

Installation, Start-Up and Service Instructions

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NOTE TO INSTALLER: Leave these instructions and the User's Manual with the equipment user after installation.

INTRODUCTION

Model 50NQ Packaged Heat Pump Units are fully self-contained, heating/cooling units designed for outdoor installation. These units may be installed either on a rooftop or ground-level slab. For rooftop downflow applications, an accessory roof-mounting curb may be used.

SAFETY CONSIDERATIONS

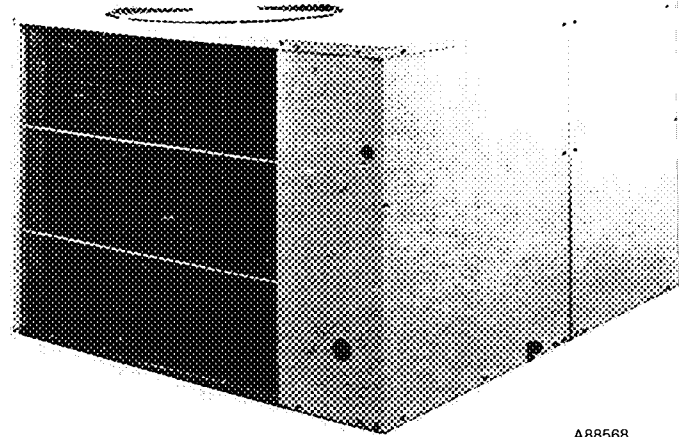
Installing and servicing air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install or service air conditioning equipment.

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

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

Recognize safety information: This is the safety-alert symbol Δ , when you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal word—DANGER, WARNING or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING, on the other hand could result in personal injury or death. CAUTION is used to identify unsafe practices, which would



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Fig. 1—Model 50NQ

result in minor personal injury or product and property damage.

1. This installation must conform with all applicable local and national codes.
2. The power supply (volts, hertz, and phase) must correspond to that specified on unit rating plate. (See Fig. 4 for location.)
3. The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.
4. Refer to the dimensional drawings (Figs. 2 and 3) for locations of electrical inlets, condensate drain, duct connections, and required clearances before setting unit in place.
5. Unit designed for outdoor installation on wood flooring or on class A, B, or C roof covering materials.

GENERAL

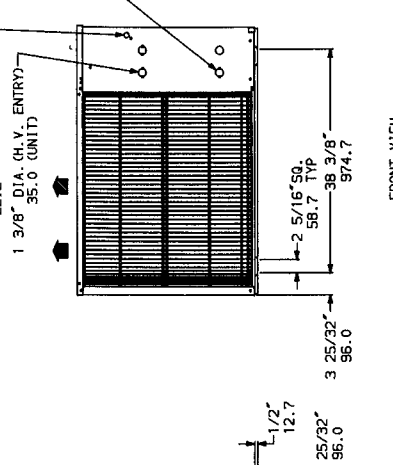
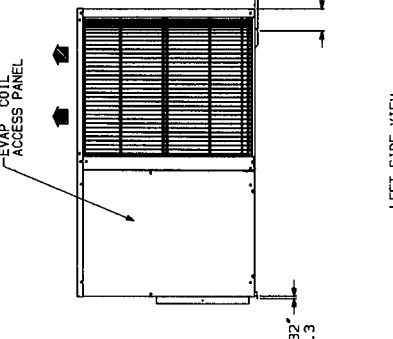
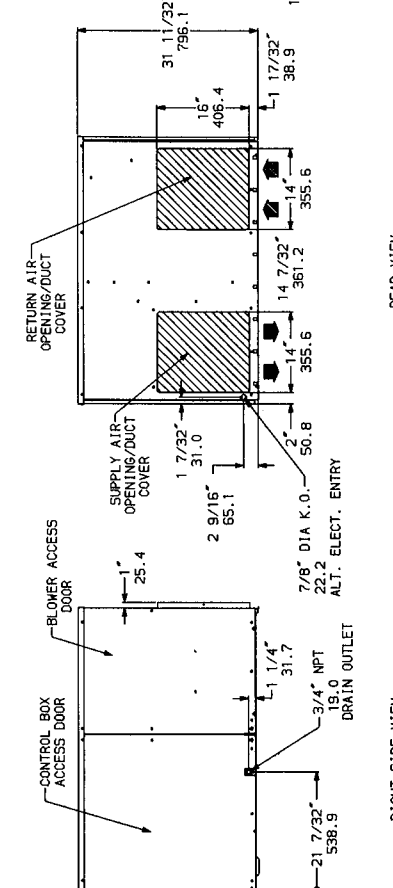
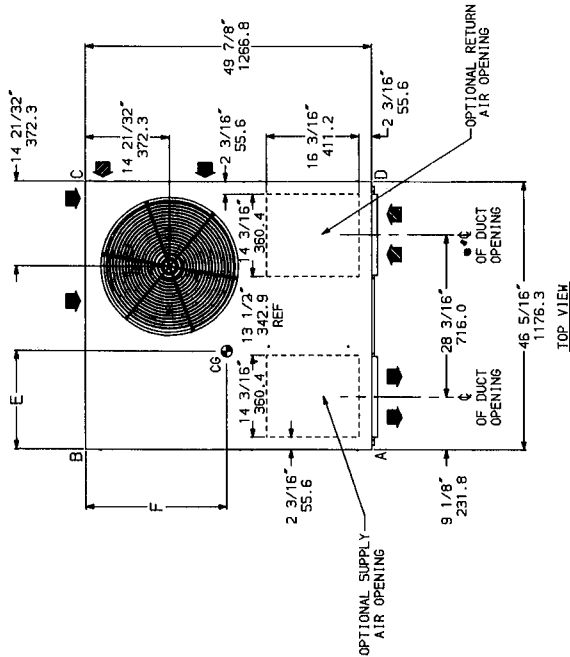
Model 50NQ Packaged Heat Pump has been designed and tested in accordance with ARI Standard 240, 270 and U.L. Standard 559.

These units are factory-charged with R-22 refrigerant. Installation is simple: connect air ducts, high- and low-voltage wiring, condensate drain, and install a field-supplied air filter.

All units can be connected into existing duct systems *that are properly sized and designed to handle an airflow of 375 to 450 Cfm per each 12,000 Btuh of rated cooling capacity. Refer to pre-sale literature for detailed air delivery capacity.*

NOTE: When installing any accessory item, see the manufacturer's Installation Instructions packaged with the accessory. The Qualified Agency must use factory authorized kits or accessories when modifying this unit.

UNIT	ELECTRICAL CHARACTERISTICS		CORNER WT. LB./KG.						CENTER OF GRAVITY		
	LBS.	KG.	A	B	C	D	E	F			
50N0018	208/230/1/60	148	100/45	102/46	63/29	61/26	17-1/2"	(444.5)	24-1/2"	(622.3)	
50N0024	208/230/1/60	334	152	102/46	108/49	63/29	60/27	17"	(431.8)	24"	(658.6)
50N0030	208/230/1/60	356	161	88/40	103/47	69/40	76/34	21-1/4"	(615.9)	22-3/4"	(577.8)
50N0036	208/230/1/60	370	168	101/46	108/49	63/38	78/35	20"	(508.0)	24"	(658.6)
50N0042	208/230/1/60	375	170	102/46	112/51	65/39	76/34	19-3/4"	(501.6)	23-1/2"	(596.9)



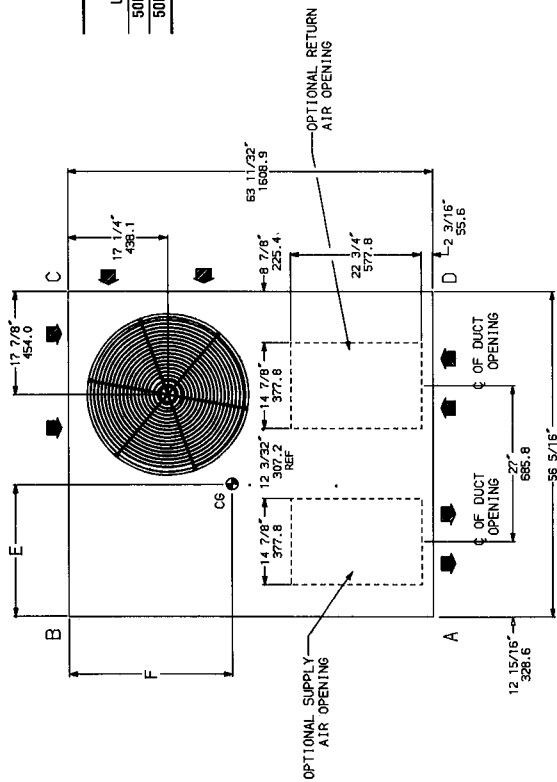
50NG REQUIRED CLEARANCES (INCHES)

UNIT TOP.....48 BLOWER ACCESS PANEL SIDE.....30
 DUCT SIDE OF UNIT.....6 MIN. CONTROL BOX ACCESS SIDE.....30
 SIDE OPPOSITE DUCTS.....30 BOTTOM OF UNIT.....0
 NOTE: PROVISION MUST BE MADE FOR FRESH AMBIENT AIR TO REACH THE OUTDOOR COIL WITHOUT RECIRCULATION OF THE AIR FROM THE OUTDOOR FAN DISCHARGE.

Fig. 2—Dimensional Drawing—Small Cabinet

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UNIT	ELECTRICAL CHARACTERISTICS	UNIT WT.			CORNER WT. LB./KG.			CENTER OF GRAVITY			
		LBS.	KG.	A	B	C	D	E	F		
50N0048	208/230/1/60	450	204	120/54	147/67	101/46	82/37	22-3/4"	57.8	28-1/4"	717.5
50N0060	208/230/1/60	483	219	128/58	170/77	106/48	80/36	21-1/2"	54.6.1	27-1/2"	698.5



50N00 REQUIRED CLEARANCES (INCHES)

- UNIT TOP.....48 BLOWER ACCESS PANEL SIDE.....30
- DUCT SIDE OF UNIT... 5 MIN. CONTROL BOX ACCESS SIDE.....30
- SIDE OPPOSITE DUCTS... 30 BOTTOM OF UNIT.....0
- NOTE: PROVISION MUST BE MADE FOR FRESH AMBIENT AIR TO REACH THE OUTDOOR COIL WITHOUT RECIRCULATION OF THE AIR FROM THE OUTDOOR FAN DISCHARGE.

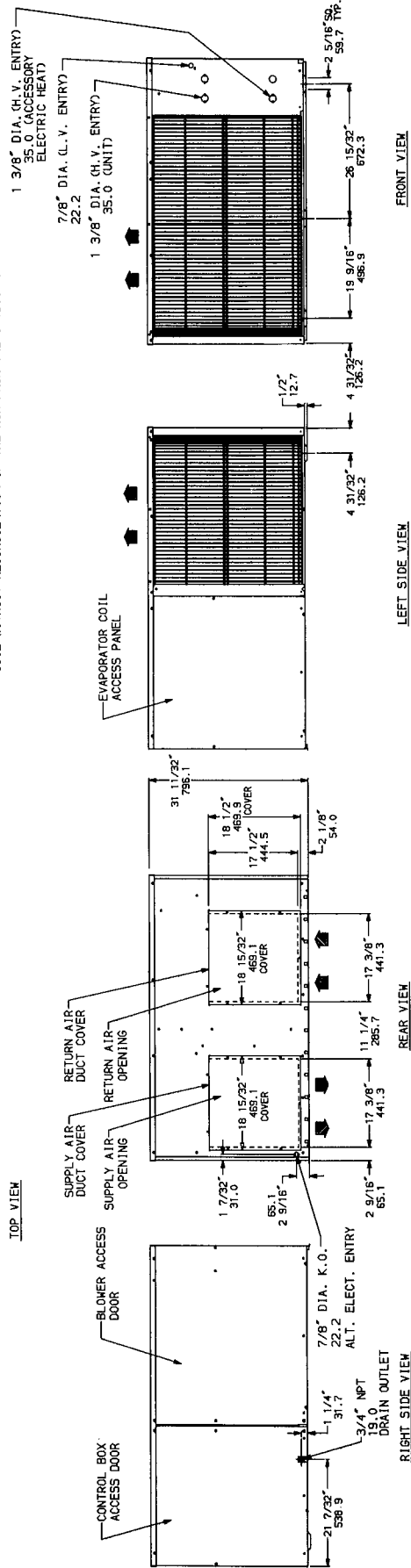


Fig. 3—Dimensional Drawing—Large Cabinet

MODEL NO.	DESCRIPTION	DATE	REVISIONS
50N	UNIT		
50NQ	UNIT		
50N1	UNIT		
50N2	UNIT		
50N3	UNIT		
50N4	UNIT		
50N5	UNIT		
50N6	UNIT		
50N7	UNIT		
50N8	UNIT		
50N9	UNIT		
50N10	UNIT		
50N11	UNIT		
50N12	UNIT		
50N13	UNIT		
50N14	UNIT		
50N15	UNIT		
50N16	UNIT		
50N17	UNIT		
50N18	UNIT		
50N19	UNIT		
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50N37	UNIT		
50N38	UNIT		
50N39	UNIT		
50N40	UNIT		
50N41	UNIT		
50N42	UNIT		
50N43	UNIT		
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50N47	UNIT		
50N48	UNIT		
50N49	UNIT		
50N50	UNIT		

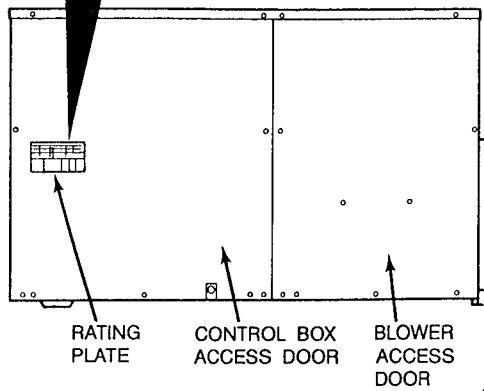


Fig. 4—Rating Plate Location

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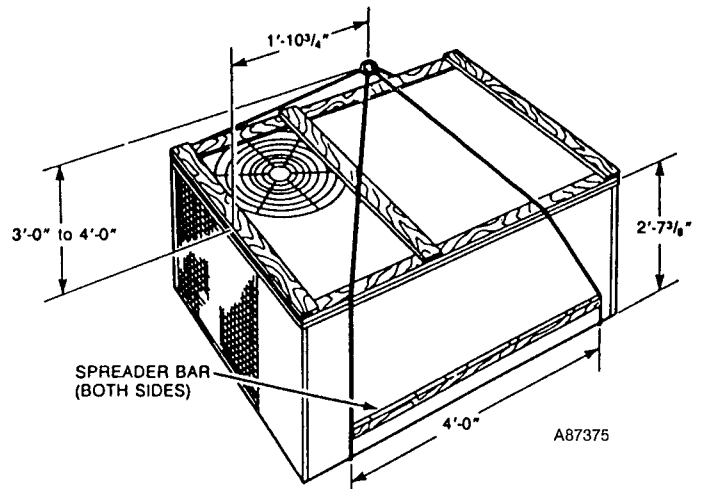


Fig. 5—Suggested Rigging

Step 1—Moving and Setting Unit in Place

▲ CAUTION

Use spreader bars and crate top when rigging the unit to be lifted. Model 50NQ must be rigged for lifting as shown in Fig. 5. 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; therefore, the ground-level pad or accessory roof-mounting curb must be level before setting the unit in place. When a field-fabricated support is used, ensure that the support is level and properly supports the unit.

ROOFTOP INSTALLATION

▲ CAUTION

When installing the unit on a rooftop, be sure that the roof will support the additional weight. Refer to Figs. 2 and 3 for total weight and corner weight information.

For downflow applications, an accessory roof-mounting curb may be installed on, and flashed into the roof before unit installation. The instructions for installing the accessory curb are packaged with the curb.

For end-discharge applications place the unit on a level base that provides proper support. Refer to Fig. 7 for location of additional supports/sleepers. On flat roofs, be sure that the unit is located at least 4 ins. above the highest expected water level on the roof to prevent flooding.

GROUND-LEVEL INSTALLATION

Place the unit on a solid, level, concrete pad that extends approximately 2 ins. beyond the casing on all four sides of the unit. Do not secure the unit to the pad except when required by local codes. Ensure pad does not obstruct coil drainage holes in bottom of unit. (Holes drain water during cooling and defrost cycles.) In areas where prolonged sub-freezing temperatures or snowfall occur, increase clearance to 12–18 ins. by constructing an angle-iron frame to support

the unit. The frame should be designed so as not to block the drainage holes. See Fig. 8 and Table 1 for recommended frame construction. Extend a 24-in. gravel apron around pad for condensate and defrost water drainage.

CLEARANCES

The required minimum operating and service clearances are shown in Figs. 2 and 3. Adequate condenser air must be provided.

▲ CAUTION

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

The condenser fan discharges through the top of the unit. Ensure that the fan discharge does not recirculate to the condenser coil. Do not locate the unit in either a corner or under a complete overhead obstruction. The minimum clearance under a partial overhang (such as a normal house roof overhang) is 48 ins. above unit top. The maximum horizontal extension of a partial overhang must not exceed 48 ins.

Do not locate the unit where water, ice, or snow from an overhang or roof will damage or flood the unit by falling on the top. Do not locate the unit where grass, shrubs, or other plants will interfere with the airflow either into or out of the unit. Do not install the unit on carpeting, tile, or other combustible material other than wood flooring. Heat pump may be installed on wood flooring or on Class A, B, or C roof covering materials.

Step 2—Condensate Disposal

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

Model 50NQ disposes of condensate water through a 3/4-in. NPT drain fitting. See Figs. 2 and 3 for location.

Install a 3-in. trap at the drain fitting to ensure proper drainage. See Fig. 6. Make sure that the outlet of the trap is at least 1 in. lower than the unit drain pan connection to prevent the pan from overflowing. Prime the trap with water.

If the installation requires draining the condensate water away from the unit, connect a drain tube using a minimum of 7/8-in. OD copper tubing, 3/4-in. galvanized pipe, or 3/4-in. plastic pipe. *Do not undersize the tube.* Pitch the

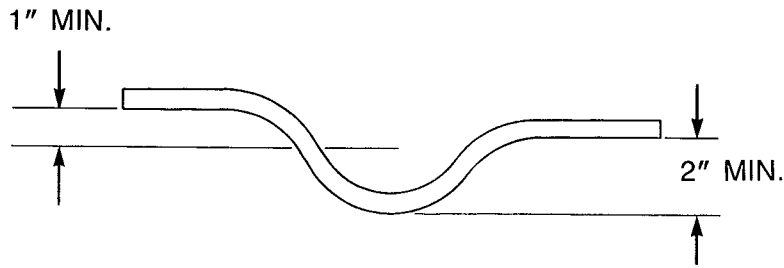
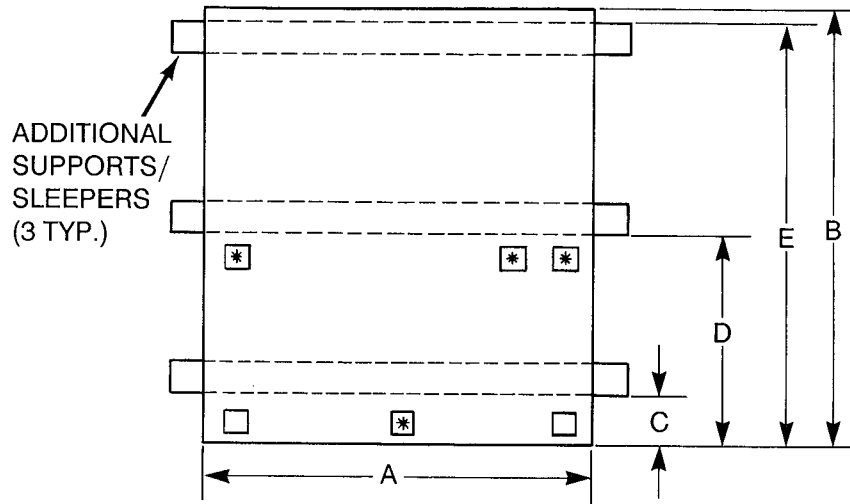


Fig. 6—Condensate Trap

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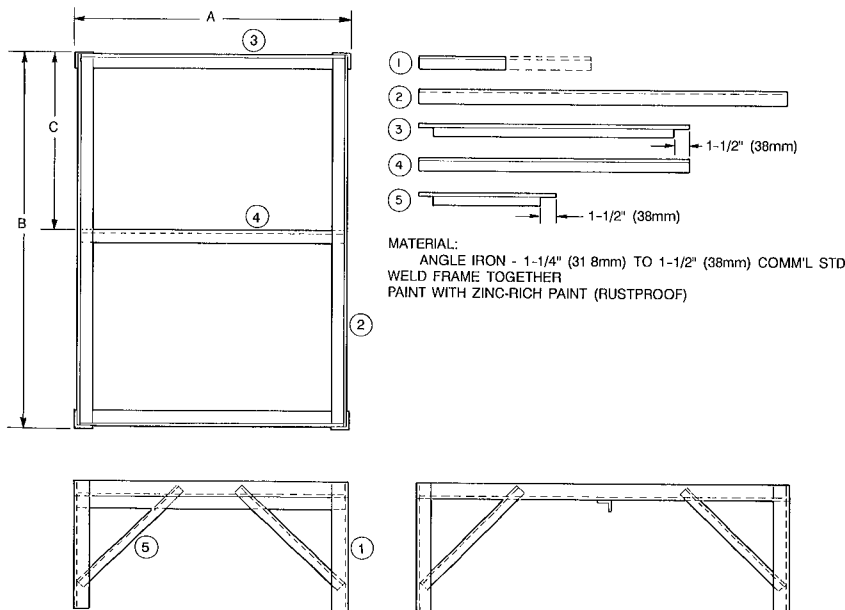


A89208

	A (in/mm)	B (in/mm)	C (in/mm)	D (in/mm)	E (in/mm)
Small Cabinet 018-042	46-5/16/ 1176.3	47-7/8/ 1266.8	7/ 178	28/ 711	49/ 1245
Large Cabinet 048-060	56-5/16/ 1430.5	62-11/32/ 1608.9	7/ 178	35/ 889	62-1/2/ 1587

*These embossments are located on Large Cabinet Units (048-060 size only.)

Fig. 7—Additional Support/Sleeper Location



A89185

Fig. 8—Mounting Frame

Table 1—Mounting Frame Dimensions

Item No.	Large Cabinet Length	Small Cabinet Length	Quantity
A	50 in (1269mm)	40-3/8 in (1024mm)	—
B	60-1/2 in (1535mm)	47 in (1193mm)	—
C	30-1/4 in (766mm)	23-1/2 in (597mm)	—
1	12 in (305mm) to 24 in (610mm)	12 in (305mm) to 24 in (610mm)	4
2	60 in (1523mm)	46-1/2 in (1181mm)	2
3	49-1/2 in (1257mm)	39-7/8 in (1012mm)	2
4	49-1/2 in (1257mm)	39-7/8 in (1012mm)	1
5	16 in (406mm)	16 in (406mm)	8

drain tube downward at a slope of at least 1 in. in every 10 ft of horizontal run. Be sure to check the drain tube for leaks.

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.

Step 3—Duct Connections

Model 50NQ has duct flanges on the supply and return air openings on the side and bottom of the unit except on sizes 048 and 060. 048 and 060 sizes do not have flanges on side discharge openings. See Figs. 2 and 3 for connection sizes and locations.

NOTE: The design and installation of the duct system must be in accordance with the standards of the National Fire Protection Association for installation of nonresidence-type air conditioning and ventilating systems, NFPA No. 90A or residence type, NFPA No. 90B, and/or local codes and ordinances.

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

1. Remove appropriate panels from unit to obtain either horizontal or down discharge. If models 018 through 042 are installed in horizontal discharge applications, remove side duct covers, save screws, and install the covers on bottom duct openings. To install duct covers on bottom duct openings, remove one flange which interferes with heater mounting plate. For models 048 through 060 remove either side or bottom duct covers as needed and discard.
2. Select and size ductwork, supply-air registers, and return-air grilles according to ASHRAE recommendations. Refer to Tables 2 & 3 for static pressure capability.

CAUTION

When the duct-system fastening holes are being drilled into side of unit instead of the unit duct flanges, use extreme care to avoid puncturing the coil or coil tubes. See Fig. 9.

3. Use flexible transition between rigid ductwork and unit to prevent transmission of vibration. The transition may be screwed or bolted to duct flanges. Use suitable gaskets to ensure weather and airtight seal.
4. Install external, field-supplied air filter(s) in return-air ductwork where it is easily accessible for service. Recommended filter sizes are shown in Table 4.
5. Size all ductwork for maximum required airflow (either heating or cooling) for unit being installed. Avoid abrupt duct size increases or decreases.
6. Adequately insulate and weatherproof all ductwork located outdoors. Insulate ducts passing through unconditioned space and use vapor barrier in accordance with latest issue of SMACNA and ACCA minimum installation standards for heating and air conditioning systems. Secure all ducts to building structure.
7. Flash, weatherproof, and vibration-isolate all openings in building structure in accordance with local codes and good building practices.
8. For Canadian Installations Only—An L-shaped exhaust duct fabricated of sheet metal or a material rated 94-5V shall be used in the case of downflow applications.

Step 4—Electrical Connections

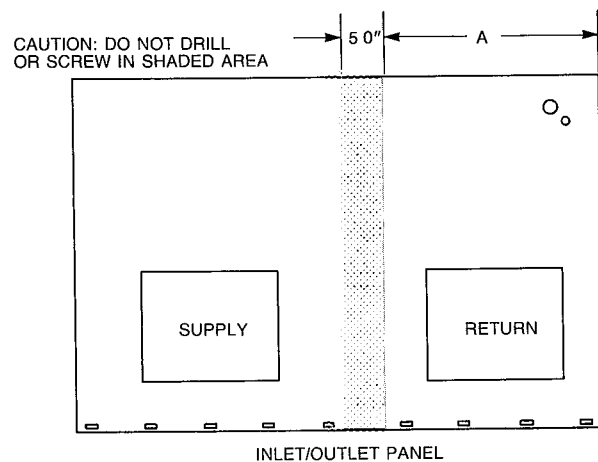
WARNING

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 electrical wire connected to the unit ground lug in the control compartment, or conduit approved for electrical ground when installed in accordance with the National Electrical Code ANSI/NFPA-70 (in Canada, Canadian Electrical Code CSA C22.1) and local electrical codes.

CAUTION

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

1. Make all electrical connections in accordance with the latest National Electrical Code, ANSI/NFPA-70 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. Ensure that high-voltage power to unit is within operating voltage range indicated on unit rating plate (Fig. 4). On 3-phase units, ensure that phases are voltage and current balanced. Consult local power company for correction of improper voltage and/or phase balance.
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.



A87410

Cabinet Size	A
Small Cabinet 018-042	20-1/2"
Large Cabinet 048-060	21-1/4"

Fig. 9—Location of Coil Area—
Not to be Drilled

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 (Fig. 4) for maximum over-current device size and minimum circuit amps (ampacity) for wire sizing.

The field-supplied disconnect switch box may be mounted on the unit over the high-voltage inlet hole in the control corner panel. See Figs. 2 and 3.

Proceed as follows to complete the high-voltage connections to the unit:

1. Connect ground lead to chassis ground connection when using separate ground wire.
2. Run high voltage leads into unit through inlet hole in control box post, and to contactor through the hole in the bottom of control box. The high voltage leads should remain in conduit until entering control box and a watertight termination should be made at bottom of control box.

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.

For operation of 208 volts, disconnect the yellow transformer-primary lead from the contactor. See the unit wiring label. Remove the tape and cover from the terminal on the end of the blue transformer-primary lead. Save the cover. Connect the blue lead to the contactor terminal from which the yellow lead was disconnected.

Using the cover removed from the blue lead, insulate the loose terminal on the yellow lead. Wrap the cover with electrical tape so that the metal terminal cannot be shorted.

Indoor blower motor speed taps should be changed for 208V operation on 208/230v rated units. Interchange motor lead at blower motor. See "Start-up and Adjustments" section (page 9) and unit wiring label.

CONTROL VOLTAGE CONNECTIONS

Locate the room thermostat on an inside wall in the space to be conditioned where it will not be subjected to either a cooling or heating source or direct exposure to sunlight. Mount the thermostat 4 to 5 ft above the floor.

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

A grommated control voltage inlet hole is located in the panel adjacent to the control access panel. See Figs. 2 and 3. Run the low-voltage leads from the thermostat, through the inlet hole, and to the control voltage terminals. Connect the thermostat leads to the terminals as shown in Fig. 10.

HEAT ANTICIPATOR SETTING

Factory thermostats have fixed heat anticipator settings. No adjustment is required.

CIRCUIT BREAKER

Unit has manual reset circuit breaker which is located in the low-voltage wiring box adjacent to low-voltage terminal board. If unit fails to operate, first check breaker for tripped

position. If breaker is tripped, re-set and try to start unit. If breaker continues to trip there is a problem in the low-voltage electrical circuit (electrical short, ground, or transformer overload). Correct the condition and check for normal unit operation.

PREPARING UNIT FOR 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 have been disconnected.
4. Relieve all pressure from system before touching or disturbing anything inside compressor terminal box if refrigerant leak is suspected around terminals.
5. Never attempt to repair soldered connection while refrigerant system is under pressure.
6. Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:
 - a. Relieve all pressure from system.
 - b. Cut component connecting tubing with tubing cutter and remove component from unit.
 - c. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

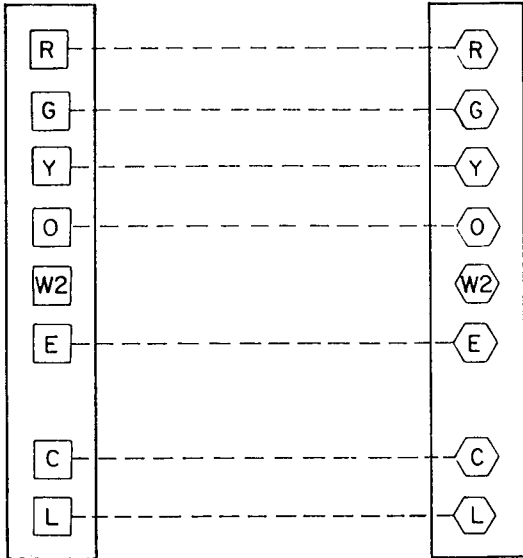
PRESTARTUP PROCEDURES

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

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution. If refrigerant leak is detected, see "Refrigerant Leaks" section on page 9.
 - c. Inspect all field- and factory-wiring connections. Be sure that connections are completed and tight.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
 - a. Make sure that outdoor fan blade is correctly positioned in fan orifice. *Blades should clear fan motor by no more than 1/4 in. The fan blade hub should be flush with end of motor shaft.*
 - 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.

THERMOSTAT & SUBBASE (SEE BELOW)

UNIT CONTROL WIRING TERMINAL BOARD

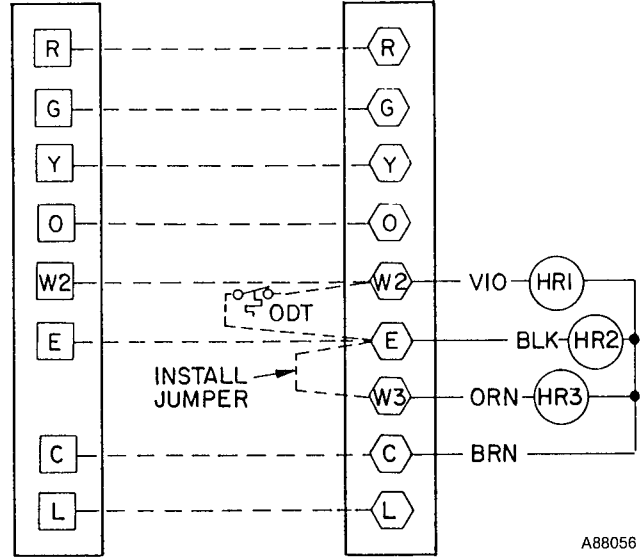


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COOLING AND ONE-STAGE HEATING (without Electric Heater)

THERMOSTAT & SUBBASE

UNIT CONTROL WIRING TERMINAL BOARD



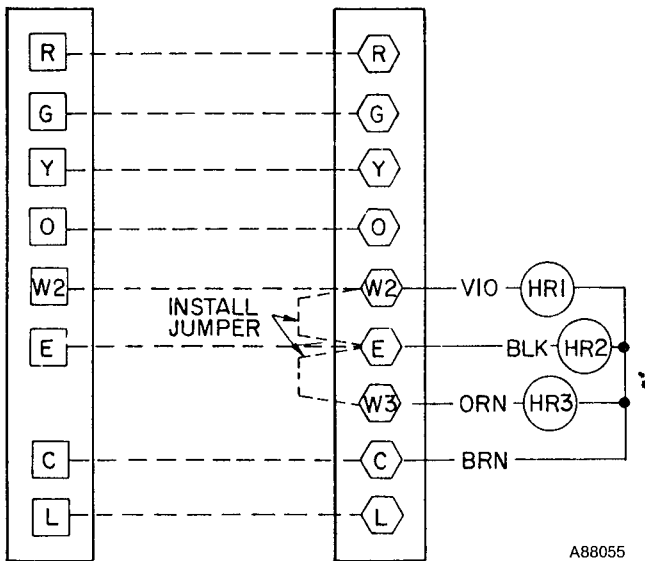
A88056

ODT — Outdoor Thermostat
HR — Heater Relay

COOLING AND TWO-STAGE HEATING (Unit equipped with Electric Heater, Supplemental Heat, One Outdoor Thermostat)

THERMOSTAT & SUBBASE

UNIT CONTROL WIRING TERMINAL BOARD



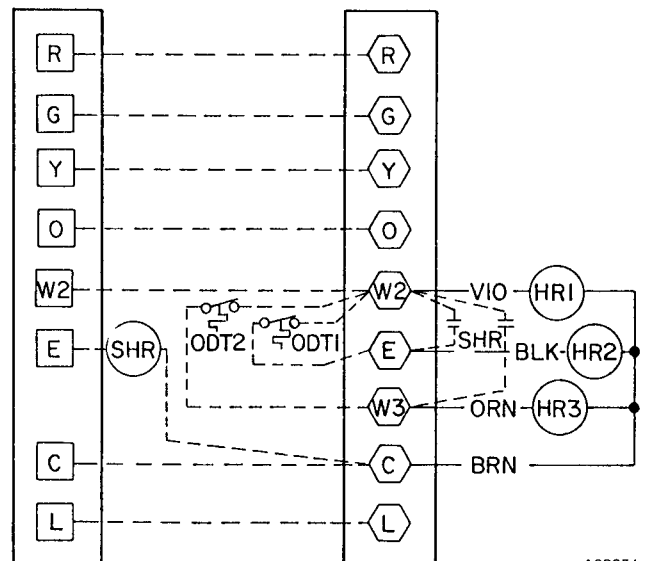
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HR — Heater Relay

COOLING AND TWO-STAGE HEATING (Unit equipped with Electric Heater, Supplemental Heat, No Outdoor Thermostats)

THERMOSTAT & SUBBASE

UNIT CONTROL WIRING TERMINAL BOARD



A88054

SHR — Supplemental Heat Relay
HR — Heater Relay
ODT — Outdoor Thermostat

COOLING AND TWO-STAGE HEATING (Unit equipped with Electric Heater, Supplemental Heat Relay, Two Outdoor Thermostats)

Fig. 10—Control Connections

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

Unit is now ready for initial startup.

REFRIGERANT LEAKS

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

1. Locate leak and ensure that refrigerant system pressure has been relieved.
2. Repair leak following accepted practices.

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

3. Add a small charge of R-22 refrigerant vapor to system and leak-test unit.
4. Evacuate refrigerant system if additional leaks are not 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.

START-UP AND ADJUSTMENTS

⚠ CAUTION

Complete the required procedures given in "Preparing Unit for Start-up," page 7, before starting the unit.

Do not jumper any safety devices when operating the unit.

Do not operate unit in the cooling mode when the outdoor temperature is below 55 F (unless accessory low-temperature kit is installed).

Do not operate unit in heating mode when outdoor temperature is above 60 F.

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

The unit compressor is equipped with a crankcase heater. It is recommended that heater be energized a minimum of 24 hours before starting unit. To energize heater only, set thermostat at OFF position; turn on unit main power at disconnect switch.

TO START UNIT—Check that main power is on and that compressor crankcase heater has been energized for at least 24 hours.

1. Check that heater main power is on as applicable.
2. Set selector switch at OFF.
3. Set fan switch as desired (FAN) (AUTO.).
4. Set thermostat dial at the desired temperature.
5. Set selector switch at HEAT or COOL. Check system refrigerant charge as described in "Checking Charge" section below.

CHECKING CHARGE—Factory Charge is shown on unit rating plate (See Fig. 4).

⚠ CAUTION

Compressor damage may occur if system is over-charged.

Adjust charge in cooling mode by following procedure shown on the "superheat charging tables" located on unit. Check charge in heating by following procedure shown on "heating check chart" located on unit.

INDOOR AIRFLOW AND AIRFLOW ADJUSTMENTS

▲ CAUTION

For proper operation, the recommended airflow is 375 to 450 CFM for each 12,000 BTUH of rated cooling capacity. Minimum airflows may be different if supplemental electric heaters are installed. See Table 5.

These units have direct-drive blower motors. Blower motors are factory-connected to deliver the proper heating and cooling airflows at normal external static pressures.

Tables 2 and 3 show both heating and cooling airflows at various external static pressures. Refer to these tables to determine the airflow for the system being installed. See Table 4 for the rated heating and cooling airflows.

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.

The heating and/or cooling airflow of 208/230-V direct-drive blower motors can be changed by changing the lead connections at the blower motor. The motor leads are color-coded as follows:

black = high speed

blue = medium speed

red = low speed

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

COOLING—On a call for cooling, thermostat makes circuit R-O, R-Y and R-G. When room temperature rises to within 2 degrees of control setting of thermostat, circuit R-O makes, energizing reversing valve solenoid (RVS). Unit is now in standby condition for cooling. As room temperature rises, the second-stage bulb makes, allowing a circuit (R-Y) through low-pressure switch (LPS) to contactor (C), starting compressor (COMP) and outdoor fan motor (OFM). Circuit R-G energizes indoor fan relay (IFR) starting indoor fan motor (IFM).

When thermostat is satisfied, contacts open de-energizing contactor. Indoor fan relay, compressor and motor stop.

HEATING—On a call for heat, thermostat makes circuits R-Y and R-G. Circuit R-Y is completed, allowing circuit through low-pressure switch (LPS) to contactor (C), starting compressor (COMP) and outdoor fan motor (OFM). Circuit R-G also is completed, energizing indoor fan relay (IFR) and

starting indoor fan motor (IFM).

Should room temperature continue to fall, circuit R-W is made through second-stage thermostat bulb. If optional electric heat package is used, a sequencer is energized bringing on first bank of supplemental electric heat. When thermostat is satisfied, contacts open, de-energizing contactor and sequencer. Motors and heaters de-energize.

DEFROST—Defrost board (DB) is a time/temperature control which includes a field-selectable time period between check if defrost is necessary (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.

CARE AND MAINTENANCE

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

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

▲ WARNING

The ability to properly maintain 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 Users Manual. A 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 cooling coil, drain pan, and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect blower motor and wheel for cleanliness each heating and cooling season. Clean when necessary.
4. Check electrical connections for tightness on controls for proper operation each heating and cooling season. Service when necessary.

▲ WARNING

A failure to follow these warnings could result in serious personal injury.

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 4 for recommended filter sizes.

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

Table 2—Models 50NQ Air Delivery (Cfm) in 208V-Horizontal Flow Set-up at Indicated External Static Pressure & Voltage (Sizes 018, 024, 030, 036, 048, 060)

UNIT SIZE	VOLT/PHASE/HZ	MOTOR SPEED	EXTERNAL STATIC PRESSURE—INCHES W.C.										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018	208/1/60	LOW	788	761	758	734	675	644	600	564	525	—	—
		MED	1195†	1184†	1160†	1121†	1092†	987†	886	744	724	667	581
		HI	1425†	1375†	1359†	1308†	1248†	1139†	1030†	917†	786	702	647
024	208/1/60	LOW	802	787	772	738	702	—	—	—	—	—	—
		MED	1211†	1200†	1190†	1169†	1138†	1061†	993†	878	768	—	—
		HI	1473†	1444†	1418†	1377†	1339†	1260†	1195†	997†	838	750	—
030	208/1/60	LOW	—	—	—	—	—	—	—	—	—	—	—
		MED	1225	1220	1211	1177	1166	1105	1040	913	—	—	—
		HI	1483	1470	1450	1415	1372	1319	1245	1098	891	—	—
036	208/1/60	LOW	—	—	—	—	—	—	—	—	—	—	—
		MED	1421	1388	1343	1306	1252	1165	1058	—	—	—	—
		HI	1882†	1809†	1722†	1644†	1546†	1386	1296	1225	1054	—	—
042	208/1/60	LOW	—	—	—	—	—	—	—	—	—	—	—
		MED	1421	1388	1343	1306	1252	—	—	—	—	—	—
		HI	1882†	1809†	1722†	1644†	1546†	1386	1296	1225	—	—	—
048	208/1/60	LOW	1603	1584	1489	—	—	—	—	—	—	—	—
		MED	2035	1985	1923	1851	1771	1678	1497	—	—	—	—
		HI	2304†	2262†	2139†	2046	1940	1815	1687	1462	—	—	—
060	208/1/60	LOW	—	—	—	—	—	—	—	—	—	—	—
		MED	2205†	2198†	2190†	2188†	2122†	2084	2020	1943	1863	—	—
		HI	2581†	2538†	2455†	2382†	2305†	2258†	2168†	2084	1992	1893	—

Table 3—Models 50NQ Air Delivery (Cfm) in 230-V Horizontal Flow Set-Up at indicated External Static Pressure & Voltage (Sizes 018, 024, 030, 036, 048, 060)

UNIT SIZE	VOLT/PHASE/HZ	MOTOR SPEED	EXTERNAL STATIC PRESSURE—INCHES W.C.										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018	230/1/60	LOW	913†	905†	891	848	827	765	699	651	606	575	—
		MED	1366†	1336†	1302	1250†	1201†	1098†	982†	898	776	676	609
		HI	1584†	1552†	1467†	1414†	1332†	1256†	1146†	1010†	825	750	665
024	230/1/60	LOW	950†	935†	926†	900	885	811	733	700	—	—	—
		MED	1414†	1399†	1373†	1333†	1289†	1229†	1148†	1015†	811	747	—
		HI	1652†	1614†	1556†	1520†	1440†	1375†	1277†	1098†	876	799	701
030	230/1/60	LOW	937	933	929	919	893	—	—	—	—	—	—
		MED	1425	1413	1391	1358	1326	1268	1196	1071	875	—	—
		HI	1670†	1576†	1552†	1533†	1468	1419	1324	1134	920	875	—
036	230/1/60	LOW	1088	1075	1050	—	—	—	—	—	—	—	—
		MED	1636†	1599†	1553†	1480	1393	1275	1158	1050	—	—	—
		HI	2034†	1957†	1846†	1734†	1602†	1571†	1316	1225	1072	—	—
042	230/1/60	LOW	—	—	—	—	—	—	—	—	—	—	—
		MED	1636†	1599†	1553†	1480	1393	1275	—	—	—	—	—
		HI	2034†	1957†	1846†	1734†	1602†	1571†	1316	1225	—	—	—
048	230/1/60	LOW	1891	1852	1819	1746	1684	1553	—	—	—	—	—
		MED	2230†	2155†	2060	1989†	1885	1782	1630	1483	—	—	—
		HI	2385†	2304†	2183†	2097	1982	1863	1717	1614	1493	—	—
060	230/1/60	LOW	2027	2000	1993	1972	1940	1872	—	—	—	—	—
		MED	2546†	2508†	2448†	2382†	2297†	2234†	2150†	2070	1977	1870	—
		HI	2837†	2758†	2652†	2587†	2476†	2392†	2304†	2224†	2089	2003	1872

Air deliveries based on unit dry coil without air filter or optional electrical heaters. Deduct field supplied air filter and electric heater pressure drop to obtain external static pressure available for ducting. Dashes indicate less than minimum airflow and coil icing may occur.

†Airflow exceeds maximum coil velocity. Condensate may be blown off of coil.

If supplemental electric heaters are used, refer to Table 5 for minimum air-flows. These airflows will be slightly greater than those required for unit operation.

Table 4—Rated Airflow and Filter Sizes

Model	50NQ														
	018300	024300	030300	036300	036500	036600	042300	042500	042600	048300	048500	048600	060300	060500	060600
Rated Airflow (Cfm)*	675	900	1100	1300			1500			1750			2100		
Recommended Min † Field Supplied Filter Size	324	432	540	648			756			864			1030		
Disposable Type Cleanable or High- Capacity	216	288	360	432			504			576			720		

*Rated in accordance with U.S. Government D.O.E. test procedures and/or ARI Standard 210.

†Required filter areas shown are based on the larger of the ARI-rated cooling or heating airflow at a velocity of 300 ft/min for disposable type or 450 ft/min for high-capacity type.

Table 5—Minimum Airflow for Safe Electric Heater Operation

SIZE	018	024	030	036	042	048	060
AIRFLOW (CFM)	600	800	1000	1200	1400	1600	2000

Table 6—Wet Coil Pressure Drop

Unit Size	Wet Coil P.D. (In. wc.)
018, 024	0.54
030	.060
036	.070
042	.075
048	.086
060	.100

UNIT TOP REMOVAL

▲ CAUTION

Condenser fan and motor are fastened to the unit top. When removing the top, use extreme care not to pull the fan motor leads loose.

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 all screws that secure unit top, including screws around four sides and those on top that screw into internal divider panels. Save all screws.
2. Tape all side panels at each seam near unit top. Use tape strips that are at least 5 ins. long to prevent sides from falling when top is removed.
3. Lift top from unit carefully. Set top on edge and ensure that top is supported by unit side that is opposite duct (or plenum) side. *Use extreme care to prevent damage to the fan blades, motor, and insulation.*
4. Carefully replace and secure unit top to unit, using screws removed in step 1, when maintenance and/or service procedures are concluded. (Be sure to use original screws that have rubber washers to seal out water when securing top to internal divider panels.)

INDOOR 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 assembly. Failure to adhere to this warning could cause personal injury or death.

Clean the blower assembly as follows:

1. Remove and disassemble blower assembly as follows:
 - a. Remove blower access door.
 - b. Disconnect blower motor leads from their termination points at motor. Disconnect yellow lead from control box at capacitor.
 - 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) that secures wheel to motor

shaft, remove screws that secure motor mount brackets to housing, and slide motor and motor mount out of housing.

2. Remove and clean blower wheel as follows:
 - a. Ensure proper reassembly by marking wheel orientation and cutoff plate location.
 - b. Remove screws holding cutoff 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 cutoff 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 coils 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.

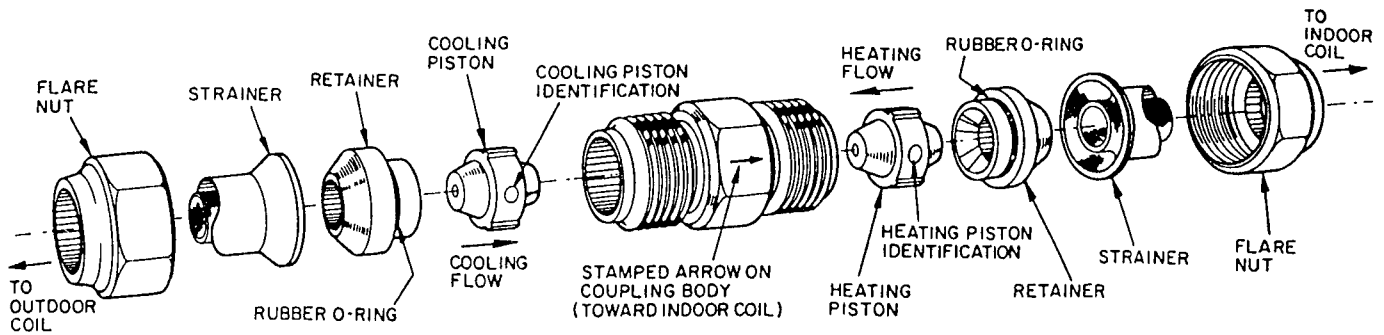
The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs that interfere with the airflow through the outdoor coil. Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent-and-water solution. Rinse coils with clear water using a garden hose. Be careful not to splash water on motors, insulation, wiring, or air filter(s). For best results, spray 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.

OUTDOOR FAN

▲ CAUTION

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



A87292

Fig. 11—Metering Device (Dual-Piston) Components

Inspect the fan blades for cracks or bends each year. *Ensure that blades clear the motor by no more than 1/4 in. The fan blade hub should be flush with end of motor shaft. If the blade assembly has slipped down the motor shaft, adjust the fan position on the motor shaft by loosening the setscrew(s), then moving the blade assembly up. Be sure that the setscrew(s) is on the flat(s) of the motor shaft before 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 heating cycle and one complete cooling cycle to ensure proper operation. If discrepancies are observed in either or both operating cycles, or if a suspected malfunction has occurred, check each electrical component with the proper electrical instrumentation. Refer to the unit wiring label when making these checkouts.

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

REFRIGERANT CIRCUIT

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

If oil is detected or if low cooling performance is suspected, leak-test all refrigerant tubing; using an electronic leak-detector, halide torch or liquid-soap solution. If a refrigerant leak is detected, see "Refrigerant Leaks" in this publication.

If no refrigerant leaks are found and low cooling performance is suspected, refer to "Checking Charge" and unit rating plate.

INDOOR AIRFLOW

The heating and/or cooling airflow does not require checking unless improper performance is suspected. *If a problem exists, be sure that all supply- and return-air grilles are open and free from obstructions, and that the air filter is clean.* When necessary, refer to "Indoor Airflow and Airflow Adjustments," page 10 of this publication to check the system airflow.

METERING DEVICE SERVICING

See Fig. 11 for metering device components. The pistons have a refrigerant metering orifice through them. The retainer forms a sealing surface for liquid line flare connection. To check, clean or replace piston:

1. Shut off power to unit.
2. Remove refrigerant from unit using approved refrigerant removal methods.
3. Remove liquid line flare connections from metering device.
4. Note position of arrow on metering device body with respect to unit.
5. Pull retainers out of body. Be careful not to scratch flare sealing surfaces. If retainers do not pull out easily, carefully use locking pliers to remove retainers. Replace scratched or damaged retainers.
6. Slide pistons out by inserting a small soft wire through metering hole (18-gauge thermostat wire). See that metering hole, sealing surface around piston cones and fluted portion of pistons are not damaged.
7. Chart on unit access panel illustrates proper arrangement and size of pistons.
8. Clean pistons refrigerant metering orifice.
9. Replacement retainer O-ring Part No. is 99CC501052.

LIQUID LINE STRAINER

The Liquid Line Strainers (to protect metering device), are made of wire mesh and are located in the liquid line on both sides of the metering device. Strainers are pressed into the line. Remove strainers by threading a No. 10 sheet metal screw into strainers and pulling the screw with pliers.

UNIT SINGLE-PHASE COMPRESSORS are equipped with a Compressor Start Thermistor (PTC device). When supply voltage is within 10% limit and compressor does not start, check the start thermistor with an ohmmeter.

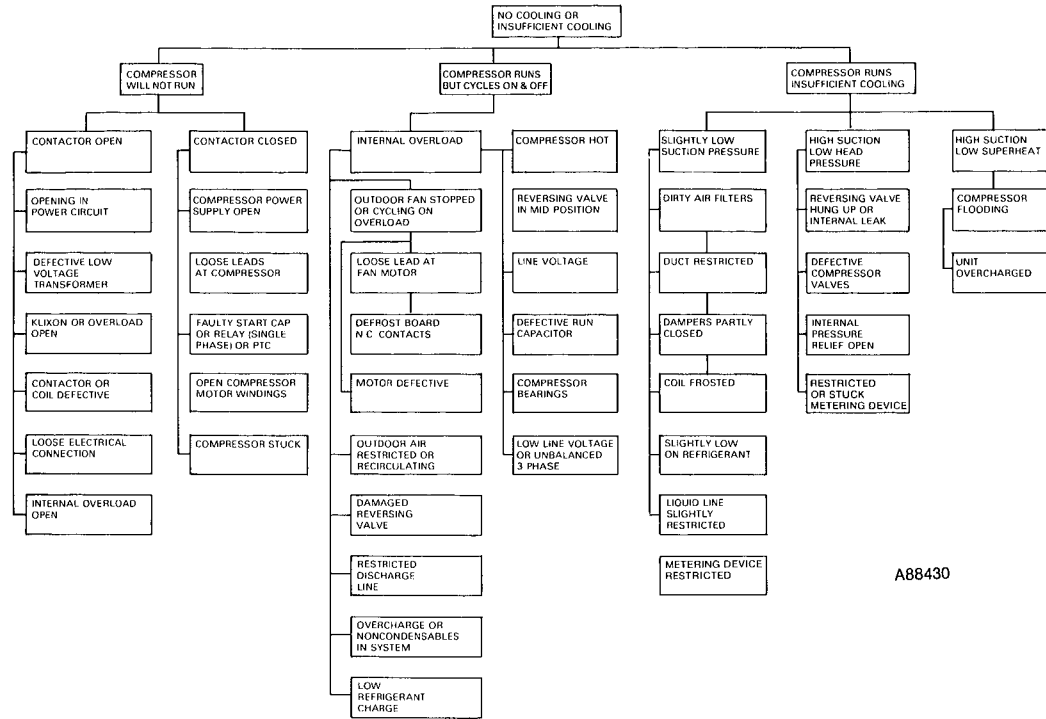
Checking Start Thermistor

1. Shut off all power to unit and wait 10 minutes for thermistor to cool to ambient temperature.
2. Remove thermistor from circuit.
3. Measure resistance of thermistor with ohmmeter. Normal resistance readings are 12.5 or 25 ohms + 20% at 75 F ambient temperature depending on your unit.

4. If ohmmeter resistance reading is not within $\pm 20\%$, the thermistor is defective and must be replaced.

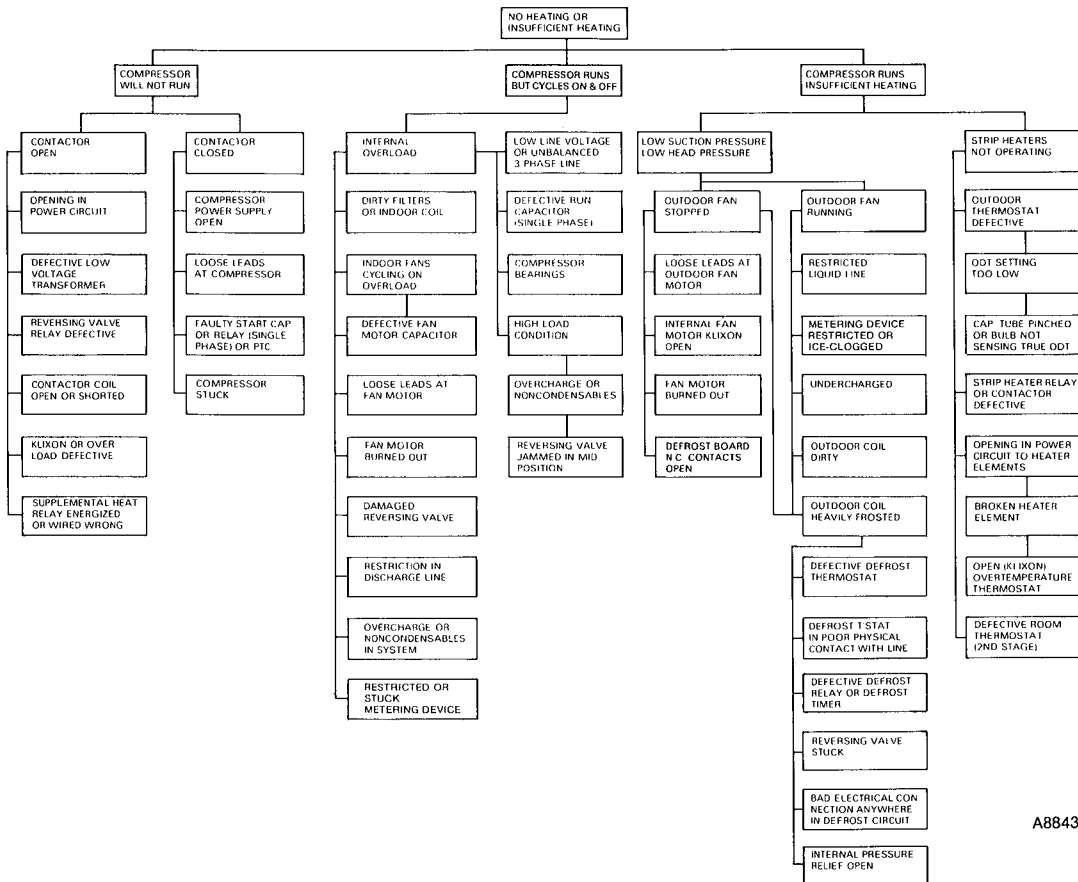
If start thermistor is good and compressor does not start, disconnect the thermistor from starting circuit and give compressor a temporary capacitance boost. Run compressor for 10 minutes, then shut off and allow system pressure to equalize. Reconnect start thermistor and try restarting compressor without boost capacitor. If after two attempts the compressor does not start, remove thermistor and add an accessory start capacitor and relay.

TROUBLESHOOTING CHART—COOLING CYCLE



A88430

TROUBLESHOOTING CHART—HEATING CYCLE



A88431

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