Carrier®
HEATING & COOLING

50HS018-060
Single-Package Heat Pump Units

Installation, Start-Up and Service Instructions

CONTENTS

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.

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.

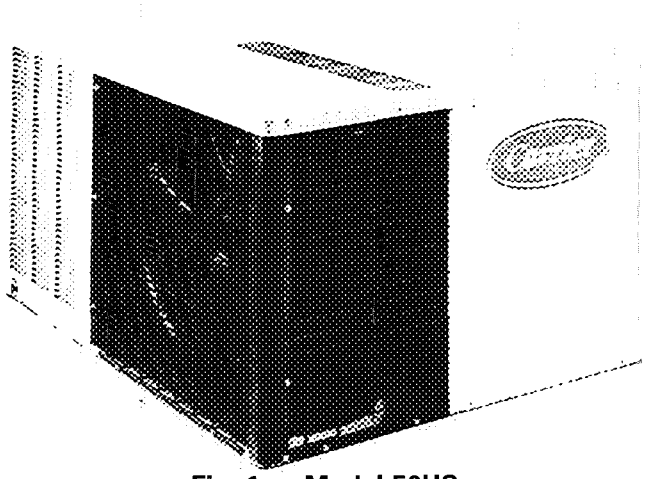


Fig. 1 — Model 50HS

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.

⚠ 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.

General — 50HS heat pumps are fully self-contained and designed for outdoor installation. See Fig. 1. As shown in Fig. 2 and 3, all units are shipped in a horizontal-discharge configuration for installation on a ground-level slab. All units can be converted to downflow discharge configurations for rooftop applications. See Fig. 4 for roof curb dimensions.

RECEIVING AND INSTALLATION

Step 1 — Check Equipment

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

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

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

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

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WT		CORNER WT Lb/Kg				UNIT HEIGHT in./mm
		Lb	Kg	A	B	C	D	E
50HS018	208/230-1-60	233	106	62/28	41/19	91/41	39/18	24 12/613
50HS024	208/230-1-60	256	117	68/31	46/21	97/44	45/20	24.12/613
50HS030	208/230-1-60, 208/230-3-60	268	122	66/30	58/26	91/41	53/24	24 12/613
50HS036	208/230-1-60, 208/230-3-60, 460-3-60	288	131	71/32	63/29	96/44	58/26	28.12/714
50HS042	208/230-1-60, 208/230-3-60, 460-3-60	295	134	73/33	65/30	97/44	60/27	28 12/714

UNIT	CENTER OF GRAVITY in./mm		
	X	Y	Z
50HS018	20 66/525	19.18/487	10 63/270
50HS024	20 37/517	19 32/419	10 63/270
50HS030	20.27/515	20.07/510	10 63/270
50HS036	20 13/511	20 19/513	12.38/314
50HS042	20 02/509	20 30/516	12 38/314

REQ'D CLEARANCES TO COMBUSTIBLE MATL, in. (mm)

Unit Top	0
Duct Side of Unit	0
Side Opposite Ducts	0
Bottom of Unit	0
Vertical Discharge Units, First 12 in (304.8) of Supply Duct	1 (25)

REQ'D CLEARANCES FOR SERVICING, in. (mm)

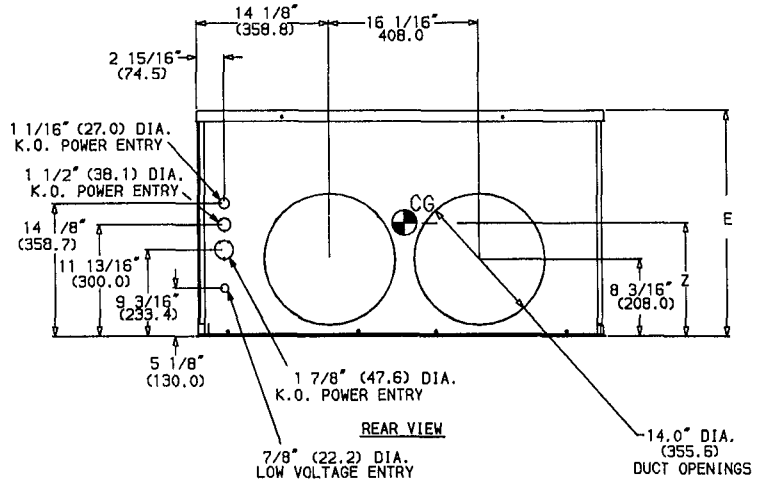
Unit Top	36 (914)
Side Opposite Ducts	30 (762)
Indoor Coil Access Side	30 (762)
Control Box Access Side (Except for NEC requirements)	30 (762)

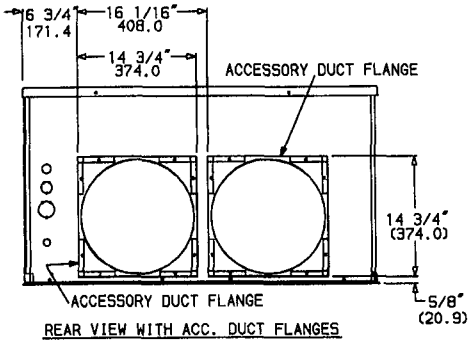
NEC REQ'D CLEARANCES, in. (mm)

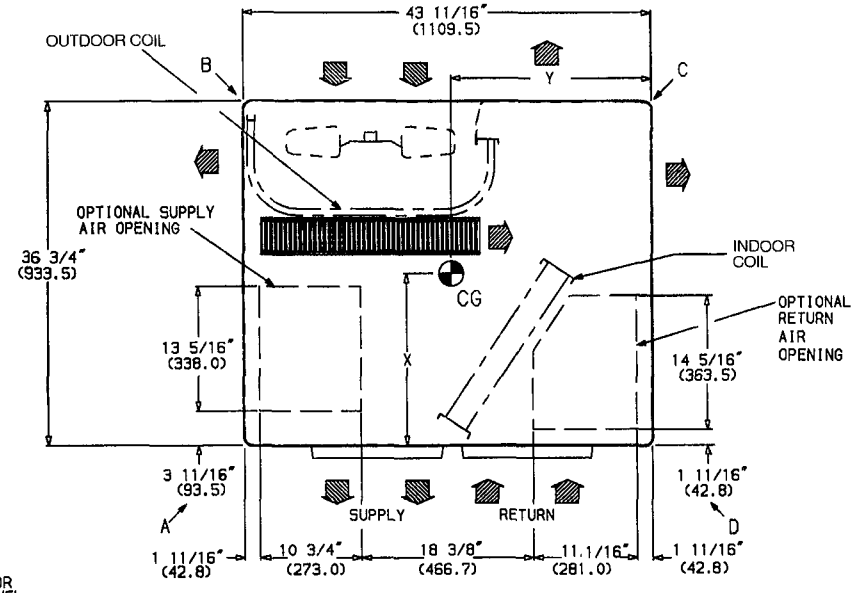
Between Units, Control Box Side	42 (1066)
Unit and Ungrounded Surfaces, Control Box Side	36 (914)
Unit and Block or Concrete Walls and Other Grounded Surfaces, Control Box Side	42 (1066)

NOTE: Clearances must be maintained to prevent recirculation of air from outdoor fan discharge. A removable fence or barricade requires no clearance.

NEC — National Electrical Code







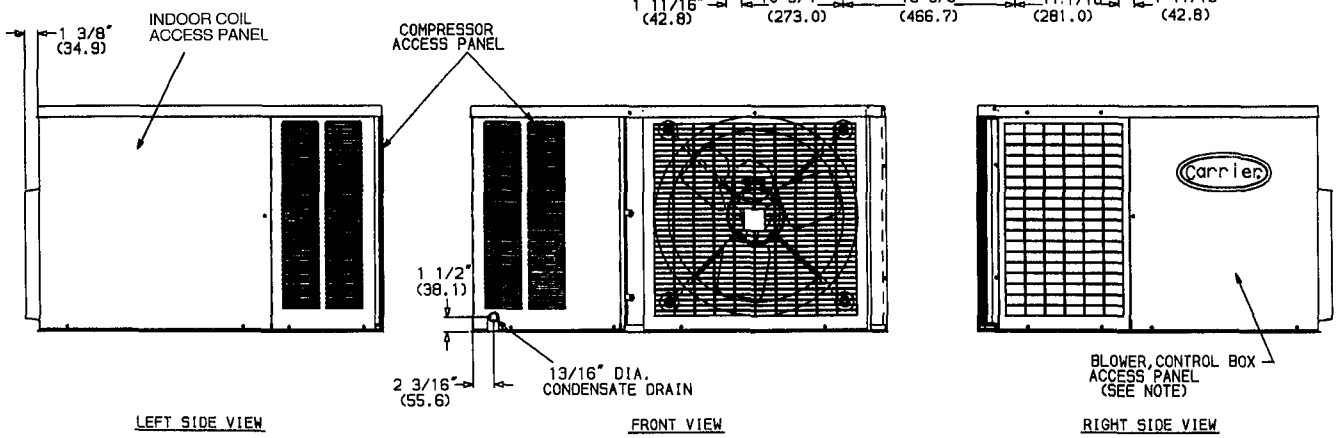


Fig. 2 — Dimensions; Sizes 018-042

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WT		CORNER WT Lb/Kg			
		Lb	Kg	A	B	C	D
50HS048	208/230-1-60, 208/230-3-60, 460-3-60	359	163	89/40	81/37	113/51	76/35
50HS060	208/230-1-60, 208/230-3-60, 460-3-60	373	170	92/42	85/39	116/53	80/36

UNIT	CENTER OF GRAVITY in./mm		
	X	Y	Z
50HS048	19.70/500	20 54/522	15 00/381
50HS060	19.65/499	20 59/523	15 00/381

REQ'D CLEARANCES TO COMBUSTIBLE MATL. in. (mm)

Unit Top	0
Duct Side of Unit	0
Side Opposite Ducts	0
Bottom of Unit	0
Vertical Discharge Units, First 12 in (304 8) of Supply Duct	1 (25)

REQ'D CLEARANCES FOR SERVICING, in. (mm)

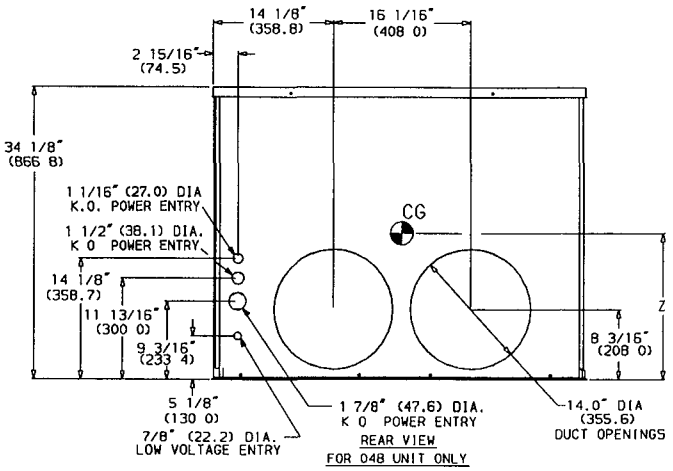
Unit Top	36 (914)
Side Opposite Ducts	30 (762)
Evap Coil Access Side	30 (762)
Control Box Access Side (Except for NEC requirements)	30 (762)

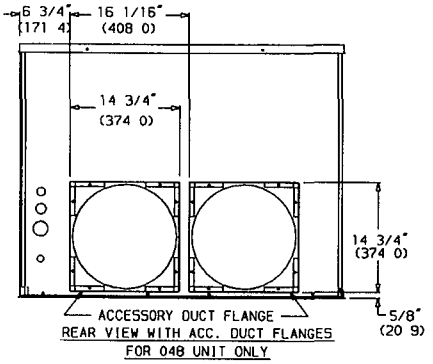
NEC REQ'D CLEARANCES, in. (mm)

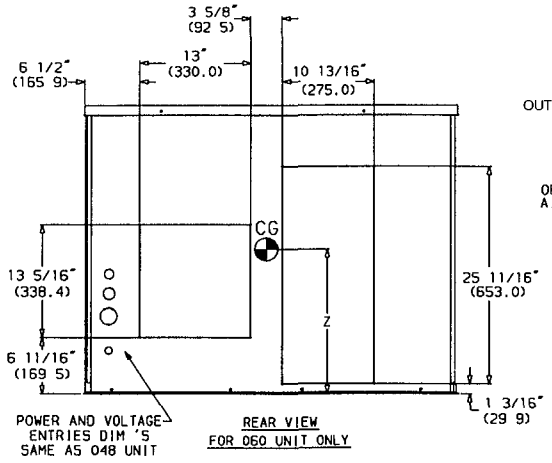
Between Units, Control Box Side	42 (1066)
Unit and Ungrounded Surfaces, Control Box Side	36 (914)
Unit and Block or Concrete Walls and Other Grounded Surfaces, Control Box Side	42 (1066)

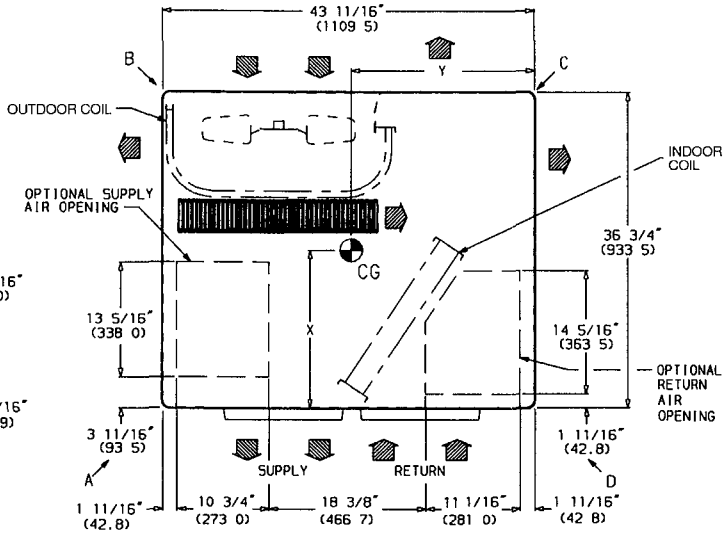
NOTE: Clearances must be maintained to prevent recirculation of air from outdoor fan discharge A removable fence or barricade requires no clearance

NEC — National Electrical Code









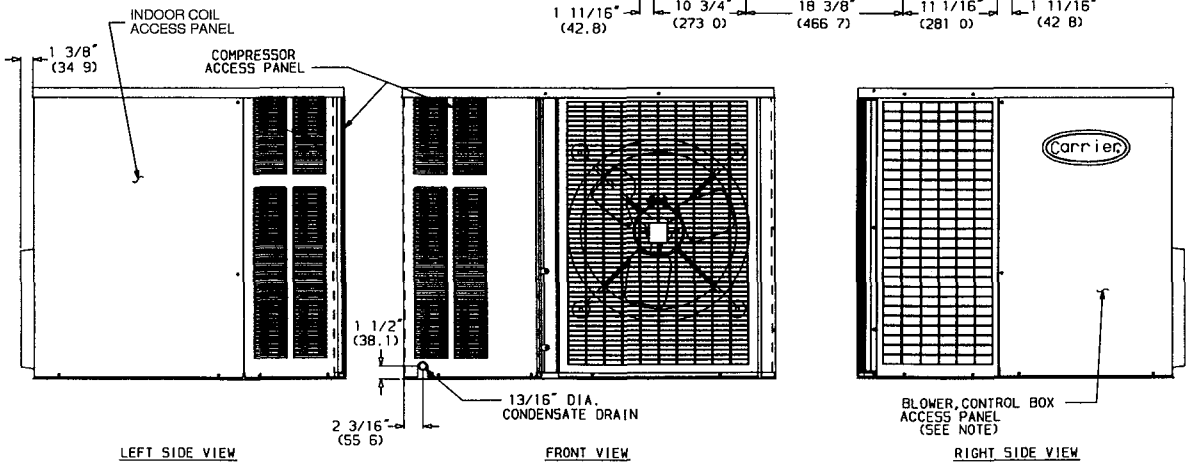
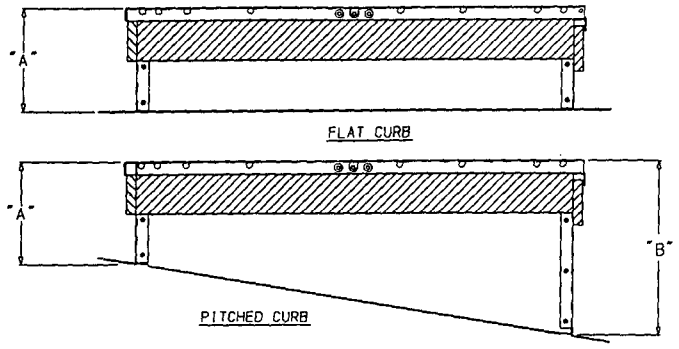
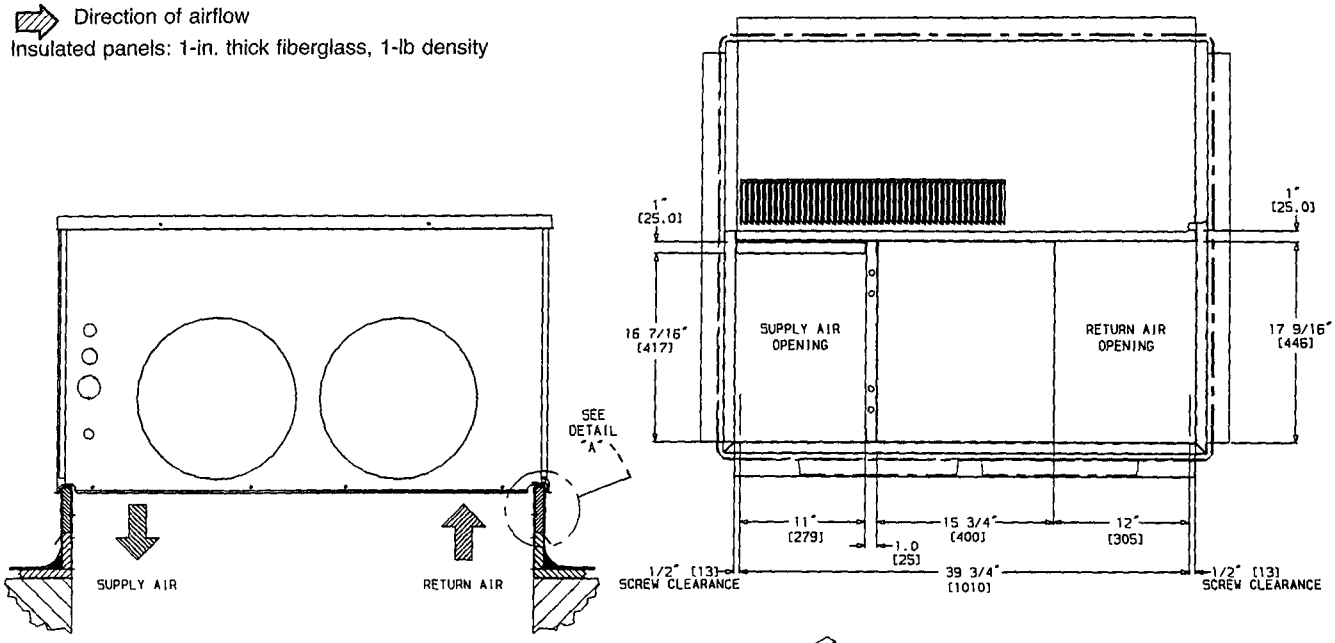


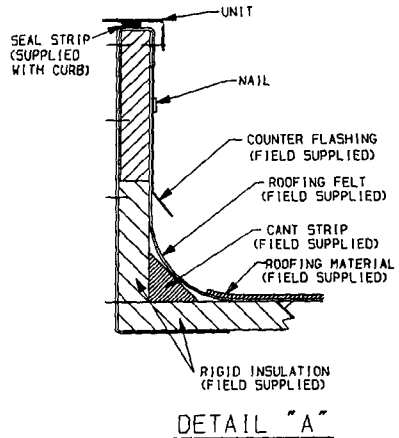
Fig. 3 — Dimensions; Sizes 048, 060

	PART NUMBER	"A"	"B"	PITCH
FLAT	50HS900015	8" [203]	—	—
	50HS900016	11" [279]	—	—
	50HS900017	14" [356]	—	—
PITCHED	50HS900019	8" [203]	10⅞" [276]	1:12
	50HS900020	8" [203]	13⁹⁄₁₆" [344]	2:12
	50HS900021	8" [203]	16⅜" [416]	3:12
	50HS900022	8" [203]	19¼" [489]	4:12
	50HS900023	8" [203]	22⅜" [568]	5:12
	50HS900024	8" [203]	25⅝" [651]	6:12

NOTES:
1. Roof curb must be set up for unit being installed
2. Seal strip must be applied as required for unit being installed
3. Dimensions in [ ] are in millimeters.
4. Roof curb is made of 16 gage steel.
5. Attach ductwork to curb (flanges of duct rest on curb)
6. Service clearance 4 ft on each side.
7. Direction of airflow
8. Insulated panels: 1-in. thick fiberglass, 1-lb density







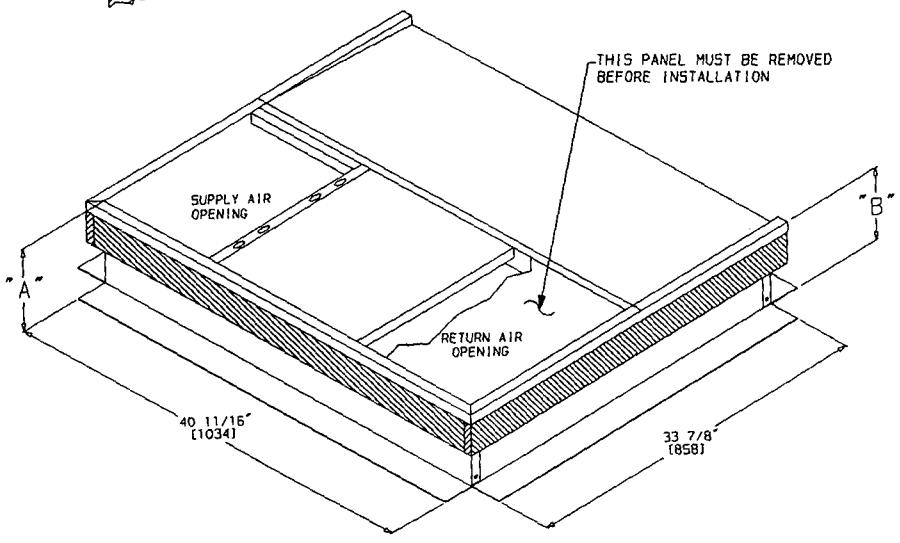


Fig. 4 — Roof Curb Dimensions

Step 2 — Provide Unit Support

ROOF CURB — Install accessory roof curb in accordance with instructions shipped with curb. See Fig. 4. 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 also can result in air leaks and poor unit performance.

Curb should be level to within ¼ inch. This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required.

SLAB MOUNT — Place the unit on a solid, level concrete pad that is a minimum of 4 in. thick with 2 in. above grade. The slab should extend approximately 2 in. beyond the casing on all 4 sides of the unit. Install a 6-in. gravel apron in front of outdoor coil air inlet to prevent obstruction of airflow by grass or shrubs. Do not secure the unit to the slab *except* when required by local codes. In areas where prolonged subfreezing temperatures or snowfall occur, increase clearance to 12 to 18 in. by constructing an angle-iron frame to support unit. See Fig. 5 for recommended frame construction. Alternate construction should follow dimensions provided in Fig. 5.

Step 3 — Provide Clearances —

The required minimum service clearances and clearances to combustibles are shown in Fig. 2 and 3. Adequate ventilation and outdoor air must be provided.

The outdoor fan pushes air through the outdoor coil and discharges it through louvers on the top cover, the decorative grille, and the compressor access panel. Be sure that the fan discharge does not recirculate to the outdoor 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 outdoor airflow. An air restriction at either the outdoor-air inlet or the fan discharge can be detrimental to compressor life.

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.

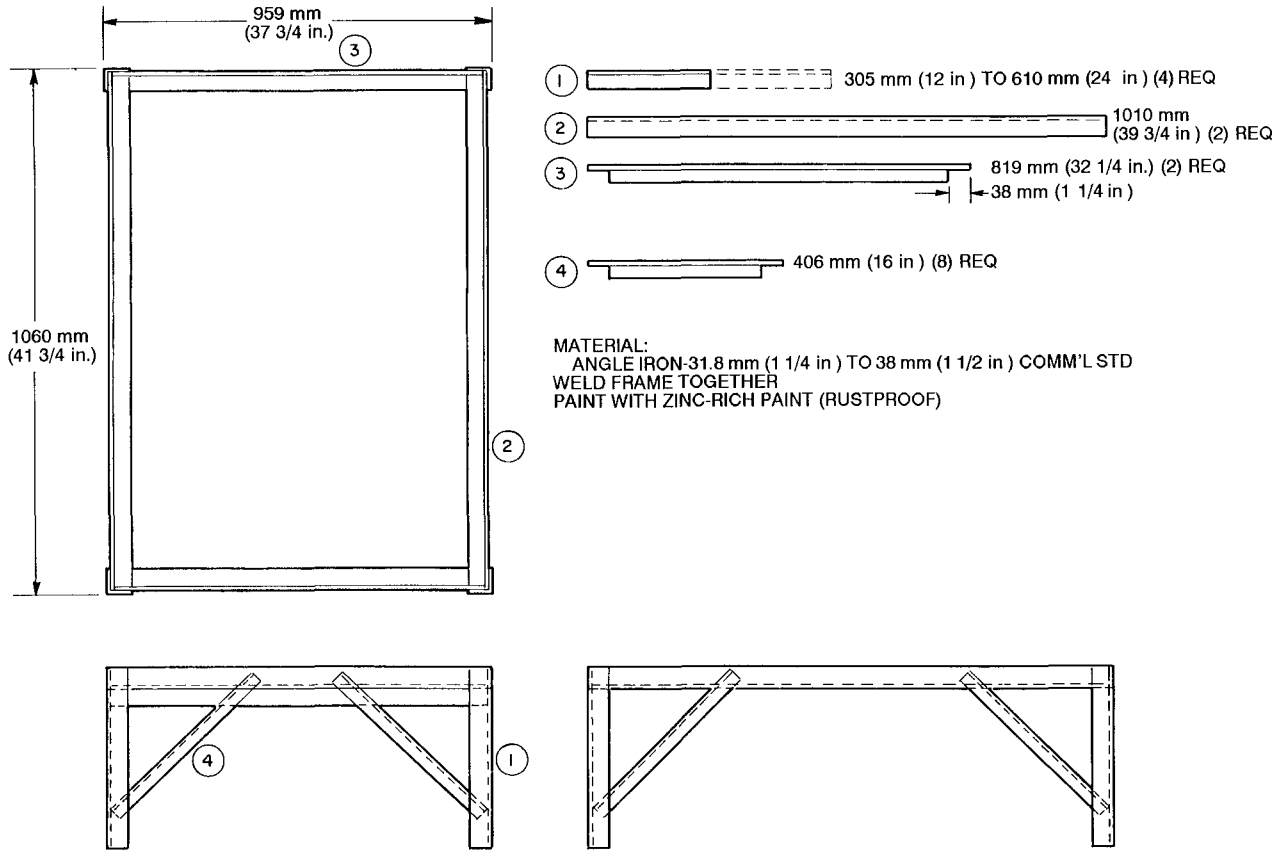


Fig. 5 — Heat Pump Mounting Frame

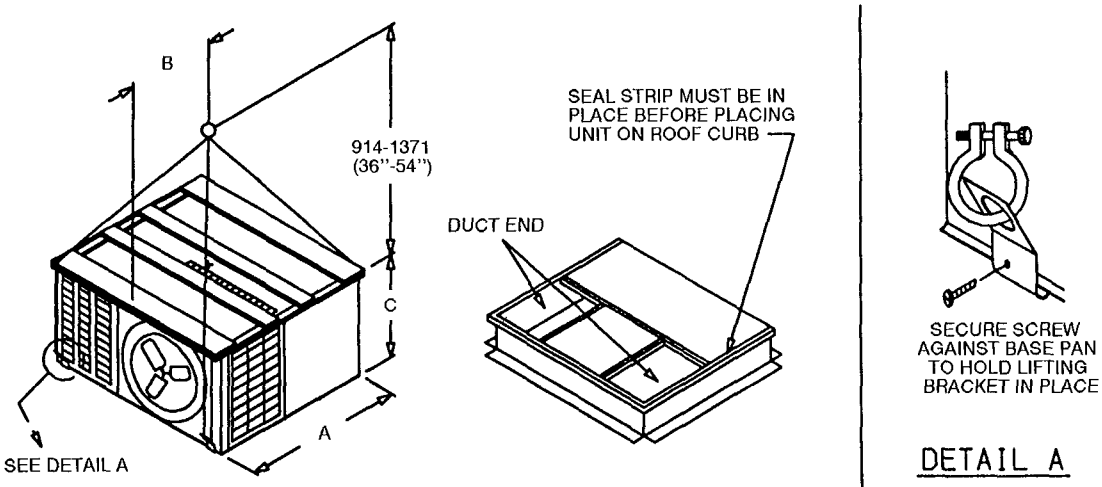
Step 4 — Rig and Place Unit — Use spreader bars or crate top when rigging the unit. The units must be rigged for lifting as shown in Fig. 6. Refer to Fig. 6 for rigging weights and Table 1 for operating weights. *Use extreme caution to prevent damage when moving the unit. Unit must remain in an upright position during all rigging and moving operations.* The unit must be level for proper condensate drainage; the ground-level pad or accessory roof curb 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.

ACCESSORY RIGGING BRACKETS — If accessory rigging brackets are to be used for rigging, install them as follows:

1. Position brackets as close to the corners of unit as possible. Be sure brackets are well outside of center of gravity. (See Fig. 2, 3, and 6.)
2. Position paint protectors and foam strips between screws and painted surface of unit. Tighten screws until they make contact with the paint protectors.
3. Secure device or hook of sufficient strength to hole in bracket as shown in detail "A" of Fig. 6.
4. If wood top is available, use it for a spreader bar to prevent straps from damaging unit. If wood top is not available, use spreader bars of sufficient length.

⚠ WARNING

Secure screws and paint protectors solidly against unit basepan to hold lifting brackets in position.
Never use lifting brackets when the temperature is below -10 F (-23 C).
Never exceed 200 lbs per bracket of lifting force.
Never use lifting brackets for lifting other models of air conditioning units.
Lifting point should be directly over the unit center of gravity



UNIT SIZE	SHIPPING WEIGHT		A		B		C	
	Lb	Kg	in.	mm	in.	mm	in.	mm
018	300	129	36¾	934	17¼	439	24⅛	613
024	308	140	36¾	934	16⅛	409	24⅛	613
030	320	145	36¾	934	16⅛	411	24⅛	613
036	340	154	36¾	934	16¼	415	28⅛	714

UNIT SIZE	SHIPPING WEIGHT		A		B		C	
	Lb	Kg	in.	mm	in.	mm	in.	mm
042	347	157	36¾	934	16½	417	28⅛	714
048	411	186	36¾	934	16¾	426	34⅛	867
060	425	193	36¾	934	16¾	427	34⅛	867

Fig. 6 — Suggested Rigging

Table 1 – Physical Data

UNIT 50HS	018	024	030	036	042	048	060
REFRIGERANT Refrigerant Control*	R-22 Acutrol™ System						
SHIPPING WEIGHT (lb)	300	308	320	340	347	411	425
COMPRESSOR Type	Reciprocating	Reciprocating	Reciprocating	Reciprocating	Reciprocating	Scroll	Scroll
INDOOR FAN	Centrifugal – Direct Drive						
Speeds	2	3	3	3	2	2	2
Rpm (High Speed)	825	1025	1025	1100	1100	1100	1100
Diameter (in.)	10	10	10	10	10	10	10
Width (in.)	9	9	9	9	9	10	10
Nominal Airflow (Cfm)	675	800	1000	1300	1400	1600	1995
Motor Hp	¼	⅓	⅓	½	¾	¾	1
INDOOR COIL							
Rows...Fins/in.	3.. 15	3. .15	3 .15	3. .15	3 15	3 ..15	4 ..15
Face Area (sq ft)	1 83	2.29	3.06	2 7	3.6	4 5	4.5
OUTDOOR FAN	Propeller – Direct Drive						
Cfm	1700	1900	1900	1900	1900	2400	2400
Rpm	850	1050	850	1050	1050	1050	1050
Diameter (in.)	18	18	18	18	20	20	20
Motor Hp	⅛	¼	¼	¼	¼	⅓	⅓
OUTDOOR COIL							
Rows...Fins/in.	2.. 17	2. .17	2 17	2.. 17	2 17	2 .17	2 17
Face Area (sq ft)	5.7	5.7	5 7	6 7	6 7	8.2	8.2
FILTER SIZE (in.)† Throwaway	20x20	20x20	20x24	24x24	24x24	24x30	24x30

*Operating charge listed on unit nameplate
†Recommended field-supplied filters are 1 in. thick

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.

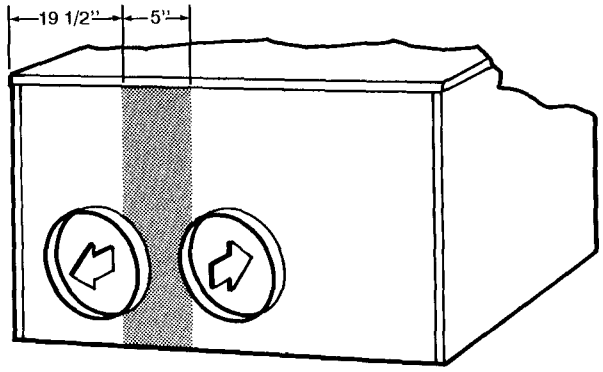
Select and size ductwork, supply-air registers and return-air grilles according to ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) recommendations.

The unit has duct flanges on the supply- and return-air openings on the side of the unit. See Fig. 2 and 3 for connection sizes and locations.

When designing and installing ductwork, consider the following:

⚠ CAUTION

When connecting ductwork to units, do not drill deeper than ½ inch in shaded area shown below or coil may be damaged.



- All units should have field-supplied filters or accessory filter rack installed in the return-air side of the unit. Recommended sizes for filters are shown in Table 1.
- 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. When electric heat is installed, use fireproof canvas (or similar heat resistant material) connector between ductwork and unit discharge connection. If flexible duct is used, insert a sheet metal sleeve inside duct. Heat resistant duct connector (or sheet metal sleeve) must extend 24-in. from electric heater element.

- 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.
- 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 7 shows a typical duct system with 50HS installed.

Table 2 – Minimum Airflow for Safe Electric Heater Operation

SIZE	018	024	030	036	042	048	060
HORIZONTAL DISCHARGE	700	700	875	1050	1225	1400	1750
VERTICAL DISCHARGE	700	700	875	1100	1225	1400	1750

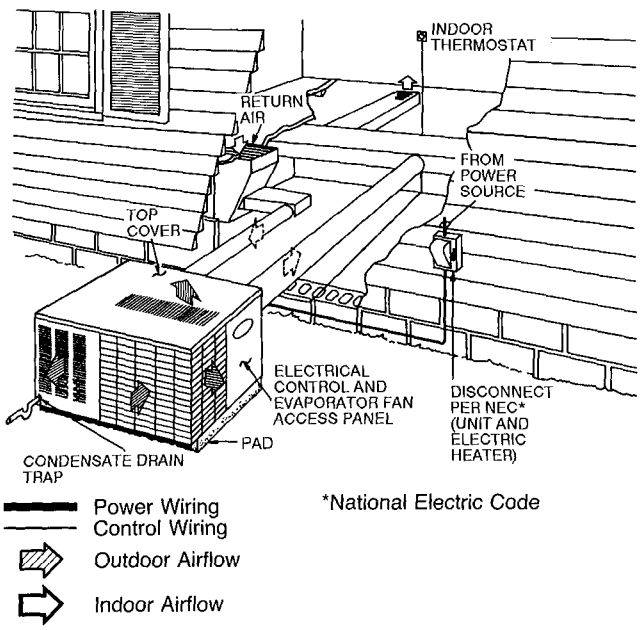


Fig. 7 — Typical Installation

CONVERTING HORIZONTAL DISCHARGE UNITS TO DOWNFLOW (VERTICAL) DISCHARGE — 50HS units are shipped in a horizontal configuration. To convert a horizontal unit for downflow (vertical) discharge, perform the following steps:

⚠ 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.

1. Open all electrical disconnects before starting any service work.
2. Remove indoor coil access panel (Fig. 8). Save screws.
3. Locate lances in basepan insulation that are placed over the perimeter of the vertical duct opening cover (Fig. 9).
4. Using a straight edge and shop knife, cut and remove the insulation around the perimeter of the cover. Remove the screws securing the cover to the basepan and slide out the cover. Discard the cover (Fig. 10).
5. Remove indoor blower access panel (Fig. 11). Save screws.
6. Disconnect indoor-fan motor leads from indoor-fan relay and unit contactor. Carefully disengage wire tie containing indoor-fan motor leads from the unit control box (Fig. 12).
7. Remove screws (Fig. 13) securing indoor blower housing to blower shelf and carefully slide out blower housing. On sizes 018-042 there is a filler bracket attached to the blower shelf; remove this filler bracket and retain for later use.
8. Locate lances in basepan insulation that are placed over the perimeter of the vertical discharge opening cover (Fig. 14).
9. Using a straight edge and sharp knife, cut the insulation around the perimeter of the cover. Remove the screws securing the cover to the basepan and slide out the cover (Fig. 15). Discard the cover. Install filler bracket removed in Step 7, if any.
10. If unit ductwork is to be attached to vertical opening flanges on the unit basepan (jackstand applications only), do so at this time.
11. It is recommended that the basepan insulation around the perimeter of the vertical opening be secured to the basepan with aluminum tape to prevent the insulation from tearing or bunching up when the blower housing is installed in the vertical discharge position.
12. Orient blower housing for vertical airflow (blower motor adjacent to horizontal duct opening) and slide into vertical opening making sure the flanges on the blower side plates engage the tabs in the unit basepan.

    Resistance will be felt as the blower housing contacts the basepan insulation; this can be overcome by applying a slight force to the base of the blower. Continue sliding blower in until hole in side plate flange aligns with the hole in the basepan.

    Secure using screw removed in Step 7 Reconnect indoor-fan motor leads and insert wire tie back into unit control box (Fig. 12).
13. Cover the horizontal duct openings. Duct covers can be ordered as an accessory or be field-fabricated as shown in Fig. 16.
14. Reinstall the indoor coil and indoor blower access panels.
15. After completing unit installation, perform all safety checks and power up unit.

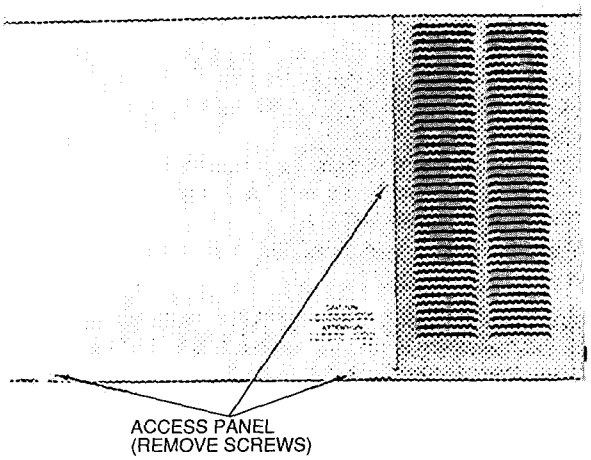


Fig. 8 — Indoor Coil Access Panel

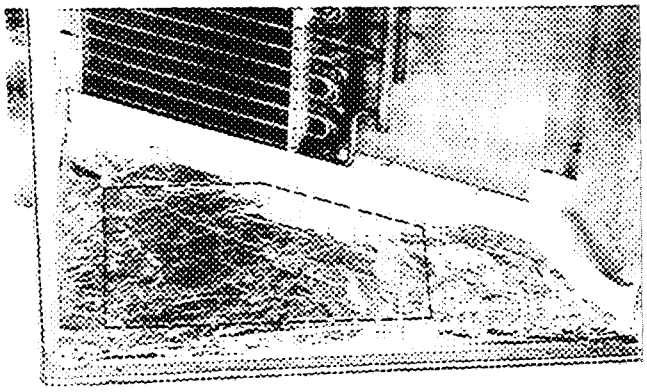


Fig. 9 — Basepan Insulation Over Vertical Duct Opening

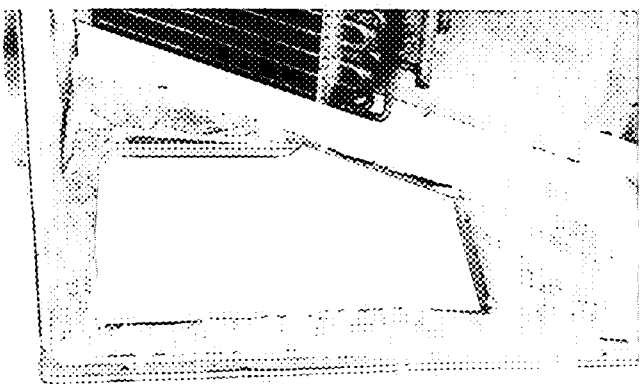


Fig. 10 — Removing Insulation and Cover from Vertical Duct Opening

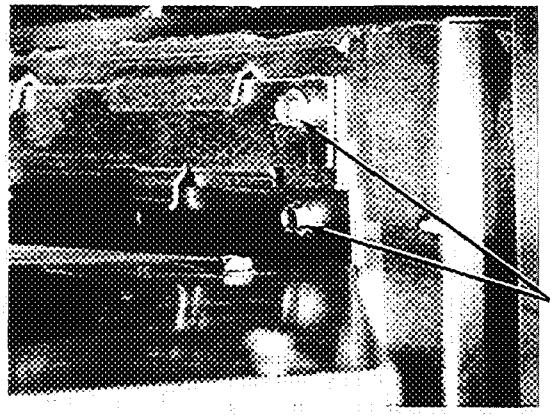


Fig. 13 — Blower Shelf and Housing

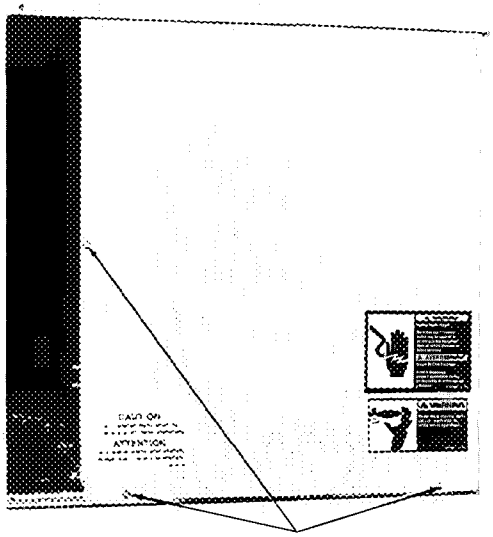


Fig. 11 — Indoor Blower Access Panel

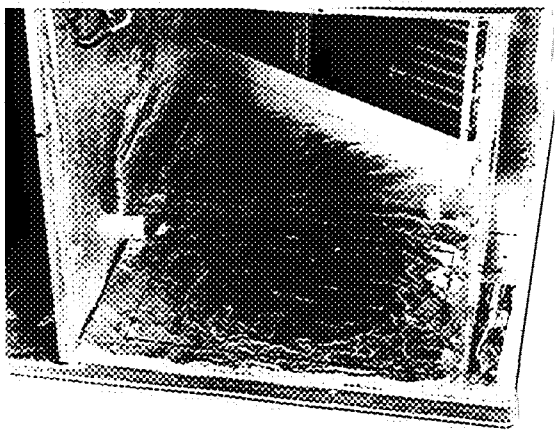


Fig. 14 — Basepan Insulation Over Vertical Discharge Opening

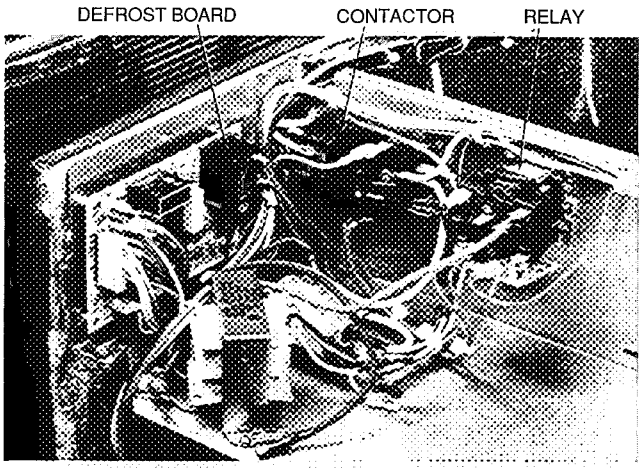


Fig. 12 — Fan Motor Leads

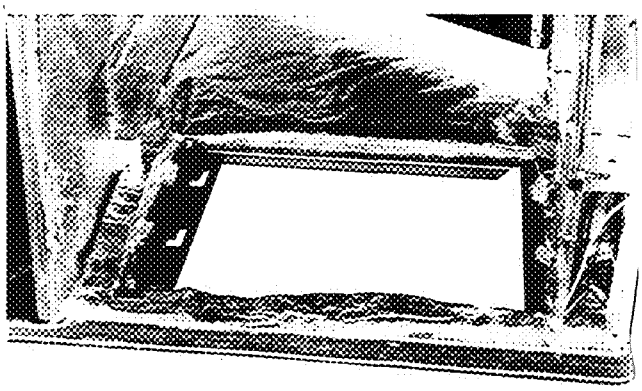
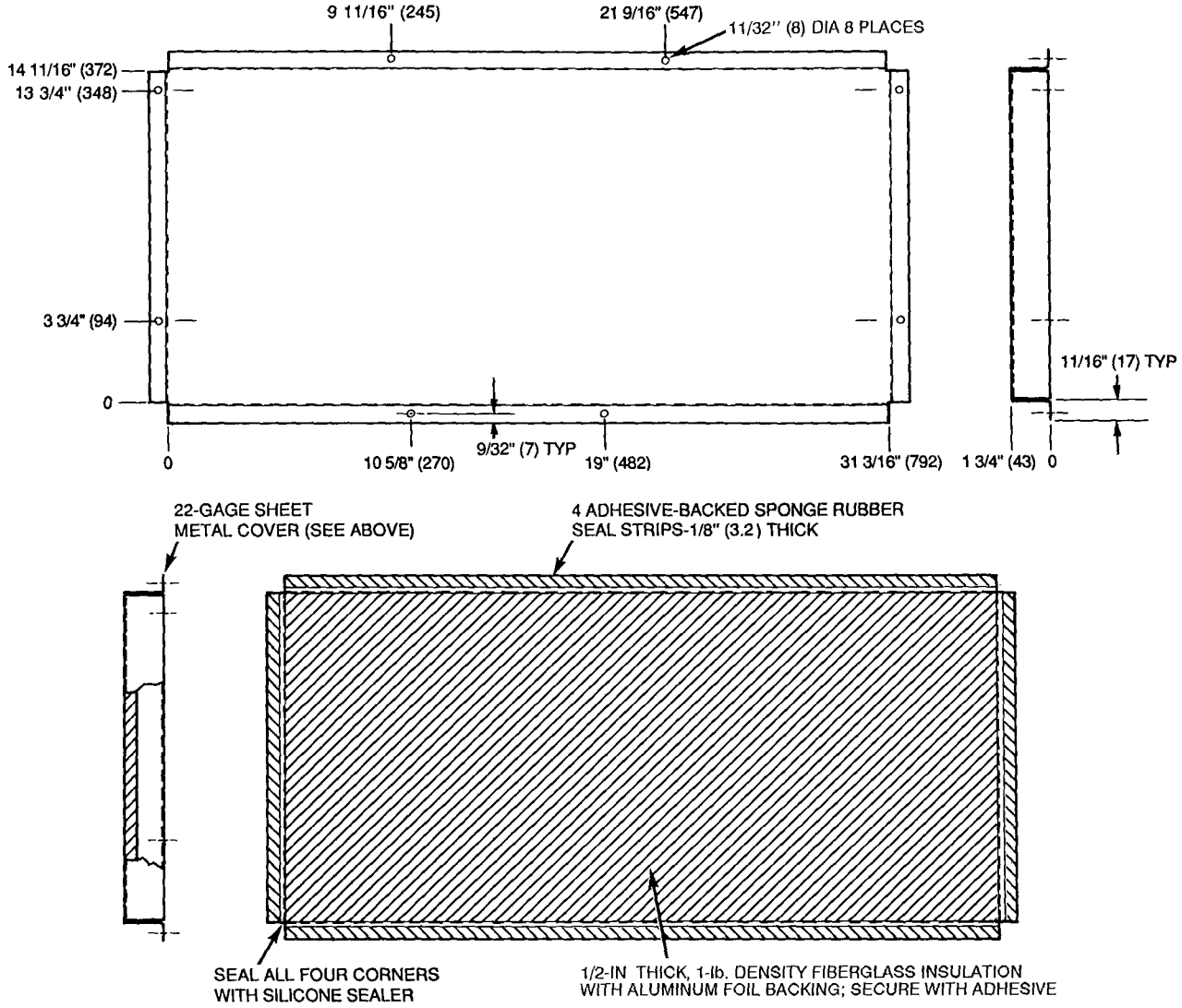


Fig. 15 — Removing Insulation and Cover from Vertical Discharge Opening



NOTES:
1 An accessory duct cover is available as an alternative to field fabrication.
2. Construct duct cover out of 22-gage sheet metal
3 Dimensions in ( ) are in millimeters.

Fig. 16 – Field-Fabricated Duct Cover

ACCESSORY DUCT FLANGE KIT INSTALLATION – Refer to Fig. 17 for duct adapter dimensions and hole locations.

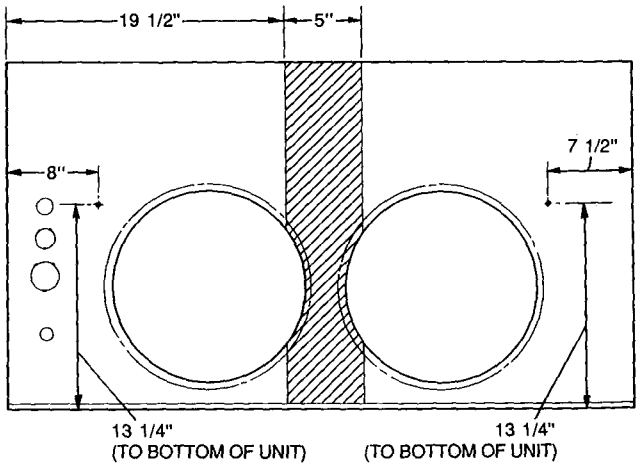
1. Mark hole locations shown in Fig. 17.
2. At marked locations, drill holes using a no. 26 (.147-in.) twist drill.
3. Partially secure duct flanges using two of the no 10, ½-in. screws provided.
4. See the following caution. Using remaining holes in duct flanges as templates, drill the remaining holes with the no. 26 (.147-in.) drill.

⚠ CAUTION

Do not drill deeper than ½-in. into shaded area shown in Fig. 17. Damage to refrigerant coil could result.

5. Fully secure the duct flanges using the remaining screws provided.

The finished kit installation accommodates a 14¾-in. x 14¾-in. duct.



NOTE: DO NOT DRILL MORE THAN ½-in. DEEP IN SHADED AREA

Fig. 17 – Duct Flange Kit – Locating Holes

Step 6 — Provide for Condensate Disposal

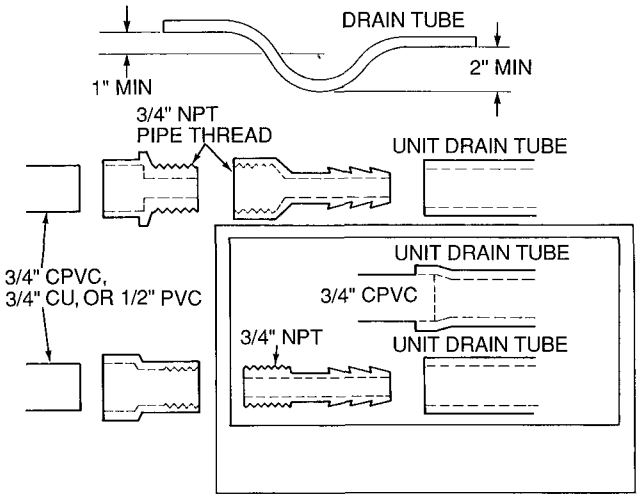
NOTE: Be sure that condensate-water disposal methods comply with local codes, restrictions, and practices.

Model 50HS disposes of condensate through a 7/8-in. ID plastic hose. See Fig. 2 and 3 for location of condensate connection.

Install factory-supplied condensate trap (shipped in the control box) at end of condensate connection. Prime trap at beginning of cooling season start-up.

Condensate water can be drained directly onto the roof in rooftop installations (where permitted) or onto a gravel apron in ground-level installations. 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 field-supplied fittings at the condensate connection to ensure proper drainage. See Fig. 18. Make sure that the outlet of the trap is at least one 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 1/2-in. PVC, 3/4-in. CPVC, or 3/4-in. copper pipe (all field supplied). See Fig. 18. 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.



NOTE: If necessary, flare drain tube slightly using a screwdriver or other suitable tool.

Fig. 18 — Drain Tubing Connection and Condensate Trap

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 lug in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code), ANSI/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.

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 Tables 3A - 3C for electrical data.

The field-supplied disconnect may be mounted on the unit over the high-voltage inlet hole. See Fig. 2 and 3.

If the unit has an electric heater, a second disconnect may be required. Consult the Installation, Start-Up and Service Instructions provided with the accessory for electrical service connections.

⚠ CAUTION

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

Table 3A — Electrical Data — 208/230 V, Single Phase

UNIT SIZE	NOMINAL VOLTS	PH	COMPRESSOR		OFM	IFM	POWER SUPPLY MOCP	
			RLA	LRA	FLA	FLA	MCA	Max
018	208/230	1	10 4	49	0.7	1 8	15 5	25
024	208/230	1	11.2	61	1.4	2.0	17.4	25
030	208/230	1	14 7	81	1 4	2 0	21 8	30
036	208/230	1	18.0	96	1.4	2 8	26 7	40
042	208/230	1	20.4	102	1 4	4 0	30 9	50
048	208/230	1	26.4	129	2 1	5 0	40.1	60
060	208/230	1	32 1	169	2 1	6.2	48.4	60

Table 3B — Electrical Data — 208/230 V, 3-Phase

UNIT SIZE	NOMINAL VOLTS	PH	COMPRESSOR		OFM	IFM	POWER SUPPLY MOCP	
			RLA	LRA	FLA	FLA	MCA	Max
030	208/230	3	10.1	73	1 4	2 0	16.0	25
036	208/230	3	11 4	75	1.4	2.8	18 5	25
042	208/230	3	14.0	91	1 4	4.0	22.9	30
048	208/230	3	15.0	99	2 1	5.0	25.9	40
060	208/230	3	19 3	123	2.1	6 2	32 4	50

Table 3C — Electrical Data — 460 V, 3-Phase

UNIT SIZE	NOMINAL VOLTS	PH	COMPRESSOR		OFM	IFM	POWER SUPPLY MOCP	
			RLA	LRA	FLA	FLA	MCA	Max
036	460	3	4 8	40.0	0.8	1.4	9.0	10
042	460	3	6.4	42.0	0.8	2.0	10 8	15
048	460	3	8.2	49 5	1.1	2 3	13.7	20
060	460	3	10.0	62 0	1 1	3 2	16 8	25

LEGEND

CSA — *Canadian Standards Association*
FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
IFM — Indoor Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection (*fuses or HACR-type circuit breaker*)
NEC — National Electrical Code
OFM — Outdoor Fan Motor
RLA — Rated Load Amps

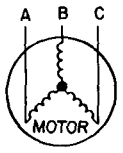
NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The CSA units may be fuse or circuit 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 percent 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



$$\text{Average Voltage} = \frac{452 + 464 + 455}{3} = \frac{1371}{3} = 457$$

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*

ROUTING POWER LEADS INTO UNIT — Use only copper wire between disconnect and unit. The high-voltage leads should be in a conduit until they enter the duct panel; conduit termination at the duct panel must be watertight. Run the high-voltage leads through the knockout on the duct panel (see Fig. 19 for location and size). When the leads are inside the unit, run leads up the high-voltage raceway to the line wiring splice box (Fig. 20). 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. 21).

CONNECTING GROUND LEAD TO GROUND LUG — Refer to Fig. 20 and 21. Connect the ground lead to the chassis using the ground lug in the wiring splice box.

ROUTING CONTROL POWER WIRES (24 v) — 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. 19) into unit control power splice box. Connect thermostat leads to unit control power leads as shown in Fig. 22.

The unit transformer supplies 24-v power for complete system including accessory electrical heater. An automatic-reset circuit breaker is provided in the 24-v circuit; see the caution label on the transformer or Fig. 23. Transformer is factory wired for 230-v operation. If supply voltage is 208 v, rewire transformer primary as described in the following section.

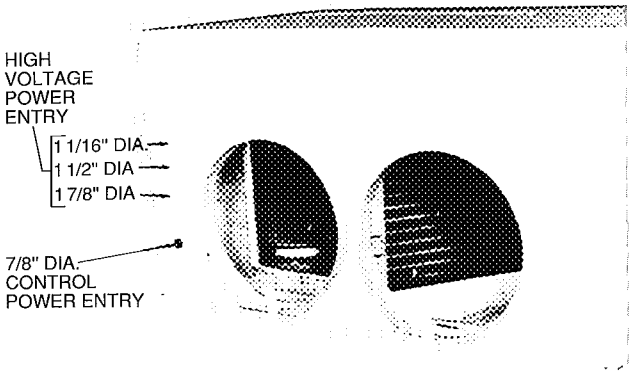


Fig. 19 — Duct Panel Knockouts

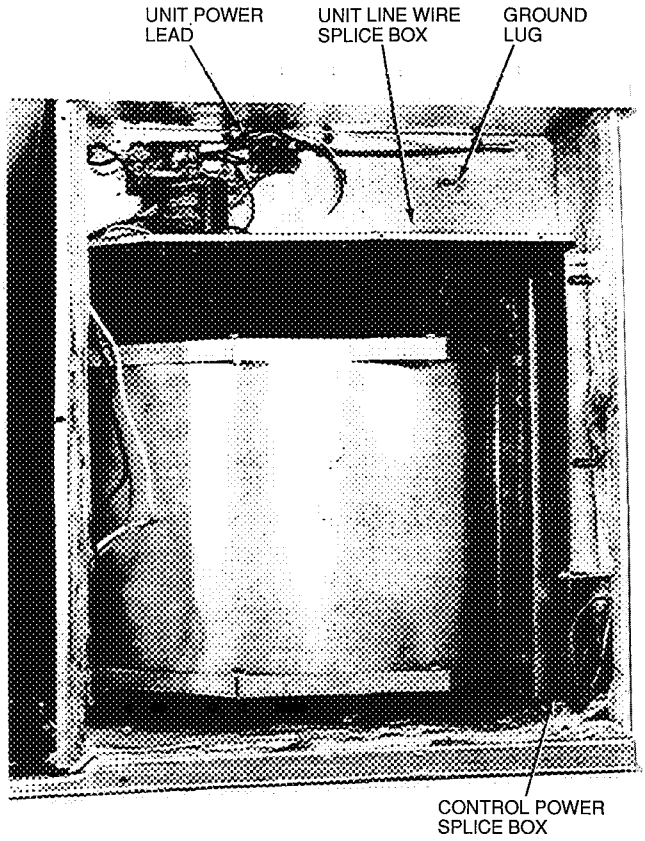


Fig. 20 — Wiring Splice Boxes

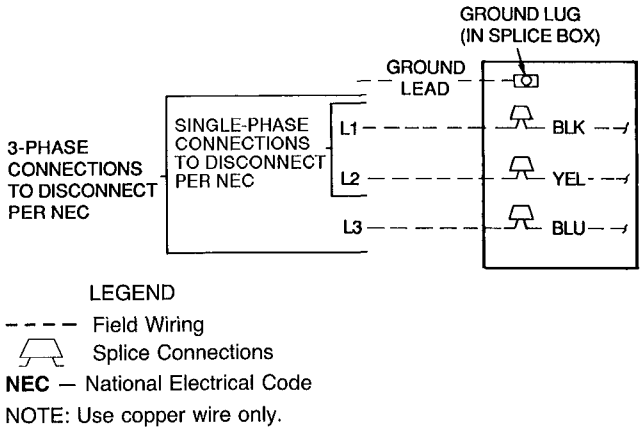


Fig. 21 — Line Power Connections

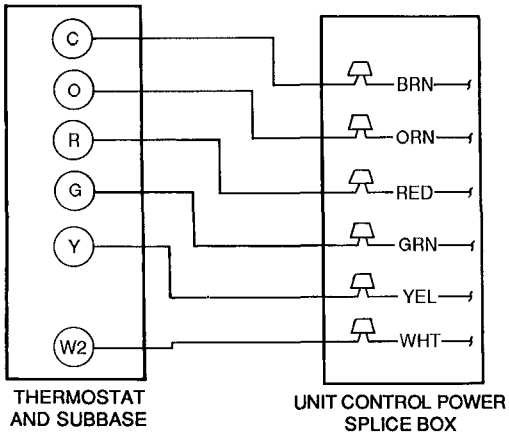


Fig. 22 — Control Connections

⚠ CAUTION

TRANSFORMER CONTAINS AUTO RESET OVERCURRENT PROTECTOR.

IT MAY RESET WITHOUT WARNING STARTING HEATING OR COOLING SECTION OF THIS PRODUCT.

DISCONNECT POWER PRIOR TO SERVICING.

THIS COMPARTMENT MUST BE CLOSED EXCEPT WHEN SERVICING.

316056-201 REV A

Fig. 23 — Transformer Label

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. Disconnect the orange transformer-primary lead from the contactor. 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 contactor terminal from which the orange lead was disconnected.
5. Using the wirenut removed from the red lead, insulate the loose terminal on the orange lead.
6. Wrap the wirenut with electrical tape so that the metal terminal 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 18.

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. Leading edge of blade should be 2 in. back from condenser inlet grille.
   b. Make sure that air filter(s) 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.
4. If the unit is equipped with a crankcase heater, start the heater 24 hours before starting the unit. To start the heater only, turn the thermostat to the OFF position and energize the electrical disconnect to the unit.

START-UP

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

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 filter drier.

Unit Start-Up Adjustments

⚠ CAUTION

Complete the required procedures given in the Pre-Start-Up section on this page before starting the unit.

Do not jumper any safety devices when operating the unit.

Do not operate the unit in Cooling mode when the outdoor temperature is below 40 F (unless accessory low-temperature kit is installed).

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

CHECKING COOLING AND HEATING CONTROL OPERATION — Start and check the unit for proper 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 within 30 seconds when FAN switch is placed in AUTO. position.
2. Place SYSTEM switch in COOL position and FAN switch in AUTO. position. Set control below room temperature. Observe that compressor, outdoor fan, and indoor blower motors start. Observe that cooling cycle shuts down when control setting is satisfied
3. Place system switch in HEAT position. Set control above room temperature Observe that heating cycle shuts down when control setting is satisfied.
4. 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), and unit operates in Heating mode when temperature control is set to "call for heating" (above room temperature).

IMPORTANT: Scroll compressors in the 048 and 060 size units are direction-oriented. Three-phase 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-22 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-22 charge. The charging label and the tables shown refer to system temperatures and pressures in Cooling mode only. If charge level is suspect in Heating mode, reclaim all refrigerant and charge to nameplate amount.

A superheat charging label is attached to the inside of the compressor access door. The label includes a "Superheat Charging Table" and a "Required Suction-Tube Temperature (F)" chart.

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

⚠ CAUTION

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.

Proceed as follows:

1. Remove caps from low- and high-pressure service fittings.
2. Using hoses with valve core depressors, attach low- and high-pressure gage hoses to low- and high-pressure service fittings, respectively.
3. Start unit in Cooling mode and let unit run until system pressures stabilize.
4. Measure and record the following:
   a. Outdoor ambient-air temperature (F db).
   b. Evaporator inlet-air temperature (F wb).
   c. Suction-tube temperature (F) at low-side service fitting.
   d. Suction (low-side) pressure (psig).
5. Using Superheat Charging Tables 4A-4G, compare outdoor-air temperature (F db) with evaporator inlet-air temperature (F wb) to determine desired system operating superheat temperature.
6. Using Required Suction-Tube Temperature (F) Table 5, compare desired superheat temperature with suction (low-side) operating pressure (psig) to determine proper suction-tube temperature.
7. Compare actual suction-tube temperature with proper suction-tube temperature. Using a tolerance of ±3° F, add refrigerant if actual temperature is more than 3° F higher than proper suction-tube temperature, or remove refrigerant if actual temperature is more than 3° F lower than required suction-tube temperature.

NOTE: If the problem causing the inaccurate readings is a refrigerant leak, refer to Check for Refrigerant Leaks section on page 14.

Table 4A — Superheat Charging Table, 50HS018

TEMP (F) AIR ENT COND		EVAP AIR — 675 CFM Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	39.9	39 9	40 0	40 0	42 7	45 4	48 1	48 3	48 5	48 8	48.6	48 4
70	SPH	34 9	34 9	34 9	35 0	38 3	41 6	45 0	45 6	46 1	46 7	46 6	46.4
75	SPH	29 9	29 9	29 9	29 9	33.9	37 9	41.9	42.8	43.7	44 7	44 5	44.4
80	SPH	26 3	26.3	26 3	26 3	30.3	34 3	38 3	39.8	41 2	42 6	42 7	42 9
85	SPH	22 8	22.8	22 8	22 8	26 8	30 8	34 8	36.7	38.6	40 6	41 0	41 3
90	SPH	20.8	20 8	20.8	20 8	24 2	27 7	31 3	34.0	36.7	39 4	39.6	39 8
95	SPH	18 7	18 7	18 7	18 7	21 7	24.7	27 7	31 2	34 7	38.2	38.2	38 3
100	SPH	16 6	16 6	16 6	16.6	19 1	21.6	24 1	28 1	32 1	36 1	36 5	36 9
105	SPH	14 6	14 6	14.6	14.6	16 6	18 6	20 6	25 1	29.6	34.1	34 8	35.6
110	SPH	12 5	12.5	12 5	12 5	14 0	15 5	17 0	21.5	26.0	30 5	32 8	35.0
115	SPH	10 5	10 5	10 5	10 5	11 5	12 5	13.5	18 0	22 5	27 0	30 7	34.5

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

Table 4B — Superheat Charging Table, 50HS024

TEMP (F) AIR ENT COND		EVAP AIR — 800 CFM Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	9 0	11 0	13 0	15 0	21 0	27.0	32 9	34.8	36 6	38 4	38 8	39 1
70	SPH	*	5 5	6 5	7 5	14 8	22 1	29 4	31 9	34 4	37 0	37 3	37.7
75	SPH	*	*	*	*	8 6	17 2	25 8	29 1	32 3	35 5	35 9	36.3
80	SPH	*	*	*	*	7 4	14 9	22 3	26 0	29 6	33 3	33 8	34.2
85	SPH	*	*	*	*	6 3	12 5	18 7	22 9	27 0	31 1	31 6	32 2
90	SPH	*	*	*	*	5 1	10 1	15 2	19 8	24 3	28 9	30 3	31 6
95	SPH	*	*	*	*	*	7 8	11 6	16 7	21.7	26 7	28 9	31 1
100	SPH	*	*	*	*	*	7 9	11 9	16 6	21.3	26 0	28 3	30 5
105	SPH	*	*	*	*	*	8.1	12.1	16 5	20.9	25.3	27.6	30 0
110	SPH	*	*	*	*	*	5 7	8 6	13 9	19 3	24 6	27 0	29.4
115	SPH	*	*	*	*	*	*	5 0	11 3	17.6	24 0	26 4	28 8

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 4C — Superheat Charging Table, 50HS030

TEMP (F) AIR ENT COND		EVAP AIR — 1000 CFM											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	17 7	17 8	17 9	18 0	24 2	30 3	36 5	37 5	38 6	39 6	39 6	39.5
70	SPH	13 4	13 4	13 5	13.5	20 0	26 5	32.9	34 5	36 0	37 6	37 5	37 4
75	SPH	9.0	9.0	9 0	9 0	15 8	22.6	29 4	31.4	33 5	35 5	35.5	35 4
80	SPH	*	*	*	*	11.6	18 7	25.8	28 8	31 8	34 7	34 8	34.8
85	SPH	*	*	*	*	7 4	14 9	22 3	26 2	30 1	33 9	34 1	34 3
90	SPH	*	*	*	*	6 3	12 5	18 8	23 1	27 5	31 9	32 8	33 8
95	SPH	*	*	*	*	5 1	10 1	15.2	20 1	25 0	29 8	31 5	33 2
100	SPH	*	*	*	*	*	8 8	13 1	18 0	22.9	27 8	29.5	31 1
105	SPH	*	*	*	*	*	7 4	11 1	16.0	20 9	25 8	27 4	29 1
110	SPH	*	*	*	*	*	5 0	7.6	12 4	17 3	22 2	24 6	27.0
115	SPH	*	*	*	*	*	*	*	8 9	13.8	18.7	21 8	25 0

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 4D — Superheat Charging Table, 50HS036

TEMP (F) AIR ENT COND		EVAP AIR — 1300 CFM											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	16.7	18.7	20 7	22 7	27 4	32 1	36 8	37.7	38 6	39 5	39 6	39 8
70	SPH	12 9	13.8	14 8	15 9	22 1	28 4	34 8	35 6	36 5	37 4	37 6	37 8
75	SPH	9.0	9.0	9 0	9 0	16.9	24 8	32.7	33 6	34 5	35 4	35.5	35 7
80	SPH	*	*	*	*	12 7	20 9	29 1	31 1	33.0	35 0	35 1	35 1
85	SPH	*	*	*	*	8.5	17 1	25 6	28.6	31 6	34 6	34 6	34 6
90	SPH	*	*	*	*	7 4	14 7	22.0	25 5	29.0	32 5	33 3	34.0
95	SPH	*	*	*	*	6.2	12 3	18.5	22.5	26 5	30 5	32 0	33 5
100	SPH	*	*	*	*	5 0	10.0	14 9	19 4	23.9	28 5	30 0	31 5
105	SPH	*	*	*	*	*	7 6	11 4	16.4	21 4	26 4	27.9	29 4
110	SPH	*	*	*	*	*	5.5	7.9	12 8	17 8	22.8	25 1	27 3
115	SPH	*	*	*	*	*	*	*	9 3	14 3	19 3	22 3	25 3

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 4E — Superheat Charging Table, 50HS042

TEMP (F) AIR ENT COND		EVAP AIR — 1400 CFM											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	9 0	11 0	13 0	15 0	19.5	24 0	28 5	30.5	32 5	34.5	34 9	35 3
70	SPH	*	5.5	6 5	7 5	13 8	20 1	26 5	28 4	30 4	32.4	33 1	33 7
75	SPH	*	*	*	*	8 1	16.3	24.4	26 4	28.4	30 4	31 3	32 2
80	SPH	*	*	*	*	7 5	14 9	22 3	24 8	27 3	29 8	30 3	30 7
85	SPH	*	*	*	*	6.8	13 5	20 3	23.3	26.3	29 3	29 2	29 2
90	SPH	*	*	*	*	6.1	12 2	18.3	21.2	24 2	27 3	27.4	27 6
95	SPH	*	*	*	*	5 4	10 8	16 2	19 2	22 2	25 2	25 6	26 1
100	SPH	*	*	*	*	5 2	10 4	15 6	18 6	21 6	24.6	25 4	26 1
105	SPH	*	*	*	*	5 0	10 1	15.1	18 1	21 1	24 1	25 1	26 0
110	SPH	*	*	*	*	*	8.7	13.0	16 0	19.0	22 0	24.0	26 0
115	SPH	*	*	*	*	*	7 3	11 0	14 0	17 0	20 0	23.0	26.0

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 4F — Superheat Charging Table, 50HS048

TEMP (F) AIR ENT COND		EVAP AIR — 1600 CFM											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	25 8	26 3	27 0	27 6	28 6	29 6	30.5	30.9	31 3	31 7	31.2	30.7
70	SPH	24 2	24 0	23.8	23 6	25 0	26 4	27 8	28 4	29 0	29.7	29.6	29.5
75	SPH	19.7	19 7	19 7	19 7	21.4	23.2	25 0	25 9	26.8	27.6	27.9	28.2
80	SPH	15.8	15.8	15.8	15 8	17 6	19 4	21.2	22 7	24.1	25.6	26.2	26.9
85	SPH	12 0	12 0	12 0	12 0	13.8	15 6	17 5	19 5	21.5	23.5	24 5	25.6
90	SPH	7 5	7.5	7 5	7.5	9 4	11 3	13 2	16.3	19.3	22.4	23.3	24 2
95	SPH	*	*	*	*	5 0	7.0	9 0	13 1	17.1	21.2	22.0	22.8
100	SPH	*	*	*	*	*	*	*	9 4	14.3	19 1	20.3	21 4
105	SPH	*	*	*	*	*	*	*	5 7	11.4	17.1	18.6	20 1
110	SPH	*	*	*	*	*	*	*	*	9.0	13.5	15.8	18.0
115	SPH	*	*	*	*	*	*	*	*	6 7	10 0	13.0	16.0

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 4G — Superheat Charging Table, 50HS060

TEMP (F) AIR ENT COND		EVAP AIR — 2000 CFM											
		Evap Air — Ewb (F)											
		54	56	58	60	62	64	66	68	70	72	74	76
65	SPH	24.8	24 8	24 8	24 8	25.6	26 4	27.2	28.0	28 8	29.6	29.0	28.5
70	SPH	20.8	20.8	20 8	20.8	21.9	23 0	24.1	25.2	26.3	27 5	27 3	27 2
75	SPH	16 7	16.7	16.7	16.7	18 2	19.6	21 1	22.5	23.9	25.3	25.6	26 0
80	SPH	12 8	12.8	12.8	12 8	14 6	16.4	18 2	19 8	21 5	23.1	24.1	25 1
85	SPH	9 0	9.0	9.0	9 0	11 1	13.1	15.2	17 1	19.0	21.0	22.6	24.2
90	SPH	*	*	*	*	7.0	9 6	12.1	14 8	17.6	20 3	21.8	23.3
95	SPH	*	*	*	*	*	6.0	9 0	12.5	16.1	19.6	21.0	22.4
100	SPH	*	*	*	*	*	*	*	8.8	13.1	17.5	19 5	21.5
105	SPH	*	*	*	*	*	*	*	5 1	10 2	15 3	18.0	20 7
110	SPH	*	*	*	*	*	*	*	*	9 8	14 6	17.2	19 8
115	SPH	*	*	*	*	*	*	*	*	9 3	14 0	16 4	18 9

LEGEND
Ewb — Entering Wet Bulb
SPH — Superheat at Compressor (F)

*Do not attempt to charge system under these conditions — refrigerant slugging may occur

Table 5 — Required Suction-Tube Temperature (F)*

SUPERHEAT TEMP (F)	SUCTION PRESSURE AT SERVICE PORT (psig)								
	61.5	64.2	67.1	70.0	73.0	76.0	79.2	82.4	85.7
0	35	37	39	41	43	45	47	49	51
2	37	39	41	43	45	47	49	51	53
4	39	41	43	45	47	49	51	53	55
6	41	43	45	47	49	51	53	55	57
8	43	45	47	49	51	53	55	57	59
10	45	47	49	51	53	55	57	59	61
12	47	49	51	53	55	57	59	61	63
14	49	51	53	55	57	59	61	63	65
16	51	53	55	57	59	61	63	65	67
18	53	55	57	59	61	63	65	67	69
20	55	57	59	61	63	65	67	69	71
22	57	59	61	63	65	67	69	71	73
24	59	61	63	65	67	69	71	73	75
26	61	63	65	67	69	71	73	75	77
28	63	65	67	69	71	73	75	77	79
30	65	67	69	71	73	75	77	79	81
32	67	69	71	73	75	77	79	81	83
34	69	71	73	75	77	79	81	83	85
36	71	73	75	77	79	81	83	85	87
38	73	75	77	79	81	83	85	87	89
40	75	77	79	81	83	85	87	89	91

*Temperature at suction service valve.

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.

Tables 6 and 7 show airflows at several external static pressures. Tables 8 - 10 show accompanying pressure drops for wet coils, electric heaters, and filters. Be sure that airflow does not fall below requirement for safe electric heater operation. See Table 2. 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

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

For 208/230-v and A.O. Smith 460-v Blower Motors: The airflow can be changed by changing the lead connections of the blower motor. 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		

NOTE: Motors are factory wired for low speed.

Two- or three-speed indoor fan motor is factory wired for low-speed operation (red wire) on all models. To change the speed of the blower motor, remove the fan motor speed leg lead from the indoor-fan contactor (IFC). This wire is attached to terminal 4 for single-phase units and terminal 3 for 3-phase units. To change the speed, remove red wire and replace with lead for desired blower motor speed. *Make sure that the removed lead is insulated so that it will not contact any unit chassis parts.*

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

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

NOTE: Two- or three-speed indoor fan motor is factory wired for low-speed operation.

To change the speed of the blower motor, remove red fan motor speed lead from the indoor-fan contactor (IFC). This wire is attached to terminal 3. Insulate lead end to avoid contact with chassis. On three-speed motors only, connect orange lead to terminal 3 of IFC. To select high-speed, disconnect blue and black leads from each other. Connect black lead to IFC terminal 3. Leave blue lead disconnected.

UNIT CONTROLS — All compressors have the following internal-protection controls.

1. *High-Pressure Relief Valve* — This valve opens when the pressure differential between the low and high side becomes excessive.
2. *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.

SEQUENCE OF OPERATION — When power is supplied to unit, the transformer (TRAN) is energized. On units with crankcase heater, heater is also energized.

Cooling— With the thermostat subbase in the cooling position, and when the space temperature comes with 2° F of the cooling set point, the thermostat makes circuit R-O. This energizes the reversing valve solenoid (RVS) and places the unit in standby condition for cooling.

As the space temperature continues to rise, the second stage of the thermostat makes, closing circuit R-Y. When compressor time delay (5 ± 2 minutes) is completed, a circuit is made to contactor (C), starting the compressor (COMP) and outdoor-fan motor (OFM). Circuit R-G is made at the same time, energizing the indoor-fan relay (IFR) and starting the indoor-fan motor (IFM) after one-second delay.

When the thermostat is satisfied, contacts open, deenergizing C. The COMP and OFM stop, and the IFM stops after a 0 to 30 second time delay

Heating— On a call for heat, thermostat makes circuits R-Y and R-G. When compressor time delay (5 ± 2 minutes) is completed, a circuit is made to C, starting COMP and OFM. Circuit R-G also energizes IFR and starts IFM after one-second delay.

Should room temperature continue to fall, circuit R-W is made through second-stage thermostat bulb. If optional electric heat package is used, a relay is energized, bringing on first bank of supplemental electric heat. When thermostat is satisfied, contacts open, deenergizing contactor and relay; motors and heaters deenergize. The IFM may be controlled by a time-delay relay that keeps the fan on for 30 seconds.

Defrost— Defrost board (DB) is a time and temperature control, which includes a field-selectable time period between checks for defrost (30, 50, and 90 minutes). Electronic timer and defrost cycle start only when contactor is energized and defrost thermostat (DFT) is closed.

Defrost mode is identical to Cooling mode, except outdoor-fan motor stops and a bank of optional electric heat turns on to warm air supplying the conditioned space.

Table 6 – Dry Coil Air Delivery* – Horizontal Discharge (Deduct 10% for 208 v)

UNIT SIZE	MOTOR SPEED		230 AND 460 V HORIZONTAL DISCHARGE 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
018	Low	Watts	230	225	220	210	195	170	—	—	—	—	—
		Cfm	760	745	725	695	640	540	—	—	—	—	—
	High	Watts	—	—	—	—	270	235	200	—	—	—	—
		Cfm	—	—	—	—	850	700	450	—	—	—	—
024, 030	Low	Watts	280	275	265	255	250	245	240	—	—	—	—
		Cfm	820	810	755	700	660	600	560	—	—	—	—
	Med	Watts	365	360	350	345	340	330	320	310	300	—	—
		Cfm	1025	1010	975	940	900	850	800	720	630	—	—
	High	Watts	—	—	490	480	470	460	445	430	410	390	380
		Cfm	—	—	1300	1255	1200	1150	1080	1005	915	790	620
036	Low	Watts	520	495	474	458	495	425	—	—	—	—	—
		Cfm	1375	1335	1290	1244	1200	1146	—	—	—	—	—
	Med	Watts	575	560	535	510	480	460	440	425	—	—	—
		Cfm	1520	1490	1450	1440	1380	1300	1200	1080	—	—	—
	High	Watts	—	—	—	—	650	614	575	540	510	480	—
		Cfm	—	—	—	—	1560	1500	1380	1280	1170	1060	—
042	Low	Watts	730	700	680	645	615	580	535	490	430	—	—
		Cfm	1620	1590	1550	1510	1460	1390	1310	1210	1050	—	—
	High	Watts	—	—	—	—	—	850	800	750	700	650	610
		Cfm	—	—	—	—	—	1780	1670	1550	1400	1230	1050
048	Low	Watts	1080	1040	1020	970	910	840	785	730	680	620	540
		Cfm	2100	2090	2080	2060	1980	1900	1810	1710	1590	1450	1200
	High	Watts	1230	1190	1125	1060	1010	940	880	820	760	710	660
		Cfm	2390	2340	2280	2210	2150	2030	1900	1770	1630	1480	1300
060	Low	Watts	1150	1100	1050	1010	950	900	850	800	730	650	—
		Cfm	2500	2410	2330	2260	2170	2080	1990	1880	1750	1580	—
	High	Watts	—	—	—	—	—	1170	1110	1050	990	920	880
		Cfm	—	—	—	—	—	2470	2340	2200	2040	1870	1700

*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

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 table that are beyond the blower motor capacity or are not recommended

Table 7 – Dry Coil Air Delivery* – Vertical Discharge (Deduct 10% for 208 v)

UNIT SIZE	MOTOR SPEED		230 AND 460 V VERTICAL DISCHARGE 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
018	Low	Watts	230	225	220	210	195	170	—	—	—	—	—
		Cfm	760	745	725	695	640	540	—	—	—	—	—
	High	Watts	—	—	—	—	270	235	200	—	—	—	—
		Cfm	—	—	—	—	850	700	450	—	—	—	—
024, 030	Low	Watts	280	275	265	255	250	245	240	—	—	—	—
		Cfm	820	810	755	700	660	600	560	—	—	—	—
	Med	Watts	365	360	350	345	340	330	320	310	300	—	—
		Cfm	1025	1010	975	940	900	850	800	720	630	—	—
	High	Watts	—	—	490	480	470	460	445	430	410	390	380
		Cfm	—	—	1300	1255	1200	1150	1080	1005	915	790	620
036	Low	Watts	520	495	474	458	495	425	—	—	—	—	—
		Cfm	1375	1335	1290	1244	1200	1146	—	—	—	—	—
	Med	Watts	575	560	535	510	480	460	440	425	—	—	—
		Cfm	1520	1490	1450	1440	1380	1300	1200	1080	—	—	—
	High	Watts	—	—	—	—	650	614	575	540	510	480	—
		Cfm	—	—	—	—	1560	1500	1380	1280	1170	1060	—
042	Low	Watts	730	700	680	645	615	580	535	490	430	—	—
		Cfm	1620	1590	1550	1510	1460	1390	1310	1210	1050	—	—
	High	Watts	—	—	—	—	—	850	800	750	700	650	610
		Cfm	—	—	—	—	—	1780	1670	1550	1400	1230	1050
048	Low	Watts	1080	1040	1020	970	910	840	785	730	680	620	540
		Cfm	2100	2090	2080	2060	1980	1900	1810	1710	1590	1450	1200
	High	Watts	1230	1190	1125	1060	1010	940	880	820	760	710	660
		Cfm	2390	2340	2280	2210	2150	2030	1900	1770	1630	1480	1300
060	Low	Watts	890	850	810	780	740	710	660	630	580	—	—
		Cfm	2500	2410	2330	2260	2170	2080	1970	1860	1700	—	—
	High	Watts	—	—	—	1000	960	910	870	830	790	750	—
		Cfm	—	—	—	2480	2370	2250	2120	2000	1850	1690	—

*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

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 table that are beyond the blower motor capacity or are not recommended

Table 8 – Wet Coil Pressure Drop

UNIT SIZE	AIRFLOW (cfm)	PRESSURE DROP (in. wg)
018	600	0 069
	700	0.082
	800	0 102
	900	0.116
024	600	0.039
	700	0 058
	800	0.075
	900	0.088
030	900	0 088
	1000	0.095
	1200	0 123
036	1000	0.082
	1200	0.102
	1400	0.120
	1600	0.143
042	1000	0 048
	1200	0.069
	1400	0.088
	1600	0.102
048	1400	0.068
	1600	0.075
	1800	0 088
060	1700	0.082
	1900	0 095
	2100	0.108
	2300	0.123

Table 9 – Electric Heater Accessory Pressure Drop (in. wg)

HEATER kW	CFM								
	600	800	1000	1200	1400	1600	1800	2000	2200
5-20	0 030	0.033	0 037	0 042	0.047	0 052	0 060	0 067	0 075

Table 10 – Filter Pressure Drop (in. wg)

UNIT SIZE	FILTER SIZE (in.)	CFM																		
		500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
018, 024	20 x 20	0 05	0.07	0 08	0 10	0 12	0 13	–	–	–	–	–	–	–	–	–	–	–	–	–
030	20 x 24	–	–	–	–	0.09	0.10	0.11	0 13	0.14	–	–	–	–	–	–	–	–	–	–
036, 042	24 x 24	–	–	–	–	–	0 08	0.09	0 10	0.11	0 12	0 14	0 15	–	–	–	–	–	–	–
048, 060	24 x 30	–	–	–	–	–	–	–	–	–	0 09	0 10	0.11	0 12	0 13	0 14	0 15	0 16	0 17	0 18

MAINTENANCE

To ensure continuing high performance, and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This heat pump unit should be inspected at least once each year by a qualified service person. To troubleshoot units, refer to Table 11.

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.

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 cooling season. Clean and lubricate (if required) when necessary.
4. Check electrical connections for tightness and controls for proper operation each cooling season. Service when necessary.

⚠ 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.

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.

Unit Top Removal

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.

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 4 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.

Indoor Blower and Motor

NOTE: Motors without oilers are prelubricated. 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.

Lubricate the motor every 5 years if the motor is used intermittently (thermostat FAN switch in AUTO. position), or every 2 years if the motor is used continuously (thermostat FAN switch in ON position).

⚠ WARNING

Disconnect and tag electrical power to the unit before cleaning and lubricating the blower motor and wheel. Failure to adhere to this warning could cause personal injury or death.

To clean and lubricate the blower motor and wheel:

1. Remove and disassemble blower assembly as follows:
   a. Remove blower access door.
   b. Disconnect motor lead from indoor-fan contactor (IFC). Disconnect yellow motor lead from terminal L2 or 23 of the contactor.
   c. Remove blower assembly from unit. 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) which secure wheel to motor shaft. Remove screws that secure motor mount brackets to housing and slide motor and motor mount out of housing.
2. Lubricate motor as follows:
   a. Thoroughly clean all accumulations of dirt or grease from motor housing.
   b. Remove dust caps or plugs from oil ports located at each end of motor.
   c. Use a good grade of SAE 20 nondetergent motor oil and put one teaspoon (5 cc, 3/16 oz., or 16 to 25 drops) in each oil port.
   d. Allow time for oil to be absorbed by each bearing, then wipe excess oil from motor housing.
   e. Replace dust caps or plugs in oil ports.
3. Remove and clean blower wheel as follows:
   a. Ensure proper reassembly by marking wheel orientation and cutoff plate location.
   b. Remove screws holding cut-off plate, and remove plate from housing.

c. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower wheel vanes.

d. 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.

e. Reassemble wheel and cut-off plate into housing.

f. Reassemble motor into housing. Be sure setscrews are tightened on motor-shaft flats and not on round part of shaft.

Outdoor Coil, Indoor Coil, and Condensate Drain Pan

— Inspect the outdoor coil, indoor 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 page 21.

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 outdoor 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 outdoor coil fins from inside to outside the unit. On units with an outer and inner outdoor 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.

Outdoor 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 screws at bottom of outdoor air intake grille and remove plastic grille.
2. Inspect the fan blades for cracks or bends.
3. If fan needs to be removed, loosen the setscrew and slide the fan off the motor shaft.
4. When replacing fan blade, position blade so that leading edge is 2 in. back from outdoor inlet grille.
5. Ensure that setscrew engages the flat area on the motor shaft when tightening.

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 control/blower and compressor compartment access panels to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any smoky or burned connections are noticed, disassemble the connection, clean all the parts, 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 18 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 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 14.

If no refrigerant leaks are found and low performance is suspected, refer to Checking and Adjusting Refrigerant Charge section on page 15.

Indoor Airflow — The indoor 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 18 to check the system airflow.

Metering Devices — Refrigerant metering devices are fixed orifices and are located in the inlet header to the indoor and outdoor coils.

Liquid Line Strainers — The liquid line strainers (to protect metering device) are made of wire mesh and are located in the liquid lines on the inlet side of the metering devices.

Check valves are also located in the liquid lines near the strainers. The strainers are the larger of the two components.

Table 11 – Cooling and Heating Troubleshooting Chart

SYMPTOM	CAUSE	REMEDY
Compressor and outdoor 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, or defrost board	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
	Units have a 5-minute time delay	DO NOT bypass this compressor time delay – wait for 5 minutes until time-delay relay is deenergized
Compressor will not start but outdoor 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 capacitor, overload, or PTC thermistor	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker. Determine cause
Three-phase scroll compressor (size 048 and 060 units only) makes excessive noise, and there may be a low pressure differential	Low input voltage (40% low)	Determine cause and correct.
	Scroll compressor is rotating in the wrong direction	Correct the direction of rotation by reversing the 3-phase power leads to the unit.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge	Reclaim refrigerant, evacuate system, and recharge to capacities shown on nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage	Determine cause and correct
	Blocked outdoor coil	Determine cause and correct.
	Defective run/start capacitor, overload, or start relay	Determine cause and replace.
	Defective thermostat	Replace thermostat.
	Faulty outdoor-fan motor or capacitor	Replace
	Damaged reversing valve	Determine cause and correct.
	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.
	Frosted coil with incorrect defrost operation	Check defrost time settings Reset as necessary. *Check defrost temperature switch Replace as necessary.*
	Air in system	Reclaim refrigerant, evacuate system, and recharge
	Outdoor coil dirty or restricted	Clean coil or remove restriction.
Excessive head pressure.	Dirty air filter	Replace filter.
	Dirty indoor or outdoor coil	Clean coil.
	Refrigerant overcharged	Reclaim excess refrigerant.
	Air in system	Reclaim refrigerant, evacuate system, and recharge.
	(Heat) Indoor air restricted or recirculating	Determine cause and correct.
	Indoor or outdoor 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.

Table 11 — Cooling and Heating Troubleshooting Chart (Cont)

SYMPTOM	CAUSE	REMEDY
Excessive suction pressure.	(Heat) Outdoor coil frosted	Move timer on control board to 30 minutes between defrost cycles.
	(Cool) High heat load	Check for source and eliminate
	Compressor valves leaking	Replace compressor.
	Reversing valve hung up or leaking internally	Replace valve
	Refrigerant overcharged	Reclaim excess refrigerant.
Suction pressure too low.	(Cool) Dirty air filter	Replace filter.
	(Heat) Outdoor coil frosted	Move timer on control board to 30 minutes between defrost cycles
	Low refrigerant charge	Check for leaks, repair and recharge
	Metering device or low side restricted	Remove source of restriction
	(Cool) Insufficient coil airflow	Increase air quantity Check filter — replace if necessary
	(Cool) Temperature too low in conditioned area	Reset thermostat.
	(Cool) Outdoor ambient below 40 F	Install low-ambient kit
	Field-installed filter-drier restricted	Replace
Compressor runs but outdoor fan does not.	NC contacts on defrost board open	Check condition of relay on board. Replace if necessary.

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
- ☐ REMOVE ALL SHIPPING HOLDDOWN BOLTS AND BRACKETS PER INSTALLATION INSTRUCTIONS
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTALLATION INSTRUCTIONS
- ☐ CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ☐ CHECK THAT INDOOR 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

CUT ALONG DOTTED LINE

III. START-UP

ELECTRICAL

SUPPLY VOLTAGE L1-L2 _____ INDOOR FAN AMPS _____

COMPRESSOR AMPS _____

TEMPERATURES

OUTDOOR-AIR TEMPERATURE _____ DB

RETURN-AIR TEMPERATURE _____ DB _____ WB

HEAT PUMP SUPPLY AIR _____

ELECTRIC HEATER SUPPLY AIR _____

PRESSURES

REFRIGERANT SUCTION _____ PSIG

REFRIGERANT DISCHARGE _____ PSIG

☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS ON PAGES 15-17.