VARIABLE SPEED R-454B HEAT PUMP/AIR CONDITIONER OUTDOOR UNITS

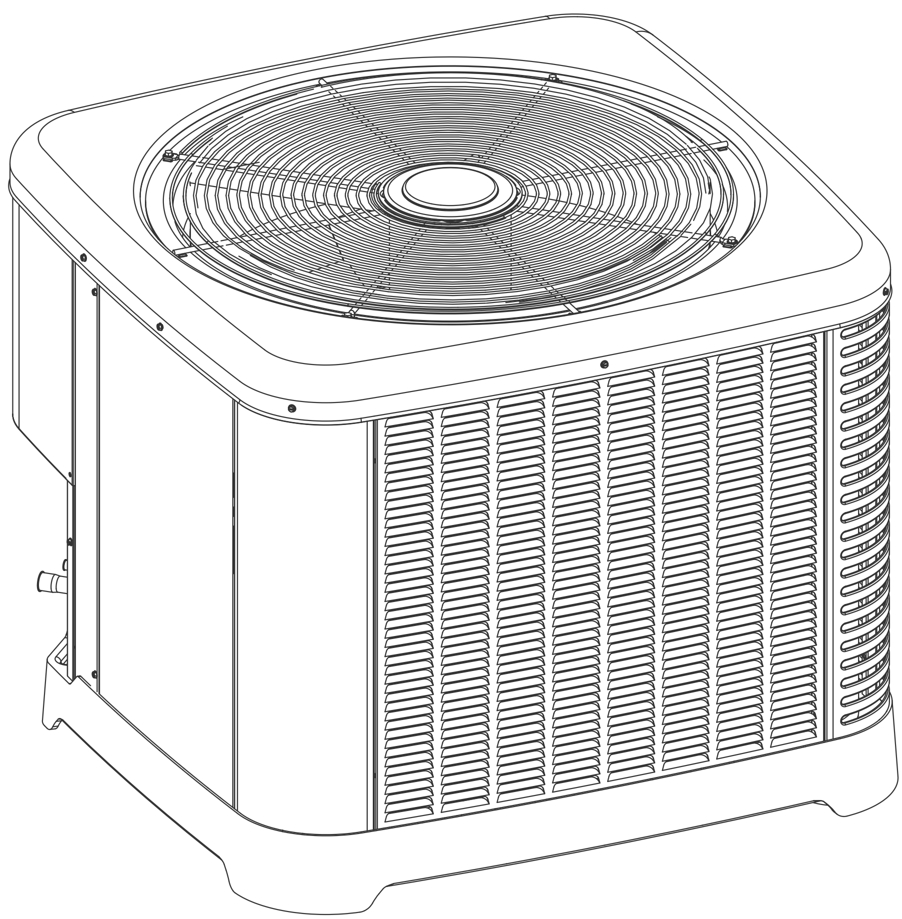
EcoNet™ Enabled

INSTALLATION INSTRUCTIONS

(-)P17AY (17 SEER2) EQUIPPED WITH ECONET™ COMMUNICATIONS

⚠WARNING:
RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION

⚠WARNING
THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED, LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT, AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE, OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.



Do not destroy this manual. Please read carefully and keep in a safe place for future reference by a serviceman.

IMPORTANT: Read page 2 carefully for best practices with R-454B systems.

[ ] indicates metric conversions.

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ISO 9001:2015

R-454B BEST PRACTICES

- *R-410A systems SHOULD NOT be retrofitted with R-454B. Reference Section 1.0 for more information.*
- *Only use indoor coils approved for use on R-454B systems. An R-410A or R-22 coil has not been evaluated for use with R–454B and may lack a refrigerant detection system necessary for safe operation of the system. Reference Section 1.0 for more information.*
- *R–454B is classified as safety group A2L, where the 2L flammability class indicates lower flammability. R-454B and air should never be mixed in tanks or supply lines or be allowed to accumulate in storage tanks due to its flammability. Reference Section 4.1.2 for more information.*
- *When using a torch during brazing, nitrogen must be flowed while brazing. Reference Section 4.4.1 for more information.*
- *Existing R-410A or R-22 unit's line sets must be purged and flushed with nitrogen if being used as a replacement for a R-454B system. Reference Section 4.4.1 for more information.*
- *R-454B system refrigerants must be charged in liquid form. Reference Section 5.4 for more information.*
- *Lines must be cut when replacing R-410A or R-22 systems with a R-454B system.*

TABLE OF CONTENTS

1.0 IMPORTANT SAFETY INFORMATION

Safety

⚠WARNINGS:

- Do not use oxygen to purge lines or pressurize system for leak test. Oxygen reacts violently with oil and possibly with R-454B, which can cause an explosion resulting in severe personal injury or death.
- *R-410A systems should not be retrofitted with R-454B. Such a retrofit violates the product listing and may result in severe personal injury or property damage*
- *These instructions are intended as an aid to qualified, licensed service personnel for proper installation, adjustment, and operation of this unit. Read these instructions thoroughly before attempting installation or operation.* **Failure to follow these instructions may result in improper installation, adjustment, service, or maintenance possibly resulting in fire, electrical shock, property damage, personal injury, or death.**
- **The unit must be permanently grounded. Failure to do so can cause electrical shock resulting in severe personal injury or death.**
- **Turn off electric power at the fuse box or service panel before making any electrical connections.**
- **Complete the ground connection before making line voltage connections. Failure to do so can result in electrical shock, severe personal injury, or death.**
- **Disconnect all power to unit before starting maintenance. Failure to do so can cause electrical shock resulting in severe personal injury or death.**
- **Never assume the unit is properly wired and/or grounded. Always test the unit cabinet with a noncontact voltage detector available at most electrical supply houses or home centers before removing access panels or coming into contact with the unit cabinet.**
- This unit is a PARTIAL UNIT AIR CONDITIONER, complying with PARTIAL UNIT requirements of this Standard, and must only be connected to other units that have been confirmed as complying to corresponding PARTIAL UNIT requirements of this Standard, UL 60335-2-40/ CSA C22.2 No. 60335-2-40, or UL 1995/CSA C22.2 No 236.
- *The fixed wiring insulation must be protected, for example, by insulating sleeving having an appropriate temperature rating. Any means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules*
- *The top of the compressor shell is hot. Touching the compressor top may result in serious personal injury.*
- *The manufacturer's warranty does not cover any damage or defect to the unit caused by the attachment or use of any components, accessories, or devices (other than those authorized by the manufacturer) into, onto, or in conjunction with the heat pump.* **You should be aware that the use of unauthorized components, accessories, or devices may adversely affect the operation of the heat pump and may also endanger life and property.** *The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized components, accessories, or devices.*
- *This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.*
- **Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.**
  The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
  Do not pierce or burn.
  Be aware that refrigerants may not contain an odor.

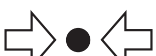
⚠CAUTIONS:

- **Only use indoor coils approved for use on R-454B systems. An R-410A or R-22 coil has not been evaluated for use with R-454B and may lack a refrigerant detection system necessary for safe operation of the system. The R-410A or R-22 coil could also contain PVE or POE oil which is incompatible with the POE oil used in R-454B systems and could result in reliability issues with the compressor and EXVs.**
- *Refrigerant R–454B operates at pressures similar to R–410A. However, it is classified in safety group A2L. Ensure that servicing equipment is compatible with group A2L refrigerants and in particular with R–454B.*
- *Only match this outdoor unit with a matched indoor coil or air handler approved for use with this outdoor unit per the unit manufacturer's specification sheet. The use of unmatched coils or air handler will likely result in a charge imbalance between the cooling and heating modes which can cause unsatisfactory operation including a high-pressure switch lockout condition.*
- *When the indoor coil or air handler is installed over a finished ceiling and/or living area, it is required that an auxiliary overflow pan be constructed and installed under the entire indoor unit. Failure to do so can result in property damage.*
- *The blue cooling status LED shall blink (1 second ON, 1 second OFF) if waiting for the short cycle timer (LOCKTIMR) to expire, otherwise it shall blink the first digit of the capacity percentage requested (for example, blink 7 times for 70% capacity). At*

100% capacity the LED shall be solid on. The orange heating status LED shall blink (1 second ON, 1 second OFF) if waiting for the short cycle timer (LOCKTIMR) to expire, otherwise it shall blink the first digit of the capacity percentage requested (for example, blink 7 times for 70% capacity). At 100% capacity the LED shall be solid on.

- The fixed wiring insulation must be protected, for example, by insulating sleeving having an appropriate temperature rating. Any means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.

Markings Reference

	[Symbol ISO 7000-1659 (2004-01)]	Service indicator: read technical manual
	A2L Symbol	Warning: low burning velocity material
 (X) Mpa	[Symbol ISO 7000-1701 (2004-01)]	Pressure
	[Symbol IEC 60417-6040 (2010-08)]	Ultraviolet radiation, instructional safeguard
	[Symbol ISO 7000-1641 (2004-01)]	Operator's manual: operating instructions
	[UN GHS (Globally Harmonized System of Classification and Labeling of Chemicals)]	Refrigerant Safety Group AXX, warning; flammable materials

2.0 GENERAL INFORMATION

⚠WARNING:

Improper installation, or installation not made in accordance with these instructions, can result in unsatisfactory operation and/or dangerous conditions and can cause the related warranty not to apply.

2.1 Introduction

The (-)P17AY series heat pumps are specifically designed to operate with indoor air handlers and furnace coils combinations that use thermal expansion valves, as well as matching communicating EcoNet™ enabled air-handlers, gas furnaces, and EcoNet™ Smart Thermostat. A conventional 24VAC 2-stage thermostat is used with existing indoor equipment or matching Rheem air handlers or furnace and coil combinations. For peak perfomance, a matching Econet enabled air handler or gas furnace and EcoNet™ Smart Thermostat is recommended.

This installation instruction manual contains complete instructions for installation and setup using the EcoNet™ or conventional 24VAC 2-stage controls. Please refer to the manufacturer's specification sheets for complete performance data, thermostat, and accessory listings.

The information contained in this manual has been prepared to assist in the proper installation, operation, and maintenance of the air conditioning system.

Read this manual and any instructions packaged with separate equipment required to make up the system prior to installation. Homeowner should retain this manual for future reference.

2.2 Agency Performance Audit Testing Notice

For purposes of verifying or testing efficiency ratings, the test procedure in Title 10 APPENDIX M to Subpart B of Part 430 (Uniform Test Method for Measuring the Energy Consumption of Central Air Conditioners and Heat Pumps) and the clarifying provisions provided in the AHRI Operations Manual 210/240 that were applicable at the date of manufacture should be used for test set up and performance.

Should this unit be selected for performance audit testing, follow the instructions included in the Appendix (Section 12.1) of this manual.

2.3 Importance of Quality Installation

A quality installation is critical to assure safety, reliability, comfort, and customer satisfaction. Strict adherence to applicable codes, the information in this installation manual, the indoor installation manual, and the thermostat installation manual are key to a quality installation. Read the entire instruction manuals before starting the installation.

IMPORTANT: This product has been designed and manufactured to meet certified AHRI capacity and efficiency ratings with the appropriate outdoor units. However, proper refrigerant charge, proper airflow, and refrigerant line sizing are critical to achieve optimum capacity and efficiency and to assure reliable operation. Installation of this product should follow the manufacturer's refrigerant charging and airflow instructions located in this installation manual and the charging chart label affixed to the outdoor unit. Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.

The equipment has been evaluated in accordance with the Code of Federal Regulations, Chapter XX, Part 3280.

Install the unit in accordance with applicable national, state, and local codes. Latest editions are available from: "National Fire Protection Association, Inc., Batterymarch Park, Quincy, MA 02269." These publications are:

- ANSI/NFPA No. 70-(Latest Edition) National Electrical Code.
- NFPA90A Installation of Air Conditioning and Ventilating Systems.
- NFPA90B Installation of warm air heating and air conditioning systems.
- Install the unit in such a way as to allow necessary access to the coil/filter rack and blower/control compartment.

2.4 System Sizing and Selection

Before specifying any heat pump equipment, a survey of the structure and heat loss and heat gain calculations must be made. A heat loss calculation involves identifying all surfaces and openings that lose heat to the surrounding air in the heating mode and quantifying that heat loss. A heat gain calculation makes similar measurements and determines the amount of heat required to be removed in the cooling mode. A heat gain calculation also calculates the extra heat load caused by sunlight and by humidity removal. These factors must be considered before selecting a heat pump system to provide year-round comfort. The Air Conditioning Contractors of America (ACCA) Manual J method of load calculation is one of the recognized procedure for determining the heating and cooling load.

After the proper equipment combination has been selected, satisfying both sensible and latent requirements, the system must be properly installed. Only then can the system provide the comfort it was designed to provide.

There are several factors that installers must consider.

- Outdoor unit location
- *Indoor unit blower speed and airflow*
- Proper equipment evacuation
- Supply and return air duct design and sizing
- Refrigerant charge
- System air balancing
- Diffuser and return air grille location and sizing

IMPORTANT: Excessive use of elbows in the refrigerant line set can produce excessive pressure drop. Follow industry best practices for installation. Installation and commissioning of this equipment is to be performed by trained and qualified HVAC professionals. For technical assistance, contact your Distributor Service Coordinator.

2.5 Importance of Proper Indoor/ Outdoor Match-Ups

To assure many years of reliable operation and optimum customer comfort and to assure the outdoor unit warranty remains valid, an air-handler model or indoor coil/furnace combination should be selected that is properly matched to the outdoor unit. This is especially critical for heat pump systems to assure proper refrigerant charge balance between the cooling and heating modes. The recommended approach is to select an air-handler or indoor coil and gas furnace that has an AHRI match with the outdoor unit. Refer to the AHRI directory at www.ahridirectory.org to confirm the air-handler and outdoor unit are a certified combination in the AHRI Directory.

2.6 Checking Product Received

Upon receiving unit, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company. Check model number, electrical characteristics, and accessories to determine if they are correct. Check system components (indoor coil, outdoor unit, air handler/furnace, etc.) to make sure they are properly matched.

2.7 Efficiency Testing Notice

For purposes of verifying or testing efficiency ratings, the test procedure in Title 10 APPENDIX M1 to Subpart B of Part 430 (Uniform Test Method for Measuring the Energy Consumption of Central Air Conditioners and Heat Pumps) and the clarifying provisions provided in the AHRI Operations Manual 210/240 that were applicable at the date of manufacture should be used for test set up and performance.

2.8 Compressor Break-In Notice

Prior to agency testing, system must be operated for 20 hours at 115ºF [46.1ºC] outdoor ambient temperature with 80ºF [26.7ºC] dry bulb 75ºF [23.9ºC] wet bulb indoor ambient temperature to break the compressor in.

2.9 DTC Match-Up

If system data is deleted and restored to default settings, the unit will not revert to the original factory-configured Saturated Suction Temperature (SST) and Saturated Liquid Temperature (SLT) cooling/heating targets. As a result, the correct target values must be manually re-entered through the contractor app to ensure proper system operation. Follow the instructions below:

• Verify the correct outdoor and indoor model. Refer to the cooling/heating targets for the correct DTC match-up below.

Cooling/Heating Target Table

Model Number	Indoor Model	EB File Number	SST Cooling Low Target	SST Cooling High Target	SLT Heating Low Target	SLT Heating High Target
RP17AY24AJVC	*Y2417S	EB-111082-01	49	55	96	108
		EB-111082-05	45	56	99	107
RP17AY36AJVC	*Y3617S	EB-111082-02	46	53	98	110
		EB-111082-06	48	52	101	109
RP17AY48AJVC	*Y4821S	EB-111082-03	46	52	91	100
		EB-111082-07	46	54	92	100
RP17AY60AJVC	*Y6024S	EB-111082-04	48	55	96	101
		EB-111082-08	42	54	97	102

NOTE:

All SST and SLT target values are shown in °F.

• Open the Contractor App on your device and navigate the advanced system settings.

• Update system parameters:

- Locate and input the value for SST Cooling Low and High Targets.
- Locate and input the value for SLT for Heating Low and High Targets.

• Validate changes.

- Ensure all changes are saved in the app and verify the updated settings are reflected properly within the system

3.0 UNIT SPECIFICATIONS

3.1 Model Number Nomenclature and Available Models

R P 17 A Y 24 A J V C A

MINOR SERIES
A = FIRST DESIGN SERIES

CONTROLS
C = COMMUNICATING

TYPE
1 = 1 STAGE
2 = 2 STAGE
3 = 3 STAGE
V =FULLY VARIABLE

VOLTAGE
J =1PH 208-230 VAC 60 Hz

MAJOR SERIES
A=FIRST DESIGN SERIES

CAPACITY
24 = 24000BTU/HR
36 = 36000BTU/HR
48 = 48000BTU/HR
60 =60000BTU/HR

REFRIGERANT
Z =R-410A
Y =R-454B
W = FUTURE REFRIGERANT

REGION
A = ALL REGIONS

SEER2

PRODUCT CATEGORY
P =HEAT PUMP

BRAND
R = RHEEM/RUUD
F = FRIEDRICH
S = SURE COMFORT/RUSSELL

Table 1: Available Models

Heat Pumps
(-)P17AY24JVCA
(-)P17AY36JVCA
(-)P17AY48JVCA
(-)P17AY60JVCA

3.2 Electrical and Physical Data

Table 2: Electrical Data

Model Number (-)P17AY	Phase Frequency (Hz) Voltage (Volts)	Rated Load Amperes (RLA)	Inverter Input Current	Minimum Circuit Ampacity Amperes	Fuse or HACR Circuit Breaker Min Amps	Fuse or HACR Circuit Breaker Max Amps
24	1-60-208/230	9.4	19	12	15	20
36	1-60-208/230	15.9	19	20	25	35
48	1-60-208/230	20.1	28	26	35	45
60	1-60-208/230	25.6	28	32	40	50

Table 3: Physical Data

Model Number (-)P17AY	Face Area Sq Ft [m2]	No. Rows	CFM [L/s]	Refrig. Per Circuit Oz. [kg]	Weight Net Lbs [kg]	Weight Shipping Lbs [kg]
24	14.4 [1.34]	1	2109 [995.34]	98 [2.78]	181 [82.10]	188 [85.28]
36	21.5 [2.00]	1	4216 [1989.73]	110 [3.12]	214 [97.07]	221 [100.24]
48	21.5 [2.00]	1	4126 [1947.26]	131 [3.71]	240 [108.86]	247 [112.04]
60	23.4 [2.17]	2	4631 [2185.59]	220 [6.23]	275 [124.74]	282 [127.91]

Table 4: Dimensions

Model Number (-)P17AY	Height "H" inches [cm]	Length "L" inches [cm]	Width "W" inches [cm]
24A	27.00 [68.58]	29.75 [75.57]	29.75 [75.57]
36A	39.00 [99.06]	32.00 [81.28]	32.00 [81.28]
48A	39.00 [99.06]	32.00 [81.28]	32.00 [81.28]
60A	39.00 [99.06]	34.00 [86.36]	34.00 [86.36]

Item Number	Item Description	Clearance Needed
1	Air Inlet Louvers	"6"" [15.2 cm] All Sides 12"" [30.5 cm] Recommended"
2	Service Panels/ Inlet Connections / High & Low Voltage Access	24" [61.0 cm]
3	Air Discharge	60" [152.4 cm]

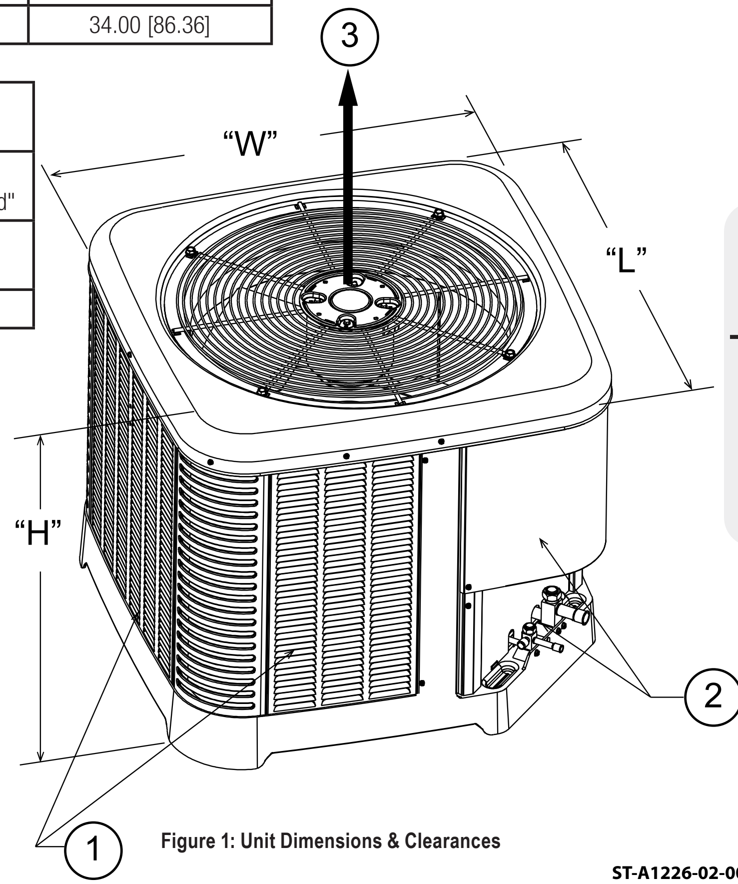


Figure 1: Unit Dimensions & Clearances

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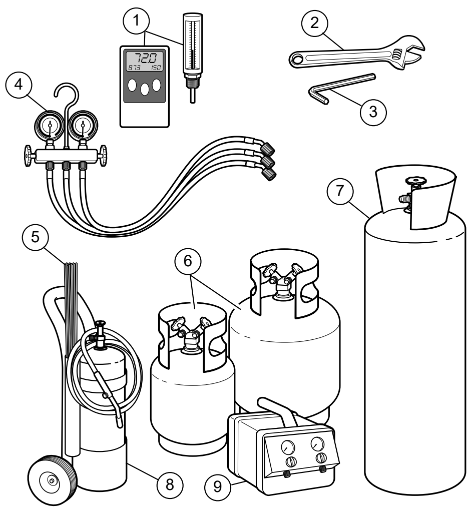
4.0 INSTALLATION

4.1 Tools and Refrigerant

4.1.1 Tools Required for Installing and Servicing R-454B Models

Manifold Sets:
– Up to 800 PSIG [5,516 kPa] High-Side
– Up to 250 PSIG [1,724 kPa] Low-Side
– 550 PSIG [3,792 kPa] Low-Side Retard
Manifold Hoses:
– Service Pressure Rating of 800 PSIG [5,516 kPa]
Recovery Cylinders:
– 400 PSIG [2,758 kPa] Pressure Rating
– Dept. of Transportation 4BA400 or BW400



Item Number	Descripton
1	Ambient and Tube Thermometers
2	Crescent Wrench
3	Allen Wrench
4	Manifold Gauge Set
5	Brazing Rods
6	Recovery Cylinders
7	Nitrogen
8	Torch
9	Reclaimer

Figure 2: Required Tools for Unit Installation

⚠CAUTION:

R–454B is classified as safety group A2L per ASHRAE Standard 34. Verify that service equipment and instruments are certified for use with group A2L refrigerants, and in particular with R–454B.

4.1.2 Specifications of R-454B

Application: <u>R–454B is not a drop-in replacement for R–410A and R-22.</u> Equipment design must accommodate the safety group A2L of R–454B. It cannot be retrofitted into R–410A and R-22 heat pumps.

Physical Properties: R–454B has an atmospheric bubble point of –59.6 °F [–50.9 °C] and an atmospheric dew point of –58.0 °F [–50.0 °C]. Its bubble point saturation pressure at 77 °F [25 °C] is 213 psig [1469 kPa] and dew point saturation pressure at 77 °F [25 °C] is 205 psig [1415 kPa].

Composition: R-454B is a non-azeotropic mixture of 68.9% by weight difluoromethane (HFC-32) and 31.1% by weight 2,3,3,3-tetrafluoro-1-propene.

Pressure: The pressure of R-454B is similar to that of R-410A. Recovery and recycle equipment, pumps, hoses, and the like must have design pressure ratings appropriate for R-454B. Manifold sets need to range up to 800 psig [5,516 kPa] high-side and 250 psig [1,724 kPa] low-side with a 550 psig [3,792 kPa] low-side retard. Hoses need to have a service pressure rating of 800 psig [5,516 kPa]. Recovery cylinders need to have a 400 psig [2,758 kPa] service pressure rating, DOT 4BA400 or DOT 4BW400.

Flammability: R–454B is classified as safety group A2L, where the 2L flammability class indicates lower flammability. **<u>R-454B and air should never be mixed in tanks or supply lines or be allowed to accumulate in storage tanks. Leak checking should be conducted using Nitrogen.</u>**

4.1.3 Quick-Reference Guide for R-454B

- Refrigerant R–454B operates at pressures similar to R–410A. However, it is classified in safety group A2L. Ensure that servicing equipment is compatible with R–454B.
- Refrigerant cylinders are no longer color-coded. R–454B cylinders are light green gray in color with a red band on the shoulder or top of the cylinder to indicate flammability.
- R-454B, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from POE oil used in R-454B systems.
- R-454B systems should be charged with liquid refrigerants in liquid phase. R-454B cylinders should be inverted to ensure liquid charging of the equipment.
- Do not install a suction line filter drier in the liquid line.
- A factory-approved bi-flow liquid line filter drier is shipped with every unit and must be installed in the liquid line at the time of installation. Only manufacturer-approved liquid line filter driers should be used. Filter driers must have a working pressure rating of at least 600 psig [4,137 kPa]. The filter drier will only have adequate moisture-holding capacity if the system is properly evacuated.
- Desiccant (drying agent) must be compatible for POE oils and R-454B refrigerant.
- R–454B cylinders containing less than 50 lbs of refrigerant require a CGA 164 fitting. R–454B cylinders containing more than 50 lbs of refrigerant require a CGA 670 fitting.

4.2 Choosing a Location

4.2.1 Allowable Clearances

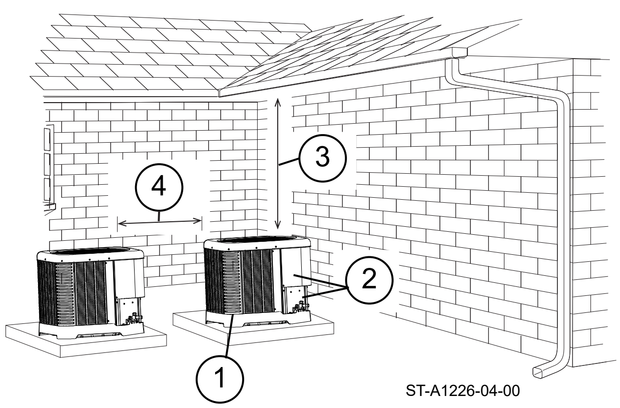
12" [30.5 cm] to side intake louvers
24" [61.0 cm] to service access panels
60" [152.4 cm] vertical for fan discharge
If space limitations exist, the following clearances will have minimal impact to capacity and efficiency and are permitted:

Single-Unit Applications: Minimum of 6" [15.2 cm] to side intake louvers. **DO NOT** reduce the 60" [152.4 cm] for fan discharge or the 24" [61.0 cm] service clearances.

Multiple-Unit Applications: For units positioned next to each other, a minimum of 6" [15.2 cm] clearance between units is recommended for 2 ton models and 9" [22.9 cm] for 3 ton to 5 ton models. Do not reduce the 60" [152.4 cm] for fan discharge or the 24" [61.0 cm] service clearances.

IMPORTANT: Consult local and national building codes and ordinances for special installation requirements. Following location information will provide longer life and simplified servicing of the outdoor heat pump.

NOTICE: These units must be installed outdoors. No ductwork can be attached, or other modifications made, to the discharge grille. Modifications will affect performance or operation.



Item Number	Item Description	Clearance Needed
1	Air Inlet Louvers	6" [15.2 cm] All Sides 12" [30.5 cm] Recommended
2	Service Panels Inlet Connections High & Low Voltage Access	24" [61.0 cm]
3	Air Discharge	60" [152.4 cm]
4	Space Between Units	12" Min. (30.5 cm) 24" [61.0 CM] Recommended

Figure 3: Required Clearances for Unit Installation

4.2.2 Operational Issues Related to Unit Location

IMPORTANT: Locate the unit in a manner that will not prevent, impair, or compromise the performance of other equipment installed in proximity to the unit. Maintain all required minimum distances to gas and electric meters, dryer vents, and exhaust and inlet openings. In the absence of national codes or manufacturers' recommendations, local code recommendations and requirements will take precedence.

- Refrigerant piping and wiring should be properly sized and kept as short as possible to avoid capacity losses and increased operating costs.
- Locate the unit where water runoff will not create a problem with the equipment. Position the unit away from the drip edge of the roof whenever possible. Units are weatherized, but can be affected by the following:
- Water pouring into the unit from the junction of rooflines, without protective guttering. Large volumes of water entering the heat pump while in operation can impact fan blade or motor life, and coil damage may occur to a heat pump if moisture cannot drain from the unit under freezing conditions.
- Freezing moisture or sleeting conditions can cause the cabinet to ice-over prematurely and prevent heat pump operation, requiring backup heat, which generally results in less economical operation It is highly recommended to switch the EcoNet™ Smart Thermostat or Legacy Thermostat to the "Emergency Heat" mode during freezing rain or sleeting conditions to prevent damage to the outdoor coil from ice accumulating on the fan blade.
- Closely follow the clearance recommendations in section 4.2.1.
  - 24" [61.0 cm] to the service panel access.
  - 60" [152.4 cm] above the fan discharge (unit top) to prevent recirculation.
  - 6" [15.2 cm] to the coil grille air inlets with 12" [30.5 cm] minimum recommended.

4.2.3 Corrosive Environment

The metal parts of this unit may be subject to rust or deterioration if exposed to a corrosive environment. This oxidation could shorten the equipment's useful life.

Corrosive elements include, but are not limited to, salt spray, fog or mist in seacoast areas, sulphur or chlorine from lawn watering systems, and various chemical contaminants from industries such as paper mills and petroleum refineries.

If the unit is to be installed in an area where contaminants are likely to be a problem, special attention should be given to the equipment location and exposure.

- Avoid having lawn sprinkler heads spray directly on the unit cabinet.
- In coastal areas, locate the unit on the side of the building away from the waterfront.
- Shielding provided by a fence or shrubs may give some protection, but cannot violate minimum airflow and service access clearances.

⚠WARNING:

Disconnect all power to unit before starting maintenance. Failure to do so can cause electrical shock resulting in severe personal injury or death.

Regular maintenance will reduce the buildup of contaminants and help to protect the unit’s finish.

- Frequent washing of the cabinet, fan blade, and coil with fresh water will remove most of the salt or other contaminants that build up on the unit.
- Regular cleaning and waxing of the cabinet with a good automobile polish will provide some protection.
- A good liquid cleaner may be used several times a year to remove matter that will not wash off with water.

4.2.4 Customer Satisfaction Issues

- ***The heat pump should be located away from the living, sleeping, and recreational spaces of the owner and those spaces on adjoining property.***
- ***To prevent noise transmission, the mounting pad for the outdoor unit should not be connected to the structure and should be located a sufficient distance above grade to prevent ground water from entering the unit.***

4.3 Unit Mounting

4.3.1 Unit Mounting Methods

The outdoor heat pump unit may be mounted in a number of ways. The most common method is on the ground mounted on a concrete or pre-fabricated pad. It can also be mounted on a ground or roof mounted metal frame, wooden frame, or 4” x 4” [10.2 cm x 10.2 cm] wooden stringers. It is extremely important to properly secure the unit to the pad or frame so it does not shift during high winds, seismic events, or other outside forces to eliminate the possibility of a safety hazard or physical damage to the unit. Local codes in regions subject to frequent hurricanes and seismic events will dictate specific mounting requirements and must be followed. It is also important to elevate the heat pump in areas that receive a significant amount of snowfall so accumulated snow does not block the outdoor coil and interfere with drainage of water during the defrost cycle. Refer to Section 4.3.4 for typical ground snow levels for different regions of the USA.

4.3.2 High Wind and Seismic Tie-Down Methods

The manufacturer-approved/recommended method is a guide to securing equipment for wind and seismic loads. Other methods might provide the same result, but the manufacturer method is the only one endorsed by the manufacturer for securing equipment where wind or earthquake damage can occur. Additional information is available on the manufacturer's website or from the wholesale distributor.

4.3.3 Elevating Unit

If elevating the heat pump, either on a flat roof or on a slab, observe the following guidelines.

- The bottom of the basepan has receptacles for 4" [10.2 cm] schedule 40 PVC pipe that can be cut to length and used as risers for slab applications.
- If elevating a unit on a flat roof, use 4" x 4" [10.2 cm x 10.2 cm] or equivalent stringers positioned to distribute unit weight evenly and prevent noise and vibration.
- ***Heat pump products will need to be elevated per local climate and code requirements to provide clearance above the estimated snowfall level to ensure the unit will be protected from damage. Failure to follow these instructions***

⚠WARNING:

Secure an elevated unit and its elevating stand in order to prevent tipping. Failure to do so may result in severe personal injury or death.

Item Number	Descripton
1	Elevate Above Anticipated High Snow Fallt
2	Do Not Block Openings In Base Pan
3	Base Pad (Concrete Or Other Suitable Material)

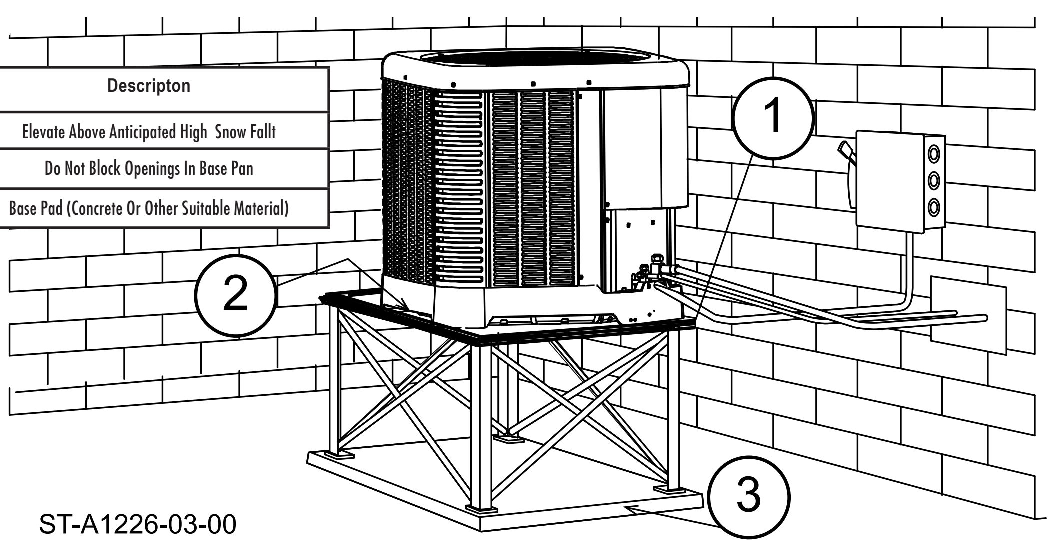


Figure 4: Elevated Unit Mounting Recommendations

may result in equipment damage and improper operation.

NOTICE: Do not block drain openings on bottom of unit.

- If unit must be elevated because of anticipated snowfall, secure unit and elevating stand such that unit and/or stand will not tip over or fall off. Keep in mind that someone may try to climb on unit.

4.4 Refrigerant Line Set Selection

4.4.1 Replacing Existing Systems

To prevent failure of a new unit, the existing line set must be correctly sized for the new unit and must be cleaned or replaced. Care must be taken so the expansion device is not plugged. For new and replacement units, a liquid line filter drier must be installed and the line set must be properly sized. Test the oil for acid. If it tests positive for acid, a suction line filter drier is mandatory.

WARNING: <u>When using a torch during brazing, nitrogen must be flowed while brazing. If an existing R-410A or R-22 unit's line set is being used for a replacement R-454B unit, it must be purged and flushed with nitrogen before use. It is recommended to replace the lineset if possible.</u>

IMPORTANT: When replacing an R-410A or R-22 unit with an R-454B unit, verify that the lineset and any joints in the lineset comply with local building code. Only brazed or welded joints and mechanical joints using fittings listed to UL 207 are permitted.

4.4.1.1 Lineset Joints

Only brazed joints, welded joints, or mechanical joints using fittings listed to UL 207 are permitted on R–454B system linesets. Field-made lineset joints should be leak tested using an A2L compatible leak detector having sensitivity of 0.2 oz/year [5 g/year] or better. The leak detector should be approved for use with group A2L refrigerants, and in particular with R–454B.

4.4.2 Line Set Application Considerations

The following are special considerations that need to be addressed when selecting and installing a line set.

- Additional refrigerant charge
- Fitting losses and maximum equivalent length considerations
- Refrigerant migration during the off cycle
- Oil return to the compressor
- Capacity losses
- System oil level adjustment

4.4.2.1 Oil Return to Compressor

Small amounts of compressor crankcase oil is picked up and carried out of the compressor by the moving refrigerant and is circulated through the system along with the refrigerant before it returns to the compressor crankcase. It is critical to the life of the compressor for the oil to be able to return to the compressor to maintain an adequate level of oil in the compressor crankcase. Oversized vapor lines result in inadequate refrigerant velocities to carry the oil along with the refrigerant and will cause the oil to accumulate in the low spots in the vapor line instead of being returned to the compressor crankcase. This is especially true for long line lengths. Variable speed systems present an additional challenge due to the fact that the system operates at a significantly reduced refrigerant flow rate for a significant percentage of operating time. Only use the vapor line sizes listed in Table 2 to assure proper oil return. **DO NOT** oversize vapor line!

4.4.2.2 Refrigerant Migration During Off Cycle

Long line set applications can require a considerable amount of additional refrigerant. This additional refrigerant needs to be managed throughout the entire ambient operating envelope that the system will go through during its life cycle. Off-Cycle migration is where excess refrigerant condenses and migrates to the coldest and/or lowest part of the system. Excessive build-up of refrigerant at the compressor will result in poor reliability and noisy operation during startup. Section 4.5.2 demonstrates the required unit configuration for different applications.

4.4.2.3 Maximum Liquid Pressure Drop

The total liquid line pressure drop must not exceed 50 psig [345 kPa] to assure a solid column of liquid at the metering device and stable control of superheat. Be sure to account for vertical separation, elbows, filter driers, solenoid valves, sight glasses, and check valves when calculating liquid line pressure drop.

4.4.2.4 Liquid Line Refrigerant Flashing

Excessive pressure drop and heat gain in long liquid lines can result in the refrigerant flashing into a vapor before it reaches the expansion device which will dramatically reduce the capacity and efficiency of the system. For this reason, the liquid line must be sized properly using Table 2 and must be insulated in unconditioned spaces.

4.4.2.5 Capacity Losses

Long line lengths can result in a reduction in capacity due to vapor line pressure drop and heat gain or loss. Refer to Table 6 for capacity loss multipliers for various vapor line diameters and equipment line lengths. This table does not account for any capacity loss due to heat gain or loss from the environment. It is extremely important not to oversize the vapor line to minimize capacity loss at the expense of proper oil return. If the table shows an "NR" for a particular vapor line diameter and length, or, if a vapor line diameter is not listed, oil return will not be adequate.

4.4.3 Line Set Length and Fitting Losses

Refrigerant tubing is measured in terms of actual length and equivalent length. Actual length is used for refrigerant charge applications. Equivalent length takes into account pressure losses from tubing length, fittings, vertical separation, accessories, and filter driers. The table below references different commonly used equivalent lengths.

Table 5: Equivalent Length for Fittings: ft [m]

Line Size in [mm]	90° Short Radius Elbow	90° Long Radius Elbow	45° Elbow	Solenoid Valve	Check Valve	Sight Glass	Filter Drier
3/8 [9.53]	1.3 [0.40]	0.8 [0.24]	0.3 [0.09]	6 [1.83]	4 [1.22]	0.4 [0.12]	6 [1.83]
1/2 [12.71]	1.4 [0.43]	0.9 [0.27]	0.4 [0.12]	9 [2.74]	5 [1.52]	0.6 [0.18]	6 [1.83]
5/8 [15.88]	1.5 [0.46]	1 [0.30]	0.5 [0.15]	12 [3.66]	6 [1.83]	0.8 [0.24]	6 [1.83]
3/4 [19.05]	1.9 [0.58]	1.3 [0.40]	0.6 [0.18]	14 [4.27]	7 [2.13]	0.9 [0.27]	6 [1.83]
7/8 [22.23]	2.3 [0.70]	1.5 [0.46]	0.7 [0.21]	15 [4.57]	8 [2.44]	1 [0.30]	6 [1.83]

4.4.4 Liquid Line Selection

The purpose of the liquid line is to transport warm sub-cooled liquid refrigerant between the outdoor unit to the indoor unit in the cooling mode. In the heating mode, the liquid line returns sub-cooled liquid from the indoor unit to the outdoor unit. It is important not to allow the refrigerant to flash into superheated vapor prior to entering the expansion device of the indoor coil or outdoor unit. Flashing of refrigerant can occur for the following reasons:

- Low refrigerant charge
- Improperly selected liquid line size
- Absorption of heat prior to expansion device
- Excessive vertical separation between the outdoor unit and indoor coil
- Restricted liquid linear filter drier
- Kinked liquid line

The total pressure drop allowed for the liquid line is 50 PSI [345 kPa]. The procedure for selecting the proper liquid line is as follows:

- Measure the total amount of vertical separation between the outdoor unit and indoor coil.
- Measure the total indoor length of liquid line required.
- Add all of the equivalent lengths associated with any fittings or accessories using Table 5.
- Add the linear length to the total fitting equivalent length. This will equal your total equivalent line length.
- Reference Table 6 to verify the calculated equivalent length is acceptable with the required vertical separation and diameter of liquid line.

Example: A 3-ton heat pump unit is installed 25’ below the indoor unit, requires a 75’ of 1/2” diameter liquid line, 3/4" vapor line, 4 90° LR elbows and a filter drier.

- Fitting Equivalent Length (ft.) = 4 × .9' + 6' = 9.6’
- Total Equivalent Length (ft.) = 75’ + 9.6' = 84.6’

This application is acceptable because the 25’ vertical rise is less than the maximum rise of 50’ for this application.

4.4.5 Vapor Line Selection

The purpose of the vapor line is to return superheated vapor to the condensing unit from the indoor coil in the cooling mode. While in the heating mode, the vapor line transports discharge vapor to the indoor coil from the outdoor unit. Proper vapor line sizing is important because it plays an important role in returning oil to the compressor to prevent potential damage to the compressor. Also, an improperly sized vapor line can dramatically reduce capacity and performance of the system. The procedure for selecting the proper vapor line is as follows:

1. Determine the total linear length of vapor line required.
2. Add all of the equivalent lengths associated with any fittings or accessories using Table 5.
3. Add the linear length and total fitting equivalent length. This will equal your total equivalent line length.
4. Reference Table 6 to verify that the calculated equivalent length falls within the compatibility region of the chart.
5. Verify capacity loss is acceptable for the application.

Table 6A: Refrigerant Line Sizing Chart (English Units)

17 SEER2 VARIABLE SPEED HEAT PUMP												
Unit Size	Allowable Liquid Line Size	Allowable Vapor Line Size	"Outdoor Unit ABOVE or BELOW Indoor Unit Equivelent Length (Feet)"									
			0-25	26-50	51-75	76-100	101-125	126-150	151-175	176-200	201-225	226-250
			Maximum Vertical Seperation / Capacity Multiplier									
2 Ton	1/4"	5/8"	25 / 1.00	50 / 0.99	29 / 0.98	0 / 0.97	0 / 0.97	0 / 0.96	0 / 0.95	0 / 0.94	0 / 0.94	0 / 0.93
	5/16"	5/8"	25 / 1.00	50 / 0.99	75 / 0.98	89 / 0.97	80 / 0.97	72 / 0.96	63 / 0.95	55 / 0.94	47 / 0.94	41 / 0.93
	3/8"	5/8"	25 / 1.00	50 / 0.99	75 / 0.98	100 / 0.97	109 / 0.97	106 / 0.96	104 / 0.95	100 / 0.94	97 / 0.94	95 / 0.93
	1/4"	3/4"	25 / 1.00	50 / 1.00	29 / 0.99	0 / 0.99	0 / 0.99	0 / 0.99	0 / 0.98	0 / 0.98	0 / 0.98	0 / 0.98
	5/16"	3/4"	25 / 1.00	50 / 1.00	75 / 0.99	89 / 0.99	80 / 0.99	72 / 0.99	63 / 0.98	55 / 0.98	47 / 0.98	41 / 0.98
	3/8"	3/4"	25 / 1.00	50 / 1.00	75 / 0.99	100 / 0.99	109 / 0.99	106 / 0.99	104 / 0.98	100 / 0.98	97 / 0.98	95 / 0.98
3 Ton	5/16"	5/8"	25 / 0.99	50 / 0.98	68 / 0.96	50 / 0.95	32 / 0.93	14 / 0.91	0 / 0.9	0 / 0.88	0 / 0.87	0 / 0.87
	3/8"	5/8"	25 / 0.99	50 / 0.98	75 / 0.96	99 / 0.95	92 / 0.93	86 / 0.91	80 / 0.9	73 / 0.88	67 / 0.87	61 / 0.87
	5/16"	3/4"	25 / 1.00	50 / 0.99	68 / 0.99	50 / 0.98	32 / 0.97	14 / 0.97	0 / 0.96	0 / 0.96	0 / 0.95	0 / 0.95
	3/8"	3/4"	25 / 1.00	50 / 0.99	75 / 0.99	99 / 0.98	92 / 0.97	86 / 0.97	80 /0.96	73 / 0.96	67 / 0.95	61 / 0.95
	1/2"	3/4"	25 / 1.00	50 / 0.99	75 / 0.99	100 / 0.98	119 / 0.97	117 / 0.97	116 / 0.96	115 / 0.96	114 / 0.95	113 / 0.95
	3/8"	7/8"	25 / 1.00	50 / 1	75 / 0.99	99 / 0.99	92 / 0.99	86 / 0.99	80 / 0.98	73 / 0.98	67 / 0.98	61 / 0.98
	1/2"	7/8"	25 /1.00	50 / 1	75 / 0.99	100 / 0.99	119 / 0.99	117 / 0.99	116 / 0.98	115 / 0.98	114 / 0.98	113 / 0.98
4 Ton	3/8"	3/4"	25 / 1.00	50 / 0.99	75 / 0.98	80 / 0.97	70 / 0.96	59 / 0.94	49 / 0.93	38 / 0.92	27 / 0.92	17 / 0.91
	1/2"	3/4"	25 / 1.00	50 / 0.99	75 / 0.98	100 / 0.97	114 / 0.96	112 / 0.94	110 / 0.93	107 / 0.92	106 / 0.92	104 / 0.91
	3/8"	7/8"	25 / 1.00	50 / 0.99	75 / 0.99	80 / 0.98	70 / 0.98	59 / 0.98	49 / 0.97	38 / 0.97	27 / 0.96	17 / 0.96
	1/2"	7/8"	25 / 1.00	50 / 0.99	75 / 0.99	100 / 0.98	114 / 0.98	112 / 0.98	110 / 0.97	107 / 0.97	106 / 0.96	104 / 0.96
5 Ton	3/8"	3/4"	25 / 0.99	50 / 0.98	74 / 0.96	58 / 0.95	42 / 0.93	25 / 0.91	9 / 0.9	0 / 0.88	0 / 0.87	0 / 0.86
	1/2"	3/4"	25 / 0.99	50 / 0.98	75 / 0.96	100 / 0.95	108 / 0.93	105 / 0.91	101 / 0.9	98 / 0.88	95 / 0.87	93 / 0.86
	3/8"	7/8"	25 / 1.00	50 / 0.99	74 / 0.98	58 / 0.98	42 / 0.97	25 / 0.96	9 / 0.96	0 / 0.95	0 / 0.94	0 / 0.94
	1/2"	7/8"	25 / 1.00	50 / 0.99	75 / 0.98	100 / 0.98	108 / 0.97	105 / 0.96	101 / 0.96	98 / 0.95	95 / 0.94	93 / 0.94

Notes:

1) Do not exceed 150 ft linear line length.

2) Do not exceed 50 ft vertical separation between indoor and outdoor units.

3) * 3/4" vapor line should only be used for 2 ton systems if outdoor unit is below or at same level as indoor unit to assure proper oil return.

4) Always use the smallest liquid line allowable to minimize refrigerant charge.

5) Applications shaded in light gray indicate capacity multipliers between 0.90 and 0.96 which are not recommended, but are allowed.

6) Applications shaded in gray are considered long line-set applications. Refer to Long Line-Set Application Guide for details.

Table 6B: Refrigerant Line Sizing Chart (Metric Units)

17 SEER2 VARIABLE SPEED HEAT PUMP												
Unit Size	Allowable Liquid Line Size	Allowable Vapor Line Size	"Outdoor Unit ABOVE or BELOW Indoor Unit Equivelent Length (Meters)"									
			0-8	8-15	16-23	24-30	31-38	39-46	46-53	54-61	61-69	69-76
			Maximum Vertical Seperation / Capacity Multiplier									
2 Ton	1/4"	5/8"	8 / 1.00	15 / 0.99	9 / 0.98	0 / 0.97	0 / 0.97	0 / 0.96	0 / 0.95	0 / 0.94	0 / 0.94	0 / 0.93
	5/16"	5/8"	8 / 1.00	15 / 0.99	23 / 0.98	27 / 0.97	24 / 0.97	22 / 0.96	19 / 0.95	17 / 0.94	14 / 0.94	12 / 0.93
	3/8"	5/8"	8 / 1.00	15 / 0.99	23 / 0.98	30 / 0.97	33 / 0.97	32 / 0.96	32 / 0.95	30 / 0.94	30 / 0.94	29 / 0.93
	1/4"	3/4"	8 / 1.00	15 / 1.00	9 / 0.99	0 / 0.99	0 / 0.99	0 / 0.99	0 / 0.98	0 / 0.98	0 / 0.98	0 / 0.98
	5/16"	3/4"	8 / 1.00	15 / 1.00	23 / 0.99	27 / 0.99	24 / 0.99	22 / 0.99	19 / 0.98	17 / 0.98	14 / 0.98	12 / 0.98
	3/8"	3/4"	8 / 1.00	15 / 1.00	23 / 0.99	30 / 0.99	33 / 0.99	32 / 0.99	32 / 0.98	30 / 0.98	30 / 0.98	29 / 0.98
3 Ton	5/16"	5/8"	8 / 0.99	15 / 0.98	21 / 0.96	15 / 0.95	10 / 0.93	4 / 0.91	0 / 0.9	0 / 0.88	0 / 0.87	0 / 0.87
	3/8"	5/8"	8 / 0.99	15 / 0.98	23 / 0.96	30 / 0.95	28 / 0.93	26 / 0.91	24 / 0.9	22 / 0.88	20 / 0.87	19 / 0.87
	5/16"	3/4"	8 / 1.00	15 / 0.99	21 / 0.99	15 / 0.98	10 / 0.97	4 / 0.97	0 / 0.96	0 / 0.96	0 / 0.95	0 / 0.95
	3/8"	3/4"	8 / 1.00	15 / 0.99	23 / 0.99	30 / 0.98	28 / 0.97	26 / 0.97	24 / 0.96	22 / 0.96	20 / 0.95	19 / 0.95
	1/2"	3/4"	8 / 1.00	15 / 0.99	23 / 0.99	30 / 0.98	36 / 0.97	36 / 0.97	35 / 0.96	35 / 0.96	35 / 0.95	34 / 0.95
	3/8"	7/8"	8 / 1.00	15 / 1.00	23 / 0.99	30 / 0.99	28 / 0.99	26 / 0.99	24 / 0.98	22 / 0.98	20 / 0.98	19 / 0.98
	1/2"	7/8"	8 / 1.00	15 / 1.00	23 / 0.99	30 / 0.99	36 / 0.99	36 / 0.99	35 / 0.98	35 / 0.98	35 / 0.98	34 / 0.98
4 Ton	3/8"	3/4"	8 / 1.00	15 / 0.99	23 / 0.98	24 / 0.97	21 / 0.96	18 / 0.94	15 / 0.93	12 / 0.92	8 / 0.92	5 / 0.91
	1/2"	3/4"	8 / 1.00	15 / 0.99	23 / 0.98	30 / 0.97	35 / 0.96	34 / 0.94	34 / 0.93	33 / 0.92	32 / 0.92	32 / 0.91
	3/8"	7/8"	8 / 1.00	15 / 0.99	23 / 0.99	24 / 0.98	21 / 0.98	18 / 0.98	15 / 0.97	12 / 0.97	8 / 0.96	5 / 0.96
	1/2"	7/8"	8 / 1.00	15 / 0.99	23 / 0.99	30 / 0.98	35 / 0.98	34 / 0.98	34 / 0.97	33 / 0.97	32 / 0.96	32 / 0.96
5 Ton	3/8"	3/4"	8 / 0.99	15 / 0.98	23 / 0.96	18 / 0.95	13 / 0.93	8 / 0.91	3 / 0.9	0 / 0.88	0 / 0.87	0 / 0.86
	1/2"	3/4"	8 / 0.99	15 / 0.98	23 / 0.96	30 / 0.95	33 / 0.93	32 / 0.91	31 / 0.9	30 / 0.88	29 / 0.87	28 / 0.86
	3/8"	7/8"	8 / 1.00	15 / 0.99	23 / 0.98	18 / 0.98	13 / 0.97	8 / 0.96	3 / 0.96	0 / 0.95	0 / 0.94	0 / 0.94
	1/2"	7/8"	8 / 1.00	15 / 0.99	23 / 0.98	30 / 0.98	33 / 0.97	32 / 0.96	31 / 0.96	30 / 0.95	29 / 0.94	28 / 0.94

Notes:

1) Do not exceed 46 meters linear line length.

2) Do not exceed 15 meters vertical separation between indoor and outdoor units.

3) * 19.05mm [3/4 in.] vapor line should only be used for 2 ton systems if outdoor unit is below or at same level as indoor unit to assure proper oil return.

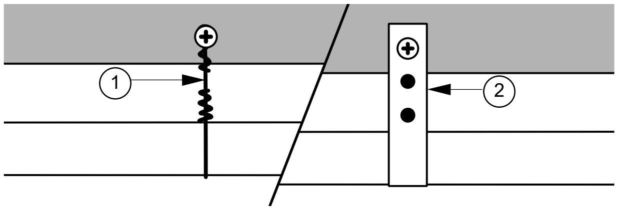
4) Always use the smallest liquid line allowable to minimize refrigerant charge.

5) Applications shaded in light gray indicate capacity multipliers between 0.90 and 0.96 which are not recommended, but are allowed.

6) Applications shaded in gray are considered long line-set applications. Refer to Long Line-Set Application Guide for details.

4.5 Line Set Installation

1. Use care in routing tubing and do not kink or twist. Use a good quality tubing bender on the vapor line to prevent kinking.



Item Number	Description
1	Temporary Hanger
2	Permanent Hanger

Figure 5: Temporary Hanger and Permanent Hanger

2. Route the tubing using temporary hangers; then straighten the tubing and install permanent hangers. The tubing must be adequately supported.
3. Isolate the vapor line from the building structure. If the vapor line comes in contact with inside walls, ceiling, or flooring, the vibration of the vapor line in the heating mode will result in noise inside the structure.
4. Blow out the liquid and vapor lines with nitrogen before connecting to the outdoor unit and indoor coil to remove debris that can plug the expansion device.

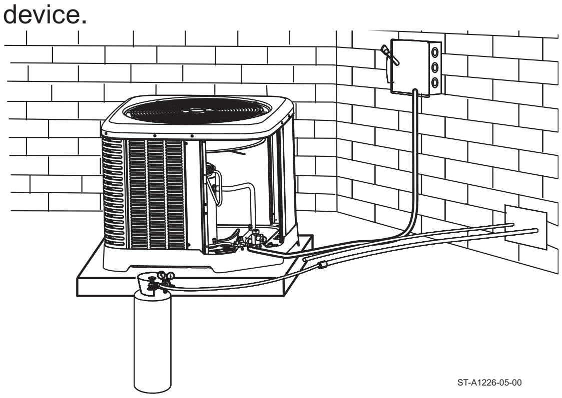


Figure 6: Isolate Vapor Line from Building Structure

4.5.1 Important Tubing Installation Practices

Observe the following when installing correctly sized type “L” refrigerant tubing between the outdoor unit and indoor coil:

- ***Check Table 6 for the correct vapor line size and liquid line size.***
- **If a portion of the liquid line passes through a very hot area where liquid refrigerant can be heated to form vapor, insulating the liquid line is required.**
- Use clean, dehydrated, sealed refrigeration-grade tubing.
- Always keep tubing sealed until tubing is in place and connections are to be made.
- A high-quality biflow filter drier is included with all R-454B heat pump units and must be installed in the liquid line upon unit installation.
- When replacing an R-22 or R-410A system with an R-454B system and the line set is not replaced, blow out the lines with nitrogen to remove as much of the remaining mineral oil as possible. Check for low spots where oil may be trapped and take measures to drain the oil from those areas.

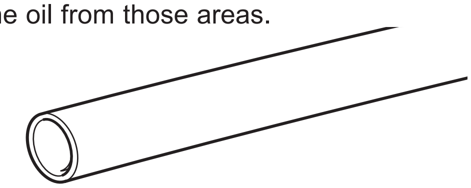
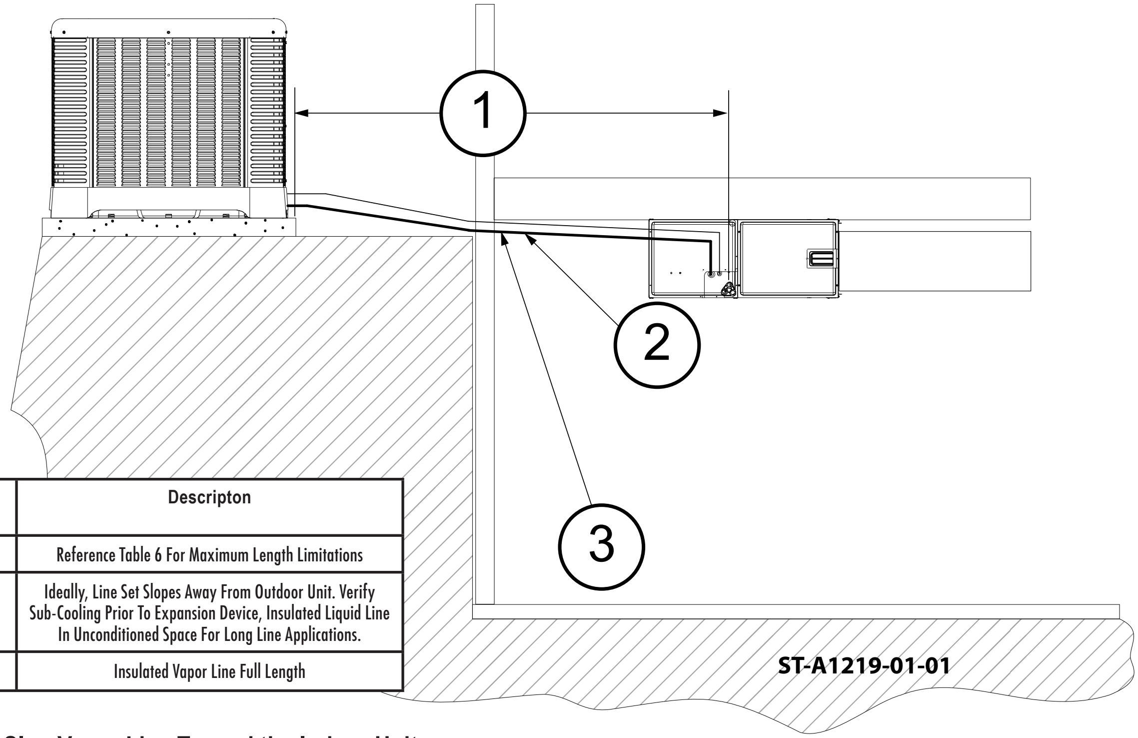


Figure 7: Debur Cut Tubing Ends

- If tubing has been cut, debur the ends while holding the tubing in a position to prevent chips from falling into tubing. Burrs such as those caused by tubing cutters can affect performance dramatically, particularly on small diameter liquid lines.
- For best operation, keep tubing run as short as possible with a minimum number of elbows or bends.
- Locations where the tubing will be exposed to mechanical damage should be avoided. If it is necessary to use such locations, the copper tubing should be protected by a housing to prevent damage.

4.5.2 Relative Location of Indoor and Outdoor Units



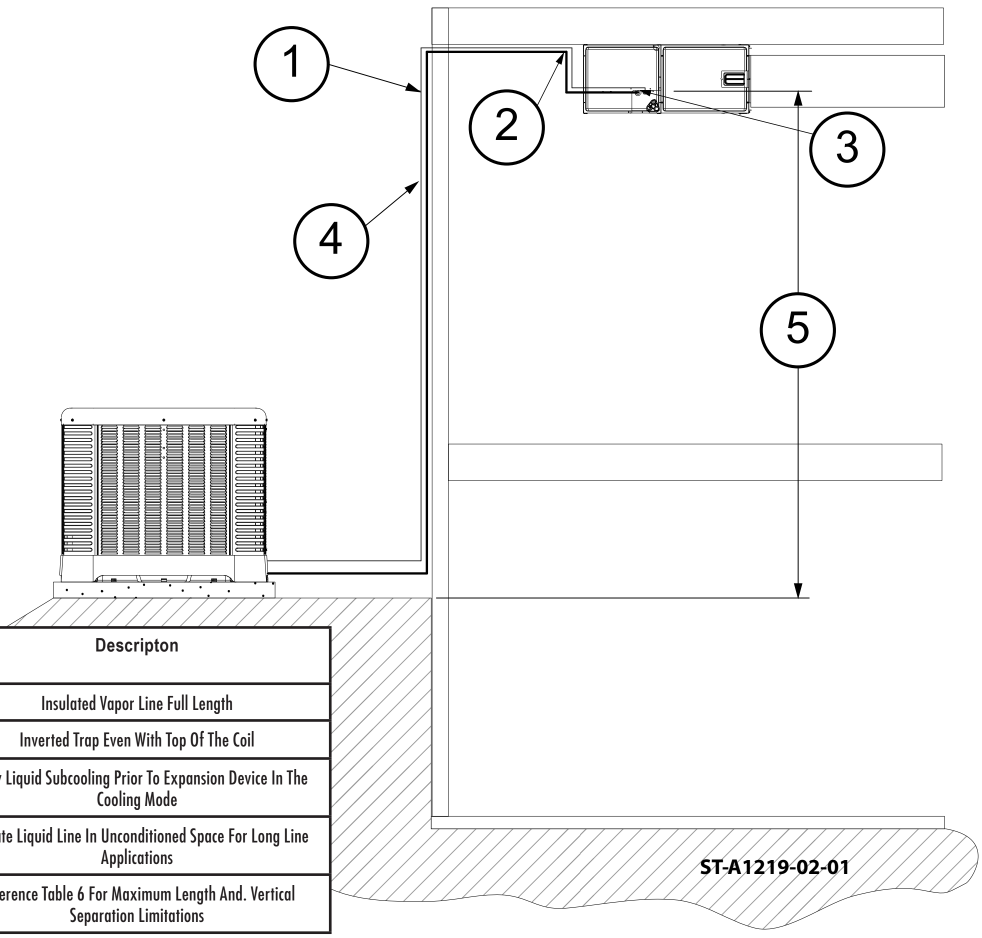
Item Number	Descripton
1	Reference Table 6 For Maximum Length Limitations
2	Ideally, Line Set Slopes Away From Outdoor Unit. Verify Sub-Cooling Prior To Expansion Device, Insulated Liquid Line In Unconditioned Space For Long Line Applications.
3	Insulated Vapor Line Full Length

Figure 8: Slop Vapor Line Toward the Indoor Unit

4.5.2.1 Outdoor Unit Level or Near Level to Indoor Coil Line Set

For applications with the outdoor unit and indoor unit on the same level the following is required:

1. Insulated liquid line in unconditioned space only.
2. Insulated vapor line full length.
3. Vapor line should slope toward the indoor unit. (Reference Figure 8)
4. Follow the proper line sizing, maximum linear and equivalent length, charging requirements, and oil level adjustments spelled out in this document.
5. Verify at least 5°F [2.8°C] sub-cooling at the indoor unit prior to expansion device.



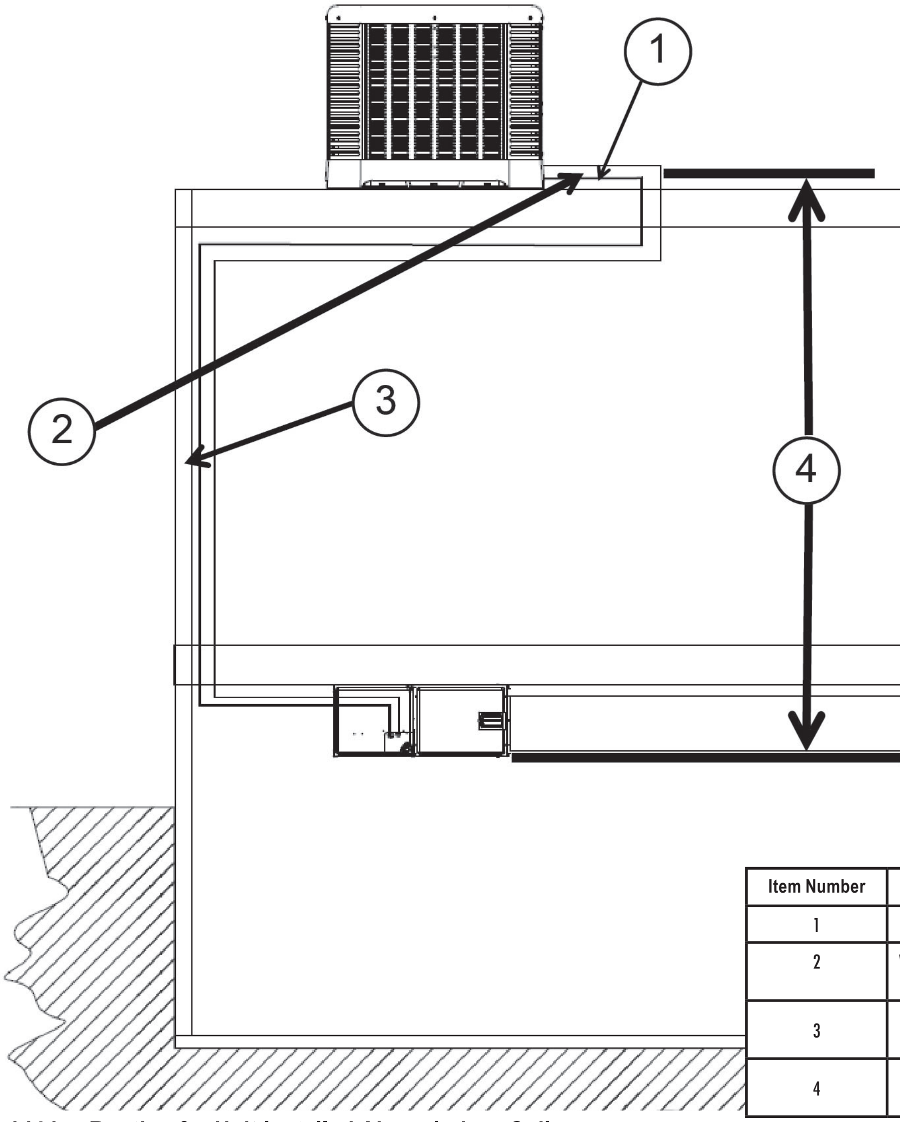
Item Number	Descripton
1	Insulated Vapor Line Full Length
2	Inverted Trap Even With Top Of The Coil
3	Verify Liquid Subcooling Prior To Expansion Device In The Cooling Mode
4	Insulate Liquid Line In Unconditioned Space For Long Line Applications
5	Reference Table 6 For Maximum Length And. Vertical Separation Limitations

Figure 9: Long Line Liquid Line Routing

4.5.2.2 Outdoor Unit Below Indoor Coil

For applications with the outdoor unit below the indoor coil, the following is required:

1. Inverted vapor-line trap (Reference Figure 9)
2. Insulated liquid line in unconditioned space only.
3. Insulated vapor line full length.
4. Follow the proper line sizing, maximum linear and equivalent length, maximum vertical separation, charging requirements, and oil level adjustments spelled out in this document.
5. Measure pressure at the liquid line service valve and prior to expansion device. Verify that the pressure drop is not greater than 50 PSI [345 kPa].
6. For elevations greater that 25’ [8 m] a lower subcooling can be expected.
7. Verify there is at least 5ºF [2.8ºC] of liquid subcooling at the indoor coil prior to the expansion device.



Item Number	Descripton
1	Insulated Vapor Line Full Length
2	Verify Liquid Sub-Cooling At Outdoor Unit Prior To Expansion Device
3	Insulated Liquid Line In Unconditioned Space For Long Line Application.
4	Reference Table 6 For Maximum Length And Vertical Separation Limitations.

Figure 10: Liquid Line Routing for Unit Installed Above Indoor Coil

4.5.2.3 Outdoor Unit Above Indoor Coil

For applications with the outdoor unit above the indoor coil the following is required:

1. Insulated liquid line in unconditioned space only.
2. Follow the proper line sizing, maximum linear and equivalent length, maximum vertical separation, charging requirements, and oil level adjustments spelled out in this document.
3. Insulated vapor line full length.
4. Verify at least 5°F [2.8°C] of liquid subcooling at the outdoor unit prior to expansion device in the heating mode.

4.5.3 Tubing Connections

Indoor coils have only a holding charge of nitrogen. Keep all tube ends sealed until connections are to be made.

1. Use type “L” copper refrigeration tubing. Braze the connections with the following alloys:

   - – Copper to copper, 5% silver minimum
   - – Copper to steel or brass, 15% silver minimum

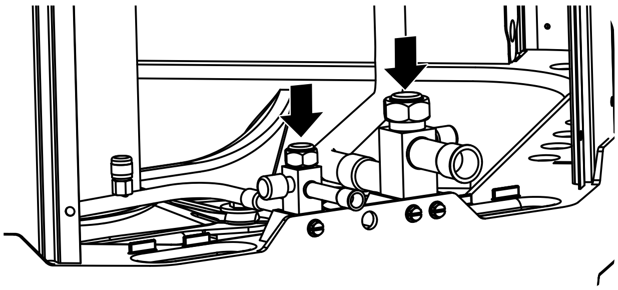


Figure 11: "L" Type Refrigeration Tubing Locations

2. Be certain both refrigerant shutoff valves at the outdoor unit are closed.

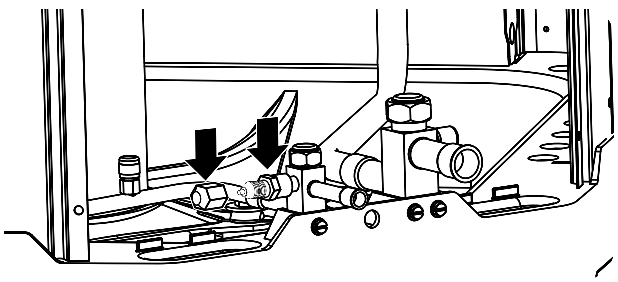


Figure 12: Remove Caps and Schrader Cores

3. Remove the caps and Schrader cores from the pressure ports to protect seals from heat damage. Both the Schrader valves and the service valves have seals that may be damaged by excessive heat.

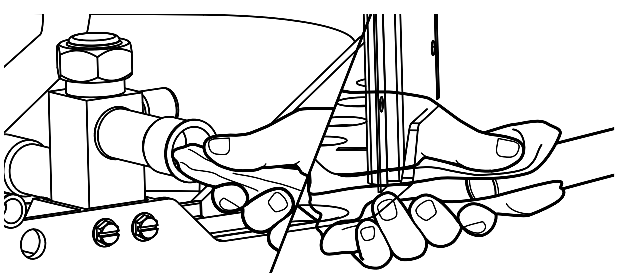


Figure 13: Clean Inside Fittings and Outside Tubing

4. Clean the inside of the fittings and outside of the tubing with a clean, dry cloth before soldering. Clean out debris, chips, dirt, etc., that enters tub-ing or service valve connections.

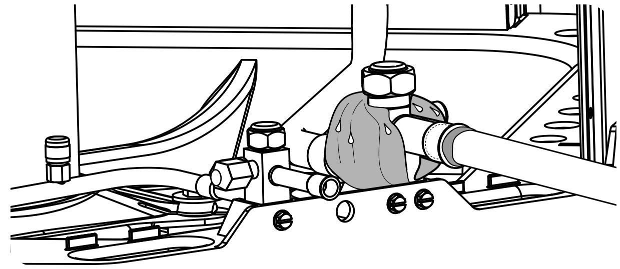


Figure 14: Wrap Valves Before Applying Heat

5. Wrap valves with a wet rag or thermal barrier compound before applying heat.

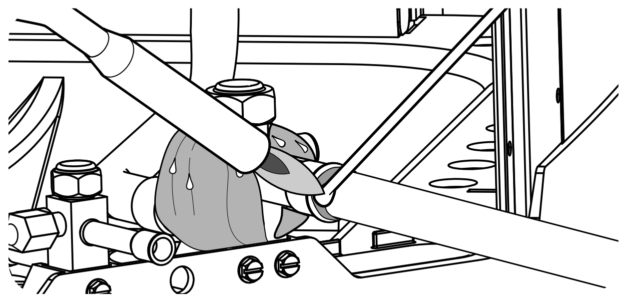


Figure 15: Braze the Tubing

6. Braze the tubing between the outdoor unit and indoor coil. Flow nitrogen into a pressure port and through the tubing while brazing, but do not allow pressure inside tubing which can result in leaks. Once the system is full of nitrogen, the nitrogen regulator should be turned off to avoid pressuring the system.

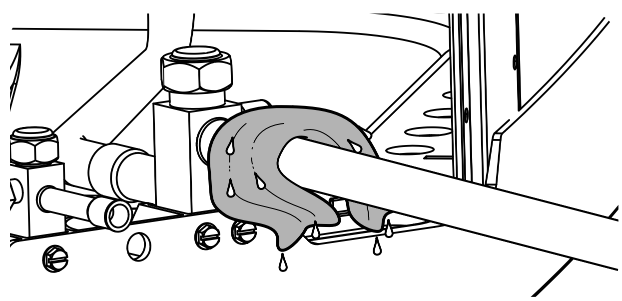


Figure 16: Cool the Joint After Brazing

7. After brazing, use an appropriate heatsink material to cool the joint.
8. Reinstall the Schrader cores into both pressure ports.

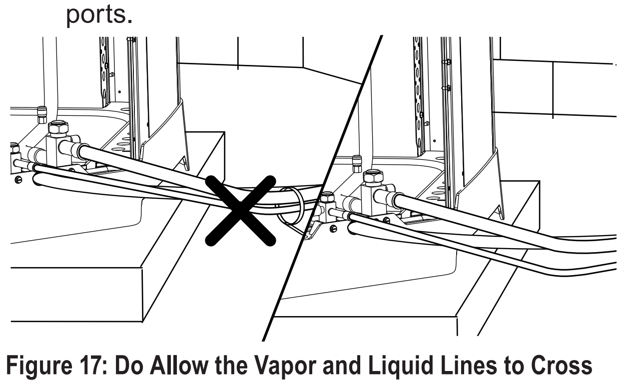


Figure 17: Do Allow the Vapor and Liquid Lines to Cross

9. Do not allow the bare vapor line and liquid line to be in contact with each other. This causes an undesirable heat transfer resulting in capacity loss and increased power consumption.

4.6 Initial Leak Testing

Indoor coils have only a holding charge of nitrogen. Keep all tube ends sealed until connections are to be made.

> **⚠WARNING:**
>
> Do not use oxygen to purge lines or pressurize system for leak test. Oxygen reacts violently with oil, which can cause an explosion resulting in severe personal injury or death.

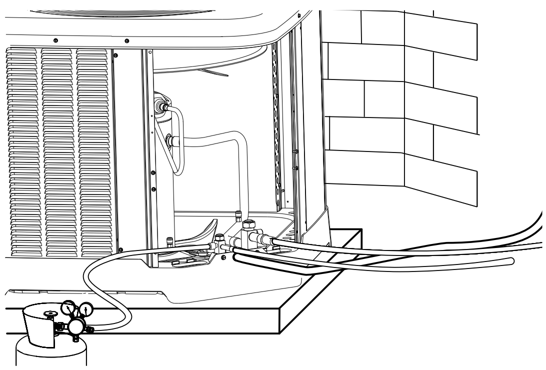


Figure 18: Pressurize Line Set

1. Pressurize line set and coil through service fittings with nitrogen to 500 PSIG [3,447 kPa] (maximum). Close nitrogen tank valve, let system sit for at least 15 minutes, and check to see if the pressure has dropped. If the pressure has dropped, check for leaks at the line set braze joints with soap bubbles and repair leak as necessary. Repeat pressure test. If line set and coil hold pressure, proceed with line set and coil evacuation (see Sections 4.7 and 4.8 for evacuation and final leak testing).

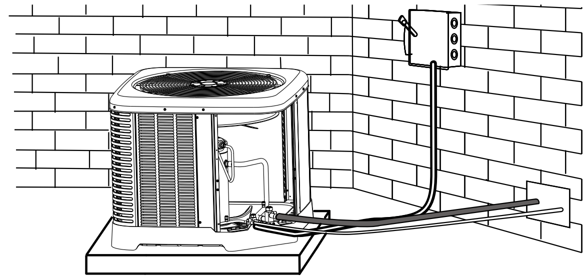


Figure 19: Insulate Vapor Line

2. The vapor line must be insulated for its entire length to prevent dripping (sweating) and prevent performance losses. Closed-cell foam insulation such as Armaflex and Rubatex® are satisfactory insulations for this purpose. Use 1/2" [12.7 mm] minimum insulation thickness. Additional insulation may be required for long runs. The liquid line must be insulated in any unconditioned space when long line sets are used and anytime the liquid line is run through an attic due to hot temperatures that occur there.

4.7 Evacuation

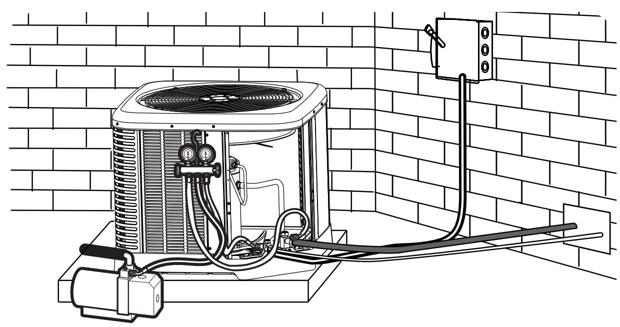


Figure 20: Evacuate Air and Moisture from System

Evacuation is one of the most important parts of the entire installation and service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air and moisture from the system.

Air or nitrogen in the system increases condensing temperature and pressure, resulting in increased power consumption, erratic operation, and reduced capacity.

Moisture chemically reacts with the refrigerant and oil to form corrosive acid which attacks the compressor motor windings and internal parts and which can result in compressor failure.

1. After the system has been leak-checked and proven sealed, connect the vacuum pump and evacuate system to 500 microns and hold 500 microns or less for at least 15 minutes. The vacuum pump must be connected to both the high and low sides of the system by connecting to the two pressure ports. Use the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.

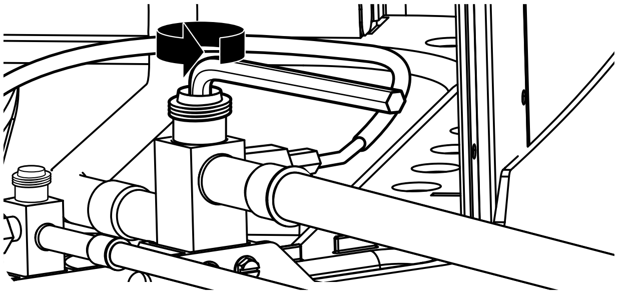


Figure 21: Open Both Service Valves

2. After adequate evacuation, open both service valves by removing both brass service valve caps with an adjustable wrench. Insert a 3/16" [5 mm] or 5/16" [8 mm] hex wrench into the stem and turn counterclockwise until the wrench stops.

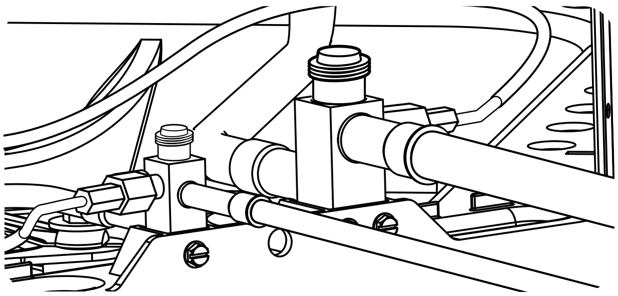


Figure 22: Connect Gauges

3. If not already connected from evacuation process, gauges must be connected at this point to check and adjust charge.

IMPORTANT: Compressors should never be used to evacuate the air conditioning system because internal electrical arcing in near vacuum conditions may result in a damaged or failed compressor. Never run a compressor while the system is in a vacuum or compressor failure will occur.

4.8 Final Leak Testing

After the unit has been properly evacuated and service valves opened, an A2L compatible leak detector should be used to detect leaks in the system. All joints and piping within the outdoor unit, indoor coil, and interconnecting tubing should be checked for leaks. If a leak is detected, the refrigerant should be recovered before repairing the leak. The Clean Air Act prohibits releasing refrigerant into the atmosphere.

4.9 Control Wiring

⚠WARNING:

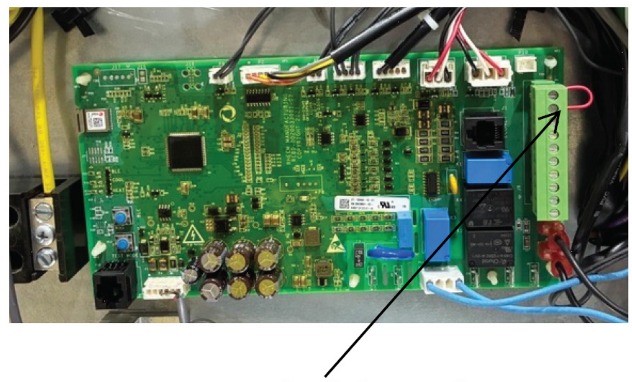
Turn off electric power at the fuse box or service panel before making any electrical connections. Also, the ground connection must be completed before making line voltage connections. Failure to do so can result in electrical shock, severe personal injury, or death.

4.9.1 For Installations with Existing Indoor Coil and Furnace or Air Handler

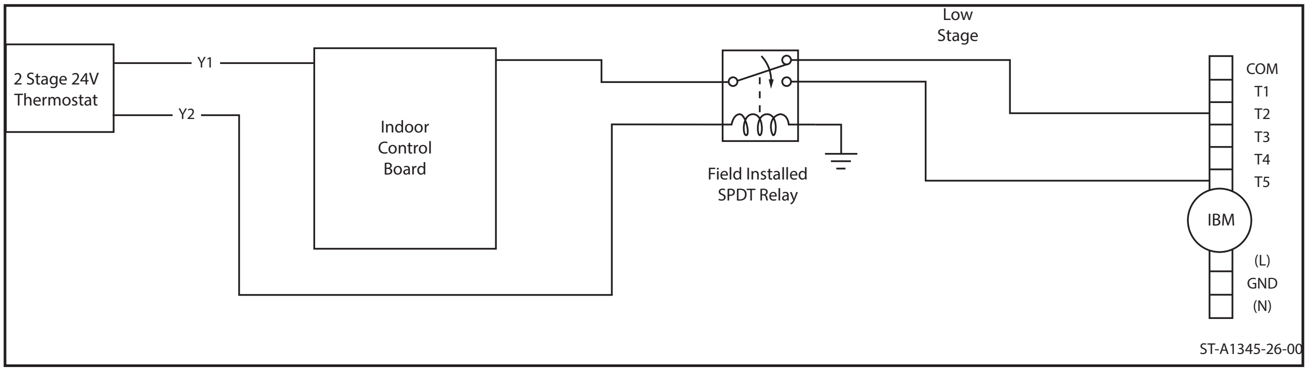
For installations that use an existing indoor coil and furnace or an existing indoor air handler, the indoor should be modified to allow use of a 2 stage thermostat.

See diagrams below for wiring instructions. A relay will need to be provided for installation that is rated for the voltage and current that will be passing through the relay. Note that the low stage airflow should be 75% of high stage.

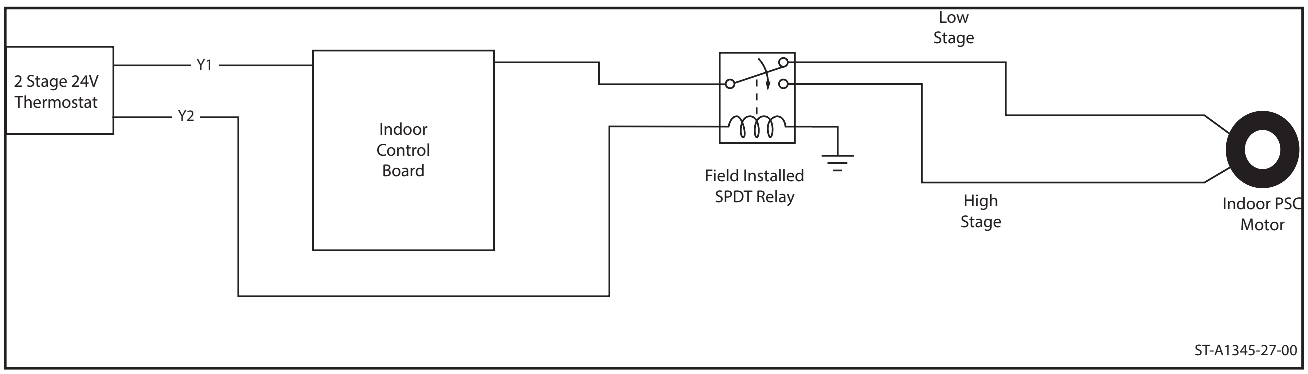
For matchups with a non-matching indoor air mover and coil, the utility terminals on the UODC board can be shorted to invoke an alternate mode of operation that allows the system to adapt to reasonably mismatched coils. The jumper is applied to terminals U1 and U2 on the UODC board.



For indoor units using an ECM motor, the schematic below shows the additional relay to drive the system to 2 stages of indoor airflow. The low stage tap should be selected to deliver 75% of the high stage airflow.



For existing indoor units that use a PSC motor, the modification requires a SPDT relay, and is installed per the schematic below: Note that the relay used must be properly rated for the voltage and current used in the PSC motor. Line voltage will be present across the relay in PSC motor applications. The low stage tap should be selected to deliver 75% of the high stage airflow.



4.9.2 EcoNet™ Communications

The EcoNet™ enabled (-)P17AY Series heat pumps and air conditioners are specifically designed to be matched with and EcoNet™ enabled air-handler or gas furnace and the EcoNet™ Smart Thermostat. While they are also designed to be controlled by a conventional 24VAC 2-stage thermostat, many features and benefits are lost.

4.9.3 EcoNet™ Smart Thermostat Installation

The EcoNet™ Smart Thermostat should be mounted 4 to 5 feet [1.2 to 1.5 m] above the floor on an inside wall of the living room or a hallway that has good air circulation from the other rooms being controlled by the Smart Thermostat. It is essential that there be free air circulation at the location of the same average temperature as other rooms being controlled. Movement of air should not be obstructed by furniture, doors, draperies, etc. The Smart Thermostat should not be mounted where it will be affected by drafts, hot or cold water pipes or air ducts in walls, radiant heat from fireplace, lamps, the sun, T.V. or an outside wall. See instructions packaged with Smart Thermostat for detailed mounting and installation instructions.

4.9.4 EcoNet™ Communication Wiring Connections

The four 18 AWG low-voltage control wires must be installed from the EcoNet™ Smart Thermostat to the indoor unit and from the indoor unit to the outdoor unit. The wire length between the Smart Thermostat and indoor unit should not be greater than 100 feet [30.5 m].

The wire length between the indoor unit and outdoor unit should not be greater than 125 feet [38.1 m].

Running low-voltage wires in conduit with line voltage power wires is not recommended. Low-voltage wiring must be connected to the low voltage terminal block on the Universal Outdoor Control . The terminal block can be unplugged from the control board to facilitate wiring.

An EcoNet™ communicating heat pump system consists of these matched components:

- *EcoNet™ communicating outdoor unit.*
- *EcoNet™ communicating air handler or EcoNet™ communicating furnace.*
- *EcoNet™ Smart Thermostat.*

IMPORTANT: The EcoNet™ control system requires continuous 18 AWG thermostat wire. Do not use phone cord to connect indoor and outdoor units. This will damage the controls.

The EcoNet™ control system requires four (4) control wires for unit operation:

- R 24 VAC
- C 24 VAC common
- Data wire E1 Communications
- Data wire E2 Communications

The EcoNet™ enabled air handler or furnace is equipped with a 24-volt, 40 or 50 VA transformer for proper system operation. See Figure 23 below for low voltage wiring connections.

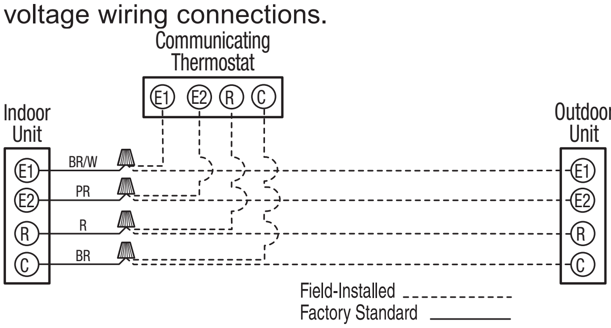


Figure 23: Low Voltage EcoNet™ Wiring

These wires need to be connected to each device (Smart Thermostat, indoor air handler or furnace, and outdoor unit).

Once all devices are connected, apply the line voltage to the indoor and outdoor units.

When all devices are powered, the EcoNet™ Smart Thermostat should detect the indoor and outdoor units within 45 seconds.

Once the system is powered and all components are communicating with each other, the airflow settings will be automatically configured in the air-handler or furnace. All adjustments for indoor airflow are made at the EcoNet™ Smart Thermostat from this point. Items that can be changed are airflow trim adjustment, on-demand dehumidification, cooling and heating airflow and electric heat airflow. The Smart Thermostat also has a wide range of fault and history information. To access any of the Smart Thermostat menus press the settings, status, or service icons at the bottom of the touch screen. Refer to the air handler or furnace installation manual and the EcoNet™ Smart Thermostat installation manual for further details on setting up the system and available adjustment options.

4.9.5 Conventional 24VAC Thermostat Control Wiring Connections

The (-)P17AY series of heat pumps allow the installer to use conventional 24 VAC control wiring and a conventional thermostat.

IMPORTANT: The preferred method of unit installation and operation is the EcoNet™ Communicating System, which provides access to system fault history and diagnostic information. The diagnostic information is not available at the thermostat when the (-)P17AY unit is using a 2 stage 24V legacy thermostat. Diagnostic information can be accessed using the Contractor App via Bluetooth connection.

Thermostat control wiring requires a minimum of six (6) wires for proper unit operation:

R – 24 VAC
C – 24 VAC common
Y1 - Low indoor airflow operation
Y2 - High indoor airflow operation
B – Heat pump operation
W – Supplemental Heat During Defrost Cycle

The following figures show the typical control wiring diagrams with (-)P17AY heat pumps using a conventional 24VAC thermostat. Adjust indoor airflow using the Bluetooth Contractor's App (Dipswitches are not available).

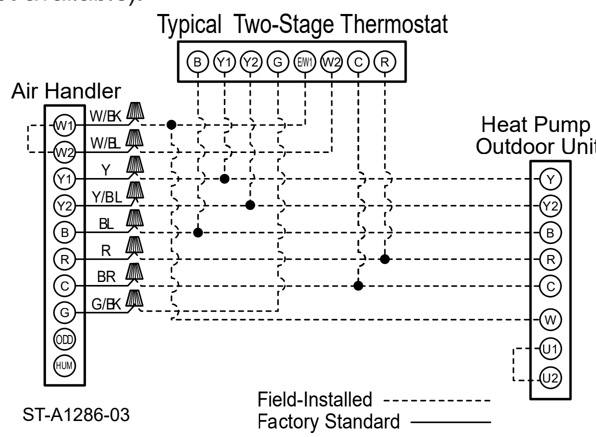


Table 7: Wire Color Code

BK – BLACK	GY – GRAY	W – WHITE
BR – BROWN	O – ORANGE	Y – YELLOW
BL – BLUE	PR – PURPLE	
G – GREEN	R – RED	

Figure 24: Typical 2-Stage Thermostat: Heat Pump With Air-Handler

4.10 Power Wiring

It is important that proper electrical power is available at the heat pump power terminal block. The acceptable operating voltage range is shown in Table 8.

Table 8: Voltage Ranges (60 Hz)

Nameplate Voltage	Operating Voltage Range at Maximum Load Conditions
208/230	197-253

1. Install a branch circuit disconnect within sight of the unit and of adequate size to handle the minimum circuit ampacity (MCA) current (see “Electrical Data” in Section 3.2).
2. Field wiring must comply with the National Electric Code (C.E.C. in Canada) and any applicable local code.
3. Power wiring must be run in a rain-tight conduit. Conduit must be attached to the hole in the bottom of the control box.
4. Connect power wiring to line-voltage lugs on the terminal block located in the outdoor heat pump unit electrical box. (See wiring diagram attached to unit access panel.)
5. Check all electrical connections, including factory wiring within the unit and make sure all connections are tight.
6. DO NOT connect aluminum field wire to the line voltage terminal block.
7.

4.10.1 Surge Protector

A UL 1449 listed, NEC 230.67-compliant field-installed Surge Protection Device (SPD) is highly recommended at the time of HVAC system installation. Proper surge protection can help safeguard sensitive electronic components from voltage spikes and transient surges, reducing the risk of equipment failure and costly repairs.

Note: In locations where incoming utility voltage is known to be inconsistent or prone to fluctuations, the use of a voltage monitoring or voltage protection device is also recommended in addition to surge protection. These devices can help protect equipment from sustained under-voltage, over-voltage, and brownout conditions that are not mitigated by standard SPDs.

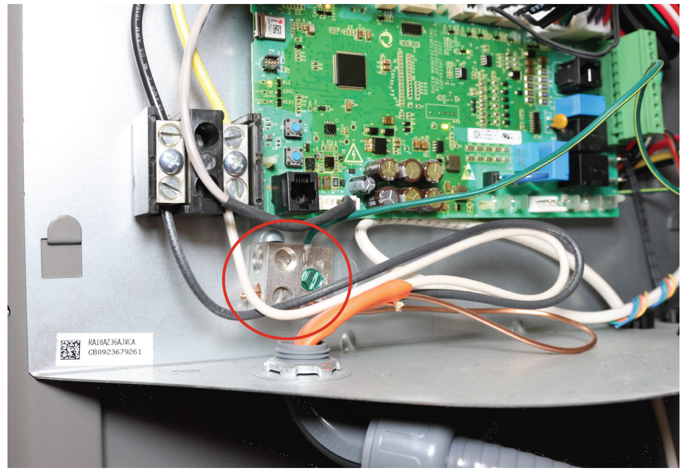
For more information, please refer to applicable local and national electrical codes, including the latest edition of the National Electrical Code (NEC), which may mandate surge protection for certain installations. Installation requirements, including the specific location of the SPD, may vary by jurisdiction, so compliance with both national and local code provisions is essential.

4.11 Grounding

⚠WARNING:

The unit must be permanently grounded. Failure to do so can cause electrical shock resulting in severe personal injury or death.

A ground lug is provided near the line-voltage power entrance for a ground wire.



5.0 SYSTEM START-UP & REFRIGERANT CHARGING

5.1 System Start-Up Overview

Once the system hardware and wiring has been properly installed, the next step is to start the system up, verify indoor air-flow, and adjust the refrigerant charge. To assure optimum comfort, efficiency, and reliability, it is extremely important to follow the procedures in this section to assure the indoor air-flow and refrigerant charge are correct.

5.2 Initial Power-Up and EcoNet™ Communication Verification

After all installation steps have been completed, apply electrical power to the indoor and outdoor units. The EcoNet™ Smart Thermostat or Legacy Thermostat should be switched to the off position initially. Within 45 seconds of power being applied, the EcoNet™ Smart Thermostat should detect the indoor and outdoor units.

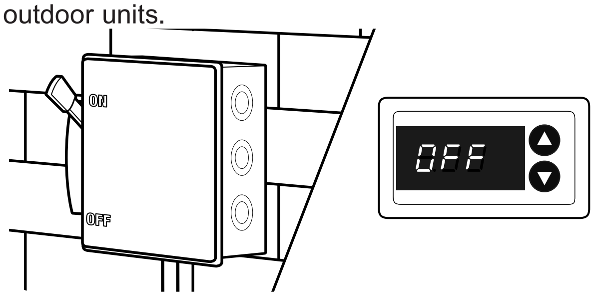


Figure 28: Apply Power with EcoNet™ Switched Off

5.3 EcoNet™ Smart Thermostat Set-Up

Follow the set-up instructions included with the EcoNet™ Smart Thermostat prior to starting system. Cooling dehumidification must be disabled for indoor air-flow verification and refrigerant charging. The indoor air-flow trim adjustment should be set to 0% for indoor air-flow verification, but should be adjusted prior to refrigerant charging should the application require an adjustment to the indoor air-flow.

5.4 Initial System Start-Up

Using the EcoNet™ Smart Thermostat service menu (See Section 5.5 below) or using the 2 Stage 24V thermostat (See Section 5.6 below), put the system into the charging mode which will force it to operate at 100% capacity and indoor air-flow which is necessary for accurate indoor air-flow verification and refrigerant charging. Check to make sure "On-Demand Dehumidification" is turned off in the EcoNet™ Smart Thermostat (or on the air-handler or gas furnace control board for conventional 24VAC control applications).

NOTE: Prior to initiating the charge mode procedure, refer to the Charging Chart on the unit and identify the correct column based on the indoor unit model and its installed orientation to ensure correct target values.

5.5 Entering Charge Mode Using EcoNet™ Smart Thermostat Service Menu

1. Set the "Mode" to the "OFF" position.
2. Select "SERVICE" on the EcoNet™ Smart Thermostat screen.
3. Select "ODU Checkout". If the next screen displays a flashing "Lock-Out" message, there will be up to a 5 minute delay before it is possible to continue.
4. Once the flashing lock-out message disappears, touch OFF on the screen displayed to the right of "Var Speed ODU Test".
5. Touch the "UP" arrow repeatedly until the "Heat Charge" or "Cool Charge" menu item is displayed depending on which mode the system is to be charged in.
6. Touch "Start Test".
7. System will now operate at 100% of capacity and indoor air-flow to allow proper indoor air-flow verification and refrigerant charging until the Charge Mode is manually ended. There may be a delay before the system actually starts. If the system doesn't start, cycle power to both the indoor and outdoor units and repeat steps 1-6.
8. **Note:** When charging in the heating mode, the system will initiate a defrost cycle every 34 minutes if the coil temperature is below 35ºF [1.7ºC] to assure the coil stays frost free during the charging process. Allow the system to complete the defrost cycle and stabilize for at least 10 minutes before attempting to evaluate the charge level.
9. To end Charge Mode, touch the "UP" arrow repeatedly until "OFF" is displayed on the screen and then touch "Stop Test". Then touch the left arrow on the screen to return to the main screen.
10. If the indoor blower continues to run continuously after exiting the Charge Mode, cycle the power to the air-handler or furnace.

5.6 Entering Charge Mode When Using a Universal Outdoor Control

1. U1 and U2 jumper shall be removed before beginning charging procedure.
2. Set the thermostat to the cool or heat mode depending on which mode the system is to be charged in. Adjust the set point several degrees below (cool mode) or above (heat mode) the room temperature to assure the thermostat is calling for operation and will continue to do so throughout the charging process.
3. Ensure that there is a 24V signal at Y1 and Y2 and that the indoor air mover is on high stage.
4. When the charging process is complete, adjust the temperature set-point to the desired level and reinstall U1 and U2 jumper.

5.7 Indoor Air-Flow Verification

Correct indoor air-flow and proper supply air distribution is critical to system comfort, efficiency and reliability. Excessive indoor air-flow results in elevated humidity levels in the cooling mode and excessive air noise. Low indoor air-flow reduces system capacity and can result in coil icing and compressor failure in the cooling mode and can cause nuisance high pressure switch tripping and increases power consumption in the heating mode.

Fortunately, when the (-)P17AY heat pumps are matched to the correct air-handler or furnace/coil combination and are controlled by the communication EcoNet™ Smart Thermostat, the indoor air-flow is automatically controlled to the proper level based on the model data stored in the UODC. When the indoor blower is operating, the EcoNet™ Smart Thermostat will display the indoor air-flow in the Service Menu of the control. The approximate indoor air-flow is also displayed in 100 CFM [47 l/s] increments by a flashing LED on the air-handler or furnace control board while the blower is operating (one flash per 100 CFM [47 l/s]) for installations where a conventional 24VAC thermostat is used.

Once the system is operating in the Charging Mode, confirm the indoor air-flow is close to those values in the table below. If the displayed indoor air-flow is not reasonable close to the value in the table, confirm cooling dehumidification is disabled, the indoor air-flow trim adjustment is set to 0%, and verify the model numbers of the indoor and outdoor units are an approved combination by the manufacturer. Once the indoor air-flow is verified, the indoor air-flow trim adjustment may be changed to suit the installation and should be done prior to final charge adjustment.

NOTICE: AHRI rated indoor air-flow may differ slightly from values in Table 9.

Table 9: Cooling and Heating CFM Ratings

Outdoor Unit Model No.	Displayed Indoor CFM Cooling Mode	Displayed Indoor CFM Heating Mode
(-)P17AY24	735	735
(-)P17AY36	1050	1050
(-)P17AY48	1400	1400
(-)P17AY60	1850	1850

5.8 System Start-Up & Refrigerant Charging

Total System Charge (oz)	Minimum Indoor Airflow (CFM)	Without Refrigerant Leak Detection Sensor Area of Smallest Conditioned Room Or Space Where Indoor Unit is Installed (sqft) Distance From Floor to Bottom Edge of Lowest Inlet or Outlet Vent Opening or Bottom Edge of Indoor Unit			With Refrigerant Leak Detection Sensor Minimum Required Total Conditioned Room Area = Sum of all conditioned spaces/rooms (sqft) Any configuration
		≤2 FT	6 FT	≥9 FT	
50	166	338	113	75	94
100	333	781	225	150	187
150	499	1758	338	225	281
200	665	3126	451	301	375
250	831	4884	564	376	469
300	998	7032	781	451	562
350	1164	9572	1064	526	656
400	1330	12502	1389	617	750
450	1497	15823	1758	781	843
500	1663	19534	2170	965	937
550	1829	not permitted - sensor required			1031
600	1996				1125

If the Smallest Conditioned Space Room Area is below the specified value in the table for the Total System Charge, a Refrigerant Leak Detection Sensor will need to be installed. Verify that the Minimum Indoor Airflow meets the specified value for the Total System Charge amount using the above tables.
For systems that are factory installed with Refrigerant Leak Detection Sensor, verify that the Smallest Total Conditioned Space Area and Minimum Indoor Airflow values meet the minimum values specified in the above table for the Total System Charge amount.

Installed Altitude (ft) H_{alt}	Altitude Adjustment Factor (AF)
1000	1.050
1500	1.110
2000	1.180
2500	1.265
3000	1.360
3500	1.423
4000	1.528
4500	1.643
5000	1.768
5500	1.903
6000	2.048
6500	2.203

Note: Installing technician to correct the minimum room area of the space Amin or the minimum room area of conditioned space TAmin by multiplying by the altitude adjustment factor (AF) based on the building site ground level altitute (Halt).
If the altitude is between each specified range in the table, the technician may interpolate the altitude adjustement factor or round up the altitude to the next interval and use the adjustment factor.

5.9 Refrigerant Charging

WARNING: **R-454B systems should be charged with refrigerants in liquid form.**

⚠WARNING:

The top of the compressor shell is hot. Touching the compressor top may result in serious personal injury.

⚠CAUTION:

R–454B is classified as safety group A2L per ASHRAE Standard 34. Verify that service equipment and instruments are approved for use with group A2L refrigerants, and in particular with R–454B. Failure to exercise care may result in equipment damage or personal injury.
Charge for all systems should be checked using the Charging Chart inside the access panel cover.

IMPORTANT: ***Total System Charge Weight must be annotated on the label provided adjacent to the unit nameplate. Total System Charge Weight can be calculated by taking the Factory Refrigerant Charge Weight listed on the nameplate and adding the Field Installation Charge Weight.***

IMPORTANT: Do not operate the compressor without charge in the system.

Addition of R-454B will raise high-side pressures (liquid and discharge).

NOTICE: System maintenance is to be performed by a qualified and certified technician.
The optimum refrigerant charge for any outdoor unit matched with an indoor coil/air handler is affected by the application. Therefore, charging data has been developed to assist the field technician in optimizing the charge for all mounting configurations (UF – Upflow, DF – Downflow, LH – Left-Hand Discharge, and RH – Right-Hand Discharge). Refer to the charging chart inside the access panel cover on the unit and choose the appropriate column for the specific application being installed or serviced. New installations utilizing either an RCF indoor coil installed on a gas furnace or an RH(-)V series air handler in the downflow or horizontal right-hand discharge may require removal of some refrigerant since the factory charge could result in an overcharge condition for short line length applications.
The following method is used for charging systems in the cooling and heating mode. All steps listed should be performed to ensure proper charge has been set.
For measuring pressures, the service valve port on the liquid valve (small valve) and the true service port located between the two service valves are to be used.
IMPORTANT: Refrigerant charging must be performed when the system is operating in charge mode.

NOTE: In addition to conventional charging procedures, the following requirements shall be followed:
• Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
• Cylinders shall be kept in an appropriate position according to the instructions.
• Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
• Label the system when charging is complete (if not already).
• Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.
Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.
The following method is used for charging systems in the cooling and heating mode. All steps listed should be performed to ensure proper charge has been set.
For measuring pressures, the service valve port on the liquid valve (small valve) and the true service port located between the two service valves are to be used.

5.9.1 Measurement Device Set-Up

1. With an R-454B gauge set, attach the high-pressure hose to the access fitting on the liquid line (small) service valve at the OD unit.
2. Attach the low-pressure hose to the exterior suction port located between the two service valves that is connected to the suction tube between the reversing valve and compressor.
3. Attach a temperature probe within 6" [15.2 cm] of the outside of the unit on the copper liquid line (small line). For more accurate measurements, clean the copper line prior to measurement and use a calibrated clamp-on temperature probe or an insulated surface thermocouple.

5.9.2 Preliminary Charging by Weight

NOTICE: Adjust the system charge by weight for the linear length of the refrigerant line set.
For a new installation, evacuation of inter-connecting tubing and indoor coil is adequate; otherwise, evacuate the entire system. Use the factory charge shown in "Electrical and Physical Data" in Section 3.2 of these instructions or on the unit data plate. Note that the charge value includes charge required for 15 ft. [4.6 m] of standard-size liquid line without a filter drier.
Calculate actual charge required with the actual installed liquid line size and length using:
1/4" [6.4 mm] O.D. = .3 oz./ft. [28.3 g/m]
5/16" [7.9 mm] O.D. = .4 oz./ft. [37.7 g/m]
3/8" [9.5 mm] O.D. = .6 oz./ft. [56.7 g/m]
1/2" [12.7 mm] O.D. = 1.2 oz./ft. [113.3 g/m]
Add 6 oz. [170 g] for field-installed filter drier.
Charge Adjustment = (Line Set (oz./ft.) x Total Length) – Factory Charge for Line Set
Example: A three ton heat pump unit with factory installed 3/8" liquid service valve requires 75 ft. of line set with a liquid line diameter of 1/2".
Factory Charge for Line Set = 15 ft. × .6 oz. = 9 oz.
Charge Adjustment = (1.2 oz. × 75 ft.) – 9 oz. = + 81 oz.
With an accurate scale (+/– 1 oz. [28.3 g]) or volumetric charging device, adjust the refrigerant charge based on the actual line set length. If the entire system has been evacuated, add the total calculated charge.
IMPORTANT: Charging by weight is not always accurate since the application can affect the optimum refrigerant charge. Charging by weight is considered a starting point ONLY. Always check the charge by using the Charging Chart and adjust as necessary. CHARGING BY LIQUID SUBCOOLING PER THE SYSTEM CHARGING CHART MUST BE USED FOR FINAL CHARGE ADJUSTMENT.

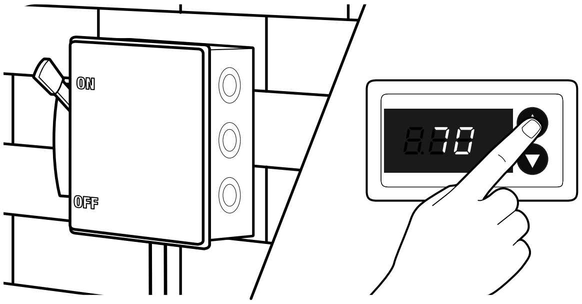


Figure 29: Run the Unit for 15 Minutes

IMPORTANT: Refrigerant charging must be performed when the system is operating in charge mode.

NOTE: In addition to conventional charging procedures, the following requirements shall be followed:

• Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.

• Cylinders shall be kept in an appropriate position according to the instructions.

• Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.

• Label the system when charging is complete (if not already).

• Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

The following method is used for charging systems in the cooling and heating mode. All steps listed should be performed to ensure proper charge has been set.

For measuring pressures, the service valve port on the liquid valve (small valve) and the true service port located between the two service valves are to be used.

IMPORTANT: R-454B is a blended refrigerant of R-32 and R-1234YF (68.9/31.1). These two refrigerants have different saturation curves and therefore change state at different pressures and temperatures. If charge is added to the system in the vapor state, it is possible to have a disproportionate amount of each part of the R-454B blend which will cause unstable and inefficient operation. Therefore, it is critical to add R-454B in the liquid form only!

5.9.3 Preliminary Charging by Pressures (Optional)

1. Following airflow verification and charge weigh-in, run the unit for a minimum of 15 minutes prior to noting pressures and temperatures.
2. Ensure that the maximum operating pressure as listed on the unit nameplate is considered when connecting to any CONDENSER UNIT or EVAPORATOR UNIT and design pressures are not exceeded.

IMPORTANT: Indoor conditions as measured at the indoor coil must be within 2°F [1.1°C] of comfort conditions per the homeowner's preference.

NOTICE: If the indoor temperature is above or below this range, run the system to bring the temperature down or run the electric heat/furnace to bring the temperature up to within this range.

3. ***Note the Outdoor Dry Bulb Temperature, ODDB° = _____°F [°C]. Unit charging is recommended under the following outdoor conditions ONLY:***

   Cooling Mode ONLY: 55°F [12.8°C] outdoor dry bulb and above.

   Heating Mode ONLY: Between 40°F [4.4°C] and 60°F [15.6°C] outdoor dry bulb

4. Locate and note the design pressures. The correct liquid and vapor pressures are found at the intersection of the installed system and the outdoor ambient temperature on the Charging Chart located inside the access panel cover.

Liquid Pressure: = ______psig [kPa]; Vapor Pressure = ______psig [kPa]

NOTICE: ***The refrigerant pressures provided are for preliminary charge check ONLY. These pressure values are typical, but may vary due to application. Evaporator load (indoor coil in cooling mode/outdoor coil in heating mode) will cause pressures to deviate. The values listed are for the correct matched indoor coil ONLY!***

5. ***If the measured liquid pressure is below the listed requirement for the given outdoor and indoor conditions, add charge. If the measured liquid pressure is above the listed requirement for the given outdoor and indoor conditions, remove charge.***

5.9.4 Final Charging by Liquid Subcooling

1. After preliminary charging by weight or pressures, find the design subcooling value. The correct subcooling value is found at the intersection of the installed system and the outdoor ambient temperature on the Charging Chart located inside the access panel cover.

   SC° from Charging Chart = _____°F [°C].

IMPORTANT: ***Indoor conditions as measured at the indoor coil are required to be within 2ºF (1.1ºC) of comfort conditions as preferred by the homeowner and must have operated for at least 15 minutes prior to final charge adjustment. Unit charging is recommended under the following outdoor conditions ONLY:***

Cooling Mode: 55°F [12.8°C] outdoor dry bulb and above

Heating Mode: Between 40°F [4.4°C] and 60°F [15.6°C] outdoor dry bulb

NOTICE: Systems should not be charged below 40°F [4.4°C] outdoor temperature.

NOTICE: If the indoor temperature is above or below the recommended range, run the system to bring the temperature down or run the electric heat/furnace to bring the temperature up.

2. Note the measured Liquid Pressure, Liq Press = ______psig [kPa], as measured from the liquid (small) service valve. Use the R-454B Temperature Pressure Chart below to determine the bubble point saturation temperature corresponding to the measured liquid pressure.

   Liquid Saturation Temperature, SAT°= _____°F [°C].

3. Note the liquid line temperature, Liq° = _____°F [°C], as measured from a temperature probe located within 6" [15.2 cm] outside of the unit on the copper liquid line (small line). It is recommended to use a calibrated clamp-on temperature probe or an insulated surface thermocouple.

4. Subtract the liquid line temperature from the saturation temperature to calculate subcooling. SAT°_____°F [°C] - Liq°_____°F [°C] = SC°_____°F [°C]

5. Adjust charge to obtain the specified subcooling value. If the measured subcooling level is below the listed requirement for the given outdoor temperature, add charge. If the measured subcooling level is above the listed requirement for the given outdoor temperature, remove charge.

5.9.5 R-454B Temperature Pressure Chart

Table 10: R-454B Temperature Pressure Chart

Saturation temperature	R–454B bubble point	R–454B dew point	Saturation temperature	R–454B bubble point	R–454B dew point	Saturation temperature	R–454B bubble point	R–454B dew point	Saturation temperature	R–454B bubble point	R–454B dew point
°F [°C]	psig [kPa]	psig [kPa]	°F [°C]	psig [kPa]	psig [kPa]	°F [°C]	psig [kPa]	psig [kPa]	°F [°C]	psig [kPa]	psig [kPa]
−55 [−48]	2 [11]	1 [6]	17 [−8]	69 [476]	66 [452]	47 [8]	128 [881]	122 [843]	80 [27]	223 [1540]	215 [1483]
−50 [−46]	4 [28]	3 [22]	19 [−7]	72 [498]	69 [474]	49 [9]	133 [914]	127 [875]	85 [29]	241 [1663]	233 [1604]
−45 [−43]	7 [46]	6 [39]	21 [−6]	76 [521]	72 [496]	51 [11]	138 [948]	132 [908]	90 [32]	260 [1793]	251 [1730]
−40 [−40]	10 [66]	8 [58]	23 [−5]	79 [545]	75 [518]	53 [12]	143 [983]	137 [942]	95 [35]	280 [1930]	270 [1864]
−35 [−37]	13 [88]	11 [79]	25 [−4]	83 [569]	79 [541]	55 [13]	148 [1018]	142 [976]	100 [38]	301 [2074]	291 [2005]
−30 [−34]	16 [112]	15 [102]	27 [−3]	86 [594]	82 [565]	57 [14]	153 [1055]	147 [1011]	105 [41]	323 [2225]	312 [2154]
−25 [−32]	20 [139]	19 [128]	29 [−2]	90 [619]	86 [590]	59 [15]	158 [1092]	152 [1048]	110 [43]	346 [2385]	335 [2311]
−20 [−29]	24 [168]	23 [156]	31 [−1]	94 [645]	89 [615]	61 [16]	164 [1130]	157 [1085]	115 [46]	370 [2552]	359 [2476]
−15 [−26]	29 [199]	27 [186]	33 [1]	97 [672]	93 [641]	63 [17]	170 [1169]	163 [1123]	120 [49]	396 [2728]	384 [2650]
−10 [−23]	34 [234]	32 [219]	35 [2]	101 [700]	97 [668]	65 [18]	175 [1209]	168 [1161]	125 [52]	422 [2912]	411 [2833]
−5 [−21]	39 [271]	37 [255]	37 [3]	106 [728]	101 [695]	67 [19]	181 [1250]	174 [1201]	130 [54]	450 [3106]	439 [3025]
0 [−18]	45 [312]	43 [294]	39 [4]	110 [757]	105 [723]	69 [21]	187 [1292]	180 [1242]	135 [57]	480 [3309]	468 [3227]
5 [−15]	52 [356]	49 [337]	41 [5]	114 [787]	109 [752]	71 [22]	194 [1335]	186 [1284]	140 [60]	511 [3521]	499 [3439]
10 [−12]	59 [404]	55 [382]	43 [6]	119 [818]	113 [782]	73 [23]	200 [1379]	192 [1326]	145 [63]	543 [3744]	531 [3663]
15 [−9]	66 [455]	63 [432]	45 [7]	123 [849]	118 [812]	75 [24]	206 [1424]	199 [1370]	150 [66]	577 [3977]	565 [3898]

5.10 Completing Installation

1. Disconnect the hoses from the pressure ports. Replace the pressure port caps and tighten adequately to seal caps. **DO NOT overtighten.**
2. Replace the service valve top caps finger-tight and then tighten with a wrench to adequately seal caps. **DO NOT overtighten.**
3. Replace control box cover and service panel and install screws to secure panels.
4. Restore power to unit at disconnect if required.
5. Exit Charging Mode and configure EcoNet™ Smart Thermostat or Legacy Thermostat per the thermostat installation instructions and set to desired mode and temperature.

6.0 NORMAL SEQUENCE OF OPERATION

The following sections provide details on how the (-)P17AY outdoor systems are designed to operate under normal conditions. Under abnormal conditions, Active Compressor and Inverter Protection features built into the controls may alter how the system operates to protect the compressor and inverter from damage. The sequence of operation is based on the system being set up for EcoNet™ communications using an EcoNet™ enabled air-handler or gas furnace and an EcoNet™ Smart Thermostat. A section is provided at the end that describes how the system will operate if a conventional 24VAC 2-stage thermostat is used.

6.1 Cooling and Heating Mode

The (-)P17AY unit has several modes of operation. These modes are listed and described below.

- Installations with Econet Stat and matching Rheem indoor:
  The unit will have fully variable operation and has overdrive capability in both cooling and heating. Heating mode operation allows the unit to deliver up to 70% of rated nominal capacity at 5°F. All diagnostic features of the Econet system are available through the thermostat and the Contractor App.
- Installations using a 2 Stage 24V legacy thermostat and a 2 Stage non Econet indoor with (-)P17AY outdoor:
  It is recommended that a jumper be installed between the U1-U2 terminals on the outdoor control board after completion of unit charging. This method allows full modulation of the outdoor unit based on system parameters and temperatures to deliver maximum performance. The indoor is controlled through the Y1 and Y2 commands from the thermostat based on demand, and the Rheem Algorithm in the outdoor will respond to the varying conditions. Diagnostic data is available through the Contractor App.
- Installations using a 2 Stage 24V thermostat and a 2 Stage non Econet indoor, if the U1-U2 jumper is not installed:
  The unit will operate at 2 discreet speeds in both cooling and heating. Capacity is limited to the nominal rated capacity in heating and cooling modes. Diagnostic data is available through the Contractor App.

6.2 On-Demand Cooling Dehumidification

The EcoNet™ Smart Thermostat can be configured for On-Demand Dehumidification. This feature allows the system to automatically increase the level of dehumidification in the cooling mode by decreasing the indoor air-flow by 15% when the indoor relative humidity measured at the Smart Thermostat rises above the set-point. Once the relative humidity drops to or below the set-point, the indoor air-flow level returns to normal.

6.3 Low Ambient Cooling Mode

Some applications require for space cooling when the outdoor ambient temperature is below normal (<55°F [13ºC]) such as a computer room or an interior space with a heat source that must be cooled. (-)P17AY heat pumps are equipped with a special low ambient cooling mode that allows the system to provide cooling when the outdoor temperature is below 55°F [13ºC] by cycling the outdoor fan to maintain an adequate condensing temperature and subcooling level based on an input from the coil temperature thermistor.

6.4 Supplemental Electric Heat in Heating Mode

If the building load should exceed the heating capacity in extreme outdoor conditions, the EcoNet™ Smart Thermostat will direct the RH(-)V air-handler to energize supplemental electric heat as required to meet the building load. The indoor air-flow will be forced to operate at the maximum level for the system. For 13kW heaters and higher, the supplemental electric heat will be energized in two stages as required. The compressor and outdoor fan will continue to operate at maximum capacity while supplemental electric heat is energized.

6.5 Dual Fuel Applications – Heating Mode

If the building load should exceed the heat pump heating capacity in extreme outdoor conditions, the EcoNet™ Smart Thermostat will direct the outdoor unit to shut down and heating responsibility will be transferred to the gas furnace. An outdoor ambient temperature can be set in the EcoNet™ Smart Thermostat to direct the system to automatically switch to gas heat when the outdoor ambient temperature drops below that set-point. If the EcoNet™ Smart Thermostat is set to the EMERGENCY HEAT (Furnace Only) mode, heating responsibility will be transferred to the gas furnace.

6.6 Demand Defrost

Defrosting of the outdoor coil in the heating mode is controlled by the Universal Outdoor Control (UODC). (-)P17AY outdoor heat pumps utilizes “demand defrost” that initiates a defrost cycle only when frosting is detected on the outdoor coil during heating operation. The UODC continuously monitors the Outdoor Ambient Temperature Thermistor (OAT) and Outdoor Coil Temperature Thermistor (EVAPIN) to determine when a defrost cycle is required. The following sequence is followed for defrost cycles.

- **Defrost Initiation:** A defrost cycle is initiated when the following conditions are met.
  1. The outdoor coil temperature is below 35°F [1.7°C].
  2. The compressor has operated for at least 34 minutes with the outdoor coil temperature below 35°F [1.7°C].
  3. The UODC determines a defrost cycle is required based on the OAT and EVAPIN temperatures.

If the above conditions are met, the following action will be taken.

1. The compressor speed is ramped to the predetermined reversing valve switching speed for 30 seconds before the reversing valve is de-energized.
2. The reversing valve is de-energized which will cause it to shift to the cooling position.
3. The outdoor EXV is driven to the 100% open position.
4. The outdoor fan motor is de-energized.
5. The indoor air-handler or gas furnace is directed to supply supplemental heat to prevent cold air from being discharged from the supply registers during the defrost cycle.
6. The compressor speed is ramped to the pre-determined defrost speed for the duration of the defrost cycle.

- Defrost Termination: The defrost cycle will continue until the coil temperature has reached the termination temperature or 14 minutes have elapsed, whichever comes first. The factory default termination temperature is 60°F [15.6°C], although this temperature can be changed to 40°F [4.4°C], 50°F [10°C], or 70°F [21.1°C] using dip switches on the UODC (see chart below for dip switch settings). When the coil temperature reaches the termination temperature or 14 minutes have elapsed, the following action is taken.
  1. The compressor speed is ramped to the reversing valve switching speed for 30 seconds before the reversing valve is energized.
  2. The reversing valve will be energized, switching it back to the heating position.
  3. The outdoor fan motor is energized.
  4. Auxiliary heat is de-energized.
  5. The EXV will return to the normal superheat control mode.
  6. The compressor speed will ramp to a pre-determined oil circulation speed for 6 minutes.
  7. The system returns to normal heating operation as directed by the EcoNet™ Smart Thermostat.

NOTE: Should the outdoor ambient temperature thermistor fail, the UODC will initiate a defrost every 34 minutes of operation when the coil temperature is below 35°F.

7.0 COMPONENTS & CONTROLS

7.1 EcoNet™ Universal Outdoor Control (UODC)

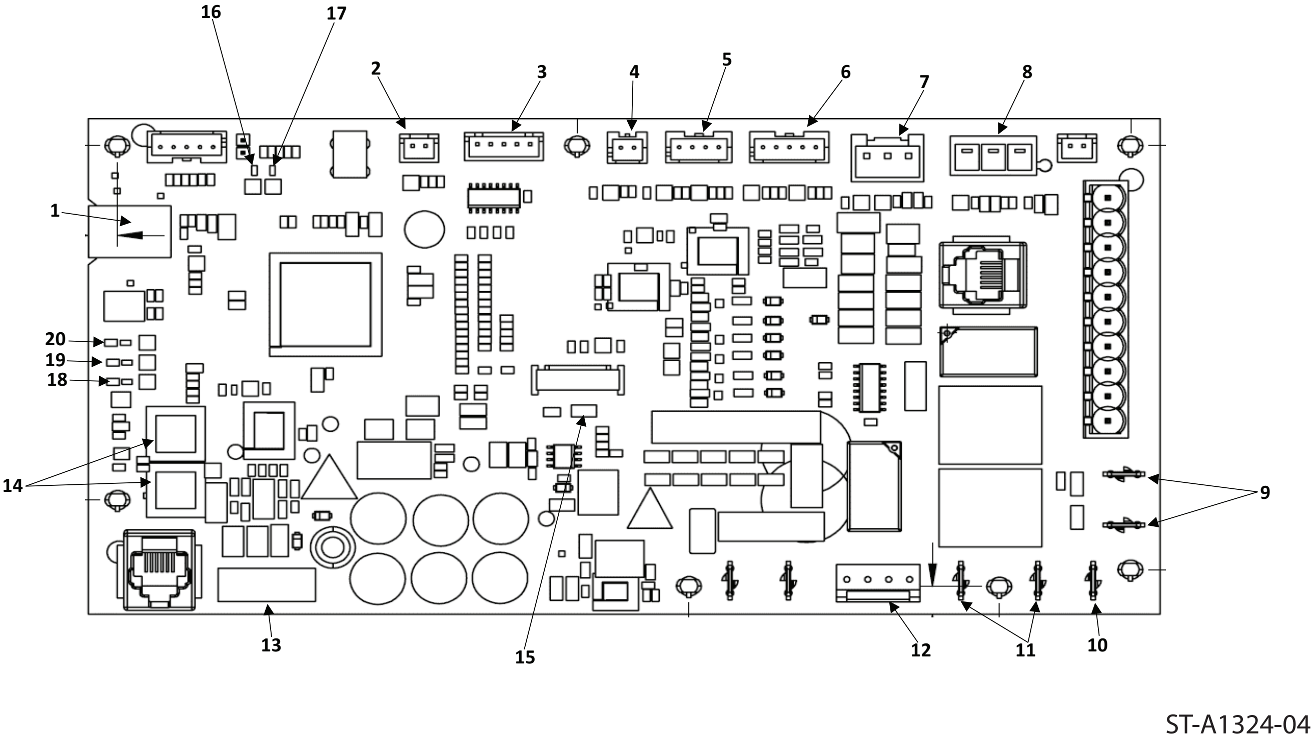


Figure 30: EcoNet™ Universal Outdoor Control (UODC) Connection Diagram

Table 12: Features on the UODC and Location of Each

Item Number	Component Feature
1	Bluetooth
2	Discharge Temp
3	EXV
4	OAT
5	COIL/OST
6	OLT/CPT
7	Suction Pressure Transducer
8	Liquid Pressure Transducer
9	Reversing Valve
10	HPS

Item Number	Component Feature
11	Common
12	Pressure Relief Valve
13	Mod Bus
14	SW1 and SW2
15	Power Supply LED
16	Fault Code LED
17	CPU Status LED
18	Heating Status LED
19	Cooling Status LED
20	Bluetooth LED

7.1.1 Board Features and Connections

(-)P17AY outdoor units are equipped with a Universal Outdoor Control (UODC) that interfaces with the inverter, EcoNet™ Smart Thermostat, and EcoNet™ enabled air-handler or gas furnace using the EcoNet™ serial communication protocol. The UODC provides a low voltage terminal block for control wiring and connections for various sensors, controls, outdoor fan motor and inverter. If an alert or alarm occurs the EcoNet™ Smart Thermostat will display the active faults as well as fault history. If used with the conventional 24 VAC 2-stage thermostat then these faults can be found using the Bluetooth Contractor's App. Buttons are provided to initiate and terminate various test modes. Model-specific information (model data) required for proper operation is preloaded into the UODC.

⚠CAUTION:

UNIT MAY START SUDDENLY AND WITHOUT WARNING.

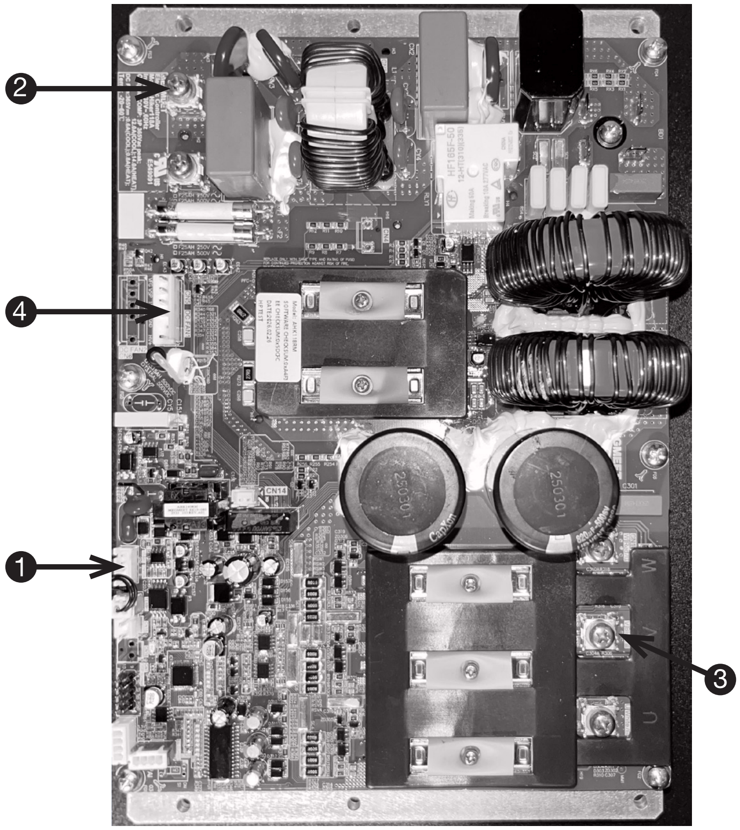


Figure 31: 2/3 Ton Power Inverter Compressor Control Diagram

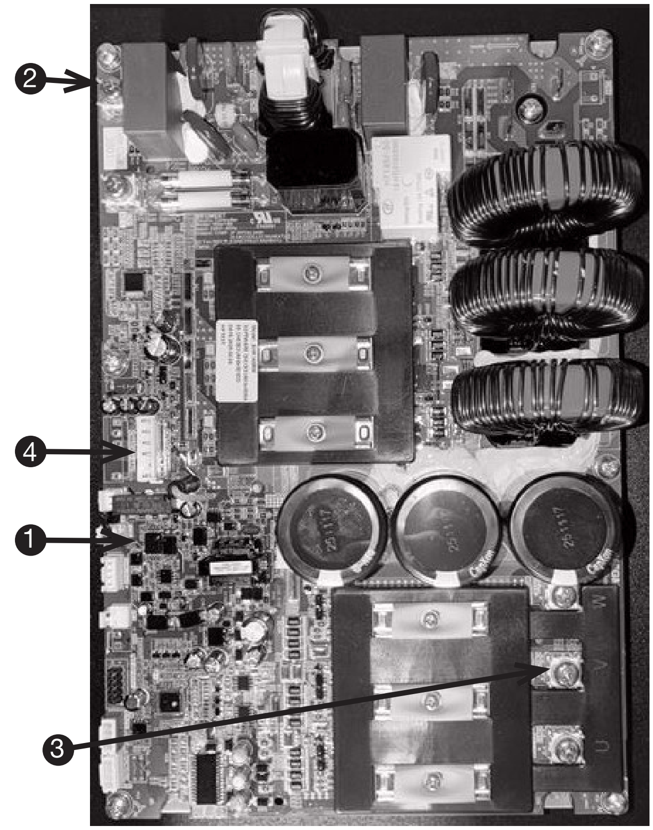


Figure 31: 4/5 Ton Power Inverter Compressor Control Diagram

Table 13: Features on the Power Inverter Compressor Control

Item Number	Component Feature
1	RS485 Communication
2	Input Power
3	Drive Output
4	OD Fan Motor

7.1.2 Factory Superheat Setting

The UODC is pre-programmed with the optimum superheat setting of 10º for each outdoor unit.

7.2 Power Inverter Compressor Control

(-)P17AY outdoor units are equipped with a power inverter that varies the compressor speed to match the changing capacity needs of the conditioned space. The inverter interfaces with the Universal Outdoor Control (UODC) which communicates the level of system capacity that is required to the inverter based on input from the EcoNet™ Smart Thermostat or conventional 24VAC 2-stage thermostat. The inverter converts incoming single phase power to simulated variable frequency 3-phase power that is connected to the 3-phase compressor motor. Each of the four (-)P17AY models has a unique inverter specifically designed and qualified for that specific model to provide reliable operation under the most extreme conditions. Each inverter is programmed to monitor compressor power consumption, motor torque, input current, input voltage, compressor discharge pressure, and compressor discharge temperature. When the inverter identifies a condition that could potentially result in compressor or inverter damage, it automatically reduces the compressor speed until a more reliable operating condition is obtained or shuts the compressor completely off if necessary. Once safe operating conditions are attained, the inverter will gradually increase the compressor speed in an attempt to meet the capacity demand as long as the operating conditions remain within the safe operating range of the compressor and inverter.

8.0 ACTIVE SYSTEM PROTECTION FEATURES

The controls found in the (-)P17AY heat pumps are designed to prevent the system from operating in under conditions that could be harmful to the compressor and inverter. The Universal Outdoor Control (UODC) and Power Inverter continuously monitor multiple sensors, current, and voltage and will modify the compressor speed or completely shut the system down to protect the compressor and/or inverter if harmful operating conditions are sensed. This process is called Active System Protection. Sections 8.1 – 8.14 give a brief description of the different forms of protection that are provided. Refer to Section 9, the Diagnostic and Troubleshooting Section of this manual for Active System Protection fault codes and additional details for each fault.

8.1 Minimum Run Timer

A minimum run time of 5 minutes is maintained by the UODC to minimize short cycling which can be harmful to the compressor.

8.2 Oil Return Cycle

When the system has been operating at significantly reduced capacity for an extended period of time, the Universal Outdoor Control (UODC) will signal the Inverter to speed the compressor up to 70% capacity to help bring any oil that has accumulated in the indoor coil and refrigerant lines back to the compressor sump.

8.3 Low Suction Pressure/ Loss of Charge

The Universal Outdoor Control (UODC) continuously monitors the Suction Pressure Transducer input and will protect the compressor from damage by shutting it down when the suction pressure drops below 50 PSIG [345 kPa] in the cooling mode and below 15 PSIG [103 kPa] in the heating mode. A low pressure condition can result from inadequate indoor air-flow, low refrigerant charge, failed EXV, or a restriction in the refrigerant circuit. The UODC will allow the compressor to restart if the suction pressure rises to 95 PSIG [655 kPa] in the cooling mode and 40 PSIG [276 kPa] in the heating mode. A low refrigerant pressure fault will be ignored for the first 90 seconds of compressor operation and during the entire defrost cycle to eliminate nuisance faults.

If there are 3 low pressure faults in the same call for cooling or during 120 minutes of continuous heating operation, the UODC will lock the compressor out and the EcoNet™ Smart Thermostat will display a Low Refrigerant Pressure Lockout fault on the screen. If the outdoor ambient is below -10°F [-23°C] in the heating mode when the lockout occurs, the control will automatically reset when the outdoor ambient rises to -10°F [-23°C]. If the outdoor ambient is above -10°F [-23°C], a manual reset is required for the UODC to exit the compressor lock-out mode and clear the fault. This is accomplished by disconnecting the electrical power to **both** the indoor and outdoor units for 1 minute and then reconnecting power.

NOTE: If the system experiences a low refrigerant pressure lock-out, the system should be evaluated to determine the cause for the low pressure condition and corrective action taken to eliminate the cause. Possible causes include low refrigerant charge, failed indoor blower motor, dirty return air filter, or a dirty indoor coil in the cooling mode or low refrigerant charge, a failed outdoor motor, or a dirty outdoor coil in the heating mode.

8.4 Compressor Shut-Down Sequence for High or Low Refrigerant Pressure Fault

1. The compressor is commanded to operate at zero (0) RPM for a minimum of 5 minutes.
2. The outdoor EXV will be directed to completely close for a period of 5 minutes and will then open up completely.
3. The outdoor fan motor will continue to operate during the 5 minute compressor off delay.
4. The EcoNet™ Smart Thermostat and the Contractor App will display the applicable fault code.
5. If after 5 minutes cooling or heating demand persists and the pressure has reached reset conditions, normal system operation will resume and the fault codes will be cleared from the UODC and EcoNet™ Smart Thermostat displays.
6. If after 5 minutes cooling or heating demand persists and the pressure has not reached reset conditions, the outdoor fan motor will be shut down. Once the pressure reaches reset conditions after the 5 minute delay, normal system operation will resume.

8.5 Overcurrent and Current Imbalance
If the compressor current exceeds an acceptable level for the compressor or inverter, the inverter will reduce the compressor speed to allow the current to return to an acceptable level. If there is a current imbalance between the compressor 3-phase windings, the inverter will shut the compressor down for 5 minutes and will lock the compressor out if there are 3 faults within a single call for operation.

8.6 Compressor Operation Outside Envelope
If the inverter detects that the compressor motor torque exceeds an acceptable level for the compressor, the inverter will reduce the compressor speed to keep the torque at an acceptable level.

8.7 Over and Under Voltage
If the supply voltage or internal DC voltage is not within an acceptable operating range, the inverter will shut the compressor off until the voltage returns to an acceptable level.

8.8 Inverter Over Temperature
If the internal inverter temperature sensors detect excessive temperatures within the inverter, the inverter will reduce the speed of the compressor or shut the compressor down until the temperatures drop to an acceptable level. The compressor will be locked out if there are 3 faults within a single call for operation.

8.9 Controls and Communication Malfunction
If the controls senses a malfunction within the control system or communications or if system model data is not available, the controls will act to shut the system down to prevent the system from operating at a condition that could harm components.

8.10 Sensor Failure Default Operation
If the controls sense an externally connected sensor has failed, the system will enter a fail safe operating mode and will continue to condition the space until the sensor can be replaced. A fault code will be available on the EcoNet™ Smart Thermostat and through the Contractor App, identifying which sensor has failed. See table 14 for the default operation for a sensor failure.

8.11 Exiting Active Protection Lock-Out Mode
Exiting an Active Protection Lock-Out mode can be accomplished by disconnecting electrical power to both the indoor and outdoor units for 1 minute and then restoring power.   Keep in mind there was a reason for the lock-out, so the fault code on the EcoNet™ Smart Thermostat and through the Contractor App should be read to assist with diagnosing the root cause of the lock-out and corrective action should be taken to prevent the system from repeating the lock-out.

Table 14: Sensor Failure Identification Chart

Failed Component	Function	Default Operation
Outdoor Sensor (OAT)	Low Ambient Cooling	No Low Ambient function
	Defrost	Defrost will be initiated based on coil temperature and time
	One minute fan off delay on COOL mode	No delay functions if failure is open or short. Continue function for a thermistor range error.
	PWM Shift above 104°F [40°C]	Shift will not occur
Coil Sensor	Defrost Initiate and Terminate	Defrost will occur at each time interval (34 mins), but will terminate after 5 minutes
	Heating Superheat Calculation	Unit Shuts Down
	Low Ambient Cooling	No function
Liquid Pressure Transducer	Subcooling Calculation	Econet - Display alert, Continue operation
	Saturated Liquid Temp Calculation	Continue to operate, but system speed limited to nominal capacity
Suction Pressure Transducer	Saturated Suction Temp Calculation	Unit Shuts Down
Suction Temperature Sensor	Heating Superheat Calculation	Unit Shuts Down

9.0 DIAGNOSTICS & TROUBLESHOOTING

Advanced operating status and diagnostic information is available through the EcoNet™ Smart Thermostat that greatly enhances the ability to quickly and accurately diagnose system faults. For further assistance for troubleshooting a system please see the Bluetooth Contractor's App or the EcoNet™ Help Pages at myrheem.com.

Table 15: EcoNet™ Fault Codes & Response Actions

EcoNet Fault Code	Response Action
A001_0 Model Data Configuration Error	Disabled while active
A002_0 Compressor Model Data Error	Disabled while active
A003_0 Fan Model Data Error	Disabled while active
A004_0 EcoNet Thermostat Version Not Compatible	Disabled while active
A093_0 Model Data Restore Failure	Disabled while active
A111_0 Communications Lost with Indoor Unit	Disabled while active
A112_0: Expected EcoNet IDU not connected	Disabled while active (Regal Beloit and Emerson only)
A811_0 Inverter - IPM Fault	3-strikes, permanent lockout
A812_0 Inverter - Drive Failure	3-strikes, permanent lockout
A813_0 Inverter - IPM Sampling Fault	3-strikes, permanent lockout
A814_0 Inverter - AC Input Sampling Fault	3-strikes, permanent lockout
A815_0 Inverter - Fan 1 Fault	3-strikes, permanent lockout
A816_0 Inverter - Fan 2 Fault	3-strikes, permanent lockout
A817_0 Inverter - Rect. Bridge Temp Sensor	3-strikes, permanent lockout
A818_0 Inverter - Logic Board Comm Fault	3-strikes, permanent lockout
A819_0 Inverter - DC Overvoltge Logic Fault	3-strikes, permanent lockout
A821_0 Inverter - DC Undervoltage Logic Fault	3-strikes, permanent lockout
A822_0 Inverter - Rect. Bridge Overtemp Fault	3-strikes, permanent lockout
A823_0 Inverter - AC Overrvoltage Logic Fault	3-strikes, permanent lockout
A824_0 Inverter - Compressor Reversed Connection	3-strikes, permanent lockout
A825_0 Inverter - AC Input Overcurrent	3-strikes, permanent lockout
A826_0 Inverter - AC Input Phase Fault	3-strikes, permanent lockout
A827_0 Inverter IPM Temp Sense Failure	Disabled while active
A828_0 Inverter EEPROM Failure	Disabled while active
A912_0 Inverter Fault - Self-Check Fault	Disabled while active
A915_0 Inverter Fault - Comm Fault	Shutdown, restart upon clearing
A920_0 Inverter Fault - PFC Desaturation	Shutdown, restart upon clearing
A924_0 Inverter Fault - Board Temp	Shutdown, restart upon clearing
A925_0 Inverter Fault - Comp. Model Unknown	Disabled while active
A926_0 Inverter Fault - HP Sensor Not Configured	Disabled while active
A927_0 Inverter Fault - Drive Configuration	Disabled while active
A928_0 Locked Out - See History Faults	Permanent lockout
A929_0 240V Missing or Inverter Comm Failure	Disabled while active
A948_0 Inverter Fault - AC Input Overvoltage	Shutdown, restart upon clearing
A949_0 Configuration Data Restore Failure	Disabled while active
A950_0 Configuration Data Restore Failure	Disabled while active
A953_0 Coil Temp Thermistor Failure	algorithms default
A954_0 Suction Temp Thermistor Failure	algorithms default

Table 15: EcoNet™ Fault Codes & Response Actions (cont.)

A956_0 Suction Pressure Sensor Failure	algorithms default
A957_0 Low Refrigerant Pressure	4 hour lockout
A958_0 High Refrigerant Pressure	4 hour lockout
A960_0 Compressor Locked Rotor - Lockout	Disabled while active
A962_0 Compressor U-Phase Over Current	3-strikes, permanent lockout
A963_0 Inverter Fault - AC Input Undervoltage	Shutdown, restart upon clearing
A966_0 Inverter Fault - Lost Rotor Position	3-strikes, permanent lockout
A969_0 Loss of Discharge Temperature Protection	Disable when active
A970_0 Inverter/Compressor Mismatch	Disabled while active
A972_0: Compressor Discharge Temp High at Min RPM	Disabled while active
A975_0 Contactor Stuck On	Shutdown, restart upon clearing
A979_0 Compressor Over/Under Speed	Shutdown, restart upon clearing
A985_0 Fan Self Check Fault	Disable when active
A987_0 Compressor Loss of Phase	3-strikes, permanent lockout
A988_0 Compressor Control Lost	3-strikes, permanent lockout
A989_0 Charge Relay Open	3-strikes, permanent lockout
A991_0 Compressor V-Phase Over Current	3-strikes, permanent lockout
A992_0 Compressor W-Phase Over Current	3-strikes, permanent lockout
A993_0 Compressor Module Over Current	3-strikes, permanent lockout
A994_0 Compressor Parameter Fault	Disabled while active
A998_0 Fan Motor Parameter Fault	Disabled while active
T011_0 Pressure Relief Valve Stuck Closed	Disabled while active
T012_0 Pressure Relief Valve Stuck Open	Disabled while active
T116_0 Suction Pressure Floodback Protection	Operation as described in Suct Press Flood Control requirements.
T949_0 Backup Ht -Amb Temp Too Low for HP	Normal Operation Resumes when OAT>30F
T911_0 Inverter Fault - Current Imbalance	3-strikes, permanent lockout
T913_0 Contactor Not Closing	3-strikes, permanent lockout
T914_0 Inverter Fault - DC Voltage Low	3-strikes, permanent lockout
T916_0 Inverter Fault - Discharge Line Temp	3-strikes, permanent lockout
T917_0 Inverter Fault - PIM Temp	3-strikes, permanent lockout
T918_0 Inverter Fault - PFC Temp	3-strikes, permanent lockout
T921_0 Inverter Fault - Comp. Overcurrent	3-strikes, permanent lockout
T922_0 Inverter Fault - PIM Temp Foldback	3-strikes, permanent lockout
T923_0 Inverter Fault - High Refrig Pressure	3-strikes, 4 hour lockout
T931_0 Fan Fault Phase Over Current	3-strikes, permanent lockout
T932_0 Fan Fault Phase Current Imbalance	3-strikes, permanent lockout
T933_0 Fan Fault Motor Over/Under Speed	3-strikes, permanent lockout
T934_0 Fan Fault U-Phase Over Current	3-strikes, permanent lockout
T935_0 Fan Fault V-Phase Over Current	3-strikes, permanent lockout
T936_0 Fan Fault W-Phase Over Current	3-strikes, permanent lockout
T937_0 Fan Fault Module Over Current	3-strikes, permanent lockout
T938_0 Fan Fault Loss of Phase	3-strikes, permanent lockout
T939_0 Fan Fault Loss of Control	3-strikes, permanent lockout
T941_0 Fan Fault Start Up Fault	3-strikes, permanent lockout
T942_0 Fan Fault Module Temp High	3-strikes, permanent lockout
T943_0 Fan Fault Module Over Temperature	3-strikes, permanent lockout
T944_0 Inverter - Envelope Protection	none
T945_0 Inverter Fault - PFC Overcurrent	3-strikes, permanent lockout
T946_0 Inverter Fault - DC Bus Overvoltage	3-strikes, permanent lockout, until DC voltage returns to normal
T947_0 Inverter Fault - DC Bus Undervoltage	3-strikes, permanent lockout
T952_0 Outside Temp Thermistor Failure	algorithms default
T953_0 Coil Temp Thermistor Failure	Use TEMP_SST in Superheat Calc instead
T955_0 Compressor Temp Thermistor Failure	algorithms default
T957_0 Low Refrigerant Pressure	3-strikes, 4 hour lockout
T958_0 High Refrigerant Pressure	3-strikes, 4 hour lockout
T959_0 Compressor Locked Rotor	3-strikes, permanent lockout
T961_0 Discharge Temp Thermistor Failure	algorithms default
T964_0 Inverter Fault - PIM Over-temp	3-strikes, permanent lockout
T965_0 Inverter Fault - PFC Over-temp	3-strikes, permanent lockout
T967_0 Inverter Fault - Low Line Current Trip	3-strikes, permanent lockout
6. After setting the fault, confirm that the	3-strikes, permanent lockout
T971_0 Compressor Lube Protection	none

Diagnostics

Table 15: EcoNet™ Fault Codes & Response Actions (cont.)

T972_0 Compressor Discharge Temp High	3-strikes, permanent lockout
T974_0 Line Current Trip	3-strikes, permanent lockout
T976_0 Fan Phase Current Low Trip	3-strikes, permanent lockout
T977_0 Fan Inrush Relay Not Closed	3-strikes, permanent lockout
T981_0 Fan Overcurrent Trip	3-strikes, permanent lockout
T982_0 Fan Overvoltage Trip	3-strikes, permanent lockout
T983_0 Fan Undervoltage Fault	3-strikes, permanent lockout
T984_0 Fan Locked Rotor Fault	3-strikes, permanent lockout
T986_0 High Refrigerant Pressure Envelope	3-strikes, permanent lockout
T995_0 IPM Overcurrent Trip	3-strikes, permanent lockout
T996_0 Phase Current Low Trip	3-strikes, permanent lockout
T997_0 High Side Overcurrent Trip	3-strikes, permanent lockout
T999_0 Fan Motor Phase Imbalance	3-strikes, permanent lockout

9.1 Checking Transducers & Temperature Sensors

TRANSDUCERS:

Checking transducers for accuracy can be tricky. A technician will be required to do some voltage reading and math to validate the transducer is functioning properly. Additionally, comparing it to a reliable source can also be a challenge. Unless the gauges have been calibrated recently, the question remains, which one is right?

Knowing where to take the measurement, and getting solid reading is crucial. Measurements are done in the 0-5 volt DC range. One confusing point may be that we will take our measurements OUT and IN to the control, which are reversed when we talk formulas because we want the IN and OUT of the transducer. For instance, 5VDC out of the control board, translates to 5VDC into the transducer. And the lower variable voltage output from the transducer will be the input to the control board.

The transducer is not removed or disconnected to make these checks. The technician's meter leads need to be the smaller needle type, or actual needles can be used to gain access to the points of measurements.

Formulas for calculating gauge pressure are shown below.

SUCTION LINE TRANSDUCER:

PSIG = 375 * (VDC out / VDC in) - 51.956

LIQUID LINE TRANSDUCER:

PSIG = 812.5 * (VDC out / VDC in) - 105.358

IMPORTANT: Do the division inside the parenthesis first, multiplication second, and subtraction last.

SUCTION LINE TRANSDUCER:

VDC out = 2.4
VDC in = 5.1
So...
PSIG = 375 * (2.4 / 5.1) - 51.956
PSIG = 375 * (0.47) - 51.956
PSIG = 176.25 - 51.956
PSIG = **124.294**

LIQUID LINE TRANSDUCER:

VDC out = 3.4
VDC in = 5.1
So...
PSIG = 812.50 * (3.4 / 5.1) - 105.358
PSIG = 812.50 * (0.667) - 105.358
PSIG = 541.67 - 105.358
PSIG = **436.312**

The pressures are best measured when the system is off since they will be the most stable.

The indoor transducer may be removed so the pressure can be checked with gauges at the actual port the transducer is connected to. Pressures for outdoor transducers can be checked at the outdoor unit service ports with gauges since they are close enough in proximity to the transducers.

With the system powered, use the smaller meter tips to measure the voltage at the back of the transducer harness where it plugs into the control board. Voltage In will be measured from the Red and Black wires. (Red is +, Black is -). This should be very close to 5VDC, but may vary by a few 1/10ths. Voltage Out will be measured from Green to Black. (Green is the variable +, Black remains -).

TEMPERATURE SENSORS:

All the temperature sensors/thermistors used in the equipment use the same scale of 10,000 Ohms at

77ºF (25ºC). This means, a sensor exposed to 77ºF will show a resistance of 10,000 Ohms +/- 1%. As the temperature decreases, the resistance increases. Alternatively, as the temperature increases, the resistance decreases.
Measurements will be made with the sensor disconnected from the control board. Again, comparing the results must be done against a calibrated tester.
A glass of water, mixed completely with ice chips and given several minutes to settle should measure 32 to 32.4ºF. [0 - 0.2 ºC]

Apply resistance measurements to Table 15 and compare to the control.
32º will have a resistance +/- 1% of 32,650 Ohms.
In the event Celsius is being used, the Fahrenheit temperature will need to be converted.
*ºC = (ºF - 32) * 5 / 9*
Example using 82ºF
*ºC = (82 - 32) * 5 / 9*
*ºC = (50) * 5 / 9*
ºC = 250 / 9
ºC = 27.8

Table 16: Temperature Sensor to Resistance Measurement Chart

Temp F°	Ohms	Temp F°	Ohms	Temp F°	Ohms	Temp F°	Ohms
0	85,378	33	31,738	66	13,138	99	5,961
1	82,710	34	30,855	67	12,811	100	5,827
2	80,135	35	30,000	68	12,493	101	5,697
3	77,649	36	29,171	69	12,184	102	5,570
4	75,249	37	28,376	70	11,883	103	5,446
5	72,931	38	27,589	71	11,591	104	5,326
6	70,693	39	26,834	72	11,307	105	5,208
7	68,531	40	26,103	73	11,031	106	5,094
8	66,442	41	25,394	74	10,762	107	4,982
9	64,475	42	24,706	75	10,501	108	4,873
10	62,475	43	24,039	76	10,247	109	4,767
11	60,592	44	23,393	77	10,000	110	4,663
12	58,771	45	22,766	78	9,760	111	4,562
13	57,012	46	22,158	79	9,526	112	4,464
14	55,311	47	21,568	80	9,298	113	4,368
15	53,667	48	20,996	81	9,077	114	4,274
16	52,077	49	20,441	82	8,862	115	4,183
17	50,540	50	19,902	83	8,651	116	4,094
18	49,054	51	19,379	84	8,448	117	4,007
19	47,616	52	18,872	85	8,250	118	3,922
20	46,225	53	18,379	86	8,056	119	3,839
21	44,880	54	17,902	87	7,868	120	3,758
22	43,578	55	17,438	88	7,685	121	3,679
23	42,318	56	16,987	89	7,507	122	3,602
24	41,099	57	16,550	90	7,333	123	3,527
25	39,920	58	16,125	91	7,164	124	3,453
26	38,778	59	15,713	92	7,000	125	3,382
27	37,672	60	15,312	93	6,839	126	3,312
28	36,602	61	14,923	94	6,683	127	3,243
29	35,566	62	14,545	95	6,531	128	3,177
30	34,563	63	14,178	96	6,383	129	3,112
31	33,591	64	13,822	97	6,238	130	3,048
32	32,650	65	13,475	98	6,098		

9.2 General Troubleshooting Guide

WARNING: Disconnect all power to unit before servicing. Contactor may break only one side. Failure to shut off power can cause electrical shock resulting in personal injury or death.

Table 17: Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	REMEDY
Unit will not run	• *Power off or loose electrical connection* • *Thermostat set too high or low.* • *Unit in active compressor protection lockout mode* • *Blown fuses/tripped breaker* • *Transformer defective* • *High-pressure control lock-out* • *Low-pressure control lock-out* • *Miswiring of communications (communication light on continuously)* • *Defective control board*	• *Check for correct voltage at line voltage connections in condensing unit.* • *Reset – Power cycle high and low voltage to outdoor unit.* • *Check control board diagnostic codes.* • *Replace fuses/reset breaker.* • *Check wiring. Replace transformer.* • *Reset by cycling power to unit. Also see high head pressure and low suction pressure remedies.* • *Check for refrigerant leaks.* • *Check communication wiring.*
Outdoor fan runs, compressor doesn't	• *Loose connection* • *Communication cable disconnected or failed* • *Compressor stuck, grounded or open motor winding, open internal overload.* • *Low-voltage condition*	• *Check for correct voltage at filter and inverter. Check and tighten all connections.* • *Check control board diagnostic codes.* • *Replace*
Insufficient cooling	• *Improperly sized unit* • *Improper indoor airflow* • *Incorrect refrigerant charge* • *Air, noncondensibles, or moisture in system* • *Restricted Refrigerant Circuit*	• *Recalculate load.* • *Check airflow. Should be approximately 400 CFM [189 l/s] per ton.* • *Charge per procedure attached to unit service panel.* • *Recover refrigerant. Evacuate and recharge. Replace filter drier.* • *Locate restriction and clear*
Compressor short cycles	• *Incorrect voltage* • *Improperly sized unit* • *Refrigerant undercharge or overcharge* • *(LPC or HPC Cycling)*	• *At inverter input terminals, voltage must be between 187-252 VAC when unit is operating.* • *Adjust charge per charging chart.*
Registers sweat	• *Low indoor airflow*	• *Increase speed of blower or reduce restriction. Replace air filter.*
High head, low vapor pressures	• *Restriction in liquid line, expansion device, or filter drier* • *Stuck EXV*	• *Remove or replace defective component.* • *Verify EXV operation.*
High head, high or normal vapor pressure – Cooling mode	• *Dirty outdoor coil* • *Refrigerant overcharge* • *Outdoor fan not running* • *Air or noncondensibles in system*	• *Clean coil.* • *Correct system charge.* • *Repair or replace.* • *Recover refrigerant. Evacuate and recharge.*
Low head, high vapor pressures	• *EXV in bypass mode* • *Reversing Valve leaking by* • *Bad compressor*	• *Verify thermostat connections at EXV control* • *Verify thermistor and pressure transducer connection and operation* • *Replace reversing valve* • *Replace compressor.*
Low vapor, cool compressor, iced indoor coil	• *Low indoor airflow* • *Operating below 55°F outdoors* • *Moisture in system* • *Low ambient cooling not operating (coil or ambient thermistor failure)*	• *Increase speed of blower or reduce restriction. Replace air filter.* • *Recover refrigerant. Evacuate and recharge. Replace filter drier.*
High vapor pressure	• *Excessive load* • *Defective compressor*	• *Recheck load calculation.* • *Replace compressor.*
Fluctuating head and vapor pressures	• *EXV hunting* • *Air or noncondensibles in system*	• *Check thermistor to vapor line connection. Check air distribution on coil.* • *Check suction thermistor and pressure transducer operation* • *Recover refrigerant. Evacuate and recharge.* • *Remove & confirm EXV movement. Clean EXV inside with nitrogen to remove any debris then reinstall*
Gurgle or pulsing noise at expansion device or liquid line	• *Air or noncondensibles in system* • *Undercharge long line application*	• *Recover refrigerant. Evacuate and recharge.* • *Adjust charge per charging chart.*

9.3 Service Analyzer Charts

Table 18: Service Analyzer Chart

COMPRESSOR OVERHEATING – HIGH DISCHARGE TEMP		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
High superheat (greater than 15°F [-8.3°C] at coil)	Low charge	Check system charge.
	Verify suction thermistor operation (10k thermistor)	Replace thermistor.
	Verify pressure transducer operation input and output voltage	Replace thermistor and/or harness and/or control board.
	Faulty metering device, inadequate suction thermistor or pressure transducer operation.	Restricted cap tube, EXV
		Foreign matter stopping flow
	High internal load	Hot air (attic) entering return
		Heat source on; miswired or faulty control
	Restriction in liquid line	Drier plugged.
		Line kinked.
	Low head pressure	Low charge
		Operating in low ambient temperatures
	Vapor or liquid line subjected to high heat source	Hot attic
		Hot water line
Low line voltage	Loose wire connections	Check wiring.
	Power company problem, transformer	Report problem.
	Undersized wire feeding unit	Correct and complete diagnosis.
High head pressure	Overcharge	Check system charge.
	Dirty heat pump coil	Clean coil.
	Faulty or wrong size heat pump fan motor	Replace fan motor.
	Faulty fan blade or wrong rotation	Replace fan blade.
		Replace with correct rotation motor.
	Recirculation of air	Correct installation.
	Additional heat source	Check for dryer vent near unit.
		Check for recirculation from other equipment.
	Noncondensibles	Recover refrigerant. Evacuate and recharge system.
	Equipment not matched	Correct mismatch.
Short cycling of compressor	Cycling or faulty pressure control	Check pressure and address cause of high or low pressure. Replace pressure control if faulty.
	Loose wiring	Check unit wiring.
	Thermostat	Located in supply air stream
		Differential setting too close
		Customer misuse
	EXV restricted or not functioning properly	Internal foreign matter
		Pressure transducer failure
		Suction thermistor failure
		EXV control failure
		EXV coil failure
	Distributor tube restricted	Restricted with foreign matter
		Kinked
		Inside diameter reduced from previous compressor failure

Table 18: Service Analyzer Chart (cont.)

COMPRESSOR OVERHEATING – HIGH DISCHARGE TEMP (cont.)		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Short cycling of compressor (cont.)	Low charge	Check system charge.
	Low evaporator airflow	Dirty coil
		Dirty filter
		Duct too small or restricted
	Faulty internal overload	Replace compressor.

ELECTRICAL		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Voltage present on load side of inverter and compressor won't run	Communication failure from UODC to inverter.	Check communication harness connectors and wire continuity.
	Compressor windings	Check for correct ohms.
187 – 252VAC present at input to inverter	Thermostat	Check for control voltage to contactor coil.
	Compressor control circuit	High-pressure switch
		Low-pressure cut-out
		Ambient thermostat
		Stater heat is active
		Compressor timed off/on control or interlock
No voltage at input to inverter	Blown fuses or tripped circuit breaker	Check for short in wiring or unit.
	Improper wiring	Recheck wiring diagram.
Improper voltage	High voltage	Wrong unit
		Power supply problem
	Low voltage	Wrong unit
		Power supply problem
		Wiring undersized
		Loose connections

FLOODED STARTS		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Liquid in the compressor shell	Faulty stator heat circuit (single leg output to compressor)	Check inverter for single leg output power and correct wiring.
Too much liquid in system	Incorrect piping	Check piping guidelines.
	Overcharge	Check and adjust charge.

CONTAMINATION		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Moisture	Poor evacuation on installation or during service	In each case, the cure is the same. Recover refrigerant, flush system. Add filter driver, evacuate, and recharge.
High head pressure	Noncondensibles air	
Unusual head and suction pressure readings	Wrong refrigerant or mixed refrigerants	
Foreign matter – copper filings	Copper tubing cuttings	
Copper oxide	Dirty copper piping or nitrogen not used when brazing	
Welding scale	Nitrogen not used during brazing	
Soldering flux	Adding flux before seating copper partway	
Excess soft solder	Wrong solder material	

Table 18: Service Analyzer Chart (cont.)

LOSS OF LUBRICATION		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Compressor failures	Vapor line tubing too large	Reduce tubing size to improve oil return.
Low suction pressure	Low charge	Check system charge.
	Refrigerant leaks	Repair and recharge.
Cold, noisy compressor – Slugging	Dilution of oil with refrigerant	Observe piping guidelines.
Noisy compressor	Migration	Check stater heat and compressor thermistor.
Cold, sweating compressor	Flooding	Check system charge.
Low load	Reduced airflow	Dirty filter
		Dirty coil
		Wrong duct size
		Restricted duct
	Thermostat setting	Advise customer.
Short cycling of compressor	Cycling or faulty high or low pressure control	Check pressure and address cause of any abnormal pressure. Replace control if faulty.
	Loose wiring	Check all control wires.
	Thermostat	In supply air stream, out of calibration
		Customer misuse
LIQUID REFRIGERANT SLUGGING		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
On start-up	Incorrect piping	Review pipe size guidelines.
EXV hunting when running	Faulty EXV components	Check EXV, suction pressure transducer, and suction thermistor for operation.
REFRIGERANT FLOOD BACK		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Poor system control using an EXV	Bad pressure reading	Check transducer wiring.
	Suction thermistor in wrong location	Relocate thermistor.
	Bad suction thermistor	Replace thermistor.
	Improper superheat setting (less than 5°F [-2.8°C])	Adjust EXV SH setpoint dipswitches and validate valve operation.

Table 18: Service Analyzer Chart (cont.)

ELECTRONIC EXPANSION VALVES		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
High Superheat, Low Suction Pressure (superheat over 15°F [8.3°C])	Moisture freezing and blocking valve	Recover charge, replace filter-drier, evacuate system, recharge.
	Dirt or foreign material blocking valve	Recover charge, replace filter-drier, evacuate system, recharge
	Low refrigerant charge	Correct the charge.
	Vapor bubbles in liquid line	Remove restriction in liquid line. Correct the refrigerant charge.
		Remove noncondensible gases.
		Size liquid line correctly.
	Undersized EXV	Replace with correct valve.
	Incorrectly sensing vapor line temperature	Verify suction thermistor resistance is correct and properly attached and insulated to the vapor line.
	Suction thermistor incorrectly calibrated.	Replace suction thermistor assembly.
	Vapor pressure measured incorrectly.	After verifying lack of connectivity, replace the pressure transducer or harness.
		If harness has a short, replace harness
		If gauge pressure measurement and the converted voltage readings at the control are different replace pressure transducer
		If gauge pressure measurement and the converted voltage readings at the control are the same, replace the control.
	EXV is stuck	Remove EXV from the system and purge with nitrogen, replace filter drier, and recharge.
		If EXV will not open, validate EXV wiring harness and rotor resistance between the black wire and the other 4 wires.
		If none of the above rectifies the issue, replace EXV and filter drier and recharge.
	UODC DC circuit failed	Verify 5VDC to pressure transducer is present. If not, replace UODC.
	High superheat adjustment	Change the superheat offset dip switches to increase superheat.
Valve feeds too much refrigerant, with low superheat, with low superheat and higher than normal suction pressure.	Moisture causing valve to stick open.	Recover refrigerant, replace filter-drier, evacuate system, and recharge.
	Dirt or foreign material causing valve to stick open	Recover refrigerant, replace filter-drier, remove EXV and purge with nitrogen, evacuate system, and recharge.
		If EXV is completely clogged use the UODC to open the EXV, and purge with nitrogen, replace filter drier, and recharge.
	Oversized EXV	Install correct EXV.
	Incorrect suction thermistor location	Install suction thermistor with the provided stainless steel strap and an additional zip tie between the 10:00 and 2:00 position on suction line, with insulation.
	Low superheat adjustment	Change the superheat offset dip switches to increase superheat.
	Incorrectly sensing vapor line temperature	Verify suction thermistor resistance is correct and properly attached and insulated to the vapor line.
	Suction thermistor incorrectly calibrated.	Replace suction thermistor assembly.
	Vapor pressure measured incorrectly.	After verifying lack of connectivity, replace the pressure transducer or harness.
		If harness has a short, replace harness.
		If gauge pressure measurement and the converted voltage readings at the control are different replace pressure transducer.
		If gauge pressure measurement and the converted voltage readings at the control are the same, replace the control.
Low load	Reduced airflow	Dirty filter
		Dirty coil
		Wrong duct size
		Restricted duct
	Thermostat setting	Advise customer.

Table 18: Service Analyzer Chart (cont.)

ELECTRONIC EXPANSION VALVES (cont.)		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
Compressor flood back upon start-up	Refrigerant drainage from flooded evaporator	Install trap riser to the top of the evaporator coil.
	Inoperable stator heat	
Superheat is low to normal with low suction pressure	Unequal evaporator circuit loading	Recover refrigerant, replace filter-drier, evacuate system, and recharge.
		Check for blocked distributor tubes.
	Low load or airflow entering evaporator coil	Ensure blower is moving proper air CFM.
		Remove/Correct any airflow restriction.
Superheat and suction pressure fluctuate (valve is hunting)	Expansion valve is oversized.	Install correct EXV
	Section thermistor is affected by liquid refrigerant or refrigerant oil flowing through suction line	Relocate sensing bulb in another position around the circumference of the suction line.
	Unequal refrigerant flow through evaporator circuit	Ensure sensing bulb is located properly.
		Check for blocked distributor tubes.
	Moisture freezing and partially blocking EXV	Recover refrigerant, change filter-drier, evacuate system, and recharge.
Valve does not regulate at all	Pressure transducer not connected or plugged	Connect pressure transducer in proper location, or remove any blockage.
	Suction line thermistor not connected, or installed on heat effected zone.	Install suction line thermistor in correct horizontal clean section of copper pipe.
	Suction line thermistor failed (continuity to control, wire damaged, resistance values incorrect)	Replace suction line thermistor.

9.4 Troubleshooting Tips

Table 19: Cooling Mode Trouble Shooting Tips

SYSTEM PROBLEM	INDICATORS			
	DISCHARGE PRESSURE	SUCTION PRESSURE	SUPERHEAT Normal: 5°–15°F [2.8° – 8.3°C]	SUBCOOLING Normal: See Charging Chart
Overcharge	High	High	Low	High
Undercharge	Low	Low	High	Low
Liquid Restriction (Filter Drier)	Low	Low	High	High
Low Indoor Airflow	Low	Low	Low	Low
Dirty Outdoor Coil	High	High	Low	Low
Low Outdoor Ambient Temperature	Low	Low	High	High
Inefficient Compressor	Low	High	High	High
Bad Indoor Suction Pressure Transducer or Faulty Measurement	Low	Low	High	High
Poorly Insulated Indoor Vapor Line Thermistor or Bad Thermistor	High	High	Low	Low

Table 20: Heating Mode Trouble Shooting Tips

SYSTEM PROBLEM	INDICATORS			
	DISCHARGE PRESSURE	SUCTION PRESSURE	SUPERHEAT Normal: 5°–15°F [2.8° – 8.3°C]	SUBCOOLING Normal: See Charging Chart
Overcharge	High	High	OK	High
Undercharge	Low	Low	OK or High	Low
Liquid Restriction (Filter Drier)	Low	Low	High	High
Low Outdoor Airflow	Low	Low	Low	Low
Dirty Indoor Coil	High	High	Low	Low
Low Indoor Ambient Temperature	Low	Low	OK	High
Inefficient Compressor	Low	High	High	High
Bad Outdoor Suction Pressure Transducer or Faulty Measurement	Low	Low	High	High
Poorly Insulated Outdoor Vapor Line Thermistor or Bad Thermistor	High	High	Low	Low

10.0 OUTDOOR UNIT SERVICING

Servicing shall be performed only as recommended by the manufacturer and by qualified personnel who are trained by a training organization or manufacturer accredited to teach national competency standards that may be set in legislation for servicing equipment with flammable refrigerant. The achieved competence should be documented by a certificate.

10.1 General Guidelines

Prior to beginning work on systems containing A2L REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the REFRIGERATING SYSTEM, the following procedures shall be completed prior to conducting work on the system:

• Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

• All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

• The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

• If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

• No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

• Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

10.2 Checks to the Refrigerant Equipment.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer’s maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer’s technical department for assistance.

The following checks shall be applied to installations using A2L REFRIGERANTS:

• The actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed.

• The ventilation machinery and outlets are operating adequately and are not obstructed.

• If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.

• Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.

• Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

10.3 Checks to Electrical Devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

• That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.

• That no live electrical components and wiring are exposed while charging, recovering or purging the system.

• That there is continuity of earth bonding.

10.4 Repairs to Sealed Components

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed

covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
• Ensure that the apparatus is mounted securely.
• Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres.
• Replacement parts shall be in accordance with the manufacturer's specifications. Sealed electrical components shall be replaced.

10.5 Repair to Intrinsically Safe Components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.
NOTE: The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components must be replaced and do not have to be isolated prior to working on them.

10.6 Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

10.7 Detection of Flammable Refrigerants

WARNING: Under NO circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall NOT be used.
The following leak detection methods are deemed acceptable for all refrigerant systems:
• Electronic leak detectors may be used to detect refrigerant leaks but, in the case of **FLAMMABLE REFRIGERANTS**, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
• Leak detection fluids (such as bubble method or fluorescent method agents) are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.
If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the next section (10.8 Removal and Evacuation).

10.8 Removal and Evacuation

When breaking into the refrigerant circuit to make repairs or for any other purpose, it is important that best practice is followed for A2L refrigerants. The following procedure shall be adhered to safely remove refrigerant following local and national regulations:
Evacuate
Purge the circuit with inert gas (optional for A2L)
Evacuate (optional for A2L)
Continuously flush or purge with inert gas when using flame to open circuit
Open the circuit
The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing A2L refrigerants, The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants.
This process might need to be repeated several times. Compressed air or oxygen shall NOT be used for purging refrigerant systems. The outlet for the vacuum pump shall NOT be close to any potential ignition sources, and ventilation shall be available.
For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system

(optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall NOT be close to any potential ignition sources, and ventilation shall be available.

10.9 Charging Procedures

Refer to Section 5.9 Refrigerant Charging of the manual.

10.10 Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the A2L refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.
The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

10.11 Decommissioning and Labeling

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.
a) Become familiar with the equipment and its operation.
b) Isolate system electrically.
c) Before attempting the procedure, ensure that:
Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
All personal protective equipment is available and being used correctly;
The recovery process is supervised at all times by a competent person;
Recovery equipment and cylinders conform to the appropriate standards.

d) Pump down refrigerant system, if possible.
e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f) Make sure that cylinder is situated on the scales before recovery takes place.
g) Start the recovery machine and operate in accordance with instructions.
h) Do not overfill cylinders (no more than 80 % volume liquid charge).
i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k) Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.
Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

10.12 Outdoor Coil Cleaning

The outdoor fan draws air across the coil during operation which results in contaminants collecting on and between the aluminum fins. These contaminants restrict the air-flow through the coil resulting in reduced capacity and efficiency and increases the temperature of the components that can reduce their life. Therefore, it is recommended that the outdoor coil be cleaned at least annually by a qualified service technician using a non- corrosive coil cleaner and low pressure water hose sprayer. Care must be taken not to damage or flatten out the fins by spraying the fins from an angle. Washing from the top of the coil down from the inside out is the most effective method of cleaning the coil. The exterior louver panels and unit top are easily removable to facilitate the coil cleaning task.

⚠WARNING:

Disconnect electrical power to the unit before removing the top panel or any electrical panel as the fan motor could start at any time and live electrical connections will be exposed.

10.13 Cabinet Cleaning and Care

Annual cleaning of the exterior cabinet is recommended using a mild detergent, water, and cloth/sponge to remove dust, mold, and potentially corrosive contaminants that have collected on the cabinet. It is also recommended to apply a good quality automotive wax to the painted metal cabinet parts annually to protect the finish and to restore the gloss of the paint. Do not apply wax to the plastic parts.

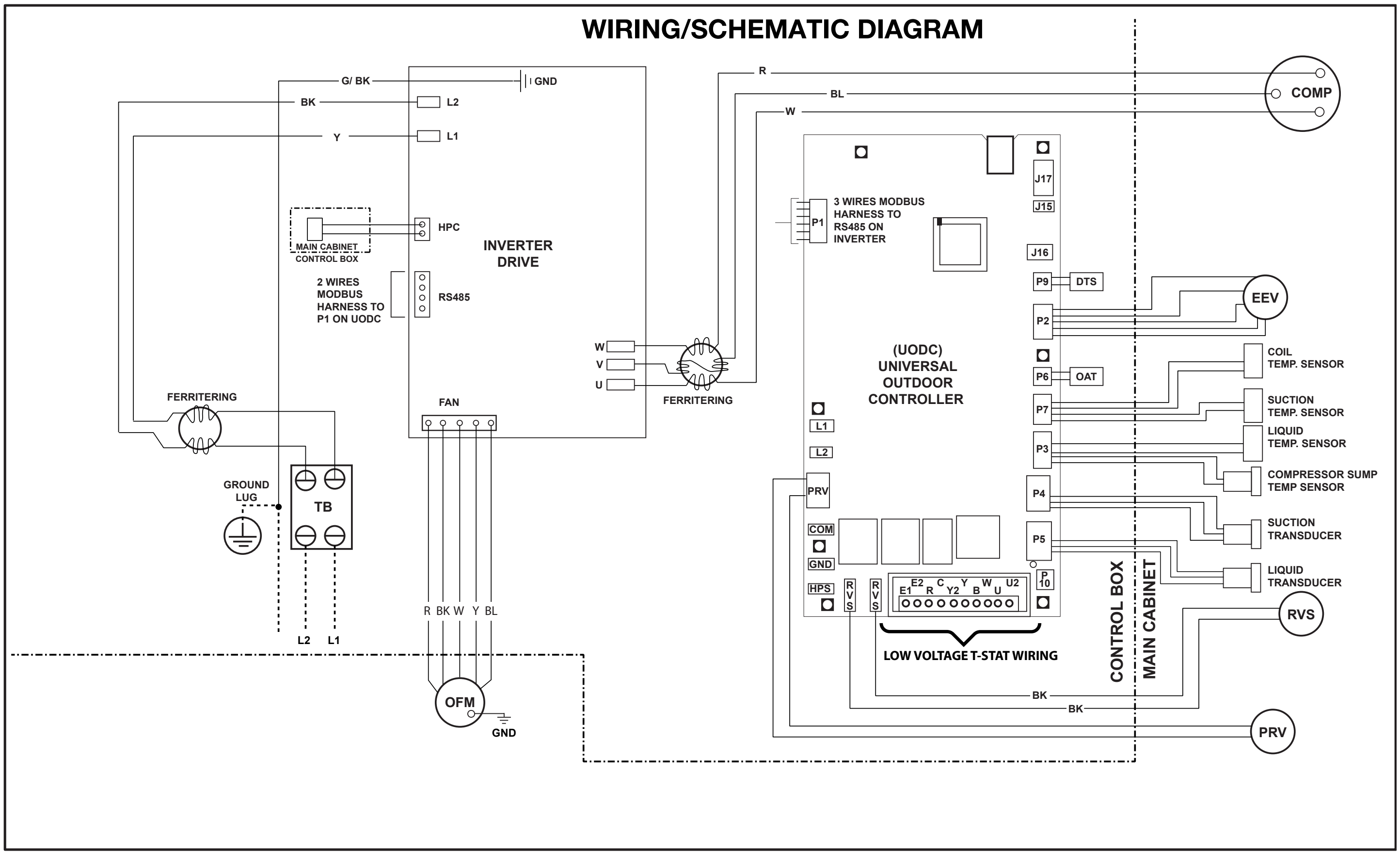
10.14 Motor Lubrication

The ball bearings in the outdoor motor are pre-lubricated by the motor manufacturer and do not have oiling ports. The motor will run for an indefinite period of time without additional lubrication.

10.15 Replacement Parts

Any replacement part used to replace parts originally supplied on equipment must be the same as or an approved alternate to the original part supplied. The manufacturer will not be responsible for replacement parts not designed to physically fit or operate within the design parameters the original parts were selected for.

11.0 WIRING DIAGRAM



NOTES	WIRING INFORMATION
	LINE VOLTAGE -FACTORY STANDARD -FACTORY OPTION -FIELD INSTALLED **LOW VOLTAGE** -FACTORY STANDARD -FIELD INSTALLED REPLACEMENT WIRE -MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (105C. MIN.) **WARNING** -CABINET MUST BE PERMANENTLY GROUNDED AND CONFORM TO I.E.C., N.E.C., C.E.C., NATIONAL WIRING REGULATIONS, AND LOCAL CODES AS APPLICABLE.

COMPONENT CODES

CAP	CAPACITOR
COM	COMMON
COMP	COMPRESSOR
CT	COIL TEMP
DTS	DISCHARGE TEMP. SENSOR
EEV	ELECTRONIC EXPANSION VALVE
GND	GROUND
HPC	HIGH PRESSURE CONTROL
HPS	HIGH PRESSURE SWITCH
LPT	LIQUID PRESSURE TRANSDUCER
OAT	OUTDOOR AMBIENT TEMPERATURE
OFM	OUTDOOR FAN MOTOR
OLT	OUTDOOR LIQUID TEMPERATURE
OST	OUTDOOR SUCTION TEMPERATURE
PRV	PRESSURE RELIEF VALVE
RVS	REVERSING VALVE SOLENOID
SPT	SUCTION PRESSURE TEMPERATURE
TB	TERMINAL BLOCK

WIRE COLOR CODE

BK......BLACK	G........GREEN	PR......PURPLE
BR......BROWN	GY ......GRAY	R........RED
BL.......BLUE	O........ORANGE	W ....WHITE
		Y........YELLOW

WIRING/SCHEMATIC DIAGRAM

A2L (-)P17AY

PART NO.: 90-111096-01 REV: 03

Figure 33: (-)P17AY Wiring/Schematic Diagram

12.0 APPENDIX

12.1 Agency Performance Audit Test Instructions

Performance audit testing a (-)P17AY variable speed heat pump rated combination requires an EcoNet™ Smart Thermostat (according to the AHRI rating database) as an accessory to obtain the rated performance. Utilize the following instructions to properly operate the system during audit tests.

1. Install the rated system consistent with this manual and ASHRAE 37.
2. Leak check and charge the rated system per the instructions found in this manual.
3. Wire the outdoor unit, indoor air mover/furnace, indoor coil EXV control (when necessary), and EcoNet™ Smart Thermostat according to the following wiring diagrams.

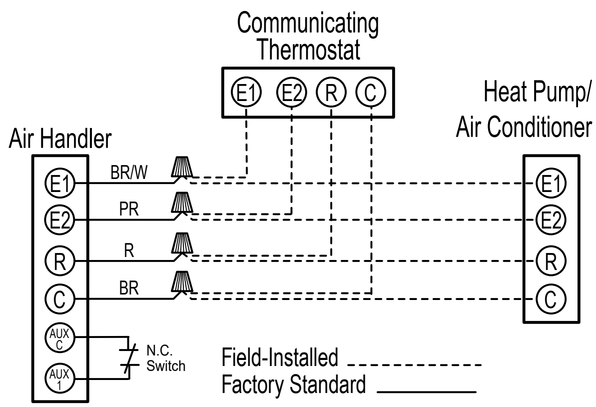


Figure 34: Thermostat Wiring for Heat Pump with Air Handler

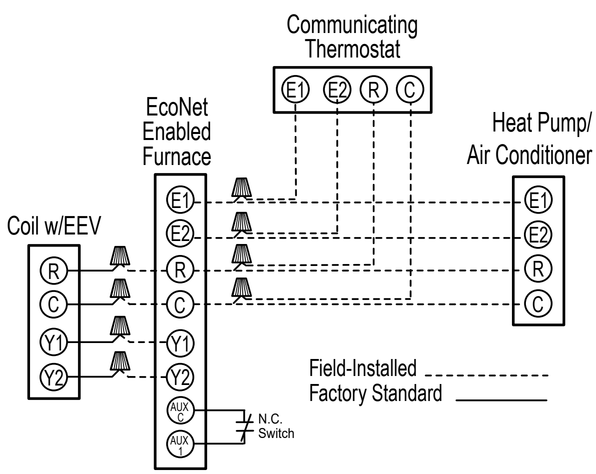


Figure 35: Thermostat Wiring for Heat Pump with Coil and Furnace

4. Supply high and low voltage to the system.
5. Once each control is powered turn off the Dehumidification feature:
   a. Pressing the “Settings” button on the home screen followed by pressing the “humidity” button.
   b. Once in the “humidity” screen, select “Yes” next to the “Enable Dehumidification ?” label.
   c. To turn dehumidification off press the orange up or blue down arrows once.
   d. The “Yes” should turn to a value of “No.”
6. Once the dehumidification feature is turned off, the Aux 1 configuration needs to be set to normally closed (N.C.) as to permit a closed switch attached to the Aux 1 contacts to keep the system operating. Thereby an open switch would indicate to the system to shut down:
   a. Press the back arrow in the bottom left of the dehumidification screen to return to the “settings” screen.
   b. Press the “installer” button in the bottom right corner of the “settings” screen.
   c. Press the “air handler” or “furnace” button.
   d. Once in the “air handler settings” or “furnace settings” screen select “N.C.” next to the “Aux Input #1 Config” label.
   e. Change the “Aux #1 Config” type to “N.C.” by pressing the orange up or blue down arrows at the bottom of the screen twice.
   f. Select “Off” next to the “Aux Input #1 Config” label.
   g. Change the “Aux #1 Config” value from “Off” to “Shutdown” by pressing the orange up button at the bottom of the screen two times. After each press of the orange up button the value next to the “Aux #1 Config” label should change.
7. Disable the schedule.
8. Make sure Econet thermostat is on the latest software.
9. Refer to the table in Section 2.9 and double check target values via contractor app.
10. Entering the Test Mode
    a. Press the back arrow in the bottom left of the screen 3 times to return to the home screen showing the inside temperature.
    b. Press the “Service” button on the home screen.
    c. Press the “ODU check-out” button in the bottom right corner of the “service” screen to enter the “installer checkout” screen.
    d. Select the desired mode of operation by pressing “Off” next to the “Var Speed ODU Test” label and then the orange up arrow or blue down arrow at the bottom of the “installer checkout” screen.

       NOTE: Any faults must be resolved before the system will start. See the troubleshooting guide in this manual for assistance.

       NOTE: If the unit does not start when the “start” button is pushed verify the switch attached to the Aux 1 input on the air handler or furnace control board is closed and no alarms are active.

NOTE: In order to change from heating mode to cooling mode or vice versa the system must first be turned off by pressing the blue down button until “stop test” appears at the bottom of the “installer checkout” screen. Then press the “Stop” button.

11. Cycle Testing
    a. The Aux #1 configuration performed above permits a N.C. set of contacts to be connected to these terminals on the air handler or the furnace controls.
    b. When performing the optional AHRI cycle tests, the Aux #1 terminals should be used to turn the unit on and off.
    c. When the system is desired to be operating the air handler or furnace control should sense continuity between the Aux #1 and Aux C terminals. This continuity will tell the system to turn on and the Test Mode selection outlined in step 7 above identifies the mode and stage of operation.
    d. When the unit is desired to be off/not operating the air handler or furnace control should sense an open state between the Aux #1 and the Aux C terminals.
12. Exiting the Test Mode

    NOTE: While the test mode is active the thermostat will not permit return to the home screen.

    a. To turn the unit off either press the blue down button until “stop test” appears at the bottom of the screen and then press “stop test” on the “installer checkout” screen or open the normally closed switch attached to the air handler or furnace Aux 1 inputs.

       NOTE: Once the unit is requested to shut down there is a 4 min. delay during which the test mode cannot be changed.

       IMPORTANT: The minimum run and minimum off timers built into the UODC will be active while operating in the test mode.
    b. Opening the N.C. contact will not exit the test mode, but will permit the system to perform a soft shutdown.
    c. In order for the system to return to normal operating mode press the “Stop” button on the “installer checkout” screen and then press the back arrow in the bottom left hand side of the screen two times. This will return the thermostat to the home screen.

12.1 Agency Performance Audit Test Instructions (Cont.)

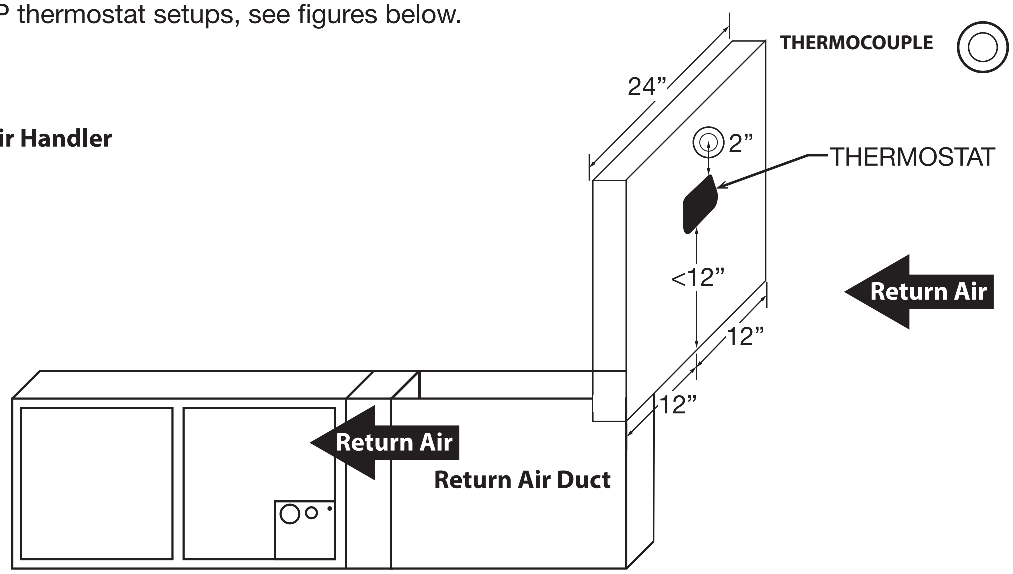
12.2 CVP Thermostat Setup

For thermostat setup during CVP testing, follow the instructions below.

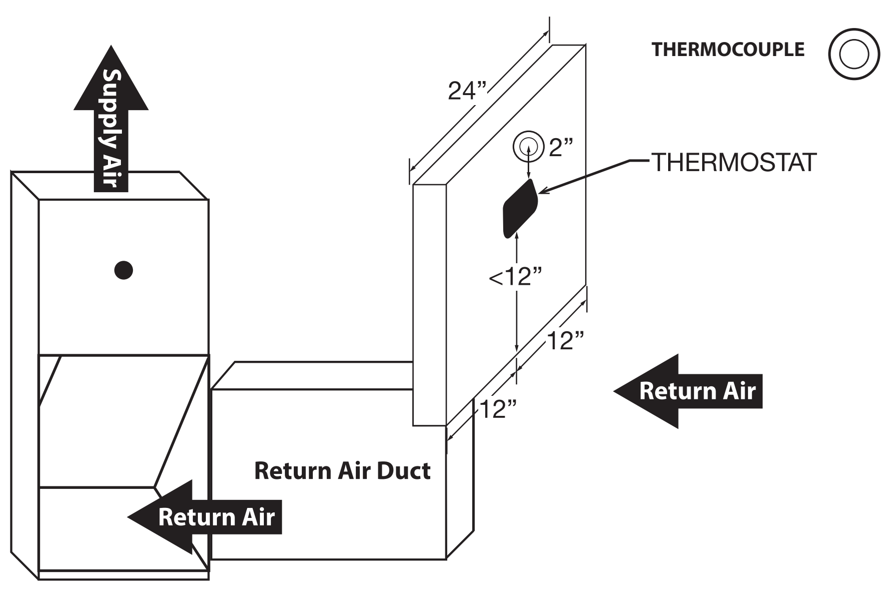
1. Thermostat Installation
    - Mount the thermostat on a flat surface that extends at least twelve inches beyond its nearest edge on all sides. Position the thermostat outside the return air duct opening and within twelve inches of the mid-point along the nearest edge of that opening.
2. Thermocouple Installation
    - Install a thermocouple within two inches of the thermostat temperature sensor inlet. If a remote return air thermistor is used for system control, install a second thermocouple within two inches of the remote thermistor.
3. Thermostat Inlet Airflow
    - Air velocity measured two inches from the thermostat's air inlet shall not exceed 50 fpm. Baffles or a perforated plate enclosure may be used to reduce the air velocity to this limit.
4. Calibration
    - If the difference between the indoor return dry bulb temperature and the target value exceeds the smallest increment of the thermostat, perform a calibration or adjust the set point.

For examples on CVP thermostat setups, see figures below.

1. H-Series Air Handler



2. Front-Return Air Handler



Appendix

12.1 Agency Performance Audit Test Instructions (Cont.)

12.3 Additional Performance Audit Test Modes

Performance audit testing of a (-)P17AY heat pump in a Coil Only configuration, using 24V control for heating and cooling, only requires installation per this manual and operation through traditional 24V signals to the outdoor unit terminals. For agency testing, there should be no jumper between the U1 and U2 terminals unless a specific test mode requires it. The following table lists the available agency test modes and the corresponding 24V control procedures used to initiate each mode.

24V Control Heating:

Agency Test Mode	Procedure
Low Heat	Y1 + B
Intermediate Heat	Y1 + B + Momentary Push of Test Button
Nominal Heat	Y1 + Y2 + B
High Heat	Y1 + Y2 + B + Momentary Push of Test Button
CVP	Y1 + Y2 + (U1 - U2 Jumper) + B

24V Control Cooling:

Agency Test Mode	Procedure
Low Cool	Y1
Intermediate Cool	Y1 + Momentary Push of Test Button
High Cool	Y1 + Y2
CVP	Y1 + Y2 + (U1 - U2 Jumper)