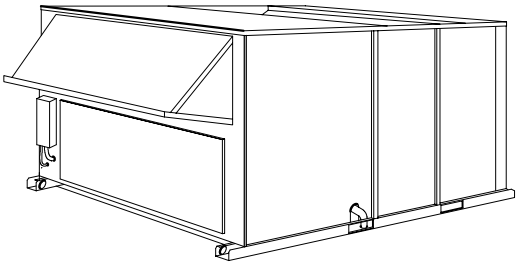
Installation Instructions

- Safety Labeling & Rules
- Installation Requirements
- Location / Clearances
- Gas Supply / Piping
- Wiring
- Air Distribution
- Ductwork Connections
- Start-Up
- Maintenance



Models

Three Phase
208-230, 460, 575 Volt

PGS180H300	PGE180H360
PGS180L300	PGE180L360
PGS180S300	PGE180S360
PGS240H360	PGE240H360
PGS240L360	PGE240L360
PGS240S360	PGE240S360

COMBINATION UNITS
ELECTRIC COOL / GAS HEAT

Printed in Mexico

509 01 2003 00 3/11/05

Table of Contents

NOTES **2**

Unit Dimensions **3**

Safe Installation Requirements **5**

Location And Set-up **6**
- Access Panels 6
- Clearances 6
- Minimum Clearances to Combustible and non-Combustible Construction (Horizontal & DownFlow) 6
- Installation 8
- Ground Level Installation 8
- Rooftop Installation 8
- Hoisting 8
- Installing Flue Hood and Wind Baffle 9
- Condensate Drain 9

Gas Supply and Piping **10**
- Gas Piping 10
- Gas Pipe Size 10
- English Measurements / Metric Measurements 11
- Piping At Unit 12
- Connecting the Gas Piping 12
- Leak Checks 12

Electrical Wiring **13**
- Line Voltage Wiring 13
- Line Connections 13
- Converting 230V Units to 208V 14
- Field Installed Equipment 14
- Low Voltage Wiring 14
- Low Voltage Wiring With Economizer Option 14
- Thermostat 14
- Heat Anticipator 14
- Final Check 14
- Make Outdoor-Air Adjustments 14
- Install Outdoor-Air Hood 15

Air Distribution System **16**
- Ductwork 16
- Ductwork Connections 16
- Circulating Blower 16
- Determining Blower Speed 16
- Circulating Blower Performance Data 17-22

Adjustable Belt Drive Blower **23**

Start-up Procedure **24**
- Blower and Phasing Check 24

High Heat Checks 25
Heating Operation/Temperature Rise Check 26
Cooling Checks 27
Turning Off the Unit 27
Heating 27
Cooling 27

Operation And Maintenance Instructions 28
Starting the Unit After Shutdown 28
Heating 28
Cooling 29
Thermostat Fan Switch Operation 29
Monthly Maintenance and Inspection Checks 29
Vent Assembly 29
Main Burner Flame 29
Air Filters (Factory Installed) 29
Disposable Replacement Filters 29
Condenser Coil 29
Condensate Drain 29
Annual Maintenance and Inspection 29
Circulating Air Blower 29
Evaporator Fan Service and Replacements (15 Ton) 30
Evaporator Fan Service and Replacements (20 Ton) 30
Inspection & Cleaning Of Burner Assy./Heat Exchangers/Flue Gas Passages 31
Main Burners 31
Flue Gas Passageways 31
Combustion Air-Blower 31
Main Burner Section 31
Main Burner Removal 31
Cleaning And Adjustment 32

Troubleshooting 32
Table 1 – LED Trouble Shooting Error Codes 32
Trouble Shooting – Cooling Service 33
Trouble Shooting – Heating Service 34

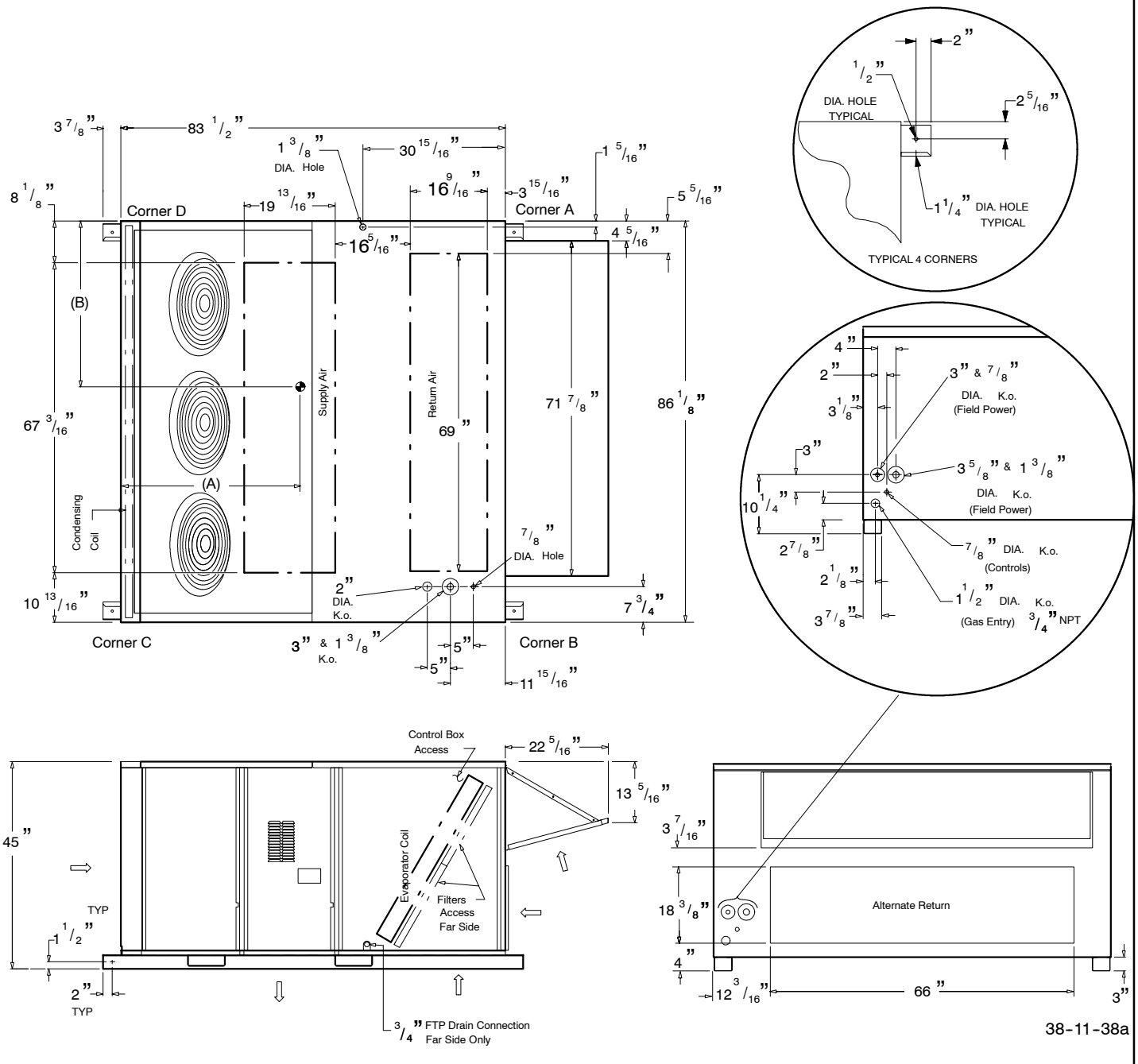
Start-Up Checklist 35

NOTES:

15 TON BASE UNIT DIMENSIONS

	Unit Weight		Corner A		Corner B		Corner C		Corner D		Dim. A		Dim. B	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	ft-in	mm	ft-in	mm
15 Ton	1650	748	423	192	386	175	403	183	438	199	3-5	1040	3-5	1046

1. Dimensions in ( ) are in millimeters.
2. Center of Gravity.
3. Direction of Airflow

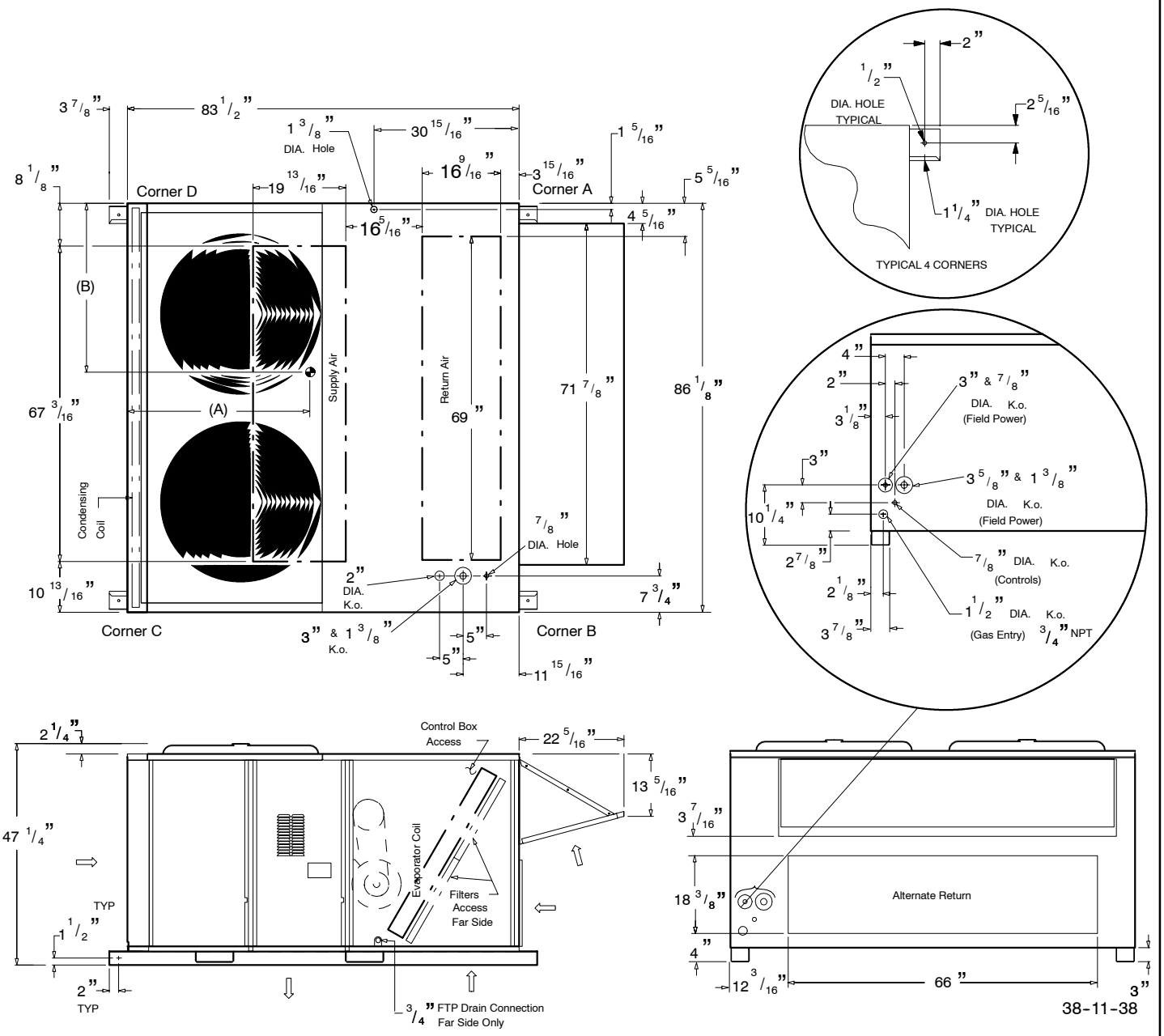


38-11-38a

20 TON BASE UNIT DIMENSIONS

	Unit Weight		Corner A		Corner B		Corner C		Corner D		Dim. A		Dim. B	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	ft-in	mm	ft-in	mm
20 Ton	1850	839	443	201	406	184	476	216	525	238	3-2	973	3-5	1043

1. Dimensions in ( ) are in millimeters.
2. Center of Gravity.
3. Direction of Airflow



38-11-38

Safe Installation Requirements

⚠ WARNING

Installation or repairs made by unqualified persons could result in hazards to you and others. Installation must conform with local building codes or, in the absence of local codes, with National Fuel Gas Code NFPA 54/ANSI Z223.1 current edition and National Electrical Code ANSI/NFPA 70 current edition. In Canada the National Standard CAN/CGA 1-B149.1 or current edition and CSA C.22.1 - Canadian Electrical Code Part 1 or current edition.

Failure to carefully read and follow all instructions in this manual could result in furnace malfunction, property damage, personal injury and/or death.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures, equipped with the proper tools and test instruments.

- Installation **MUST** conform to the most current version of the following standards or a superseding standard.

  In the United States:

  - National Fuel Gas Code NFPA 54/ANSI Z223.1
  - National Electrical Code ANSI/NFPA 70

  In Canada:

  - National Standard CAN/CGA 1-B149.1
  - CSA C.22.1 - Canadian Electrical Code Part 1.
- Do **NOT** use this furnace as a construction heater.
- Use only the type of gas approved for this furnace (see rating plate).
- Do **NOT** use open flame to test for gas leak.
- Seal supply and return air ducts.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation is adequate and conforms to governing codes and ordinances.

⚠ CAUTION

RISK OF REDUCED COMPONENT LIFE

Failure to follow these Caution could result in premature component failure.

It is recommended that a qualified service technician check the heat exchanger integrity a minimum of every two (2) years.

Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air.

Be sure that unit is installed so that snow will not block the combustion intake or flue outlet.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Locate mechanical draft system flue assembly at least 48 inches from any opening through which combustion products could enter the building, or as local codes dictate, and at least 48 inches from an adjacent building or combustible material. When unit is located adjacent to public walkways, flue assembly must be at least 7 feet above grade.

Flue vent discharge must have a minimum horizontal clearance of 48 inches from electric and gas meters, gas regulators, and gas relief equipment.

Flue gas can deteriorate building materials. Orient unit so that flue gas will not affect building materials.

Adequate combustion-air space must be provided for proper operation of this equipment. Be sure that installation complies with all local codes and Section 5.3, Air for Combustion and Ventilation, NFGC (National Fuel gas Code), ANSI (American National Standards Institute)Z223.1 -latest year and addendum Z223.1A latest year. In Canada, installation must be accordance with CAN1B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

Location And Set-up

The unit is designed for outdoor installation **ONLY**. The unit may be installed on a level concrete mounting base (or other adequate platform) at ground level or on a flat rooftop with an adequate platform. If using as a downflow model, use a roof curb. Typical installations are shown in **Figure 2**.

Access Panels

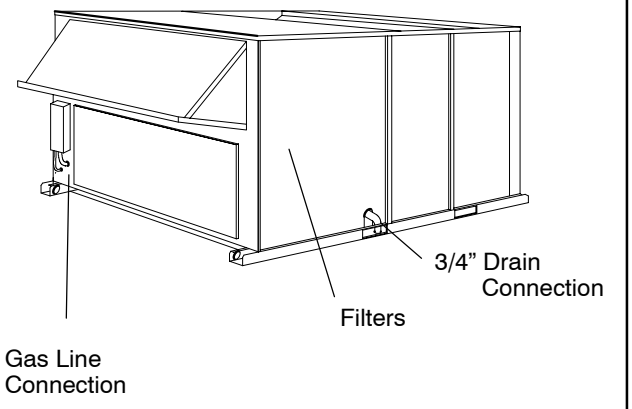
⚠ WARNING

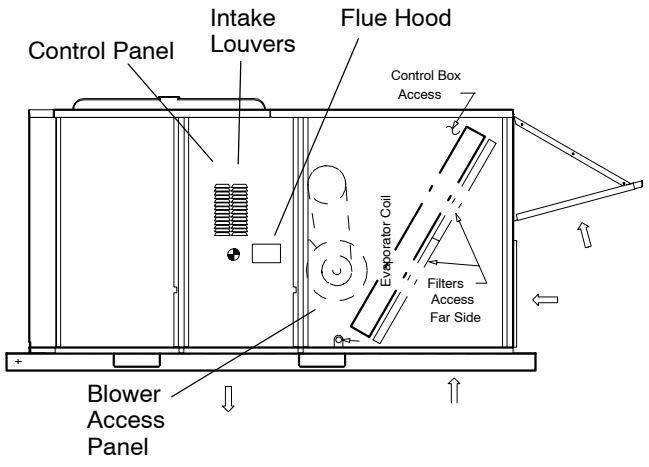
CARBON MONOXIDE POISONING HAZARD.

Failure to keep blower access panels in place could result in bodily injury and/or death.

Keep blower access panels in place.

Figure 1 **Access Panels**





Clearances

The location **MUST** allow for minimum clearances and should not be adjacent to an area where the unit's operating sound level might be objectionable.

Minimum clearances, as specified below, **MUST** be maintained to provide adequate fire protection, adequate combustion air, and room for service personnel. In addition, local codes **MUST** be observed.

Do **NOT** install the unit in a location that will permit discharged air from the condenser to recirculate to the condenser inlet.

Do **NOT** install the unit in a location that will permit discharged air from the furnace exhaust flue to recirculate into the unit or into the intake vent of any other equipment or ventilation system.

⚠ CAUTION

RISK OF REDUCED COMPONENT LIFE

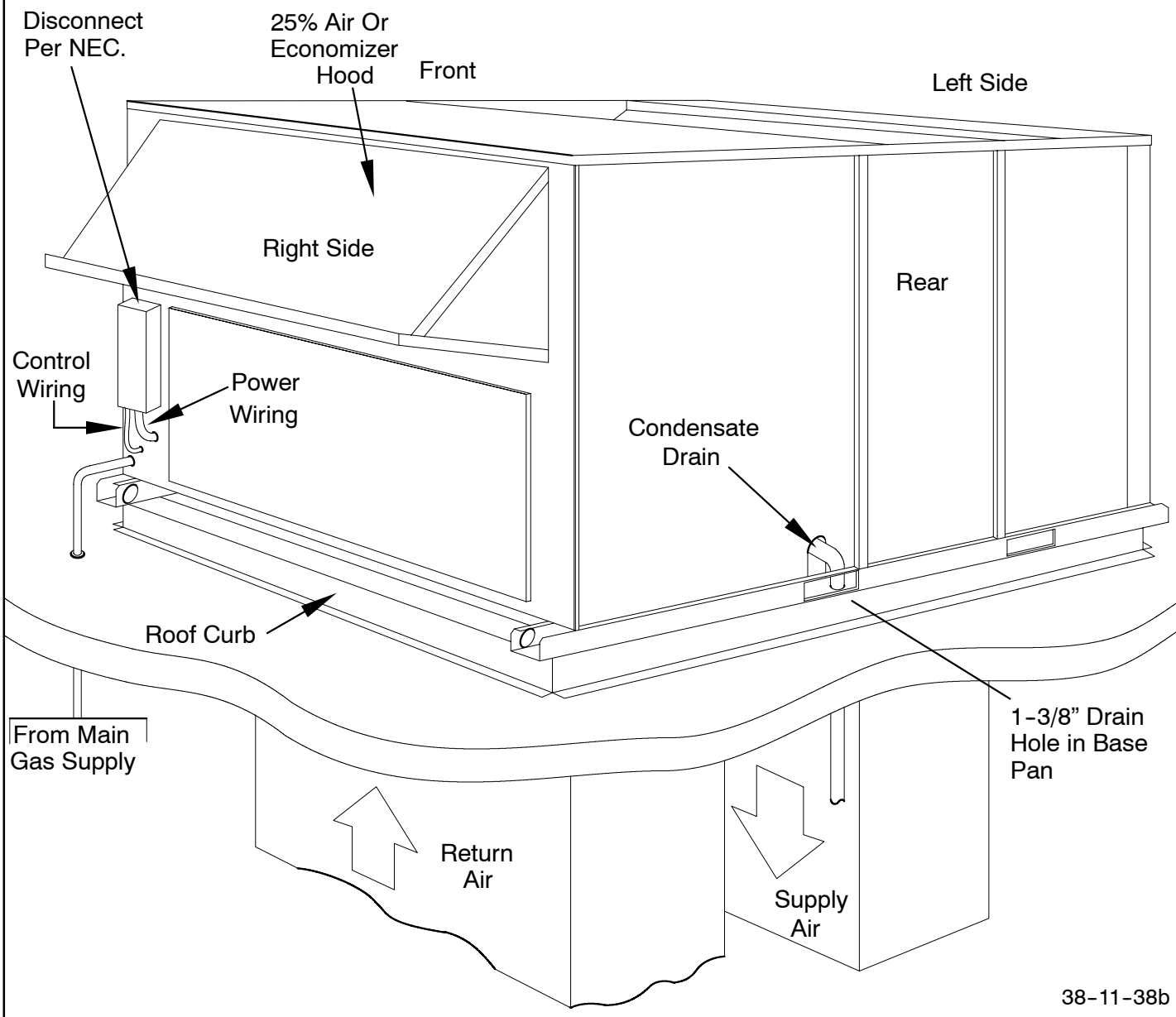
Failure to follow these Caution could result in premature component failure.

Do NOT operate unit in a corrosive atmosphere containing chlorine, fluorine, or any other corrosive chemicals.

Minimum Clearances to Combustible and non-Combustible Construction (Horizontal & DownFlow)

Flue Side and combustible surfaces	48"
Bottom of Unit and combustible surfaces with no curb	1"
Condenser Coil, one side	36"
other side (which side is optional)	12"
Overhead clearance	60"
Control Box Side	42"
Horizontal Duct Connections Side	0"

Figure 2 | **TYPICAL INSTALLATIONS & CLEARANCES**



CLEARANCES

1. Ductwork to be attached to accessory roof curb only.
2. Minimum clearance:
   - Rear: 7'-0" (2134) for coil removal. This dimension can be reduced to 4'0" (1219) if conditions permit coil removal from the top.
   - 4'0" (1219) to combustible surfaces, all four sides (includes between units).
   - Left Side: 4'-0" (1219) for proper condenser coil airflow.
   - Front: : 4'-0" (1219) for control box access.
   - Right side: 4'-0" (1219) for proper operations of damper and power exhaust if so equipped.
   - Top: 6'-0" (1829) to assure proper condenser fan operation.
   - Bottom: 14" (356) to combustible surfaces (when not using curb).
   - Control Box side: 3'-0" (914) to ungrounded surfaces, non-combustible
   - Control Box Side: 3'-6" (1067) to block or concrete walls, or other grounded surfaces.
   - Local codes or jurisdiction may prevail.
3. With the exception of clearance for the condenser coil as stated in Note 2, a removable . . . . . fence or barricade requires no clearance.
4. Dimensions are from outside of corner post. Allow 5/16" (8) on each side for top cover drip edge.

Installation

NOTE:

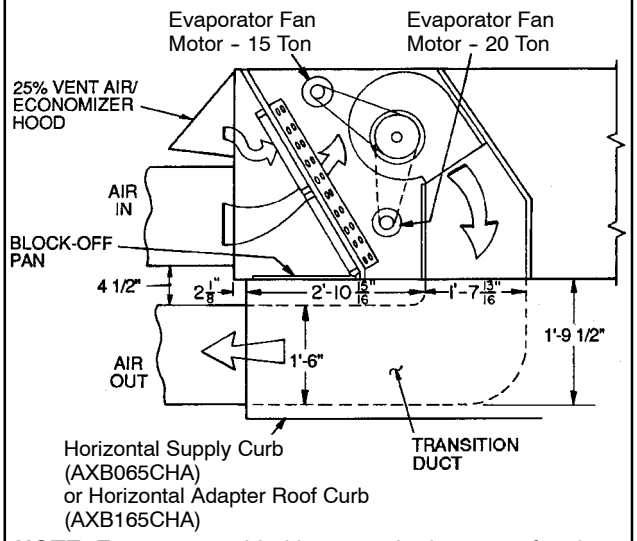
Unit will NOT operate properly unless it is installed level front to rear and side to side.

The slope MUST NOT be greater than $^{1}/_{16}$″ per foot (10mm per meter). For side to side leveling, the control box side MUST always be higher.

Ground Level Installation

ROOF CURB: Assemble and install accessory horizontal adapter roof curb in accordance with instructions shipped with accessory. See Figure 2. Ductwork can be installed to horizontal adapter roof curb before unit is set in place. Adapter roof curb should be level. This is necessary to permit unit drain to function properly. Unit leveling tolerance is +/- 1/16" per linear foot in any direction. Refer to Accessory Horizontal Adapter Roof Curb Installation Instructions for additional information as required. When accessory horizontal adapter roof curb is used, unit may be installed on class A, B, or C roof covering material.

Figure 3 **Horizontal Adapter Roof Curbs and Roof Curbs**



NOTE: For preassembled horizontal adapter roof curb part no. (AXB165CHA), the accessory kit includes a factory-designed, high-static, transition duct. For horizontal curb part no., (AXB065CHA), a field supplied transition duct is required.

IMPORTANT: The gasketing of the unit to the roof curb or adapter roof curb is critical for a watertight seal. Improperly applied gasket can also result in air leaks and poor unit performance.

ALTERNATE UNIT SUPPORT: When the curb or adapter cannot be used, install unit on a noncombustible surface. Support unit with sleepers, using unit curb support area. If sleepers cannot be used, support long sides or unit with a minimum of 3 equally spaced 4-in. x 4-in. pads on each side.

Rooftop Installation

- The unit **MUST** be situated to provide safe access for servicing.
- The existing roof structure **MUST** be adequate to support the weight of the unit or the roof **MUST** be reinforced.

  Check the weight of the unit in relation to the roof structure and local building codes or ordinances and reinforce roof structure if necessary. See product specification sheet for unit weights and corner weights.
- Support for the unit **MUST** be level and strong enough to carry unit weight. The support may consist of a platform or a combination of platform and roof beams or curb.

  The platform may be constructed of pressure treated wood and may be covered with Class A, B or C roof covering.
- Platform **MUST** allow for proper condensate trap installation and drainage. See associated text for more information about condensate drainage.

NOTE: MAKE SURE DOWNFLOW SUPPLY AND RETURN AIR DUCTS ARE FREE OF OBSTRUCTIONS BEFORE INSTALLING UNIT ON ROOF CURB OR ANY DOWNFLOW APPLICATION. Remove all forklift supports, covers, cardboard, etc., from the downflow return and supply air ducts.

Hoisting

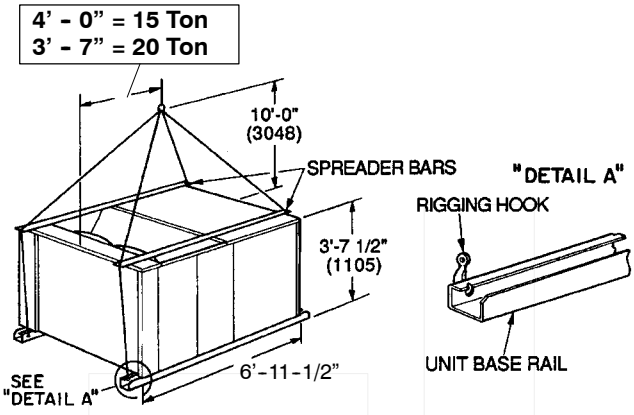
NOTE: All access panels **MUST** be secured in place before hoisting.

The unit should be hoisted with two lifting slings. Attach the slings to rigging shackles that have been hooked through holes in the base rail. See **Figure 4**.

Two spreader bars **MUST** be placed on top of the unit to protect the unit from damage from the pressure exerted by the slings. Make sure that all equipment is adequate to handle the weight of the unit and that the slings will not allow the unit to shift. See **Figure 4**.

Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit.

Figure 4 **Rigging and Hoisting**



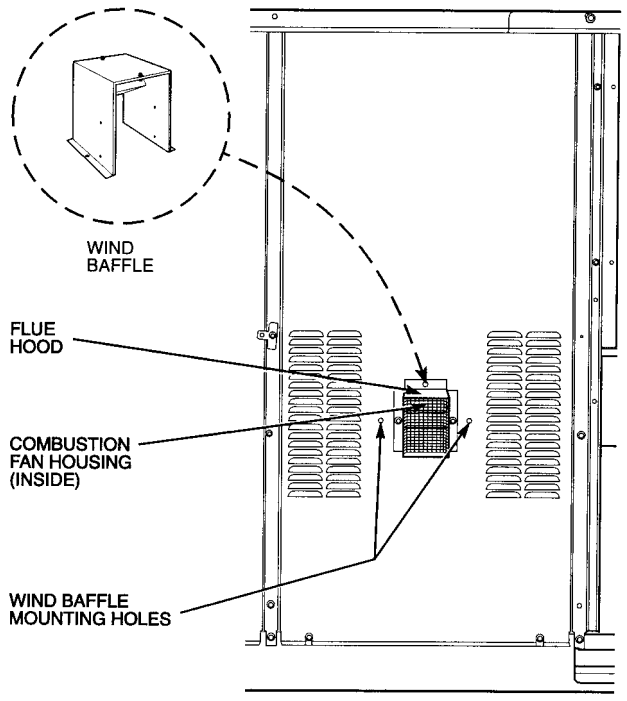
Notes: Remove boards at ends of unit and runners prior to rigging. Rig by inserting hooks into unit base rails as shown. Use corner post from packaging to protect coil from damage. Use bumper boards for spreader bars on all units.

Install Flue Hood and Wind Baffle

Install flue hood and wind baffle. Flue hood and wind baffle are shipped secured under main control box. To install, secure flue hood to access panel. See **Figure 5**. The wind baffle is then installed over the flue hood.

NOTE: When properly instaled, flue hood will line up with combustion fan housing.

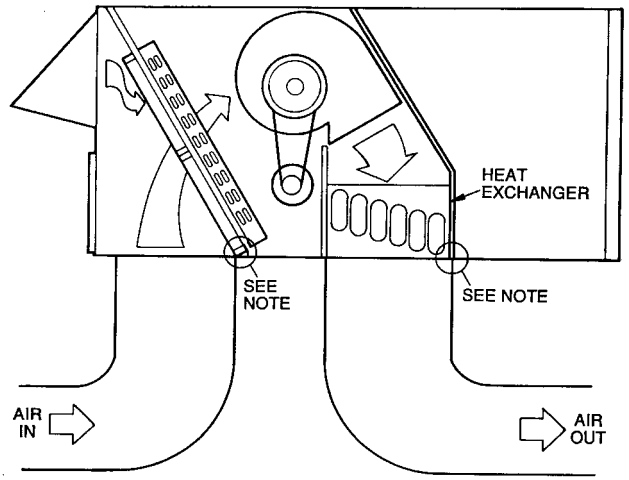
Figure 5 **Flue Hood Location**



Unit Duct Connections

These units are shipped ready for downflow operation but are adaptable to horizontal use. To convert to horizontal operation, refer to Ground Level Installation Section of this manual.

Figure 6 **Air Distribution - Thru the Bottom**



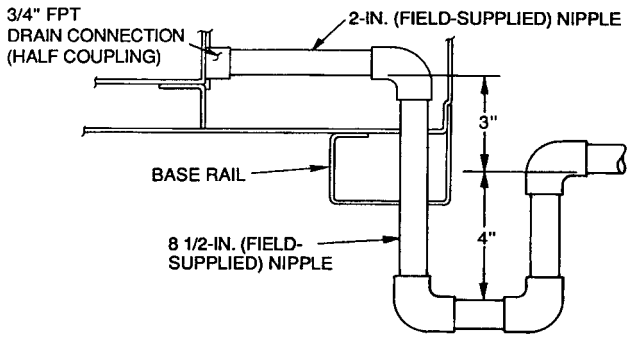
NOTE: Do not drill in this area; damage to basepan may result in water leak.

Condensate Drain

The condensate drain outlet is a 3/4 –in. threaded female connection located inside the evaporator section.

The circulating blower and the condenser fan create a negative pressure on the condensate drain line that will prevent the condensate from draining properly without a trap. To combat this negative pressure, a field supplied condensate trap that will allow a standing column of water of at least 4" **MUST** be installed. Bottom of outlet from trap **MUST** be at least 3" below bottom of outlet from unit. An 8–1/2" x 3/4" diameter and 2" x 3/4" pipe nipple, couple to standard 3/4" diameter elbows, provide a straight path down through hole in unit base rails. **See Figure 7.** A 3/4" drain line **MUST** be installed if required by local codes or if location of unit requires it. Run the drain line to an open drain or other suitable disposal point.

Figure 7 **Condensate Drain Information**



NOTE: There are many types of liquefied petroleum (LP) gases. In this manual, the term LP gas refers to *propane* gas *only*.

The UL/CSA rating plate located on the side panel of the unit contains the model number, type of gas, gas input rating, and other important information.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Make certain the unit is equipped to operate on the type of gas available. Models designated as natural gas are to be used with natural gas only. Models designated for use with liquefied petroleum (LP) gas are shipped with orifices sized for commercially pure propane gas. They MUST NOT be used with butane or a mixture of butane and propane unless properly sized orifices are installed by a licensed LP installer.

Gas Piping

The gas supply line **MUST** be of adequate size to handle the Btu/hr requirements and length of the run for the unit being installed. Determine the minimum pipe size from the tables in **Figures 8 and 9**. Base the length of the run from the gas meter or source to the unit.

Btu ratings of all other gas appliances **MUST** be considered for sizing of main gas line. Check gas line to installation for compliance with local codes or, in the absence of local codes, with the National Fuel Gas Code NFPA/ANSI Z223.1–1990 (or current edition) or in Canada the National Standard CAN/CGA 1–B149.1 (or current edition).

Figure 8 Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe

English Measurements / NATURAL GAS

Pipe Length (Includes Fittings)	Btu/hr (in thousands)				
	3/4″	1″	1 1/4″	1 1/2″	2″
20′	– –	350	730	1,100	2,100
40′	– –	245	500	760	1,450
60′	– –	– –	400	610	1,150
80′	– –	– –	350	530	990
100′	– –	– –	305	460	870
125′	– –	– –	275	410	780
150′	– –	– –	250	380	710
175′	– –	– –	225	350	650
200′	– –	– –	210	320	610

LP GAS*

Pipe Length (Includes Fittings)	Btu/hr (in thousands)				
	1/2″	3/4″	1″	1 1/4″	1 1/2″
20′	– –	393	732	1,496	2,299
40′	– –	267	504	1,039	1,559
60′	– –	217	409	834	1,275
80′	– –	– –	346	724	1,086
100′	– –	– –	307	630	976
125′	– –	– –	275	567	866
150′	– –	– –	252	511	787

* If copper tubing is used, see the following applicable publications to determine type and size requirements:
In the United States, the National Fuel Gas Code NFPA 54/ANSI Z223.1–1988 (or current edition).
In Canada, the National Standard CAN/CGA 1–B149.1 (or current edition).

Figure 9 Gas Pipe Size, Length and kW** Capacity for Schedule 40 Iron Pipe

Metric Measurements / NATURAL GAS

Pipe Length (Includes Fittings)	kW**				
	3/4″	1″	1 1/4″	1 1/2″	2″
6.1m	– –	103	214	322	615
12.2m	– –	72	147	223	425
18.3m	– –	– –	117	179	337
24.4m	– –	– –	103	155	290
30.5m	– –	– –	89	135	255
38.1m	– –	– –	81	120	229
45.7m	– –	– –	73	111	208
53.3m	– –	– –	66	103	191
61.0m	– –	– –	62	94	179

LP GAS*

Pipe Length (Includes Fittings)	kW**				
	1/2″	3/4″	1″	1 1/4″	1 1/2″
6.1m	– –	115	215	438	674
12.2m	– –	78	148	305	457
18.3m	– –	64	120	244	374
24.4m	– –	– –	101	212	318
30.5m	– –	– –	90	185	286
38.1m	– –	– –	81	166	254
45.7m	– –	– –	74	150	231

* If copper tubing is used, see the following applicable publications to determine type and size requirements:
In the United States, the National Fuel Gas Code NFPA 54/ANSI Z223.1–1988 (or current edition).
In Canada, the National Standard CAN/CGA 1–B149.1 (or current edition).
**kW (kilowatts) is the metric equivalent of Btu/hr.

Piping At Unit

Connecting the Gas Piping

Refer to **Figure 11** for the general layout of the unit. It shows the basic fittings needed.

The following rules apply:

1. Use black iron pipe and fittings for natural gas.
2. Use pipe joint compound on male threads only. Pipe joint compound **MUST** be resistant to the action of LP gases. Do **NOT** use Teflon tape or similar materials. See **Figure 10.**

Figure 10 **Proper Piping Practice**

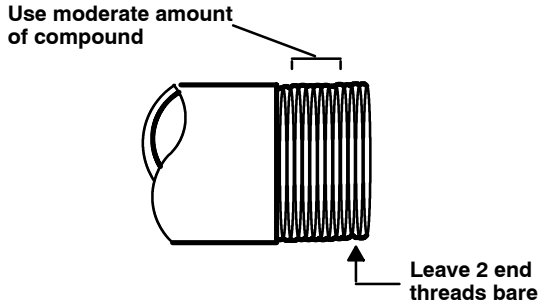
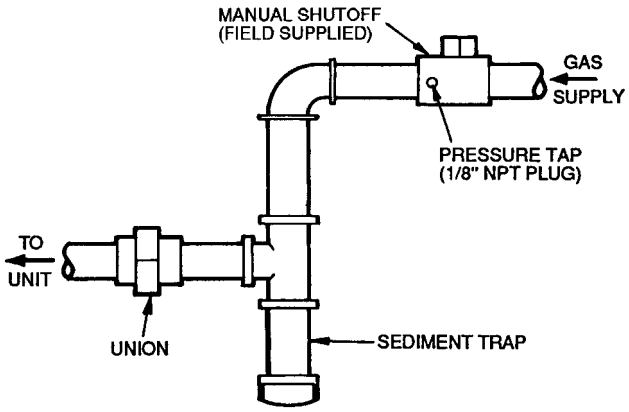


Figure 11 **Piping at Unit (Natural Gas)**



3. Use ground joint unions.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

Failure to do so could result in property damage, bodily injury, and/or death.

Gas connector MUST be properly installed and can NOT be used inside the furnace.

4. Install a drip leg to trap dirt and moisture before it can enter the gas valve. Drip leg **MUST** be a minimum of 3″ (76mm) long.
5. Install a manual shut off valve.
6. Provide a $^{1}/_{8}$″ NPT test gauge connection immediately upstream of the gas supply connection to the unit.
7. If installation is for LP gas:
   a. Have a licensed LP gas dealer make all connections from storage tank to unit.
   b. **TWO-STAGE REGULATION** is required.
   c. If copper tubing is used, usage **MUST** comply with limitations set forth in National Fuel Gas Code NFPA 54/ANSI Z223.1-1990 (or latest edition) or in Canada the National Standard CAN/CGA 1-B149.1 (or latest edition).
8. Hold a flat-jawed wrench on the squared end of the gas valve when tightening the supply pipe going into the gas valve. This will prevent turning or damaging the gas valve and wiring and/or misaligning the burners.

NOTE:

Overtightening assembly may cause damage to the gas valve and/or wiring and may misalign the burners.

9. Tighten all joints securely.

Leak Checks

1. Gas pressure **MUST NOT** exceed 1/2 PSIG (3450 Pa). If gas piping is to be checked with pressures above 1/2 PSIG (3450 Pa), the gas valve and the manual shut off valve **MUST** be disconnected from the line during testing.
2. Before pressure checking the gas piping to the unit, shut **OFF** the manual shut off valve for the unit.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Never exceed specified pressures. Higher pressures may damage the gas valve. Such damage may result in overfiring and possible heat exchanger failure.

3. Test all pipes for leaks.
4. Apply soap suds or a liquid detergent to each joint. A leak is indicated when bubbles form.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

An open flame or spark could result in property damage, bodily injury, and/or death.

Do NOT use a match or open flame to test for leaks.

5. Be sure to check burner orifices for leaks.
6. Correct even the smallest leak at once.

Electrical Wiring

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Shut off electric power at unit disconnect or service panel before making any electrical connections.

Unit MUST be grounded to electrical service panel.

NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and in the United States the National Electrical Code ANSI/NFPA70-1990 (or current edition) and in Canada CSA C.22.1 - Canadian Electrical Code Part 1 (or current edition). Provide line voltage power supply from a separate protected circuit with a disconnect switch (when required) located within sight of the unit. Supply voltage, amperage, wire, fuse and disconnect switch sizes **MUST** conform with specifications on the unit rating plate.

Wiring **MUST** be protected from possible mechanical damage and **MUST NOT** interfere with removal of access panels, filters, etc.

All exposed wiring or connections **MUST** be made with weatherproof cable or wire unless installed in conduit.

Field Power Supply - Unit is factory wired for voltage shown on nameplate.
When installing units, provide a disconnect per NEC (National Electrical code) of adequate size.

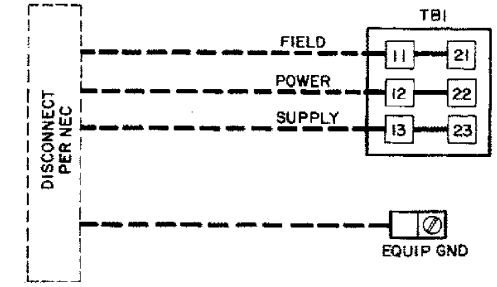
For access to high and low voltage connections, remove the control box access panel. (see **Figure 1 & 12**).

Line Voltage Wiring

Route power ground lines through control box end panel or unit basepan and to connections as shown on unit wiring diagram.

Do **NOT** complete line voltage connections until unit is permanently grounded. All line voltage connections and the ground connection **MUST** be made with copper wire.

Figure 12 | **Typical Wiring Connections**

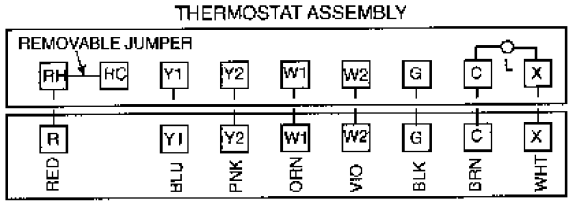


NOTE: The maximum wire size for TB1 is 2/0.

LEGEND

EQUIP	—	Equipment
GND	—	Ground
NEC	—	National Electrical Code
TB	—	Terminal Block

Field Power Wiring Connections



Field Control Thermostat Wiring

⚠ CAUTION

RISK OF REDUCED COMPONENT LIFE

Failure to follow these Caution could result in premature component failure.

The correct power phasing is critical in the operation of the scroll compressors. An incorrect phasing will cause the compressor to rotate in the wrong direction This may lead to premature compressor failure.

Converting 230V Units to 208V

Field wiring must confirm to temperature limitations for type 'T' wire. All field wiring must comply with NEC and local requirements.

Transformer # 1 is wired for 230-v unit. IF 208/230-v unit is to be run with 208-v power supply, the transformer must be rewired as follows:

1. Remove cap from red (208 v) wire.
2. Remove cap from orange (230 v) spliced wire.
3. Replace orange wire with red wire.
4. Recap both wires.

IMPORTANT: BE CERTAIN UNUSED WIRES ARE CAPPED. Failure to do so may damage the transformers.

Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3 phase units, voltages between phases must be balanced within 2%.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

Field Installed Equipment

All wiring done in the field between the unit and other devices, or between separate devices that are field installed and located, **MUST** not exceed the temperature limitations for type T wire and **MUST** be installed according to the manufacturer's instructions for the devices.

Low Voltage Wiring

Route thermostat cable or equivalent single leads of colored wire from subbase terminals through conduit in unit to low-voltage connections as shown on unit label wiring diagram.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum), for 50-75 ft. runs, use no. 16 AWG insulated wire (35 C minimum), for over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected at the thermostat and will require a junction box and splice at the thermostat.

Low Voltage Wiring With Economizer Option

The economizer electrical harness taps into **Y1** and **Y2** on the low voltage terminal board. Low voltage wires from the thermostat are connected to **Y1** and **Y2** with or without an economizer.

Thermostat

NOTE: Do NOT attempt to use a thermostat designed for electric heat or heat pump use. Such thermostats will NOT control the unit properly.

The thermostat **MUST** be a field supplied 2 stage cooling, 2 stage gas heating thermostat.

The location of the thermostat has an important effect on the operation of the unit. **FOLLOW THE INSTRUCTIONS INCLUDED WITH THE THERMOSTAT FOR CORRECT LOCATION, MOUNTING AND WIRING.**

Heat Anticipator

Voltage	W1	W2
208/230, 575	0.98	0.44
460	0.80	0.44

Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

Final Check

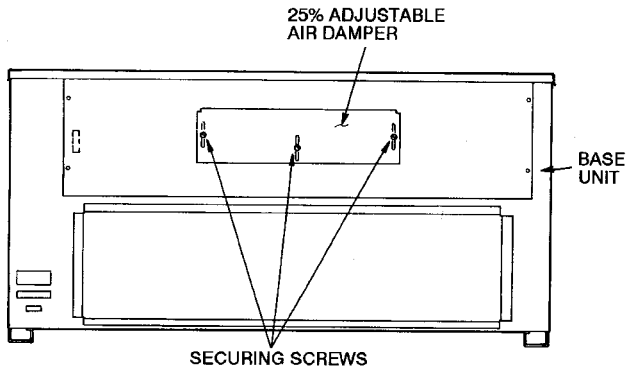
Make a final wiring check to be sure system is correctly wired. Inspect field installed wiring and the routing to ensure that rubbing or chafing due to vibration will not occur.

Make Outdoor-Air Inlet Adjustments

All units have a manual outdoor-air damper to provide ventilation air.

Damper can be reset to admit up to 25% outdoor air into return-air compartment. To adjust, loosen securing screws and move damper to desired setting, then retighten screws to secure damper. **See Figure 13.**

Figure 13 **Standard 25% Outdoor-Air Section**



Install Outdoor-Air Hood

NOTE: The hood top panel, upper and lower filter retainers, hood drain pan, baffle and filter support bracket are secured opposite the condenser end of the unit. The screens, hood side panels, remaining section of filter support bracket, seal strip, and hardware are in a package located inside the return-air filter access panel. **See Figure 14.**

1. Attach seal strip to upper filter retainer. **See Figure 15.**

2. Assemble hood top panel, side panels, upper filter retainer, and drain pan. **See Figure 16.**

Figure 14 Outdoor-Air Hood Compartment

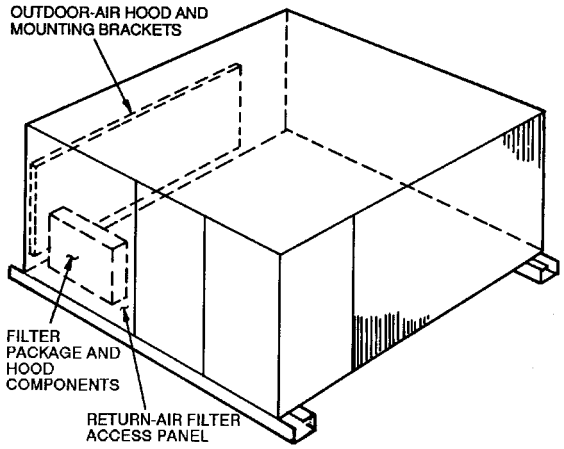


Figure 15 Seal Strip

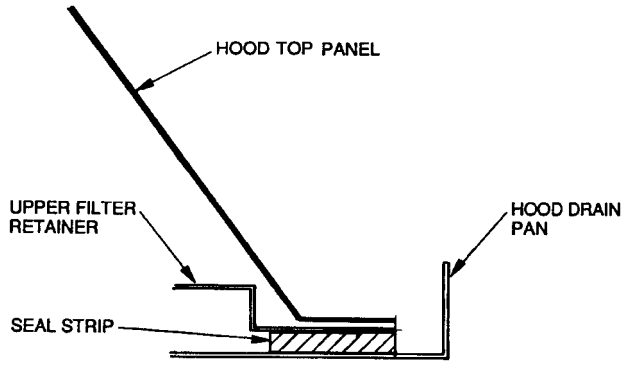
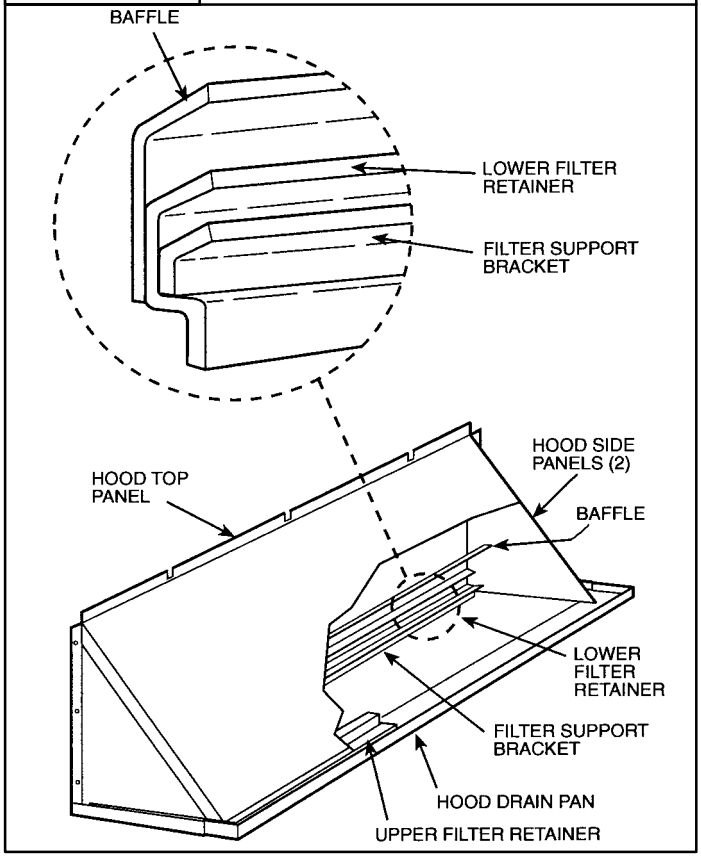


Figure 16 Outdoor-Air Hood Details



3. Secure lower filter retainer and support bracket to unit. **See Figure 16.** Leave screws loose on 20 ton units.

4. For 20 ton units only, slide baffle behind lower filter retainer and tighten screws.

5. Loosen sheet metal screws for top panel of base unit located above outdoor-air inlet opening, and remove screws for hood side panels located on the sides of the outdoor-air inlet opening.

6. Match notches in hood top panel to unit top panel screws. Insert hood flange between top panel flange and unit. Tighten screws.

7. Hold hood side panel flanges flat against unit, and install screws removed in Step 5.

8. Insert outdoor-air inlet screens and spacer in channel created by lower filter retainer and filter support bracket.

9. Attach remaining section of filter support bracket.

Ductwork

NOTE: The total heat loss from the structure as expressed in total Btu/hr **MUST** be calculated by manufacturer's method or in accordance with "A.S.H.R.A.E. Guide" or "Manual N – Load Calculations" published by the Air Conditioning Contractors of America or in Canada H.R.A.I. "Manual N". The total heat loss calculated should be equal to or less than the heating capacity. Output based on D.O.E. test procedures, steady state efficiency times input.

Ductwork, supply registers, and return air grilles **MUST** be designed and sized to handle the greater of the units heating or cooling air volume requirements. If the unit is connected to an existing system, the ductwork **MUST** be checked to make sure it is adequate. Extra runs or larger duct sizes may have to be installed. **Use only non-combustible type insulation on supply plenum or supply ductwork within 6 feet of unit.**

Maximum recommended velocity in trunk ducts is 1000 feet per minute (5.08 m/s). Velocity in branches should not exceed 800 feet per minute (4.06 m/s).

Ductwork installed outdoors should have a minimum of 2″ (50.8mm) of fiberglass insulation and a weatherproof vapor barrier. It should also be protected against damage. Caulk and flashing, or other means adequate to provide a permanent weather seal should be used.

Ductwork installed in attics or other areas exposed to outside temperatures should be installed with a minimum of 2″ (50.8mm) fiberglass insulation and have an indoor type vapor barrier.

Ductwork Connections

The use of flexible, **non-combustible** connectors between main trunk ducts and supply and return air plenums is recommended to minimize vibration transmission . Attach all ductwork to roof curb and roof curb basepans.

Field Fabricate Ductwork

Secure all ducts to roof curb and building structure on vertical units. Do not connect ductwork to unit. For horizontal applications, field supplied flanges should be attached to horizontal discharge openings and all ductwork secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -.45 in. wg without an economizer.

The units are designed for a minimum heating operation continuous return-air temperature of 50 F (dry bulb), or an intermittent operation down to 45 F (dry bulb), such as when used with a night set-back thermostat.

Filters

NOTE:

Do NOT operate the unit without all filters in place.

All air **MUST** pass through a filter before entering the unit. Electronic air cleaner, optional filter racks, or other accessible filter arrangements **MUST** be installed in the return air ductwork.

NOTE: If the unit has an economizer or any other type of outdoor air damper, disposable filters **MUST** be used in the internal filter racks.

For replacement filter sizes and instructions, see specification sheet.

Circulating Blower

Determining Blower Speed

1. From the system design, determine the external static pressure (ESP) for the supply ducts, return ducts and registers, diffusers, grilles, dampers, heaters and special filters (if any).
2. If unit is to be set up in cooling mode, add .08″ W.C. (20 Pa) for wet coil operation to the total ESP determined in Step 1.
3. For static additions due to installation of an economizer or manual air dampers, add .05 inches to ESP.
4. From the system design, determine the desired airflow in CFM (L/s). See **Figure 17** for CFM to L/s conversion table.
5. To determine the blower speed necessary to obtain the desired CFM (L/s), see the Circulating Blower Performance Data for the unit located on the pages that immediately follow.
6. Determine the blower RPM's needed to obtain the desired CFM (L/s).
7. Compare required RPM to unit's factory setting for blower RPM (see Blower Performance Tables). If different from the RPM your installation requires, the blower speed will need to be changed.
8. Following the circulating Blower Performance Data table is a table that shows how many turns open the adjustable blower motor pulley needs to be to obtain the required RPM.
9. To change the blower speed, see pages 21 and 22 .

Figure 17 **Metric Conversions: Cubic Feet per Minute (CFM) to Liters per Second (L/s); Inches of Water Column (In. W.C.) to Pascals (Pa)**

CFM	L/s	CFM	L/s	CFM	L/s	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa
50	24	2550	1203	5050	2383	0.01	2	0.51	127	1.01	251	1.51	376	2.01	501
100	47	2600	1227	5100	2407	0.02	5	0.52	130	1.02	254	1.52	379	2.02	503
150	71	2650	1251	5150	2430	0.03	7	0.53	132	1.03	257	1.53	381	2.03	506
200	94	2700	1274	5200	2454	0.04	10	0.54	135	1.04	259	1.54	384	2.04	508
250	118	2750	1298	5250	2477	0.05	12	0.55	137	1.05	262	1.55	386	2.05	511
300	142	2800	1321	5300	2501	0.06	15	0.56	139	1.06	264	1.56	389	2.06	513
350	165	2850	1345	5350	2525	0.07	17	0.57	142	1.07	267	1.57	391	2.07	516
400	189	2900	1369	5400	2548	0.08	20	0.58	144	1.08	269	1.58	394	2.08	518
450	212	2950	1392	5450	2572	0.09	22	0.59	147	1.09	271	1.59	396	2.09	521
500	236	3000	1416	5500	2595	0.10	25	0.60	149	1.10	274	1.60	399	2.10	523
550	260	3050	1439	5550	2619	0.11	27	0.61	152	1.11	276	1.61	401	2.11	526
600	283	3100	1463	5600	2643	0.12	30	0.62	154	1.12	279	1.62	404	2.12	528
650	307	3150	1486	5650	2666	0.13	32	0.63	157	1.13	281	1.63	406	2.13	531
700	330	3200	1510	5700	2690	0.14	35	0.64	159	1.14	284	1.64	408	2.14	533
750	354	3250	1534	5750	2713	0.15	37	0.65	162	1.15	286	1.65	411	2.15	536
800	378	3300	1557	5800	2737	0.16	40	0.66	164	1.16	289	1.66	413	2.16	538
850	401	3350	1581	5850	2761	0.17	42	0.67	167	1.17	291	1.67	416	2.17	541
900	425	3400	1604	5900	2784	0.18	45	0.68	169	1.18	294	1.68	418	2.18	543
950	448	3450	1628	5950	2808	0.19	47	0.69	172	1.19	296	1.69	421	2.19	545
1000	472	3500	1652	6000	2831	0.20	50	0.70	174	1.20	299	1.70	423	2.20	548
1050	495	3550	1675	6050	2855	0.21	52	0.71	177	1.21	301	1.71	426	2.21	550
1100	519	3600	1699	6100	2879	0.22	55	0.72	179	1.22	304	1.72	428	2.22	553
1150	543	3650	1722	6150	2902	0.23	57	0.73	182	1.23	306	1.73	431	2.23	555
1200	566	3700	1746	6200	2926	0.24	60	0.74	184	1.24	309	1.74	433	2.24	558
1250	590	3750	1770	6250	2949	0.25	62	0.75	187	1.25	311	1.75	436	2.25	560
1300	613	3800	1793	6300	2973	0.26	65	0.76	189	1.26	314	1.76	438	2.26	563
1350	637	3850	1817	6350	2997	0.27	67	0.77	192	1.27	316	1.77	441	2.27	565
1400	661	3900	1840	6400	3020	0.28	70	0.78	194	1.28	319	1.78	443	2.28	568
1450	684	3950	1864	6450	3044	0.29	72	0.79	197	1.29	321	1.79	446	2.29	570
1500	708	4000	1888	6500	3067	0.30	75	0.80	199	1.30	324	1.80	448	2.30	573
1550	731	4050	1911	6550	3091	0.31	77	0.81	202	1.31	326	1.81	451	2.31	575
1600	755	4100	1935	6600	3115	0.32	80	0.82	204	1.32	329	1.82	453	2.32	578
1650	779	4150	1958	6650	3138	0.33	82	0.83	207	1.33	331	1.83	456	2.33	580
1700	802	4200	1982	6700	3162	0.34	85	0.84	209	1.34	334	1.84	458	2.34	583
1750	826	4250	2006	6750	3185	0.35	87	0.85	212	1.35	336	1.85	461	2.35	585
1800	849	4300	2029	6800	3209	0.36	90	0.86	214	1.36	339	1.86	463	2.36	588
1850	873	4350	2053	6850	3233	0.37	92	0.87	217	1.37	341	1.87	466	2.37	590
1900	897	4400	2076	6900	3256	0.38	95	0.88	219	1.38	344	1.88	468	2.38	593
1950	920	4450	2100	6950	3280	0.39	97	0.89	222	1.39	346	1.89	471	2.39	595
2000	944	4500	2124	7000	3303	0.40	100	0.90	224	1.40	349	1.90	473	2.40	598
2050	967	4550	2147	7050	3327	0.41	102	0.91	227	1.41	351	1.91	476	2.41	600
2100	991	4600	2171	7100	3350	0.42	105	0.92	229	1.42	354	1.92	478	2.42	603
2150	1015	4650	2194	7150	3374	0.43	107	0.93	232	1.43	356	1.93	481	2.43	605
2200	1038	4700	2218	7200	3398	0.44	110	0.94	234	1.44	359	1.94	483	2.44	608
2250	1062	4750	2242	7250	3421	0.45	112	0.95	237	1.45	361	1.95	486	2.45	610
2300	1085	4800	2265	7300	3445	0.46	115	0.96	239	1.46	364	1.96	488	2.46	613
2350	1109	4850	2289	7350	3468	0.47	117	0.97	242	1.47	366	1.97	491	2.47	615
2400	1133	4900	2312	7400	3492	0.48	120	0.98	244	1.48	369	1.98	493	2.48	618
2450	1156	4950	2336	7450	3516	0.49	122	0.99	247	1.49	371	1.99	496	2.49	620
2500	1180	5000	2360	7500	3539	0.50	125	1.00	249	1.50	374	2.00	498	2.50	623

PGS Series PERFORMANCE DATA

CIRCULATING BLOWER PERFORMANCE - 15 TON UNITS (3.7 HP Standard Motor w/891-1179 rpm drive pkg)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER															
	0.3		0.5		0.7		0.9		1.1		1.3		1.5		1.7	
	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W
5250	926	1879	1009	2075	1087	2272	1162	2472	1233	2674	1301	2879	1367	3087	1430	3299
5500	960	2110	1039	2308	1113	2508	1185	2710	1253	2914	1318	3121	1381	3331	1442	3543
5750	995	2358	1070	2558	1141	2761	1209	2965	1274	3172	1337	3380	1400	3589		
6000	1034	2539	1109	2745	1180	2953	1248	3163	1313	3375	1376	3589				
6250	1073	2733	1148	2945	1218	3158	1287	3373	1352	3591	1418	3808				
6500	1109	3024	1180	3238	1248	3454	1315	3669								
6750	1145	3333	1213	3550	1281	3767										

NOTES:
1) Maximum motor Watts is 3775 for standard 3.7 HP motor.
2) Maximum blower wheel speed is 1468 rpm.
3) Motor drive range is 891 to 1179 rpm.
4) Air flow data based on dry coil with filters. Deduct 0.08 inches for wet coil performance.
5) Operation in shaded areas requires accessory high static drive kit sold separately.

CIRCULATING BLOWER PERFORMANCE - 20 TON UNITS (7.5 HP Standard Motor w/1002-1225 rpm drive pkg)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER															
	0.3		0.5		0.7		0.9		1.1		1.3		1.5		1.7	
	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W
6750	**945**	**3162**	1006	3440	1063	3723	1119	4012	1172	4307	1224	4607	1274	4911	1323	5221
7000	**975**	**3414**	1034	3695	1090	3981	1144	4272	1196	4569	1246	4870	1295	5176	1343	5487
7250	1006	3692	1063	3975	1118	4264	1170	4557	1226	4856	1270	5159	1318	5466	1365	5779
7500	1037	3969	1092	4255	1145	4546	1196	4842	1256	5142	1294	5447	1340	5756	1386	6070
7750	1068	4272	1121	4561	1173	4854	1223	5152	1277	5454	1319	5761	1364	6072	1409	6387
8000	1099	4575	1150	4866	1201	5162	1249	5462	1297	5766	1343	6075	1388	6388	1431	6704
8250	1130	4904	1180	5198	1230	5496	1277	5798	1323	6105	1368	6415	1412	6730	1455	7047

NOTES:
1) Maximum motor Watts is 7915 for standard 7.5 HP motor.
2) Maximum blower wheel speed is 1540 rpm.
3) Motor drive range is 1002-1225 rpm.
4) Air flow data based on dry coil with filters. Deduct 0.08 inches for wet coil performance.
5) Operation in shaded areas requires accessory high static drive kit sold separately.
6) Boldface indicates field-supplied drive is required.

PGS Series PERFORMANCE DATA

CIRCULATING BLOWER PERFORMANCE - 15 TON UNITS (5 HP Std Motor w/873-1021 rpm drive pkg)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER															
	0.3		0.5		0.7		0.9		1.1		1.3		1.5		1.7	
	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W
5250	**794**	**1692**	**867**	**1947**	936	2209	1001	2478	1062	2754	1119	3035	1175	3323	1228	3618
5500	**823**	**1916**	893	2178	958	2446	1020	2720	1079	3001	1134	3288	1188	3580	1239	3878
5750	**853**	**2154**	919	2423	981	2698	1041	2978	1097	3263	1150	3555	1204	3846		
6000	886	2329	952	2607	1015	2891	1074	3180	1130	3474	1184	3774				
6250	920	2519	985	2806	1048	3099	1107	3396	1164	3700	1220	4003				
6500	950	2811	1013	3104	1072	3403	1132	3702								
6750	981	3125	1041	3425	1101	3725										

NOTES:
1) Maximum motor Watts is 5180 for standard 5 HP motor.
2) Maximum blower wheel speed is 1550 rpm.
3) Motor drive range is 873 to 1021 rpm.
4) Air flow data based on dry coil with filters. Deduct 0.08 inches for wet coil performance.
5) Operation in shaded areas requires accessory high static drive kit sold separately.
6) Boldface indicates field-supplied drive is required.

CIRCULATING BLOWER PERFORMANCE - 20 TON UNITS (7.5 HP Standard Motor w/1002-1151 rpm drive pkg)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER															
	0.3		0.5		0.7		0.9		1.1		1.3		1.5		1.7	
	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W	RPM	W
6750	**960**	**3444**	1020	3680	1078	3918	1134	4160	1187	4405	1239	4652	1289	4901	1337	5152
7000	**991**	**3687**	1049	3923	1105	4161	1159	4403	1211	4647	1262	4894	1311	5142	1358	5392
7250	1023	3949	1079	4185	1133	4424	1186	4665	1237	4909	1286	5155	1334	5403	1381	5652
7500	1054	4211	1109	4447	1161	4686	1213	4926	1262	5170	1310	5415	1357	5663	1403	5912
7750	1086	4492	1139	4728	1190	4967	1240	5207	1288	5451	1335	5696	1381	5943	1426	6042
8000	1117	4773	1168	5009	1218	5247	1267	5488	1314	5731	1360	5976	1405	6222	1449	6171
8250	1149	5073	1199	5309	1248	5547	1295	5788	1341	6031	1386	6276	1430	6522	1473	6620

NOTES:
1) Maximum motor Watts is 7915 for standard 7.5 HP motor.
2) Maximum blower wheel speed is 1550 rpm.
3) Motor drive range is 1002-1151 rpm.
4) Air flow data based on dry coil with filters. Deduct 0.08 inches for wet coil performance.
5) Operation in shaded areas requires accessory high static drive kit sold separately.
6) Boldface indicates field-supplied drive is required.

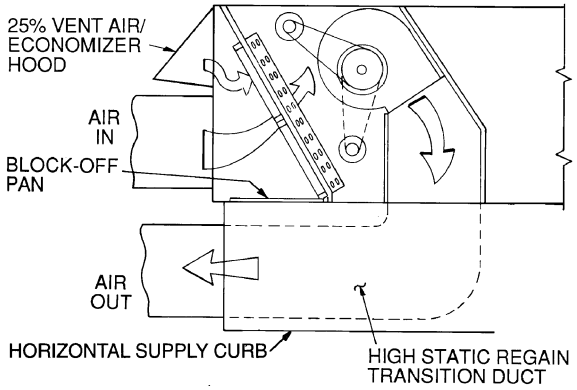
PERFORMANCE DATA - All Models (cont.)

GAS HEAT FAN PERFORMANCE LOSS

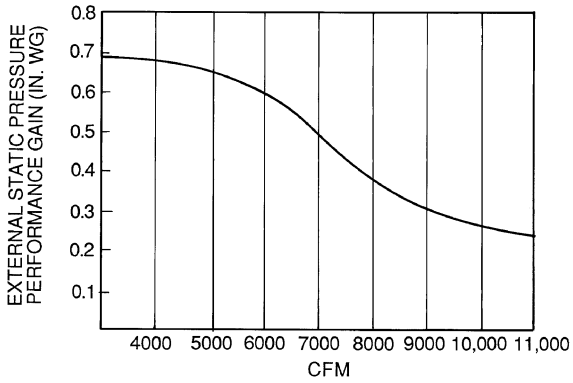
15 Ton		
Airflow	Low Heat	High Heat
cfm	in. wg	in. wg
4500	0.16	0.17
4800	0.17	0.19
5100	0.19	0.20
5400	0.20	0.22
5700	0.21	0.24
6000	0.23	0.26
6300	0.24	0.28
6600	0.26	0.30
6900	0.28	0.33
7200	0.29	0.35
7500	0.31	0.37

20 Ton		
Airflow	Low Heat	High Heat
Cfm	in. wg	in. wg
5,500	0.23	0.31
6,000	0.26	0.37
6,500	0.30	0.43
7,000	0.33	0.49
7,500	0.37	0.56
8,000	0.41	0.63
8,500	0.46	0.70
9,000	0.50	0.78
9,500	0.55	0.87
10,000	0.60	0.96

HORIZONTAL SUPPLY/RETURN FAN PERFORMANCE WITH HIGH STATIC REGAIN ADAPTER CURB



NOTE: The high static regain adapter accessory may be used to provide horizontal supply//return.



NOTE: The high static supply/return adapter accessory improves fan performance by increasing external static pressure by anount shown above.

Altitude Compensation* - PGS/PGE180-240

ELEVATION (ft)	NATURAL GAS ORIFICE Size **	
	Low Heat	High Heat
0-3,000	30	29
3,000- 7,000	31	30
7,000- 9,000	32	31
9,000-10,000	33	31
above 10,000	35	32

*Includes a 4% input reduction per each 1,000 feet.
** Orifices available through your local distributor .

Altitude Derating Factor* - All Units

ELEVATION (ft)	MAXIMUM HEATING VALUE (Btu/ft ^{3})
0-2,000	1,100
2,001-3,000	1,050
3,001-4,000	1,000
4,001-5,000	950
5,001-6,000	900

*Derating of the unit is not required unless the heating value of the gas exceeds the values listed in the table above, or if the elevation exceeds 6000 ft. Derating conditions must be 4% per thousand ft above sea level. For example, at 4000 ft, if the heating value of the gas exceeds 1000 Btu/ft ^{3}, the unit will require a 16% derating. For elevations above 6000 ft, the same formula applies. For example, at 7000 ft, the unit will require a 28% derating of the maximum heating value per the National Fuel Gas Code.

PGS Series PERFORMANCE DATA (cont.)

AIR QUANTITY LIMITS		
UNIT Size	MINIMUM CFM	MAXIMUM
PGS180	4,500	7,500
PGS240	6,000	10,000

Evaporator Fan Motor Efficiency		
UNIT		MOTOR EFFICIENCY (%)
PGS180	(3.7 Hp)	85.8
PGS240	(7.5 Hp)	88.5

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

OUTDOOR SOUND POWER

UNIT PGS	SOUND RATING (60 Hz)	A-WEIGHTED (db)	OCTAVE BANDS							
			63	125	250	500	1000	2000	4000	8000
PGS180	8.8 Bels	87.8	90.8	88.7	86.4	84.3	83.5	78.4	75.6	66.8
PGS240	9.5 Bels	94.1	98.7	92.3	93.8	90.9	89.6	85.9	80.3	74.3

Bels - Sound Levels (1 bel = 10 decibels)

FAN RPM AT MOTOR PULLEY SETTINGS*

UNIT PGS	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
180**	****	****	1179	1150	1121	1093	1064	1035	1006	978	949	920	891
180-575v Only**	****	****	1429	1403	1376	**1349**	**1323**	**1296**	**1269**	**1242**	**1215**	**1188**	**1159**
180***	****	****	1559	1522	1488	1455	1422	1389	1356	1323	1289	1256	1227
240**	****	****	1225	1209	1187	1165	1143	1120	1098	1076	1053	1031	1002
240***	****	****	1458	1434	1407	1381	1354	1328	1301	1275	1248	1222	1193

*** Approximate fan rpm shown.**
**** Indicates standard drive package**
*****Indicates alternate drive package.**
******Due to belt and pulley size, pully cannot be set to this number of turns open.**

Evaporator-Fan Motor Performance

UNIT PGS	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE CONTINUOUS WATTS	MAXIMUM AMP DRAW
PGS180	208/230	4.25	3,775	10.5
	460			4.8
	575	3.45	3,065	3.9
PGS240	208/230	8.70	7,915	22.0
	460	9.50	8,640	13.0
	575	8.70	7,915	10.0

Bhp - Brake Horsepower

*Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence Using your fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

PGE Series PERFORMANCE DATA (cont.)

AIR QUANTITY LIMITS		
UNIT	MINIMUM CFM	MAXIMUM CFM
PGE180	4,500	7,500
PGE240	6,000	10,000

Evaporator Fan Motor Efficiency		
UNIT		MOTOR EFFICIENCY (%)
PGE180	(5.0 Hp)	87.5
PGE240	(7.5 Hp)	88.5

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

OUTDOOR SOUND POWER

UNIT PGE	SOUND RATING (60 Hz)	A-WEIGHTED (db)	OCTAVE BANDS							
			63	125	250	500	1000	2000	4000	8000
180	8.8 Bels	87.8	90.8	88.7	86.4	84.3	83.5	78.4	75.6	66.8
240	9.5 Bels	94.1	98.7	92.3	93.8	90.9	89.6	85.9	80.3	74.3

Bels - Sound Levels (1 bel = 10 decibels)

FAN RPM AT MOTOR PULLEY SETTINGS*

UNIT PGE	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
180**	****	****	****	****	1021	1002	984	965	947	928	910	891	873
180***	****	****	****	****	1200	1178	1156	1134	1112	1091	1069	1047	1025
240**	****	****	1225	1209	1187	1165	1143	1120	1098	1076	1053	1031	1002
240***	****	****	1458	1434	1407	1381	1354	1328	1301	1275	1248	1222	1193

*** Approximate fan rpm shown.**
**** Indicates standard drive package**
*****Indicates alternate drive package.**
******Due to belt and pulley size, pully cannot be set to this number of turns open.**

Evaporator-Fan Motor Performance

UNIT PGE	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*	MAXIMUM ACCEPTABLE CONTINUOUS WATTS	MAXIMUM AMP DRAW
180	208/230	6.13	5,180	15.8
	460			7.9
	575	6.13	5,180	6.0
240	208/230	8.70	7,915	22.0
	460	9.50	8,640	13.0
	575	8.70	7,915	10.0

Bhp - Brake Horsepower

*Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence Using your fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

Adjustable Belt Drive Blower

⚠ WARNING

PERSONAL INJURY HAZARD.

Failure to do so could result in personal injury.

Use extreme care during the following procedures and obey Safety Information.

The following safety rules **MUST** always be followed when working near belt drive.

Always Turn The Power Off

Turn electric power to the unit **OFF** before you begin working on it.

Always Wear Protective Clothing

NEVER wear loose or bulky clothes, such as neckties, exposed shirttails, loose sleeves, or lab coats around belt drives. Wear gloves while inspecting sheaves to avoid nicks, burrs, or sharply worn pulley edges.

The blower speed is changed by adjusting the variable speed pulley mounted on the blower motor.

NOTE FOR 20 TON UNIT: A 3-1/2" bolt and threaded plate are included in the installer's packet. They can be added to the motor support channel below the motor mounting plate to aid in raising the fan motor.

If the blower speed needed is different than the speed of the blower as shipped, follow the steps below to change the blower speed. Before changing the blower speed, read the above safety rules first.

1. Turn electric power **OFF.**
2. Remove the side blower access panel (see **Figure 1**).
3. 15 Ton Only - Loosen belt by loosening carriage nuts holding motor mount assembly to fan scroll side plates (A and B).

   20 Ton Only - Loosen nuts on the 2 carriage bolts in the motor mounting base. Install jacking bolt and plate under motor base (bolt and plate are shipped in installer's packet). Using bolt and plate, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
4. Loosen movable-pulley flange setscrew. See page 20 for air quanity limits.
5. Screw movable flange toward fixed flange to increases speed and away from fixed flange to decrease speed. Increasing fan speed increases load load on motor. Do not exceed maximum speed specified in the performance data listed in this instruction.
6. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table on page 20 for speed change for each full turn of pulley flange.)
7. Replace and tighten belts. See Belt Tension Adjustment section on page 22.

Figure 18 15 Ton Evaporator Fan Motor Adjustment

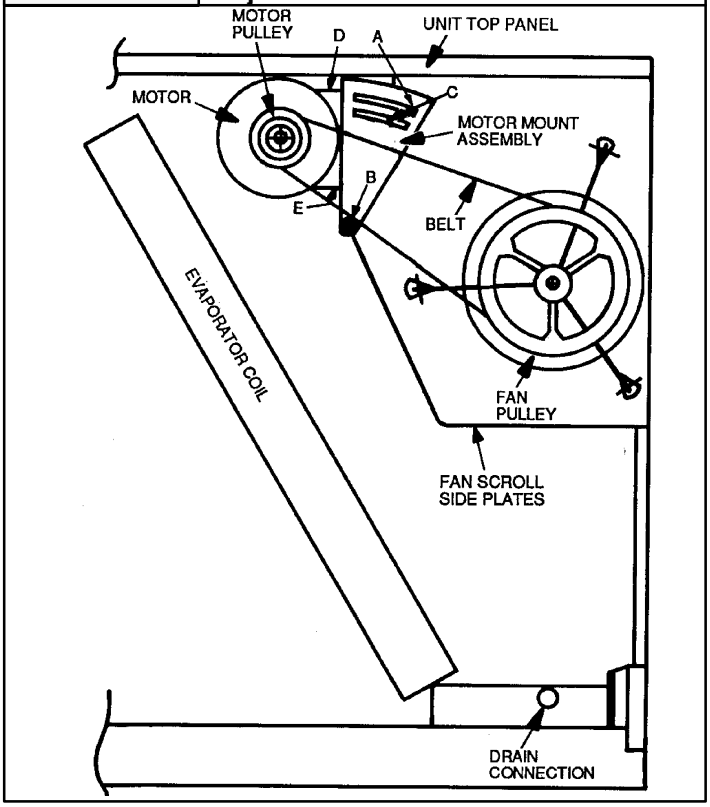
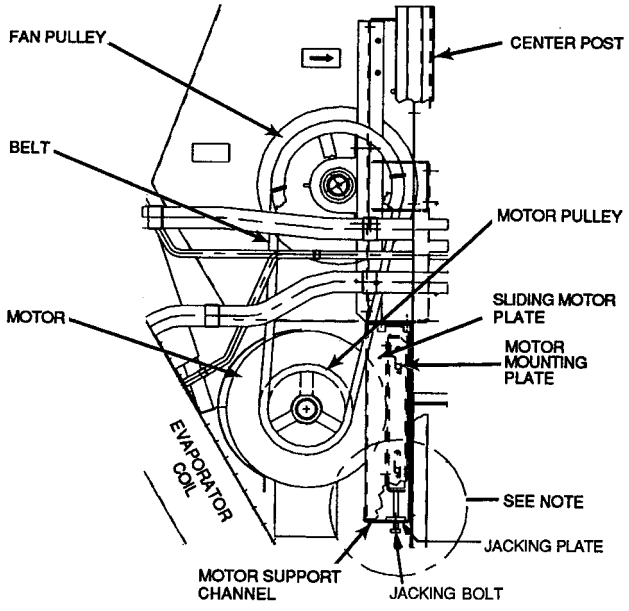


Figure 19 20 Ton Evaporator Fan Motor Adjustment

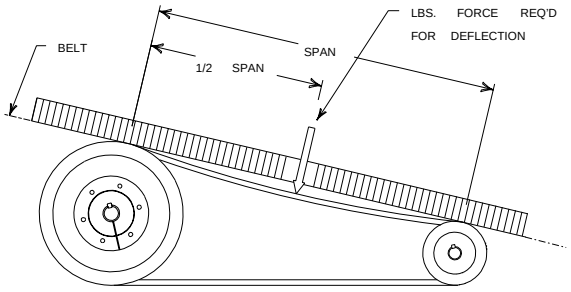


NOTE: A 3-1/2" jacking bolt (1171103) and threaded jacking plate (1171400) are included in the unit's base pan. They should be added to the motor support channel below the motor mounting plate to aid in raising the motor.

Belt Tension Adjustment

Figure 20	Checking Tension and Deflection

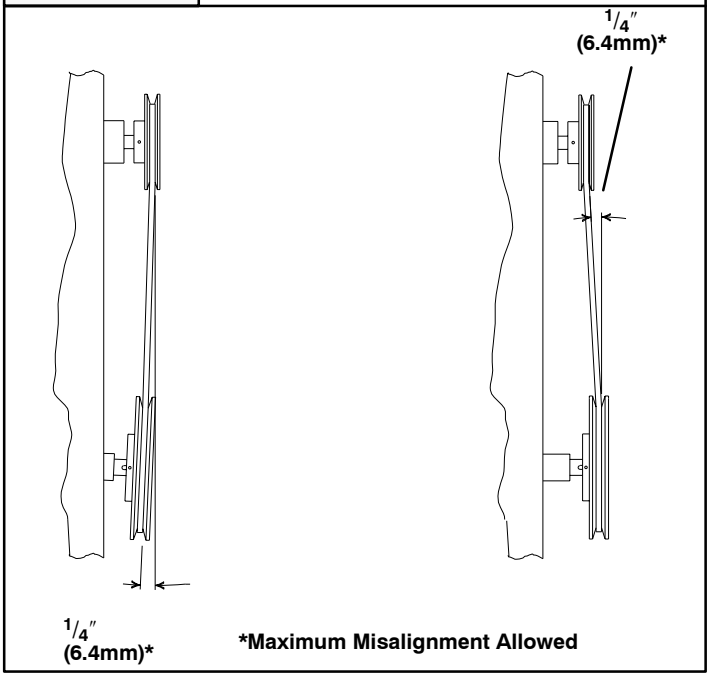
PG(S/E)180 – 1/2" deflection with 5–10 lbs. of force.
PG(S/E)240 – 3/8" deflection with 8–10 lbs. of force.



1. Turn motor adjustment bolt clockwise until the belt has enough tension at the proper deflection. Use one of the commercially available belt tension gauges to set the correct tension at the proper deflection (see **Figure 20 & 21).**
2. Use a straight–edge (angle iron, straight piece of board or anything with a good straight surface or edge) to check the alignment of the blower pulley with blower motor pulley (see **Figure 21**).

   It may be necessary to back the tension off the belt temporarily and tighten one of the motor mount bolts before it is possible to adjust the angle of the blower motor.
3. Tighten all blower motor mount bolts.
4. Ensure that all bolts, nuts and screws are tightened and ensure that all tools, gloves, etc. are removed from unit.
5. Replace side blower access panel before Start–up.
6. During Start–up, listen for any unusual noises or vibrations.
7. Shut down the unit after it runs for a while and check the bearings and motor. If they feel hot, the belt tension may be too tight, bearings may be misaligned or not lubricated correctly, etc.
8. It is a good idea to retension a new belt after a run–in period of about 24 hours. A run–in period of overnight or during a lunch break is better than no run–in period at all.

Figure 21	Checking Pulley Alignment



Start–up Procedure

⚠ WARNING

ELECTRICAL SHOCK, FIRE AND/OR EXPLOSION HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Use extreme care during all of the following checks and procedures.

Make sure Electric Power and/or Gas supply is turned OFF as instructed in appropriate steps.

Check the unit's operation as outlined in the following instructions.

Blower and Phasing Check

1. Shut **OFF** electric power at unit disconnect.
2. Shut **OFF** gas valve and manual shut off valve (see **Figure 23**).
3. Check to see that clean, properly sized air filters are installed.
4. Check to see that everything inside the unit is clear and ready to operate safely. Ensure that there are no objects in, on or around the motor, belt or blower wheel.
5. Set thermostat Heat–Cool selector to **OFF**.
6. Set thermostat fan switch to **AUTO**.

⚠ WARNING

MOVING PARTS HAZARD.

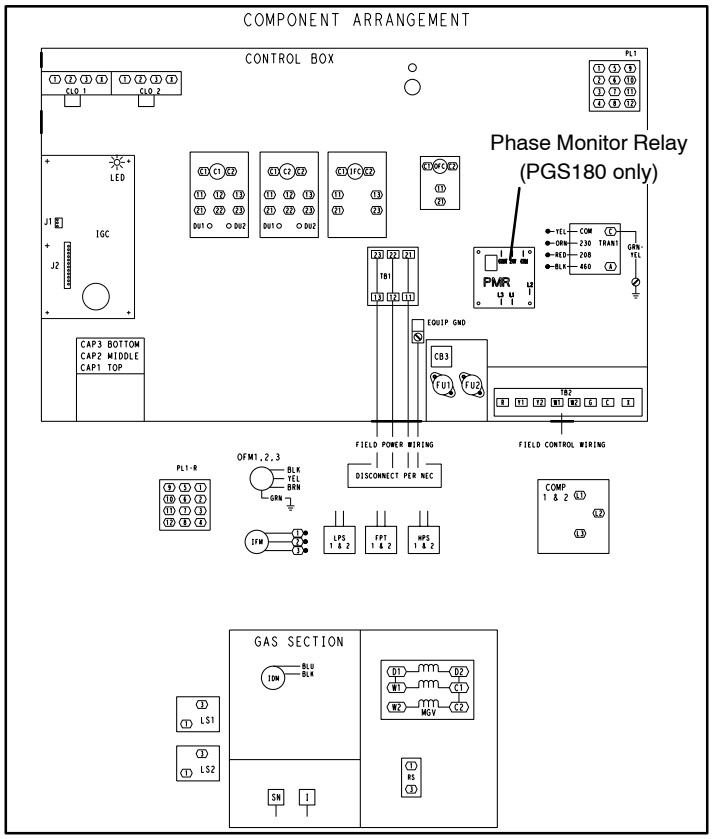
Failure to follow this warning could result in property damage, personal injury, and/or death.

Do NOT put hands or any other object in, on or around the motor, belt or blower wheel. Ensure that there are no objects in, on or around the motor, belt or blower wheel before turning electric power on.

7. Turn **ON** electric power. Nothing should start running. If any unusual arcing, odors or noises are encountered, shut **OFF** electric power immediately and check for wiring errors.

NOTE: The circulation blower motor and compressor(s) are three phase and are factory synchronized for proper rotation. For model PGS180, the unit is equipped with a phase

protection device that will monitor the sequence of three phase electrical system to provide phase reversal protection. It will also monitor the three phase voltage inputs to provide a phase loss protection for the three phase device. If the device detects phase reversal or phase loss, it will be indicated by a flashing red light on the Phase Monitor Relay located inside the control box (see component arrangement). For models PGS240 and PGE180/240 it is necessary to check for improper phasing. The following steps must be performed to verify correct electrical phasing.



NOTE:

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed by running the following test.

8. Set thermostat fan switch to **ON**. The circulating air blower should come **ON.**
9. Shut **OFF** electric power at unit disconnect and visually observe the direction of the blower rotation as it slows down. Do **NOT** put hands or any other object in, on or around the belt, motor or blower wheel.

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature equipment failure.

If blower rotation is incorrect, shut electric power OFF at unit disconnect and reverse any two supply wires at field connections ONLY. Do NOT reverse the blower and/or compressor leads or rewire any internal wiring. After rewiring is done, repeat blower rotation check to ensure that blower rotation is now correct.

10. If blower rotation is correct, reset thermostat fan switch to **AUTO**. The circulating air blower should go **OFF**. Nothing should be running.
11. Shut **OFF** electric power at unit disconnect.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Never exceed specified pressures. Higher pressures may damage the gas valve. Such damage may result in overfiring and possible heat exchanger failure.

High Heat Checks

1. Be sure that gas valve and manual shut off valve are **OFF**.
2. Be sure that electric power is **OFF**.
3. Remove inlet plug from gas valve (see **Figure 23**). Insert $^1/_8$″ NPT barbed fitting into inlet for use as supply line pressure tap.
4. Connect U-Tube manometer to barbed fitting. Use a manometer with a 0-12″ (0-3 Pa) range.
5. Remove outlet plug from gas valve. Insert $^1/_8$″ NPT barbed fitting into outlet for use as manifold pressure tap.
6. Connect U-Tube manometer to barbed fitting.
7. To check the supply gas pressure at high heat, place a jumper between the **R** and **W1** and **W2** terminals on the low voltage terminal board.
8. Turn **ON** electric power. The combustion blower should come **ON**.
9. Turn **ON** gas valve (see **Figure 23**).
10. Turn **ON** the manual shut off valve. The unit will fire at high heat.

NOTE: Supply line pressures **MUST** be checked with main burners operating and all other gas appliances on same gas line fired at high heat.

11. Manometer reading **MUST** be within the minimum and maximum supply gas pressure values listed in **Figure 22**.

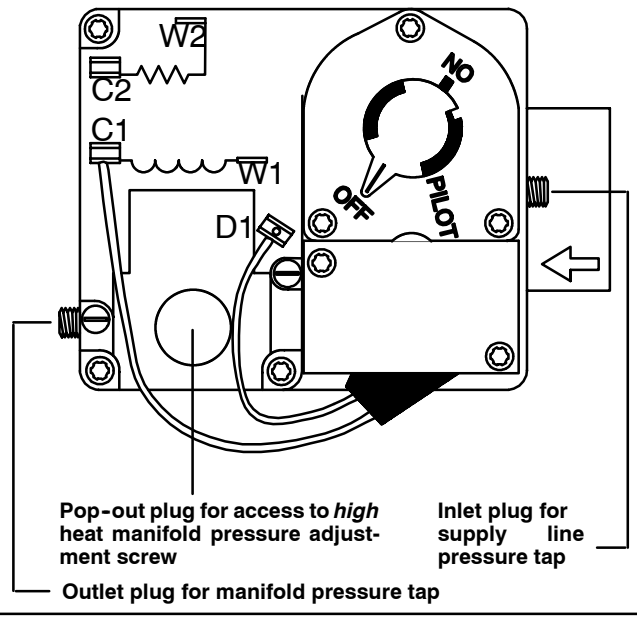
    If supply gas pressure is not within the minimum and maximum values, turn manual shut off valve **OFF** and contact gas supplier.
12. The induced draft motors will start, purging heat exchangers.
13. After a call for heating, the main burners should light within 5 seconds. If the burners do not light, then there is

a 22-second delay before another 5-second ignition try. If the burners still do not light, the time delay is repeated. If the burners do not light with 15 minutes, there is a lockout. To reset the control, break the 24v power to W1.

14. The evaporator-fan motor will turn on 45 seconds after the burners are ignited.
15. The evaporator-fan motor will turn off 45 seconds after the thermostat temperature is satisfied.

Figure 22	Supply Gas Pressures	
	Natural Gas	LP Gas
Minimum	4.5″W.C. (1120 Pa)	11″ W.C. (2740 Pa)
Recommended	7″ W.C. (1740 Pa)	11″ W.C. (2740 Pa)
Maximum	13″ W.C. (3230 Pa)	13″ W..C. (3230 Pa)

Figure 23 Typical White Rogers Gas Valve



16. Inspect main burner flames. Flames should be stable and blue.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD.

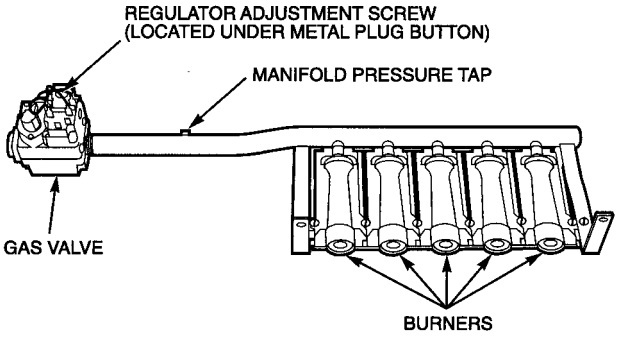
Failure to properly set input pressure could result in property damage, personal injury, and/or death.

Manifold pressure MUST be set correctly to obtain rated input.

NOTE: Manifold pressures MUST be checked with main burners operating.

17. Check manifold pressure on manometer. Manometer reading MUST be within range for high values listed in **figure 25**.
    a. If the manometer reading is not within the range for high heat listed in **Figure 22**, an adjustment MUST be made. To adjust the high heat manifold pressure:
    b. Remove the pop-out plug from the top of the gas valve (see **Figure23**) to access the high heat manifold pressure adjustment screw.
    c. To increase the manifold pressure, turn the adjustment screw clockwise. To decrease the manifold pressure, turn the adjustment screw counterclockwise.
    d. When the manifold pressure is correct, replace pop-out plug.

Figure 24 Burner Tray



18. Inspect main burner flames. Flames should be stable and blue.
19. Shut manual shut off valve OFF.
20. Shut gas valve OFF. Allow circulating blower to run before turning electric power off.
21. Shut electric power OFF at unit disconnect.
22. Remove barbed fitting from inlet and replace outlet plug.
23. Remove barbed fitting from outlet and replace outlet plug.
24. Remove jumpers from low voltage terminal board.

Figure 25	Manifold Gas Pressures	
	Natural Gas	LP Gas
High Heat	3.5″ W.C. ± 0.3 (870 Pa ± 75)	3.5″ W.C. ± 0.3 (2490 Pa ± 75)

Heating Operation/Temperature Rise Check

1. Open **ALL** registers and duct dampers.
2. Set thermostat Heat-Cool selector to **HEAT**.
3. Set the thermostat as high as it will go.

4. Turn **ON** electric power.
5. Turn **ON** manual shut off valve.
6. Turn gas valve **ON**. Unit should come on at high heat.
7. Operate unit **AT LEAST** 15 minutes, then check temperature rise.
8. To check the temperature rise through the space, place thermometers in the supply and return air ducts as close to the unit as possible.
   Keep the economizer dampers (if equipped) completely closed while checking the temperature rise.

NOTE: Temperature rise is the difference between the supply and return air temperatures. If the air distribution system is designed properly, the correct temperature rise is usually obtained when the unit is operating at rated input with the recommended blower speed .

NOTE: The temperature rise must be within the specifications marked on the unit rating plate.

NOTE: It may be necessary to change the blower speed if the correct temperature rise is not obtained. A faster blower speed will decrease the temperature rise. A slower blower speed will increase the temperature rise. To change the blower speed, see Air Distribution system and blower chart.

9. After the correct temperature rise has been obtained, check the limit control function by blocking the return air grille(s).

   After several minutes the main burners should go **OFF**. The circulating air blower should continue to run.

   Remove air restrictions. Main burners should relight after a cool down period of a few minutes.

10. Adjust the thermostat setting below room temperature.

    Main burners, and combustion air blower should go **OFF.**

    The circulation air blower should continue to run for approximately 45 seconds.

Cooling Checks

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature equipment failure.

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed during the Blower and Phasing Check in the previous section. If the phasing is incorrect, the scroll compressor(s) (if equipped) will run backwards and they will be damaged.

1. Be sure that electric power is **OFF**.
2. To check cooling Stage 1, place jumper wires across low voltage terminal board terminals **R** to **G, R** to **Y1**.
3. Turn electric power **ON**. Check to see that the following occurs:
   a. Compressor 1 – **ON**
   b. Condenser fan motor(s) – **ON**
   c. Circulation air blower – **ON** with correct rotation and adequate airflow from ductwork.
4. Shut **OFF** electric power at unit disconnect.
5. To check cooling Stage 2, remove jumper wires from **Y1** and place it on **Y2**.

NOTE: Allow 5 minutes between Steps 4 and 6.

6. Turn **ON** electric power. Check to see that the following occurs:
   a. Compressors 1 & 2 – **ON**
   b. Condenser fan motor(s) – **ON**
   c. Circulation air blower – **ON**
7. Shut **OFF** electric power at unit disconnect**.**
8. Remove jumpers from low voltage terminal board.
9. Replace all service access panels.

Turning Off the Unit

Heating

1. Set thermostat selector to **OFF** and fan switch to **AUTO**.
2. To shut the furnace down completely, shut **OFF** the manual shut off valve. If furnace is running at time of shut–down, wait 2.5 minutes then shut **OFF** electric power supply at disconnect switch or service panel. (No wait is necessary if furnace was not running within 2.5 minutes prior to shut–down.)

Cooling

1. Set thermostat selector to **OFF** and fan switch to **AUTO**.
2. To shut the unit down completely, shut **OFF** electric power supply at disconnect switch or service panel.

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Turn off electric power supply at disconnect switch or service panel before removing any access or service panel from unit.

Starting the Unit After Shutdown

⚠ WARNING

CARBON MONOXIDE, FIRE, AND/OR EXPLOSION HAZARD.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Do not operate the unit on heating (except during service checks) unless all access panels are securely fastened in place. Abnormal and possibly hazardous burner operation could result.

Heating

1. Set the thermostat to **OFF**.
2. Remove the burner access panel. Shut **OFF** gas valve. Wait 5 minutes.
3. Turn **ON** gas valve (White Rogers valve knobs must be pressed down before turning). Replace burner access panel. Turn **ON** manual shut off valve.
4. Turn **ON** electric power.
5. Set thermostat to desired temperature and set selector to **HEAT**. Unit will come on and operate automatically under control of the thermostat.

When the thermostat calls for heating, power is sent to W on the IGC (integrated gas unit controller) board. An LED (light-emitting diode) on the IGC board will be on during normal operation. A check is made to ensure that the rollout switch and limit switch are closed and the induced-draft motor is running. The induced-draft motor is then energized, and when speed is proven with the hall effect sensor on the motor, the ignition activation period begins. The burners will ignite within 5 seconds.

If the burners do not light, there is a 22 second delay before another 5 second attempt. If the burners still do not light, this sequence is repeated for 15 minutes. After the 15 minutes have elapsed, if the burners still have not lighted, heating is locked out. To reset the control, break 24v power to the thermostat.

When ignition occurs the IGC board will continue to monitor the condition of the rollout and limit switches, the hall effect sensor, as well as the flame sensor. If the unit is controlled through a room thermostat set for fan auto., 45 seconds after ignition occurs, the indoor-fan motor will be energized. If for some reason the overtermperature limit opens prior to the start of the indoor fan blower, on the next attempt, the 45-second delay will be shortened to 5 seconds less than the time from initiation of heat to when the limit ripped. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan on delay will not change back to 45 seconds unless power is reset to the control.

When additional heat is required, W2 closes and initiates power to the second stage of the main gas valve. When the thermostat is satisfied, W1 and W2 open and the gas valve closes, interrupting the flow of gas to the main burners. If the call for W1 lasted less than 1 minute, the heating cycle will not terminate until 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controllled through a room thermostat set for fan auto., the indoor fan motor will continue to operate for an additional 45 seconds then stop. If the overtemperature limit opens after the indoor motor is stopped within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. once modified, the fan off delay will not change back to 45 seconds unless power is reset to the control.

Table 1 - LED Error Code Description

LED Indication	Error Code Description
ON	Normal Operation
OFF	Hardware Failure
1 Flash	Fan On/Off Delay Modified
2 Flashes	Limit Switch Fault
3 Flashes	Flame Sense Fault
4 Flashes	5 Consecutive Limit Switch Faults
5 Flashes	Ignition Lockout Fault
6 Flashes	Inducer Switch Fault
7 Flashes	Rollout Switch Fault
8 Flashes	Internal Switch Fault
9 Flashes	Software Lockout

LEGEND
IGC - Integrated Gas unit Controller
LED - Light-Emitting Diode
1. A 3 second pause exists between LED error code flashes.
2. If more than one error code exists, all applicable codes will be displayed in numerical sequence.
3. Error codes on teh IGC will be lost if power to the unit is interrupted.

Cooling

⚠ CAUTION

RISK OF REDUCED EQUIPMENT LIFE

Failure to follow this Caution could result in premature component failure.

To prevent possible damage to the compressor(s), do NOT operate on cooling when outdoor temperature is below 35°F (2°C).

NOTE: An optional low ambient kit is available that allows the unit to operate at temperatures down to 0°F (-18°C).

When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporater) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized and evaporator fan motor (IFM), compressor no. 1, and condenser fans start. The condenser fan motors run continuously while

unit is cooling. If the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

Close all doors and windows. The unit may run continuously for several hours or longer on the initial run because of residual heat and moisture in the building. This is normal for any air conditioning system.

Thermostat Fan Switch Operation

The circulating air blower will run continuously with the fan selector switch in the **ON** position . When the fan selector switch is in the **AUTO** position, the blower will run during each heating or cooling cycle.

Monthly Maintenance and Inspection Checks

Vent Assembly

⚠ WARNING

BURN HAZARD.

Failure to follow this warning could result in personal injury.

Flue cover may be hot! Allow adequate time for flue cover to cool.

Inspect the inside of the vent hood and burner compartment using a light and mirror as necessary. Look for soot and severe rust or corrosion and any obstructions due to leaves, spider webs, etc. Clean as required.

Air Filters (Factory Installed)

NOTE:

Do NOT operate unit without all air filters installed in the unit.

Dirty filters are the most common cause of compressor failures and inadequate heating and cooling performance.
Inspect filters at least monthly and replace or clean as required.
Install filters so that the arrows on the side point in the direction of air flow.

Filter racks are accessible through the filter access panel.

Disposable Replacement Filters

For all units: 4 filters 20″ x 20″ x 2″
4 filters 16″ x 20″ x 2″

Condenser Coil

Keep the condenser inlet and outlet area clean and free of leaves, grass clippings and other debris. Grass should be kept short in front of the condenser inlet. Shrubbery **MUST** be trimmed back so it is no closer than 30 inches (762 mm) to condenser coil.

Condensate Drain

Check for condensate drainage. Clean as required.

Annual Maintenance and Inspection

⚠ WARNING

ELECTRICAL SHOCK, FIRE AND EXPLOSION HAZARDS.

Failure to follow this warning could result in property damage, personal injury, and/or death.

Turn off electric power supply at disconnect switch or service panel and gas supply at manual shutoff valve before removing any access or service panel from unit.

The annual inspection should include cleaning as required to ensure efficient operation of the unit.

The condenser and evaporator fan motors have permanently sealed bearings, so no field lubrication is necessary.

Fan shaft bearings on the 15 ton units are permanently lubricated. No field lubrication is required. For 20 ton units, lubricate bearings at least every 6 months with suitable bearing grease. Extended grease line is provided for far side fan bearing (opposite drive side).

Evaporator–fan motor protection – A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Circulating Air Blower

Visually inspect the blower wheel for accumulations of dirt or lint. Clean the compartment and the blower wheel. If accumulation is excessive on blower wheel or does not remove easily, it will be necessary to remove the blower assembly.

Evaporator Fan Service and Replacements - 15 Ton

NOTE: To remove belts only, follow Steps 1-6. **See Figure 18.**

1. Remove filter and supply-air section panels.
2. Remove unit top panel.
3. Loosen carriage nuts A and B holding motor mount assembly to fan scroll side plates.
4. Loosen screw C.
5. Rotate motor mount assembly (with motor attached) as far as possible away from evaporator coil.
6. Remove belt.
7. Rotate motor mount assembly back past original position toward evaporator coil.
8. Remove motor mounting nuts D and E (both sides).
9. Lift motor up through top of unit.
10. Reverse above procedure to reinstall motor.
11. Check and adjust belt tension as necessary.

Evaporator Fan Service and Replacements - 20 Ton

The 20 ton units use a fan motor mounting system that features a slide-out motor mounting plate. To replace or service the motor, slide out the bracket. **See Figure 19.**

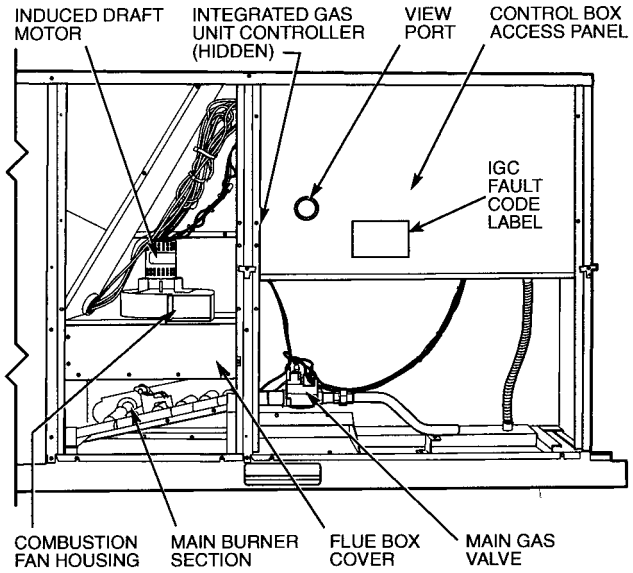
1. Remove the evaporator-fan access panel and the heating control access panel.
2. Remove the center post (located between the evaporator fan and heating control access panels) and all screws securing it.
3. Loosen nuts on the two carriage bolts in the motor mounting base.
4. Using jacking bolt under motor base, raise motor to top of slide and remove belt. Secure motor in the position by tightening the nuts on the carriage bolts.
5. Remove the belt drive.
6. Remove jacking bolt and tapped jacking bolt plate.
7. Remove the 2 screws that secure the motor mounting plate to the motor support channel.
8. Remove the 3 screws from the end of the motor support channel that interfere with the motor slide path.
9. Slide out the motor and motor mounting plate.
10. Disconnect wiring connections and remove the 4 mounting bolts.
11. Remove the motor.
12. To install the new motor, reverse steps 1 - 11.

Inspection And Cleaning Of Burner Assembly Heat Exchangers/Flue Gas Passages

For Qualified Service Technicians Only

See **Figure 26** for identification of parts.

Figure 26 Burner Section Details



Main Burners

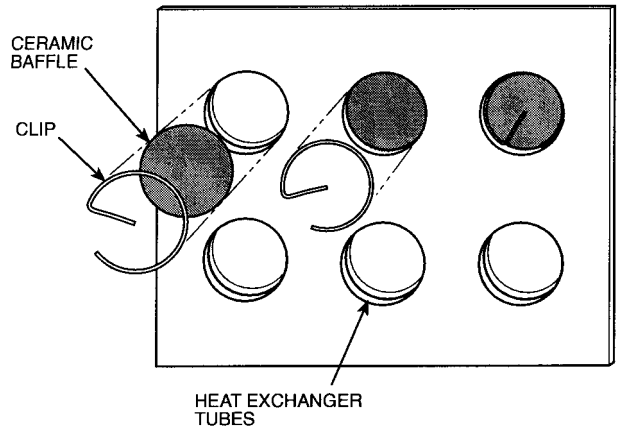
At the beginning of each heating season, inspect for deterioration, blockage due to corrosion or other causes. Observe the main burner flames and replace burners, if necessary. Refer to main burner section on this page.

Flue Gas Passageways

The flue collector box and heat exchanger cells may be inspected by removing heat exchanger access panel, flue box cover, and main burner assembly. **See Figure 26.** Refer to main burners section (below) for burner removal sequence. If cleaning is required, remove heat exchanger baffles and clean tubes with a wire brush.

Use caution with ceramic heat exchanger baffles. When installing retaining clip, be sure the center leg of the clip extends inward toward baffle. **See figure 27.**

Figure 27 Removing Heat Exchanger Ceramic Baffles and Clips



NOTE: One baffle and clip will be in each upper tube of the heat exchanger.

Combustion-Air Blower

Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To inspect blower wheel, remove heat exchanger access panel. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel assembly by removing screws holding motor mounting plate to top of combustion fan housing. The motor and wheel assembly will slide up and out of the fan housing. Remove the blower wheel from the motor shaft and clean with a detergent or solvent. Replace motor and wheel assembly.

Main Burner Section

For all applications, main burners are factory set and should require no adjustment.

Main Burner Removal

1. Shut **OFF** (field supplied) manual gas valve.
2. Shut **OFF** power to unit and install lockout tag.
3. Remove unit control box access panel, burner section access panel, and center post. See **Figure1 & 26.**
4. Disconnect gas piping at unit gas valve.
5. Remove wires connected to gas valve. Mark each wire.
6. Remove wires from gas valve.
7. Remove wires from rollout switch.
8. Remove sensor wire and ignitor cable from IGC board.
9. Remove 2 screws securing manifold bracket to base-pan.
10. Remove 2 screws that hold the burner support plate flange to the vestibule plate.
11. Lift burner assembly out of unit.

CLEANING AND ADJUSTMENT

1. Remove burner rack from unit as described in Main Burner Removal section above.
2. Inspect burners, and if dirty, remove burners from rack.
3. Using a soft brush, clean burners and crossover port as required.
4. Adjust spark gap. **See figure 28.**
5. Reinstall burners on rack.
6. Reinstall burner rack as described above.

Figure 28 Adjust Spark Gap

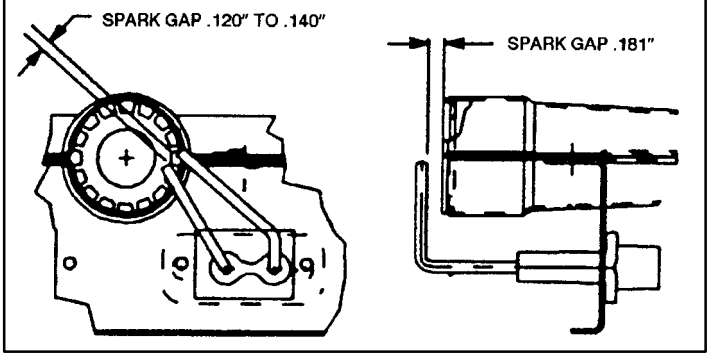


Table 1- TROUBLESHOOTING, LED Troubleshooting Error Code

SYMPTOM	CAUSE	REMEDY
Hardware Failure OFF	Loss of power to control module (IGC).	Check 5 amp fuse on IGC, power to unit, 24-v circuit breaker, and transformer, Units withour a 24-v circuit breaker have an internal overload in the 24-v transformer. If the overload trips, allow 10 minutes to auto reset.
On/Off Delay Modified 1 Flash	High limit switch opens during heat exchanger warm-up period before fan-on delay expires. Limit switch opens within three minutes after blower-off delay timing in Heating mode.	Ensure unit is fired on rate and temperature rise is correct. Ensure unit's external static pressure is witin application guidelines.
Limit Switch Fault 2 Flashes	High temperature limit switch is open.	Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate.
Flame Sense Fault 3 Flashes	The IGC sensed flame that should not be present.	Reset unit. If problem persists, replace control board.
4 Consecutive Limit Switch Faults 4 Flashes	Inadequate airflow to unit.	Check operation of indoor (evaporator) fan motor and that supply-air temperature rise agrees with range on unit nameplate.
Ignition Lockout Fault 5 Flashes	Unit unsuccessfully attempted ingnition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that flame sense and ignition wires are properly terminated. Verify that unit is obtaing proper amount of gas.
Induced-Draft Motor Fault 6 Flashes	IGC does not sense that induced-draft notor is operating.	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 - White, PIN 2 - Red, PIN 3 - Black.
Rollout Switch Fault 7 Flashes	Rollout switch has opened.	Rollout switch will autmatically reset, but IGC will continue to lock out unit. Check gas valve operation. Ensure that induced draft blower wheeel is properly secured to motor shaft. Reset unit at unit disconnect.
Internal Switch Fault 8 Flashes	Micropreocessor has snesed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC.
CAUTION: If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that may be present before handling new control board. The IGC is sensitive to static electricity and may be damaged if the necessary precautions are not take.		**IMPORTANT:** Refer to Heating troubleshooting chart for additional troubleshooting analysis. LEGEND: IGC - Integrated Gas Controller. LED - Light emitting diode.

TROUBLESHOOTING - Cooling Service

PROBLEM	CAUSE	REMEDY
Compressor and condenser fans will not start.	Power failure	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
(PGS180 Only) Compressor and condenser fans will not start.	Three phase power incorrectly connected. Indicated by flashing red LED on Phase Monitor Relay Board (PMR) inside control box.	Correct Field power phasing.
Compressor will not start but condenser fans run.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker.
Compressor cycles(other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective run/start capacitor, overload, or startrelay.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor or capacitor	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
(PGS240, PGE180/240 Only) Compressor makes excessive noise (Scroll only)	Compressor rotating in wrong direction	Reverse the 3-phase power leads as described in Start-Up section
Compressor operates continuously.	Dirty air filter	Replace filter.
	Unit undersized for load	Decrease load or increase unit size
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system	Recover refrigerant, evacuate system, and recharge.
	Condesor coil dirty or restricted.	Clean coil or remove restriction.
Excessive head pressure.	Dirty air filter	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Remove excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge	Check for leaks, repair, and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient evaporator airflow	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
Compressor no. 2 will not run.	Unit in economizer mode.	Proper operation; no remedy necessary.

TROUBLESHOOTING - Heating Service

PROBLEM	CAUSE	REMEDY
Burners will not Ignite.	Misaligned spark electrodes.	Check flame ignition and sensor electrode positioning. Adust as needed.
	No gas at main burners	Check gas line for air purge as necessary, After purging gas line of air, allow gas to dissipate for at lest 5 minutes before attempting to relight unit.
		Check gas valve.
	Water in gas line	Drain water and install drip leg to trap water.
	No power to furnace.	Check power supply, fuses, wiring, and circuit breaker.
	No 24 v power supply to control corcuit.	Check transformer. Transformers with internal overurrent protection require a cool down period before resetting.
	Miswired or loose connections.	Check all wiring and wirenut connections.
	Burned-out heat anticipator in thermostat.	Replace thermostat.
	Broken thermostat wires.	Run continuity check. Replace wires, if necessary.
Inadequate Heating.	Dirty air filter	Clean all wiring and wirenut connections.
	Gas input to unit too low.	Check gas pressure at manifold. Clock gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
	Unit undersized for application.	Replace with proper unit or add additional unit.
	Restricted airflow.	Clean filter, replace filter, or remove any restrictions.
	Blower speed too low.	Use high speed tap, increase fan speed, or install optional blower as suitable for individual units.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and termperature rise of unit. akjust as needed.
	Too much outdoor air.	Adjust minimum position.
		Check economizer operation.
Poor flame characteristics.	Incomplete combustion (lack of combustion air) results in: Aidehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger.
		Overfired unit - reduce input, change orifices, or adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment.
Burners will not turn off.	Unit is locked into Heating mode for a one minute minimum.	Wait until mandatory one minute time period has elapsed or power to unit.

I. START-UP CHECKLIST (Remove and store in job file)		
	Model No:	Serial No:
	Date:	Technician:
	Unit No:	Job Location:
		Job Name:

II. PRE-START-UP (Insert Checkmark in box as each item is completed)	
	Verify that all packing materials have been removed from unit.
	Verify installation of indoor fan motor adjustment bolt and plate. (20 ton only)
	Verify installation of flue hood and wind baffle.
	Verify that condensate connection is installed per installation instructions.
	Check all electrical connections and terminals for tightness.
	Check gas piping for leaks.
	Check that indoor-air filters are clean and in place.
	Verify that unit installation is level.
	Check fan wheels and propellers for location in housing/orifice and setscrew tightness.
	Ensure belt tension is correct and blower pulleys are properly aligned.

III. START-UP			
ELECTRICAL			
Supply Voltage	L1-L2	L2-L3	L3-L1
Compressor AMPS	L1	L2	L3
Compressor AMPS	L1	L2	L3
Indoor-Fan AMPS	L1	L2	L3

TEMPERATURES and PRESSURES		
Outdoor-Air Temperature	°DB	
Return-Air Temperature	°DB	°WB
Cooling Supply air	°DB	°WB
Gas Heat Supply air	°DB	
Gas Inlet Pressure	In. wg	
Gas Manifold Pressure	In. wg (High Fire)	In. wg (Lo Fire)
Refrigerant Suction Pressure	PSIG-Circuit # 1	PSIG-Circuit # 2
Refrigerant Temp. (Suction) Pressure	Circuit # 1	Circuit # 2
Refrigerant Discharge	PSIG-Circuit # 1	PSIG-Circuit # 2
Discharge Temperature	°F/C-Circuit # 1	°F/C-Circuit # 2

		Verify that 3-phase scroll compressor rotating in correct direction on select models.