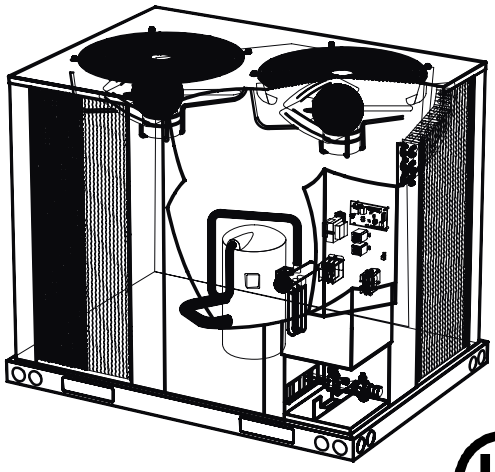


c UL us LISTED

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

⚠ IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFCs, HCFCs AND HFCs) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for noncompliance.

⚠ WARNING

This product and/or the indoor unit it is matched with may contain fiberglass wool.

Disturbing the insulation during installation, maintenance, or repair will expose you to fiberglass wool dust. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)

Fiberglass wool may also cause respiratory, skin, and eye irritation.

To reduce exposure to this substance or for further information, consult material safety data sheets.

INSTALLATION INSTRUCTIONS

T-CLASS™ TPA Series

HEAT PUMPS
7.5 TO 10 TONS
506148-01
12/08

Technical Publications
Litho U.S.A.

Table of Contents

Shipping and Packing List

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause personal injury, loss of life, or damage to property.

Installation and service must be performed by a licensed professional installer (or equivalent) or a service agency.

Check the unit for shipping damage and listed times below are intact. If damaged, or if parts are missing, immediately contact the last shipping carrier.

1 — Assembled outdoor unit

1 — Installation instruction

Unit Dimensions, Corner Weights and Center of Gravities

TPA090S4S AND TPA120S4S

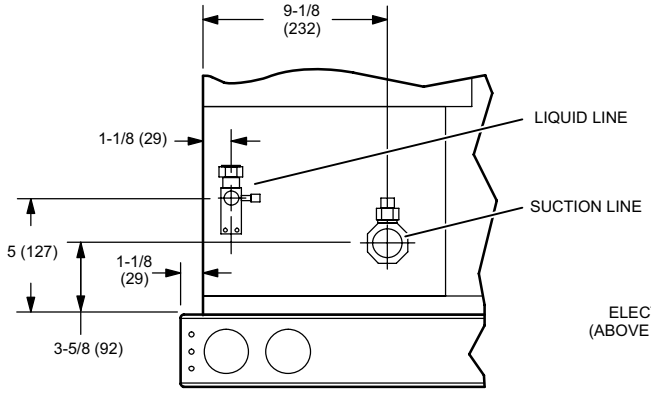
Corner Weights

Model No.	AA		BB		CC		DD	
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
TPA090S4S	105	48	105	48	112	51	112	51
TPA120S4S	129	59	110	50	123	56	145	66

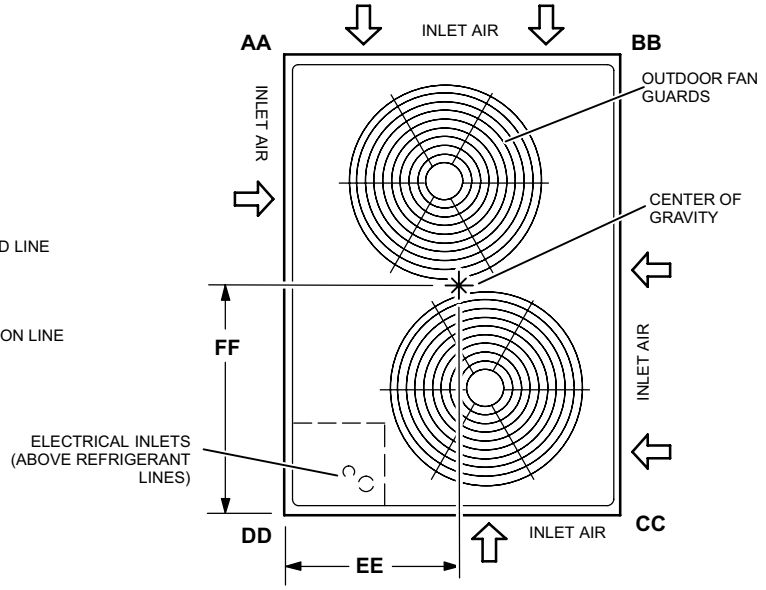
Center of Gravities

Model No.	EE		FF	
	inch	mm	inch	mm
TPA090S4S	21.75	552	29.0	737
TPA120S4S	20.0	508	28.25	718

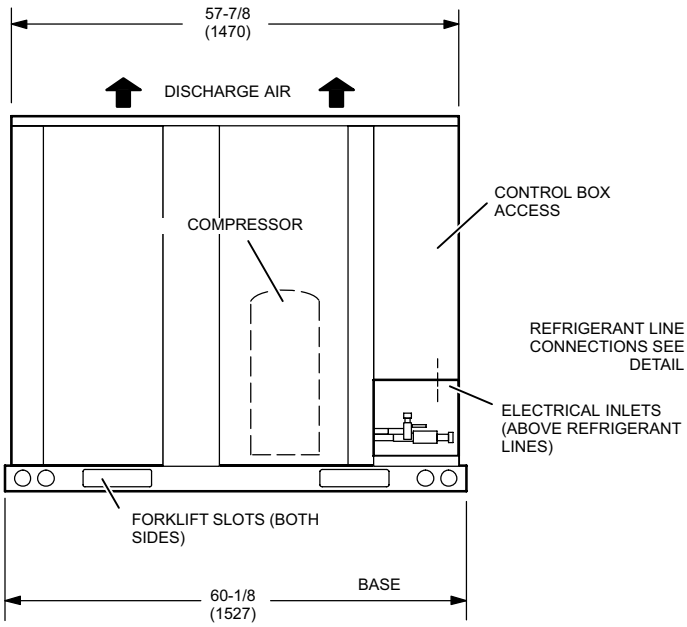
INCHES (MM)



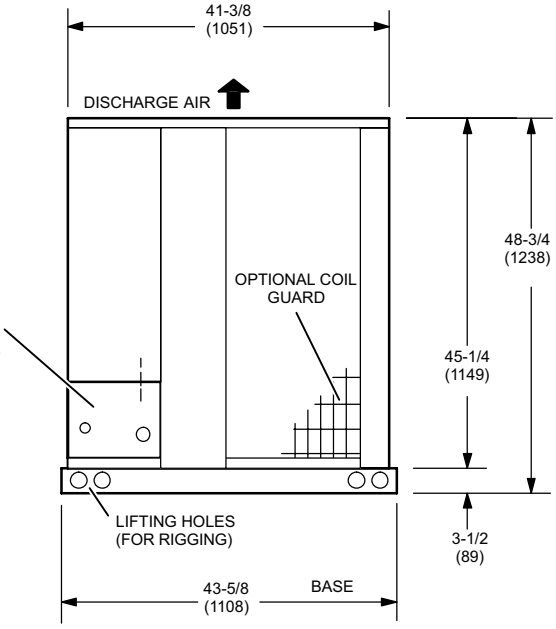
REFRIGERANT LINE CONNECTIONS DETAIL



TOP VIEW



FRONT VIEW



SIDE VIEW

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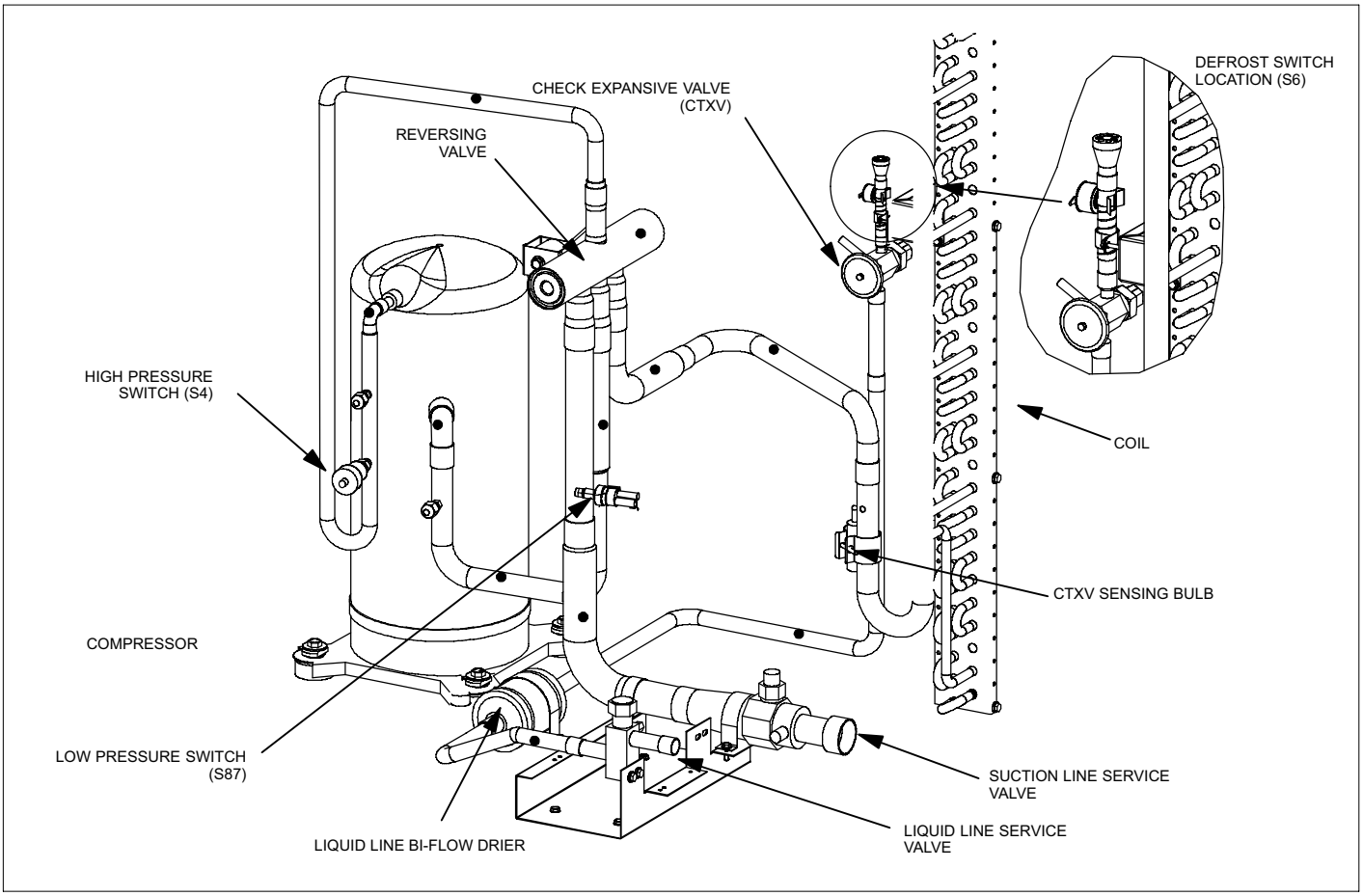
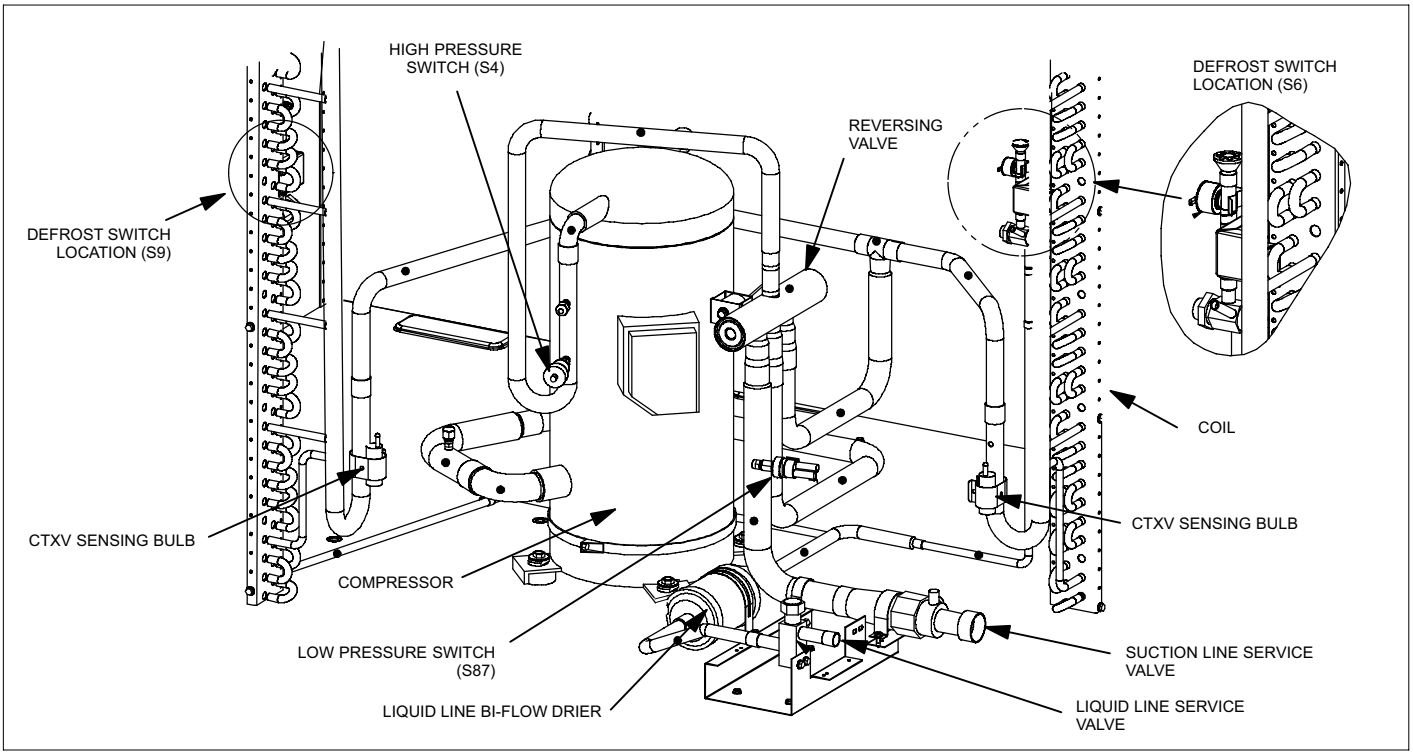
Unit Plumbing Parts Arrangement

TPA090S4S

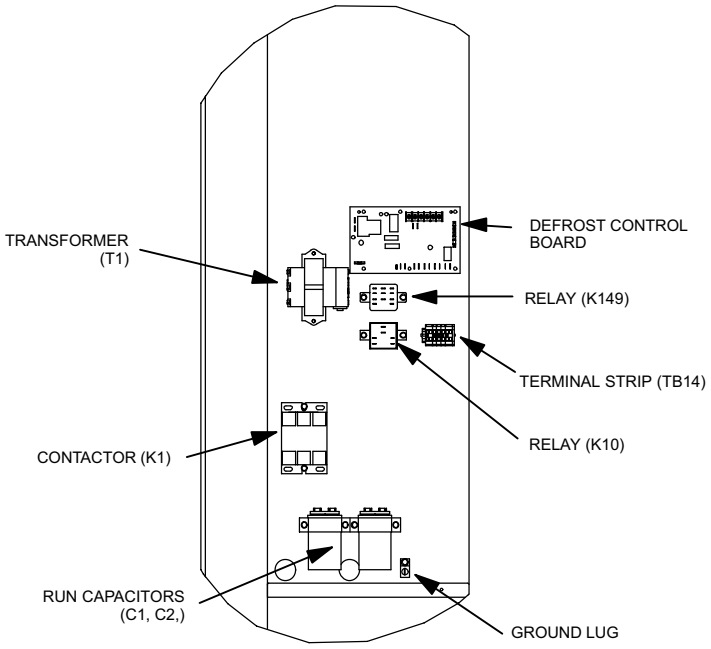


TPA120S4S



Unit Control Box Components Arrangement

TPA090S4S AND TPA120S4S



Outdoor Unit

TPA series heat pumps, which will also be referred to in this instruction as the outdoor unit, uses HFC-410A refrigerant. This outdoor unit must be installed with a matching indoor unit and line set as outlined in the *TP Engineering Handbook*.

This outdoor unit is designed for use in thermal expansion valve (TXV) systems only.

Rigging the Unit for Lifting

Rig the unit for lifting by attaching four cables to the holes in the base rail of the unit as illustrated in figure 4.

1. Remove protective packaging before rigging the unit for lifting.
2. Connect the rigging to the holes in each corner of the unit's base.
3. All panels must be in place for rigging.
4. Place a field-provided H-style frame just above the top edge of the unit. The frame must be of adequate strength and length. (An H-style frame will prevent the top of the unit from being damaged.)

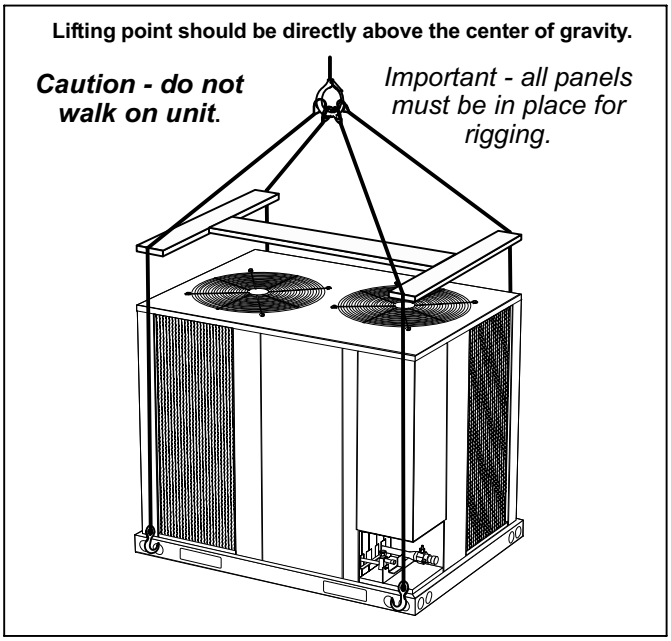


Figure 1. TPA 090S4S and TPA 120S4S

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Installation Clearances

See *Unit Dimensions* on page to sizing mounting slab, platforms or supports. Refer to figure 2 for mandatory installation clearance requirements.

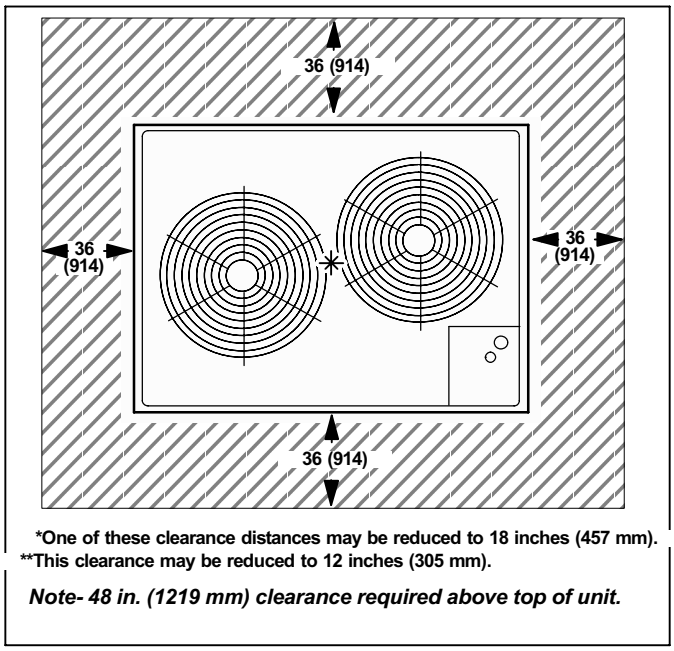


Figure 2. TPA 090S4S and TPA 120S4S Installation Clearances

Line Set

Field refrigerant piping consists of liquid and suction lines connecting the condensing unit and the indoor unit. Liquid and suction service valves are located in a compartment at the corner of the unit below the control box. Piping can be routed directly from the service valves or field supplied elbows can be added to divert the piping as required

Refer to table 1 for field-fabricated refrigerant line sizes for runs up to 50 linear feet (15 m).

Table 1. Refrigerant Line Sizes for Runs Up to 50 Linear Feet

Unit	Liquid Line	Suction Line
TPA 090	5/8" (16 mm)	1-3/8" (35 mm)
TPA 120	5/8" (16 mm)	1-3/8" (35 mm)

Refrigerant Line Limitations

You may install the unit in applications that have line set lengths of up to 50 linear feet (15 m) with refrigerant line sizes as outlined in table 1 (excluding equivalent length of fittings). Size refrigerant lines greater than 50 linear feet (15m or greater) according to the Lennox Refrigerant Piping Design and Fabrication Guidelines (Corp. 9351-L9) or latest version.

Electrical Connections

⚠ WARNING

Electric Shock Hazard. Can cause injury or death.

Line voltage is present at all components on units with single-pole contactors, even when unit is not in operation!

Unit may have multiple power supplies. Disconnect all remote electric power supplies before opening access panel.

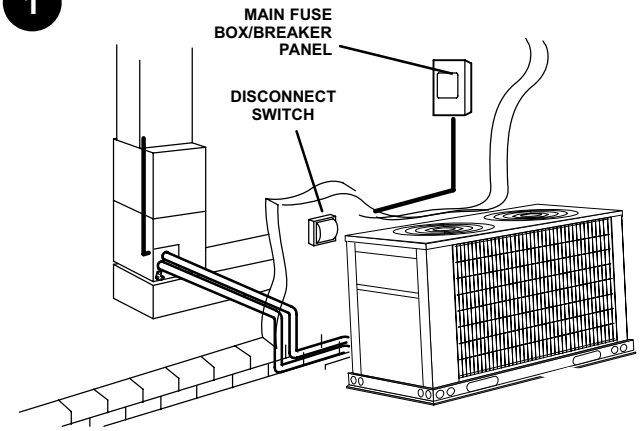
Unit must be grounded in accordance with national and local codes.

In the United States, wiring must conform with current local codes and the current National Electric Code (NEC). In Canada, wiring must conform with current local codes and the current Canadian Electrical Code (CEC).

TRANSFORMER - 24VAC, 70VA - PROVIDED

NOTE - The addition of accessories to the system could exceed the 70VA power requirement of the factory-provided transformer. Measure the system's current and voltage after installation is complete to determine transformer loading. If loading exceeds the factory-provided transformer capacity, a larger field-provided transformer will need to be installed in the system.

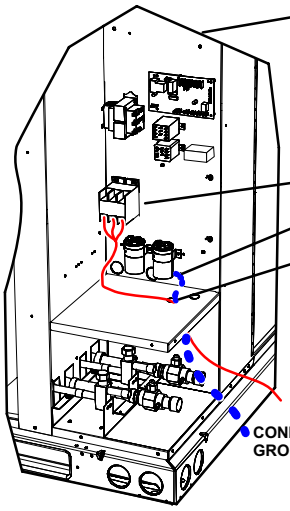
1 CIRCUIT SIZING AND DISCONNECT SWITCH



Refer to the unit nameplate for minimum circuit ampacity amperage minimum, and maximum fuse or circuit breaker fusible (HACR per NEC). Install power wiring and properly sized disconnect switch.

NOTE - UNITS ARE APPROVED FOR USE ONLY WITH COPPER CONDUCTORS. GROUND UNIT AT DISCONNECT SWITCH OR TO AN EARTH GROUND.

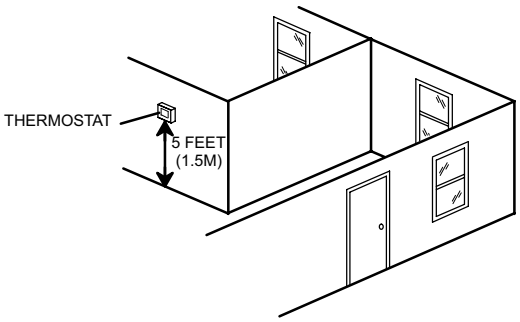
2 TYPICAL HIGH VOLTAGE POWER SUPPLY CONNECTIONS



USE THE LEFT CUTOUT TO ROUTE HIGH VOLTAGE WIRING TO THE K1 CONTACTOR ON THE TPA 090S AND 120S MODELS.

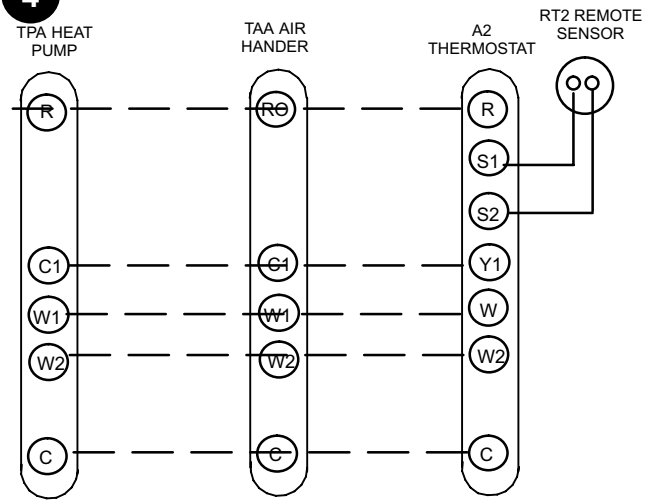
NOTE - ANY EXCESS HIGH VOLTAGE FIELD WIRING SHOULD BE TRIMMED AND SECURED AWAY FROM ANY LOW VOLTAGE FIELD WIRING.

3 INSTALL THERMOSTAT



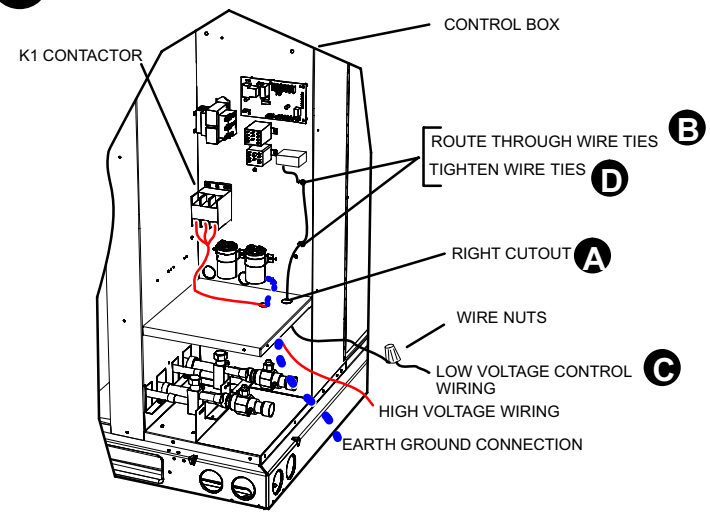
Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight, drafts or vibrations.

4 TYPICAL CONTROL WIRING



Install low voltage wiring from outdoor to indoor unit and from thermostat to indoor unit as illustrated.

5 TYPICAL UNIT LOW VOLTAGE CONNECTIONS



WIRE RUN LENGTH	AWG#	INSULATION TYPE
LESS THAN 100' (30 METERS)	18	TEMPERATURE RATING
MORE THAN 100' (30 METERS)	16	35ºC MINIMUM.

A Run control wires through right cutout.
B Run control wires through wire ties.
C Make control wire connections using field provided wire nuts. See figure 3 for connections requirements.
D Tighten wire tie to secure 24V low voltage control wiring.

NOTE - FOR PROPER VOLTAGES, SELECT THERMOSTAT WIRE (CONTROL WIRES) GAUGE PER TABLE ABOVE.

NOTE - WIRE TIE PROVIDES LOW VOLTAGE WIRE STRAIN RELIEF AND TO MAINTAIN SEPARATION OF FIELD INSTALLED LOW AND HIGH VOLTAGE CIRCUITS.

NOTE - DO NOT BUNDLE ANY EXCESS 24VAC CONTROL WIRES INSIDE CONTROL BOX.

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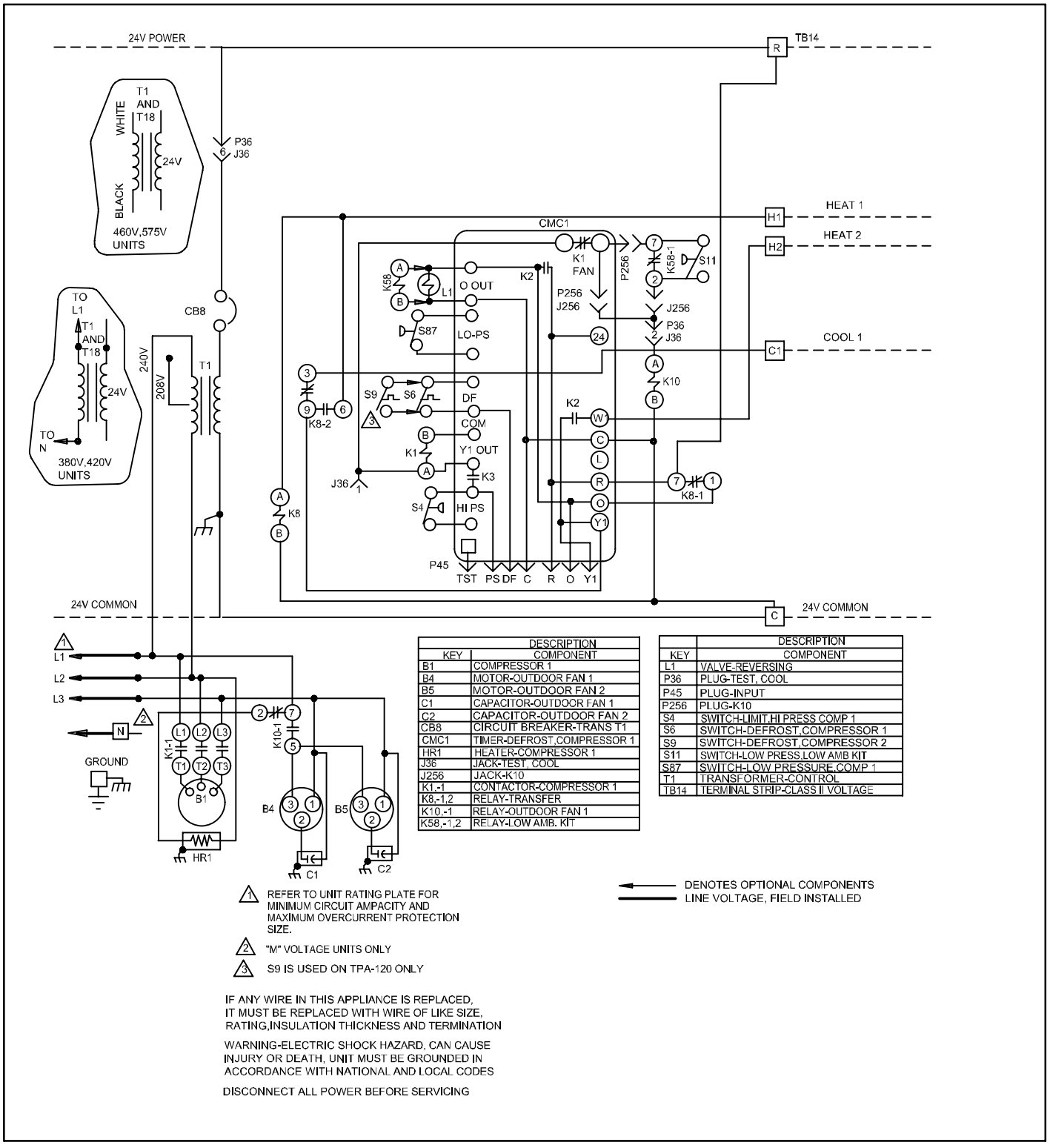

DESCRIPTION	
KEY	COMPONENT
B1	COMPRESSOR 1
B4	MOTOR-OUTDOOR FAN 1
B5	MOTOR-OUTDOOR FAN 2
C1	CAPACITOR-OUTDOOR FAN 1
C2	CAPACITOR-OUTDOOR FAN 2
CB8	CIRCUIT BREAKER-TRANS T1
CMC1	TIMER-DEFROST,COMPRESSOR 1
HR1	HEATER-COMPRESSOR 1
J36	JACK-TEST, COOL
J256	JACK-K10
K1,-1	CONTACTOR-COMPRESSOR 1
K8,-1,2	RELAY-TRANSFER
K10,-1	RELAY-OUTDOOR FAN 1
K58,-1,2	RELAY-LOW AMB. KIT

DESCRIPTION	
KEY	COMPONENT
L1	VALVE-REVERSING
P36	PLUG-TEST, COOL
P45	PLUG-INPUT
P256	PLUG-K10
S4	SWITCH-LIMIT,HI PRESS COMP 1
S6	SWITCH-DEFROST,COMPRESSOR 1
S9	SWITCH-DEFROST,COMPRESSOR 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S87	SWITCH-LOW PRESSURE,COMP 1
T1	TRANSFORMER-CONTROL
TB14	TERMINAL STRIP-CLASS II VOLTAGE

Figure 3. TPA090S4S and TPA120S4S G, J, M, and Y Voltages) Typical Wiring Diagram

Refrigerant Charge and Check

This unit has a factory holding charge of one pound of HFC-410A refrigerant for each stage. Additional refrigerant will be needed.

NOTE - Refrigerant line sets longer than 200 feet (60 meters) are not recommended. For assistance contact Lennox Application Department.

To check the charge, use the following procedure:

1. Attach gauge manifolds and operate unit in **cooling mode** until system stabilizes (approximately five minutes). Make sure outdoor air dampers are closed.
2. Use a thermometer to accurately measure the outdoor ambient temperature.
3. Apply the outdoor temperature to table 2 to determine normal operating pressures.
4. Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**
5. If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.
   - Add or remove charge in increments.
   - Allow the system to stabilize each time refrigerant is added or removed.

CHARGE VERIFICATION - APPROACH METHOD

Use the following approach method along with the normal operating pressures to confirm readings.

1. Using the same thermometer, compare liquid temperature to outdoor ambient temperature.

   Approach Temperature = Liquid temperature minus ambient temperature

2. Approach temperature should be 6°F ± 1 (3.3°C ± 0.5) for each stage. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

Table 2. HFC-410A Normal Operating Pressures (Liquid ±10 and Suction ±5 psig) (Single-Stage Units)

Temp*	-090S4S		-120S4S	
	Liquid	Suction	Liquid	Suction
65° F (18° C)	231	128	243	130
75° F (24° C)	265	130	281	133
85° F (29° C)	310	131	325	136
95° F (35° C)	358	134	372	139
105° F (41° C)	410	137	427	140
115° F (46° C)	467	140	478	142
125° F (52° C)	551	146	548	142

**Temperature of air entering outdoor Coil*

Table 3. HFC-410A Temperature (°F) - Pressure (Psig)

°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig	°F	Psig
32	100.8	48	137.1	63	178.5	79	231.6	94	290.8	110	365.0	125	445.9	141	545.6
33	102.9	49	139.6	64	181.6	80	235.3	95	295.1	111	370.0	126	451.8	142	552.3
34	105.0	50	142.2	65	184.3	81	239.0	96	299.4	112	375.1	127	457.6	143	559.1
35	107.1	51	144.8	66	187.7	82	242.7	97	303.8	113	380.2	128	463.5	144	565.9
36	109.2	52	147.4	67	190.9	83	246.5	98	308.2	114	385.4	129	469.5	145	572.8
37	111.4	53	150.1	68	194.1	84	250.3	99	312.7	115	390.7	130	475.6	146	579.8
38	113.6	54	152.8	69	197.3	85	254.1	100	317.2	116	396.0	131	481.6	147	586.8
39	115.8	55	155.5	70	200.6	86	258.0	101	321.8	117	401.3	132	487.8	148	593.8
40	118.0	56	158.2	71	203.9	87	262.0	102	326.4	118	406.7	133	494.0	149	601.0
41	120.3	57	161.0	72	207.2	88	266.0	103	331.0	119	412.2	134	500.2	150	608.1
42	122.6	58	163.9	73	210.6	89	270.0	104	335.7	120	417.7	135	506.5	151	615.4
43	125.0	59	166.7	74	214.0	90	274.1	105	340.5	121	423.2	136	512.9	152	622.7
44	127.3	60	169.6	75	217.4	91	278.2	106	345.3	122	428.8	137	519.3	153	630.1
45	129.7	61	172.6	76	220.9	92	282.3	107	350.1	123	434.5	138	525.8	154	637.5
46	132.2	62	175.4	77	224.4	93	286.5	108	355.0	124	440.2	139	532.4	155	645.0
47	134.6			78	228.0			109	360.0			140	539.0		

System Operation

The outdoor unit and indoor blower cycle on demand from the room thermostat. When the thermostat blower switch is in the **ON** position, the indoor blower operates continuously.

HIGH PRESSURE SWITCHES (S4 AND S7)

These units are equipped with a auto-reset high pressure switch (single-pole, single-throw) which is located on the discharge line. The switch shuts off the compressor when discharge pressure rises above the factory setting. **High Pressure** (auto reset) - trip at 640 psig, reset at 512 psig.

LOW PRESSURE SWITCH (S87)

These units are equipped with a low pressure switch that is located on the suction line. The switch is a SPST, auto-reset switch that is normally closed. The switch opens at 40 psi and closes at 90 psi.

Defrost System

The defrost system includes a defrost thermostat and a defrost control.

DEFROST THERMOSTAT

The defrost thermostat is located on the liquid line between the check/expansion valve and the distributor on each coil. When the defrost thermostat senses 42°F (5.5°C) or cooler, its contacts close and send a signal to the defrost control board to start the defrost timing. It also terminates defrost when the liquid line warms up to 70°F (21°C).

DEFROST CONTROL

The defrost control board includes the combined functions of a time/temperature defrost control, defrost relay, time delay, diagnostic LEDs, and a terminal strip for field wiring connections.

The control provides automatic switching from normal heating operation to defrost mode and back. During compressor cycle (defrost thermostat is closed, calling for defrost), the control accumulates compressor run times at 30, 60, or 90 minute field adjustable intervals. If the defrost thermostat is closed when the selected compressor run time interval ends, the defrost relay is energized and defrost begins.

Defrost Control Board

DEFROST CONTROL TIMING PINS

Each timing pin selection provides a different accumulated compressor run time period during one thermostat run cycle. This time period must occur before a defrost cycle is initiated. The defrost interval can be adjusted to 30 (T1), 60 (T2), or 90 (T3) minutes. (See figure 4 on page 9). The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval. The maximum defrost period is 14 minutes and cannot be adjusted.

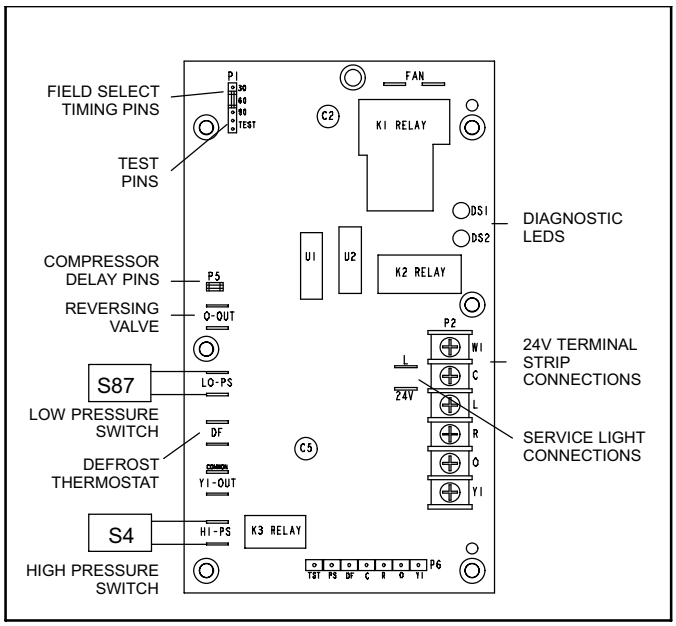

Figure 4. Outdoor Unit Defrost Control Board

A TEST option is provided for troubleshooting. **The TEST mode may be started any time the unit is operating in the heating mode and the defrost thermostat is closed or jumpered.** If the jumper is in the TEST position at power-up, the control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost thermostat opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

COMPRESSOR DELAY

The defrost board has a field-selectable function to reduce occasional sounds that may occur while the unit is cycling in and out of the defrost mode. When the compressor delay jumper is removed, the compressor will be cycled off for 30 seconds going in and out of the defrost mode.

NOTE - The 30-second compressor feature is ignored when jumpering the TEST pins.

TIME DELAY

The timed-off delay is five minutes long. The delay helps protect the compressor from short-cycling in case the power to the unit is interrupted or a pressure switch opens. The delay is bypassed by placing the timer select jumper across the TEST pins for 0.5 seconds.

NOTE - The board must have a thermostat demand for the bypass function.

PRESSURE SWITCH CIRCUITS

The defrost control includes two pressure switch circuits. The factory-installed high pressure switch (S4) wires are connected to the board's HI PS terminals (figure 4). The board also includes LO PS terminals to accommodate the factory installed low pressure switch.

During a single thermostat cycle, the defrost control will lock out the unit after the fifth time that the circuit is interrupted by any pressure switch that is wired to the control board. In addition, the diagnostic LEDs will indicate a pressure switch lockout after the fifth occurrence of an open pressure switch (see table 4). The unit will remain locked out until power is broken then remade to the control or until the jumper is applied to the TEST pins for 0.5 seconds.

NOTE - The defrost control board ignores input from the low pressure switch terminals during the TEST mode, during the defrost cycle, during the 90-second start-up period, and for the first 90 seconds each time the reversing valve switches heat/cool modes. ***If the TEST pins are jumpered and the 5-minute delay is being bypassed, the LO PS terminal signal is not ignored during the 90-second start-up period.***

SERVICE LIGHT CONNECTION

The defrost control board includes terminal connections for a service light which provides a signal that activates the room thermostat service light during periods of inefficient operation.

⚠ IMPORTANT

NOTE - After testing has been completed, properly reposition test jumper across desired timing pins.

DIAGNOSTIC LEDS

The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the diagnosis. See table 4.

Table 4. Defrost Control Board Diagnostic LEDs

DS2 Green	DS1 Red	Condition
OFF	OFF	Power problem
Simultaneous Slow Flash		Normal operation
Alternating Slow Flash		5-min. anti-short cycle delay
Simultaneous Fast Flash		Ambient Sensor Problem
Alternating Fast Flash		Coil Sensor Problem
ON	ON	Circuit Board Failure
Fault and Lockout Codes		
OFF	Slow Flash	Low Pressure Fault
OFF	ON	Low Pressure Lockout
Slow Flash	OFF	High Pressure Fault
ON	OFF	High Pressure Lockout
Slow Flash	ON	Discharge Line Temp. Fault
Fast Flash	ON	Disch. Line Temp. Lockout
OFF	Fast Flash	Discharge Sensor Fault
Fast Flash	OFF	Discharge Sensor Lockout
Shaded entries apply to demand boards only.		

Maintenance

At the beginning of each cooling season, the system should be checked as follows:

OUTDOOR UNIT

1. Clean and inspect the condenser coil. You can flush the coil with a water hose.
2. The outdoor fan motor is prelubricated and sealed. No further lubrication is necessary.
3. Visually inspect connecting lines and coils for evidence of oil leaks.
4. Check wiring for loose connections.
5. Check for correct voltage at the unit while the unit is operating and while it is off.
6. Check amp-draw of the outdoor fan motor.
   Unit nameplate _____ Actual _____
7. Check amp-draw of the compressor.
   Unit nameplate _____ Actual _____

NOTE - If the owner complains of insufficient cooling, gauge the unit and check the refrigerant charge. Refer to section on refrigerant charging in this instruction.

INDOOR COIL

1. If necessary, clean the coil.
2. Check connecting lines and coils for evidence of oil leaks.
3. If necessary, check the condensate line and clean it.

INDOOR UNIT

1. Clean or change filters.
2. Adjust the blower speed for cooling. Measure the pressure drop over the coil to determine the correct blower CFM. Refer to the unit information service manual for pressure drop tables and procedure.
3. On belt drive blowers, check the belt for wear and proper tension.
4. Check all wiring for loose connections.
5. Check for correct voltage at the unit (blower operating).
6. Check amp-draw on blower motor.
   Unit nameplate _____ Actual _____

⚠WARNING

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

Start-Up and Performance Checklist

Job Name _____ Job no. _____ Date _____

Job Location _____ City _____ State _____

Installer _____ City _____ State _____

Unit Model No. _____ Serial No. _____ Service Technician _____

Nameplate Voltage _____

Rated Load Ampacity _____ Compressor Amperage: _____

Maximum Fuse or Circuit Breaker _____

Electrical Connections Tight? ❑ Indoor Filter clean? ❑ Supply Voltage (Unit Off) _____

Indoor Blower RPM _____ S.P. Drop Over Indoor (Dry) _____ Outdoor Coil Entering Air Temp. _____

Vapor Pressure; _____

Refrigerant Lines: - Leak Checked? ❑ Properly Insulated? ❑ Outdoor Fan Checked? ❑

Service Valves: --- Fully Opened? ❑ Caps Tight? ❑ Voltage With Compressor Operating _____

SEQUENCE OF OPERATION

Heating Correct? ❑ Cooling Correct? ❑

THERMOSTAT

Calibrated? ❑ Properly Set? ❑ Level? ❑