installation, start-up and service instructions

PACKAGED AIR CONDITIONERS

PA1Z

Sizes 024-060

Cancels: New

II PA1Z-24-1
11/15/97

CONTENTS

	Page
SAFETY CONSIDERATIONS	1-4
I. General	1
RECEIVING AND INSTALLATION	5-10
I. Step 1 — Check Equipment	5
II. Step 2 — Provide Unit Support	5
III. Step 3 — Provide Clearances	5
IV. Step 4 — Place Unit	5
V. Step 5 — Select and Install Ductwork	6
VI. Step 6 — Provide for Condensate Disposal	7
VII. Step 7 — Install Electrical Connections	7
PRE-START-UP	11
START-UP	11-14
I. Check for Refrigerant Leaks	11
II. Start-Up Cooling Section and Make Adjustments	11
III. Refrigerant Charge	11
IV. Indoor Airflow and Airflow Adjustments	14
V. Unit Controls	14
VI. Sequence of Operation	14
MAINTENANCE	14-17
I. Air Filter	16
II. Unit Top Removal (Condenser Coil Side)	16
III. Evaporator Blower and Motor	16
IV. Condenser Coil, Evaporator Coil, and Condensate Drain Pan	16
V. Condenser Fan	17
VI. Electrical Controls and Wiring	17
VII. Refrigerant Circuit	17
VIII. Evaporator Airflow	17
IX. Metering Devices	17
X. Liquid Line Strainer	17
TROUBLESHOOTING COOLING CHART	18
START-UP CHECKLIST	CL-1

NOTE TO INSTALLER — Before the installation, READ THESE INSTRUCTIONS CAREFULLY AND COMPLETELY. Also, make sure the Owner's Manual and Service Instructions are left with the unit after installation.

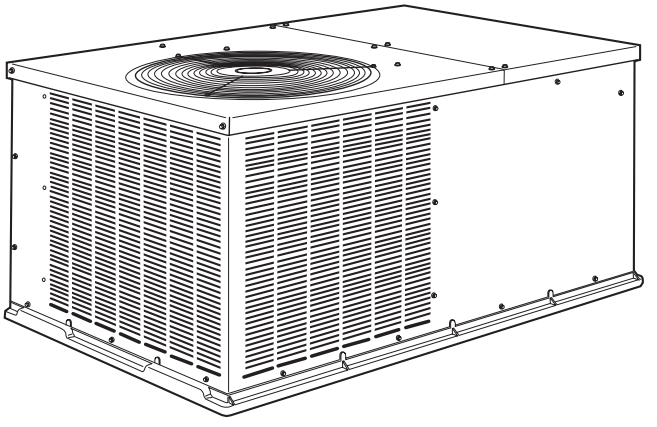


Fig. 1 — Unit PA1Z (Size 036 Shown)

SAFETY CONSIDERATIONS

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

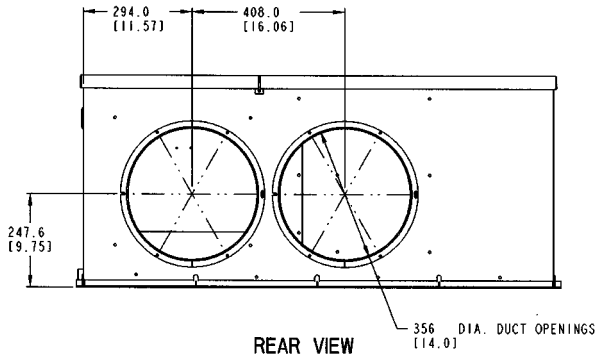
Untrained workers can perform basic maintenance functions of cleaning coils and filters. All other operations should be performed by trained service people. When working on air-conditioning equipment, pay attention to precautions in the literature, tags and labels attached to the unit, and other safety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

⚠ **WARNING:** Before performing service or maintenance operations on system, turn off main power to unit. Turn off accessory heater power switch if applicable. Electrical shock can cause personal injury.

I. GENERAL

The PA1Z cooling unit is fully self-contained and designed for outdoor installation. See Fig. 1. As shown in Fig. 2-4, units are shipped in a horizontal-discharge configuration for installation on a ground-level slab. All units can be field-converted to downflow discharge configurations for rooftop applications with a field-supplied plenum.



REQUIRED CLEARANCES TO COMBUSTIBLE MAT'L — mm (in.)

Top of Unit 0
Duct Side of Unit 0
Side Opposite Ducts 0
Bottom of Unit 0

NEC REQUIRED CLEARANCES — mm (in.)

Between Units, Power Entry Side 1066.8 (42.00)
Unit and Ungrounded Surfaces, Power Entry Side 914.0 (36.00)
Unit and Block or Concrete Walls and Other Grounded Surfaces, Power Entry Side 1066.8 (42.00)

REQUIRED CLEARANCES FOR SERVICING — mm (in.)

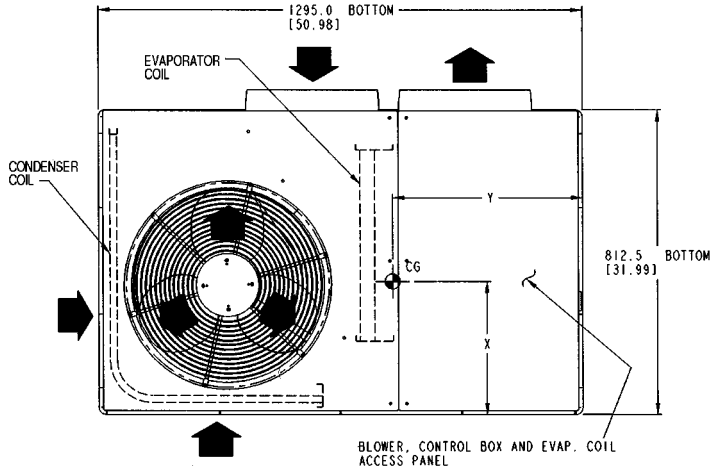
Condenser Coil Access Side 762.0 (30.00)
Power Entry Side 762.0 (30.00)
(Except for NEC Requirements)
Unit Top 914.0 (36.00)
Side Opposite Ducts 762.0 (30.00)

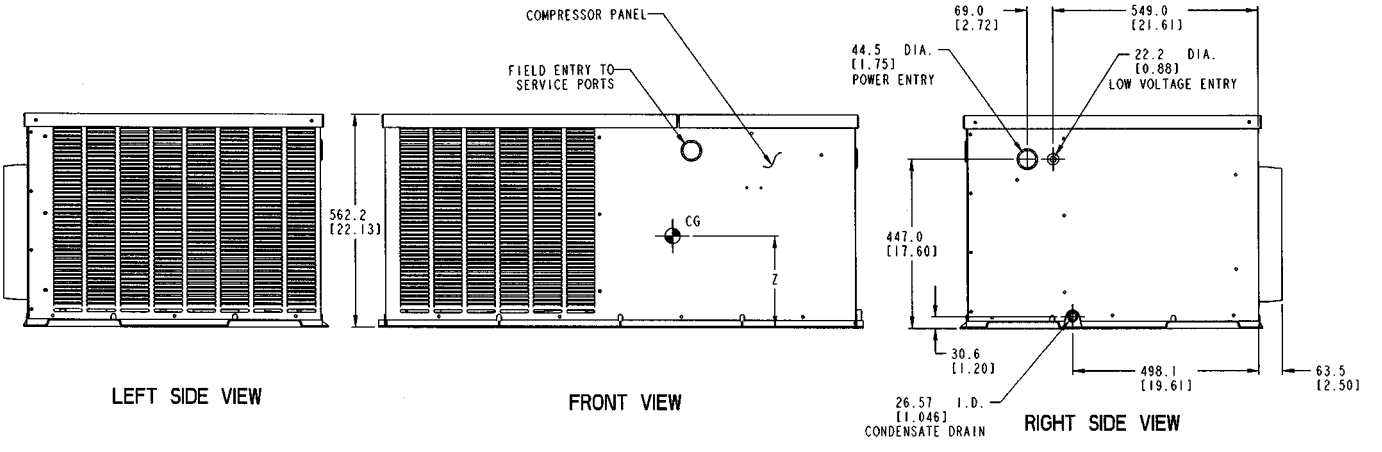
LEGEND

NEC — National Electrical Code

NOTES:

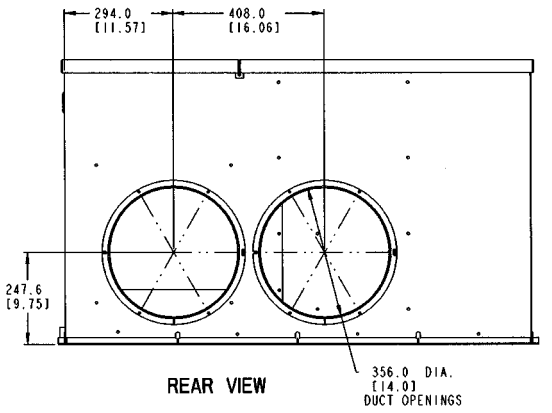
1. Clearances must be maintained to prevent recirculation of air from outdoor-fan discharge, with the exception of the condenser coil (914 mm [36 in.]). A removable fence or barricade requires no clearance.
2. Dimensions are in millimeters. Dimensions in ( ) are in inches.

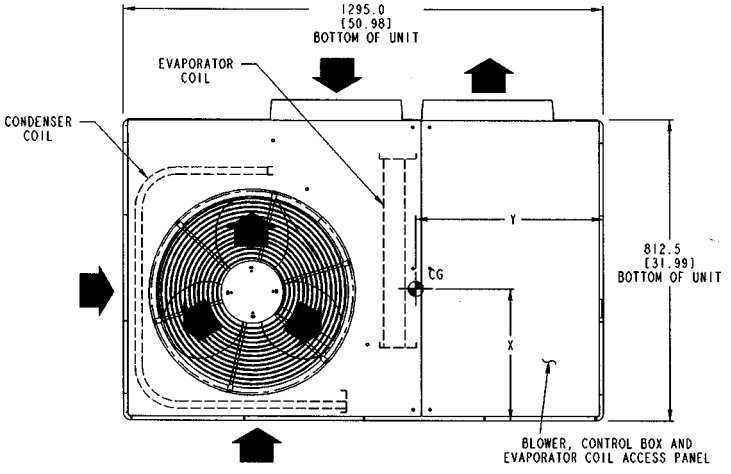




UNIT PA1Z	ELECTRICAL CHARACTERISTICS	UNIT WT		CENTER OF GRAVITY — mm (in.)		
		lb	kg	X	Y	Z
024	208/230-1-60	222	101	355.6 (14.00)	508.0 (20.00)	241.3 (9.50)
030	208/230-1-60	236	107	355.6 (14.00)	508.0 (20.00)	241.3 (9.50)
036	208/230-1-60, 208/230-3-60	250	114	355.6 (14.00)	508.0 (20.00)	241.3 (9.50)

Fig. 2 — Base Unit Dimensions, PA1Z024-036





REQUIRED CLEARANCES TO COMBUSTIBLE MAT'L — mm (in.)

Top of Unit	0
Duct Side of Unit	0
Side Opposite Ducts	0
Bottom of Unit	0

NEC REQUIRED CLEARANCES — mm (in.)

Between Units, Power Entry Side	1066.8 (42.00)
Unit and Ungrounded Surfaces, Power Entry Side	914.0 (36.00)
Unit and Block or Concrete Walls and Other Grounded Surfaces, Power Entry Side	1066.8 (42.00)

REQUIRED CLEARANCES FOR SERVICING — mm (in.)

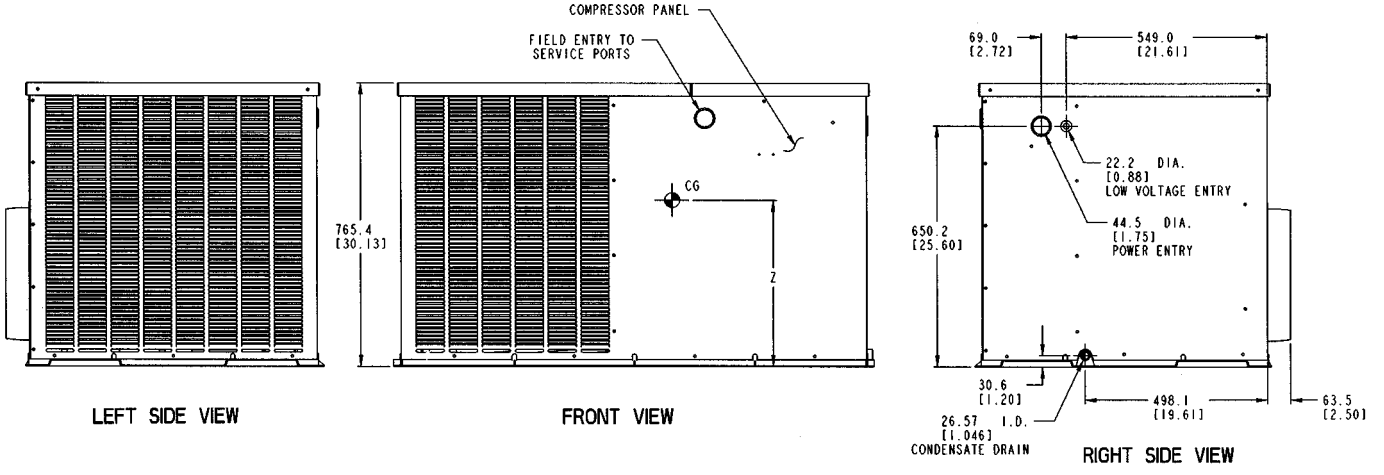
Condenser Coil Access Side	762.0 (30.00)
Power Entry Side (Except for NEC Requirements)	762.0 (30.00)
Unit Top	914.0 (36.00)
Side Opposite Ducts	762.0 (30.00)

LEGEND

NEC — National Electrical Code

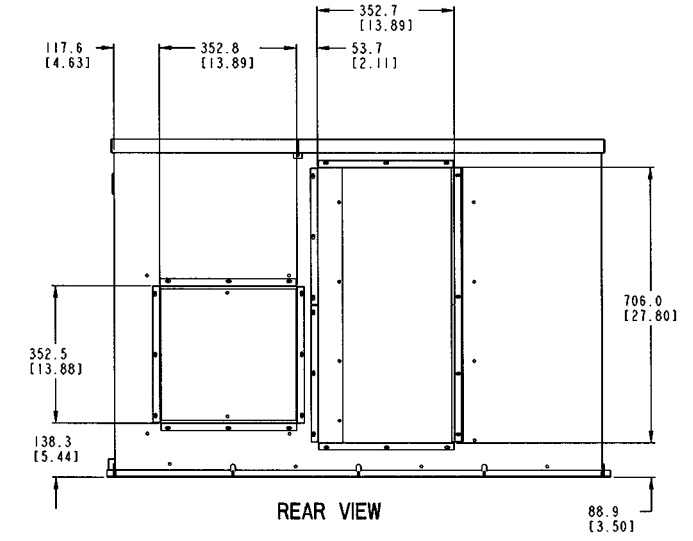
NOTES:

1. Clearances must be maintained to prevent recirculation of air from outdoor-fan discharge, with the exception of the condenser coil (914 mm [36 in.]). A removable fence or barricade requires no clearance.
2. Dimensions are in millimeters. Dimensions in ( ) are in inches.



UNIT PA1Z	ELECTRICAL CHARACTERISTICS	UNIT WT		CENTER OF GRAVITY — mm (in.)		
		lb	kg	X	Y	Z
042	208/230-1-60, 208/230-3-60	297	135	355.6 (14.00)	508.0 (20.00)	304.8 (12.00)
048	208/230-1-60, 208/230-3-60	310	141	355.6 (14.00)	508.0 (20.00)	304.8 (12.00)

Fig. 3 — Base Unit Dimensions, PA1Z042,048



REQUIRED CLEARANCES TO COMBUSTIBLE MAT'L — mm (in.)

Top of Unit 0
Duct Side of Unit 0
Side Opposite Ducts 0
Bottom of Unit 0

NEC REQUIRED CLEARANCES — mm (in.)

Between Units, Power Entry Side 1066.8 (42.00)
Unit and Ungrounded Surfaces, Power Entry Side 914.0 (36.00)
Unit and Block or Concrete Walls and Other Grounded Surfaces, Power Entry Side 1066.8 (42.00)

REQUIRED CLEARANCES FOR SERVICING — mm (in.)

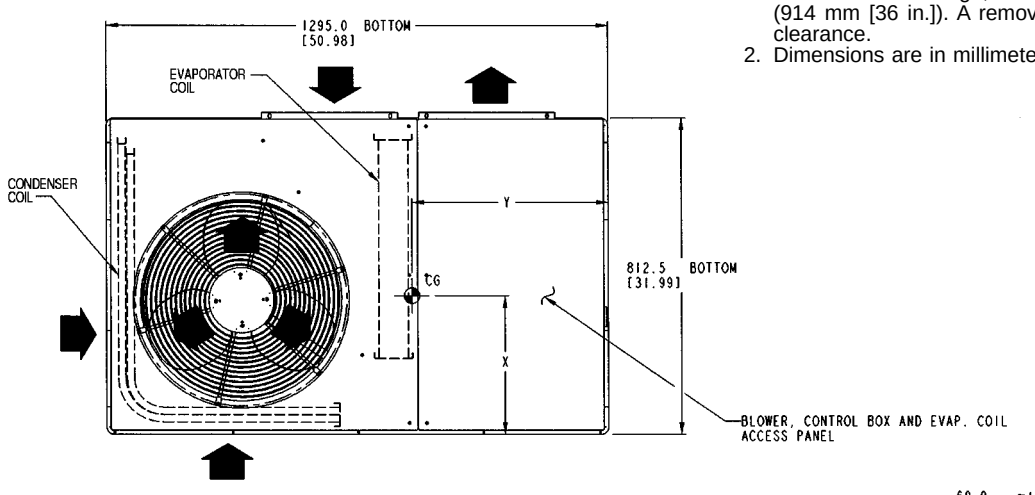
Condenser Coil Access Side 762.0 (30.00)
Power Entry Side 762.0 (30.00)
(Except for NEC Requirements)
Unit Top 914.0 (36.00)
Side Opposite Ducts 762.0 (30.00)

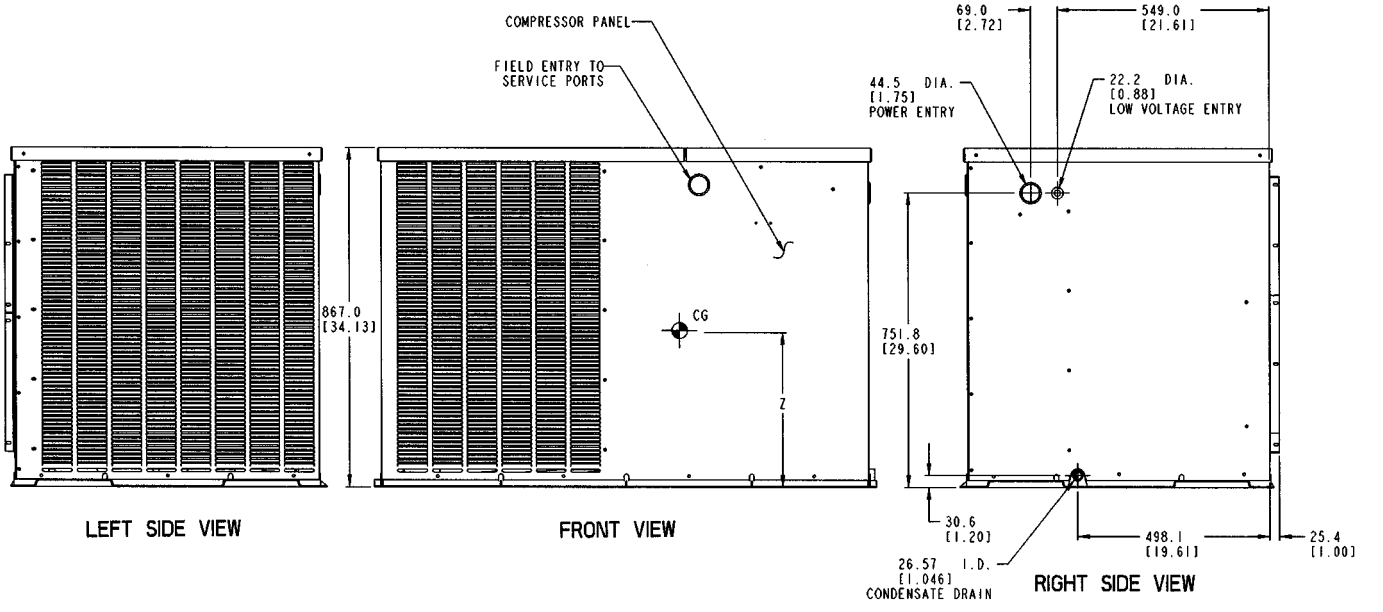
LEGEND

NEC — National Electrical Code

NOTES:

1. Clearances must be maintained to prevent recirculation of air from outdoor-fan discharge, with the exception of the condenser coil (914 mm [36 in.]). A removable fence or barricade requires no clearance.
2. Dimensions are in millimeters. Dimensions in ( ) are in inches.





UNIT PA1Z	ELECTRICAL CHARACTERISTICS	UNIT WT		CENTER OF GRAVITY — mm (in.)		
		lb	kg	X	Y	Z
060	230-1-60, 208/230-3-60, 460-3-60	350	159	355.6 (14.00)	508.0 (20.00)	355.6 (14.00)

Fig. 4 — Base Unit Dimensions, PA1Z060

RECEIVING AND INSTALLATION

I. STEP 1 — CHECK EQUIPMENT

A. Identify Unit

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

B. 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 securing points, 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 your local representative if any item is missing.

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

II. STEP 2 — PROVIDE UNIT SUPPORT

A. Slab Mount

Place the unit on a rigid, level surface, suitable to support the unit weight. The flat surface should extend approximately 2-in. beyond the unit casing on the 2 sides. The duct connection side and condensate drain connection sides should be flush with the edge of the flat surface. A concrete pad or a suitable fiberglass mounting pad is recommended.

A 6-in. wide gravel apron should be used around the flat surface to prevent airflow blockage by grass or shrubs. Do not secure the unit to the flat surface except where required by local codes.

The unit should be level to within ¼ inch. This is necessary for the unit drain to function properly.

III. STEP 3 — PROVIDE CLEARANCES

The required minimum service clearances and clearances to combustibles are shown in Fig. 2-4. Adequate ventilation and condenser air must be provided.

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

⚠ **CAUTION:** Do not restrict condenser airflow. An air restriction at either the outdoor-air inlet or the fan discharge can be harmful to compressor life.

Do not place the unit where water, ice, or snow from an overhang or roof will damage or flood the unit. The unit may be installed on wood flooring or on Class A, B, or C roof covering materials.

IV. STEP 4 — PLACE UNIT

Unit can be moved with the handholds provided in the unit basepan. Refer to Table 1 for operating weights. *Use extreme caution to prevent damage when moving the unit. Unit must remain in an upright position during all moving operations.* The unit must be level for proper condensate drainage; the ground-level pad must be level before setting the unit in place. When a field-fabricated support is used, be sure that the support is level and that it properly supports the unit.

Table 1 — Physical Data

UNIT PA1Z	024	030	036	042	048	060
OPERATING WEIGHT (lbs)	222	236	250	297	310	350
COMPRESSOR TYPE	Reciprocating					
REFRIGERANT	R-22					
Charge (lbs)	2.8	3.9	4.7	4.4	6.1	7.5
REFRIGERANT METERING DEVICE	Acutrol™ System					
CONDENSER COIL	Copper Tubes, Aluminum Plate Fins					
Rows...Fins/in.	1...17	1...17	2...17	1...17	2...17	2...17
Total Face Area (sq ft)	6.7	7.9	6.2	11.1	8.6	10.7
CONDENSER-FAN MOTOR	Propeller					
CFM	1600	2000	2000	2600	2600	2800
Nominal Rpm	825	1100	1100	1100	1100	1100
Motor Hp	⅛	¼	¼	¼	¼	¼
Diameter (in.)	20	20	20	20	20	20
EVAPORATOR COIL	Copper Tubes, Aluminum Plate Fins					
Rows...Fins/in.	2...15	3...15	3...15	3...15	3...15	4...15
Total Face Area (sq ft)	2.8	2.8	3.1	3.9	4.3	4.9
EVAPORATOR-FAN MOTOR	Direct Drive					
Blower Motor Size (in.)	10 x 8	10 x 8	10 x 8	10 x 9	10 x 9	10 x 10
Nominal Cfm	800	1000	1200	1400	1600	2000
Rpm Range	550-1000	550-1000	800-1050	800-1050	1000-1100	950-1100
Number of Speeds	3	3	3	3	2	3*
Factory Speed Setting	Low	Med	Low	Med	Low	Low
Motor Hp	¼	¼	½	½	¾	1
CONNECTING DUCT SIZES	Round					Square
Supply Air (in.)	14					13.9 x 13.9
Return Air (in.)	14					13.9 x 27.8
FIELD-SUPPLIED RETURN AIR FILTER†						
Throwaway (in.)	24 x 24	24 x 24	24 x 24	24 x 24	24 x 30	24 x 30

*460-v motors are 2-speed only.
†Required filter sizes shown are based on the ARI (Air Conditioning and Refrigeration Institute) rated airflow at a velocity of 300 ft/min for throwaway type or 450 ft/min for high capacity type. Recommended filters are 1-in. thick.

V. STEP 5 — SELECT AND INSTALL DUCTWORK

The design and installation of the duct system must be in accordance with:

- the standards of the NFPA (National Fire Protection Association) 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.

Select and size ductwork, supply-air registers and return-air grilles according to ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) recommendations.

Use the duct flanges provided on the supply- and return-air openings on the side of the unit. See Fig. 2-4 for connection sizes and locations. The 14-in. round duct collars (size 024-048 units) are shipped inside the unit attached to the indoor blower. They are field-installed and must be removed from the indoor cavity prior to start-up, even if they are not used for installation.

A. Install Flanges for Ductwork Connections (PA1Z060 Only)

The PA1Z060 units are shipped with flanges which must be field-installed on the unit.

To install unit flanges:

1. Five pieces of flange are shipped on the return-air opening of the unit. Remove the flanges from the shipping position. See Fig. 5. Screws are field-supplied.
2. One piece of flange is used as it is shipped (straight). Bend the other 4 pieces at right angles.
3. Install the straight flange on the right side of the return air opening in holes provided. See Fig. 6. Flanges should stick out from unit to allow for connection of ductwork.
4. Install 2 hand-formed flanges onto return air opening in holes provided to form a rectangle around the return air opening.
5. Install remaining 2 hand-formed flanges around discharge air opening in holes provided.
6. Ductwork can now be attached to flanges.

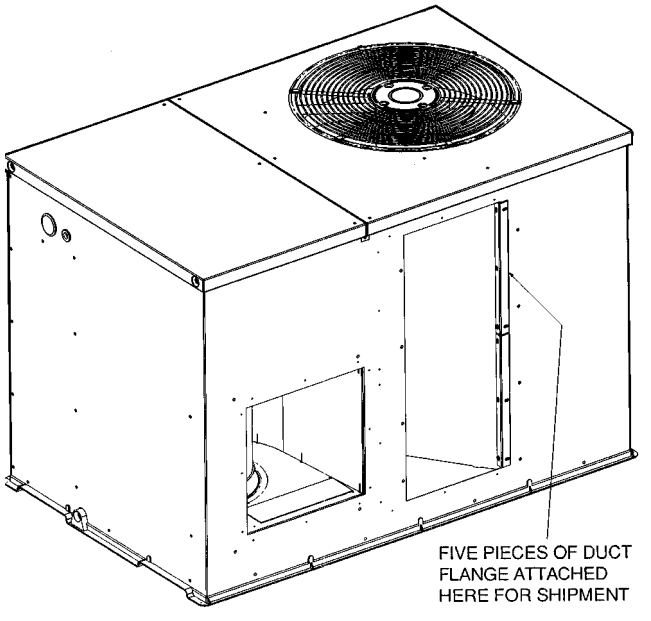


Fig. 5 — Shipping Location of Duct Flanges (Size 060 Only)

When designing and installing ductwork, consider the following:

⚠CAUTION: When connecting ductwork to units, do not drill deeper than ¾ inch in shaded area shown in Fig. 7 or coil may be damaged.

- All units should have field-supplied filters installed in the return-air side of the unit. Recommended sizes for filters are shown in Table 1.
- Avoid abrupt duct size increases and reductions. Abrupt change in duct size adversely affects air performance.

IMPORTANT: Use flexible connectors between ductwork and unit to prevent transmission of vibration. Use suitable gaskets to ensure weathertight and airtight seal.

- Size ductwork for cooling air quantity (cfm). The minimum air quantity for proper electric heater operation is listed in Table 2. Heater limit switches may trip at air quantities below those recommended.

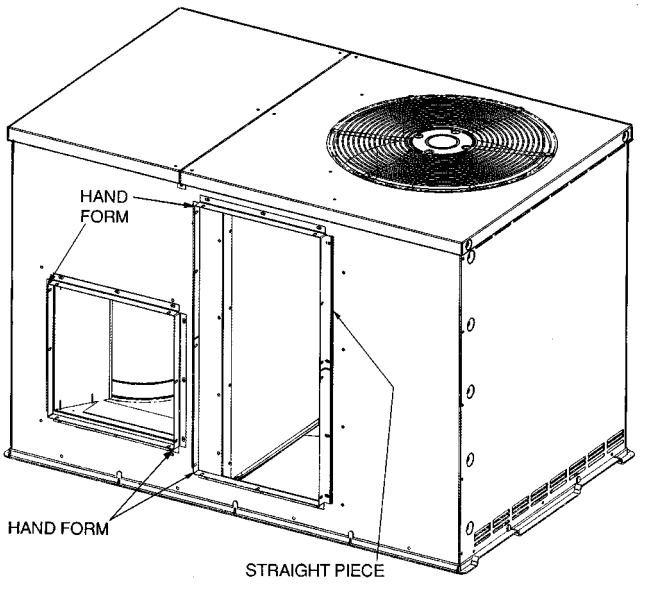


Fig. 6 — Flanges Installed on PA1Z060 Units

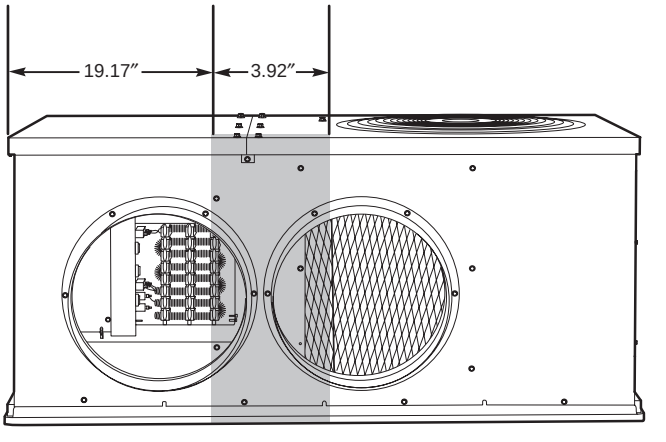
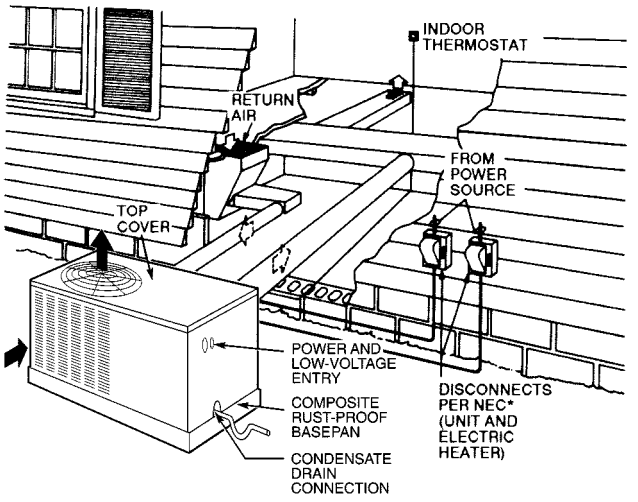


Fig. 7 — Area Not to be Drilled More than ¾-in.

- Insulate and weatherproof all external ductwork. Insulate and cover with a vapor barrier all ductwork passing through conditioned spaces. Follow latest Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and Air Conditioning Contractors Association (ACCA) minimum installation standards for residential heating and air conditioning systems.
- Secure all ducts to building structure. Flash, weatherproof, and vibration-isolate duct openings in wall or roof according to good construction practices.

Figure 8 shows a typical duct system with PA1Z unit installed.



LEGEND

Power Wiring
Control Wiring
Condenser Airflow
Evaporator Airflow

*Separate disconnect per NEC (National Electrical Code) required for electric heater when single-point connection is not used.

Fig. 8 — Typical Installation

Table 2 — Minimum Airflow for Safe Electric Heater Operation (Cfm)

UNIT SIZE PA1Z					
024	030	036	042	048	060
700	875	1200	1225	1400	1750

B. Converting Horizontal Discharge Units to Downflow (Vertical) Discharge

⚠ **WARNING:** Before performing service or maintenance operations on system, turn off main power to unit. Turn off accessory heater power switch if applicable. Electrical shock can cause personal injury.

Units are dedicated side supply products. They are not convertible to vertical air supply. A field-supplied plenum must be used to convert to vertical air discharge.

VI. STEP 6 — PROVIDE FOR CONDENSATE DISPOSAL

NOTE: Be sure that condensate-water disposal methods comply with local codes, restrictions, and practices.

Unit removes condensate through a 1$^{3}/_{64}$-in. ID hole which is located at the end of the unit. See Fig. 2-4 for location of condensate connection.

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. 9A and 9B. 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 using a ¾-in. OD tubing or pipe. See Fig. 9A and 9B. Make sure that the outlet of the trap is at least 1 in. lower than the unit drain-pan condensate connection to prevent the pan from overflowing. Prime the trap with water. Connect a drain tube using a minimum of ¾-in. PVC, ¾-in. CPVC, or ¾-in. copper pipe (all field supplied). Do not undersize the tube. Pitch the drain tube downward at a slope of at least 1 in. for every 10 ft of horizontal run. Be sure to check the drain tube for leaks. Prime trap at the beginning of the cooling season start-up. Allowable glues for condensate trap connection are: Standard ABS, CPVC, or PVC cement.

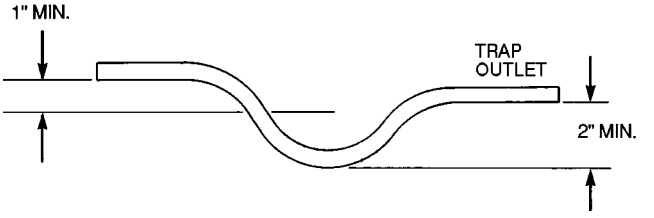


Fig. 9A — Condensate Trap (Using Tubing)

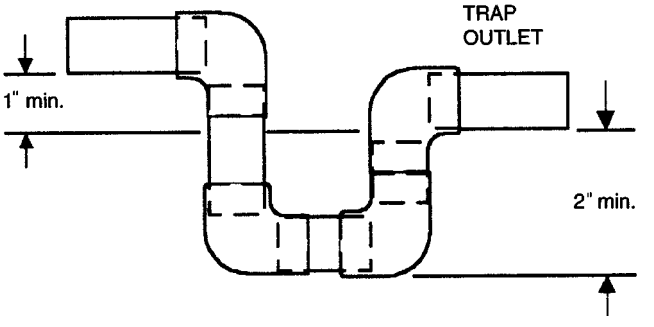


Fig. 9B — Condensate Trap (Using PVC Piping)

VII. STEP 7 — INSTALL ELECTRICAL CONNECTIONS

⚠ **WARNING:** The unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of an electrical wire connected to the unit ground in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code), ANSI (American National Standards Institute)/ NFPA (latest edition) (in Canada, Canadian Electrical Code CSA C22.1) and local electrical codes. Failure to adhere to this warning could result in personal 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 (latest edition) and local electrical codes governing such wiring. In Canada, all electrical connections must be in accordance with CSA Standard C22.1 Canadian Electrical Code Part 1 and applicable local codes. Refer to unit wiring diagram.
2. Use only *copper* conductor for connections between field-supplied electrical disconnect switch and unit. DO NOT USE ALUMINUM WIRE.
3. Be sure that high-voltage power to unit is within operating voltage range indicated on unit rating plate. On 3-phase units, ensure that phases are balanced within 2%. Consult local power company for correction of improper voltage and/or phase imbalance.
4. Insulate low-voltage wires for highest voltage contained within conduit when low-voltage control wires are run in same conduit as high-voltage wires.
5. Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.

A. High-Voltage Connections

The unit must have a separate electrical service with a field-supplied, waterproof disconnect switch mounted at, or within sight from the unit. Refer to the unit rating plate for maximum fuse/circuit breaker size and minimum circuit amps (ampacity) for wire sizing. See Table 3 for electrical data.

The field-supplied disconnect may be mounted on the unit over the high-voltage inlet hole. See Fig. 2-4.

⚠ **CAUTION:** Operation of unit on improper line voltage constitutes abuse and may cause unit damage that could affect warranty.

B. Routing Power Leads into Unit

Use only copper wire between disconnect and unit. The high-voltage leads should be in a conduit until they enter the unit; conduit termination at the unit must be watertight. Run the high-voltage leads through the hole on the control box side of the unit (see Fig. 10 for location). When the leads are inside the unit, run leads to the control box (Fig. 11). For single-phase units, connect leads to the black and yellow wires; for 3-phase units, connect the leads to the black, yellow, and blue wires (see Fig. 12).

C. Connecting Ground Lead to Unit Ground

Refer to Fig. 11 and 12. Connect the ground lead to the chassis using the unit ground lug in the control box.

D. Routing Control Power Wires

Form a drip-loop with the thermostat leads before routing them into the unit. Route the thermostat leads through grommeted hole provided in unit (see Fig. 10) into unit control box. Connect thermostat leads to unit control power leads as shown in Fig. 13.

Route thermostat wires through grommet providing a drip loop at the panel. Connect low-voltage leads to the thermostat as shown in Fig. 13.

The unit transformer supplies 24-v power for complete system including accessory electrical heater. Transformer is factory wired for 230-v operation. If supply voltage is 208 v, rewire transformer primary as described in the Special Procedures for 208-v Operation section below.

E. Accessory Electric Heat Wiring

Refer to accessory electric heat installation instructions for information on installing accessory electric heat. Accessory electric heat wiring is shown in Fig. 14.

F. Special Procedures for 208-V Operation

⚠ **WARNING:** Make sure that the power supply to the unit is switched OFF before making any wiring changes. Electrical shock can cause personal injury or death.

1. Remove wirenut from connection of ORG wire to BLK wire. Disconnect the ORG transformer-primary lead from the BLK wire. Save wirenut. See unit wiring label.
2. Remove the wirenut from the terminal on the end of the RED transformer-primary lead.
3. Save the wirenut.
4. Connect the RED lead to the BLK wire from which the ORG lead was disconnected. Insulate with wirenut from Step 1.
5. Using the wirenut removed from the RED lead, insulate the loose terminal on the ORG lead.
6. Wrap the wirenuts with electrical tape so that the metal terminals cannot be seen.

Indoor blower-motor speeds may need to be changed for 208-v operation. Refer to Indoor Airflow and Airflow Adjustments section on page 14.

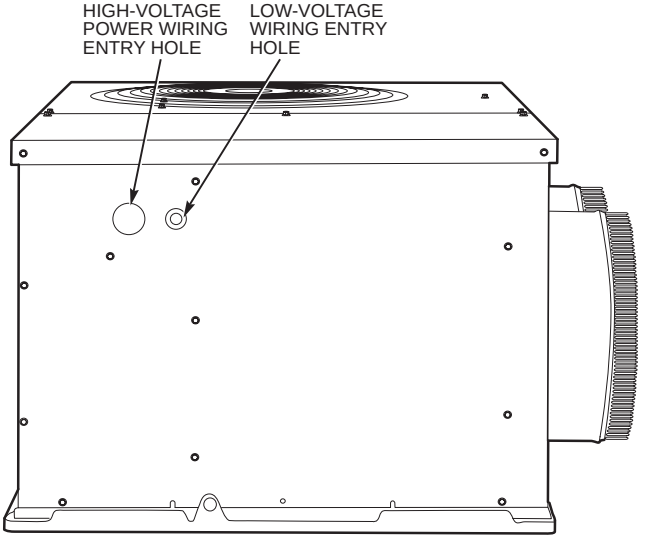


Fig. 10 — Unit Electrical Connection Entry Holes

Table 3 — Electrical Data

UNIT PA1Z	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR		OFM	IFM	ELECTRIC HEAT		POWER SUPPLY		DISCONNECT SIZE	
		Min	Max	RLA	LRA	FLA	FLA	Nominal kW*	FLA	MCA	MOCP	FLA	LRA
024	208/230-1-60	187	254	10.9	61.0	0.9	2.4	—/— 3.8/ 5.0 7.5/10.0	—/— 18.1/20.8 36.1/41.7	16.9/ 16.9 25.6/ 29.0 48.1/ 55.1	20/ 20 30/ 30 50/ 60	16/ 16 24/ 27 44/ 51	68
030	208/230-1-60	187	254	15.2	69.4	1.5	2.4	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0	—/— 18.1/20.8 36.1/41.7 54.2/62.5	22.9/ 22.9 25.6/ 29.0 48.1/ 55.1 70.7/ 81.1	30/ 30 30/ 30 50/ 60 80/ 90†	22/ 22 24/ 27 44/ 51 65/ 75	79
036	208/230-1-60	187	254	15.9	86.0	1.5	2.8	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 18.1/20.8 36.1/41.7 54.2/62.5 72.2/83.3	24.2/ 24.2 26.1/ 29.5 48.6/ 55.6 71.2/ 81.6 93.6/107.7	30/ 30 30/ 30 50/ 60 80/ 90† 100/110†	23/ 23 24/ 27 45/ 51 66/ 75 86/ 99	96
	208/230-3-60	187	254	8.9	64.5	1.5	2.8	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 10.4/12.0 20.8/24.1 31.3/36.1 41.7/48.1	15.4/ 15.4 16.5/ 18.5 29.6/ 33.6 42.6/ 48.6 55.6/ 63.6	20/ 20 20/ 20 30/ 35 45/ 50 60/ 70†	15/ 15 15/ 17 27/ 31 39/ 45 51/ 59	74
042	208/230-1-60	187	254	18.5	97.6	1.5	2.8	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 18.1/20.8 36.1/41.7 54.2/62.5 72.2/83.3	27.4/ 27.4 27.4/ 29.5 48.6/ 55.6 71.2/ 81.6 93.8/107.7	35/ 35 35/ 35 50/ 60 80/ 90† 100/110†	26/ 26 26/ 27 45/ 51 66/ 75 86/ 99	107
	208/230-3-60	187	254	10.9	73.0	1.5	2.8	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 10.4/12.0 20.8/24.1 31.3/36.1 41.7/48.1	17.9/ 17.9 17.9/ 18.5 29.6/ 33.6 42.6/ 48.6 55.6/ 63.6	25/ 25 25/ 25 30/ 35 45/ 50 60/ 70†	17/ 17 17/ 17 27/ 31 39/ 45 51/ 59	83
048	208/230-1-60	187	254	21.3	107.0	1.5	4.2	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 18.1/20.8 36.1/41.7 54.2/62.5 72.2/83.3	32.3/ 32.3 32.3/ 32.3 50.4/ 57.3 72.9/ 83.4 95.5/109.4	40/ 40 40/ 40 60/ 60 80/ 90† 100/110†	31/ 31 31/ 31 46/ 53 67/ 77 88/101	121
	208/230-3-60	187	254	12.3	73.0	1.5	4.2	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 10.4/12.0 20.8/24.1 31.3/36.1 41.7/48.1	21.1/ 21.1 21.1/ 21.1 31.3/ 35.3 44.3/ 50.4 57.4/ 65.4	25/ 25 25/ 25 35/ 40 45/ 60 60/ 70†	21/ 21 21/ 21 29/ 32 41/ 46 53/ 60	87
060	230-1-60	207	254	26.9	128.0	1.4	6.2	— 5.0 10.0 15.0 20.0	— 20.8 41.7 62.5 83.3	41.2 41.2 59.8 85.9 111.9	50 50 60 90† 125†	40 40 55 79 103	141
	208/230-3-60	187	254	17.7	128.0	1.4	6.2	—/— 3.8/ 5.0 7.5/10.0 11.3/15.0 15.0/20.0	—/— 10.4/12.0 20.8/24.1 31.3/36.1 41.7/48.1	29.7/ 29.7 29.7/ 29.7 33.8/ 37.8 46.8/ 52.9 59.9/ 67.9	35/ 35 35/ 35 35/ 40 50/ 60 60/ 70†	29/ 29 29/ 29 31/ 35 43/ 49 55/ 62	146
	460-3-60	414	508	9.0	63.0	0.7	3.2	— 5.0 10.0 15.0 20.0	— 6.0 12.0 18.0 24.1	15.2 15.2 19.0 26.6 34.1	20 20 20 30 35	15 15 18 24 31	71

LEGEND

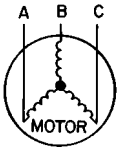
FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
NEC — National Electrical Code
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Heater capacity (kW) is based on heater voltage of 208 v, 240 v, or 480 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.
†Fuse or HACR circuit breaker.

NOTES:
1. In compliance with NEC requirements for multimotor and combination load and equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker.
2. **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.

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

EXAMPLE: Supply voltage is 460-3-60



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

$$\text{Average voltage} = \frac{452 + 464 + 455}{3} = 457$$

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 percentage 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.

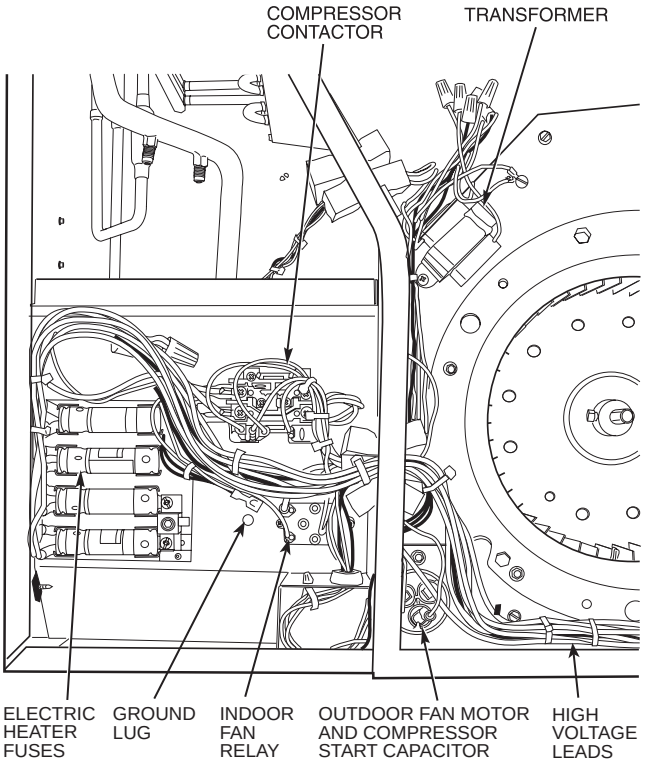
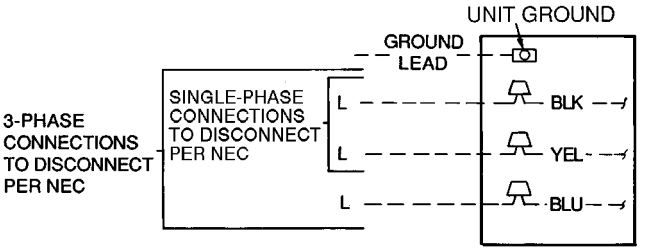


Fig. 11 — Control Box Wiring



LEGEND

NEC — National Electrical Code
Field Wiring
Splice Connections

NOTE: Use copper wire only.

Fig. 12 — Line Power Connections

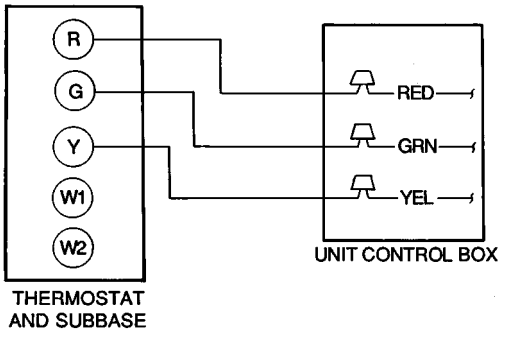


Fig. 13 — Control Connections

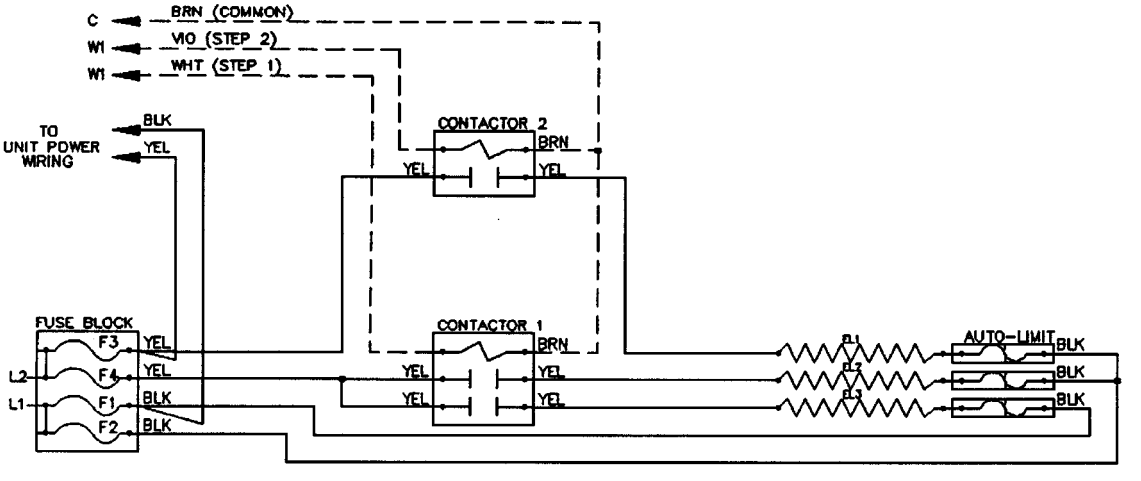


Fig. 14 — Accessory Electric Heater Wiring

PRE-START-UP

⚠ **WARNING:** Failure to observe the following warnings could result in serious personal injury:

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 all pressure from both high- and low-pressure sides of the system before touching or disturbing anything inside terminal box if refrigerant leak is suspected around compressor terminals. Use accepted methods to recover refrigerant.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
   a. Shut off electrical power to unit.
   b. Relieve all pressure from system using both high- and low-pressure ports. Use accepted methods to recover refrigerant.
   c. Cut component connecting tubing with tubing cutter and remove component from unit.
   d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

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

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.

   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, or liquid-soap solution. If a refrigerant leak is detected, see following Check for Refrigerant Leaks section.

   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.
3. Verify the following conditions:

   a. Make sure that outdoor-fan blade is correctly positioned in fan orifice. Top edge of blade should be 3.125 in. down from condenser outlet grille. See Condenser Fan section on page 17.

   b. Make sure that air filter is in place.

   c. Make sure that condensate drain pan and trap are filled with water to ensure proper drainage.

   d. Make sure that all tools and miscellaneous loose parts have been removed.

START-UP

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

I. CHECK FOR REFRIGERANT LEAKS

Locate and repair refrigerant leaks and charge the unit as follows:

1. Using both high- and low-pressure ports, locate leaks and reclaim remaining refrigerant to relieve system pressure.
2. Repair leak following accepted practices.

NOTE: Install a 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-22 refrigerant, using a volumetric-charging cylinder or accurate scale. *Refer to unit rating plate for required charge.* Be sure to add extra refrigerant to compensate for internal volume of field-installed filter drier.

II. START-UP COOLING SECTION AND MAKE ADJUSTMENTS

⚠ **CAUTION:** Complete the required procedures given in the Pre-Start-Up section this page 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.

Do not rapid-cycle the compressor. Allow 5 minutes between "on" cycles to prevent compressor damage.

A. 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.
3. When using an automatic changeover room thermostat, place both SYSTEM and FAN switches in AUTO. positions. Observe that unit operates in Cooling mode when temperature control is set to "call for cooling" (below room temperature).

III. REFRIGERANT CHARGE

Amount of refrigerant charge is listed on unit nameplate (also refer to Table 1).

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

A. No Charge

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to Table 1).

B. Low Charge Cooling

Use Cooling Charging Charts, Fig. 15-20. Vary refrigerant until the conditions of the appropriate chart are met. Note that charging charts are different from the type normally used. Charts are based on charging the units to the correct superheat for the various operating conditions. Accurate pressure gage and temperature sensing device are required.

To measure suction pressure, perform the following:

1. Connect the pressure gage to the service port on the suction line.
2. Mount the temperature sensing device on the suction line and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air cfm must be within the normal operating range of the unit.

C. To Use Cooling Charging Charts

1. Take the outdoor ambient temperature and read the suction pressure gage.
2. Refer to appropriate chart to determine what the suction temperature should be.
3. If suction temperature is high, add refrigerant. If suction temperature is low, carefully recover some of the charge.
4. Recheck the suction pressure as charge is adjusted.

EXAMPLE: (Fig. 15)

Outdoor Temperature ..... 85 F
Suction Pressure ..... 80 psig
Suction Temperature should be ..... 70 F
(Suction Temperature may vary ± 5° F.)

If Chargemaster® charging device is used, temperature and pressure readings must be accomplished using the charging chart.

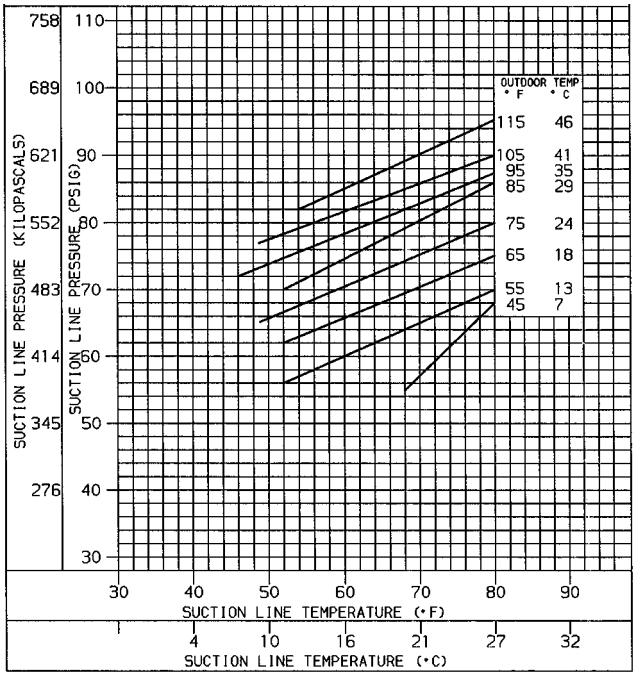


Fig. 15 — Cooling Charging Chart — PA1Z024

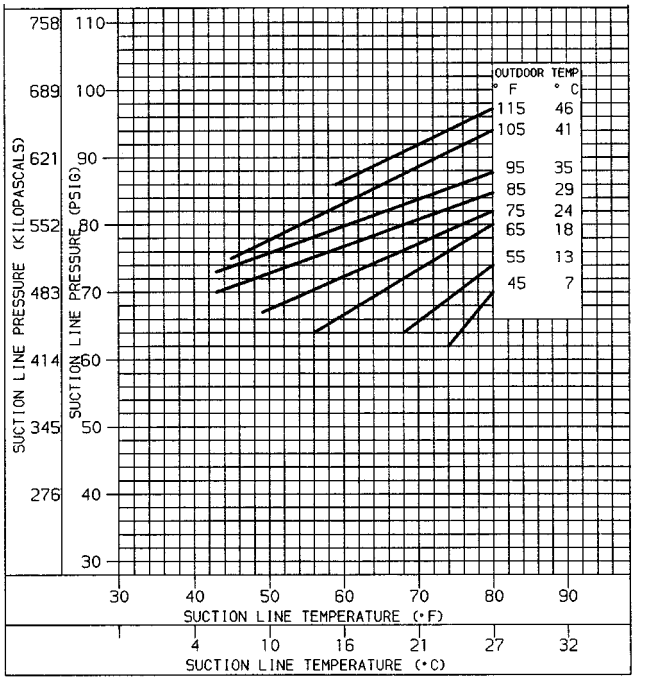


Fig. 16 — Cooling Charging Chart — PA1Z030

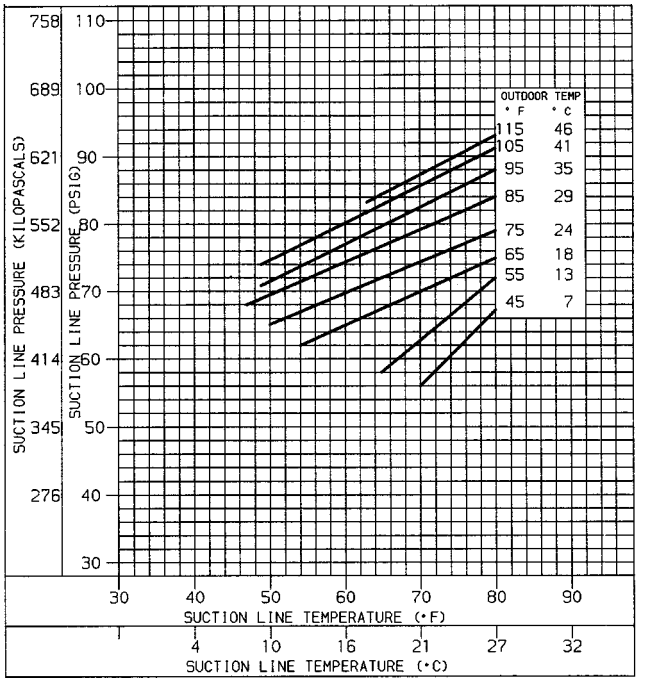


Fig. 17 — Cooling Charging Chart — PA1Z036

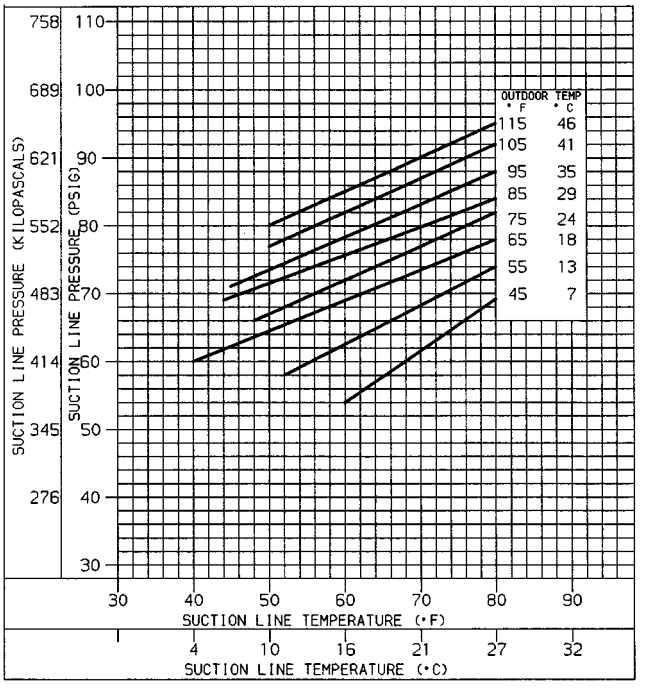


Fig. 18 — Cooling Charging Chart — PA1Z042

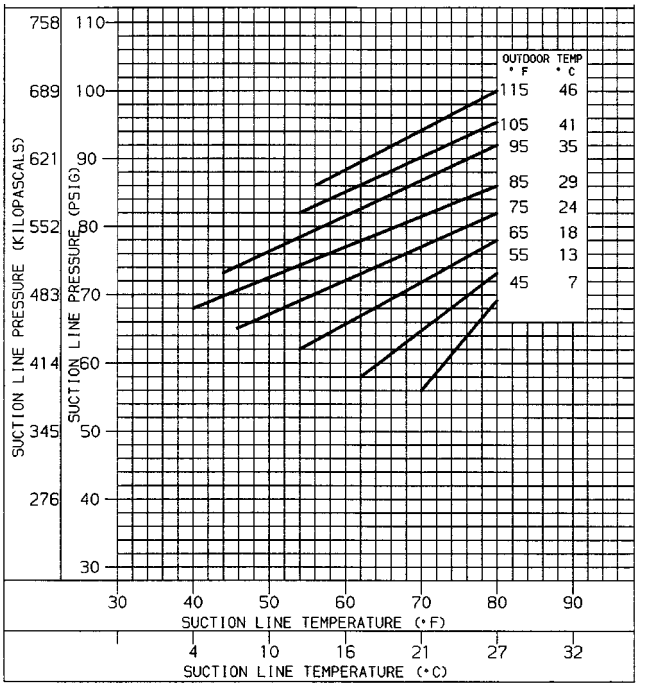


Fig. 19 — Cooling Charging Chart — PA1Z048

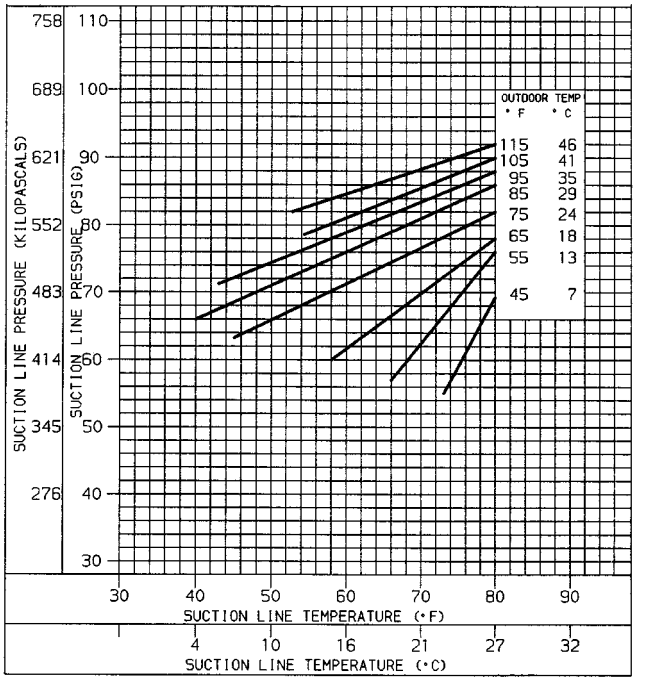


Fig. 20 — Cooling Charging Chart — PA1Z060

IV. INDOOR AIRFLOW AND AIRFLOW ADJUSTMENTS

⚠ **CAUTION:** For cooling operation, the recommended airflow is 350 to 450 cfm per each 12,000 Btuh of rated cooling capacity.

Table 4 shows dry coil air delivery for horizontal discharge units. Tables 5-7 show pressure drops.

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

⚠ **WARNING:** Disconnect electrical power to the unit before changing blower speed. Electrical shock can cause personal injury or death.

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

Units PA1Z024,036,048, and 060 blower motors are factory wired for low speed operation. Units PA1Z030 and 042 are factory wired for medium speed operation.

A. For 208/230-V Blower Motors:

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, remove the fan motor speed leg lead from the indoor (evaporator) fan relay (IFR) and replace with lead for desired blower motor speed. *Insulate the removed lead to avoid contact with chassis parts.*

B. For 460-V Blower Motors:

The motor leads are color coded as follows:

2-SPEED

black = to purple
yellow = line
purple = to black
red = line

To change the speed of the blower motor from low speed to high speed, remove the red lead from the indoor-fan relay (IFR). Insulate the red lead to avoid contact with any chassis parts. Separate the black lead from the purple lead. Connect the black lead to the IFR. Insulate the purple lead to avoid contact with any chassis parts.

V. UNIT CONTROLS

All compressors have the following internal-protection controls.

A. High-Pressure Relief Valve

This valve opens when the pressure differential between the low and high side becomes excessive.

B. Compressor Overload

This overload interrupts power to the compressor when either the current or internal temperature become excessive, and automatically resets when the internal temperature drops to a safe level.

This overload may require up to 60 minutes (or longer) to reset; therefore, if the internal overload is suspected of being open, disconnect the electrical power to the unit and check the circuit through the overload with an ohmmeter or continuity tester.

VI. SEQUENCE OF OPERATION

A. Fan Operation

The FAN switch on the thermostat controls indoor fan operation. When the FAN switch is placed in the ON position, the IFR (indoor-fan relay) is energized through the G terminal on the thermostat. The normally-open contacts close, which then provide power to the indoor (evaporator) fan motor (IFM). The IFM will run continuously when the FAN switch is set to ON.

When the FAN switch is set to AUTO, the thermostat deenergizes the IFR (provided there is not a call for cooling). The contacts open and the IFM is deenergized. The IFM will be energized only when there is a call for cooling, or if the unit is equipped with accessory electric heat, the indoor-fan motor will also run while he accessory electric heat is energized.

NOTE: PA1Z030 and 060 units are equipped with a time-delay relay. On these units, the indoor fan remains on for 30 seconds after G or Y is deenergized.

B. Cooling

On a call for cooling, the compressor contactor (C) and the IFR are energized through the Y and G terminals of the thermostat. On units with a compressor time-delay relay, there is a 5-minute (± 45 sec) delay between compressor starts. Energizing the compressor contactor supplies power to the compressor and the outdoor (condenser) fan motor (OFM). Energizing the IFR provides power to the IFM. When the need for cooling has been satisfied, the OFM, compressor, and IFM (FAN on AUTO) are deenergized. If the unit is equipped with a 30-second delay, the indoor fan will remain energized for 30 seconds after the compressor is deenergized (030 and 060 units only).

C. Heating

If accessory electric heaters are installed, on a call for heat the thermostat energized the W relay which energizes the electric heaters. The IFR is energized which starts the indoor-fan motor. If the heaters are staged, W2 is energized when the second stage of heating is required. When the need for heating is satisfied, the heater and IFM are deenergized.

MAINTENANCE

To ensure continuing high performance, and to reduce the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This cooling unit should be inspected at least once each year by a qualified service person. To troubleshoot cooling of units, refer to Troubleshooting chart in back of 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 PERSONAL INJURY AND POSSIBLE DAMAGE TO THIS EQUIPMENT.

Table 4 — Dry Coil Air Delivery* — Horizontal Discharge
(Deduct 10% for 208 Volt Operation)

UNIT PA1Z	MOTOR SPEED	AIR DELIVERY	230 AND 460 VOLT HORIZONTAL DISCHARGE								
			External Static Pressure (in. wg)								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
024	Low	Watts	288	285	282	279	274	268	261	—	—
		CFM	875	820	802	734	668	582	478	—	—
	Med	Watts	390	383	378	369	360	350	340	—	—
		CFM	1131	1090	1038	978	917	830	721	—	—
	High	Watts	528	520	510	495	480	460	450	—	—
		CFM	1391	1338	1285	1200	1115	1018	920	—	—
030	Low	Watts	288	285	282	279	274	268	261	—	—
		CFM	875	820	802	734	668	582	478	—	—
	Med	Watts	390	383	378	369	360	350	340	—	—
		CFM	1131	1090	1038	978	917	830	721	—	—
	High	Watts	528	520	510	495	480	460	450	—	—
		CFM	1891	1338	1285	1200	1115	1018	920	—	—
036	Low	Watts	450	435	420	400	380	335	326	311	—
		CFM	1231	1218	1204	1120	1008	950	863	751	—
	Med	Watts	470	450	445	410	388	359	338	321	—
		CFM	1302	1264	1205	1163	1081	940	873	783	—
	High	Watts	660	635	610	575	540	505	485	460	—
		CFM	1700	1660	1581	1450	1297	1190	1095	989	—
042	Low	Watts	478	458	440	411	378	350	327	317	—
		CFM	1303	1270	1224	1179	1126	1022	911	816	—
	Med	Watts	481	468	450	438	404	370	338	320	—
		CFM	1310	1280	1241	1181	1110	1022	943	811	—
	High	Watts	—	798	678	647	618	578	540	500	460
		CFM	—	1736	1688	1618	1510	1421	1309	1187	1060
048	Low	Watts	—	—	801	760	730	688	650	600	570
		CFM	—	—	1898	1841	1757	1682	1564	1429	1365
	High	Watts	—	—	870	842	818	782	696	632	628
		CFM	—	—	2000	1903	1799	1718	1625	1446	1333
060†	Low	Watts	890	850	810	790	735	680	580	480	422
		CFM	1834	1820	1791	1762	1703	1640	1415	1159	950
	Med	Watts	1040	1018	1000	950	890	835	790	650	580
		CFM	2230	2102	2025	1960	1901	1855	1752	1468	1121
	High	Watts	1073	1038	1001	958	896	840	800	691	575
		CFM	2230	2202	2160	2122	2052	1926	1791	1588	1202

*Air delivery values are based on operating voltage of 230 v or 460 v, dry coil, without filter or electric heater. Deduct wet coil, filter, and electric heater pressure drops to obtain external static pressure available for ducting. See Tables 5-7.
†460-v motors have 2 speeds (size 060 only).

NOTES:
1. Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Evaporator-coil frosting may occur at airflows below this point.
2. Dashes indicate portions of the table that are beyond the blower motor capacity or are not recommended.

Table 5 — Wet Coil Pressure Drop

UNIT SIZE PA1Z	AIRFLOW (cfm)	PRESSURE DROP (in. wg)
024	600	0.02
	700	0.05
	800	0.06
	900	0.07
030	900	0.06
	1000	0.06
	1200	0.08
036	1000	0.07
	1200	0.09
	1400	0.11
	1600	0.12
042	1000	0.04
	1200	0.06
	1400	0.08
	1600	0.09
048	1400	0.07
	1600	0.08
	1800	0.09
060	1700	0.07
	1800	0.08
	2100	0.09
	2300	0.10

Table 6 — Filter Pressure Drop (in. wg)

UNIT SIZE PA1Z	FILTER SIZE (in.)	CFM						
		500	600	700	800	900	1000	1100
024-042	24 × 24	0.06	0.07	0.08	0.08	0.09	0.09	0.09
048,060	24 × 30	—	—	—	—	—	—	—

UNIT SIZE PA1Z	FILTER SIZE (in.)	CFM						
		1200	1300	1400	1500	1600	1700	1800
024-042	24 × 24	0.10	0.11	0.12	0.14	0.15	—	—
048,060	24 × 30	—	0.08	0.09	0.10	0.11	0.12	0.13

UNIT SIZE PA1Z	FILTER SIZE (in.)	CFM				
		1900	2000	2100	2200	2300
024-042	24 × 24	—	—	—	—	—
048,060	24 × 30	0.14	0.15	0.16	0.17	0.18

Table 7 — Accessory Electric Heat Pressure Drop (in. wg)

HEATER kW	CFM				
	600	800	1000	1200	1400
5-20	0.06	0.08	0.10	0.13	0.15

HEATER kW	CFM			
	1600	1800	2000	2200
5-20	0.18	0.20	0.23	0.25

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, outdoor coil, drain pan, and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect blower motor and wheel for cleanliness each 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 cooling season. Service when necessary.
5. Check the drain channel in the top cover periodically for blockage (leaves, insects). Clean as needed.

⚠ **WARNING:** Failure to follow these warnings could result in serious personal injury:

1. 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, personal injury can result from sharp edges.
3. Never place anything combustible either on, or in contact with, the unit.

I. AIR FILTER

⚠ **CAUTION:** Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 1 for recommended filter sizes.

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

Replace filters with the same dimensional size and type as originally provided, when necessary.

II. UNIT TOP REMOVAL (CONDENSER-COIL SIDE)

NOTE: When performing maintenance or service procedures that require removal of the unit top, be sure to perform *all* of the routine maintenance procedures that require top removal, including coil inspection and cleaning, and condensate drain pan inspection and cleaning.

⚠ **WARNING:** Disconnect and tag electrical power to the unit before removing top. Failure to adhere to this warning could cause personal injury or death.

Only qualified service personnel should perform maintenance and service procedures that require unit top removal. Refer to the following top removal procedures:

1. Remove 7 screws on unit top cover surface. (Save all screws.)
2. Remove 2 screws on unit top cover flange. (Save all screws.)
3. Lift top from unit carefully. Set top on edge and make sure that top is supported by unit side that is opposite duct (or plenum) side.
4. Carefully replace and secure unit top to unit, using screws removed in Steps 1 and 2, when maintenance and/or service procedures are completed.

III. EVAPORATOR BLOWER AND MOTOR

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

⚠ **WARNING:** Disconnect and tag electrical power to the unit before cleaning the blower wheel. Failure to adhere to this warning could cause personal injury or death.

To clean the blower wheel:

1. Access the blower assembly as follows:
   a. Remove top access panel.
   b. Remove 3 screws that hold blower orifice ring to blower housing. Save screws.
   c. Loosen setscrew(s) which secure wheel to motor shaft.
2. Remove and clean blower wheel as follows:
   a. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower wheel vanes.
   b. 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 a soft brush attachment. Remove grease and oil with a mild solvent.
   c. Reassemble blower into housing. Place upper orifice ring on blower to judge location of the blower wheel. Blower wheel should be approximately 0.2-in. below bottom of orifice ring when centered correctly. Be sure setscrews are tightened on motor and are not on round part of shaft.
   d. Set upper orifice ring in place with 3 screws removed in Step 1.
   e. Replace top access panel.

IV. CONDENSER COIL, EVAPORATOR COIL, AND CONDENSATE DRAIN PAN

Inspect the condenser coil, evaporator coil, and condensate drain pan at least once each year. Proper inspection and cleaning requires the removal of the unit top. See Unit Top Removal section *on this page.*

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 a 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.

V. 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. Shut off unit power supply.
2. Remove condenser-fan assembly (grille, motor, motor cover, and fan) by removing screws and flipping assembly onto unit top cover.
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in Fig. 21.
5. Tighten setscrews.
6. Replace condenser-fan assembly.

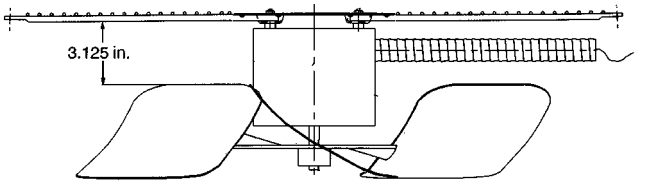


Fig. 21 — Condenser-Fan Adjustment

VI. ELECTRICAL CONTROLS AND WIRING

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

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

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

NOTE: Refer to the Sequence of Operation section on page 14, as an aid in determining proper control operation.

VII. 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, or liquid-soap solution. If a refrigerant leak is detected, refer to Check for Refrigerant Leaks section on page 11.

If no refrigerant leaks are found and low cooling performance is suspected, refer to Refrigerant Charge section on page 11.

VIII. EVAPORATOR AIRFLOW

The 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 14 to check the system airflow.

IX. METERING DEVICES

Refrigerant metering devices are fixed orifices and are located in the inlet header to the evaporator coil.

X. LIQUID LINE STRAINER

The liquid line strainer (to protect metering device) is made of wire mesh and is located in the liquid line on the inlet side of the metering device.

TROUBLESHOOTING COOLING CHART

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, or control relay	Replace component.
	Insufficient line voltage	Determine cause and correct.
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly.
	Thermostat setting too high	Lower thermostat setting below room temperature.
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, or start relay	Determine cause and replace.
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker. Determine cause.
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. Check for other evaporator coil obstructions.
	Temperature too low in conditioned area	Reset thermostat.
	Outdoor ambient below 40 F	Install low-ambient kit.
	Field-installed filter-drier restricted	Replace.

Copyright 1997 Carrier Corporation

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

☐ 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 FAN AMPS _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB

RETURN-AIR TEMPERATURE _____ DB _____ WB

COOLING SUPPLY AIR _____

PRESSURES

REFRIGERANT SUCTION _____ PSIG

REFRIGERANT DISCHARGE _____ PSIG

☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGES 12 AND 13

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

Copyright 1997 Carrier Corporation