INSTALLATION MANUAL

SINGLE PACKAGE HEAT PUMP / GAS HEAT

MODELS: PHG6 SERIES

2 TO 5 TONS – 208/230 V - 1 PHASE

ISO 9001 Certified Quality Management System

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SECTION I: GENERAL INFORMATION

These are electric heat pump/gas heating units designed for outdoor installation. Only gas piping, electric power, and duct connections are required at the point of installation.

The gas-fired heaters have spark ignition.

The refrigerant system is fully charged with R-410A refrigerant, 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 assistance or additional information consult a qualified installer, service agency or the gas supplier.

⚠ 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.

⚠ 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.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel must install, repair, or service this equipment. Untrained personnel can perform the 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. Ensure 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.

INSPECTION

As soon as a unit is received, it must be inspected for possible damage during transit. If damage is evident, the extent of the damage must be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent must be made in writing.

SECTION III: MODEL NUMBER NOMENCLATURE

PHG	4	A	24	50	2	X	1	A
1	2	3	4	5	6	7	8	9

1. Model Family
PHG - packaged heat pump with gas heat
PCG - packaged A/C with gas heat
PCE - packaged A/C with electric heat
PHE - packaged heat pump with electric heat

2. Nominal Cooling Efficiency
4 = 14 SEER, 6 = 16 SEER, etc.

3. Cabinet Size
A = small 35 x 51, B = large 45 x 51

4. Nominal Air Conditioning Cooling Capacity BTUx1000
24 = 24,000 BTU, etc.

5. Gas Heating Input BTU/Hr x 1000
050 = 50,000 BTU/Hr. input, blank = electric heat

6. Voltage-Phase-Frequency
2 = 208/230-1-60, 3=208/230-3-60, 4 = 460-3-60

7. NOx Approval
X = low-NOx, blank = not low-Nox

8. Generation Level
1 = first generation

9. Revision Level
A = original release, B = second release

Examples:
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)

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 ensure that these instructions are made available to the consumer with instructions to retain them for future reference.

- Refer to the unit rating plate for the approved type of gas for this product.
- Install this unit only in a location and position as specified on Page 4 of these instructions.

⚠ 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.

- 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.
- Always install furnace to operate within the furnace'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 7 of these instructions.
- This equipment is not to be used for temporary heating of buildings or structures under construction.

LIMITATIONS

These units must be installed in accordance with the following:

In U.S.A:

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

In Canada:

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

See the 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 it is necessary to add components to a unit to meet local codes, installation is done at the dealer's and/or customer's expense.

The size of the unit for proposed installation must 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 Temperature
		Minimum	Maximum	Maximum (°F)
PHG6A24	208/230-1-60	187	252	125
PHG6A30	208/230-1-60	187	252	125
PHG6B36	208/230-1-60	187	252	125
PHG6B42	208/230-1-60	187	252	125
PHG6B48	208/230-1-60	187	252	125
PHG6B60	208/230-1-60	187	252	125

Table 2: Application Limitations

Packaged Equipment Series	Air Temperature at Outdoor Coil (°F)				Air Temperature at Indoor Coil (°F)			
	Minimum		Maximum		Minimum		Maximum	
	DB Cool	DB Heat	DB Cool	DB Heat	WB Cool	DB Heat	WB Cool	DB Heat
16 SEER HP	55	-10	125	75	57	50	72	80

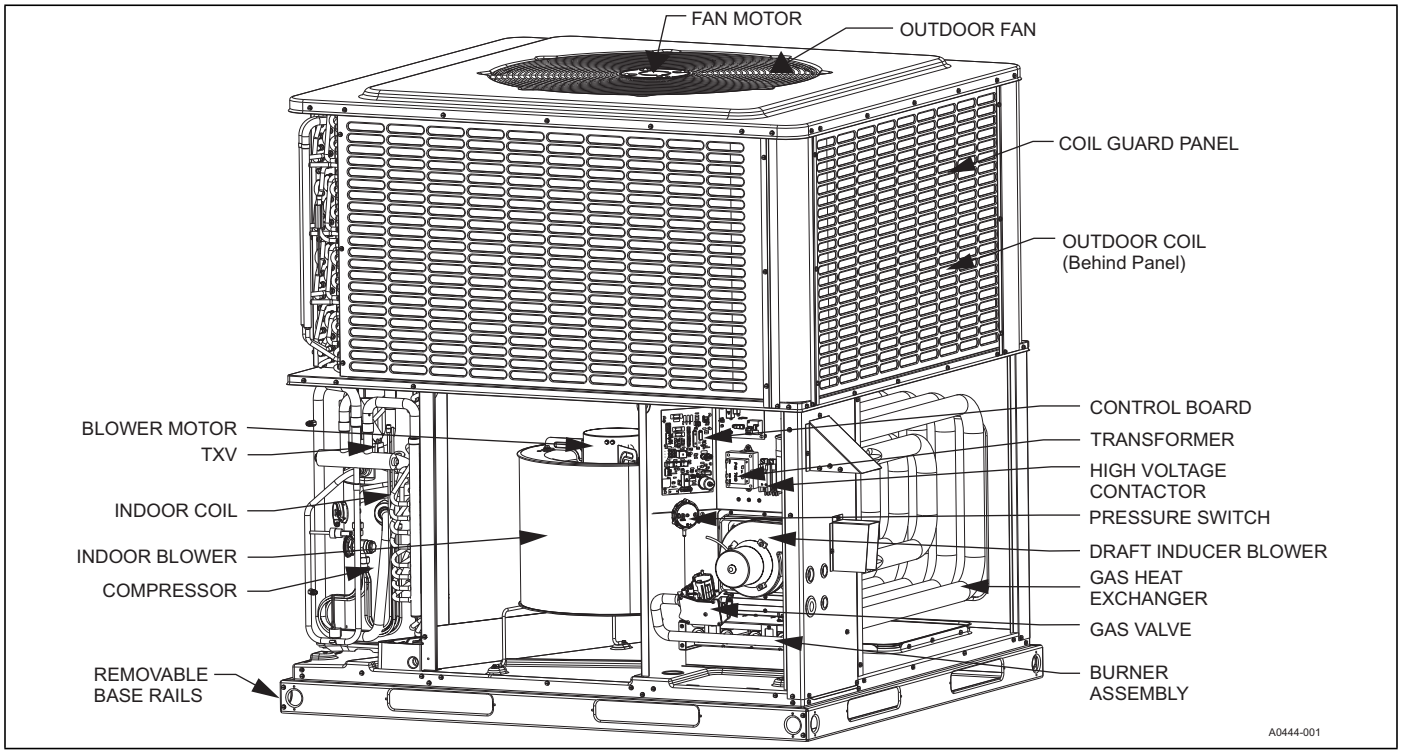


FIGURE 1: Component Location

LOCATION

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

- The unit is designed for **outdoor installation** only.
- Outdoor 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 the building.
- Suitable for mounting on a roof curb.

⚠ WARNING

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

- For ground level installation, use a level pad or slab. The thickness and size of the pad or slab used must meet local codes and unit weight. Do not tie the slab to the building foundation.
- 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.
- Maintain level tolerance to 1/8 in. across the entire width and length of unit.

⚠ WARNING

Excessive exposure of this furnace to contaminated combustion air may result in equipment damage or personal injury. Typical contaminates 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, antistatic fabric softeners for clothes dryers, masonry acid washing materials.

CLEARANCES

⚠ WARNING

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

All units require particular clearances for proper operation and service. Installers 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. See Table 5 for the 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 Ducted Systems 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. Spreader bars whose length exceeds the largest dimension across the unit **MUST** be used across the top of the unit.

⚠ CAUTION

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

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

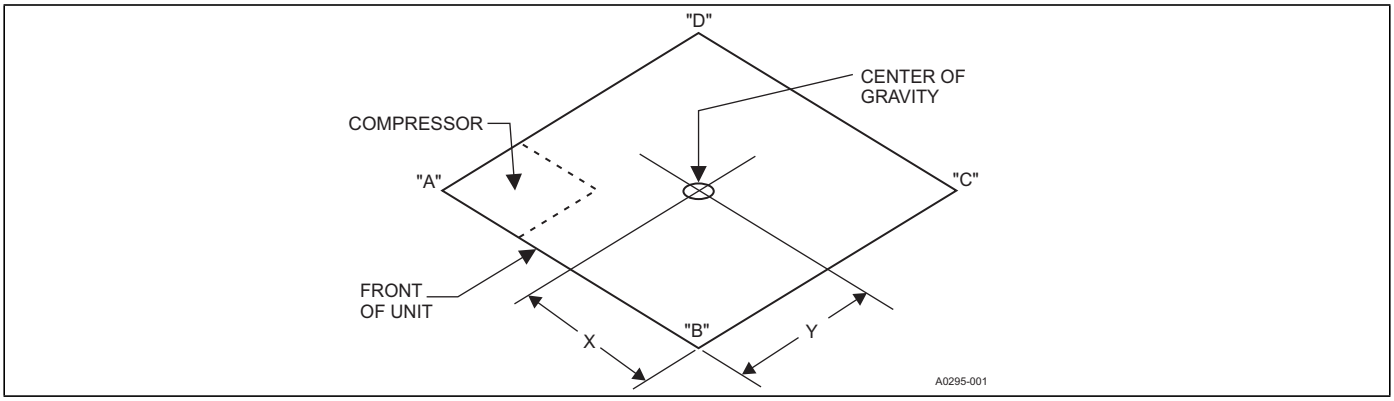


FIGURE 2: Dimensions and 4 Point Load Weights

Table 3: Weights, Dimensions, and 4 Point Load Weights

Model	Weight (lb)		Center of Gravity		4 Point Load Location (lb)			
	Shipping	Operating	X	Y	A	B	C	D
PHG6A24050	399	394	28	15	131	101	86	76
PHG6A24075	409	404	28	15	135	103	86	80
PHG6A30050	454	449	28	15	155	108	96	90
PHG6A30075	458	453	28	15	161	102	90	100
PHG6B36065	503	498	29	14	176	122	104	96
PHG6B36100	510	505	29	14	178	123	109	95
PHG6B42065	537	532	29	14	190	132	112	98
PHG6B42100	539	534	29	14	191	133	109	101
PHG6B48065	556	551	28	14	199	137	106	109
PHG6B48100	564	559	28	14	194	141	117	107
PHG6B48125	569	564	29	14	193	146	126	99
PHG6B60065	582	577	29	14	199	151	127	100
PHG6B60100	586	581	28	14	201	152	123	105
PHG6B60125	593	588	27	15	202	151	125	110

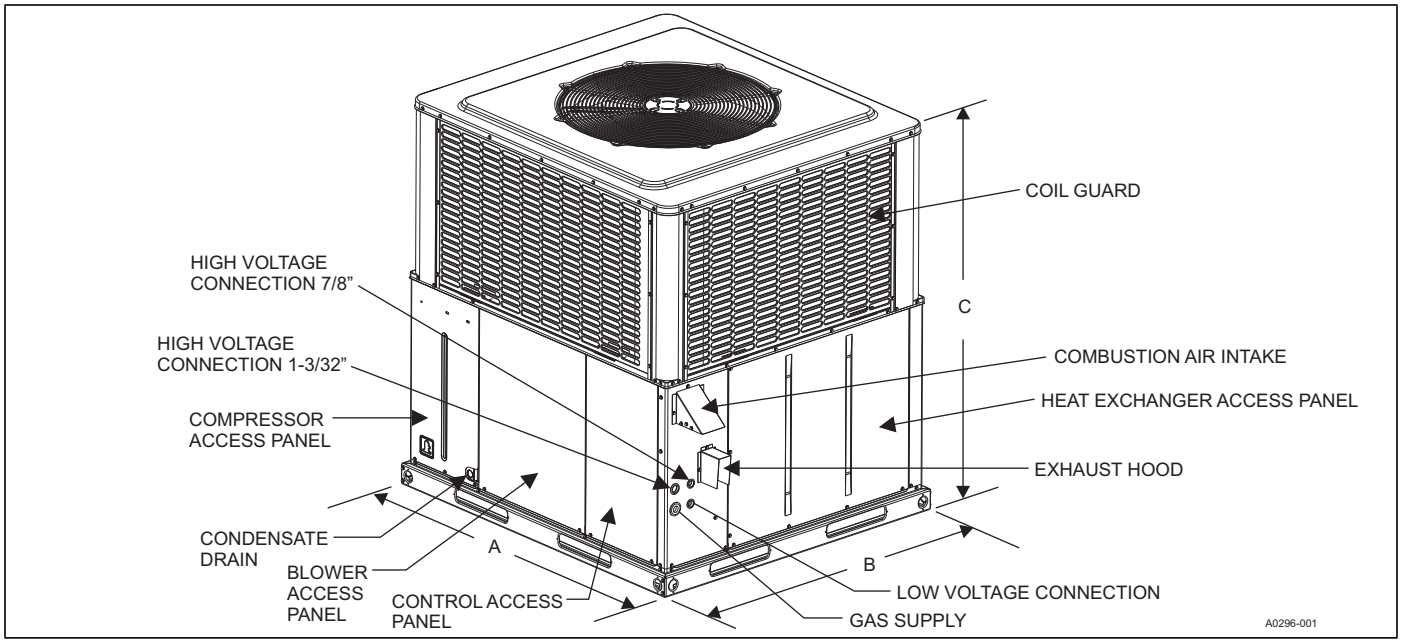


FIGURE 3: Unit Dimensions and Access Locations

Table 4: Unit Dimensions and Access Locations

Model	Dimensions (in.)		
	A	B	C
PHG6A24	51-1/4	35-3/4	47
PHG6A30	51-1/4	35-3/4	49
PHG6B36	51-1/4	45-3/4	49
PHG6B42	51-1/4	45-3/4	49
PHG6B48	51-1/4	45-3/4	53
PHG6B60	51-1/4	45-3/4	55

Table 5: Unit Clearances[1] [2]

Direction	Distance (in.)	Direction	Distance (in.)
Top[3]	36	Power Entry (Right Side)	36
Side Opposite Ducts	36	Left Side	24
Duct Panel	0	Bottom[4]	1

1. A 1 in. 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. Overhanging structures or shrubs must not obstruct the outdoor air discharge outlet.
4. Units can be installed on combustible materials made from wood or class A, B, or C roof covering materials 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 must be designed and sized according to the methods of the Air Conditioning Contractors of America (ACCA), as set forth in their Manual D.

Use a closed return duct system. This does not preclude use of economizers or ventilation air intake. It is best practice to use flexible joints in the supply and return duct work to minimize the transmission of vibration and noise.

NOTICE

Be sure to note supply and return openings.

See 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 must 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.

A filter rack and high velocity filters are standard on three phase units.

Always use filters and keep filters clean. When filters become dirt laden, insufficient air is delivered by the blower, decreasing your unit's efficiency and increasing operating costs and wear-and-tear on the unit and controls.

Check filters monthly. This is especially important because the unit is used for both heating and cooling.

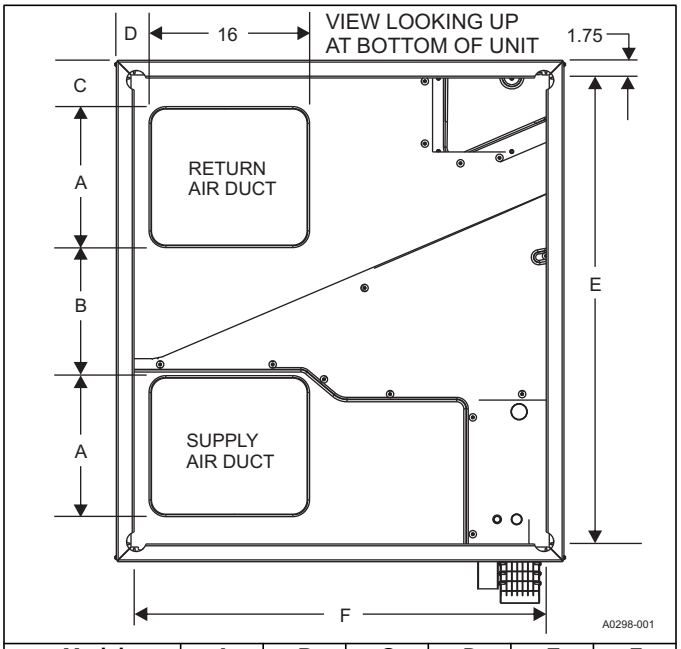
CONDENSATE DRAIN

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

⚠ CAUTION

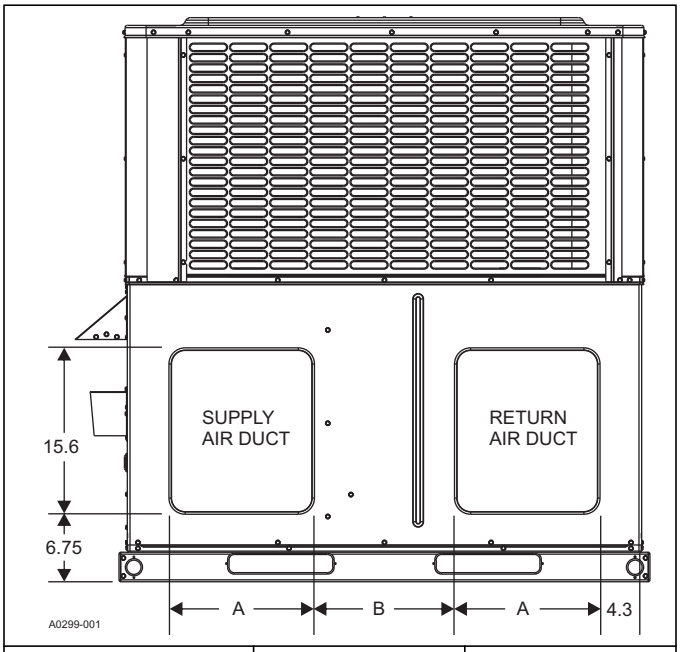
Hand tighten only.

Use Teflon tape or pipe thread compound if needed.



Model	A	B	C	D	E	F
24, 30	10	21.5	5	4.5	47.5	32
36, 42, 48, 60	14	13.5	5	3.5	47.5	42

FIGURE 4: Bottom Duct Dimensions (in.)



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

FIGURE 5: Rear Duct Dimensions (in.)

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

See Figure 3 for the location of these access locations and see Table 5 for minimum clearances.

⚠ 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

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

See Figure 16 for the R-410A Quick Reference Guide.

THERMOSTAT

Locate the room thermostat on an inside wall approximately 60 in. above the floor where it is not subject to drafts, sun exposure, or heat from electrical fixtures or appliances. Use sealant behind the thermostat to prevent air infiltration. Follow the manufacturer instructions enclosed with the thermostat for general installation procedures. Use color coded insulated wires (minimum 18 AWG) to connect the thermostat to the unit. See Figure 6. The thermostat must be a heat pump thermostat that is able to control fossil fuel backup heat. A 4H/2C dual fuel heat pump thermostat must be used. Do not use power stealing thermostats.

POWER AND CONTROL WIRING

Field wiring to the unit must conform to provisions of the current NEC ANSI/NFPA No. 70 or CEC and/or local ordinances. The unit must be electrically grounded in accordance with local codes or, in their absence, with the NEC/CEC. Voltage tolerances that must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The wiring entering the cabinet must be provided with mechanical strain relief.

A fused disconnect switch must 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.

See Figure 7 for typical field wiring and refer to the appropriate unit wiring diagram for control circuit and power wiring information. Unit comes wired for 230 V power. If supply power is 208 V, wires connected to control transformer 230 V tap must be moved to the 208 V tap.

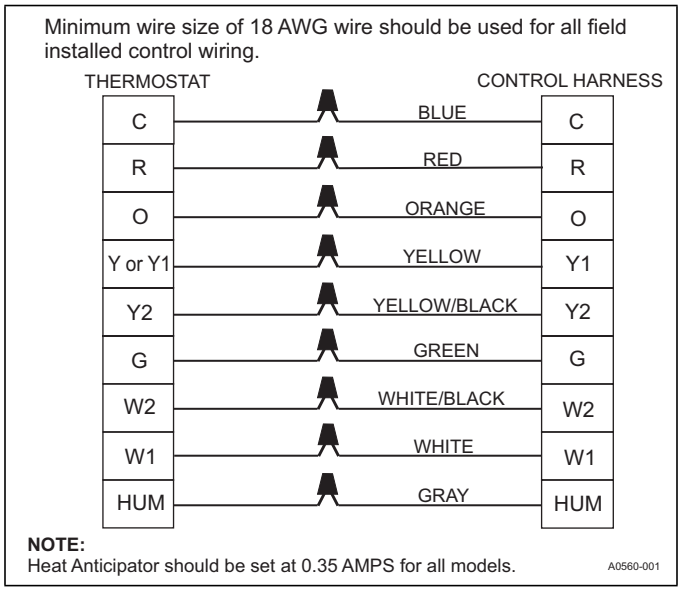


FIGURE 6: Typical Field Control Wiring Diagram for Dual Fuel Models

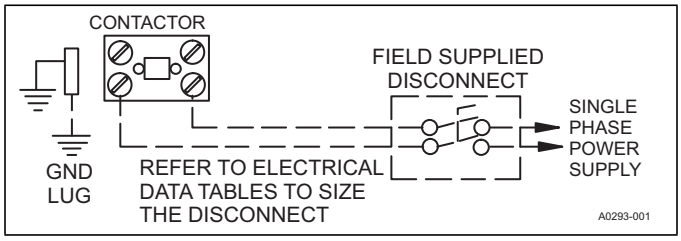


FIGURE 7: Typical Field Power Wiring Diagram

Table 6: Electrical Data - PHG6

Model	Voltage	Compressor			OD Fan Motor	Supply Blower Motor	MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
		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	15.3	83.0	23.8	1.7	3.8	24.6	35
36100	208/230-1-60	15.3	83.0	23.8	1.7	5.4	26.2	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	28.8	152.9	45.0	1.7	7.0	44.7	70

NOTES:

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

Table 7: Physical Data

MODELS:	PHG6A24		PHG6A30		PHG6B36		PHG6B42		PHG6B48			PHG6B60		
NOMINAL TONNAGE:	**2.0**		**2.5**		**3.0**		**3.5**		**4.0**			**5.0**		
AHRI Cooling Performance														
Gross capacity @ AHRI A point (MBH)	23.7		29.5		37.0		43.2		49.2			59.2		
AHRI net capacity (MBH)	23.4		29.0		36.4		42.5		47.5			57.5		
EER	12.5		12.5		12.5		12.5		12.5			12.5		
SEER	16.0		16.0		16.0		16.0		16.0			16.0		
Nominal CFM	800		1000		1200		1400		1600			1800		
System power (kW)	1.8		2.3		2.8		3.3		3.7			4.5		
Refrigerant type	R410A		R410A		R410A		R410A		R410A			R410A		
Refrigerant charge (lb-oz)	9-0		10-0		12-12		11-8		15-0			15-8		
AHRI Heat Pump Heating Performance														
47 F capacity rating (MBH)	22.2		27.2		33.8		38.0		45.5			56.0		
System power (kW/COP)	3.7		3.6		3.6		3.6		3.6			3.6		
17 F capacity rating (MBH)	12.0		16.8		19.0		22.0		28.0			31.7		
HSPF (BTU/Watts-hr.)	8.2		8.2		8.2		8.2		8.2			8.2		
AHRI Gas Heat Performance														
Heating model	50	75	50	75	65	100	65	100	65	100	125	65	100	125
Heat input - High Fire (kBTU)	50.0	75.0	50.0	75.0	65.0	100.0	65.0	100.0	65.0	100.0	125.0	65.0	100.0	125.0
Heat output - High Fire (kBTU)	40	60	40	60	52	80	52	80	52	80	101	52	80	101
Heat input - Low Fire (kBTU)	33.0	49.0	33.0	49.0	43.0	65.0	43.0	65.0	43.0	65.0	82.0	43.0	65.0	82.0
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. of burners	2	3	2	3	2	3	2	3	2	3	4	2	3	4
No. of 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		
Maximum static pressure W.C.	0.5		0.5		0.5		0.5		0.5			0.5		
Maximum outlet air temperature (°F)	180		180		180		180		180			180		
Gas piping connection (in.)	1/2		1/2		1/2		1/2		1/2			1/2		
Dimensions (in.)														
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		
Operating Weight (lb)	394	404	449	453	498	505	532	534	551	559	564	577	581	588
Compressors														
Type	Scroll		Scroll		Scroll		Scroll		Scroll			Scroll		
Stage	2		2		2		2		2			2		
Outdoor Coil Data														
Face area (sq ft)	15.1		16.9		19.5		19.5		23.8			25.9		
Rows	2		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		
Refrigerant control	TXV		TXV		TXV		TXV		TXV			TXV		
Indoor Coil Data														
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		
Outdoor Fan Data														
Fan diameter (in.)	24		24		26		26		26			26		
Type	Prop		Prop		Prop		Prop		Prop			Prop		
Drive type	Direct		Direct		Direct		Direct		Direct			Direct		
No. of speeds	1		1		1		1		1			1		
Motor HP each	1/8		1/8		1/3		1/3		1/3			1/3		
RPM	790		790		850		850		850			850		
Nominal total CFM	2300		2300		4000		4000		4200			4200		

Table continued on next page.

Table 7: Physical Data (Continued)

MODELS:	PHG6A24	PHG6A30	PHG6B36	PHG6B42	PHG6B48	PHG6B60
NOMINAL TONNAGE:	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**5.0**
Direct Drive Indoor Fan Data						
Fan Size (in.)	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
Filters						
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 the kit for replacement filter sizes. Filter sizes: A=20x10 (2 each), B=20x10 (3 each).					

COMPRESSORS

The compressor used in this product is specifically designed to operate with R-410A refrigerant and cannot be interchanged.

⚠ 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 uses polyolester oil (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 the 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 that risk oil leakage include, but are not limited to, replacing compressor, repairing refrigerant leaks, and 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 that are factory-adjusted and ready for operation.

GAS HEAT

These two stage gas-fired heaters 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 must be followed in all cases unless superseded by local codes or gas company requirements. See Tables 8 and 9.

The BTU content of the gas may differ with locality. Check the value 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 in. pipe connection at the gas valve.

GAS CONNECTION

The gas supply line must be routed through the 1-5/8 in. 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 TO PREVENT LEAKAGE OF AIR AND WATER INTO THE HEATING/ CONTROLS COMPARTMENT.

Gas piping requirements:

- A drip leg and a ground joint union must be installed in the gas piping.
- When required by local codes, a manual shut-off valve may have to be installed outside of the unit.
- Use wrought iron or steel pipe for all gas lines. Apply pipe thread sealant sparingly to male threads only.

Table 8: Natural Gas Pipe Sizing Chart[1]

Length (ft)	Nominal Inches Iron Pipe Size			
	1/2 in.	3/4 in.	1 in.	1-1/4 in.
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 in. W.C. and 0.6 specific gravity gas).

Table 9: Propane (LP) Gas Pipe Sizing Chart[1]

Length (ft)	Nominal Inches Iron Pipe Size			
	1/2 in.	3/4 in.	1 in.	1-1/4 in.
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 in. W.C.).

⚠ 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.

⚠ 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.

- All piping must be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out the loose dirt and scale. Before initial start-up, ensure that all of the gas lines external to the unit have been purged of air.
- The gas supply must be a separate line and 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.

⚠ 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.

- The furnace and its equipment shutoff valve must be disconnected from the gas supply system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.48 kPA).
- The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve before conducting any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.48 kPa).

HIGH ALTITUDE GAS CONVERSION

This furnace is constructed at the factory for natural gas-fired operation at altitudes up to 2,000 ft above sea level. For installations located above 2,000 ft, the gas input rate to the burners must be reduced by 4% per 1,000 ft above sea level. It may be necessary to change to smaller orifices at high altitude. See the table below for the correct orifice size to use.

Table 10: High Altitude Gas Orifice Sizing

Gas Type	Cabinet Size	Elevation Above Sea Level (ft)								
		0–2000 (Factory)	2001–3000	3001–4000	4001–5000	5001–6000	6001–7000	7001–8000	8001–9000	9001–10000
Natural Gas Orifice Sizes	B	36	37	38	38	39	40	41	41	42
	A	42	42	43	43	43	44	44	45	46
LP Gas Orifice Sizes	B	51	51	52	52	52	52	53	53	53
	A	54	54	55	55	55	55	55	56	56

FLUE VENT AND AIR INTAKE HOOD

The flue vent hood and air intake hoods are shipped loose. These hoods must be installed to ensure 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.

⚠ CAUTION

The flue exhaust hood must be properly installed and 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.

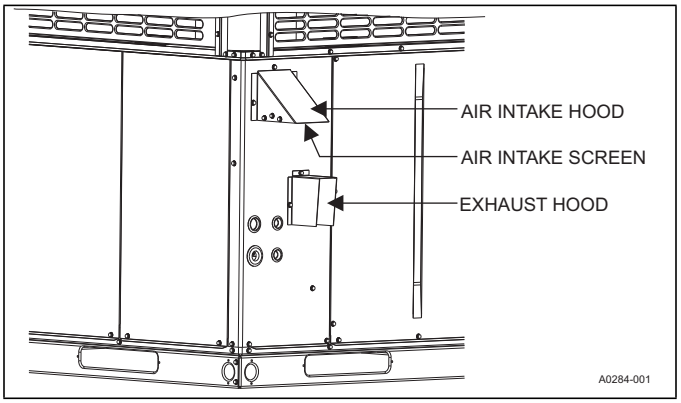


FIGURE 8: Flue Vent Outlet Air Hood

Table 11: Natural Gas Application Data - PHG6

Available on Models	Input (MBH)[1] High Fire	Output (MBH) High Fire	Gas Rate[2] Cubic Feet per Hour High Fire/Low Fire	Number of Burners	Temperature Rise ºF at Full Input[3]	
					Minimum	Maximum
2, 2-1/2 Tons	50/33	40/26	46.5/29.8	2	40-70	20-50
3, 3-1/2, 4, 5 Tons	65/43	52/34	60.5/39.1	2	40-70	20-50
2, 2-1/2 Tons	75/49	60/39	69.8/45.6	3	40-70	20-50
3, 3-1/2, 4, 5 Tons	100/65	80/53	93.0/60.5	3	40-70	20-50
4, 5 Tons	125/82	101/66	116.3/75.3	4	40-70	20-50

1. Heating capacity valid for elevations up to 2000 ft above sea level. For elevations above 2,000 ft, rated capacity must be reduced by 4% for each 1,000 ft above sea level.
2. Based on 1075 BTU/ft^3.
3. The airflow must be adequate to obtain a temperature rise within the range shown. Continuous return air temperature must not be below 55°F.

Table 12: Propane[1] (LP) Gas Application Data - PHG6

Available on Models	Input Capacity (MBH)[1] High Fire / Low Fire	Output Capacity (MBH) High Fire / Low Fire	Gas Rate[2] Cubic Feet per Hour High Fire / Low Fire	Number of Burners	Temperature Rise ºF at Full Input[4]		Propane Conversion
					Minimum	Maximum	
2, 2-1/2 Tons	50/33	40/26	20.0/12.8	2	40-70	20-50	S1-1NP0703
3, 3-1/2, 4, 5 Tons	65/43	52/34	26.0/16.8	2	40-70	20-50	S1-1NP0704
2, 2-1/2 Tons	75/49	60/39	30.0/19.6	3	40-70	20-50	S1-1NP0703
3, 3-1/2, 4, 5 Tons	100/65	80/53	40.0/26.0	3	40-70	20-50	S1-1NP0704
4, 5 Tons	125/82	101/66	50.0/32.4	4	40-70	20-50	S1-1NP0704

1. Propane applications are accomplished by field installation of a Propane Conversion Accessory.
2. Heating capacity valid for elevations up to 2,000 ft above sea level. For elevations above 2,000 ft, rated capacity must be reduced by 4% for each 1,000 ft above sea level.
3. Based on 2500 BTU/ft^3.
4. The airflow must be adequate to obtain a temperature rise within the range shown. Continuous return air temperature must not be below 55°F.

SECTION V: AIRFLOW PERFORMANCE

Table 13: Airflow Performance - Side Duct Application

Model	Jumper Position		External Static Pressure (in. W.C.)									
			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
PHG6A24050	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
PHG6A24075	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
PHG6A30050	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
PHG6A30075	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

Table continued on next page. See NOTES at end of table.

Table 13: Airflow Performance - Side Duct Application (Continued)

Model	Jumper Position		External Static Pressure (in. W.C.)									
			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
PHG6B36065	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
PHG6B36100	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
PHG6B42065	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
PHG6B42100	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

Table continued on next page. See NOTES at end of table.

Table 13: Airflow Performance - Side Duct Application (Continued)

Model	Jumper Position		External Static Pressure (in. W.C.)									
			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
PHG6B48065	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
PHG6B48100	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
PHG6B48125	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
PHG6B60065	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

Table continued on next page. See NOTES at end of table.

Table 13: Airflow Performance - Side Duct Application (Continued)

Model	Jumper Position		External Static Pressure (in. W.C.)									
			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
PHG6B60100	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
PHG6B60125	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 V.
2. Applications above 0.8 in. W.C. external static pressure are not recommended.
3. Brushless DC high efficiency standard ECM blower motor used for all indoor blower assemblies.
4. Minimal variations in airflow performance data result from operating at 208 V. Data above may be used in those cases.
5. Minimal variations in airflow performance data result from using downflow duct applications. Data above may be used in those cases.
6. Heating applications tested at 0.50 in. W.C. esp, and cooling applications tested at 0.30 in. W.C. esp per standards.

Table 14: Additional Static Resistance

Size (Tons)	CFM	Wet Indoor Coil	Economizer[1]	Filter/Frame Kit
24 (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
30 (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
36 (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
42 (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
48 (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
60 (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

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 delivers less CFM during full economizer operation.
2. 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 dual fuel thermostat. If an electronic thermostat is used, ensure it has a common connection. DO NOT use a power stealing thermostat.

This unit has a multi-stage compressor, so the unit has two stages of mechanical heat, and two stages of mechanical cooling. For optimum performance, it is best practice to use a four stage heat/two stage cool (4H/2C) heat pump dual fuel thermostat.

NOTICE

This unit REQUIRES the use of a thermostat to control fossil fuel (dual fuel) operation.

COOLING SEQUENCE OF OPERATIONS

A call for a compressor cooling signal from the thermostat is initiated at the Y1 terminal (for OD compressor) and the O terminal (for reversing valve).

The control cycles the compressor and indoor blower to second stage cooling speed 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.

1. On a call for cooling, the thermostat sends 24 V to Y and O on the defrost control board. The reversing valve solenoid is energized. After the anti-short cycle delay (ASCD) period is complete, the contactor coil M is energized. Power is supplied to the compressor and outdoor fan motor, and the reversing valve is switched to the cooling position. The indoor blower is controlled by the indoor blower control board. It operates on the LOW COOL or HIGH COOL speed based on the 24 VAC input from the defrost control board. If the control receives an O input without a Y input, it energizes the reversing valve only.
2. When the demand for cooling has been satisfied, the 24 V Y signal is removed, and the contactor is de-energized. The indoor blower motor continues to run and ramps down after a 60-second delay.

Dehumidification/Humidity Switch Input

This model unit features a built in dehumidification 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 setpoint. The control is open when the humidity is above the setpoint. 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 and a humidistat must be connected from the low voltage R and HUM color coded leads. During cooling operation, if the humidity level is above the humidistat setpoint, 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 (HPS) - This switch protects against excessive discharge pressures. If system pressures exceed 650 psi, the defrost control locks out compressor operation.

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

The above pressure switches are specifically designed to operate with R-410A systems. R-22 pressure switches must not be used as replacements for 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 on 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 for each Delay jumper setting are shown in Table 15. The levels shown in the Pre-Run, Short-Run, and Run periods are a percentage of the fan speed corresponding to the thermostat call. The Post-Run and Off Delay levels are derived from the level of the previous state, not the fan 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 15 : Delay Profile Descriptions

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

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

HEATING SEQUENCE OF OPERATIONS

This dual fuel package unit has two methods of heating. Primary heating is accomplished by the heat pump section. Secondary heating, supplemental heating, and back up heating are accomplished by the gas heating section. The gas heating section is also used to temper the indoor discharge air during heat pump defrost operation. The system is **NOT** designed to run heat pump heating and gas heating at the same time. However, the unit functions this way if the incorrect indoor thermostat is used or the incorrect indoor thermostat settings are selected. If the heat pump and gas heating sections are run at the same time, HI LIMIT trips may occur. A Y1 or Y1 + Y2 call without an O call from the indoor thermostat is primary (heat pump) heat. A W1 or W1 + W2 call from the indoor thermostat is secondary or emergency (gas) heat. The indoor thermostat MUST lock out the heat pump section on a call for supplemental heat or emergency heat.

HEAT PUMP HEATING SEQUENCE OF OPERATION

1. On a call for heating, the thermostat sends 24 V to Y1 or Y1 + Y2 on the defrost control board. After the anti-short cycle period is complete, the 24 V signal from Y1 energizes contactor coil M to supply power for the compressor and outdoor fan motor. The indoor blower control operates the indoor blower motor at the LOW COOL speed. If the 24 V signal from Y2 is present, the defrost control board energizes the second stage compressor solenoid and signals the indoor blower control to operate the indoor blower motor at the HIGH COOL speed. The reversing valve remains in the heating position. Indoor blower speeds are selected by the COOL jumper on the ignition control board.
2. If the heat pump cannot meet the heating demand using mechanical (compressor) heating, the indoor thermostat locks out the heat pump and energizes the secondary gas heating. The room thermostat sends a 24 VAC signal on W1 or W1 + W2. This brings on inducer and starts the ignition cycle. The W1 or W1 + W2 signal activates the LOW HEAT or HIGH HEAT airflow speed on the indoor blower motor.
3. When the heating demand is satisfied, the 24 V W1 or W1 + W2 or Y1 or Y1 + Y2 is de-energized, depending on whether heating was satisfied using primary or secondary heating mode.

   When the fan switch on the thermostat is in the ON position, the indoor blower continues to run. When the fan switch is in the AUTO position, the indoor blower motor ramps down after the blower off delay.

DEFROST OPERATION

The demand defrost control implements a temperature differential (delta-T) demand defrost algorithm. The heat pump is allowed to operate in the heating mode until the combination of outdoor ambient and outdoor coil temperatures indicates that defrosting is necessary. When coil temperature is below the initiate point for the ambient temperature continuously for 4-1/2 minutes, the heat pump is put into a defrost cycle. This 4-1/2 minute timer eliminates unnecessary defrost cycles caused by refrigeration surges such as those that occur at the start of a heating cycle.

A timed inhibit feature prevents the system from responding to a call for defrost less than 40 minutes after the initiation of the previous defrost. After the 40-minute inhibit time has expired, temperature conditions must call for defrost continuously for 4-1/2 minutes before a defrost cycle is initiated. A temperature inhibit feature prohibits defrost if the coil temperature is above 40°F.

A forced defrost feature puts the system into a defrost period every 6 hours and 4 minutes of accumulated compressor run-time to recirculate lubricants, unless the coil temperature is above 40°F and the ambient temperature is above 50°F. All defrost timing occurs only while the compressor is on. The defrost curve selection can be switched to pin 4 if a more powerful defrost cycle is necessary.

During the defrost mode, the reversing valve is energized, the outdoor fan is de-energized, the compressor is energized in second stage, and the defrost control provides a 24 V signal from terminal W1OUT or W1OUT + W2OUT, based on the defrost supplemental heat selection jumper located on the defrost control board to energize gas heat.

For troubleshooting purposes, the defrost cycle can be manually initiated by shorting the TEST pins together for 5 seconds while Y is energized. After removing the short, defrost terminates normally during the TEST mode.

Table 16: Demand Defrost Selection

Unit	Pin Position
024 — 060	2
024 — 060	4*

*For extreme environments as necessary only

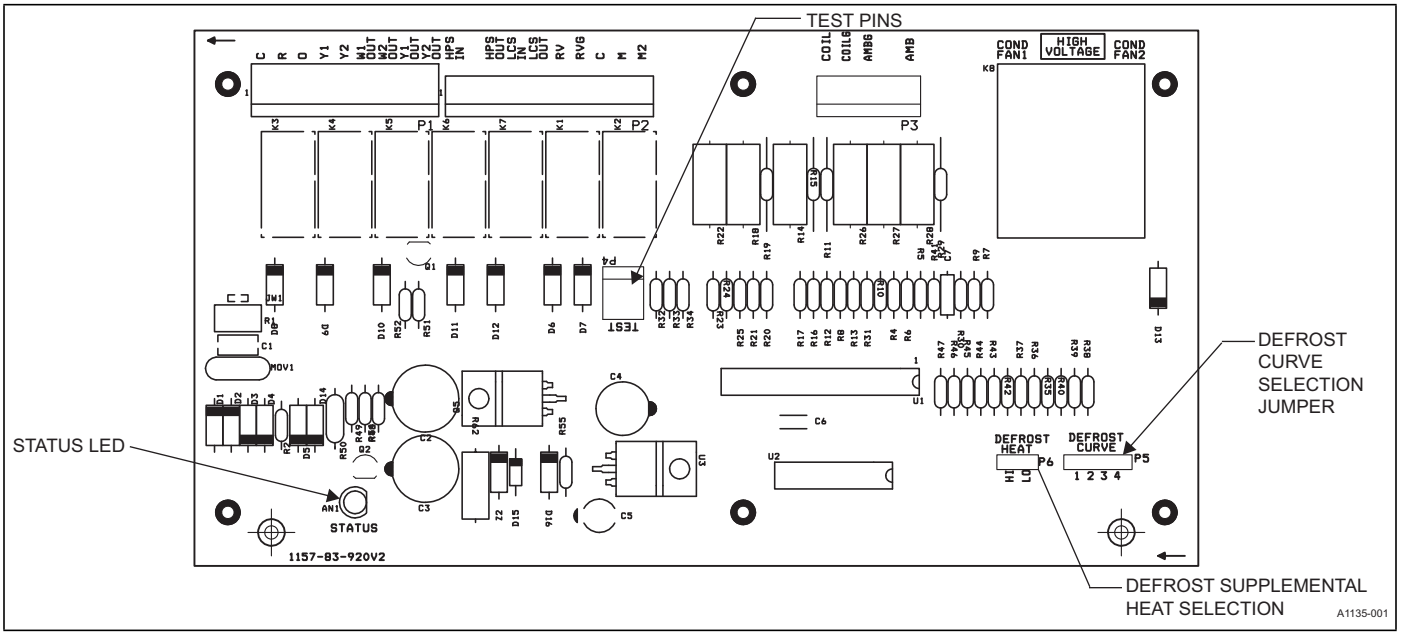


FIGURE 9: Demand Defrost Control

Heat Pump Safety Switch Operation

The unit is equipped with a safety package. The high pressure switch prevents the pressure in the refrigeration system from becoming too high. The loss of charge switch protects against loss of charge due to a leak in the refrigeration system. If either of these safety switches open, the unit is shut off for the 5-minute anti-short cycle time. When this has expired, a six-hour elapsed run timer begins. If a second opening of a safety switch occurs during this six-hour period, the compressor is locked out.

To reset the lockout function:

1. Remove power from the control's thermostat 1st stage (Y) input for longer than 2 seconds.
2. Remove power from R for more than 2 seconds.
3. Short the TEST pins together for more than 2 seconds while Y is energized.
4. Short the TEST pins together for more than 5 seconds while Y is de-energized.

Table 17: Defrost Control Test Pins

Test Pin Shorted	With Y Call	Without Y Call
Greater than 2 s	Bypass ASCD	Display error codes
Greater than 5 s	Forced defrost	Clear error codes

Table 18: Defrost Control Fault Codes

Description	STATUS LED
High-pressure switch fault (not in lockout yet)	2 Flashes
System in high-pressure switch lockout (last mode of operation was normal compressor)	3 Flashes
System in high-pressure switch lockout (last mode of operation was defrost)	4 Flashes
System in loss of charge switch lockout (last mode of operation was normal compressor)	5 Flashes
Low voltage (<19.2 VAC) preventing further relay outputs for > 2 seconds	6 Flashes
Low voltage (<16 VAC) stopped current relay outputs for > 2 seconds	7 Flashes
Liquid line sensor failure (Open or Shorted) – Comp Allowed / Lockout	8 Flashes
Ambient sensor failure (Open or Shorted) – Comp Allowed (if coil is > 40°F) / Lockout	9 Flashes
Control failure	10 Flashes

NOTE: If an ambient sensor failure is present, the control uses the coil sensor to determine if the compressor will continue to operate or enter a lockout state during compressor heating.

A lockout state is determined by the coil temperature. When the coil temperature drops below a predetermined range, the control does not allow compressor heating operation.

If the coil temperature is above the predetermined range, compressor heating operation is allowed.

During cooling mode, the coil temperature has no effect on compressor operation, if the ambient sensor fails.

GAS HEATING SEQUENCE OF OPERATION

Heating

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

The control checks 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 the pressure switch proving period. If the call for heat is removed, the control goes back to standby.

The unit control contains a built-in second 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 an OFF, 10-minute, 15-minute, 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 the HI HEAT DELAY jumper setting, if 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 the 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 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 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 can be reset by removing the call for heat (W1) for more than 1 second or 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 for 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.

The rollout switch used is a manual reset switch.

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 seconds during a period when the gas valve should be closed, the control enters a lockout, flashing “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 24 VAC power to the control board.

Safety Controls

The control circuit includes the following safety controls:

- Limit Switch (LS) - This control is located inside the blower compartment and protrudes into the heat exchanger compartment. The limit switch is set to open at a temperature selected to prevent the outlet air temperature from exceeding the maximum shown on the unit rating plate. It resets automatically. The limit switch operates when a high temperature condition occurs. The limit switch shuts down the ignition control, closes the main gas valve, and energizes the blower.
- Pressure Switch (PS) - If the draft motor fails, the pressure switch prevents the ignition control and gas valve from being energized.
- 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, the main gas valve closes.
- 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.

GAS HEATING FAULT CODES

The gas heating section has built-in self-diagnostic capability. A blinking LED light on the control board can flash red, green, or amber to indicate various conditions. The control continuously monitors its own operation and the operation of the system. If a fault occurs, the LED light indicates the fault code.

The slow flash speed is 2 seconds on and 2 seconds off. The other flash codes listed below have the following timing: the LED light turns on for 1/3 second and off for 1/3 second. This pattern is repeated the number of times equal to the code. There is a two-second pause between codes. For example, the 6 Red Flashes fault code means the LED light flashes on and off six times and then remains off for 2 seconds. This pattern repeats as long as the fault condition remains. The continuous flash codes listed below mean the LED light flashes on and off continuously with no breaks or longer pauses.

Slow Green Flash: Indicates normal operation with no thermostat calls. Standby mode

Slow Amber Flash: Indicates normal operation with a call for heat

LED Steady Off: If the LED light does not flash at all, check for power to the control board and check for an open fuse on the control board. If the control board is properly powered and the fuse is not open, the control board may need to be replaced.

Steady On Any Color: Indicates a possible control failure. Turn the power to the furnace off and back on. If the fault code recurs, the control board must be replaced. The control board is not field-repairable.

Rapid Amber Flash: Indicates the flame sense current is below 1.5 VDC. Check and clean the flame sensor. Check for proper gas flow. Verify that the current is greater than 1.5 VDC at the flame current test pad.

4 Amber Flashes: Indicates the control is receiving a Y signal from the thermostat without a G signal. The furnace operates normally during heating and cooling, but this fault code is displayed to alert the user that there is a wiring problem. Verify that the G wire from the thermostat is connected properly.

1 Red Flash: Indicates flame was sensed when there was no call for heat. The control turns on both the inducer motor and supply air blower. Check for a leaking or slow-closing gas valve.

2 Red Flashes: Indicates the pressure switch is closed when it should be open. The control confirms the pressure switch contacts are open at the beginning of each heat cycle. The control prevents the ignition sequence from continuing if the pressure switch contacts are closed when they should be open. Check for a faulty pressure switch or miswiring.

3 Red Flashes: Indicates the pressure switch contacts are open when they should be closed. Check for the following:

- Faulty inducer
- Blocked vent
- Broken pressure switch hose
- Disconnected pressure switch or inducer wires
- Faulty pressure switch

4 Red Flashes: Indicates the main limit or rollout switch has opened its contacts, which are normally closed. The control turns on the supply air blower and inducer. Check for the following:

- Dirty filter
- Improperly sized duct system
- Incorrect blower speed setting
- Incorrect firing rate
- Loose limit switch or rollout switch wiring
- Faulty blower motor

If the limit switch does not close within 5 minutes, the control operates as if the blower is not functioning. The control starts a hard lockout and flashes the 11 Red Flashes fault code. If the limit switch does not close after 15 minutes, the control operates as if a manual-reset rollout switch has opened, and flashes the 5 Red Flashes fault code. See the 5 Red Flashes and 11 Red Flashes descriptions below. If the main limit switch opens five times within a single call for heat, the control flashes the 4 Red Flashes fault code and enters a one-hour soft lockout.

5 Red Flashes: Indicates the limit circuit has been open for more than 15 minutes, usually meaning that a manual-reset rollout switch has opened. Check for proper combustion air, proper inducer operation, primary heat exchanger failure, or a burner problem. The control enters a hard lockout. After the problem is corrected, you must turn the power off and back on to reset the control.

6 Red Flashes: Indicates that while the unit was operating, the pressure switch opened four times during the call for heat. Check for a faulty inducer, blocked vent, or faulty pressure switch. The furnace locks out for 1 hour and then restarts.

7 Red Flashes: Indicates the flame could not be established during three attempts for ignition. Check that the gas valve switch is in the On position. Check for the following:

- Low gas pressure or no gas pressure
- Faulty gas valve
- Dirty or faulty flame sensor
- Faulty hot surface ignitor
- Loose wires
- Burner problem

The furnace locks out for 1 hour and then restarts.

8 Red Flashes: Indicates the flame has been lost five times (four recycles) during the heating cycle. Check for low gas pressure, a dirty or faulty flame sensor, or a faulty gas valve. The furnace locks out for 1 hour and then restarts.

9 Red Flashes: Indicates reversed line voltage polarity, a grounding problem, or reversed low voltage transformer wires. Check the polarity at the furnace and branch. Check the furnace grounding. Check that the flame probe is not shorted to chassis. The furnace does not start the ignition sequence until this problem is corrected.

10 Red Flashes: Indicates the gas valve is energized with no call for heat. The main blower and inducer blower run and no ignition sequence starts as long as this condition exists. Check the gas valve and gas valve wiring.

11 Red Flashes: Indicates the limit circuit has remained open for more than 5 minutes and less than 15 minutes. This condition is usually caused by a failed blower motor or blower wheel. The control enters a hard lockout. After the problem is corrected, you must turn the power off and back on to reset the control.

12 Red Flashes: Indicates the ID plug is not present or not connected properly. Check for a loose plug or loose wires in the plug.

Soft Lockout: The control includes a soft lockout that resets automatically after 1 hour. This provides protection for an unoccupied structure if a temporary condition causes a furnace malfunction, for example, if a temporary interruption in gas supply prevents the furnace from lighting. In this case, the control keeps trying to light each hour and resumes normal operation if the gas supply is restored.

Hard Lockout: Some fault conditions cause a hard lockout, and you must turn the power to the control off and back on to reset the control. The control does not automatically restart.

START-UP

Prestart Check List

Complete the following checks before starting the unit.

- Check the type of gas being supplied. Ensure that it is the same as listed on the unit nameplate.
- Ensure that the vent outlet air hood and air intake hood have been properly installed.
- Set the airflow selection jumpers to the appropriate settings based on external static pressures and heating temperature rise. See Figure 10 and Table 7.

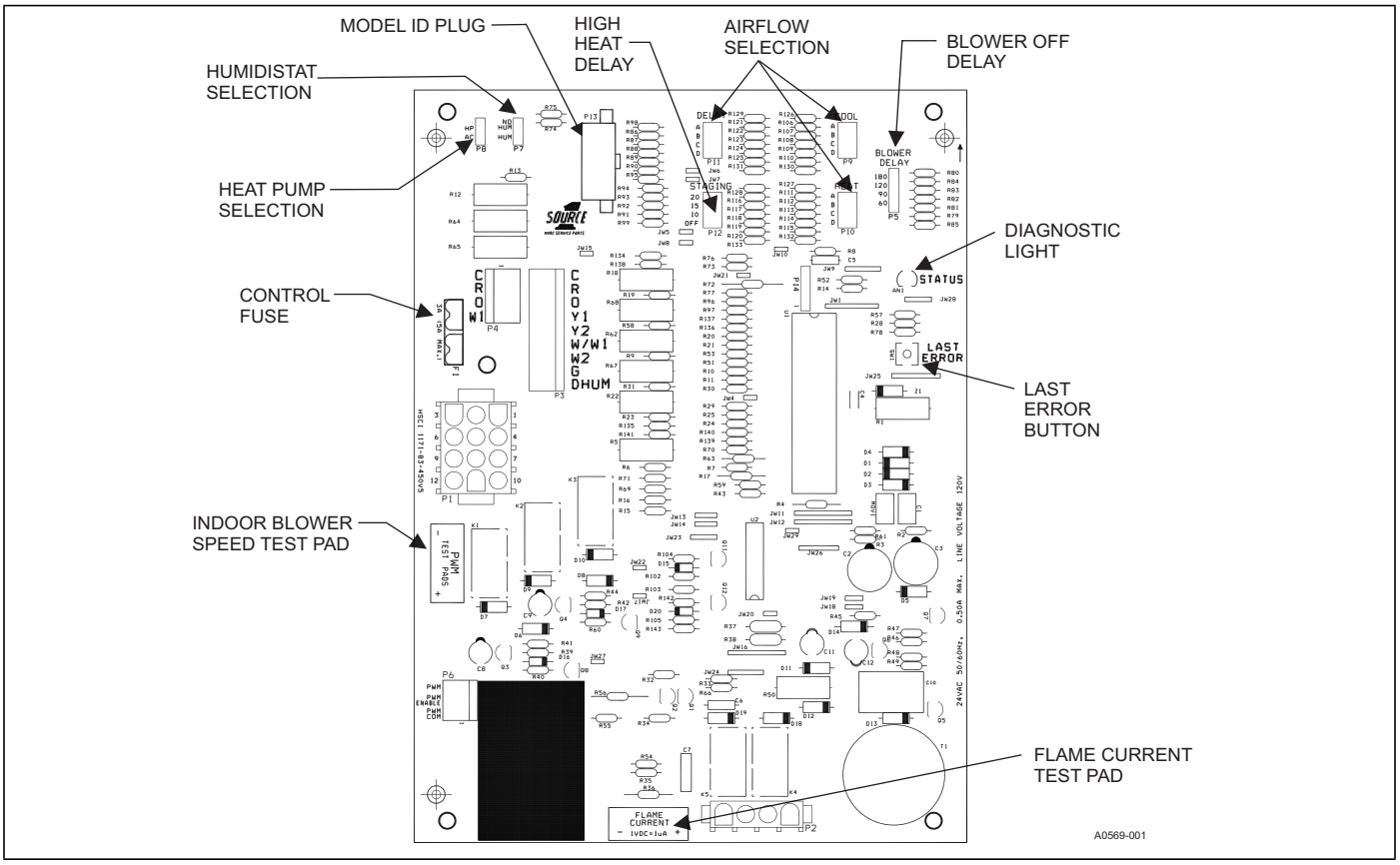


FIGURE 10: Ignition Control Board

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 that automatically lights the burners.
5. Remove the access panel.
6. Turn the gas valve switch to the OFF position.
7. Wait 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 required setting.
12. If the unit does not operate, follow the instructions in the Turning Off Gas to Unit section and call your service technician or gas supplier.

Turning 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:

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

ADJUSTMENT OF MANIFOLD GAS PRESSURE AND 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. See Figure 11 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 in. (2.4 mm) hex head wrench, loosen the set screw by turning it one 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. See 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 19: Inlet Gas Pressure Range

INLET GAS PRESSURE RANGE		
	Natural Gas	Propane (LP)
Minimum	4.5 in. W.C. (1.12 kPa)	8.0 in. W.C. (1.99 kPa)
Maximum	10.5 in. W.C. (2.61 kPa)	13.0 in. 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 correctly. The gas line pressure **MUST BE** a minimum of:

- 7 in. W.C. (1.74 kPA) for Natural Gas
- 11 in. W.C. (2.74 kPA) for Propane (LP) Gas

This is 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 19. Turn the gas valve to OFF, and turn the electrical supply switch to OFF. Remove the flexible tubing from the gas valve pressure port, and tighten the pressure port plug using the 3/32 in. (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 do 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. See Figures 11 and 12 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 11. 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. See Figure 11 for the location of the pressure regulator adjustment cap and adjustment screws on the main gas valve.
2. Turn on gas and electrical supplies, 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. When the 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 20: Nominal Manifold Pressure

NOMINAL MANIFOLD PRESSURE	
Natural Gas (High Fire)	3.5 in. W.C. (0.87 kPa)
Natural Gas (Low Fire)	1.6 in. W.C. (0.40 kPa)
Propane (LP) Gas (High Fire)	9.8 in. W.C. (2.488 kPa)
Propane (LP) Gas (Low Fire)	4.0 in. W.C. (0.99 kPa)

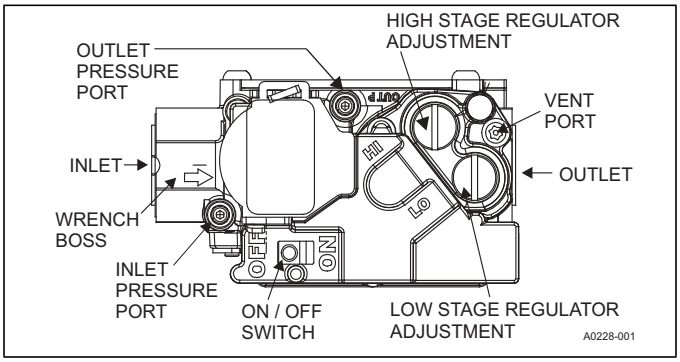


FIGURE 11: Gas Valve

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. See Natural Gas in the CHECKING GAS HEAT INPUT section.
5. When the correct BTU (kW) input has been established, turn the gas valve to OFF, and turn the electrical supply switch to OFF. Remove the flexible tubing from the gas valve pressure port, and tighten the pressure port plug using the 3/32 in. (2.4 mm) hex head wrench.
6. Turn on electrical and gas supplies. 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 do the leak check.

MANIFOLD PRESSURE "U" TUBE CONNECTION

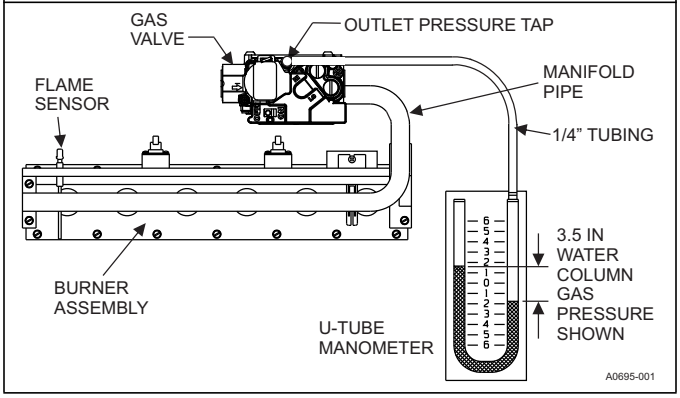


FIGURE 12: Reading Gas Pressure

Adjust as follows:

1. Remove the cap from the valve body. See Figure 11 for location.
2. To decrease the gas pressure, turn the adjusting screw counter-clockwise.
3. To increase the gas pressure, turn the adjusting screw clockwise.

NOTICE

The correct manifold pressure for natural gas furnaces is 3.5 IWG. The correct manifold pressure for propane (LP) is 10.0 IWG.

AIRFLOW SETTINGS

Cooling Airflow Settings

The unit is equipped with an electronically commutated (ECM) blower motor. The motor and blower can deliver airflow over a wide range of operating conditions.

Select the required cooling airflow by placing the Cool jumper on the control board in the required position: A, B, C, or D. The A position gives the highest airflow and the D position gives the lowest airflow. See Table 13 for the expected airflow at each speed setting. Select the speed to deliver approximately 350 CFM to 400 CFM per ton of A/C cooling capacity. Use of airflow outside this range may cause diminished air conditioning performance, lower overall energy efficiency, and higher electric utility bills. See Table 21 for default cooling blower settings.

Table 21: Default Blower Speeds

Model Number	Default Blower Speeds	
	Heat Jumper	Cool Jumper
PHG6A24075	B	A
PHG6A30075	B	A
PHG6B36100	C	A
PHG6B42100	B	A
PHG6B48065	B	A
PHG6B48100	B	A
PHG6B60125	C	A

Continuous Fan Airflow Settings

To operate the furnace in continuous fan mode, set the wall thermostat Fan switch to On. The default continuous fan setting is with the Cool jumper in the D position. During continuous fan operation, the blower delivers approximately 67% of the high stage cooling airflow.

Gas Heating Airflow Settings

See Table 21 for the default heating blower speed. The unit is equipped with an electronically commutated (ECM) blower motor. The motor and blower can deliver airflow over a wide range of operating conditions.

Select the required heating airflow by placing the Heat jumper on the control board in the required position: A, B, C, or D. The A position gives the highest airflow and the D position gives the lowest airflow. See Table 13 for the expected airflow at each speed setting. See Table 21 for the default heating blower speed for each model.

In certain circumstances, it may be necessary to move the heating blower speed to a different motor speed tap. Not all of the motor heating speeds are appropriate for gas heating operation for all models and applications. Use of heating airflow at a speed other than the default speed causes diminished heating performance and may cause the furnace temperature limit controls to shut down the furnace.

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 "Physical 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 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts about 6 ft from the furnace, where they are not affected by radiant heat.

The temperature rise (or temperature difference between the return air and the heated air from the furnace) must lie within the range shown on the rating plate and the data in Table 7.

After the temperature rise has been determined, the CFM can be calculated as follows:

$$\text{Degrees F Temp Rise} = \frac{\text{BTUH Output}}{1.08 \times \text{CFM}}$$

OR

$$\text{CFM} = \frac{\text{BTUH Output}}{1.08 \times \text{Degrees F Temp Rise}}$$

DIRECT DRIVE BLOWER

All units have direct drive, enhanced ECM blower motors.

EXTERNAL STATIC PRESSURE SETUP

To measure external static pressure:

1. Measure the supply air static pressure (see Figure 13) and record this positive number.
2. Measure the return air static pressure and record this negative number.
3. Treat the negative number as a positive, and add the two numbers together. This is total system static.

CHECKING GAS HEAT INPUT

Natural Gas

1. Turn off all other gas appliances connected to the gas meter.
2. With the furnace 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 cubic foot or a 1 cubic foot test dial.
3. 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 22.

If the actual input is not within 5% of the furnace 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 22: Gas Rate Cubic Feet Per Hour[1]

Seconds for One Revolution	Size of Test Dial	
	1/2 Cubic Foot	1 Cubic Foot
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

1. ***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 22. Read across to the 1 Cubic Foot column, where you see that 95 cubic feet of gas per hour are consumed by the furnace at that rate. Multiply 95 x 1050 (or 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 furnace.

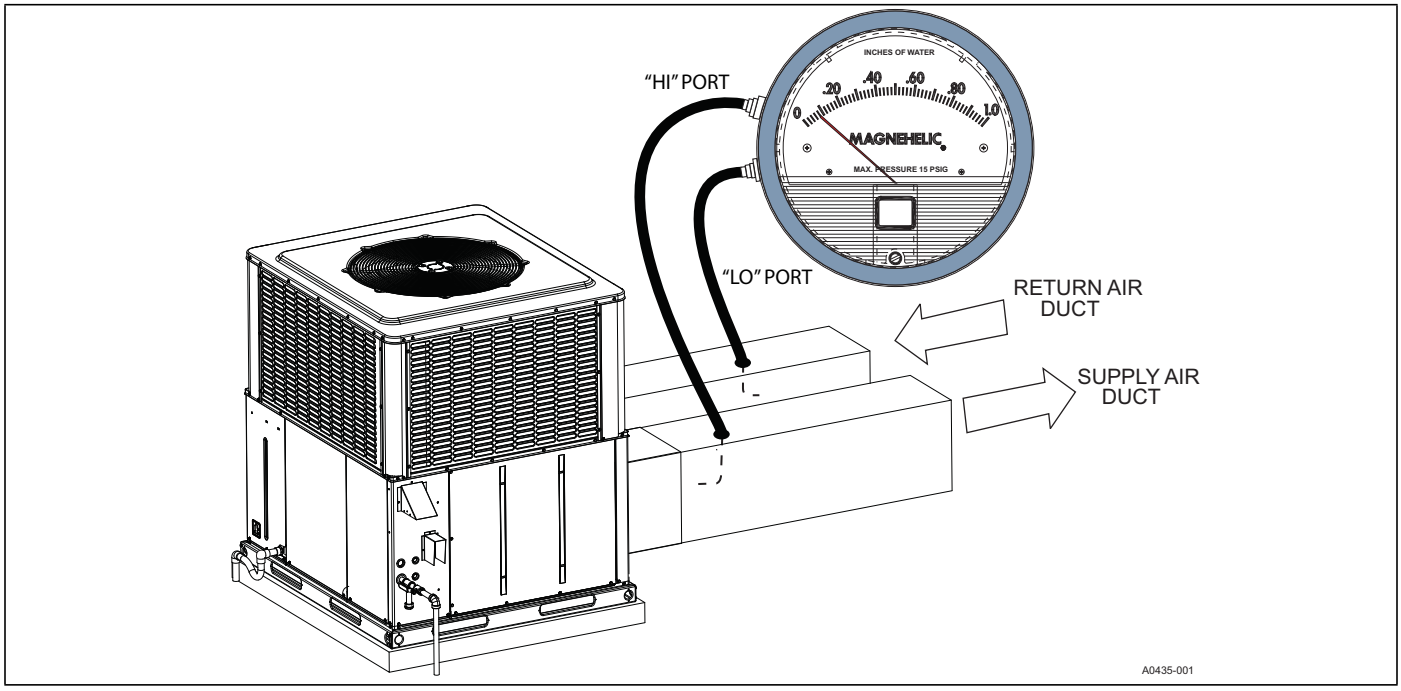
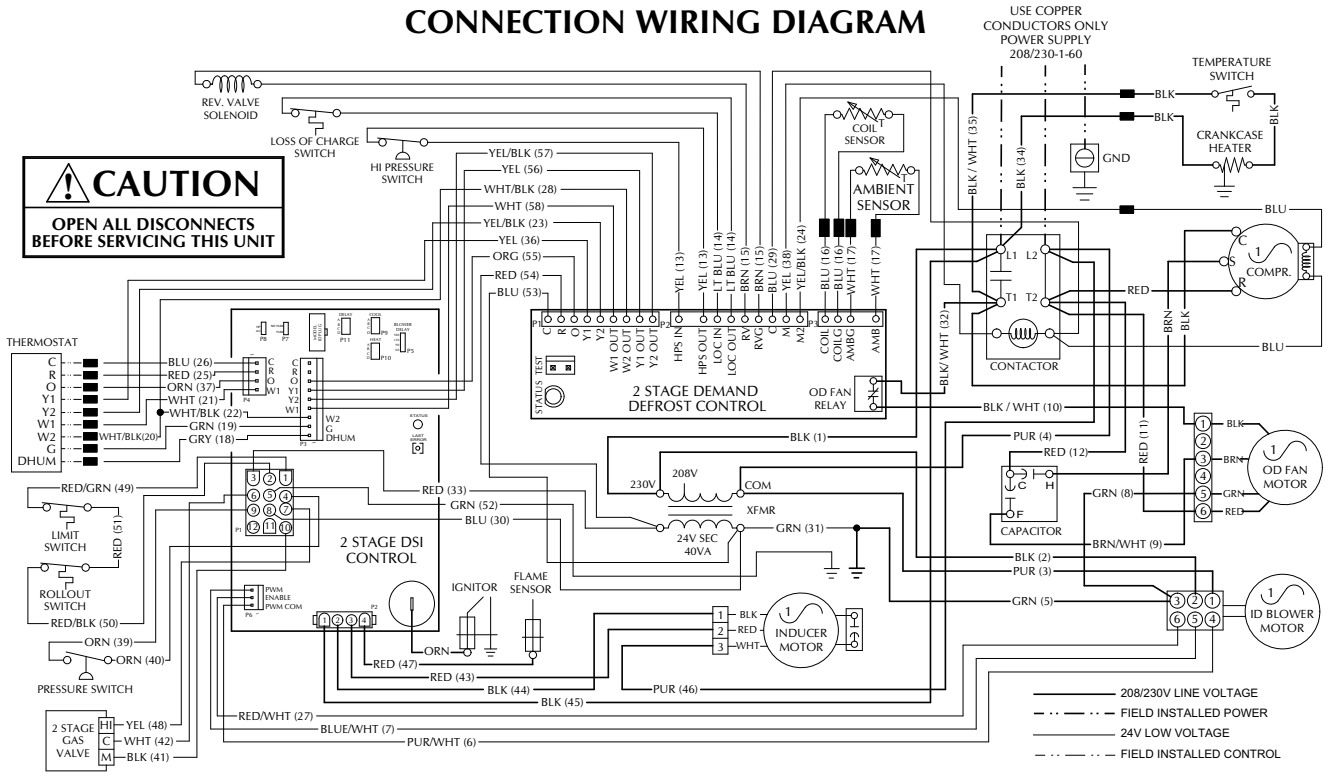


FIGURE 13: Measuring External Static Pressure

SECTION VII: TYPICAL WIRING DIAGRAMS

2 STAGE HEAT PUMP WITH GAS HEAT
208/230-1-60
CONNECTION WIRING DIAGRAM



DSI Control Operation / Fault Codes

Normal Operation

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

Operational Fault Codes

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

Demand Defrost Control Operation / Fault Codes

Normal Operation

LAMP OFF	No Power to Control
STEADY RED	Compressor operation active - Compressor contactor energized.
SLOW RED	Control normal operation - No call for compressor.
RAPID RED	Control normal operation - ASCD (Anti Short Cycle Delay) active

Operational Fault Codes

Flashes	Fault Condition
2 RED	High Pressure Switch fault (Not yet in lockout)
3 RED	System in high pressure switch lockout (Last mode of operation was normal compressor)
4 RED	System in high pressure switch lockout (Last mode of operation was defrost)
5 RED	System in low pressure switch lockout (Last mode of operation was normal compressor)
6 RED	Low Voltage (<19.2 VAC) preventing further relay outputs for >2 seconds
7 RED	Low Voltage (<16 VAC) stopped current relay outputs for >2 seconds
8 RED	Liquid line sensor failure (Open or Shorted) Comp Allowed / Lockout
9 RED	Ambient sensor failure (Open or Shorted) - Comp Allowed (If coil is >40°F) / Lockout
10 RED	Control Failure

FACTORY DSI CONTROL BOARD SETTINGS:
COMBUSTION BLWR POST PURGE: 15 SEC.
INDOOR BLWR HEAT ON DELAY: 30 SEC.
INDOOR BLWR COOL OFF DELAY: 60 SEC.
INDOOR BLWR HEAT OFF DELAY: FIELD SELECT

Refer to Installation Manual for more detailed information.

NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF THE 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 THE UNIT, MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 C. 600 VOLT WIRE OR EQUIVALENT CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. THE THERMOSTAT/CONTROL CONNECTED TO THIS UNIT MUST BE DUAL FUEL CAPABLE.
4. FACTORY WIRED FOR 230 VOLT SUPPLY POWER. FOR 208 VOLT, MOVE BLACK WIRES FROM THE 230 TO THE 208 VOLT TAP ON THE TRANSFORMER.
5. MOTORS ARE INHERENTLY PROTECTED.
6. SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY.
7. SELECT "COOL" JUMPER THAT WILL DELIVER APPROXIMATELY 400 CFM/TON FOR COOLING AND HEAT PUMP OPERATION.

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FIGURE 14: Connection Wiring Diagram

2 STAGE HEAT PUMP WITH GAS HEAT
208/230-1-60
LADDER WIRING DIAGRAM

DSI Control Operation / Fault Codes

Normal Operation

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

Operational Fault Codes

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

Demand Defrost Control Operation / Fault Codes

Normal Operation

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STEADY RED	Compressor operation active - Compressor contactor energized.
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Operational Fault Codes

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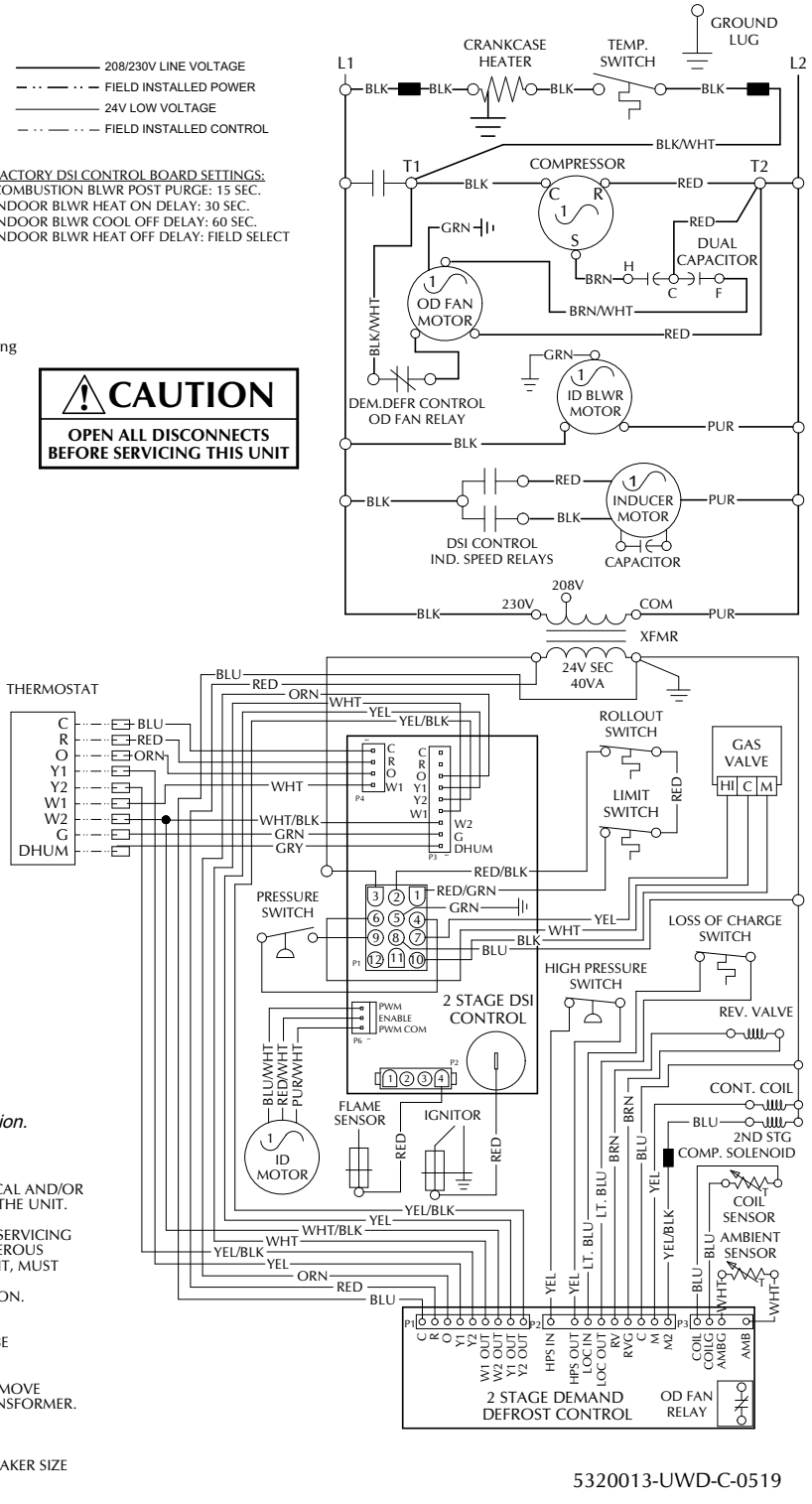
6 RED	Low Voltage (< 19.2 VAC) preventing further relay outputs for > 2 seconds
7 RED	Low Voltage (< 16 VAC) stopped current relay outputs for > 2 seconds
8 RED	Liquid line sensor failure (Open or Shorted) Comp Allowed / Lockout
9 RED	Ambient sensor failure (Open or Shorted) - Comp Allowed (If coil is > 40° F) / Lockout
10 RED	Control Failure

Refer to Installation Manual for more detailed information.

208/230V LINE VOLTAGE
FIELD INSTALLED POWER
24V LOW VOLTAGE
FIELD INSTALLED CONTROL

FACTORY DSI CONTROL BOARD SETTINGS:
COMBUSTION BLWR POST PURGE: 15 SEC.
INDOOR BLWR HEAT ON DELAY: 30 SEC.
INDOOR BLWR COOL OFF DELAY: 60 SEC.
INDOOR BLWR HEAT OFF DELAY: FIELD SELECT

⚠ CAUTION
OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT



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NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF THE 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 THE UNIT, MUST BE REMOVED, IT MUST BE REPLACED WITH TYPE 105 C. 600 VOLT WIRE OR EQUIVALENT CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. THE THERMOSTAT/CONTROL CONNECTED TO THIS UNIT MUST BE DUAL FUEL CAPABLE.
4. FACTORY WIRED FOR 230 VOLT SUPPLY POWER. FOR 208 VOLT, MOVE BLACK WIRES FROM THE 230 TO THE 208 VOLT TAP ON THE TRANSFORMER.
5. MOTORS ARE INHERENTLY PROTECTED.
6. SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY.
7. SELECT "COOL" JUMPER THAT WILL DELIVER APPROXIMATELY 400 CFM/TON FOR COOLING AND HEAT PUMP OPERATION.

FIGURE 15: Ladder Wiring Diagram

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 16: R-410A Quick Reference Guide

NOTES

SECTION VIII: START UP SHEET

Print Form

Residential Package Dual Fuel Start-Up Sheet

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

Reset Form

Start-Up Date | Company Name | Start-Up Technician

Owner Information

Name | Address | Daytime Phone

City | State or Province | Zip or Postal Code

Equipment Data

Unit Model # | Unit Serial #

General Information (Check all that apply)

◯ Residential	◯ New Construction	◯ Roof level	◯ Down flow
◯ Commercial	◯ Retrofit	◯ Grade level	◯ Side flow

Unit Location and Connections (Check all that apply)

☐ Unit is level and installed on: ☐ Slab ☐ Roof curb ☐ Duct connections are complete: ☐ Supply ☐ Return

☐ Condensate drain properly connected per the installation instructions ☐ Condensate trap has been primed with water

Filters

☐ Filters installed Number of filters | Filter size | ◯ Filter located inside ◯ Filter located outside

Additional Kits & Accessories Installed (Check all that apply)

☐ Refrigerant safety kit ☐ Low ambient kit ☐ Anti-recycle timer ☐ Crank case heater ☐ Filter frame kit

☐ Transformer kit ☐ Economizer ☐ Roof curb kit ☐ Burglar bar kit ☐ Hail guard kit

☐ Manual fresh air damper kit ☐ Motorized fresh air damper kit

Electrical Connections & Inspection (Check all that apply)

◯ Single phase ◯ Three phase ◯ 208 volts AC ◯ 230 volt AC ◯ 460 volts AC ◯ 575 volts AC

☐ Inspect wires and electrical connections ☐ Transformer wired properly for primary supply voltage ☐ Ground connected

☐ Low voltage present at control board "R & C" Measured voltage "R" and "C" outdoor unit control board

☐ Line voltage present at disconnect Measured voltage "L1 to L2" | "L2 to L3" | "L1 to L3"

Compressor amperes "L1" | "L2" | "L3" Total amperes "L1" | "L2" | "L3"

◯ Single stage compressor ◯ Two stage compressor

Air Flow Setup / Cooling

Blower Type & Set-Up	◯ ECM	COOL	◯ A	◯ B	◯ C	◯ D
		ADJUST	◯ A	◯ B	◯ C	◯ D
		DELAY	◯ A	◯ B	◯ C	◯ D
	◯ X-13	◯ 1	◯ 2	◯ 3	◯ 4	◯ 5
	◯ PSC	◯ Low	◯ Medium Low	◯ Medium	◯ Medium High	◯ High

Supply static (inches of water column)	Supply air dry bulb temperature	Outside air dry bulb temperature
Return static (inches of water column)	Return air dry bulb temperature	Return air wet bulb temperature
Total external static pressure	Temperature drop	Supply air wet bulb temperature

Refrigerant Charge and Metering Device

◯ R-410A ◯ R-22	Data plate - lbs / Oz	Suction line temperature	Discharge pressure
◯ TXV ◯ Fixed Orifice	Discharge line temperature	Suction pressure	Liquid line temperature
TXV# / Orifice size		Superheat	Subcooling

YorkGuard VI Defrost Control Board

Fill in the information ie.. "ON", "OFF", "YES", "NO", or the appropriate "Value" for the selected pin settings

Part Number	Version Number (located on the Chip on the Defrost Board)			
Low Temp Cut Out	Balance Point	Defrost Curve	Y2 Lock	FFUEL
Switch Point	Hot Heat Pump	Bonnet Sensor Present	Compressor Delay	

Supplementary Heating Indoor Blower Set-Up	◯ ECM	HEAT	◯ A	◯ B	◯ C	◯ D
	◯ X-13	◯ 1	◯ 2	◯ 3	◯ 4	◯ 5
	◯ PSC	◯ Low	◯ Medium Low	◯ Medium	◯ Medium High	◯ High

◯ Single Stage ◯ Two Stage | ◯ Natural Gas ◯ Propane LP (Requires LP Conversion Kit)

LP Gas Conversion Kit # | LP Conversion Kit Installed By | Inlet Gas Pressure (w.c.")

Manifold Pressure at 100% Firing Rate (w.c.") | Measured BTU/H (Clock Gas Meter Nat Gas) | Rated BTU/H

Manifold Pressure / Low Fire Rate (w.c.") | Return Air Dry Bulb Temp | Supply Air Dry Bulb Temp | Temp Rise

☐ Burner Flame Inspection - Blue flames extending directly into the primary heat exchanger cells

Clean Up Job Site

- ☐ Job site has been cleaned, indoor and outdoor debris removed from job site
- ☐ Tools have been removed from unit
- ☐ All panels have been installed

Unit Operation and Cycle Test

- ☐ Operate the unit through continuous fan cycles from the thermostat, noting and correcting any problems
- ☐ Operate the unit through cooling cycles from the thermostat, noting and correcting any problems

Owner Education

- ☐ Provide owner with the owner's manual
- ☐ Explain operation of system to equipment owner
- ☐ Explain thermostat use and programming (if applicable) to owner
- ☐ Explain the importance of regular filter replacement and equipment maintenance

Comments and Additional Job Details

5322625-UIM-C-0919
Supersedes: 5322625-UIM-B-0819

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