# Installation Manual: PG5 Series - 208 V/230 V - 1 Phase

## 15.2 SEER2 Packaged Air Conditioner with Gas Heat




**⚠ CAUTION**

**Risk of fire**

This unit uses a mildly flammable (A2L) refrigerant. See A2L refrigerant safety considerations to ensure safe installation, operation, and servicing of this unit.

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# About the PG5 unit

PG5 models are two-stage electric cooling and gas heating units designed for outdoor installation. Only gas piping, electric power, and duct connections are required at the point of installation. The gas-fired heaters in these units have direct spark ignition. The refrigerant system is fully charged with R-454B refrigerant, tested, and factory sealed.

# Certification

AHRI CERTIFIED www.ahridirectory.org Residential Furnaces DOE 10 CFR Part 430

C SA US

AHRI CERTIFIED www.ahridirectory.org Unitary Small AC AHRI Standard 210/240 Certification applies only when the complete system is listed with AHRI.

Assembled at a facility with an ISO 9001:2015-certified Quality Management System

CSA CERTIFIED

DESIGN CERTIFIED

# GoTemp Pro app (Formerly DS Solutions app)

BHC Group Heating & Cooling believes in empowering our customers with up-to-date, unit-specific information. Download GoTemp Pro app, a powerful, comprehensive app designed for contractors on the jobsite, available now in the App Store for iOS and Google Play for Android. Use the app to scan the unique QR code on the unit rating plate for easy access to product information and resources such as nomenclature, technical guide, installation manual, wiring diagrams, parts list, product registration, warranty, and much more. Simplify your tasks, save time, and stay ahead with the most comprehensive app built for professionals.

GoTemp Pro

iOS

Android

# Safety

It is important to understand the safety symbols used in this manual. Read safety information carefully and follow all safety requirements.

## Understanding safety symbols and instructions

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

Understand and pay particular attention to the signal words **DANGER**, **WARNING**, or **CAUTION**, as well as the **NOTICE**, **Important**, and **Note** alerts.

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

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

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

**NOTICE** indicates information considered important, but not hazard-related, such as messages relating to property damage.

**Important** indicates information that is essential to complete a task or may result in damage to the device if not followed.

**Note** indicates something of special interest or importance. Notes can contain any type of information except safety information.

## Safety requirements

**WARNING**

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

**CAUTION**

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

**⚠ WARNING**

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

**⚠ CAUTION**

This system uses R-454B refrigerant. No other refrigerant may be used in this system. Gauge sets, hoses, refrigerant containers, and recovery systems must be designed to handle R-454B. If you are unsure, consult the equipment manufacturer. Failure to use R-454B compatible servicing equipment may result in property damage or injury.

**⚠ WARNING**

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given proper supervision and sufficient instruction concerning use of the appliance by a person responsible for their safety.

Children must be supervised to ensure that they do not play with the appliance.

**⚠ CAUTION**

Do not install the appliance above 3,048 m (10,000 ft) altitude. Ensure the appliance's functions, including but not limited to gas heat, work properly before installation/servicing is completed.

**⚠ CAUTION**

In order to avoid a hazard due to inadvertent resetting of the thermal cut-out, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by the utility.

**⚠ WARNING**

**RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH**

System contains oversize protective earthing (grounding) terminal which shall be properly connected.

## ⚠ WARNING

**FIRE OR EXPLOSION HAZARD**

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

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

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

• Do not try to light any appliance.

• Do not touch any electrical switch; do not use any phone (including cell phone) in your building.

• Do not generate any open flames, arcs or sparks; do not smoke.

• Leave the building immediately.

• Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

• If you cannot reach your gas supplier, call the fire department.

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

## ⚠ WARNING

**FIRE OR EXPLOSION HAZARD**

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

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

Adhere to the following:

- Read these instructions before installing the unit. This is an outdoor combination heating and cooling unit.
- Be aware that due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel must install, repair, or service this equipment. Unlicensed personnel can perform the basic maintenance functions of cleaning coils and filters and replacing filters.
- Observe all precautions in the literature, labels, and tags accompanying the equipment when working on air conditioning equipment. Ensure to follow all other applicable safety precautions and codes including ANSI Z223.1 or CSA-B149.1 (latest edition).
- Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.
- Refer to the unit rating plate for the approved type of gas for this product.
- Install the unit only in a location and position specified in these instructions.
- Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when checking all connections, as specified in these instructions.
- Install the unit to operate within the unit's intended temperature rise range with the duct system and within the allowable external static pressure range, as specified on the unit rating plate and in Table 15.
- Do not use this equipment for temporary heating of buildings or structures under construction.

# A2L refrigerant safety guidance

**⚠ CAUTION**

You must read all of this section before installing this unit.

**⚠ WARNING**

Do not use means to accelerate the defrosting or thawing process or to clean, other than those recommended by the manufacturer.

The appliance shall be placed outdoors and kept away from continuously operating ignition sources (for example: open flames, a third-party operating gas appliance or a third-party operating electric heater.)

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

**⚠ WARNING**

Any required ventilation and circulation openings must be kept clear of obstruction.

**⚠ WARNING**

Any ducts connected to the unit shall not contain any potential ignition source(s).

Do not install auxiliary devices not approved by the appliance manufacturer or not declared suitable with the refrigerant in connecting ductwork.

**⚠ WARNING**

If disconnect switch(es) are installed within 6.6 ft (2 m) of any surfaces of the unit and/or the installation/commissioning/troubleshooting/servicing requires powering up or down the unit by operating the disconnect switch(es), confirm there is no presence of A2L refrigerant around the disconnect switch(es) before operating them. This requirement can be waived if such disconnect switch(es) are intrinsically safe or compliant with necessary safety standard to not cause any flammability concern with A2L refrigerant.

## General

**Table 1: General**

| Item number | Safety guideline |
|---|---|
| 1 | Typical potential continuously operating sources that could cause ignition of A2L refrigerants include but are not limited to gas appliances, electric heaters, hot surfaces over 700°C (1292°F), all sorts of continuously operating open flames, all sorts of continuously operating devices that generate open arcs and/or sparks, and cigarette smoking. Follow the A2L safety guideline in this manual to eliminate such a concern or risk and ensure safe/compliant operation of the unit. |
| 2 | Any appliance containing 1.776 kg (3.915 lb) or more of A2L charge amount for any refrigerant circuit must be constructed such that any refrigerant leak cannot flow or stagnate in a way that would create a fire or explosion hazard. |
| 3 | Ensure return and supply duct openings of the unit are not obstructed. Ensure any air vents in all rooms are not obstructed in any way. If zoning dampers are installed in a space conditioned by a unit with an A2L charge amount at or over 1.776 kg (3.915 lb), ensure that they are actuated by the A2L mitigation controls to be open in a detected A2L leakage event **and** the actual floor area of the total conditioned space (TA) is no less than the required minimum floor area of the total conditioned space ($TA_{min}$).<br>ⓘ **Note:** If zoning dampers are installed in a space conditioned by a unit with an A2L charge amount under 1.776 kg (3.915 lb), there are no A2L mitigation requirements for the zoning dampers. |
| 4 | For the unit marked as LEAK DETECTION SYSTEM installed, the unit must be powered except for service. Such a unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing. |
| 5 | Ensure the unit refrigerant circuit is protected from physical damage in installation, operation, and service. Ensure pipe work including piping material, pipe routing, and installation follows the factory design and specification and complies with applicable national and local codes and standards such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection before being covered or enclosed. Consider leaving sufficient inspection space in addition to following the unit clearances table. |
| 6 | If the refrigerant tubing in the unit needs repair during servicing, the refrigerant tubing must be pressure tested with nitrogen and then vacuum tested before refrigerant charging. Adhere to the following:<br>• The minimum test pressure is 423 PSIG (2.92 MPa, gauge) for residential packaged units.<br>• Field-made joints or refrigerant tubing not directly exposed to ambient air must be tightness tested. Use a tester with a sensitivity of 5 grams per year of refrigerant or better under 163+ PSIG test pressure. Ensure no leak can be detected. |
| 7 | You must verify actuation of A2L mitigation actions before installation or any A2L refrigerant-leakage-related service is completed. |
| 8 | You must replace refrigerant detection sensors only with the ones specified by the appliance manufacturer for the refrigerant detection system (RDS). There are no exceptions. |
| 9 | Do not use false ceilings or drop ceilings as a return air plenum. |
| 10 | After transporting a unit to the installation site **and** before working on any electrical connection/ wiring, ensure there is no refrigerant leak in the system, especially in the indoor coil section. |
| 11 | Before beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system, item 12 to item 18 below must be adhered to before conducting work on the system. |

**Table 1: General**

| Item number | Safety guideline |
|---|---|
| 12 | Work must be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed. |
| 13 | Instruct all maintenance staff and others working in the local area on the nature of work being carried out. Avoid work in confined spaces. |
| 14 | The area must be checked with an appropriate refrigerant detector before and during work to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants: non-sparking, adequately sealed, or intrinsically safe. |
| 15 | If conducting any hot work on the refrigerating equipment or any associated parts, you must have appropriate fire-extinguishing equipment on hand. Have a dry powder or $CO_2$ fire extinguisher adjacent to the charging area. |
| 16 | If conducting work in relation to the refrigerating system that involves exposing any pipework, do not use any sources of ignition in such a manner that may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, must be kept sufficiently far away from the site of installation, repair, removal, and disposal, during which refrigerant can possibly be released to the surrounding space. Before conducting any work, survey the area around the equipment to ensure that there are no flammable hazards or ignition risks. Display “No Smoking” signs. |
| 17 | Ensure the area is in the open or that it is adequately ventilated before opening the system or while conducting any hot work. The ventilation must safely disperse any released refrigerant and preferably expel it externally into the atmosphere. |
| 18 | Ensure that the refrigerant detection sensor is not obstructed in any way. |

## Meeting conditioned space and system requirements

**Important:**

- It is the installer's responsibility to ensure that the actual floor area of the total conditioned space (TA) is well above the required minimum floor area of the total conditioned space ($TA_{min}$), in a space that is to be conditioned by a unit with an A2L system charge amount ($m_c$) before proceeding with the unit installation. See Table 2. For most installations, the TA value is typically well above the $TA_{min}$ value, but you must review Table 2 carefully to ensure compliance.
- For PG5E24 and PG5E36 units, the refrigerant charge is less than 1.776 kg (3.915 lb) so an A2L mitigation system or a mechanical ventilation system is not required, and there are no minimum floor area or circulation airflow rate requirements.

For PG5E48 and PG5E60 units, the refrigerant charge is more than 1.776 kg (3.915 lb), so an A2L mitigation system that meets requirements for minimum floor area and system airflow rates as outlined in Table 2 is required. Table 3 provides an altitude adjustment factor (AAF) based on the building site ground level altitude ($H_{alt}$) to use if required. In typical applications of PG5E48 and PG5E60 units, the TA value is well above the $TA_{min}$ value, so adding natural ventilation openings to meet the $TA_{min}$ requirement or installing a mechanical ventilation system as outlined in this procedure is not generally required. Figure 1 and Figure 2 provide more specific sizing and installation information for upper and lower natural ventilation openings if needed.

## Table 2: Requirements for minimum conditioned space floor area and system airflow rates

| Model | A2L system charge amount | | Minimum opening for natural ventilation connecting conditioned and unconditioned spaces | | Actual floor area of the total conditioned space | | Required minimum floor area of the total conditioned space | | Allowable maximum refrigerant charge in the total conditioned space based on TA | | Minimum circulation airflow by A2L system to the total conditioned space | | Minimum mechanical ventilation airflow required only if $TA<TA_{min}$ or $m_c>m_{max}$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $m_c$ | | $Anv_{min}$ | | TA | | $TA_{min}$ | | $m_{max}$ | | $Q_{min_circ}$ | | $Q_{min_mech_vent}$ | |
| | lb | kg | $in^2$ | $m^2$ | $ft^2$ | $m^2$ | $ft^2$ | $m^2$ | lb | kg | CFM | $m^3/h$ | CFM | $m^3/h$ |
| PG5E48 | 4.44 | 2.01 | 47.7 | 0.0308 | 75 | 7.0 | 133.16 | 12.37 | 2.50 | 1.13 | 240 | 408 | 52.5 | 89.1 |
| | 4.44 | 2.01 | 27.2 | 0.0175 | 100 | 9.3 | 133.16 | 12.37 | 3.33 | 1.51 | 240 | 408 | 29.9 | 50.8 |
| | 4.44 | 2.01 | 0 | 0 | 133.16 | 12.4 | 133.16 | 12.37 | 4.44 | 2.01 | 240 | 408 | 0 | 0 |
| PG5E60 | 5.19 | 2.35 | 45.6 | 0.0295 | 100 | 9.3 | 155.65 | 14.46 | 3.33 | 1.51 | 281 | 477 | 50.2 | 85.3 |
| | 5.19 | 2.35 | 25.1 | 0.0162 | 125 | 11.6 | 155.65 | 14.46 | 4.17 | 1.89 | 281 | 477 | 27.7 | 47 |
| | 5.19 | 2.35 | 0 | 0 | 155.65 | 14.5 | 155.65 | 14.46 | 5.19 | 2.35 | 281 | 477 | 0 | 0 |

## Table 3: Altitude adjustment factor (AAF)

| AAF based on building site ground level altitude ($H_{alt}$) in m/ft | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $H_{alt}$ | 0 m/0 ft | 200 m/656 ft | 400 m/1312 ft | 600 m/1969 ft | 800 m/2625 ft | 1000 m/3281 ft | 1200m/3937 ft | 1400 m/4593 ft | 1600 m/5249 ft |
| AAF | 1 | 1 | 1 | 1 | 1.02 | 1.05 | 1.07 | 1.1 | 1.12 |
| $H_{alt}$ | 1600 m/5249 ft | 1800 m/5906 ft | 2000 m/6562 ft | 2200 m/7218 ft | 2400 m/7874 ft | 2600 m/8530 ft | 2800 m/9186 ft | 3000 m/9843 ft | 3200 m/10499 ft |
| AAF | 1.12 | 1.15 | 1.18 | 1.21 | 1.25 | 1.28 | 1.32 | 1.36 | 1.4 |

**Important:** It is important to be aware of the following about the data provided in Table 2 and Table 3:

- The $TA_{min}$ values, $m_{max}$ values, $Q_{min_circ}$ values, and $Q_{min_mech_vent}$ values shown are compliant with both UL60335-2-40 3rd Edition and UL60335-2-40 4th Edition.
- Follow national, state and local codes and standards if there are more stringent requirements on $TA_{min}$ values, $m_{max}$ values, $Q_{min_circ}$ values, and $Q_{min_mech_vent}$ values. For example, if there is a building code that requires higher $Q_{min_mech_vent}$ values than shown, follow the higher airflow requirement.
- Follow national, state, and local codes and standards to check if UL60335-2-40 3rd Edition is required. If so, multiply the appropriate AAF by the $TA_{min}$ value to get the corrected $TA_{min}$ value. This AAF correction applies to only the $TA_{min}$ value as required in UL60335-2-40 3rd Edition and not to the $TA_{min}$ value as required in UL60335-2-40 4th Edition. For example, the $TA_{min}$ value of 133.2 $ft^2$ (12.37 $m^2$) meets the UL60335-2-40 4th Edition requirement for a space conditioned by a PG5E48 unit. But if there is a code requiring compliance to UL60335-2-40 3rd Edition for the same conditioned space and the building site ground level altitude is 1400 m (4593 ft), the corrected $TA_{min}$ value is 1.1 × 133.2 = 146.5 $ft^2$ (13.61 $m^2$). This AAF correction for UL60335-2-40 3rd Edition applies to only $TA_{min}$ values and not to other values.
- The data in the *Minimum opening for natural ventilation connecting conditioned and unconditioned spaces* column in Table 2 is for increasing total conditioned space floor area if required. This data is not typically needed.
- One of the required warning labels on the unit refers to the following:
  - Minimum installation height, X m (W ft). The minimum installation height does not apply to this model series.
  - Minimum room area (operating or storage), Y $m^2$ (Z $ft^2$). For the minimum room area, use the values in the *Required minimum floor area of the total conditioned space* column in Table 2.

## Figure 1: Natural ventilation openings - lower opening entirely below the 0.3 m point above the floor

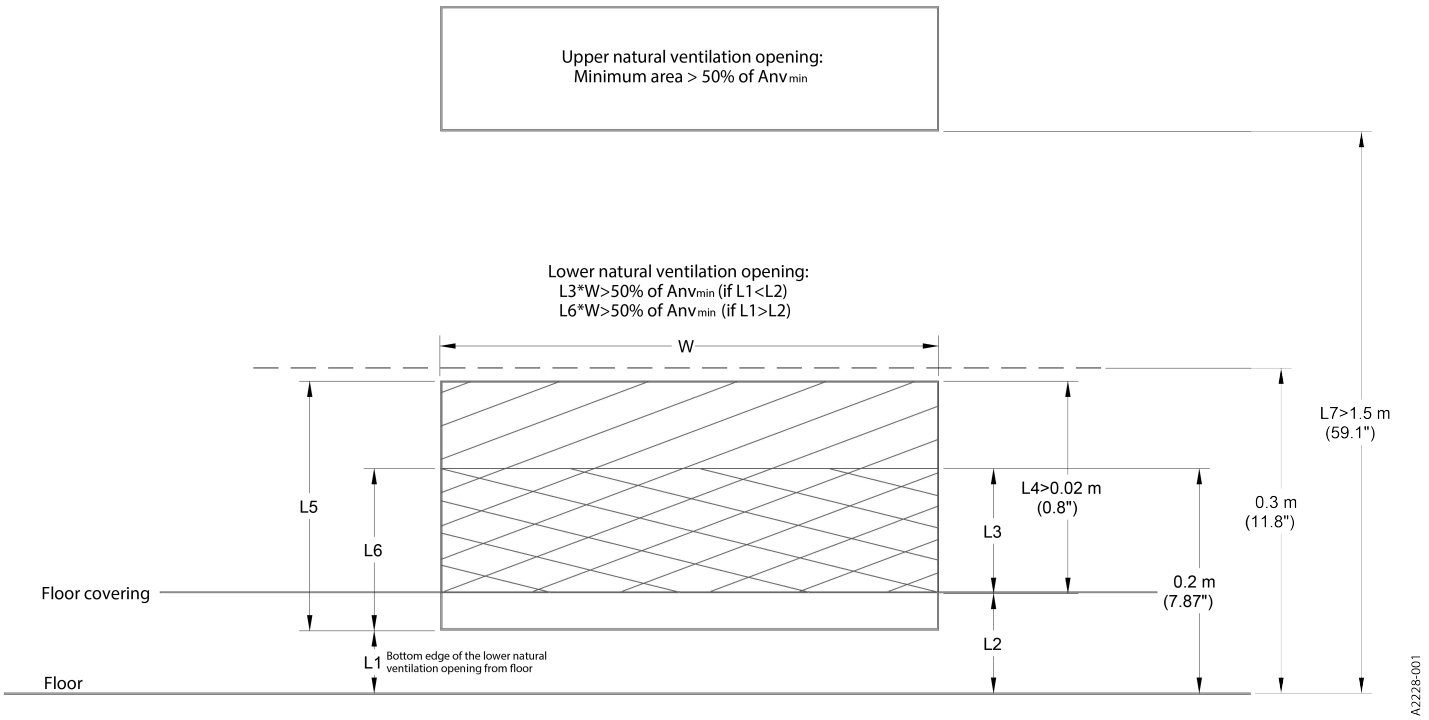
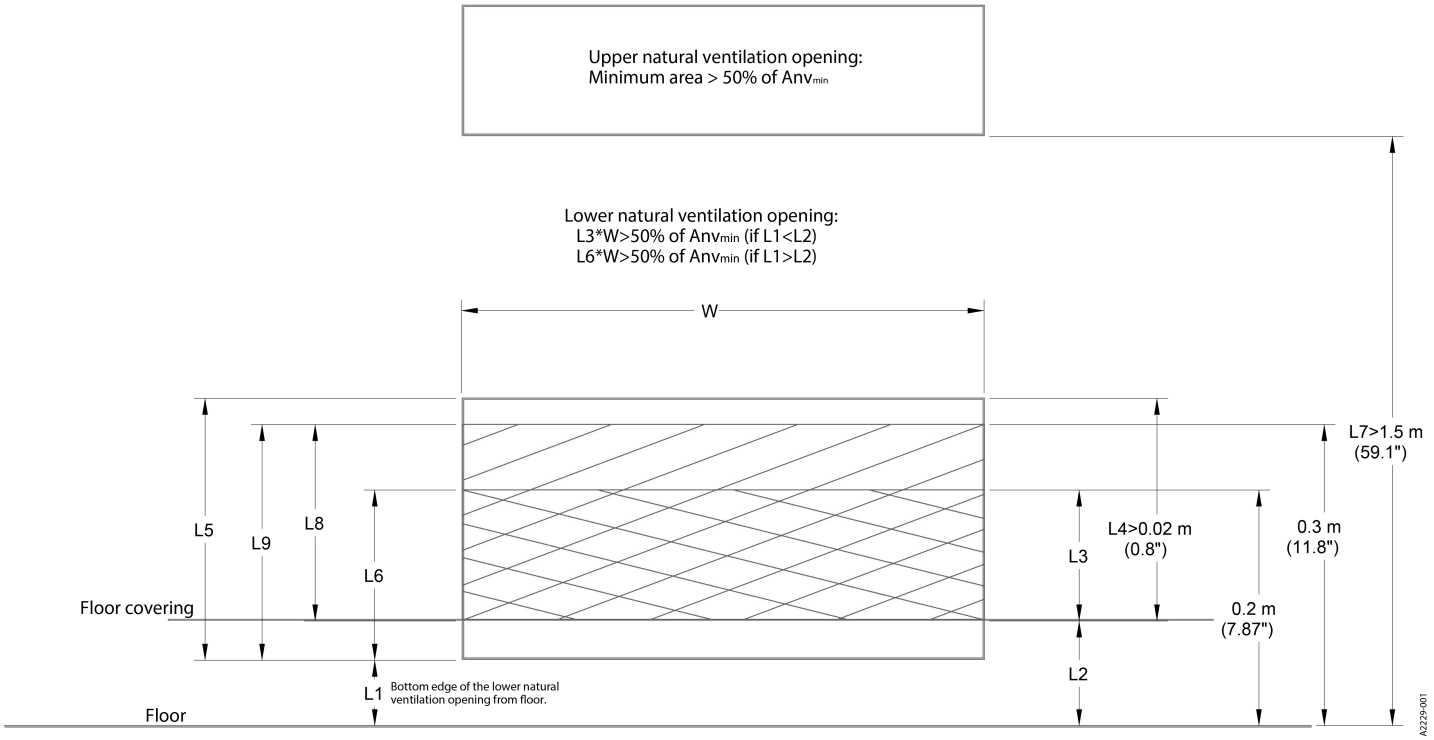


**Figure 2: Natural ventilation openings - lower opening partially below the 0.3 m point above the floor**




**Note:** In Figure 2, only the shaded opening area below the 0.3 m point and above the floor covering (L2) counts as the effective natural ventilation area for the lower natural ventilation opening. To discern the effective natural ventilation area for the lower natural ventilation opening, use the area between the 0.3 m point and whichever is higher of the floor covering height (L2) or the opening bottom edge height (L1).

To meet conditioned space and system requirements for PG5E48 and PG5E60 units, do the following:

1. Measure the area of each conditioned space that has air vents in it, for example, bedroom, office, living room, kitchen, and dining room, to calculate the TA value.
2. Check if the TA value is equal to or above the relevant $TA_{min}$ value:
   - If compliance with UL60335-2-40 4th Edition is required, use the $TA_{min}$ values in Table 2.
   - If compliance with UL 60335-2-40 3rd Edition is required, use Table 3 to calculate the corrected $TA_{min}$ value. You can use the example provided for a PG5E48 unit above as a guide.
3. Depending on the result of Step 2, proceed as follows:
   - If the TA value is equal to or above the $TA_{min}$ value, you do not need to install a mechanical ventilation system.
   - If the TA value is below the $TA_{min}$ value, do the following:
     i. Select one conditioned space and check its adjacent unconditioned space, for example, linen closet, space under the staircase, or pantry, to determine if it is feasible to add two natural ventilation openings to connect the two adjacent spaces, so the added floor area of the occupied space increases. Do the same for other applicable conditioned spaces to determine if it is possible to attain a TA value equal to or above the $TA_{min}$ value in Table 2.

        **Note:** The two natural ventilation openings are an upper natural ventilation opening and a lower natural ventilation opening. Each opening must be at least 50% of the $Anv_{min}$ area and the openings must be located on the same side of the wall. See Figure 1 and Figure 2.

ii. If you can attain a TA value equal to or above the $TA_{min}$ value in Table 2, add the natural ventilation openings as required. This is a cost-competitive approach to meet the $TA_{min}$ requirement and avoid installing a mechanical ventilation system.

iii. If you can not attain a TA value equal to or above the $TA_{min}$ value in Table 2, install a mechanical ventilation system to ventilate outdoors and bring in makeup air from the atmosphere.

4. Make sure that the circulation airflow is above the $Q_{min_circ}$ value in Table 2. The unit control board sets the indoor motor to operate at the maximum airflow rate in a detected A2L leakage event to promptly remove any leaked R-454B from the unit. The max airflow rate is well above the required $Q_{min_circ}$ value.
5. For applications where a mechanical ventilation system is required, make sure that the mechanical ventilation airflow is above the $Q_{min_mech_vent}$ value in Table 2, and adhere to the following:
   - For mechanical ventilation, ensure that the lower edge of openings extracting air from the conditioned space are not more than 3.94 in. (100 mm) above the floor.
   - Locate the openings supplying makeup air to the conditioned space so the supplied makeup air mixes with any leaked refrigerant.
   - Set the mechanical ventilation system so the makeup air is supplied from the atmosphere and the ventilation air extracted from the conditioned space is discharged to the atmosphere. Ensure that the ventilation air discharge openings are separated by a sufficient distance, but not less than 9.84 ft (3 m), from the makeup air intake openings to prevent re-circulation to the conditioned space.

ⓘ **Note:** As the TA value increases from a very low value to the $TA_{min}$ value, the $Q_{min_mech_vent}$ value decreases from a positive value to 0. When the TA value is above the $TA_{min}$ value, no mechanical ventilation system is required, no opening is needed between the conditioned and unconditioned spaces for natural ventilation, and the allowable maximum refrigerant charge in the A2L system ($m_{max}$ value) is above the unit charge ($m_c$ value).

## Refrigerant equipment checks

**Table 4: Refrigerant equipment checks**

| Item number | Safety guideline |
|---|---|
| 1 | Where electrical components are being changed, they must be fit for the purpose and to the correct specification. At all times, the manufacturer's maintenance and service guidelines must be followed. If in doubt, consult the manufacturer's technical department for assistance. |
| 2 | Apply the following checks to installations using flammable refrigerants:<br>• Ensure the actual refrigerant charge is in accordance with the total conditioned space floor area.<br>• Ensure the ventilation machinery and outlets are operating adequately and are not obstructed.<br>• Ensure marking on the equipment continues to be visible and legible. Correct any markings and signs that are illegible.<br>• Install refrigerating pipe or components in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components, unless the components are constructed of materials that are inherently resistant to being corroded or are suitably protected against being corroded. |

## Electrical devices checks

**Table 5: Electrical devices checks**

| Item number | Safety guideline |
|---|---|
| 1 | Repair and maintenance to electrical components must include initial safety checks and component inspection procedures. |
| 2 | If a fault exists that could compromise safety, then do not connect any electrical supply to the circuit until the fault is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, use an adequate temporary solution. This must be reported to the owner of the equipment so all parties are advised. |
| 3 | Initial safety checks must include:<br>• Ensure capacitors are discharged: take care to avoid the possibility of sparking.<br>• Ensure no live electrical components and wiring are exposed while charging, recovering, or purging the system.<br>• Ensure there is continuity of earth bonding. |
| 4 | Check that wiring and/or cabling are not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors, indoor blowers, and outdoor fans. |

## Detection of refrigerant

**Table 6: Detection of refrigerant**

| Item number | Safety guideline |
|---|---|
| 1 | Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. Do not use a halide torch or any other detector using a naked flame. |
| 2 | The following leak detection methods are deemed acceptable for all refrigerant systems.<br>• Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate or may need re-calibration. Calibrate the detection equipment in a refrigerant-free area. Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Set leak detection equipment at a percentage of the LFL of the refrigerant and calibrate to the refrigerant employed. Ensure the appropriate percentage of gas with a maximum of 25% is confirmed.<br>• Leak detection fluids are also suitable for use with most refrigerants but avoid the use of detergents containing chlorine as the chlorine may react with the refrigerant and corrode the copper pipework. Examples of leak detection fluids are bubble method and fluorescent method agents. |
| 3 | If a leak is suspected, all naked flames shall be removed/extinguished. |
| 4 | If a leakage of refrigerant is found that requires brazing, recover all of the refrigerant from the system and purge the system with nitrogen. |

## Removing and evacuating refrigerant

You must follow conventional procedures to remove and evacuate A2L flammable refrigerant charge before breaking into the refrigerant circuit to make repairs or for any other purposes. Safely remove refrigerant following local and national regulations, and adhere to the following requirements:

1. During evacuation, the outlet for the vacuum pump must not be close to any potential ignition sources, and ventilation must be available. The refrigerant charge must be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. See Recovering refrigerant for servicing or decommissioning for more requirements on recovery.
2. Continuously flush or purge with oxygen-free nitrogen before and when using flame to open the refrigerant circuit. **Do not** use compressed air or oxygen for purging.

## Charging

For standard charging procedures, see Checking the refrigerant charge and refer to the charging chart on the compressor barrier. Follow standard charging procedures and adhere to the following requirements:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Keep hoses or lines as short as possible to minimize the amount of refrigerant contained in them.
- Keep cylinders in an appropriate position according to the instructions.
- Ensure that the refrigerating system is grounded before charging the system with refrigerant.
- Ensure to meet the requirements for weighing scales outlined in Recovering refrigerant for servicing or decommissioning.
- Label the system when charging is complete, if this has not been done already.
- Take extreme care not to overfill the refrigerating system.
- Before recharging the system, pressure test the system with oxygen-free nitrogen. Leak test the system on completion of charging but before commissioning. Do a follow-up leak test before leaving the site.

## Recovering refrigerant for servicing or decommissioning

**Before you begin:**
Before starting the procedure, do the following:

- Ensure that you (the technician) are completely familiar with the equipment and all its detail.
- Take an oil and refrigerant sample in case analysis is required before reusing the recovered refrigerant.
- Ensure that electrical power is available.
- Ensure that mechanical handling equipment is available, if required, for handling refrigerant cylinders.
- Ensure that all personal protective equipment is available and being used correctly.
- Ensure that a competent person is available to supervise the recovery process at all times.
- Ensure that recovery equipment and cylinders conform to the appropriate standards. Note the following:
  - The recovery equipment must be in good working order with necessary and sufficient instructions and must be suitable for the recovery of the flammable refrigerant. If in doubt, consult the manufacturer.
  - All cylinders to be used must be designated for the recovered refrigerant and labeled for that refrigerant.
  - Cylinders must have a pressure relief valve and associated shut-off valves in good working order.
  - Empty recovery cylinders must be evacuated and, if possible, cooled before recovery occurs.

To safely recover all refrigerants for unit servicing or decommissioning, do the following:

1. Isolate the system electrically.
2. Connect a recovery machine to remove refrigerant from the system.

3. Ensure that the cylinder is situated on the scales before recovery takes place and the following requirements are met:
   - The weighing scales are calibrated and in good working order.
   - The weighing scales are placed on solid horizontal foundation that can sufficiently support the total weight of the cylinders and weighing scales without any compromise.
   - Hoses are complete with leak-free disconnect couplings and in good condition.
4. Start the recovery machine and operate in accordance with the instructions provided with the machine. Adhere to the following requirements:
   - Do not overfill cylinders to more than 80% volume liquid charge.
   - Do not exceed the maximum working pressure of the cylinder, even temporarily.
5. When the cylinders have been filled correctly and the process completed, ensure that the cylinders and the equipment are removed from the site promptly and that all isolation valves on the equipment are closed off. Adhere to the following requirements:
   - Process the recovered refrigerant according to local legislation in the correct recovery cylinder, and arrange the relevant waste transfer note.
   - Do not mix refrigerants in recovery units and especially not in cylinders.
   - Do not charge recovered refrigerant into another refrigerating system unless it has been cleaned and checked.
   - If removing compressors or compressor oils, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. Do not heat the compressor body by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it must be carried out safely.

- If you are servicing the unit, read Removing and evacuating refrigerant and Charging to get the refrigerant circuit to proper function. Before any other checks, follow the guidance in Detection of refrigerant to ensure safety.
- If you are decommissioning the unit, label the equipment stating that it has been decommissioned and emptied of refrigerant. Date and sign the label. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating that the equipment contains a flammable refrigerant.

## Competence of service personnel

Training on all required and relevant procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation. The achieved competence must be documented by a certificate. Training must include but is not limited to information about the following:

- The explosive potential of flammable refrigerants to show that flammables may be dangerous when handled without care
- Potential ignition sources especially those that are not obvious
- Safety concepts such as unventilated and ventilated enclosure and ventilated room
- Refrigerant detectors or detection sensors including a focus on the following:
  - Principle of function, including influences on the operation
  - Procedures for repairing, checking, or replacing a refrigerant detection sensor or parts of it in a safe way
  - Procedures for disabling a refrigerant detection sensor if repair work on the refrigerant carrying parts is needed
- The concept of sealed components and sealed enclosures
- Correct working procedures as outlined in Table 7

## Table 7: Correct working procedures

| Item number | Commissioning | Maintenance and repair | Decommissioning | Disposal |
|---|---|---|---|---|
| 1 | n/a | n/a | If safety is affected when the equipment is put out of service, the refrigerant charge must be removed before decommissioning. | n/a |
| 2 | Ensure that the total conditioned space floor area is sufficient for the refrigerant charge or that the ventilation duct is assembled correctly. | Ensure that there is sufficient ventilation at the equipment place. | | |
| 3 | Confirm that there is no refrigerant leak before doing any other commissioning or installation work. | Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible. | | n/a |
| 4 | Check safety equipment before putting it into service. | Discharge capacitors in a safe way that does not cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks. | | n/a |
| 5 | n/a | When brazing is required for A2L system, the following procedures must be carried out in the correct order:<br>1. Safely remove the refrigerant following local and national regulations. Follow the procedure outlined in Recovering refrigerant for servicing or decommissioning for recovery.<br>2. Purge the refrigerant circuit with oxygen-free nitrogen.<br>3. Remove parts that are to be replaced by cutting or brazing.<br>4. Continuously purge the braze point with nitrogen during the brazing procedure required for repair.<br>5. Perform a leak test.<br>6. Evacuate the refrigerant circuit.<br>7. Charge with refrigerant. | Safely remove the refrigerant following local and national regulations. Follow the procedure outlined in Recovering refrigerant for servicing or decommissioning for recovery. | |
| 6 | n/a | Reassemble sealed enclosures accurately. If seals are worn, replace them. | Fill with nitrogen up to atmospheric pressure. | Evacuate the refrigerant circuit and purge the refrigerant circuit with oxygen-free nitrogen. |
| 7 | n/a | Check safety equipment before putting it into service. | Put a label on the equipment indicating that the refrigerant is removed. | Cut out the compressor and drain the oil. Follow the procedure outlined in Recovering refrigerant for servicing or decommissioning for compressor and compressor oil treatment. |

## Wiring installation

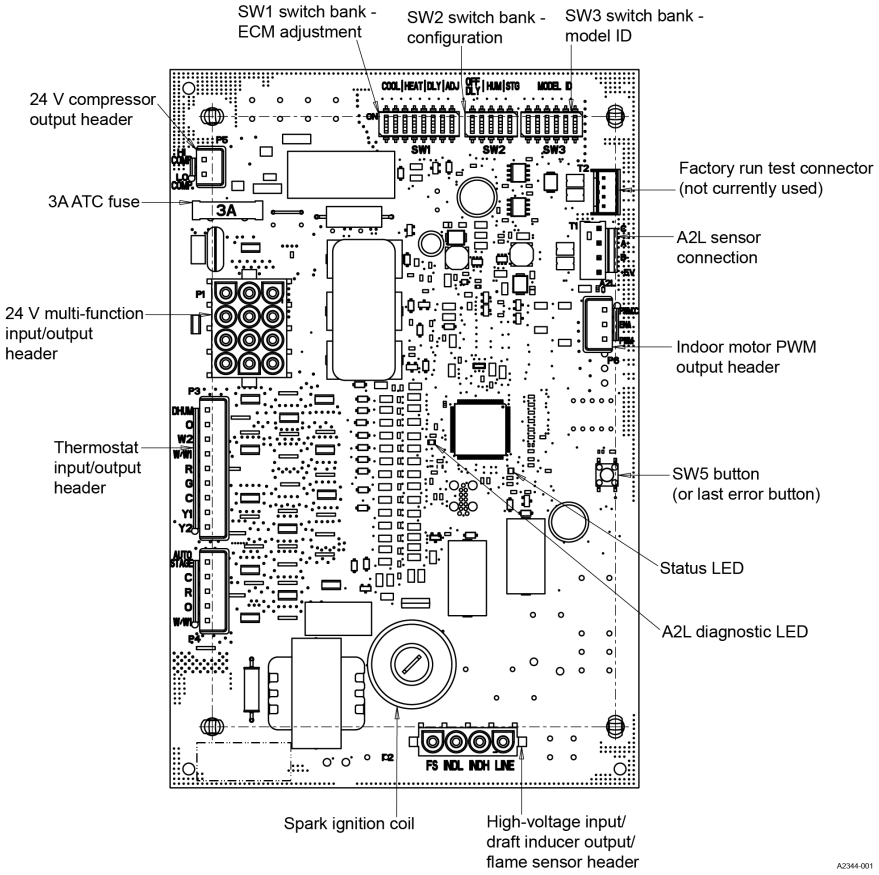
**NOTICE**

Cap unused wiring connections.

All PG5 units use the same two-stage direct spark ignition (DSI) control board, which is referred to as the main control board. The main control board includes an A2L diagnostic LED. For PG5E24 and PG5E36 units, the A2L mitigation logic is deactivated and the A2L diagnostic LED does not emit light even in the event of A2L refrigerant leakage because the unit charge is under 1.776 kg (3.915 lb). PG5E24 and PG5E36 units do not include an A2L sensor because they do not require an A2L mitigation system. The main control board does not adjust the blower airflow in the event of A2L refrigerant leakage because there is no compliance or safety concern.

For PG5E48 and PG5E60 units, the A2L mitigation logic is activated and the A2L diagnostic LED emits light in the event of detected A2L refrigerant leakage. There is an A2L sensor in each unit as part of the A2L mitigation system. The main control board waits 5 s for the signal to remain continuous before flagging the detected A2L refrigerant leakage fault. The main control board energizes the 95% pulse width modulation (PWM) speed for the blower while the A2L refrigerant leakage fault is active and continues to energize the 95% PWM speed for the blower for 5 min after the A2L refrigerant leakage detection signal is removed. All thermostat calls are ignored while the A2L refrigerant leakage fault is active and the main control board is continuously energizing the 95% PWM output for the blower. Figure 3 shows the control board layout for PG5 units.

**Figure 3: Control board layout**



### Field-testing the sensor and taking A2L mitigation actions

This task applies to PG5E48 and PG5E60 units.

1. After wiring and configuring the system, verify that the system is in standby mode.

   ⓘ **Note:** In standby mode, the status LED emits a slow green flash (or heartbeat) **and** the A2L diagnostic LED is off.

2. Simulate an A2L leak by disconnecting the A2L sensor wire from the main control board.
3. After 15 s, verify that the circulation fan is energized, which means that the indoor blower motor is turned on. Confirm that the status LED is emitting 2 red flashes **and** the A2L diagnostic LED is showing solid red.
4. Reinstall the A2L sensor wire, then wait 15 s and verify that the system returns to standby mode.
5. When the system is in standby mode, use the thermostat to call for first-stage cooling or second-stage cooling. First-stage cooling is a G and Y1 call and second-stage cooling is a G and Y1 + Y2 call. Then, test the system during cooling operation as follows:
   a. Let the system run for 5 min.
   b. Simulate an A2L leak by disconnecting the A2L sensor wire from the main control board.
   c. After 15 s, verify that the compressor shuts off, the outdoor fan shuts off, and only the indoor blower motor is still running.
   d. Reinstall the A2L sensor wire, then wait 15 s and verify that the system returns to cooling operation and the compressor, outdoor fan, and indoor blower motor run. Let the system run for 5 min.
6. Use the thermostat to put the system in standby mode.
7. When the system is in standby mode, use the thermostat to call for first-stage heating or second-stage heating if applicable. First-stage heating is a W call and second-stage heating is a W1 + W2 call. Then, test the system during heating operation as follows:
   a. Let the system run for 5 min.
   b. Simulate an A2L leak by disconnecting the A2L sensor wire from the main control board.
   c. After 15 s, verify that the gas heat shuts off and only the indoor blower motor is still running.
   d. Reinstall the A2L sensor wire, then wait 15 s and verify that the system returns to heating operation and the gas heat and indoor blower motor run. Let the system run for 5 min.
8. When testing is complete, put the controls access panel on until it is time for more testing of the unit normal operation.

## Understanding status LED and A2L diagnostic LED codes

PG5E48 and PG5E60 units include an A2L sensor and an AL2 diagnostic LED as shown in Figure 3. For PG5E48 and PG5E60 units, the A2L mitigation logic is activated and the A2L diagnostic LED works with the status LED on the main control board. See Using unit control board diagnostics and Table 40 for an overview of the status LED and A2L diagnostic LED codes and troubleshooting guidance for A2L-related faults.

ⓘ **Note:** PG5E24 and PG5E36 units do not include an A2L sensor because they do not require an A2L mitigation system. For these units, the A2L mitigation logic is deactivated and the A2L diagnostic LED does not emit light.

# Model number nomenclature

### Table 8: Model nomenclature description

| Number | Category | Option | Description |
|---|---|---|---|
| 1, 2 | Model type | PG | Packaged air conditioner with gas heat |
| | | PD | Packaged heat pump with gas heat |
| | | PC | Packaged air conditioner with optional electric heat |
| | | PH | Packaged heat pump with optional electric heat |
| 3 | Efficiency | 3 | 13.4 SEER2 |
| | | 5 | 15.2 SEER2 |
| 4 | Refrigerant | E | R-454B |
| 5, 6 | Nominal capacity (Btu/h x 1000) | 24 | 24,000 Btu/h or 2 ton |
| | | 30 | 30,000 Btu/h or 2.5 ton |
| | | 36 | 36,000 Btu/h or 3 ton |
| | | 42 | 42,000 Btu/h or 3.5 ton |
| | | 48 | 48,000 Btu/h or 4 ton |
| | | 60 | 60,000 Btu/h or 5 ton |
| 7 | Heat type | L | Low NOx <40ng/J |
| | | U | ULNx <14ng/J |
| | | N | Electric heat |
| 8, 9 | Gas heating input (Btu/h x 1000) | 05 | 50,000 Btu/h |
| | | 06 | 65,000 Btu/h |
| | | 07 | 75,000 Btu/h |
| | | 10 | 100,000 Btu/h |
| | | 12 | 125,000 Btu/h |
| | | 00 | Electric heat |
| 10 | Control strategy | C | Communicating |
| | | B | Wireless, communicating |
| | | S | Standard, conventional |
| | | W | Wireless, conventional |
| 11 | Voltage (V-phase-Hz) | 2 | 208/230-1-60 |
| | | 3 | 208/230-3-60 |
| | | 4 | 460-3-60 |
| 12 | Generation | 1 | First generation |
| | | 2 | Second generation |
| | | 3 | Third generation |
| | | 4 | Fourth generation |
| 13 | Style | A | Style A |
| | | B | Style B |
| | | C | Style C |
| | | D | Style D |

## Model number nomenclature example

### Table 9: Model number nomenclature example

| Number | 1, 2 | 3 | 4 | 5, 6 | 7 | 8, 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|
| Option | PG | 5 | E | 24 | L | 05 | S | 2 | 1 | A |

The PG5E24L05S21A model is a two-stage packaged air conditioner with gas heat. It has a 15.2 SEER2 efficiency rating and uses R-454B refrigerant. It has a nominal capacity of 24,000 Btu/h or 2 ton for cooling. It produces <40ng/J Low NOx emissions and has a gas heating input of 50,000 Btu/h. It uses a standard control strategy and voltage of 208 V/230 V, single phase, 60 Hz. It is a first generation, style A model.

# Installation

Complete all installation stages. You may not need to perform some tasks outlined, depending on the specific installation. See Unit components and operation to familiarize yourself with unit components and system operation as required, and see Troubleshooting if needed.

**Important:** See A2L refrigerant safety guidance and follow procedures as required.

# Preparing for installation

Complete the necessary preparation before you begin the installation:

## Selecting a location for installation

Before starting the installation, you must select a suitable location for the unit. You can install the unit on a roof or on the ground.

**WARNING**

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

**WARNING**

Do not permit overhanging structures or shrubs to obstruct outdoor air discharge outlet.

**Important:** The unit is designed for only outdoor installation.

To select a location for installation, do the following:

- Select a location for the unit that meets the following general requirements for installation:
  - Provides the outdoor coil with an unlimited supply of air. Where a choice of location is available, position the unit on either the north or east side of the building.
  - Allows you to maintain all required clearances, for example, for combustible construction, servicing, correct unit operation, and adequate combustion and ventilation air.
  - Allows you to maintain level tolerance to 1/8 in. across the entire width and length of the unit.
- Select a location for the unit that meets any requirements that are specific to the type of installation as outlined in Table 10.

**Table 10: Additional location requirements for each type of installation**

| Type of installation | Additional location requirements |
|---|---|
| Ground installation | • The location of the unit allows you to install the unit on a level equipment pad or concrete slab. |
| Roof installation | • The location of the unit allows you to install the unit on a solid, level roof curb or an appropriate angle iron frame.<br>• The roof structure is able to support the weight of the unit and its options and accessories. |

# Providing the required clearances

You must provide all required clearances, for example, for combustible construction, servicing, correct unit operation, and adequate combustion and ventilation air.

**⚠ WARNING**

Do not permit overhanging structures or shrubs to obstruct outdoor air discharge outlet.

To provide the required clearances, do the following:

- Make provisions for adequate combustion and ventilation air in accordance with the following:
  - **US**: Section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 - latest edition and applicable provisions of local building codes
  - **Canada**: Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 - latest edition and applicable provisions of local building codes
- Provide clearances in accordance with Unit clearances.

## Unit clearances

**Table 11: Unit clearances**

| Direction | Distance (in.) | Direction | Distance (in.) |
|---|---|---|---|
| Top | 36 | Power entry (right side) | 36 |
| Side opposite ducts | 36 | Left side | 24 |
| Duct panel | 6 | Bottom | 1 |

**Note:**
- Provide a 1 in. clearance between any combustible material and the supply air ductwork.
- Do not allow the products of combustion to accumulate within a confined space and recirculate.
- Install units outdoors. Make sure that overhanging structures or shrubs do not obstruct the outdoor air discharge outlet.
- You can install units on combustible materials made from wood or class A, B, or C roof covering materials if the factory base rails are left in place as shipped.

# Inspecting the unit

1. Inspect the unit immediately after receiving it for possible damage during transit.
2. If damage is evident, do the following:
   a. Note the extent of any damage on the carrier's receipt.
   b. Make a separate written request for the carrier's agent to inspect the unit.
   c. Contact your local distributor for more information.

# Rigging and handling the unit

**⚠ CAUTION**

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

**⚠ CAUTION**

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

To rig and handle the unit, do the following:

- Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation.
- Use the slotted openings in the base rails if moving or lifting the unit with a forklift.
- Use Figure 4 and Table 12 to determine the required capacity of lifting gear to use.

**Figure 4: Center of gravity**

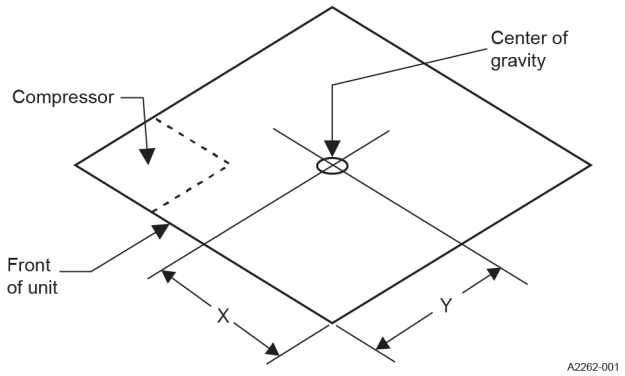



**Table 12: Weights and dimensions**

| Model | Weight (lb) | | Center of gravity (in.) | |
|---|---|---|---|---|
| | Shipping | Operating | X | Y |
| PG5E24L05S2 | 339 | 334 | 28 | 14 |
| PG5E24L07S2 | 345 | 340 | 27 | 15 |
| PG5E36L07S2 | 373 | 368 | 28 | 15 |
| PG5E36L10S2 | 385 | 380 | 28 | 15 |
| PG5E48L06S2 | 447 | 442 | 28 | 18 |
| PG5E48L10S2 | 455 | 450 | 28 | 18 |
| PG5E48L12S2 | 461 | 456 | 28 | 18 |
| PG5E60L06S2 | 460 | 455 | 28 | 18 |
| PG5E60L12S2 | 473 | 468 | 28 | 19 |

- Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails.
- Use spreader bars across the top of the unit. The length of the spreader bars must exceed the unit's longest width.

# Understanding installation and operation limitations

- Install the unit in accordance with the following national and local safety codes:
  - **US**
    - National Electrical Code, ANSI/NFPA No. 70 - latest edition
    - National Fuel Gas Code, ANSI Z223.1 - latest edition
    - Gas-Fired Central Furnace Standard, ANSI Z21.47a. - latest edition
    - Local building codes
    - Local gas utility requirements
  - **Canada**
    - Canadian Electrical Code, CSA C22.1
    - Installation Codes, CSA - B149.1
    - Local plumbing and wastewater codes
    - Other applicable local codes

  ⓘ **Note:** If it is necessary to add components to a unit to meet local codes, installation is done at the dealer's or the customer's expense.
- Observe the unit limitations shown in Table 13.
- Observe the application limitations shown in Table 14.
- Observe the physical data for the unit shown in Table 15.
- Observe the electrical data for the unit shown in Table 19.
- Make sure that the size of the unit for proposed installation is based on heat loss or heat gain calculations made in accordance with industry-recognized procedures such as the procedures of the Air Conditioning Contractors of America (ACCA). Refer to *Manual J*.
- After installation, adjust gas-fired units to obtain a temperature rise within the range specified on the unit rating plate.
- Do not use this furnace for temporary heating of buildings or structures under construction.

## Unit limitations

**Table 13: Unit limitations**

| Model | Voltage (V-phase-Hz) | Unit limitations | | |
|---|---|---|---|---|
| | | Applied voltage (V) | | Outdoor DB temperature (°F) |
| | | Minimum | Maximum | Maximum |
| PG5E24<br>PG5E36<br>PG5E48<br>PG5E60 | 208/230-1-60 | 187 | 252 | 125 |

## Application limitations

**Table 14: Application limitations**

| Model | Air temperature at outdoor coil (°F) | | | | Air temperature at indoor coil (°F) | | | |
|---|---|---|---|---|---|---|---|---|
| | Minimum | | Maximum | | Minimum | | Maximum | |
| | DB cool | DB heat | DB cool | DB heat | WB cool | DB heat | WB cool | DB heat |
| PG5E24<br>PG5E36<br>PG5E48<br>PG5E60 | 55 | — | 125 | — | 57 | 55 | 72 | 80 |

# Physical data

## Table 15: Physical data

| Model | | PG5E24L05 | PG5E24L07 | PG5E36L07 | PG5E36L10 | PG5E48L06 | PG5E48L10 | PG5E48L12 | PG5E60L06 | PG5E60L12 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal tonnage** | | **2.0** | **2.0** | **3.0** | **3.0** | **4.0** | **4.0** | **4.0** | **5.0** | **5.0** |
| **Refrigerant information** | **Refrigerant type** | R-454B | R-454B | R-454B | R-454B | R-454B | R-454B | R-454B | R-454B | R-454B |
| | **Refrigerant charge (lb-oz)** | 2-8 | 2-8 | 3-11 | 3-11 | 4-7 | 4-7 | 4-7 | 5-3 | 5-3 |
| **AHRI gas heat performance** | **Heating model** | 50 | 75 | 75 | 100 | 65 | 100 | 125 | 65 | 125 |
| | **Heat input - high fire (kBtu)** | 50 | 75 | 75 | 100 | 65 | 100 | 125 | 65 | 125 |
| | **Heat output - high fire (kBtu)** | 40 | 60 | 60 | 81 | 52 | 81 | 101 | 52 | 101 |
| | **Heat input - low fire (kBtu)** | 33 | 49 | 49 | 65 | 43 | 65 | 82 | 43 | 82 |
| | **Heat output - low fire (kBtu)** | 26 | 39 | 39 | 53 | 34 | 53 | 66 | 34 | 66 |
| | **AFUE (%)** | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 |
| | **Number of burners** | 2 | 3 | 3 | 4 | 2 | 3 | 4 | 2 | 4 |
| | **Number of stages** | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| | **Temp. rise range - high fire (°F)** | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 | 40 to 70 |
| | **Temp. rise range - low fire (°F)** | 20 to 50 | 20 to 50 | 20 to 50 | 25 to 55 | 25 to 55 | 25 to 55 | 25 to 55 | 25 to 55 | 25 to 55 |
| | **Maximum static pressure (in. W.C.)** | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | **Maximum outlet air temp. (°F)** | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| | **Gas piping connection (in.)** | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| **Dimensions** | **Length (in.)** | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 | 51 1/4 |
| | **Width (in.)** | 35 3/4 | 35 3/4 | 35 3/4 | 35 3/4 | 45 3/4 | 45 3/4 | 45 3/4 | 45 3/4 | 45 3/4 |
| | **Height (in.)** | 44 | 44 | 47 | 47 | 47 | 47 | 47 | 50 | 50 |
| **Operating weight (lb)** | | 334 | 340 | 368 | 380 | 442 | 450 | 456 | 455 | 468 |
| **Compressor** | **Type** | Scroll | Scroll | Scroll | Scroll | Scroll | Scroll | Scroll | Scroll | Scroll |
| | **Number of stages** | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Outdoor coil data** | **Face area (sq ft)** | 12.3 | 12.3 | 15.3 | 15.3 | 17.5 | 17.5 | 17.5 | 21.1 | 21.1 |
| | **Rows** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | **Fins per inch** | 21 | 21 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| | **Tube diameter (mm)** | 12 | 12 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| | **Coil type** | Microchannel | Microchannel | Microchannel | Microchannel | Microchannel | Microchannel | Microchannel | Microchannel | Microchannel |
| **Indoor coil data** | **Face area (sq ft)** | 4.6 | 4.6 | 4.6 | 4.6 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| | **Rows** | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| | **Fins per inch** | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| | **Tube diameter (in.)** | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 |
| | **Circuitry type** | Straight | Straight | Straight | Straight | Straight | Straight | Straight | Straight | Straight |
| | **Refrigerant control** | TXV | TXV | TXV | TXV | TXV | TXV | TXV | TXV | TXV |
| | **Coil type** | Finned tube | Finned tube | Finned tube | Finned tube | Finned tube | Finned tube | Finned tube | Finned tube | Finned tube |
| **Outdoor fan data** | **Fan diameter (in.)** | 24 | 24 | 24 | 24 | 26 | 26 | 26 | 26 | 26 |
| | **Type** | Propeller | Propeller | Propeller | Propeller | Propeller | Propeller | Propeller | Propeller | Propeller |
| | **Drive type** | Direct | Direct | Direct | Direct | Direct | Direct | Direct | Direct | Direct |
| | **Number of speeds** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | **Motor (hp)** | 1/8 | 1/8 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 | 1/3 |
| | **RPM** | 790 | 790 | 850 | 850 | 850 | 850 | 850 | 850 | 850 |
| | **Nominal total CFM** | 2400 | 2400 | 2400 | 2400 | 3200 | 3200 | 3200 | 3200 | 3200 |
| **Direct drive indoor blower data** | **Blower size (in.)** | 11 x 8 | 11 x 8 | 11 x 10 | 11 x 10 | 11 x 10 | 11 x 10 | 11 x 10 | 11 x 10 | 11 x 10 |
| | **Type** | Centrifugal | Centrifugal | Centrifugal | Centrifugal | Centrifugal | Centrifugal | Centrifugal | Centrifugal | Centrifugal |
| | **Motor (hp)** | 1/3 | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 3/4 | 1 | 1 |
| | **RPM (maximum)** | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 | 1400 |
| | **Frame size (in.)** | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 |
| **Filter size** | | A | A | A | A | B | B | B | B | B |

**Note:** You must size field-supplied external filters so as not to exceed 300 fpm air velocity through disposable filters. For internal filter use, an air filter frame kit is available for field installation. Refer to the instructions supplied with the kit for replacement filter sizes. Filter size A is 20 in. x 20 in. Filter size B is 20 in. x 30 in.

# Becoming familiar with the unit dimensions

- Make sure that you are familiar with the unit dimensions before you begin the installation. See Figure 5 and Table 16.

## Unit dimensions and access locations

**Figure 5: Unit dimensions and access locations**

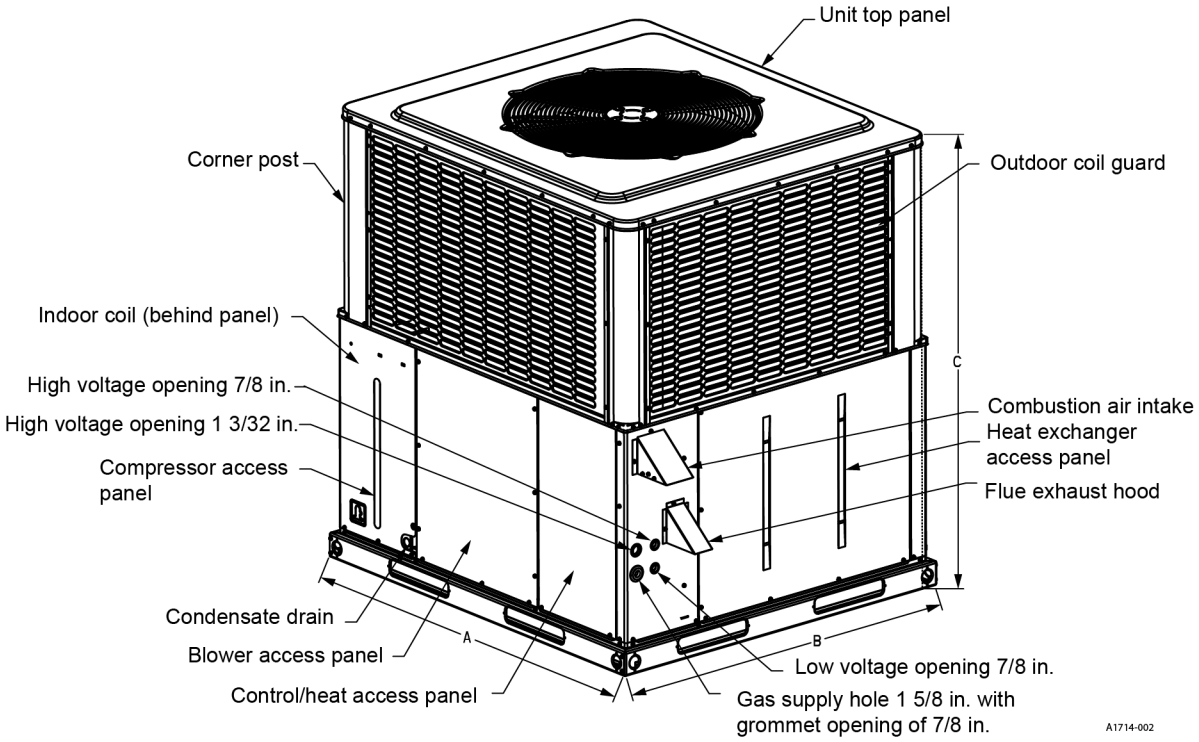



**Table 16: Unit dimensions**

| Model | Dimensions (in.) | | |
|---|---|---|---|
| | A | B | C |
| PG5E24 | 51 1/4 | 35 3/4 | 44 |
| PG5E36 | 51 1/4 | 35 3/4 | 47 |
| PG5E48 | 51 1/4 | 45 3/4 | 47 |
| PG5E60 | 51 1/4 | 45 3/4 | 50 |

# Installing the unit

There are two installation options for the unit: ground installation or roof installation. You must follow all requirements for the specific type of installation.

**Important:** If the unit is received with unpainted, uninsulated covers installed on the rear duct openings, you must discard those covers.

## Designing and installing the ductwork

You may need to design and install ductwork, depending on the specific installation, for example, in a new construction.

To design and install the ductwork, do the following:

- Design and size ductwork according to the methods of the Air Conditioning Contractors of America (ACCA), as outlined in their *Manual D*.
- Always consider filter size, type, and pressure drop during duct system design. Correct filter sizing is very important.
- Use a closed return duct system. This does not preclude use of economizers or ventilation air intake.

## Using an existing duct system

- Check that the ductwork meets requirements and is correctly sized, and adjust the ductwork if needed. See Designing and installing the ductwork for more information about requirements.

## Adapting the unit for downflow application

You can adapt the unit for downflow application if needed.

To adapt the unit for downflow application, do the following:

1. Remove the duct covers from the bottom return and supply air duct openings. Save the four screws securing each duct cover to use in Step 3.
2. If the unit has unpainted, uninsulated covers installed on the rear duct openings, discard those covers. You must use the insulated duct covers from the bottom duct openings.
3. Install the duct covers removed in Step 1 to the rear supply and return air duct openings. Secure the duct covers with the four screws removed in Step 1.
4. Seal the duct covers with silicone caulk.

## Setting the unit on the ground

**Before you begin:**
Make sure that the location you have selected for the unit is suitable.

For ground installation, you must use a level equipment pad or concrete slab. The thickness and size of the equipment pad or concrete slab must meet local codes and support the weight of the unit. Do not tie the equipment pad or concrete slab to the building foundation.

To set the unit on the ground, do the following:

1. Position the equipment pad or concrete slab so the unit is level.
2. Set the unit on the equipment pad or concrete slab.

## Setting the unit on a roof

**Before you begin:**
Make sure that the location you have selected for the unit is suitable.

For roof installation, you must use a solid, level roof curb or an appropriate angle iron frame.

**⚠ CAUTION**

If a unit is to be installed on a roof curb other than a BHC Group Heating & Cooling roof curb, gasket or sealant must be applied to all surfaces that come in contact with the unit underside.

To set the unit on the roof, do the following:

1. Position the roof curb or iron frame so the unit is level.
2. Set the unit on the roof curb or iron frame.

## Connecting the unit to the ductwork

**⚠ WARNING**

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

**⚠ CAUTION**

When fastening duct work to the side duct flanges on the unit, insert the screws through the duct flanges only. **Do not** insert the screws through the casing. Seal the ductwork to the unit using duct mastic. Outdoor ductwork must be insulated and waterproofed.

**NOTICE**

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

**NOTICE**

Be sure to note supply and return openings.

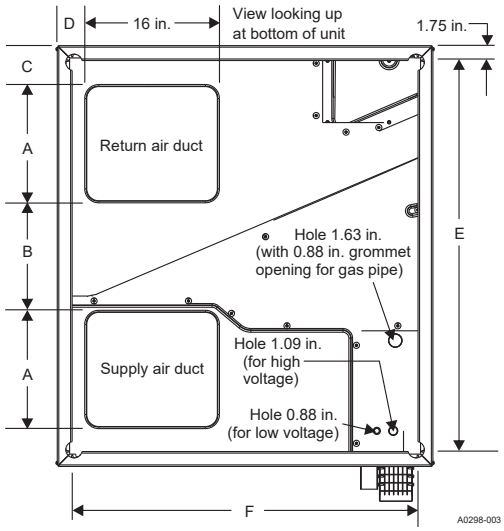
To connect the unit to the ductwork, do the following:

- Use flexible duct connectors in the supply and return ductwork to minimize the transmission of vibration and noise.

- Observe the information about bottom and rear supply and return air duct openings in Figure 6, Table 17, Figure 7, and Table 18.

## Bottom duct dimensions

### Figure 6: Bottom duct dimensions (in.)

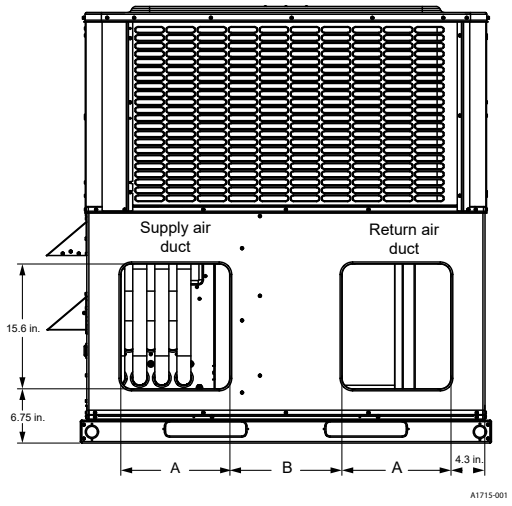



### Table 17: Bottom duct dimensions

| Model | A (in.) | B (in.) | C (in.) | D (in.) | E (in.) | F (in.) |
|---|---|---|---|---|---|---|
| PG5E24 and PG5E36 | 10 | 21.5 | 5 | 4.5 | 47.5 | 32 |
| PG5E48 and PG5E60 | 14 | 13.5 | 5 | 3.5 | 47.5 | 42 |

## Rear duct dimensions

### Figure 7: Rear duct dimensions (in.)




### Table 18: Rear duct dimensions

| Model | A (in.) | B (in.) |
|---|---|---|
| PG5E24 and PG5E36 | 9.6 | 22 |
| PG5E48 and PG5E60 | 13.6 | 14 |
| **Note:** See Figure 5 for side hole sizes of electrical and gas lines. | | |

## Installing the air filter

Single-phase units are shipped without air filters or an air filter frame kit. You must install an air filter or an air filter frame kit.

**Important:**

- One air filter is typically used, but this depends on the specific installation.
- Make sure that the air filter size is correct.
- It is essential to always use air filters and keep air filters clean. When air filters become dirty, insufficient air is delivered by the blower, decreasing the unit's efficiency and increasing operating costs and deterioration of the unit and controls.

To install the air filter, do the following:

- Secure an air filter in the return air ductwork or inside the conditioned space at the return air opening, **or** install an air filter frame kit using the installation procedure in the *Installation Manual* provided with the kit.

## Installing a condensate trap

You must install a condensate trap for the unit. The plumbing must conform to local codes.

**⚠ CAUTION**

Hand tighten only.

To install a condensate trap, do the following:

- Install a condensate trap in the condensate drain.

# Connecting the wiring

Follow all requirements when connecting the unit wiring, and see Table 19, Wiring diagrams, and Humidistat feature as needed.

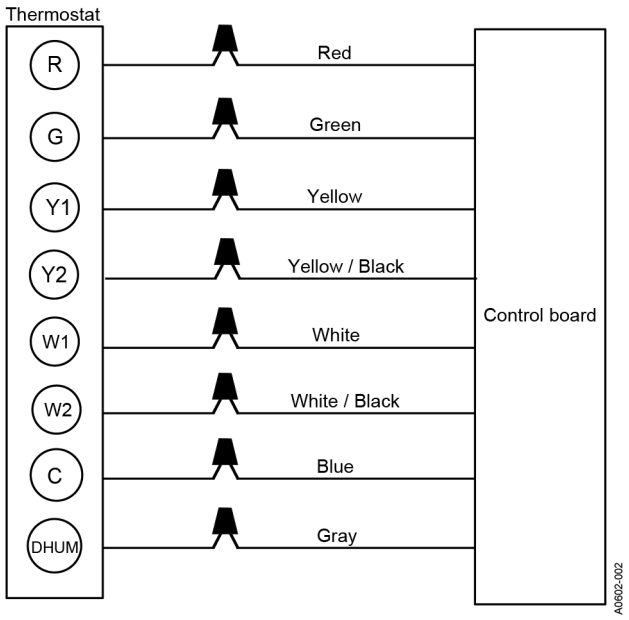
## Completing the power and control wiring

Make sure that all field wiring to the unit conforms to provisions of the current NEC ANSI/NFPA No. 70 or CEC and/or local ordinances. The unit must be electrically grounded in accordance with local codes or, in their absence, with the NEC/CEC. See Table 19 for unit electrical data as needed.

To complete the power and control wiring, do the following:

- See Figure 5, which shows where wiring enters the unit.
- Use Figure 8 and Figure 9, which show typical field wiring, as a guide, and refer to the appropriate unit wiring diagram for control circuit and power wiring information. See Wiring diagrams.

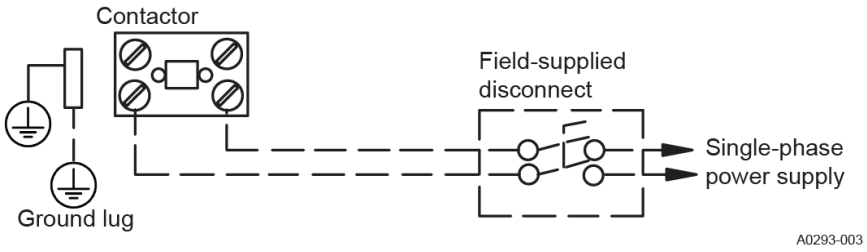
**Figure 8: Typical field control wiring diagram for gas heat - residential packaged AC models**




**Note:**

- Use a minimum wire size of 18 AWG wire for all field-installed control wiring.
- Set the heat anticipator at 0.35 A for all unit models.

**Figure 9: Typical field power wiring diagram**




**Note:** Use Table 19 to size the disconnect switch.

- Observe the voltage tolerances that must be maintained at the compressor terminals during starting and running conditions as outlined on the unit rating plate and in Table 13.
- Provide the wiring entering the unit cabinet with mechanical strain relief.
- Install a fused disconnect switch for the unit.

**Note:** The fused disconnect switch is field provided.

- If you need to replace any of the wire supplied with the unit, make sure that the replacement wire is the type shown on the wiring diagrams. See Wiring diagrams.
- Make sure that the electrical service is sized correctly to carry the load. The unit must be wired with a separate branch circuit fed directly from the main distribution panel and correctly fused.
- Be aware that the unit comes wired for 230 V power. If the supply power is 208 V, move wires connected to the control transformer 230 V tap to the 208 V tap.

# Connecting the thermostat

**Important:**

- The unit contains a multistage cooling compressor, and has two stages of gas heat and two stages of electric cooling. The unit can be controlled using a single-stage heat or single-stage cool (1H/1C) thermostat, but second-stage cooling is not available unless the main control board is physically wired for full capacity cooling operation. For optimum performance, it is best practice to use a two-stage heat/two-stage cool (2H/2C) thermostat. If a single-stage thermostat is used, you must configure the auto heat staging feature on the main control board to control the high and low gas heat input staging. See Configuring auto heat staging.
- Do not use a power-stealing thermostat.
- If using an electronic thermostat, make sure that it has a 24 V common connection.

To connect the thermostat, do the following:

1. Locate the room thermostat on an inside wall approximately 60 in. above the floor where it is not subject to drafts, sun exposure, or heat from electrical fixtures or appliances.
2. Use sealant behind the thermostat to prevent air infiltration.
3. Install the thermostat in accordance with the installation instructions for the thermostat provided by the manufacturer.
4. Use color-coded insulated wires that are No. 18 AWG minimum to connect the thermostat to the unit. See Figure 8.

# Electrical data

**Table 19: Electrical data for 208/230-1-60**

| Model | Voltage (V-phase-Hz) | Compressor | | | Outdoor fan motor | Supply blower motor | MCA | MOP |
|---|---|---|---|---|---|---|---|---|
| | | RLA | LRA | MCC | FLA | FLA | A | A |
| PG5E24L05 | 208/230-1-60 | 10.3 | 62 | 16 | 0.8 | 4.8 | 18.4 | 25 |
| PG5E24L07 | 208/230-1-60 | 10.3 | 62 | 16 | 0.8 | 4.8 | 18.4 | 25 |
| PG5E36L07 | 208/230-1-60 | 14.6 | 90 | 22.7 | 1.7 | 4.8 | 24.7 | 35 |
| PG5E36L10 | 208/230-1-60 | 14.6 | 90 | 22.7 | 1.7 | 6.8 | 26.7 | 40 |
| PG5E48L06<br>PG5E48L10<br>PG5E48L12 | 208/230-1-60 | 18.3 | 138 | 28.6 | 1.7 | 6.8 | 31.4 | 45 |
| PG5E60L06<br>PG5E60L12 | 208/230-1-60 | 23.7 | 123 | 37 | 1.7 | 8.0 | 39.3 | 60 |

**Note:**

- 208/230-1-60 indicates 208 V/230 V, single phase, 60 Hz.
- MCA indicates minimum circuit ampacity.
- MOP indicates maximum overcurrent protection device. This must be a HACR circuit breaker or time delay fuse. The maximum overcurrent protection must be in accordance with the UL 60335-2-40 standard (fourth edition).

# Setting up the gas heating

Follow all requirements when setting up the gas heating components. See Table 23 for natural gas application data and Table 24 for propane (LP) gas application data.

## Converting the unit for operation with propane gas

The unit is constructed at the factory for natural gas-fired operation. To convert the furnace for operation with propane gas, you must use a propane (LP) conversion accessory kit. See Table 24 for the correct propane (LP) conversion kit to install for the specific unit model. Refer to *Applications and accessories* in the *Technical Guide* for more information.

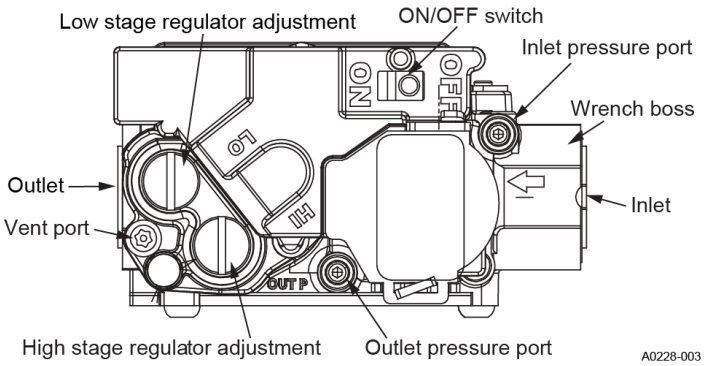
To convert the unit for operation with propane gas, do the following:

- Follow the installation procedure in the *Installation Manual* for the propane (LP) conversion kit.

## Installing the gas piping

See Figure 10 for the gas valve components.

**Figure 10: Gas valve**




To install the gas piping, do the following:

- Bring gas piping to connect the gas supply mains to the inlet port of the gas valve.
- Be aware that correct sizing of gas piping depends on the cubic feet per hour of gas flow required, the specific gravity of the gas, and the length of run. Follow National Fuel Gas Code Z223.1 or CSA B149.1 in all cases unless superseded by local codes or gas company requirements. See Table 20 and Table 21.

**NOTICE**

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

- Be aware that the Btu content of the gas may differ with locality. Check the value with the local gas utility.
- Route the gas supply line through the 1 5/8 in. hole located on the right side of the unit. See Figure 5 for the location. The unit is supplied with a rubber grommet that fits in this hole and is used to seal around the gas pipe.

  **Important:** Install the rubber grommet to prevent leakage of air and water into the heating/controls compartment.

- Install a drip leg and a ground joint union in the gas piping.
- When required by local codes, install a manual shutoff valve outside of the unit.
- Use wrought iron or steel pipe for all gas lines. Apply pipe thread sealant sparingly to male threads only.

**⚠ CAUTION**

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

**⚠ WARNING**

Natural gas may contain some propane. Propane, being an excellent solvent, will quickly dissolve white lead or most standard commercial compounds. Therefore, a special pipe thread sealant must be applied when wrought iron or steel pipe is used. Compounds such as RectorSeal No. 5 or equivalent compounds may be used.

- Clean all piping of dirt and scale by hammering on the outside of the pipe and blowing out the loose dirt and scale. Before initial start-up, ensure that all of the gas lines external to the unit have been purged of air.
- Be aware that the gas supply must be a separate line and installed in accordance with all applicable safety codes. After the gas connections have been completed, open the main shutoff valve admitting normal gas pressure to the gas valve. Check all joints for leaks with soap solution or other material suitable for the purpose. **Never test for gas leaks with an open flame.**

**⚠ WARNING**

**FIRE OR EXPLOSION HAZARD**

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

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

- Disconnect the unit and its equipment shutoff valve from the gas supply system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.5 kPa).
- Isolate the unit from the gas supply piping system by closing its individual manual shut-off valve before conducting any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5 kPa).

## Natural gas pipe sizing

**Table 20: Natural gas pipe sizing**

| Length (ft) | Iron pipe size in nominal inches | | | |
|---|---|---|---|---|
| | 1/2 in. | 3/4 in. | 1 in. | 1 1/4 in. |
| 10 | 132 | 278 | 520 | 1050 |
| 20 | 92 | 190 | 350 | 730 |
| 30 | 73 | 152 | 285 | 590 |
| 40 | 63 | 130 | 245 | 500 |
| 50 | 56 | 115 | 215 | 440 |

### Table 20: Natural gas pipe sizing

| Length (ft) | Iron pipe size in nominal inches | | | |
|---|---|---|---|---|
| | 1/2 in. | 3/4 in. | 1 in. | 1 1/4 in. |
| 60 | 50 | 105 | 195 | 400 |
| 70 | 46 | 96 | 180 | 370 |
| 80 | 43 | 90 | 170 | 350 |
| 90 | 40 | 84 | 160 | 320 |
| 100 | 38 | 79 | 150 | 305 |
| ⓘ **Note:** Maximum capacity of pipe in cubic feet of gas per hour, based upon a pressure drop of 0.3 in. W.C. and 0.6 specific gravity gas. | | | | |

## Propane (LP) gas pipe sizing

### Table 21: Propane (LP) gas pipe sizing

| Length (ft) | Iron pipe size in nominal inches | | | |
|---|---|---|---|---|
| | 1/2 in. | 3/4 in. | 1 in. | 1 1/4 in. |
| 10 | 275 | 567 | 1071 | 2205 |
| 20 | 189 | 393 | 732 | 1496 |
| 30 | 152 | 315 | 590 | 1212 |
| 40 | 129 | 267 | 504 | 1039 |
| 50 | 114 | 237 | 448 | 913 |
| 60 | 103 | 217 | 409 | 834 |
| 70 | 96 | 196 | 378 | 771 |
| 80 | 89 | 185 | 346 | 724 |
| 90 | 83 | 173 | 322 | 677 |
| 100 | 78 | 162 | 307 | 630 |
| ⓘ **Note:** Maximum capacity of pipe in thousands of Btu/h, based upon a pressure drop of 0.5 in. W.C. | | | | |

# Meeting requirements for high-altitude applications

The unit is constructed at the factory for natural gas-fired operation at altitudes up to 2,000 ft above sea level.

If the unit is installed at an altitude above 2,000 ft, do the following:

- Reduce the gas input rate to the burners by 4% per 1,000 ft above sea level.
- Be aware that it may be necessary to change to smaller orifices at high altitude. See Table 22 for the correct orifice size to use.

## High-altitude gas orifice sizing

### Table 22: High-altitude gas orifice sizing

| Gas type | Model | Cabinet size | Elevation above sea level (ft) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 to 2,000 (Factory) | 2,001 to 3,000 | 3,001 to 4,000 | 4,001 to 5,000 | 5,001 to 6,000 | 6,001 to 7,000 | 7,001 to 8,000 | 8,001 to 9,000 | 9,001 to 10,000 |
| Natural gas orifice sizes | PG5E48L06<br>PG5E48L10<br>PG5E48L12<br>PG5E60L06<br>PG5E60L12 | B | 36 | 37 | 38 | 38 | 39 | 40 | 41 | 41 | 42 |
| | PG5E24L05<br>PG5E24L07<br>PG5E36L07<br>PG5E36L10 | A | 42 | 42 | 43 | 43 | 43 | 44 | 44 | 45 | 46 |

### Table 22: High-altitude gas orifice sizing

| Gas type | Model | Cabinet size | Elevation above sea level (ft) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 to 2,000 (Factory) | 2,001 to 3,000 | 3,001 to 4,000 | 4,001 to 5,000 | 5,001 to 6,000 | 6,001 to 7,000 | 7,001 to 8,000 | 8,001 to 9,000 | 9,001 to 10,000 |
| Propane (LP) gas orifice sizes | PG5E48L06<br>PG5E48L10<br>PG5E48L12<br>PG5E60L06<br>PG5E60L12 | B | 51 | 51 | 52 | 52 | 52 | 52 | 53 | 53 | 53 |
| | PG5E24L05<br>PG5E24L07<br>PG5E36L07<br>PG5E36L10 | A | 54 | 54 | 55 | 55 | 55 | 55 | 55 | 56 | 56 |

**Note:** PG5E24 and PG5E36 units are cabinet size A, and PG5E48 and PG5E60 units are cabinet size B.

# Installing the flue exhaust hood and air intake hood

The flue exhaust hood and air intake hood are shipped loose. You must install these hoods to ensure correct unit operation.

**WARNING**

Flue exhaust hood surfaces may be hot.

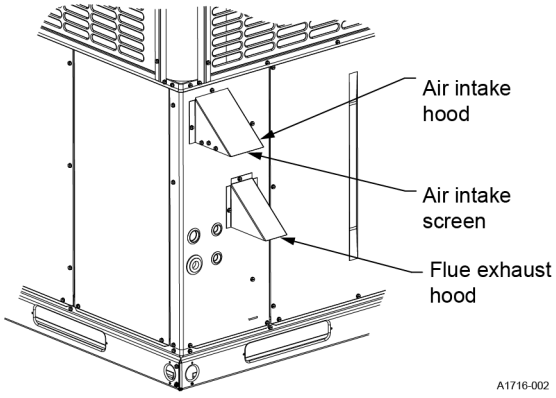
**CAUTION**

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

To install the flue exhaust hood and air intake hood, do the following:

- Fasten the hoods to the outside of the side gas control/electrical compartment with the screws provided. See Figure 11.

**Figure 11: Flue exhaust hood and air intake hood**



# Natural gas application data

### Table 23: Natural gas application data

| Model | Input - high fire/low fire (MBH) | Output - high fire/low fire (MBH) | Gas rate - high fire/low fire ($ft^3/h$) | Number of burners | Temperature rise - high fire (°F) | | Temperature rise - low fire (°F) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum | Maximum | Minimum | Maximum |
| PG5E24 - 2 ton | 50/33 | 40/26 | 46.5/29.8 | 2 | 40 | 70 | 20 | 50 |
| PG5E48 - 4 ton<br>PG5E60 - 5 ton | 65/43 | 52/34 | 60.5/40.0 | 2 | 40 | 70 | 25 | 55 |
| PG5E24 - 2 ton<br>PG5E36 - 3 ton | 75/49 | 60/39 | 69.8/45.6 | 3 | 40 | 70 | 20 | 50 |
| PG5E48 - 4 ton | 100/65 | 80/53 | 93.0/60.5 | 3 | 40 | 70 | 25 | 55 |
| PG5E36 - 3 ton | 100/65 | 80/53 | 93.0/60.5 | 4 | 40 | 70 | 25 | 55 |
| PG5E48 - 4 ton<br>PG5E60 - 5 ton | 125/82 | 101/66 | 116.3/75.3 | 4 | 40 | 70 | 25 | 55 |

**Note:**

- The heating capacity is valid for elevations up to 2,000 ft above sea level. For elevations above 2,000 ft, reduce the rated capacity by 4% for each 1,000 ft above sea level.
- The gas rate is based on 1,075 $Btu/ft^3$.
- The airflow must be adequate to obtain a temperature rise within the range shown in the table. The continuous return air temperature must not be below 55°F.

# Propane (LP) gas application data

### Table 24: Propane (LP) gas application data

| Model | Input - high fire/low fire (MBH) | Output - high fire/low fire (MBH) | Gas rate - high fire/low fire ($ft^3/h$) | Number of burners | Temperature rise - high fire (°F) | | Temperature rise - low fire (°F) | | Propane (LP) conversion accessory kit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum | Maximum | Minimum | Maximum | |
| PG5E24 - 2 ton | 50/33 | 40/26 | 20.0/12.8 | 2 | 40 | 70 | 20 | 50 | S1-1NP0703 |
| PG5E48 - 4 ton<br>PG5E60 - 5 ton | 65/43 | 52/34 | 26.0/16.8 | 2 | 40 | 70 | 25 | 55 | S1-1NP0704 |
| PG5E24 - 2 ton<br>PG5E36 - 3 ton | 75/49 | 60/39 | 30.0/19.6 | 3 | 40 | 70 | 20 | 50 | S1-1NP0703 |
| PG5E48 - 4 ton | 100/65 | 80/53 | 40.0/26.0 | 3 | 40 | 70 | 25 | 55 | S1-1NP0704 |
| PG5E36 - 3 ton | 100/65 | 80/53 | 40.0/26.0 | 4 | 40 | 70 | 25 | 55 | S1-1NP0703 |
| PG5E48 - 4 ton<br>PG5E60 - 5 ton | 125/82 | 101/66 | 50.0/32.4 | 4 | 40 | 70 | 25 | 55 | S1-1NP0704 |

**Note:**

- Propane applications require field installation of a propane (LP) conversion accessory kit. See Converting the unit for operation with propane gas and refer to *Applications and accessories* in the *Technical Guide* for more information.
- The heating capacity is valid for elevations up to 2,000 ft above sea level. For elevations above 2,000 ft, reduce the rated capacity by 4% for each 1,000 ft above sea level.
- The gas rate is based on 2,500 $Btu/ft^3$.
- The airflow must be adequate to obtain a temperature rise within the range shown in the table. The continuous return air temperature must not be below 55°F.

# Starting up the unit

**Before you begin:**
Complete the following checks before starting up the unit:

- Check the type of gas being supplied. Ensure that it is the same as listed on the unit rating plate.
- Make sure that the flue exhaust hood and air intake hood are correctly installed. See Installing the flue exhaust hood and air intake hood.

You must complete the checks outlined above before starting up the unit. If you need to turn off the thermostat, electric power, and gas supply to the unit at any point, follow the procedure in Turning off the thermostat, electric power, and gas supply to the unit.

To start up the unit, do the following:

1. **Stop** and read the safety information on the unit label.
2. Set the thermostat to the **OFF** position.
3. Turn off all electrical power to the unit.

> **⚠ WARNING**
>
> **Do not** try to light the burners by hand. This unit is equipped with an ignition device that automatically lights the burners.

4. Check the electrical supply voltage being supplied. Make sure that it is within the specified range on the unit rating plate.
5. Remove the control access panel by removing the screws and lifting the panel out.
6. Make sure that all electrical connections are tight.
7. If the unit is connected to 208 V supply power, make sure that the control transformer is wired accordingly. See Completing the power and control wiring.
8. Set the gas valve switch to the **OFF** position.
9. Wait 5 min to clear out any gas and then proceed as follows:
   - If you smell gas, **stop**. Locate the lighting instructions at the inside surface of the control access panel and follow item B.
   - If you do not smell gas, go to the next step.
10. Set the gas valve switch to the **ON** position.
11. Replace the control access panel.
12. Turn on all electric power to the unit.
13. Set the thermostat to the required setting.
14. Make sure that the unit is operating correctly. When the entire control circuit is energized and the heating section is operating, proceed to check and configure the unit.

    ⓘ **Note:** See Unit components and operation for more information about the unit if needed. See  if needed. If the unit does not operate and the solution is to replace a broken part and the process takes extended time, follow the procedure outlined in Turning off the thermostat, electric power, and gas supply to the unit.

# Checking and configuring the unit

You **must** complete all required checks and configure unit settings correctly at the time of installation to ensure correct system operation. **STOP** and read all of the information and tasks relating to configuring main control board settings before you start to change settings. Otherwise, you may set DIP switches incorrectly and cause difficulties in the installation process.

## Checking the gas piping for leaks

You **must** do a gas piping leak check for every new unit installation.

To check the gas piping for leaks, do the following:

- Check for gas leaks in the unit piping as well as the supply piping.

## Checking the unit input rate for natural gas applications

For natural gas applications, you **must** verify the natural gas input rate by clocking the gas meter for every new unit installation.

**NOTICE**

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

To check the unit input rate for natural gas applications, do the following:

1. Turn off all other gas appliances connected to the gas meter.
2. With the unit turned on and in heating mode, measure the time needed in seconds for one revolution of the hand on the smallest dial on the gas meter. Note this measurement.

   ⓘ **Note:** A typical gas meter usually has a 1/2 cu ft or a 1 cu ft test dial.
3. See Table 25 for the cubic feet per hour of gas for the specific time and test dial size.
4. Multiply the cubic feet per hour by the Btu rating of the gas obtained from the local gas company to calculate the input rate. See Table 25 for an example of calculating the input rate. If the actual input is not within 5% of the unit heating rating with allowance being made for the permissible range of the regulator setting, replace the orifice spuds with spuds of the correct size.

### Gas rate in cubic feet per hour

**Table 25: Gas rate in cubic feet per hour**

| Seconds for 1 revolution | Size of test dial | |
|---|---|---|
| | 1/2 cu ft | 1 cu ft |
| 10 | 180 | 360 |
| 12 | 150 | 300 |
| 14 | 129 | 257 |
| 16 | 113 | 225 |
| 18 | 100 | 200 |
| 20 | 90 | 180 |
| 22 | 82 | 164 |
| 24 | 75 | 150 |
| 26 | 69 | 138 |
| 28 | 64 | 129 |
| 30 | 60 | 120 |

**Table 25: Gas rate in cubic feet per hour**

| Seconds for 1 revolution | Size of test dial | |
|---|---|---|
| | 1/2 cu ft | 1 cu ft |
| 32 | 56 | 113 |
| 34 | 53 | 106 |
| 36 | 50 | 100 |
| 38 | 47 | 95 |
| 40 | 45 | 90 |
| 42 | 43 | 86 |
| 44 | 41 | 82 |
| 46 | 39 | 78 |
| 48 | 37 | 75 |
| 50 | 36 | 72 |
| 52 | 35 | 69 |
| 54 | 34 | 67 |
| 56 | 32 | 64 |
| 58 | 31 | 62 |
| 60 | 30 | 60 |

ⓘ **Note:** As an **example**, by actual measurement, it takes 38 s for the hand on the 1 cu ft dial to make a revolution with a 100,000 Btu/h furnace running. Using this information, locate 38 s in the first column of the table. Read across to the *1 cu ft* column, where you see that 95 $ft^3$/h of gas are consumed by the furnace at that rate. Multiply 95 x 1050 or the actual Btu rating of the gas obtained from the local gas company. The result is 99,750 Btu/h, which is close to the 100,000 Btu/h rating of the unit.

# Measuring the standby gas pressure

You **must** measure the standby gas pressure for every new unit installation. Standby gas pressure refers to the pressure in the gas line when the unit is not in operation, including the pressure in the gas line upstream of the gas meter regulator. You can measure standby gas pressure by connecting a manometer to the inlet pressure port on the gas valve with a piece of flexible tubing. See Figure 10 for the location of the inlet pressure port, which is the port marked **IN P**.

➤ **Important:**

- You must measure the standby gas pressure when the unit is not in operation.
- You take the standby gas pressure reading and the inlet gas pressure reading at the port marked **IN P**. You take the manifold gas pressure reading at the port marked **OUT P**. See Measuring and adjusting the inlet gas pressure and Measuring and adjusting the manifold gas pressure.

To check the standby gas pressure, do the following:

1. Turn off gas at the ball valve or gas cock on the gas supply line before the gas valve, and turn off the electrical supply.
2. Locate the inlet pressure port marked **IN P** on the gas valve. See Figure 10.
3. Using a 3/32 in. (2.4 mm) hex head wrench, loosen the set screw by turning it 1 turn counter clockwise. **Do not remove the set screw from the inlet pressure port.**
4. Connect the positive side of the manometer to the **IN P** tap on the gas valve. Do not connect any tubing to the negative side of the manometer, because it references atmospheric pressure.

   ⓘ **Note:** See Figure 12 for an illustration of connecting a U-tube manometer.
5. Measure the standby gas pressure. Be aware that the standby gas pressure must not exceed 13.5 in. W.C. at any time for natural gas units or propane (LP) gas units. If the standby gas pressure is outside this limit, contact the local gas utility for corrective action.

# Measuring and adjusting the inlet gas pressure

You **must** measure the inlet gas pressure and adjust the inlet gas pressure if needed for every new unit installation. Inlet gas pressure refers to the pressure entering the gas valve when the unit is in operation. You can measure inlet gas pressure by connecting a manometer to the inlet pressure port on the gas valve with a piece of flexible tubing. See Figure 10 for the location of the inlet pressure port, which is the port marked **IN P**.

**Important:**

- You must measure the inlet gas pressure with all gas appliances in the building at full fire and make sure that the inlet gas pressure is within the limits shown on the rating plate.
- You take the inlet gas pressure reading and the standby gas pressure reading at the port marked **IN P**. You take the manifold gas pressure reading at the port marked **OUT P**. See Measuring the standby gas pressure and Measuring and adjusting the manifold gas pressure.

To measure and adjust the inlet gas pressure, do the following:

1. Turn off gas at the ball valve or gas cock on the gas supply line before the gas valve, and turn off the electrical supply.
2. Locate the inlet pressure port marked **IN P** on the gas valve. See Figure 10.
3. Using a 3/32 in. (2.4 mm) hex head wrench, loosen the set screw by turning it 1 turn counter clockwise. **Do not remove the set screw from the inlet pressure port.**
4. Connect the positive side of the manometer to the **IN P** tap on the gas valve. Do not connect any tubing to the negative side of the manometer, because it references atmospheric pressure.

   **Note:** See Figure 12 for an illustration of connecting a U-tube manometer.
5. Turn on the gas and electrical supplies and follow the operating instructions to place the unit back in operation.
6. Measure the inlet gas pressure and compare the measurement to the inlet gas pressure operating range for the gas type in Table 26.

   **Table 26: Inlet gas pressure operating range**

| Gas type | Minimum | Maximum |
|---|---|---|
| Natural gas | 4.5 in. W.C. (1.12 kPa) | 10.5 in. W.C. (2.61 kPa) |
| Propane (LP) gas | 8.0 in. W.C. (1.99 kPa) | 13.0 in. W.C. (3.24 kPa) |
| **Important:** The table specifies what the minimum and maximum gas line pressures must be for the furnace to operate safely. The gas line pressure **must be** a minimum of 7 in. W.C. (1.74 kPA) for natural gas and 11 in. W.C. (2.74 kPA) for propane (LP) gas to obtain the BTU input specified on the rating plate and/or the nominal manifold pressure specified in these instructions and on the rating plate. If the inlet gas pressure is outside this limit, contact the local gas utility for corrective action. | | |

7. Adjust the inlet gas pressure if needed so it is in accordance with Table 26.
8. When the inlet gas pressure is correct, turn the gas valve to **OFF** and turn the electrical supply switch to **OFF**. Then, remove the flexible tubing of the manometer from the **IN P** pressure tap on the gas valve and tighten the **IN P** pressure tap plug using the 3/32 in. (2.4 mm) hex head wrench.
9. Turn on the electrical and gas supplies, and with the burners in operation, check for gas leakage around the inlet pressure port on the gas valve using an approved non-corrosive gas leak detection fluid or other non-flammable leak detection methods.

# Measuring and adjusting the manifold gas pressure

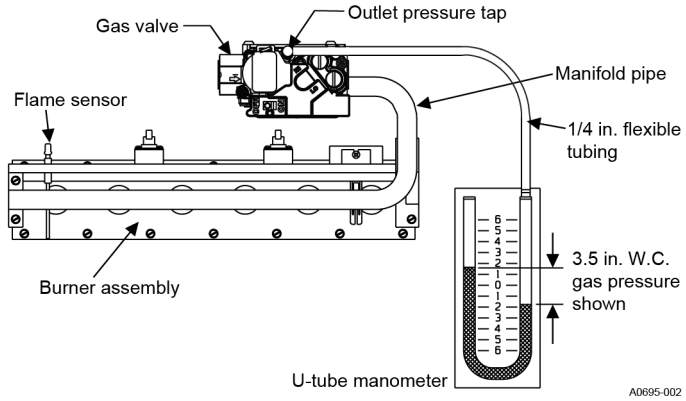
You **must** measure the manifold gas pressure and adjust the manifold gas pressure if needed for every new unit installation. You can measure manifold gas pressure by connecting a manometer to the outlet pressure port on the gas valve with a piece of flexible tubing. See Figure 10 for the location of the outlet pressure port, which is the port marked **OUT P**. The gas valve has separate regulator adjustment screws for high fire and low fire as shown in Figure 10. You must adjust the high fire manifold gas pressure before adjusting the low fire manifold gas pressure as outlined in the procedural steps.

**Important:** You take the manifold gas pressure reading at the port marked **OUT P**. You take the standby gas pressure reading and the inlet gas pressure reading at the port marked **IN P**. See Measuring the standby gas pressure and Measuring and adjusting the inlet gas pressure.

To measure and adjust the manifold gas pressure, do the following:

1. Turn off gas at the ball valve or gas cock on the gas supply line before the gas valve, and turn off the electrical supply.
2. Locate the outlet pressure port marked **OUT P** on the gas valve. See Figure 10.
3. Using a 3/32 in. (2.4 mm) hex head wrench, loosen the set screw by turning it 1 turn counter clockwise. **Do not remove the set screw from the outlet pressure port.**
4. Connect the positive side of the manometer to the **OUT P** tap on the gas valve. See Figure 12. Do not connect any tubing to the negative side of the manometer, because it references atmospheric pressure.

**Figure 12: Connecting a U-tube manometer to read manifold gas pressure**




5. Locate the high fire and low fire pressure regulator adjustment caps and adjustment screws on the gas valve. See Figure 10.
6. Remove the caps from the high fire and low fire pressure regulators to gain access to the adjustment screws.

   **Important:** You must remove the caps from the pressure regulators entirely to gain access to the adjustment screws. Loosening or tightening the caps does not adjust the flow of gas.
7. Turn on the gas and electrical supplies.
8. On the main control board, in the SW2 switch bank, locate the stage (**STG**) DIP switches: DIP switch 4 and DIP switch 5. Note the position of the **STG** DIP switches, then set them to the off position.

   **Note:** The **STG** DIP switches are used to configure the auto heat staging feature. See Configuring auto heat staging.
9. Connect a temporary jumper wire from the thermostat R connection to the thermostat W1 connection, and connect another temporary jumper wire from the thermostat W2 connection to the thermostat W1 connection. The unit starts up and operates in high fire heating mode.

10. Measure the manifold gas pressure and compare the measurement to the required nominal manifold pressure for high fire operation for the gas type in Table 27.

**Table 27: Nominal manifold pressure**

| Gas type | Nominal manifold pressure - high fire | Nominal manifold pressure - low fire |
|---|---|---|
| **Natural gas** | 3.5 in. W.C. (0.87 kPa) | 1.6 in. W.C. (0.40 kPa) |
| **Propane (LP) gas** | 10.0 in. W.C. (2.488 kPa) | 4.0 in. W.C. (0.995 kPa) |

11. Adjust the high fire manifold gas pressure if needed so it is in accordance with Table 27 by adjusting the high fire pressure regulator adjustment screw on the gas valve.

    **Important:** If the pressure regulator adjustment screw on the gas valve is turned in (clockwise), the manifold pressure increases. If the pressure regulator adjustment screw on the gas valve is turned out (counter clockwise), the manifold pressure decreases.

12. Remove the temporary jumper wire from the thermostat W2 connection to the thermostat W1 connection. The unit stops operating in high fire heating mode and operates in low fire heating mode.
13. Measure the manifold gas pressure and compare the measurement to the required nominal manifold pressure for low fire operation for the gas type in Table 27.
14. Adjust the low fire manifold gas pressure if needed so it is in accordance with Table 27 by adjusting the low fire pressure regulator adjustment screw on the gas valve.
15. Remove the temporary jumper wire from the thermostat R connection to the thermostat W1 connection. The unit shuts down. The blower continues to operate until the gas heating blower off delay time and the 15 s blower stage down time that follows the blower off delay timing expire.
16. Replace the high fire and low fire pressure regulator adjustment caps.
17. Set the **STG** DIP switches to their previous position.
18. Re-calculate the unit input rate as outlined in Checking the unit input rate for natural gas applications to make sure you have not exceeded the specified unit input rate on the rating plate.
19. When the Btu/h input is correct, turn the gas valve to **OFF** and turn the electrical supply switch to **OFF**. Then, remove the flexible tubing of the manometer from the **OUT P** pressure tap on the gas valve and tighten the **OUT P** pressure tap plug using the 3/32 in. (2.4 mm) hex head wrench.
20. Turn on the electrical and gas supplies, and with the burners in operation, check for gas leakage around the outlet pressure port on the gas valve using an approved non-corrosive gas leak detection fluid or other non-flammable leak detection methods.

## Setting the unit model

The main control board in the unit can be used with many different models and must have the correct setting for the model in which it is installed. The model ID of each main control board is programmed in the factory for each production unit. The programming does not require manual setting of DIP switches, so the model ID DIP switches on the main control board are in the 0 or off position, but the correct model ID for the unit is set. It is best practice to manually set the model ID DIP switches during installation to facilitate unit servicing or repair. You **must** set the model ID if replacing the main control board in the unit. You set the model ID for your specific application using the six model ID (MODEL ID) DIP switches in the SW3 switch bank on the main control board. Table 28 shows the DIP switch settings for PG5 models.

**Table 28: Model ID DIP switch settings**

| Model | A2L enabled | Model ID DIP switch setting - SW3 switch bank |
|---|---|---|
| PG5E24L05S2 | No | 000001 |
| PG5E24L07S2 | No | 000010 |
| PG5E36L07S2 | No | 000011 |
| PG5E36L10S2 | No | 000100 |
| PG5E48L06S2 | Yes | 000101 |
| PG5E48L10S2 | Yes | 000110 |
| PG5E48L12S2 | Yes | 000111 |
| PG5E60L06S2 | Yes | 001000 |
| PG5E60L12S2 | Yes | 001010 |
| ⓘ **Note:** The model ID DIP switch settings are shown left to right from DIP switch 1 to DIP switch 6. 0 is the off position and 1 is the on position. | | |

To set the unit model, do the following:

- Check the DIP switch setting for the specific PG5 model in Table 28. Then, on the main control board, in the **SW3** switch bank, set the six **MODEL ID** DIP switches to the required position.

## Configuring airflow and staging settings

You **must** configure the unit airflow and heat staging settings correctly at the time of installation. You do this on the main control board using the cool, heat, delay, and adjust DIP switches in the SW1 switch bank and the blower off delay, humidistat, and stage DIP switches in the SW2 switch bank. See Figure 13.

**Figure 13: Main control board - SW1 and SW2 switch banks**

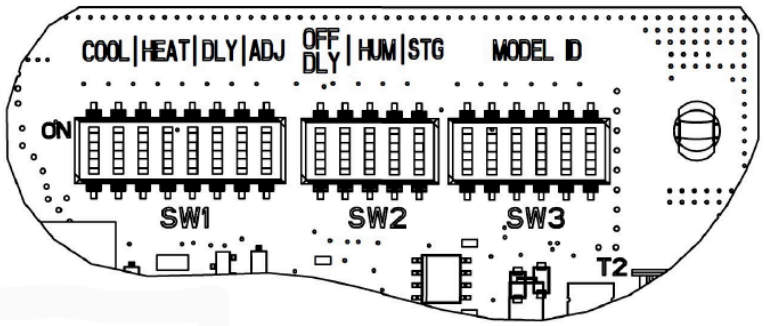



Table 29 gives an overview of the DIP switch settings and how they operate for quick reference. Follow the procedures for configuring specific DIP switch settings as needed. The unit has a direct drive, constant airflow ECM blower motor. In normal operation, the continuous fan airflow is 67% of the high cool airflow selected using the cool and adjust DIP switches as outlined in Configuring cooling airflow settings. You do not configure additional continuous fan airflow settings. For unit airflow data, see Table 36, Table 37, Table 38, and Table 39.

### Table 29: Understanding airflow and heat staging DIP switch settings

| Mode | Airflow settings | | SW1 switch bank - ECM adjust | | | | | | | | SW2 switch bank - configuration | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cool DIP switches - for compressor cooling | | Heat DIP switches - for gas heating | | Delay DIP switches - for compressor cooling | | Adjust DIP switches - for compressor cooling | | Blower off delay DIP switches - for gas heating | | Humidistat DIP switch - for compressor cooling | Stage DIP switches - for gas heating | |
| | Cool or Heat | Adjust | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 |
| **Cooling** | A | A | Off | Off | The heat DIP switch settings do not impact cooling CFM. | | Select the cooling delay profile using the delay DIP switches based on customer preference and the specific installation. The selected profile does not impact the cooling values in Table 36. See Adjusting the cooling delay profile for the setting options. | | Off | Off | The blower off delay DIP switch settings for gas heating do not impact the cooling values in Table 36. | | Enable the humidistat feature for cooling operation by setting the humidistat DIP switch to the on position if the unit is installed and operated with a humidistat. See Enabling the humidistat feature. | The stage DIP switch settings do not impact the cooling values in Table 36. | |
| | A | B | Off | Off | | | | | Off | On | | | | | |
| | A | C | Off | Off | | | | | On | Off | | | | | |
| | B | A | Off | On | | | | | Off | Off | | | | | |
| | B | B | Off | On | | | | | Off | On | | | | | |
| | B | C | Off | On | | | | | On | Off | | | | | |
| | C | A | On | Off | | | | | Off | Off | | | | | |
| | C | B | On | Off | | | | | Off | On | | | | | |
| | C | C | On | Off | | | | | On | Off | | | | | |
| | D | A | On | On | | | | | Off | Off | | | | | |
| | D | B | On | On | | | | | Off | On | | | | | |
| | D | C | On | On | | | | | On | Off | | | | | |
| **Heating** | A | Any | The cool DIP switch settings do not impact gas heating CFM. | | Off | Off | The cooling delay profile does not impact gas heating operation. | | The adjust DIP switch settings do not impact gas heating operation. | | Select the gas heating blower off delay time for the unit using the blower off delay DIP switches. See Configuring gas heating blower off delay settings for the setting options. | | The humidistat DIP switch setting does not impact gas heating operation. | Configure the auto heat staging feature using the stage DIP switches if the unit is installed and operated with a thermostat that has only one stage of heating control. See Configuring auto heat staging for the setting options. | |
| | B | Any | | | Off | On | | | | | | | | | |
| | C | Any | | | On | Off | | | | | | | | | |
| | D | Any | | | On | On | | | | | | | | | |
| For more information on configuring cool, adjust, and heat DIP switch settings, see Configuring cooling airflow settings and Configuring gas heating airflow settings. | | | | | | | | | | | | | | | |

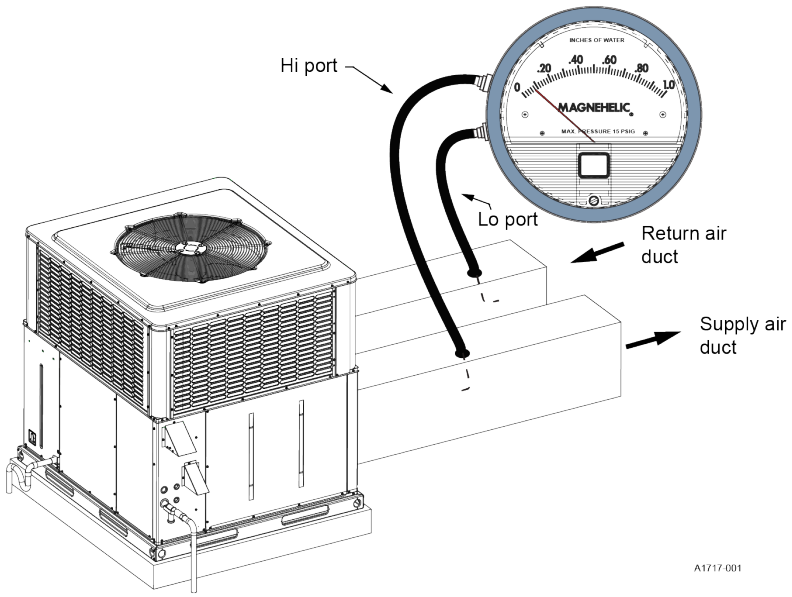
## Measuring external static pressure

**Before you begin:**

Make sure that the unit is in cooling mode.

You must use a manometer as part of this procedure. Figure 14 shows how to use a manometer to measure external static pressure.

### Figure 14: Measuring the external static pressure



To measure the external static pressure, do the following:

1. Measure the supply air static pressure and record this positive number.
2. Measure the return air static pressure and record this negative number.
3. Treat the negative number as a positive number and add the two numbers together. This is the total external static pressure.

## Configuring cooling airflow settings

**Before you begin:**
Measure the external static pressure.

The unit has a direct drive, constant airflow ECM blower motor. You can adjust the blower airflow settings for cooling on the main control board using the cool (COOL) and adjust (ADJ) DIP switches in the SW1 switch bank. Use the cool DIP switches to select the required cooling blower airflow setting and use the adjust DIP switches to increase or decrease the airflow for the selected cooling blower airflow setting if needed. Table 30 and Table 31 show the DIP switch setting options. When configuring the cooling airflow settings, select the cooling blower airflow setting to deliver approximately 350 CFM to 400 CFM per ton of AC cooling capacity. Use of airflow outside of this range may cause diminished air conditioning performance, lower overall energy efficiency, and higher electric utility bills.

**Important:** The continuous fan airflow is based on the high cool airflow you select using the cool and adjust DIP switches. See Table 30 and Table 31. You do not configure additional continuous fan airflow settings. When a cool DIP switch setting is selected for compressor high cooling and the thermostat sends a G only call to the main control board, a continuous fan airflow rate is obtained at 67% of the high cool airflow.

**Table 30: Cool DIP switch settings**

| SW1 switch bank - cool DIP switches | | Setting description |
|---|---|---|
| DIP switch 1 | DIP switch 2 | |
| Off | Off | A - delivers nominal or medium high cooling airflow |
| Off | On | B - delivers the highest cooling airflow |
| On | Off | C - delivers medium low cooling airflow |
| On | On | D - delivers the lowest cooling airflow |

**Table 31: Adjust DIP switch settings**

| SW1 switch bank - adjust DIP switches | | Setting description |
|---|---|---|
| DIP switch 7 | DIP switch 8 | |
| Off | Off | A - nominal setting for cooling airflow |
| Off | On | B - 10% increase of nominal setting for cooling airflow |
| On | Off | C - 10% decrease of nominal setting for cooling airflow |
| On | On | D - nominal setting for cooling airflow. Setting D is the same as setting A |

To configure cooling airflow settings, do the following:

1. See Figure 3, Figure 18, and Figure 19.
2. Using Table 36, compare the CFM data for the cooling blower airflow setting with the blower motor energized with the measured external static pressure. Then, adjust the cooling blower airflow setting as necessary to obtain the correct cooling airflow. To do so, on the main control board, in the **SW1** switch bank, set the **COOL** and **ADJ** DIP switches to the required position.

## Enabling the humidistat feature

The unit is designed to operate with an optional humidistat to help control the humidity level in the conditioned space during cooling operation. If the unit is being used with a humidistat, you must enable the humidistat feature on the main control board by setting the humidistat (HUM) DIP switch to the on position. When the humidistat DIP switch is set to the on position, if the humidistat reports high humidity, the main control board automatically reduces the airflow by 15% in cooling mode to help remove humidity from the indoor air. When the humidistat DIP switch is set to the off position, the main control board does not reduce airflow to remove humidity from the indoor air. See Humidistat feature.

To enable the humidistat feature, do the following:

- On the main control board, in the SW2 switch bank, set the **HUM** DIP switch to the **ON** position. The **HUM** DIP switch is DIP switch 3 in the SW2 switch bank.

## Adjusting the cooling delay profile

This unit has a compressor cooling delay profile feature that allows the unit cooling blower operation to be optimized for better control of humidity and efficiency. You can use the delay (DLY) DIP switches in the SW1 switch bank on the main control board to adjust the cooling delay profile if required. Table 32 shows the DIP switch settings options.

**Table 32: Cooling delay profile DIP switch settings**

| SW1 switch bank - delay DIP switches | | Cooling delay profile | Period | Cooling | |
|---|---|---|---|---|---|
| DIP switch 5 | DIP switch 6 | | | Level (%) | Time in state (min) |
| Off | Off | A | Pre-run | Bypass | Bypass |
| | | | Short-run | Bypass | Bypass |
| | | | Run | 100 | No limit |
| | | | Post-run | 100 | 1 |
| | | | Off delay | Bypass | Bypass |
| Off | On | B | Pre-run | 50 | 2 |
| | | | Short-run | 82 | 5 |
| | | | Run | 100 | No limit |
| | | | Post-run | 100 | 1 |
| | | | Off delay | Bypass | Bypass |
| On | Off | C | Pre-run | Bypass | Bypass |
| | | | Short-run | Bypass | Bypass |
| | | | Run | 100 | No limit |
| | | | Post-run | 100 | 1 |
| | | | Off delay | 50 | 1 |
| On | On | D | Pre-run | Bypass | Bypass |
| | | | Short-run | 63 | 1.55 |
| | | | Run | 100 | No limit |
| | | | Post-run | 100 | 1 |
| | | | Off delay | 63 | 0.5 |

**Note:**

- The levels shown in the pre-run, short-run, and run periods are a percentage of the cooling blower airflow setting corresponding to the thermostat call.
- The post-run and off delay levels are derived from the level of the previous state, not the cooling blower airflow setting corresponding to the thermostat call.
- If cooling delay profile B is selected and the thermostat call is removed in the short-run period (82% of capacity), the main control board enters the post-run state. The post-run state level for cooling delay profile B is 100% of the previous level, so the level during the post-run state is 82%.

To adjust the cooling delay profile, do the following:

- On the main control board, in the **SW1** switch bank, set the **DLY** DIP switches to the required position.

## Configuring gas heating airflow settings

The unit has a direct drive, constant airflow ECM blower motor. You can adjust the blower airflow settings for gas heating on the main control board using the heat (HEAT) DIP switches in the SW1 switch bank. Table 33 shows the DIP switch setting options. When configuring the gas heating airflow settings, you can select any gas heating blower airflow setting provided the temperature rise requirements for the unit are met. See Checking the air temperature rise and Table 15.

**Table 33: Heat DIP switch settings**

| SW1 switch bank - heat DIP switches | | Setting description |
|---|---|---|
| DIP switch 3 | DIP switch 4 | |
| Off | Off | A - delivers medium low gas heating airflow |
| Off | On | B - delivers the highest gas heating airflow |
| On | Off | C - delivers medium high gas heating airflow |
| On | On | D - delivers the lowest gas heating airflow |

To configure the gas heating airflow settings, do the following:

- On the main control board, in the **SW1** switch bank, set the **HEAT** DIP switches to the required position.

## Configuring gas heating blower off delay settings

You can adjust the gas heating blower off delay time for the unit if required. You do this on the main control board using the blower off delay (OFF DLY) DIP switches in the SW2 switch bank. Table 34 shows the DIP switch setting options. The factory setting is 60 s with DIP switches 1 and 2 in the off position.

**Table 34: Gas heating blower off delay DIP switch settings**

| SW2 switch bank - OFF DLY DIP switches | | Setting description |
|---|---|---|
| DIP switch 1 | DIP switch 2 | |
| Off | Off | A - 60 s gas heating blower off delay |
| Off | On | B - 90 s gas heating blower off delay |
| On | Off | C - 120 s gas heating blower off delay |
| On | On | D - 180 s gas heating blower off delay |

To configure the gas heating blower off delay settings, do the following:

- On the main control board, in the SW2 switch bank, set the **OFF DLY** DIP switches for the gas heating blower off delay time required.

## Configuring auto heat staging

The unit has two stages of heating and is typically used with a wall thermostat that has two stages of heating control. The auto heat staging feature for gas heating allows you to use the unit with a thermostat that has only one stage of heating control. You configure auto heat staging on the main control board using the stage (STG) DIP switches in the SW2 switch bank. If you set the stage DIP switches to the off position, the unit only stages from low to high heat when it receives a signal from a thermostat with two heating stages. If you set the stage DIP switches to the 10 min, 15 min or 20 min position, the unit can be used with a single-stage thermostat. Table 35 shows the DIP switch setting options.

**Table 35: Stage DIP switch settings**

| SW2 switch bank - stage DIP switches | | Setting description |
|---|---|---|
| DIP switch 4 | DIP switch 5 | |
| Off | Off | Auto heat staging is not enabled. The unit only stages from low heat to high heat when it receives a signal from a thermostat with two heating stages. Use this setting if the system has a two-stage heating thermostat. |
| Off | On | Auto heat staging is enabled. The unit can be used with a single-stage thermostat. The unit automatically switches from low heat to high heat after 10 min and remains at high heat until the thermostat call for heat is complete. |
| On | Off | Auto heat staging is enabled. The unit can be used with a single-stage thermostat. The unit automatically switches from low heat to high heat after 15 min and remains at high heat until the thermostat call for heat is complete. |
| On | On | Auto heat staging is enabled. The unit can be used with a single-stage thermostat. The unit automatically switches from low heat to high heat after 20 min and remains at high heat until the thermostat call for heat is complete. |

To configure auto heat staging, do the following:

- On the main control board, in the **SW2** switch bank, set the **STG** DIP switches to the required position.

## Checking the air temperature rise

You **must** check the air temperature rise for every new unit installation.

**⚠ DANGER**

The temperature rise, or temperature difference between the return air and the supply (heated) air from the furnace, must be within the range shown on the furnace rating plate and within the application limitations shown in Table 15.

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

To check the air temperature rise, do the following:

1. After about 5 min of operation, determine the furnace temperature rise. Measure the temperature of both the return air and the heated air in the ducts, about 6 ft (1.83 m) from the furnace where they are not affected by radiant heat.
2. Increase the gas heating blower airflow setting to decrease the temperature rise or decrease the gas heating blower airflow setting to increase the temperature rise if needed. See Configuring gas heating airflow settings.

# Airflow performance data for side duct application

### Table 36: Airflow cooling performance data for side duct application

| Airflow settings | | High and low stage cooling (CFM) by PG5E unit model | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cool | Adjust | 24L05 and 24L07 | | 36L10 and 36L07 | | 48L06 and 48L10 | | 48L12 | | 60L06 and 60L12 | |
| | | High cool | Low cool | High cool | Low cool | High cool | Low cool | High cool | Low cool | High cool | Low cool |
| A | A | 800 | 550 | 1150 | 750 | 1610 | 1100 | 1610 | 1100 | 1800 | 1250 |
| A | B | 880 | 610 | 1270 | 830 | 1770 | 1210 | 1770 | 1210 | 1980 | 1380 |
| A | C | 720 | 500 | 1040 | 680 | 1450 | 990 | 1450 | 990 | 1620 | 1130 |
| B | A | 880 | 610 | 1270 | 830 | 1770 | 1210 | 1820 | 1210 | 1980 | 1380 |
| B | B | 970 | 670 | 1400 | 910 | 1950 | 1330 | 2000 | 1330 | 2180 | 1520 |
| B | C | 790 | 550 | 1140 | 750 | 1590 | 1090 | 1640 | 1090 | 1780 | 1240 |
| C | A | 720 | 500 | 1040 | 680 | 1450 | 990 | 1450 | 990 | 1620 | 1130 |
| C | B | 790 | 550 | 1140 | 750 | 1600 | 1090 | 1600 | 1090 | 1780 | 1240 |
| C | C | 650 | 450 | 940 | 610 | 1310 | 890 | 1310 | 890 | 1460 | 1020 |
| D | A | 640 | 440 | 920 | 600 | 1290 | 880 | 1290 | 880 | 1440 | 1000 |
| D | B | 700 | 480 | 1010 | 660 | 1420 | 970 | 1420 | 970 | 1580 | 1100 |
| D | C | 580 | 400 | 830 | 540 | 1160 | 790 | 1160 | 790 | 1300 | 900 |

### Table 37: Airflow heating performance data for side duct application

| Airflow settings | | High and low stage heating (CFM) by PG5E unit model | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heat | Adjust | 24L05 | | 24L07 | | 36L07 | | 36L10 | | 48L06 | | 48L10 | | 48L12 | | 60L06 | | 60L12 | |
| | | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat | High heat | Low heat |
| A | Any | 650 | 650 | 1010 | 1070 | 1110 | 1100 | 1390 | 1210 | 930 | 820 | 1300 | 1150 | 1770 | 1620 | 880 | 840 | 1720 | 1570 |
| B | Any | 810 | 950 | 1200 | 1250 | 1290 | 1290 | 1700 | 1700 | 1130 | 1070 | 1680 | 1480 | 1980 | 1980 | 1080 | 1250 | 2000 | 2000 |
| C | Any | 730 | 770 | 1120 | 1200 | 1240 | 1250 | 1580 | 1390 | 1020 | 930 | 1480 | 1300 | 1850 | 1850 | 970 | 1000 | 1880 | 1820 |
| D | Any | 580 | 540 | 920 | 940 | 1020 | 940 | 1270 | 1050 | 850 | 720 | 1150 | 900 | 1600 | 1500 | 810 | 720 | 1540 | 1430 |

**Important:** It is important to be aware of the following about the data provided in the airflow cooling and heating performance tables:

- Airflow is tested with dry coil conditions, without air filters, at 230 V.
- All CFMs are shown at 0.5 in. W.C. external static pressure. PG5E units have variable speed motors that automatically adjust to provide constant CFM from 0.0 in. W.C. to 0.6 in. W.C. external static pressure. From 0.6 in. W.C. to 1.0 in. W.C. external static pressure, CFM is typically reduced by 2% per 0.1 in. W.C. increase in static. Operation on duct systems with greater than 1.0 in. W.C. external static pressure is not recommended.
- A brushless DC high-efficiency standard ECM blower motor is used for all indoor blower assemblies
- Minimal variations in airflow performance data result from operating at 208 V. The data in the tables can be used in those cases.
- Heating applications are tested at 0.50 in. W.C. external static pressure. Cooling applications are tested according to AHRI Standard 210/240.
- The differences between side duct airflows and bottom duct airflows are insignificant.

# Additional static resistance data

### Table 38: Additional static resistance data

| Model | CFM | Wet indoor coil | Economizer | Filter frame kit |
|---|---|---|---|---|
| PG5E24 - 2 ton | 500 | 0.01 | 0.00 | 0.01 |
| | 600 | 0.01 | 0.00 | 0.02 |
| | 700 | 0.01 | 0.00 | 0.04 |
| | 800 | 0.02 | 0.01 | 0.06 |
| | 900 | 0.03 | 0.01 | 0.08 |
| | 1000 | 0.04 | 0.01 | 0.10 |
| | 1100 | 0.05 | 0.01 | 0.13 |
| | 1200 | 0.06 | 0.02 | 0.16 |
| PG5E36 - 3 ton | 700 | 0.01 | 0.00 | 0.04 |
| | 800 | 0.02 | 0.01 | 0.06 |
| | 900 | 0.03 | 0.01 | 0.08 |
| | 1000 | 0.04 | 0.01 | 0.10 |
| | 1100 | 0.05 | 0.01 | 0.13 |
| | 1200 | 0.06 | 0.02 | 0.16 |
| | 1300 | 0.07 | 0.03 | 0.17 |
| | 1400 | 0.08 | 0.04 | 0.18 |
| PG5E48 - 4 ton | 1100 | 0.02 | 0.02 | 0.04 |
| | 1200 | 0.03 | 0.02 | 0.04 |
| | 1300 | 0.04 | 0.02 | 0.05 |
| | 1400 | 0.05 | 0.03 | 0.05 |
| | 1500 | 0.06 | 0.04 | 0.06 |
| | 1600 | 0.07 | 0.04 | 0.07 |
| | 1700 | 0.07 | 0.04 | 0.08 |
| | 1800 | 0.08 | 0.04 | 0.09 |
| | 1900 | 0.09 | 0.05 | 0.10 |
| | 2000 | 0.09 | 0.05 | 0.11 |
| PG5E60 - 5 ton | 1100 | 0.02 | 0.02 | 0.04 |
| | 1200 | 0.03 | 0.02 | 0.04 |
| | 1300 | 0.04 | 0.02 | 0.05 |
| | 1400 | 0.05 | 0.03 | 0.05 |
| | 1500 | 0.06 | 0.04 | 0.06 |
| | 1600 | 0.07 | 0.04 | 0.07 |
| | 1700 | 0.07 | 0.04 | 0.08 |
| | 1800 | 0.08 | 0.04 | 0.09 |
| | 1900 | 0.09 | 0.05 | 0.10 |
| | 2000 | 0.09 | 0.05 | 0.11 |

**Note:**

- The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 in. W.C., the unit delivers less CFM during full economizer operation.
- The filter pressure drop is based on standard filter media tested at velocities not exceeding 300 ft/min.

## Default blower airflow settings

**Table 39: Default blower airflow settings**

| Model | Default blower airflow - DIP switch settings | | |
|---|---|---|---|
| | Heat | Cool | Continuous fan |
| PG5E24L05S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E24L07S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E36L07S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E36L10S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E48L06S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E48L10S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E48L12S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E60L06S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |
| PG5E60L12S2 | HEAT D | COOL B, ADJ B | COOL D, ADJ C |

# Completing the installation

Complete final installation tasks including filling out the unit start-up sheet provided and instructing the user on the unit.

## Securing the unit panels

**Before you begin:**
If the air filter is located inside the unit, make sure that you have installed the air filter before you secure the unit panels.

- Secure all of the unit panels in place.

## Instructing the user

The unit requires regular maintenance, so it is important to instruct the user about maintenance.

**⚠ WARNING**

Before performing any maintenance procedure, shut off all power to the unit to avoid personal injury.

- Instruct the user to refer to *Maintaining your system* in the *User's Information Manual* for the unit for detailed information about maintenance and procedures.
- Direct the user to their limited warranty certificate in the *User's Information Manual*. Complete the following information fields in the limited warranty certificate for user reference:
  - Product Model Number
  - Unit Serial Number
  - Installation Date
  - Participating Dealer

# Unit components and operation

It is important to be familiar with the different unit components and understand how they operate.

## Unit components

**Figure 15: Unit components - PG5E24 and PG5E36 units**

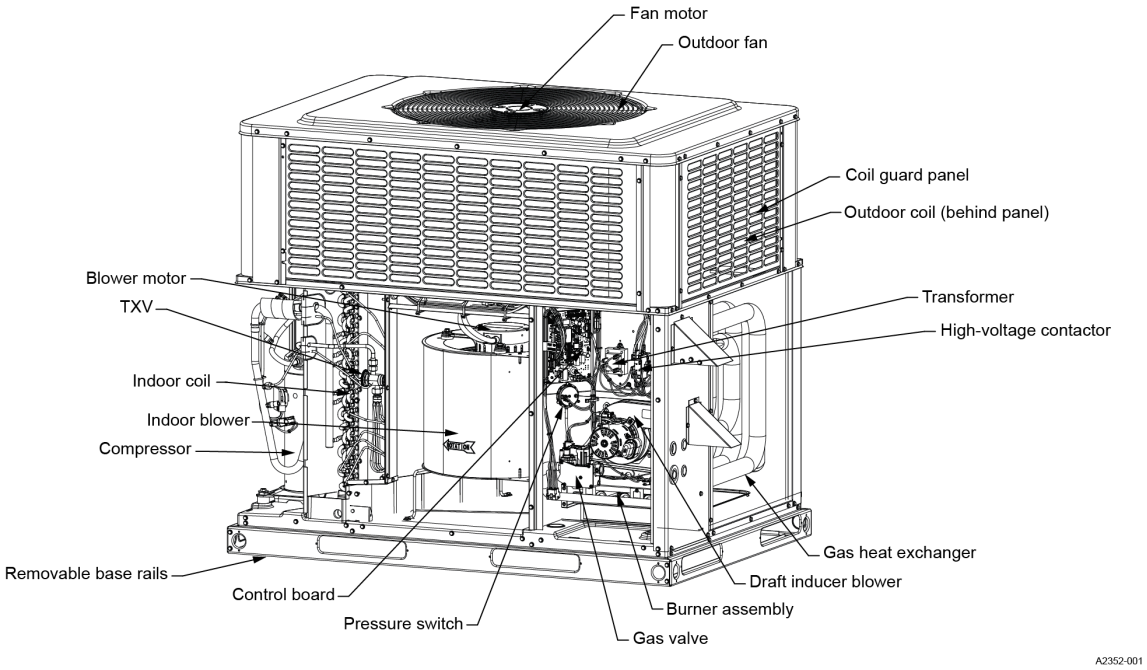
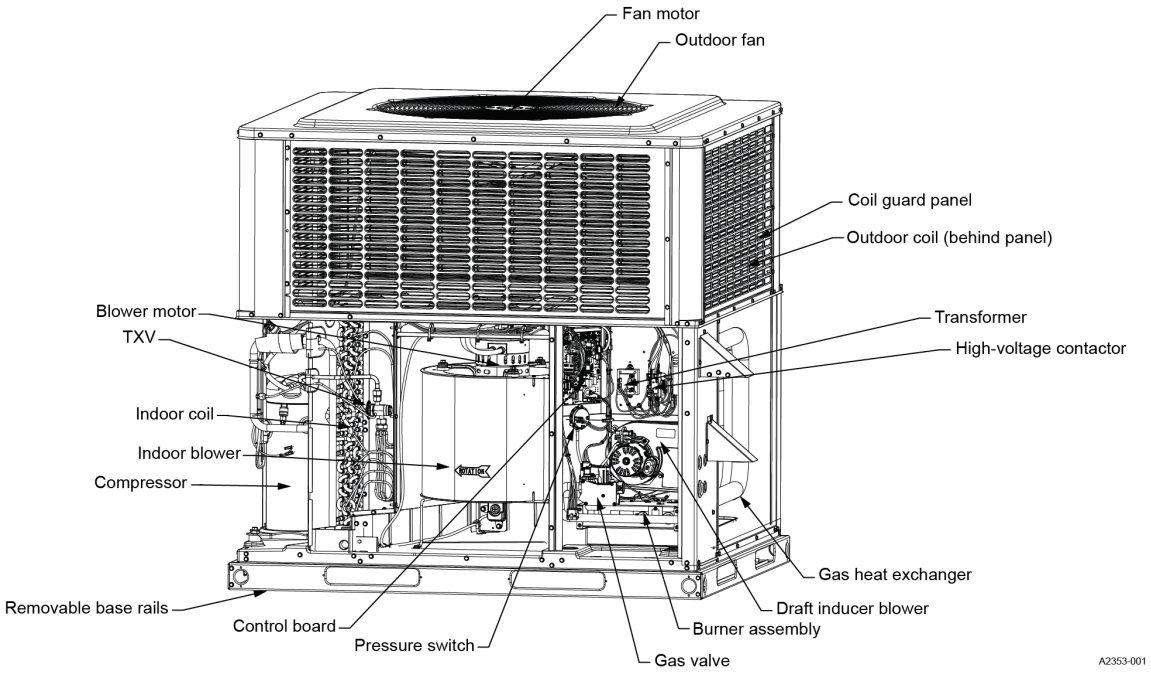


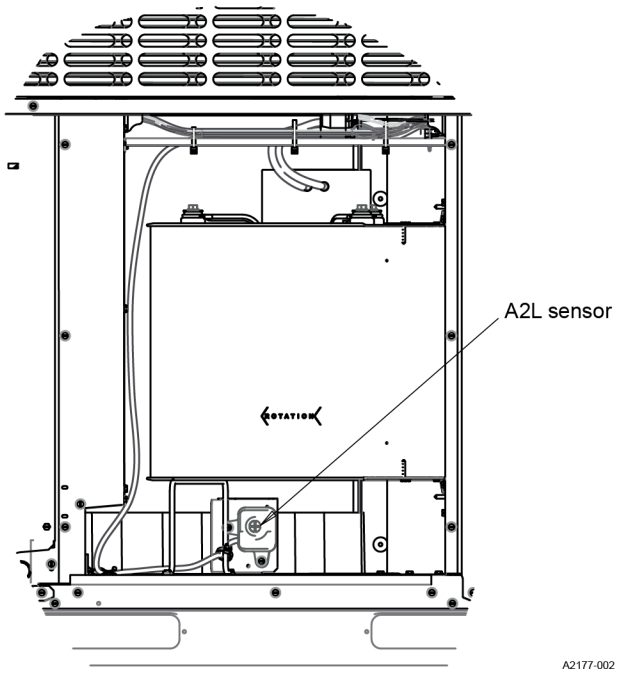

**Figure 16: Unit components - PG5E48 and PG5E60 units**



## A2L components

PG5E48 and PG5E60 units have an A2L sensor and the A2L mitigation logic for the A2L diagnostic LED on the main control board is activated, because they contain over 1.776 kg (3.915 lb) of refrigerant. The main control board drives A2L mitigation airflow in the event of detected A2L refrigerant leakage. Figure 17 shows the location of the A2L sensor. See A2L refrigerant safety guidance for more information.

**Figure 17: A2L sensor location - PG3E48 and PG3E60 units**




# Main control board

PG5 units have a two-stage direct spark ignition (DSI) main control board. The main control board includes the following:

- **Status LED**: Indicates system status and fault codes.
- **A2L diagnostic LED**: For PG5E48 and PG5E60 units, the A2L diagnostic LED works with the status LED and indicates A2L-related status codes and fault codes. For PG5E24 and PG5E36 units, the A2L mitigation logic is deactivated so the A2L diagnostic LED does not operate.
- **A2L sensor connector**: Applies only to PG5E48 and PG5E60 units. PG5E24 and PG5E36 units do not include an A2L sensor because they do not require an A2L mitigation system. There is an A2L sensor in PG5E48 and PG5E60 units as part of the A2L mitigation system.
- **SW1 switch bank - ECM adjust**: Used to configure blower airflow settings for cooling and gas heating and select the cooling delay profile for compressor cooling, Contains the cool, heat, delay, and adjust DIP switches.
- **SW2 switch bank - configuration**: Used to configure the gas heating blower off delay time and humidistat and auto heat staging features. Contains the blower off delay, humidistat, and stage DIP switches.
- **SW3 switch bank - model ID**: Contains the model ID DIP switches for setting the unit model. It is best practice to set the unit model during installation. You **must** set the unit model when replacing the main control board in the unit. See Table 28.
- **SW5 button**: Also referred to as the last error button. Used to view and clear stored fault codes.

Figure 3 shows the main control board, and Figure 13 shows a close view of the SW1, SW2, and SW3 switch banks.

## Compressor

It is important to be aware of the following:

- The unit compressor is specifically designed to operate with R-454B refrigerant and cannot be interchanged with a different type of compressor.
- The unit compressor uses polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oil can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. If the refrigerant circuit is opened, take all necessary precautions to avoid exposure of the oil to the atmosphere.

**⚠ CAUTION**

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

- POE compressor lubricants are known to cause long-term damage to some synthetic roofing materials.

**⚠ CAUTION**

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

- Procedures that risk oil leakage include, but are not limited to the following:
  - Replacing the compressor
  - Repairing refrigerant leaks
  - Replacing refrigerant components, for example, filter drier, pressure switch, metering device, or coil
- The unit is shipped with compressor mountings, which are factory-adjusted and ready for operation.

**⚠ CAUTION**

Do not loosen compressor mounting bolts.

## Heating safety controls

The control circuit includes the following heating safety controls:

- **High-temperature limit switch**: The high-temperature limit switch is located inside the blower compartment and protrudes into the heat exchanger compartment. The high-temperature limit switch is set to open at a temperature selected to prevent the outlet air temperature from exceeding the maximum shown on the unit rating plate. It resets automatically. The high-temperature limit switch operates when a high-temperature condition occurs. The high-temperature limit switch shuts down the ignition control, closes the main gas valve, and energizes the blower. See High-temperature limit switch operation for more information.
- **Pressure switch**: If the induced draft motor fails, the pressure switch prevents the ignition control and gas valve from being energized.
- **Flame sensor**: The flame sensor is located on the left-most burner. If an ignition control fails to detect a signal from the flame sensor indicating the flame is correctly ignited, the main gas valve closes.

- **Rollout switch**: The rollout switch is located on the burner assembly. In the event of a sustained main burner flame rollout, the rollout switch closes the main gas valve. This is a manual reset switch. See Rollout switch operation for more information.

**NOTICE**

The manual reset rollout switch (RS) must be reset before allowing furnace operation.

## Cooling safety controls

The control circuit includes the following cooling safety controls:

- **High-pressure switch**: The high-pressure switch protects against excessive discharge pressures due to a blocked outdoor coil or an outdoor fan motor failure. The high-pressure switch opens at 650 ± 10 psig and closes at 450 ± 15 psig.
- **Low-pressure switch**: The low-pressure switch protects against abnormally low suction pressure due to refrigerant leakage or a blocked indoor coil or indoor blower motor failure. The low-pressure switch opens at 60 ± 5 psig and closes at 90 ± 7 psig.

**Important:** The high-pressure and low-pressure switches are specifically designed to operate with R-454B systems. Do not use R-22 pressure switches as replacements for R-454B pressure switches.

**⚠ WARNING**

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

## Heating operation

The unit is controlled by a conventional heating or cooling thermostat. When the thermostat calls for gas heating, the following occurs:

1. **Heating**: The main control board begins a call for heating when W is energized (connected to R). The main control board checks if the pressure switch is open. If the pressure switch is closed, the status LED on the main control board emits 2 red flashes, and the main control board waits indefinitely for the pressure switch to open. When the pressure switch is sensed as open, the main control board begins the pressure switch proving period. If the call for heating is removed, the main control board goes back to standby. The main control board contains a built-in auto heat staging feature. This feature enables the main control board to automatically stage up to full capacity heating operation based on first-stage heating call timing. The stage (STG) DIP switch setting options for the auto heat staging feature are off, 10 min, 15 min, or 20 min. Based on the stage (STG) DIP switch settings, the main control board automatically stages up to high heat during a call for low heat on the W1 input terminal. This timing starts again with each new call for heat. Regardless of the stage (STG) DIP switch setting, if the main control board is operating in low heat (W1) and a 24 VAC signal is received on the high heat input (W2), the main control board stages up to full capacity heating operation. When using the auto heat staging feature, if the main control board stages up to full capacity heating, the unit remains in full capacity heating until the call for heating on the W1 input is terminated. If the system has a two-stage heating thermostat, set the stage (STG) DIP switches to the off position. See Configuring auto heat staging.

2. **Pressure switch proving**: The main control board energizes the induced draft motor and waits for the pressure switch to close. When the pressure switch closes, the main control board begins the pre-purge period. If the call for heating is removed, the main control board de-energizes the inducer without a post-purge period and returns to standby. If the pressure switch does not close within 5 s of the inducer energizing, the status LED on the main control board emits 3 red flashes. If the pressure switch does not close within 60 s of the inducer energizing, the main control board shuts off the inducer for 60 s, then energizes the inducer for another 60 s in an attempt to close the pressure switch. This cycle continues indefinitely until the pressure switch is proved to be closed or the call for heating ends.
3. **Pre-purge**: The main control board monitors the pressure switch and ensures it remains closed during the pre-purge period. If the pressure switch opens, the main control board returns to pressure switch proving mode. The main control board waits for a 15 s pre-purge period, then begins the ignition trial.
4. **Ignition trial**: The main control board energizes the gas valve and spark outputs for a 5 s ignition trial. The main control board de-energizes the spark when the flame is sensed and enters a flame stabilization period. The main control board establishes flame in high heat mode. If a call for heating is only present on the first-stage heating (W1) input, the main control board switches to first-stage heat after 10 s of flame. If there is a call for heating on the first-stage and second-stage input (W1 + W2), the main control board remains in high heat mode. If the flame is not established within the ignition trial, the main control board de-energizes the spark and gas valve and begins an inter-purge period before attempting another ignition trial. If the call for heating is removed during an ignition trial, the main control board immediately de-energizes spark and gas. The main control board runs the induced draft motor through a post-purge period before de-energizing. If the pressure switch opens during an ignition trial, the main control board immediately de-energizes spark and gas. The main control board begins pressure switch proving before an inter-purge and reignition attempt.
5. **Heat blower on delay**: The main control board waits for 30 s and then energizes the indoor blower at the required gas heating airflow setting, which is based on the heat (HEAT) DIP switch settings and the low heating (W1) or the high heating (W1+W2) input. The blower on delay time begins at the start of the flame proving period in the ignition trial. If the thermostat call for heating is removed, the main control board deenergizes the gas valve, energizes the blower on the gas heating airflow setting, and initiates a post-purge period and heat blower off delay.
6. **Main burner operation**: The main control board keeps the main gas valve and induced draft motor energized while continuously monitoring the call for heating, pressure switch, and flame status. If the call for heating (W1) is removed, the main control board de-energizes the gas valve, and begins the post-purge period and heat blower off delay. If a call for low fire heating (W1) is present and a call for high-stage heating (W2) is removed, the main control board stages down to low fire heating. The main control board stages back up to high fire heating if there is a high-stage heating (W2) call. During normal operation, if the main control board is operating the unit in low stage heating, the main control board switches to high fire heating any time there is a call for high-stage heating (W2), regardless of the stage (STG) DIP switch settings. If the pressure switch opens, the main control board de-energizes the gas valve and begins pressure switch proving mode. If the flame is removed, the main control board de-energizes the gas valve within 2 s and counts the flame loss. If the flame has been lost less than five times, the main control board attempts re-ignition after a 15 s inter-purge period. If the flame has been lost five times within the same call for heating, the main control board locks out, and the status LED on the main control board emits 8 red flashes.
7. **Post-purge**: The main control board runs the induced draft motor for a 15 s post-purge period, and then de-energizes the inducer. If a call for heating occurs during the post-purge period, the main control board finishes the post-purge period, and begins the next ignition sequence immediately.

8. **Heat blower off delay**: When the thermostat ends the call for heating operation, the main control board de-energizes the indoor blower motor after a delay time. There are four options for the delay time: 60 s, 90 s, 120 s, or 180 s. The factory setting is 60 s. You select the blower off delay time using the delay (DLY) DIP on the main control board. See Configuring gas heating blower off delay settings. The blower off timing begins when the thermostat is satisfied and removes the call for heating (W). The main control board returns to standby when the blower off delay is complete. If a thermostat call for heating occurs before the blower off delay is complete, the main control board begins an ignition sequence, starting with the pre-purge period, while the blower off delay continues.

See High-temperature limit switch operation, Rollout switch operation, Power interruptions, Flame present with gas off, Gas valve fault, and Lockout for more information about how these conditions affect heating operation.

## High-temperature limit switch operation

Any time the high-temperature limit switch is open for less than 5 min, the main control board runs the indoor blower motor on maximum airflow, runs the inducer, and de-energizes the gas valve, and the status LED on the main control board emits 4 red flashes. When the high-temperature limit switch closes, the main control board restarts the ignition sequence, beginning with the pre-purge period.

If the high-temperature limit switch is open for more than 5 min, the main control board de-energizes the inducer and continues to operate the indoor blower motor on heat airflow, and the status LED on the main control board emits 11 red flashes.

## Rollout switch operation

If the limit circuit is open for more than 15 min, the status LED on the main control board emits 5 red flashes. The blower output is energized at the maximum airflow when the rollout switch is open. If the rollout switch is reset, the main control board remains in lockout until power is removed or a call for heating (W) is removed. See Resetting a lockout. The rollout switch does not reset automatically.

## Power interruptions

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

## Flame present with gas off

If the flame is sensed for longer than 4 s during a period when the gas valve should be closed, the main control board energizes the inducer motor and runs the blower motor at the maximum airflow, and the status LED on the main control board emits 1 red flash while the flame is sensed. When the main control board no longer senses flame, the inducer motor shuts down after a 15 s delay, the blower motor is de-energized after the blower off delay timing, the main control board enters a hard lockout, and the status LED on the main control board continues to emit 1 red flash. See Resetting a lockout.

## Gas valve fault

If the main valve output is sensed as energized for more than 1 s when commanded to be off, the main control board de-energizes the induced draft motor, if the flame is not present, to attempt to open the pressure switch to de-energize the gas valve. If the main gas valve is still sensed as energized after the inducer has been off for 10 s, the main control board reenergizes the inducer to vent the unburned gas. The main control board enters a hard lockout, and the status LED on the main control board emits 10 red flashes. See Resetting a lockout.

# Cooling operation

The unit is controlled by a conventional heating or cooling thermostat. When the thermostat calls for cooling, the following occurs:

1. Thermostat terminals G and Y1 are energized, which signals the compressor, outdoor fan, and indoor blower to run on first stage cooling. With a call for Y1, the indoor circulating blower is energized at the low cool airflow setting.
2. The control board cycles the compressor and indoor blower to the second-stage cooling setting anytime a second-stage cooling (Y2) call is received during a first-stage cooling (Y1) call. The control board does not operate second-stage cooling without a call on the Y2 thermostat input.
3. When the thermostat is satisfied, terminals G and Y are de-energized, de-energizing the compressor and outdoor fan. After a blower off delay in accordance with the selected cooling delay profile, followed by a 15 s staging down period, the indoor circulating blower is de-energized. See Table 32.

## Humidistat feature

The unit can operate with an optional humidistat to help control the humidity level in the conditioned space during cooling operation. The unit has a built-in humidistat feature for advanced dehumidification in cooling mode. The main control board is designed to work with a humidity control that opens when the humidity is below the setpoint. The humidity control closes when the humidity is above the setpoint. This humidity control may be referred to as a humidistat or dehumidistat. During cooling operation, if the humidity level is above the humidistat setpoint, the indoor blower airflow is reduced by approximately 15% of the selected high cool airflow setting.

If the unit is being used with a humidistat, you must connect the humidistat from the low voltage R and HUM color-coded leads and enable the humidistat feature on the main control board by setting the humidistat (HUM) DIP switch to the on position. See Enabling the humidistat feature.

# Indoor circulating blower operation

The unit is controlled by a conventional heating or cooling thermostat. When the thermostat calls for continuous fan operation, the following occurs:

1. Thermostat terminal G is energized, signaling the main control board to operate the indoor circulating blower continuously. The indoor circulating blower airflow is approximately 67% of the high cool airflow selected on the main control board.
2. If a call for cooling occurs on Y1, the indoor circulating blower runs at the low cool airflow based on the cool (COOL) DIP switch settings. If a call for cooling is present on Y1+Y2, the indoor blower runs at the high cool airflow based on the cool (COOL) DIP switch settings. If a call for heating occurs on W1 or W1+W2, the indoor circulating blower runs at the low heat or high heat airflow based on the heat (HEAT) DIP switch settings.
3. When the thermostat ends the call for continuous fan operation, thermostat terminal G is de-energized, and the main control board stops the indoor circulating blower operation after a 15 s staging down period.

# Lockout

It is important to understand the following:

- **Soft lockout**: The main control board has a built-in 1 h soft lockout for repeated failures during the same heating call. During a soft lockout, the main control board responds to calls for cooling or fan operation but does not respond to calls for heat and keeps the main gas valve and induced draft motor de-energized. A soft lockout resets automatically after 1 h. This provides protection for an unoccupied structure if a temporary condition causes a furnace malfunction, for example, if a temporary interruption in gas supply prevents the furnace from lighting. The main control board keeps trying to light each hour and resumes normal operation if the gas supply is restored. To reset a soft lockout and override the 1 h lockout time, follow the procedure outlined in Resetting a lockout.

- **Hard lockout**: When a fault code indicating a potentially hazardous condition for users or occupants of the space where the unit is located occurs, the main control board enters a hard lockout. This includes the occurrence of repeated fault codes during a call for gas heating, for example. During a hard lockout, the main control board responds to calls for cooling or fan operation, but does not respond to calls for gas heating. To reset a hard lockout, follow the procedure outlined in Resetting a lockout.

## Turning off the thermostat, electric power, and gas supply to the unit

1. Set the thermostat to the **OFF** position.
2. Turn off all electric power to the unit if service is to be performed.
3. Remove the control access panel by removing the screws and lifting the panel out.
4. Set the gas valve switch to the **OFF** position.

   ⓘ **Note:** Do not force the gas valve switch.
5. Replace the control access panel.

## Servicing the unit

You can access all serviceable unit components at the following locations:

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

See Figure 5 and Figure 15 or Figure 16 for an illustration.

See  for the minimum clearances you must maintain for the unit.

**⚠ CAUTION**

This system uses R-454B refrigerant. No other refrigerant may be used in this system. Gauge sets, hoses, refrigerant containers, and recovery systems must be designed to handle R-454B. If you are unsure, consult the equipment manufacturer. Failure to use R-454B compatible servicing equipment may result in property damage or injury.

**⚠ WARNING**

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

### Sourcing replacement parts

Contact your local BHC Group Heating & Cooling parts distribution center for authorized replacement parts.

# Troubleshooting

If troubleshooting is needed, follow all safety requirements, and use the unit control board diagnostics to assist.

**⚠ WARNING**

Troubleshooting of components necessarily requires opening the electrical control box with the power connected to the unit. Use extreme care when working with live circuit! Check the unit nameplate for the correct range before making any connections with line terminals.

**⚠ CAUTION**

The wire number or color and terminal designations referred to may vary. Check the wiring label inside the control box access panel for the correct wiring.

## Using unit control board diagnostics

The gas heating section has built-in self-diagnostic capability. The main control board continuously monitors its own operation and the operation of the system. The status LED on the main control board flashes red, green, or amber to indicate various conditions, for example, when there are active faults, when there are no thermostat calls, and when there are thermostat calls for heating, cooling, or continuous fan operation. If a fault occurs, the status LED indicates the fault code.

PG5E48 and PG5E60 units have an A2L sensor and use the A2L diagnostic LED in combination with the status LED on the main control board. See Main control board and A2L components.

Table 40 provides an overview of the status LED and A2L diagnostic LED codes and troubleshooting guidance for faults.

**Note:**

- For the slow flash codes, the slow flash speed of the status LED is 2 s on and 2 s off.
- For the continuous flash codes, the status LED flashes on and off continuously with no breaks or longer pauses.
- For the red flash codes, the status LED turns on for 1/3 s and turns off for 1/3 s. This pattern is repeated the number of times equal to the code. There is a 2 s pause between codes. For example, for the 6 red flashes code, the status LED flashes on and off six times and then remains off for 2 s. This pattern repeats as long as the fault condition remains.

## Status LED and A2L diagnostic LED codes

### Table 40: Status LED and A2L diagnostic LED codes

| Status LED | A2L diagnostic LED - applies to only PG5E48 and PG5E60 units | Condition | Solution |
|---|---|---|---|
| Off | Off | Indicates there is no power to main control board or the main control board has failed | Do the following:<br>1. Supply power to the main control board.<br>2. Replace the fuse on the main control board if the fuse is open.<br>3. If the status LED on the main control board is still off, replace the main control board with a new control board. |
| Solid on any color | Off | Indicates a possible internal main control board failure | If possible, the main control board resets after 1 h in an attempt to clear the fault. Cycle the power to the unit. If the condition persists, replace the main control board. The main control board is not field repairable. |
| Slow green flash (or heartbeat) | Off | Indicates the following:<br>• Normal operation with no thermostat calls<br>• Normal operation with an active compressor call<br>• Normal operation with an active call for continuous fan operation | Normal operation. No action is required. |
| Slow amber flash (or heartbeat) | Off | Indicates normal operation with a thermostat call for heating | Normal operation. No action is required. |
| Rapid green flashes | Off | Indicates the main control board is powered and test mode is activated | Normal operation. No action is required. |
| Rapid amber flash | Off | Indicates the flame sense current is low - below 1.5 µA | Do the following:<br>• Check and clean or replace the flame sensor.<br>• Check for correct gas flow.<br>• Verify that the voltage is greater than 1.5 VDC at the flame current test pad. |
| 4 amber flashes | Off | Indicates the main control board is receiving a Y signal from the thermostat without a G signal. The unit continues to operate during heating and cooling, but this fault code is displayed to alert the user that there is a wiring problem. | Verify that the G wire from the thermostat is connected correctly. |
| 1 red flash | Off | Indicates the flame was sensed when there was no call for heating. The main control board turns on both the induced draft motor and supply air blower. | Check for a leaking or slow-closing gas valve. |
| 2 red flashes | Off | Indicates the pressure switch is closed when it should be open. The main control board confirms the pressure switch contacts are open at the beginning of each heat cycle. The main control board prevents the ignition sequence from continuing if the pressure switch contacts are closed when they should be open. | Check for a faulty pressure switch or miswiring. |

## Table 40: Status LED and A2L diagnostic LED codes

| Status LED | A2L diagnostic LED - applies to only PG5E48 and PG5E60 units | Condition | Solution |
|---|---|---|---|
| 3 red flashes | Off | Indicates the pressure switch is open when it should be closed | Check for the following:<br>• Faulty inducer<br>• Blocked vent<br>• Broken pressure switch hose<br>• Disconnected pressure switch or inducer wires<br>• Faulty pressure switch |
| 4 red flashes | Off | Indicates the high-temperature limit switch or rollout switch has been open for less than 5 min. The main control board turns on the supply air blower and inducer. | Check for the following:<br>• Dirty filter<br>• Incorrectly sized duct system<br>• Incorrect blower speed setting<br>• Incorrect firing rate<br>• Loose high-temperature limit switch or rollout switch wiring<br>• Faulty blower motor<br>**Note:** If the high-temperature limit switch does not close within 5 min, the main control board operates as if the blower is not functioning. The main control board starts a hard lockout and the status LED on the main control board emits 11 red flashes. See Resetting a lockout. If the high-temperature limit switch does not close after 15 min, the main control board operates as if a manual reset rollout switch has opened, and the status LED on the main control board emits 5 red flashes. See the 5 red flashes and 11 red flashes entries in this table. If the high-temperature limit switch opens five times within a call for heat, the status LED on the main control board emits 4 red flashes. |
| 5 red flashes | Off | Indicates the high-temperature limit switch or rollout switch has been open for more than 15 min, usually meaning that a manual reset rollout switch has opened or that the blower motor or blower wheel has failed | Check for the following:<br>• Proper combustion air<br>• Correct inducer operation<br>• Primary heat exchanger failure<br>• Burner problem<br>• Faulty blower motor<br>**Note:** The main control board enters a hard lockout. When the problem is corrected, you must cycle the power to the unit to reset the main control board. See Resetting a lockout. |
| 6 red flashes | Off | Indicates that while the unit was operating, the pressure switch opened five times during the call for heat | Check for a faulty inducer, blocked vent, or faulty pressure switch.<br>**Note:** The furnace locks out for 1 h and then restarts. See Resetting a lockout. |

## Table 40: Status LED and A2L diagnostic LED codes

| Status LED | A2L diagnostic LED - applies to only PG5E48 and PG5E60 units | Condition | Solution |
|---|---|---|---|
| 7 red flashes | Off | Indicates the flame could not be established or sensed during three attempts for ignition | Do the following:<br>• Check that the gas valve switch is in the on position.<br>• Check for the following:<br>- Low gas pressure or no gas pressure<br>- Faulty gas valve<br>- Dirty or faulty flame sensor<br>- Faulty ignitor<br>- Loose wires<br>- Burner problem<br>ⓘ **Note:** The furnace locks out for 1 h and then restarts. See Resetting a lockout. |
| 8 red flashes | Off | Indicates the flame has been lost five times (four recycles) during a single heating cycle | Check for low gas pressure, a dirty or faulty flame sensor, or a faulty gas valve.<br>ⓘ **Note:** The furnace locks out for 1 h and then restarts. See Resetting a lockout. |
| 9 red flashes | Off | Indicates reversed line voltage polarity, a grounding problem, or reversed low-voltage transformer wires | Do the following:<br>• Check the polarity at the furnace and branch.<br>• Check the furnace grounding.<br>• Check that the flame probe is not shorted to the chassis.<br>ⓘ **Note:** The furnace does not start the ignition sequence until the problem is corrected. |
| 10 red flashes | Off | Indicates the gas valve is energized with no call for heating. The main blower and inducer blower run and no ignition sequence starts as long as this condition exists. See Gas valve fault. | Check the gas valve and gas valve wiring. |
| 11 red flashes | Off | Indicates the high-temperature limit switch or rollout switch has remained open for more than 5 min and less than 15 min. This condition is usually caused by a failed blower motor or blower wheel. | Check the blower motor, blower wheel, and blower motor wiring.<br>ⓘ **Note:** The main control board enters a hard lockout. When the problem is corrected, you must cycle the power to the unit to reset the main control board. See Resetting a lockout. |
| 12 red flashes | Off | Indicates the model ID for the unit is configured incorrectly | Check the model ID DIP switch settings. See Setting the unit model. |

## Table 40: Status LED and A2L diagnostic LED codes

| Status LED | A2L diagnostic LED - applies to only PG5E48 and PG5E60 units | Condition | Solution |
|---|---|---|---|
| Rapid red flash. Applies to only PG5E48 and PG5E60 units | Solid red | Indicates A2L refrigerant leakage or potentially gas leakage | Proceed as follows:<br>1. Owner to notify service personnel as soon as possible. Maintain power to the unit and try to keep the conditioned space ventilated by opening windows if possible.<br>2. Service personnel to locate refrigerant leak point(s) and repair. Adjust the unit charge and get the unit back to correct functions.<br>ⓘ **Note:** There is potential for the A2L sensor to detect natural gas or propane leakage. If the service person can not find refrigerant leakage, check for gas pipe leaks and check other gas heat components for leakage. Change to new parts after you confirm gas heat component leaks. |
| 1 red flash. Applies to only PG5E48 and PG5E60 units | Solid red | Indicates the refrigerant detection sensor is bypassed. Occurs only on power up if the A2L sensor is not connected to the A2L terminal of the main control board | Do the following:<br>• Ensure the correct A2L sensor is properly plugged in the A2L terminal of the main control board.<br>• Ensure the A2L sensor cable is not damaged. Replace the wiring to the A2L sensor if necessary. |
| 2 red flashes. Applies to only PG5E48 and PG5E60 units | Solid red | Indicates refrigerant detection sensor communications have been lost. The A2L sensor is not connected to the A2L terminal of the main control board | Do the following:<br>• Ensure the correct A2L sensor is properly plugged in the A2L terminal of the main control board.<br>• Ensure the A2L sensor cable is not damaged. Replace the wiring to the A2L sensor if necessary. |
| 3 red flashes. Applies to only PG5E48 and PG5E60 units | Solid red | Indicates refrigerant detection sensor failure. The A2L sensor may have failed or broken | If the fault code occurs during normal operation, cycle power to the unit. If the fault code remains, replace the A2L sensor. Make sure the replacement is the correct A2L sensor.<br>ⓘ **Note:** The A2L sensor may have this fault code if the unit is out of temperature range or out of humidity range, or if the A2L sensor is at its end of life. |

### Displaying and clearing stored fault codes

The main control board stores fault codes for 30 days. You can use the SW5 button (or last error button) on the main control board to retrieve and clear stored fault codes if no active faults or thermostat calls are present.

**Important:** If an active fault or thermostat call is present when you press and hold the SW5 button, the main control board does not respond.

To display and clear stored fault codes, do the following:

1. Make sure that there are no active thermostat calls or faults.
2. On the main control board, press and hold the **SW5** button for 0.2 s to 5 s. If stored fault codes are present, the fault codes display. If there are no stored fault codes, the status LED on the main control board emits 2 green flashes.
3. Press and hold the **SW5** button for more than 5 s to clear the stored fault codes if required.

## Resetting a lockout

You can reset a soft or hard lockout if required. Soft lockouts reset automatically after 1 h. Hard lockouts do not reset automatically. See Lockout for more information about soft and hard lockouts.

- **To reset a soft lockout**, do one of the following:
  - Remove all thermostat calls for more than 5 s.
  - Cycle the power to the main control board. To do so, turn off the power to the main control board or the entire unit for more than 5 s and turn on the power again.
  - Let the 1 h lockout time expire.
- **To reset a hard lockout**, cycle the power to the main control board. To do so, turn off the power to the main control board or the entire unit for more than 5 s and turn on the power again.

# Checking the refrigerant charge

If you suspect there is a refrigerant circuit problem, check the refrigerant charge.

**Important:**

- The unit is critically charged. Several ounces of refrigerant are lost each time you connect a refrigerant gauge to the unit. **Do not** connect a refrigerant gauge to the unit to check the refrigerant charge unless you suspect there is a refrigerant circuit problem.
- See A2L refrigerant safety guidance and follow procedures as required. See Charging after refrigerant circuit repair work.

To check the refrigerant charge, do the following:

1. Connect a temperature probe to the compressor discharge line approximately 6 in. away from the compressor shell.
2. Connect a high side refrigerant pressure gauge to the unit discharge pressure port.
3. Record the discharge line temperature and discharge pressure. Using an R-454B temperature pressure chart, convert gauge pressure to saturation temperature. The difference between discharge saturation temperature and discharge line temperature is discharge superheat.
4. Obtain an entering indoor wet bulb temperature reading.
5. Obtain an ambient dry bulb temperature reading.
6. Compare readings taken to the unit charging chart.

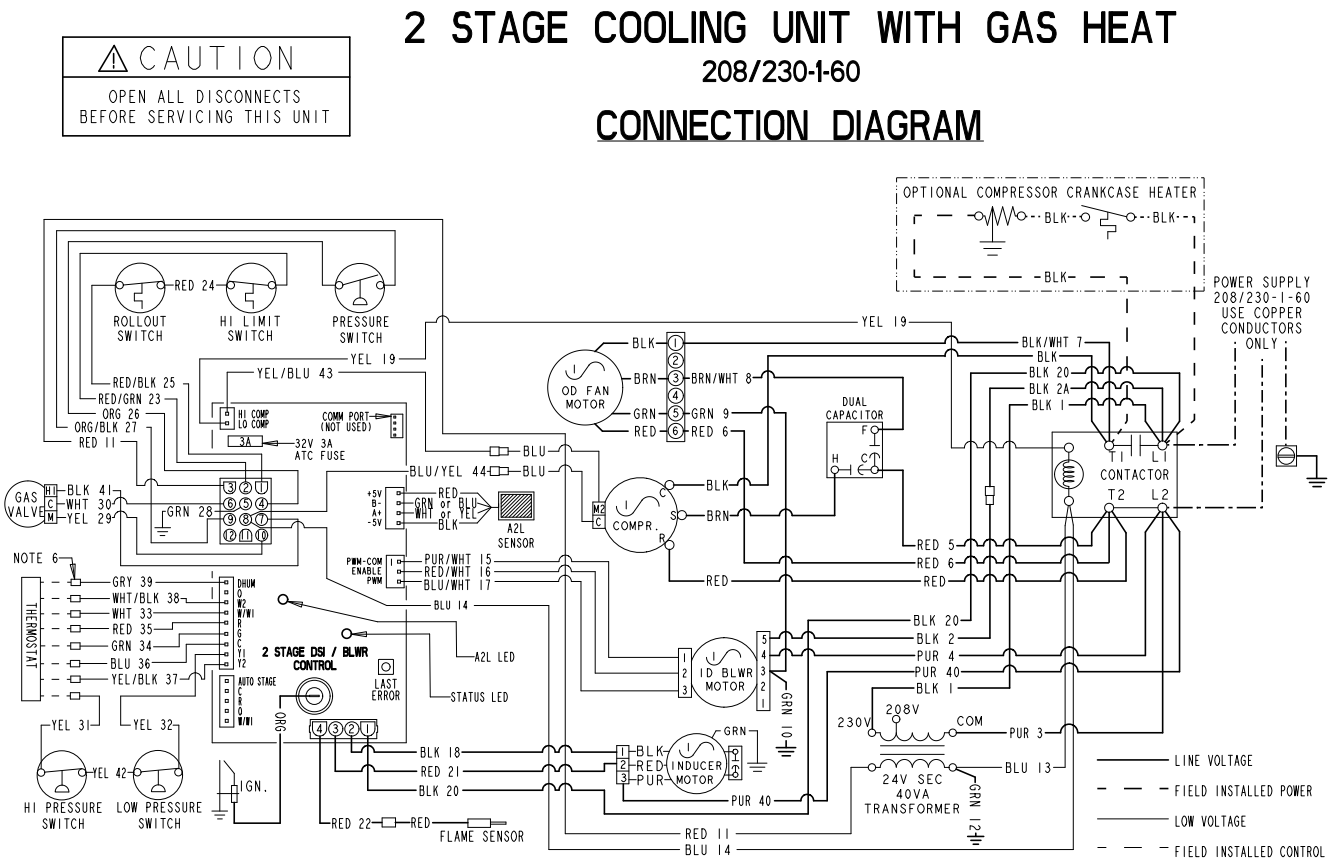
   **Important:** You can follow the charging chart to check and adjust unit charge if there is no hot work or refrigerant circuit repair involved; otherwise, read the A2L refrigerant safety guidance in its entirety before charging the unit. Whenever applicable, it is preferred to accurately charge the rating plate charge amount into the unit after satisfactory vacuuming.

# Third-party trademarks

**Third-Party Trademarks Notice:** For information about third-party trademarks, refer to the relevant company websites.

# Wiring diagrams

**Figure 18: Connection wiring diagram**




## DSI CONTROL STATUS/DIAGNOSTIC CODES

| STATUS LED | A2L LED (IF EQUIPPED) | CONDITION |
|---|---|---|
| OFF | OFF | NO POWER TO CONTROL OR CONTROL FAILURE |
| GREEN HEARTBEAT | OFF | STANDBY,CALL FOR FAN OR COOL |
| AMBER HEARTBEAT | OFF | CALL FOR HEAT ACTIVE |
| RAPID GREEN FLASH | OFF | FACTORY TEST MODE |
| RAPID AMBER FLASH | OFF | LOW FLAME CURRENT |
| ON (ANY COLOR) | OFF | CONTROL FAILURE |
| 1 RED FLASH | OFF | FLAME SENSED W/GAS VALVE OFF |
| 2 RED FLASHES | OFF | PRESS. SWITCH CLOSED W/DRAFT INDUCER OFF |
| 3 RED FLASHES | OFF | PRESS. SWITCH OPEN W/DRAFT INDUCER ON |
| 4 RED FLASHES | OFF | LIMIT/ROLLOUT SWITCH OPEN |
| 4 AMBER FLASHES | OFF | CALL FOR COOL "Y" W/O CALL FOR FAN "G" |
| 5 RED FLASHES | OFF | LIMIT/ROLLOUT SWITCH OPEN GREATER THAN 15 MIN. |
| 6 RED FLASHES | OFF | PRESS. SWITCH CYCLE LOCKOUT |
| 7 RED FLASHES | OFF | LOCKOUT - FAILED IGNITION |
| 8 RED FLASHES | OFF | LOCKOUT - TOO MANY FLAME DROPOUTS |
| 9 RED FLAHSES | OFF | TRANSFORMER LOW VOLTAGE OUT OF PHASE WITH LINE VOLTAGE |
| 10 RED FLASHES | OFF | GAS VALVE FAULT |
| 11 RED FLASHES | OFF | LIMIT/ROLLOUT OPEN BETWEEN 5 AND 15 MIN. |
| 12 RED FLASHES | OFF | MODEL INCORRECTLY CONFIGURED |
| RAPID RED FLASH | ON | REFRIG. LEAK DETECTED (ABOVE 15% LFL) |
| 1 RED FLASH | ON | REFRIG. DETECTION SENSOR - BYPASSED |
| 2 RED FLASHES | ON | REFRIG. DETECTION SENSOR - LOST COMMUNICATION |
| 3 RED FLASHES | ON | REFRIG. DETECTION SENSOR - FAILURE |

**FAULT CODE RETRIEVAL**

PRESS "LAST ERROR" BUTTON FOR MORE THAN 1/5 SECOND AND LESS THAN 5 SECONDS WITH NO ACTIVE THERMOSTAT SIGNALS TO DISPLAY STORED ERROR CODE FLASHES ON STATUS LED WITH 2 SECOND DELAY BETWEEN CODES. IF NO ERROR CODES ARE PRESENT, LED WILL DISPLAY 2 GREEN FLASHES. HOLD "LAST ERROR" BUTTON FOR MORE THAN 5 SECONDS TO CLEAR MEMORY.

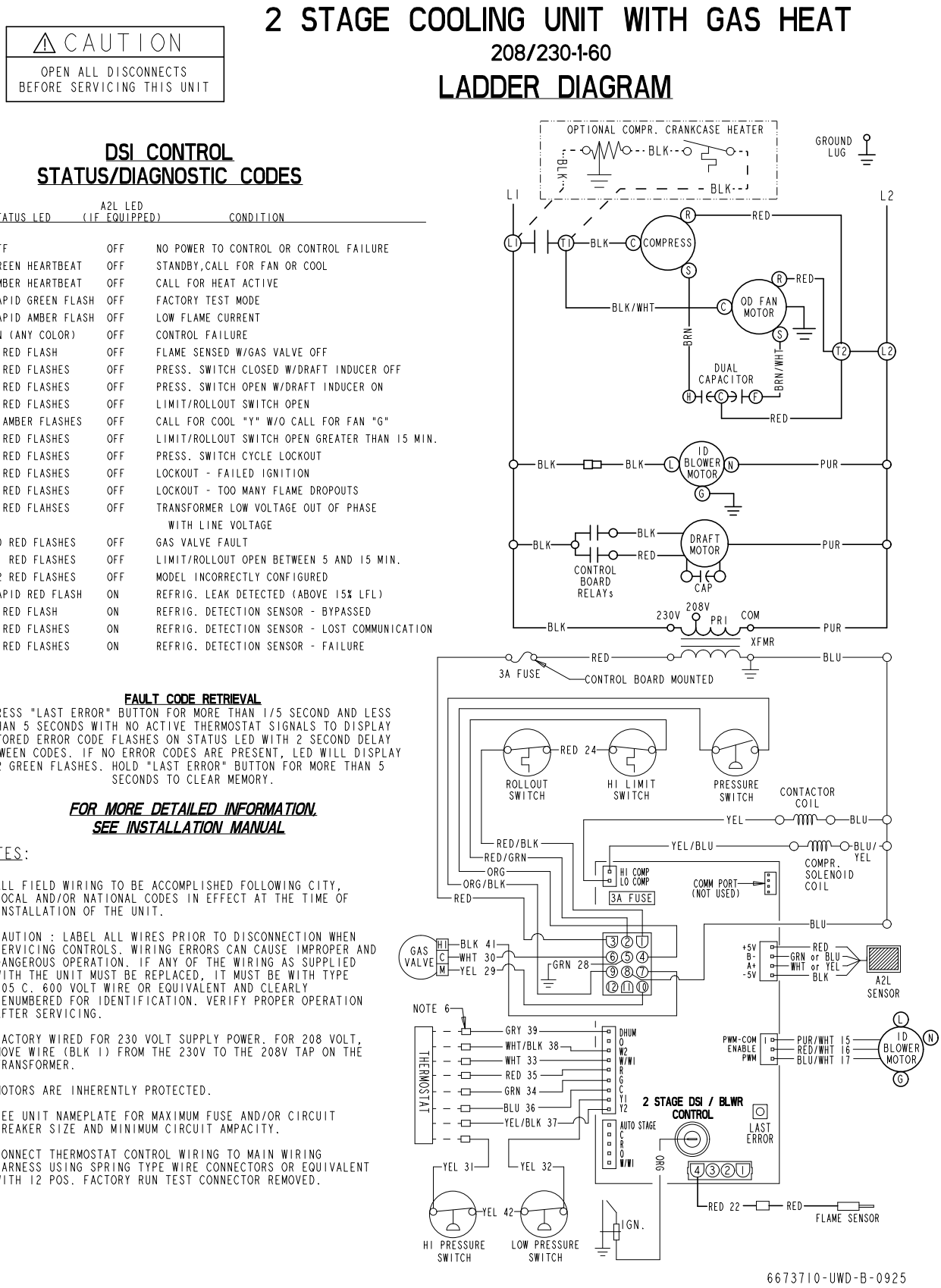
***FOR MORE DETAILED INFORMATION, SEE INSTALLATION MANUAL***

NOTES:

1. ALL FIELD WIRING TO BE ACCOMPLISHED FOLLOWING CITY, LOCAL AND/OR NATIONAL CODES IN EFFECT AT THE TIME OF INSTALLATION OF THE UNIT.
2. CAUTION : LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION. IF ANY OF THE WIRING AS SUPPLIED WITH THE UNIT MUST BE REPLACED, IT MUST BE WITH TYPE 105 C. 600 VOLT WIRE OR EQUIVALENT AND CLEARLY RENUMBERED FOR IDENTIFICATION. VERIFY PROPER OPERATION AFTER SERVICING.
3. FACTORY WIRED FOR 230 VOLT SUPPLY POWER. FOR 208 VOLT, MOVE WIRE (BLK 1) FROM THE 230V TO THE 208V TAP ON THE TRANSFORMER.
4. MOTORS ARE INHERENTLY PROTECTED.
5. SEE UNIT NAMEPLATE FOR MAXIMUM FUSE AND/OR CIRCUIT BREAKER SIZE AND MINIMUM CIRCUIT AMPACITY.
6. CONNECT THERMOSTAT CONTROL WIRING TO MAIN WIRING HARNESS USING SPRING TYPE WIRE CONNECTORS OR EQUIVALENT WITH 12 POS. FACTORY RUN TEST CONNECTOR REMOVED.

6673710-UWD-B-0925

## Figure 19: Ladder wiring diagram



# Start-up sheet

Residential package unit cooling with gas heat start-up sheet

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

| Start-up date | | Company name | | Start-up technician | |
|---|---|---|---|---|---|

**Owner information**

| Name | | Address | | Daytime phone | |
|---|---|---|---|---|---|
| City | | State or province | | Zip or postal code | |

**Equipment data**

| Unit model number | | Unit serial number | |
|---|---|---|---|

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

| | | | |
|---|---|---|---|
| ◯ Residential | ◯ New construction | ◯ Roof level | ◯ Down flow |
| ◯ Commercial | ◯ Retrofit | ◯ Grade level | ◯ Side flow |

**Unit location and connections** (Check all that apply)

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

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

**Filters**

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

**Additional kits and accessories Installed (Check all that apply)**

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

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

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

**Electrical connections and inspection (Check all that apply)**

◯ Single phase ◯ Three phase ◯ 208 VAC ◯ 230 VAC ◯ 460 VAC ◯ 575 VAC

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

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

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

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

◯ Single-stage compressor ◯ Two-stage compressor

**Airflow setup/cooling**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Blower type and set-up** | ◯ Standard ECM | COOL | ◯ 1 | ◯ 2 | ◯ 3 | ◯ 4 | ◯ 5 |
| | | HEAT | ◯ 1 | ◯ 2 | ◯ 3 | ◯ 4 | ◯ 5 |
| | | CONT. FAN | ◯ 1 | ◯ 2 | ◯ 3 | ◯ 4 | ◯ 5 |
| | ◯ Constant airflow ECM | COOL | ◯ A | ◯ B | ◯ C | ◯ D | |
| | | HEAT | ◯ A | ◯ B | ◯ C | ◯ D | |
| | | COOL BLOWER DELAY | ◯ A | ◯ B | ◯ C | ◯ D | |
| | | COOL ADJUST (D = A) | ◯ A | ◯ B | ◯ C | ◯ D | |
| | | HEAT OFF DELAY | ◯ 60 s | ◯ 90 s | ◯ 120 s | ◯ 180 s | |
| | | HUMIDISTAT | ◯ NO | ◯ YES | | | |
| | | HEAT STAGING | ◯ OFF | ◯ 10 min | ◯ 15 min | ◯ 20 min | |
| | | MODEL ID SET | ◯ YES | | | | |

| | | |
|---|---|---|
| Supply static (in. W.C.) | Supply air dry bulb temperature | Outside air dry bulb temperature |
| Return static (in. W.C.) | Return air dry bulb temperature | Return air wet bulb temperature |
| Total external static pressure | Temperature drop | Supply air wet bulb temperature |

Page 1 of 2

## Refrigerant charge and metering device

| | | | |
|---|---|---|---|
| ○ R-410A ○ R-454B | Data plate - lb-oz | Suction line temperature | Discharge pressure |
| ○ TXV ○ Fixed orifice | Discharge line temperature | Suction pressure | Liquid line temperature |
| TXV model/orifice size | Discharge superheat | Suction superheat | Subcooling |

## Gas heat

| | | | |
|---|---|---|---|
| ○ Single stage ○ Two stage | | ○ Natural gas ○ Propane (LP) gas (requires LP conversion kit) | |
| LP conversion kit model | | LP conversion kit installed by | Inlet gas pressure (in. W.C.) |
| Manifold pressure at 100% firing rate (in. W.C.) | | Measured Btu/h (Clock gas meter nat gas) | Rated Btu/h |
| Manifold pressure/low fire rate (in. W.C.) | | Return air dry bulb temp | Supply air dry bulb temp / Temp rise |

☐ Burner flame inspection - Blue flames extending directly into the primary heat exchanger cells

## Clean up job site

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

## Unit operation and cycle test

- ☐ If the unit includes an A2L sensor and a refrigerant detection system (RDS), operate the unit through field testing the A2L sensor and taking A2L mitigation actions, noting and correcting any problems
- ☐ Operate the unit through continuous fan cycles from the thermostat, noting and correcting any problems
- ☐ Operate the unit through cooling cycles from the thermostat, noting and correcting any problems
- ☐ Operate the unit through gas heating cycles from the thermostat, noting and correcting any problems

## Owner education

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

## Comments and additional job details



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