

Installation Instructions

PGD3 Series

PACKAGED GAS/ELECTRIC UNIT

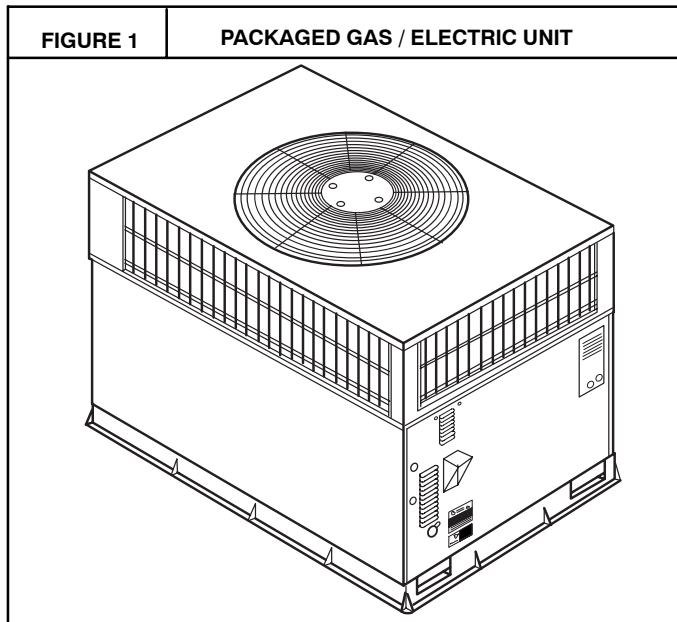


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SAFE INSTALLATION REQUIREMENTS



Installation and servicing of this equipment can be hazardous due to mechanical and electrical components. Only trained and qualified personnel should install, repair, or service this equipment.

Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on this equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the unit and other safety precautions that may apply.

Follow all safety codes. Installation must be in compliance with local and national building codes. Wear safety glasses, protective clothing, and work gloves. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit.



CAUTION


CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

INTRODUCTION

The packaged unit is a fully self-contained, combination Category I gas heating/electric cooling unit designed for outdoor installation (see Figures 3 and 4 for unit dimensions). All unit sizes have return and discharge openings for both horizontal and downflow configurations, and are factory shipped with all downflow duct openings covered.

Recognize safety information. This is the safety-alert symbol . When you see this symbol in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTE**. These words are used with the safety-alert symbol. **DANGER** identifies the most serious hazards which **will** result in serious injury or death. **WARNING** signifies a hazard which **could** result in serious injury or death. **CAUTION** is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. **NOTE** is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.



WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable. TAG DISCONNECT SWITCH WITH LOCKOUT TAG.



WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK AND CARBON MONOXIDE POISONING HAZARD

Failure to follow this warning could result in personal injury or unit damage.

A qualified installer or agency must use only factory-authorized kits or accessories when modifying this product.

RECEIVING AND INSTALLATION

STEP 1 — Check Equipment

Identify Unit

The unit model number and serial number are stamped on the unit information plate. Check this information against shipping papers.

Inspect Shipment

Inspect for shipping damage while unit is still on shipping pallet. If unit appears to be damaged or is torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to transportation company. Manufacturer is not responsible for any damage incurred in transit. Check all items against shipping list. Immediately notify the nearest equipment distribution office if any item is missing. To prevent loss or damage, leave all parts in original packages until installation.

STEP 2 — Provide Unit Support

For hurricane tie downs, contact distributor for details and PE (Professional Engineering) Certificate, if required.

Roof Curb

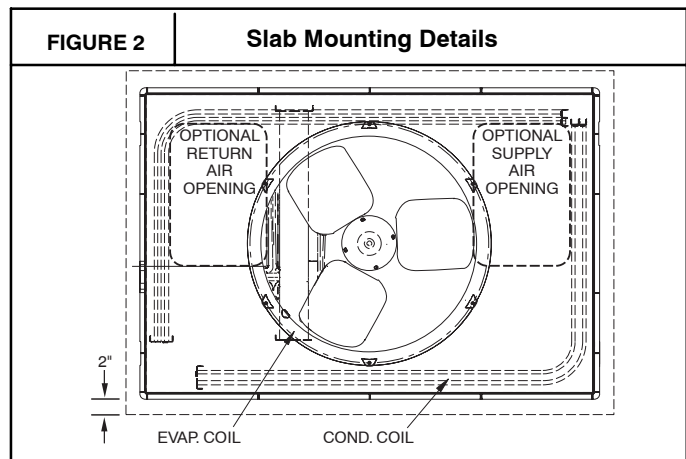
Install accessory roof curb in accordance with instructions shipped with curb. Install insulation, cant strips, roofing, and flashing. Ductwork must be attached to curb.

NOTE: The gasketing of the unit to the roof curb is critical for a water tight seal. Install gasketing material supplied with the roof curb. Improperly applied gasketing also can result in air leaks and poor unit performance.

Curb should be level to within $\frac{1}{4}$ " (6mm) This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required.

Slab Mount

Place the unit on a solid, level concrete pad that is a minimum of 4" (102mm) thick with 2" (51mm) above grade (see Figure 2). The slab should extend approximately 2" beyond the casing on all 4 sides of the unit. Do not secure the unit to the slab *except* when required by local codes.



Ground Mount

The unit may be installed either on a slab or placed directly on the ground, if local codes permit. Place the unit on level ground prepared with gravel for condensate discharge.

STEP 3 — Field Fabricate Ductwork

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

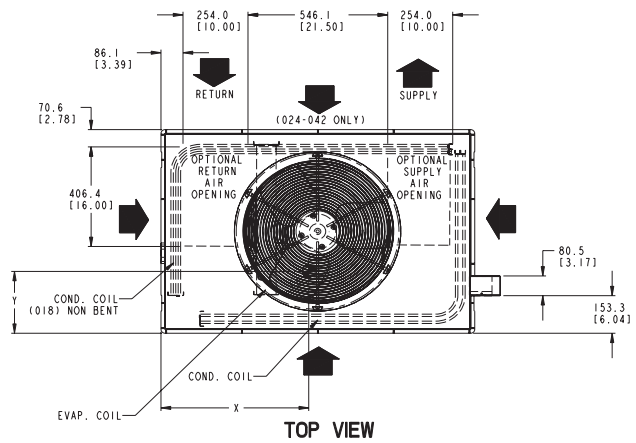
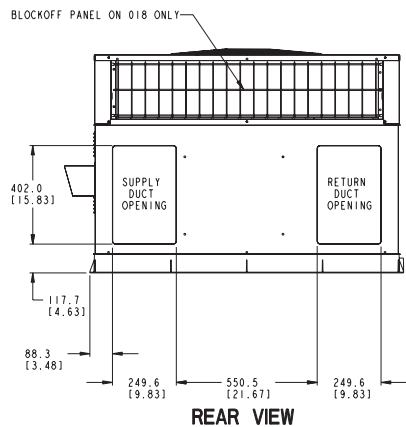
Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

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

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -.25 inches water column.

FIGURE 3

MODEL SIZE 24-36 DIMENSIONS



REQUIRED CLEARANCE TO COMBUSTIBLE MAT'L (Refer to Maximum Operating Clearances)

	INCHES [mm]
TOP OF UNIT	14.00 [355.6]
DUCT SIDE OF UNIT	2.00 [50.8]
SIDE OPPOSITE DUCTS	14.00 [355.6]
BOTTOM OF UNIT	0.50 [12.7]

NEC. REQUIRED CLEARANCES.

	INCHES [mm]
BETWEEN UNITS, POWER ENTRY SIDE	42.00 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36.00 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42.00 [1066.8]

LEGEND

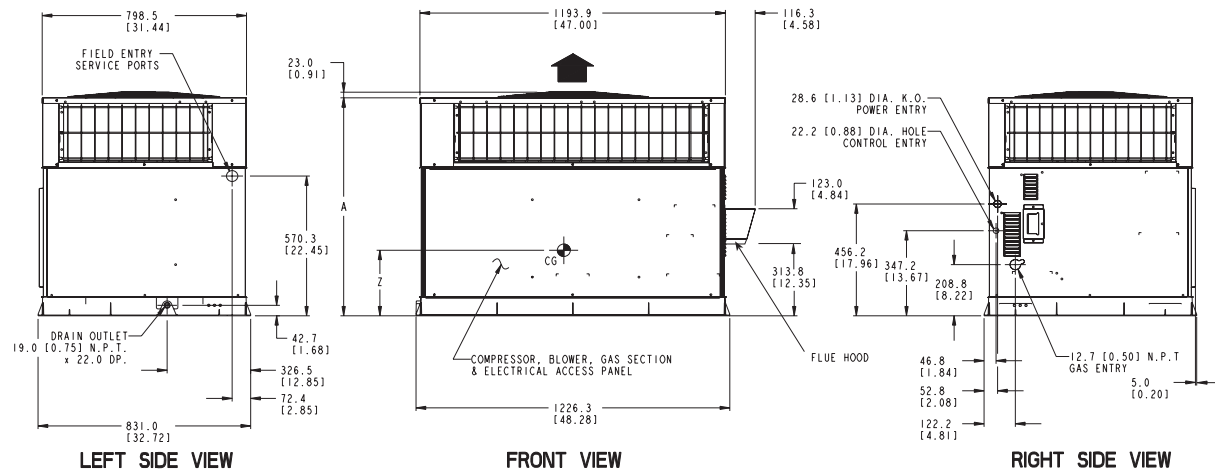
CG - Center of Gravity
COND - Condensor
EVAP - Evaporator
NEC - National Electrical Code
REQ'D - Required

NOTE: Dimensions are in in. [mm]

REQUIRED CLEARANCE FOR OPERATION AND SERVICING

	INCHES [mm]
EVAP COIL ACCESS SIDE	36.00 [914.0]
POWER ENTRY SIDE	42.00 [1066.8]
(EXCEPT FOR NEC REQUIREMENTS)	
UNIT TOP	48.00 [1219.2]
SIDE OPPOSITE DUCTS	36.00 [914.0]
DUCT PANEL	12.00 [304.8] *

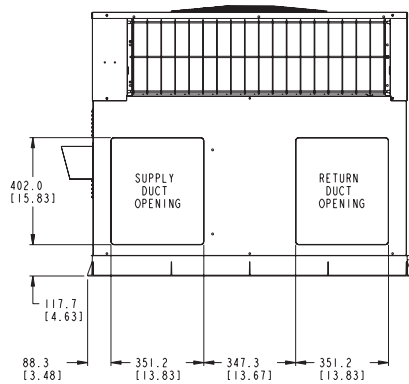
*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12.00 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISE.



Model Size	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN. [MM] "A"	CENTER OF GRAVITY IN. [MM]		
		lb	kg		X	Y	Z
24	208/230-1-60	307	139.3	37 [940]	23.6 [599.4]	15.8 [401.3]	15.7 [398.8]
30	208/230-1-60, 208/230-3-60	319	144.7	37 [940]	23.6 [599.4]	15.8 [401.3]	15.7 [398.8]
36	208/230-1-60, 208/230/460-3-60	353	160.1	43 [1093]	25.0 [635]	15.9 [403.9]	16.0 [406.4]

FIGURE 4

MODEL SIZE 42-60 DIMENSIONS



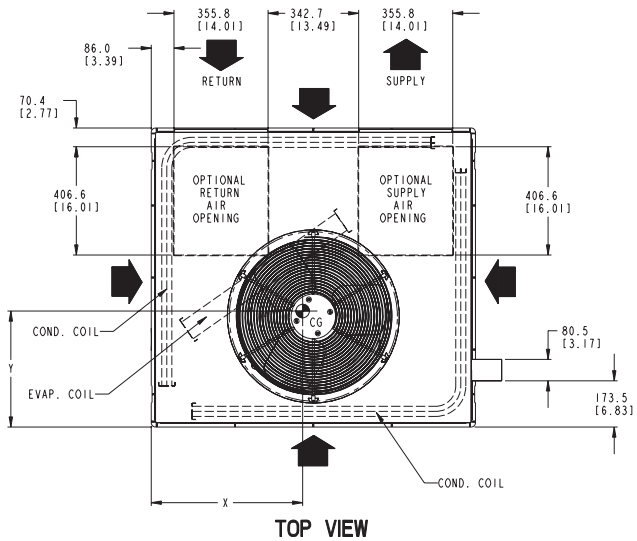
REAR VIEW

REQUIRED CLEARANCE TO COMBUSTIBLE MATL

	INCHES [mm]
TOP OF UNIT	14.00 [355.6]
DUCT SIDE OF UNIT	2.00 [50.8]
SIDE OPPOSITE DUCTS	14.00 [355.6]
BOTTOM OF UNIT	0.50 [12.7]
ELECTRIC HEAT PANEL	36.00 [914.4]

NEC. REQUIRED CLEARANCES.

	INCHES [mm]
BETWEEN UNITS, POWER ENTRY SIDE	42.00 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36.00 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42.00 [1066.8]



TOP VIEW

REQUIRED CLEARANCE FOR OPERATION AND SERVICING

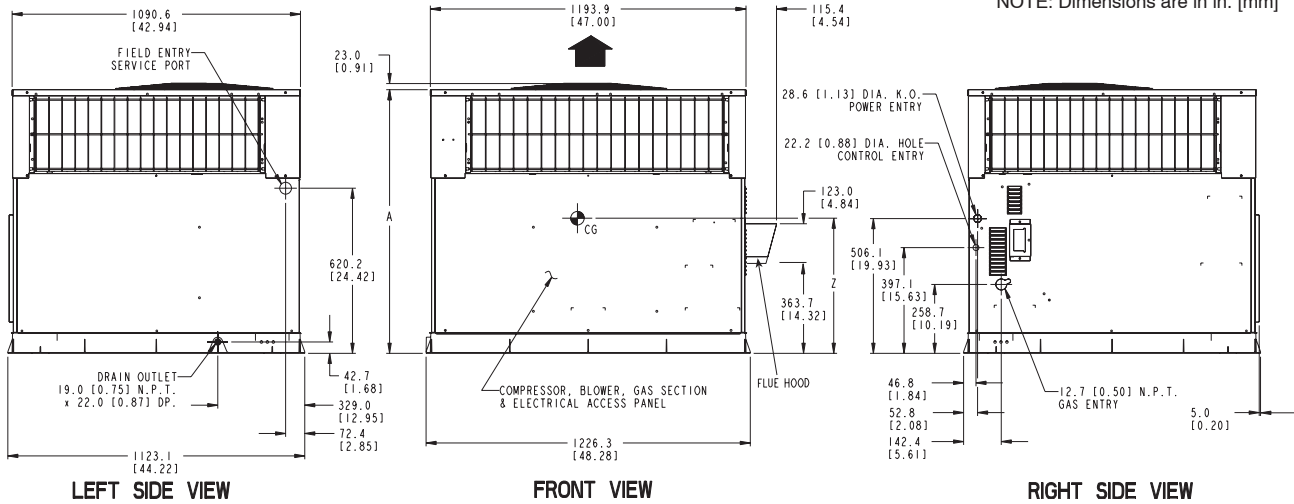
	INCHES [mm]
EVAP. COIL ACCESS SIDE	36.00 [914.0]
POWER ENTRY SIDE	42.00 [1066.8]
(EXCEPT FOR NEC REQUIREMENTS)	
UNIT TOP	48.00 [1219.2]
SIDE OPPOSITE DUCTS	36.00 [914.0]
DUCT PANEL	12.00 [304.8] *

*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12.00 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISE.

LEGEND

CG - Center of Gravity
COND - Condensor
EVAP - Evaporator
NEC - National Electrical Code
REQ'D - Required

NOTE: Dimensions are in in. [mm]



LEFT SIDE VIEW

FRONT VIEW

RIGHT SIDE VIEW

Model Size	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN. [MM] "A"	CENTER OF GRAVITY IN. [MM]		
		lb	kg		X	Y	Z
42	208/230-1-60, 208/230/460-3-60	435	197.3	46.98 [1193]	25.5 [647.7]	21.0 [533]	17.6 [447]
48	208/230-1-60, 208/230/460-3-60	453	205.5	46.98 [1193]	25.7 [652.8]	21.8 [553.7]	18.0 [457.2]
60	208/230-1-60, 208/230/460-3-60	481	218.2	50.98 [1295]	25.8 [655.3]	22.0 [558.8]	20.0 [508.0]

STEP 4 — Provide Clearances

The required minimum operating and service clearances are shown in Figures 3 and 4. Adequate combustion, ventilation and condenser air must be provided in accordance with section 9.3, Air for Combustion and Ventilation, of the National Fuel Gas Code ANSI (American National Standards Institute) Z223.1 or applicable provisions of local building code. In Canada, follow sections 8.2, 8.3, or 8.4 of Can/CGA (Canadian Gas Association) B149 Installation Codes or applicable provisions of local building code.

NOTE: Do not restrict outdoor airflow. An air restriction at either the outdoor-air inlet or the fan discharge may be detrimental to compressor life.

The condenser fan pulls air through the condenser coil and discharges it through the top grille. Be sure that the fan discharge does not recirculate to the condenser coil. Do not locate the unit in either a corner or under an overhead obstruction. The minimum clearance under a partial overhang (such as a normal house overhang) is 48" (1219mm). above the unit top. The maximum horizontal extension of a partial overhang must not exceed 48" (1219mm).

Do not place the unit where water, ice, or snow from an overhang or roof will damage or flood the unit. Do not install the unit on carpeting or other combustible materials. Slab-mounted units should be at least 4" (102mm) above the highest expected water and runoff levels. Do not use unit if it has been under water.

STEP 5 — Rig and Place Unit

Rigging and handling of this equipment can be hazardous for many reasons due to the installation location (roofs, elevated structures, etc.).

Only trained, qualified crane operators and ground support staff should handle and install this equipment.

When working with this equipment, observe precautions in the literature, on tags, stickers, and labels attached to the equipment, and any other safety precautions that might apply.

Training for operators of the lifting equipment should include, but not be limited to, the following:

1. Application of the lifter to the load, and adjustment of the lifts to adapt to various sizes or kinds of loads.
2. Instruction in any special operation or precaution.
3. Condition of the load as it relates to operation of the lifting kit, such as balance, temperature, etc.

Follow all applicable safety codes. Wear safety shoes and work gloves.

Inspection

The lifting/rigging bracket is engineered and designed to be installed *only* on Small Packaged Products. This bracket is to be used to rig/lift a Small Packaged Product onto roofs or other elevated structures.

Prior to initial use, and at monthly intervals, all rigging brackets and straps should be visually inspected for any damage, evidence of wear, structural deformation, or cracks. Particular attention should be paid to excessive

wear at hoist hooking points and load support areas. Brackets or straps showing any kind of wear in these areas must not be used and should be discarded.



WARNING

UNIT FALLING HAZARD

Failure to follow this warning could result in personal injury or death.

Never stand beneath rigged units or lift over people.



WARNING

PROPERTY DAMAGE HAZARD

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

Rigging brackets are for one time use only. When removing a unit at the end of its useful life, use a new set of brackets.

Use of Rigging Bracket

NOTE: Rigging brackets are factory installed on 3-phase units only. Single-Phase units require accessory kit NPLIFTBK003A10.

Field Installation of Rigging Bracket (if not already installed)

1. Remove unit from shipping carton. Leave top shipping skid on the unit for use as a spreader bar to prevent the rigging straps from damaging the unit. If the skid is not available, use a spreader bar of sufficient length to protect the unit from damage.
2. Remove 4 screws in unit corner posts.
3. Attach each of the 4 metal rigging brackets under the panel rain lip (see Figure 5). Use the screws removed in step 2 above to secure the brackets to the unit.



WARNING

PROPERTY DAMAGE HAZARD

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

Rigging bracket **MUST** be under the rain lip to provide adequate lifting.



WARNING

PROPERTY DAMAGE HAZARD

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

Do not strip screws when re-securing the unit. If a screw is stripped, replace the stripped one with a larger diameter screw (included). When straps are taut, the clevis should be a minimum of 36" (914mm) above the unit top cover.

Rigging/Lifting of Unit

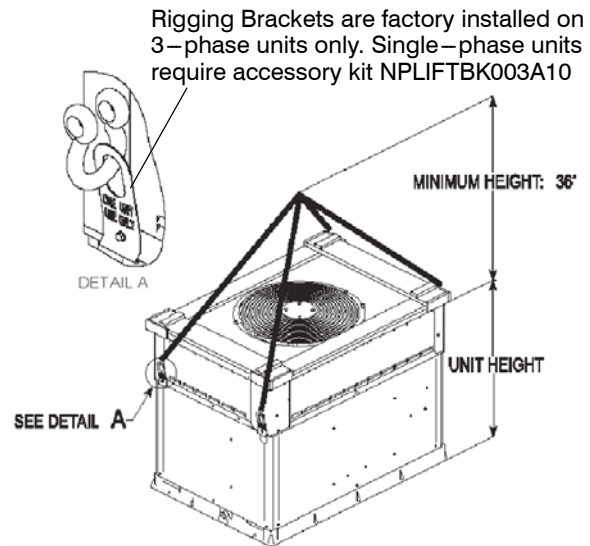
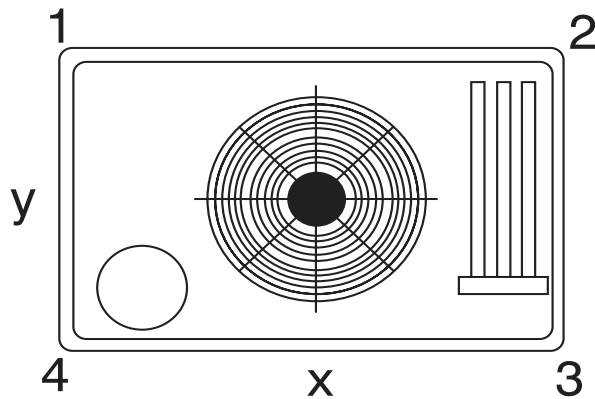
1. Bend top of brackets down approximately 30 degrees from the corner posts.
2. Attach straps of equal length to the rigging brackets at opposite ends of the unit. Be sure straps are rated to hold the weight of the unit (see Figure 5).
3. Attach a clevis of sufficient strength in the middle of the straps. Adjust the clevis location to ensure unit is lifted level with the ground.

4. After unit is securely in place detach rigging straps. Remove corner posts screws, and rigging brackets then reinstall screws.

After the unit is placed on the roof curb or mounting pad, remove the top crating.

FIGURE 5

Unit Corner Weight (lbs) and Rigging



CORNER WEIGHTS

Model Size:	24		30		36		42		48		60	
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
Unit Only Weight	296	134.2	313	142.0	338	153.3	401	181.9	418	189.6	446	202.3
Corner Weight 1	59	26.8	55	25.1	72	32.5	68	30.6	62	28.1	54	24.5
Corner Weight 2	84	38.0	95	42.9	89	40.3	119	53.8	135	61.2	158	71.7
Corner Weight 3	81	36.8	78	35.2	95	43.0	60	27.2	64	29.2	81	36.6
Corner Weight 4	72	32.6	85	38.7	83	37.5	155	70.3	157	71.1	154	69.7
Rigging Weight	315	142.9	332	150.6	357	161.9	423	191.8	440	199.5	468	212.2
Shipping Weight	350	158.7	367	166.4	392	177.8	463	210.0	480	217.7	508	230.4

STEP 6 — Connect Condensate Drain

NOTE: When installing condensate drain connection be sure to comply with local codes and restrictions.

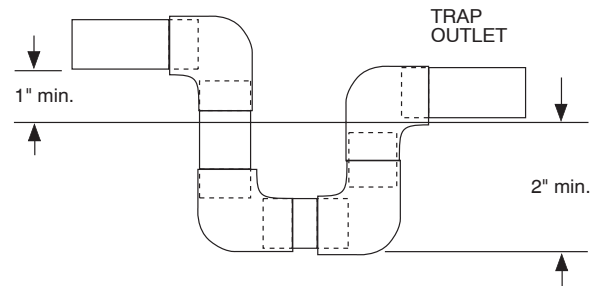
The unit disposes of condensate water through a $\frac{3}{4}$ " NPT fitting which exits through the base on the evaporator coil access side. See Figure 3 & 4 for location.

Condensate water can be drained directly onto the roof in rooftop installations (where permitted) or onto a gravel apron in ground level installations. Install a field-supplied 2" (51mm) condensate trap at the end of condensate connection to ensure proper drainage. Make sure that the outlet of the trap is at least 1" (25mm) lower than the drain-pan condensate connection to prevent the pan from overflowing (see Figure 6). Prime the trap with water. When using a gravel apron, make sure it slopes away from the unit.

Connect a drain tube using a minimum of $\frac{3}{4}$ " PVC or $\frac{3}{4}$ " copper pipe (all field-supplied) at the outlet end of the 2" (51mm) trap. Do not undersize the tube. Pitch the drain tube downward at a slope of at least 1" (25mm) for every 10 feet (3.0m) of horizontal run. Be sure to check the drain tube for leaks.

FIGURE 6

Condensate Trap



STEP 7 — Install Flue Hood

The flue assembly is secured and shipped in the return air duct. Remove duct cover to locate the assembly (see Figure 8).

NOTE: Dedicated low NOx models **MUST** be installed in California Air Quality Management Districts where a Low NOx rule exists. These models meet the California maximum oxides of nitrogen (NOx) emissions requirements of 40 nanograms per joule or less as shipped from the factory.

NOTE: Low NOx requirements apply only to natural gas installations.



WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow this warning could result in personal injury or death.

The venting system is designed to ensure proper venting. The flue hood assembly must be installed as indicated in this section of the unit installation instructions.

Install the flue hood as follows:

1. This installation must conform with local building codes and with the National Fuel Gas Code (NFGC), ANSI Z223.1 (in Canada, CAN/CGA B149.1, and B149.2) or NFPA (National Fire Protection Association) latest revision. Refer to Provincial and local plumbing or wastewater codes and other applicable local codes.
2. Remove flue hood from shipping location (inside the return section of the blower compartment—see Figure 8). Remove the return duct cover to locate the flue hood. Place flue hood assembly over flue panel. Orient screw holes in flue hood with holes in the flue panel.
3. Secure flue hood to flue panel by fastening one screw on the right side and one screw on the left side of the hood.

STEP 8 — Install Gas Piping

The gas supply pipe enters the unit through the access hole provided. The gas connection to the unit is made to the ½" FPT gas inlet on the gas valve.



WARNING

FIRE OR EXPLOSION HAZARD

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

–Connect gas pipe to unit using a backup wrench to avoid damaging gas controls.

–Never purge a gas line into a combustion chamber. 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.

–Use proper length of pipe to avoid stress on gas control manifold.

–If a flexible connector is required or allowed by authority having jurisdiction, black iron pipe shall be installed at furnace gas valve and extend a minimum of 2" (51mm) outside furnace casing.

–If codes allow a flexible connector, always use a new connector. do not use a connector which has previously serviced another gas appliance.

Install a gas supply line that runs to the heating section. Refer to Table 1 and the NFGC for gas pipe sizing. Do not use cast-iron pipe. It is recommended that a black iron pipe is used. Check the local utility for recommendations concerning existing lines. Size gas supply piping for 0.5

inches water column maximum pressure drop. Never use pipe smaller than the ½" FPT gas inlet on the unit gas valve.

For natural gas applications, the gas pressure at unit gas connection must not be less than 4.0 inches water column or greater than 13 inches water column while the unit is operating. For Propane applications, the gas pressure must not be less than 7.0 inches water column or greater than 13 inches water column at the unit connection.

A ⅛" NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the gas valve.

When installing the gas supply line, observe local codes pertaining to gas pipe installations. Refer to the NFGC ANSI Z223.1–2005 NFPA latest edition (in Canada, CAN/CGA B149.1).

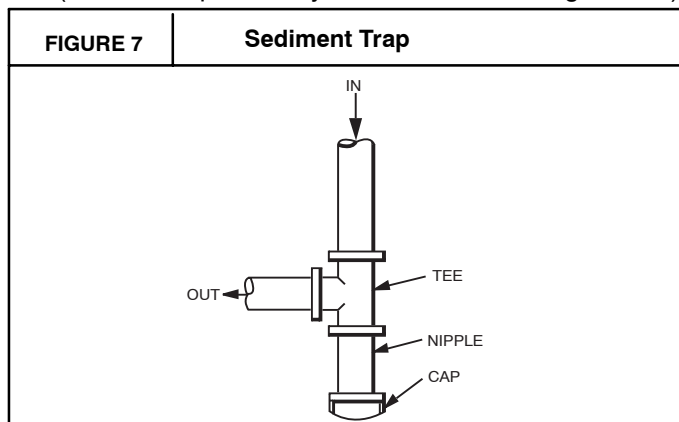
NOTE:In the state of Massachusetts:

1. Gas supply connections **MUST** be performed by a licensed plumber or gas fitter.
2. When flexible connectors are used, the maximum length shall not exceed 36 inches (915 mm).
3. When lever handle type manual equipment shutoff valves are used, they shall be T-handle valves.
4. The use of copper tubing for gas piping is **NOT** approved by the state of Massachusetts.

In the absence of local building codes, adhere to the following pertinent recommendations:

1. Avoid low spots in long runs of pipe. Grade all pipe ¼" (6mm) for every 15 feet (4.6m) of length to prevent traps. Grade all horizontal runs downward to risers. Use risers to connect to heating section and to meter.
2. Protect all segments of piping system against physical and thermal damage. Support all piping with appropriate straps, hangers, etc. Use a minimum of one hanger every 6 feet. (1.8m) For pipe sizes larger than ½", follow recommendations of national codes.
3. Apply joint compound (pipe dope) sparingly and only to male threads of joint when making pipe connections. Use only pipe dope that is resistant to action of liquefied petroleum gases as specified by local and/or national codes. Never use Teflon tape.
4. Install sediment trap in riser leading to heating section (see Figure 7). This drip leg functions as a trap for dirt and condensate.
5. Install an accessible, external, manual main shutoff valve in gas supply pipe within 6 feet (1.8m) of heating section.
6. Install ground–joint union close to heating section between unit manual shutoff and external manual main shut–off valve.
7. Pressure test all gas piping in accordance with local and national plumbing and gas codes before connecting piping to unit.
8. Check for gas leaks at the field–installed and factory–installed gas lines after all piping connections

have been completed. Use soap-and-water solution (or method specified by local codes and/or regulations).



NOTE: Pressure test the gas supply system after the gas supply piping is connected to the gas valve. The supply piping must be disconnected from the gas valve during the testing of the piping systems when test pressure is in excess of 0.5 psig. Pressure test the gas supply piping system at pressures equal to or less than 0.5 psig. The unit heating section must be isolated from the gas piping system by closing the external main manual shutoff valve and slightly opening the ground-joint union.

Table 1 - PIPING SIZES

NOMINAL IRON PIPE SIZE (inch)	INTERNAL DIAMETER (inch)	LENGTH OF PIPE (feet)†													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
		Gas Capacity (ft ³ of gas per hour)													
½	.622	175	120	97	82	73	66	61	57	53	50	44	40	-	-
¾	.824	360	250	200	170	151	138	125	118	110	103	93	84	77	72
1	1.049	680	465	375	320	285	260	240	220	205	195	175	160	145	135
1¼	1.380	1400	950	770	600	580	530	490	460	430	400	360	325	300	280
1½	1.610	2100	1460	1180	990	900	810	750	690	650	620	550	500	460	430

* Capacity of pipe in ft³ of gas per hour for gas pressure of 0.5 psig or less. Pressure drop of 0.5 inches water column (based on a 0.60 specific gravity gas). Refer to Table, National Fire Protection Association NFPA 54.

† This length includes an ordinary number of fittings.

STEP 9 — Install Duct Connections

The unit has duct flanges on the supply and return-air openings on the side and bottom of the unit. For downflow applications, the ductwork connects to the roof curb (see Figure 3 and 4 for connection sizes and locations).

NOTE: The design and installation of the duct system must be in accordance with the standards of the NFPA for installation of nonresidence-type air conditioning and ventilating systems, NFPA 90A or residence-type, NFPA 90B; and/or local codes and ordinances.

Adhere to the following criteria when selecting, sizing, and installing the duct system:

1. Units are shipped for horizontal duct installation (by removing duct covers).
2. Select and size ductwork, supply-air registers, and return-air grilles according to American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) recommendations.
3. Use flexible transition between rigid ductwork and unit to prevent transmission of vibration. The transition may be screwed or bolted to duct flanges. Use suitable gaskets to ensure weather-tight and airtight seal.
4. All units must have field-supplied filters or accessory filter rack installed in the return-air side of the unit. When using a separate return air plenum and grille, refer to Table 2 for recommended filters sizes. When using the accessory filter rack, refer to filter rack instructions for required filter size(s) and quantity.
5. Size all ductwork for maximum required airflow (either heating or cooling) for unit being installed. Avoid abrupt duct size increases or decreases or performance may be affected.

6. Adequately insulate and weatherproof all ductwork located outdoors. Insulate ducts passing through unconditioned space, and use vapor barrier in accordance with latest issue of Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and Air Conditioning Contractors of America (ACCA) minimum installation standards for heating and air conditioning systems. Secure all ducts to building structure.

7. Flash, weatherproof, and vibration isolate all openings in building structure in accordance with local codes and good building practices.

Configuring Unit for Downflow (Vertical Discharge)

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off power supply to the unit and install lockout tag.

1. Open all electrical disconnects before starting any service work.
2. Remove horizontal (metal) duct covers to access vertical (downflow) discharge duct knockouts in unit base.
3. Use a screwdriver and hammer to remove the panels in the bottom of the unit base (see Figure 9).
4. If unit ductwork is to be attached to vertical opening flanges on the unit base (jackstand applications only), do so at this time.

5. It is recommended that the base insulation around the perimeter of the vertical return-air opening be secured to the base with aluminum tape. Applicable local codes may require aluminum tape to prevent exposed fiberglass.
6. Cover both horizontal duct openings with the provided duct covers. Ensure opening is air and water tight.
7. After completing unit conversion, perform all safety checks and power up unit.

⚠ CAUTION

PROPERTY DAMAGE HAZARD

Failure to follow this caution may result in property damage.

Collect ALL screws that were removed. **Do not** leave screws on rooftop as permanent damage to the roof may occur.

FIGURE 8

Supply and Return Duct Opening

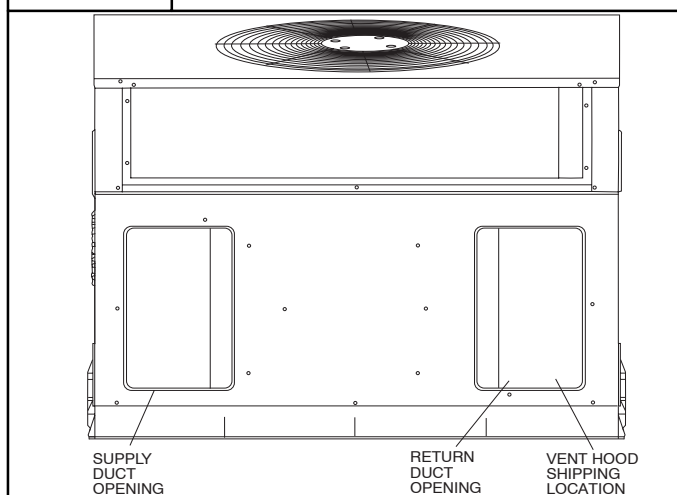


FIGURE 9

Vertical Duct Cover Removed

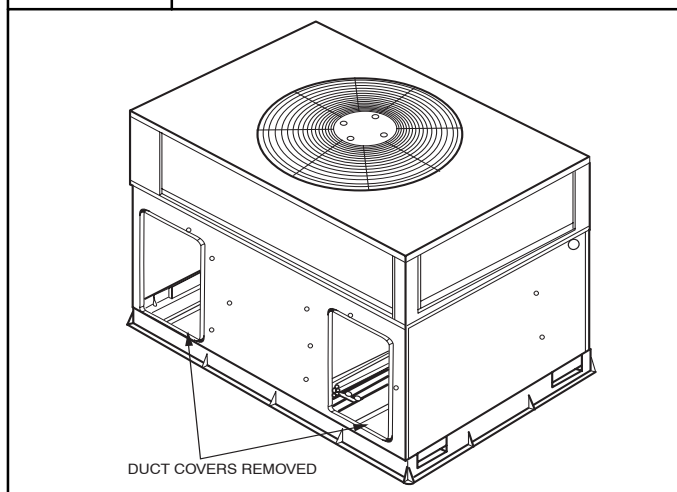


Table 2—Filter Data, Throw-away Type

MODEL SIZE:	24, 30	36	42, 48, 60
RETURN-AIR FILTER* (inches)	20x24x1	24x30x1	24x36x1

* Required filter sizes shown are based on the larger of the ARI (Air Conditioning and Refrigeration Institute) rated cooling airflow or the heating airflow velocity of 300 feet per

minute for throwaway type or 450 feet per minute for high-capacity type. Air filter pressure drop for non-standard filters must not exceed 0.08 inches water column.

STEP 10 — Install Electrical Connections

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

The unit cabinet must have an uninterrupted, unbroken electrical ground. This ground may consist of an electrical wire connected to the unit ground screw in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC, ANSI/NFPA American National Standards Institute/National Fire Protection Association (latest edition) (in Canada, Canadian Electrical Code CSA C22.1) and local electrical codes.

⚠ CAUTION

UNIT COMPONENT DAMAGE HAZARD

Failure to follow this caution may result in damage to the unit being installed.

1. Make all electrical connections in accordance with NEC ANSI/NFPA (latest edition) and local electrical codes governing such wiring. In Canada, all electrical connections must be in accordance with CSA standard C22.1 Canadian Electrical Code Part 1 and applicable local codes. Refer to unit wiring diagram.
2. Use only copper conductor for connections between field-supplied electrical disconnect switch and unit. **DO NOT USE ALUMINUM WIRE.**
3. Be sure that high-voltage power to unit is within operating voltage range indicated on unit rating plate. On 3-phase units, ensure phases are balanced within 2 percent. Consult local power company for correction of improper voltage and/or phase imbalance.
4. Insulate low-voltage wires for highest voltage contained within conduit when low-voltage control wires are in same conduit as high-voltage wires.
5. Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.

High Voltage Connections

When routing power leads into unit, use only copper wire between disconnect and unit. The high voltage leads should be in a conduit until they enter the duct panel; conduit termination at the duct panel must be watertight.

The unit must have a separate electrical service with a field-supplied, waterproof disconnect switch mounted at, or within sight from, the unit. Refer to the unit rating plate, NEC and local codes for maximum fuse/circuit breaker size and minimum circuit amps (ampacity) for wire sizing.

The field-supplied disconnect switch box may be mounted on the unit over the high-voltage inlet hole when the standard power and low-voltage entry points are used (see Figure 3 and 4 for acceptable location).

See unit wiring label and Figure 10 for reference when making high voltage connections. Proceed as follows to complete the high-voltage connections to the unit.

Single-phase units:

1. Run the high-voltage (L1, L2) and ground lead into the control box.
2. Connect ground lead to chassis ground connection.
3. Locate the black and yellow wires connected to the line side of the contactor.
4. Connect field L1 to black wire on connection 11 of the compressor contactor.
5. Connect field wire L2 to yellow wire on connection 23 of the compressor contactor.

Three-phase units:

1. Run the high-voltage (L1, L2, L3) and ground lead into the control box.
2. Connect ground lead to chassis ground connection.
3. Locate the black and yellow wires connected to the line side of the contactor.
4. Connect field L1 to black wire on connection 11 of the compressor contactor.
5. Connect field wire L2 to yellow wire on connection 13 of the compressor contactor.
6. Connect field wire L3 to blue wire from compressor.



WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before making any wiring changes, **make sure** the gas supply is switched off first. *Then* switch off the power supply to the unit and install lockout tag.

Special Procedures For 208 Volt Operation



WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system. with disconnect switch open, move black wire from transformer ($\frac{3}{16}$ " terminal marked 230 to terminal marked 208. This re-taps transformer to primary voltage of 208 VAC.

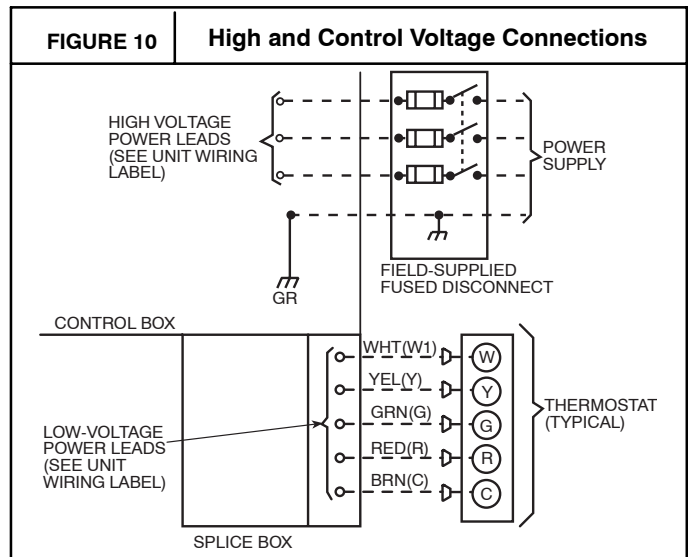
Control Voltage Connections

Do not use any type of power-stealing thermostat. Unit control problems may result.

Use no. 18 American Wire Gage (AWG) color-coded, insulated (35°C minimum) wires to make the control voltage connections between the thermostat and the unit. If the thermostat is located more than 100 feet from the unit (as measured along the control voltage wires), use no. 16 AWG color-coded, insulated (35°C minimum) wires.

Standard Connection

Remove knockout hole located in the flue panel adjacent to the control access panel (see Figures 3 and 4). Remove the rubber grommet from the installer's packet (included with unit) and install grommet in the knockout opening. Provide a drip loop before running wire through panel.



Run the low-voltage leads from the thermostat, through the inlet hole, and into unit low-voltage splice box.

Locate five 18-gage wires leaving control box. These low-voltage connection leads can be identified by the colors red, green, yellow, brown, and white (see Figure 10). Ensure the leads are long enough to be routed into the low-voltage splice box (located below right side of control box). Route leads through hole in bottom of control box and make low-voltage connections (see Figure 10). Secure all cut wires so that they do not interfere with operation of unit.

Heat Anticipator Setting

The room thermostat heat anticipator must be properly adjusted to ensure proper heating performance. Set the heat anticipator, using an ammeter between the W and R terminals to determine the exact required setting.

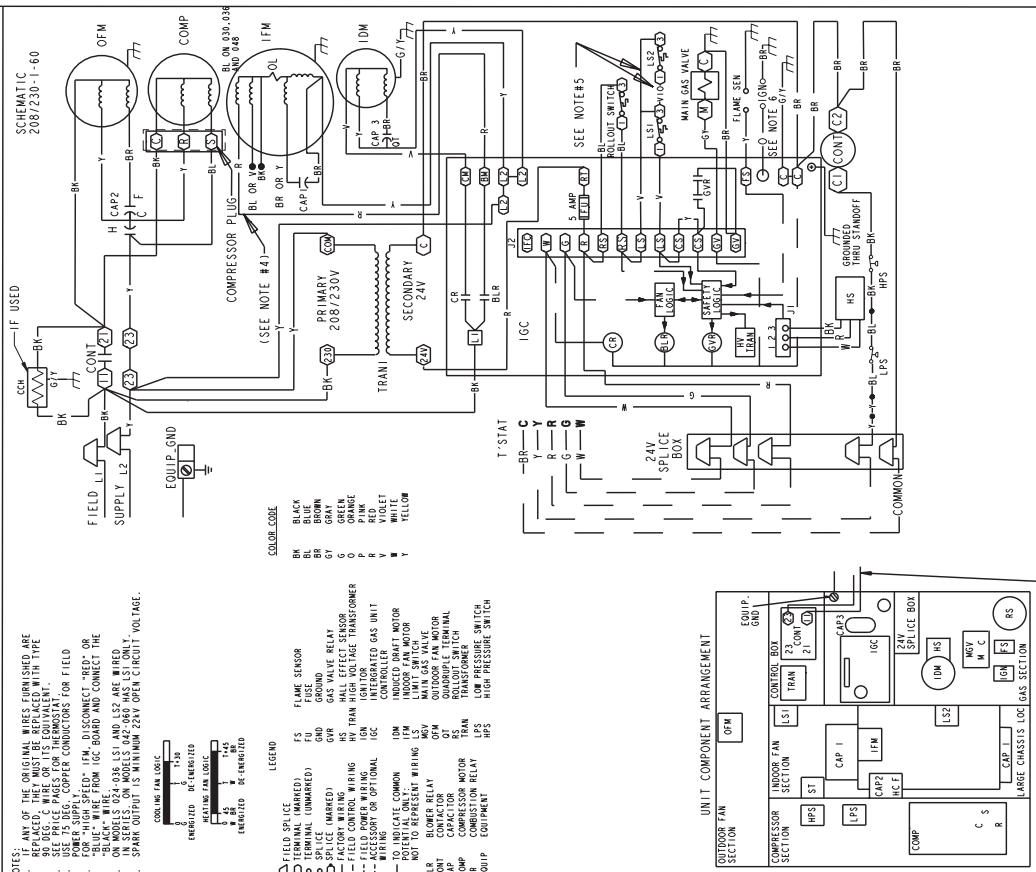
NOTE: For thermostat selection purposes, use 0.18 amp for the approximate anticipator setting. Failure to make a proper heat anticipator adjustment will result in improper operation, discomfort to the occupants of the conditioned space, and inefficient energy utilization; however, the required setting may be changed slightly to provide a greater degree of comfort for a particular installation.

Transformer Protection

The transformer is of the energy-limiting type. It is set to withstand a 30 second. overload or shorted secondary condition. If an overload or short is present, correct overload condition and check for blown fuse on gas control board. Replace fuse as required with correct size.

CONNECTION WIRING DIAGRAM

WARNING: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

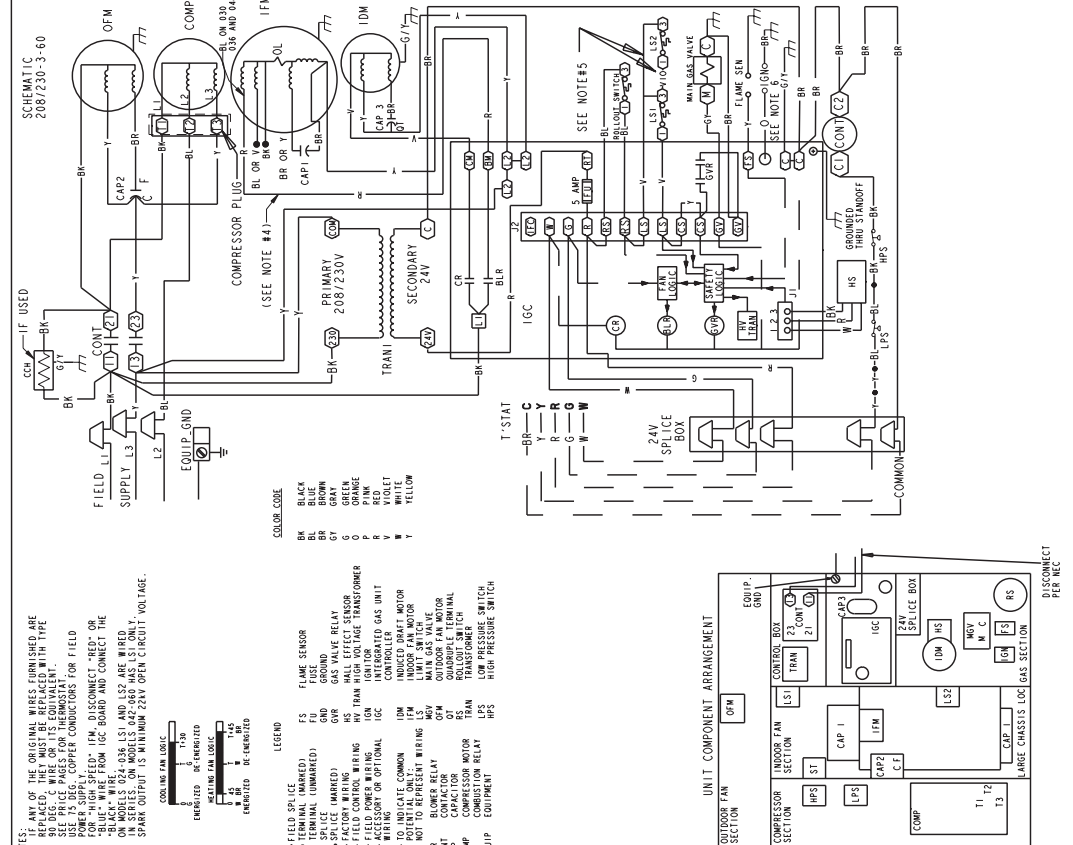


48ES50000	4.0
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208/230 - 3 - 60 WIRING DIAGRAM

CONNECTION WIRING DIAGRAM

WARNING: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

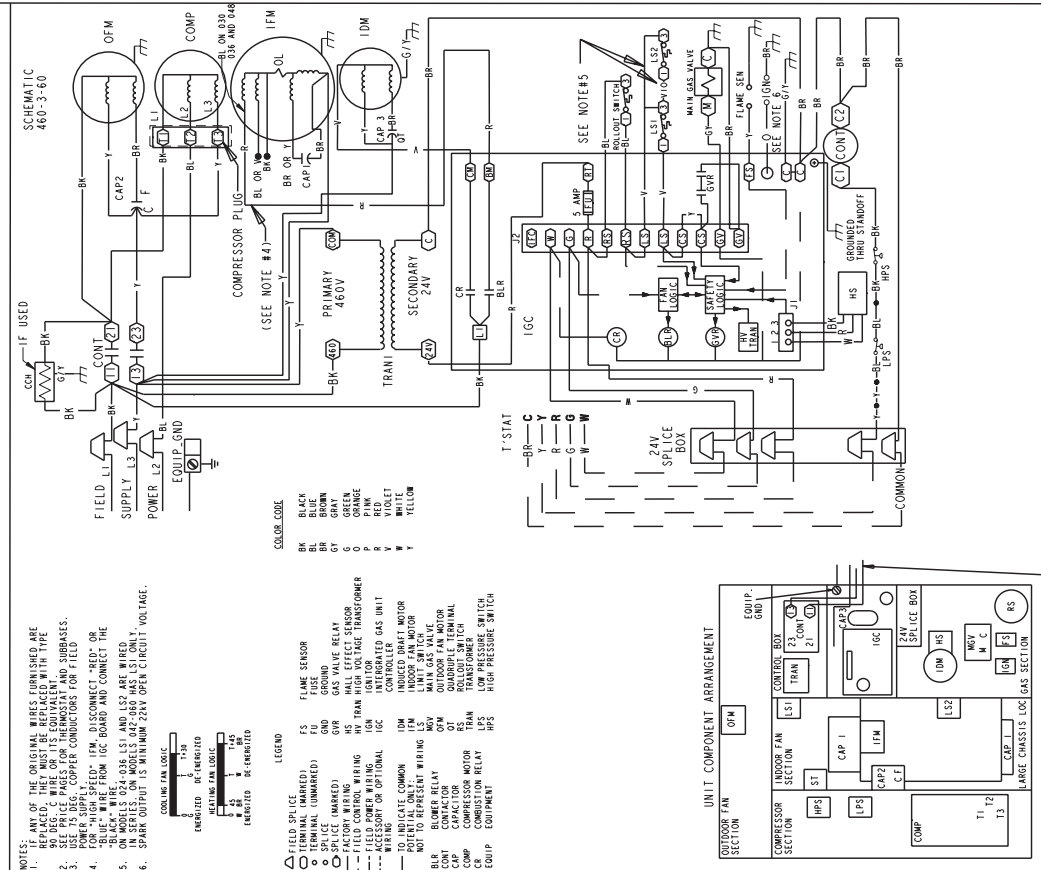
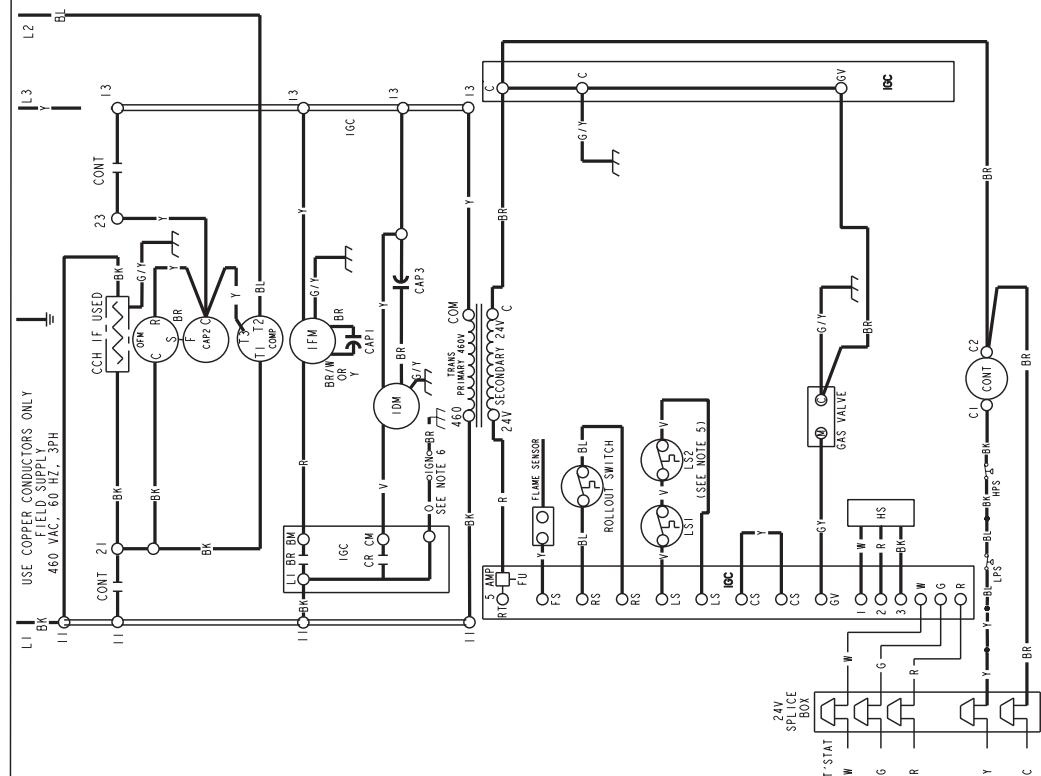


48ES500003	4.0
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CONNECTION WIRING DIAGRAM

WARNING: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

WARNING: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



48E500002	4.0
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WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

1. Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.
2. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
3. Do not remove compressor terminal cover until all electrical sources are disconnected and tagged.
4. Relieve and recover all refrigerant from system before touching or disturbing anything inside terminal box if refrigerant leak is suspected around compressor terminals.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
 - a. Shut off electrical power to unit and install lockout tag.
 - b. Relieve and reclaim all refrigerant from system using both high- and low-pressure ports.
 - c. Cut component connecting tubing with tubing cutter and remove component from unit.
 - d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Use the Start-Up Checklist supplied at the end of this book and proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove access panel.
2. Read and follow instructions on all DANGER, WARNING, CAUTION, and INFORMATION labels attached to, or shipped with unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damage, such as broken lines, loose parts, disconnected wires, etc.

STARTUP

STEP 1 — Check for refrigerant leaks

Proceed as follows to locate and repair a refrigerant leak and to charge the unit:

1. Locate leak and make sure that refrigerant system pressure has been relieved and reclaimed from both high- and low-pressure ports.
2. Repair leak following accepted practices.

NOTE: Install a filter drier whenever the system has been opened for repair.

3. Add a small charge of R-410A refrigerant vapor to system and leak-test unit.

- b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak.
- c. Leak-test all refrigerant tubing connections using electronic leak detector, or liquid-soap solution. If a refrigerant leak is detected, see following Check for Refrigerant Leaks section.
- d. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight.
- e. Ensure wires do not touch refrigerant tubing or sharp sheet metal edges.
- f. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.



WARNING

FIRE, EXPLOSION HAZARD

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

Do not purge gas supply into the combustion chamber. Do not use a match or other open flame to check for gas leaks.

4. Verify the following conditions:

- a. Make sure gas line is free of air. Before lighting the unit for the first time, perform the following with the gas valve in the OFF position:

NOTE: If the gas supply pipe was not purged before connecting the unit, it will be full of air. It is recommended that the ground joint union be loosened, and the supply line be allowed to purge until the odor of gas is detected. Never purge gas lines into a combustion chamber. Immediately upon detection of gas odor, retighten the union. Allow 5 minutes to elapse, then light unit.

- b. Ensure fan hub is positioned correctly with respect to motor housing.
- c. Make sure that air filter(s) is in place.
- d. Make sure that condensate drain trap is filled with water to ensure proper drainage.
- e. Make sure that all tools and miscellaneous loose parts have been removed.

4. Recover refrigerant from refrigerant system and evacuate to 500 microns if no additional leaks are found.

5. Charge unit with R-410A refrigerant, using a volumetric charging cylinder or accurate scale. Refer to unit rating plate for required charge. Be sure to add extra refrigerant to compensate for internal volume of filter drier.

STEP 2 — Start-up heating and make adjustments

Complete the required procedures given in the Pre-Start-Up section before starting the unit. Do not jumper any safety devices when operating the unit. Make sure that burner orifices are properly aligned. Unstable

operation may occur when the burner orifices in the manifold are misaligned.

Follow the lighting instructions on the heating section operation label (located inside the burner or blower access door) to start the heating section.

NOTE: Make sure that gas supply has been purged and that all gas piping has been checked for leaks.

Check Heating Control

Start and check the unit for proper heating control operation as follows (see furnace lighting instructions located inside burner or blower access panel):

1. Place room thermostat SYSTEM switch in the HEAT position and the fan switch in the AUTO position.
2. Set the heating temperature control of the thermostat above room temperature.
3. The induced-draft motor will start.
4. On a call for heating, the main burner should light within 5 seconds of the sparker being energized. If the burners do not light, there is a 22 second delay before another 5 second try. If the burners still do not light, this sequence is repeated. If the burners do not light within 15 minutes from the initial call for heat, there is a lockout. To reset the control, break the 24-v power to W.
5. The indoor (evaporator) fan motor will turn on 45 seconds after the flame has been established. The indoor (evaporator) fan motor will turn off 45 seconds after the thermostat has been satisfied.

NOTE: The integrated gas unit controller (IGC) has the capability to automatically reduce the indoor (evaporator) fan motor "ON" delay and increase the indoor (evaporator) "OFF" delay in the event of high duct static and/or partially-clogged filter.

Check Gas Input

Check gas input and manifold pressure after unit start-up (see Table 4).

NOTE: The rated gas inputs shown in Table 4 are for altitudes from sea level to 2000 feet above sea level. These inputs are based on natural gas with a heating value of 1050 Btu/ft³ at 0.65 specific gravity, or Propane with a heating value of 2500 Btu/ft³ at 1.5 specific gravity. When the gas supply being used has a different heating value or specific gravity, refer to national and local codes, or contact your distributor to determine the required orifice size.

In the USA:

The input rating for altitudes above 2,000 feet must be reduced by 4% for each 1,000 feet above sea level.

(For installations below 2,000 feet, refer to the unit rating plate.)

For installations above 2,000 feet, multiply the input on the rating plate by the de-rate multiplier in Table 3 for correct input rate.

Table 3 - Altitude Derate Multiplier for U.S.A.

ALTITUDE (ft)	PERCENT OF DERATE	DE-RATE MULTIPLIER *
0 – 2000	0	1.00
2001 – 3000	8 – 12	0.90
3001 – 4000	12 – 16	0.86
4001 – 5000	16 – 20	0.82
5001 – 6000	20 – 24	0.78
6001 – 7000	24 – 28	0.74
7001 – 8000	28 – 32	0.70
8001 – 9000	32 – 36	0.66
9001 – 10,000	36 – 40	0.62

* De-rate multiplier factors are based on midpoint altitude for altitude range.

In Canada:

The input rating for altitudes from 2,000 to 4,500 feet above sea level must be derated 10% by an authorized Gas Conversion Station or Dealer.

Example:

90,000 BTU/hr Input Furnace Installed at 4300 feet:

$$\begin{array}{rcl} \text{Furnace Input} & \times & \text{De-rate} \\ \text{Rate at Sea Level} & & \text{Multiplier} \\ 90,000 & \times & 0.90 \\ & & = 81,000 \end{array} = \begin{array}{l} \text{Furnace Input Rate at} \\ \text{Installation Altitude} \end{array}$$

CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in reduced unit and/or component life.

Do Not redrill an orifice. Improper drilling (burrs, out-of-round holes, etc.) can cause excessive burner noise and misdirection of burner flame. If orifice hole appears damaged or it is suspected to have been redrilled, check orifice hole with a numbered drill bit of correct size.

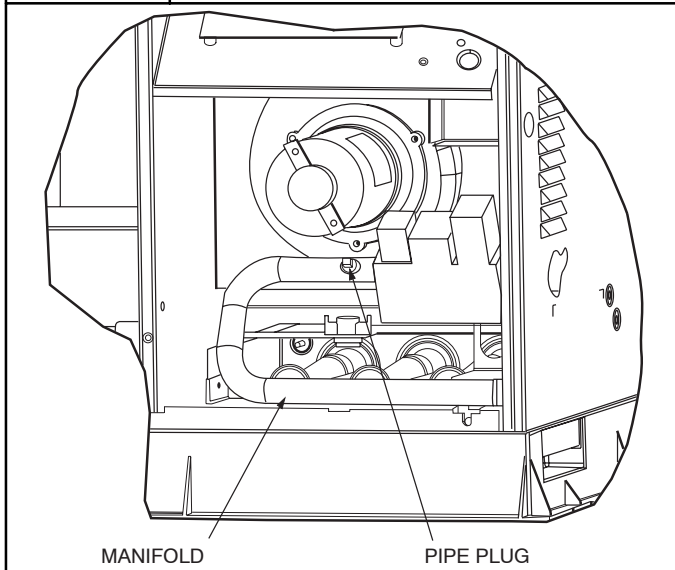
Adjust Gas Input

The gas input to the unit is determined by measuring the gas flow at the meter or by measuring the manifold pressure. Measuring the gas flow at the meter is recommended for natural gas units. The manifold pressure must be measured to determine the input of propane gas units.

Measure Gas Flow (Natural Gas Units)

Minor adjustment to the gas flow can be made by changing the manifold pressure. The manifold pressure must be maintained between 3.2 and 3.8 in. wc.

FIGURE 14

Burner Assembly

Proceed as follows:

1. Turn off gas supply to unit.
2. Remove pipe plug on manifold (see Figure 14) and connect manometer. Turn on gas supply to unit.
3. Record number of seconds for gas meter test dial to make one revolution.
4. Divide number of seconds in Step 3 into 3600 (number of seconds in one hour).
5. Multiply result of Step 4 by the number of ft³ (cubic feet) shown for one revolution of test dial to obtain ft³ of gas flow per hour.
6. Multiply result of Step 5 by BTU heating value of gas to obtain total measured input in BTU/h. Compare this value with heating input shown in Table 4 (Consult the local gas supplier if the heating value of gas is not known).

Example: Assume that the size of test dial is 1 ft³, one revolution takes 32 seconds, and the heating value of the gas is 1050 BTU/ft³. Proceed as follows:

1. 32 seconds to complete one revolution.
2. $3600 / 32 = 112.5$.
3. $112.5 \times 1 = 112.5$ ft³ of gas flow/hr.
4. $112.5 \times 1050 = 118,125$ BTU/h input.

If the desired gas input is 115,000 BTU/h, only a minor change in the manifold pressure is required.

Observe manifold pressure and proceed as follows to adjust gas input:

1. Remove cover screw over regulator adjustment screw on gas valve (see Figure 15).
2. Turn regulator adjustment screw clockwise to increase gas input, or turn regulator adjustment screw counterclockwise to decrease input. Manifold pressure must be between 3.2 and 3.8 inches water column.

Figure 15

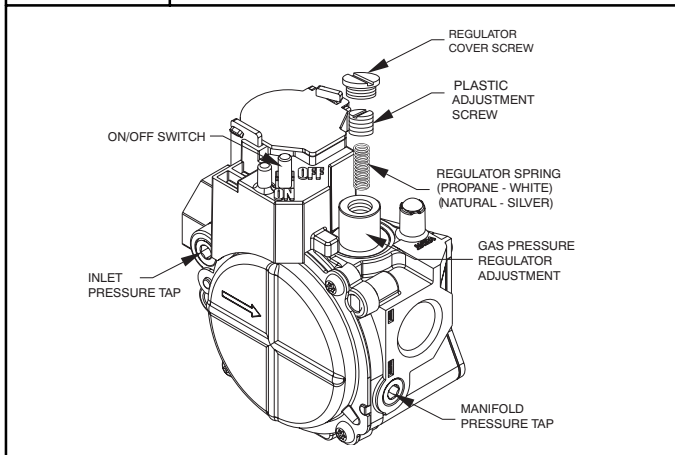
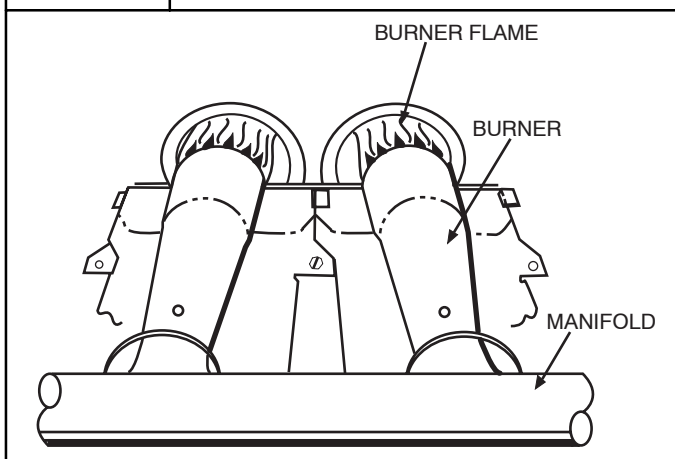
Gas Valve Components

FIGURE 16

Monoport Burner

If larger adjustments are required, change main burner orifices following the recommendations of national and local codes.

NOTE: All other appliances that use the same meter must be turned off when gas flow is measured at the meter.

⚠ WARNING

FIRE AND UNIT DAMAGE HAZARD

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

Unsafe operation of the unit may result if manifold pressure is outside this range.

3. Replace cover screw cap on gas valve.
4. Turn off gas supply to unit. Remove manometer from pressure tap and replace pipe plug on gas valve. Turn on gas to unit and check for leaks.

Measure Gas Flow (Propane Units)

The main burner orifices on a propane gas unit are sized for the unit rated input when the manifold pressure reading matches the level specified in Table 4.

Proceed as follows to adjust gas input on a propane gas unit:

1. Turn off gas to unit.
2. Remove pipe plug on manifold and connect manometer (see Figure 14).
3. Turn on gas to unit.
4. Remove cover screw over regulator adjustment screw on gas valve.

5. Adjust regulator adjustment screw to the correct manifold pressure, as specified in Table 3. Turn adjusting screw clockwise to increase manifold pressure, or turn adjusting screw counterclockwise to decrease manifold pressure.
6. Replace cover screw.
7. Turn off gas to unit. Remove manometer from pressure tap. Replace pipe plug on gas valve, then turn on gas to unit. Check for leaks.

Check Burner Flame

With burner access panel removed, observe the unit heating operation. Watch the burner flames to see if they are light blue and soft in appearance, and that the flames are approximately the same for each burner. Propane will have blue flame (see Figure 16). Refer to the Maintenance section for information on burner removal.

Airflow and Temperature Rise

The heating section for each size unit is designed and approved for heating operation within the temperature-rise range stamped on the unit rating plate.

Table 7 shows the approved temperature rise range for each heating input, and the air delivery cfm at various

temperature rises. The heating operation airflow must produce a temperature rise that falls within the approved range.

Refer to Indoor Airflow and Airflow Adjustments section to adjust heating airflow when required.

Heating Sequence of Operation

(see Figures 11, 12, 13, and unit wiring label.)

On a call for heating, terminal W of the thermostat is energized, starting the induced-draft motor. When the hall-effect sensor on the induced-draft motor senses that it has reached the required speed, the burner sequence begins. This function is performed by the Integrated Gas Control (IGC) board. The indoor (evaporator) fan motor is energized 45 seconds after flame is established. When the thermostat is satisfied and W is de-energized, the burners stop firing and the indoor (evaporator) fan motor shuts off after a 45 second time-off delay.

NOTE: The integrated gas unit controller (IGC) has the capability to automatically reduce the indoor (evaporator) fan motor "ON" delay and increase the indoor (evaporator) "OFF" delay in the event of high duct static and/or partially-clogged filter.

Table 4 - Heating Inputs

HEATING INPUT (BTU/h)	NUMBER OF ORIFICES	GAS SUPPLY PRESSURE (inches water column)				MANIFOLD PRESSURE (inches water column)	
		Natural†		Propane *†		Natural†	Propane *†
		Min	Max	Min	Max		
40,000	2	4.0	13.0	4.0	13.0	3.5	3.5
60,000	2	4.0	13.0	4.0	13.0	3.5	3.5
90,000	3	4.0	13.0	4.0	13.0	3.5	3.4
115,000	3	4.0	13.0	4.0	13.0	3.5	3.7
130,000	3	4.0	13.0	4.0	13.0	3.5	3.5

* When a unit is converted to Propane, different size orifices must be used. See separate, natural-to-propane conversion kit instructions.

† Based on altitudes from sea level to 2000 feet above sea level. For altitudes above 2000 feet, reduce input rating 4 percent for each additional 1000 feet above sea level. In Canada, from 2000 feet above sea level to 4500 feet above sea level, de-rate the unit 10 percent.

LED Monitor

An LED (light-emitting diode) indicator is provided on the control board to monitor operation. The control board is located by removing the burner access panel. During normal operation, the LED is continuously on (See Table 5 for error codes).

Table 5 - LED INDICATIONS

ERROR CODE	LED INDICATION
Normal Operation	On
Hardware Failure	Off
Limit Switch Fault	2 Flashes
Flame Sense Fault	3 Flashes
Four Consecutive Limit Faults	4 Flashes
Ignition Lockout Fault	5 Flashes
Induced-Draft Motor Fault	6 Flashes
Rollout Switch Fault	7 Flashes
Internal Control Fault	8 Flashes
Temporary Lock-Out (1 hr)	9 Flashes

Notes:

1. There is a 3 second pause between error code displays.
2. If more than one error code exists, all applicable error codes will be displayed in numerical sequence.
3. This chart is on the wiring diagram located inside the burner access panel.

Limit Switches

Normally closed limit switch (LS) completes the control circuit. Should the leaving-air temperature rise above the maximum allowable temperature, the limit switch opens and the control circuit “breaks.” Any interruption in the control circuit instantly closes the gas valve and stops gas flow to the burners. The blower motor continues to run until LS resets.

When the air temperature at the limit switch drops to the low-temperature setting of the limit switch, the switch closes and completes the control circuit. The direct-spark ignition system cycles and the unit returns to normal heating operation.

Rollout Switch

The function of the rollout switch is to close the main gas valve in the event of flame rollout. The switch is located above the main burners. When the temperature at the rollout switch reaches the maximum allowable temperature, the control circuit trips, closing the gas valve and stopping gas flow to the burners. The indoor (evaporator) fan motor (IFM) and induced draft motor continue to run until switch is reset. The Integrated Gas Control (IGC) Board LED will display FAULT CODE 7.

STEP 3 — Start-up cooling and make adjustments

Complete the required procedures given in the Pre-Start-Up section before starting the unit. Do not jumper any safety devices when operating the unit. Do not operate the compressor when the outdoor temperature is below 40° F (4.4° C) (unless accessory low-ambient kit is installed). Do not rapid-cycle the compressor. Allow 5 minutes between on cycles to prevent compressor damage.

Check Cooling Control Operation

Start and check the unit for proper cooling control operation as follows:

1. Place room thermostat SYSTEM switch in OFF position. Observe that blower motor starts when FAN switch is placed in ON position and shuts down when FAN switch is placed in AUTO position.
2. Place SYSTEM switch in COOL position and FAN switch in AUTO position. Set cooling control below room temperature. Observe that compressor, outdoor (condenser) fan, and indoor (evaporator) blower motors start. Observe that cooling cycle shuts down when control setting is satisfied. The indoor (evaporator) fan motor will continue to run for 30 seconds.
3. When using an auto-changeover room thermostat, place both SYSTEM and FAN switches in AUTO positions. Observe that unit operates in Heating mode when temperature control is set to call for heating (above room temperature) and operates in Cooling mode when temperature control is set to call for cooling (below room temperature).

Checking and Adjusting Refrigerant Charge

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

NOTE: Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper R-410A charge.

The charging label and the tables shown refer to system temperatures and pressures in cooling mode only. A refrigerant charging label is attached to the outside of the service access door. The chart includes the required liquid line temperature at given discharge line pressures and outdoor ambient temperatures.

An accurate thermocouple or thermistor type thermometer and a gauge manifold are required when using the subcooling charging method for evaluating the unit charge. Do not use mercury or small dial-type thermometers because they are not adequate for this type of measurement.

NOTE: Allow system to operate a minimum of 15 minutes before checking or adjusting charge.

Proceed as follows:

1. Remove cap from high and low-pressure service fittings.
2. Using hoses with valve core depressors, attach high and low-pressure gauge hose to high and low-pressure service fittings.
3. Start unit in Cooling Mode and let unit run until system pressures stabilize.
4. Measure and record the following:
 - a. Outdoor ambient-air temperature (dry bulb).
 - b. Liquid line temperature.
 - c. Discharge (high-side) pressure (psig).
 - d. Suction (low-side) pressure (psig) – for reference only.
5. Using “Cooling Charging Charts,” compare outdoor-air temperature (dry bulb) with the discharge line pressure (psig) to determine desired system operating liquid line temperature (See Table 5).
6. Compare actual liquid line temperature with desired liquid line temperature. Using a tolerance of +/- 2° F (1.1° C), add refrigerant if actual temperature is higher than proper liquid line temperature, or remove refrigerant if actual temperature is lower than desired liquid line temperature.



CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in unit damage.

When evaluating the refrigerant charge, an indicated adjustment to the specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in the cooling system, such as insufficient airflow across either coil or both coils.

NOTE: If the problem causing the inaccurate readings is a refrigerant leak, refer to the Check for Refrigerant Leaks section.

Table 6 - Cooling Charging Chart

Required Subcooling of (°C)						Required Liquid Line Temperature for a Specific Subcooling (R-410A)														
Model Size	Outdoor Ambient Temperature					Pressure (psig)	Required Subcooling (°F)					Pressure (kPa)	Required Subcooling (°C)							
	75 (24)	85 (29)	95 (35)	105 (41)	115 (46)		5	10	15	20	25		3	6	8	11	14			
018	13 (7.2)	14 (7.8)	15 (5.0)	16 (8.9)	16 (8.9)	189	66	61	56	51	46	41	1303	19	16	13	11	8	5	
024	10 (5.6)	11 (6.1)	11 (6.1)	12 (6.7)	13 (7.2)	196	68	63	58	53	48	43	1351	20	17	15	12	9	6	
030	12 (6.7)	13 (7.2)	14 (7.8)	15 (5.0)	15 (5.0)	203	71	66	61	56	51	46	1399	21	19	16	13	10	8	
036	14 (7.8)	14 (7.8)	14 (7.8)	14 (7.8)	14 (7.8)	210	73	68	63	58	53	48	1448	23	20	17	14	11	9	
042	11 (6.1)	11 (6.1)	11 (6.1)	10 (5.6)	9 (5.0)	217	75	70	65	60	55	50	1496	24	21	18	15	13	10	
048	8 (4.4)	7 (3.9)	7 (3.9)	7 (3.9)	6 (3.3)	224	77	72	67	62	57	52	1544	25	22	19	16	14	11	
060	14 (7.8)	13 (7.2)	12 (6.7)	11 (6.1)	10 (5.6)	231	79	74	69	64	59	54	1593	26	23	20	18	15	12	
						238	81	76	71	66	61	56	1641	27	24	21	19	16	13	
						245	82	77	72	67	62	57	1689	28	25	22	20	17	14	
						252	84	79	74	69	64	59	1737	29	26	23	21	18	15	
						260	86	81	76	71	66	61	1792	30	27	25	22	19	16	
						268	88	83	78	73	68	63	1848	31	29	26	23	20	17	
						276	90	85	80	75	70	65	1903	32	30	27	24	21	19	
						284	92	87	82	77	72	67	1958	33	31	28	25	22	20	
						292	94	89	84	79	74	69	2013	35	32	29	26	23	21	
						300	96	91	86	81	76	71	2068	36	33	30	27	24	22	
						309	98	93	88	83	78	73	2130	37	34	31	28	26	23	
						318	100	95	90	85	80	75	2192	38	35	32	29	27	24	
						327	102	97	92	87	82	77	2254	39	36	33	31	28	25	
						336	104	99	94	89	84	79	2316	40	37	34	32	29	26	
						345	106	101	96	91	86	81	2378	41	38	35	33	30	27	
						354	108	103	98	93	88	83	2440	42	39	36	34	31	28	
						364	110	105	100	95	90	85	2509	43	40	38	35	32	29	
						374	112	107	102	97	92	87	2578	44	41	39	36	33	30	
						384	113	108	103	98	93	88	2647	45	42	40	37	34	31	
						394	115	110	105	100	95	90	2716	46	44	41	38	35	32	
						404	117	112	107	102	97	92	2785	47	45	42	39	36	33	
						414	119	114	109	104	99	94	2854	48	46	43	40	37	34	
						424	121	116	111	106	101	96	2923	49	47	44	41	38	35	
						434	123	118	113	108	103	98	2992	50	48	45	42	39	36	
						444	124	119	114	109	104	99	3061	51	48	46	43	40	37	
						454	126	121	116	111	106	101	3130	52	49	47	44	41	38	
						464	128	123	118	113	108	103	3199	53	50	48	45	42	39	
						474	129	124	119	114	109	104	3268	54	51	48	46	43	40	
						484	131	126	121	116	111	106	3337	55	52	49	47	44	41	
						494	132	127	122	117	112	107	3406	56	53	50	47	45	42	
						504	134	129	124	119	114	109	3475	57	54	51	48	46	43	
						514	136	131	126	121	116	111	3544	58	55	52	49	46	44	
						524	137	132	127	122	117	112	3612	58	56	53	50	47	45	
						534	139	134	129	124	119	114	3681	59	56	54	51	48	45	

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Charging Procedure

- 1- Measure Discharge line pressure by attaching a gauge to the service port.
- 2- Measure the Liquid line temperature by attaching a temperature sensing device to it.
- 3- Insulate the temperature sensing device so that the Outdoor Ambient doesn't affect the reading.
- 4- Refer to the required Subcooling in the table based on the model size and the Outdoor Ambient temperature.
- 5- Interpolate if the Outdoor ambient temperature lies in between the table values.
- 6- Find the Pressure Value in the table corresponding to the the measured Pressure of the Compressor Discharge line.
- 7- Read across from the Pressure reading to obtain the Liquid line temperature for a required Subcooling
- 8- Add Charge if the measured temperature is higher than the table value.
- 9 - Remove charge if the measured temperature is lower than the table value.