

INSTALLATION INSTRUCTIONS

T-CLASS™ TPA Series 7.5 AND 10 TON

HEAT PUMPS
7.5 TO 10 TONS
506148-01
10/2011
Supersedes 06/11

TP Technical
Publications
Litho U.S.A.

**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.

⚠ 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.

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Shipping and Packing List

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

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.



Unit Dimensions, Corner Weights and Center of Gravities

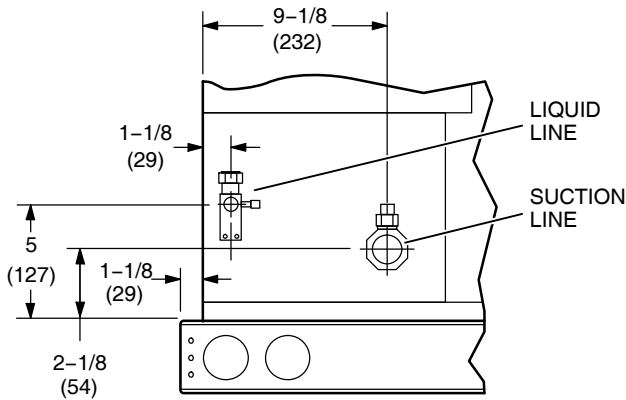
TPA090S4S AND TPA120S4S

Corner Weights

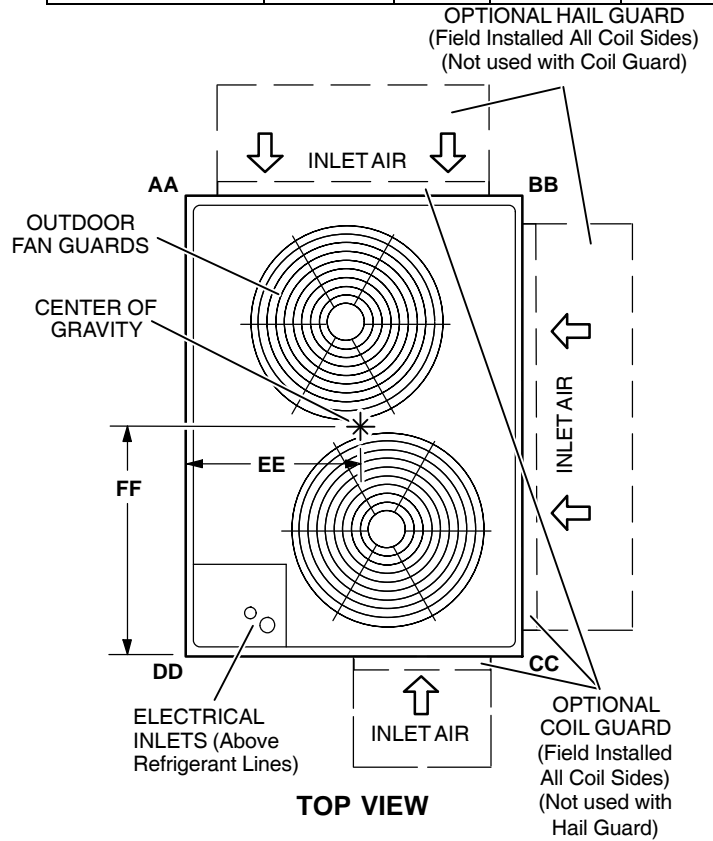
Model No.	AA		BB		CC		DD	
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
TPA090S4S	105	48	105	48	112	51	112	51
TPA120S4S	129	59	110	50	123	56	145	66

Center of Gravities

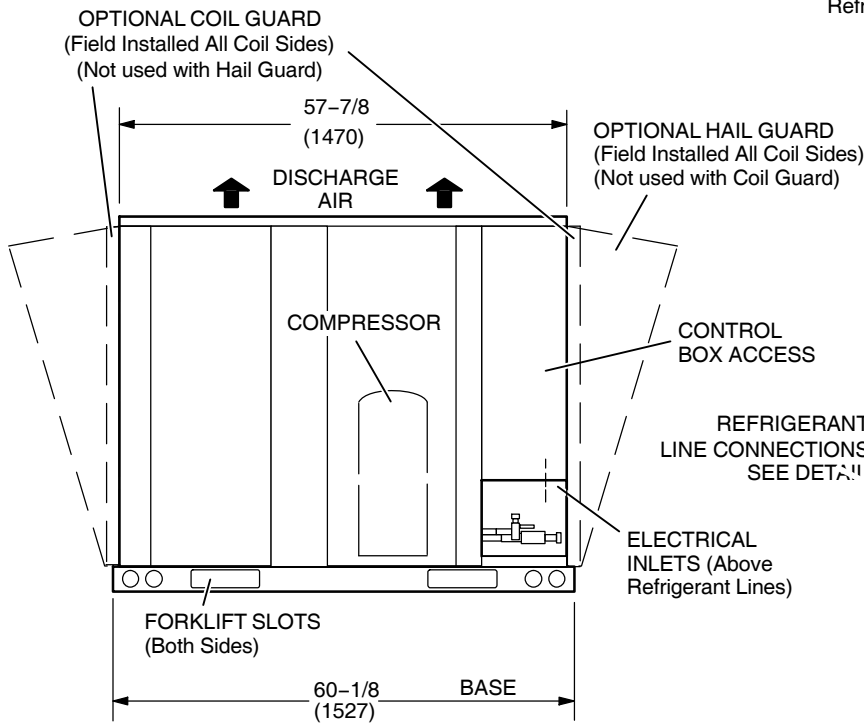
Model No.	EE		FF	
	inch	mm	inch	mm
TPA090S4S	21.75	552	29.0	737
TPA120S4S	20.0	508	28.25	718



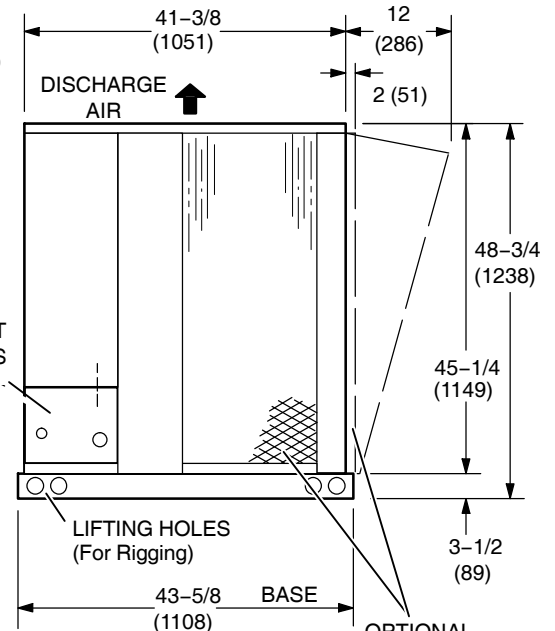
REFRIGERANT LINE CONNECTIONS DETAIL



TOP VIEW



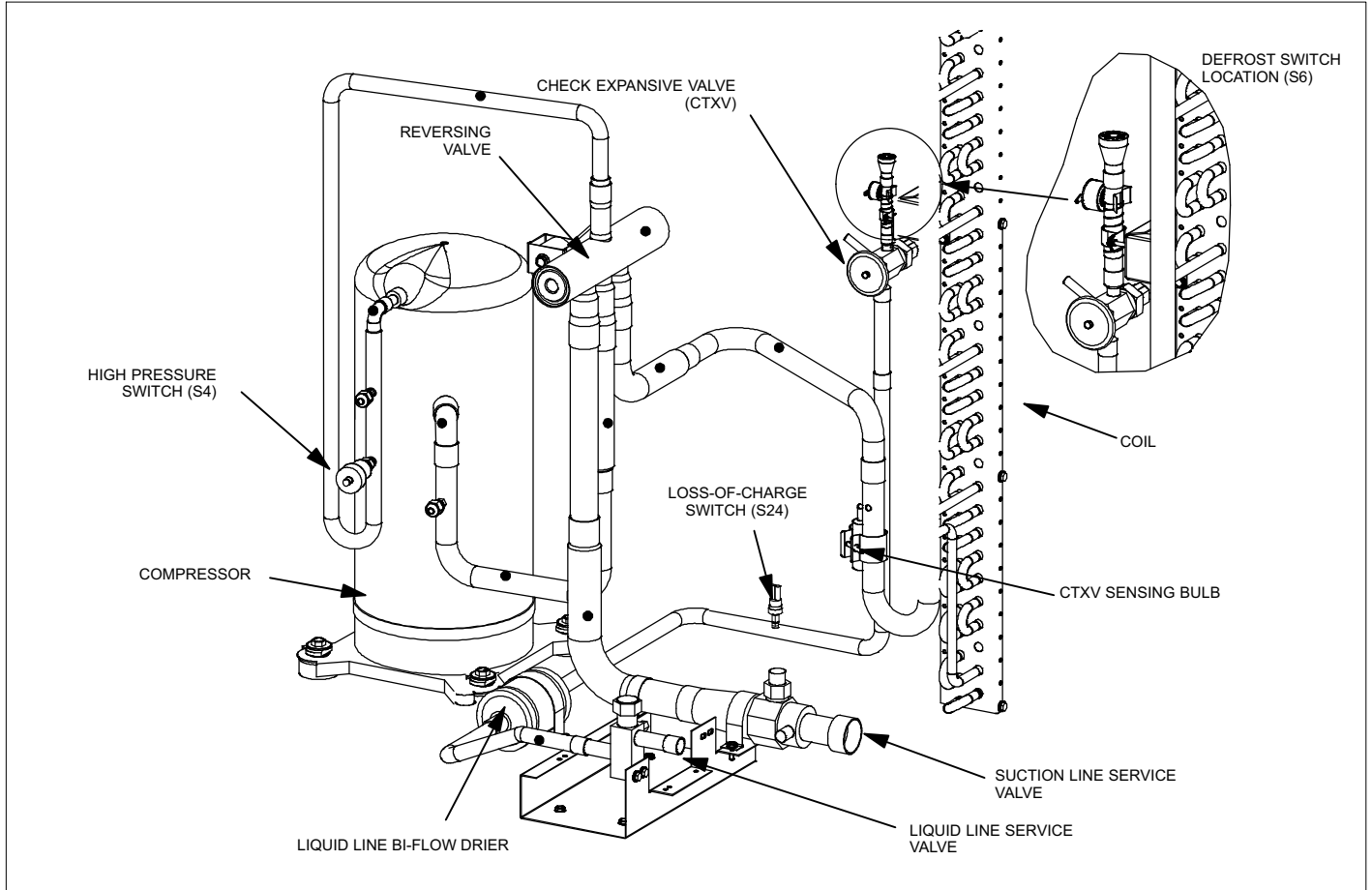
FRONT VIEW



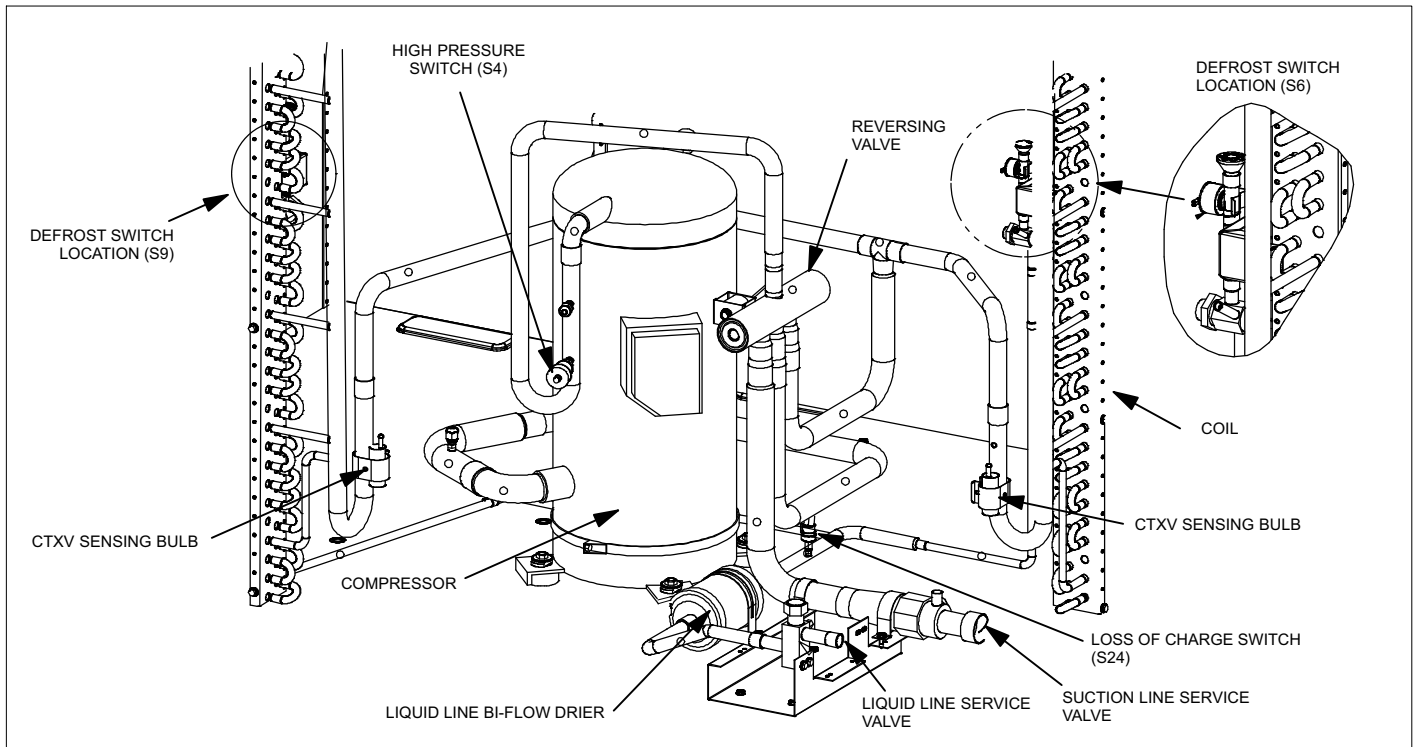
SIDE VIEW

Unit Plumbing Parts Arrangement

TPA090S4S

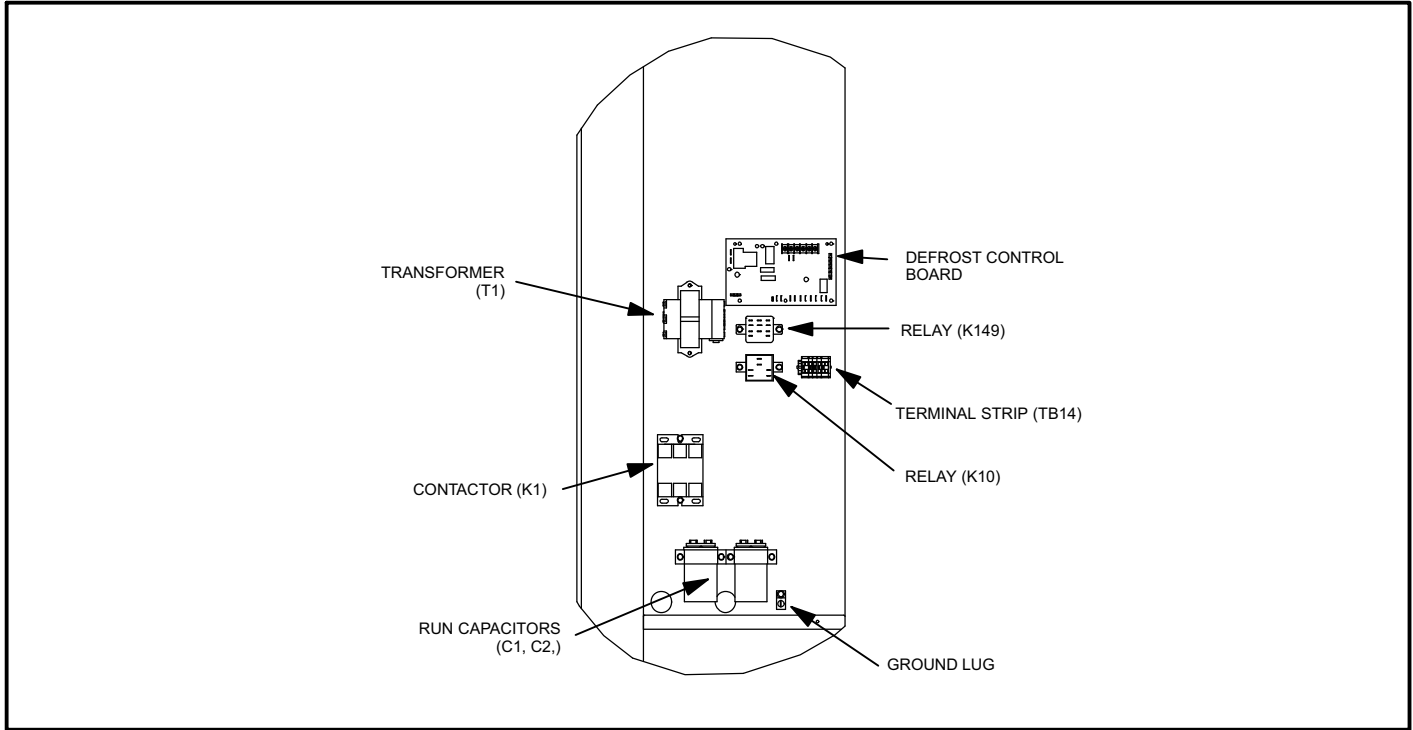


TPA120S4S

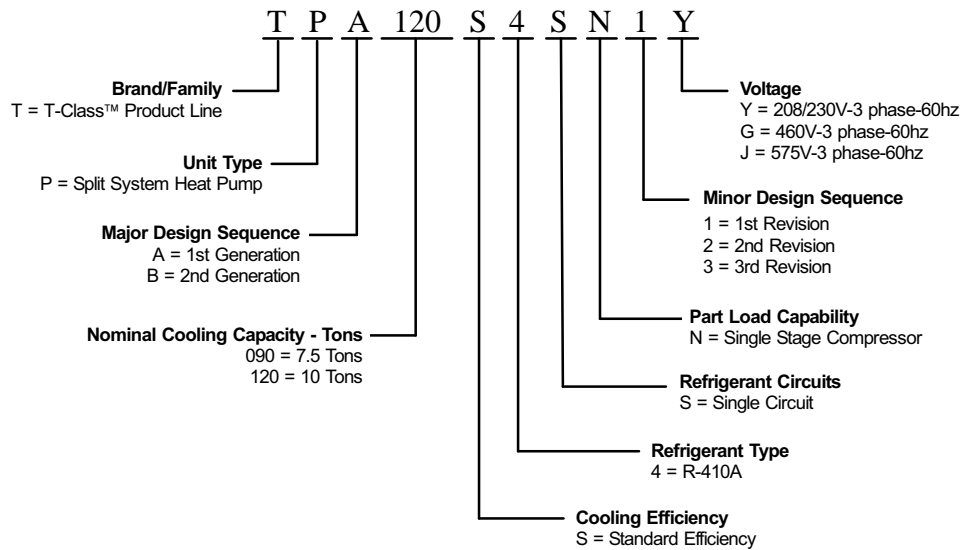


Unit Control Box Components Arrangement

TPA090S4S AND TPA120S4S



Model Number Identification



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 5.

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.)

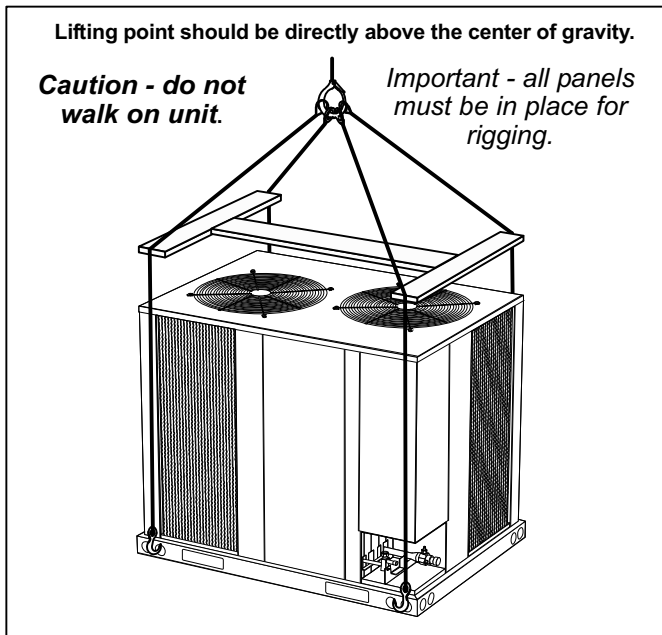


Figure 1. TPA 090S4S and TPA 120S4S

Installation Clearances

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

NOTES:

- Clearance to one of the remaining two sides may be 12 in. (305 mm) and the final side may be 6 in. (152 mm).
- A clearance of 24 in. (610 mm) must be maintained between two units.
- 48 in. (1219 mm) clearance required on top of unit.

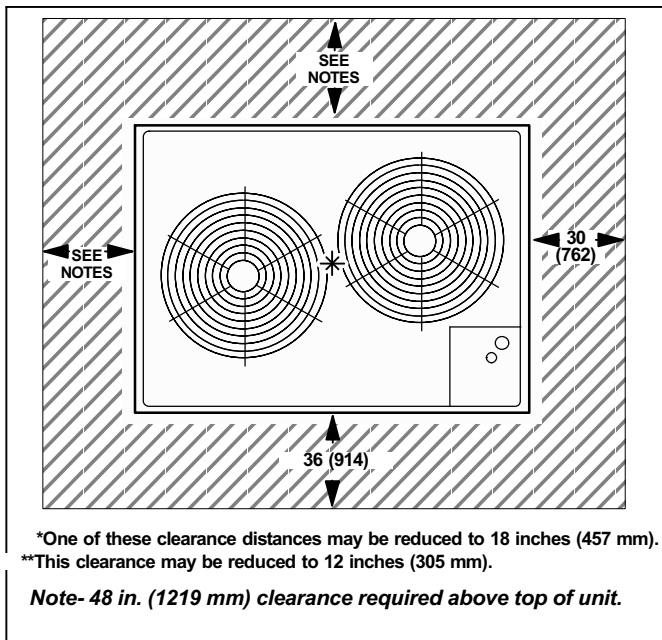


Figure 2. TPA 090S4S and TPA 120S4S Installation Clearances

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.

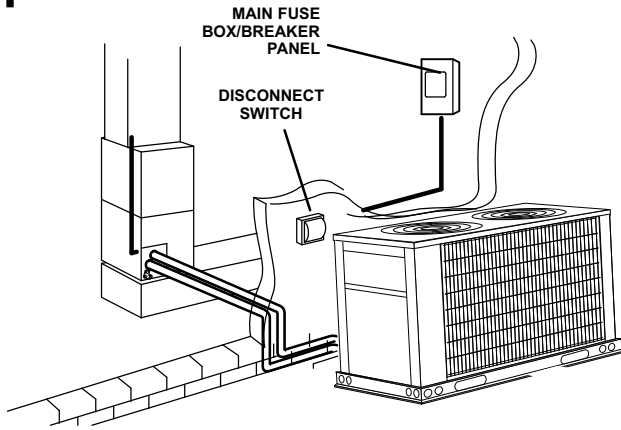
Unit must be grounded in accordance with national and local codes.

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.

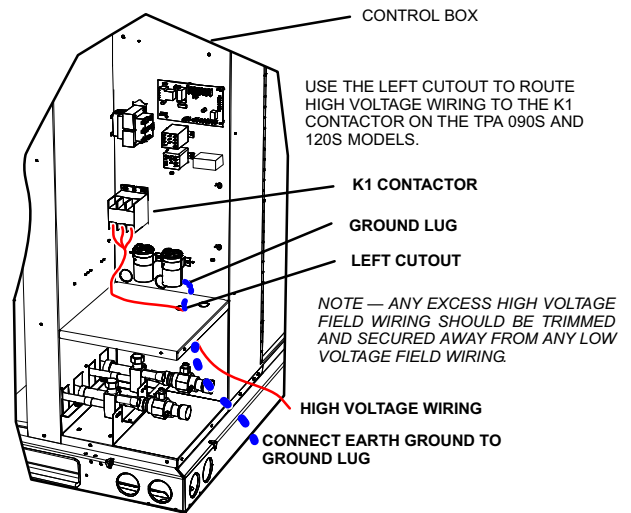
1 CIRCUIT SIZING AND DISCONNECT SWITCH



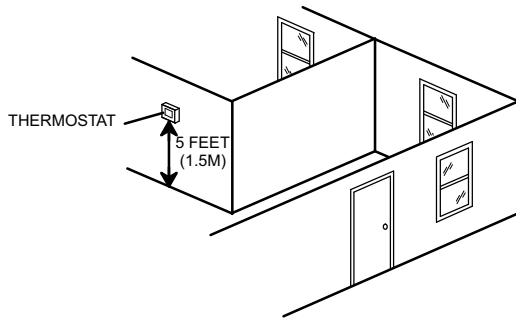
Refer to the unit nameplate for minimum circuit ampacity amperage minimum, and maximum fuse or circuit breaker fusible (HACR per NEC). Install power wiring and properly sized disconnect switch.

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

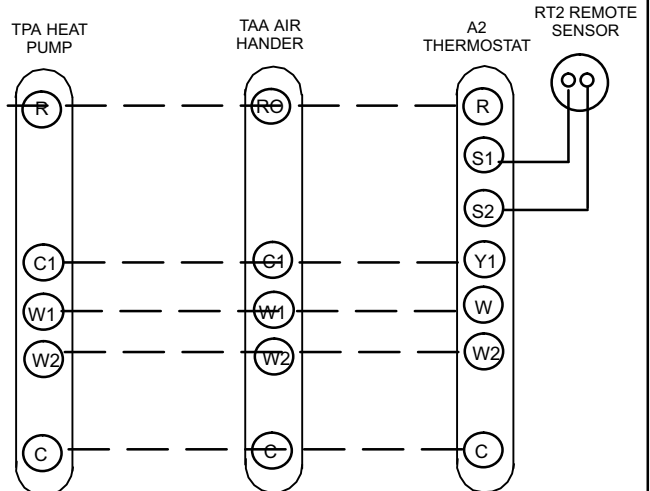


3 INSTALL THERMOSTAT



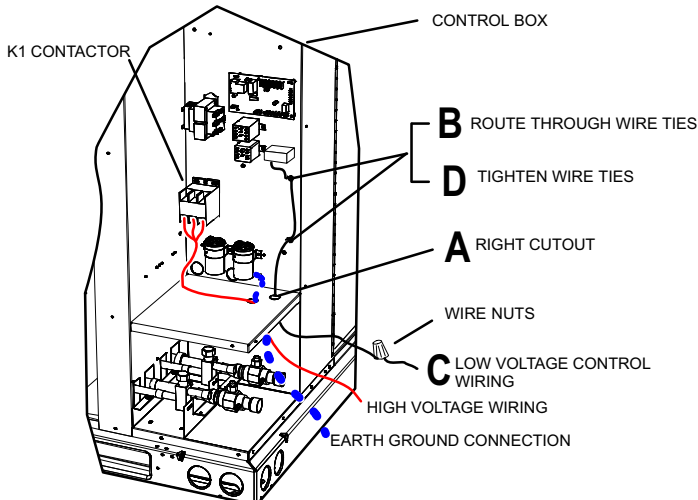
Install room thermostat (ordered separately) on an inside wall approximately in the center of the conditioned area and 5 feet (1.5m) from the floor. It should not be installed on an outside wall or where it can be affected by sunlight, drafts or vibrations.

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	35°C 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.

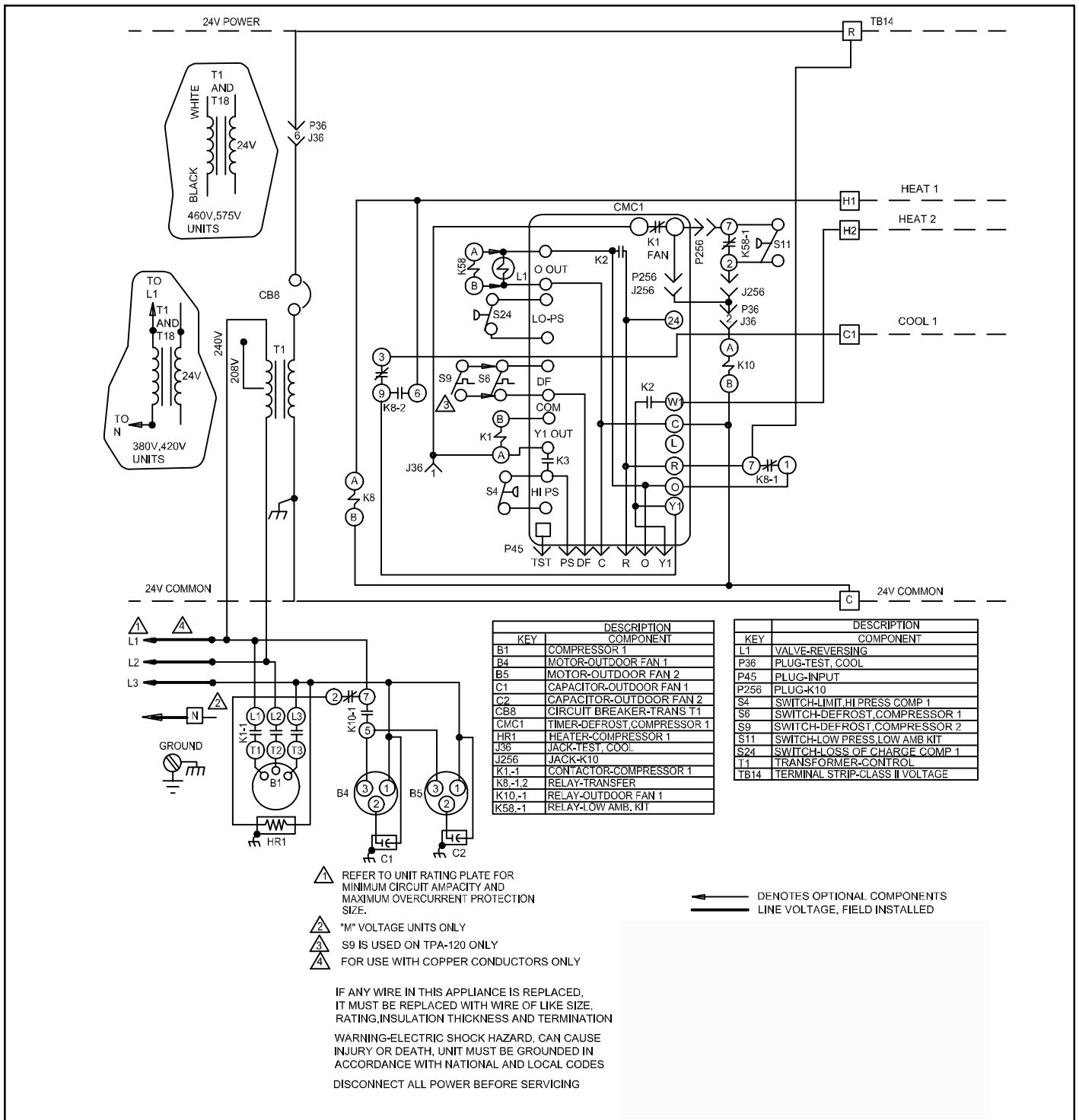


Figure 3. TPA090S4S and TPA120S4S (G, J, M, and Y Voltages) Typical Wiring Diagram

Refrigerant Charge and Check

TPA units have a factory holding charge of 1 pound of HFC-410A. Additional refrigerant will need to be added during installation (table 2).

Table 2. Adding Refrigerant

Models	25 Feet ¹ (pounds)	Liquid Line Diameter (inches)	Vapor Line Diameter (inches)	Adjustment per foot of Line ² (Ounces)
TPA090	17	5/8	1-3/8	1.8
TPA120	23	5/8	1-3/8	1.8

¹ Total amount of charge necessary to accommodate 25 feet of line set.

² If line set length is greater than 25 feet, add this amount to each circuit. If line set is less than 25 feet, subtract this amount from each circuit. Refer to Lennox Refrigerant Piping Design and Fabrication Guidelines for more information.

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

To charge the system, use either of the following procedures:

CHARGE PROCEDURE — NORMAL OPERATING PRESSURES

1. Connect a manifold gauge set to the service valves:
 - A Low pressure gauge to vapor service port.
 - B High pressure gauge to liquid valve service port
2. Operate system in cooling mode until pressures and temperatures stabilize (5 minutes minimum).
3. Use a thermometer to measure the outdoor ambient temperature. The outdoor temperature will determine which charging procedure to use.

Outdoor Temp ≥ 65°F (18°C)

1. Apply the outdoor ambient temperature to tables 4 or 5 to determine normal operating pressures. Compare the normal operating pressures to the pressures obtained from the connected gauges. If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.
 - A Add or remove charge in increments.
 - B Allow the system to stabilize at least 5 minutes each time refrigerant is added or removed
2. 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.
3. Switch to heating mode to confirm normal operating pressures. Let the system stabilize at least 10 minutes then compare the pressure obtained from the

connected gauges to the normal operating pressures (heating mode) in table 5.

4. Verify the charge, as described in the approach method section.

Outdoor Temp < 65°F (18°C)

1. When the outdoor ambient temperature is below 65F (18C) it may be necessary to restrict the air flow through the outdoor coil to achieve liquid pressures in the 325-375 psig (2240-2585 kPa) range. These higher pressures are necessary for checking the charge. Block equal sections of the outdoor coil on all coil sides until the liquid pressure is in the 325-375 psig range (figure 4).
2. Charge the system as described in the approach method section.
3. Switch to heating mode and let the system stabilize at least 10 minutes. Then confirm that the pressures obtained from the connected gauges match the normal operating pressures (heating mode) in table 5
4. 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.

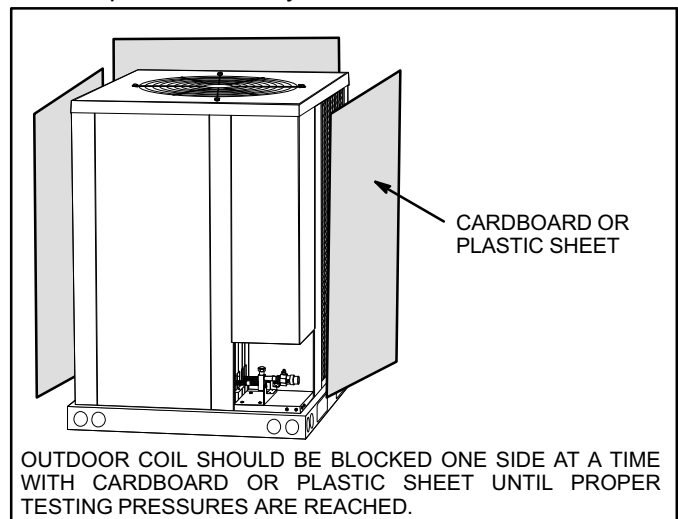


Figure 4. Blocking Outdoor Coil

PROCEDURE — APPROACH METHOD

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

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

$$\text{Approach Temperature} = \text{Liquid temperature} - \text{ambient temperature}$$

2. Approach temperature should be as indicated in table 3 for each stage. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.
 - A Add or remove charge in increments.

B Allow the system to stabilize at least 5 minutes each time refrigerant is added or removed

3. Do not use the approach method if system pressures do not match pressures in tables 4 or 5 except when the outdoor ambient temperature is below 65°F (18°C). The approach method is not valid for grossly over or undercharged systems.

Table 3. HFC-410A Approach Temperatures

Models	Stage	Approach Temperature (°F) (+/- 1)	Approach Temperature (°C) (+/- 0.5)
TPA090S4S	1	7.0	3.8
TPA120S4S	1	8.0	4.4

Table 4. HFC-410A Normal Operating Pressures — Cooling Mode (Liquid ±10 and Suction ±5 psig)

Temp*	TPA090		TPA120		(2) TPA090 / TAA240			
					Stage 1		Stage 2	
	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction
65° F (18° C)	231	128	243	130	239	132	239	132
75° F (24° C)	265	130	281	133	289	135	289	135
85° F (29° C)	310	131	325	136	322	137	322	137
95° F (35° C)	358	134	372	139	370	140	370	140
105° F (41° C)	410	137	427	140	422	142	422	142
115° F (46° C)	467	140	478	142	480	145	480	145
125° F (52° C)	551	146	548	142	541	148	541	148

*Temperature of air entering outdoor Coil

Table 5. HFC-410A Normal Operating Pressures — Heating Mode (Liquid ±10 and Suction ±5 psig)

Temp*	TPA090		TPA120		(2) TPA090 / TAA240			
					Stage 1		Stage 2	
	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction
60° F (15° C)	384	116	367	120	394	117	394	117
50° F (10° C)	366	101	350	105	376	102	376	102
47° F (8° C)	361	96	345	101	370	97	370	97
40° F (4° C)	348	85	333	91	357	87	357	87
30° F (-1° C)	330	70	316	76	338	72	338	72
20° F (-6° C)	312	55	299	61	320	57	320	57
17° F (-8° C)	307	50	294	57	314	52	314	52

*Temperature of air entering outdoor Coil

Table 6. 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.

LOSS-OF-CHARGE SWITCH (S24)

These units are equipped with a loss-of-charge switch that is located on the liquid 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.

Each timing pin selection provides a different accumulated compressor run time period for one defrost 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. The maximum defrost period is 14 minutes and cannot be adjusted.

NOTE — Defrost control part number is listed near the P1 timing pins.

- Units with defrost control **100269-02**: Factory default is 60 minutes.
- Units with defrost control **100269-04**: Factory default is 90 minutes

If the timing selector jumper is missing, the defrost control defaults to a 90-minute defrost interval.

Defrost Control Board

DEFROST CONTROL TIMING PINS

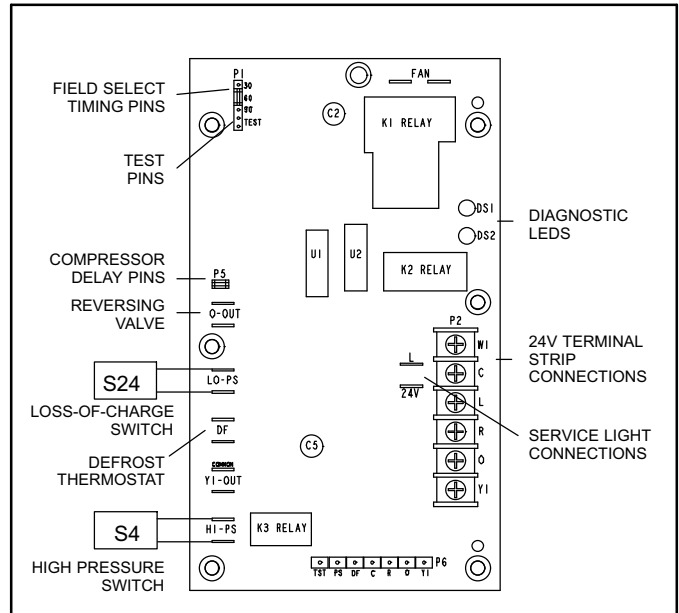


Figure 5. Outdoor Unit Defrost Control Board

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 the TEST pins have been jumpered.

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 5). The board also includes LO PS terminals to accommodate the factory installed loss-of-charge 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 (table 7). 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 loss-of-charge 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

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

DIAGNOSTIC LEDES

The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the diagnosis (table 7).

Table 7. 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
Fault and Lockout Codes		
OFF	Slow Flash	Loss-of-Charge Fault
OFF	ON	Loss-of-Charge Lockout
Slow Flash	OFF	High Pressure Fault
ON	OFF	High Pressure Lockout

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

THERMOSTAT

Heating Correct? Cooling Correct? Calibrated? Properly Set? Level?