

# INSTALLATION MANUAL

**SINGLE PACKAGE  
AIR CONDITIONER / GAS HEAT**  
**MODELS: PCG6 SERIES**  
**2 THRU 5 TONS – 208/230V - 1 PHASE**



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## SECTION I: GENERAL INFORMATION

These are electric cooling/gas heating units designed for outdoor installation. Only gas piping, electric power and duct connections are required for installation.

The gas-fired heaters have spark ignition.

The refrigerant system is fully charged with R-410A refrigerant. The system is tested and factory sealed.

## SECTION II: SAFETY



This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention to the signal words **DANGER**, **WARNING**, or **CAUTION**.

**DANGER** indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury**.

**WARNING** indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury**.

**CAUTION** indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury**. It is also used to alert against unsafe practices and hazards involving only property damage.

## ▲ WARNING

*Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. **Failure to carefully read and follow all instructions in this manual can result in furnace malfunction, death, personal injury and/or property damage.** Only a qualified contractor, installer or service agency should install this product.*

## ▲ CAUTION

*This product must be installed in strict compliance with the installation instructions and any applicable local, state, and national codes including, but not limited to building, electrical, and mechanical codes.*

**⚠ WARNING**

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for information. For additional assistance, consult a qualified installer, service agency or the gas supplier.

**⚠ CAUTION**

This system uses R-410A refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

**⚠ 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.

**WHAT TO DO IF YOU SMELL GAS:**

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

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

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including ANSI Z223.1 or CSA-B149.1- latest edition.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

**SECTION III: MODEL NUMBER NOMENCLATURE**

PCG	4	A	24	50	2	X	1	A
1	2	3	4	5	6	7	8	9
<b>1. Model Family</b> PCG - packaged A/C with gas heat, PHG - packaged heat pump with gas heat, PCE - packaged A/C with electric heat, PHE - packaged heat pump with electric heat					<b>5. Gas Heating Input BTU/Hr x 1000</b> 050 = 50,000 BTU/Hr. input, blank = electric heat			
<b>2. Nominal Cooling Efficiency</b> 4 = 14 SEER, 6 = 16 SEER, etc.					<b>6. Voltage-Phase-Frequency</b> 2 = 208/230-1-60, 3=208/230-3-60, 4 = 460-3-60			
<b>3. Cabinet Size</b> A = small 35 x 51, B = large 45 x 51					<b>7. NOx Approval</b> X = low-NOx, blank = not low-NOx			
<b>4. Nominal Air Conditioning Cooling Capacity BTUx1000</b> 24 = 24,000 BTU, etc.					<b>8. Generation Level</b> 1 = first generation			
<b>Examples:</b> PHG4B421002X1A is a dual fuel, 14 SEER, 3-1/2 ton, large cabinet, single-stage heat, 100,000 BTU gas heat, 230 volt, single phase, low-NOx model (first generation, first release)					<b>9. Revision Level</b> A = original release, B = second release			

**SECTION IV: INSTALLATION****INSTALLATION SAFETY INFORMATION**

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer with instructions to retain them for future reference.

1. Refer to the unit rating plate for the approved type of gas for this product.
2. Install this unit only in a location and position as specified on Page 4 of these instructions.
3. Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when checking all connections, as specified on Page 10 of these instructions.

4. Always install unit to operate within the unit's intended temperature-rise range with the duct system and within the allowable external static pressure range (as specified on the unit name/rating plate and in Table 6 of these instructions).
5. This equipment is not to be used for temporary heating of buildings or structures under construction.

**⚠ WARNING****FIRE OR EXPLOSION HAZARD**

Failure to follow the safety warning 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.

**LIMITATIONS**

These units must be installed in accordance with the following:

**In U.S.A.:**

1. National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
2. National Fuel Gas Code, ANSI Z223.1 - Latest Edition
3. Gas-Fired Central Furnace Standard, ANSI Z21.47a. - Latest Edition
4. Local building codes
5. Local gas utility requirements

**In Canada:**

1. Canadian Electrical Code, CSA C22.1
2. Installation Codes, CSA - B149.1.
3. Local plumbing and waste water codes
4. Other applicable local codes.

Refer to unit application data found in this document.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

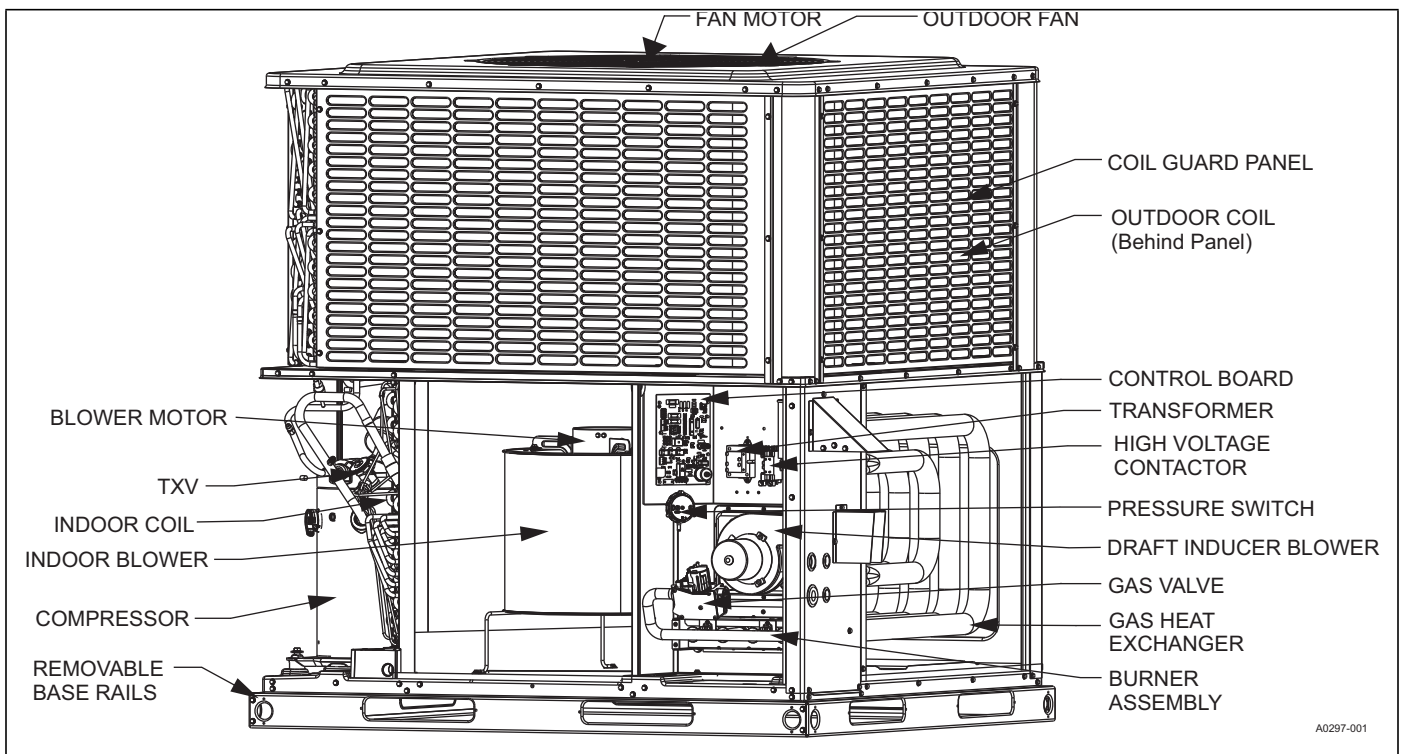
If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA).

This furnace is not to be used for temporary heating of buildings or structures under construction.

**Table 1: Unit Limitations**

Model	Unit Voltage	Unit Limitations		
		Applied Voltage		Outdoor DB Temp
		Min	Max	Max (°F)
All Models	208/230-1-60	187	252	125



**FIGURE 1: Component Location**

**LOCATION**

**⚠ WARNING**

*Excessive exposure of this unit to contaminated combustion air may result in equipment damage or personal injury. Typical contaminants include: permanent wave solution, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, anti-static fabric softeners for clothes dryers, masonry acid washing materials.*

Use the following guidelines to select a suitable location for these units:

**⚠ WARNING**

*Do not attach supply and return duct work to the bottom of the unit base pan as the drain pan could be compromised.*

1. Unit is designed for **outdoor installation** only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, a level pad or slab should be used. The thickness and size of the pad or slab used should meet local codes and requirements of unit weight. Do not tie the slab to the building foundation.

5. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/8" across the entire width and length of unit.

CLEARANCES

**⚠ WARNING**

*Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.*

All units require particular clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 – Latest Edition (in U.S.A.), or Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 (in Canada) - Latest Edition, and/or applicable provisions of the local building codes. Refer to Table 4 for clearances required for combustible construction, servicing, and proper unit operation.

RIGGING AND HANDLING

**⚠ CAUTION**

*If a unit is to be installed on a roof curb other than a Unitary Products roof curb, gasket or sealant must be applied to all surfaces that come in contact with the unit underside.*

**⚠ CAUTION**

*All panels must be secured in place when the unit is lifted. The outdoor coils should be protected from rigging cable damage with plywood or other suitable material.*

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. **MAKE SURE** to use the spreader bars across the top of the unit if the length of the spreader bars exceed the largest dimension across the unit.

**⚠ CAUTION**

*Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.*

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

Table 2: Weights and Dimensions

Model	Weight (lbs.)		Center of Gravity		4 Point Load Location (lbs.)			
	Shipping	Operating	X	Y	A	B	C	D
24050	372	367	28	15	120	95	81	71
24075	382	377	28	15	124	96	81	76
30050	417	412	28	15	139	99	90	84
30075	421	416	28	15	146	93	82	95
36065	466	461	28	15	161	113	96	91
36100	473	468	28	15	163	114	101	90
42065	500	495	28	15	175	123	104	93
42100	502	497	28	15	176	124	101	96
48065	520	515	28	15	189	116	93	117
48100	528	523	28	15	169	139	115	100
48125	533	528	28	15	164	145	124	95
60065	537	532	29	15	174	142	124	92
60100	541	536	28	15	177	140	117	102
60125	548	543	27	15	151	167	141	84

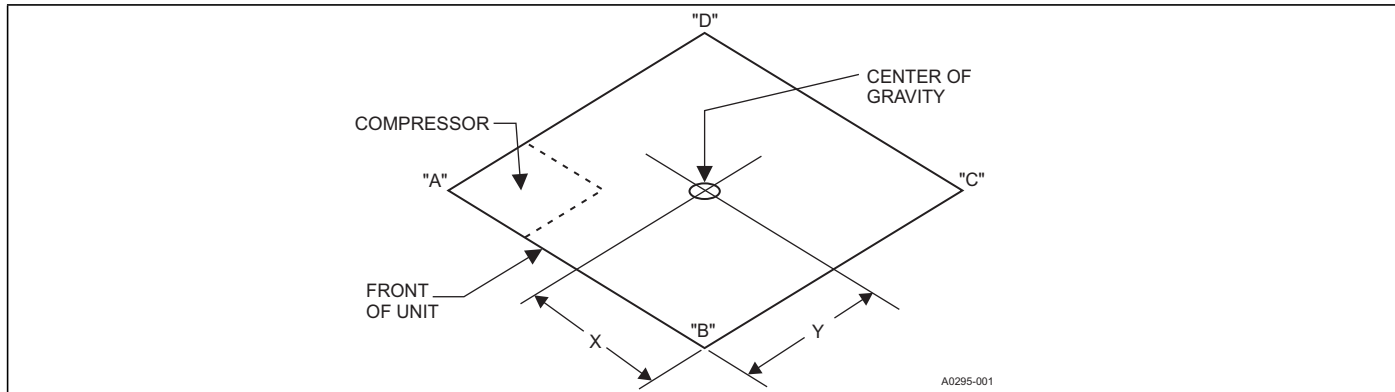
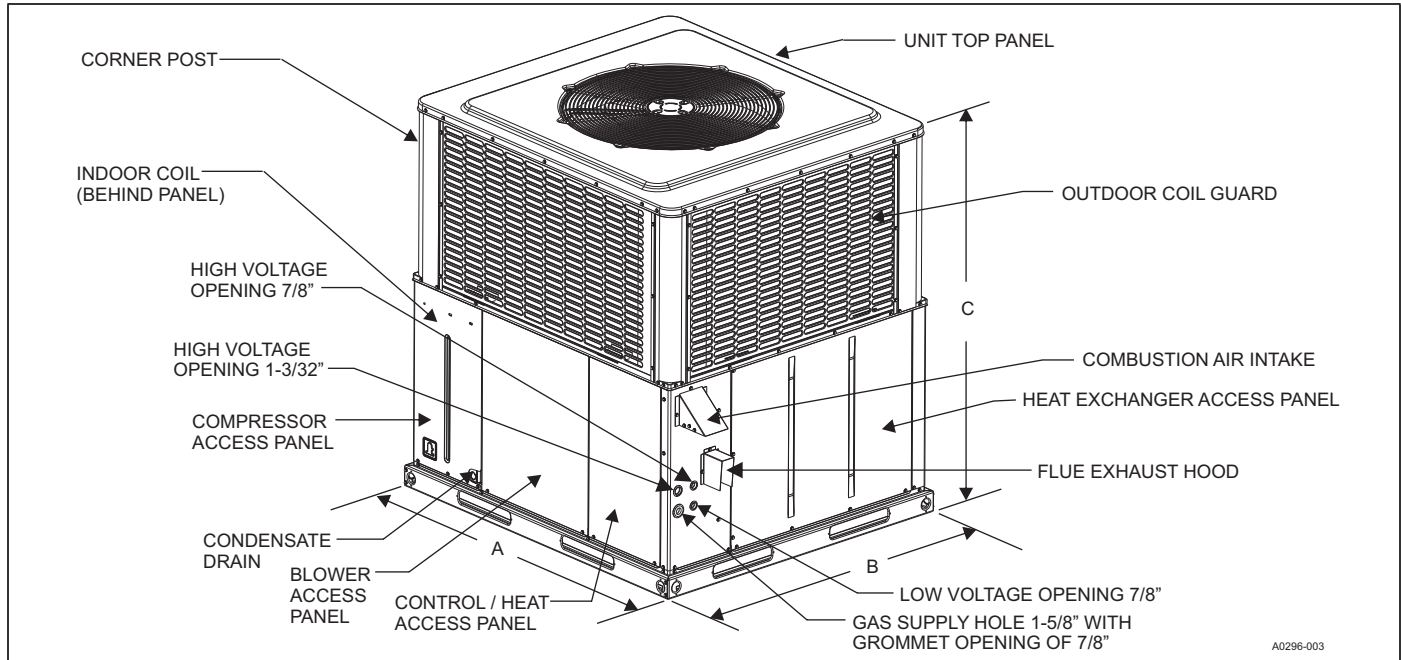


FIGURE 2: Center of Gravity Location

**Table 3:** Unit Dimensions

Model	Dimensions		
	A	B	C
24	51-1/4	35-3/4	47
30	51-1/4	35-3/4	47
36	51-1/4	45-3/4	49
42	51-1/4	45-3/4	49
48	51-1/4	45-3/4	53
60	51-1/4	45-3/4	55

**FIGURE 3:** Unit Dimensions**Table 4:** Unit Clearances<sup>1,2</sup>

Direction	Distance (in.)	Direction	Distance (in.)
Top <sup>3</sup>	36	Power Entry (Right Side)	36
Side Opposite Ducts	36	Left Side	24
Duct Panel	0	Bottom <sup>4</sup>	1

**NOTES:**

1. A 1" clearance must be provided between any combustible material and the supply air duct work.
2. The products of combustion must not be allowed to accumulate within a confined space and recirculate.
3. Units must be installed outdoors. Over hanging structure or shrubs should not obstruct condenser air discharge outlet.
4. Units may be installed on combustible materials made from wood or class A, B or C roof covering materials only if factory base rails are left in place as shipped.

DUCTWORK

**NOTICE**

*All units are shipped in the horizontal supply/return configuration. It is important to reduce the possibility of any air leakage through the bottom duct covers (resulting from cut, torn, or rolled gasket) due to improper handling or shipping processes. To ensure a good tight seal, it is recommended that silicone caulk and/or foil tape be applied along the cover edges.*

These units are adaptable to downflow use as well as rear supply and return air duct openings. To convert to downflow, use the following steps:

1. Remove the duct covers found in the bottom return and supply air duct openings.
2. Install the duct covers (removed in step one) to the rear supply and return air duct openings.
3. Seal duct covers with silicone caulk.

Duct work should be designed and sized according to the methods of the Air Conditioning Contractors of America (ACCA) as set forth in their Manual D.

A closed return duct system must be used. This does not preclude use of economizers or ventilation air intake. Flexible joints are recommended to be used in the supply and return duct work to minimize the transmission of vibration and noise.

**NOTICE**

*Be sure to note supply and return openings.*

Refer to Figures 4 and 5 for information concerning rear and bottom supply and return air duct openings.

FILTERS

Proper filter size is very important. Filter size, type and pressure drop should always be considered during duct system design.

Single phase units are shipped without a filter or filter racks. It is the responsibility of the installer to secure a filter in the return air ductwork or install a Filter/Frame Kit.

Filters must always be used and must be kept clean. When filters become dirt laden:

- insufficient air is delivered by the blower
- the unit efficiency is decreased
- operating costs are increased
- wear-and-tear is increased on the unit and controls.

Filters should be checked monthly. This is especially important since this unit is used for both heating and cooling.

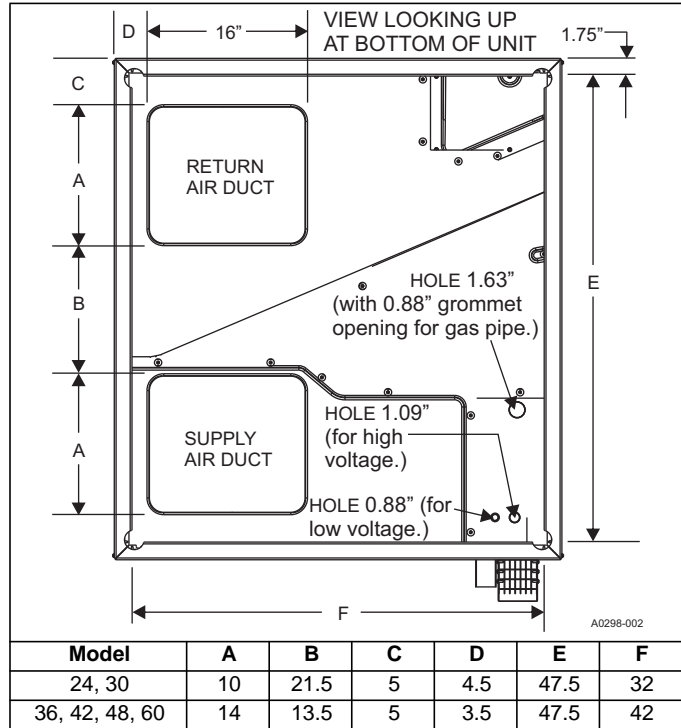
CONDENSATE DRAIN

A condensate trap must be installed in the condensate drain. The plumbing must conform to local codes.

**CAUTION**

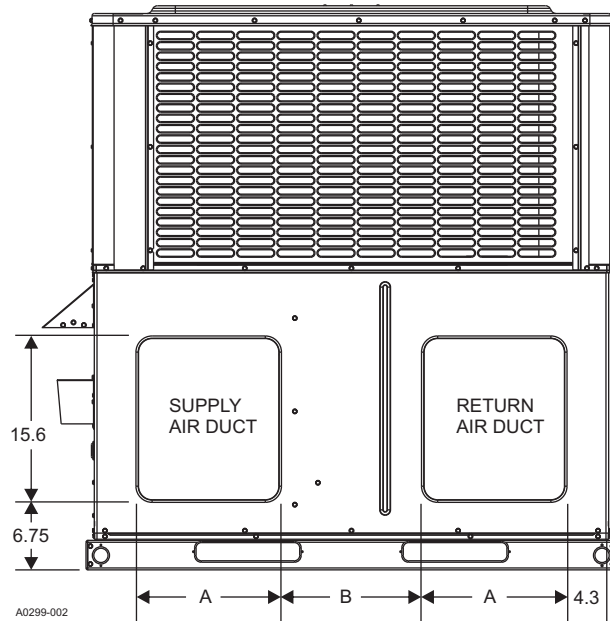
*Hand tighten only.*

Use Teflon tape or pipe thread compound if needed.



**FIGURE 4:** Bottom Duct Dimensions (inches)

NOTE: See Figure titled "Unit Dimensions" for side hole sizes of electrical and gas lines.



Model	A	B
24, 30	9.6	22
36, 42, 48, 60	13.6	14

FIGURE 5: Rear Duct Dimensions (inches)

## SERVICE ACCESS

Access to all serviceable components is provided at the following locations:

- Coil guards
- Unit top panel
- Corner posts
- Blower access panel
- Control access panel
- Indoor coil access panel
- Compressor access panel
- Heat exchanger access panel

Refer to Figure 3 for location of these access locations and minimum clearances in Table 4.

## CAUTION

*This system uses R-410A refrigerant which operates at higher pressures than some alternative refrigerants. Only R-410A refrigerant may be used in this system. Gauge sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If unsure, the equipment manufacturer should be consulted. Failure to use R-410A compatible servicing equipment may result in property damage or injury.*

## WARNING

*Wear safety glasses and gloves when handling refrigerants. Failure to follow this warning can cause serious personal injury.*

Refer to Figure 14 for the R-410A Quick Reference Guide.

**THERMOSTAT**

The room thermostat should be located on an inside wall approximately 60" above the floor where it is not subject to drafts, sun exposure or heat from electrical fixtures or appliances. Sealant should be used behind thermostat to prevent air infiltration. Manufacturer instructions enclosed with the thermostat should be followed for general installation procedures. Color coded insulated wires (minimum #18 AWG) should be used to connect thermostat to unit. See Figure 6.

This unit contains a multistage cooling compressor. A two heat / two cool (2H/2C) conventional thermostat must be used. If a single stage thermostat is used, the high / low gas heat input staging can be controlled by a built in staging function on the unit control board. Do not use power stealing thermostats.

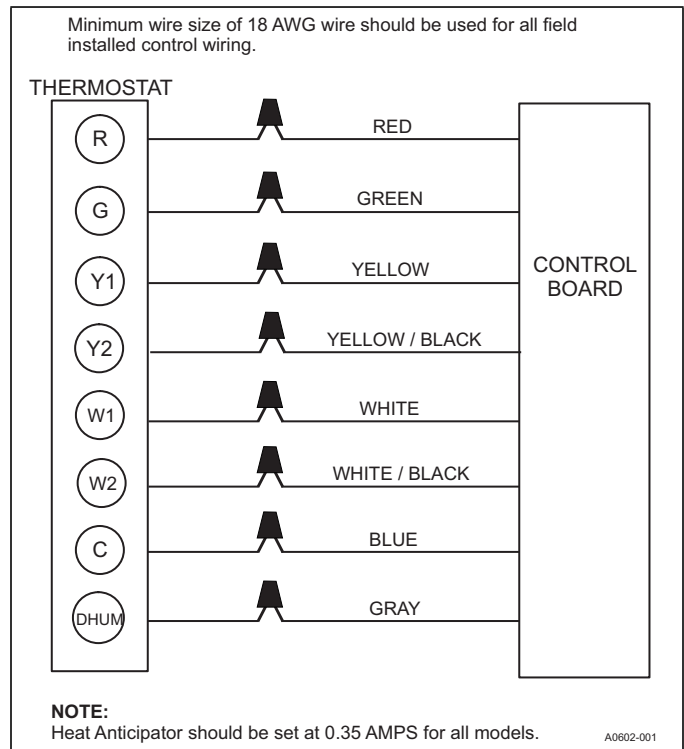
**POWER AND CONTROL WIRING**

Field wiring to the unit must conform to provisions of the current N.E.C. ANSI/NFPA No. 70 or C.E.C. and/or local ordinances. The unit must be electrically grounded in accordance with local codes or, in their absence, with the N.E.C./C.E.C. The correct voltage must be maintained at the compressor terminals during starting and running conditions. The voltage tolerances can be referenced in Table 1.

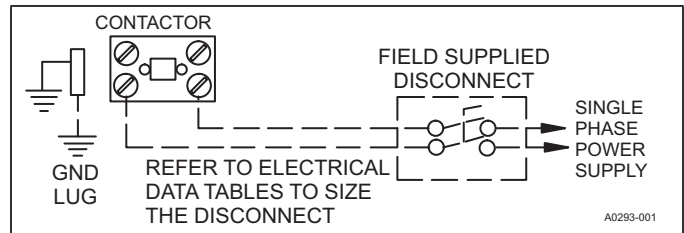
The wiring entering the cabinet must be provided with mechanical strain relief. A fused disconnect switch should be field provided for the unit. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram.

Electrical service must be sized properly to carry the load. Each unit must be wired with a separate branch circuit fed directly from the main distribution panel and properly fused.

Refer to Figures 6 and 7 for typical field wiring and for the appropriate unit wiring diagram of the control circuit and the power wiring information.



**FIGURE 6:** Typical Field Control Wiring Diagram For Gas Heat - AC Models



**FIGURE 7:** Typical Field Power Wiring Diagram

**Table 5:** Electrical Data

Model	Voltage	Compressor			Outdoor Fan Motor	Indoor Fan Blower Motor	MCA <sup>1</sup> (Amps)	Max Fuse <sup>2</sup> / Breaker Size (Amps) <sup>3</sup>
		RLA	LRA	MCC	FLA	FLA		
24050	208/230-1-60	11.7	58.3	18.2	0.7	2.6	17.9	25
24075	208/230-1-60	11.7	58.3	18.2	0.7	3.8	19.1	30
30050	208/230-1-60	13.1	73.0	20.4	0.8	2.6	19.8	30
30075	208/230-1-60	13.1	73.0	20.4	0.8	3.8	21.0	30
36065	208/230-1-60	15.6	83.0	24.4	1.7	3.8	25.0	40
36100	208/230-1-60	15.6	83.0	24.4	1.7	5.4	26.6	40
42065, 42100	208/230-1-60	17.9	96.0	28.0	1.7	5.4	29.5	45
48065, 48100, 48125	208/230-1-60	21.2	104.0	33.0	1.7	5.4	33.6	50
60065, 60100, 60125	208/230-1-60	26.9	152.9	42.0	1.7	7.0	42.3	60

**NOTES:**

1. Minimum Circuit Ampacity.
2. Maximum Over Current Protection per standard UL 1995.
3. Fuse or HACR circuit breaker to be field installed.



Table 6: Physical Data

MODELS:	PCG6A24		PCG6A30		PCG6B36		PCG6B42		PCG6B48			PCG6B60		
NOMINAL TONNAGE:	2.0		2.5		3.0		3.5		4.0			5.0		
<b>AHRI Cooling Performance</b>														
Gross Capacity @ AHRI A point (MBH)	24.6		30.7		36.5		43.3		49.1			60.0		
AHRI net capacity (MBH)	24.0		30.0		36.0		42.5		45.5			58.0		
EER	12.5		12.5		12.5		12.5		12.0			12.0		
SEER	16.0		16.0		16.0		16.0		16.0			16.0		
Nominal CFM	800		1000		1200		1400		1600			2000		
System power (kW)	2.0		2.4		3.0		3.4		3.6			4.6		
Refrigerant type	R410A		R410A		R410A		R410A		R410A			R410A		
Refrigerant charge (lb-oz)	6-8		8-2		11-8		11-4		13-8			14-0		
<b>AHRI Gas Heat Performance</b>														
Heating model	50	75	50	75	65	100	65	100	65	100	125	65	100	125
Heat input - High Fire (kBtu)	50	75	50	75	65	100	65	100	65	100	125	65	100	125
Heat output - High Fire (kBtu)	40	60	40	60	52	80	52	80	52	80	101	52	80	101
Heat input - Low Fire (kBtu)	33	49	33	49	43	65	43	65	43	65	82	43	65	82
Heat output - Low Fire (kBtu)	26	39	26	39	34	53	34	53	34	53	66	34	53	66
AFUE%	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0
No. burners	2	3	2	3	2	3	2	3	2	3	4	2	3	4
No. stages	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Temperature Rise Range - High Fire (°F)	40-70		40-70		40-70		40-70		40-70			40-70		
Temperature Rise Range - Low Fire (°F)	20-50		20-50		25-55		25-55		25-55			25-55		
Max. Static Pressure w.c.	0.5		0.5		0.5		0.5		0.5			0.5		
Max. Outlet Air Temp. (°F)	180		180		180		180		180			180		
Gas piping connection (inch)	1/2		1/2		1/2		1/2		1/2			1/2		
<b>Dimensions (inches)</b>														
Length	51-1/4		51-1/4		51-1/4		51-1/4		51-1/4			51-1/4		
Width	35-3/4		35-3/4		45-3/4		45-3/4		45-3/4			45-3/4		
Height	47		47		49		49		53			55		
<b>Compressor</b>														
Type	Scroll		Scroll		Scroll		Scroll		Scroll			Scroll		
Stages	2		2		2		2		2			2		
<b>Outdoor Coil Data</b>														
Face area (Sq. Ft.)	15.1		15.1		19.5		19.5		23.8			25.9		
Rows	1		2		2		2		2			2		
Fins per inch	22		22		22		22		22			22		
Tube diameter	3/8		3/8		3/8		3/8		3/8			3/8		
Circuitry Type	Interlaced		Interlaced		Interlaced		Interlaced		Interlaced			Interlaced		
<b>Indoor Coil Data</b>														
Face area (Sq. Ft.)	4.6		4.6		6.3		6.3		6.3			6.3		
Rows	3		3		3		3		3			4		
Fins per inch	16		16		16		16		16			16		
Tube diameter	3/8		3/8		3/8		3/8		3/8			3/8		
Circuitry Type	Interlaced		Interlaced		Interlaced		Interlaced		Interlaced			Interlaced		
Refrigerant control	TXV		TXV		TXV		TXV		TXV			TXV		
<b>Outdoor Fan Data</b>														
Fan diameter (Inches)	24		24		26		26		26			26		
Type	Prop		Prop		Prop		Prop		Prop			Prop		
Drive type	Direct		Direct		Direct		Direct		Direct			Direct		
No. speeds	1		1		1		1		1			1		
Motor HP each	1/10		1/8		1/3		1/3		1/3			1/3		
RPM	850		850		850		850		850			850		
Nominal total CFM	2400		2400		3200		3200		3200			3200		
<b>Direct Drive Indoor Fan Data</b>														
Fan Size (Inches)	11 x 8		11 x 8		11 x 10		11 x 10		11 x 10			11 x 10		
Type	Centrifugal		Centrifugal		Centrifugal		Centrifugal		Centrifugal			Centrifugal		
Motor HP each	1/3	1/2	1/3	1/2	1/2	3/4	3/4		3/4			1		
RPM	1200 Max		1200 Max		1200 Max		1200 Max		1200 Max			1200 Max		
Frame size	48		48		48		48		48			48		
<b>Filters</b>														
Filter size	A		A		B		B		B			B		
Quantity - Size	Field-supplied external filters must be sized so as not to exceed 300 fpm air velocity through disposable filters. For internal filter use, a filter rack kit is available. Consult the instructions supplied with that kit for replacement filter sizes. Filter sizes: A=20x20, B=20x30.													

## COMPRESSORS

**⚠ CAUTION**

*This system uses R-410A refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.*

The compressor used in this product is specifically designed to operate with R-410A refrigerant and cannot be interchanged. Compressors used in PCG6 models contain two internal bypass ports which enable the compressor to operate at 67% part load capacity.

The compressor uses polyolester (POE oil), Mobile 3MA POE. This oil is extremely hydroscopic, meaning it absorbs water readily. POE oil can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. If refrigerant circuit is opened, take all necessary precautions to avoid exposure of the oil to the atmosphere.

**⚠ CAUTION**

*Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the **POE oil** in the system. This type of oil is highly susceptible to moisture absorption*

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials.

**⚠ CAUTION**

*Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.*

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

**⚠ CAUTION**

*Do not loosen compressor mounting bolts.*

Units are shipped with compressor mountings which are factory-adjusted and ready for operation.

## GAS HEAT

These two stage gas-fired heat sections have direct spark ignition.

## GAS PIPING

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. National Fuel Gas Code Z223.1 or CSA B149.1 should be followed in all cases unless superseded by local codes or gas company requirements. Refer to Tables 7 and 8.

The BTU content of the gas may differ with locality. The value should be checked with the local gas utility.

**NOTICE**

*There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 1/2 inch pipe connection at the gas valve.*

**GAS CONNECTION**

The gas supply line should be routed through the 1-5/8" hole located on the right side of the unit. See Figure 3 for the location. The unit is supplied with a rubber grommet that fits in this hole and is used to seal around the gas pipe. **THIS GROMMET MUST BE INSTALLED IN ORDER TO PREVENT LEAKAGE OF AIR AND WATER INTO THE HEATING/CONTROLS COMPARTMENT.**

**Gas piping requirements:**

1. Install a drip leg and a ground joint union in the gas piping.
2. Install a manual shut-off valve outside of the unit if required by local codes.

**⚠ CAUTION**

*If flexible stainless steel tubing is allowed by the authority having jurisdiction, wrought iron or steel pipe must be installed at the gas valve and extend a minimum of two (2) inches outside of the unit casing.*

3. Use wrought iron or steel pipe for all gas lines. Apply pipe thread sealant sparingly to male threads only.

**Table 7: Natural Gas Pipe Sizing Chart<sup>1</sup>**

Length In Feet	Nominal Inches Iron Pipe Size			
	1/2"	3/4"	1"	1-1/4"
10	132	278	520	1,050
20	92	190	350	730
30	73	152	285	590
40	63	130	245	500
50	56	115	215	440
60	50	105	195	400
70	46	96	180	370
80	43	90	170	350
90	40	84	160	320
100	38	79	150	305

1. Maximum capacity of pipe in cubic feet of gas per hour (based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas).

**Table 8: Propane (LP) Gas Pipe Sizing Chart<sup>1</sup>**

Length In Feet	Nominal Inches Iron Pipe Size			
	1/2"	3/4"	1"	1-1/4"
10	275	567	1071	2,205
20	189	393	732	1496
30	152	315	590	1212
40	129	267	504	1039
50	114	237	448	913
60	103	217	409	834
70	96	196	378	771
80	89	185	346	724
90	83	173	322	677
100	78	162	307	630

1. Maximum capacity of pipe in thousands of BTU per hour (based upon a pressure drop of 0.5 inch water column).

**⚠ WARNING**

*Natural gas may contain some propane. Propane being an excellent solvent, will quickly dissolve white lead or most standard commercial compounds. Therefore, a special pipe thread sealant must be applied when wrought iron or steel pipe is used. Shellac base compounds such as gaskoloc or stalastic, and compounds such as Rectorseal # 5, Clyde's or John Crane may be used.*

4. Clean all piping of dirt and scale by hammering on the outside of the pipe and blowing out the loose dirt and scale. Before initial start-up, be sure that all of the gas lines external to the unit have been purged of air.
5. Ensure that the gas supply is a separate line and is installed in accordance with all applicable safety codes. After the gas connections have been completed, open the main shut-off valve admitting normal gas pressure to the gas valve. Check all joints for leaks with soap solution or other material suitable for the purpose. **NEVER USE AN OPEN FLAME** to check for leaks.

**⚠ WARNING**

**FIRE OR EXPLOSION HAZARD**  
*Failure to follow the safety warning 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.*

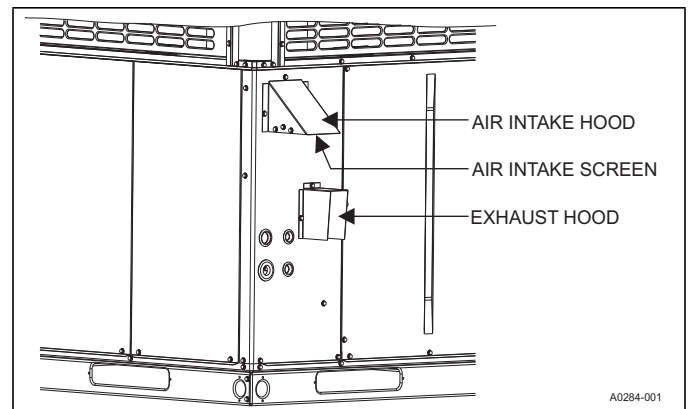
6. Pressure tests in excess of 1/2 psi (3.48 kPa): During the gas supply piping system pressure test, ensure that the unit and its equipment shutoff valve is disconnected from the gas supply system.
7. Pressure tests equal to or less than 1/2 psig (3.48 kPa): During the gas supply piping system pressure test, verify that the unit is isolated from the gas supply piping system by closing its individual manual shut-off valve.

**FLUE VENT AND AIR INTAKE HOOD**

The flue vent hood and air intake hoods are shipped loose. These hoods must be installed to assure proper unit operation. The hoods must be fastened to the outside of the side gas control/electrical compartment with the screws provided. See Figure 8.

**⚠ WARNING**

*Flue hood surfaces may be hot.*



**FIGURE 8: Flue Vent Outlet Air Hood**

**⚠ CAUTION**

*The flue exhaust hood must be properly installed within the recommended clearances. Further communications and action must be given to the home or building owner(s) to eliminate any unauthorized human contact around this area during the heating cycle. Flue hood surfaces and the immediate area reach high temperatures during the heating cycle.*

**Table 9:** Natural Gas Application Data

Available On Models	Input (MBH) <sup>1</sup> High Fire / Low Fire	Output (MBH) High Fire / Low Fire	Gas Rate <sup>2</sup> Cu. Ft. Per Hr. High Fire / Low Fire	Number of Burners
2, 2-1/2 Tons	50 / 32	40 / 26	46.5 / 29.8	2
3, 3-1/2, 4, 5 Tons	65 / 42	52 / 34	60.5 / 39.1	2
2, 2-1/2Tons	75 / 49	60 / 39	69.8 / 45.6	3
3, 3-1/2, 4, 5 Tons	100 / 65	80 / 53	93.0 / 60.5	3
4, 5 Tons	125 / 81	101 / 66	116.3 / 75.3	4

**NOTES:**

1. Heating capacity valid for elevations up to 2000 feet above sea level. For elevations above 2,000 feet, rated capacity should be reduced by 4% for each 1,000 feet above sea level.
2. Based on 1075 BTU Per Cu. Ft.

**Table 10:** Propane<sup>1,4</sup> (LP) Gas Application Data

Available On Models	Input (MBH) <sup>2</sup> High Fire / Low Fire	Output (MBH) High Fire / Low Fire	Gas Rate <sup>3</sup> Cu. Ft. Per Hr. High Fire / Low Fire	Number of Burners
2, 2-1/2 Tons	50 / 32	40 / 26	20.0 / 12.8	2
3, 3-1/2, 4, 5 Tons	65 / 42	52 / 34	26.0 / 16.8	2
2, 2-1/2Tons	75 / 49	60 / 39	30.0 / 19.6	3
3, 3-1/2, 4, 5 Tons	100 / 65	80 / 53	40.0 / 26.0	3
4, 5 Tons	125 / 81	101 / 66	50.0 / 32.4	4

**NOTES:**

1. Propane applications are accomplished by field installation of a Propane Conversion Accessory Kit.
2. Input rate valid for elevations up to 2,000 feet above sea level. For elevations above 2,000 feet, gas input rated capacity should be reduced by 4% for each 1,000 feet above sea level.
3. Based on 2500 BTU Per Cu. Ft.
4. Refer to the Accessories section in the Technical Guide for a brief description of the propane conversion kits.

## SECTION V: AIRFLOW PERFORMANCE

Table 11: Airflow Performance - Side Duct Application

Model	Jumper Position		External Static Pressure (Inches WC)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
			SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
24050	High Cool	A	991	957	913	863	809	768	717	662	630	598
		B	902	858	809	753	703	659	615	570	513	496
		C	826	779	719	664	616	570	531	478	434	417
		D	693	642	571	529	466	430	390	357	309	275
	Low Cool	A	808	761	699	645	597	552	512	455	420	401
		B	718	668	599	554	495	457	416	375	334	304
		C	615	556	489	450	390	358	311	281	221	181
		D	562	494	436	395	348	317	259	217	155	113
	High Heat	A	862	815	761	702	655	607	571	524	463	450
		B	768	721	654	604	553	511	469	411	386	362
		C	680	628	557	516	451	416	376	348	296	261
		D	655	602	530	491	422	389	350	330	271	232
	Low Heat	A	862	815	761	702	655	607	571	524	463	450
		B	756	708	640	591	539	498	456	402	373	347
		C	628	571	503	464	400	368	324	298	238	198
		D	602	540	476	436	379	348	298	265	204	164
24075	High Cool	A	982	946	899	849	801	761	710	656	609	581
		B	927	867	813	761	717	667	612	561	524	487
		C	870	761	699	649	605	539	484	449	422	370
		D	799	623	552	475	436	387	338	294	237	192
	Low Cool	A	902	822	764	713	669	612	557	513	480	437
		B	855	734	669	615	572	509	454	418	385	334
		C	827	678	611	545	504	448	396	356	311	263
		D	675	546	466	404	347	277	205	160	126	80
	High Heat	A	1184	1161	1124	1084	1041	994	954	913	872	822
		B	1076	1047	1011	967	912	875	833	790	734	707
		C	992	957	912	863	813	774	724	672	622	596
		D	927	867	813	761	717	667	612	561	524	487
	Low Heat	A	1205	1182	1145	1107	1065	1019	979	938	896	845
		B	1076	1047	1011	967	912	875	833	790	734	707
		C	992	957	912	863	813	774	724	672	622	596
		D	902	822	764	713	669	612	557	513	480	437
30050	High Cool	A	1148	1117	1081	1039	991	945	901	862	821	764
		B	1078	1047	1007	962	906	859	816	769	722	693
		C	1026	994	951	903	846	803	757	696	673	635
		D	871	824	771	712	664	616	580	536	470	458
	Low Cool	A	982	947	904	853	799	759	707	654	620	589
		B	910	867	819	763	713	670	624	578	524	505
		C	808	761	699	645	597	552	512	455	420	401
		D	781	734	668	617	568	525	482	420	398	376
	High Heat	A	862	815	761	702	655	607	571	524	463	450
		B	768	721	654	604	553	511	469	411	386	362
		C	680	628	557	516	451	416	376	348	296	261
		D	655	602	530	491	422	389	350	330	271	232
	Low Heat	A	862	815	761	702	655	607	571	524	463	450
		B	756	708	640	591	539	498	456	402	373	347
		C	628	571	503	464	400	368	324	298	238	198
		D	602	540	476	436	379	348	298	265	204	164

Continued on following pages. See Notes at end of table.

**Table 11: Airflow Performance - Side Duct Application (Continued)**

Model	Jumper Position	External Static Pressure (Inches WC)										
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
		SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	
30075	High Cool	A	1152	1128	1090	1049	1005	958	917	876	834	788
		B	1076	1047	1011	967	912	875	833	790	734	707
		C	1023	991	950	903	850	813	767	719	664	640
		D	910	837	780	729	685	631	576	529	495	453
	Low Cool	A	982	946	899	849	801	761	710	656	609	581
		B	927	867	813	761	717	667	612	561	524	487
		C	870	761	699	649	605	539	484	449	422	370
		D	813	650	582	510	470	417	367	325	274	227
	High Heat	A	1184	1161	1124	1084	1041	994	954	913	872	822
		B	1076	1047	1011	967	912	875	833	790	734	707
		C	992	957	912	863	813	774	724	672	622	596
		D	927	867	813	761	717	667	612	561	524	487
	Low Heat	A	1205	1182	1145	1107	1065	1019	979	938	896	845
		B	1076	1047	1011	967	912	875	833	790	734	707
		C	992	957	912	863	813	774	724	672	622	596
		D	902	822	764	713	669	612	557	513	480	437
36065	High Cool	A	1371	1354	1303	1257	1209	1148	1084	1008	934	878
		B	1293	1246	1206	1152	1098	1028	938	865	813	767
		C	1232	1178	1131	1077	1012	929	853	790	738	690
		D	1058	999	931	859	762	694	635	582	523	459
	Low Cool	A	1153	1095	1036	979	899	810	751	697	643	588
		B	1015	952	884	802	709	646	582	528	467	402
		C	882	805	741	625	556	501	415	359	297	228
		D	805	718	642	523	436	376	294	247	193	118
	High Heat	A	1126	1067	1006	945	860	777	718	664	608	551
		B	1015	952	884	802	709	646	582	528	467	402
		C	955	886	821	721	642	584	508	453	391	324
		D	910	836	774	661	592	537	453	396	333	265
	Low Heat	A	970	902	837	742	659	599	527	472	410	343
		B	818	732	659	540	456	397	314	265	211	136
		C	766	674	593	473	377	314	234	190	142	63
		D	721	625	540	413	314	251	172	131	102	53
36100	High Cool	A	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		B	1304	1260	1218	1170	1116	1055	1007	953	896	834
		C	1233	1186	1137	1085	1029	965	915	861	799	736
		D	1063	1006	937	871	806	735	678	628	550	484
	Low Cool	A	1120	1067	1004	944	882	813	758	707	635	569
		B	1025	966	892	823	756	684	625	575	494	427
		C	882	812	716	633	559	480	412	366	270	199
		D	821	746	641	552	475	392	321	276	174	101
	High Heat	A	1704	1667	1645	1612	1572	1520	1477	1419	1384	1327
		B	1506	1468	1441	1404	1358	1302	1259	1203	1159	1101
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1251	1205	1157	1107	1051	987	938	884	824	761
	Low Heat	A	1392	1352	1318	1276	1226	1168	1123	1067	1017	957
		B	1251	1205	1157	1107	1051	987	938	884	824	761
		C	1139	1087	1027	968	907	839	785	733	663	598
		D	984	922	841	769	700	625	564	515	430	361

Continued on following pages. See Notes at end of table.

Table 11: Airflow Performance - Side Duct Application (Continued)

Model	Jumper Position		External Static Pressure (Inches WC)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
			SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
42065	High Cool	A	1555	1518	1494	1459	1414	1360	1318	1261	1220	1162
		B	1473	1435	1406	1368	1320	1264	1220	1164	1119	1060
		C	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		D	1216	1168	1117	1064	1007	942	892	838	775	712
	Low Cool	A	1233	1186	1137	1085	1029	965	915	861	799	736
		B	1139	1087	1027	968	907	839	785	733	663	598
		C	1025	966	892	823	756	684	625	575	494	427
		D	964	900	816	742	672	596	534	485	398	329
	High Heat	A	1120	1067	1004	944	882	813	758	707	635	569
		B	1063	1006	937	871	806	735	678	628	550	484
		C	964	900	816	742	672	596	534	485	398	329
		D	882	812	716	633	559	480	412	366	270	199
	Low Heat	A	1101	1047	982	919	857	787	732	680	606	541
		B	923	856	766	688	616	538	473	426	334	264
		C	821	746	641	552	475	392	321	276	174	101
		D	735	655	533	435	353	266	189	147	100	85
42100	High Cool	A	1555	1518	1494	1459	1414	1360	1318	1261	1220	1162
		B	1473	1435	1406	1368	1320	1264	1220	1164	1119	1060
		C	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		D	1216	1168	1117	1064	1007	942	892	838	775	712
	Low Cool	A	1233	1186	1137	1085	1029	965	915	861	799	736
		B	1139	1087	1027	968	907	839	785	733	663	598
		C	1025	966	892	823	756	684	625	575	494	427
		D	964	900	816	742	672	596	534	485	398	329
	High Heat	A	1704	1667	1645	1612	1572	1520	1477	1419	1384	1327
		B	1506	1468	1441	1404	1358	1302	1259	1203	1159	1101
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1251	1205	1157	1107	1051	987	938	884	824	761
	Low Heat	A	1392	1352	1318	1276	1226	1168	1123	1067	1017	957
		B	1251	1205	1157	1107	1051	987	938	884	824	761
		C	1139	1087	1027	968	907	839	785	733	663	598
		D	984	922	841	769	700	625	564	515	430	361
48065	High Cool	A	1851	1809	1781	1746	1707	1656	1609	1552	1518	1460
		B	1689	1652	1630	1597	1556	1504	1461	1404	1368	1310
		C	1614	1578	1554	1520	1477	1424	1382	1324	1286	1228
		D	1374	1333	1298	1255	1204	1145	1100	1044	993	933
	Low Cool	A	1473	1435	1406	1368	1320	1264	1220	1164	1119	1060
		B	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1286	1241	1197	1149	1095	1032	984	930	872	810
	High Heat	A	1120	1067	1004	944	882	813	758	707	635	569
		B	1063	1006	937	871	806	735	678	628	550	484
		C	964	900	816	742	672	596	534	485	398	329
		D	882	812	716	633	559	480	412	366	270	199
	Low Heat	A	1101	1047	982	919	857	787	732	680	606	541
		B	923	856	766	688	616	538	473	426	334	264
		C	821	746	641	552	475	392	321	276	174	101
		D	735	655	533	435	353	266	189	147	100	85

Continued on following pages. See Notes at end of table.

**Table 11: Airflow Performance - Side Duct Application (Continued)**

Model	Jumper Position		External Static Pressure (Inches WC)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
			SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
48100	High Cool	A	1851	1809	1781	1746	1707	1656	1609	1552	1518	1460
		B	1689	1652	1630	1597	1556	1504	1461	1404	1368	1310
		C	1614	1578	1554	1520	1477	1424	1382	1324	1286	1228
		D	1374	1333	1298	1255	1204	1145	1100	1044	993	933
	Low Cool	A	1473	1435	1406	1368	1320	1264	1220	1164	1119	1060
		B	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1286	1241	1197	1149	1095	1032	984	930	872	810
	High Heat	A	1704	1667	1645	1612	1572	1520	1477	1419	1384	1327
		B	1506	1468	1441	1404	1358	1302	1259	1203	1159	1101
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1251	1205	1157	1107	1051	987	938	884	824	761
	Low Heat	A	1392	1352	1318	1276	1226	1168	1123	1067	1017	957
		B	1251	1205	1157	1107	1051	987	938	884	824	761
		C	1139	1087	1027	968	907	839	785	733	663	598
		D	984	922	841	769	700	625	564	515	430	361
48125	High Cool	A	1851	1809	1781	1746	1707	1656	1609	1552	1518	1460
		B	1689	1652	1630	1597	1556	1504	1461	1404	1368	1310
		C	1614	1578	1554	1520	1477	1424	1382	1324	1286	1228
		D	1374	1333	1298	1255	1204	1145	1100	1044	993	933
	Low Cool	A	1473	1435	1406	1368	1320	1264	1220	1164	1119	1060
		B	1374	1333	1298	1255	1204	1145	1100	1044	993	933
		C	1322	1278	1238	1191	1138	1077	1030	975	920	859
		D	1286	1241	1197	1149	1095	1032	984	930	872	810
	High Heat	A	2114	2046	1974	1914	1874	1815	1745	1696	1645	1582
		B	1982	1930	1887	1844	1806	1752	1697	1643	1604	1545
		C	1785	1746	1720	1687	1647	1596	1551	1494	1459	1402
		D	1614	1578	1554	1520	1477	1424	1382	1324	1286	1228
	Low Heat	A	2114	2046	1974	1914	1874	1815	1745	1696	1645	1582
		B	1982	1930	1887	1844	1806	1752	1697	1643	1604	1545
		C	1490	1452	1423	1386	1339	1283	1240	1183	1139	1080
		D	1357	1315	1278	1234	1182	1123	1077	1021	969	908
60065	High Cool	A	2149	2114	2077	2030	1989	1948	1905	1859	1816	1768
		B	2013	1977	1941	1898	1860	1816	1772	1726	1677	1630
		C	1936	1900	1864	1822	1783	1739	1695	1649	1597	1551
		D	1719	1685	1642	1600	1555	1508	1465	1418	1372	1327
	Low Cool	A	1629	1591	1546	1502	1455	1409	1362	1315	1266	1220
		B	1558	1516	1469	1423	1375	1329	1280	1232	1181	1135
		C	1453	1406	1355	1305	1255	1207	1153	1100	1047	997
		D	1410	1361	1307	1255	1204	1155	1100	1044	992	938
	High Heat	A	1276	1219	1158	1098	1040	987	927	869	818	761
		B	1133	1068	995	922	849	793	730	680	634	579
		C	1025	950	868	788	713	654	591	505	458	415
		D	844	748	651	563	494	433	372	168	115	105
	Low Heat	A	1228	1169	1104	1039	976	922	861	806	757	700
		B	1086	1017	940	863	786	728	664	617	573	519
		C	844	748	651	563	494	433	372	168	115	105
		D	786	666	593	514	453	370	314	263	180	38

See Notes at end of table on next page.



**Table 11: Airflow Performance - Side Duct Application (Continued)**

Model	Jumper Position		External Static Pressure (Inches WC)									
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
			SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM	SCFM
60100	High Cool	A	2149	2114	2077	2030	1989	1948	1905	1859	1816	1768
		B	2013	1977	1941	1898	1860	1816	1772	1726	1677	1630
		C	1936	1900	1864	1822	1783	1739	1695	1649	1597	1551
		D	1719	1685	1642	1600	1555	1508	1465	1418	1372	1327
	Low Cool	A	1629	1591	1546	1502	1455	1409	1362	1315	1266	1220
		B	1558	1516	1469	1423	1375	1329	1280	1232	1181	1135
		C	1453	1406	1355	1305	1255	1207	1153	1100	1047	997
		D	1410	1361	1307	1255	1204	1155	1100	1044	992	938
	High Heat	A	1739	1705	1664	1620	1577	1530	1487	1441	1393	1348
		B	1558	1516	1469	1423	1375	1329	1280	1232	1181	1135
		C	1410	1361	1307	1255	1204	1155	1100	1044	992	938
		D	1323	1270	1213	1156	1104	1052	993	933	880	821
	Low Heat	A	1594	1553	1507	1462	1415	1369	1321	1274	1223	1178
		B	1323	1270	1213	1156	1104	1052	993	933	880	821
		C	1181	1118	1049	980	913	857	795	743	696	640
		D	1025	950	868	788	713	654	591	505	458	415
60125	High Cool	A	2149	2114	2077	2030	1989	1948	1905	1859	1816	1768
		B	2013	1977	1941	1898	1860	1816	1772	1726	1677	1630
		C	1936	1900	1864	1822	1783	1739	1695	1649	1597	1551
		D	1719	1685	1642	1600	1555	1508	1465	1418	1372	1327
	Low Cool	A	1629	1591	1546	1502	1455	1409	1362	1315	1266	1220
		B	1558	1516	1469	1423	1375	1329	1280	1232	1181	1135
		C	1453	1406	1355	1305	1255	1207	1153	1100	1047	997
		D	1410	1361	1307	1255	1204	1155	1100	1044	992	938
	High Heat	A	2259	2221	2183	2142	2099	2060	2015	1975	1931	1882
		B	2093	2059	2023	1977	1938	1896	1852	1805	1760	1712
		C	1908	1872	1835	1792	1753	1709	1665	1619	1566	1522
		D	1760	1726	1685	1641	1598	1552	1510	1463	1413	1370
	Low Heat	A	2259	2221	2183	2142	2099	2060	2015	1975	1931	1882
		B	1965	1929	1893	1851	1813	1769	1724	1678	1628	1580
		C	1701	1666	1623	1580	1535	1488	1445	1397	1351	1305
		D	1683	1648	1604	1560	1515	1468	1424	1377	1330	1284

**NOTES:**

1. Airflow tested with dry coil conditions, without air filters, at 230 volts
2. Applications above 0.8" w.c. external static pressure are not recommended.
3. Brushless DC high efficiency enhanced ECM blower motor used for all indoor blower assemblies.
4. Minimal variations in airflow performance data results from operating at 208 volts. Data above may be used in those cases.
5. Minimal variations in airflow performance data results from using downflow duct applications. Data above may be used in those cases.
6. Heating applications tested at 0.50" w.c. esp, and cooling applications tested at 0.30" w.c. esp per standards.

**Table 12:** Additional Static Resistance

Size (Tons)	CFM	Wet Indoor Coil	Economizer	Filter/Frame Kit
024 (2.0)	500	0.01	0.00	0.01
	600	0.01	0.00	0.02
	700	0.01	0.00	0.04
	800	0.02	0.01	0.06
	900	0.03	0.01	0.08
	1000	0.04	0.01	0.10
	1100	0.05	0.01	0.13
	1200	0.06	0.02	0.16
030 (2.5)	700	0.01	0.00	0.04
	800	0.02	0.01	0.06
	900	0.03	0.01	0.08
	1000	0.04	0.01	0.10
	1100	0.05	0.01	0.13
	1200	0.06	0.02	0.16
	1300	0.07	0.03	0.17
036 (3.0)	700	0.01	0.00	0.04
	800	0.02	0.01	0.06
	900	0.03	0.01	0.08
	1000	0.04	0.01	0.10
	1100	0.05	0.01	0.13
	1200	0.06	0.02	0.16
	1300	0.07	0.03	0.17
	1400	0.08	0.04	0.18
042 (3.5)	1100	0.02	0.02	0.04
	1200	0.03	0.02	0.04
	1300	0.04	0.02	0.05
	1400	0.05	0.03	0.05
	1500	0.06	0.04	0.06
	1600	0.07	0.04	0.07
	1700	0.07	0.04	0.08
	1800	0.08	0.04	0.09
	1900	0.09	0.05	0.10
	2000	0.09	0.05	0.11
048 (4.0)	1100	0.02	0.02	0.04
	1200	0.03	0.02	0.04
	1300	0.04	0.02	0.05
	1400	0.05	0.03	0.05
	1500	0.06	0.04	0.06
	1600	0.07	0.04	0.07
	1700	0.07	0.04	0.08
	1800	0.08	0.04	0.09
	1900	0.09	0.05	0.10
	2000	0.09	0.05	0.11
060 (5.0)	1100	0.02	0.02	0.04
	1200	0.03	0.02	0.04
	1300	0.04	0.02	0.05
	1400	0.05	0.03	0.05
	1500	0.06	0.04	0.06
	1600	0.07	0.04	0.07
	1700	0.07	0.04	0.08
	1800	0.08	0.04	0.09
	1900	0.09	0.05	0.10
	2000	0.09	0.05	0.11

**NOTES:**

1. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation. Filter pressure drop based on standard filter media tested at velocities not to exceed 300 ft/min.

**SECTION VI: OPERATION**

The unit is controlled by a conventional heating/cooling thermostat.

If an electronic thermostat is used, make sure it has a common connection. DO NOT use a power stealing thermostat.

The unit has two stages of gas heat, and two stages of electric cooling. The unit may be controlled using a single stage heat / single stage cool (1H/1C) thermostat, but the second stage cooling is not available unless the unit control is physically wired for full capacity cooling operation. For optimum performance, it is recommend to use a two stage heat / two stage cool (2H/2C) thermostat.

**HEATING SEQUENCE OF OPERATION****Heating**

The control board begins a call for heat when "W1" is energized (connected to "R").

The control checks to see if the pressure switch is open. If the pressure switch is closed, the control board flashes "2" on the LED and waits indefinitely for it to open. When the pressure switch is sensed as open, the control begins pressure switch proving period. If the call for heat is removed, the control goes back to Standby.

The unit control contains a built in 2<sup>nd</sup> stage heating "HI HEAT DELAY" jumper that can automatically stage up to full capacity heating operation based on first stage heating call timing. Built in heating stage up selection is a "OFF," "10," "15," or "20" minute timer. Based on "HI HEAT DELAY" jumper selection, the control is automatically staged up to high heat during a call for low heat on the "W1" input terminal. This timing starts over with each new call for heat. Regardless of "HI HEAT DELAY" jumper setting if anytime the control is operating in low heat (W1) and a 24 VAC signal is received on the high heat input (W2), the control is staged up to full capacity heating operation. When using the built in "HI HEAT DELAY" feature and the control has staged up to full capacity heating, the unit remains in full capacity heating until the call for heat on the "W1" input is terminated. If using a two stage heating thermostat, set the "HI HEAT DELAY" jumper to the "OFF" position.

**Pressure Switch Proving**

The control board energizes the induced draft motor and waits for the pressure switch to close. When the pressure switch closes, the control begins Pre-purge period. If the call for heat is removed, the control de-energizes the inducer without post-purge and returns to standby.

If the pressure switch does not close within 5 seconds of inducer energizing, the control board flashes "3" on the LED. If the pressure switch does not close within 60 seconds of inducer energizing, the control shuts off the inducer for 60 seconds, then energizes the inducer for another 60 seconds in an attempt to close the pressure switch. This cycle continues indefinitely until either the pressure switch is proved closed, or the call for heat ends.

**Pre-purge**

The control board monitors the pressure switch and ensures it remains closed during pre-purge. If the pressure switch opens, the control goes back to pressure switch proving mode. The control waits for a 15 second pre-purge period, then begins the ignition trial.

**Ignition Trial Period**

The control board energizes the gas valve and spark outputs for a 5 second Ignition trial. The control de-energizes the spark when flame is sensed and enters a flame stabilization period.

The unit control establishes flame in "HI HEAT" mode. If a call for heating is only present on the first stage heating (W1) input, the control switches to first stage heat after 10 seconds of flame. If there is a heat call on the first and second stage input (W1 + W2), the control remains in high heat mode.

If flame is not established within the ignition trial period, the control de-energizes the spark and gas valve and begins an inter-purge period before attempting another ignition trial.

If the call for heat is removed during an ignition trial period, the control immediately de-energizes spark and gas. The control runs the inducer motor through a post purge period before de-energizing.

If the pressure switch opens during an ignition trial period, the control immediately de-energizes spark and gas. The control begins pressure switch proving before an inter-purge and reignition attempt.

### Heat Blower On Delay

The control board waits for 30 seconds and then energizes the indoor blower heat speed. The indoor blower heat speed is based on the "HEAT" airflow selection jumper, and the low heating (W1) or the high heating (W1+W2) input.

Blower on delay time begins at the start of flame proving period in the trial for ignition.

If the thermostat demand for heat is removed, the control de-energizes the gas valve, energizes the blower on heat speed and initiates a post purge and heat blower off delay.

### Main Burner Operation

The control board keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heat, pressure switch and flame status.

If the call for heat (W1) is removed, the control de-energizes the gas valve and begins the post purge and heat blower off delay.

If a call for low fire heat (W1) is present and a call for high stage heat (W2) is removed, the control is staged down to low fire heat. The control is staged back up to high fire heat if the high stage heat (W2) call is re-applied to the control. During normal operation if the control is operating the unit in low stage heat, the control is switched to high fire heat any time a call for high stage heat (W2) is applied to the control regardless of the setting on the "HI HEAT DELAY" jumper.

If the pressure switch opens, the control de-energizes the gas valve and begins pressure switch proving mode.

If flame is removed, the control de-energizes the gas valve within 2.0 seconds and counts the flame loss. If flame has been lost less than 5 times, the control attempts re-ignition after a 15 second inter-purge period. If flame has been lost more than 5 times within the same call for heat, the control board locks out, and flashes a sequence of "8" times on the LED.

### Post Purge

The control board runs the induced draft motor for a 15 second post purge period and then de-energizes the inducer. If a call for heat occurs during post purge, the control finishes the post purge and immediately begins the next ignition sequence.

### Heat Blower Off Delay

After a heating sequence, the control board de-energizes the indoor blower motor after a delay time as selected by a movable shunt (60, 90, 120 or 180 seconds). Blower off timing begins when the thermostat is satisfied and removes the (W1) call for heat. The control returns to standby when the blower off delay is complete.

If the thermostat call for heat returns before the blower off delay is complete, the control begins an ignition sequence with pre-purge while the blower off delay continues.

### Lockout

While in lockout, the control board keeps the main gas valve and induced draft motor de-energized.

Lockouts due to failed ignition or flame losses may be reset by removing the call for heat (W1) for more than 1 second, or by removing power from the control for over 0.25 second. The control automatically resets from lockout after 60 minutes.

Lockouts due to detected internal control faults reset after 60 minutes or power interruption. Cooling operations are available during a heating lockout.

### High Temperature Limit Switch

Any time the high temperature limit switch is open less than 5 minutes, the control board runs the indoor blower motor on high heat speed, runs the inducer, de-energizes the gas valve, and flashes a sequence of "4" times on the LED. When the high temperature switch closes, the control restarts the ignition sequence beginning with pre-purge.

If the limit switch has been open more than 5 minutes the control de-energizes the inducer, continues to operate the indoor blower motor on heat speed, and flashes a sequence of "11" times on the LED.

### Rollout Switch

If the limit circuit is open for more than 15 minutes, the control board flashes a sequence of "5" times on the LED. The blower output energizes on high heat speed during an open rollout condition.

If the rollout switch is reset, the control remains locked out until power is removed or a call for heat (W) is removed.

Rollout switch lockout does not reset automatically.

### Power Interruptions

Power interruptions of any duration do not cause lockout or any operation requiring manual intervention.

### Flame present with Gas off

If flame is sensed for longer than 4.0 seconds during a period when the gas valve should be closed, the control enters a lockout flashing a sequence of "1" time on the LED. The control energizes the inducer blower while the flame is sensed.

### GAS VALVE FAULT

If the main valve output is sensed to be energized for more than 1 second when commanded to be off, the control de-energizes the induced draft motor (if flame is not present) to attempt to open the pressure switch to de-energize the gas valve. If the main gas valve still senses being energized after the inducer has been off for 10 seconds, the control re-energizes the inducer to vent the unburned gas. The control enters a hard lockout flashing a sequence of "10" times on the LED.

The only way to recover from a hard lockout is to remove and reapply 24VAC power to the control board.

### Safety Controls

The control circuit includes the following safety controls:

1. Limit Switch (LS) - This control is located inside the blower compartment and protrudes into the heat exchanger compartment and is set to open at the temperature indicated in the Temperature Controls Table of the unit wiring diagram. It resets automatically. The limit switch operates when a high temperature condition occurs, thus shutting down the ignition control, closing the main gas valve and energizing the blower.
2. Pressure Switch (PS) - If the draft motor should fail, the pressure switch prevents the ignition control and gas valve from being energized.
3. Flame Sensor - The flame sensor is located on the left-most burner. If an ignition control fails to detect a signal from the flame sensor indicating the flame is properly ignited, then the main gas valve closes.
4. Rollout Switch (RS) - This switch is located on the burner assembly. In the event of a sustained main burner flame rollout, the control closes the main gas valve. This is a manual reset type switch.

## NOTICE

*The manual reset Rollout Switch (RS) must be reset before allowing furnace operation.*

**Table 13:** Ignition Control Board Flash Codes

Flash Code	Description
<b>Normal Operation</b>	
Green Heartbeat	Standby mode
Amber Heartbeat	Call for furnace heat active
<b>Operational Faults</b>	
Steady ON (any color)	Control failure
Rapid Amber Flashes	Low flame current
1 Red Flash	Flame sensed with gas valve off
2 Red Flashes	Pressure switch closed with inducer off
3 Red Flashes	Pressure switch open with inducer on
4 Red Flashes	Limit switch or rollout switch open
5 Red Flashes	Limit switch or rollout switch open greater than 15 minutes
6 Red Flashes	Pressure switch cycle lockout
7 Red Flashes	Lockout due to failed ignition
8 Red Flashes	Lockout due to too many flame dropouts
10 Red Flashes	Gas valve fault code
11 Red Flashes	Limit/Rollout switch open between 5 and 15 minutes
12 Red Flashes	Model plug not inserted
<b>Wiring Related Faults</b>	
9 Red Flashes	Incorrect low voltage polarity
4 Amber Flashes	Y1 or Y2 thermostat demand without a G

### COOLING SEQUENCE OF OPERATIONS

When the thermostat calls for "COOL," the thermostat terminals "G" and "Y1" are energized, which signals the compressor, outdoor fan and indoor blower to run on first stage cooling.

With a call for "Y1," the indoor circulating blower is energized at "LOW COOL" speed.

The control cycles the compressor and indoor blower to second stage cooling anytime a second stage cooling (Y2) call is received during a first stage cooling (Y1) call. The control does not operate on second stage cooling without a call on the "Y2" thermostat input.

When the thermostat is satisfied, terminals "G" and "Y" are de-energized, de-energizing the compressor and outdoor fan.

After a cool fan off delay timing of 30 seconds, the circulating fan is de-energized.

### Dehumidification/Humidity Switch Input

This model unit features a built in de-humidification feature for advanced dehumidification during cooling operation. The unit indoor blower control is designed to work with a humidity control that closes when the humidity is below the set-point. The control is open when the humidity is above the set-point. This humidity control may be referred to as a humidistat or dehumidistat.

To use this feature, the control "HUM STAT" jumper must be set to "YES," the AC / HP jumper must be set to "A/C," and a humidistat is connected from the low voltage "R" and "HUM" color coded leads. During cooling operation if the humidity level is above the humidistat set point, the indoor blower speed is reduced by approximately 15%.

### Safety Controls

## ⚠ WARNING

*The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools and equipment. If you do not possess these, do not attempt to perform any maintenance other than those procedures recommended in this Installation Manual. Failure to heed this warning could result in serious injury and possible damage to this equipment.*

The control circuit includes the following safety controls:

**High Pressure Switch (HP)** - This switch protects against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure (switch opens at 650 ± 25 psig and closes at 450 ± 25 psig).

**Loss of Charge Switch (LCS)** - The switch protects against loss of charge due to a leak in the system.

The high pressure switch is specifically designed to operate with R-410A systems. R-22 pressure switches must not be used as replacements for the R-410A pressure switches.

### Indoor Circulating Blower

When the thermostat calls for "FAN," the thermostat terminal "G" is energized signaling the indoor blower control board to operate the circulating blower to run continuously. The circulating blower airflow is approximately 63% of the "HIGH COOL" airflow selected on the indoor blower control board.

If a call for "COOL" occurs on "Y1," the indoor blower runs at the "LOW COOL" speed based on the "COOL" jumper setting. If a call for cool is present on "Y1"+"Y2," the indoor blower runs at the "HIGH COOL" speed based on the "COOL" jumper setting.

If a call for "HEAT" occurs "W1" or "W1"+"W2," the circulating blower runs at the heat speed based on the "HEAT" jumper setting.

When the thermostat ends the call for "FAN," the thermostat terminal "G" is de-energized, and the indoor blower control board stops the circulating blower operation.

### Delay Profiles

The Delay Profiles are shown in Table 15 for each Delay jumper setting.

The levels shown in the Pre-Run, Short-Run, and Run Periods are a percentage of the blower speed corresponding to the thermostat call.

The Post-Run and Off Delay levels are derived from the level of the previous state, not the blower speed corresponding to the thermostat call.

If in Delay Profile B and in the Short-Run Period (82% of capacity) and the thermostat call is removed, this causes the control to enter the Post-Run state. The Post-Run state level for Delay Profile B is 100% of the previous level, so the level during the Post-Run state is 82%.

**TABLE 14 : Delay Profile Descriptions**

Delay Profile	Period	Cooling	
		Level%	Time in State (Minutes)
A	Pre-Run	Bypass	Bypass
	Short-Run	Bypass	Bypass
	Run	100	No Limit
	Post-Run*	100	1
B	Off Delay*	Bypass	Bypass
	Pre-Run	50	2
	Short-Run	82	5
	Run	100	No Limit
	Post-Run*	100	1
C	Off Delay*	Bypass	Bypass
	Pre-Run	Bypass	Bypass
	Short-Run	Bypass	Bypass
	Run	100	No Limit
	Post-Run*	100	1
D	Off Delay*	50	1
	Pre-Run	Bypass	Bypass
	Short-Run	63	1.55
	Run	100	No Limit
	Post-Run*	100	1
	Off Delay*	63	0.5

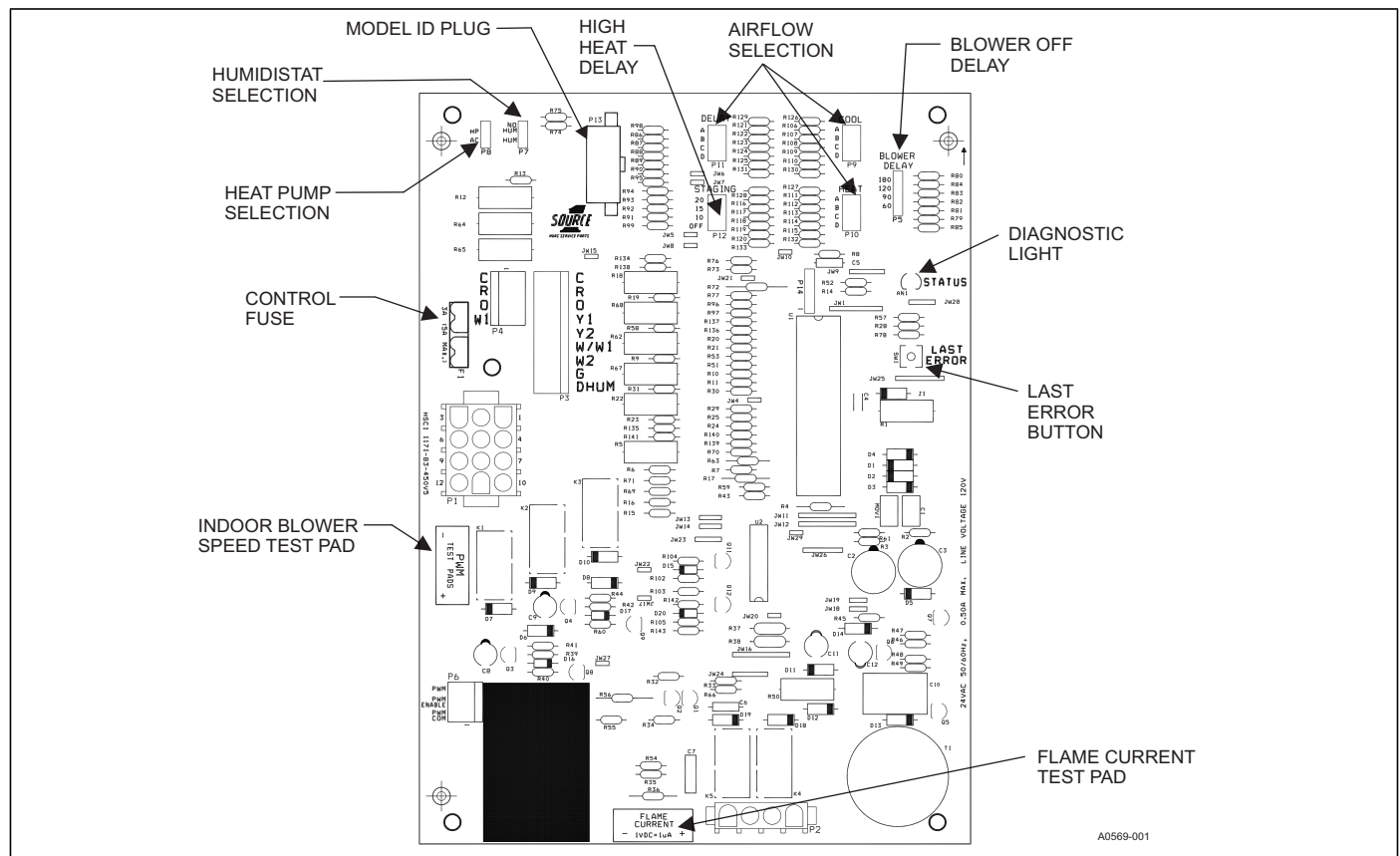
## START-UP

**Prestart Check List**

Complete the following checks before starting the unit.

1. Check the type of gas being supplied. Be sure that it is the same as listed on the unit nameplate.

2. Make sure that the vent outlet air hood and air intake hood has been properly installed.
3. Set the airflow selection jumpers to the appropriate settings based on external static pressures and heating temperature rise. See Figure 9.



**FIGURE 9:** Control Board

**Operating Instructions**

1. STOP! Read the information on the unit safety label.
2. Set the thermostat to the OFF position.
3. Turn off all electrical power to the unit.
4. DO NOT try to light the burners by hand. This appliance is equipped with an ignition device which automatically lights the burners.
5. Remove the access panel.
6. Turn the gas valve switch to the OFF position.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow B in the information on the unit safety label. If you don't smell gas, go to the next step.
8. Turn the gas valve switch to the ON position.
9. Replace the control access panel.
10. Turn on all electric power to the unit.
11. Set the thermostat to the desired setting.
12. If the unit still does not operate, follow the instructions To Turn Off Gas To Appliance, and call service technician or gas supplier.

**To Turn Off Gas To Unit**

1. Set the thermostat to the OFF position.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove the control access panel.
4. Turn the gas valve switch to the OFF position. DO NOT FORCE.
5. Replace the control access panel.

**Post Start Check List**

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.
2. Check for correct manifold gas pressures. See Checking Gas Input.
3. Check the supply gas pressure. It must be within the limits shown on rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas line pressure exceed 13.5", nor the operating pressure drop below 4.5" for natural gas units. If gas pressure is outside these limits, contact the local gas utility for corrective action.

## ADJUSTMENT OF MANIFOLD GAS PRESSURE & INPUT RATE

Inlet and manifold gas pressure may be measured by connecting the "U" tube manometer to the gas valve with a piece of tubing. Follow the appropriate section in the instructions below. Refer to Figure 10 for the locations of the pressure ports on the gas valve.

### Turn gas off at the ball valve or gas cock on gas supply line before the gas valve. Find the pressure ports on the gas valve marked Out P and In P.

1. Take the manifold pressure at the port marked OUT P.
2. Take the gas line pressure at the port marked IN P.
3. Using a 3/32" (2.4 mm) hex head wrench, loosen the set screw by turning it 1 turn counter clockwise. **DO NOT REMOVE THE SET SCREW FROM THE PRESSURE PORT.**

### Read the inlet gas pressure

Connect the positive side of the manometer to the port marked IN P on the gas valve. Do not connect any tubing to the negative side of the manometer to prevent atmospheric pressure from being referenced by the manometer. Refer to Figure 11 for connection details.

1. Turn gas and electrical supplies on and follow the operating instructions to place the unit back in operation.

**Table 15:** Inlet Gas Pressure Range

INLET GAS PRESSURE RANGE		
	Natural Gas	Propane (LP)
Minimum	4.5" w.c. (1.12 kPa)	8.0" w.c. (1.99 kPa)
Maximum	10.5" w.c. (2.61 kPa)	13.0" w.c. (3.24 kPa)

## IMPORTANT

The inlet gas pressure operating range table specifies what the minimum and maximum gas line pressures must be for the furnace to operate safely. The gas line pressure **MUST BE** a minimum of:

- 7" w.c. (1.74 kPa) for Natural Gas
- 11" w.c. (2.74 kPa) for Propane (LP) Gas

in order to obtain the BTU input specified on the rating plate and/or the nominal manifold pressure specified in these instructions and on the rating plate.

2. Establish the correct gas inlet pressure in accordance with Table 15. Turn the gas valve to OFF, and turn the electrical supply switch to OFF. Then remove the flexible tubing from the gas valve pressure port, and tighten the pressure port plug using the 3/32" (2.4 mm) hex head wrench.
3. Turn the electrical and gas supplies back on. With the burners in operation, check for gas leakage around the gas valve pressure port. Use an approved non-corrosive gas leak detection fluid or other non-flammable leak detection methods to accomplish the leak check.

### Read the manifold gas pressure

Connect the positive side of the manometer to the port marked OUT P on the gas valve. Do not connect any tubing to the negative side of the manometer to prevent atmospheric pressure from being referenced by the manometer. Refer to Figures 10 and 11 for connection details.

## IMPORTANT

The cap for the pressure regulator must be removed entirely to gain access to the adjustment screw. Loosening or tightening the cap does not adjust the flow of gas.

## NOTICE

The regulated outlet pressure has been calibrated at the factory. Additional pressure adjustment should not be necessary. If adjustment is necessary, set to the following specifications. After adjustment, check for gas leakage.

This gas valve has separate regulator adjustment screws for high fire and low fire as shown in Figure 10. The procedure below is used to adjust either the high fire manifold pressure or the low fire manifold pressure.

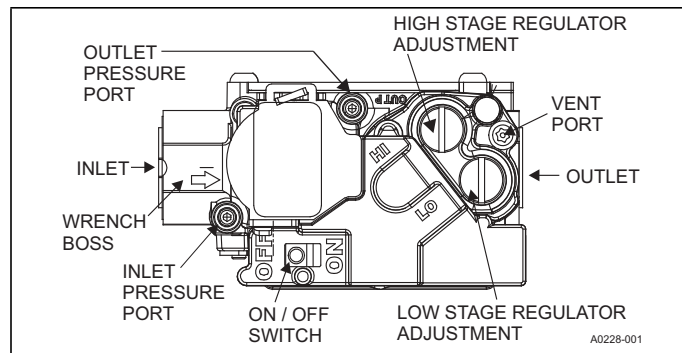
## NOTICE

Gas manifold pressure must be set on high fire before adjusting low fire pressure.

1. Refer to Figure 10 for location of pressure regulator adjustment cap and adjustment screws on main gas valve.
2. Turn gas and electrical supplies on, and follow the operating instructions to place the unit back in operation.
3. Connect unit control wiring leads W1, W2, and R together so the equipment operates on HIGH fire. Once correct manifold pressure is set (HI), remove control wire lead W2 so the equipment operates on low fire. Set the manifold pressure (LO) to correct manifold pressure.

**Table 16:** Nominal Manifold Pressure

NOMINAL MANIFOLD PRESSURE	
Natural Gas (High Fire)	3.5" w.c. (0.87 kPa)
Natural Gas (Low Fire)	1.6" w.c. (0.40 kPa)
Propane (LP) Gas (High Fire)	9.8" w.c. (2.488 kPa)
Propane (LP) Gas (Low Fire)	4.0" w.c. (0.99 kPa)



**FIGURE 10:** Gas Valve

## IMPORTANT

If gas valve regulator screw is turned in (clockwise), manifold pressure is increased. If screw is turned out (counterclockwise), manifold pressure is decreased.

4. After the manifold pressure has been adjusted, re-calculate the furnace input to make sure you have not exceeded the specified input on the rating plate. Refer to "CALCULATING THE FURNACE INPUT (NATURAL GAS)."

- Once the correct BTU (kW) input has been established, turn the gas valve to OFF, and turn the electrical supply switch to OFF. Then remove the flexible tubing from the gas valve pressure port, and tighten the pressure port plug using the 3/32" (2.4 mm) hex head wrench.
- Turn the electrical and gas supplies back on. With the burners in operation, check for gas leakage around the gas valve pressure port. Use an approved non-corrosive gas leak detection fluid or other non-flammable leak detection methods to accomplish the leak check.

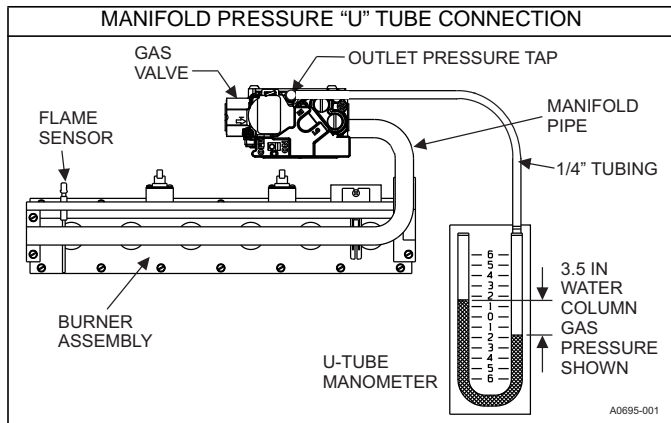


FIGURE 11: Reading Gas Pressure

#### ADJUSTMENT OF TEMPERATURE RISE

### ⚠ DANGER

The temperature rise, or temperature difference between the return air and the supply (heated) air from the furnace, must be within the range shown on the furnace rating plate and within the application limitations shown in Table 7 "RATINGS & PHYSICAL / ELECTRICAL DATA".

The supply air temperature cannot exceed the "Maximum Supply Air Temperature" specified in these instructions and on the furnace rating plate. Under NO circumstances can the furnace be allowed to operate above the Maximum Supply Air Temperature. Operating the furnace above the Maximum Supply Air Temperature will cause premature heat exchanger failure, high levels of Carbon Monoxide, a fire hazard, personal injury, property damage, and/or death.

After about 5 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts, about six feet (1.83 m) from the furnace where they will not be affected by radiant heat. Increase the blower speed to decrease the temperature rise; decrease the blower speed to increase the rise.

## CHECKING GAS HEAT INPUT

### Natural Gas

- Turn off all other gas appliances connected to the gas meter.
- With the unit turned on, measure the time needed for one revolution of the hand on the smallest dial on the meter (a typical gas meter usually has a 1/2 or a 1 cubic foot test dial).
- Using the number of seconds for each revolution and the size of the test dial increment, find the cubic feet of gas consumed per hour from Table 17.

If the actual input is not within 5% of the unit input rating with allowance being made for the permissible range of the regulator setting, replace the orifice spuds with spuds of the proper size.

## NOTICE

To find the BTU input, multiply the number of cubic feet of gas consumed per hour by the BTU content of the gas in your particular locality. (Contact your gas company for this information since it varies widely from city to city.)

Table 17: Gas Rate Cubic Feet Per Hour<sup>1</sup>

Seconds for One Rev.	Size of Test Dial	
	1/2 cu. ft.	1 cu. ft.
10	180	360
12	150	300
14	129	257
16	113	225
18	100	200
20	90	180
22	82	164
24	75	150
26	69	138
28	64	129
30	60	120
32	56	113
34	53	106
36	50	100
38	47	95
40	45	90
42	43	86
44	41	82
46	39	78
48	37	75
50	36	72
52	35	69
54	34	67
56	32	64
58	31	62
60	30	60

#### NOTES:

- EXAMPLE:** By actual measurement, it takes 38 seconds for the hand on the 1-cubic foot dial to make a revolution with just a 100,000 BTUH furnace running. Using this information, locate 38 seconds in the first column of Table 17. Read across to the column headed "1 Cubic Foot," and see that 95 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 95 x 1050 (the BTU rating of the gas obtained from the local gas company). The result is 99,750 BTUH, which is close to the 100,000 BTUH rating of the unit.

## EXTERNAL STATIC PRESSURE SETUP

To measure external static pressure:

- Measure the supply air static pressure
- Record this positive number
- Measure the return air static pressure

- Record this negative number
- Treat the negative number as a positive and add the two numbers together
- This is total system static

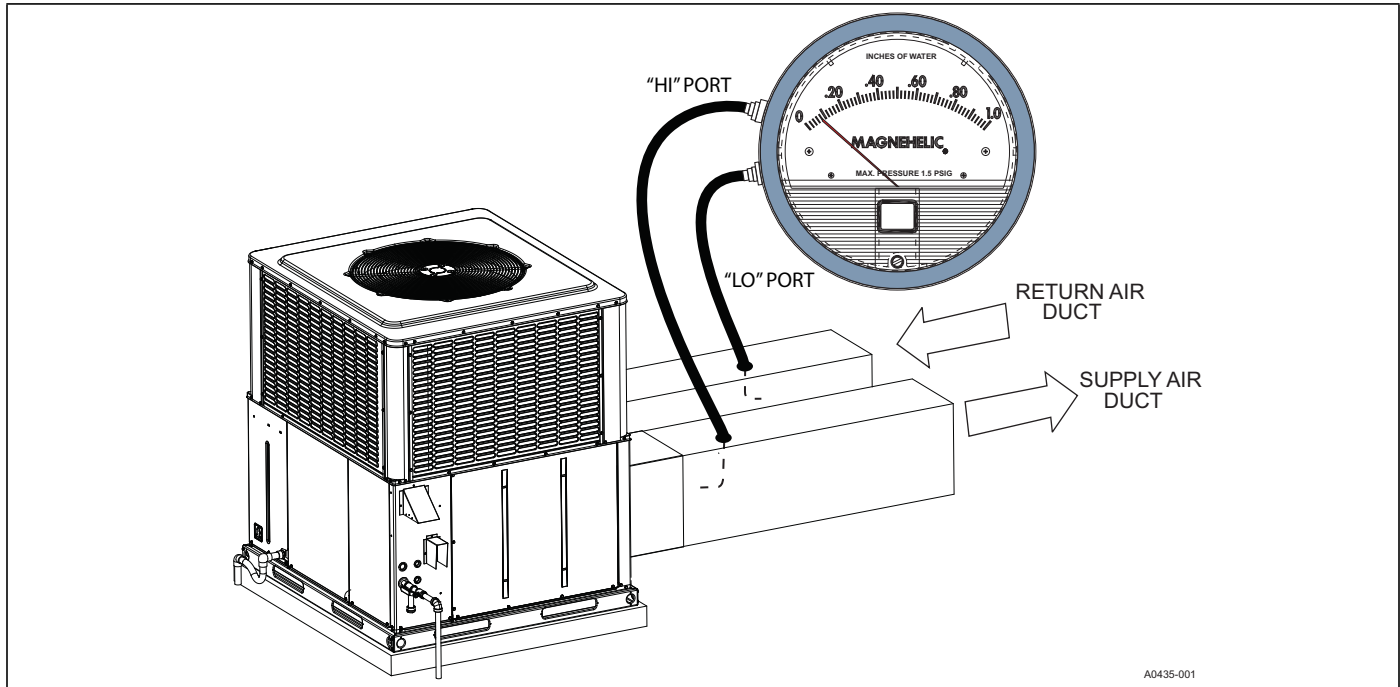


FIGURE 12: Measuring External Static Pressure

## R-410A QUICK REFERENCE GUIDE

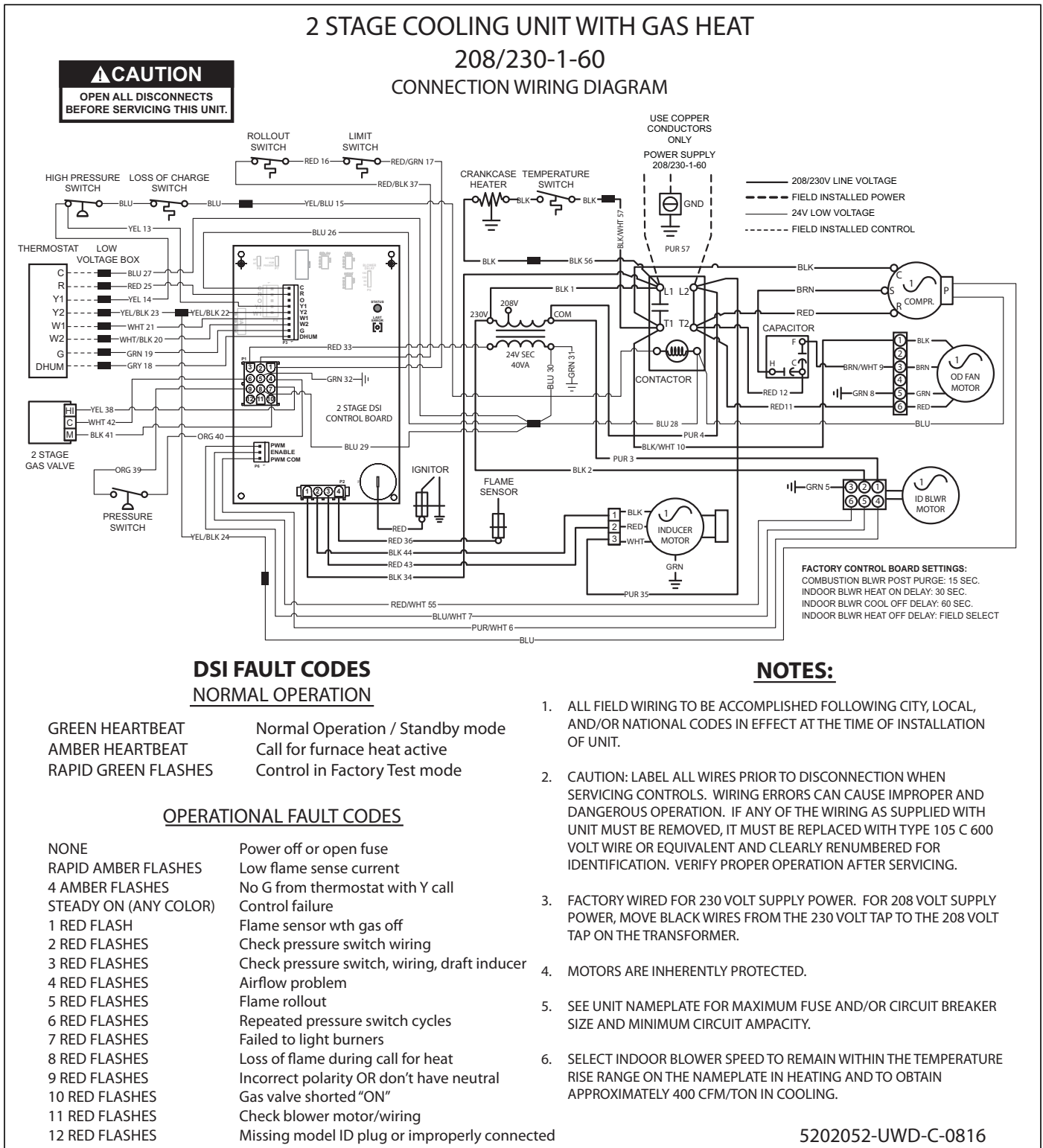
### Refer to Installation Instructions for specific installation requirements

- R-410A refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400, or DOT BW400.
- Recovery equipment must be rated for R-410A.
- **DO NOT** use R-410A service equipment on R-22 systems. All hoses, gages, recovery cylinders, charging cylinders and recovery equipment must be dedicated for use on R-410A systems only.
- Manifold sets must be at least 700 psig high side, and 180 psig low side, with 550 psig retard.
- All hoses must have a service pressure rating of 800 psig.
- Leak detectors must be designed to detect HFC refrigerants.
- Systems must be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.
- R-410A can only be used with POE type oils.
- POE type oils rapidly absorb moisture from the atmosphere.
- Vacuum pumps will **not** remove moisture from R-410A refrigerant oils.
- **Do not** use liquid line driers with a rated working pressure rating less than 600 psig.
- **Do not** install suction line driers in the liquid line.
- A liquid line drier is required on every unit.
- **Do not** use a R-22 TXV. If a TXV is to be used, it must be a R-410A TXV.
- Never open system to atmosphere when under a vacuum.
- If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace all filter driers.

FIGURE 13: R-410A Quick Reference Guide



SECTION VII: TYPICAL WIRING DIAGRAMS



**DSI FAULT CODES**  
NORMAL OPERATION

GREEN HEARTBEAT	Normal Operation / Standby mode
AMBER HEARTBEAT	Call for furnace heat active
RAPID GREEN FLASHES	Control in Factory Test mode

OPERATIONAL FAULT CODES

NONE	Power off or open fuse
RAPID AMBER FLASHES	Low flame sense current
4 AMBER FLASHES	No G from thermostat with Y call
STEADY ON (ANY COLOR)	Control failure
1 RED FLASH	Flame sensor wth gas off
2 RED FLASHES	Check pressure switch wiring
3 RED FLASHES	Check pressure switch, wiring, draft inducer
4 RED FLASHES	Airflow problem
5 RED FLASHES	Flame rollout
6 RED FLASHES	Repeated pressure switch cycles
7 RED FLASHES	Failed to light burners
8 RED FLASHES	Loss of flame during call for heat
9 RED FLASHES	Incorrect polarity OR don't have neutral
10 RED FLASHES	Gas valve shorted "ON"
11 RED FLASHES	Check blower motor/wiring
12 RED FLASHES	Missing model ID plug or improperly connected

**NOTES:**

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL, AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF UNIT.
2. CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. IF ANY OF THE WIRING AS SUPPLIED WITH UNIT MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 C 600 VOLT WIRE OR EQUIVALENT AND CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. FACTORY WIRED FOR 230 VOLT SUPPLY POWER. FOR 208 VOLT SUPPLY POWER, MOVE BLACK WIRES FROM THE 230 VOLT TAP TO THE 208 VOLT TAP ON THE TRANSFORMER.
4. MOTORS ARE INHERENTLY PROTECTED.
5. SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY.
6. SELECT INDOOR BLOWER SPEED TO REMAIN WITHIN THE TEMPERATURE RISE RANGE ON THE NAMEPLATE IN HEATING AND TO OBTAIN APPROXIMATELY 400 CFM/TON IN COOLING.

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FIGURE 14: Connection Wiring Diagram

## 2 STAGE COOLING UNIT WITH GAS HEAT

### 208/230-1-60

### LADDER WIRING DIAGRAM

**CAUTION**  
OPEN ALL DISCONNECTS  
BEFORE SERVICING THIS UNIT.

#### DSI FAULT CODES

#### NORMAL OPERATION

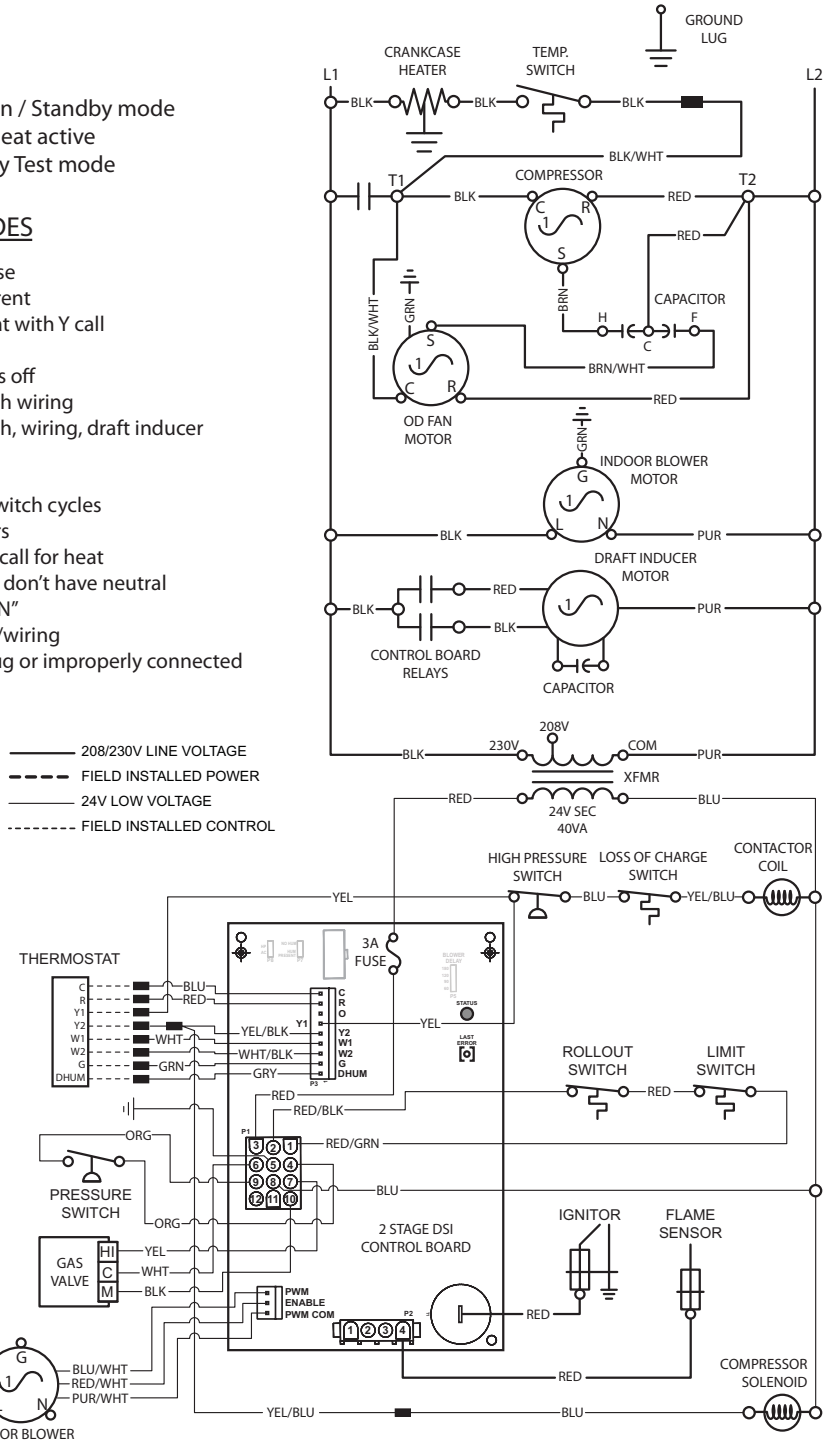
GREEN HEARTBEAT	Normal Operation / Standby mode
AMBER HEARTBEAT	Call for furnace heat active
RAPID GREEN FLASHES	Control in Factory Test mode

#### OPERATIONAL FAULT CODES

NONE	Power off or open fuse
RAPID AMBER FLASHES	Low flame sense current
4 AMBER FLASHES	No G from thermostat with Y call
STEADY ON (ANY COLOR)	Control failure
1 RED FLASH	Flame sensor with gas off
2 RED FLASHES	Check pressure switch wiring
3 RED FLASHES	Check pressure switch, wiring, draft inducer
4 RED FLASHES	Airflow problem
5 RED FLASHES	Flame rollout
6 RED FLASHES	Repeated pressure switch cycles
7 RED FLASHES	Failed to light burners
8 RED FLASHES	Loss of flame during call for heat
9 RED FLASHES	Incorrect polarity OR don't have neutral
10 RED FLASHES	Gas valve shorted "ON"
11 RED FLASHES	Check blower motor/wiring
12 RED FLASHES	Missing model ID plug or improperly connected

#### NOTES:

- ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL, AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF UNIT.
- CAUTION: LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. IF ANY OF THE WIRING AS SUPPLIED WITH UNIT MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 C 600 VOLT WIRE OR EQUIVALENT AND CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
- FACTORY WIRED FOR 230 VOLT SUPPLY POWER. FOR 208 VOLT SUPPLY POWER, MOVE BLACK WIRES FROM THE 230 VOLT TAP TO THE 208 VOLT TAP ON THE TRANSFORMER.
- MOTORS ARE INHERENTLY PROTECTED.
- SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY.
- SELECT INDOOR BLOWER SPEED TO REMAIN WITHIN THE TEMPERATURE RISE RANGE ON THE NAMEPLATE IN HEATING AND TO OBTAIN APPROXIMATELY 400 CFM/TON IN COOLING.



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FIGURE 15: Ladder Wiring Diagram

SECTION VIII: START UP SHEET

Residential Package Unit Cooling / Gas Heat Start-Up Sheet

Proper start-up is critical to customer comfort and equipment longevity

Start-Up Date <input style="width:80%;" type="text"/>	Company Name <input style="width:80%;" type="text"/>	Start-Up Technician <input style="width:80%;" type="text"/>
---	--	---

**Owner Information**

Name <input style="width:80%;" type="text"/>	Address <input style="width:80%;" type="text"/>	Daytime Phone <input style="width:80%;" type="text"/>
City <input style="width:80%;" type="text"/>	State or Province <input style="width:80%;" type="text"/>	Zip or Postal Code <input style="width:80%;" type="text"/>

**Equipment Data**

Unit Model # <input style="width:80%;" type="text"/>	Unit Serial # <input style="width:80%;" type="text"/>
--	---

**General Information** (Check all that apply)

<input type="radio"/> Residential	<input type="radio"/> New Construction	<input type="radio"/> Roof level	<input type="radio"/> Down flow
<input type="radio"/> Commercial	<input type="radio"/> Retrofit	<input type="radio"/> Grade level	<input type="radio"/> Side flow

**Unit Location and Connections** (Check all that apply)

<input type="checkbox"/> Unit is level and installed on:	<input type="checkbox"/> Slab	<input type="checkbox"/> Roof curb	<input type="checkbox"/> Duct connections are complete:	<input type="checkbox"/> Supply	<input type="checkbox"/> Return
<input type="checkbox"/> Condensate drain properly connected per the installation instructions		<input type="checkbox"/> Condensate trap has been primed with water			

**Filters**

<input type="checkbox"/> Filters installed	Number of filters <input style="width:40px;" type="text"/>	Filter size <input style="width:40px;" type="text"/>	<input type="radio"/> Filter located inside	<input type="radio"/> Filter located outside
--	--	--	---	--

**Additional Kits & Accessories Installed** (Check all that apply)

<input type="checkbox"/> Refrigerant safety kit	<input type="checkbox"/> Low ambient kit	<input type="checkbox"/> Anti-recycle timer	<input type="checkbox"/> Crank case heater	<input type="checkbox"/> Filter frame kit
<input type="checkbox"/> Transformer kit	<input type="checkbox"/> Economizer	<input type="checkbox"/> Roof curb kit	<input type="checkbox"/> Burglar bar kit	<input type="checkbox"/> Hail guard kit
<input type="checkbox"/> Manual fresh air damper kit		<input type="checkbox"/> Motorized fresh air damper kit		

**Electrical Connections & Inspection** (Check all that apply)

<input type="radio"/> Single phase	<input type="radio"/> Three phase	<input type="radio"/> 208 volts AC	<input type="radio"/> 230 volt AC	<input type="radio"/> 460 volts AC	<input type="radio"/> 575 volts AC
<input type="checkbox"/> Inspect wires and electrical connections		<input type="checkbox"/> Transformer wired properly for primary supply voltage		<input type="checkbox"/> Ground connected	
<input type="checkbox"/> Low voltage present at control board "R & C"		Measured voltage "R" and "C" outdoor unit control board		<input style="width:40px;" type="text"/>	
<input type="checkbox"/> Line voltage present at disconnect		Measured voltage "L1 to L2"	<input style="width:40px;" type="text"/>	"L2 to L3"	<input style="width:40px;" type="text"/>
Compressor amperes "L1"		<input style="width:40px;" type="text"/>	"L2"	<input style="width:40px;" type="text"/>	"L3"
Total amperes "L1"		<input style="width:40px;" type="text"/>	"L2"	<input style="width:40px;" type="text"/>	"L3"
<input type="radio"/> Single stage compressor		<input type="radio"/> Two stage compressor			

**Air Flow Setup / Cooling**

<b>Blower Type &amp; Set-Up</b>	<input type="radio"/> ECM	COOL	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
		ADJUST	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
		DELAY	<input type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C	<input type="radio"/> D
	<input type="radio"/> X-13	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5
	<input type="radio"/> PSC	<input type="radio"/> Low	<input type="radio"/> Medium Low	<input type="radio"/> Medium	<input type="radio"/> Medium High	<input type="radio"/> High

Supply static (inches of water column)	<input style="width:40px;" type="text"/>	Supply air dry bulb temperature	<input style="width:40px;" type="text"/>	Outside air dry bulb temperature	<input style="width:40px;" type="text"/>
Return static (inches of water column)	<input style="width:40px;" type="text"/>	Return air dry bulb temperature	<input style="width:40px;" type="text"/>	Return air wet bulb temperature	<input style="width:40px;" type="text"/>
Total external static pressure	<input style="width:40px;" type="text"/>	Temperature drop	<input style="width:40px;" type="text"/>	Supply air wet bulb temperature	<input style="width:40px;" type="text"/>

### Refrigerant Charge and Metering Device

<input type="radio"/> R-410A <input type="radio"/> R-22	Data plate - lbs / Oz <input type="text"/>	Suction line temperature <input type="text"/>	Discharge pressure <input type="text"/>
<input type="radio"/> TXV <input type="radio"/> Fixed Orifice	Discharge line temperature <input type="text"/>	Suction pressure <input type="text"/>	Liquid line temperature <input type="text"/>
TXV# / Orifice size <input type="text"/>		Superheat <input type="text"/>	Subcooling <input type="text"/>

### Gas Heat

<input type="radio"/> Single Stage <input type="radio"/> Two Stage	<input type="radio"/> Natural Gas <input type="radio"/> Propane LP (Requires LP Conversion Kit)
LP Gas Conversion Kit # <input type="text"/>	LP Conversion Kit Installed By <input type="text"/>
Inlet Gas Pressure (w.c.) <input type="text"/>	
Manifold Pressure at 100% Firing Rate (w.c.) <input type="text"/>	Measured BTU/H (Clock Gas Meter Nat Gas) <input type="text"/>
	Rated BTU/H <input type="text"/>
Manifold Pressure / Low Fire Rate (w.c.) <input type="text"/>	Return Air Dry Bulb Temp <input type="text"/>
	Supply Air Dry Bulb Temp <input type="text"/>
	Temp Rise <input type="text"/>
<input type="checkbox"/> Burner Flame Inspection - Blue flames extending directly into the primary heat exchanger cells	

### Clean Up Job Site

<input type="checkbox"/> Job site has been cleaned, indoor and outdoor debris removed from job site
<input type="checkbox"/> Tools have been removed from unit
<input type="checkbox"/> All panels have been installed

### Unit Operation and Cycle Test

<input type="checkbox"/> Operate the unit through continuous fan cycles from the thermostat, noting and correcting any problems
<input type="checkbox"/> Operate the unit through cooling cycles from the thermostat, noting and correcting any problems

### Owner Education

<input type="checkbox"/> Provide owner with the owner's manual
<input type="checkbox"/> Explain operation of system to equipment owner
<input type="checkbox"/> Explain thermostat use and programming (if applicable) to owner
<input type="checkbox"/> Explain the importance of regular filter replacement and equipment maintenance

### Comments and Additional Job Details