installation, start-up and service instructions

COMMERCIAL AIR-COOLED SPLIT SYSTEM HEAT PUMP

575A
Size 090
7½ Tons

Cancels: II 575A-90-1 II 575A-90-2
12/1/95

IMPORTANT — READ BEFORE INSTALLING

1. Read and become familiar with these installation instructions before installing this unit.
2. Be sure the installation conforms to all applicable local and national codes.
3. These instructions contain important information for the proper maintenance and repair of this equipment. Retain these instructions for future use.

CONTENTS

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.

When working on air-conditioning equipment, observe precautions in 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. Read these instructions *thoroughly.* Consult local building codes and National Electrical Code (NEC) for special installation requirements.

⚠ **WARNING:** Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Electrical shock can cause personal injury.

INSTALLATION

The 575A090 unit uses a semi-hermetic compressor. See Table 1 for physical data.

The 575A090 outdoor unit is approved for use only with the 524A-H090 indoor unit. Use only approved indoor unit.

The 575A090 unit is Underwriters' Laboratories (UL) and UL Canada approved for use with the 524A-H090 indoor unit only.

I. COMPLETE PREINSTALLATION CHECKS

A. Uncrate Unit (See Fig. 1)

Remove unit packaging except for the top skid assembly and wood bumpers, which should be left in place until after unit is rigged into place.

B. Inspect Shipment

File claim with shipping company if shipment is damaged or incomplete.

C. Consider System Requirements

- Consult local building codes and NEC for special installation requirements.
- Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit. See Fig. 2.
- Locate unit so that outdoor unit airflow is unrestricted on all sides and above. Refer to Fig. 2.
- Unit may be mounted on a level pad directly on base rails or mounted on raised pads at support points. See Fig. 2 for weight distribution based on recommended support points.
- Provide for condensate drainage and defrost water disposal beneath unit.
- Areas with high snowfall may need elevated mounting for adequate airflow.

NOTE: If vibration isolators are required for a particular installation, use corner weight information in Fig. 2 to make proper selection.

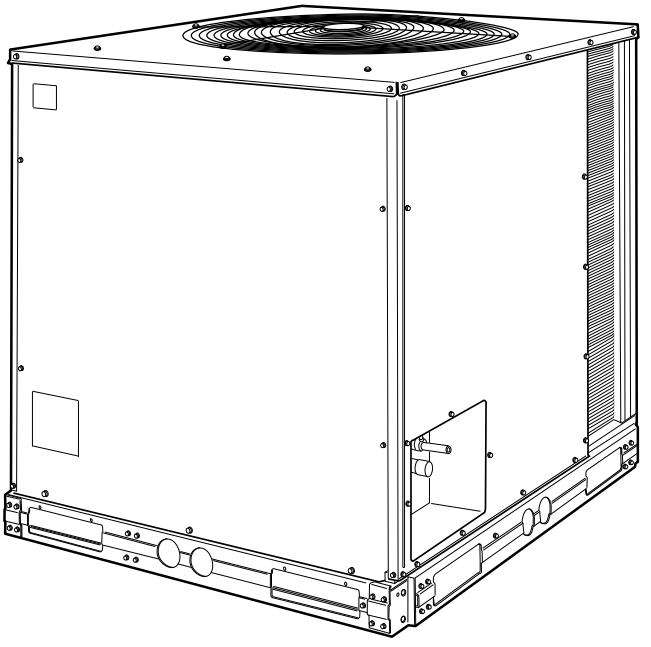
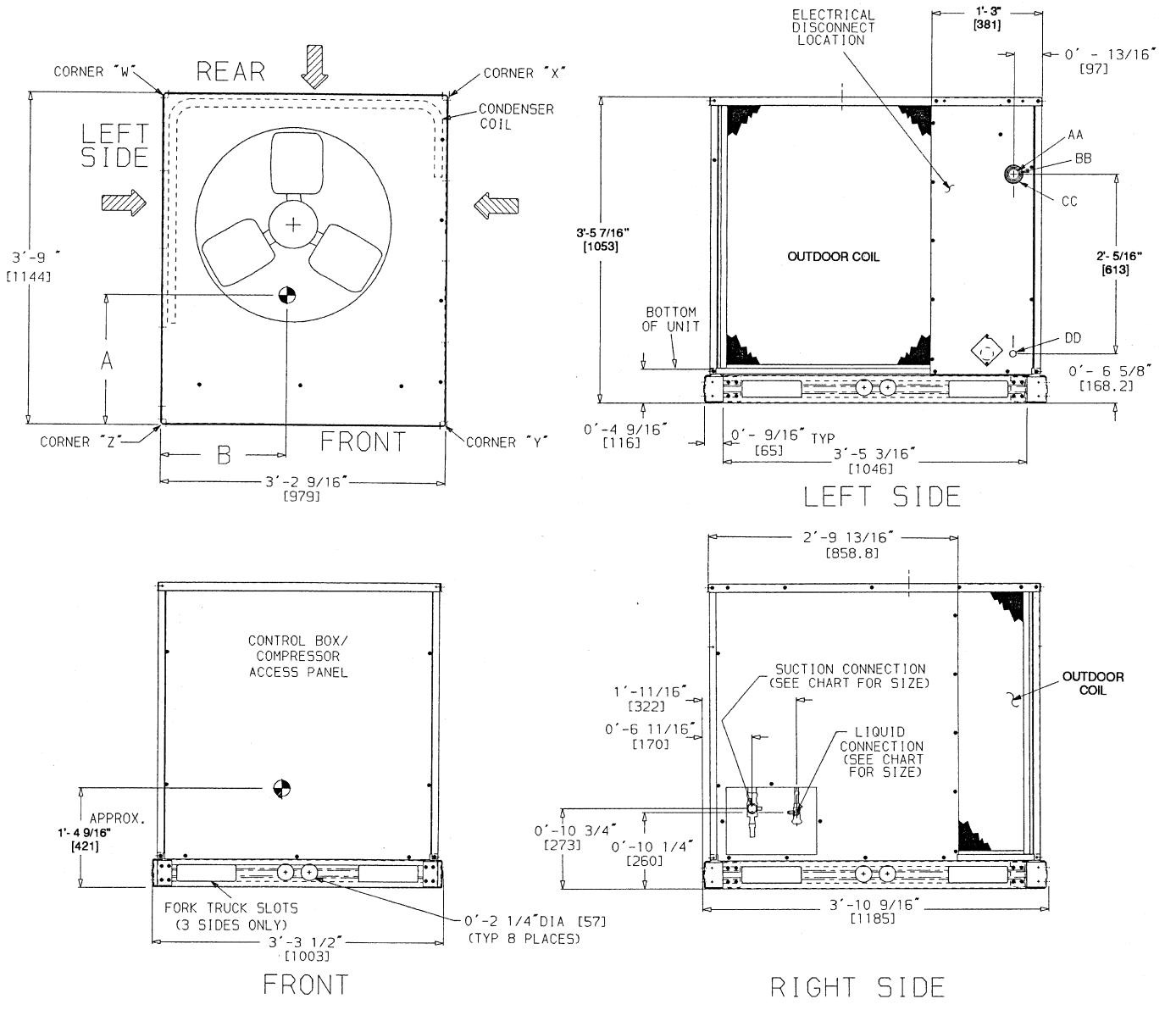


Fig. 1 — 575A090 Unit



UNIT 575A	UNIT W/ ALUMINUM-FIN COIL		UNIT W/ COPPER-FIN COIL		WEIGHT (WITH ALUMINUM-FIN COIL)										WEIGHT (WITH COPPER-FIN COIL)									
					Std Unit		Corner W		Corner X		Corner Y		Corner Z		Std Unit		Corner W		Corner X		Corner Y		Corner Z	
	Dim. A	Dim. B	Dim. A	Dim. B	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg
090	1′-8″ [508.0]	1′-5″ [431.8]	1′-9½″ [546.0]	1′-4¾″ [425]	540	245	132	60	100	45	133	60	175	80	608	276	160	73	117	53	142	64	189	86

NOTES:
1. Dimensions in [ ] are in millimeters.
2. Center of Gravity. See chart for dimensions.
3. Direction of airflow.
4. Minimum clearance (local codes or jurisdiction may prevail):
   a. Bottom to combustible surfaces, 0 in. (0 mm)
   b. Outdoor coil, for proper airflow, 36 in. (914 mm) one side, 12 in. (305 mm) the other. The side getting the greater clearance is optional.
   c. Overhead, 60 in. (1524 mm) to assure proper outdoor-fan operation.
   d. Between units, control box side, 42 in. (1067 mm) per National Electrical Code (NEC).
   e. Between unit and ungrounded surfaces, control box side, 36 in. (914 mm) per NEC.
   f. Between unit and block or concrete walls and other grounded surfaces, control box side, 42 in. (1067 mm) per NEC.
5. With the exception of the clearance for the outdoor coil as stated in note 4b, a removable fence or barricade requires no clearance.
6. Units may be installed on combustible floors made from wood or Class A, B, or C roof covering material.
7. Vertical center of gravity is approximately 40% of total unit height.

ELECTRICAL CONNECTIONS

CONNECTION SIZES	
AA	1⅜″ Dia. [35] Field Power Supply Hole
BB	2″ Dia. [51] Power Supply Knockout
CC	2½″ Dia. [64] Power Supply Knockout
DD	⅞″ Dia. [22] Field Control Wiring Hole

SERVICE VALVE CONNECTIONS

UNIT	SUCTION	LIQUID
575A090	1⅛″ [28.6]	½″ [12.7]

Fig. 2 — Dimensions

Table 1 — Physical Data

UNIT 575A	090
OPERATING WEIGHT (lb)	
Aluminum Coils (Standard)	540
Copper Coils (Optional)	608
RIGGING WEIGHT (lb)	
Aluminum Coils (Standard)	590
Copper Coils (Optional)	658
REFRIGERANT*	R-22
COMPRESSOR	Reciprocating, Semi-Hermetic
Quantity...Type	1...06DA818
Quantity Cylinders	4
Speed (rpm)	1750
Oil Charge (oz) (ea)	88
OUTDOOR FAN	Propeller; Direct Drive
Quantity...rpm	1...1100
Diameter (in.)	26
Motor Hp (NEMA)	¾
Nominal Airflow (cfm)	6500
OUTDOOR COIL	Enhanced Copper Tubes, Aluminum Lanced Fins
Face Area (sq ft)	18.0
Storage Capacity (lb)†	16.56
Fins/in.	17.0
Rows (No.)	2
CONNECTIONS (Sweat)	
Suction (in.)	1⅛
Liquid (in.)	½
CONTROLS	
Pressurestat Settings (psig)	
High Cutout	426 ± 7
Cut-in	320 ± 20
Low Cutout	7 ± 3
Cut-in	22 ± 5
Defrost Thermostat	
Initiate Defrost (F)	28
Terminates Defrost (F)	65

LEGEND

NEMA — National Electrical Manufacturing Association

*Unit is factory supplied with holding charge only.
†Storage capacity of coil with coil 80% full of liquid R-22 at 120 F.

II. RIG AND MOUNT THE UNIT

⚠ **CAUTION:** Be sure unit panels are securely in place prior to rigging.

A. Rigging

The unit is designed for overhead rigging. Refer to rigging label for preferred rigging method. Spreader bars are not required if top crating is left on unit. All panels must be in place when rigging. (See Fig. 3.) As further protection for coil faces, plywood sheets may be placed against sides of unit, behind cables. Run cables to a central suspension point so that angle from the horizontal plane is not less than 45 degrees. Raise and set unit down carefully.

If it is necessary to roll unit into position, mount unit on rails, using a minimum of 3 rollers. *Apply force to rails, not unit.* If unit is to be skidded into position, place it on a large pad and drag it by the pad. *Do not apply any force to unit.*

Raise from above to lift unit from rails or pad when unit is in final position.

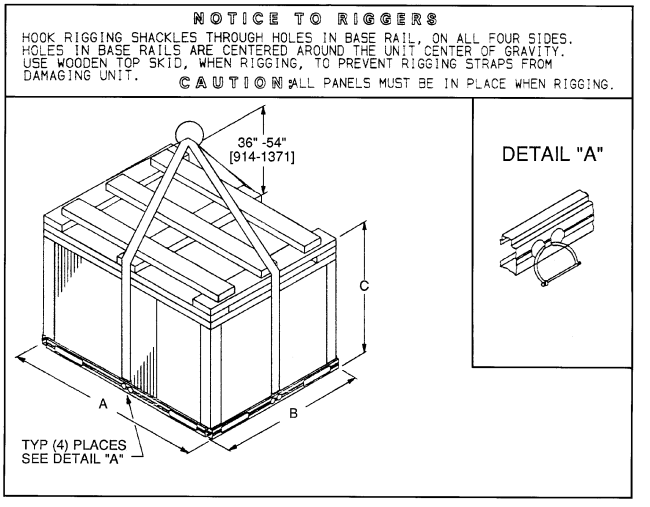
After unit is in position, remove all shipping wrapping and top crating.

B. Mounting

The unit must be elevated to ensure drainage from basepan during sub-freezing conditions and to prevent or limit blockage of outdoor coil during snowfall. Consideration should be given to specific geographical areas when determining height of unit elevation.

C. Compressor Mounting

As shipped, compressors are held down by 4 bolts. After unit is installed, loosen each bolt until the snubber washer can be moved with finger pressure. See Fig. 4.



UNIT	MAX WEIGHT				A		B		C	
	w/Al Coil		w/Cu Coil							
	Lb	Kg	Lb	Kg	in.	mm	in.	mm	in.	mm
575A090	590	268	658	298	45.0	1143	38.5	989	43.5	1105

Al — Aluminum-Fin
Cu — Copper-Fin

Fig. 3 — Rigging Label

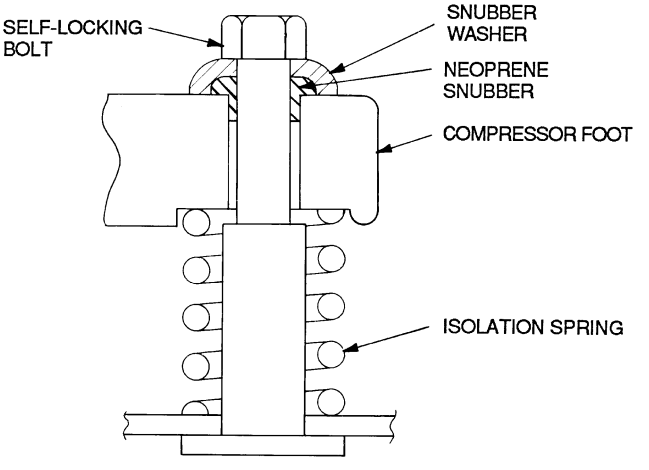


Fig. 4 — Compressor Mounting

III. COMPLETE REFRIGERANT PIPING CONNECTIONS

Suction connection is sweat with plastic cap; liquid connection is sweat with plastic cap. Refer to Table 2 for the proper line sizes. Follow standard piping practices.

Table 2 — Refrigerant Piping Sizes

LINEAR LENGTH OF PIPING — ft								
UNIT 575A	0-25		25-50		50-75		75-100	
	Line Size (in. OD)							
	L	S	L	S	L	S	L	S
090	½	1⅛	⅝	1⅛	⅝	1⅜	¾	1⅜

LEGEND

L — Liquid Line **OD —** Outside Diameter **S —** Suction Line

NOTES:
1. Pipe sizes are based on a 2° F loss for liquid and suction lines.
2. Pipe sizes are based on the maximum linear length shown for each column, plus a 50% allowance for fittings.
3. Charge units with R-22 in accordance with unit installation instructions.

A. Size Refrigerant Lines

Consider length of piping required between 575A unit and 524A-H unit, amount of liquid lift, and compressor oil return. See Table 3. Refer to 524A installation instructions for additional information.

Table 3 — Liquid Line Data

UNIT 575A	MAX ALLOWABLE LIQUID LIFT (ft)		LIQUID LINE	
090	Heating	Cooling	Max Allowable Pressure Drop (psi)	Max Allowable Temp Loss (F)
	75	65	7	2

LEGEND

db — Dry Bulb
wb — Wet Bulb

NOTES:
1. The liquid lift in cooling mode is based on 80/67 F (db/wb) entering indoor-air temperature and a 95 F outdoor-air temperature, with R-22 refrigerant, at an indoor airflow of 3000 cfm.
2. The liquid lift in heating mode is based on 70/60 F (db/wb) entering indoor-air temperature and a 47/43 F (db/wb) outdoor-air temperature, with R-22 refrigerant, at an indoor airflow of 3000 cfm.

B. Filter Drier and Moisture Indicator

See Fig. 5. The filter drier is factory supplied and field-installed in the liquid line. Moisture indicator is field-supplied and should be installed just after liquid line shutoff valve. *Do not use a receiver;* there is none provided with unit and one should not be used.

NOTE: Unit is shipped with R-22 holding charge. System pressure must be relieved before removing caps. Recover refrigerant prior to brazing.

Pass nitrogen or other inert gas through piping while brazing to prevent formation of copper oxide.

C. Liquid Line Solenoid Valve

A field-supplied liquid line solenoid valve (LLSV) is recommended when piping system length exceeds 75 feet. The LLSV must be of the biflow type, suited for use in heat pump systems.

NOTE: Part number EF23JS214 (Sporlan model CB14S2, ⅝-in. ODF/⅞-in. ODM) is recommended and is available from the Replacement Components Division. This solenoid requires field-supplied Sporlan MKC-2 coils.

Wire the solenoid in parallel with the compressor contactor coil.

Install the LLSV near the outdoor unit. The flow arrow must be pointed toward the outdoor unit.

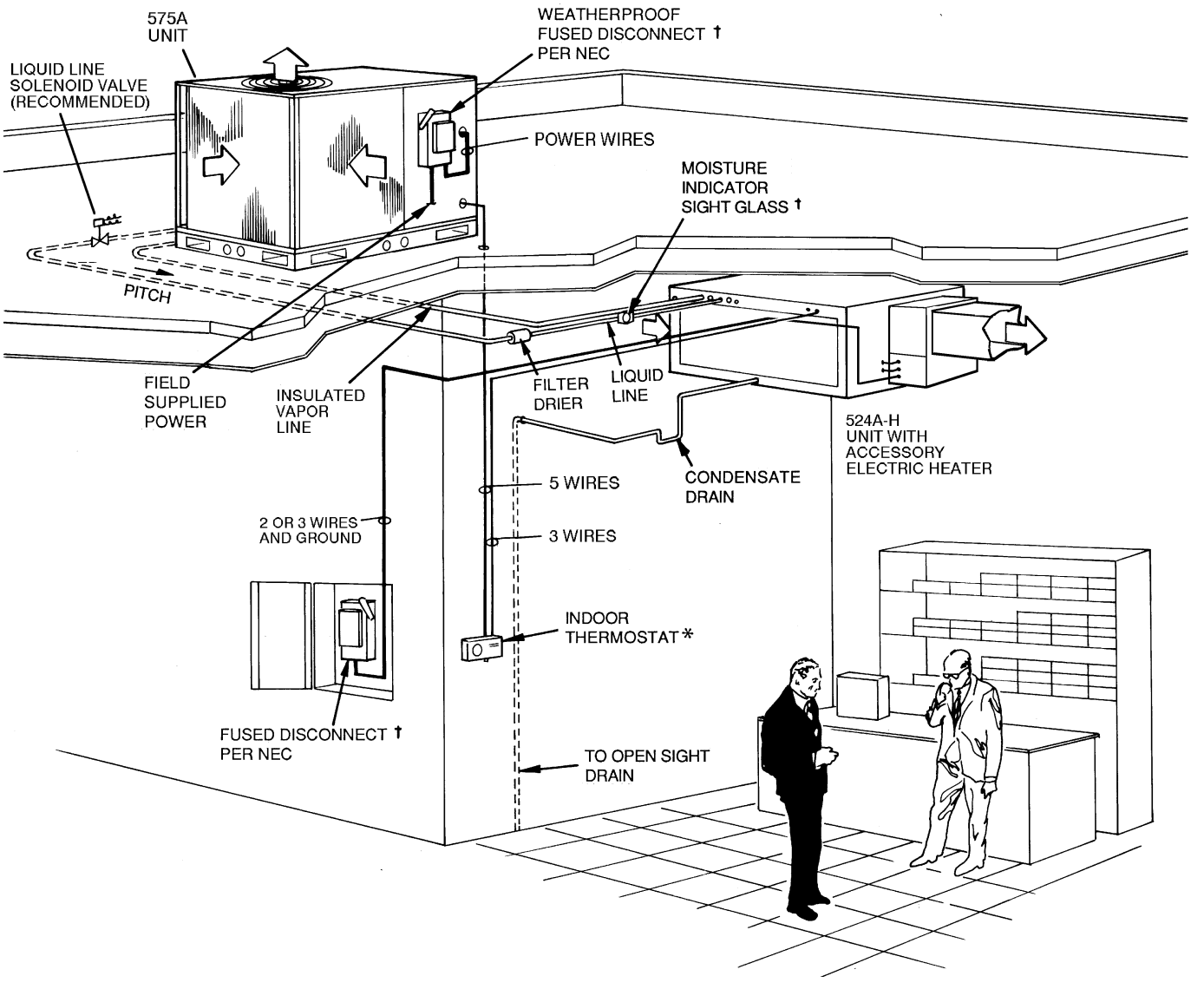
D. Safety Relief

A fusible plug is located on top of the accumulator. See Fig. 6. Note that all safety relief components are factory installed. **Do not cap fusible plug.** If local code requires additional safety device(s), install as directed.

E. Suction Piping at Indoor Coil and TXV Sensing Bulb Location

Suction piping must be designed so that refrigerant is thoroughly mixed after it leaves the indoor coil suction header. The thermostatic expansion valve (TXV) sensing bulb must also be correctly located. This ensures that the TXV sensing bulb receives reliable readings. Install the suction piping as follows:

1. Install a minimum of two 90-degree elbows upstream of the TXV bulb location.
2. Locate the TXV bulb on a vertical riser where possible. If a horizontal location is necessary, secure the bulb at approximately the 4 o'clock position or the 8 o'clock position. See Fig. 7.
3. Make sure that the piping system has no inherent oil traps, and that the piping layout does not allow oil to migrate into an idle indoor coil.
4. Complete refrigerant piping from indoor coil to outdoor coil before opening liquid and suction lines at the 575A unit. See Tables 1 and 2 for piping selection data.



LEGEND

NEC — National Electrical Code
TXV — Thermostatic Expansion Valve

*Accessory item.
†Field supplied.

NOTES:

1. All piping must follow standard refrigerant piping techniques.
2. All wiring must comply with the applicable local and national codes.
3. Wiring and piping shown are general points-of-connection guides only and are not intended for, or to include all details for, a specific installation.
4. Liquid line solenoid valve (solenoid drop control) is recommended to prevent refrigerant migration to the compressor. A biflow type solenoid valve is required.
5. Filter drier must be of the biflow type, suitable for heat pump duty.
6. Internal factory-supplied TXV and bypass check valve not shown.

Fig. 5 — Typical Piping Diagram, 575A/524A-H

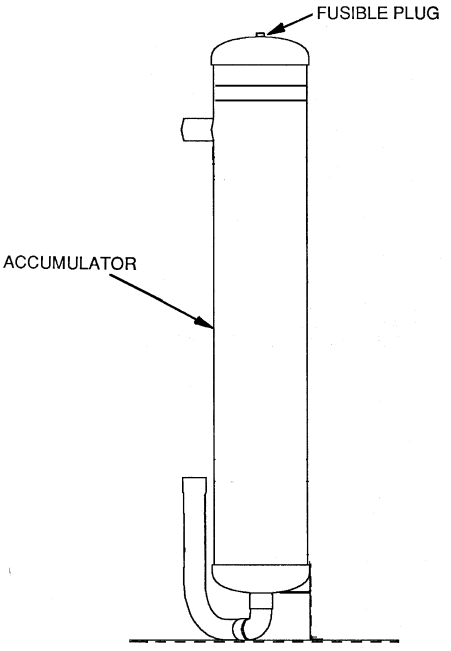
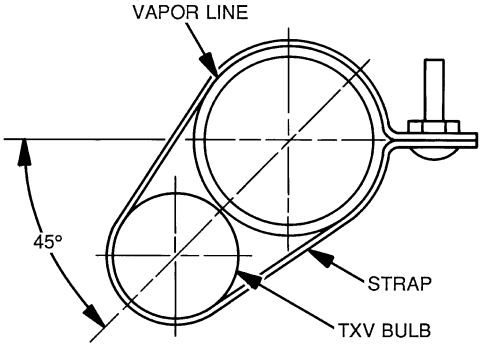


Fig. 6 — Fusible Plug Locations



LEGEND

TXV — Thermostatic Expansion Valve

NOTE: The 8 o'clock position is shown above.

Fig. 7 — TXV Sensing Bulb Location

IV. MAKE ELECTRICAL CONNECTIONS

⚠ **WARNING:** 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 unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with National Electrical Code (NEC) ANSI (American National Standards Institute)/NFPA 70 (National Fire Protection Association) and local electrical codes. Failure to follow this warning could result in the installer being liable for personal injury of others.

A. Field Power Supply

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the transformer *must* be rewired by disconnecting the black wire from the 230-v orange wire on the transformer and connecting it to the 208-v red wire from the transformer. The end of the orange wire must then be insulated.

Refer to unit label diagram for additional information. Short wire leads (pigtails) are provided for field wire connections. Use factory-supplied splices or UL approved copper/aluminum connector.

When installing units, provide a disconnect per NEC.

All field wiring must comply with NEC and local requirements.

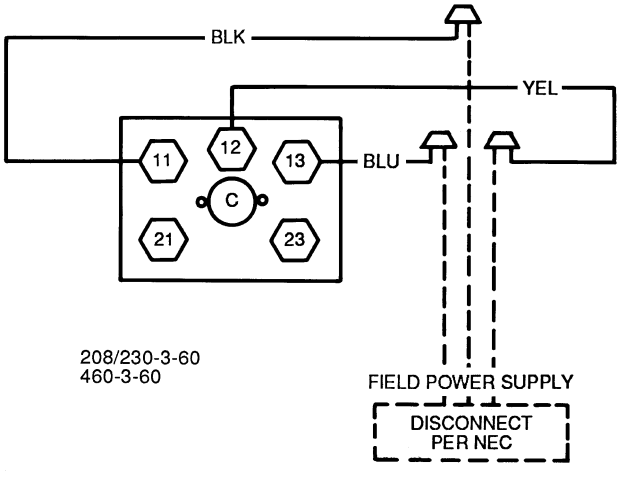
Install field wiring as follows:

1. Install conduit through side panel openings.
2. Install power lines to connections as shown in Fig. 8. Wrap connections with electrical tape.

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate (also see Table 4). Voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in Table 4, Note 2, to determine the percentage of voltage imbalance. *Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation invalidates any applicable unit warranty.*

B. Accessory Electric Heat

If the system is to be equipped with an accessory electric heater, refer to the 524A-H090 installation instructions and Table 5.



LEGEND

C — Contactor
NEC — National Electrical Code
Field Wiring
Factory Wiring
Splice Connection (Factory Supplied)

Fig. 8 — 575A090 Power Wiring Connections

Table 4 — Electrical Data

UNIT 575A	NOMINAL VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR		OFM	POWER SUPPLY		MINIMUM DISCONNECT	
		Min	Max	RLA	LRA	FLA	MCA	MAX FUSE OR HACR BRKR AMPS	FLA	LRA
090	208/230-3-60	187	254	31.5	160	3.1	42.5	50	45	177
	460-3-60	414	508	15.7	80	1.4	21.0	25	25	89

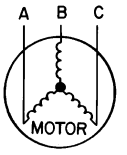
LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
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.
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 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

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

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

$$= 457$$

(AB) 457 − 452 = 5 v
(BC) 464 − 457 = 7 v
(AC) 457 − 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance

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

$$= 1.53\%$$

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.

Table 5 — Accessory Electric Heater Data

UNIT 524A-H	NOMINAL kW	V-PH-HZ	HEATER PART NO.	HEATER AMPS	MCA*	MOCP*
090	5	240-3-60	CAELHEAT001A00	12.0	25.6	30
		480-3-60	CAELHEAT002A00	6.0	12.3	15
	10	240-3-60	CAELHEAT004A00	24.1	40.7	50
		480-3-60	CAELHEAT005A00	12.0	19.8	25
	15	240-3-60	CAELHEAT007A00	36.0	55.7	80
		480-3-60	CAELHEAT008A00	18.0	27.4	40
	25	240-3-60	CAELHEAT010A00	60.1	85.8	125
		480-3-60	CAELHEAT011A00	30.1	42.4	60
	35	240-3-60	CAELHEAT013A00	84.0	115.8	175
		480-3-60	CAELHEAT014A00	42.1	57.4	80

LEGEND

MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection (Amps)
*Sizes shown are for single-point connection of electric heat accessory and air handler.

NOTES:
1. MCA and MOCP values apply to both standard and alternate factory-supplied motors.
2. Electrical resistance heaters are rated at 240 v or 480 v. To determine heater capacity (kW) at unit nameplate voltage, multiply 240-v or 480-v capacity by multipliers found in table below.

HEATER RATING VOLTAGE	ACTUAL SITE VOLTAGE							
	200	208	230	240	400	440	460	480
240	.694	.751	.918	1	—	—	—	—
480	—	—	—	—	.694	.840	.918	1

NOTE: The following equation converts kW of heat energy to Btuh:
kW x 3,412 = Btuh.

C. Field Control Wiring

Install an approved accessory thermostat assembly according to installation instructions included with the accessory. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature in accordance with thermostat installation instructions.

Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections on unit (shown in Fig. 9) as described in following Steps 1 through 3:

1. Pass the control wires through the hole provided in the corner post. (See Fig. 10.)
2. Feed wire through the raceway built into the corner post to the 24-v barriers located on the left side of the control box. The raceway provides the required clearance between the high- and low-voltage wiring.
3. Connect thermostat wires to screw terminals of low-voltage connection board.

NOTE: 39 VA is available for field-installed accessories. Control power requirement for heat pump outdoor unit is 36 VA (sealed). The factory-supplied control transformer is rated at 75 VA.

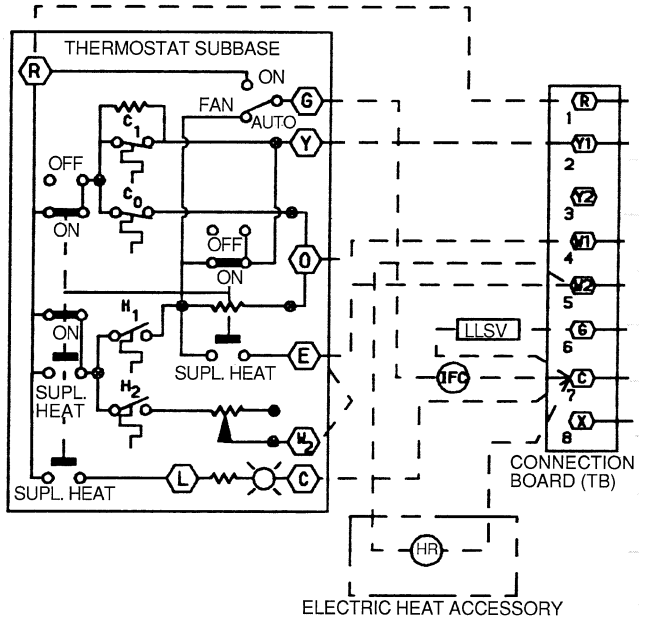
NOTE: For wire runs, use the following insulated wire:

LENGTH		INSULATION RATING (C)	SIZE	
Ft	M		AWG	sq mm
0-50	0-15.2	35	18	0.82
50-75	15.2-22.9	35	16	1.30
Over 75	Over 22.9	35	14	2.08

LEGEND

AWG — American Wire Gage

All wire larger than no. 18 AWG (American Wire Gage) cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.



LEGEND

C	— Cooling	**LLSV**	— Liquid Line Solenoid Valve
H	— Heating		
HR	— Heater Relay	**SUPL**	— Supplemental
IFC	— Indoor Fan Contactor	**TB**	— Terminal Block

Fig. 9 — Control Wiring Connections

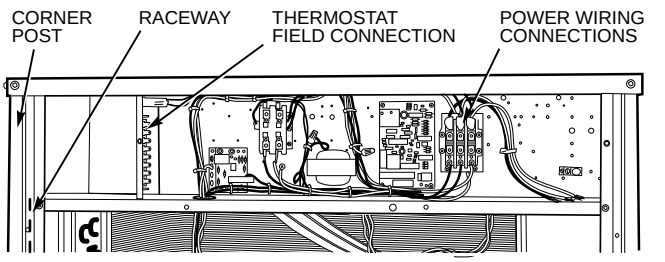


Fig. 10 — Field Control Wiring Raceway

START-UP

I. PRELIMINARY CHECKS

1. Check that all internal wiring connections are tight and that all barriers, covers, and panels are in place.
2. Field electrical power source must agree with unit nameplate rating.
3. Ensure all service valves are open. Ensure all compressor service valves are backseated.
4. Verify that compressor holddown bolts have been loosened and that flat/snubber washers can be rotated by finger pressure (snug, but not tight).
5. Verify compressor crankcase heater is securely in place. Crankcase heater must operate for at least 24 hours before start-up.
6. Note that compressor oil level is visible in the sight glass.
7. Check for leaks in refrigerant system by using soap bubbles and/or electronic leak detector.
8. Check voltage imbalance as shown in Table 4, Note 2.
9. Check that both outdoor and indoor units are properly mounted in accordance with installation instructions and applicable codes.

II. EVACUATE AND DEHYDRATE

Evacuate and dehydrate entire refrigerant system using methods described in GTAC II, Module 4, System Dehydration.

III. REFRIGERANT AND OIL CHARGE

Refer to GTAC II, Module 5, Charging Recovery, Recycling, and Reclamation.

NOTE: Use of a Totalclaim® refrigeration recovery unit is highly recommended when recovering refrigerant.

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

Unit is shipped with holding charge only. Weigh in 15 lb of R-22 to start unit.

A. Refrigerant Charging

Use Cooling Charging Chart (see Fig. 11). Vary refrigerant until the conditions of the chart are met. Note that charging chart is different from the type normally used. Chart is based on charging the units to the correct subcooling for the various operating conditions. Accurate pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the liquid line service valve. Mount the temperature sensing device on the liquid line, close to the liquid line service valve, and insulate it so that outdoor ambient temperature does not affect the reading. Indoor airflow must be within the normal operating range of the unit.

Operate unit a minimum of 15 minutes. Ensure pressure and temperature readings have stabilized. Plot liquid pressure and temperature on chart and add or reduce charge to meet curve. Adjust charge to conform with charging chart, using liquid pressure and temperature to read chart.

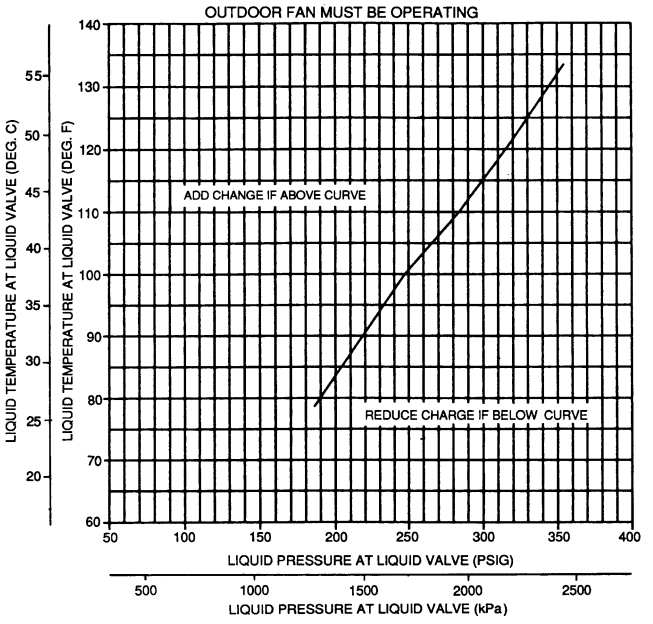


Fig. 11 — Cooling Charging Chart — 575A090

B. Oil Charging

Allow unit to run for about 20 minutes. Stop unit and check compressor oil level. Add oil only if necessary to bring oil into view in sight glass. See Table 1 for oil charge. *Use only approved compressor oil as follows:*

Suniso 3GS and WF32-150

Do not reuse drained oil or use any oil that has been exposed to atmosphere. Procedures for adding or removing oil are given in Refrigerant Service Techniques manual.

If oil is added, run unit for additional 10 minutes. Stop unit and check oil level. If level is still low, add oil *only after* determining that piping system is designed for proper oil return and that system is not leaking oil.

IV. REFRIGERANT SERVICE PORTS

Each unit system has 3 service ports; one on the suction line, one on the liquid line, and one on the compressor discharge line. Be sure caps on the ports are tight.

V. SEQUENCE OF OPERATION

When power is supplied to unit, the transformer (TRAN) is energized. The crankcase heater is also energized.

A. Cooling

With the thermostat in the cooling position, and when the space temperature comes within 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 contactor (IFC) and starting the indoor-fan motor (IFM) after one-second delay.

When the thermostat is satisfied, contacts open, deenergizing C. The COMP, IFM, and OFM stop.

As shown in Fig. 12, cooling mode refrigerant flow is as follows:

1. Hot refrigerant gas from compressor flows through the reversing valve and is directed to the outdoor coil vapor header.
2. Once at the outdoor coil vapor header, hot refrigerant gas flows up to check valve "A," which is closed. All refrigerant is then directed to complete a path through the lower 6 coil circuits (6 passes in each circuit).
3. Refrigerant flows through from the liquid header side outlets into the transfer header, where it flows upward.
4. Refrigerant leaves the transfer header through side connections in 4 locations and enters the middle coil circuits (4 coil circuits above check valve "A").
5. Refrigerant leaves the 4 middle coil circuits and enters the top portion of vapor header. The refrigerant moves up to the top 2 remaining coil circuits, where it enters the subcooler section.
6. Subcooled refrigerant leaves the coil circuits through the side outlets. It passes through check valve "B" into the system liquid line and then into the indoor coil.
7. Liquid refrigerant is expanded and evaporated to a low-pressure vapor in the indoor coil. Refrigerant vapor then returns to the outdoor unit through the system vapor line, where it is drawn through the reversing valve and accumulator and back to the compressor suction connection.

B. 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 IFC and starts IFM after a 1-second delay.

If room temperature continues 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 supplemental electric heat. When thermostat is satisfied, contacts open, deenergizing contactor and relay; motors and heaters deenergize.

As shown in Fig. 13, heating mode refrigerant flow is as follows:

1. Hot gas from compressor flows through the reversing valve and is directed to the system vapor line and indoor coil vapor header (not shown). Refrigerant is condensed and subcooled in the indoor coil and returns to the outdoor unit through the system liquid line.
2. Check valve "B" is closed and all liquid refrigerant enters the liquid header.
3. Refrigerant leaves the liquid header through 12 locations. It is then expanded in fixed orifice metering devices contained within the outlet tubes.
4. Refrigerant evaporates to low pressure vapor as it completes its passage through the 12 parallel coil circuits (6 passes each).
5. Refrigerant moves from the coil circuits into the vapor header, where it is drawn through the reversing valve and accumulator and back to compressor suction connection.

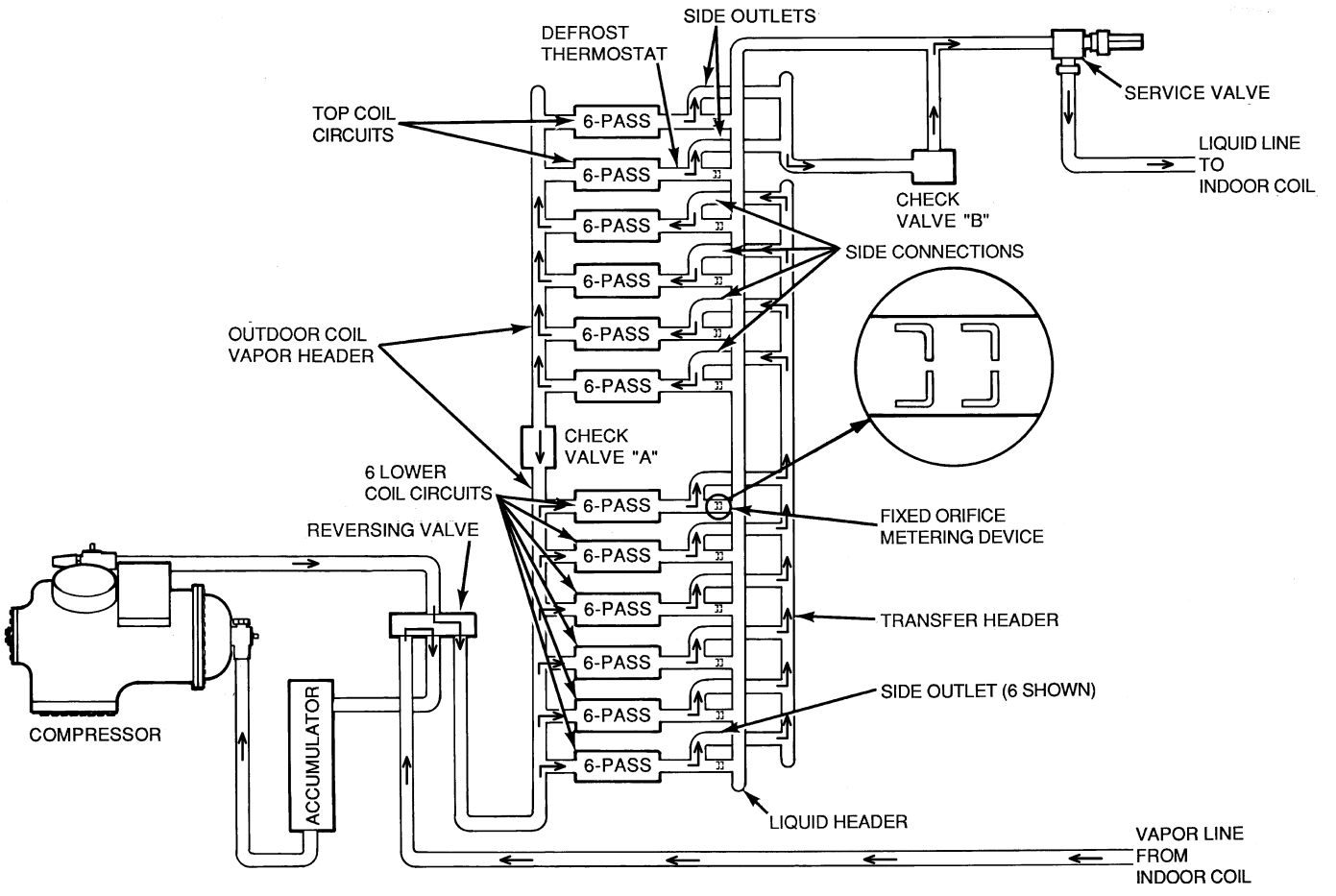


Fig. 12 — Cooling Mode Operation

C. Defrost

Defrost board (DB) is a time and temperature control, which includes a field-selectable time period between checks for frost (30, 50, and 90 minutes). Electronic timer and defrost cycle start only when contactor is energized and defrost thermostat (DFT) is closed (below 28 F).

Defrost mode is identical to Cooling mode, except outdoor-fan motor (OFM) stops and a bank of supplemental electric heat turns on to warm air supplying the conditioned space. Defrost mode is terminated when the DFT reaches 65 F.

VI. CHECKING COOLING AND HEATING CONTROL OPERATION

Start and check the unit for proper control operation as follows:

1. Place room thermostat SYSTEM switch in an OFF position. Observe that blower motor starts when FAN switch is placed in ON position and shuts down when FAN switch is placed in AUTO position.
2. Place SYSTEM switch in COOL position and FAN switch in AUTO position. Set control below room temperature. Observe that compressor, outdoor fan, and indoor fan 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 compressor, outdoor fan, indoor-fan motor, and electric heaters (if equipped) start. 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).

VII. MALFUNCTION

The high-pressure switch, loss-of-charge switch, and compressor overtemperature safety are located in a Cycle-LOC™ circuit that prevents heat pump operation if these safety devices are activated.

The lockout system can be reset by adjusting the thermostat to open the contacts (down for heating mode, up for cooling mode) deenergizing the Cycle-LOC circuitry. Compressor overcurrent protection is achieved with overload breakers which are temperature-sensitive and will automatically reset.

Unit is equipped with a no-dump reversing valve circuit. When unit is in cooling mode, reversing valve remains in cooling position until a call for heating is requested by thermostat. When unit is in heating mode, reversing valve remains in heating position until there is a call for cooling.

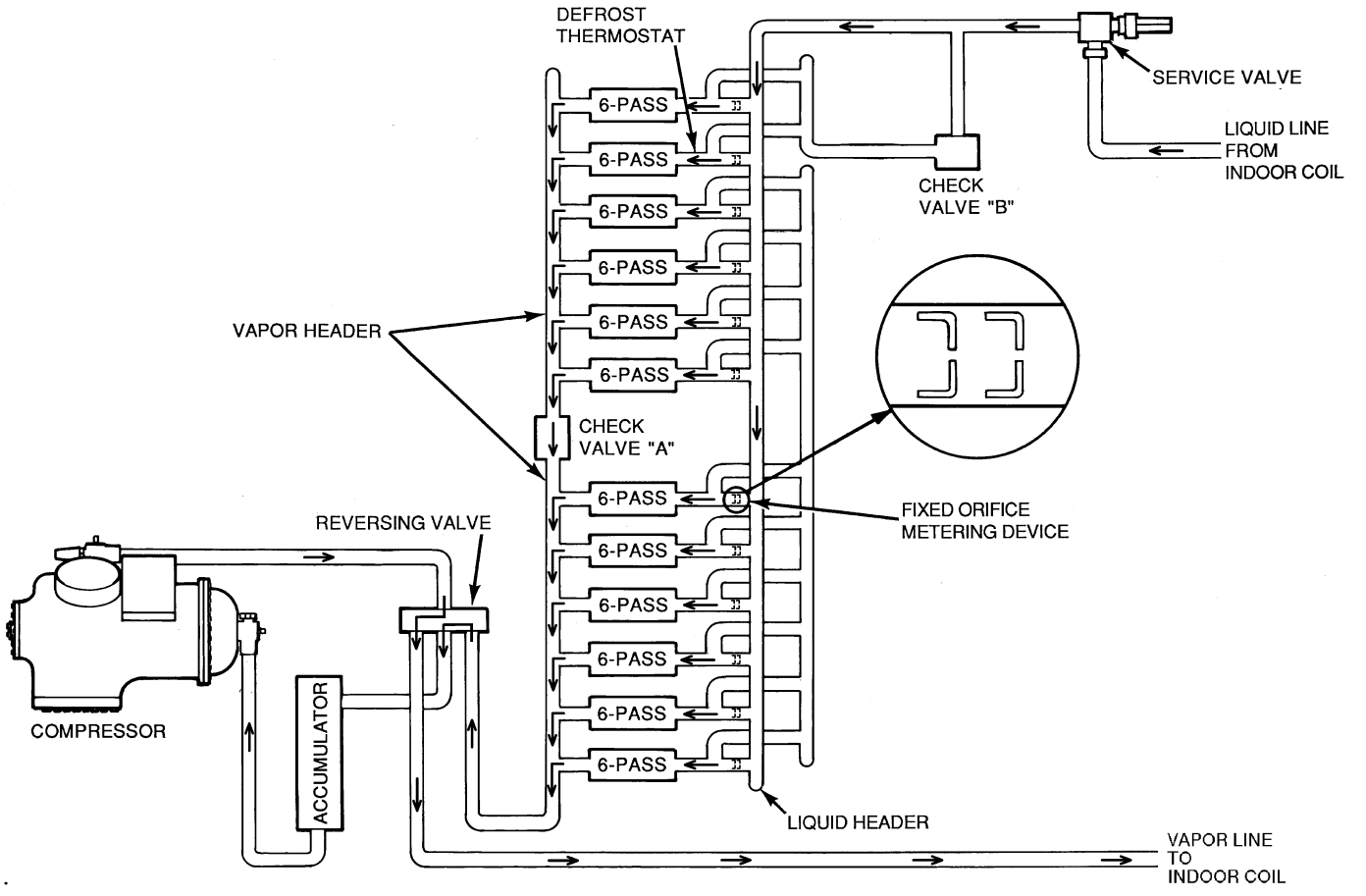


Fig. 13 — Heating Mode Operation

SERVICE

⚠ **CAUTION:** When servicing unit, shut off all electrical power to unit to avoid shock hazard or injury from rotating parts.

I. CLEANING

Inspect unit interior at the beginning of each cooling season and as operating conditions require.

A. Outdoor Coil

Inspect coil monthly. Clean outdoor coil annually and as required by location or outdoor-air conditions.

Clean coil as follows:

1. Turn off unit power.
2. Remove and save top panel screws on outdoor unit.
3. Remove outdoor coil corner post. See Fig. 14. To hold top panel open, place coil corner post between top panel and side panel. See Fig. 15.
4. Remove bracket holding coil sections together at return end of outdoor coil. Carefully separate the outer coil section 3 to 4 in. from the inner coil section. See Fig. 16.
5. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.
6. Reposition the outer coil section and secure the sections together. Remove the coil corner post from between the top panel and side panel. Install the coil corner post and replace all screws removed in Step 2.

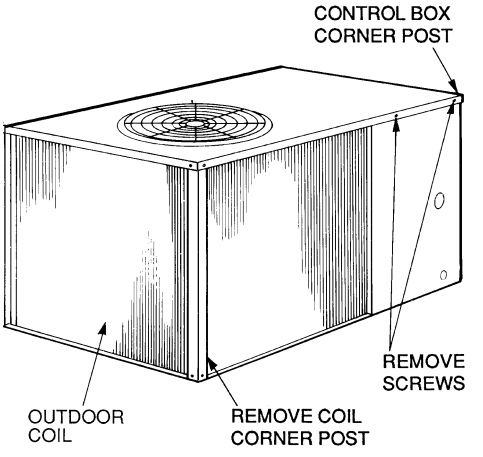


Fig. 14 — Cleaning Outdoor Coil

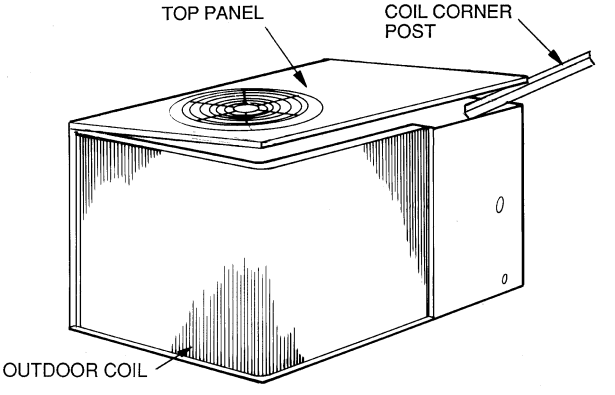


Fig. 15 — Propping Up Top Panel

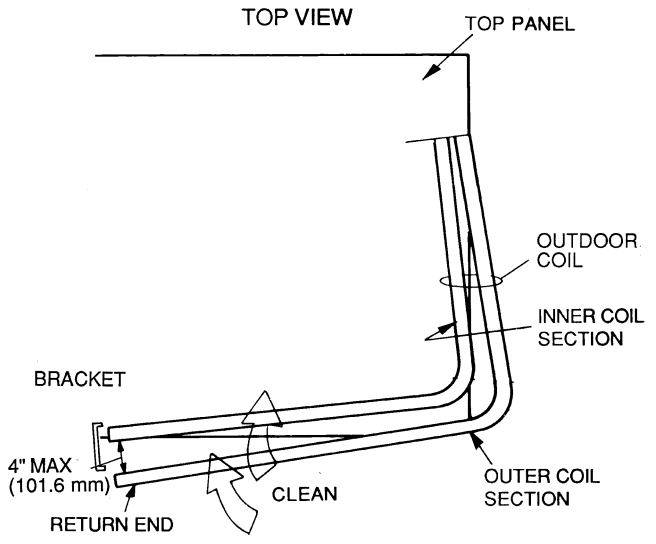


Fig. 16 — Separating Coil Sections

II. LUBRICATION

A. Compressors

Compressor has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after the system has been in operation. See Start-Up, Oil Charging section.

B. Fan Motor Bearings

Fan motor bearings are permanently lubricated. No further lubrication is required.

III. OUTDOOR FAN ADJUSTMENT (Fig. 17)

1. Shut off unit power supply.
2. Remove outdoor-fan assembly (grille, motor, motor cover, and fan).
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in Fig. 17.
5. Tighten setscrews.
6. Replace outdoor-fan assembly.

IV. COMPRESSOR REMOVAL

See Table 1 for compressor information. Follow safety codes and wear safety glasses and work gloves.

1. Shut off power to unit. Remove unit access panel (front of unit).
2. Remove refrigerant from system using refrigerant removal methods described in Refrigerant Service Techniques manual.
3. Disconnect compressor wiring at compressor terminal box. Disconnect high-pressure switch.
4. Remove bolts from discharge service valve and suction flange.

⚠ **CAUTION:** Excessive movement of copper lines at compressor may cause higher levels of vibration when unit is restored to service.

5. Remove crankcase heater from compressor base.
6. Remove compressor holddown bolts and lift compressor off basepan.
7. Remove compressor from unit.
8. Clean system. Add new liquid line filter drier (biflow type).
9. Install new compressor and position in unit. Connect suction and discharge lines to compressor. Connect high-pressure switch. Ensure that compressor holddown bolts are in place. Connect wiring. Install crankcase heater.
10. Evacuate and recharge unit.
11. Restore unit power.

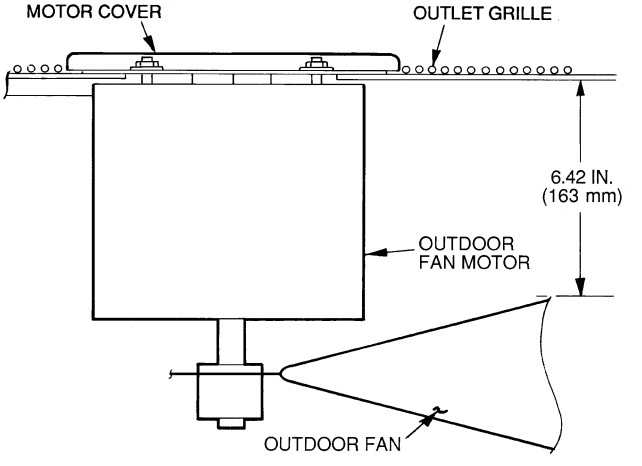
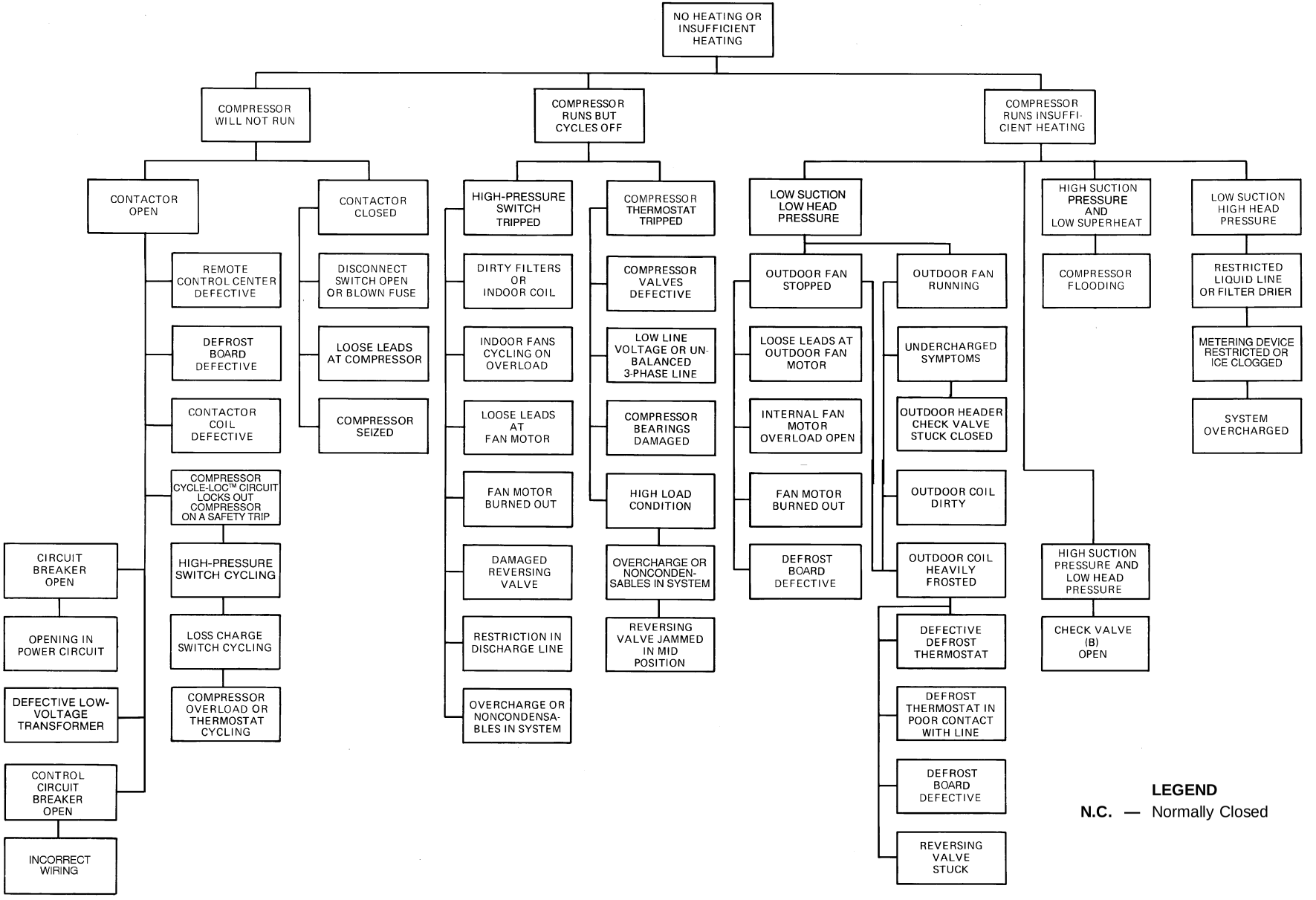
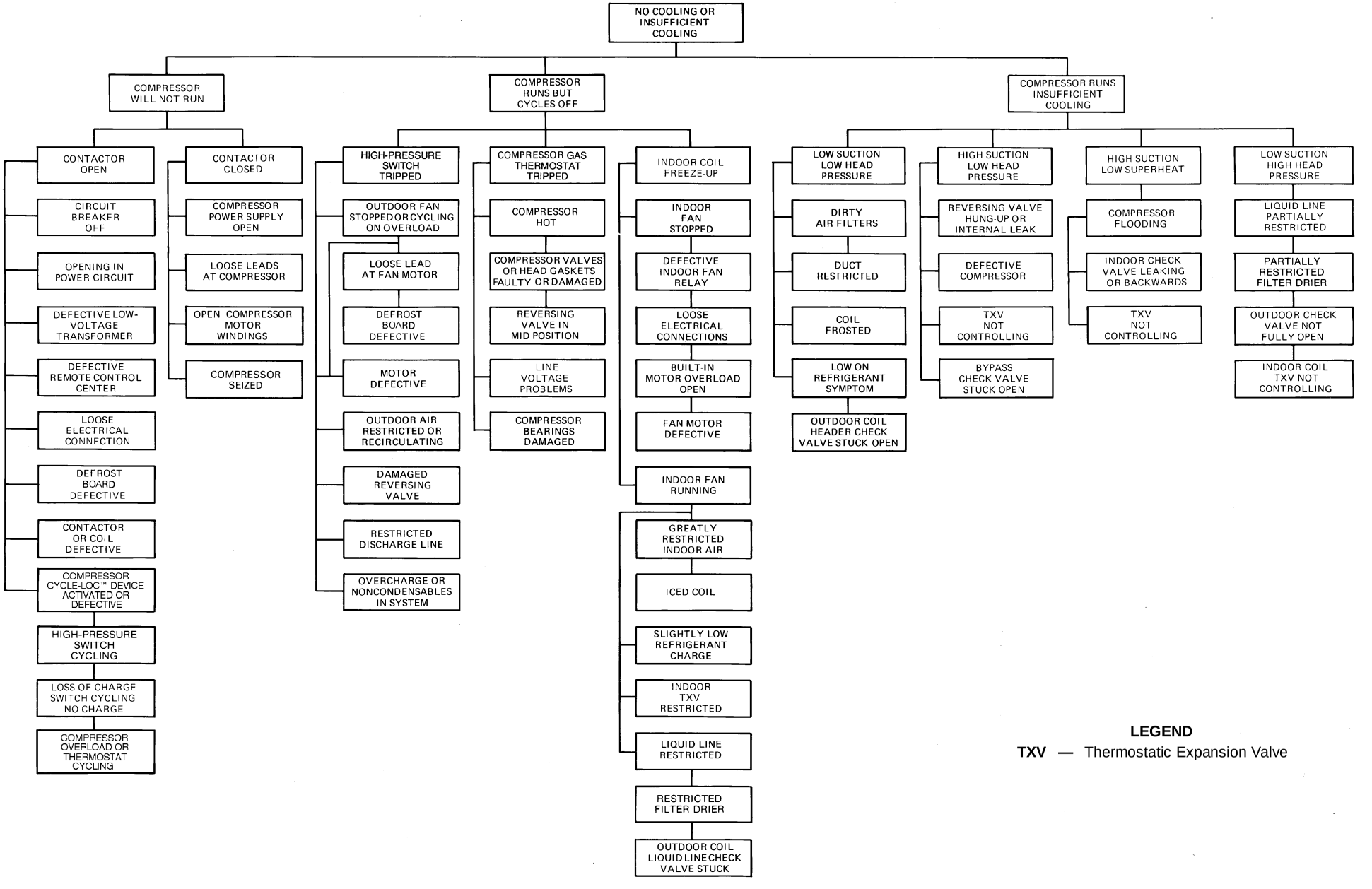


Fig. 17 — Outdoor-Fan Adjustment

TROUBLESHOOTING CHART, HEATING CYCLE



TROUBLESHOOTING CHART, COOLING CYCLE



LEGEND

TXV — Thermostatic Expansion Valve

CATALOG NO. BDP-3357-502

START-UP CHECKLIST

I. PRELIMINARY INFORMATION

OUTDOOR: MODEL NO. _____ SERIAL NO. _____

INDOOR: MODEL NO. _____ SERIAL NO. _____

ADDITIONAL ACCESSORIES _____

B. Pre-Start-Up

OUTDOOR UNIT

IS THERE ANY SHIPPING DAMAGE? _____ (Y/N) _____

IF SO, WHERE: _____

_____

WILL THIS DAMAGE PREVENT UNIT START-UP? (Y/N) _____

CHECK POWER SUPPLY. DOES IT AGREE WITH UNIT? (Y/N) _____

HAS THE GROUND WIRE BEEN CONNECTED? (Y/N) _____

HAS THE CIRCUIT PROTECTION BEEN SIZED AND INSTALLED PROPERLY? (Y/N) _____

ARE THE POWER WIRES TO THE UNIT SIZED AND INSTALLED PROPERLY? (Y/N) _____

HAVE COMPRESSOR HOLDDOWN BOLTS BEEN LOOSENED (Snubber washers are snug, but not tight)? (Y/N) _____

CONTROLS

ARE THERMOSTAT AND INDOOR-FAN CONTROL WIRING CONNECTIONS MADE AND CHECKED? (Y/N) _____

ARE ALL WIRING TERMINALS (including main power supply) TIGHT? (Y/N) _____

HAS CRANKCASE HEATER BEEN ENERGIZED FOR 24 HOURS? (Y/N) _____

INDOOR UNIT

HAS WATER BEEN PLACED IN DRAIN PAN TO CONFIRM PROPER DRAINAGE? (Y/N) _____

ARE PROPER AIR FILTERS IN PLACE? (Y/N) _____

HAVE FAN AND MOTOR PULLEYS BEEN CHECKED FOR PROPER ALIGNMENT? (Y/N) _____

DO THE FAN BELTS HAVE PROPER TENSION? (Y/N) _____

HAS CORRECT FAN ROTATION BEEN CONFIRMED? (Y/N) _____

PIPING

IS LIQUID LINE SOLENOID VALVE LOCATED AT THE OUTDOOR UNIT AS RECOMMENDED? (Y/N) _____

HAVE LEAK CHECKS BEEN MADE AT COMPRESSOR, OUTDOOR COIL, INDOOR COIL, TXV (Thermostatic Expansion Valve), SOLENOID VALVES, FILTER DRIER, REVERSING VALVE, CHECK VALVE, AND FUSIBLE PLUGS WITH A LEAK DETECTOR? (Y/N) _____

LOCATE, REPAIR, AND REPORT ANY LEAKS. _____

HAVE ALL COMPRESSOR SERVICE VALVES BEEN FULLY OPENED (BACKSEATED)? (Y/N) _____

HAVE LIQUID LINE SERVICE VALVE AND SUCTION LINE SERVICE VALVE BEEN OPENED? (Y/N) _____

IS THE OIL LEVEL IN COMPRESSOR CRANKCASE INTO VIEW IN THE COMPRESSOR SIGHT GLASS? (Y/N) _____

CHECK VOLTAGE IMBALANCE

LINE-TO-LINE VOLTS: AB _____ V AC _____ V BC _____ V

(AB + AC + BC)/3 = AVERAGE VOLTAGE = _____ V

MAXIMUM DEVIATION FROM AVERAGE VOLTAGE = _____ V

VOLTAGE IMBALANCE = 100 X (MAX DEVIATION)/(AVERAGE VOLTAGE) = _____ %

IF OVER 2% VOLTAGE IMBALANCE, DO NOT ATTEMPT TO START SYSTEM!
CALL LOCAL POWER COMPANY FOR ASSISTANCE.

C. Start-Up

CHECK INDOOR-FAN SPEED AND RECORD. _____

CHECK OUTDOOR-FAN SPEED AND RECORD. _____

AFTER AT LEAST 15 MINUTES RUNNING TIME, RECORD THE FOLLOWING MEASUREMENTS:

	COOLING	HEATING
OIL PRESSURE	_____	_____
SUCTION PRESSURE	_____	_____
SUCTION LINE TEMP	_____	_____
DISCHARGE PRESSURE	_____	_____
DISCHARGE LINE TEMP	_____	_____
ENTERING OUTDOOR-AIR TEMP	_____	_____
LEAVING OUTDOOR-AIR TEMP	_____	_____
INDOOR ENTERING-AIR DB (dry bulb) TEMP	_____	_____
INDOOR ENTERING-AIR WB (wet bulb) TEMP	_____	_____
INDOOR LEAVING-AIR DB TEMP	_____	_____
INDOOR LEAVING-AIR WB TEMP	_____	_____

COMPRESSOR AMPS (L1/L2/L3) _____ / _____ / _____

NOTES:

CUT ALONG DOTTED LINE