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Application Guide

Tube Size and Component Selection for RAUC Split Systems (20–120 Tons)





Preface

This application guide provides refrigerant piping guidelines for Trane® Model RAUC air-cooled condensing units that range in size from 20 through 120 tons. Use the information presented here to properly select interconnecting piping and refrigerant components for these systems.

This publication also outlines an “envelope” of application that is based on the proximity of the refrigerant components. The guidelines presented pertain specifically to the operating envelope for standard air-conditioning applications that deliver either a constant or variable volume of airflow and that provide no more than 45 percent ventilation (outdoor) air.

Prospective applications outside this operating envelope — including low-ambient, process, and 100-percent outdoor-air applications — must be reviewed by Trane to help assure proper performance.

The Trane Company, in proposing these system design and application concepts, assumes no responsibility for the performance or desirability of any resulting system design. Design of the HVAC system is the prerogative and responsibility of the engineering professional.

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Overview

“Why did Trane change the rules for refrigerant piping in large split systems? Didn’t the old rules work?” ... “The *Trane Reciprocating Refrigeration Manual* has been used for decades to size lines; are you saying it’s wrong?”

These questions and others have been posed by split-system designers about the current piping practices for RAUC condensing units. But did we (Trane) really change the rules, or simply refocus them?

Traditionally, refrigerant piping practices were guided by only three principles:

- **Return the oil to the compressor.**
- **Maintain a solid column of liquid at the expansion valve.**
- **Minimize the loss of capacity.**

These rules remain unchanged for today’s piping practices, but through practical experience, we’ve identified one more:

- **Minimize the refrigerant charge in the system.**

Years of observation revealed that the lower the system refrigerant charge, the more reliably the split system performed. Any amount in excess of the minimum design charge made it more difficult to manage the refrigerant in the system. Why? Excess refrigerant increases the likelihood that refrigerant will end up in areas where it may cause operational problems over the life of the system.

To successfully minimize the system refrigerant charge, the manner in which the original rules are implemented must be reconsidered.

Background

The equivalent line lengths for refrigerant components, recommended pressure drops for suction and liquid lines, and minimum and maximum refrigerant velocities that were originally published in the 1940s edition of the *Trane Reciprocating Refrigeration Manual* originated from long-forgotten research. At least some of the supporting data was probably derived from measurements and/or equations that involved water because the pictures found in likely resources illustrate water components.

Through the years, analytical and empirical information for refrigerant piping has been reviewed and updated based on equation-based modeling and on two research papers: *Pressure Losses in Tubing, Pipe, and Fittings* by R.J.S. Pigott and *Refrigerant Piping Systems – Refrigerants 12, 22, 500* by the American Society of Refrigeration Engineers (ASRE). In his paper, Mr. Pigott describes his use of refrigerant as the fluid and his direct measurement of pressure drops. His findings indicated that the pressure drop of many line components is small and

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difficult to measure. For such cases, he derived a formula based on experimental data that relates the geometry of the component to its pressure drop. Overall, the calculated pressure loss of the components was less than presumed.

Similarly, the conclusion of the ASRE research paper states that the minimum velocity requirement (needed to maintain oil entrainment in vertical risers and horizontal lines) varies with the diameter of the refrigerant tubing *and* the saturated temperature of the suction gas.

Based on the findings of both papers, it is understood that the minimum velocity required to maintain oil entrainment in lines sized for RAUC units is *not* a constant 1,000 ft/min [305 m/min].

Updated Guidelines

Smaller Liquid Lines

Historically, liquid lines were sized to minimize the pressure losses within the piping circuit. Then, as now, movement of oil through the piping is not a concern because oil is miscible in liquid refrigerant at normal liquid-line temperatures. For the liquid line and its components, keeping the pressure drop at or below the traditional 6 psid [41 kPa] requirement assures that a solid column of liquid refrigerant will be available at the expansion valve.

If the objective is also to **minimize the liquid-line charge**, we would choose the smallest liquid line that maintains subcooling at the thermal expansion valve (TXV). Most likely, such an approach would increase the pressure drop well beyond 6 psid [41 kPa]; it would also use more, but not all, of the subcooling. As a safety factor, we recommend maintaining at least 5°F [2.7°C] of subcooling at the TXV throughout the system operating envelope. The line sizes and refrigeration components identified in Table 1 and Table 2 (page 6) were chosen to minimize the refrigerant charge and to maintain the needed subcooling.

Suction-Line Dependencies

Suction lines were previously sized to maintain oil-entrainment velocities that exceeded 500 ft/min [152 m/min] in horizontal lines and 1,000 ft/min [305 m/min] in vertical lines. At the same time, the objective was to avoid exceeding a pressure drop of 3 lb/in.² [20 kPa].

We now know that oil-entrainment velocity depends on line size and saturated suction pressure. Although the target pressure drop remains 3 lb/in.² [20 kPa], an additional pressure drop of 3 lb/in.² [20 kPa] only increases the capacity loss by approximately 2.5 percent in systems with matched RAUC units.

Table 1. Expansion Valves for RAUC 20–120-Ton Applications

Evaporator Coil Capacity ^a	Expansion Valve ^b Trane Part No.
2 to 4 tons	VAL07364
5 to 6 tons	VAL07074
7 to 10 tons	VAL07075
11 to 14 tons	VAL07076
15 to 18 tons	VAL02824
19 to 27 tons	VAL05036
28 to 37 tons	VAL07233
38 to 49 tons	VAL07234
50 to 67 tons	VAL07235

^a Choose an expansion valve that matches the tonnage of the evaporator coil it serves.

^b Provide and install one expansion valve per distributor.

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Table 2. Component Selection Summary^a

	RAUCC20	RAUCC25	RAUCC30	RAUCC40^b	RAUCC50^b	RAUCC60^b	RAUCC80^b	RAUCD100^b	RAUCD120^b
Refrigerant ckts	1	1	1	2	2	2	2	2	2
Minimum step	9 tons	9 tons	14 tons	9 tons	14 tons	14 tons	15 tons	20 tons	30 tons
Suction Line									
Tube diameter ^c									
Horizontal	2-1/8 in.	2-1/8 in.	2-1/8 in.	2-1/8 in.	2-1/8 in.	2-1/8 in.	2-5/8 in.	2-5/8 in.	3-1/8 in.
Vertical (up)	1-5/8 in.	1-5/8 in.	2-1/8 in.	1-5/8 in.	2-1/8 in.	2-1/8 in.	2-1/8 in.	2-5/8 in.	2-5/8 in.
Filter shell (1 per ckt)	DHY00345	DHY00339	DHY00339	DHY00345	DHY00339	DHY00339	DHY00341	DHY00341	DHY00342
Filter core	COR00067 (1 per ckt)	COR00067 (1 per ckt)	COR00067 (1 per ckt)	COR00067 (1 per ckt)	COR00067 (1 per ckt)	COR00067 (1 per ckt)	COR00067 (2 per ckt)	COR00067 (2 per ckt)	COR00067 (2 per ckt)
Access port (3 per ckt)	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core
Frostat™ control	KIT01387	KIT01387	KIT01387	KIT01387	KIT01387	KIT01387	KIT01387	KIT01387	KIT01387
Ball valve (2 per ckt)	VAL06645	VAL06645	VAL06645	VAL06645	VAL06645	VAL06645	VAL06647	VAL06647	VAL06649
Liquid Line									
Tube diameter ^c	5/8 in.	7/8 in.	7/8 in.	5/8 in.	7/8 in.	7/8 in.	7/8 in.	1-1/8 in.	1-1/8 in.
Filter shell (1 per ckt)	DHY00110	DHY00111	DHY00111	DHY00110	DHY00111	DHY00111	DHY00115	DHY00116	DHY00116
Filter core	COR00019 (1 per ckt)	COR00019 (1 per ckt)	COR00019 (1 per ckt)	COR00019 (1 per ckt)	COR00019 (1 per ckt)	COR00019 (1 per ckt)	COR00019 (2 per ckt)	COR00019 (2 per ckt)	COR00019 (2 per ckt)
Solenoid valve, coil (1 per ckt)	VAL07010 COI01004	VAL01829 COI01004	VAL01829 COI01004	VAL07010 COI01004	VAL01829 COI01004	VAL01829 COI01004	VAL01831 COI01004	VAL02150 COI01004	VAL02133 COI01004
Sight glass ^d (1 per ckt)	GLS00830	GLS00831	GLS00831	GLS00830	GLS00831	GLS00831	GLS00831	GLS00832	GLS00832
Access port (2 per ckt)	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core	Schraeder valve w/core
Expansion valve	See Table 1 (page 5)								
Ball valve (2 per ckt)	VAL06655	VAL06657	VAL06657	VAL06655	VAL06657	VAL06657	VAL06657	VAL06659	VAL06659
	RAUCC20	RAUCC25	RAUCC30	RAUCC40^b	RAUCC50^b	RAUCC60^b	RAUCC80^b	RAUCD100^b	RAUCD120^b

^a All refrigerant-line components are identified by Trane part number.

^b RAUCC40, C50, C60, C80, D100, and D120 condensing units include two refrigerant circuits. Be sure to double the component quantities shown above for these units.

^c Tube diameters shown for the suction and liquid lines only apply for permissible line lengths.

^d Liquid-line sight glass is of the moisture-indicating type.

Overview

Hot Gas Bypass in Commercial Comfort-Cooling Applications

Many years ago, hot gas bypass (HGBP) was successfully added to HVAC systems to correct a number of operational problems. Hoping to avoid such problems altogether, it eventually became common practice for designers to specify hot gas bypass in new systems. Unfortunately, the practice often degraded rather than improved reliability.

Hot gas bypass increases the minimum refrigerant charge; it also inflates the first cost of the system. Besides adding more paths for potential refrigerant leaks, hot gas bypass increases the likelihood of refrigerant distribution problems. Finally, hot gas bypass uses excessive amounts of energy by preventing compressors from cycling with fluctuating loads.

Trane now has more than ten years of experience in the successful use of packaged rooftop equipment *without hot gas bypass* in commercial comfort-cooling applications. To prevent evaporator freeze-up, our equipment typically includes Trane® Froststat™ coil frost protection.

Like hot gas bypass, the Froststat system protects the coil from freezing, but it does so by turning off compressors when a sensor detects the formation of frost on the evaporator coil. The compressor is released to operate when the coil temperature rises a few degrees above the frost threshold. The Froststat control strategy reduces the overall energy consumption of the system while reliably maintaining system control.

Note: If the needs of a particular installation warrant the addition of hot gas bypass, consult Hot Gas Bypass Control (Trane applications engineering manual AM-CON 10) for piping recommendations.

Equipment Proximity

In split-system applications, minimizing the refrigerant charge is critical to reliable, cost-effective operation. This design goal can be accomplished, in part, by routing the refrigerant lines as directly as possible to shorten the distance between components. Line lengths and riser heights should be no longer than absolutely necessary.

Equipment Placement

Position the RAUC condensing unit as close to the evaporator as possible to maximize reliability and to minimize both the length of the interconnecting lines and the system refrigerant charge. Route the refrigerant lines by the shortest direct path using only horizontal and vertical piping configurations. The



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permissible separation between the evaporator and the RAUC condensing unit depends on the total line length and the elevation difference between these devices.

*Note: Elevation differences between the evaporator and the RAUC unit are critical. **Interconnecting lines of 150 ft [45.7 m] are permissible without Trane review, but only a limited length can be in a riser.***

Line Sizing, Routing, and Component Selection

Figure 1 illustrates an example of an RAUC split-system arrangement. Use it to determine the proper, relative sequence of the components in the refrigerant lines that connect the RAUC condensing unit to an evaporator coil. Refer to “Examples of Field-Installed Evaporator Piping,” pages 14–19, for more detailed schematics of evaporator piping.

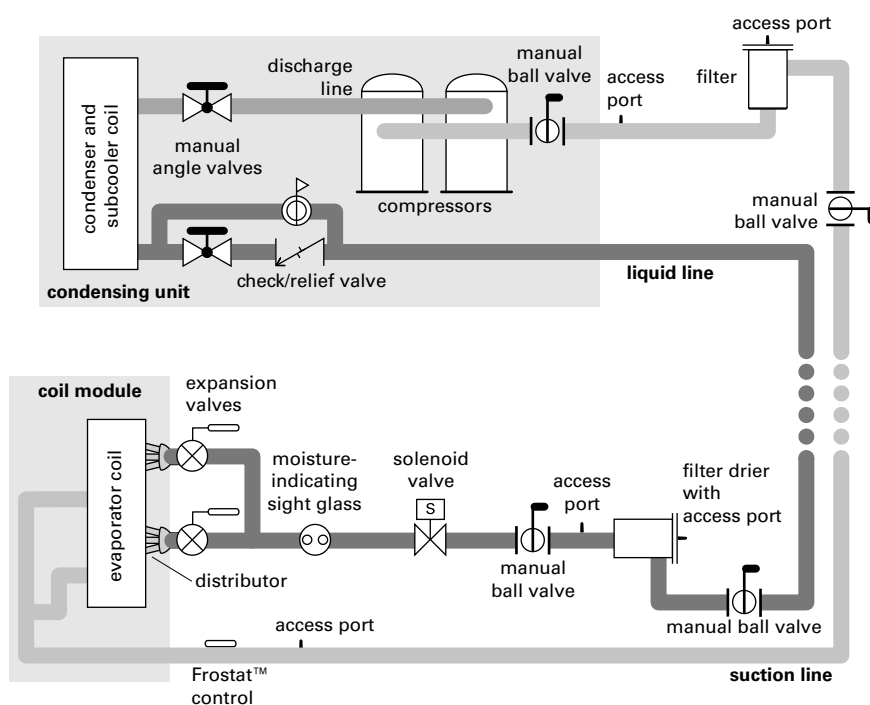
Total length of the liquid line, including riser height (Figure 2, page 10) must not exceed 150 feet.

Liquid Lines

Line sizing. Properly sizing the liquid line is critical to a successful split-system application. The selected tube diameter must provide at least 5°F [2.7°C] of subcooling at the expansion valve throughout the RAUC operating envelope. Increasing the size of the liquid line will *not* increase the available subcooling.

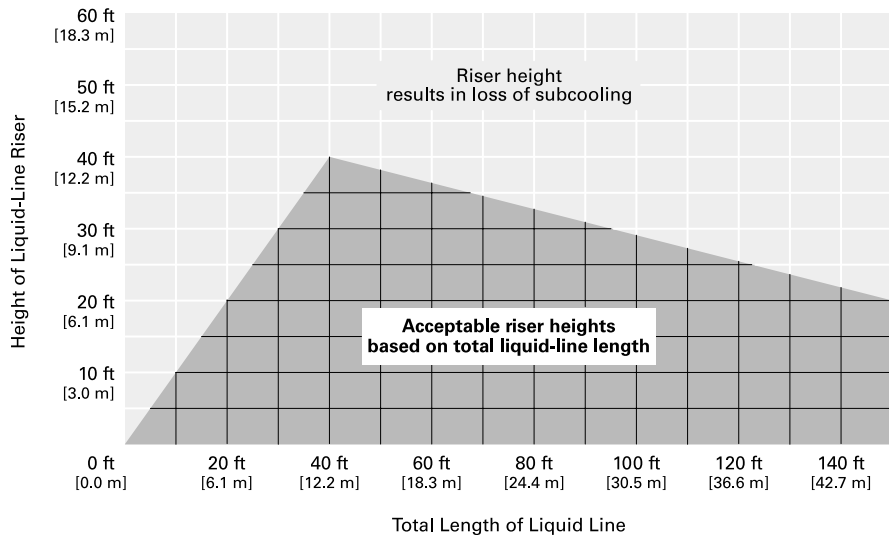
To provide the minimum subcooling required for proper operation, liquid-line sizing is preselected for each RAUC model based on its nominal capacity; see Table 2 (page 6). Using the preselected tube diameter to uniformly size the liquid line will maintain the minimum subcooling requirement of 5°F [2.7°C]; it also minimizes the system refrigerant charge.

Figure 1. Example of Placement for Split-System Components



Line Sizing, Routing, and Component Selection

Figure 2. Liquid-Line Riser Limitations for RAUC 20- through 120-Condensing Units



Riser height limitations defined in this chart assume that the liquid line contains 10 elbows. The effect of additional elbows varies based on the specific characteristics of each installation.

Note: Preselected liquid-line diameters are independent of line length or rise, within the permissible guidelines, for properly charged 20- through 120-ton RAUC units in normal air-conditioning applications.

Routing. Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line.

A height limitation exists for liquid lines that include a liquid riser because of the loss of subcooling that accompanies the pressure loss in the height of the liquid column. Figure 2 depicts the *permissible* rise in the liquid line (that is, without excessive loss of subcooling). Again, **system designs outside the application envelope of the RAUC unit require Trane review.**

Note: Beginning in May 2000, 20- through 120-ton RAUC units include a check/relief valve to prevent liquid refrigerant from being drawn back to the compressor during the off cycle. The relief valve discharges to the condenser to prevent excessive pressures from developing in the liquid line during off cycles.

Insulation. The liquid line is generally warmer than the surrounding air, so it does not require insulation. In fact, heat loss from the liquid line improves system capacity because it provides additional subcooling.

Components. Liquid-line refrigerant components necessary for a successful job include a filter drier, access port, solenoid valve, moisture-indicating sight glass, expansion valve(s), and ball shutoff valves. Figure 1 on page 9 illustrates the proper sequence for positioning them in the liquid line. **Position the**

Line Sizing, Routing, and Component Selection

components as close to the evaporator as possible. Table 2 (page 6) identifies suitable components, by part number, for each RAUC model.

- **Filter drier.** There is no substitute for cleanliness during system installation. The filter drier prevents residual contaminants, introduced during installation, from entering the expansion valve and solenoid valve.

If choosing a filter other than the one listed in Table 2, make sure that its volume, filtering, and moisture-absorbing characteristics are equivalent.

- **Access port.** The access port allows the unit to be charged with liquid refrigerant and is used to determine subcooling. This port is usually a Schraeder valve with a core.
- **Solenoid valve.** In RAUC split systems, solenoid valves isolate the refrigerant from the evaporator during off cycles; under certain conditions, they may also trim the amount of active evaporator as compressors unload. Generally, the “trim” solenoid valve is unnecessary for VAV comfort-cooling applications, and is only required for constant-volume applications when dehumidification is a concern.

*Note: RAUC units that shipped after January 1999 are equipped with pumpdown, so **isolation solenoid valves are REQUIRED.** The suggested solenoid valve uses 120-volt service and requires code-compliant wiring to the RAUC condensing unit.*

- **Moisture-indicating sight glass.** Be sure to install one moisture-indicating sight glass in the main liquid line. The *sole* value of the sight glass is its moisture indication ability. Use actual measurements of temperature and pressure – not the sight glass – to determine subcooling and whether the system is properly charged.
- **Expansion valve.** The expansion valve is the throttling device that meters the refrigerant into the evaporator coil. Metering too much refrigerant floods the compressor; metering too little elevates the compressor temperature. Choosing the correct size and type of expansion valve is critical to assure that it will correctly meter refrigerant into the evaporator coil throughout the entire operating envelope of the system. **Correct refrigerant distribution into the coil requires an expansion valve for each distributor.**

For improved modulation, choose expansion valves with balanced port construction and external equalization. Table 1 (page 5) identifies the part numbers of the valves recommended for commercial RAUC systems.

- **Ball shutoff valves.** Adding manual, ball-type shutoff valves upstream and downstream of the filter simplifies replacement of the filter core.

As a matter of practicality, Table 2 (page 6) lists only one of the numerous manufacturers of these valves. If you choose a valve by another



Line Sizing, Routing, and Component Selection

manufacturer, ensure that its specifications are equivalent to the valve identified in this guide.

Total length of the suction line, including a maximum rise of 50 feet, must not exceed 150 feet.

Suction Lines

Line sizing. Proper suction-line sizing is required to guarantee that the oil returns to the compressor throughout the system's operating envelope. At the same time, the line must be sized so that the pressure drop does not excessively affect capacity or efficiency. To accomplish both objectives, it may be necessary to use two different line diameters: one for the horizontal run and for vertical drops, and another for the vertical lifts.

Note: Preselected suction-line diameters shown in Table 2 (page 6) are independent of the total line length for properly charged 20- through 120-ton RAUC units in normal air-conditioning applications.

Routing. To prevent residual or condensed refrigerant from "free-flowing" toward the compressor, install the suction line so that it slopes slightly — that is, by ¼ inch to 1 inch per 10 feet of run [1 cm per 3 m] — toward the evaporator.

When the application includes a suction riser, oil must be forced to travel the height of the riser. Riser traps and double risers are unnecessary in the suction line. All 20- through 120-ton RAUC units unload such that a single line size, preselected in Table 2, provides sufficient lift to push entrained oil up the permissible riser height. To assure proper oil movement, the **permissible unit separation is 150 ft [45.7 m], including a maximum vertical rise of 50 ft [15 m]**. System designs outside this application envelope require Trane review.

Note: If a suction riser is properly sized, oil will return to the compressor regardless of whether a trap is present. If a suction riser is oversized, adding a trap will not restore proper oil movement.

Avoid putting refrigerant lines underground. Refrigerant condensation or installation debris inside the line, service access, and abrasion/corrosion can quickly impair reliability.

Insulation. Any heat that transfers from the surrounding air to the cooler suction lines increases the load on the condenser (reducing the system's air-conditioning capacity) and promotes condensate formation (adversely affecting indoor air quality). After operating the system and testing all fittings and joints to verify that the system is leak-free, insulate the suction lines to prevent heat gain and unwanted condensation.

Components. Installing the suction line requires field installation of these components: a filter, access port, Froststat™ control for coil frost protection, and

Line Sizing, Routing, and Component Selection

ball shutoff valve. **Position them as close to the compressor as possible.** Table 2 (page 6) identifies suitable components, by part number, for each RAUC model.

Note: Placement of the Froststat control is illustrated in Figure 1 on page 9.

- **Filter.** The suction filter prevents contaminants, introduced during installation, from entering the compressor. For this reason, the suction filter should be the replaceable-core type, *and* a clean core should be installed after the system is cleaned up.

As a matter of practicality, Table 2 (page 6) lists only one of the many manufacturers of suction-line filters. If you choose a filter by another manufacturer, ensure that its capability and volume are equivalent to the suction filter identified in this guide.

- **Access port.** The access port is used to determine suction pressure. This port is usually a Schraeder valve with a core.
- **Froststat™ coil frost protection.** The Froststat control is the preferred method for protecting evaporator coils from freezing. It senses the suction-line temperature and temporarily disables mechanical cooling if it detects frost conditions. The control is mechanically attached to the outside of the refrigerant line, near the evaporator, and wired to the unit control panel.

- **Ball shutoff valve.** Adding manual, ball-type shutoff valves upstream and downstream of the filter simplifies replacement of the filter core.

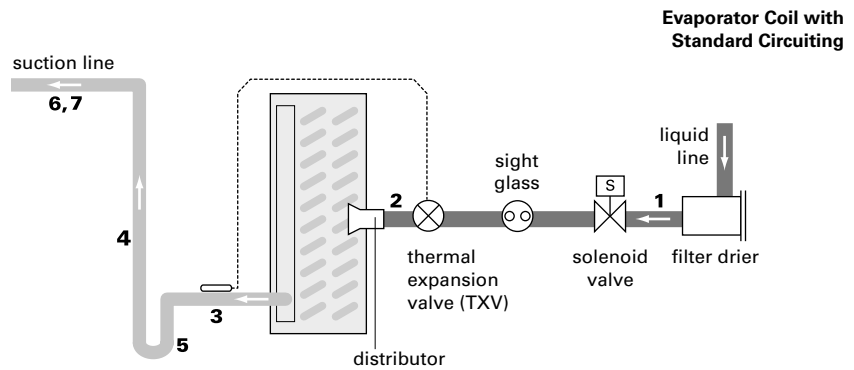
As a matter of practicality, Table 2 (page 6) lists only one of the numerous manufacturers of these valves. If you choose a valve by another manufacturer, ensure that its specifications are equivalent to the valve identified in this guide.

Single-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 3. Type UF Evaporator Coil with One Distributor

- 1** Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 2** Provide one expansion valve per distributor.
- 3** Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4** Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assume that the top of the riser is higher than the evaporator coil.
- 5** Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward.
- 6** Pitch the suction line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 7** Insulate the suction line.

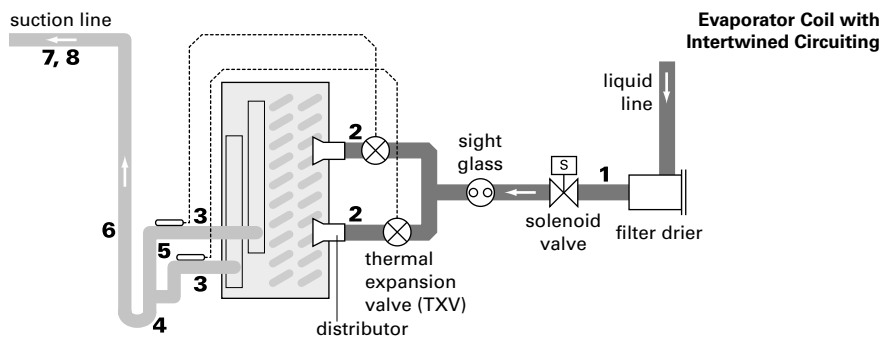
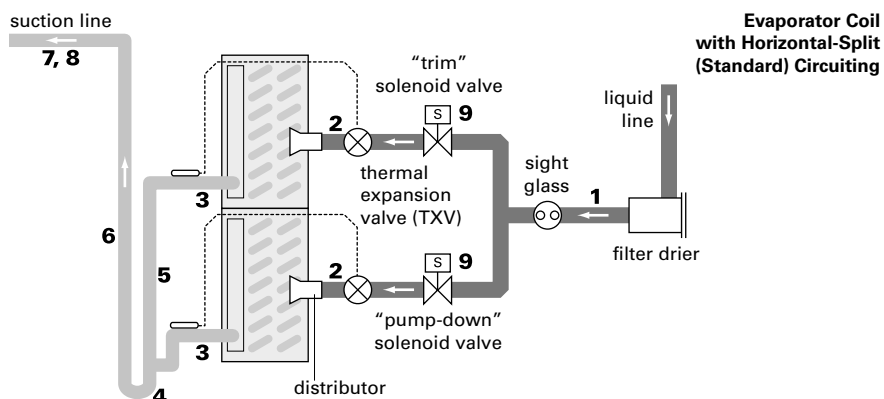


Single-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 4. Type UF Evaporator Coil with Two Distributors

- 1** Pitch the liquid line slightly – 1 in./10 ft [1 cm/3 m] – so that the refrigerant drains toward the evaporator.
- 2** Provide one expansion valve per distributor.
- 3** Slightly pitch the outlet line from the suction header toward the suction riser – that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4** Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.
- 5** Use the “horizontal” tube diameter identified in Table 2 (page 6).
- 6** Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assure that the top of the riser is higher than the evaporator coil.
- 7** Pitch the suction line slightly – 1 in./10 ft [1 cm/3 m] – so that the refrigerant drains toward the evaporator.
- 8** Insulate the suction line.
- 9** Only use a “trim” solenoid valve for constant-volume, *humidity-sensitive* applications. For all other applications, install a single solenoid valve (the “pump-down” solenoid valve) between the liquid-line filter drier and the sight glass.

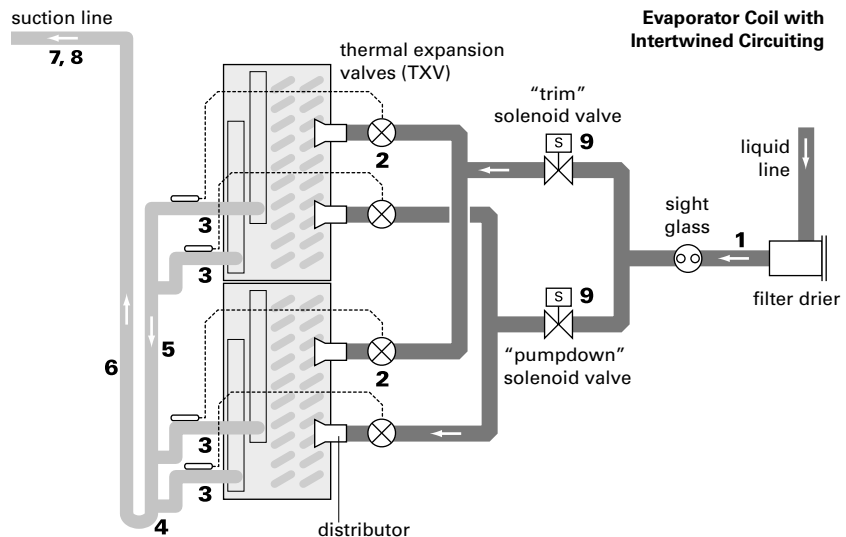
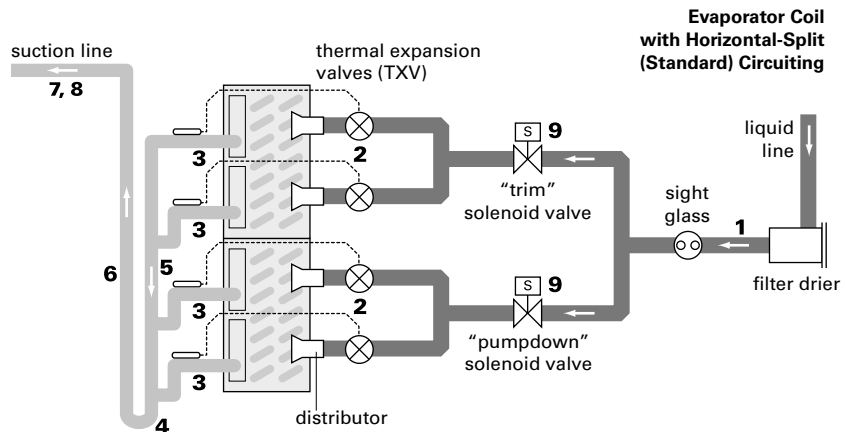


Single-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 5. Type UF Evaporator Coil with Four Distributors

- 1** Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 2** Provide one expansion valve per distributor.
- 3** Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4** Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.
- 5** Use the “horizontal” tube diameter identified in Table 2 (page 6).
- 6** Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assure that the top of the riser is higher than the evaporator coil.
- 7** Pitch the suction line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 8** Insulate the suction line.
- 9** Only use a “trim” solenoid valve for constant-volume, *humidity-sensitive* applications. For all other applications, install a single solenoid valve (the “pumpdown” solenoid valve) between the liquid-line filter drier and the sight glass.

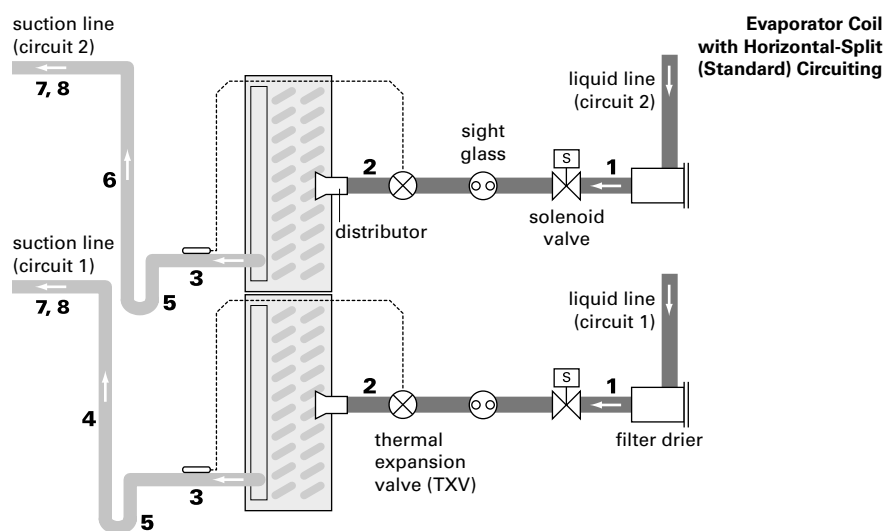


Dual-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 6. Type UF Evaporator Coil with Two Distributors

- 1** Pitch the liquid lines slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 2** Provide one expansion valve per distributor.
- 3** Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4** The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).
- 5** Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward.
- 6** The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).
- 7** Pitch the suction lines slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 8** Insulate the suction lines.

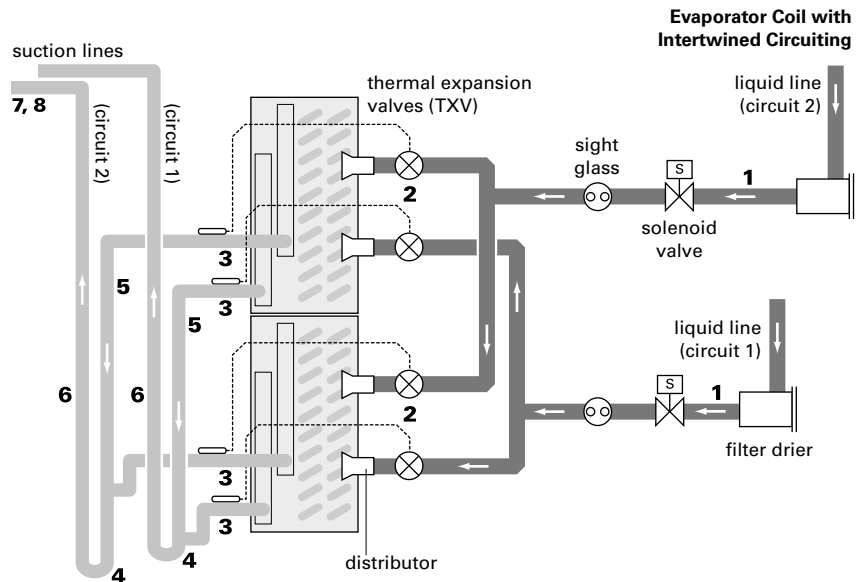
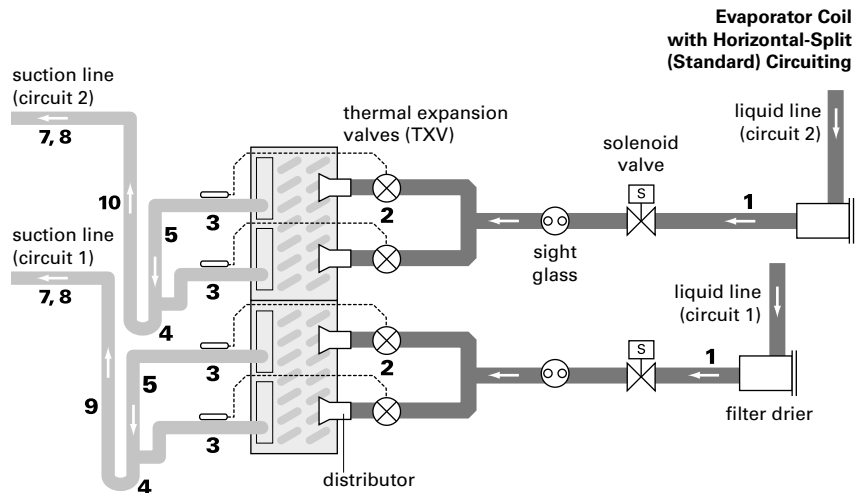


Dual-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 7. Type UF Evaporator Coil with Four Distributors

- 1 Pitch the liquid line slightly – 1 in./10 ft [1 cm/3 m] – so that the refrigerant drains toward the evaporator.
- 2 Provide one expansion valve per distributor.
- 3 Slightly pitch the outlet line from the suction header toward the suction riser – that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.
- 5 Use the “horizontal” tube diameter identified in Table 2 (page 6).
- 6 Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assure that the top of the riser is higher than the evaporator coil.
- 7 Pitch the suction line slightly – 1 in./10 ft [1 cm/3 m] – so that the refrigerant drains toward the evaporator.
- 8 Insulate the suction line.
- 9 The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).
- 10 The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).

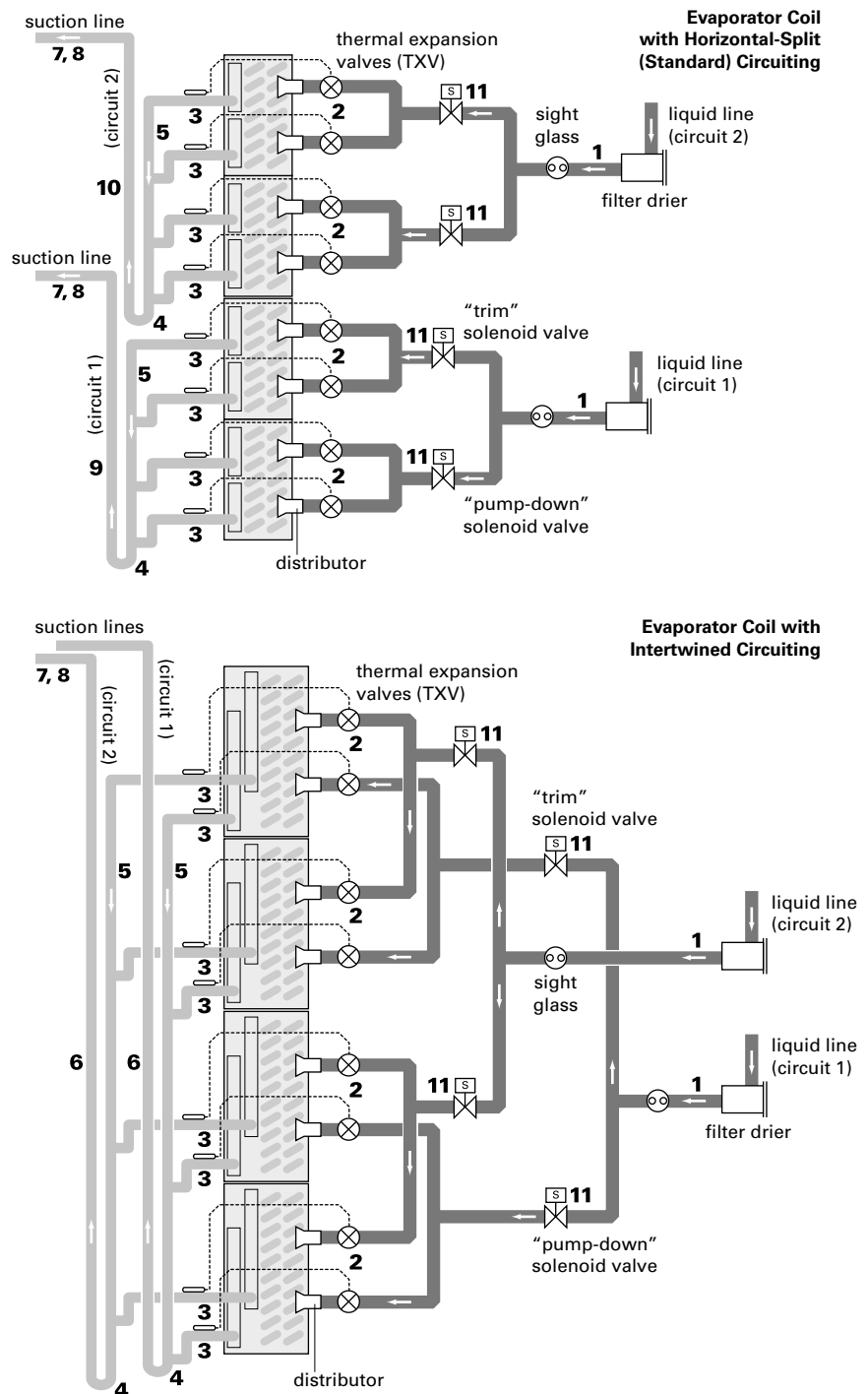


Dual-Circuit RAUCs

Examples of Field-Installed Evaporator Piping

Figure 8. Type UF Evaporator Coil with Eight Distributors

- 1 Pitch the liquid line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 2 Provide one expansion valve per distributor.
- 3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
- 4 Arrange the suction line so that the refrigerant gas leaving the coil flows downward, *past the lowest suction-header outlet*, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.
- 5 Use the “horizontal” tube diameter identified in Table 2 (page 6).
- 6 Use the tube diameter recommended for a vertical rise in Table 2 (page 6). Assure that the top of the riser is higher than the evaporator coil.
- 7 Pitch the suction line slightly — 1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.
- 8 Insulate the suction line.
- 9 The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).
- 10 The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended for a vertical rise in Table 2 (page 6).
- 11 Only use a “trim” solenoid valve for constant-volume, *humidity-sensitive* applications. For all other applications, install a single solenoid valve (the “pump-down” solenoid valve) between the liquid-line filter drier and the sight glass.





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