	VALVE SOLENOID EXHALE COIL 2
A237	INVERTER	VALVE SOLENOID INHALE COIL 1
A238	INVERTER	VALVE SOLENOID EXHALE COIL 1
A239	INVERTER	VALVE SOLENOID INHALE COIL 2
A240	INVERTER	VALVE SOLENOID EXHALE COIL 2
A241	INVERTER	VALVE SOLENOID INHALE COIL 1
A242	INVERTER	VALVE SOLENOID EXHALE COIL 1
A243	INVERTER	VALVE SOLENOID INHALE COIL 2
A244	INVERTER	VALVE SOLENOID EXHALE COIL 2
A245	INVERTER	VALVE SOLENOID INHALE COIL 1
A246	INVERTER	VALVE SOLENOID EXHALE COIL 1
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A251	INVERTER	VALVE SOLENOID INHALE COIL 2
A252	INVERTER	VALVE SOLENOID EXHALE COIL 2
A253	INVERTER	VALVE SOLENOID INHALE COIL 1
A254	INVERTER	VALVE SOLENOID EXHALE COIL 1
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A273	INVERTER	VALVE SOLENOID INHALE COIL 1
A274	INVERTER	VALVE SOLENOID EXHALE COIL 1
A275	INVERTER	VALVE SOLENOID INHALE COIL 2
A276	INVERTER	VALVE SOLENOID EXHALE COIL 2
A277	INVERTER	VALVE SOLENOID INHALE COIL 1
A278	INVERTER	VALVE SOLENOID EXHALE COIL 1
A279	INVERTER	VALVE SOLENOID INHALE COIL 2
A280	INVERTER	VALVE SOLENOID EXHALE COIL 2
A281	INVERTER	VALVE SOLENOID INHALE COIL 1
A282	INVERTER	VALVE SOLENOID EXHALE COIL 1
A283	INVERTER	VALVE SOLENOID INHALE COIL 2
A284	INVERTER	VALVE SOLENOID EXHALE COIL 2
A285	INVERTER	VALVE SOLENOID INHALE COIL 1
A286	INVERTER	VALVE SOLENOID EXHALE COIL 1
A287	INVERTER	VALVE SOLENOID INHALE COIL 2
A288	INVERTER	VALVE SOLENOID EXHALE COIL 2
A289	INVERTER	VALVE SOLENOID INHALE COIL 1
A290	INVERTER	VALVE SOLENOID EXHALE COIL 1
A291	INVERTER	VALVE SOLENOID INHALE COIL 2
A292	INVERTER	VALVE SOLENOID EXHALE COIL 2
A293	INVERTER	VALVE SOLENOID INHALE COIL 1
A294	INVERTER	VALVE SOLENOID EXHALE COIL 1
A295	INVERTER	VALVE SOLENOID INHALE COIL 2
A296	INVERTER	VALVE SOLENOID EXHALE COIL 2
A297	INVERTER	VALVE SOLENOID INHALE COIL 1
A298	INVERTER	VALVE SOLENOID EXHALE COIL 1
A299	INVERTER	VALVE SOLENOID INHALE COIL 2
A300	INVERTER	VALVE SOLENOID EXHALE COIL 2

06/17 WIRING DIAGRAM 06/17

537884-01

COOLING - VFD

LCH/LGH, 4205, 4805, 5405 1-G, J, Y

SECTION B

REV. 0

537884-01

NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, TOLERANCE AND LENGTH. THEREFORE, ALWAYS VERIFY WIRE SIZE AND RATING. WIRE MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

--- DENOTES OPTIONAL COMPONENTS

--- WIRE VOLTAGE FIELD INSTALLED

--- CLASS FIELD WIRING

- ▲ P.F. LESS INVERTER WIRING SHOWN
- ▲ ONLY ON UNITS WITH HUMIDITY CONTROL OPTION
- ▲ EXTERNAL HUMIDITY CONTACTS CONNECTS TO SECTION "H" HEATING COMPARTMENT
- ▲ S48, S85 AND S86 ARE PART OF PFD CIRCUIT
- ▲ S17 AND S18 ARE NOT USED ON UNITS WITH ELECTRIC HEAT, AS AND ASV
- ▲ S27 AND S28 PRESSURE SWITCH CONTROL FOR POWER EXHAUST
- ▲ VOLTAGE CONTROL SINGLE STAGE P.E
- ▲ VOLTAGE CONTROL TWO STAGE P.E
- ▲ AS SENSOR FOR SUPPLY AIR BLOWER IN VAV APPLICATIONS ONLY
- ▲ UNITS WILL COME EQUIPPED WITH EITHER S48, S27 OR T245 POWER ENTRY OPTIONS
- ▲ AS4 SENSOR AND A187 INVERTER COMPRESSOR FOR S85 AND S86 EXHAUST AIR
- ▲ AS4 MAY BE USED WITH OR WITHOUT AS5
- ▲ AS4 MAY BE USED WITH OR WITHOUT AS5 FOR UNITS WITH BYPASS OPTION. PLEASE REFER TO SECTION 39 WIRING DIAGRAM
- ▲ FOR POWER EXHAUST, INVERTER WIRING PLEASE REFER TO SECTION 39 WIRING DIAGRAM

NOTE: USE COPPER CONDUCTORS ONLY

## Repair Parts Listing

When ordering repair parts, include the complete model number and serial number listed on the ETL rating plate - e.g. LGH480H4BH1Y.

### Gas Heat Section Parts

Heat Exchanger  
Combustion Air Assembly  
Combustion Air Proving Switch  
Burner Assembly  
Burner Manifold Assembly  
Main Burner Orifices  
Flame Roll-out Switches  
Auxiliary Limit Controls  
Ignition Electrode Assembly  
Ignition Lead  
Ignition Sensor Assembly  
Sensor Lead  
Combination Gas Valve  
Limit Controls

### Cooling Parts

Compressors  
Condenser Fan Motors  
Condenser Fan Blades  
Condenser Fan Run Capacitors  
Freezestats  
Condenser Fan Mounting Bracket  
Fan Grille  
Indoor Blower Motors  
Blower Wheel  
Expansion Valve  
Distributor  
Exhaust Fans (Opt.)

### Electrical Control Parts

Unit Controller  
Compressor Contactors  
Circuit Breakers (Opt.)  
Transformer (Control)  
Transformer (Contactor)  
Blower Contactor  
Limit, Blower Relay  
Heat Relays  
Condenser Fan Relays  
Capacitor CAB  
Relay CAB  
Crankcase Heater  
Disconnect Switch (Opt.)

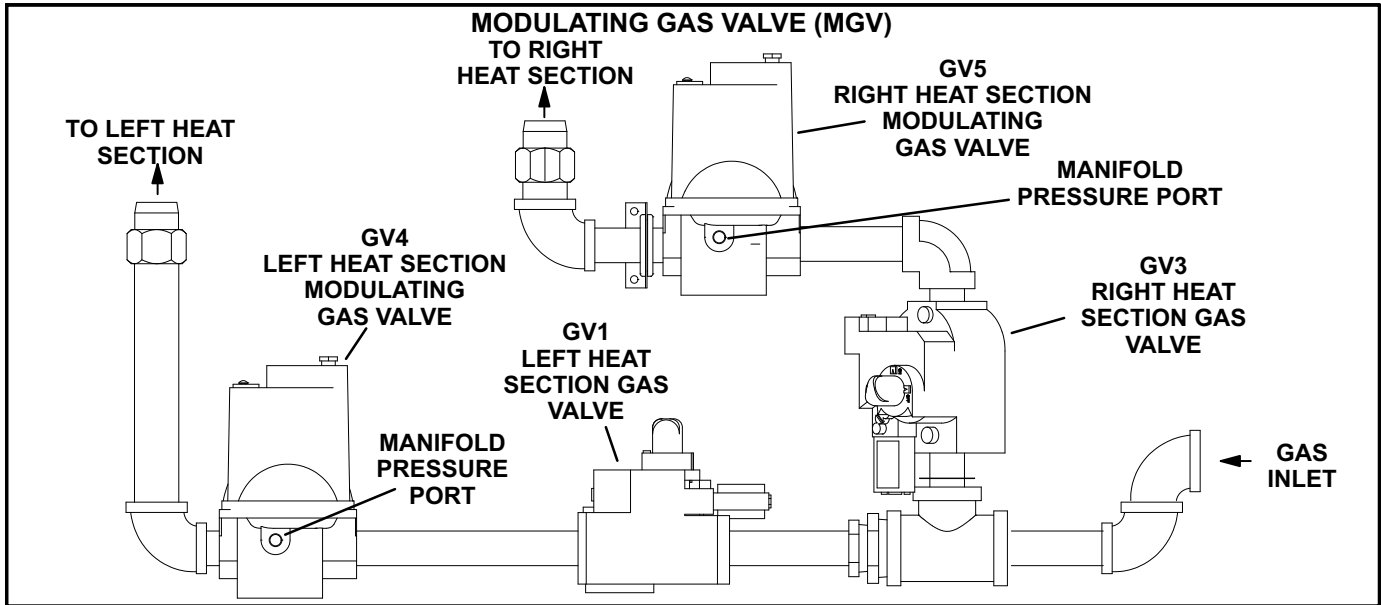


FIGURE 5

**Optional Modulating Gas Valve (MGV)**

Units equipped with optional modulating gas valves (MGV) contain two modulating gas valves in addition to two standard gas valves. See figure 5.

**Operation**

The Unit Controller will control modulating gas valves to maintain 110°F (default) discharge air during the heating cycle. The left heat section will operate when 25-50% of nameplate heat is needed. Both heat sections will operate when 50-100% of the nameplate heat is needed. The normally open MGV will allow full heating capacity should the MGV fail.

**Start-Up**

- 1- Operate the unit in heating mode according to the Heating Start-Up section in this manual.

**NOTE - BOTH GENERAL PURPOSE BOARD SWITCHES MUST BE OFF FOR NORMAL UNIT OPERATION. SEE FIGURE 6.**

- 2- After the unit has operated for 5 minutes, use the Unit Controller menu path MAIN > SERVICE > TEST > HEAT > HEAT 2. The unit will operate at maximum heating input.
- 3- Measure the manifold pressure at the gas valves. Manifold pressures should be:
  - GV1 & GV3:  
Natural - 4.0" w.c. LP - 10.8" w.c.
  - GV4 & GV5:  
Natural - 3.7" w.c. LP - 10.5" w.c.
- 4- After the unit has operated for 5 minutes, use the Unit Controller menu path MAIN > SERVICE > TEST > HEAT > HEAT 1. The unit will operate at minimum heating input.
- 5- Measure the manifold pressure at the gas valves. Manifold pressures should be:

- GV1 & GV3:  
Natural - 4.0" w.c. LP - 10.8" w.c.
- GV4 & GV5:  
Natural - 0.9" w.c. LP - 2.6" w.c.

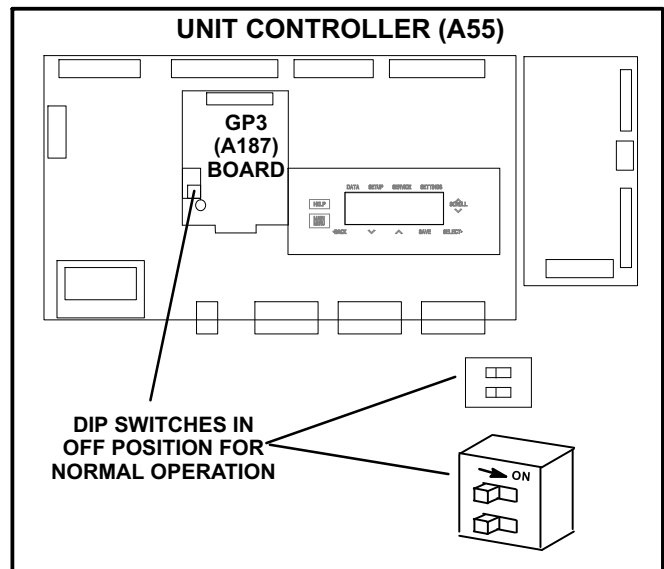


FIGURE 6

**Unit Controller Output**

The Unit Controller 0-10VDC output to the MGVs increases to modulate valves further closed during a reduced heating demand. The Unit Controller 0-10VDC output to the MGVs decreases to modulate valves further open during a higher heating demand.

