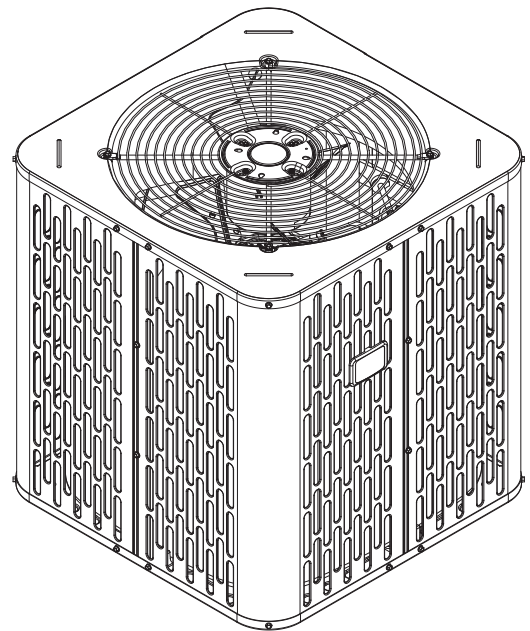


# Installation, Operation, and Maintenance

## Condensing Units

A5AC5018A  
A5AC5024A  
A5AC5030A  
A5AC5036A  
A5AC5042A  
A5AC5048A  
A5AC5060A



*Note: Graphics in this document are for representation only.  
Actual model may differ in appearance.*

### **⚠ SAFETY WARNING**

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

# Introduction

Read this manual thoroughly before operating or servicing this unit.

This document is customer property and is to remain with this unit. Return to the service information pack upon completion of work.

## Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:



### WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

### NOTICE

Indicates a situation that could result in equipment or property-damage only accidents.

## Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

## Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

## ⚠ WARNING

### Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

## ⚠ WARNING

### Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury.

Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, **MUST** follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER** **PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

**⚠ WARNING****Follow EHS Policies!**

Failure to follow instructions below could result in death or serious injury.

- All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.
- Non-Trane personnel should always follow local regulations.

**⚠ WARNING****Cancer and Reproductive Harm!**

This product can expose you to chemicals, including lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**⚠ WARNING****Safety Hazard!**

Failure to follow instructions below could result in death or serious injury or property damage.

This unit is not to be used 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 the use of the appliance by a person responsible for their safety.

Do not allow children to play or climb on the unit or to clean or maintain the unit without supervision.

**⚠ WARNING****Safety Hazard!**

Failure to follow instructions below could result in death or serious injury and/or property damage. Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

**⚠ WARNING****Risk of Fire — Flammable Refrigerant!**

Failure to follow instructions below could result in death or serious injury, and equipment damage.

- To be repaired only by trained service personnel.
- Do not puncture refrigerant tubing.
- Dispose of properly in accordance with federal or local regulations.

**⚠ WARNING****Safety Hazard!**

Failure to follow instructions below could result in death or serious injury and/or property damage.

Only qualified personnel with adequate electrical and mechanical experience must repair the unit. The manufacturer or seller is not responsible for any interpretation or resulting liability.

**⚠ WARNING****System Charge!**

Failure to follow instructions below could result in abrupt release of system charge and could result in serious injury or property damage.

When opening the suction and liquid line service valve, turn the valve stem counterclockwise only until the stem contacts the rolled edge. Do not apply torque.

**⚠ WARNING****Ventilation Required!**

Failure to follow instructions below could result in death or serious injury or property damage.

Confirm the area is adequately ventilated before breaking into the system or conducting any hot work.

**⚠ WARNING****Safety Hazard!**

Failure to follow instructions below could result in death or serious injury and equipment or property damage.

- Do not use any items other than those approved by the manufacturer for the defrosting or cleaning process.
- Do not pierce or burn.
- Be cautious that refrigerants may be odorless.

### **⚠ WARNING**

#### **Live Electrical Components!**

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

### **⚠ CAUTION**

#### **Brazed Joints!**

Failure to follow instructions below could result in minor to moderate injury or equipment damage.

When using existing refrigerant lines, verify all joints are brazed and not soldered.

### **⚠ CAUTION**

#### **Hot Surface!**

Failure to follow instructions below could result in minor to severe burns.

**Do not touch top of compressor. It may be hot.**

### **⚠ CAUTION**

#### **Unit Contains R-454B Refrigerant!**

Failure to use proper service tools may result in equipment damage or personal injury.

**Use only R-454B refrigerant and approved compressor oil.**

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## Trademark

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## Revision History

- Updated figure titles in the Low Voltage Connection Diagrams chapter.
- Updated figures in the Wiring Diagram chapter.

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# Pre-Installation

## General

### ⚠ WARNING

#### Safety Hazard!

Failure to follow instructions below could result in death or serious injury and/or property damage. Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

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#### Risk of Fire — Flammable Refrigerant!

Failure to follow instructions below could result in death or serious injury, and equipment damage.

- To be repaired only by trained service personnel.
- Do not puncture refrigerant tubing.
- Dispose of properly in accordance with federal or local regulations.

### ⚠ WARNING

#### Safety Hazard!

Failure to follow instructions below could result in death or serious injury and/or property damage. Only qualified personnel with adequate electrical and mechanical experience must repair the unit. The manufacturer or seller is not responsible for any interpretation or resulting liability.

### ⚠ CAUTION

#### Unit Contains R-454B Refrigerant!

Failure to use proper service tools may result in equipment damage or personal injury. Use only R-454B refrigerant and approved compressor oil.

### ⚠ WARNING

#### System Charge!

Failure to follow instructions below could result in abrupt release of system charge and could result in serious injury or property damage. When opening the suction and liquid line service valve, turn the valve stem counterclockwise only until the stem contacts the rolled edge. Do not apply torque.

### ⚠ WARNING

#### Ventilation Required!

Failure to follow instructions below could result in death or serious injury or property damage. Confirm the area is adequately ventilated before breaking into the system or conducting any hot work.

### ⚠ WARNING

#### Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

### ⚠ WARNING

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### ⚠ CAUTION

#### Brazed Joints!

Failure to follow instructions below could result in minor to moderate injury or equipment damage. When using existing refrigerant lines, verify all joints are brazed and not soldered.

### ⚠ CAUTION

#### Hot Surface!

Failure to follow instructions below could result in minor to severe burns. Do not touch top of compressor. It may be hot.

### ⚠ WARNING

#### Cancer and Reproductive Harm!

This product can expose you to chemicals, including lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**⚠ WARNING****Ventilation Required!**

Failure to follow instructions below could result in death or serious injury or property damage. Confirm the area is adequately ventilated before breaking into the system or conducting any hot work.

**Note:** The manufacturer recommends installing only approved matched indoor and outdoor systems. All of the manufacture's split systems are AHRI rated only with TXV/EEV indoor systems. Some of the benefits of installing approved matched indoor and outdoor split systems are maximum efficiency, optimum performance and the best overall system reliability.

**Operating Range****Table 1. Operating range**

| Mode    | Model       | Operating Range |
|---------|-------------|-----------------|
| Cooling | 1.5 – 5 Ton | 55°F – 115°F    |

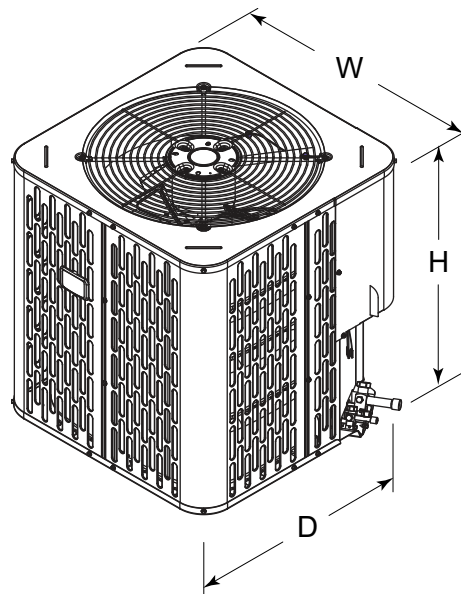
**Unit Location Considerations****Unit Dimensions and Weight****Table 2. Unit dimensions and weight**

| Models    | H x D x W (in.) | Weight (lb) <sup>(a)</sup> |
|-----------|-----------------|----------------------------|
| A5AC5018A | 37 x 30 x 30    | 184                        |
| A5AC5024A | 33 x 30 x 30    | 161                        |
| A5AC5030A | 37 x 30 x 30    | 184                        |
| A5AC5036A | 33 x 30 x 30    | 161                        |
| A5AC5042A | 37 x 34 x 34    | 212                        |
| A5AC5048A | 45 x 34 x 34    | 252                        |
| A5AC5060A | 45 x 34 x 34    | 252                        |

<sup>(a)</sup> Weight values are estimated uncrated.

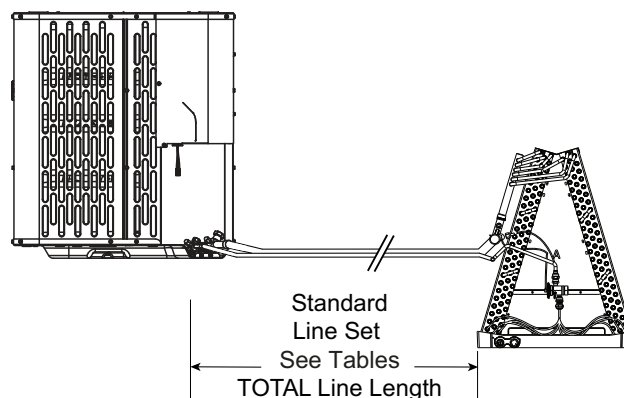
When mounting the outdoor unit on a roof, be sure the roof will support the unit's weight.

Properly selected isolation is recommended to alleviate sound or vibration transmission to the building structure.

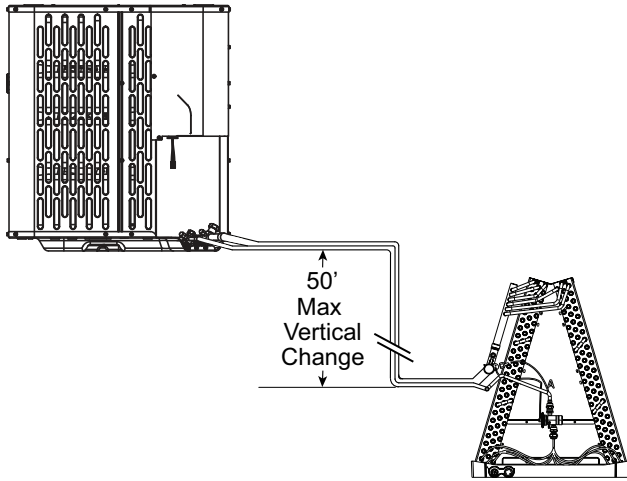
**Figure 1. Unit dimensions****Refrigerant Piping Limits**

- The maximum total length of refrigerant lines from outdoor to indoor unit should not exceed 150 feet (including lift).
- The maximum vertical change should not exceed 50 feet.
- Service valve connection diameters are shown in "Refrigerant Line Considerations," p. 9.

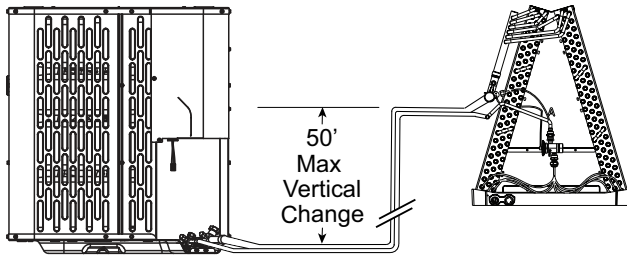
**Note:** For other line lengths, see the *Refrigerant Piping Manual for Small Split Cooling and Heat Pump Systems — Application Guide, (SS-APG006\*-EN)* or *Refrigerant Piping Software Program*.

**Figure 2. Refrigerant total line length limit**

**Figure 3. Refrigerant piping vertical change limit**



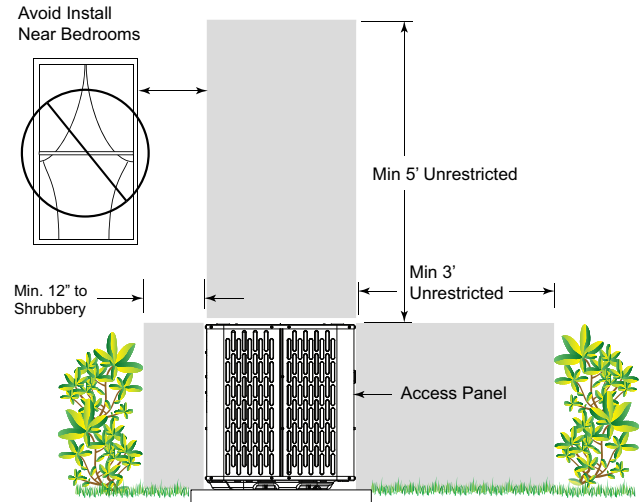
**Figure 4. Refrigerant piping vertical change limit**



### Suggested Locations for Best Reliability

- Confirm the top discharge area is unrestricted for at least five feet above the unit.
- Three feet clearance must be provided in front of the control box (access panels) and any other side requiring service.
- Avoid installing the unit in areas where operating noise may disturb occupants, such as sleeping quarters or living-area windows. Confirm the installation location with the building owner before proceeding.
- Avoid installing the unit near windows where condensation or defrost vapor may create a nuisance for occupants.
- Position the outdoor unit a minimum of 12 inches from any wall or surrounding shrubbery to ensure adequate airflow.
- Place the outdoor unit far enough from any structure to prevent excess roof runoff or icicles from falling directly onto it.

**Figure 5. Suggested locations for best reliability**



## Unit Preparation

### Prepare the Unit for Installation

Inspect the unit for damage and promptly report any damage to the carrier.

## Setting the Unit

### Pad Installation

When installing the unit on a support pad, such as a concrete slab, consider the following:

- The pad should be at least 1-inch larger than the unit on all sides.
- The pad must be separate from any structure.
- The pad must be level.
- The pad should be high enough above grade to allow for drainage.
- The pad location must comply with national, state, and local codes.

For other applications refer to application guide.

## Refrigeration

### Refrigerant Line Considerations

**Table 3. Refrigerant line and service valve connection sizes**

| Model     | Rated Line Sizes (in.) |             | Service Valve Connection Sizes (in.) |                        |
|-----------|------------------------|-------------|--------------------------------------|------------------------|
|           | Vapor Line             | Liquid Line | Vapor Line Connection                | Liquid Line Connection |
| A5AC5018A | 3/4                    | 5/16        | 3/4                                  | 5/16                   |
| A5AC5024A | 3/4                    | 5/16        | 3/4                                  | 5/16                   |
| A5AC5030A | 3/4                    | 5/16        | 3/4                                  | 5/16                   |
| A5AC5036A | 3/4                    | 5/16        | 3/4                                  | 5/16                   |
| A5AC5042A | 7/8                    | 5/16        | 7/8                                  | 5/16                   |
| A5AC5048A | 7/8                    | 5/16        | 7/8                                  | 5/16                   |
| A5AC5060A | 1-1/8                  | 3/8         | 7/8                                  | 3/8                    |

**Table 4. Alternate refrigerant line and service valve connection sizes**

| Model     | Alternate Line Sizes (in.) |             | Service Valve Connection Sizes (in.) |                        |
|-----------|----------------------------|-------------|--------------------------------------|------------------------|
|           | Vapor Line                 | Liquid Line | Vapor Line Connection                | Liquid Line Connection |
| A5AC5018A | 5/8                        | 3/8         | 3/4                                  | 5/16                   |
| A5AC5024A | 5/8                        | 3/8         | 3/4                                  | 5/16                   |
| A5AC5030A | 5/8                        | 3/8         | 3/4                                  | 5/16                   |
| A5AC5036A | 5/8                        | 3/8         | 3/4                                  | 5/16                   |
| A5AC5042A | 3/4                        | 3/8         | 7/8                                  | 5/16                   |
| A5AC5048A | 3/4                        | 3/8         | 7/8                                  | 5/16                   |
| A5AC5060A | 7/8                        | 3/8         | 7/8                                  | 5/16                   |

### Factory Charge

The outdoor condensing units are factory charged with the system charge required for the outdoor condensing unit, fifteen (15) ft. of tested connecting line, and the nominal rated indoor evaporative coil match. Always verify proper system charge via subcooling (TXV/EEV) or superheat (fixed orifice) per the unit nameplate.

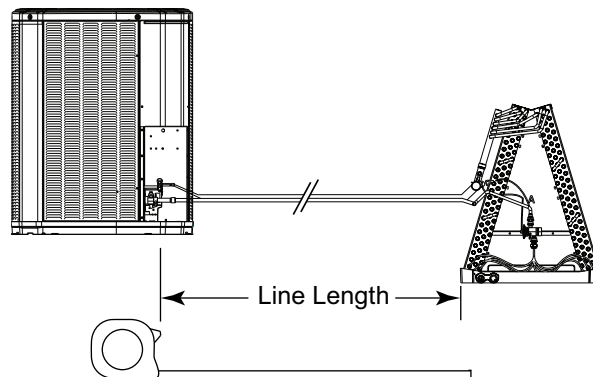
### Required Refrigerant Line Length

Determine required line length and lift.

Total Line Length = \_\_\_\_\_ Ft.

Total Vertical Change (lift) = \_\_\_\_\_ Ft.

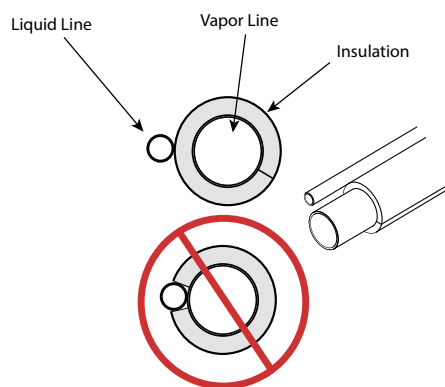
**Figure 6. Required refrigerant line length**



### Line Insulation

**Important:** The vapor line must always be insulated. Do not allow the liquid line and vapor line to come in direct (metal-to-metal) contact.

**Figure 7. Refrigerant line insulation**



### Line Routing

**Important:** Take precautions to prevent noise within the building structure due to vibration transmission from the refrigerant lines.

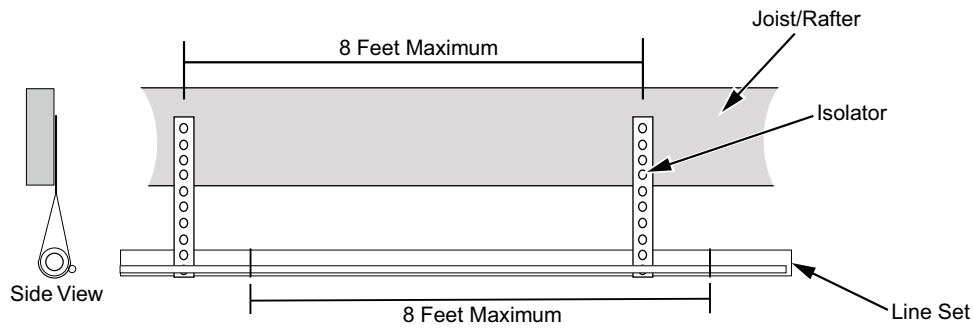
Comply with national, state, and local codes when isolating line sets from joists, rafters, walls, or other structural elements.

For example:

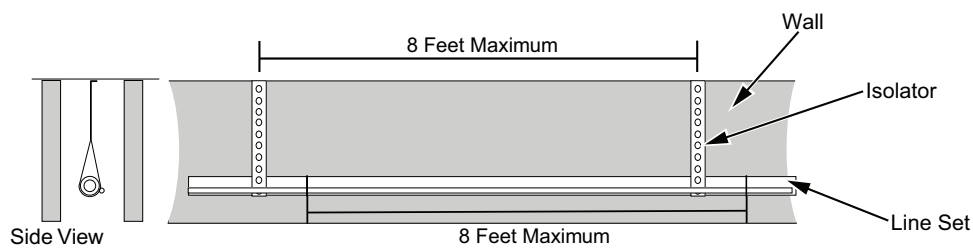
- Use isolation hangers when securing refrigerant lines to floor joists or other structural framing.
- Use isolation hangers when routing refrigerant lines through stud spaces or enclosed ceilings.
- Insulate and isolate refrigerant lines where they pass through walls or sills.
- Isolate the lines from all ductwork.
- Minimize the number of 90° turns.

Secure the vapor line from joists using isolators every 8 feet. Secure the liquid line directly to the vapor line using tape, wire, or other appropriate method every 8 feet.

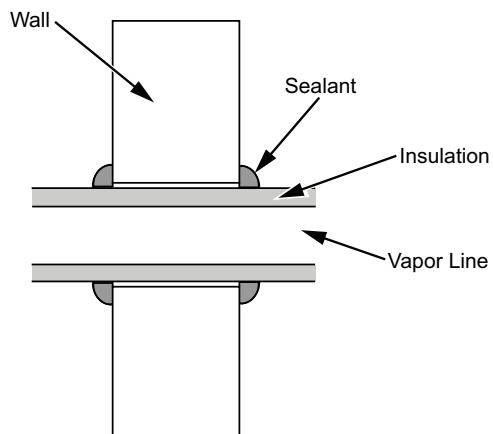
**Figure 8. Isolation from joist/rafter**



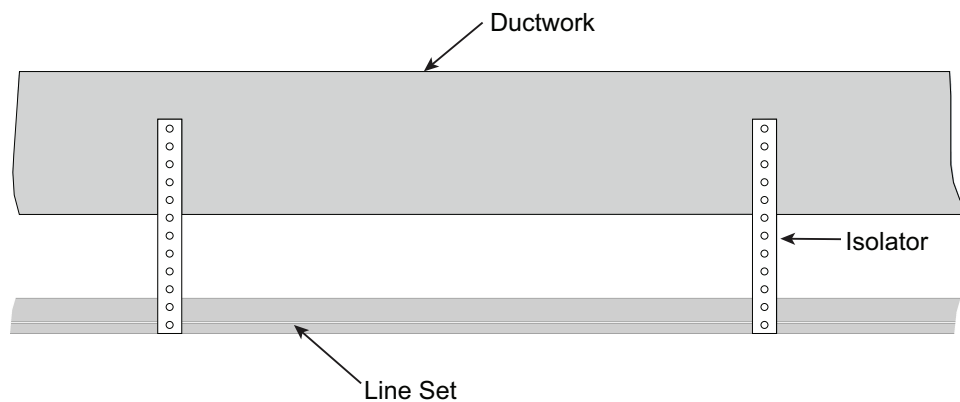
**Figure 9. Isolation in wall spaces**



**Figure 10. Isolation through wall**



**Figure 11. Incorrect lineset installation**



**Important:** Do not hang linesets from ductwork.

## Line Brazing

1. Remove caps or plugs. Use a deburring tool to deburr the pipe ends. Clean both internal and external surfaces of the tubing using an emery cloth.
2. Remove the pressure tap cap and valve cores from both service valves.
3. Purge the refrigerant lines and indoor coil with dry nitrogen.

**Note:** A2L equipment shall have red marked service ports and pipes through which refrigerant is serviced.

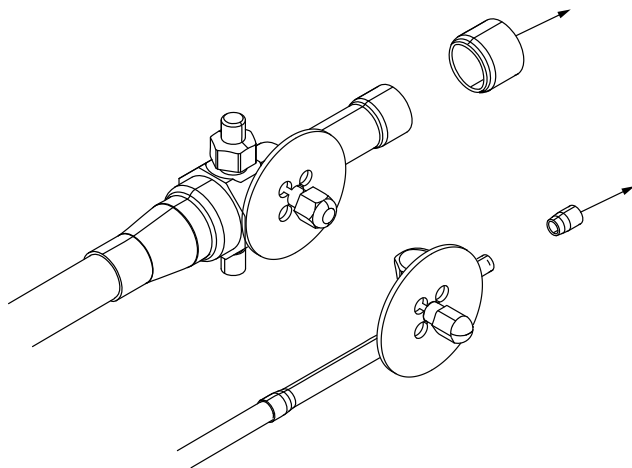
4. Wrap a wet rag around the valve body to avoid heat damage and continue the dry nitrogen purge.
  - a. Braze the refrigerant lines to the service valves.
  - b. For units shipped with a field-installed external drier, check liquid line filter driers directional flow arrow to confirm correct direction of refrigeration flow (away from outdoor unit and toward evaporator coil) as illustrated. Braze the filter drier to the liquid line.
  - c. Continue the dry nitrogen purge. Do not remove the wet rag until all brazing is completed.

**Important:** Remove the wet rag before stopping the dry nitrogen purge.

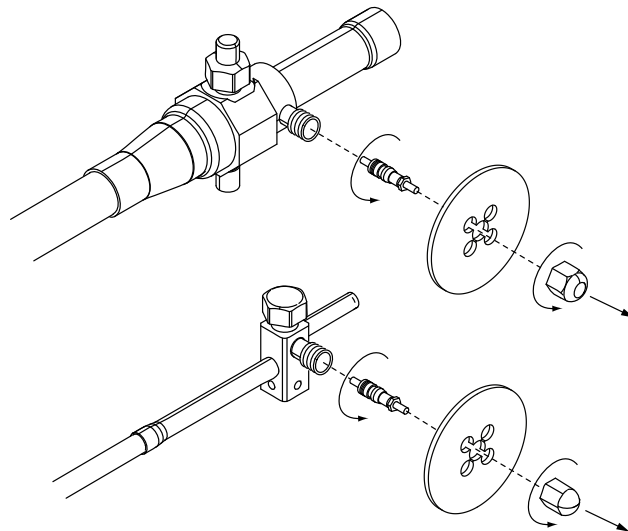
### Notes:

- Install the drier into the liquid line.
  - Precautions should be taken to avoid heat damage to the basepan during brazing. It is recommended to keep the flame directly off the basepan.
5. Replace the pressure tap valve cores and plastic tabs after the service valves have cooled.

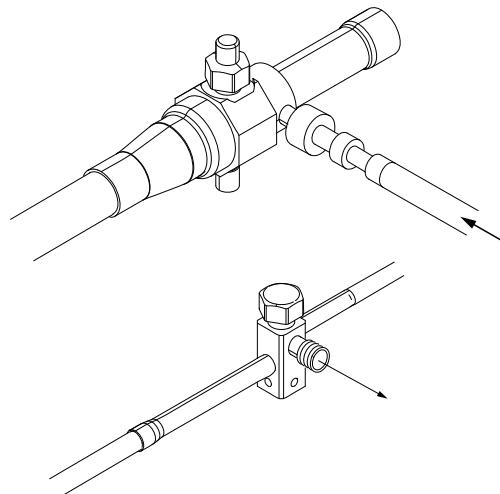
**Figure 12. Removal of caps or plugs from pipe ends**



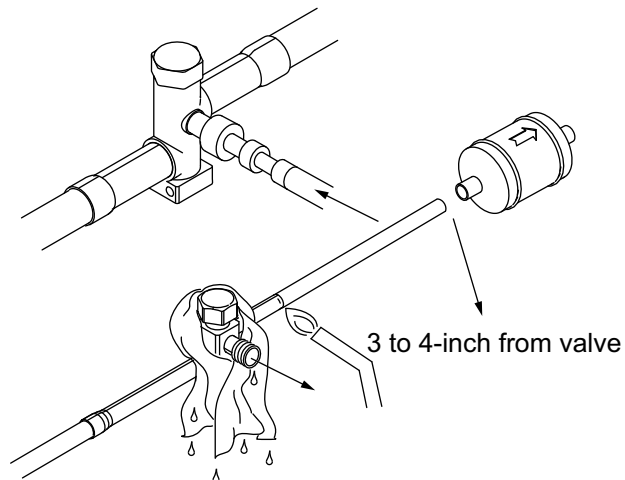
**Figure 13. Removal of pressure cap and valve cores from service valves**



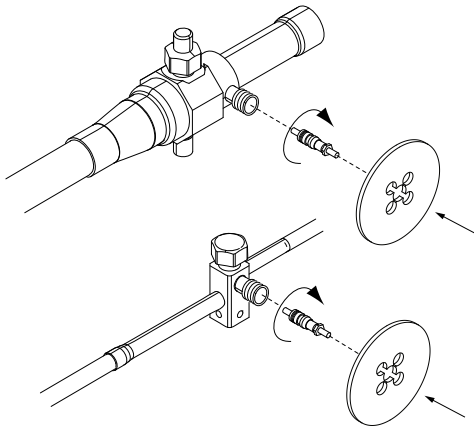
**Figure 14. Purging of refrigerant lines**



**Figure 15. Wrapping of wet rag**



**Figure 16. Re-installation of pressure valve cores and plastic tabs**



## Refrigerant Line Leak Check

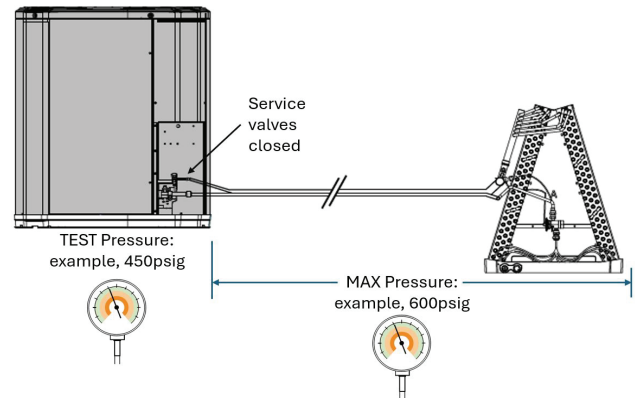
### Check For Leaks

After completion of field piping for split systems, the field pipework shall be pressure tested with nitrogen and then vacuum tested prior to refrigerant charging.

#### **Important:**

1. *Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.*
2. *The following leak detection methods are deemed acceptable for all refrigerant systems:*
  - a. *Electronic leak detectors calibrated for R-454B (with a sensitivity of 5 grams/year).*
  - b. *Bubble method.*
3. *The outdoor unit should not be tested higher than 450 psig for servicing or component replacement. The indoor unit and line sets should be tested to the max pressure specified on the outdoor or indoor unit nameplate. The service valves should be closed when pressure testing the evaporator coil and linesets to separate the outdoor unit from the indoor unit.*

**Figure 17. Refrigerant line leak check**



#### 1. Final Pressure Check:

Isolate the outdoor unit from the evaporator coil and linesets using the service valves. Pressurize the evaporator coil and linesets to the max pressure specified on the outdoor or indoor unit nameplate for a minimum of 60 minutes. Do not add additional refrigerant or test gas after reaching the evaporator coil specified pressure. The system should show no loss of pressure once pressurized. Once the pressure test is complete follow the steps for evacuation.

#### 2. Preliminary Pressure Check (\*Optional):

Pressurize the refrigerant lines and evaporator coil to 150 psig using dry nitrogen. Check for leaks by using a soapy solution or bubbles at each brazed location. Remove pressure and repair any leaks before continuing.

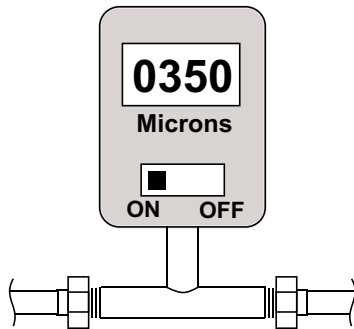
# Evacuation and Servicing

## Evacuate the Refrigerant Lines and Indoor Coil

**Important:** Do not open the service valves until the refrigerant lines and indoor coil leak check and evacuation are complete.

1. Evacuate until the micron gauge reads no higher than 350 microns, then close the valve to the vacuum pump.

**Figure 18. Observe micron gauge reading**



2. Observe the micron gauge. Evacuation is complete if the micron gauge does not rise above 500 microns in one minute.

**Figure 19. Stopwatch**



3. Once evacuation is complete, clear the vacuum pump and micron gauge, then close the valve on the manifold gauge set.

## Servicing

- If repairs are required after the system is charged, safely remove or isolate the refrigerant and purge the section needing repair with nitrogen or oxygen-free nitrogen before opening the circuit.
- The refrigerant charge shall be recovered into the correctly marked recovery cylinders.
- Keep the vacuum pump outlet away from potential ignition sources, and make sure ventilation is available.

- Before recharging the system, pressure-test it with the appropriate purging gas. After charging and before commissioning, perform a leak test. Conduct a follow-up leak test before leaving the site.
- Use only appropriate refrigerant recovery cylinders. Have enough cylinders available to hold the full system charge. Use only cylinders designated and labeled for the recovered refrigerant. Cylinders must include a pressure-relief valve and associated shut-off valves in good working order.
- Have a set of calibrated weighing scales available and in good working order. Use hoses with leak-free disconnect couplings, and keep them in good condition. Confirm that any associated electrical components are sealed.
- Return the recovered refrigerant to the refrigerant supplier in the correct recovery cylinder. Do not mix refrigerants.
- If compressors or compressor oils are removed, evacuate them to an acceptable level to confirm that no A2L refrigerant remains in the lubricant.

## Service Valves

### Open the Gas Service Valve First

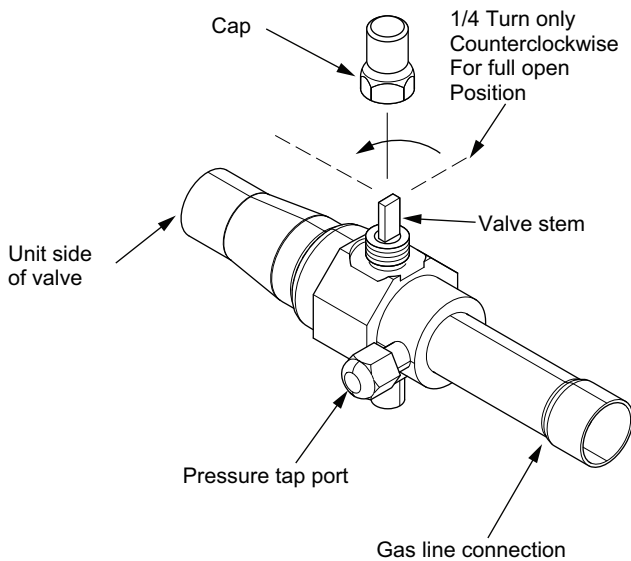
**Important:** Complete the leak check and evacuation must before opening the service valves.

**Note:** Do not vent refrigerant gases into the atmosphere.

1. Remove the valve stem cap.
2. Using an adjustable wrench, turn the valve stem 1/4 turn counterclockwise to the fully open position.
3. Replace the valve stem cap to prevent leaks. Finger-tighten plus an additional 1/6 turn.

**Note:** Service valves may be ball or angle style.

**Figure 20. Gas service valve**



### Open the Liquid Service Valve Second

#### **⚠ WARNING**

##### **System Charge!**

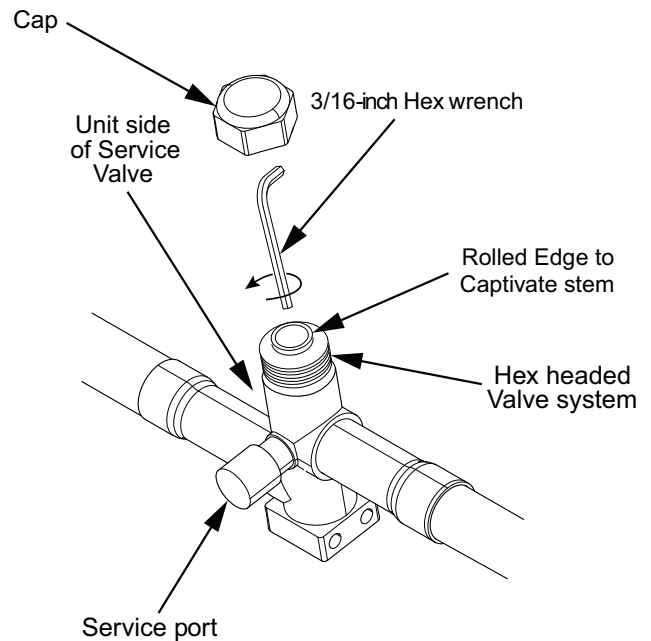
Failure to follow instructions below could result in abrupt release of system charge and could result in serious injury or property damage.

When opening the suction and liquid line service valve, turn the valve stem counterclockwise only until the stem contacts the rolled edge. Do not apply torque.

**Important:** Leak check and evacuation must be completed before opening the service valves.

1. Remove the service valve cap.
2. Fully insert a 3/16-inch hex wrench into the stem and back out counterclockwise until the valve stem just touches the rolled edge (approximately five turns).
3. Replace the valve cap to prevent leaks. Finger-tighten plus an additional 1/6 turn.

**Figure 21. Liquid service valve**



# Electrical

## Maximum Wire Length

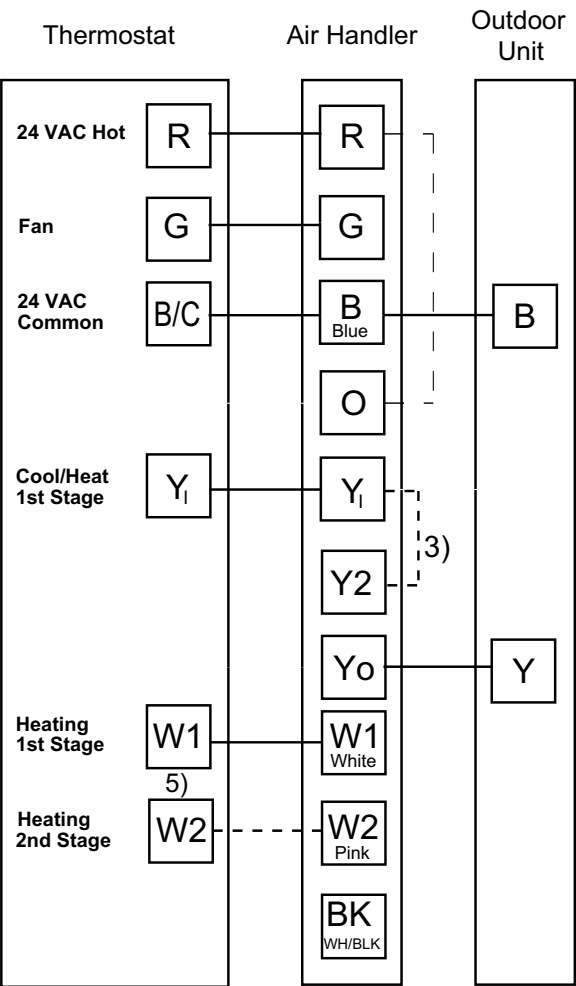
The following table defines the maximum total length of low voltage wiring from the outdoor unit, to the indoor unit, and to the thermostat.

**Table 5. Low voltage maximum wire length**

| 24 Volts  |                           |
|-----------|---------------------------|
| Wire Size | Maximum Wire Length (ft.) |
| 18 AWG    | 150                       |
| 16 AWG    | 225                       |
| 14 AWG    | 300                       |

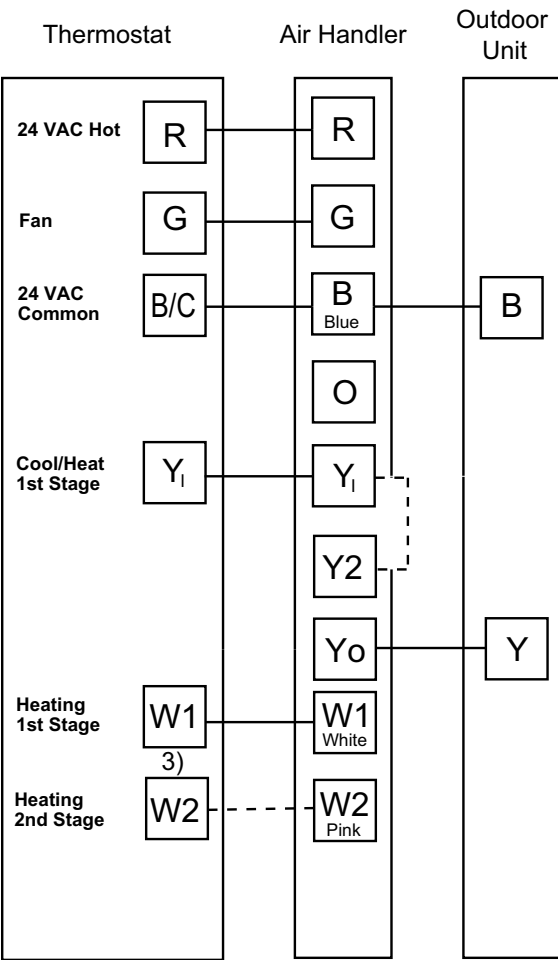
## Low Voltage Connection Diagrams

**Figure 22. With A5AHV**



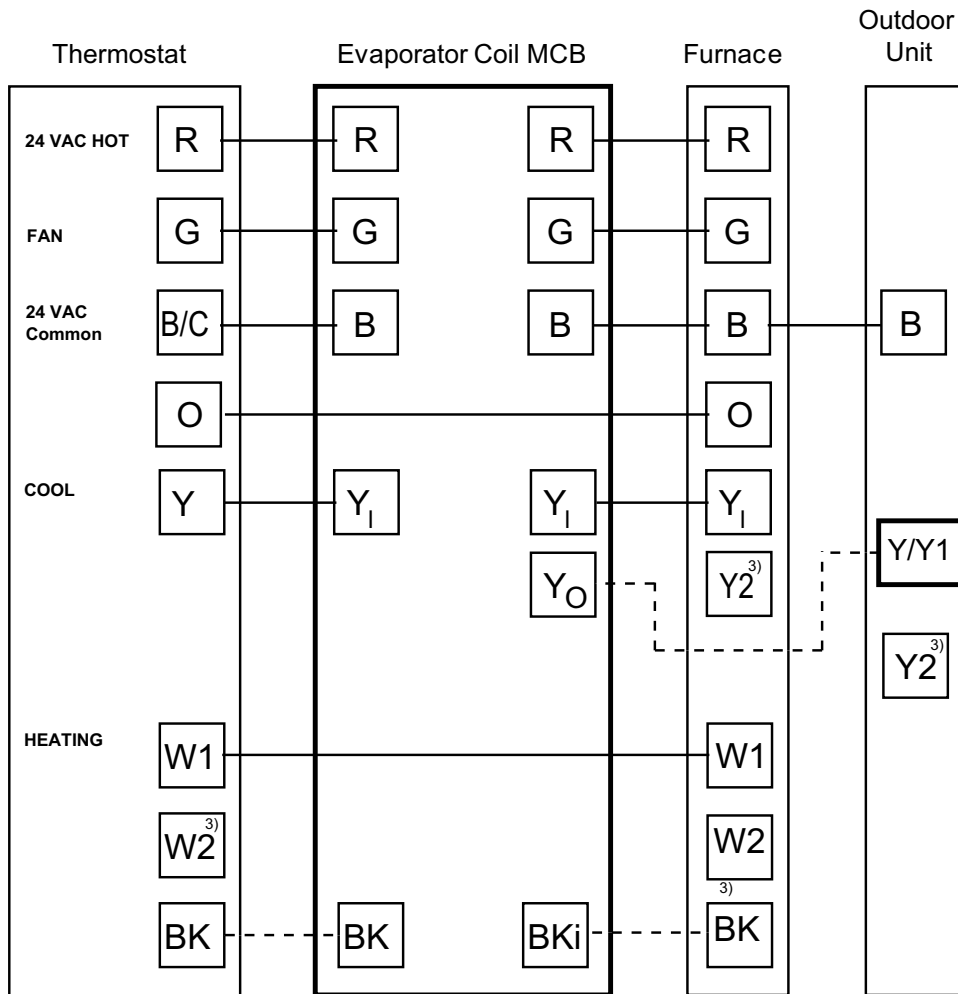
1. Units with pigtails require wirenuts for connections.
2. Cap all unused wires.
3. When BK is used, do not connect Y2 at the air handler.
4. When BK is used, cut the jumper between R and BK on the control board. See indoor wiring schematic for details.
5. In AC systems, for multiple stages of electric heat, jumper W1 and W2 together if comfort control has only one stage of heat.

**Figure 23. With A5AHC**



1. Units with pigtails require wirenuts for connections.
2. Cap all unused wires.
3. In AC systems, for multiple stages of electric heat, jumper W1 and W2 together if comfort control has only one stage of heat.

**Figure 24. AC with furnace**



1. Units with pigtails require wirenuts for connections.
2. Cap all unused wires.
3. For 24V control, connect factory supplied harness to circuit board at evaporator. Complete all other wiring connections at the furnace.
4. For 2 stage systems, connect W2 to W2 and Y2 to Y2.

## Mitigation Board Guidelines

- The approved ID/OD combination provides sufficient safe ventilation in case of a leak.
- All systems require mitigation boards so an altitude adjustment factor may be required.
- The mitigation control board needs to be included in an A2L System.

## High Voltage

### High Voltage Power Supply

#### ⚠ WARNING

#### Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.



# System Start-Up

1. Confirm that all steps from Refrigerant Line Brazing through Electrical – Low Voltage Mitigation Board Guidelines are complete.
2. Turn on the disconnect(s) to power the indoor and outdoor units.
3. If the compressor crankcase heater accessory is used and the outdoor ambient is below 70°F, wait one hour before starting the unit.
4. Set the system thermostat to ON.

# System Charge Adjustment

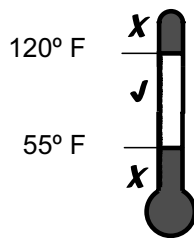
For systems using an indoor piston metering device, refer to the superheat charging method and chart. For systems using a TXV or EEV indoor metering device, refer to the subcool charging method and charts.

## Temperature Measurements

Check the outdoor temperatures.

Subcooling (in cooling mode) is the only recommended method of charging above 55°F ambient outdoor temperature.

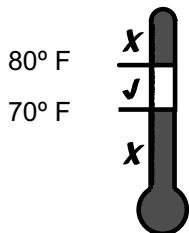
**Figure 26. Outdoor temperature**



**Note:** For Superheat (In Cooling Mode), see the [Table 12, p. 25](#).

For best results the indoor temperature should be kept between 70° F to 80° F.

**Figure 27. Indoor temp**



**Note:** It is important to return in the spring or summer to accurately charge the system in the cooling mode when outdoor ambient temperature is above 55° F.

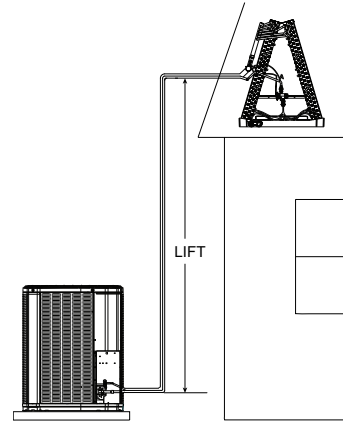
## Subcooling Charging in Cooling (Above 55°F Outdoor Temperature)

1. Use the refrigerant line total length and lift measurements from “[Required Refrigerant Line Length,](#)” p. 9.

Total Line Length = \_\_\_\_\_ Ft.

Vertical Change (Lift) = \_\_\_\_\_ Ft.

**Figure 28. Refrigerant line total length and lift**



2. Determine the final subcooling target using total line length and lift measured in [Step 1](#). and the charts below.

**Table 6. Maximum line length and rise (models 018A, 024A, 030A, 036A)**

| 018A, 024A, 030A, and 036A |             |        |      |
|----------------------------|-------------|--------|------|
| Vapor Line                 | Liquid Line | Length | Lift |
| 5/8                        | 5/16        | 150    | 50   |
| 3/4                        | 5/16        | 150    | 50   |
| 5/8                        | 3/8         | 150    | 50   |
| 3/4                        | 3/8         | 150    | 50   |
| <b>Note:</b>               |             |        |      |
| Ratings/Primary            |             |        |      |
| Alternate Lineset          |             |        |      |

**Table 7. Maximum line length and rise (models 042A and 048A)**

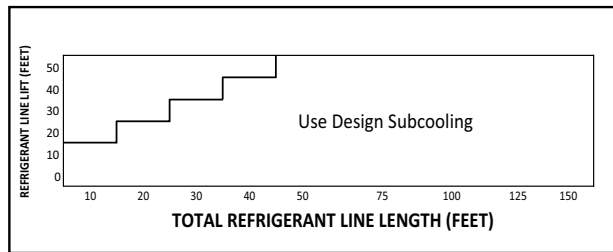
| 042A and 048A     |             |        |      |
|-------------------|-------------|--------|------|
| Vapor Line        | Liquid Line | Length | Lift |
| 3/4               | 5/16        | 150    | 50   |
| 7/8               | 5/16        | 150    | 50   |
| 3/4               | 3/8         | 150    | 50   |
| 7/8               | 3/8         | 150    | 50   |
| <b>Note:</b>      |             |        |      |
| Ratings/Primary   |             |        |      |
| Alternate Lineset |             |        |      |

## System Charge Adjustment

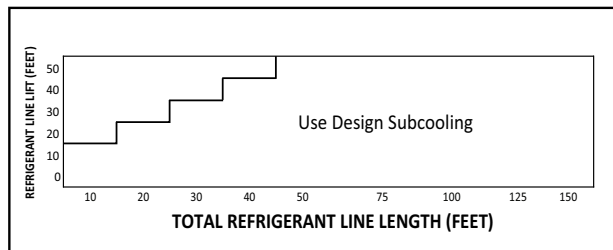
**Table 8. Maximum line length and rise (model - 060A)**

| 060A              |             |             |      |
|-------------------|-------------|-------------|------|
| Vapor Line        | Liquid Line | Liquid Line | Lift |
| 7/8               | 3/8         | 150         | 50   |
| 1-1/8             | 3/8         | 75          | 50   |
| 7/8               | 3/8         | 150         | 50   |
| 1-1/8             | 3/8         | 75          | 50   |
| <b>Note:</b>      |             |             |      |
| Ratings/Primary   |             |             |      |
| Alternate Lineset |             |             |      |

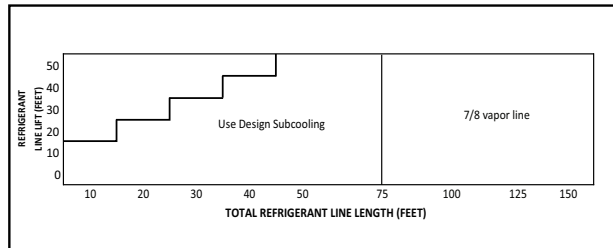
**Figure 29. Subcool charging corrections – models 018A, 024A, 030A, and 036A**



**Figure 30. Subcool Charging Corrections – models 042A and 048A**



**Figure 31. Subcool Charging Corrections – model 060A**



Design Subcooling Value = \_\_\_\_\_ °F

(from nameplate or Service Facts)

Subcooling Correction = \_\_\_\_\_ °F

Final Subcooling Value = \_\_\_\_\_ °F

3. Stabilize the system by operating for a minimum of 20 minutes whenever charge is removed or added before accurate measurements can be made.

4. Measure the liquid line temperature and pressure at the outdoor unit's service valve.

Measured Liquid Line Temperature = \_\_\_\_\_ °F

Liquid Gage Pressure = \_\_\_\_\_ PSI

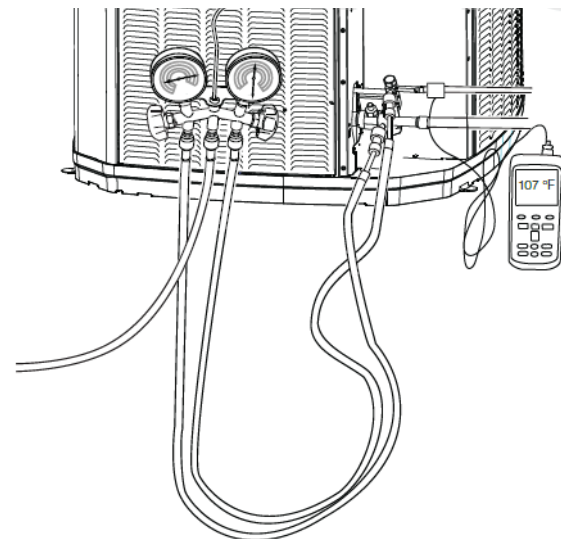
Final Subcooling Target = \_\_\_\_\_ °F

5. Use the final subcooling target, refrigerant temperature and pressure from [Step 4.](#), to determine the proper liquid gage pressure using [Table 9, p. 20.](#)

Example: Assume a 12°F Final Subcooling Target and liquid temperature of 90°F.

- a. Locate 12°F Final Subcooling in [Table 9, p. 20.](#)
- b. Locate the Liquid Temperature (90°F) in the left column.
- c. The Liquid Gage Pressure should be approximately 327 PSI. (This is the shown as the intersection of the Final Subcooling column and the Liquid Temperature row).

**Figure 32. Charging the unit**



**Table 9. R-454B refrigerant charging chart**

| Liquid Temp(°F) | Design Subcooling (°F)      |     |     |     |     |     |     |
|-----------------|-----------------------------|-----|-----|-----|-----|-----|-----|
|                 | 8                           | 9   | 10  | 11  | 12  | 13  | 14  |
|                 | Liquid Gauge Pressure (PSI) |     |     |     |     |     |     |
| 55              | 170                         | 172 | 175 | 178 | 181 | 184 | 187 |
| 60              | 184                         | 187 | 190 | 194 | 197 | 200 | 203 |
| 65              | 200                         | 203 | 206 | 210 | 213 | 217 | 220 |
| 70              | 217                         | 220 | 223 | 227 | 230 | 234 | 238 |
| 75              | 234                         | 238 | 241 | 245 | 249 | 252 | 256 |
| 80              | 252                         | 256 | 260 | 264 | 268 | 272 | 276 |
| 85              | 272                         | 276 | 280 | 284 | 288 | 292 | 297 |
| 90              | 292                         | 297 | 301 | 305 | 309 | 314 | 318 |

**Table 9. R-454B refrigerant charging chart (continued)**

| Liquid Temp(° F) | Design Subcooling (°F)      |     |     |     |     |     |     |
|------------------|-----------------------------|-----|-----|-----|-----|-----|-----|
|                  | 8                           | 9   | 10  | 11  | 12  | 13  | 14  |
|                  | Liquid Gauge Pressure (PSI) |     |     |     |     |     |     |
| 95               | 314                         | 318 | 323 | 327 | 332 | 336 | 341 |
| 100              | 336                         | 341 | 346 | 351 | 355 | 360 | 365 |
| 105              | 360                         | 365 | 370 | 375 | 380 | 385 | 390 |
| 110              | 385                         | 390 | 396 | 401 | 406 | 412 | 417 |
| 115              | 412                         | 417 | 422 | 428 | 433 | 439 | 445 |
| 120              | 439                         | 445 | 450 | 456 | 462 | 468 | 474 |
| 125              | 468                         | 474 | 480 | 486 | 492 | 498 | 504 |

6. Adjust refrigerant level to attain proper gage pressure.

Add refrigerant if the Liquid Gauge Pressure is lower than the chart value.

- Connect gauges to refrigerant bottle and unit as illustrated.
- Purge all hoses.
- Open bottle.
- Stop adding refrigerant when liquid line temperature and Liquid Gauge Pressure matches the charging chart Final Subcooling Target.

Recover refrigerant if the Liquid Gauge Pressure is higher than the chart value.

7. Stabilize the system.

- Wait 20 minutes for the system condition to stabilize between adjustments.

**Note:** When the Liquid Line Temperature and Gauge Pressure approximately match the chart, the system is properly charged.

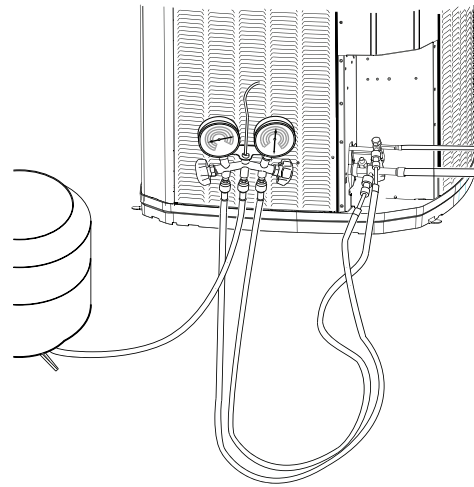
- Remove gauges.

- Replace service port caps to prevent leaks. Tighten finger tight plus an additional 1/6 turn.

8. Verify typical performance.

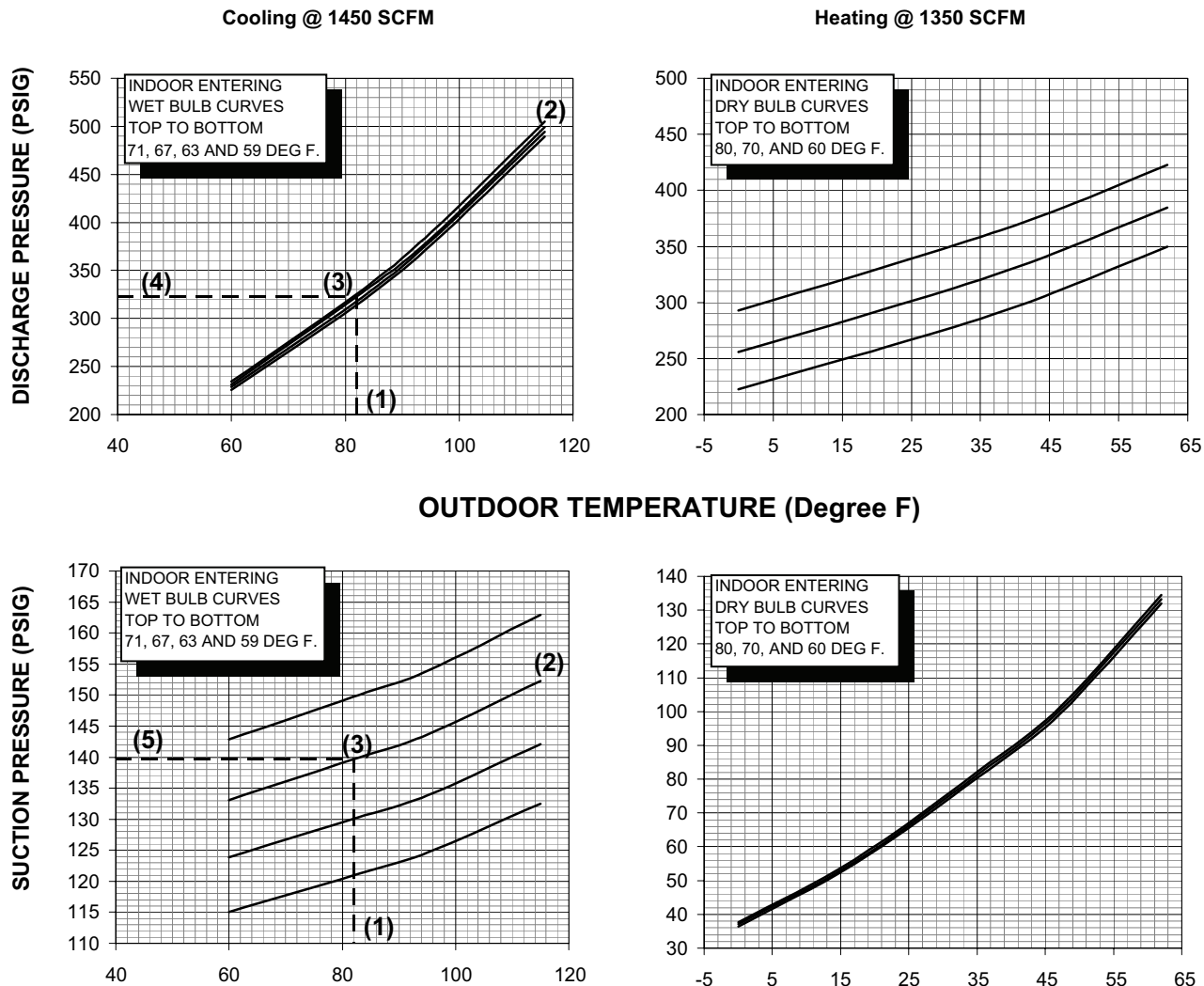
Refer to the Pressure Curves to verify typical performance.

**Figure 33. Charging the unit**



## System Charge Adjustment

Figure 34. Pressure curve sample



9. Record System Information for reference.

Record system pressures and temperatures after charging is complete.

Outdoor model number = \_\_\_\_\_

Measured Outdoor Ambient = \_\_\_\_\_ °F

Measured Indoor Ambient = \_\_\_\_\_ °F

Measured Liquid Line Temperature = \_\_\_\_\_ °F

Measured Suction Line Temperature = \_\_\_\_\_ °F

Liquid Gauge Pressure = \_\_\_\_\_ PSI

Suction Gauge Pressure = \_\_\_\_\_ PSI

10. If repairs must be made after system is charged, properly and safely remove and isolate refrigerant and purge the section of the system needing repair with oxygen free nitrogen prior to opening the circuit.

The refrigerant charge should be recovered into the correctly marked recovery cylinders. Ensure that the

correct number of cylinders for holding the total system charge is available. Only use cylinders designated for the recovered refrigerant and labelled for that refrigerant. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order.

Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

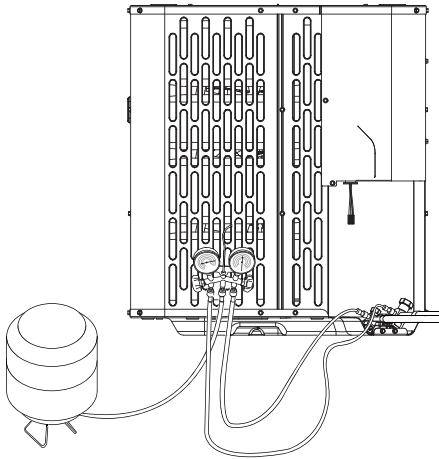
The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder. Do not mix refrigerants.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that Flammable Refrigerant does not remain within the lubricant.



## System Charge Adjustment

Figure 35. Charging the unit



2. Stabilize the system.
  - a. Wait 20 minutes for the system condition to stabilize between adjustments.

Figure 36. Stopwatch



**Note:** When the liquid line temperature and gauge pressure approximately match the chart, the system is properly charged.

- b. Remove the gauges.
  - c. Replace the service port caps to help prevent leaks. Finger-tighten, then turn an additional 1/6 turn.
3. Record system information for reference. After charging is complete, record the system pressures and temperatures.

Outdoor model number = \_\_\_\_\_

Measured suction line temperature = \_\_\_\_\_ °F

Measured outdoor ambient = \_\_\_\_\_ °F

Liquid gauge pressure = \_\_\_\_\_ PSIG

Measured indoor ambient = \_\_\_\_\_ °F

Suction gauge pressure = \_\_\_\_\_ PSIG

Measured liquid line temperature = \_\_\_\_\_ °F

4. Complete the **Total System Charge** charge rating label below and label located on the outside of the unit with a permanent marker.
  - a. Charge added at factory = \_\_\_\_\_ lb/oz
  - b. Charge added at install = \_\_\_\_\_ lb/oz
  - c. Total system charge (a + b) = \_\_\_\_\_ lb/oz

Table 12. Fixed orifice superheat charging table

|                                        | Indoor Wet Bulb Temp (°F) |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----------------------------------------|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Outdoor Dry Bulb Temper-<br>ature (°F) |                           | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 |
|                                        | 55                        | 7  | 9  | 10 | 11 | 12 | 14 | 15 | 17 | 18 | 20 | 21 | 23 | 24 | 26 | 27 | 29 | 30 | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  |
|                                        | 60                        | 5  | 7  | 8  | 9  | 10 | 12 | 13 | 15 | 16 | 18 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 30 | 31 | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  |
|                                        | 65                        | —  | —  | 4  | 6  | 8  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 27 | 31 | —  | —  | —  | —  | —  | —  | —  | —  |
|                                        | 70                        | —  | —  | —  | —  | 5  | 7  | 8  | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 30 | 31 | —  | —  | —  | —  | —  | —  |
|                                        | 75                        | —  | —  | —  | —  | —  | —  | 5  | 6  | 7  | 9  | 10 | 12 | 14 | 16 | 18 | 19 | 21 | 22 | 24 | 26 | 28 | 29 | 31 | 32 | —  | —  | —  | —  | —  |
|                                        | 80                        | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 6  | 7  | 9  | 10 | 11 | 12 | 14 | 16 | 18 | 19 | 21 | 23 | 25 | 26 | 28 | 29 | 31 | 33 | —  | —  |
|                                        | 85                        | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 6  | 7  | 9  | 10 | 13 | 14 | 16 | 18 | 20 | 21 | 23 | 24 | 26 | 28 | 29 | 30 | 31 | 32 |
|                                        | 90                        | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 6  | 8  | 10 | 11 | 13 | 14 | 16 | 18 | 20 | 22 | 24 | 25 | 27 | 28 | 30 | 31 |
|                                        | 95                        | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 6  | 8  | 10 | 13 | 14 | 16 | 18 | 20 | 22 | 23 | 25 | 26 | 28 | 29 |
|                                        | 100                       | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 6  | 8  | 10 | 12 | 13 | 16 | 18 | 20 | 21 | 23 | 25 | 27 | 29 |
|                                        | 105                       | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 6  | 7  | 9  | 11 | 13 | 15 | 18 | 20 | 22 | 24 | 26 | 28 |
|                                        | 110                       | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 4  | 7  | 9  | 11 | 13 | 16 | 18 | 21 | 23 | 26 | 28 |    |
| 115                                    | —                         | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | —  | 6  | 9  | 12 | 14 | 16 | 19 | 21 | 24 | 26 |    |

- Measure the return-air wet-bulb temperature at the unit just before the coil using a digital psychrometer.
- Measure the outdoor dry-bulb temperature.
  - Use these temperatures to determine target superheat from the charging table. Do not charge the system if the conditions fall outside the table.
  - To decrease total superheat, add refrigerant.
  - To increase total superheat, remove refrigerant.
- After any refrigerant or airflow change, allow the system to operate for 10 to 15 minutes before determining final superheat.

## Weigh-in Method for Calculating Charge

Use the weigh-in method in the following situations:

- During initial installation when replacing the system charge.
- When power is not available at the equipment site.
- When indoor or outdoor temperatures are outside the range required to verify charge using the subcooling method.

To calculate the charge:

- Measure the distance in feet between the outdoor unit and the indoor unit, and record it on Line 1. Include the

full line length from the service valve to the IDU, minus 15 ft.

Line length (ft) = \_\_\_\_\_

- Enter the charge multiplier: 0.47 oz/ft for 3/8-inch tubing or 0.30 oz/ft for 5/16-inch tubing.
- Multiply the total refrigerant tubing length from Line 1 by the value in Step 2. Record the result on Line 3 of the worksheet.

Step 1 x Step 2 = \_\_\_\_\_

- Record this value as the amount of refrigerant to weigh in before opening the service valves.

Refrigerant = \_\_\_\_\_

- Complete the **Total System Charge** rating label below and the label on the outside of the unit using a permanent marker.

Complete the **Total System Charge** chart after final charging is complete.

a. Charge added at factory = \_\_\_\_\_ lb/oz

b. Charge added at install = \_\_\_\_\_ lb/oz

c. Total system charge (a + b) = \_\_\_\_\_ lb/oz

- Return to the site for adjustment.

**Important:** Return in spring or summer to accurately charge the system in cooling mode when the outdoor ambient is above 55°F.

# Operational and Checkout Procedures

The final phase of installation is completing the unit operational and checkout procedures. For proper performance, operate the unit and make any required charge adjustments.

1. Inspect factory tubing for any shifting during shipment.
2. Adjust the tubing to prevent tube-to-tube contact during operation.
3. Confirm all wiring connections are tight and secure.

After installation is complete, check the following:

- ☐ Leak-check the refrigerant lines.
- ☐ Properly insulate the suction lines and fittings.
- ☐ Secure and isolate all refrigerant lines.
- ☐ Seal all passages through masonry. If mortar is used, prevent it from contacting the copper tubing.
- ☐ Verify that all electrical connections are tight.
- ☐ Observe the outdoor fan during operation for clearance and smooth operation.
- ☐ Verify that the indoor coil drain line drains freely by pouring water into the drain pan.
- ☐ Verify that supply registers and return grilles are open and unobstructed.
- ☐ Verify that a return air filter is installed.
- ☐ Verify that the correct airflow setting is used for the indoor blower motor.
- ☐ Confirm safe operation by operating the complete system in each mode.
- ☐ Confirm that the refrigerant leak detection system is operational.
- ☐ Confirm that the refrigerant quantity is marked on the outdoor unit.

**Figure 37. Wiring diagram - models A5AC5018, 024, and 030**



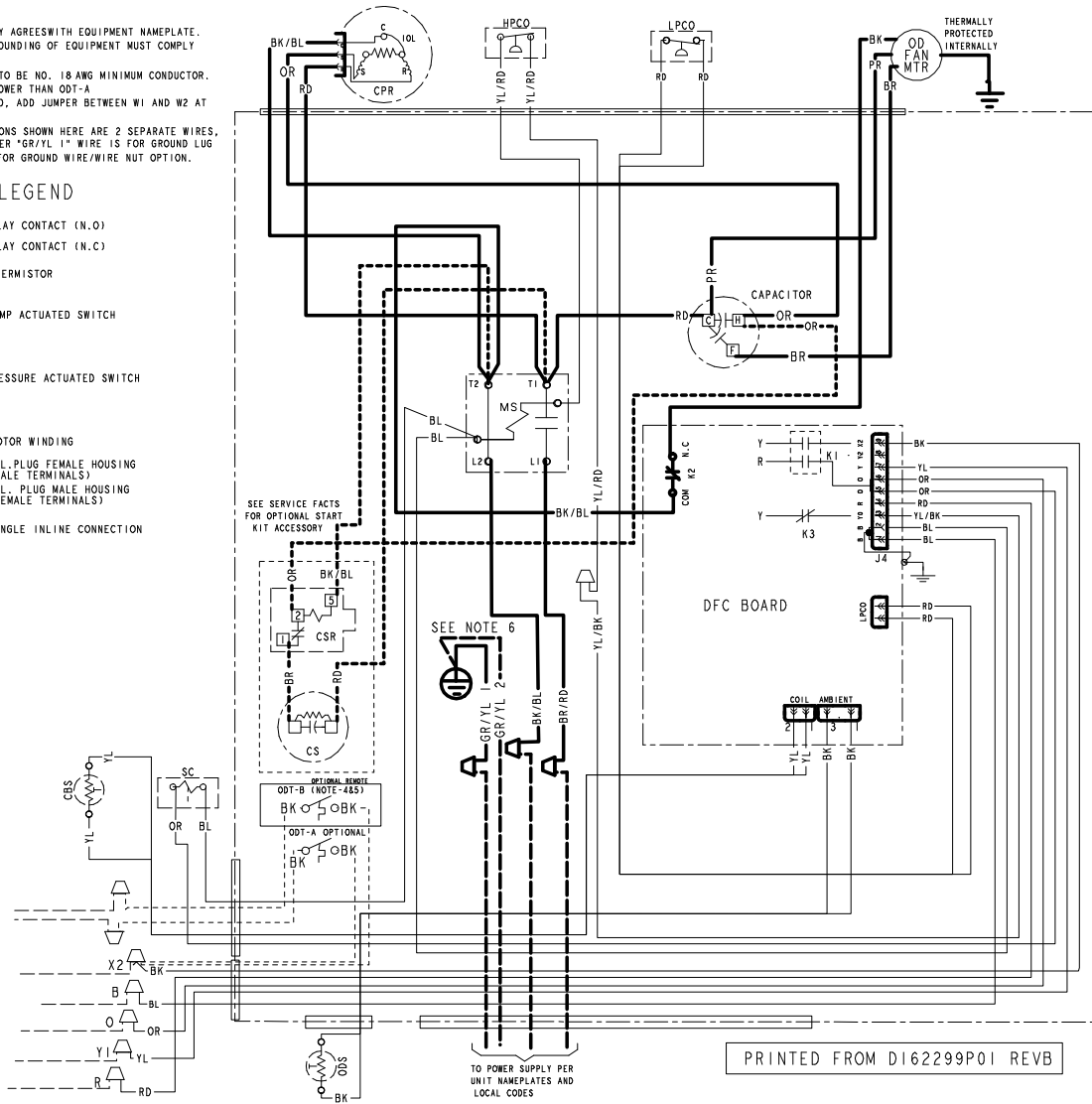
**Figure 38. Wiring diagram - models A5AC5018, 024, and 030**

**NOTES:**

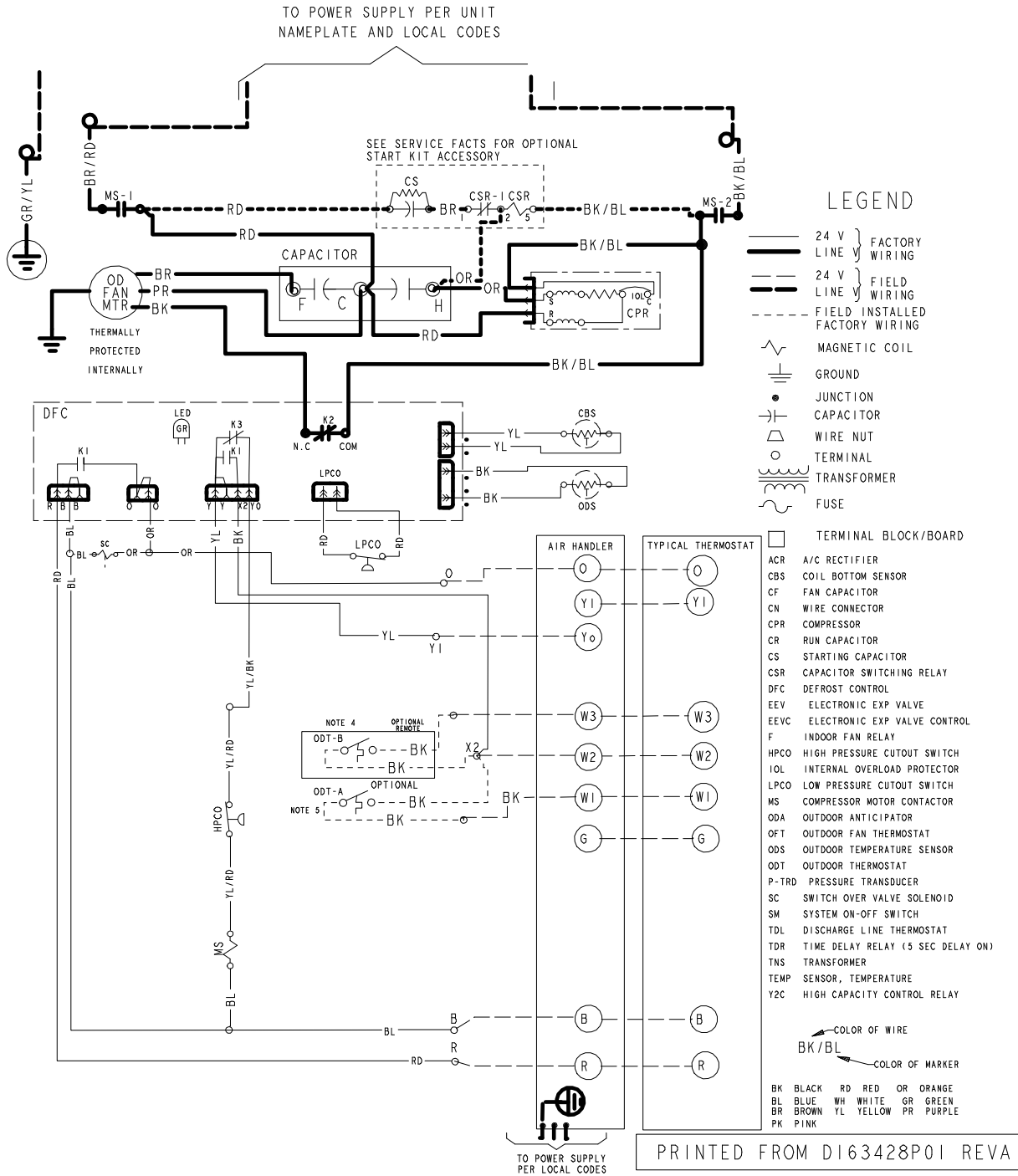
1. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
2. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
3. LOW VOLTAGE WIRING TO BE NO. 18 AWG MINIMUM CONDUCTOR.
4. ODT-B MUST BE SET LOWER THAN ODT-A.
5. IF ODT-A IS NOT USED, ADD JUMPER BETWEEN W1 AND W2 AT AIR HANDLER.
6. THE GROUND CONNECTIONS SHOWN HERE ARE 2 SEPARATE WIRES. DO NOT CRIMP TOGETHER "GR/YL 1" WIRE IS FOR GROUND LUG AND "GR/YL 2" IS FOR GROUND WIRE/WIRE NUT OPTION.

**LEGEND**

- RELAY CONTACT (N.O.)
- RELAY CONTACT (N.C.)
- THERMISTOR
- TEMP ACTUATED SWITCH
- PRESSURE ACTUATED SWITCH
- MOTOR WINDING
- POL. PLUG FEMALE HOUSING (MALE TERMINALS)
- POL. PLUG MALE HOUSING (FEMALE TERMINALS)
- SINGLE INLINE CONNECTION



**Figure 39. Wiring diagram - models A5AC5036**

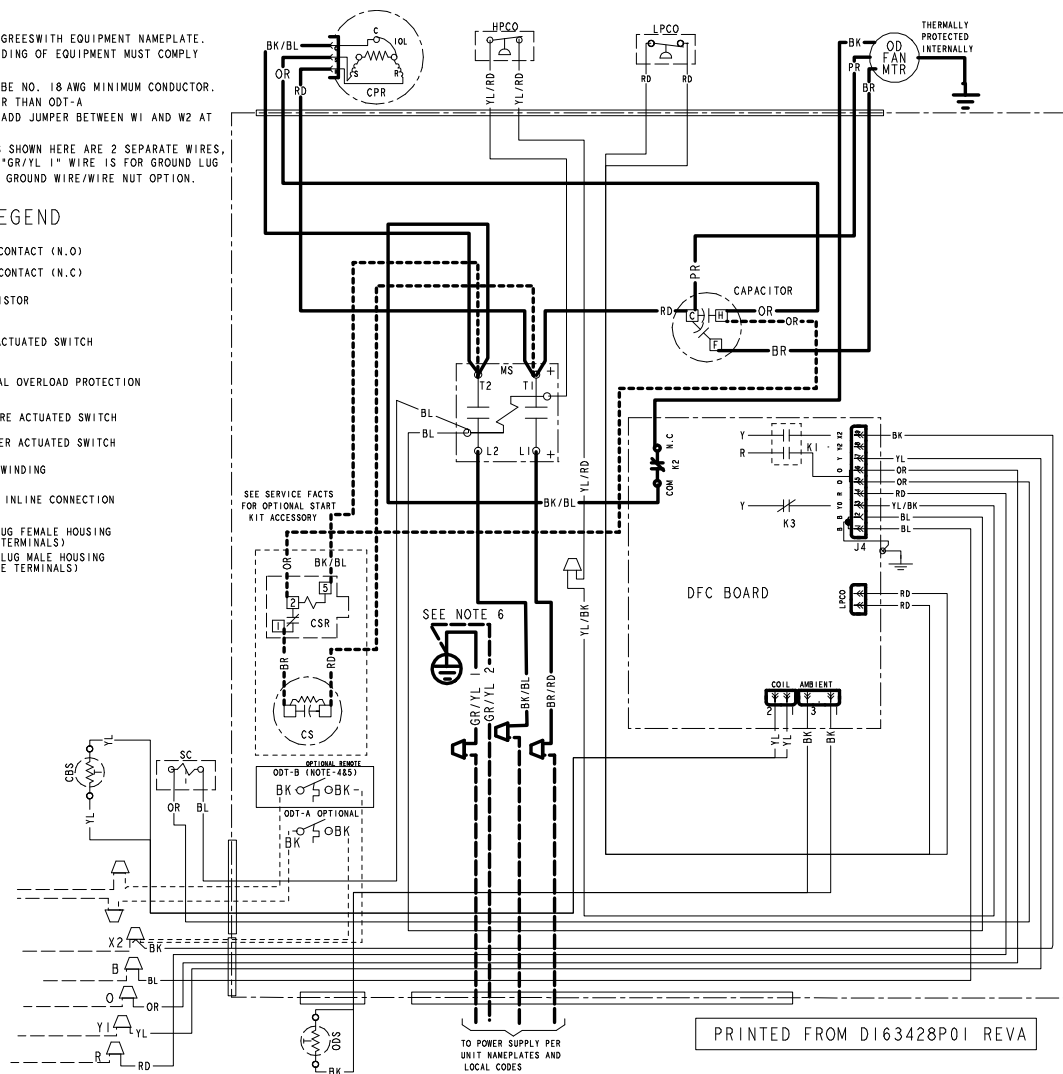
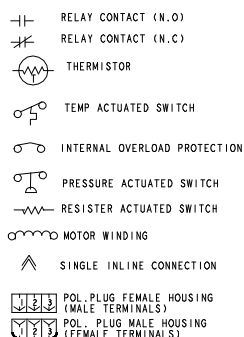


**Figure 40. Wiring diagram - models A5AC5036**

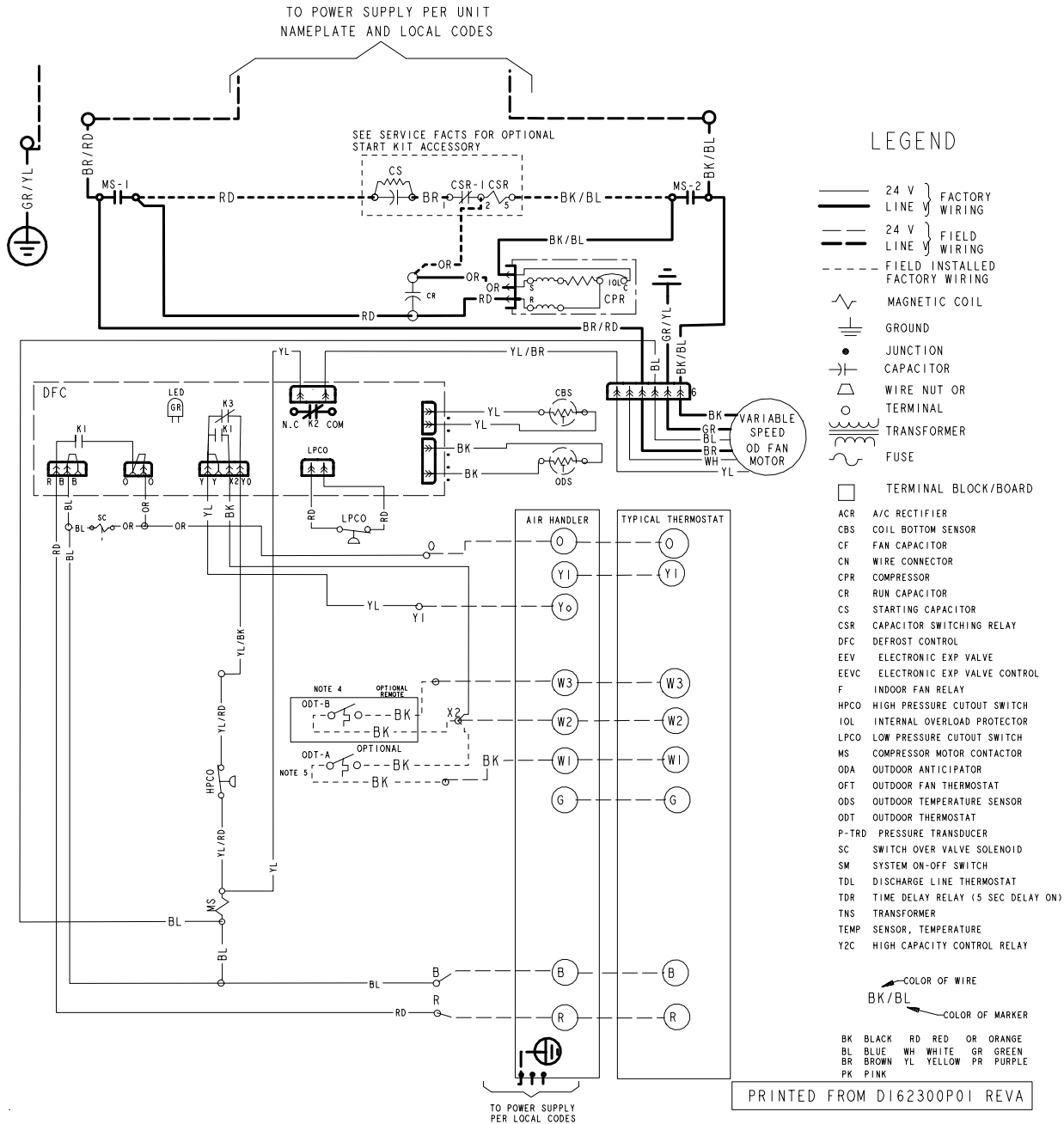
NOTES:

1. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
2. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES
3. LOW VOLTAGE WIRING TO BE NO. 18 AWG MINIMUM CONDUCTOR.
4. OT-B MUST BE SET LOWER THAN OT-A
5. IF OT-A IS NOT USED, ADD JUMPER BETWEEN W1 AND W2 AT AIR HANDLER
6. THE GROUND CONNECTIONS SHOWN HERE ARE 2 SEPARATE WIRES, DO NOT CRIMP TOGETHER "GR/YL 1" WIRE IS FOR GROUND LUG AND "GR/YL 2" IS FOR GROUND WIRE/WIRE NUT OPTION.

### LEGEND



**Figure 41. Wiring diagram - models A5AC5042, 048, and 060**



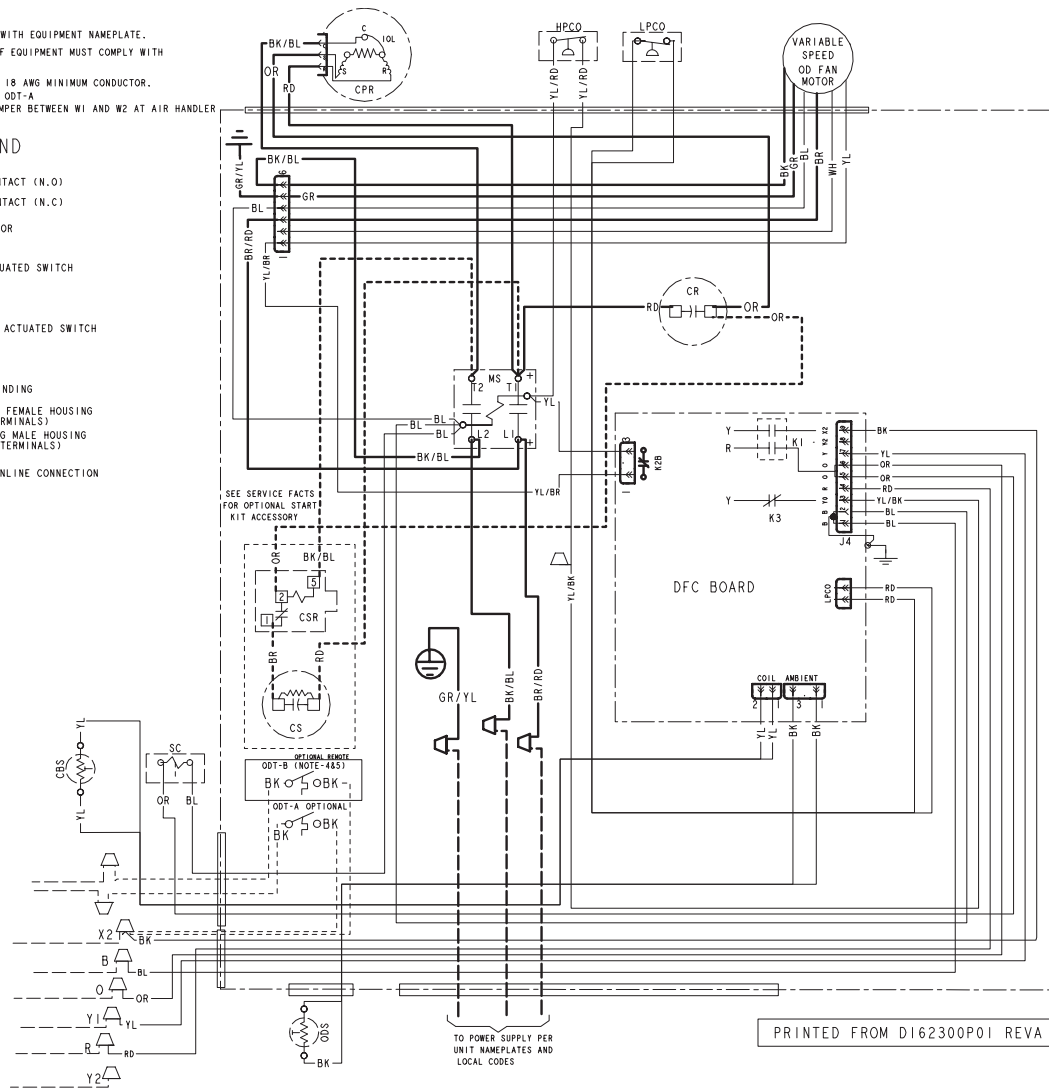
**Figure 42. Wiring diagram - models A5AC5042, 048, and 060**

**NOTES:**

1. BE SURE POWER SUPPLY AGREES WITH EQUIPMENT NAMEPLATE.
2. POWER WIRING AND GROUNDING OF EQUIPMENT MUST COMPLY WITH LOCAL CODES.
3. LOW VOLTAGE WIRING TO BE NO. 18 AWG MINIMUM CONDUCTOR.
4. ODT-B MUST BE SET LOWER THAN ODT-A
5. IF ODT-A IS NOT USED, ADD JUMPER BETWEEN W1 AND W2 AT AIR HANDLER

**LEGEND**

- RELAY CONTACT (N.O.)
- RELAY CONTACT (N.C.)
- THERMISTOR
- TEMP ACTUATED SWITCH
- PRESSURE ACTUATED SWITCH
- MOTOR WINDING
- POL. PLUG FEMALE HOUSING (MALE TERMINALS)
- POL. PLUG MALE HOUSING (FEMALE TERMINALS)
- SINGLE INLINE CONNECTION



# Pressure Curves

Cooling performance can be checked when the outdoor temperature is above 65°F.

To check cooling performance, select the proper indoor CFM, all pressures to stabilize. Measure indoor wet bulb temperature, outdoor temperature, liquid, and suction pressures.

On the plots:

- Locate outdoor temperature
- Locate indoor wet bulb
- Find intersection of OD temperature and ID W.B
- Read discharge or suction pressure in left column.

## Example:

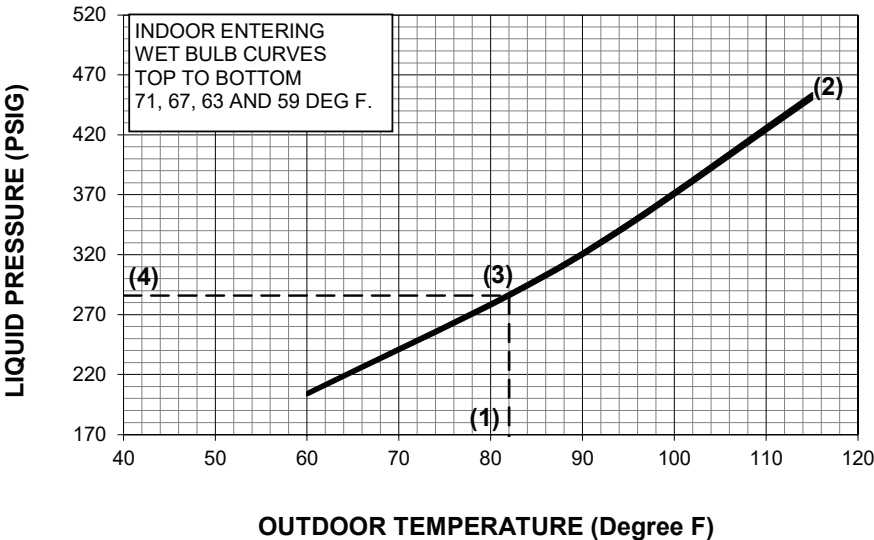
1. Outdoor temperature 82°F
2. In door wet bulb 67°F
3. At intersection
4. Discharge pressure at 600 CFM is 304 psig
5. Suction pressure at 600 CFM is 145 psig

Actual:

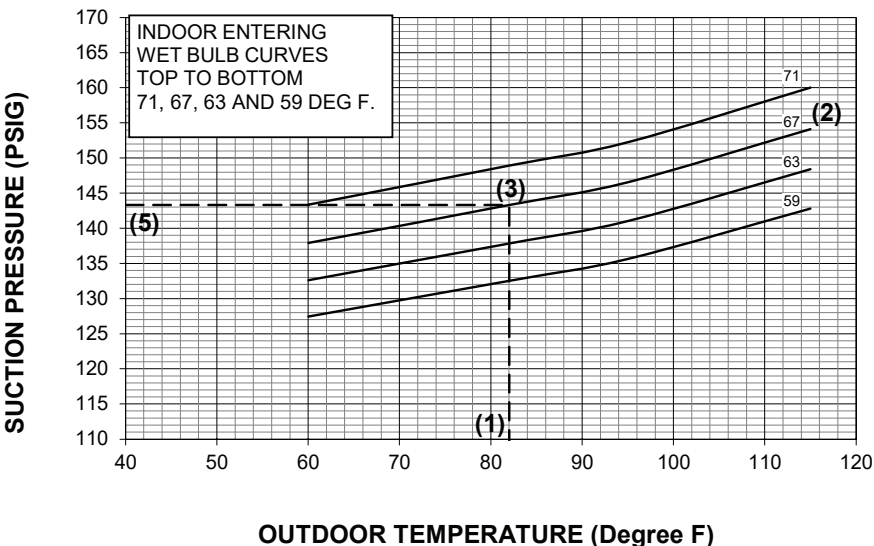
Discharge pressure should be +/- 10 psi of chart.

Suction pressure should be +/- 3 psi of chart.

**Figure 43. Pressure curves – model A5AC5018A1**



| OD Model   | Cooling @SCFM |
|------------|---------------|
| A5AC5018A1 | 600           |



# Pressure Curves

Figure 44. Pressure curves – models A5AC5024A1, A5AC5030A1, A5AC5036A1, A5AC5042A1, and A5AC5048A1

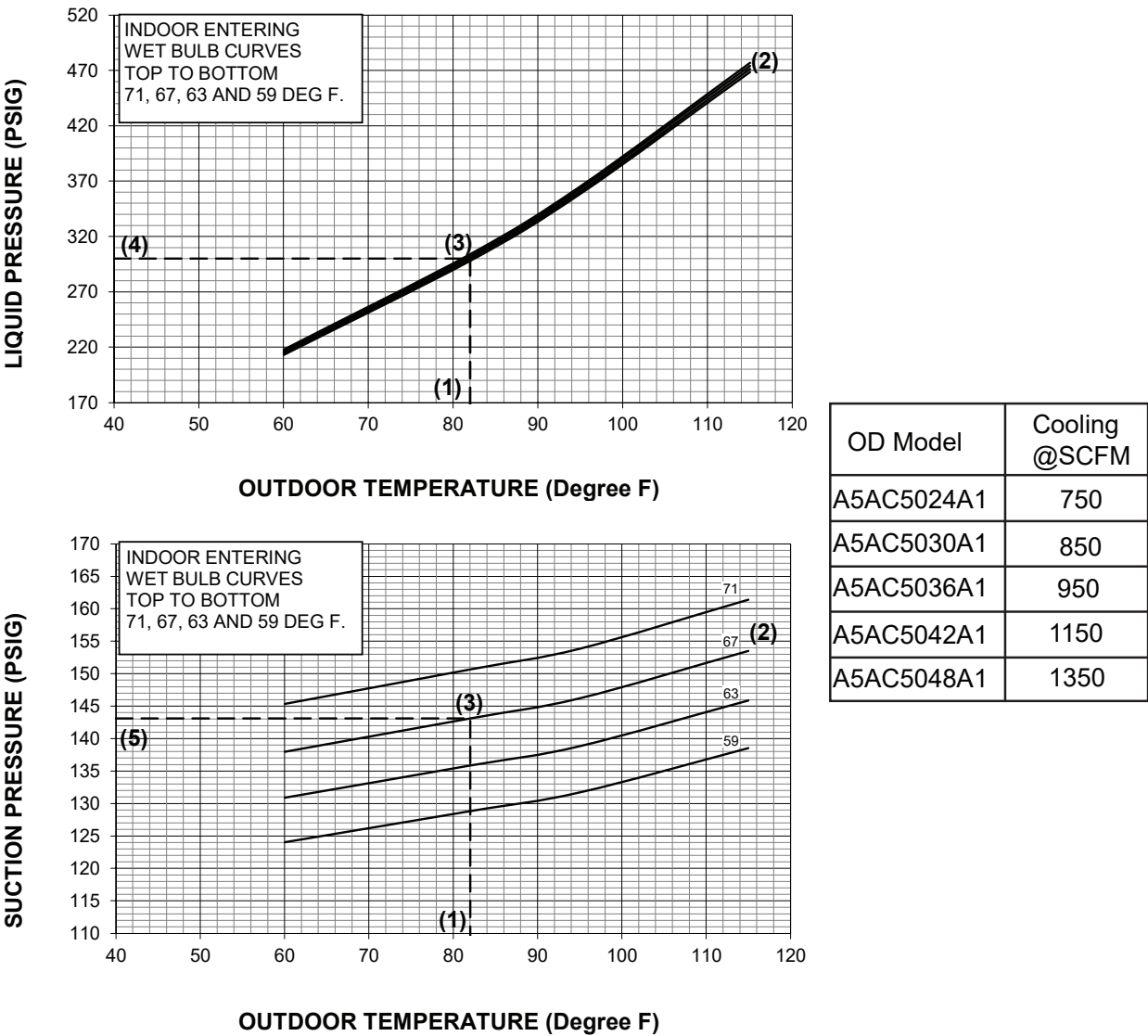
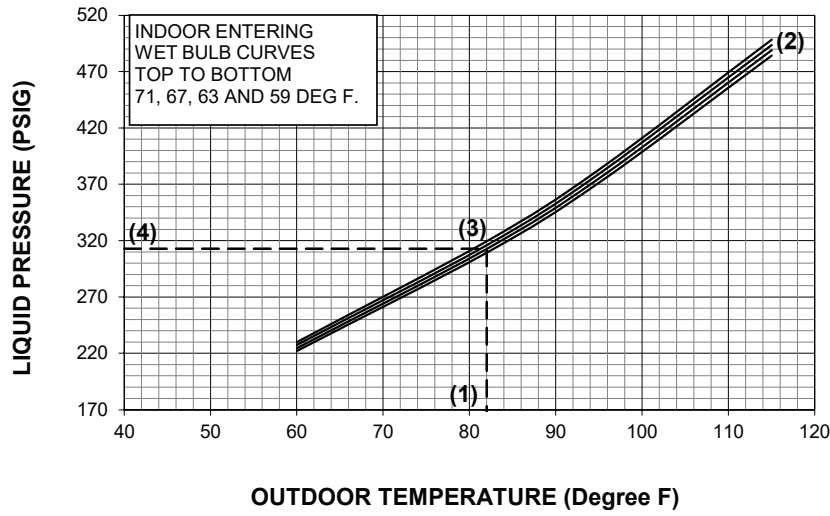
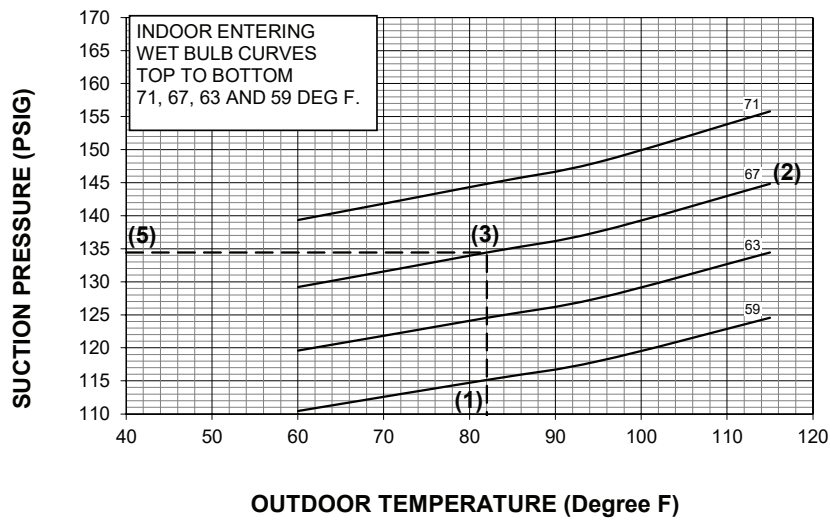


Figure 45. Pressure curves - model A5AC5060A1

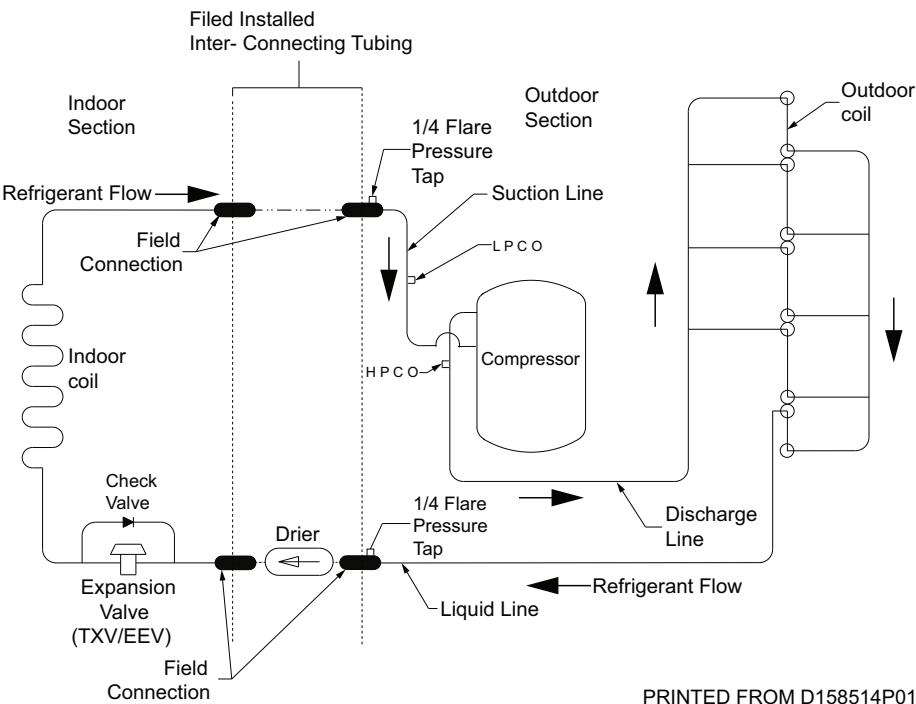


| OD Model   | Cooling @SCFM |
|------------|---------------|
| A5AC5060A1 | 1450          |

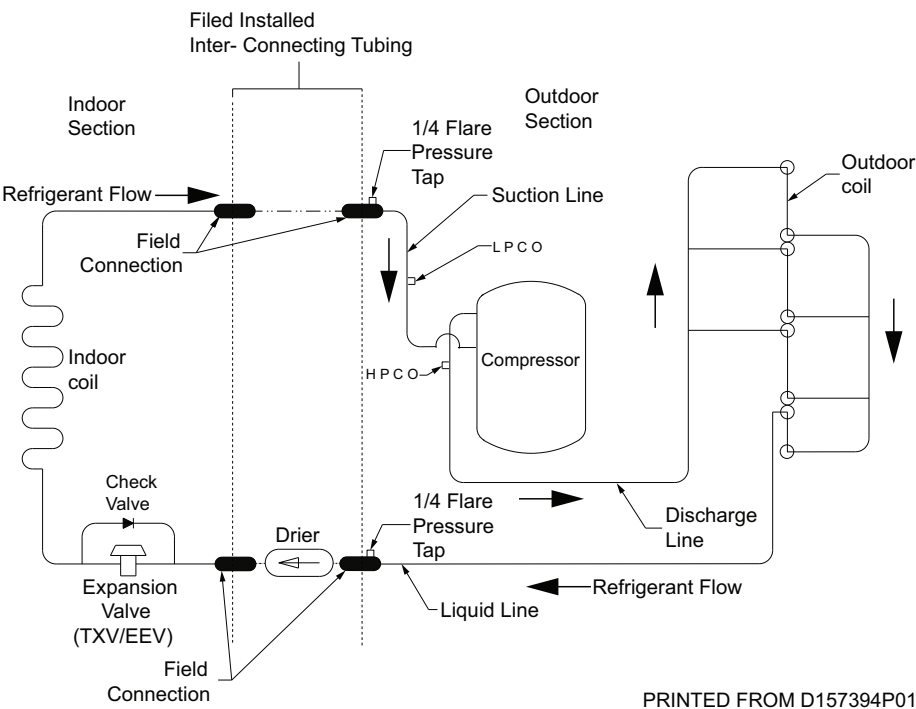


# Refrigeration Circuits

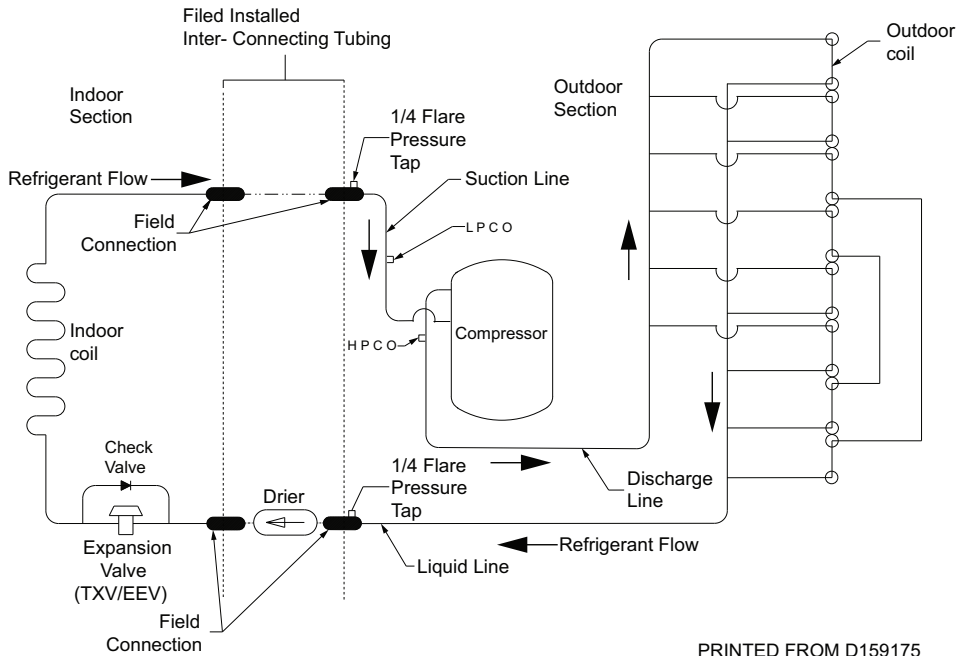
**Figure 46. Refrigeration cycle for models 018, 030, and 042**



**Figure 47. Refrigeration cycle for models 024 and 036**



**Figure 48. Refrigeration cycle for models 048 and 060**



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## Refrigerant Detection System

The approved ID/OD combination will provide sufficient safe ventilation.

Airflow provided is sufficient to cover minimum room area including adjustments for altitude. All systems require a refrigerant detection system so no altitude adjustment factors are required.

Installer must ensure refrigerant detection system is connected and placed in appropriate orientation per application.

The control system power shall not be interrupted to ensure the refrigerant detection system is always functioning.

Please reference Indoor Unit installers guide for correct specification on refrigerant detection system.





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