

INSTALLATION INSTRUCTIONS

T-CLASS™ TSA Series 6 to 20 Ton

AIR CONDITIONERS
6 - 20 TONS
506147-01
11/2012
Supersedes 6/2011

TP Technical
Publications
Litho U.S.A.

THIS MANUAL MUST BE LEFT WITH THE HOMEOWNER 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

The State of California has determined that this product may contain or produce a chemical or chemicals, in very low doses, which may cause serious illness or death. It may also cause cancer, birth defects, or reproductive harm.

⚠ 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 instructions

Outdoor Unit

TSA Series Air Conditioners, 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 TSA Series *Engineering Handbook*.

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



Unit Dimensions, Corner Weights and Center of Gravities

TSA072S4S AND TSA090S4S

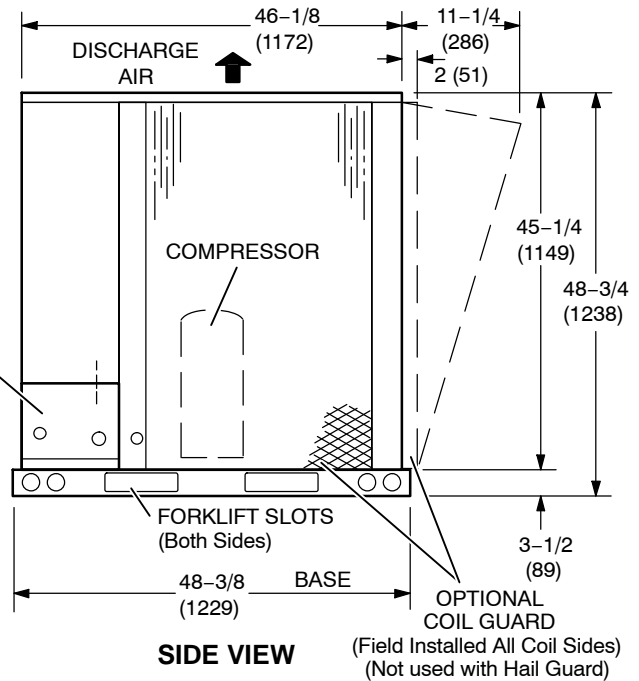
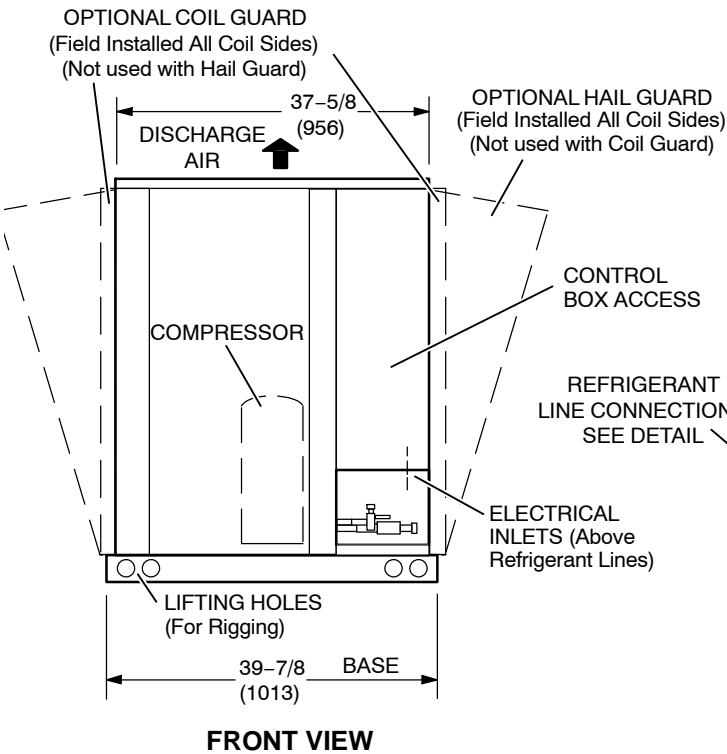
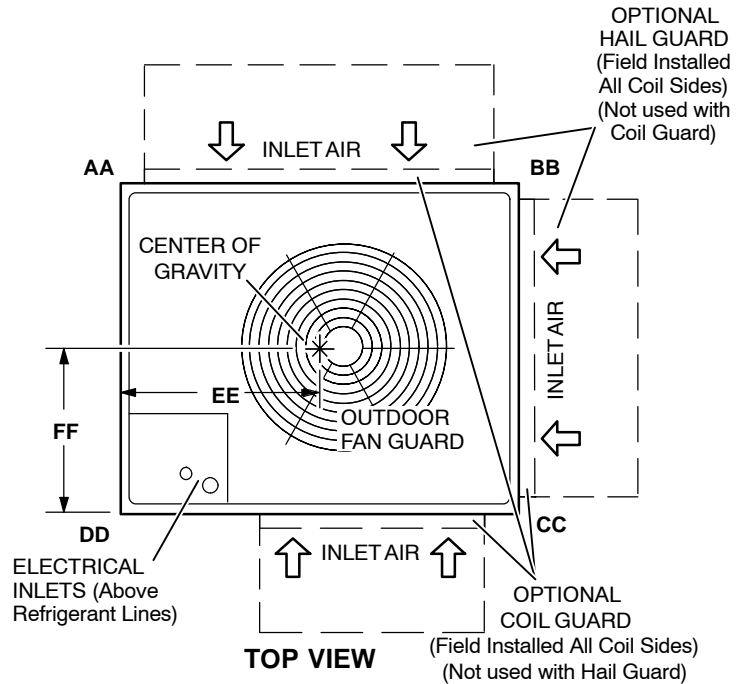
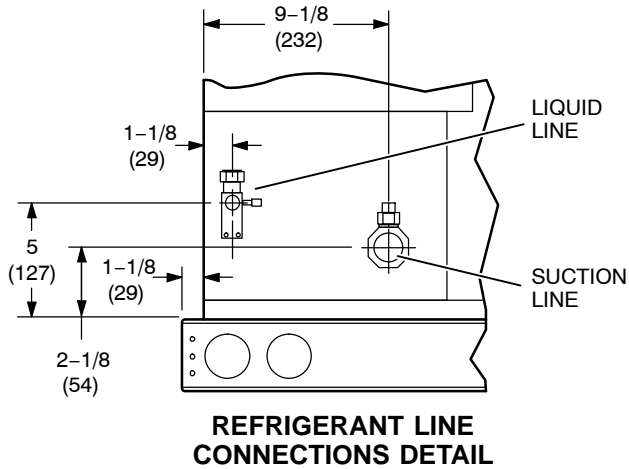
Corner Weights

Model No.	AA		BB		CC		DD	
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
TSA072S4S	73	33	67	30	78	35	85	39
TSA090S4S	86	39	93	42	92	42	85	39

Center of Gravities

Model No.	EE		FF	
	inch	mm	inch	mm
TSA072S4S	23	584	18.5	470
TSA090S4S	25	635	20.25	514

INCHES (MM)



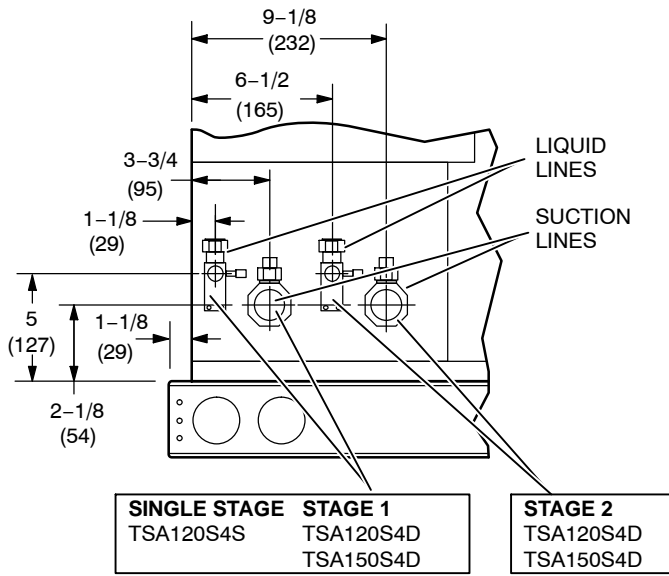
TSA120S4S, TSA120S4S AND TSA150S4D

Corner Weight

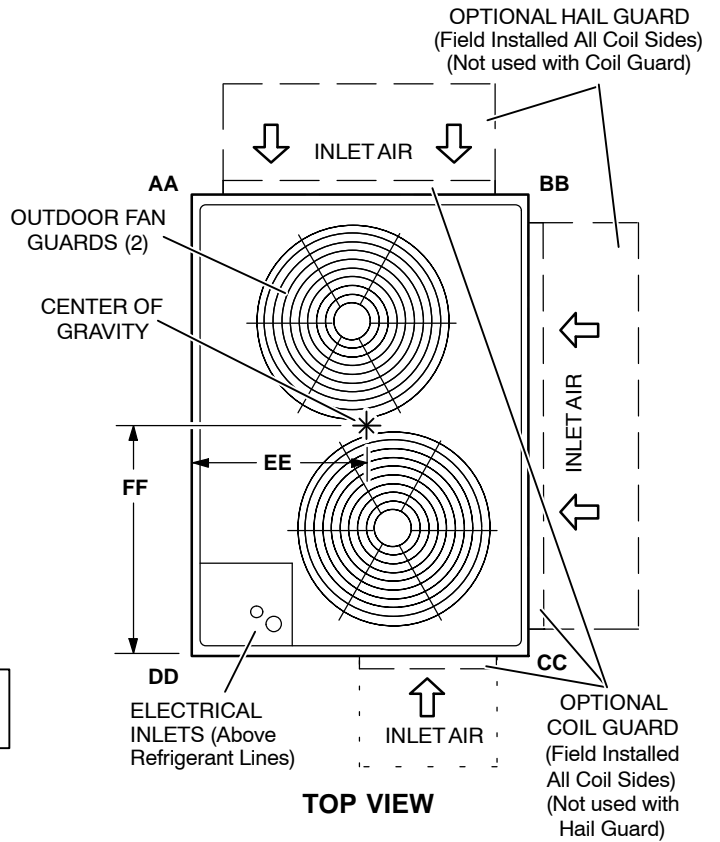
Model No.	AA		BB		CC		DD	
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
TSA 120S4S	136	62	121	55	96	44	108	49
TSA 120S4D	120	54	112	51	124	56	133	60
TSA 150S4D	152	69	117	53	117	53	152	69

Center of Gravities

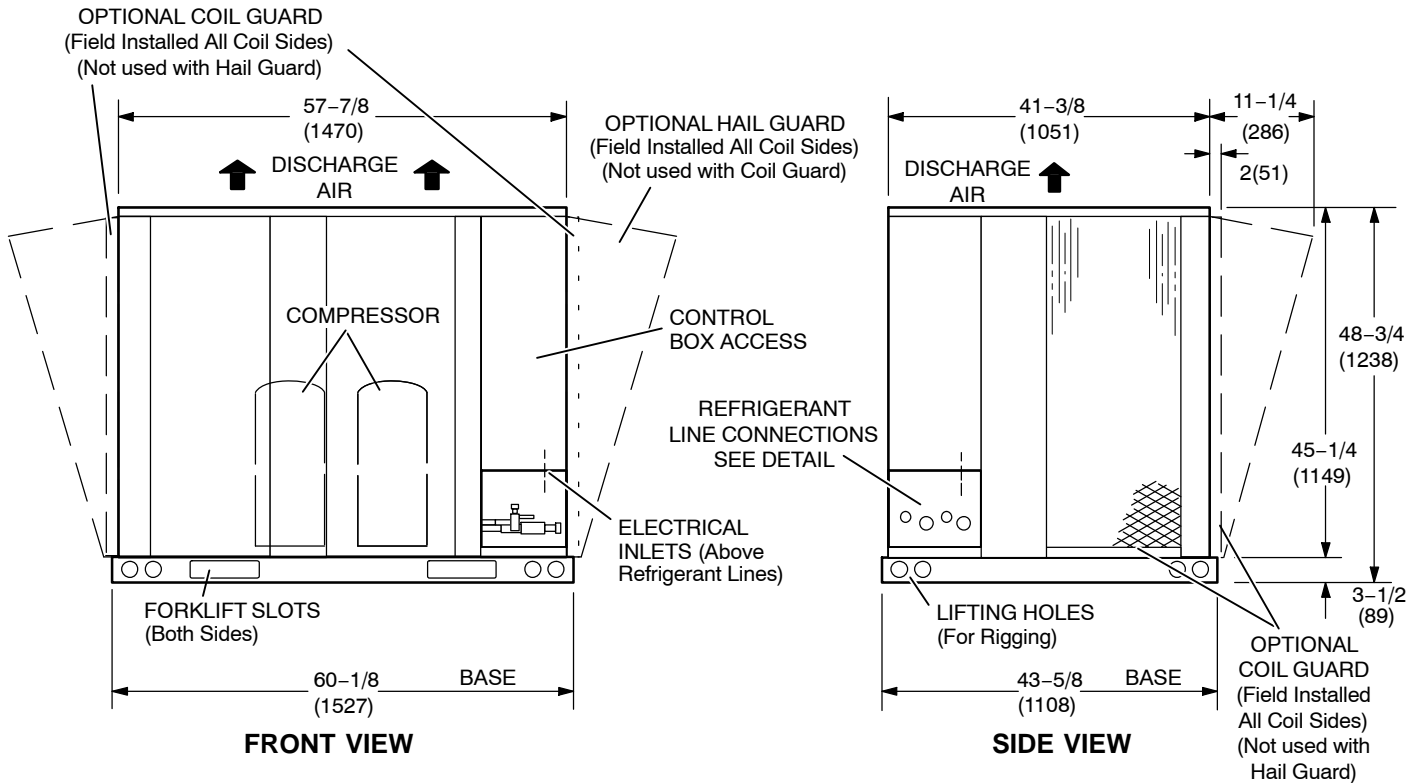
Model No.	EE		FF	
	inch	mm	inch	mm
TSA 120S4S	20.5	521	33.5	851
TSA 120S4D	21.0	533	28.5	724
TSA 150S4D	19.0	483	30.0	762



REFRIGERANT LINE CONNECTIONS DETAIL



TOP VIEW



FRONT VIEW

SIDE VIEW

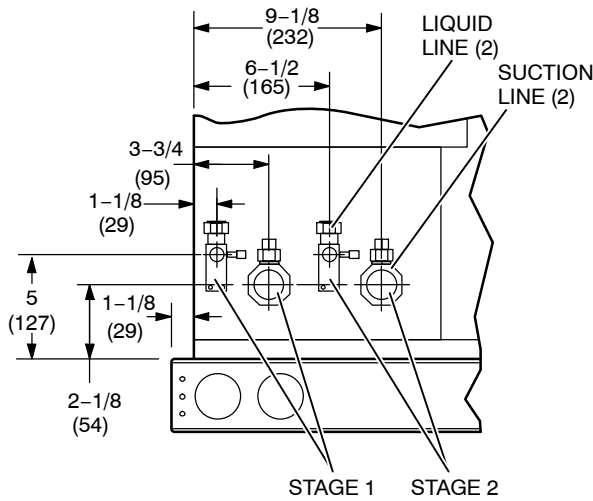
TSA180S4D AND TSA240S4D

Corner Weight

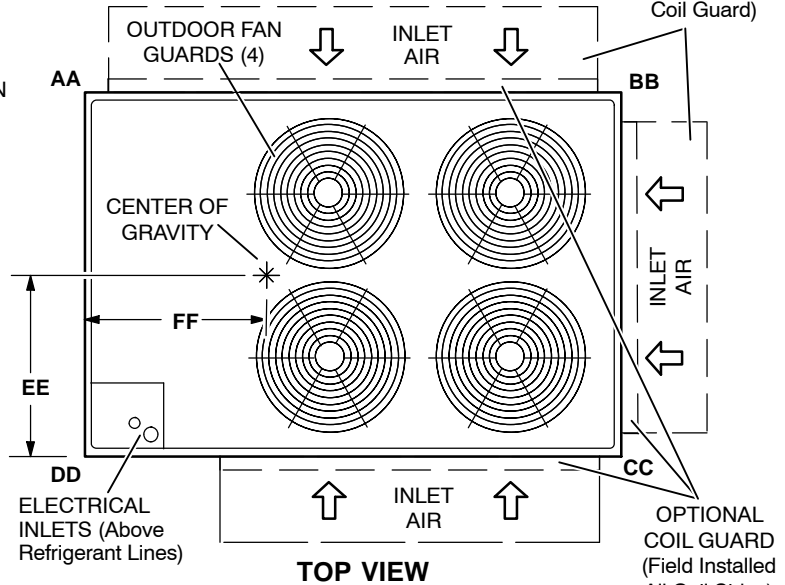
Model No.	AA		BB		CC		DD	
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
TSA180S4D	223	101	166	75	178	81	238	108
TSA240S4D	265	120	197	89	197	89	265	120

Center of Gravities

Model No.	EE		FF	
	inch	mm	inch	mm
TSA180S4D	29	737	38	965
TSA240S4D	30	762	38	965



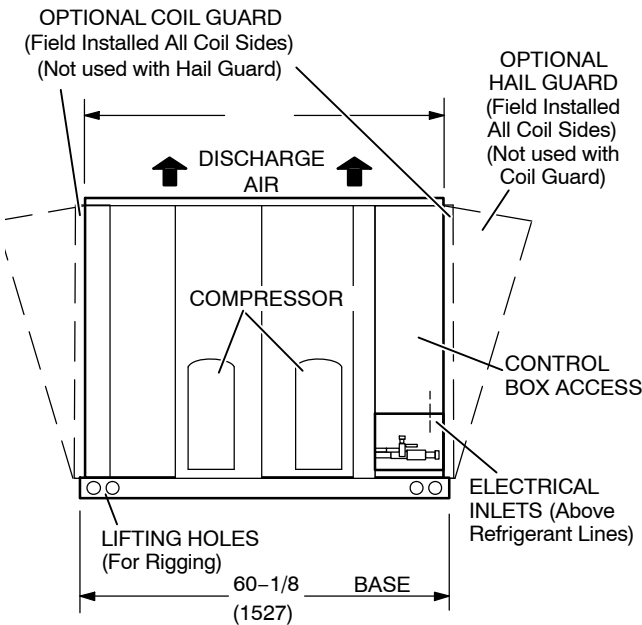
REFRIGERANT LINE CONNECTIONS DETAIL



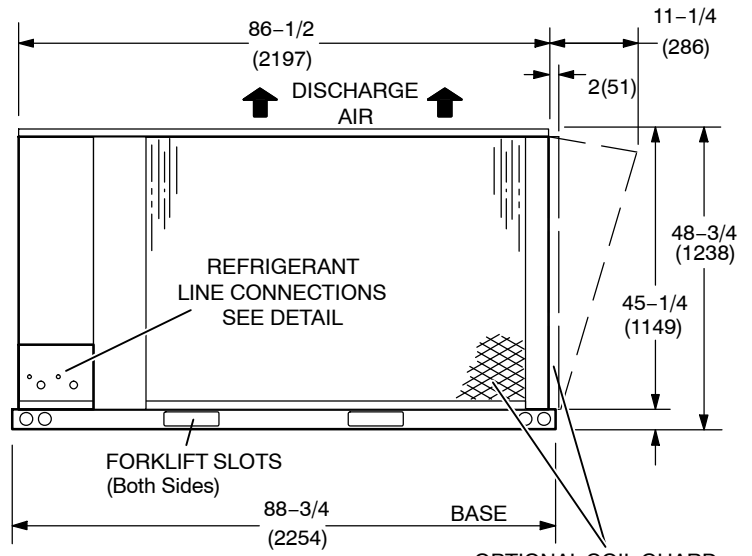
TOP VIEW

OPTIONAL HAIL GUARD (Field Installed All Coil Sides) (Not used with Coil Guard)

OPTIONAL COIL GUARD (Field Installed All Coil Sides) (Not used with Hail Guard)



FRONT VIEW

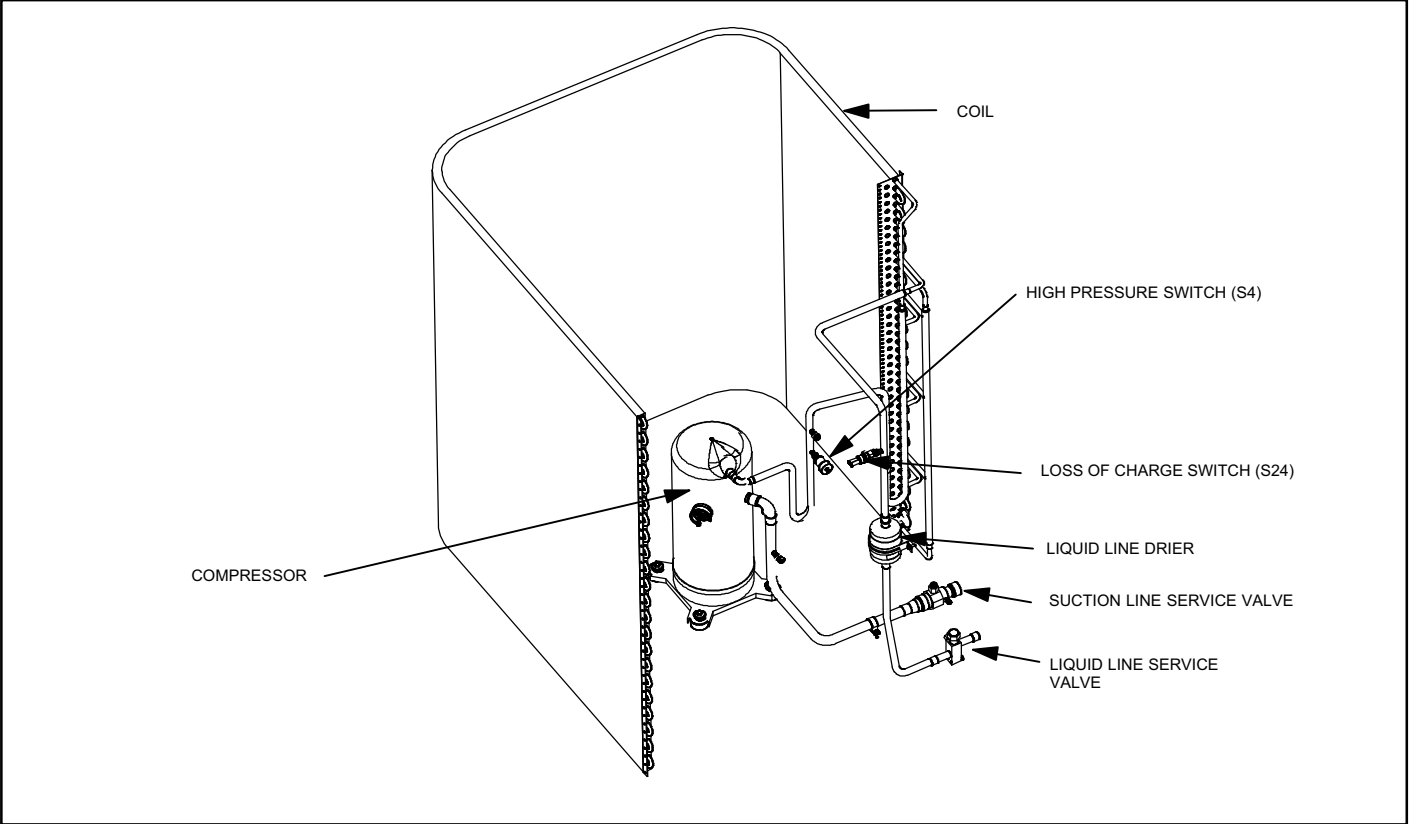


SIDE VIEW

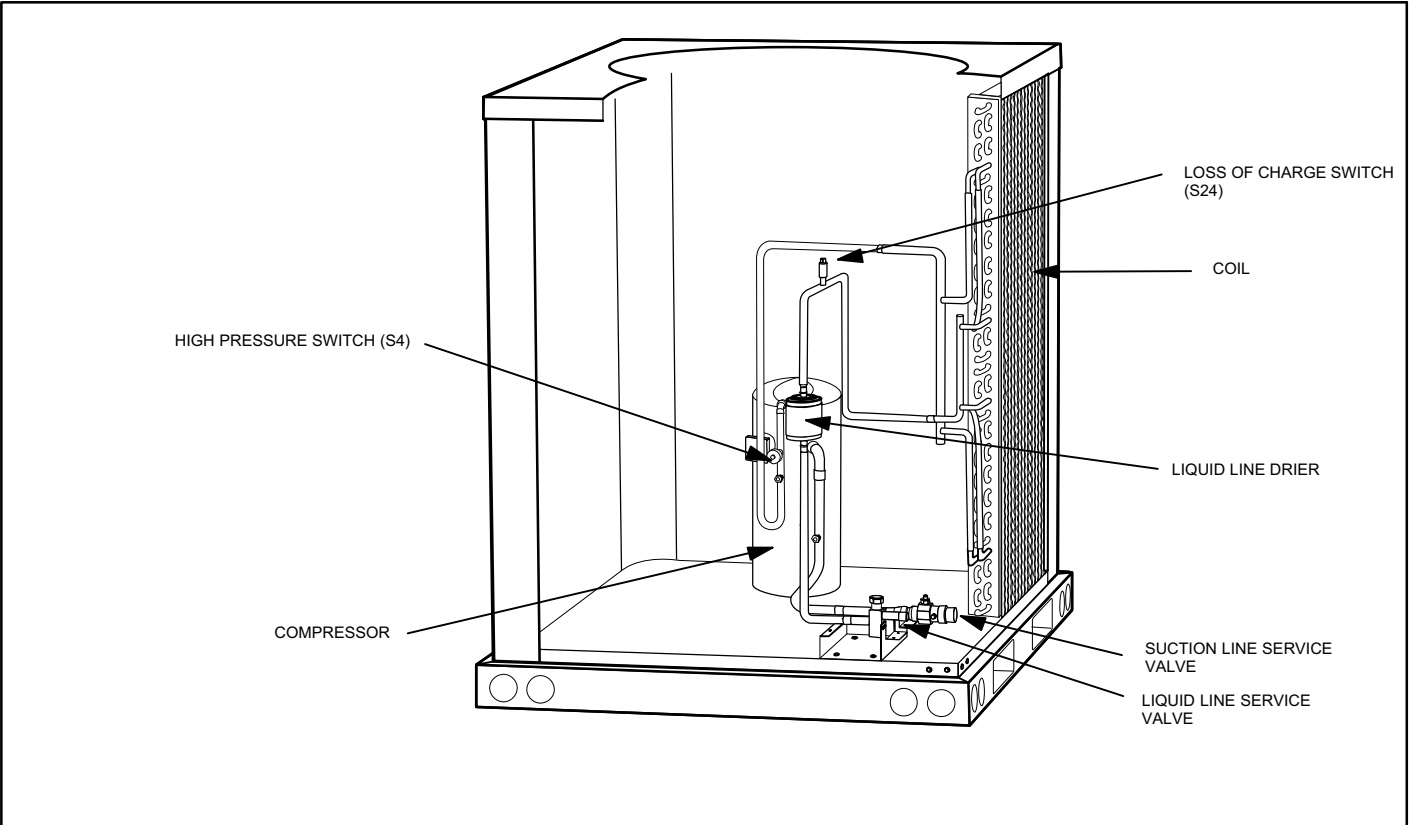
OPTIONAL COIL GUARD (Field Installed All Coil Sides) (Not used with Hail Guard)

Unit Plumbing Parts Arrangement

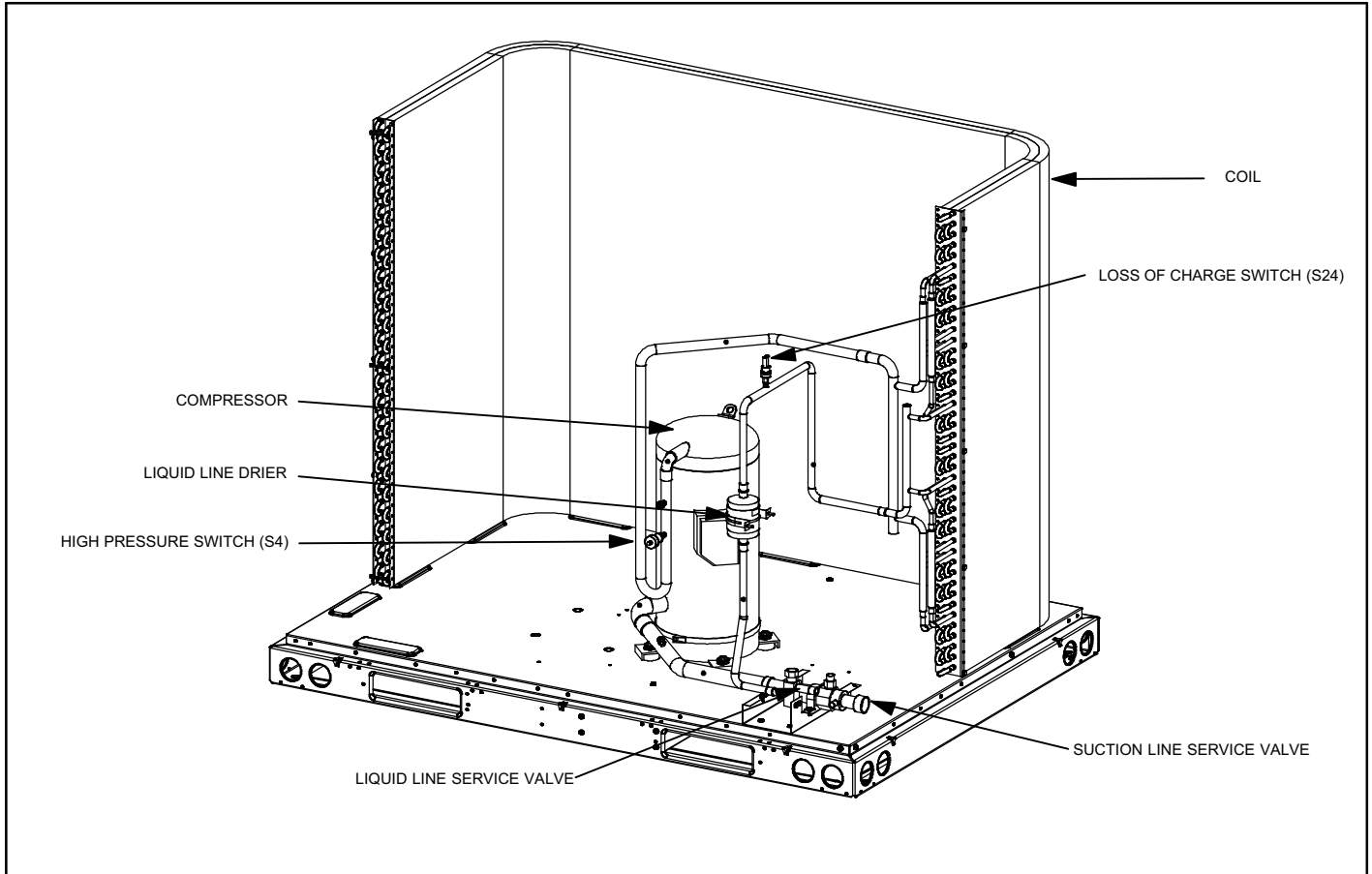
TSA072S4S



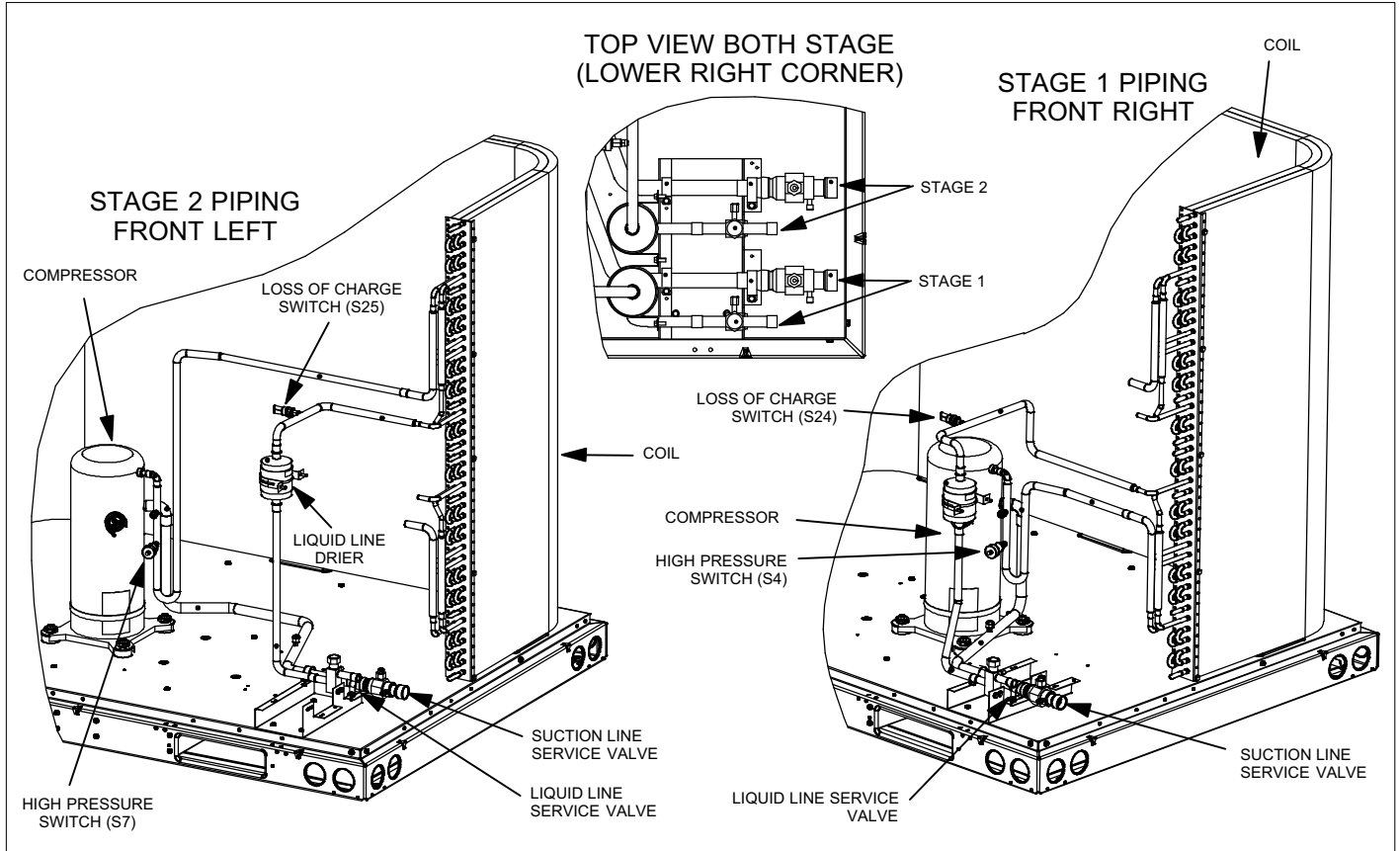
TSA090S4S



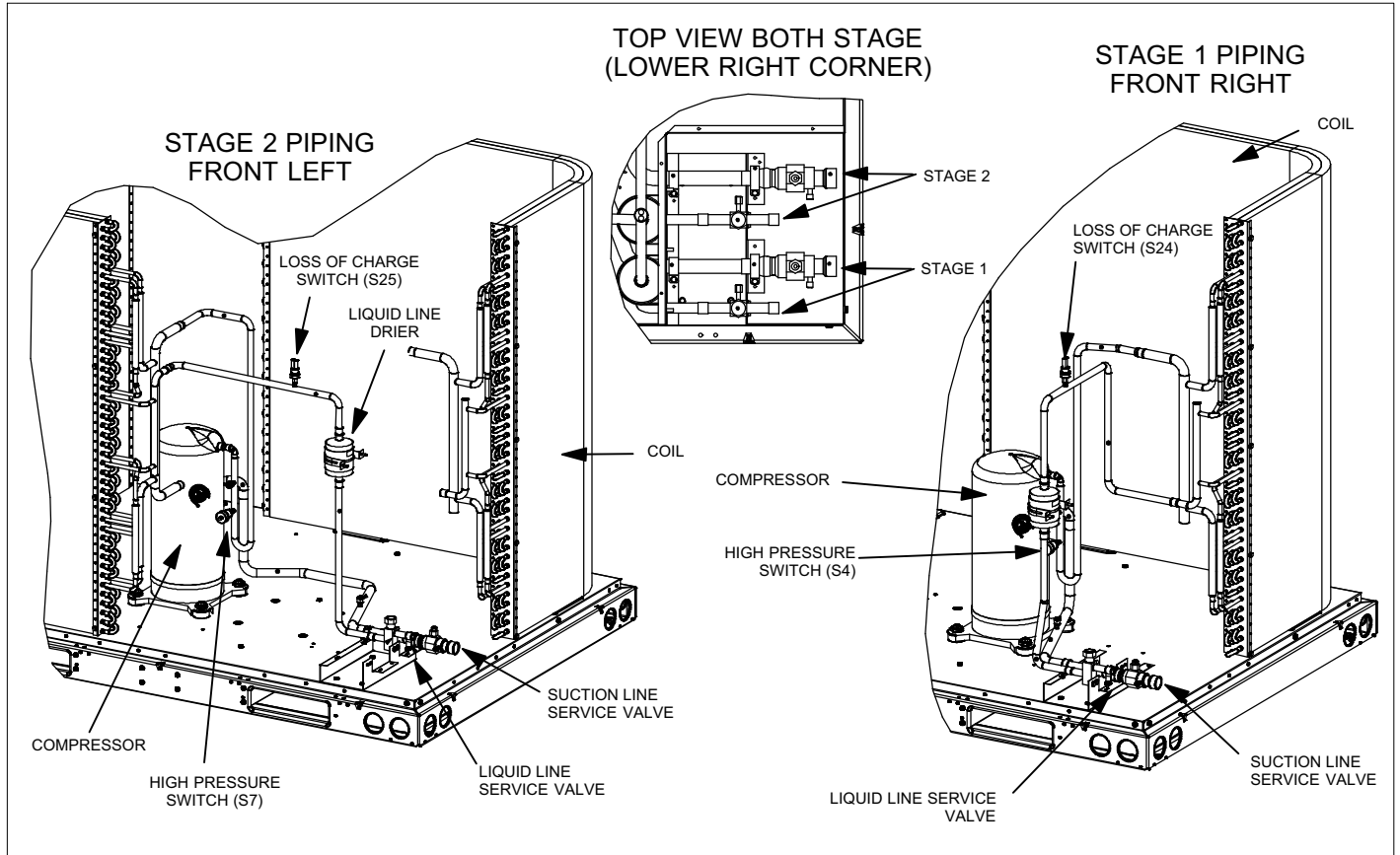
TSA120S4S



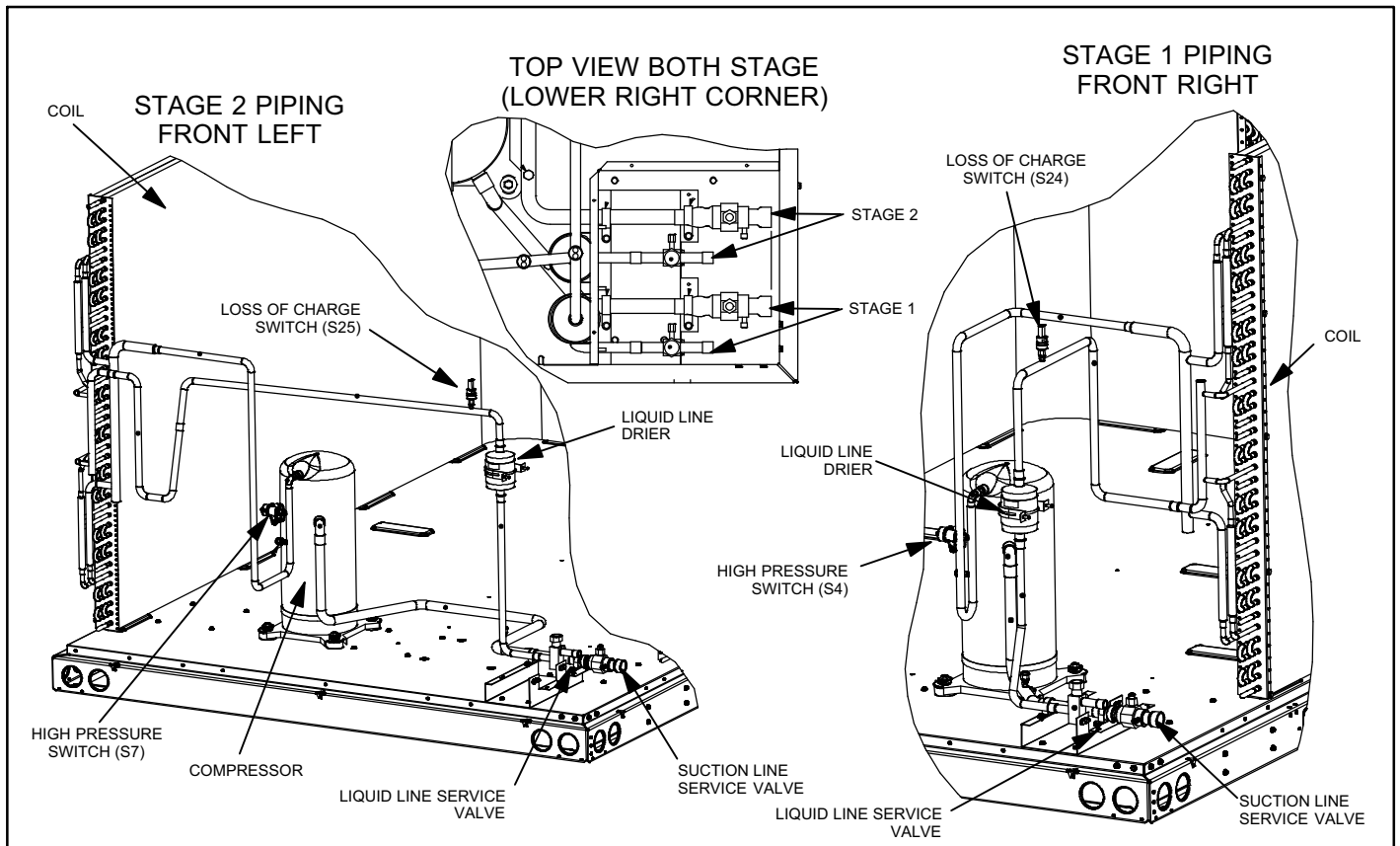
TSA120S4D

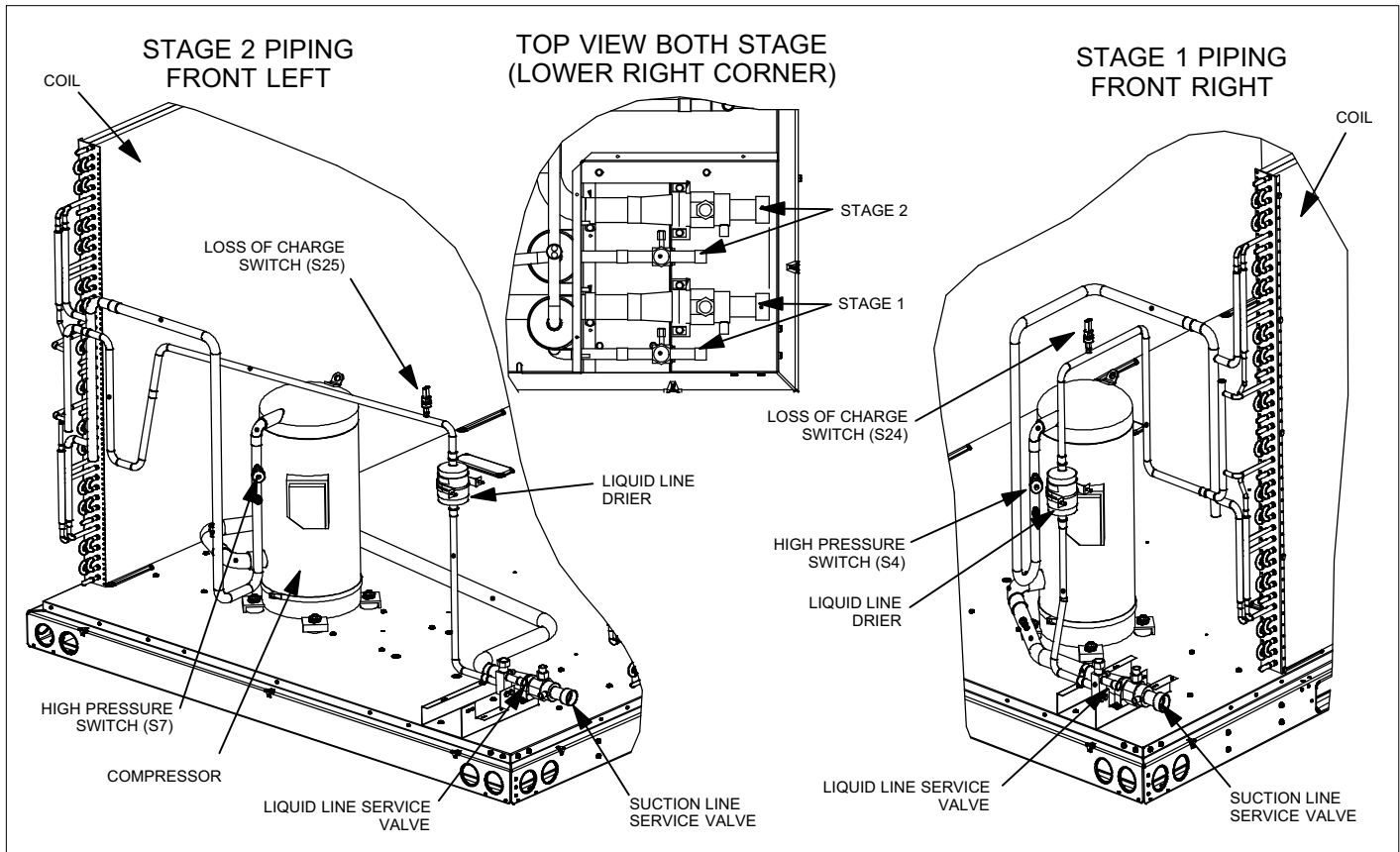


TSA150S4D

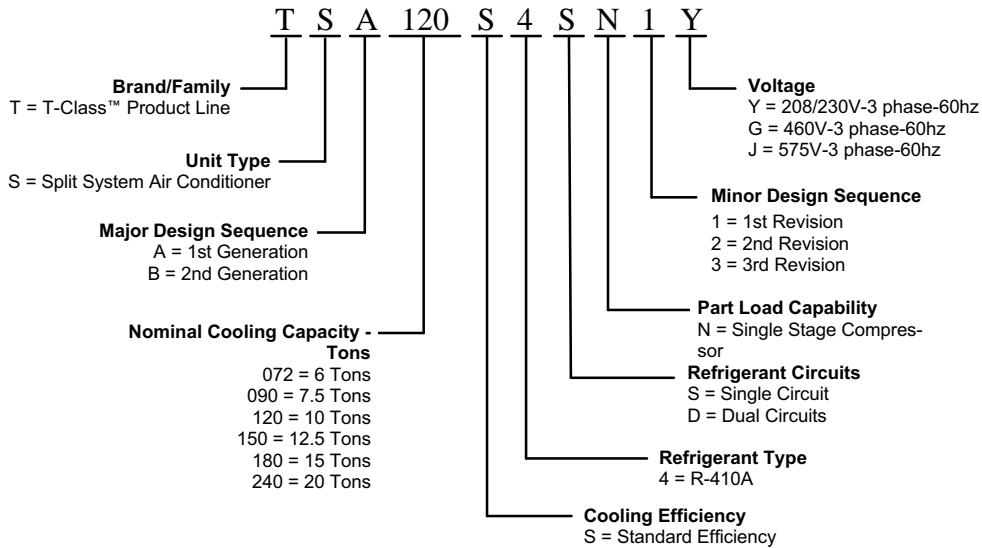


TSA180S4D

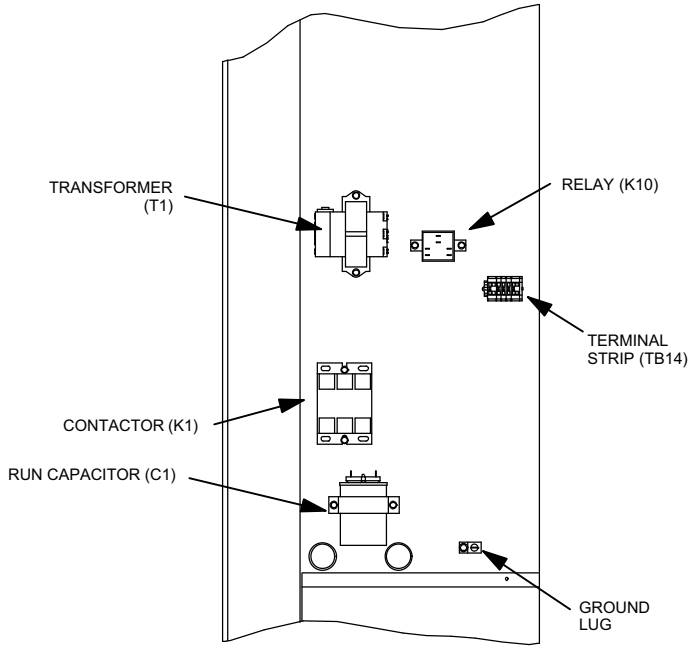




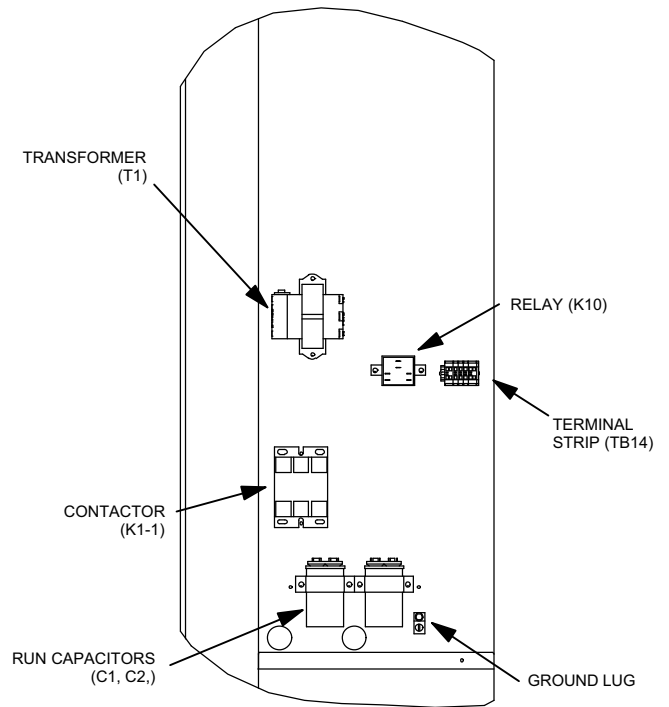
Model Number Identification



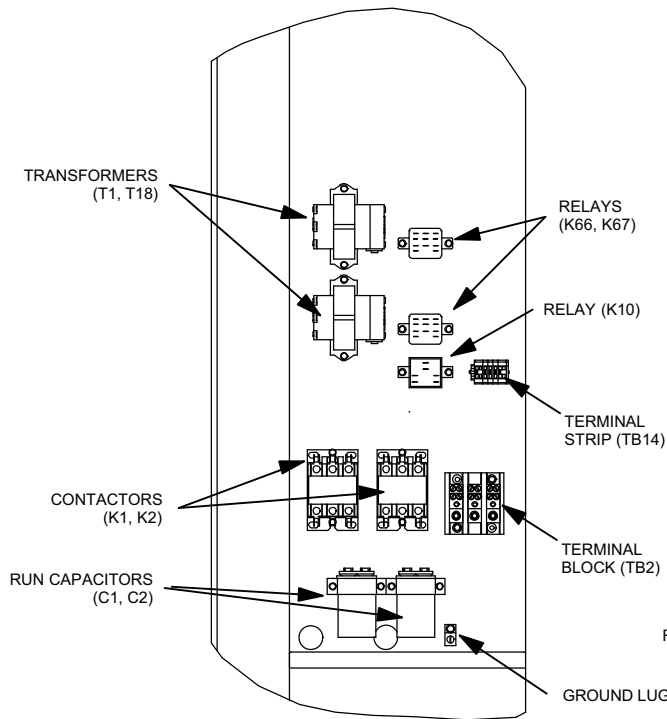
Unit Control Box Components Arrangement



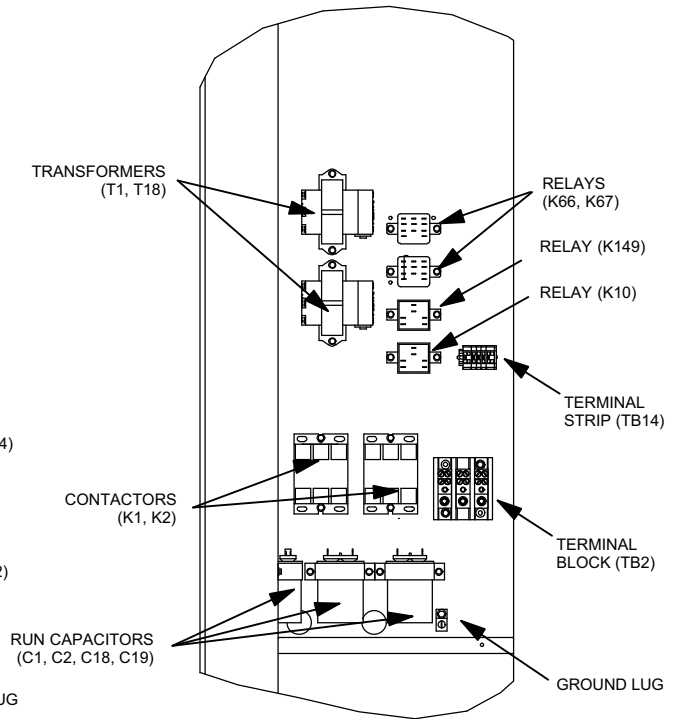
TSA072S4S AND TSA090S4S



TSA120S4S



TSA120S4D AND TSA150S4D



TSA180S4D AND TSA240S4D

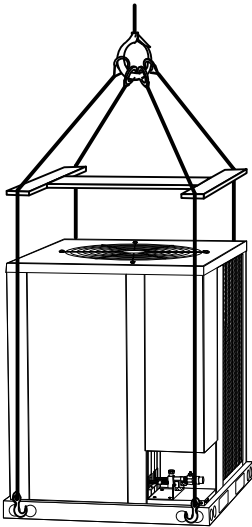
Rigging the Unit for Lifting

Rig the unit for lifting by attaching four cables to the holes in the base rail of the unit. See figure 1 through 3.

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.)

Lifting point should be directly above the center of gravity.

Caution - do not walk on unit.

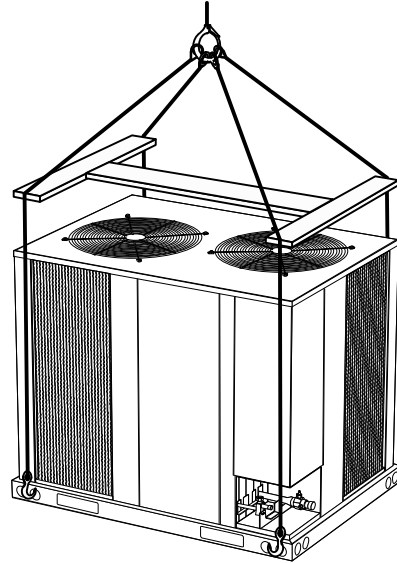


Important - all panels must be in place for rigging.

Figure 1. TSA072S4S and TSA090S4S

Lifting point should be directly above the center of gravity.

Caution - do not walk on unit.

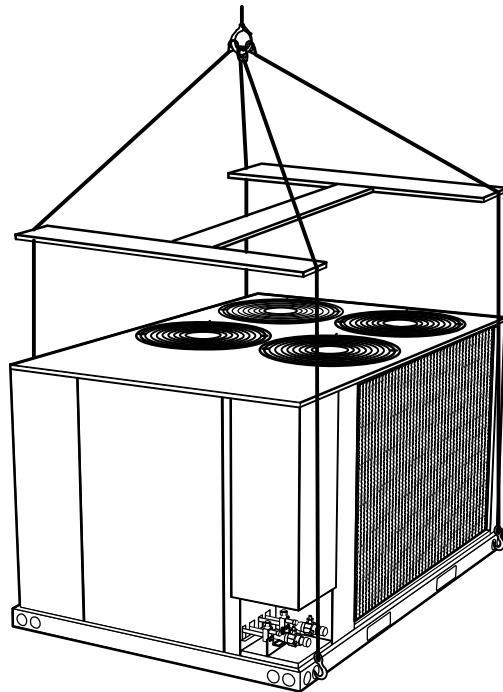


Important - all panels must be in place for rigging.

Figure 2. TSA120S4S, TSA120S4D and TSA150S4D

Lifting point should be directly above the center of gravity.

Caution - do not walk on unit.



Important - all panels must be in place for rigging.

Figure 3. TSA180S4D and TSA240S4D

Installation Clearances

See *Unit Dimensions* on page 2 to sizing mounting slab, platforms or supports. Refer to figures 4 through 6 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.

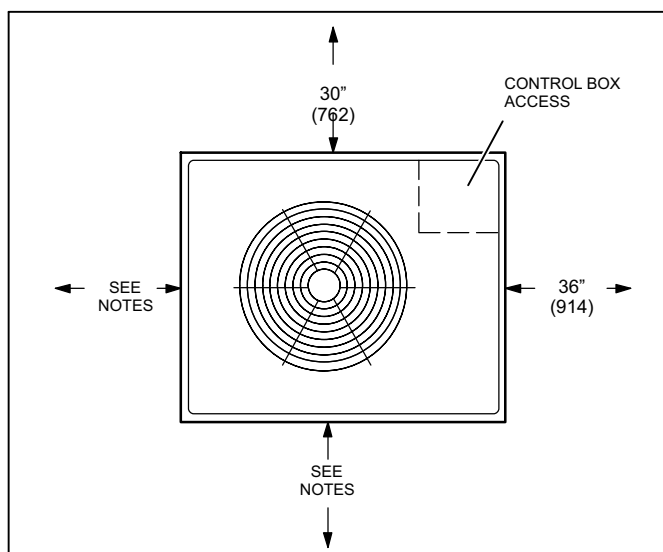


Figure 4. TSA 072 and TSA 090 Installation Clearances

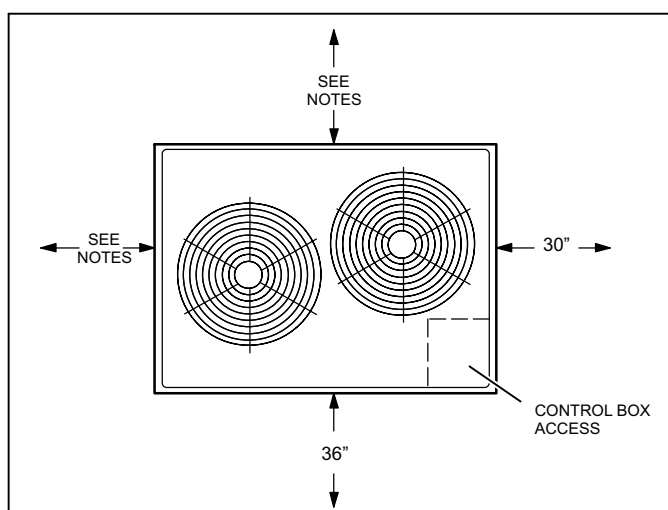


Figure 5. TSA 120S4S, TSA 120S4D and TSA 150 Installation Clearances

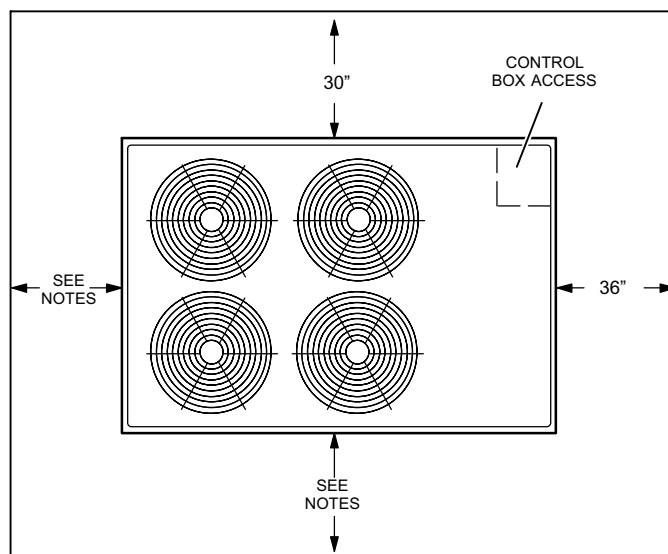


Figure 6. TS 180A and TSA 240 Installation Clearances

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
TSA 072	5/8" (16 mm)	1-1/8" (29 mm)
TSA 090	5/8" (16 mm)	1-1/8" (29 mm)
TSA 120S4S	5/8" (16 mm)	1-3/8" (35 mm)
TSA 120S4D	5/8" (16 mm)	1-1/8" (29 mm)
TSA 150	5/8" (16 mm)	1-1/8" (29 mm)
TSA 180	5/8" (16 mm)	1-1/8" (29 mm)
TSA 240	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

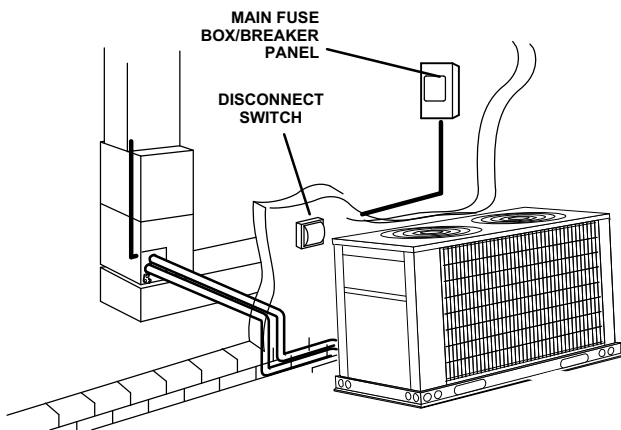
In the United States, wiring must conform with current local codes and the current National Electric Code (NEC). In Canada, wiring must conform with current local codes and the current Canadian Electrical Code (CEC).

TRANSFORMER - 24V

Use the transformer provided with the air conditioning unit for low-voltage control power (24V, 70VA)

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.

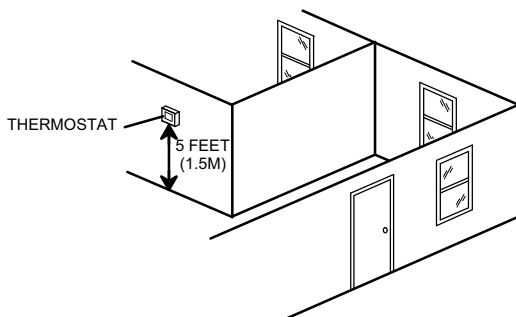
1 CIRCUIT SIZING AND DISCONNECT SWITCH



Refer to the unit nameplate for minimum circuit ampacity, 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.

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.

⚠ WARNING

Electric Shock Hazard. Can cause injury or death.

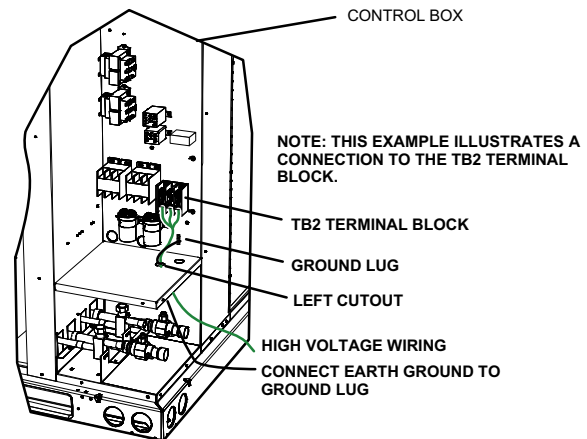
Line voltage is present at all components on units with single-pole contactors, even when unit is not in operation!

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.



2 TYPICAL HIGH VOLTAGE POWER SUPPLY CONNECTIONS

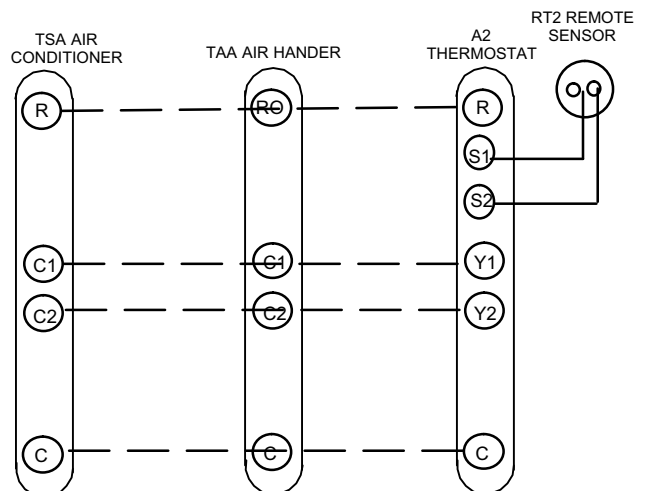


Use the left cutout to route high voltage wiring to the K1 or K1-1 contactor on the TSA 072S, 090S, and 120S4S models.

Use the left cutout to route high voltage wiring to the TB2 terminal block on the TSA 120S4D, 150S4D, 180S4D and 240S4D models.

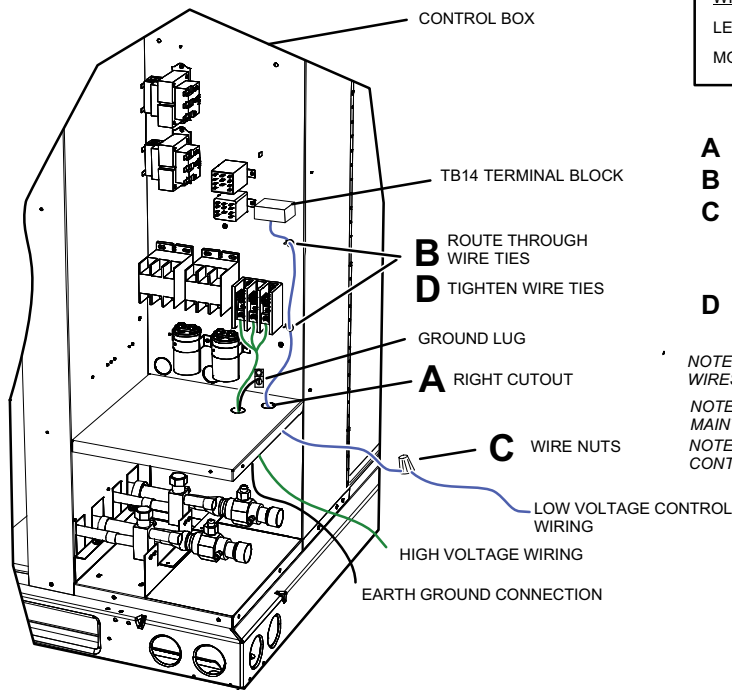
NOTE — ANY EXCESS HIGH VOLTAGE FIELD WIRING SHOULD BE TRIMMED AND SECURED AWAY FROM ANY LOW VOLTAGE FIELD WIRING.

4 TYPICAL CONTROL WIRING



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

5 TYPICAL UNIT CONTROL WIRE 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 figures 7 through 10 for connections requirements.
- D** Tighten wire tie to security 24VDC 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.

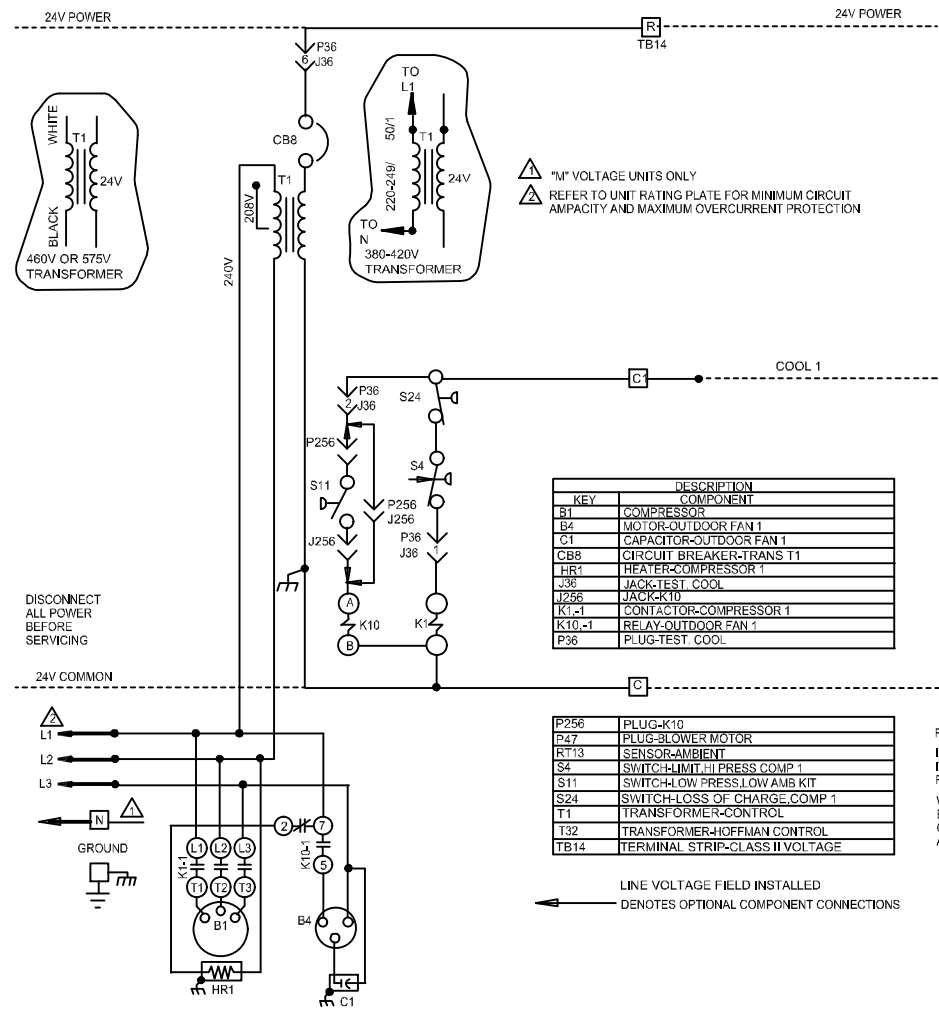


Figure 7. TSA 072S4S and TSA 090S4S G, J, M, and Y Voltages) Typical Wiring Diagram

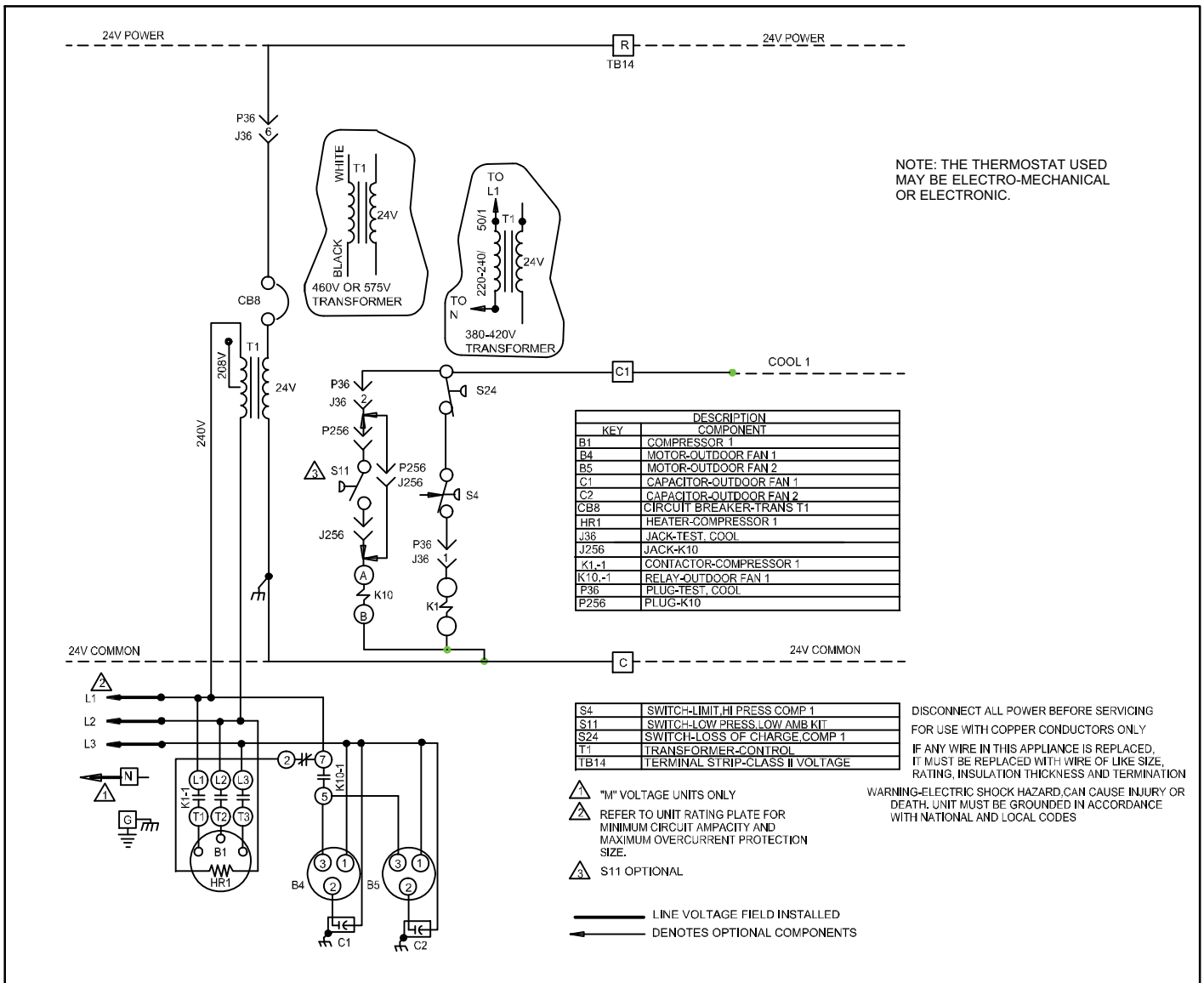


Figure 8. TSA 120S4S (G, J, M, and Y Voltages) Typical Wiring Diagram

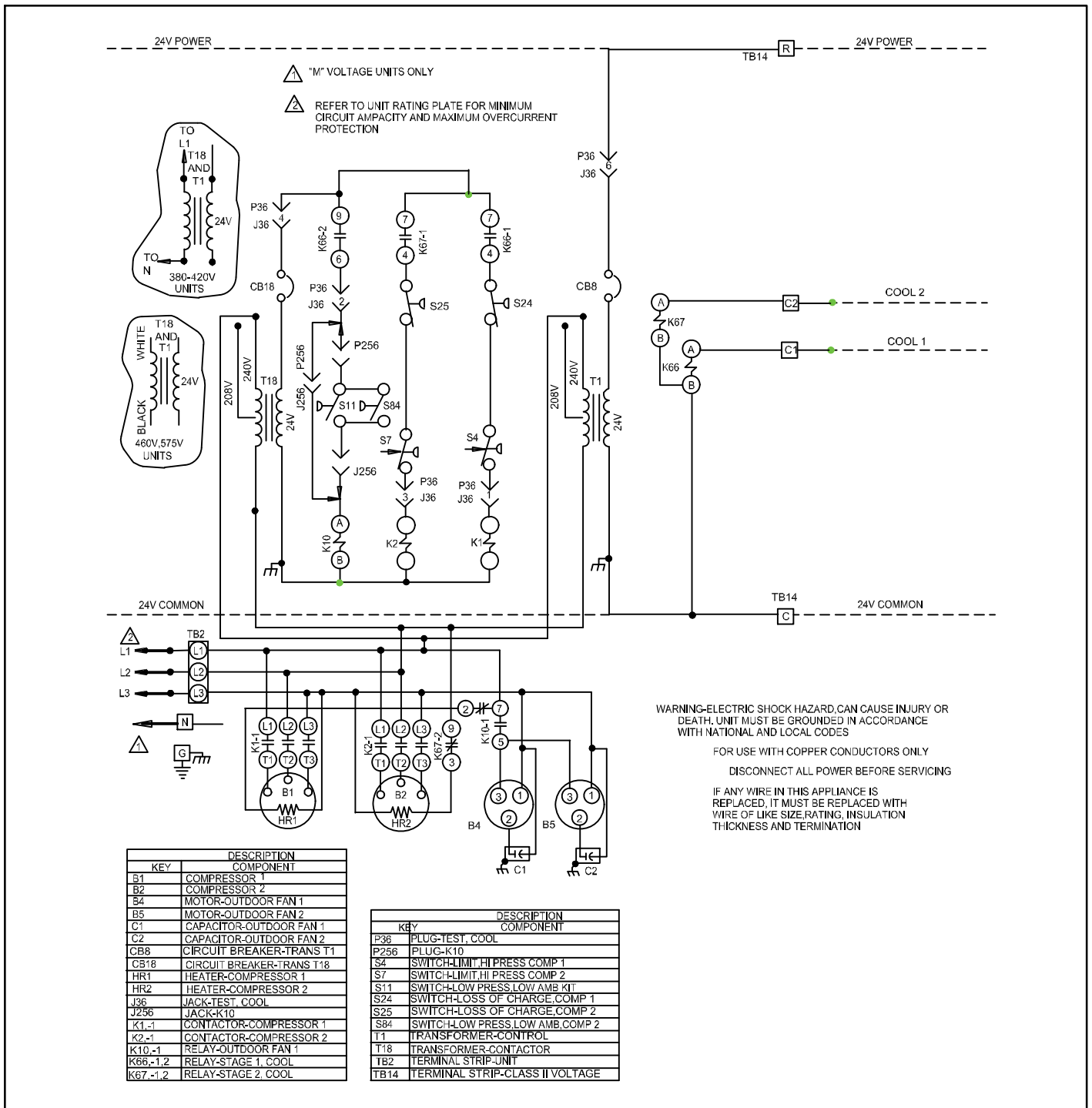


Figure 9. TSA 120S4D and TSA 150S4D (G, J, M, and Y Voltages) Typical Wiring Diagram

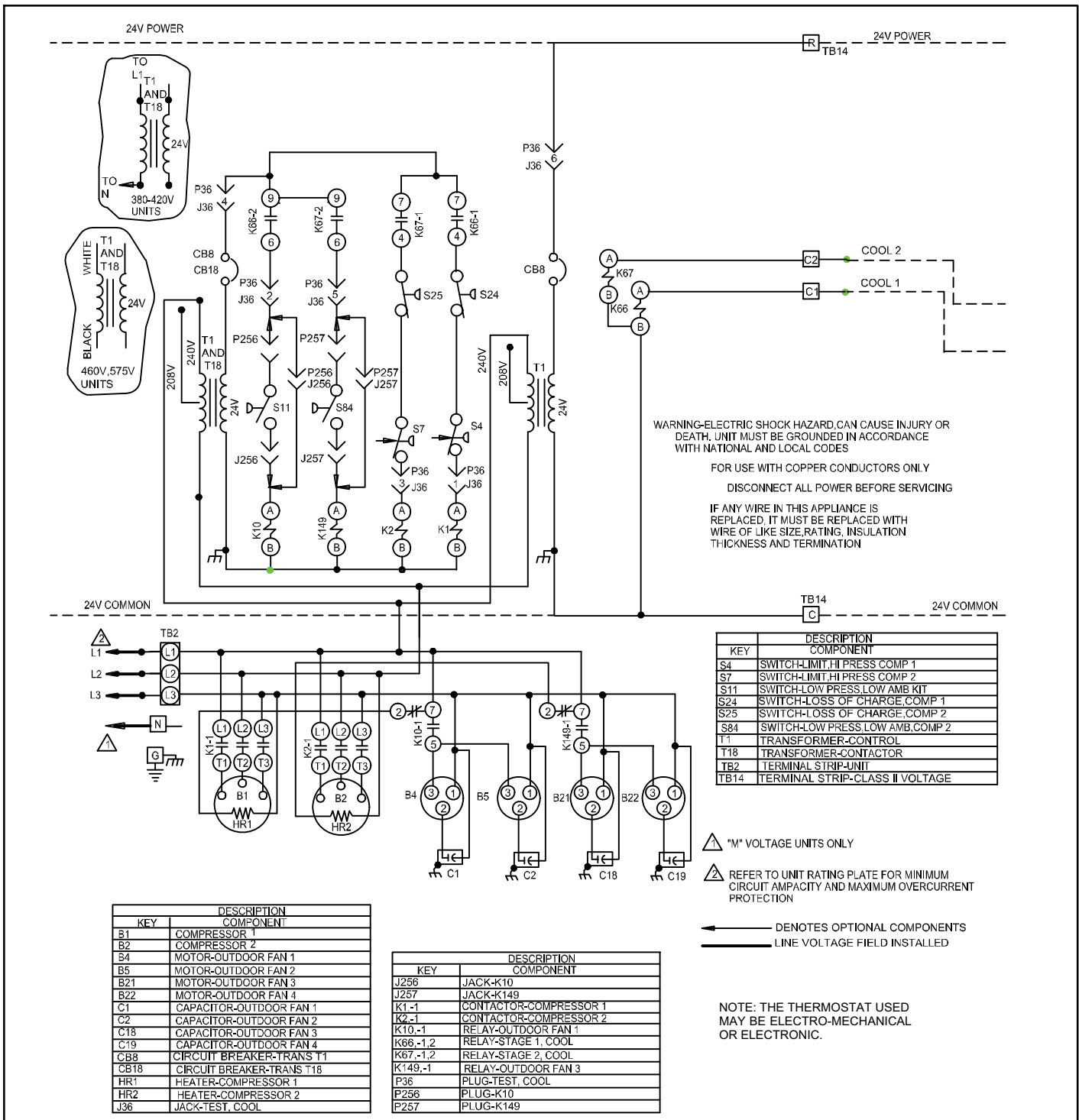


Figure 10. TSA 180S4D and TSA 240S4D (G, J, M, and Y Voltages) Typical Wiring Diagram

Refrigerant Charge

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

Table 2. Adding Refrigerant

Models	25 Feet ¹ (pounds)	Liquid Line Diameter (inches)	Suction Line Diameter (inches)	Adjustment per foot of Line ² (Ounces)
TSA072S4S	11	5/8	1-1/8	1.7
TSA090S4S	16	5/8	1-1/8	1.7
TSA120S4S	17	5/8	1-3/8	1.8
TSA120S4D	20 ³	5/8	1-1/8	1.7
TSA150S4D	21 ³	5/8	1-1/8	1.7
TSA180S4D	29 ³	5/8	1-1/8	1.7
TSA240S4D	35 ³	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.

³ Amounts listed are total charge.

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 procedure:

CHARGE PROCEDURE — NORMAL OPERATING PRESSURES

- Connect a manifold gauge set to the service valves:
 - Low pressure gauge to vapor service port.
 - High pressure gauge to liquid valve service port
- Operate system until pressures and temperatures stabilize (5 minutes minimum).
- 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)

- Apply the outdoor ambient temperature to table 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.
 - Add or remove charge in increments.
 - Allow the system to stabilize at least 5 minutes each time refrigerant is added or removed
- 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.

- Verify the charge, as described in the approach method.

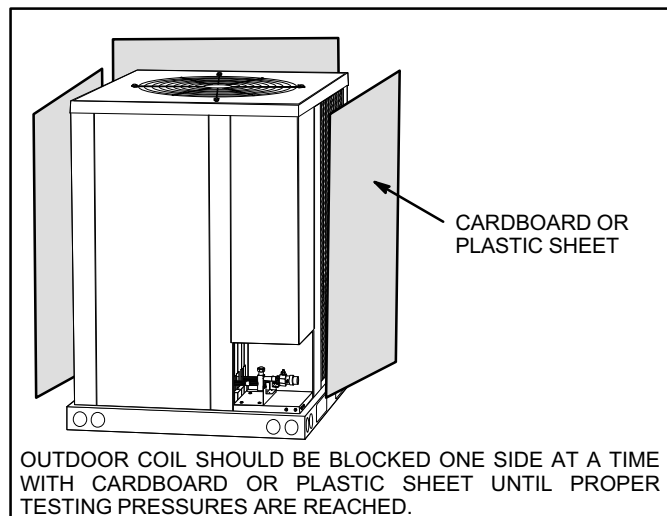


Figure 11. Blocking Outdoor Coil

Outdoor Temp < 65°F (18°C)

- 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 11).
- Charge the unit using the approach method in the next section.

PROCEDURE — APPROACH METHOD

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

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

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

- 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.
 - Add or remove charge in increments.
 - Allow system to stabilize at least 5 minutes each time refrigerant is added or removed.
- Do not use the approach method if system pressures do not match pressures in table 4 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)
TSA072S4S	1	7.0	3.9
TSA090S4S	1	7.0	3.9
TSA120S4S	1	6.0	3.3
TSA120S4D	1	6.0	3.3
	2	6.0	3.3
TSA150S4D	1	6.0	3.3
	2	6.0	3.3
TSA180S4D	1	6.0	3.3
	2	6.0	3.3
TSA240S4D	1	6.0	3.3
	2	6.0	3.3

Table 4. HFC-410A Normal Operating Pressures (Liquid \pm 10 and Suction \pm 5 psig) (Single-Stage Units)

Temp*	-072S4S		-090S4S		-120S4S	
	Liquid	Suction	Liquid	Suction	Liquid	Suction
65° F (18° C)	272	131	256	129	259	132
75° F (24° C)	311	134	296	131	299	135
85° F (29° C)	355	137	337	131	341	137
95° F (35° C)	401	139	384	135	388	139
105° F (41° C)	455	143	431	137	437	142
115° F (46° C)	513	143	483	142	491	145
125° F (52° C)	574	148	537	146	548	147

*Temperature of air entering outdoor Coil

Table 5. HFC-410A Normal Operating Pressures (Liquid \pm 10 and Suction \pm 5 psig) (Two-Stage Units)

Temp*	-120S4D STAGE 1		-120S4D STAGE 2		-150S4D STAGE 1		-150S4D STAGE 2	
	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction
65° F (18° C)	236	133	245	131	264	129	261	126
75° F (24° C)	275	138	285	134	303	131	302	128
85° F (29° C)	316	142	326	136	344	133	345	131
95° F (35° C)	366	146	368	147	391	136	391	134
105° F (41° C)	409	147	419	142	440	138	442	136
115° F (46° C)	458	150	469	145	493	141	496	139
125° F (52° C)	516	153	528	148	554	143	557	142
Temp*	-180S4D STAGE 1		-180S4D STAGE 2		-240S4D STAGE 1		-240S4D STAGE 2	
	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction
65° F (18° C)	228	126	234	124	254	133	257	128
75° F (24° C)	266	127	272	125	289	134	296	128
85° F (29° C)	307	130	313	126	333	136	337	132
95° F (35° C)	355	132	359	129	379	140	383	136
105° F (41° C)	414	136	409	132	431	143	437	138
115° F (46° C)	469	139	464	137	492	144	486	142
125° F (52° C)	522	138	513	142	556	146	550	142

*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 manual 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 SWITCHES (S24 AND S25)

These units are equipped with a loss-of-charge switch that is located in 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.

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? <input type="checkbox"/> Cooling Correct? <input type="checkbox"/>	Calibrated? <input type="checkbox"/> Properly Set? <input type="checkbox"/> Level? <input type="checkbox"/>