Carrier
HEATING & COOLING

48GP, 48GPN
Single Package Gas Heating/Electric Cooling Units With Puron® (R-410A) Refrigerant

Visit www.carrier.com

Installation, Start-Up, and Operating Instructions
48GP, 48GPN Sizes 024-060

NOTE: Read the entire instruction manual before starting the installation.

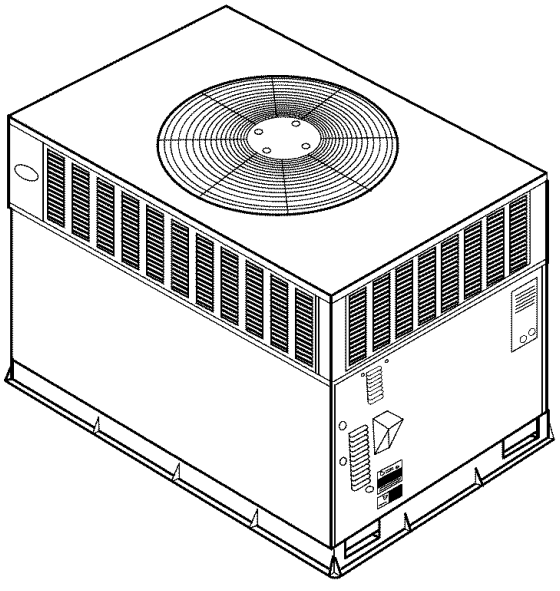
NOTE TO INSTALLER — Before the installation, READ THESE INSTRUCTIONS CAREFULLY AND COMPLETELY. Also, make sure the User's Manual and Replacement Guide are left with the unit after installation. the furnace is **NOT** to be used for temporary heating of buildings or structures under construction.

SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.



C99088

Fig. 1—Unit 48GP

RULES FOR SAFE INSTALLATION AND OPERATION

⚠ WARNING

Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, fire, or an explosion which can result in serious injury or unit damage. Consult a qualified installer, service agency, or gas supplier for information or assistance. The qualified installer or agency must use only factory-authorized kits or accessories when modifying this product.

Understand the signal words —**DANGER**, **WARNING**, and **CAUTION**. DANGER identifies the most serious hazards which will result in severe serious injury or death. WARNING indicates a condition that could result in serious injury or death. CAUTION is used to identify unsafe practices which would result in minor or moderate injury or product and property damage.

The power supply (volts, phase, and hertz) must correspond to that specified on unit rating plate.

The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.

This installation must conform with local building codes and with NEC (National Electrical Code) and NFPA 70, NFPA 54/ANSI Z223.1 latest revision, and NFGC (National Fuel Gas Code). Refer to provincial and local plumbing or waste water codes and other applicable local codes.

Approved for outdoor installation on wood flooring or on class A, B or C roof covering materials.

⚠ WARNING

Before performing service or maintenance operations on unit, turn off gas supply *then* unit main power switch. Electrical shock or explosion could cause serious injury or death.

⚠ CAUTION

Puron (R-410A) systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on Puron (R-410A) equipment. Ensure service equipment is rated for Puron (R-410A).

GENERAL — The 48GP units (see Fig. 1) are fully self-contained, combination Category I gas heating/electric cooling units designed for outdoor installation. See Fig. 6 and 7 for unit dimensions. All unit sizes have 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, cement slab, or directly on the ground (if permitted by local codes). See Figs. 4 and 5 for roof curb dimensions.

48GPN units are dedicated Low NOx units designed for California installations. These models meet the California maximum oxides of nitrogen (NOx) emissions requirement of 40 nanograms/joule or less as shipped from the factory and **MUST** be installed in California Air Quality Management Districts where a Low NOx rule exists.

RECEIVING AND INSTALLATION

Step 1—Check Equipment

IDENTIFY UNIT — The unit model number and serial number are stamped on unit identification plate. Check this information against shipping papers and job data.

INSPECT SHIPMENT — Inspect for shipping damage while unit is still on shipping pallet. If unit appears to be damaged or is torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to transportation company. Manufacturer is not responsible for any damage incurred in transit.

Check all items against shipping list. Immediately notify the nearest Carrier Air Conditioning office if any item is missing.

To prevent loss or damage, leave all parts in original packages until installation.

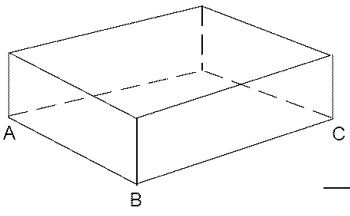
Step 2—Provide Unit Support

ROOF CURB — Install accessory roof curb in accordance with instructions shipped with curb. See Figs. 4 and 5 and Table 1 for roof curb dimensions. Install insulation, cant strips, roofing, and flashing. Ductwork must be attached to curb.

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

Curb should be level to within 1 /4 inch. This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required (see Fig. 2).

SLAB MOUNT — Place the unit on a solid, level concrete pad that is a minimum of 4 in. thick with 2 in. above grade. The slab should be flush on the compressor end of the unit (to allow condensate drain installation) and should extend 2 in. on the three remaining sides of the unit. See Fig. 3. Do not secure the unit to the slab *except* when required by local codes.



MAXIMUM ALLOWABLE DIFFERENCE (in.)		
A-B	B-C	A-C
1/4	1/4	1/4

C99065

Fig. 2—Unit Leveling Tolerances

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

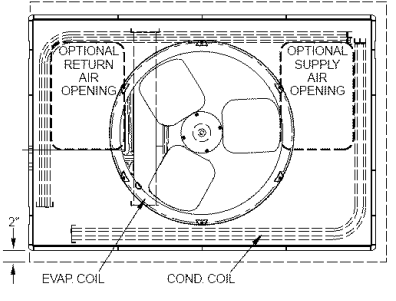
Step 3—Field Fabricate Ductwork

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

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

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

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -.25 in. wg.



C99014

Fig. 3—Slab Mounting Details

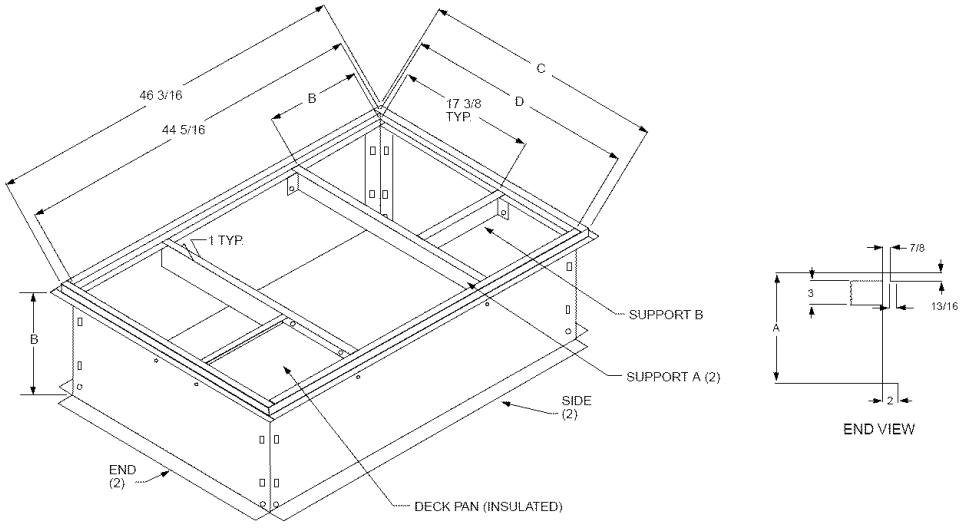
Step 4—Provide Clearances

The required minimum operating and service clearances are shown in Fig. 6 and 7. Adequate combustion, ventilation, and condenser air must be provided, in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code ANSI (American National Standards Institute) Z223.1 (in Canada, sections 7.2, 7.3 or 7.4 or Can/CGA [Canadian Gas Association] B149 Installation Codes), or applicable provisions of local building code.

⚠ CAUTION

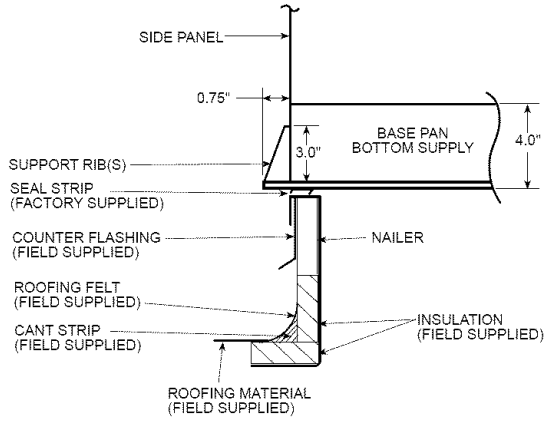
Do not restrict condenser airflow. An air restriction at either the outdoor-air inlet or the fan discharge can be detrimental to compressor life.

The condenser pulls air through the condenser coil and discharges it through the top cover. Be sure that the fan discharge does not



A99320

Fig. 4—Roof Curb Dimensions Top View



A99340

Fig. 5—Roof Curb Dimensions Side View

	UNIT SIZE	ODS ORDER NUMBER	A IN. [MM]	B IN. [MM]	C IN. [MM]	D IN. [MM]
ROOF CURB	48GP024-036	CPRFCURB006A00	8 [203]	11 27/32 [301]	30 5/8 [778]	28 3/4 [730]
		CPRFCURB007A00	14 [356]	11 27/32 [301]	30 5/8 [778]	28 3/4 [730]
	48GP042-060	CPRFCURB008A00	8 [203]	15 27/32 [402]	42 1/8 [1070]	40 1/4 [1022]
		CPRFCURB009A00	14 [356]	15 27/32 [402]	42 1/8 [1070]	40 1/4 [1022]

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. Dimensions in [ ] are in millimeters.
4. Roof curb is made of 16 gage steel.
5. Table lists only the dimensions per part number that have changed.
6. Attach ductwork to curb (flanges of duct rest on curb).
7. Insulated panels: 1-in. thick fiberglass 1 lb. density.
8. Dimensions are in inches.

Table 1—Roof Curb Dimensions

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. above the unit top. The maximum horizontal extension of a partial overhang must not exceed 48 inches.

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, tile, or other combustible materials. The unit may be installed on wood flooring or on Class A, B, or C roof covering materials.

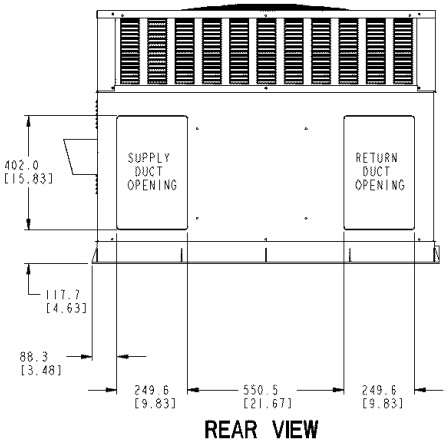
Step 5—Rig and Place Unit

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

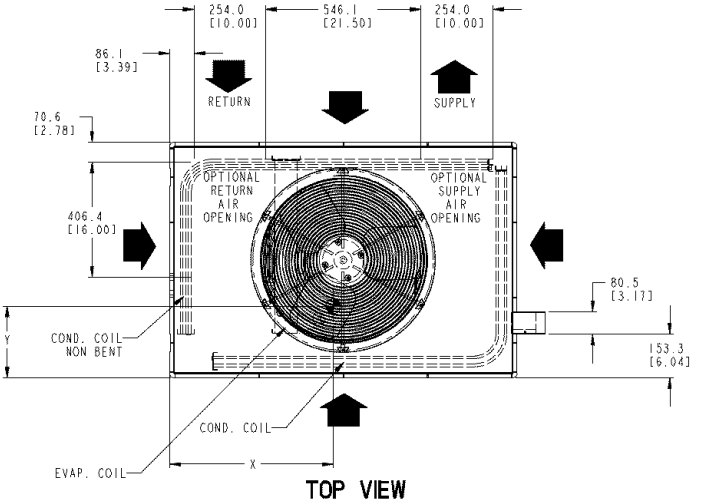
Only trained, qualified crane operators and ground support staff should handle and install this equipment.

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 operations of the lifting equipment should include, but NOT be limited to the following:



REAR VIEW



TOP VIEW

REQ'D CLEARANCES FOR OPERATION AND SERVICING. in. (mm)

Evaporator coil access side	36 (914)
Power entry side (except for NEC requirements)	36 (914)
Unit top	48 (1219)
Side opposite ducts	36 (914)
Duct panel	12 (304.8)*

*Minimum distances: If unit is placed less than 12 in. (304.8 mm) from wall system, then the system performance may be compromised.

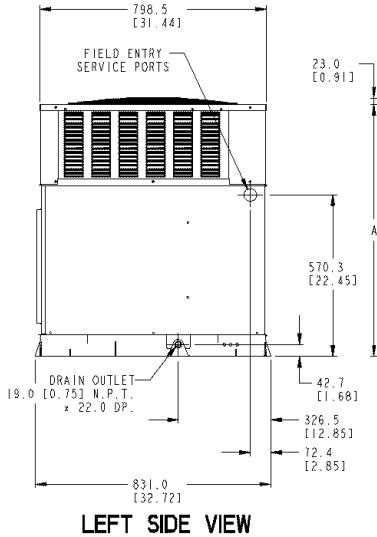
LEGEND
CG - Center of Gravity
COND - Condenser
EVAP - Evaporator
NEC - National Electrical Code
REQ'D - Required
Note: Dimensions are in in. (mm)

REQ'D CLEARANCES TO COMBUSTIBLE MAT'L. in. (mm)

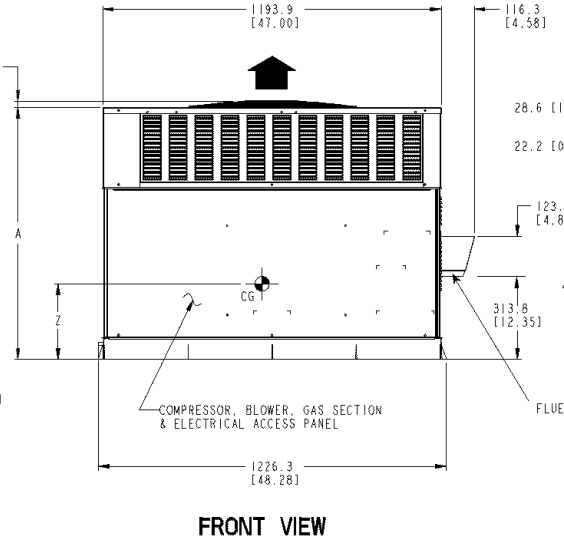
Top of unit	14 (355.6)
Duct side of unit	2 (50.8)
Side opposite ducts	14 (355.6)
Bottom of unit	0.50 (12.7)
Flue panel	36 (914.4)

NEC REQ'D CLEARANCES. in. (mm)

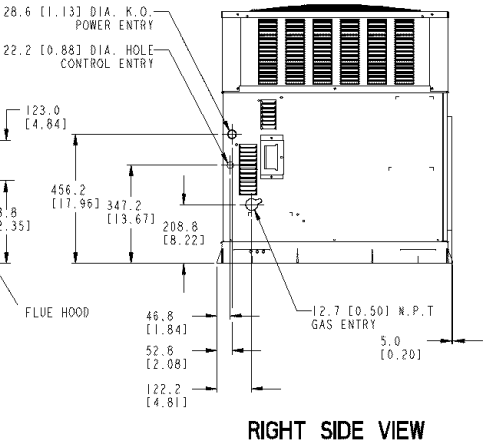
Between units, power entry side	42 (1066.8)
Unit and ungrounded surfaces, power entry side	36 (914)
Unit and block or concrete walls and other grounded surfaces, control box side	42 (1066.8)



LEFT SIDE VIEW



FRONT VIEW

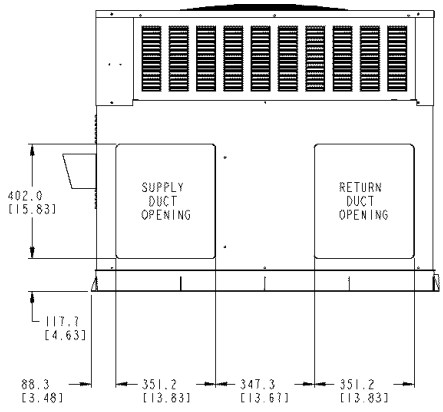


RIGHT SIDE VIEW

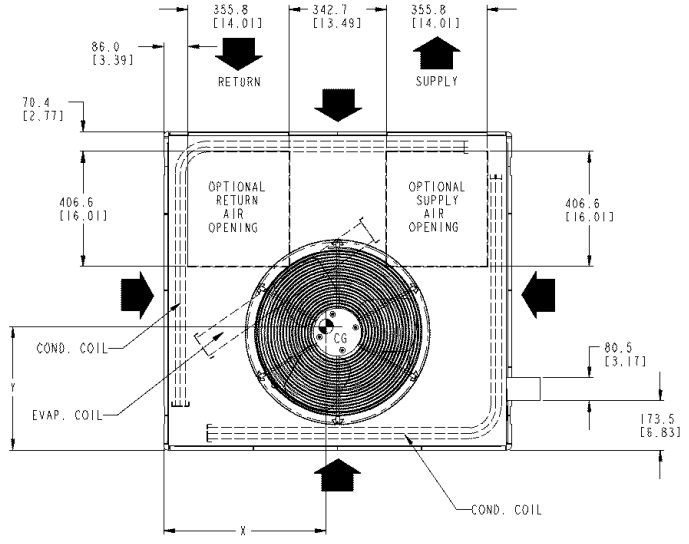
C99017

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN. [MM] "A"	CENTER OF GRAVITY IN. [MM]		
		lb.	kg.		X	Y	Z
48GP024040/060	208/230-1-60	290.0	131.5	37.02 [940.3]	22.0 [558.8]	14.5 [368.3]	16.0 [406.4]
48GP030040/060	208/230-1-60, 208/230-3-60	313.0	142.0	39.02 [991.1]	22.0 [558.8]	15.3 [387.4]	17.6 [447.0]
48GP036060/090	208/230-1-60, 208/230-3-60, 460-3-60	321.0	145.6	35.02 [889.5]	22.0 [558.8]	15.3 [387.4]	16.5 [419.1]

Fig. 6—48GP024-036 Unit Dimensions



REAR VIEW



TOP VIEW

REQUIRED CLEARANCE FOR OPERATION AND SERVICING

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

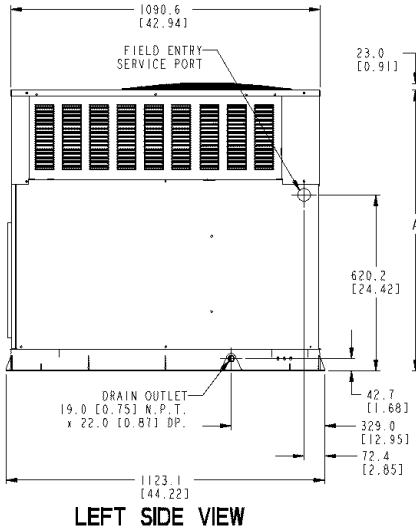
*MINIMUM DISTANCES: IF UNIT IS PLACED LESS THAN 12.00 [304.8] FROM WALL SYSTEM, THEN SYSTEM PERFORMANCE MAYBE COMPROMISE.

REQUIRED CLEARANCE TO COMBUSTIBLE MATL.

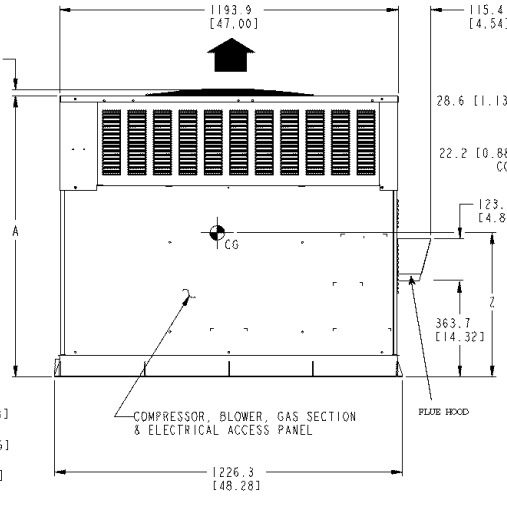
	in. [mm]
TOP OF UNIT	14.00 [355.6]
DUCT SIDE OF UNIT	2.00 [50.8]
SIDE OPPOSITE DUCTS	14.00 [355.6]
BOTTOM OF UNIT	0.50 [12.7]
ELECTRIC HEAT PANEL	36.00 [914.4]

NEC. REQUIRED CLEARANCES.

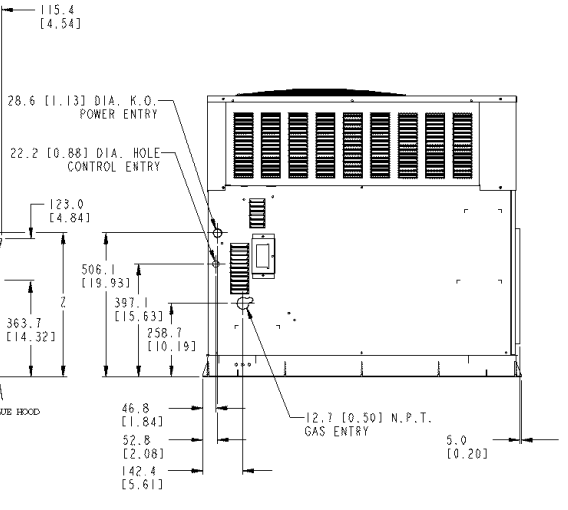
	MILLIMETERS [IN.]
BETWEEN UNITS, POWER ENTRY SIDE	42.00 [1066.8]
UNIT AND UNGROUNDED SURFACES, POWER ENTRY SIDE	36.00 [914.0]
UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES, POWER ENTRY SIDE	42.00 [1066.8]



LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW

C99074

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		UNIT HEIGHT IN. [MM] "A"	CENTER OF GRAVITY IN. [MM]		
		lb.	kg.		X	Y	Z
48GP042060/090	208/230-1-60 208/230-3-60 460-3-60	382	173.3	38.98 [990.2]	23.0 [584.2]	16.3 [412.8]	16.6 [421.6]
48GP048090/115/130	208/230-1-60 208/230-3-60 460-3-60	421	191.0	38.98 [990.2]	21.5 [546.1]	16.6 [422.1]	18.0 [457.2]
48GP060090/115/130	208/230-1-60, 208/230-3-60, 460-3-60	468	212.3	42.98 [1091.7]	23.5 [596.9]	16.3 [412.8]	17.6 [447.0]

Fig. 7—48GP042-060 Unit Dimensions

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

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

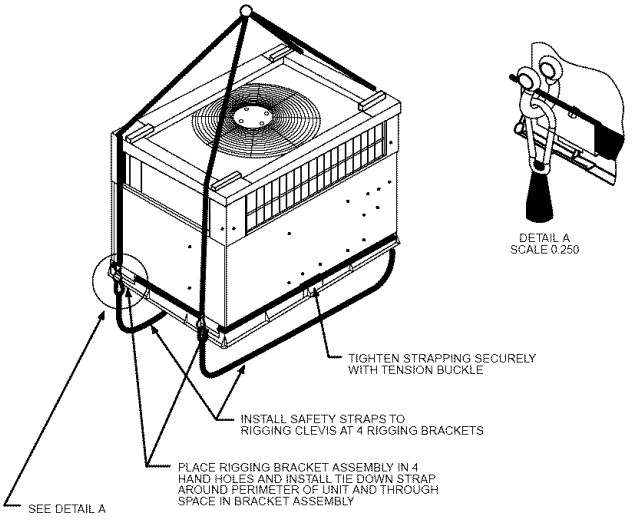
⚠ WARNING

— Never exceed 200 lbs. per bracket lifting force.
— Accessory lifting kit is only to be used with Small Packaged units which have a composite base pan with molded hand holds.
— Never stand beneath rigged units or lift over people.
— Lifting point should be directly over the center of gravity for the unit.
— A dropped unit could cause serious injury or death.

INSPECTION — Prior to initial use, and at monthly intervals, all rigging brackets and straps should be visually inspected for any damage, evidence of wear, structural deformation, or cracks. Particular attention should be paid to excessive wear at hoist hooking points and load support areas. Brackets or straps showing any kind of wear in these areas must not be used and should be discarded.

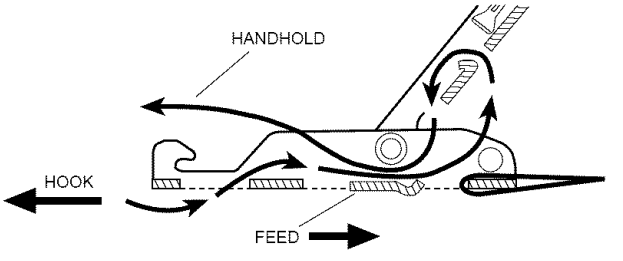
INSTALLATION:

1. Position the lifting bracket assembly around the base of the unit. Leave the top shipping skid on the unit to act as a spreader bar. Be sure the strap does not twist.
2. Place each of the four (4) metal lifting brackets into the handholds in the composite pan.
3. Tighten the ratchet strap until tight. Lifting brackets should be secure in the handholds.
4. Attach the clevis or hook of sufficient strength to hole in the lifting bracket as shown in Fig. 8.
5. Attach safety straps directly to the field supplied rigging straps or clevis clip. Do not attach the safety straps to the lifting brackets.
6. Use the top of the unit as a spreader bar to prevent the rigging straps from damaging the unit. If the wood top is not available, use a spreader bar of sufficient length to not damage the unit.



C99066

Fig. 8—Lifting Point

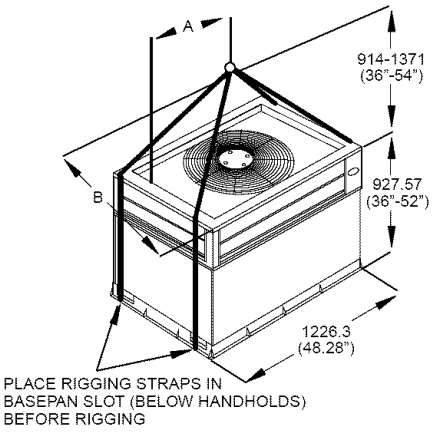


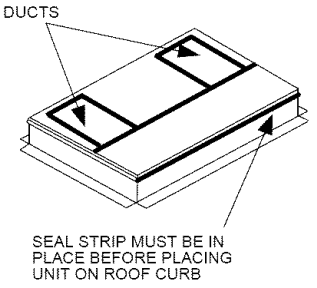
C99067

Belt Threading Instructions:

1. Open lever of tension buckle
2. Feed webbing through tension buckle as shown
3. Pull webbing through tension buckle until taught
4. Snap lever down to lock strap in tension buckle
5. To release, squeeze safety latch, lift lever and pull webbing outward

Fig. 9—Belt Threading





C99015

UNIT 48GP	MAXIMUM WEIGHT		A		B	
Size	lb	kg	in.	mm	in.	mm
024	312	142	22.0	558.5	14.5	368.3
030	335	152	22.0	558.5	15.3	388.6
036	343	156	22.0	558.5	15.3	388.6
042	404	183	23.0	584.2	16.3	414.0
048	443	201	21.5	546.1	16.3	414.0
060	490	222	23.5	596.9	16.3	414.3

Fig. 10—Suggested Rigging

Step 6—Connect Condensate Drain

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

The 48GP units dispose of condensate water through a 3/4 in. NPT fitting which exits through the compressor access panel. See Fig. 6 and 7 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 condensate trap at end of condensate connection to ensure proper drainage. Make sure that the outlet of the trap is at least 1 in. lower than the drain pan condensate connection to prevent the pan from overflowing. See Fig. 11. Prime the trap with water. When using a gravel apron, make sure it slopes away from the unit.

If the installation requires draining the condensate water away from the unit, install a 2-in. trap at the condensate connection to ensure proper drainage. See Fig. 11. Make sure that the outlet of the trap is at least 1 in. lower than the drain pan condensate connection to prevent the pan from overflowing. Prime the trap with water. 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. trap. Do not undersize the tube. Pitch the drain tube downward at a slope of at least one in. for every 10 ft of horizontal run. Be sure to check the drain tube for leaks. [12]

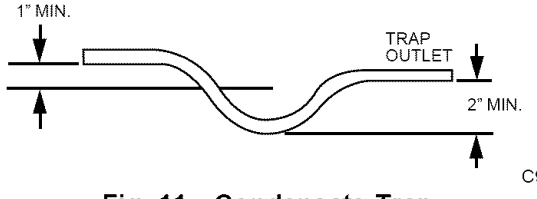


Fig. 11—Condensate Trap

Step 7—Install Flue Hood

The flue hood assembly is shipped screwed to the coil panel in the indoor blower compartment. Remove the service access panel to locate the assembly.

Dedicated low NOx 48GP 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 requirement of 40 nanograms/joule or less as shipped from the factory.

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

⚠ CAUTION

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

Install the flue hood as follows:

1. This installation must conform with local building codes and with the National Fuel Gas Code (NFGC), ANSI Z223.1 (in Canada, CAN/CGA B149.1, and B149.2) or NFPA (National Fire Protection Association) latest revision. Refer to Provincial and local plumbing or waste water codes and other applicable local codes.
2. Remove flue hood from shipping location (inside the blower compartment). Place vent cap assembly over flue panel. Orient screw holes in vent cap with holes in the flue panel.
3. Secure flue hood to flue panel by inserting a single screw on the right side and the left side of the hood.

Step 8—Install Gas Piping

The gas supply pipe enters the unit through the access hole provided. The gas connection to the unit is made to the 1/2-in. FPT gas inlet on the manual shutoff or gas valve.

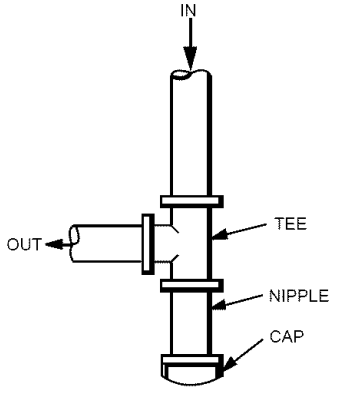
Install a gas supply line that runs to the heating section. Refer to Table 4 and the NFGC for gas pipe sizing. **Do not use cast-iron pipe**. It is recommended that a black iron pipe is used. check the local utility for recommendations concerning existing lines. Size gas supply piping for 0.5 in. wg maximum pressure drop. **Never use pipe smaller than the 1/2-in. 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. wg or greater than 13 in. wg while the unit is operating. For propane applications, the gas pressure must not be less than 7.0 in. wg or greater than 13 in. wg at the unit connection.

A 1/8-in. NPT plugged tapping accessible for test gage connection must be installed immediately upstream of the gas supply connection to the gas valve.

When installing the gas supply line, observe local codes pertaining to gas pipe installations. Refer to the NFGC ANSI Z223.1, NFPA 54 latest edition (in Canada, CAN/CGA B149.1, B149.2 latest edition). 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. in every 15 ft. 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. 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 per Fig. 12. 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. of heating section.
6. Install ground-joint union close to heating section between unit manual shutoff and external manual main shutoff valve.
7. Pressure-test all gas piping in accordance with local and national plumbing and gas codes before connection of piping to unit.



C99020

Fig. 12—Sediment Trap

NOTE: 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 (13.8 WC). If the test pressure is 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.

⚠ CAUTION

Unstable operation may occur when the gas valve and manifold assembly are forced out of position while connecting improperly routed rigid gas piping to the gas valve. Use a backup wrench when making connection to avoid strain on, or distortion of, the gas control piping.

⚠ CAUTION

If a flexible conductor is required or allowed by the authority having jurisdiction, black iron pipe shall be installed at the gas valve and shall extend a minimum of 2 in. outside the unit casing.

⚠ WARNING

Never use a match or other open flame when checking for gas leaks. Never purge gas line into combustion chamber. Failure to follow this warning could result in an explosion causing serious injury or death

8. Check for gas leaks at the field-installed and factory-installed gas lines after all piping connections have been completed. Use soap and water solution (or method specified by local codes and/or regulations).

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 can be connected to the roof curb. See Fig. 6 and 7 for connection sizes and locations.

CONFIGURING UNITS FOR DOWNFLOW (VERTICAL) DISCHARGE

⚠ WARNING

Before performing service or maintenance operations on the system, turn off main power to unit. Electrical shock could cause serious injury or death.

1. Open all electrical disconnects before starting any service work.
2. Remove return duct cover located on duct panel by breaking connecting tabs with screwdriver and a hammer (Fig. 13).
3. To remove supply duct cover, break front and right side connecting tabs with a screwdriver and a hammer. Push louver down to break rear and left side tabs (Fig. 14).
4. If unit ductwork is to be attached to vertical opening flanges on the unit basepan (jackstand applications only), do so at this time. Collect ALL screws that were removed. Do not leave screws on rooftop as permanent damage to the roof may occur.
5. It is recommended that the basepan insulation around the perimeter of the vertical return-air opening be secured to the basepan with aluminum tape. Applicable local codes may require aluminum tape to prevent exposed fiberglass.
6. Cover both horizontal duct openings with the duct covers from the accessory duct cover kit. Ensure opening is air-and watertight.

Table 2—Physical Data — Unit 48GP — 024040-042090

UNIT SIZE 48GP	024040	024060	030040	030060	036060	036090	042060	042090
NOMINAL CAPACITY (ton)	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2
OPERATING WEIGHT (lb)	290	290	313	313	321	321	382	382
COMPRESSORS Quantity	Scroll 1							
REFRIGERANT (R-410A) Quantity (lb)	5.0	5.0	5.5	5.5	6.9	6.9	9.0	9.0
REFRIGERANT METERING DEVICE Orifice ID (in.) AccuRater® Piston	.057	.057	.057	.057	.065	.065	.070	.070
CONDENSER COIL Rows...Fins/in. Face Area (sq ft)	1/17 10.9	1/17 10.9	1/17 12.7	1/17 12.7	2/17 9.1	2/17 9.1	2/17 12.3	2/17 12.3
CONDENSER FAN Nominal CFM Diameter (in.) Motor Hp (RPM)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)	2350 22 1/8 (825)
EVAPORATOR COIL Rows...Fins/in. Face Area (sq ft)	3/15 3.7	3/15 3.7	3/15 3.7	3/15 3.7	3/15 3.7	3/15 3.7	3/15 4.7	3/15 4.7
EVAPORATOR BLOWER Nominal Airflow (CFM) Size (in.) Motor HP	800 10 x 10 1/4	800 10 x 10 1/4	800 10 x 10 1/4	1000 10 x 10 1/4	1200 10 x 10 1/2	1200 10 x 10 1/2	1400 11 x 10 3/4	1400 11 x 10 3/4
FURNACE SECTION* Burner Orifice No. (Qty...Drill Size) Natural Gas Burner Orifice No. (Qty...Drill Size) Propane Gas	2...44 2...50	2...38 2...46	2...44 2...50	2...38 2...46	2...38 2...46	3...38 3...46	2...38 2...46	3...38 3...46
HIGH-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	610 ± 15 420 ± 25							
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (psig) Cutout Reset (Auto.)	20 ± 5 45 ± 10							
RETURN-AIR FILTERS (in.)Throwaway	20 x 24x1	20 x 24x1	20 x 24x1	20 x 24x1	20 x 24x1	20 x 24x1	24 x 30x1	24 x 30x1

Table 3—Physical Data — Unit 48GP — 048090-060130

UNIT SIZE 48GP	048090	048115	048130	060090	060115	060130
NOMINAL CAPACITY (ton)	4	4	4	5	5	5
OPERATING WEIGHT (lb)	421	421	421	468	468	468
COMPRESSORS Quantity	Scroll 1					
REFRIGERANT (R-410A) Quantity (lb)	9.5	9.5	9.5	10.0	10.0	10.0
REFRIGERANT METERING DEVICE Orifice ID (in.) Accurater® Piston	.073	.073	.073	.086	.086	.086
CONDENSER COIL Rows...Fins/in. Face Area (sq ft)	2/17 12.3	2/17 12.3	2/17 12.3	2/17 16.4	2/17 16.4	2/17 16.4
CONDENSER FAN Nominal Cfm Diameter (in.) Motor Hp (RPM)	3300 22 1/4 (1100)	3300 22 1/4 (1100)	3300 22 1/4 (1100)	3300 22 1/4 (1100)	3300 22 1/4 (1100)	3300 22 1/4 (1100)
EVAPORATOR COIL Rows...Fins/in. Face Area (sq ft)	4/15 4.7	4/15 4.7	4/15 4.7	4/15 4.7	4/15 4.7	4/15 4.7
EVAPORATOR BLOWER Nominal Airflow (Cfm) Size (in.) Motor HP	1600 11 x 10 3/4	1600 11 x 10 3/4	1600 11 x 10 3/4	1750 11 x 10 1.0	1750 11 x 10 1.0	1750 11 x 10 1.0
FURNACE SECTION* Burner Orifice No. (Qty...Drill Size) Natural Gas Burner Orifice No. (Qty...Drill Size) Propane Gas	3...38 3...46	3...33 3...42	3...31 3...41	3...38 3...46	3...33 3...42	3...31 3...41
HIGH-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	610 ± 15 420 ± 25					
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (psig) Cutout Reset (Auto.)	20 ± 5 45 ± 10					
RETURN-AIR FILTERS (in.)Throwaway	24 x 30x1	24 x 30x1	24 x 30x1	24 x 30x1	24 x 30x1	24 x 30x1

Table 4—Maximum Gas Flow Capacity*

NOMINAL IRON PIPE SIZE (IN.)	INTERNAL DIAMETER (IN.)	LENGTH OF PIPE, FT†													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
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. wg (based on a 0.60 specific gravity gas). Refer to Table C-4, National Fire Protection Association NFPA 54

†This length includes an ordinary number of fittings.

7. After completing unit conversion, perform all safety checks and power up unit.

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 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 side shot installation.
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 Tables 2 and 3.
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.

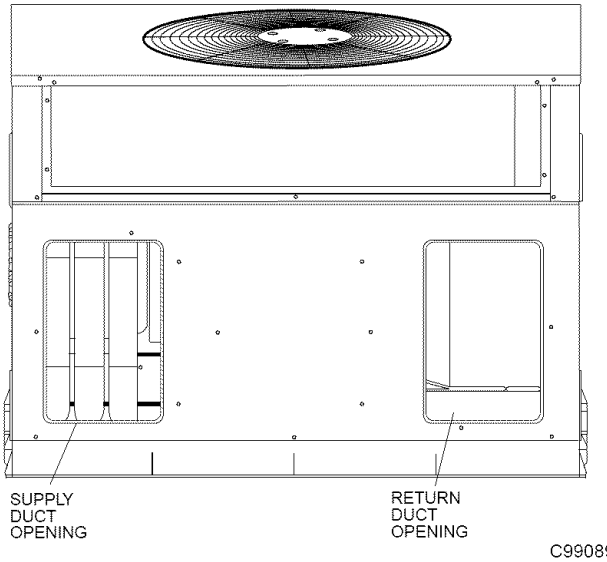


Fig. 13—Supply and Return Duct Opening

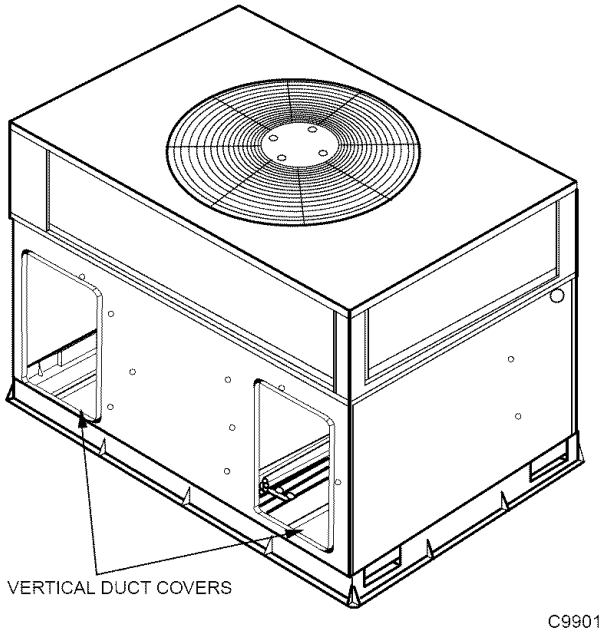


Fig. 14—Vertical Duct Cover Removed

Step 10—Install Electrical Connections

⚠ WARNING

The unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of serious injury if an electrical fault should occur. This ground may consist of an electrical wire connected to the unit ground lug in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code) ANSI/ NFPA 70 (latest edition) (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1) and local electrical codes. *Do not use gas piping as an electrical ground.* Failure to adhere to this warning could result in serious injury or death.

⚠ CAUTION

Failure to follow these precautions could result in damage to the unit being installed:

1. Make all electrical connections in accordance with NEC ANSI/NFPA 70 (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.
4. Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.
5. On 3-phase units, ensure phases are balanced within 2%. Consult local power company for correction of improper voltage and/or phase imbalance (refer to Table 5).

HIGH-VOLTAGE CONNECTIONS — The unit must have a separate electrical service with a field-supplied, water-proof, disconnect switch mounted at, or within sight from the unit. Refer to the unit rating plate for maximum fuse/ circuit breaker size and minimum circuit amps (ampacity) for wire sizing. See Table 5 for electrical data.

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 Fig. 6 and 7 for acceptable location.

See unit wiring label and Fig. 16 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 leads into the control box.
2. Connect ground lead to chassis ground connection.
3. Connect L1 to pressure lug connection 11 of the compressor contactor.
4. Connect L2 to pressure lug connection 23 of the compressor contactor.

Three phase units:

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

SPECIAL PROCEDURES FOR 208-V OPERATION

⚠ WARNING

Make sure that the gas supply *then* the power supply to the unit is switched OFF before making any wiring changes. Electrical shock or explosion could cause serious injury or death.

With disconnect switch open, move yellow wire from transformer (3/16 in.) terminal marked 230 to terminal marked 200. This retaps transformer to primary voltage of 208 vac.

Table 5—Electrical Data — 48GP

UNIT SIZE 48GP	V-PH-HZ	VOLTAGE RANGE		COMPRESSOR		OUTDOOR FAN MOTOR	INDOOR FAN MOTOR	POWER SUPPLY	
		Min	Max	RLA	LRA	FLA	FLA	MCA	MOCP*
024	208/230-1-60	187	253	13.5	61.0	0.8	2.0	19.7	30
030	208/230-1-60	187	253	14.7	73.0	0.8	2.1	21.3	35
	208/230-3-60	187	253	9.6	63.0	0.8	2.1	14.9	20
036	208/230-1-60	187	253	15.4	83.0	0.8	3.6	23.7	35
	208/230-3-60	187	253	12.2	77.0	0.8	3.6	19.7	30
	460-3-60	414	506	5.1	35.0	0.8	1.9	9.1	15
042	208/230-1-60	187	253	18.6	105.0	1.6	4.1	29.0	45
	208/230-3-60	187	253	13.5	77.0	1.6	4.1	22.6	35
	460-3-60	414	506	6.3	39.0	0.9	2.0	10.8	15
048	208/230-1-60	187	253	20.5	109.0	1.6	4.1	31.3	50
	208/230-3-60	187	253	14.7	91.0	1.6	4.1	24.1	35
	460-3-60	414	506	6.5	46.0	0.9	2.0	11.0	15
060	208/230-1-60	187	253	27.6	158.0	1.6	6.2	42.3	60
	208/230-3-60	187	253	18.1	137.0	1.6	6.2	30.4	45
	460-3-60	414	506	9.0	62.0	0.9	3.2	15.4	20

LEGEND

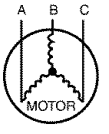
FLA — Full Load Amps
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
RLA — Rated Load Amps

NOTES:
1. In compliance with NEC (National Electrical Code) requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be Power Supply fuse. The CGA (Canadian Gas Association) units may be fuse or circuit breaker.
2. Minimum wire size is based on 60 C copper wire. If other than 60 C wire is used, or if length exceeds wire length in table, determine size from NEC.
3. Unbalanced 3-Phase Supply Voltage
   Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

   % Voltage imbalance

   $$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

EXAMPLE: Supply voltage is 460-3-60.



AB = 452 v
BC = 464 v
AC = 455 v

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3}$$

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage.
(AB) 457 452 = 5 v
(BC) 464 457 = 7 v
(AC) 457 455 = 2 v
Maximum deviation is 7 v.

Determine percent of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457}$$

$$= 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

C99024

Fig. 15—Electrical Data Legend

CONTROL VOLTAGE CONNECTIONS

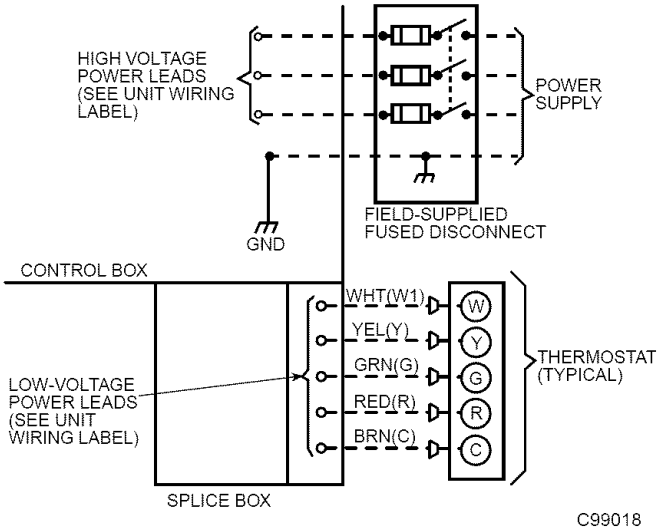
NOTE: Do not use any type of power-stealing thermostat. Unit control problems may result.

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 ft from the unit (as measured along the control voltage wires), use no. 16 AWG color-coded, insulated (35 C minimum) wires.

STANDARD CONNECTION — Remove knockout hole located in the flue panel adjacent to the control access panel. See Fig. 6 and 7. Remove the rubber grommet from the installer's packet (included with unit) and install grommet in the knockout opening. Provide a drip loop before running wire through panel.

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

Locate five 18-gage wires leaving control box. These low-voltage connection leads can be identified by the colors red, green, yellow, brown, and white. (See Fig. 16.) Ensure the leads are long enough to be routed into the low-voltage splice box (located below right side of control box). Stripped yellow wire is located in connection box. Route leads through hole in bottom of control box and make low-voltage connections as shown in Fig. 16. Secure all cut wires, so that they do not interfere with operation of unit.



C99018

Fig. 16—High- and Control-Voltage Connections

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 required setting.

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

TRANSFORMER PROTECTION — The transformer is of the energy-limiting type. It is set to withstand a 30-second overload or shorted secondary condition.

PRE-START-UP

⚠ WARNING

Failure to observe the following warnings could result in serious 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.
4. Relieve and recover all refrigerant from both high- and low-pressure sides of 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 gas supply and *then* electrical power to unit.
   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.

Proceed as follows to inspect and prepare the unit for initial startup:

1. Remove access panel.
2. Read and follow instructions on all DANGER, WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
   a. Inspect for shipping and handling damages 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. Leak test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution. If a refrigerant leak is detected, see Check for Refrigerant Leaks section on page 13.
   c. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight.
   d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:

⚠ WARNING

Do not purge gas supply into the combustion chamber. Do not use a match or other open flame to check for gas leaks. Failure to follow this warning could result in an explosion causing serious injury or death.

   a. Before lighting the unit for the first time, perform the following with the gas valve in the "OFF" position: 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, re-tighten the union. Allow 5 minutes to elapse, then light unit.
   b. Make sure that condenser-fan blade is correctly positioned in fan orifice. Leading edge of condenser-fan blade should be 1/2 in. maximum from fan orifice (see Fig. 17).
   c. Ensure fan hub is 1/8 in. max from motor housing.
   d. Make sure that air filter(s) is in place.
   e. Make sure that condensate drain trap is filled with water to ensure proper drainage.
   f. Make sure that all tools and miscellaneous loose parts have been removed.

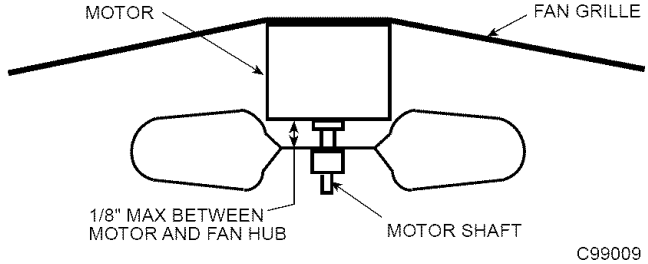


Fig. 17—Fan Blade Clearance

START-UP

Use the Start-Up Checklist supplied at the end of this book, and proceed as follows:

CHECK FOR REFRIGERANT LEAKS — Proceed as follows to locate and repair refrigerant leaks and charge the unit:

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

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

3. Check system for leaks using an approved method.
4. Evacuate refrigerant system and reclaim refrigerant if no additional leaks are found.
5. Charge unit with R-410a refrigerant, using a volumetric-charging cylinder or accurate scale. *Refer to unit rating plate for required charge.*

Table 6—Heating Inputs

HEATING INPUT (BTUH)*	NUMBER OF ORIFICES	GAS SUPPLY PRESSURE (IN. WG)				MANIFOLD PRESSURE (IN. WG)	
		Natural		Propane†			
		Min	Max	Min	Max	Natural	Propane†
40,000	2	4.0	13.0	7.0	13.0	3.5	3.5
60,000	2	4.0	13.0	7.0	13.0	3.5	3.5
90,000	3	4.0	13.0	7.0	13.0	3.5	3.5
115,000	3	4.0	13.0	7.0	13.0	3.5	3.5
130,000	3	4.0	13.0	7.0	13.0	3.5	3.5

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

†Based on altitudes from sea level to 2000 ft. above sea level. For altitudes above 2000 ft., reduce input rating 4% for each 1000 ft. above sea level. In Canada, from 2000 ft. above sea level to 4500 ft. above sea level, derate the unit 10%.

START UP HEATING SECTION AND MAKE ADJUSTMENTS

IMPORTANT: Complete the required procedures given in the Pre-Start-Up section above before starting the unit.

Do not jumper any safety devices when operating the unit.

Make sure that burner orifices are properly aligned. Unstable operation may occur when the burner orifices in the manifold are misaligned.

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

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

1. Place room thermostat SYSTEM switch in the HEAT position and the FAN switch in the AUTO position.
2. Set the heating temperature control of the thermostat above room temperature.
3. The induced-draft motor will start.
4. After a call for heating, the main burner should light within 5 seconds. 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 evaporator fan will turn on 45 seconds after the flame has been established. The evaporator fan will turn off 45 seconds after the thermostat has been satisfied.

CHECK GAS INPUT—Check gas input and manifold pressure after unit start-up (See Table 6.) If adjustment is required, proceed as follows:

The rated gas inputs shown in Table 6 are for altitudes from sea level to 2000 ft. above sea level. These inputs are based on natural gas with a heating value of 1050 Btu/ft^3 at 0.65 specific gravity, or propane gas with a heating value of 2500 Btu/ft^3 at 1.5 specific gravity. For elevations above 2000 ft., reduce input 4% for each 1000 ft. above sea level. 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.

⚠ CAUTION

These units are designed to consume the rated gas inputs using the fixed orifices at specified manifold pressures as shown in Table 6. **DO NOT REDRILL THE ORIFICES UNDER ANY CIRCUMSTANCES.**

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 3.4 and 3.6 in. wg. If larger adjustments are required, change main burner orifices following the recommendations of national 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:

Turn off gas supply to unit.

1. Remove pipe plug on manifold (see Fig. 18) then connect manometer at this point. turn on gas to unit.
2. Record number of seconds for gas meter test dial to make one revolution.
3. Divide number of seconds in Step 3 into 3600 (number of seconds on one hour).
4. Multiply result of Step 4 by the number of cu. ft. shown for one revolution of test dial to obtain cu. ft. of gas flow per hour.
5. Multiply result of Step 5 by Btu heating value of gas to obtain total measured input in Btuh. Compare this value with heating input shown in Table 6. (Consult the local gas supplier if the heating value of gas is not known.)

EXAMPLE: Assume that the size of test dial is 1 cu. ft., 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 Btuh input.

If the desired gas input is 115,000 Btuh, 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.
2. Turn regulator adjustment screw clockwise to increase gas input, or turn regulator adjustment screw counterclockwise to decrease input. Manifold pressure must be between 3.4 and 3.6 in. wg.

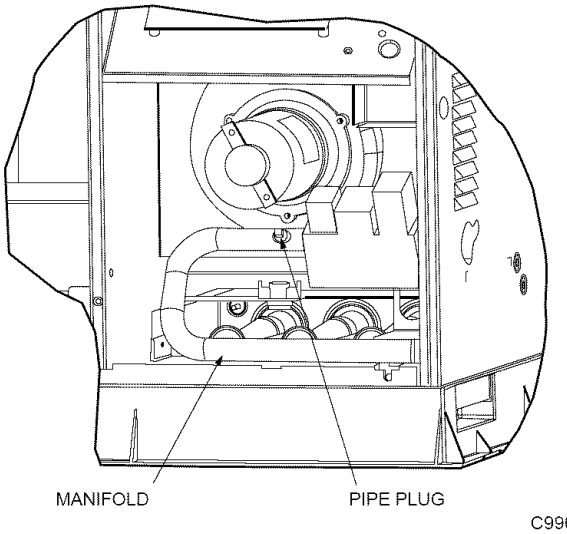


Fig. 18—Burner Assembly

⚠ WARNING

Unsafe operation of the unit may result if manifold pressure is outside this range. Serious injury or unit damage may result.

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 MANIFOLD PRESSURE (PROPANE UNITS) — The main burner orifices on a propane unit are sized for the unit rated input when the manifold pressure reading matches the level specified in Table 6.

⚠ WARNING

If converting to propane gas, remove the burner assembly and inspect the heat exchanger tubes. If there are V-shaped NOx baffles installed in the firing tubes, **THEY MUST BE REMOVED**.
Discard the baffles after removal.
Refer to Maintenance section for information on burner removal.

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

1. Turn off gas to unit.
2. Remove pipe plug on manifold (see Fig. 18) then connect manometer at this point.
3. Turn on gas to unit.
4. Remove cover screw over regulator adjustment screw on gas valve.
5. Adjust regulator adjustment screw to the correct manifold pressure, as specified in Table 6. Turn adjusting screw clockwise to increase manifold pressure, or turn adjusting screw counterclockwise to decrease manifold pressure.
6. Replace cover screw.
7. Turn off gas to unit. Remove manometer from pressure tap. Replace pipe plug on gas valve, then turn on gas to unit. check for leaks.

CHECK BURNER FLAME—With burner access panel removed, observe the unit heating operation. Watch the burner flames to see if they are light blue and soft in appearance, and that the flames are approximately the same for each burner. Propane will have blue flame with yellow tips. (See Fig. 19). Refer to Maintenance section for information on burner removal.

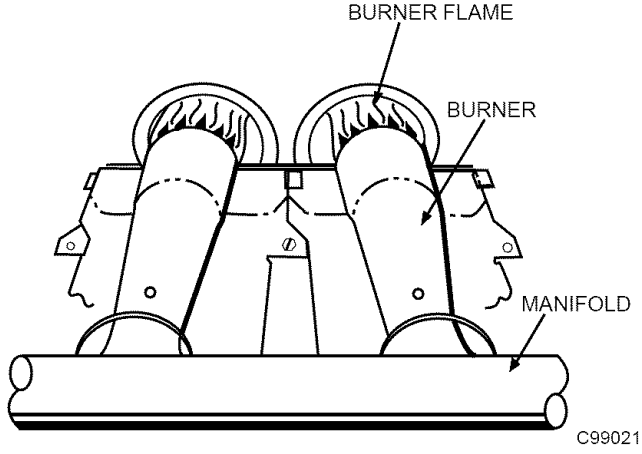


Fig. 19—Monoport Burners

AIRFLOW AND TEMPERATURE RISE—The heating section for each size unit is designed and approved for heating operation within the temperature rise range stamped on the unit rating plate.

Table 7 shows the approved temperature rise range for each heating input, and the air delivery cfm at various temperature rises. The heating operation airflow must produce a temperature rise that falls within the approved range.

Refer to Indoor Airflow and Airflow Adjustments section on the following pages to adjust heating airflow when required.

Table 7—Air Delivery (Cfm) at Indicated Temperature Rise and Rated Heating Input

HEATING INPUT (BTUH) INPUT	TEMPERATURE RISE °F										
	20	25	30	35	40	45	50	55	60	65	70
40,000	1500	1200	1000	857	750	667	600	—	—	—	—
60,000	2250	1800	1500	1286	1125	1000	900	818	750	692	—
90,000	—	2700	2250	1929	1688	1500	1350	1227	1125	1038	964
115,000	—	—	—	2464	2156	1917	1725	1568	1438	1327	—
130,000	—	—	—	—	2438	2167	1950	1773	1625	1500	1393

NOTE: Dashed areas do not fall within the approved temperature rise range of the unit.

HEATING SEQUENCE OF OPERATION—See Fig. 20-22 and unit wiring label.

On a call for heating, terminal "W" of the thermostat is energized, starting the induced-draft motor. When the hall-effect sensor on the induced-draft motor senses that it has reached the required speed, the burner sequence begins. This function is performed by the integrated gas control (IGC). The 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 evaporator fan motor shuts off after a 45-second time-off delay.

An LED (light-emitting diode) indicator is provided on the control board to monitor operation. The control board is located by removing the burner access panel. During normal operation, the LED is continuously on. See Table 8 for error codes.

Table 8 LED Indications

ERROR CODE	LED INDICATION
Normal Operation	On
Hardware Failure	Off
Fan On/Off Delay Modified	1 Flash
Limit Switch Fault	2 Flashes
Flame Sense Fault	3 Flashes
Four Consecutive Limit Switch Faults	4 Flashes
Ignition Lockout Fault	5 Flashes
Induced-Draft Motor Fault	6 Flashes
Rollout Switch Fault	7 Flashes
Internal Control Fault	8 Flashes
Internal Software Fault	9 Flashes

NOTES:

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

LIMIT SWITCHES—Normally closed limit switch (LS) completes the control circuit through the thermostat R circuit. Should the leaving-air temperature rise above the maximum allowable temperature, the limit switch opens and the R control circuit "breaks". Any interruption in the R control circuit instantly closes the gas valve and stops gas flow to the burners and pilot. 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 R control circuit. The electric spark ignition system cycles and the unit returns to normal heating operation. When this fault occurs, the IGC LED will display FAULT CODE 2.

AUXILIARY LIMIT SWITCH (ROLLOUT)—The function of the 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 auxiliary switch reaches the maximum allowable temperature, the R 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 LED will display FAULT CODE 7.

START UP COOLING SECTION AND MAKE ADJUSTMENTS

⚠ CAUTION

Complete the required procedures given in the Pre-Start-Up section on previous pages 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 (unless accessory low-ambient kit is installed).
Do not rapid-cycle the compressor. Allow 5 minutes between "on" cycles to prevent compressor damage.

CHECKING COOLING CONTROL OPERATION — Start and check the unit for proper cooling control operation as follows:

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

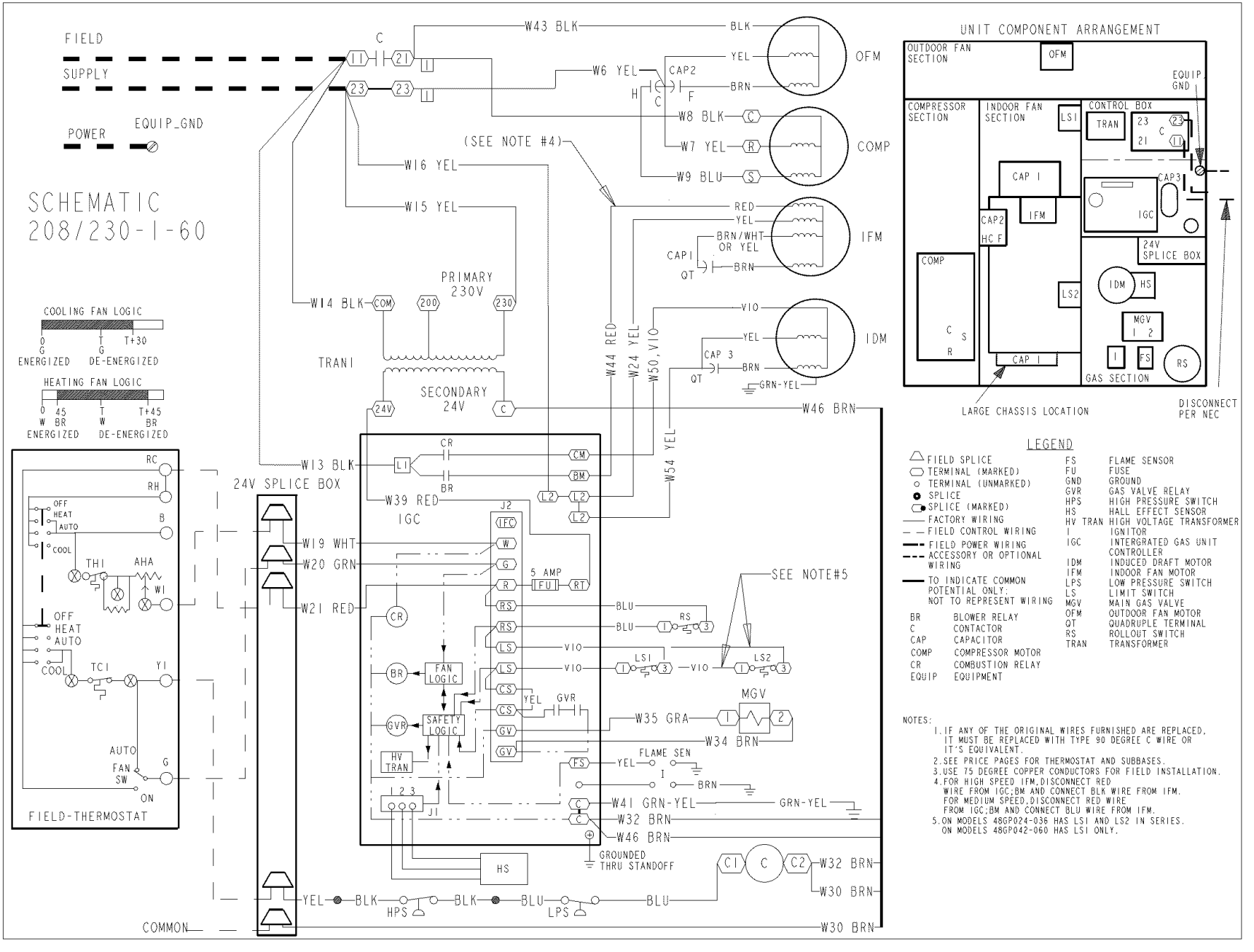
IMPORTANT: Three-phase, scroll compressor units are direction-oriented. These units must be checked to ensure proper compressor 3-phase power lead orientation. If not corrected within 5 minutes, the internal protector will shut off the compressor. The 3-phase power leads to the unit must be reversed to correct rotation. When turning backwards, scroll compressors emit elevated noise levels, and the difference between compressor suction and discharge pressures may be dramatically lower than normal.

CHECKING AND ADJUSTING REFRIGERANT CHARGE — The refrigerant system is fully charged with R-410A (Puron) 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.

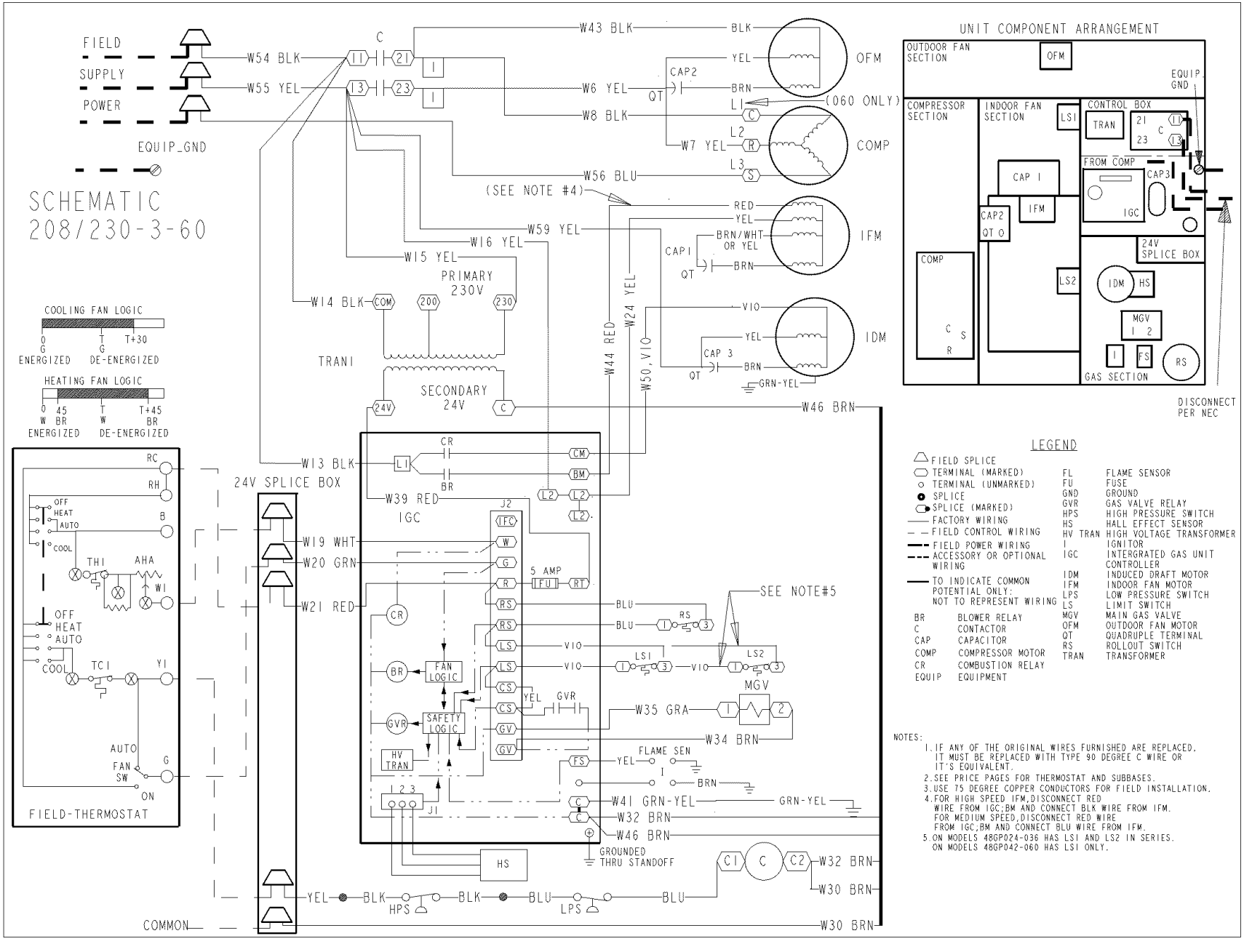
A refrigerant charging chart label is attached to the outside of the compressor access door. The chart includes the required suction line temperature at given suction line pressures and outdoor ambients..

An accurate superheat, thermocouple- or thermistor-type thermometer, and a gage manifold are required when using the



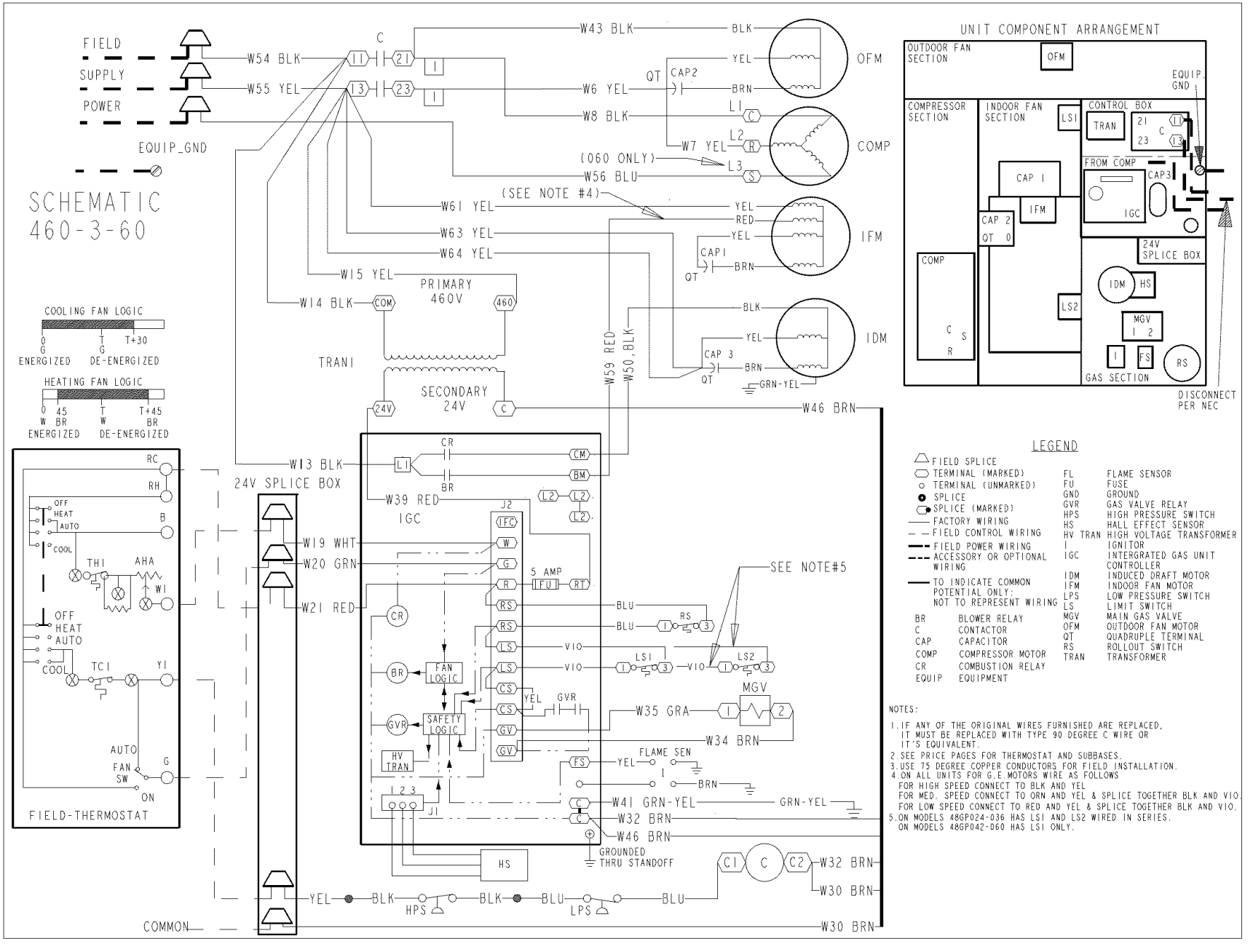
C99076

Fig. 20—208/230-1-60 Wiring Diagram



C99077

Fig. 21—208/230-3-60 Wiring Diagram



C99078

Fig. 22—460-3-60 Wiring Diagram

superheat 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.*

IMPORTANT: 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.

REFRIGERANT CHARGE — The amount of refrigerant charge is listed on the unit nameplate. Refer to Carrier Refrigeration Service Techniques Manual, Refrigerants section.

Unit panels must be in place when unit is operating during charging procedures.

NO CHARGE: Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to system data plate).

LOW CHARGE COOLING: Measure outdoor ambient using Cooling Charging Charts (Figs. 23-28). Vary refrigerant until the conditions of the chart are met. Note that charging charts are different from type normally used. Charts are based on charging the units to correct superheat for the various operating conditions. Accurate pressure gage and temperature sensing devices are required. Connect the pressure gage to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that the outdoor ambient does not effect the reading. Indoor air CFM must be within the normal operating range of the unit.

TO USE COOLING CHARGING CHARTS: Take the outdoor ambient temperature and read the suction pressure gage. Refer to the chart to determine what the suction temperature should be.

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

INDOOR AIRFLOW AND AIRFLOW ADJUSTMENTS

⚠ CAUTION

For cooling operation, the recommended airflow is 350 to 450 cfm for each 12,000 Btuh 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.

Table 7 shows the temperature rise at various air-flow rates. Table 9 shows both heating and cooling airflows at various external static pressures. Refer to these tables to determine the airflow for the system being installed.

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

⚠ WARNING

Shut off gas supply *then* disconnect electrical power to the unit before changing blower speed. Electrical shock or explosion could cause serious injury or death.

Airflow can be changed by changing the lead connections of the blower motor.

All 48GP units are factory wired for low speed and may need to be wired for medium or high speed in the field.

For 208/230-v — The motor leads are color-coded as follows:

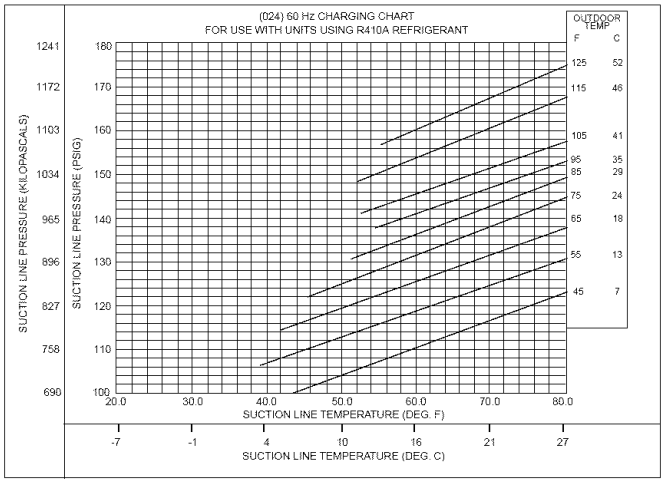
3-SPEED	2-SPEED
black = high speed	black = high speed
blue = medium speed	---
red = low speed	red = low speed

To change the speed of the blower motor (BM), remove the fan motor speed leg lead from the blower relay (BR). This wire is attached to terminal BM for single-phase and 3-phase units. To change the speed, remove and replace with lead for desired blower motor speed. *Insulate the removed lead to avoid contact with chassis parts.*

For 460-v GE Motors — The motor leads are color coded as follows:

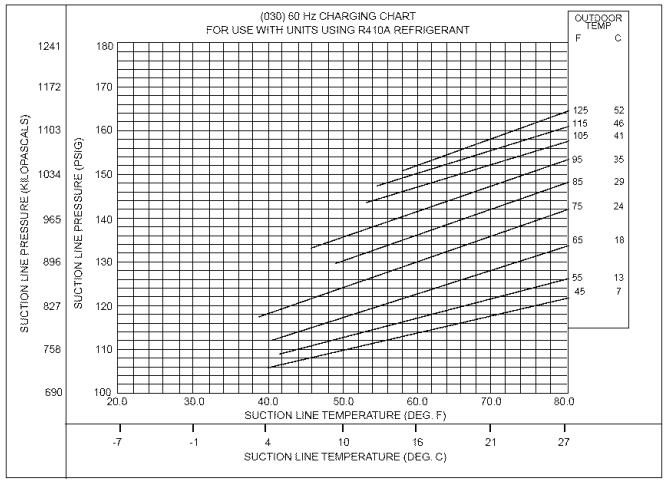
3-SPEED	2-SPEED
black = high	black = high
violet = jumper	blue = jumper
orange = medium	---
red = low	red = low

To change the speed of the blower motor (BM), remove fan motor speed lead from the blower relay (BR) and replace with the lead for the desired blower motor speed. The motor speed lead is attached to terminal BM. For low and medium speeds black must be connected to the jumper wire. *Insulate removed lead end to avoid contact with chassis parts.* To select high speed on 460-v GE motors, separate the black female quick connect (QC) from the jumper lead male quick connect (QC) and connect the black lead to the BR. *Insulate the jumper to avoid contact with any chassis parts.*



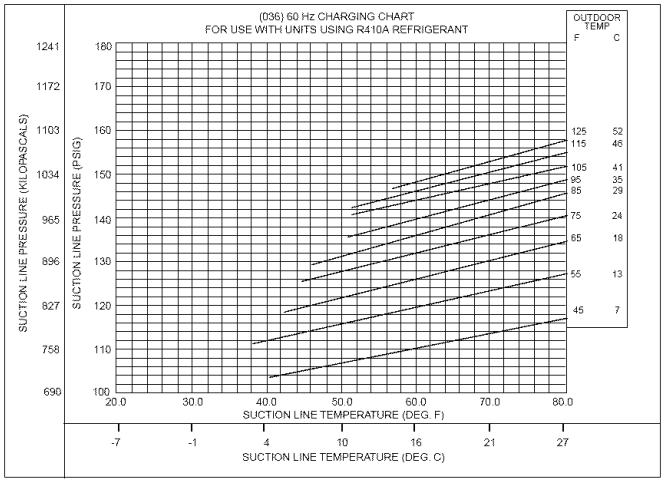
C99079

Fig. 23—Cooling Charging Chart, 48GP024 Units



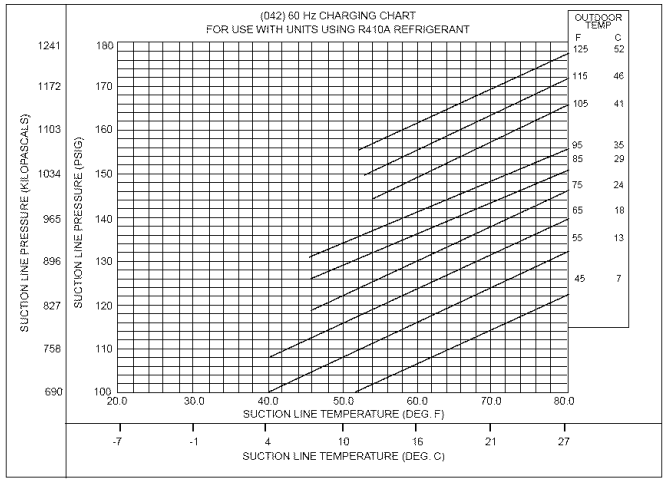
C99080

Fig. 24—Cooling Charging Chart, 48GP030 Units



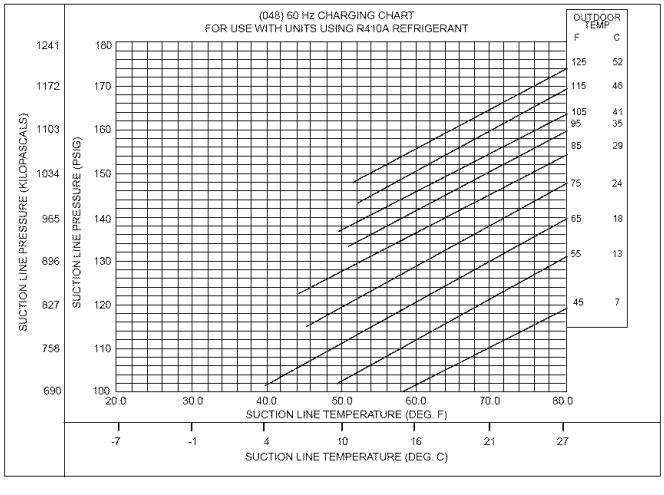
C99081

Fig. 25 — Cooling Charging Chart, 48GP036 Units



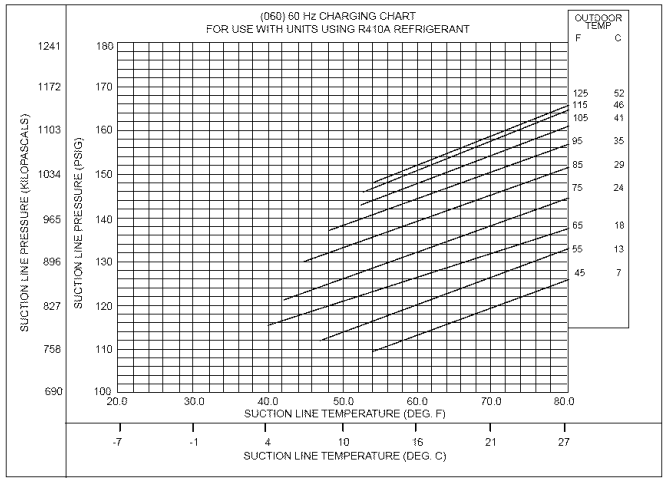
C99082

Fig. 26—Cooling Charging Chart, 48GP042 Units



C99083

Fig. 27—Cooling Charging Chart, 48GP048 Units



C99084

Fig. 28—Cooling Charging Chart, 48GP060 Units

Table 9—Wet Coil Air Delivery* — Horizontal and Downflow Discharge
Unit 48GP024-060 (Deduct 10% for 208 Volts)

230 AND 460 VOLT												
Unit 48GP	Motor Speed		External Static Pressure (in. wg)									
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
024	Low	Watts	279	282	280	277	276	–	–	–	–	–	–
		Cfm	882	801	738	674	604	–	–	–	–	–	–
	Medium	Watts	–	–	–	373	367	361	356	351	–	–	–
		Cfm	–	–	–	936	868	797	719	626	–	–	–
	High	Watts	–	–	–	–	–	463	452	439	428	–	–
		Cfm	–	–	–	–	–	956	878	794	702	–	–
030	Low	Watts	243	244	242	–	–	–	–	–	–	–	–
		Cfm	885	842	786	–	–	–	–	–	–	–	–
	Medium	Watts	353	339	333	330	326	320	–	–	–	–	–
		Cfm	1195	1134	1070	997	911	818	–	–	–	–	–
	High	Watts	–	–	–	443	436	426	416	406	397	–	–
		Cfm	–	–	–	1230	1145	1061	977	888	786	–	–
036	Low	Watts	490	463	446	432	418	403	389	378	–	–	–
		Cfm	1431	1398	1347	1281	1205	1118	1024	921	–	–	–
	Medium	Watts	–	513	501	488	474	459	443	428	–	–	–
		Cfm	–	1491	1426	1351	1267	1175	1077	976	–	–	–
	High	Watts	–	–	645	636	627	616	605	593	583	–	–
		Cfm	–	–	1484	1410	1330	1243	1147	1044	936	–	–
042	Low	Watts	634	618	608	598	583	562	534	502	473	454	457
		Cfm	1669	1599	1545	1498	1448	1391	1326	1257	1189	1132	1101
	Medium	Watts	–	–	–	733	704	672	638	604	574	550	536
		Cfm	–	–	–	1746	1688	1630	1566	1492	1399	1279	1120
	High	Watts	–	–	–	–	–	–	797	773	751	727	696
		Cfm	–	–	–	–	–	–	1727	1632	1537	1423	1308
048	Low	Watts	591	578	573	568	559	544	524	500	–	–	–
		Cfm	1554	1523	1496	1467	1432	1387	1332	1269	–	–	–
	Medium	Watts	755	737	719	699	678	653	627	602	579	562	556
		Cfm	1834	1802	1758	1706	1648	1585	1520	1455	1392	1332	1276
	High	Watts	–	–	–	890	858	828	801	777	756	734	709
		Cfm	–	–	–	1943	1870	1793	1711	1624	1531	1433	1329
060	Low	Watts	589	576	569	566	559	541	499	–	–	–	–
		Cfm	1946	1891	1836	1779	1718	1651	1577	–	–	–	–
	Medium	Watts	750	733	715	695	673	648	623	598	577	–	–
		Cfm	2189	2097	2021	1952	1883	1809	1727	1635	1530	–	–
	High	Watts	–	879	850	821	795	772	750	728	701	–	–
		Cfm	–	2337	2159	2050	1974	1905	1824	1722	1597	–	–

*Air delivery values are without air filter.
Note: Deduct field-supplied air filter pressure drop to obtain external static pressure available for ducting.

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:

When the room temperature rises to a point that is slightly above the cooling control setting of the thermostat, the thermostat completes the circuit between thermostat terminal R to terminals Y and G. These completed circuits through the thermostat connect contactor coil (C) (through unit wire Y) and blower relay coil (BR) (through unit wire G) across the 24-v secondary of transformer (TRAN).

The normally open contacts of energized contactor (C) close and complete the circuit through compressor motor (COMP) to condenser (outdoor) fan motor (OFM). Both motors start instantly.

The set of normally open contacts of energized relay BR close and complete the circuit through evaporator blower (indoor) fan motor (IFM).

NOTE: Once the compressor has started and then has 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 Y and G. These open circuits de-energize contactor coil C and relay coil BR. The condenser and compressor motors stop. After a 30-second delay, the blower motor stops. The unit is in a ''standby'' condition, waiting for the next ''call for cooling'' from the room thermostat.

MAINTENANCE

To ensure continuing high performance, and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This combination heating/cooling unit should be inspected at least once each year by a qualified service person. To troubleshoot heating or cooling of units, refer to tables at the back of the book.

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

⚠ WARNING

The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools, and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment other than those procedures recommended in the User's Manual. FAILURE TO HEED THIS WARNING COULD RESULT IN SERIOUS INJURY AND POSSIBLE DAMAGE TO THIS EQUIPMENT.

⚠ WARNING

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

1. Turn off gas supply, *then* turn off electrical power to the unit before performing any maintenance or service on the unit.
2. Use extreme caution when removing panels and parts. As with any mechanical equipment, serious injury can result from sharp edges, etc.
3. Never place anything combustible either on, or in contact with, the unit.
4. Should overheating occur, or the gas supply fail to shut off, shut off the external main manual gas valve to the unit, *then* shut off the electrical supply.

⚠ CAUTION

Errors made when reconnecting wires may cause improper and dangerous operation. Label all wires prior to disconnection 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 blower motor and wheel for cleanliness and check lubrication each heating and cooling season. Clean when necessary. For first heating season, inspect blower wheel bimonthly 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. Check and inspect heating section before each heating season. Clean and adjust when necessary.
6. 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 Tables 2 and 3 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 heating and cooling season or whenever the filter(s) becomes clogged with dust and lint.

EVAPORATOR BLOWER AND MOTOR

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

Turn off the gas supply, *then* disconnect and tag electrical power to the unit before cleaning the blower motor and wheel. Failure to adhere to this warning could cause serious injury or death.

To clean the blower motor and wheel:

1. Remove and disassemble blower assembly as follows:
   a. Remove unit access panel.
   b. Disconnect motor lead from blower relay (BR). Disconnect yellow lead from terminal L2 of the contactor.
   c. On all units, 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 setscrew(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 setscrew(s) are tightened on motor shaft flats and not on round part of shaft.
   f. Reinstall unit access panel.
3. Restore electrical power, then gas supply to unit. Start unit and check for proper blower rotation and motor speeds during heating and cooling cycles.

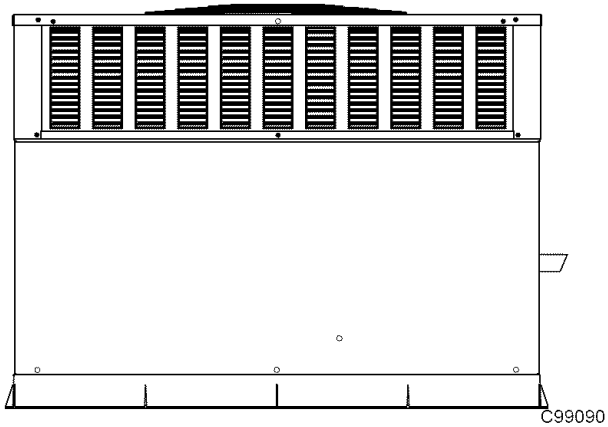


Fig. 29—Unit Access Panel

FLUE GAS PASSAGEWAYS — To inspect the flue collector box and upper areas of the heat exchanger:

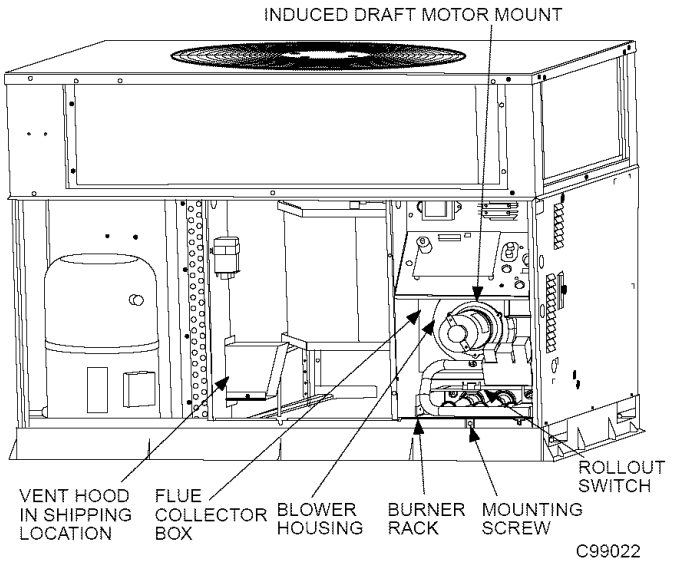


Fig. 30—Blower Housing and Flue Collector Box

1. Remove the combustion blower wheel and motor assembly according to directions in Combustion-Air Blower section below.
2. Remove the 3 screws holding the blower housing to the flue collector box cover (see Fig. 30).
3. Remove the 12 screws holding the flue collector box cover (Fig. 30) to the heat exchanger assembly. Inspect the heat exchangers.
4. Clean all surfaces as required, using the wire brush.

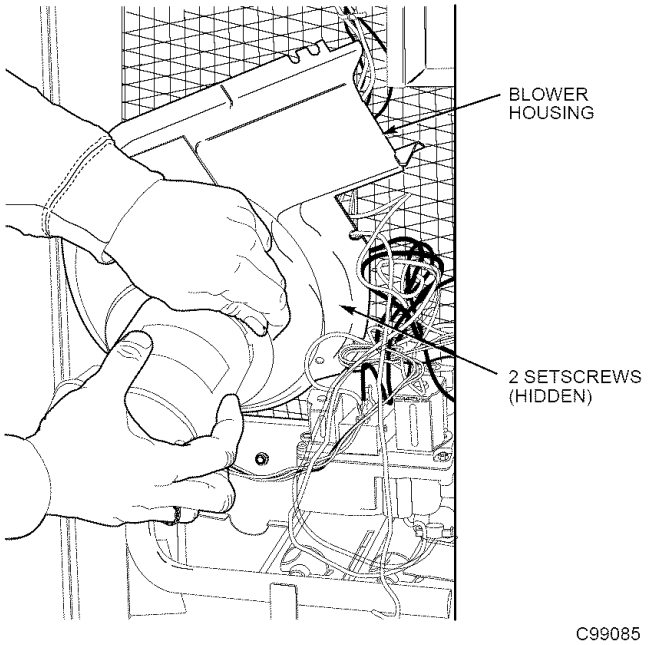


Fig. 31—Removal of Motor and Blower Wheel

COMBUSTION-AIR BLOWER — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel 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 unit access panel (See Fig. 29).
2. Remove the 7 screws that attach induced-draft motor mounting plate to blower housing (See Fig. 30).
3. Slide the motor and blower wheel assembly out of the blower housing (See Fig. 31). Clean the blower wheel. If additional cleaning is required, continue with Steps 4 and 5.
4. To remove blower, remove 2 setscrews (See Fig. 31).
5. To remove motor and cooling fan assembly, remove 4 screws that hold blower housing to mounting plate.
6. To reinstall, reverse the procedure outlined above.

LIMIT SWITCH — Remove unit access panel. Limit switch is located on the blower partition.

BURNER IGNITION — Unit is equipped with a direct spark ignition 100% lockout system. Ignition module is located in the control box. Module contains a self-diagnostic LED. During servicing, refer to label diagram for LED interpretations.

If lockout occurs, unit may be reset by either momentarily interrupting power supply to unit, or 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.

⚠ CAUTION

When servicing gas train, do not hit or plug orifice spuds.

REMOVAL OF GAS TRAIN

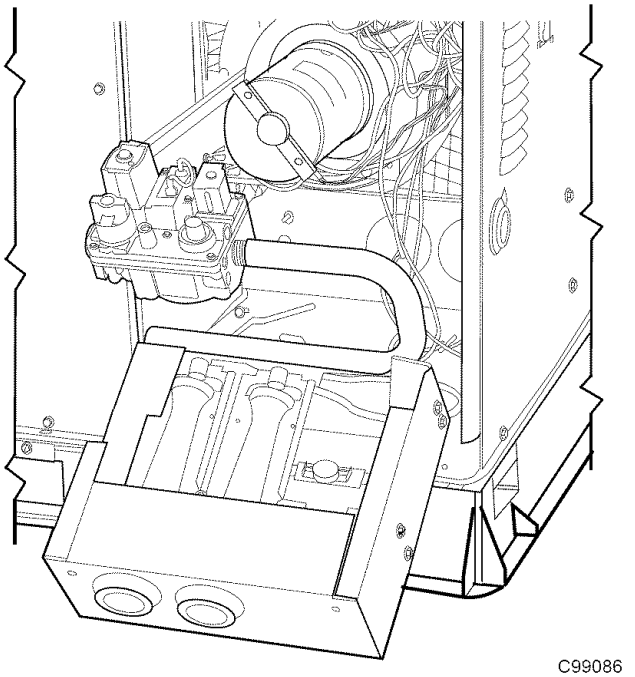


Fig. 32—Burner Rack Removed

1. Shut off manual gas valve.
2. Shut off power to unit.
3. Remove unit access panel (See Fig. 29).
4. Disconnect gas piping at unit gas valve.
5. Remove wires connected to gas valve. Mark each wire.
6. Remove ignitor and sensor wires at the ignitor module.
7. Remove the mounting screw that attaches the burner rack to the basepan (See Fig. 30).
8. Slide the burner rack out of the unit (See Figs. 30 and 32).

9. To reinstall, reverse the procedure outlined above.

CONDENSER COIL, EVAPORATOR 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 tube with clear water. Do not splash water on the insulation, motor, wiring, or air filter(s). If the drain tube is restricted, clear it with a ''plumbers snake'' or similar probe device. Ensure that the auxiliary drain port above the drain tube is also clear.

CONDENSER FAN

⚠ CAUTION

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

1. Remove 6 screws holding condenser grille and motor to top cover.
2. Turn motor/grille assembly upside down on top cover to expose the fan blade.
3. Inspect the fan blades for cracks or bends.
4. If fan needs to be removed, loosen the setscrew and slide the fan off the motor shaft.
5. When replacing fan blade, position blade so that the hub is 1/8 in. away from the motor end (1/8 in. 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 gas supply, and then the electrical power to the unit.*

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

After inspecting the electrical controls and wiring, replace the access panel. Start the unit, and observe at least one complete heating cycle and one complete cooling cycle to ensure proper operation. If discrepancies are observed in either or both operating cycles, 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 checkouts.

NOTE: Refer to the heating and/or cooling sequence of operation in this publication as an aid in determining proper control operation.

REFRIGERANT CIRCUIT — Inspect all refrigerant tubing connections and the unit base for oil accumulations annually. Detecting oil generally indicates a refrigerant leak.

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 Check for Refrigerant Leaks section on page 13.

If no refrigerant leaks are found and low cooling performance is suspected, refer to Checking and Adjusting Refrigerant Charge section on page 20.

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 Indoor Airflow and Airflow Adjustments section on page 20 to check the system airflow.

METERING DEVICE–ACCURATOR® **PISTON** — This metering device is a fixed orifice and is contained in the brass hex-body in the liquid line.

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 Puron (R-410A) systems. R-22 pressure switches **must not** be used as replacements for the Puron (R-410A) air conditioner.

LOSS OF CHARGE/LOW-PRESSURE SWITCH (AIR CONDITIONER ONLY) — 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 gas and then all power to unit.
2. Disconnect leads on switch.
3. Apply ohmmeter 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 gages 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 610 psig.

High pressure may be caused by a dirty condenser coil, failed fan motor, or condenser air recirculation.

To check switch:

1. Turn off gas and then all power to unit.
2. Disconnect leads on switch.
3. Apply ohmmeter leads across switch. You should have continuity on a good switch.

COPELAND SCROLL COMPRESSOR (PURON REFRIGERANT — **The compressor used in this product is specifically designed to operate with Puron (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

Wear safety glasses and gloves when handling refrigerants. Failure to follow this warning can cause a fire, serious injury, or death.

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 and 625 psi differential pressure.

The Copeland scroll compressor uses Mobil 3MA POE oil. This is the only oil allowed for oil recharge.

REFRIGERANT —

⚠ CAUTION

This system uses Puron® (R-410A) refrigerant which has higher operating pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gage set, hoses, and recovery system must be designed to handle Puron. If you are unsure consult the equipment manufacturer. Failure to use Puron compatible servicing equipment or replacement components may result in property damage or injury.

COMPRESSOR OIL — The compressor in this system uses a polyolester (POE) oil, Mobil 3MA POE. 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. area.
2. Cover area in front of the unit service panel with a terry cloth shop towel to absorb lubricant spills and prevent run-offs, and protect drop cloth from tears caused by tools or components.
3. 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 base pan.
4. Perform required service.
5. Remove and dispose of any oil contaminated material per local codes.

LIQUID LINE FILTER DRIER — The filter drier is specifically designed to operate with Puron. 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.

PURON (R-410A) REFRIGERANT CHARGING — Refer to unit information plate and charging chart. **Some R-410A refrigerant cylinders contain a dip tube to allow liquid refrigerant to flow from cylinder in upright position**. For cylinders equipped with a dip tube, charge Puron units with cylinder in upright position and a commercial metering device in manifold hose. Charge refrigerant into suction-line.

AIR CONDITIONER WITH PURON® (R-410A)—QUICK REFERENCE GUIDE

Puron refrigerant operates at 50%-70% higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron.

- Puron refrigerant cylinders are rose colored.
- Puron refrigerant cylinders manufactured prior to March 1, 1999, have a dip tube that allows liquid to flow out of cylinder in upright position. Cylinders manufactured March 1, 1999 and later DO NOT have a dip tube and MUST be positioned upside down to allow liquid to flow.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- Puron 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.
- Puron, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Only use factory specified liquid-line filter driers with rated working pressures no 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 Puron liquid-line filter drier is required on every unit.
- Do not use 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 filter driers.
- Always replace filter drier after opening system for service.
- Do not vent Puron into the atmosphere.
- Observe all **warnings**, **cautions**, and **bold text**.
- Do not leave Puron suction line driers in place for more than 72 hours.

Table 10—Troubleshooting — 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 thermostat, contactor, transformer, control relay, high pressure, or loss of charge 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 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.
Three-phase scroll compressor makes excessive noise, and there may be a low pressure differential.	Scroll compressor is rotating in the wrong direction	Correct the direction of rotation by reversing the 3-phase power leads to the unit. Shut down unit to allow pressures to equalize.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge	Recover refrigerant, evacuate system, and recharge to capacities shown on nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage	Determine cause and correct.
	Blocked condenser	Determine cause and correct.
	Defective run/start capacitor, overload or start relay	Determine cause and replace.
	Defective thermostat	Replace thermostat.
	Faulty condenser-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 set too low	Reset thermostat.
	Low refrigerant charge	Locate leak, repair, and recharge.
	Leaking valves in compressor	Replace compressor.
	Air in system	Recover refrigerant, evacuate system, and recharge.
	Condenser 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.
	Compressor valves leaking	Replace compressor.
	Restriction in liquid tube	Remove restriction.
Excessive suction pressure.	High heat load	Check for source and eliminate.
	Compressor valves leaking	Replace compressor.
	Refrigerant overcharged	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter	Replace filter.
	Low refrigerant charge	Check for leaks, repair and recharge.
	Metering device or low side restricted	Remove source of restriction.
	Insufficient evaporator airflow	Increase air quantity. Check filter — replace if necessary.
	Temperature too low in conditioned area	Reset thermostat.
	Outdoor ambient below 40 F	Install low-ambient kit.
	Field-installed filter-drier restricted	Replace.

Table 11—Troubleshooting — 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.
	Miswired or loose connections	Check all wiring and wirenut connections.
	Burned-out heat anticipator in thermostat	Replace thermostat.
	Broken thermostat wire	Run continuity check. Replace wire if necessary.
	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.
	Blower speed too low	Use faster speed tap if available, or install alternate motor.
	Limit switch cycles main burners	Check rotation of blower, thermostat heat anticipator settings, and 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 compartments. 2. Cracked heat exchanger. Replace 3. Unit overfired. Reduce input (change orifices or adjust gas line or manifold pressure). 4. Check burner alignment.

Table 12—LED Troubleshooting–Error Code

SYMPTOM	CAUSE	REMEDY
Hardware failure. (LED OFF)	Loss of power to control module (IGC)	Check 5 amp fuse on 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 20 minutes for automatic reset.
Fan ON/OFF delay modified. (LED/FLASH)	High limit switch opens during heat exchanger warm-up period before fan-on delay expires	Ensure unit is fired on rate and temperature rise is correct.
	Limit switch opens within three minutes after blower-off delay timing in Heating mode	Ensure unit's external static pressure is within application guidelines.
Limit switch fault. (LED 2 flashes)	High temperature limit switch is open	Check operation of indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate.
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 operation of 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 flame sensor and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induce-draft motor fault. (LED 6 flashes)	IGC does not sense that induced-draft motor is operating	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 – White, PIN 2 – Red, PIN 3 – Black.
Rollout switch fault. (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. 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.
Internal software fault. (LED 9 flashes)	Microprocessor has sensed an error in it's redundant software comparison	If error code is not cleared by resetting unit power, replace the IGC.

⚠ CAUTION

If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that may be present before handling new control board. the IGC is sensitive to static electricity and may be damaged if the necessary precautions are not taken.

IMPORTANT: Refer to Heating Troubleshooting Chart for additional troubleshooting analysis.

LEGEND

IGC – Integrated Gas Unit Controller

LED – Light-Emitting Diode

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

I. PRELIMINARY INFORMATION

MODEL NO.: _____ SERIAL NO.: _____

DATE: _____ TECHNICIAN: _____

II. PRE-START-UP (Insert checkmark in box as each item is completed)

( ) VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT

( ) VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS

( ) CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS

( ) CHECK GAS PIPING FOR LEAKS

( ) CHECK THAT INDOOR (EVAPORATOR) AIR FILTER IS CLEAN AND IN PLACE

( ) VERIFY THAT UNIT INSTALLATION IS LEVEL

( ) CHECK FAN WHEEL, AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS

III. START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2_____ L2-L3_____ L3-L1_____

COMPRESSOR AMPS L1 _____ L2 _____ L3 _____

INDOOR (EVAPORATOR) FAN AMPS _____

TEMPERATURES

OUTDOOR (CONDENSER) AIR TEMPERATURE _____ DB

RETURN-AIR TEMPERATURE _____ DB _____ WB

COOLING SUPPLY AIR _____ DB _____ WB

GAS HEAT SUPPLY AIR _____

PRESSURES

GAS INLET PRESSURE _____ IN. WG

GAS MANIFOLD PRESSURE _____ IN. WG

REFRIGERANT SUCTION _____ PSIG SUCTION LINE TEMP* _____

REFRIGERANT DISCHARGE _____ PSIG DISCHARGE TEMP† _____

( ) VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

( ) VERIFY THAT THREE-PHASE SCROLL COMPRESSOR IS ROTATING IN CORRECT DIRECTION.

* Measured at suction inlet to compressor.
† Measured at liquid line leaving condenser.

Book 1 4 Tab 6a 8a PC 101 Catalog No. 534-755 Printed in U.S.A. Form 48GP-1SI Pg 32 3-00 Replaces: New