INSTALLATION INSTRUCTIONS
R-410A Single Package Gas/Electric Units
PGD/S524-60
Single Phase

These instructions must be read and understood completely before attempting installation

Safety Labeling and Signal Words

DANGER, WARNING, CAUTION, and NOTE

The signal words **DANGER, WARNING**, **CAUTION**, and **NOTE** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING**, **CAUTION**, and **NOTE** will be used on product labels and throughout this manual and other manual that may apply to the product.

DANGER – Immediate hazards which will result in severe personal injury or death.

WARNING –Hazards or unsafe practices which could result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which may result in minor personal injury or product or property damage.

NOTE – Used to highlight suggestions which will result in enhanced installation, reliability, or operation.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:

⚠ WARNING

The signal word **CAUTION** is used throughout this manual in the following manner:

⚠ CAUTION

Signal Words on Product Labeling

Signal words are used in combination with colors and/or pictures or product labels.

TABLE OF CONTENTS **PAGE**

SAFETY CONSIDERATIONS 2
RECEIVING AND INSTALLATION 2
Step 1 – Check Equipment 2
Step 2 – Provide Unit Support 3
Step 3 – Field Fabricate Ductwork 3
Step 4 – Provide Clearances 7
Step 5 – Rig and Place Unit 7
Step 6 – Connect Condensate Drain 11
Step 7 – Install Flue Hood 11
Step 8 – Install Gas Piping 11
Step 9 – Install Duct Connections 12
Step 10 – Install Electrical Connections 13
Wiring Diagrams 15
PRE-START-UP 17
START-UP 17
Step 1 – Check for Refrigerant Leaks 17
Step 2 – Start-Up Heating and Adjustments 17
Step 3 – Start-Up Cooling and Adjustments 20
Maintenance 23
Troubleshooting 26
Start-Up Checklist 34

⚠ WARNING

PERSONAL INJURY, AND/OR PROPERTY DAMAGE HAZARD

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

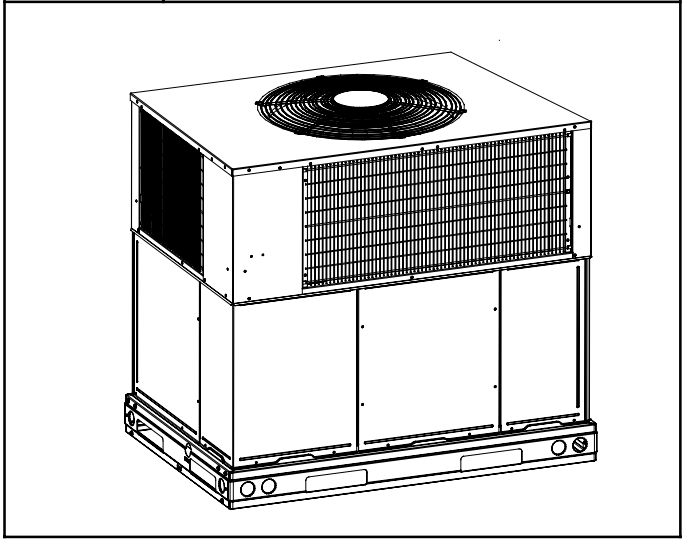
Installation or repairs made by unqualified persons could result in equipment malfunction, property damage, personal injury and/or death.

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

Installation must conform with local building codes and with the national Electrical Code NFPA70 current edition or Canadian Electrical Code part 1 CSA C.22.1.

SAFE INSTALLATION REQUIREMENTS

FIGURE 1	PACKAGED GAS / ELECTRIC UNIT



SAFETY CONSIDERATIONS

Improper installation adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes, the current editions of the National Fuel Gas Code (NFGC 54/ANSI Z223.1, and the National Electrical Code (NEC) NFPA 70.

In Canada refer to the current editions of the National Standards of Canada CAN/CSA-B149.1 and .2 Natural Gas and Propane Installation codes, and Canadian electrical Code CSA C22.1.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal 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.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

When removing access panels or performing maintenance functions inside your unit, be aware of sharp sheet metal parts and screws. Although special care is taken to reduce sharp edges to a minimum, be extremely careful when handling parts or reaching into the unit.

⚠ 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. 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.

INTRODUCTION

The PGD5 / PGS5 units (see Fig. 1) are a fully self-contained, combination Category I gas heating/electric cooling unit designed for outdoor installation (See Fig. 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. Units may be installed either on a rooftop or on a cement slab. (See Fig. 5 for roof curb dimensions).

Models with the number “1” in the 13th position of the model number are dedicated Low NOx units designed for California installations. These models meet the California maximum oxides of nitrogen (NOx) emissions requirements of 40 nanograms/joule or less as shipped from the factory and must be installed in California Air Quality Management Districts or any other regions in North America where a Low NOx rule exists.

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

In gas heating mode, this unit is designed for a minimum continuous return-air temperature of 55°F (13°C) db and a maximum continuous return-air temperature of 80°F (27°C) db. Failure to follow these return-air temperature limits may affect reliability of heat exchangers, motors, and other components.

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 before removing packaging materials. 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

IMPORTANT: The unit must be secured to the curb by installing screws through the bottom of the curb flange and into the unit base rails. When installing large base units onto the common curb, the screws must be installed before allowing the full weight of the unit to rest on the curb. A minimum of six screws are required for large base units. Failure to secure unit properly could result in an unstable unit. See Warning near Rigging/Lifting information and accessory curb instructions for more details.

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

IMPORTANT: 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 1/4 in. (6 mm). This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required.

Roof Curb

Install accessory roof curb in accordance with instructions shipped with curb. See Fig. 5. Install insulation, cant strips, roofing, and flashing. Ductwork must be attached to curb.

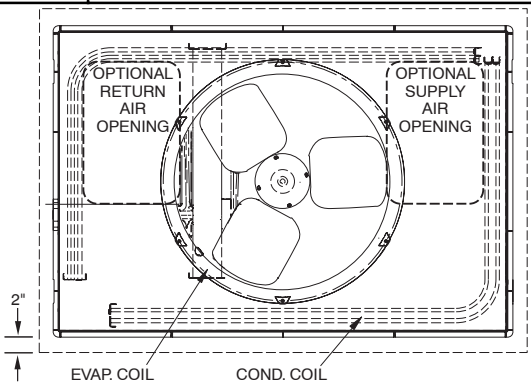
Accessory kits are available to aid in installing a new metal base rail unit on an old roof curb.

Accessory kit number CPADCURB001A00, (small chassis) and accessory kit number CPADCURB002A00, (large chassis) includes roof curb adapter and gaskets for the perimeter seal and duct openings. No additional modifications to curb are required when using this kit.

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.

FIGURE 2 **Slab Mounting Details**



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.

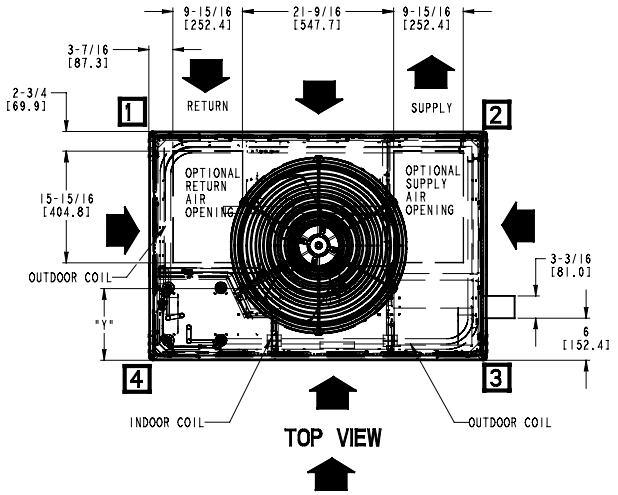
If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

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

FIGURE 3 Model Size 24 Dimensions

Unit	Electrical Characteristics	Unit WT.		Unit HT.		Center of Gravity					
		LB	KG	A		X		Y		Z	
24040	208/230-1-60	419	189.9	44-3/4	1136.7	22-13/16	579.4	15-5/16	388.9	17-5/8	447.7
24060	208/230-1-60	426	193.1	44-3/4	1136.7	22-13/16	579.4	15-5/16	388.9	17-5/8	447.7

UNIT	Voltage	Corner Weight LB/KG							
		1		2		3		4	
24040	208/230	62.8	28.5	83.8	38.0	125.6	57.0	146.6	66.5
24060	208/230	63.6	28.9	84.8	38.5	127.1	57.7	148.3	67.3



REQUIRED CLEARANCES TO COMBUSTIBLE MATL.

	INCHES [MM]
TOP OF UNIT	14 [355.6]
DUCT SIDE OF UNIT	2 [50.8]
SIDE OPPOSITE DUCTS	14 [355.6]
BOTTOM OF UNIT	1/2 [12.7]
FLUE PANEL	36 [914.4]

NEC. REQUIRED CLEARANCES.

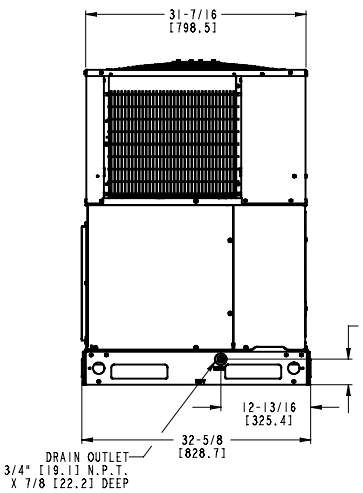
	INCHES [MM]
BETWEEN UNITS, POWER ENTRY SIDE	42 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42 [1066.8]

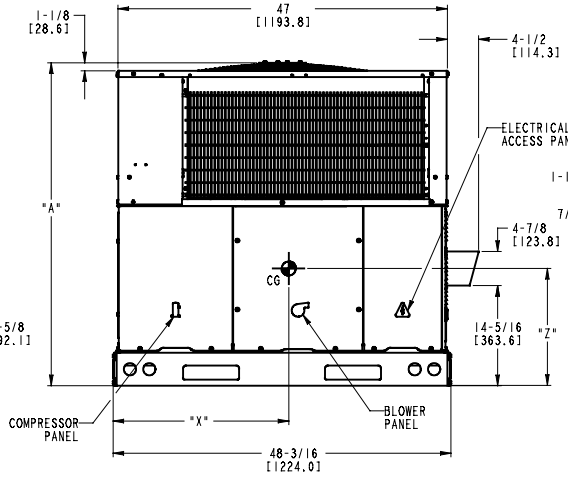
REQUIRED CLEARANCE FOR OPERATION AND SERVICING

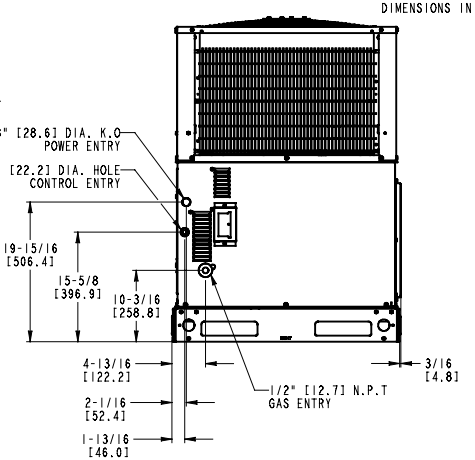
	INCHES [MM]
EVAP. COIL ACCESS SIDE	36 [914.0]
POWER ENTRY SIDE	42 [1066.8]
(EXCEPT FOR NEC REQUIREMENTS)	
UNIT TOP	48 [1219.2]
SIDE OPPOSITE DUCTS	36 [914.0]
DUCT PANEL	12 [304.8]*

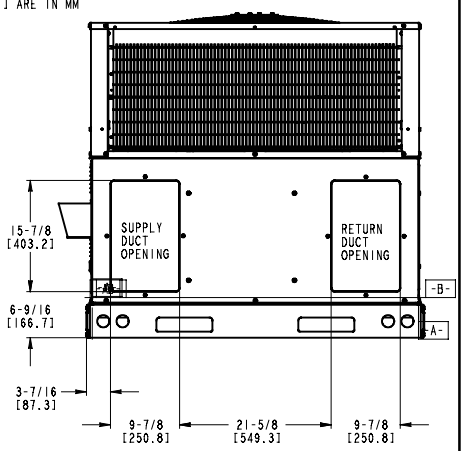
*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.

DIMENSIONS IN [] ARE IN MM







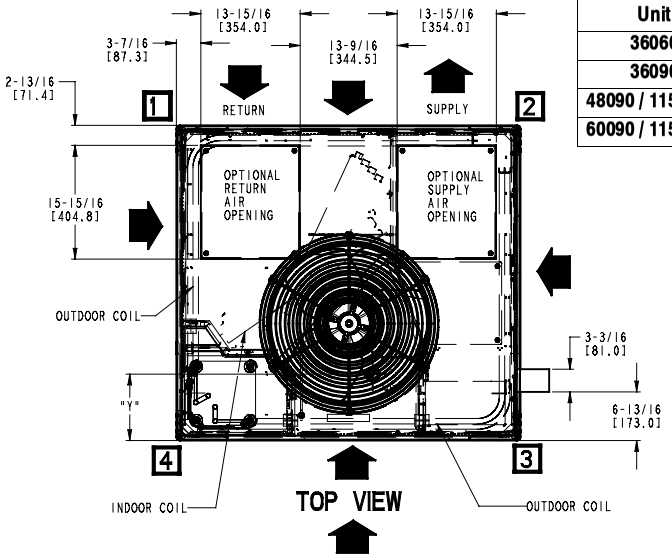


48VT500026 REV 2.0

FIGURE 4 | **Model Size 36-60 Dimensions**

Unit	Electrical Characteristics	Unit WT.		Unit HT.		Center of Gravity					
		LB	KG	A		X		Y		Z	
36060	208/230-1-60	513	232.8	48-5/8	1235.1	22-13/16	579.4	18	457.2	16-5/8	422.3
36090	208/230-1-60	521	236.4	48-5/8	1235.1	22-13/16	579.4	18	457.2	16-5/8	422.3
48090 / 115 / 130	208/230-1-60	549	249.1	50-5/8	1285.9	22-13/16	579.4	18	457.2	17-5/8	447.7
60090 / 115 / 130	208/230-1-60	600	272.3	54-5/8	1387.5	22-13/16	579.4	18	457.2	18	457.2

Unit	Voltage	Corner Weight LB/KG							
		1		2		3		4	
36060	208/230	77.0	35.0	102.6	46.6	154.0	69.9	179.6	81.6
36090	208/230	78.2	35.5	104.2	47.3	156.4	71.0	182.4	82.8
48090 / 115 / 130	208/230	82.4	37.4	109.8	49.9	164.8	74.8	192.2	87.3
60090 / 115 / 130	208/230	90.0	40.9	120.0	54.5	180.1	81.8	210.1	95.4



REQUIRED CLEARANCES TO COMBUSTIBLE MATL.

	INCHES [MM]
TOP OF UNIT	14 [355.6]
DUCT SIDE OF UNIT	2 [50.8]
SIDE OPPOSITE DUCTS	14 [355.6]
BOTTOM OF UNIT	1/2 [12.7]
FLUE PANEL	36 [914.4]

NEC. REQUIRED CLEARANCES.

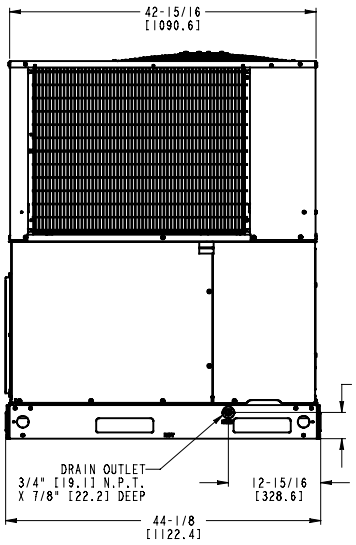
	INCHES [MM]
BETWEEN UNITS, POWER ENTRY SIDE	42 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42 [1066.8]

REQUIRED CLEARANCE FOR OPERATION AND SERVICING

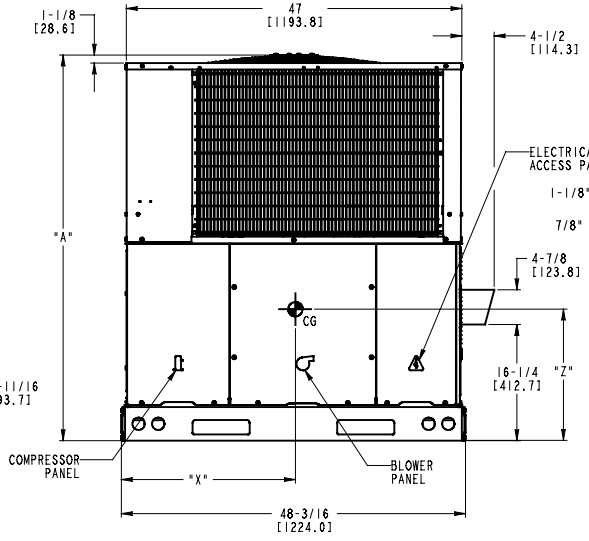
	INCHES [MM]
EVAP. COIL ACCESS SIDE	36 [914.0]
POWER ENTRY SIDE	42 [1066.8]
(EXCEPT FOR NEC REQUIREMENTS)	
UNIT TOP	48 [1219.2]
SIDE OPPOSITE DUCTS	36 [914.0]
DUCT PANEL	12 [304.8]*

*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISED.

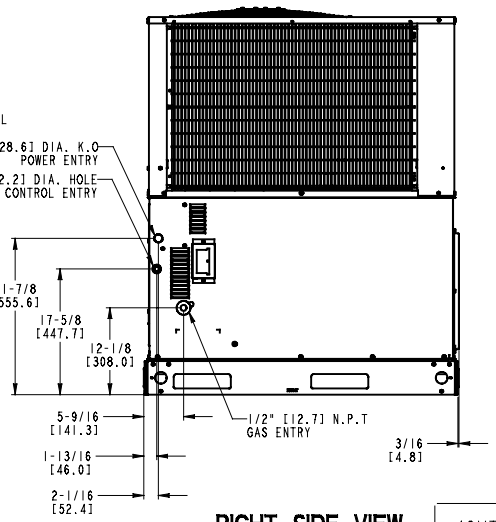
DIMENSIONS IN [] ARE IN MM



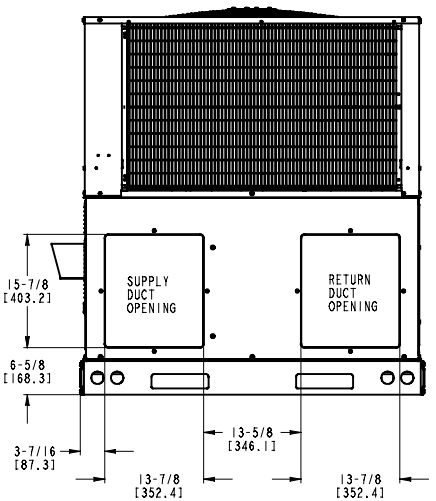
LEFT SIDE VIEW



FRONT VIEW



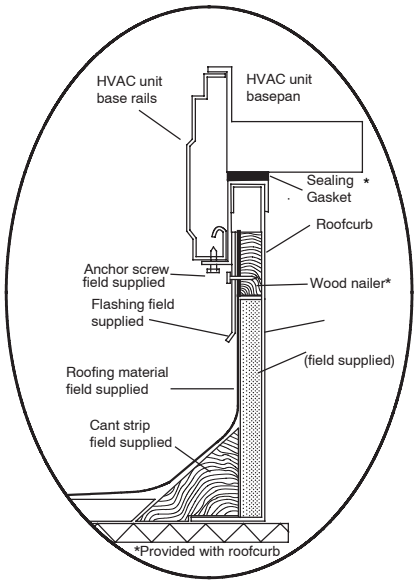
RIGHT SIDE VIEW



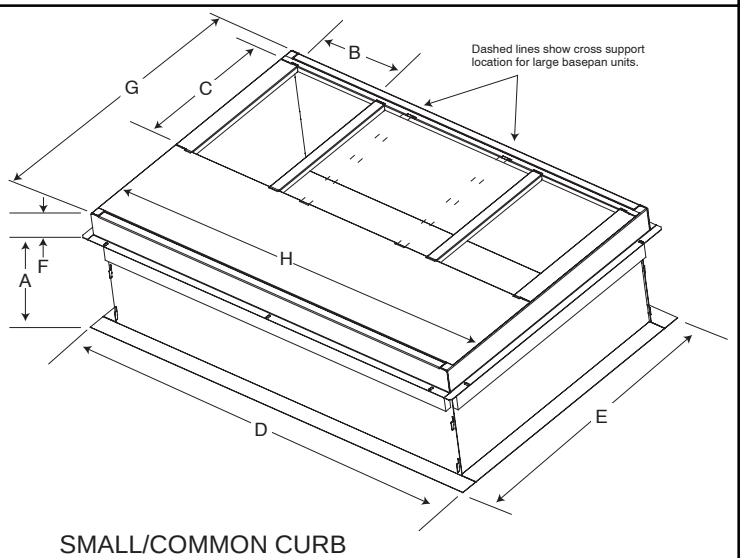
REAR VIEW

48VT500027 | 2

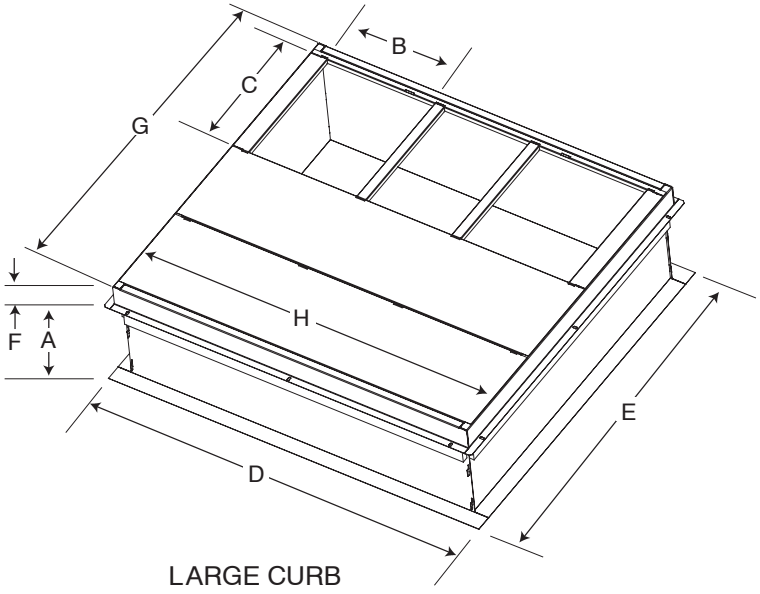
FIGURE 5 **Roof Curb Dimensions**



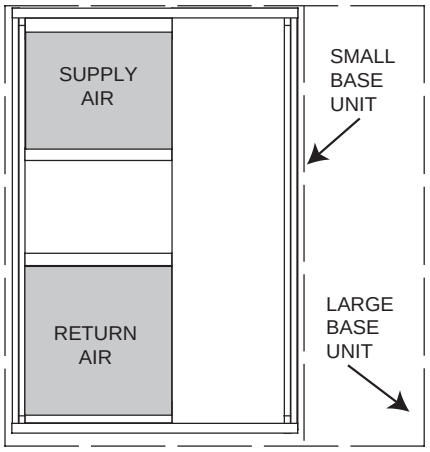
ROOF CURB DETAIL



SMALL/COMMON CURB



LARGE CURB



UNIT PLACEMENT ON COMMON CURB

SMALL OR LARGE BASE UNIT

UNIT SIZE	CATALOG NUMBER	A IN. (mm)	B (small/common base) IN. (mm)*	B (large base) IN. (mm)*	C IN. (mm)	D IN. (mm)	E IN. (mm)	F IN. (mm)	G IN. (mm)	H IN. (mm)
Small or Large	CPRFCURB010A00	11 (279)	10 (254)	14 (356)	16 (406)	47.8 (1214)	32.4 (822)	2.7 (69)	30.6 (778)	46.1 (1170)
	CPRFCURB011A00	14 (356)								
Large	CPRFCURB012A00	11 (279)	14 (356)				43.9 (1116)		42.2 (1072)	
	CPRFCURB013A00	14 (356)								

NOTES:

1. Roof curb must be set up for unit being installed.
2. Seal strip must be applied, as required, to unit being installed.
3. Roof curb is made of 16-gauge steel.
4. Attach ductwork to curb (flanges of duct rest on curb).
5. Insulated panels: 1-in. (25 mm) thick fiberglass 1 lb. density.

STEP 4 — Provide Clearances

The required minimum operating and service clearances are shown in Fig. 3 and 4. Adequate combustion, ventilation and condenser air must be provided.

IMPORTANT: 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-in. (1219 mm) above the unit top. The maximum horizontal extension of a partial overhang must not exceed 48-in. (1219 mm).

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 in. (102 mm) 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

Prior to initial use, and at monthly intervals, all rigging shackles, clevis pins, 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. Materials 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.

Rigging/Lifting of Unit

⚠ WARNING

PROPERTY DAMAGE HAZARD

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

When straps are taut, the clevis should be a minimum of 36 in. (914 mm) above the unit top cover.

⚠ WARNING

UNIT FALLING HAZARD

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

Large base units must be secured to common curb before allowing full weight of unit to rest on curb. Install screws through curb into unit base rails while rigging crane is still supporting unit.

Lifting holes are provided in base rails as shown in Fig. 3 and 4.

1. 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. Attach shackles, clevis pins, and straps to the base rails of the unit. Be sure materials are rated to hold the weight of the unit (See Fig. 6).
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.

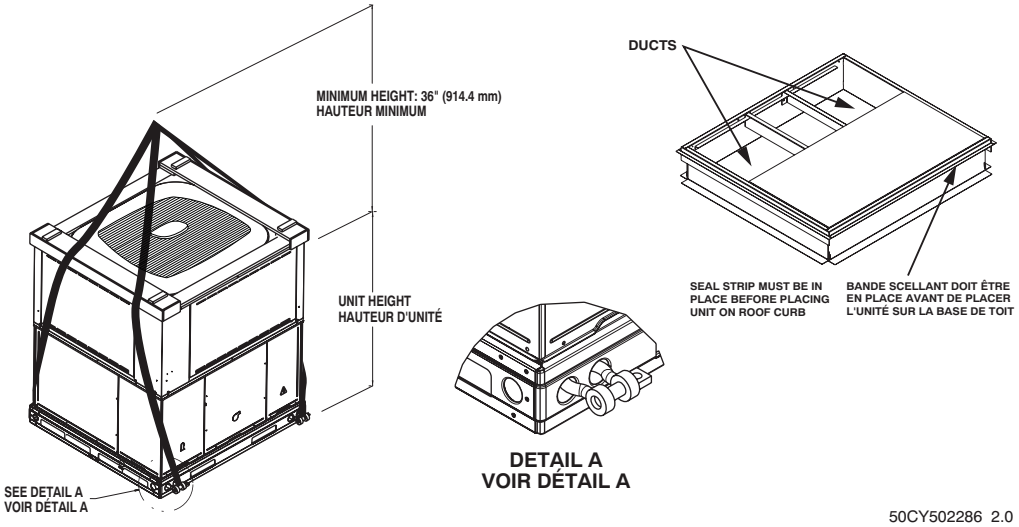
After the unit is placed on the roof curb or mounting pad, remove the top crating.

FIGURE 6 | **Unit Corner Weight (lbs) and Rigging**

⚠ CAUTION - NOTICE TO RIGGERS
⚠ PRUDENCE - AVIS AUX MANIPULATEUR

ACCESS PANELS MUST BE IN PLACE WHEN RIGGING.
PANNEAUX D'ACCES DOIT ÊTRE EN PLACE POUR MANIPULATION.

Use top skid as spreader bar. / Utiliser la palette du haut comme barre de répartition



50CY502286 2.0

Cabinet	MODEL NUMBER	Rigging Weight	
		lb	kg
Small	PG(D,S)524	431	196
Large	PG(D,S)536	530	240
	PG(D,S)548	558	253
	PG(D,S)560	609	276

Table 2 – PHYSICAL DATA PG(D,S)524-36

UNIT SIZE	24040	24060	36060	36090
NOMINAL COOLING CAPACITY (ton)	2	2	3	3
NOMINAL HEATING CAPACITY (Btu)	40,000	60,000	60,000	90,000
SHIPPING WEIGHT (lb)	426	431	522	530
(kg)	193	196	237	240
COMPRESSORS	2-Stage Scroll			
Quantity	1			
REFRIGERANT: R-410A				
Quantity (lb)	10.1	10.1	9.5	9.5
(kg)	4.6	4.6	4.3	4.3
REFRIGERANT METERING DEVICE	TXV			
Size	2 Ton	2 Ton	3 Ton	3 Ton
OUTDOOR COIL				
Rows...Fins/in.	2...21	2...21	2...21	2...21
Face Area (sq ft)	13.6	13.6	17.5	17.5
OUTDOOR FAN				
Nominal Cfm	2700	2700	2800	2800
Diameter (in.)	22	22	22	22
(mm)	559	559	559	559
Motor Hp (Rpm)	1/8 (825)	1/8 (825)	1/8 (825)	1/8 (825)
INDOOR COIL				
Rows...Fins/in.	3...17	3...17	3...17	3...17
Face Area (sq ft)	3.7	3.7	4.7	4.7
INDOOR FAN				
Nominal Low Stage Cooling Airflow (Cfm)	600	600	850	850
Nominal High Stage Cooling Airflow (Cfm)	800	800	1200	1200
Size (in.)	10x10	10x10	11x10	11x10
(mm)	254x254	254x254	279x254	279x254
Motor HP (RPM)	1/2	1/2	3/4	3/4
FURNACE SECTION*				
Burner Orifice No. (Qty...Drill Size)				
Natural Gas	2...44	2...38	2...38	3...38
HIGH-PRESSURE SWITCH (psig) Cut-out	670 ±10			
Reset (Auto)	470 ± 25			
HIGH-PRESSURE SWITCH 2 (psig)				
(Compressor Solenoid)				
Cut-out	565 ± 15			
Reset (Auto)	455 ± 15			
LOSS-OF-CHARGE /				
LOW-PRESSURE SWITCH				
(Liquid Line) (psig)				
Cut-out	23 ± 5			
Reset (auto)	55 ± 5			
RETURN-AIR FILTERS Throwaway†				
(in.)	20x20x1	20x24x1	24x30x1	
(mm)	508x508x25	508x610x25	610x762x25	

Continued next page.

Table 2—Physical Data PG(D,S)548-60

UNIT SIZE	48090	48115	48130	60090	60115	60130
	4	4	4	5	5	5
NOMINAL HEATING CAPACITY (Btu)	90,000	115,000	130,000	90,000	115,000	130,000
SHIPPING WEIGHT (lb)	558	558	558	609	609	609
(kg)	253	253	253	276	276	276
COMPRESSORS	2-Stage Scroll					
Quantity	1					
REFRIGERANT: R-410A						
Quantity (lb)	15.3	15.3	15.3	15.8	15.8	15.8
(kg)	6.9	6.9	6.9	7.2	7.2	7.2
REFRIGERANT METERING DEVICE	TXV					
Size	4 Ton	4 Ton	4 Ton	5 Ton	5 Ton	5 Ton
OUTDOOR FAN						
Nominal Cfm	3300	3300	3300	3300	3300	3300
Diameter (in.)	22	22	22	22	22	22
(mm)	559	559	559	559	559	559
Motor Hp (Rpm)	1/4 (1100)	1/4 (1100)	1/4 (1100)	1/3 (1110)	1/3 (1110)	1/3 (1110)
OUTDOOR COIL						
Rows...Fins/in.	2...21	2...21	2...21	2...21	2...21	2...21
Face Area (sq ft)	19.4	19.4	19.4	23.3	23.3	23.3
INDOOR COIL						
Rows...Fins/in.	3...17	3...17	3...17	4...17	4...17	4...17
Face Area (sq ft)	5.7	5.7	5.7	5.7	5.7	5.7
INDOOR FAN						
Nominal Low Stage Cooling Airflow (Cfm)	1100	1100	1100	1200	1200	1200
Nominal High Stage Cooling Airflow (Cfm)	1600	1600	1600	1750	1750	1750
Size (in.)	11x10	11x10	11x10	11x10	11x10	11x10
(mm)	279x254	279x254	279x254	279x254	279x254	279x254
Motor HP (RPM)	1	1	1	1	1	1
FURNACE SECTION*						
Burner Orifice No. (Qty...Drill Size)						
Natural Gas	3...38	3...33	3...31	3...38	3...33	3...31
HIGH-PRESSURE SWITCH (psig)						
Cut-out	670 ± 10					
Reset (Auto)	470 ± 25					
HIGH-PRESSURE SWITCH 2 (psig)						
(Compressor Solenoid)						
Cut-out	565 ± 15					
Reset (Auto)	455 ± 15					
LOSS-OF-CHARGE /						
LOW-PRESSURE SWITCH						
(Liquid Line) (psig)						
Cut-out	23 ± 5					
Reset (auto)	55 ± 5					
RETURN-AIR FILTERS Throwaway† **(in.)**	24x36x1					
(mm)	610x914x25					

*Based on altitude of 0 to 2000 ft (0 to 610 m).

†Recommended filter sizes for field−installed air filter grilles mounted on the wall or ceiling of the conditioned structure. 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 ft/minute for throwaway type or 450 ft/minute for high−capacity type. Air filter pressure drop for non−standard filters must not exceed 0.08 IN. W.C.

STEP 6 — Connect Condensate Drain

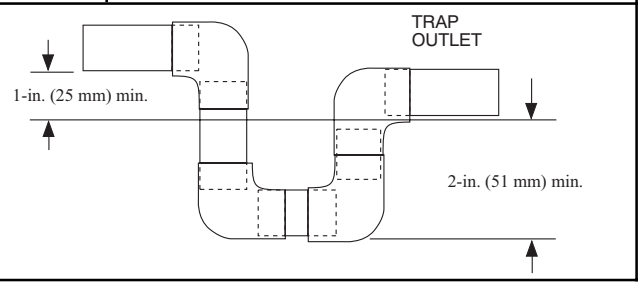
NOTE: When installing condensate drain connection be sure to comply with local codes and restrictions.

Unit disposes of condensate water through a 3/4 in. NPT fitting which exits through the base on the evaporator coil access side. See Fig. 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-in. (51 mm) condensate trap at the end of condensate connection to ensure proper drainage. Make sure that the outlet of the trap is at least 1 in. (25 mm) lower than the drain-pan condensate connection to prevent the pan from overflowing (See Fig. 7). 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 3/4-in. PVC or 3/4-in. copper pipe (all field-supplied) at the outlet end of the 2-in. (51 mm) trap. Do not undersize the tube. Pitch the drain tube downward at a slope of at least 1-in. (25 mm) for every 10 ft (3.1 m) of horizontal run. Be sure to check the drain tube for leaks.

FIGURE 7 **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 Fig. 9).

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/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 indicted 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 NFPA 54/ANSI Z223.1 National Fuel Gas Code (NFGC), (in Canada, CAN/CGA B149.1, and B149.2) 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 Fig. 9). 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 inserting a single screw on the top flange and the bottom flange 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 1/2-in. (12.7 mm) FPT gas inlet on the gas valve.

Install a gas supply line that runs to the heating section. Refer to 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 in. wc maximum pressure drop. Never use pipe smaller than the 1/2-in. (12.7 mm) 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 in. wc or greater than 13 in. wc while the unit is operating. For propane applications, the gas pressure must not be less than 11.0 in. wc or greater than 13 in. wc at the unit connection.

A 1/8-in. (3.2 mm) 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 NFPA 54/ANSI Z223.1 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 1/4 in. (6.35 mm) for every 15 ft (4.6 m) 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 ft (1.8 m). For pipe sizes larger than 1/2 in., 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 Fig. 8). 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 ft (1.8 m) 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 a commercially available soap solution (or method specified by local codes and/or regulations).

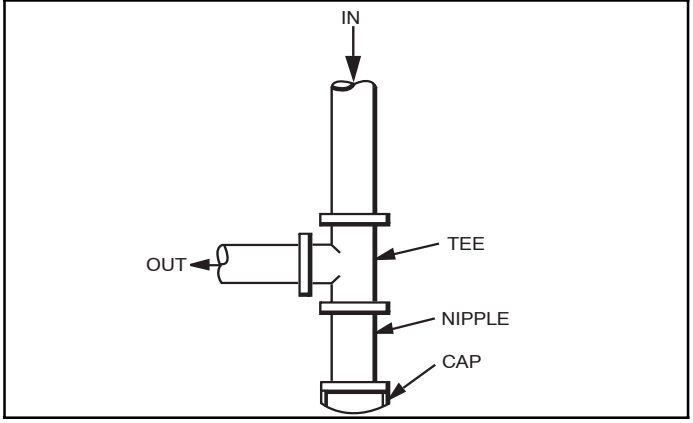
Table 9—Maximum Gas Flow Capacity*

NOMINAL IRON PIPE SIZE (IN.)	INTERNAL DIAMETER (IN.)	LENGTH OF PIPE FT (m)†													
		10 (3)	20 (6)	30 (9)	40 (12)	50 (15)	60 (18)	70 (21)	80 (24)	90 (27)	100 (30)	125 (38)	150 (46)	175 (53)	200 (61)
1/2	.622	175	120	97	82	73	66	61	57	53	50	44	40	—	—
3/4	.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
1-1/4	1.380	1400	950	770	600	580	530	490	460	430	400	360	325	300	280
1-1/2	1.610	2100	1460	1180	990	900	810	750	690	650	620	550	500	460	430

*Capacity of pipe in cu ft of gas per hr for gas pressure of 0.5 psig or less. Pressure drop of 0.5-in. wc (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.

FIGURE 8 Sediment Trap



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.

⚠ 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 in. (51 mm) 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.

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 downshot applications, the ductwork connects to the roof curb (See Fig. 3 and 4 for connection sizes and locations).

Configuring Units for Downflow (Vertical) Discharge

⚠ WARNING

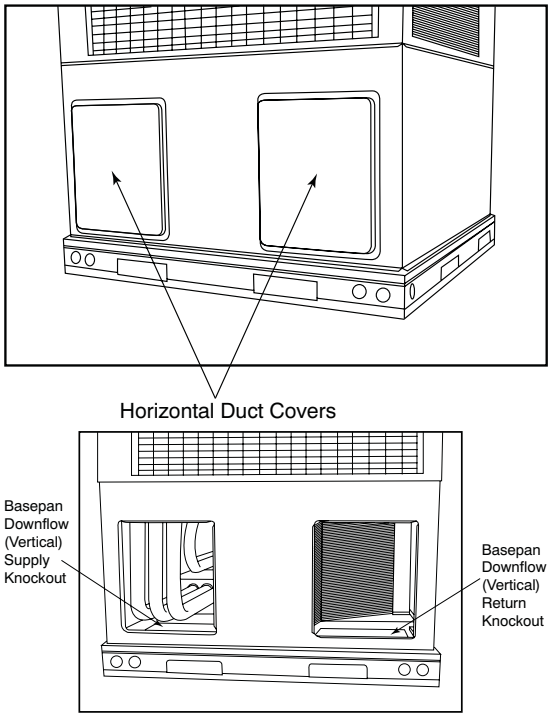
ELECTRICAL SHOCK HAZARD

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

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

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 basepan.
3. To remove downflow return and supply knockout covers, break front and right side connecting tabs with a screwdriver and hammer. Push cover down to break rear and left side tabs.

FIGURE 9 Supply and Return Opening



NOTE:These panels are held in place with tabs similar to an electrical knockout. Reinstall horizontal duct covers (Fig. 9) shipped on unit from factory. Insure openings are air and watertight.

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. Recommended sizes for filters are shown in Table 1.
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.

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 Figures 3 and 4 for acceptable location).

NOTE: Field supplied disconnect switch box should be positioned so that it does not cover up any of the unit gas combustion supply air louvers.

See unit wiring label (Figure 11) 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.

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 (3/16" [4.8mm]) terminal marked 230 to terminal marked 208. This re-taps transformer to primary voltage of 208 VAC.

⚠ WARNING

ELECTRICAL SHOCK FIRE/EXPLOSION 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.

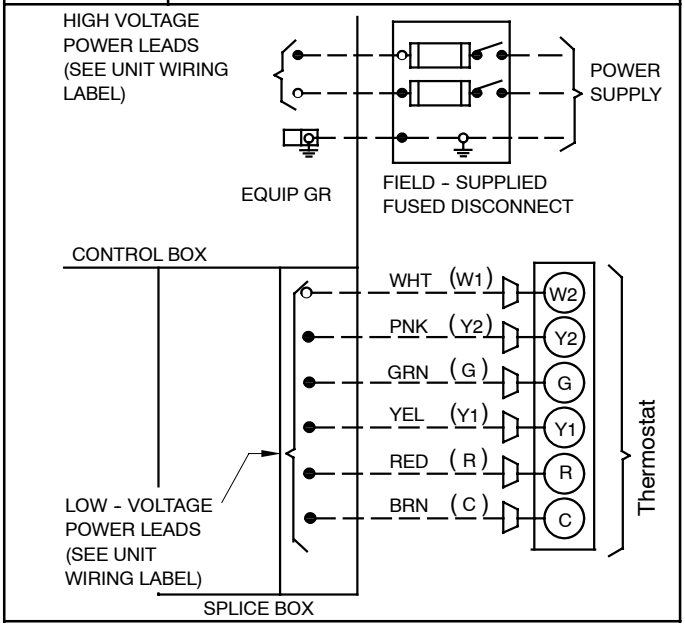
Control Voltage Connections

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

FIGURE 10 High and Control Voltage Connections



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

Locate six 18-gage wires leaving control box. These low-voltage connection leads can be identified by the colors red, green, yellow, brown, pink, 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, however a direct short will likely blow a secondary fuse. If an overload or short is present, correct overload condition and check for blown fuse on Indoor Fan board or Integrated Gas Controller. Replace fuse as required with correct size and rating.

FIGURE 11 208/230-1-60 ALL UNITS

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

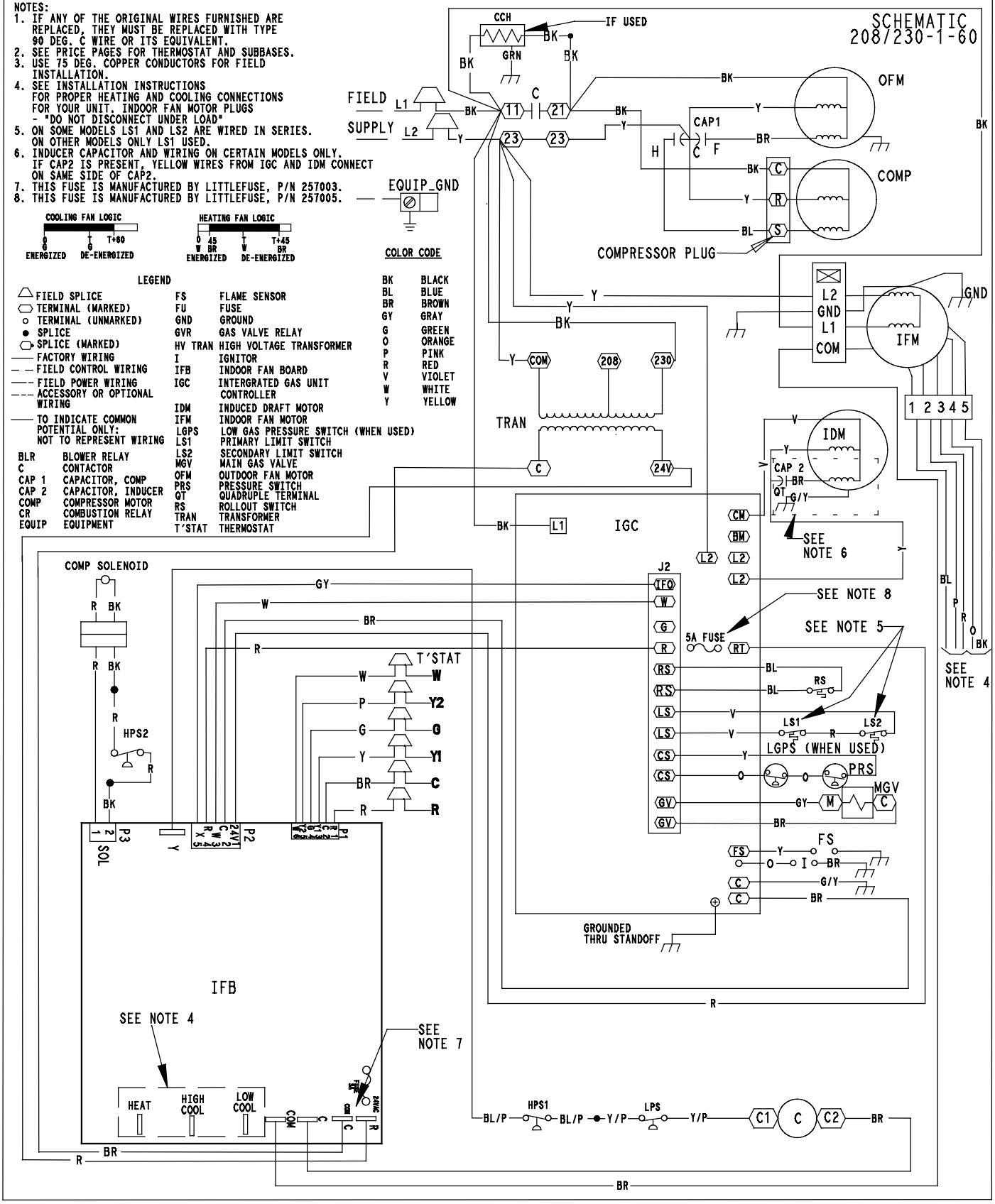
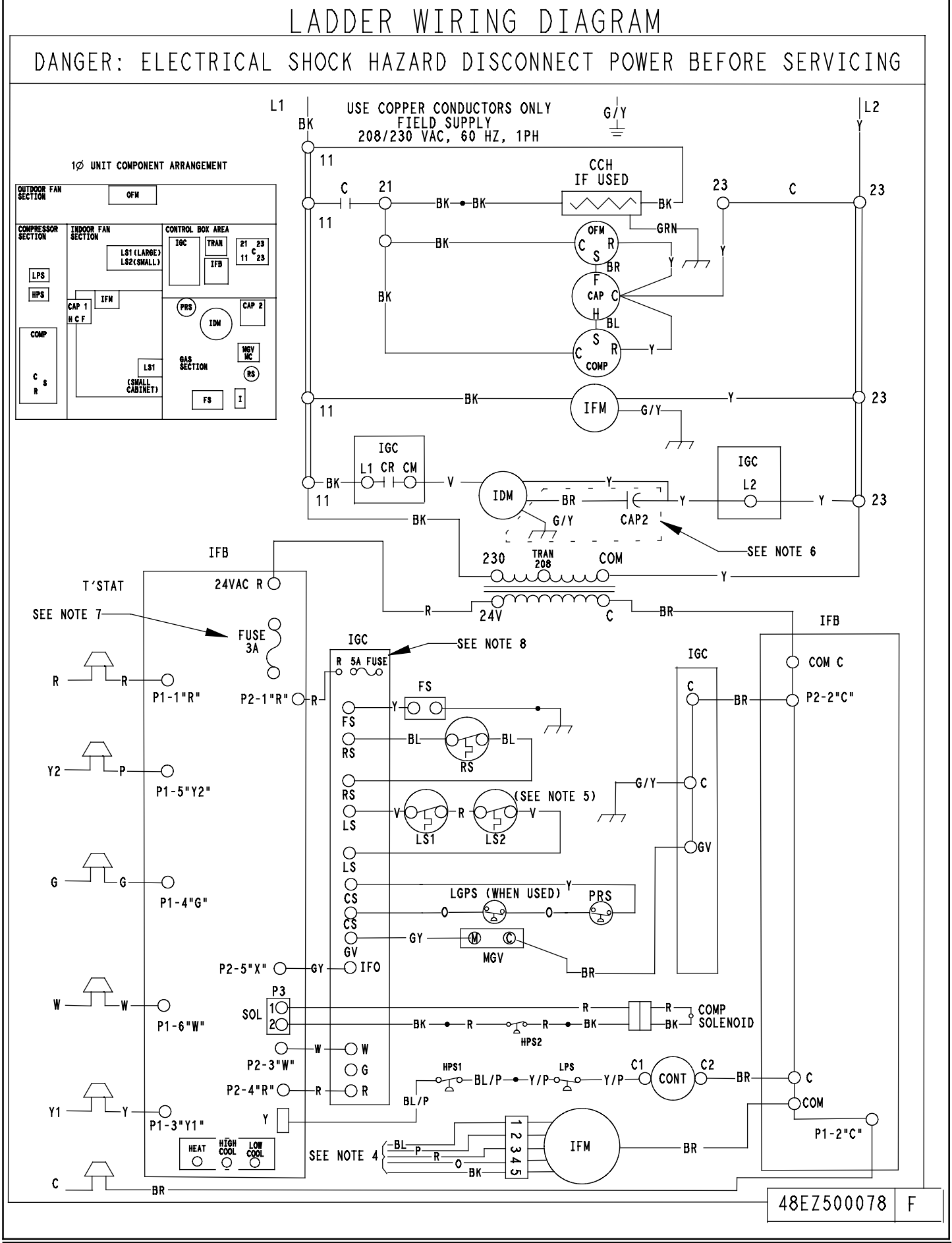


Fig. 11 (Cont.) 208/230–1–60 All Units



⚠ 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 panels. See Fig. 16)
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.
   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. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.

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.

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.
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 an accurate scale. Refer to unit rating plate for required charge.

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 my occur when the burner orifices in the manifold are misaligned.

Follow the lighting instructions on the heating section operation label (located inside of the control access panel) 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 on the inside of the control 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 5). If adjustment is required, proceed as follows:

NOTE: The rated gas inputs shown in Table 5 are for altitudes from sea level to 2000 feet above sea level. These inputs are based on natural gas with a heating value of 1025 Btu/ft^3 at 0.6 specific gravity, or Propane with a heating value of 2500 Btu/ft^3 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 see 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 4 for correct input rate.

Table 4 - 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:

Furnace Input Rate at Sea Level	X	De−rate Multiplier	=	Furnace Input Rate at Installation Altitude
90,000	X	0.90	=	81,000

⚠ 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 12 Burner Assembly

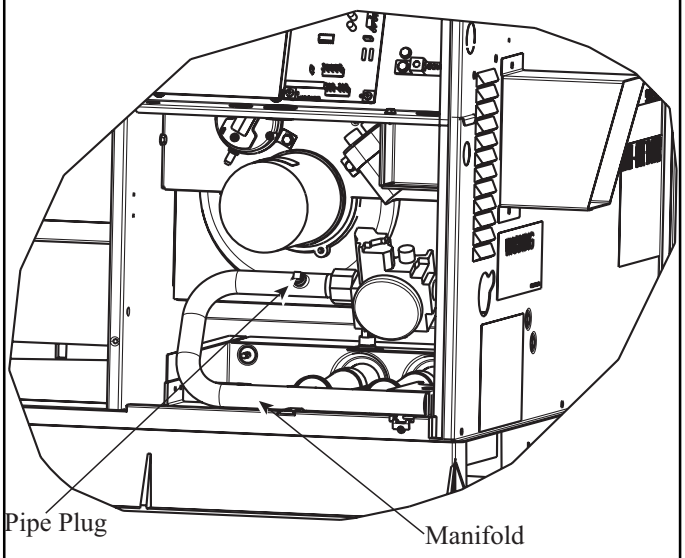


FIGURE 13 Gas Valve Components

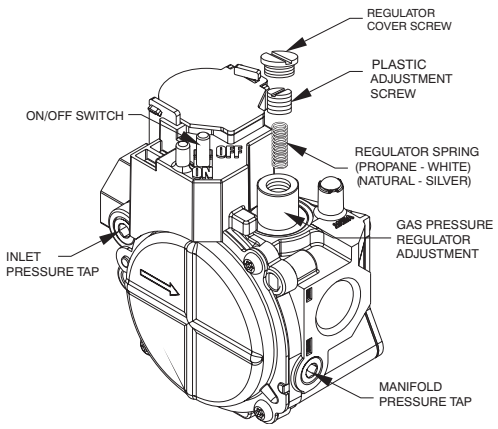
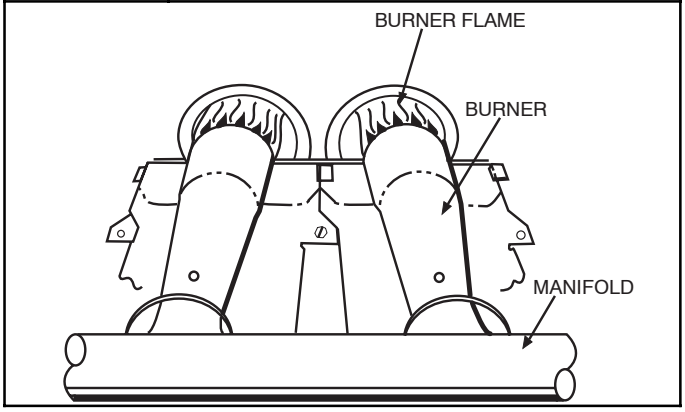


FIGURE 14 **Monoport Burner**



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.

Proceed as follows:

1. Turn off gas supply to unit.
2. Remove pipe plug on manifold (see Figure 12) 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 ft^3 (cubic feet) shown for one revolution of test dial to obtain ft^3 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 5 (Consult the local gas supplier if the heating value of gas is not known).

Example: Assume that the size of test dial is 1 ft^3, one revolution takes 32 seconds, and the heating value of the gas is 1050 BTU/ft^3 . Proceed as follows:

1. 32 seconds to complete one revolution.
2. 3600 / 32 = 112.5.
3. 112.5 x 1 = 112.5 ft^3 of gas flow/hr.
4. 112.5 x 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 13).
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.

⚠ 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)

Refer to Propane kit installation instructions for gas input measurement procedure.

NOTE:For installations below 2,000 feet, refer to the unit rating plate for proper Propane conversion kit part number. For installations above 2,000 feet, contact your distributor for proper Propane conversion kit.

Check Burner Flame

With control access panel removed (See Fig. 16), 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. 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 marked on the unit rating plate.

Table 5 shows the approved temperature rise range for each heating input, and the air delivery CFM at various temperature rises for a given external static pressure. 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 Figure 11, unit wiring label.)

On a call for heating, thermostat closes R to W, starting the induced–draft motor. When the pressure switch senses that the induced–draft motor is moving sufficient combustion air, 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 5 – 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	Natural†	Propane *†
40,000	**38,000**	2	4.0	13.0	11.0	13.0	3.2 – 3.8	10.0 – 11.0
60,000	**53,000**	2	4.0	13.0	11.0	13.0	3.2 – 3.8	10.0 – 11.0
90,000	**79,000**	3	4.0	13.0	11.0	13.0	3.2 – 3.8	10.0 – 11.0
115,000	**103,000**	3	4.0	13.0	11.0	13.0	3.2 – 3.8	10.0 – 11.0
130,000	**116,000**	3	4.0	13.0	11.0	13.0	3.2 – 3.8	10.0 – 11.0

***** When 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 Integrated Gas Control board (IGC) to monitor operation. The IGC is located by removing the control access panel. During normal operation, the LED is continuously on (See Table 6 for error codes).

Limit Switches

Normally closed limit switch (LS) completes the control circuit. If the supply air temperature rises 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 IGC board is in a hard lockout and unit will require power reset to remove the hard lockout function. The IGC Board LED will display FAULT CODE 7.

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.

Table 6 – LED INDICATIONS

STATUS CODE	LED INDICATION
Normal Operation[2]	On
No Power or Hardware Failure	Off
Limit Switch Fault	2 Flashes
Flame Sense Fault	3 Flashes
Four Consecutive Limit Switch Faults	4 Flashes
Ignition Lockout Fault	5 Flashes
Pressure Switch Fault	6 Flashes
Rollout Switch Fault	7 Flashes
Internal Control Fault	8 Flashes
Temporary 1 hr auto reset[1]	9 Flashes

NOTES:
1.This code indicates an internal processor fault that will reset itself in one hr. Fault can be caused by stray RF signals in the structure or nearby. This is a UL requirement.
2. LED indicates acceptable operation. Do not change ignition control board.
3. When W is energized the burners will remain on for a minimum of 60 sec.
4. If more than one error code exists they will be displayed on the LED in sequence.

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 desired temperature at least 10 degrees below room temperature (to allow time to check charge). Observe that compressor, outdoor (condenser) fan, and indoor (evaporator) blower motors start. Observe that cooling cycle shuts down when temperature setting is satisfied. The indoor (evaporator) fan motor will continue to run for 90 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 (R–410A)

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 inside of the compressor access panel. 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 on high stage cooling 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 7).
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.

Indoor Airflow and Airflow Adjustments

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in unit damage.

For cooling operation, the recommended airflow is 350 to 450 cfm for each 12,000 BTU/h of rated cooling capacity. For heating operation, the airflow must produce a temperature rise that falls within the range stamped on the unit rating plate.

All blower motors are factory wired for nominal high stage and low stage cooling airflow operation at minimum external static pressure. See Table 3.

NOTE: Be sure that all supply-and return-air grilles are open, free from obstructions, and adjusted properly.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Disconnect electrical power to the unit and install lockout tag before changing blower speed.

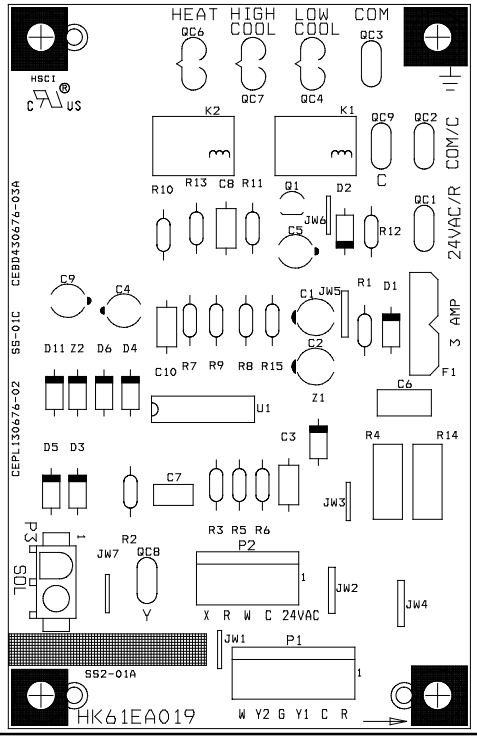
There are independent fan speeds for heating (marked "HEAT"), low stage cooling (marked "LOW COOL"), and high stage cooling (marked "HIGH COOL") on the interface fan board (IFB) (see Figure 15). The unit is factory-shipped with heating and cooling speeds noted in Table 9. There are 2 additional speed tap wires available for use in either heating or cooling (For color coding on the indoor fan motor leads, see Table 8). The additional 2 speed tap wires are shipped loose with vinyl caps and are located in the control box, near the Interface Fan Board (IFB).

To change heating fan speed, remove the vinyl cap off of the desired speed tap wire (Refer to Table 8 for color coding). Remove the current speed tap wire from the "HEAT" terminal on the Interface Fan Board (IFB) (see Figure 15) and place vinyl cap over the connector on the wire. Connect the desired speed tap wire to the "HEAT" terminal on the IFB. Table 9 shows the temperature rise associated with each fan speed for a given static pressure. Make sure that the speed chosen delivers a temperature rise within the rise range listed on the unit rating plate.

To change the cooling fan speed, remove the vinyl cap off the desired speed tap wire (Refer to Table 8 for color coding). Remove the current speed tap wire from the "HIGH COOL" or "LOW COOL" terminal on the IFB (Figure 16) and place vinyl cap over the connector on the wire. Connect the desired speed tap wire to the "HIGH COOL" or "LOW COOL" terminal on the IFB. For optimum performance, add the wet coil pressure drop in Table 10 to the system static to determine the correct cooling airflow speed in Table 9, that will deliver the nominal cooling airflow as listed in Table 3 for each size.

NOTE:For cooling operation, the recommended airflow is 350 to 450 CFM for each 12,000 BTU/h of rated cooling capacity.

FIGURE 15 Interface Fan Board (IFB)



Continuous Fan Operation

Thermostat closes R to G. The continuous fan operates at the same fan speed as low stage cooling fan operation.

Table 8 - Color Coding for Indoor Fan Motor Leads

Black = High Speed
Orange = Med-High Speed
Red = Med Speed
Pink = Med-Low Speed
Blue = Low Speed

Cooling Sequence of Operation

With the room thermostat SYSTEM switch in the COOL position and the FAN switch in the AUTO position, the cooling sequence of operation is as follows:

1. **Low Stage:** Thermostat closes R to G and R to Y1. The compressor and indoor fan are energized on low speed. The outdoor fan is also energized.
2. **High Stage:** Thermostat closes R to G, R to Y1 and R to Y2. The compressor and indoor fan are energized on high speed. The outdoor fan is also energized.
3. The set of normally open contacts of energized relay BM close and complete the circuit through evaporator blower (indoor) fan motor (IFM).

NOTE:Once the compressor has started and then stopped, it should not be started again until 5 minutes have elapsed. The cooling cycle remains on until the room temperature drops to a point that is slightly below the cooling control setting of the room thermostat. At this point, the thermostat breaks the circuit between thermostat terminal R to terminals Y1 and Y2. These open circuits de-energize contactor coil C. The compressor and condenser (outdoor) motor stop. After a 90 second delay, the evaporator (indoor) motor stops. The unit is in a standby condition, waiting for the next call for cooling from the room thermostat.

Table 7 - Cooling Charging Chart

REQUIRED SUBCOOLING °F(°C)

Model Size	Outdoor Ambient Temperature °F(°C) 75 (24)	85 (29)	95 (35)	105 (41)	115 (46)
24	12 (6.7)	12 (6.7)	12 (6.7)	11 (6.1)	11 (6.1)
30	16 (8.9)	15 (8.3)	15 (8.3)	15 (8.3)	14 (7.8)
36	16 (8.9)	15 (8.3)	14 (7.8)	14 (7.8)	13 (7.2)
42	14 (7.8)	14 (7.8)	13 (7.2)	13 (7.2)	13 (7.2)
48	18 (10)	17 (9.4)	17 (9.4)	17 (9.4)	17 (9.4)
60	15 (8.3)	15 (8.3)	14 (7.8)	14 (7.8)	14 (7.8)

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.

50VT500173 REV 4.0

Required Liquid Line Temperature for a Specific Subcooling (R-410A)

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

MAINTENANCE

To ensure continuing high performance and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This unit should be inspected at least once each year by a qualified service person. To troubleshoot unit, refer to Tables 12, 13, and 14 – Troubleshooting Charts.

NOTE TO EQUIPMENT OWNER: Consult your local dealer about the availability of a maintenance contract.

⚠ WARNING

PERSONAL INJURY AND UNIT DAMAGE HAZARD

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

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 on this equipment, other than those procedures recommended in the Owner's Manual.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow these warnings could result in personal injury or death:

1. Turn off electrical power to the unit before performing any maintenance or service on this unit. TAG DISCONNECT SWITCH WITH LOCKOUT TAG.
2. Use extreme caution when removing panels and parts.
3. Never place anything combustible either on or in contact with the unit.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper operation.

Errors made when reconnecting wires may cause improper and dangerous operation. Label all wires prior to disconnecting when servicing.

The minimum maintenance requirements for this equipment are as follows:

1. Inspect air filter(s) each month. Clean or replace when necessary.
2. Inspect indoor coil, drain pan, and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect evaporator (indoor) blower motor and wheel for cleanliness at the beginning of each heating and cooling season. Clean when necessary. For first heating and cooling season, inspect blower wheel bi-monthly to determine proper cleaning frequency.
4. Check electrical connections for tightness and controls for proper operation each heating and cooling season. Service when necessary.
5. Ensure electric wires are not in contact with refrigerant tubing or sharp metal edges.
6. Check and inspect heating section before each heating season. Clean and adjust when necessary.
7. Check flue hood and remove any obstructions, if necessary.

Air Filter

IMPORTANT: Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 2 for recommended filter sizes.

Inspect air filter(s) at least once each month and replace (throwaway-type) or clean (cleanable-type) at least twice during each cooling season and twice during the heating season, or whenever the filter becomes clogged with dust and lint.

Evaporator (Indoor) Motor and Blower

NOTE: All motors are pre-lubricated. Do not attempt to lubricate these motors.

For longer life, operating economy, and continuing efficiency, clean accumulated dirt and grease from the blower wheel and motor annually.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Disconnect and tag electrical power to the unit before cleaning and lubricating the blower motor and wheel.

To clean the blower motor and wheel:

1. Remove and disassemble blower assembly as follows:
   a. Remove control access panel.
   b. Disconnect 5-pin plug and 4-pin plug from motor.
   c. Remove blower assembly from unit. Remove screws securing blower to blower partition and slide assembly out. Be careful not to tear insulation in blower compartment.
   d. Ensure proper reassembly by marking blower wheel and motor in relation to blower housing before disassembly.
   e. Loosen set screw(s) that secures wheel to motor shaft, remove screws that secure motor mount brackets to housing, and slide motor and motor mount out of housing.
2. Remove and clean blower wheel as follows:
   a. Ensure proper reassembly by marking wheel orientation.
   b. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower wheel vanes.
   c. Remove caked-on dirt from wheel and housing with a brush. Remove lint and/or dirt accumulations from wheel and housing with vacuum cleaner, using soft brush attachment. Remove grease and oil with mild solvent.
   d. Reassemble wheel into housing.
   e. Reassemble motor into housing. Be sure setscrews are tightened on motor shaft flats and not on round part of shaft.
   f. Connect 5-pin plug and 4-pin plug to motor.
   g. Reinstall control access panel.
3. Restore electrical power to unit. Start unit and check for proper blower rotation and motor speeds during heating and cooling cycles.

Induced Draft (Combustion Air) Blower

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

To inspect blower wheel, remove draft hood assembly. Shine a flashlight into opening to inspect wheel. If cleaning is required, remove motor and wheel as follows:

1. Remove control access panel (see Figure 16).
2. Remove the 5 screws that attach the induced-draft blower assembly to the flue collector box cover.
3. Slide the assembly out of the unit (see Figure 17). Clean the blower wheel. If additional cleaning is required, continue with Steps 4 and 5.
4. To remove blower wheel, remove 2 setscrews.
5. To remove inducer motor, remove screws that hold the inducer motor to the blower housing.
6. To reinstall, reverse the procedure outlined above.

Flue Gas Passageways

To inspect the flue collector box and upper areas of the heat exchanger:

1. Remove the induced draft blower assembly according to directions in the Induced Draft Blower Assembly section.
2. Remove the 11 screws holding the flue collector box cover (see Figure 18) to the heat exchanger assembly. Inspect the heat exchangers.
3. Clean all surfaces, as required, using a wire brush.

Limit Switch

Remove control access panel. Limit switch is located on the blower partition.

Burner Ignition

Unit is equipped with a direct spark ignition 100 percent lockout system. Ignition module is located in the control box (see Figure 17). Module contains a self-diagnostic LED. During servicing, refer to Table 6 or unit label diagram for LED interpretation.

If lockout occurs, unit may be reset by either momentarily interrupting power supply to unit or by turning selector switch to OFF position at the thermostat.

Main Burners

At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames and adjust, if necessary.

Removal of Gas Train

To remove the gas train for servicing:

1. Shut off main gas valve.
2. Shut off power to unit and install lockout tag.
3. Remove control access panel (see Figure 17).
4. Disconnect gas piping at unit gas valve.
5. Remove fan partition mounting bracket (2 screws located on the left side of the control compartment on the fan partition panel). Slide bracket forward, bottom first, to remove (See Fig. 17 & 18).
6. Remove wires connected to gas valve. Remove wires connected to the rollout switch. Mark each wire.
7. Remove ground wire from fan partition panel.
8. Remove the mounting screw that attaches the burner rack to the unit base (see Figure 19).
9. Slide the burner rack out of the unit (see Figure 19). Remove ignitor wire from ignitor and remove flame sensor wire from flane sensor.
10. To reinstall, reverse the procedure outlined above.

Outdoor Coil, Indoor Coil, and Condensate Drain Pan

Inspect the condenser coil, evaporator coil, and condensate drain pan at least once each year.

The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs, that interfere with the airflow through the condenser coil.

Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner, using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent and water solution. Rinse coils with clear water, using a garden hose. Be careful not to splash water on motors, insulation, wiring, or air filter(s). For best results, spray condenser coil fins from inside to outside the unit. On units with an outer and inner condenser coil, be sure to clean between the coils. Be sure to flush all dirt and debris from the unit base.

Inspect the drain pan and condensate drain line when inspecting the coils. Clean the drain pan and condensate drain by removing all foreign matter from the pan. Flush the pan and drain trough with clear water. Do not splash water on the insulation, motor, wiring, or air filter(s). If the drain trough is restricted, clear it with a “plumbers snake” or similar probe device.

FIGURE 16 **Unit Access Panels**

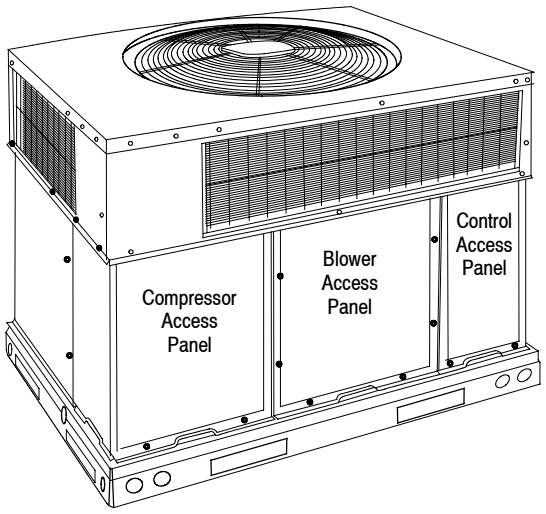


FIGURE 17 **Blower Housing and Flue Collector Box**

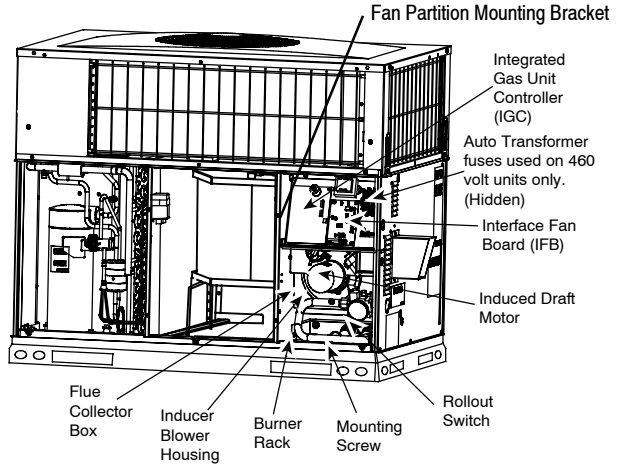


FIGURE 18 **Removal of Motor and Blower Wheel**

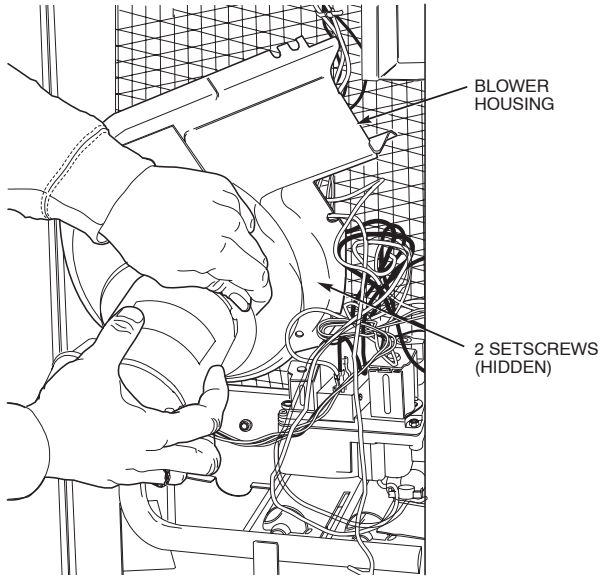
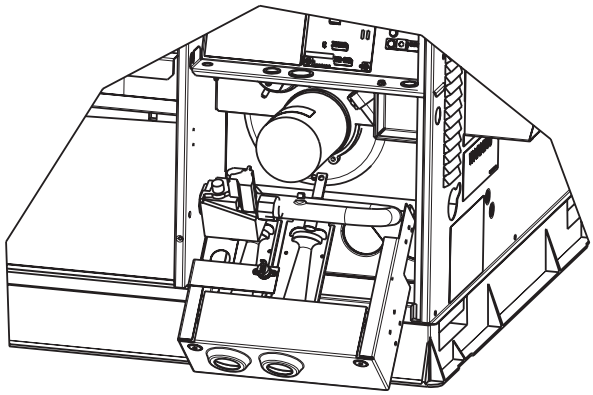


FIGURE 19 **Burner Rack Removed**



Outdoor Fan

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in damage to unit components.

Keep the condenser fan free from all obstructions to ensure proper cooling operation. Never place articles on top of the unit.

1. Remove 6 screws holding discharge grille and motor to top cover.
2. Turn motor/grille assembly upside down on top cover to expose fan blade.
3. Inspect the fan blades for cracks or bends.
4. If fan needs to be removed, loosen setscrew and slide fan off motor shaft.
5. When replacing fan blade, position blade so that the hub is 8" (3.2mm) away from the motor end (8" (3.2mm) of motor shaft will be visible).
6. Ensure that setscrew engages the flat area on the motor shaft when tightening.
7. Replace grille.

Electrical Controls and Wiring

Inspect and check the electrical controls and wiring annually. Be sure to turn off the electrical power to the unit.

Remove access panels to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any smoky or burned connections are noticed, disassemble the connection, clean all the parts, re-strip the wire end and reassemble the connection properly and securely.

After inspecting the electrical controls and wiring, replace all the panels. Start the unit, and observe at least one complete cooling cycle to ensure proper operation. If discrepancies are observed in operating cycle, or if a suspected malfunction has occurred, check each electrical component with the proper electrical instrumentation. Refer to the unit wiring label when making these checks.

Refrigeration Circuit

Annually inspect all refrigerant tubing connections and the unit base for oil accumulations. Detecting oil generally indicates a refrigerant leak.

⚠ WARNING

EXPLOSION, SAFETY AND ENVIRONMENTAL HAZARD

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

System under pressure. Relieve pressure and recover all refrigerant before system repair or final unit disposal. Use all service ports and open all flow-control devices, including solenoid valves.

If oil is detected or if low cooling performance is suspected, leak-test all refrigerant tubing using an electronic leak-detector, halide torch, or liquid-soap solution. If a refrigerant leak is detected, refer to the Check for Refrigerant Leaks section.

If no refrigerant leaks are found and low cooling performance is suspected, refer to the Checking and Adjusting Refrigerant Charge section.

Gas Input

The gas input does not require checking unless improper heating performance is suspected. If a problem exists, refer to the Start-Up section.

Evaporator Airflow

The heating and/or cooling airflow does not require checking unless improper performance is suspected. If a problem exists, be sure that all supply- and return-air grilles are open and free from obstructions, and that the air filter is clean. When necessary, refer to the Indoor Airflow and Airflow Adjustments section to check the system airflow.

R-410A Items

Metering Device (Thermostatic Expansion Valve)

This metering device is a hard shutoff, balance port TXV. The TXV maintains a constant superheat at the evaporator exit resulting in higher overall system efficiency.

Pressure Switches

Pressure switches are protective devices wired into control circuit (low voltage). They shut off compressor if abnormally high or low pressures are present in the refrigeration circuit. These pressure switches are specifically designed to operate with R-410A systems. R-22 pressure switches must not be used as replacements for the R-410A system.

Loss of Charge Switch

This switch is located on the liquid line and protects against low suction pressures caused by such events as loss of charge, low airflow across indoor coil, dirty filters, etc. It opens on a pressure drop at about 20 psig. If system pressure is above this, switch should be closed. To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

NOTE:Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 psi. Never open system without breaking vacuum with dry nitrogen.

High-Pressure Switch

The high-pressure switch is located in the discharge line and protects against excessive condenser coil pressure. It opens at 650 psig.

High pressure may be caused by a dirty outdoor coil, failed fan motor, or outdoor air recirculation. To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

Copeland Scroll Compressor (R-410A Refrigerant)

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

The compressor is an electrical (as well as mechanical) device. Exercise extreme caution when working near compressors. Power should be shut off, if possible, for most troubleshooting techniques. Refrigerants present additional safety hazards.

⚠ WARNING

FIRE/EXPLOSION HAZARD

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

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

The scroll compressor pumps refrigerant throughout the system by the interaction of a stationary and an orbiting scroll. The scroll compressor has no dynamic suction or discharge valves, and it is more tolerant of stresses caused by debris, liquid slugging, and flooded starts. The compressor is equipped with an anti-rotational device and an internal pressure relief port. The anti-rotational device prevents the scroll from turning backwards and replaces the need for a cycle protector. The pressure relief port is a safety device, designed to protect against extreme high pressure. The relief port has an operating range between 550 psi (26.34 kPa) and 625 psi (29.93 kPa) differential pressure.

⚠ WARNING

EXPLOSION, ENVIRONMENTAL SAFETY HAZARD

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

This system uses R-410A refrigerant which has higher operating pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gauge set, hoses, and recovery system must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer.

Compressor Oil

The Copeland scroll compressor uses 3MAF POE oil. If additional oil is needed, use Uniqema RL32-3MAF. If this oil is not available, use Copeland Ultra 32 CC or Mobil Arctic EAL22 CC. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

Servicing Systems on Roofs with Synthetic Materials

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

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

Synthetic Roof Precautionary Procedure

1. Cover extended roof working area with an impermeable polyethylene (plastic) drip cloth or tarp. Cover an approximate 10 X 10 ft. (3.1 m X 3.1 m) area.
2. Place terry cloth shop towel inside unit immediately under component(s) to be serviced and prevent lubricant run-offs through the louvered openings in the unit base.
3. Perform required service.
4. Remove and dispose of any oil contaminated material per local codes.

Liquid Line Filter Drier

This filter drier is specifically designed to operate with R-410A. Use only factory-authorized components. Filter drier must be replaced whenever the refrigerant system is opened. When removing a filter drier, use a tubing cutter to cut the drier from the system. Do not unsweat a filter drier from the system. Heat from unsweating will release moisture and contaminants from drier into system.

TROUBLESHOOTING

Use the Troubleshooting Guides (see Tables 12, 13, and 14) if problems occur with these units.

STARTUP CHECKLIST

Use Start-Up checklist to ensure proper start-up procedures are followed.

Table 9—Dry Coil Air Delivery* - Horizontal and Downflow Discharge (Deduct 10% for 208 Volts)

Unit	Heating Rise Range	Motor Speed	Wire Color		External Static Pressure (”WC)								
					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PG(D,S)524040	30 - 60°F (17 - 33°C)	Low1	Blue	CFM	659	551	440	355	-	-	-	-	-
				Heating Rise (°F)	46	55	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	25	30	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	726	625	537	407	-	-	-	-	-
				Heating Rise (°F)	42	48	56	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	23	27	31	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	907	837	759	679	588	474	343	-	-
				Heating Rise (°F)	33	36	40	45	51	NA	NA	NA	NA
				Heating Rise (°C)	19	20	22	25	29	NA	NA	NA	NA
		Med-High3	Orange	CFM	953	870	807	718	652	528	443	-	-
				Heating Rise (°F)	32	35	37	42	46	57	NA	NA	NA
				Heating Rise (°C)	18	19	21	23	26	32	NA	NA	NA
		High	Black	CFM	1179	1118	1061	996	942	864	794	718	619
				Heating Rise (°F)	NA	NA	NA	30	32	35	38	42	49
				Heating Rise (°C)	NA	NA	NA	17	18	19	21	23	27
PG(D,S)524060	25 - 55°F (14 - 31°C)	Low1	Blue	CFM	659	551	440	355	-	-	-	-	-
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	726	625	537	407	-	-	-	-	-
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	907	837	759	679	588	474	343	-	-
				Heating Rise (°F)	49	53	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	27	29	NA	NA	NA	NA	NA	NA	NA
		Med-High	Orange	CFM	953	870	807	718	652	528	443	-	480
				Heating Rise (°F)	47	51	55	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	26	28	31	NA	NA	NA	NA	NA	NA
		High3	Black	CFM	1179	1118	1061	996	942	864	794	718	619
				Heating Rise (°F)	38	40	42	45	47	51	NA	NA	NA
				Heating Rise (°C)	21	22	23	25	26	29	NA	NA	NA
PG(D,S)536060	25 - 55°F (14 - 31°C)	Low1	Blue	CFM	921	740	448	-	-	-	-	-	-
				Heating Rise (°F)	48	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	27	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1019	849	603	479	-	-	-	-	-
				Heating Rise (°F)	44	52	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	24	29	NA	NA	NA	NA	NA	NA	NA
		Medium3	Red	CFM	1272	1203	1150	1097	1054	996	937	881	841
				Heating Rise (°F)	35	37	39	41	42	45	47	50	53
				Heating Rise (°C)	19	21	21	23	23	25	26	28	29
		Med-High2	Orange	CFM	1321	1258	1212	1168	1114	1075	1009	956	904
				Heating Rise (°F)	34	35	37	38	40	41	44	46	49
				Heating Rise (°C)	19	20	20	21	22	23	24	26	27
		High	Black	CFM	1478	1426	1387	1334	1292	1247	1212	1148	1108
				Heating Rise (°F)	30	31	32	33	34	36	37	39	40
				Heating Rise (°C)	17	17	18	19	19	20	20	22	22
PG(D,S)536090	35 - 65°F (19 - 36°C)	Low1	Blue	CFM	921	740	448	-	-	-	-	-	-
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1019	849	603	479	-	-	-	-	-
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium	Red	CFM	1272	1203	1150	1097	1054	996	937	881	841
				Heating Rise (°F)	53	57	59	62	65	NA	NA	NA	NA
				Heating Rise (°C)	30	31	33	34	36	NA	NA	NA	NA
		Med-High2	Orange	CFM	1321	1258	1212	1168	1114	1075	1009	956	904
				Heating Rise (°F)	51	54	56	58	61	63	NA	NA	NA
				Heating Rise (°C)	29	30	31	32	34	35	NA	NA	NA
		High3	Black	CFM	1478	1426	1387	1334	1292	1247	1212	1148	1108
				Heating Rise (°F)	46	48	49	51	53	55	56	59	61
				Heating Rise (°C)	26	26	27	28	29	30	31	33	34

Table 9—Dry Coil Air Delivery* - Horizontal and Downflow Discharge (Deduct 10% for 208 Volts) (Cont.)

Unit	Heating Rise Range	Motor Speed	Wire Color		External Static Pressure (”WC)								
					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PG(D,S)548090	35 - 65°F (19 - 36°C)	Low1	Blue	CFM	1201	1159	1101	1062	1004	957	897	852	793
				Heating Rise (°F)	57	59	62	64	NA	NA	NA	NA	NA
				Heating Rise (°C)	31	33	34	36	NA	NA	NA	NA	NA
		Med-Low3	Pink	CFM	1419	1364	1318	1258	1214	1160	1118	1053	1009
				Heating Rise (°F)	48	50	52	54	56	59	61	65	NA
				Heating Rise (°C)	27	28	29	30	31	33	34	36	NA
		Medium2	Red	CFM	1678	1635	1602	1558	1513	1474	1438	1404	1349
				Heating Rise (°F)	41	42	42	44	45	46	47	48	50
				Heating Rise (°C)	23	23	24	24	25	26	26	27	28
		Med-High	Orange	CFM	1916	1881	1846	1810	1761	1722	1681	1647	1600
				Heating Rise (°F)	35	36	37	38	39	39	40	41	43
				Heating Rise (°C)	20	20	20	21	21	22	22	23	24
		High	Black	CFM	2093	2051	2024	1967	1947	1907	1854	1826	1749
				Heating Rise (°F)	NA	NA	NA	35	35	36	37	37	39
				Heating Rise (°C)	NA	NA	NA	19	19	20	20	21	22
PG(D,S)548115	30 - 60°F (17 - 33°C)	Low1	Blue	CFM	1201	1159	1101	1062	1004	957	897	852	793
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1419	1364	1318	1258	1214	1160	1118	1053	1009
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	1678	1635	1602	1558	1513	1474	1438	1404	1349
				Heating Rise (°F)	52	53	54	56	57	59	60	NA	NA
				Heating Rise (°C)	29	30	30	31	32	33	34	NA	NA
		Med-High	Orange	CFM	1916	1881	1846	1810	1761	1722	1681	1647	1600
				Heating Rise (°F)	45	46	47	48	49	50	52	53	54
				Heating Rise (°C)	25	26	26	27	27	28	29	29	30
		High3	Black	CFM	2093	2051	2024	1967	1947	1907	1854	1826	1749
				Heating Rise (°F)	42	42	43	44	45	46	47	48	50
				Heating Rise (°C)	23	24	24	25	25	25	26	26	28
PG(D,S)548130	35 - 65°oF (19 - 36°oC)	Low1	Blue	CFM	1201	1159	1101	1062	1004	957	897	852	793
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1419	1364	1318	1258	1214	1160	1118	1053	1009
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	1678	1635	1602	1558	1513	1474	1438	1404	1349
				Heating Rise (°F)	57	59	60	62	64	65	NA	NA	NA
				Heating Rise (°C)	32	33	33	34	35	36	NA	NA	NA
		Med-High	Orange	CFM	1916	1881	1846	1810	1761	1722	1681	1647	1600
				Heating Rise (°F)	50	51	52	53	55	56	57	58	60
				Heating Rise (°C)	28	28	29	30	30	31	32	32	33
		High3	Black	CFM	2093	2051	2024	1967	1947	1907	1854	1826	1749
				Heating Rise (°F)	46	47	48	49	49	50	52	53	55
				Heating Rise (°C)	26	26	26	27	27	28	29	29	31
PG(D,S)560090	35 - 65°F (19 - 36°C)	Low1	Blue	CFM	1320	1256	1211	1142	1096	1028	973	903	835
				Heating Rise (°F)	52	54	56	60	62	NA	NA	NA	NA
				Heating Rise (°C)	29	30	31	33	34	NA	NA	NA	NA
		Med-Low3	Pink	CFM	1351	1295	1258	1212	1170	1124	1080	1036	992
				Heating Rise (°F)	50	53	54	56	58	60	63	NA	NA
				Heating Rise (°C)	28	29	30	31	32	34	35	NA	NA
		Medium2	Red	CFM	1824	1782	1742	1711	1673	1641	1607	1563	1490
				Heating Rise (°F)	37	38	39	40	41	41	42	44	46
				Heating Rise (°C)	21	21	22	22	23	23	24	24	25
		Med-High	Orange	CFM	2001	1958	1923	1883	1831	1776	1705	1624	1538
				Heating Rise (°F)	NA	35	35	36	37	38	40	42	44
				Heating Rise (°C)	NA	19	20	20	21	21	22	23	25
		High	Black	CFM	2292	2238	2158	2049	1935	1840	1732	1635	1513
				Heating Rise (°F)	NA	NA	NA	NA	35	37	39	42	45
				Heating Rise (°C)	NA	NA	NA	NA	20	21	22	23	25

Table 9—Dry Coil Air Delivery* - Horizontal and Downflow Discharge (Deduct 10% for 208 Volts) (Cont.)

Unit	Heating Rise Range	Motor Speed	Wire Color		External Static Pressure (”WC)								
					0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PG(D,S)560115	30 - 60°F (17 - 33°C)	Low1	Blue	CFM	1320	1256	1211	1142	1096	1028	973	903	835
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1351	1295	1258	1212	1170	1124	1080	1036	992
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	1824	1782	1742	1711	1673	1641	1607	1563	1490
				Heating Rise (°F)	48	49	50	51	52	53	54	56	58
				Heating Rise (°C)	26	27	28	28	29	29	30	31	32
		Med-High3	Orange	CFM	2001	1958	1923	1883	1831	1776	1705	1624	1538
				Heating Rise (°F)	43	44	45	46	47	49	51	54	56
				Heating Rise (°C)	24	25	25	26	26	27	28	30	31
		High	Black	CFM	2292	2238	2158	2049	1935	1840	1732	1635	1513
				Heating Rise (°F)	38	39	40	42	45	47	50	53	57
				Heating Rise (°C)	21	22	22	24	25	26	28	30	32
PG(D,S)560130	35 - 65°F (19 - 36°C)	Low1	Blue	CFM	1320	1256	1211	1142	1096	1028	973	903	835
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Med-Low	Pink	CFM	1351	1295	1258	1212	1170	1124	1080	1036	992
				Heating Rise (°F)	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Heating Rise (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA
		Medium2	Red	CFM	1887	1847	1783	1726	1677	1625	1578	1527	1432
				Heating Rise (°F)	51	52	54	56	57	59	61	63	NA
				Heating Rise (°C)	28	29	30	31	32	33	34	35	NA
		Med-High3	Orange	CFM	2001	1958	1923	1883	1831	1776	1705	1624	1538
				Heating Rise (°F)	48	49	50	51	53	54	56	59	63
				Heating Rise (°C)	27	27	28	28	29	30	31	33	35
		High	Black	CFM	2292	2238	2158	2049	1935	1840	1732	1635	1513
				Heating Rise (°F)	42	43	45	47	50	52	56	59	64
				Heating Rise (°C)	23	24	25	26	28	29	31	33	35

* Air delivery values are without air filter and are for dry coil (See Table 15 - PG(D,S) Wet Coil Pressure Drop table).

1 Factory-shipped low stage cooling speed

2 Factory-shipped high stage cooling speed

3Factory-shipped heating speed

"NA" = Not allowed for heating speed

Note: Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.

Table 10—Wet Coil Pressure Drop

Unit Size	STANDARD CFM (SCFM)															
	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
24	0.005	0.007	0.010	0.012	0.015	–	–	–	–	–	–	–	–	–	–	–
36	–	–	–	0.019	0.023	0.027	0.032	0.037	0.042	0.047	–	–	–	–	–	–
48	–	–	–	–	–	–	0.027	0.032	0.036	0.041	0.046	0.052	0.057	0.063	0.068	–
60	–	–	–	–	–	–	–	–	–	0.029	0.032	0.036	0.040	0.045	0.049	0.053

Table 11—Filter Pressure Drop Table

	CFM																		
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
FILTER SIZE	Pressure Drop (inches water column)																		
20 x 20 x 1	0.05	0.07	0.08	0.10	0.12	0.13	0.14	0.15	—	—	—	—	—	—	—	—	—	—	—
20 x 24 x 1	—	—	—	—	0.09	0.1	0.11	0.13	0.14	0.15	0.16	—	—	—	—	—	—	—	—
24 x 30 x 1	—	—	—	—	—	—	—	0.07	0.08	0.09	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
24 x 36 x 1	—	—	—	—	—	—	—	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.12	0.13	0.14	0.14

Table 12—Troubleshooting Guide - Cooling

SYMPTOM	CAUSE	REMEDY
Compressor and condenser fan will not start.	Power failure	Call power company
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	Defective contactor, transformer, or high-pressure, loss-of-charge or low-pressure switch	Replace component
	Insufficient line voltage	Determine cause and correct
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly
	Thermostat setting too high	Lower Thermostat temperature setting below room temperature
Compressor will not start but condenser fan runs	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace
	Compressor motor burned out, seized, or internal overload open	Determine cause Replace compressor
	Defective run/start capacitor, overload, start relay	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker Determine cause
	Low input voltage (20% low)	Determine cause and correct
Compressor cycles (other than normally satisfying UI)	Refrigerant overcharge or undercharge	Recover refrigerant, evacuate system, and recharge to capacities shown on rating plate
	Defective compressor	Replace and determine cause
	Insufficient line voltage	Determine cause and correct
	Blocked outdoor coil	Determine cause and correct
	Defective run/start capacitor	Determine cause and replace
	Faulty outdoor fan motor or capacitor	Replace
	Restriction in refrigerant system	Locate restriction and remove
Compressor operates continuously	Dirty air filter	Replace filter
	Unit undersized for load	Decrease load or increase unit size
	Thermostat temperature set too low	Reset Thermostat
	Low refrigerant charge	Locate leak, repair, and recharge
	Air in system	Recover refrigerant, evacuate system, and recharge
	Outdoor coil dirty or restricted	Clean coil or remove restriction
Excessive head pressure	Dirty air filter	Replace filter
	Dirty condenser coil	Clean coil
	Refrigerant overcharged	Recover excess refrigerant
	Air in system	Recover refrigerant, evacuate system, and recharge
	Condenser air restricted or air short-cycling	Determine cause and correct
Head pressure too low	Low refrigerant charge	Check for leaks, repair, and recharge.
	Restriction in liquid tube	Remove restriction
Excessive suction pressure	High heat load	Check for source and eliminate
	Compressor valves leaking	Replace compressor
	Refrigerant overcharged	Recover excess refrigerant
Suction pressure too low	Dirty air filter	Replace filter
	Low refrigerant charge	Check for leaks, repair and recharge
	Metering device or low side restricted	Remove source of restriction
	Insufficient evaporator airflow	Increase air quantity Check filter–replace if necessary
	Temperature too low in conditioned area	Reset Thermostat
	Outdoor ambient below 55°F (12.7°C)	Install low-ambient kit
	Filter drier restricted	Replace filter

Table 13—Troubleshooting Guide–Heating

SYMPTOM	CAUSE	REMEDY
Burners will not ignite	Water in gas line	Drain. Install drip leg.
	No power to furnace	Check power supply fuses, wiring or circuit breaker.
	No 20-v power supply to control circuit	Check transformer. NOTE: Some transformers have internal over-current protection that requires a cool-down period to reset.
	Mis-wired or loose connections	Check all wiring and wire nut connections
	Misaligned spark electrodes	Check flame ignition and sense electrode positioning. Adjust as necessary.
	No gas at main burners	1. Check gas line for air. Purge as necessary. NOTE: After purging gas line of air, wait at least 5 minutes for any gas to dissipate before attempting to light unit. 2. Check gas valve.
Inadequate heating	Dirty air filter	Clean or replace filter as necessary
	Gas input to furnace too low	Check gas pressure at manifold match with that on unit nameplate
	Unit undersized for application	Replace with proper unit or add additional unit
	Restricted airflow	Clean or replace filter. Remove any restriction.
	Limit switch cycles main burners	Check rotation of blower, temperature rise of unit. Adjust as necessary.
Poor flame characteristics	Incomplete combustion results in: Aldehyde odors, carbon monoxide, sooting flame, floating flame	1. Tighten all screws around burner compartment 2. Cracked heat exchanger. Replace. 3. Unit over-fired. Reduce input (change orifices or adjust gas line or manifold pressure). 4. Check burner alignment. 5. Inspect heat exchanger for blockage. Clean as necessary.

Table 14—Troubleshooting Guide–LED Error Codes

SYMPTOM	CAUSE	REMEDY
No Power or Hardware failure (LED OFF)	Loss of power to control module (IGC)*.	Check 5-amp fuse son IGC*, power to unit, 24-v circuit breaker, and transformer. Units without a 24-v circuit breaker have an internal overload in the 24-v transformer. If the overload trips, allow 10 minutes for automatic reset.
Limit switch faults (LED 2 flashes)	High temperature limit switch is open.	Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate. Clean or replace filters.
Flame sense fault (LED 3 flashes)	The IGC* sensed flame that should not be present.	Reset unit. If problem persists, replace control board.
4 consecutive limit switch faults (LED 4 flashes)	Inadequate airflow to unit.	Check the operation of the indoor (evaporator) fan motor and that supply-air temperature rise agrees with range on unit nameplate information.
Ignition lockout (LED 5 flashes)	Unit unsuccessfully attempted ignition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that fame sense and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induced-draft motor fault (LED 6 flashes)	Open pressure switch.	Verify wiring connections to pressure switch and inducer motor. Verify pressure switch hose is tightly connected to both inducer housing and pressure switch. Verify inducer wheel is properly attached to inducer motor shaft. Verify inducer motor shaft is turning.
Rollout switch fault (LED 7 flashes)	Rollout switch has opened.	Rollout switch will automatically reset, but IGC* will continue to lockout unit. Check gas valve operation. Ensure that induced-draft blower wheel is properly secured to motor shaft. Inspect heat exchanger. Reset unit at unit disconnect.
Internal control fault (LED 8 flashes)	Microprocessor has sensed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC*.
Temporary software lockout (LED 9 flashes)	Electrical interference impeding IGC software	Reset 24-v. to control board or turn thermostat off, then on again. Fault will automatically reset itself in one (1) hour.

***WARNING ⚠:** If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that my be present before handling new control board. The IGC is sensitive to static electricity and my be damaged if the necessary precautions are not taken.
IMPORTANT: Refer to Table 13-Troubleshooting Guide-Heating for additional troubleshooting analysis.
LEGEND
IGC-Integrated Gas Unit Controller
LED-Light-Emitting Diode

R-410A QUICK REFERENCE GUIDE

- R-410A refrigerant operates at 50% - 70% higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.
- R-410A refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- R-410A systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.
- Manifold sets should be 750 psig high-side and 200 psig low-side with 520 psig low-side retard.
- Use hoses with 750 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- R-410A, as with other HFC refrigerants, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Do not use liquid line filter-driers with rated working pressures less than 600 psig.
- Do not install a suction line filter-drier in liquid line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter-driers and service valves with wet cloth when brazing.
- A liquid line filter-drier is required on every unit.
- Do not use with an R-22 TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, break vacuum with dry nitrogen and replace all filter-driers.
- Do not vent R-410A into the atmosphere.
- Observe all **WARNINGS**, **CAUTIONS, NOTES,** and **bold** text.

START-UP CHECKLIST
(Remove and Store in Job File)

1. Preliminary Information

Model Number:_____

Serial Number:_____

Date:_____

Technician:_____

2. Pre-Start-Up

____ Verify that all packing materials have been removed from unit

____ Check all electrical connections and terminals for tightness

____ Check gas piping for leaks

____ Check that the indoor (evaporator) air filter is clean and in place

____ Verify that the unit installation is level

____ Check blower (indoor) and propeller (outdoor) for location in housing/orifice (no rubs) and set screw tightness

3. Start-Up

Electrical

Supply Voltage (measured):_____

Compressor Amps (measured):_____

Indoor (evaporator) motor amps:_____

Temperatures

Outdoor (condenser) air temperature (dry bulb): _____

Indoor return air temperature: (dry bulb)_____(wet bulb):_____

Indoor supply air - cooling: (dry bulb)_____(wet bulb):_____

Indoor supply air - heating: (dry bulb)_____

Gas heat temperature rise:_____

____ Verify temperature rise is within acceptable temperature rise range using airflow chart

Pressures

Gas inlet pressure (inches water column):_____

Gas manifold pressure (inches water column):_____

Refrigerant suction pressure during cooling (psi):____

Refrigerant discharge pressure during cooling (psi):__

____ Verify proper refrigerant charge using charging chart