Installation, Operation, and Maintenance

Air Heating and Cooling Coils

⚠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.

October 2024 **COIL-SVX01F-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

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 Labeling 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

R-454B Flammable A2L Refrigerant!

Failure to use proper equipment or components as described below could result in equipment failure, and possibly fire, which could result in death, serious injury, or equipment damage.

The equipment described in this manual uses R-454B refrigerant which is flammable (A2L). Use ONLY R-454B rated service equipment and components. For specific handling concerns with R-454B, contact your local representative.

Copyright

Trademarks

Revision History

Added A2L Information chapter.

Table of Contents

Model Number Descriptions

Digit 1 – Product

D = Heating and cooling coil

Digit 2, 3 – Coil Type

A0 = 5/8" tube Steam Coil
AA = 5/8" tube Steam Coil
D0 = 5/8" tube Water Coil
D1 = 5/8" tube Water Coil
D2 = 5/8" tube Water Coil
DD = 5/8" tube Water Coil
DL = 5/8" tube Water Coil
F0 = 5/8" tube DX Coil
FD = 5/8" tube DX Coil
HA = 5/8" tube Refrig Heat Recovery Coil
HB = 5/8" tube Refrig Heat Recovery Coil
H4 = 1/2" tube Refrig Heat Recovery Coil
K0 = 5/8" tube Water Coil
LL = 1/2" tube Water Coil
N0 = 1" tube Steam Coil
NN = 1" tube Steam Coil
NS = 1" tube Steam Coil
OD = 5/8" tube Water Coil
OK = 5/8" tube Water Coil
OW = 5/8" tube Water Coil
P2 = 5/8" tube Water Coil
P4 = 5/8" tube Water Coil
P8 = 5/8" tube Water Coil
RD = 5/8" tube Water Coil
RK = 5/8" tube Water Coil
RW = 5/8" tube Water Coil
ST = 5/8" tube WTR/STM Coil
T0 = 5/8" tube WTR/STM Coil
TT = 5/8" tube Water Coil
UA = 1/2" tube Water Coil
UF = 1/2" tube DX Coil
UU = 1/2" tube Water Coil
UW = 1/2" tube Water Coil
W = 5/8" tube Water Coil
WA = 5/8" tube Water Coil
WC = 5/8" tube Water Coil
WD = 5/8" tube Water Coil
WL = 1/2" tube Water Coil
WR = 5/8" tube Water Coil
WS = 5/8" tube Steam Coil
XW = 5/8" tube Water Coil
5A = 5/8" tube Water Coil
5D = 5/8" tube Water Coil
5W = 5/8" tube Water Coil
S0 = Special Coil

Digit 4 – Development

B = Development "B"

Digit 5, 6 – Fin Width

12 = 12" Finned Coil Width TO
57 = 57" Finned Coil Width

Digit 7, 8, 9 – Fin Length

012 = 12" Finned Coil Length TO
168 = 168" Finned Coil Length

Digit 10,11 – Design sequence

F0 = Design sequence "F"

Digit 12 – Rows

A = 1 Row
B = 2 Rows
C = 3 Rows
D = 4 Rows
E = 6 rows
F = 8 rows
G = 10 rows
H = 12 rows
S = Special

Digit 13 – Application

A = Heating
B = Cooling with drain holes
C = Cooling without drain holes
S = Special

Digit 14, 15, 16 – Fin Spacing

072 = 72 Fins per foot To
168 = 168 Fins per foot

Digit 17 – Fin Type

C = Delta Flo™ E – Energy Efficiency
D = Delta Flo H – High Efficiency
B = Prima Flo™ E – Energy Efficiency
E = Prima Flo H – High Efficiency
A = Sigma Flo™

Digit 18 – Fin Material

A = Aluminum
B = Copper
S = Special

Digit 19 – Tube Material

A = 0.016" Copper ½" O.D.
B = 0.020" Copper 5/8" O.D.
C = 0.024" Copper 5/8" O.D.
G = 0.049" Red Brass 5/8"
H = 0.025" Copper ½" O.D.
J = 0.016" Copper ½" OD Internally Enhanced
S = Special

Digit 20 – Casing Material

A = Galvanized
B = Stainless Steel

Digit 21 – Fin Coating

C = CompleteCoat™
S = Special

Digit 22 – Turbulators

0 = None/Not Used
A = Turbulators
S = Special

Digit 23 – Coil Supply

A = RH – Horizontal side
B = LH – Horizontal side
S = Special

Digit 24 - DX Coil Circuiting Type

A = Standard single distributor
B = Horizontal Split
C = Vertically Split
D = Intertwined
E = Heat Pump / Intertwined
0 = Not a DX coil
S = Special

Digit 25 - Distributor Tube Size

A = 3/16" Diam Tubes
B = 1/4" Diam Tubes
C = 5/16" Diam Tubes
0 = Not a DX coil
S = Special

Digit 26

A = Full
B = Half
C = Quarter
D = Eighth
E = Sixteenth

Digit 27 – Distributor Tube Size for Vertical (Leaving air side)

3 = 3/16" Diam Tubes
4 = 1/4" Diam Tubes
5 = 5/16" Diam Tubes
0 = Not a DX coil
S = Special

Digit 28 – Number of circuits for vertically split

A = Full
B = Half
C = Quarter
D = Eighth
E = Sixteenth
0 = Not a DX coil
S = Special

Digit 29 – Test

0 = Standard Test
A = High Pressure Proof and Leak Test (450/300 PSI)
B = High Pressure Proof and Leak Test (6000/400 PSI)
S = Quarter

Digit 30 – Inspection

0 = Standard Inspection
A = Certification Required
B = Special

Digit 31 – 35 Special Supply Header Location Dimension

0 = Location
27.75 = Location

Digit 36 – 40 Special Return Header Location Dimension

0 = Location
27.75 = Location

Refrigerant Heat Recovery Coils Digits

Digit 31, 32 to 53,54 – Heat Recovery Coil (N) Compressor Circuit - No of Tubes/Circuit

00 = Tubes per CircuitTo
36 = Tubes per Circuit

Digit 31 – 35 Special Supply Header Location Dimension

0 = Location
27.75 = Location

Refrigerant Coils Digits

Digit 55 – Packed Elbow

A = With Packed Elbow
0 = Not a DX coil

Digit 56 – Refrigerant Type

0 = None
A = R12
B = R22
C = R410A
D = Special

General Information

Shipping and Receiving

All coils are shipped assembled and packaged.

Upon receipt, inspect each coil for any in-transit damage. Freight claims must be filed for any shipping damage or shipping loss.

Claims for shipping damage must be filed immediately with the delivering carrier. Make specific notations concerning the damage on the freight bill. Concealed damage must be reported within 15 days of receipt.

Coil Information

Trane water, steam and refrigerant coils are identified according to specific types, fins per foot, widths and lengths.

Trane refrigerant coils, Type F, FD, H and H4 are factory dehydrated and sealed with a 10 – 20 psig dry Nitrogen holding change prior to shipment. A Schrader valve is installed to verify the holding pressure. Do not break the seals until the coil is installed.

General data is given in General data Table 1, p. 7. Type 3F, FD, UF, H4, F, and H refrigerant coils are typically used with Refrigerant R-410A or R-22, and may be used with other refrigerants (see Coil Applications chart in COIL-PRC002*-EN). Use a thermal expansion valve or other metering device to control refrigerant flow into the coil.

Applications

Table 1. General data

Coil Type	Rows	Tube material	Pressure PSI	Temp F
Heating and Cooling Water Coils				
W	1	Copper 0.020 in. 0.024 in. 0.035 in.	200	325
		Red Brass 0.049 in.	200	388
	3	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in	200	220
	4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
WL	2, 4, 6, 8	Copper 0.016 in. 0.025in.	200	220
UW	2, 4, 6, 8	Copper 0.016 in. 0.025 in.	200	220
5W	1	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	250
	2		200	220
WA	1	Copper 0.020 in. 0.024 in. 0.035 in.	200	325
		Red Brass 0.049 in.	200	388
WD	6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
LL	4, 6, 8	Copper 0.016 in. 0.025 in.	200	220
UU	4, 8	Copper 0.016 in. 0.025 in.	200	220
5D	6, 8, 10	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220

Table 1. General data (continued)

Coil Type	Rows	Tube material	Pressure PSI	Temp F
DD	4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
D	3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
D1	3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
D2	6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
K	2, 3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
P2	2, 4, 6	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
P4	2, 4, 6, 8	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
P8	4, 8	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
UA	2	Copper 0.016 in. 0.025 in.	200	220
TT	1, 2	Copper 0.020 in. 0.024 in.	225	325
		Copper 0.035 in.	225	325
		Red Brass 0.049 in.	350	400

Table 1. General data (continued)

Coil Type	Rows	Tube material	Pressure PSI	Temp F
T, ST	1, 2	Copper 0.020 in. 0.024 in.	225	325
		Copper 0.035 in.	225	325
		Red Brass 0.049 in.	350	400
Steam Coils				
T, ST	1, 2	Copper 0.020 in. 0.024 in. 0.035 in.	100	400
		Red Brass 0.049 in.	200	450
NS, N	1	Copper 0.031 in.	100	400
		Red Brass 0.049 in.	200	400
A	1	Copper 0.020 in. 0.024 in. 0.035 in.	100	400
		Red Brass 0.049 in.	200	400
Refrigerant coils				
H	1, 2, 3, 4, 6	Copper 0.020 in.	300	n/a
H4	2, 4, 6	Copper 0.016 in.	300	n/a
		Copper 0.025 in.	650	n/a
FD	4, 6	Copper 0.016 in. smooth 0.016 in. internally enhanced 0.025 in.	480	n/a
UF	4, 6, 8	Copper 0.016 in. smooth tubes 0.016 in. internally enhanced 0.025 in.	480	n/a
F	2, 3, 4, 6, 8	Copper 0.020 in. 0.024 in.	300	n/a

Table 1. General data (continued)

Coil Type	Rows	Tube material	Pressure PSI	Temp F
Replacement and Special Coils				
OW	2, 3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
OD - Old style D coil replacement (copper header)	2, 3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
OK- Old style K coil replacement (copper header)	2, 3, 4, 6, 8, 10, 12	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
WC	1	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	250
WS	1	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	250
XW - Old style WA coil	2	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220
NN (NSN) - One N coil header and one NS header (dual steam fed - special coil)	1	Copper 0.031 in.	100	400
		Red Brass 0.049 in	200	400
5A	2	Copper 0.020 in. 0.024 in. 0.035 in. Red Brass 0.049 in.	200	220

A2L Information

A2L Work Procedures

⚠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

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Verify that no power is present with a voltmeter.

The units described in this manual use R-454B refrigerant. Use ONLY R-454B rated service equipment or components with these units. For specific handling concerns with R-454B, contact your local Trane representative.

Installation, repair, removal, or disposal should be performed by trained service personnel.

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

Servicing

Prior to initiating work on equipment, check the area with an appropriate refrigerant detector. Ensure the service personnel are properly trained regarding work in potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed, or intrinsically safe. Be aware that the refrigerant does not contain an odor.

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

At all times, Trane's maintenance and service guidelines shall be followed. If in doubt, contact Trane technical support for assistance.

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

Ignition Source Mitigation

Do not use any sources of ignition when working on the refrigeration system.

Keep all ignition sources, including cigarette smoking, away from the site of installation, repair, removal or disposal, during which refrigerant can potentially be released to the surrounding space.

Survey the area around the equipment before initiating work to ensure no flammable hazards or ignition risks are present.

"No Smoking" signs shall be displayed.

Do not use devices that can be a source of ignition to accelerate defrosting of components. Use only defrost and cleaning procedures recommended by Trane. Do not pierce or burn.

Ventilation

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere. If present, check that the ventilation system, including outlets, are operating adequately and are not obstructed.

Refrigerating Equipment

Refrigerant piping or components should not be installed in locations where substances which may corrode them are present.

Check that equipment hazard markings are visible and legible. Replace them if they are not.

For equipment using secondary fluids, like water or glycol, check that refrigerant is not present in the secondary fluid loop before conducting any hot work.

Electrical Devices

Do not apply power to the circuit if a fault exists which compromises safety. If the fault cannot be corrected immediately, but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- Cabling is not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. Account for the effects of aging or continual vibration from sources such as compressors or fans.
- Capacitors are discharged. This shall be done in a safe manner to avoid possibility of sparking.
- No live electrical components and wiring are exposed while charging, recovering, or purging the system.
- Verify continuity of earth bonding.
- Replace electrical components with Trane replacement parts, or those meeting the same ratings and qualified for flame arrest protection, UL LZGH2 category.

Leak Detection

Never use an open flame to detect leaks. A halide torch should not be used. Use only approved leak detection methods per this instruction manual.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL gas (25% maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids are:

- Bubble method
- Fluorescent method agents

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a refrigerant leak is found which requires brazing, all refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

Refrigerant Removal and Evacuation

Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (special cylinders for the recovery of refrigerant, for example). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

When breaking into the refrigerant circuit to make repairs –or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

1. Safely remove refrigerant following local and national regulations.
2. Evacuate.
3. Purge the circuit with inert gas.
4. Evacuate (optional for A2L).
5. Continuously flush or purge with inert gas when using flame to open circuit.
6. Open the circuit.

Prior to refrigerant removal, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

The recovery equipment shall be in good working order with instructions available. Equipment shall be suitable for the recovery of the flammable refrigerant. For specific handling concerns, contact the manufacturer. Ensure all hose connections are checked for tightness to avoid refrigerant leaks.

The refrigerant shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. Do not mix refrigerants in recovery unit and especially not in cylinders.

Refrigerant recovery unit should be purged with an inert gas after each use or before using with a different refrigerant Class – for example, A2L to A1.

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. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

The system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

The system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Refrigerant Charging

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

- Ensure that contamination of different refrigerants does not occur when using charging equipment.

- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

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

Prior to refrigerant charging, open all appropriate valves, including solenoid and electronic expansion valves (EXVs). Use control settings, where available. When not available, manually open all electronically controlled valves using acceptable service procedures.

Decommissioning

Before carrying out the decommissioning procedure, it is essential that the trained service personnel is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
   a. Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
   b. All personal protective equipment is available and being used correctly.
   c. The recovery process is supervised at all times by a competent person.
   d. Recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked. When equipment has been decommissioned, attach a signed label which includes the date of decommissioning.
12. When equipment has been decommissioned, attach a signed label which includes the date of decommissioning.

A2L Application Considerations

This product is listed to UL standard 60335-2-40, Household and Similar Electrical Appliances – Safety –Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, which defines safe design and use strategies for equipment using A2L refrigerants. This standard limits the refrigerant concentration in a space in the event of a refrigerant leak. To meet the requirements, the UL standard defines minimum room area, refrigerant charge limit, minimum circulation airflow and/or ventilation airflow requirements, and limits the use of ignition sources in spaces. The standard may require a unit refrigerant leak detection system.

For equipment with R-454B and charge amounts less than or equal to 3.91 lbs per circuit, this UL standard does not prescribe a room area limit and does not require a refrigerant leak detection system or any circulation airflow or ventilation airflow mitigation strategies.

Depending on the application, a specific requirement of ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems, could be more stringent than UL 60335-2-40 requirements. See *Refrigeration Systems and Machinery Rooms Application Considerations for Compliance with ASHRAE® Standard 15-2022 Application Engineering Manual* (APP-APM001*-EN) for more information.

Ignition Sources in Ductwork

Do not install open flames in the ductwork. Hot surfaces exceeding 700°C (1290°F) should not be installed in the ductwork unless the average airflow velocity is not less than 1.0 m\s (200 ft\min) across the heater and proof of airflow is verified before system is energized.

Electric heaters can exceed the surface temperature limit if airflow distribution is poor, or insufficient airflow is provided over the heater.

Surface temperatures of most gas heaters do not exceed the surface temperature limits due to ANSI construction requirements.

Ignition Sources in Unit

This UL-listed unit does not contain any ignition sources. All potential ignition sources, (including factory or field installed accessory electric heaters, gas heaters, relays, and contactors) were evaluated during product UL listing.

Minimum Room Area Limits (Refrigerant charge greater than 3.91 lb per circuit)

Equipment with R–454B charge amounts greater than 3.91 lb per circuit may require additional circulation or ventilation airflow mitigation strategies. In this case, there are two minimum room area (A_{min}) thresholds.

- The first threshold defines when equipment serving a single room is required to provide circulation airflow, either continuous or activated by a leak detection system. A ducted system requires circulation airflow unless the smallest room it serves is larger than the adjusted A_{min} threshold. This product contains a leak detection system if a circuit charge is greater than 3.91 lbs. As a result, no further leak detection system evaluation is needed.
- The second threshold defines when additional ventilation airflow is required. If the room area, A or TA, is below the adjusted A_{min} or TA_{min} threshold, additional ventilation is required to remove refrigerant in the event of a leak. Refer to UL 60335-2-40 Clause GG.8 and ANSI\ASHRAE Standard 15 Section 7 for natural and mechanical ventilation requirements. See equipment nameplate and table below for minimum room area.

Split systems minimum room area requirements need to be determined after final field charging. Use the following figures and the largest final circuit charge to determine the systems A_{min} value. Record the final charge value on the label provided on the condensing unit.

Figure 1. Charge vs min room area (IP)

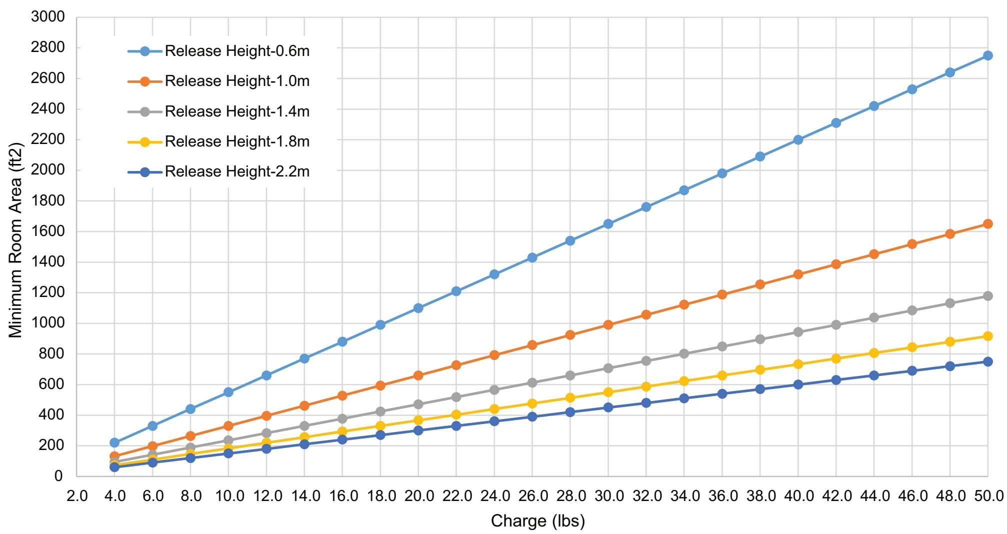
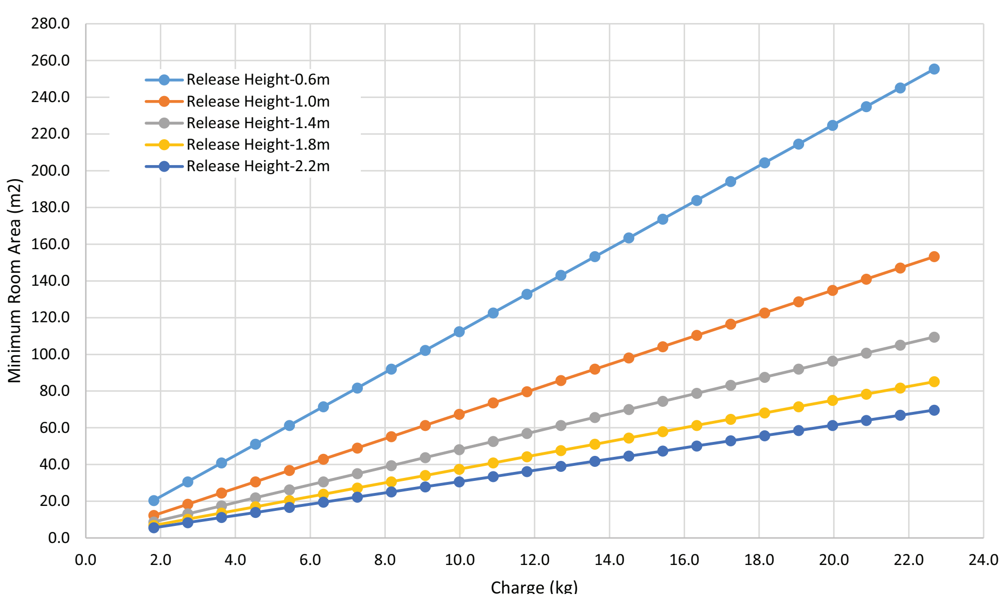


Figure 2. Charge vs min room area (SI)



Release height is the vertical distance from the floor to the lowest point in a space refrigerant would leak from first. The minimum value is 0.6 m from the floor. This point is typically the bottom of free return openings or supply diffusers. For fully ducted units, the release height is 2.2 meters.

Minimum Room Area (A_{min}) Adjustments

Use equation below to adjust the minimum room area, as applicable, based on the unit's installation height, altitude, and occupancy level it serves.

$$A_{min.adj} = \text{Nameplate } A_{min} \times \text{Altitude Adj} \times \text{Height Adj} \times F_{occ}$$

Multiply the altitude adjustment factor in the table below by A_{min} listed on the unit nameplate or in the Installation, Operation, and Maintenance manual (IOM).

Table 2. Altitude adjustment factor

Altitude (ft)	Sea Level to 2000	2001 to 4000	4001 to 6000	6001 to 8000	8001 to 10000	10001 to 12000	12001 to 14000	14001 to 15000	Over 15000
Amin Adjustment	1	1.05	1.11	1.17	1.24	1.32	1.41	1.51	1.57

In addition, A_{min} can be adjusted if the unit is installed in a room at a height that is higher than the minimum height shown on the unit. To adjust A_{min}, multiply by the ratio of the unit minimum release height (in meters) / actual release height (in meters). Use 0.6 m in the ratio for unit minimum installation heights less than or equal to 0.6 m.

For institutional occupancies, ASHRAE Standard 15 applies an additional adjustment factor F_{occ} to the amount of a charge allowed in a space. To calculate the adjusted A_{min} for institutional occupancies, multiply the A_{min} on the nameplate by two.

EXAMPLE 1: 20 Ton Packaged Rooftop Multi-Zone VAV System Serving an Institutional Occupancy Space

The packaged unit serves 7600 ft^2 of a nursing home located at an attitude of 4000 ft. The unit has two equally charged 10 ton refrigeration circuits. Each circuit has 12 lbs of refrigerant with a minimum room area requirement of 180 ft^2 with a 2.2 m release height.

$$TA_{min.adj} = 180\ ft^2 \times 1.05 \times 2 = 378\ ft^2$$

No additional ventilation is required.

EXAMPLE 2: 10 Ton Split System Serving a Single Commercial Occupancy Space

The split system serves a 1500 ft^2 manufacturing space at 5000 ft altitude. The final installed charge of the single circuit 10 ton unit is 20 lb. The unit has an open return with a release height of 1 m and ducted supply air. The unit A_{min} is 660 ft^2.

$$A_{min.adj} = 660\ ft^2 \times 1.11 = 733\ ft^2$$

No additional ventilation is required.

Determining Room Area (A or TA)

The room area (A) is the room area enclosed by the projection to the floor of the walls, partitions, and doors of the space that the equipment serves. For ducted systems, total room area (TA) of all rooms connected by ducts, may be used instead of A.

Rooms connected by drop ceilings only are not considered a single room.

Rooms on the same floor of the building, and connected by an open passageway, can be considered part of the same room if the passageway is a permanent opening, extends to the floor and is intended for people to walk through.

Adjacent rooms on the same floor of the building and connected by permanent openings in the walls and/or doors between rooms (including gaps between the wall and the floor), can be considered part of the same room if the openings meet the following criteria.

- The opening is permanent and cannot be closed.
- Openings extending to the floor, such as door gaps, need to be at least 20mm above the floor covering surface.
- Natural ventilations opening areas must meet the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.2.3.2.

Rooms that are connected by a mechanical ventilation system can be considered a single room area if the mechanical ventilation system meets the requirements of ANSI\ASHRAE Standard 15-2022, Section 7.6.4.

Leak Detection System (Refrigerant charge greater than 3.91 lb per circuit)

The leak detection system consists of one or more refrigerant detection sensors. When the system detects a leak, the following mitigation actions will be initiated until refrigerant has not been detected for at least 5 minutes:

- Energize the supply fan(s) to deliver a required minimum amount of circulation airflow.

- Disable compressor operation.
- Provide an output signal to fully open all zoning dampers, such as VAV boxes.
- Provide an output to energize additional mechanical ventilation (if needed).
- Units without airflow proving will disable electric heat sources.

Building fire and smoke systems may override this function.

If the refrigerant sensor has a fault, is at the end of its life, or is disconnected, the unit will initiate the mitigation actions. Mitigation actions may be verified by disconnecting the sensor.

The refrigerant sensors do not need service. Use only manufacturer-approved sensors when replacement is required.

Field Piping Installation and Charging

When refrigerant piping is routed indoors, protect from physical damage in operation or service, and verify installation complies with national and local codes. All joints must be accessible for inspection prior to being covered.

Follow the Refrigerant Charging procedure. Prior to refrigerant charging, check field-made indoor joints for leaks using an instrument with a sensitivity of 5 grams per year refrigerant. Pressurize the system to 25% of the maximum allowable pressure. Verify no leaks are detected.

Installation

⚠WARNING

Explosion Hazard and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

Water Coils

Consider the following when selecting coil location:

- Allow sufficient space for access to the coil for maintenance.
- Coil piping and condensate drain requirements must be observed.

Coil Installation

Refer to Figure 3 and Figure 4.

1. Install coil with airflow as indicated by arrow on nameplate or coil casing.
2. Drain and vent piping connections are provided as standard on most coils. It is the installers responsibility to locate and use the appropriate header taps to adequately drain these coils.
3. Check for fin damage and straighten fins, if necessary.
4. If necessary, coils may be stacked. Stacking channels or bar stock (supplied by installer) are recommended when stacking coils more than three high.
5. Position stacking channels (if used) under both ends of the coil and at each center support.
6. To insure no unconditioned air bypasses the coil when stacking, caulk or install sheet metal blockoffs (supplied by installer) between and around coils on the entering air side.
7. Duct mounted air heating coils will leak air through the end support tube holes and the sheet metal casing joints. This is not a manufacturing defect. The end support tube collar inside diameter is larger than the expanded tube outside diameter, resulting in an air gap around each coil tube, to accommodate thermal stress over the coil's design life. For duct mounted air heating coils, to insure no air leaks from end support tube holes and coil casing joints, caulk end support tube holes and coil casing joints with an appropriate sealant. An alternative sealing method is to make a sheet metal end cap that fits over each end of coil and caulk it with an appropriate sealant.
8. Drain pans are used as one method of condensate removal. Figure 5 illustrates a typical drain pan installation.

Important: *Before operating equipment, install filters to insure maximum coil performance.*

Figure 3. Type W coil with vent and mounting hole locations

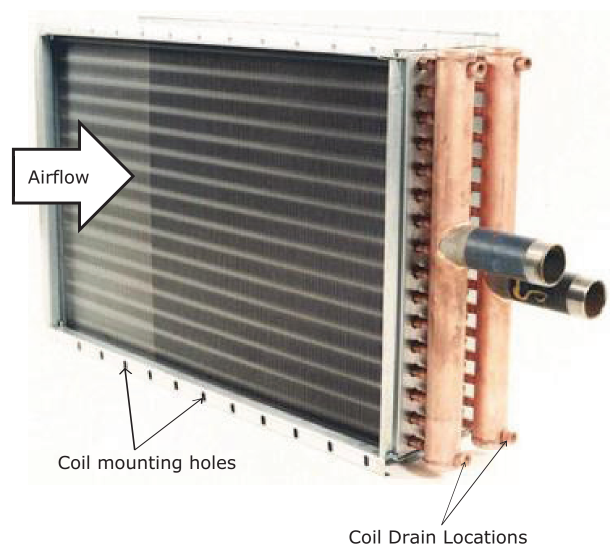


Figure 4. Typical DD coil piping, center connections

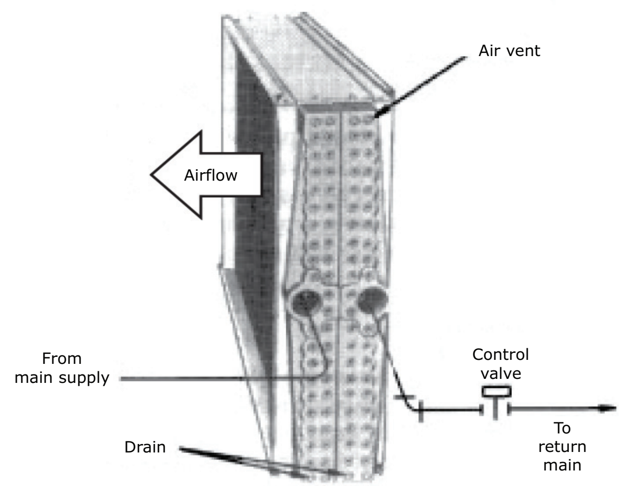
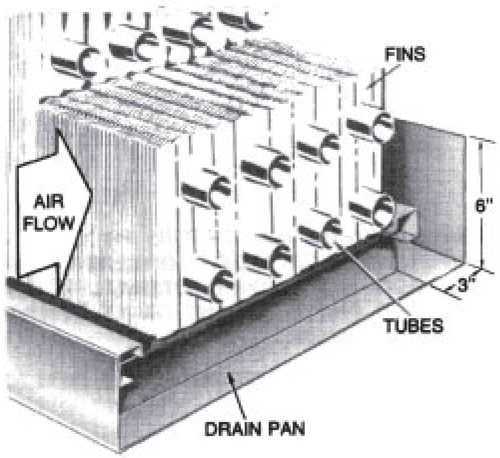


Figure 5. Typical drain pan installation



Refrigerant Coils

Note: *Type F, FD, H, H4 and UF coils have been dehydrated and charged with a holding charge. To prevent leaks and system contamination, do not break the seals until the coil is installed.*

To determine which side of the coil the piping connections should be on, look at the fin surface on the downstream side and with the air blowing in your face, call out right or left hand connections.

Install the coil with airflow in the same direction as indicated on the coil nameplate or casing. Be careful not to damage the coil fins while handling.

NOTICE

Coil Damage!

Do not use slots in coil casing to lift coils weighing more than 750 pounds. Failure to follow this instruction could result in damage to coil and coil casing.

The suction connection must be at the bottom of the suction header. Refrigerant distributor must be in a vertical down-feed position. *A refrigerant coil should not be used for vertical upward or downward airflow or in a vertical tube position.*

When stacking more than three coils, stacking channels or bar stock (supplied by the installer) should be used. If used, stacking channels should be positioned under both ends of the coil and at each center support. To ensure that no unconditioned air bypasses the staked coils, install caulk or metal blockoffs between and around the coils, on the entering air side.

Note: *Straighten coil fins at the time of installation to maintain maximum heat transfer. For additional information refer to Maintenance Section.*

Provide means for condensate collection and removal. Figure 5 illustrates the dimensional recommendations for drain pans.

Be sure that filters are installed upstream of the coil. Clean, efficient filters will minimize the need for frequent coil cleaning and will help keep the coils operating at maximum performance.

⚠WARNING

Hazard of Explosion!

Failure to follow safe leak test procedures below could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

Leak-test the entire refrigeration system after all piping is complete. Charge the unit according to approximate weight requirements, operating pressures and superheat/subcooling measurements.

Coil Piping and Connections

General Recommendations

Proper installation, piping, and trapping is necessary to ensure satisfactory coil operation and to prevent operational damage:

- Support all piping independently of the coils.
- Provide swing joints or flexible fittings on all connections that are adjacent to heating coils to absorb thermal expansion and contraction strains.

Note: *The contractor is responsible for supplying the installation hardware.*

- For best results, use a short pipe nipple on the coil headers prior to making any welded flange or welded elbow type connections.
- Pipe coils counterflow to airflow.

NOTICE

Connection Leaks!

Failure to follow instructions below could result in damage to the coil header and cause connection leaks. Use a backup wrench when attaching piping to coils with copper headers. Do not use brass connectors because they distort easily.

- When attaching the piping to the coil header, make the connection only tight enough to prevent leaks. Maximum recommended torque is 200 foot-pounds.

NOTICE

Over Tightening!

Failure to follow instructions below could result in damage to the coil header. Do not use teflon-based products for any field connections because their high lubricity could allow connections to be over tightened.

- Use pipe sealer on all thread connections.

NOTICE

Leakage!

Failure to follow instructions below could result in equipment damage. Properly seal all penetrations in unit casing from inner to outer panel in order to prevent unconditioned air from entering the module, as well as prevent water from infiltrating the insulation.

- After completing the piping connections, seal around pipe from any casing enclosing the coil from inner panel to outer panel.

NOTICE

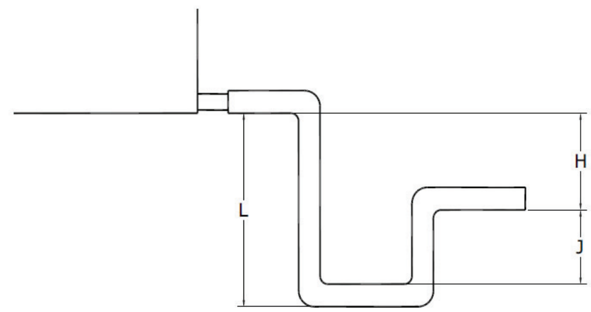
Header Damage!

Bottoming out of the connecting pipe in header results in extreme stresses that could cause the header to crack.

Drain Pan Trapping

- 3-30: 1 inch
- 35-57: 1-1/4 inch
- 66-1201: 1/2 inch

Figure 6. Drain pan trapping for negative and positive pressure applications



Drain pan trapping for section under negative pressure

L = H + J + pipe diameter where:

H = 1 inch for each inch of negative pressure plus 1 inch

J = 1/2 H

Drain pan trapping for section under positive pressure

L = H + J + pipe diameter where:

H = 1/2 inch (minimum)

J = 1/2 H plus the unit positive static pressure at coil discharge (loaded filters)

Steam Coil Piping

Note: *When installing coils in a duct mounted application, air leakage through the tube and U-bend penetrations in the coil casing should be expected. Capping over the coil ends or sealing around the tubes with a pliable sealant such as silicone will minimize this leakage.*

Air handlers fitted with steam coils have labeled holes for piping penetrations. Figure 7, p. 18 illustrates a typical steam coil piping configuration. See Table 3 for the codes of system components in these figures.

The coil condensate return line must be piped full size of the condensate trap connection, except for a short nipple screwed directly into the coil header's condensate return tapping. Do not bush or reduce the coil return trapping size.

Table 3. Code of system components for piping figures

Code	System Component
FT	Float and thermostatic steam trap
GV	Gate valve

Table 3. Code of system components for piping figures (continued)

Code	System Component
OV	Automatic two-position (ON-OFF) control valve
VB	Vacuum breaker
ST	Strainer
AV	Automatic or manual air vent
MV	Modulating control valve

Figure 7. Typical piping for Type NS steam coils and horizontal tubes for horizontal airflow

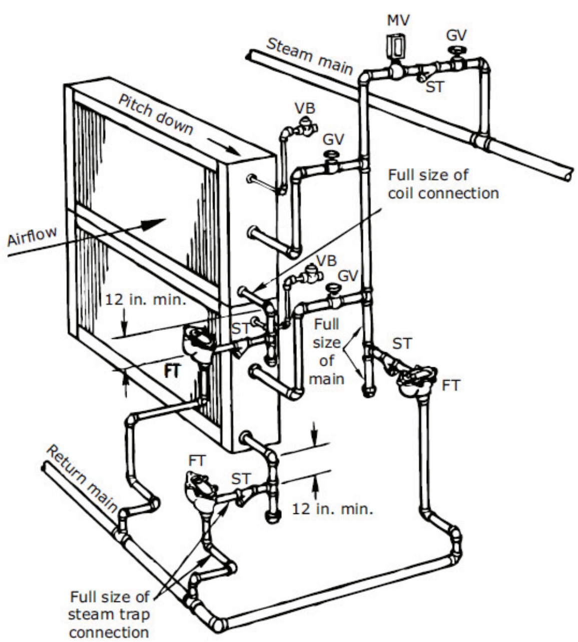


Figure 8. Typical piping for type NS steam coils, vertical tubes for horizontal airflow

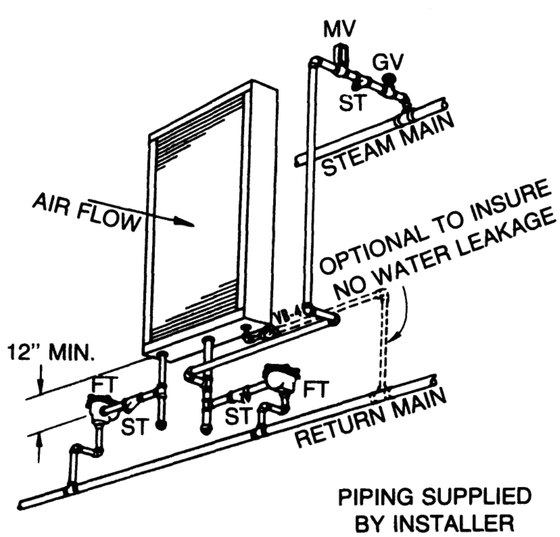


Figure 9. Typical piping for type A or N steam coils, horizontal tubes for horizontal airflow

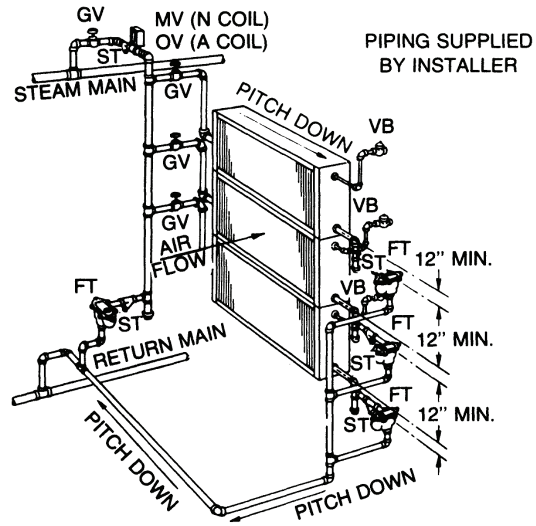


Figure 10. Typical piping for type A or N steam coils, vertical tubes for horizontal airflow

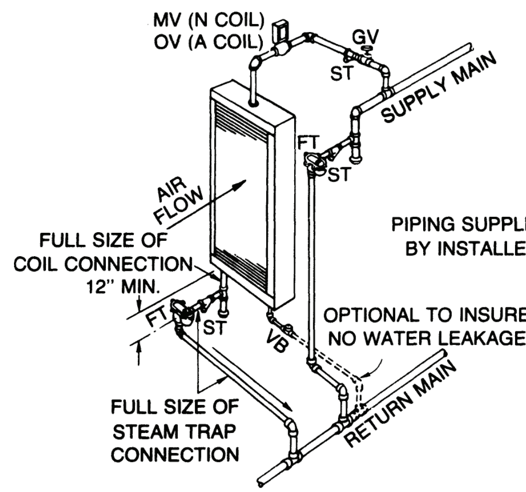
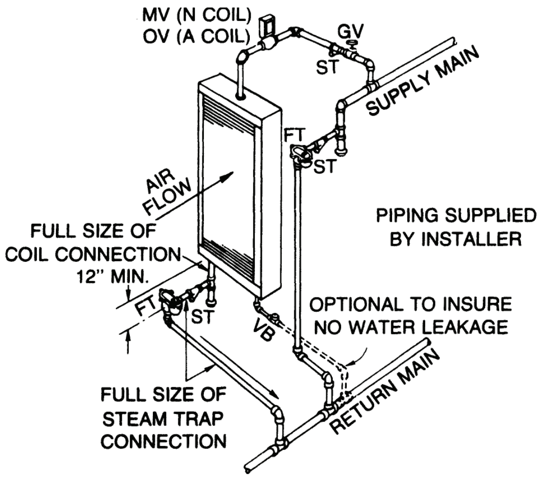


Figure 11. Typical piping for type T steam coils, horizontal tubes for horizontal airflow



NOTICE

Breaker Cracking Pressure!

The 1/2-inch NPT, 15 degree swing check valve vacuum breaker is recommended because other vacuum breakers, such as spring-loaded ball-check breakers, have cracking pressures as high as 1.25 inches Hg (17 inches of water). Vacuum breakers with fitting sizes smaller than 1/2 inch NPT are too small to relieve vacuum quick enough to ensure complete condensate drainage. Other types of swing check valve vacuum breakers are acceptable if the fittings size is not smaller than 1/2-inch NPT and the cracking pressure is not larger than 0.25 inches Hg (3.4 inches of water). Failure to follow these instructions could result in equipment damage.

To prevent coil damage, complete the following recommendations:

- Install a 1/2-inch NPT, 15 degree swing check valve vacuum breaker with cracking pressure of 0.25 inches Hg (3.4 inches water) or lower at the top of the coil. This vacuum breaker should be installed as close to the coil as possible.
- For coil type NS, install the vacuum breaker in the unused condensate return tapping at the top of the coil.
- Vent the vacuum breaker line to atmosphere or connect it into the return main at the discharge side of the steam trap.

Note: *Vacuum breaker relief is mandatory when the coil is controlled by a modulating steam supply or automatic two position (ON-OFF) steam supply valve. Vacuum breaker relief is also recommended when face-and-bypass control is used.*

NOTICE

Equipment Damage!

Condensate must flow freely from the coil at all times to prevent coil damage from water hammer, unequal thermal stresses, freeze-up and/or corrosion. In all steam coil installations, the condensate return connections must be at the low point of the coil. Failure to follow these instructions could result in equipment damage

Proper steam trap installation is necessary for satisfactory coil performance and service life. For steam trap installation:

1. Install the steam trap discharge 12 inches below the condensate return connection. 12 inches provides sufficient hydrostatic head pressure to overcome trap losses and ensures complete condensate removal.
   a. Use float and thermostatic traps with atmospheric pressure gravity condensate return, with automatic controls, or where the possibility of low-pressure supply steam exists. (Float and thermostatic traps are recommended because of gravity drain and continuous discharge operation.)
   b. Use bucket traps only when the supply steam is not modulated and is 25 psig or higher.

Note: *Trane steam coils require a minimum of 2 psi of pressure to assure even heat distribution.*

2. Trap each coil separately to prevent holding up condensate in one or more of the coils.
3. Install strainers as close as possible to the inlet side of the trap.
4. If installing coils in series airflow, control each coil bank independently with an automatic steam-control valve. Size the traps for each coil using the capacity of the first coil in direction of airflow.
5. Use a modulating valve that has linear flow characteristics to obtain gradual modulation of the coil steam supply.

Note: *Do not modulate systems with overhead or pressurized returns unless the condensate is drained by gravity into a receiver, vented to atmosphere, and returned to the condensate pump.*

6. Pitch all supply and return steam piping down 1 inch for every 10 feet in the direction of the steam or condensate flow.

Note: *Do not drain the steam mains or take-offs through the coils. Drain the mains ahead of the coils through a steam trap to the return line.*

7. Ensure overhead returns have 1 psig of pressure at the steam trap discharge for every 2 feet of elevation for continuous condensate removal.
8. At start-up on units with fresh air dampers, slowly turn the steam on full for at least 10 minutes before opening the fresh air intake.

Water Coil Piping

Note: *When installing coils in a duct mounted application, air leakage through the tube and U-bend penetrations in the coil casing should be expected. Capping over the coil ends or sealing around the tubes with a pliable sealant such as silicone will minimize this leakage.*

Figure 12 and Figure 13 illustrate typical water coil piping configurations. Type 5A, 5W, D1, OD, OK, OW, P2, P4, P8, T, TT, UA, UW, W, WC and WS water coils are self-venting only if the water velocity exceeds 1.5 feet per second (fps) in the coil tubes. Type D2, DD, LL, UU, and WD water coils are self-venting only if the water velocity exceeds 2.5 fps in the coil tubes. See the unit submittals for coil water velocity. If the water velocity is below these minimums, vent the coil by one of the following methods:

1. Install an air vent in the top pipe plug tapping of the return header.
2. When the return line rises above the top of the coil, vent from the top of the return header horizontally to the return piping.

Note: *When installing coils in a duct mounted application, air leakage through the tube and U-bend penetrations in the coil casing should be expected. Capping over the coil ends or sealing around the tubes with a pliable sealant such as silicone will minimize this leakage.*

Figure 12. Typical piping for type 5W (1-row), WC and WS water coil

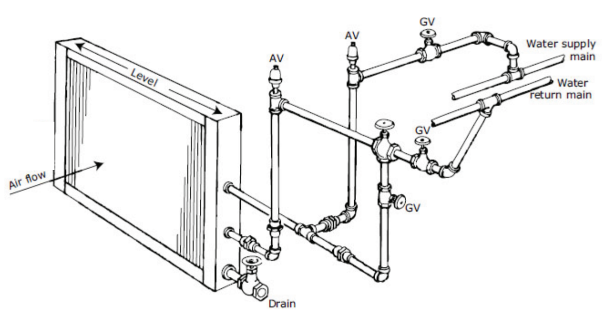


Figure 13. Typical piping for type 5A, 5W (2-row), D, DD, D1, D2, K, LL, OD, OK, OW, W3 (to 12-row), WA (2-row), WD, and WL water coils

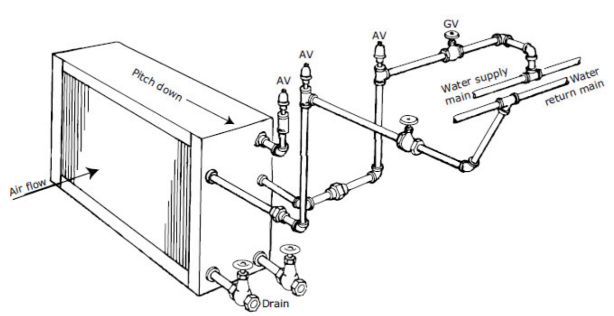


Figure 14. Typical piping for stacked water coils

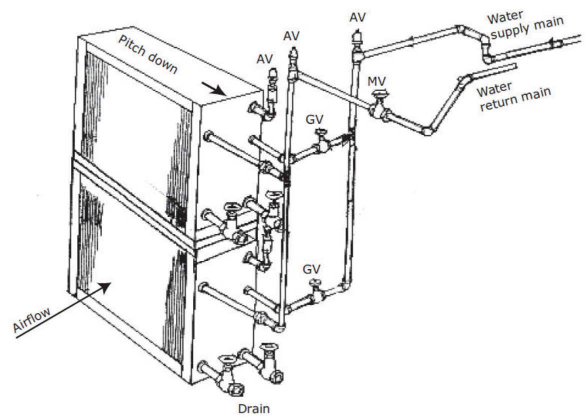


Figure 15. Type T and ST water coil

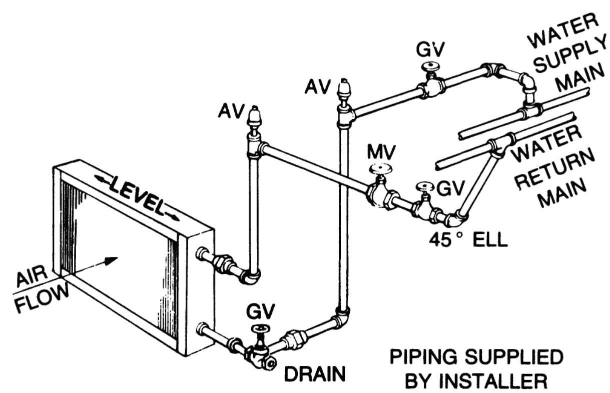
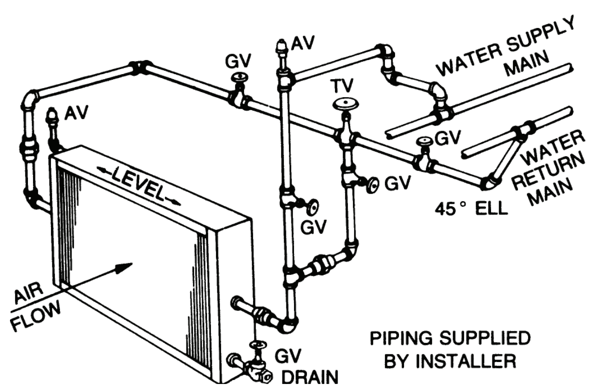


Figure 16. Type W or WA, 1-row water coil



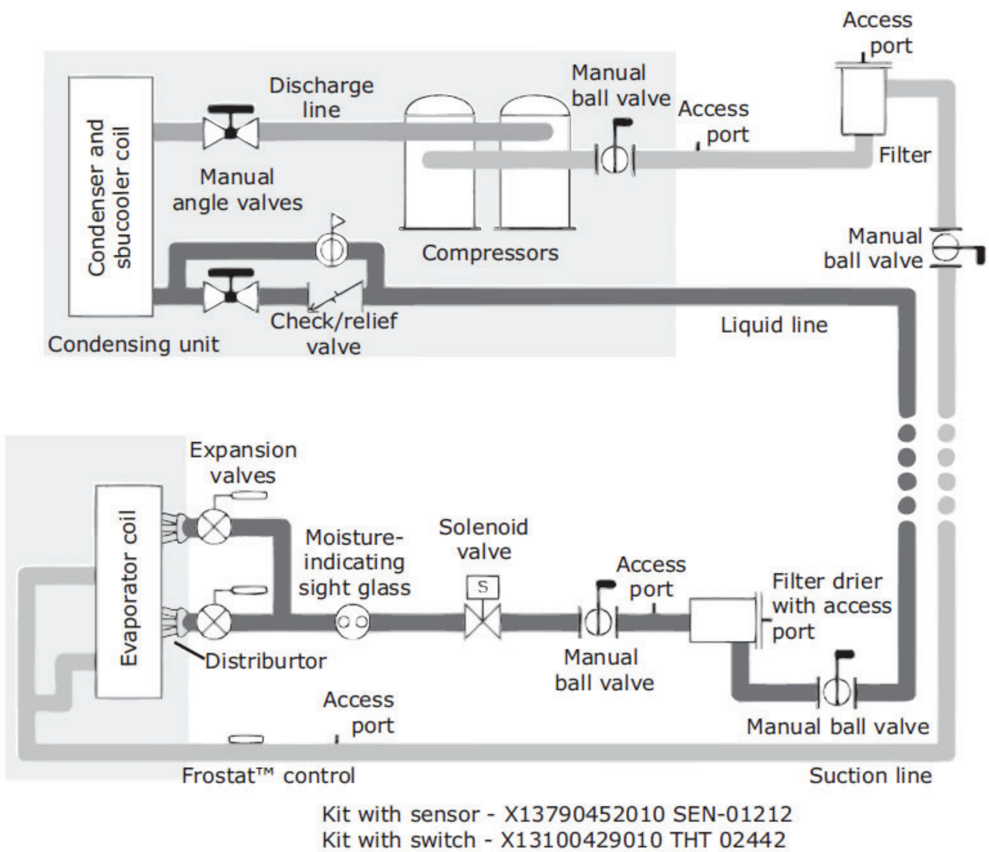
Refrigerant Coil Piping

Note: *Refer to the Warnings, Cautions and Notices page under the "Responsible Refrigerant Practices" section.*

Use Figure 17 to determine the proper, relative sequence of the components in the refrigerant lines that connect the condensing unit to an evaporator coil. Refer to "Examples of

Field-Installed Evaporator Piping” on p. 23 for more detailed schematics of evaporator piping.

Figure 17. Example of placement for split-system components



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 operating envelope. Increasing the size of the liquid line will not increase the available subcooling.

Routing: Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line. Minimize tube bends and reducers because these items tend to increase pressure drop and to reduce subcooling at the expansion valve. Liquid line receivers, other than those that are factory-installed, are not recommended.

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 17 illustrates the proper sequence for positioning them in the liquid line. Position the components as close to the evaporator as possible.

- *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.
- *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 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 variable-airvolume comfort-cooling applications, and is only required for

constant-volume applications when dehumidification is a concern.

- *Moisture-indicating sight glass:* Be sure to install one moisture-indicating sight glass in the main liquid line. The only 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. The moisture indicator/ sight glass must be sized to match the size of the liquid line at the thermal expansion valve.
- *Thermal 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 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.*

NOTICE

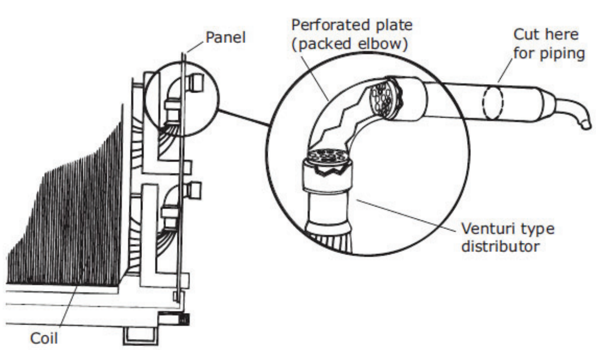
Valve Damage!

Failure to follow instruction below could result in valve damage. Remove, do not wrap, water cooled condenser pressure relief valves during brazing.

The thermal expansion valve must be selected for proper size and capacity. The size of the expansion valve should cover the full range of loadings. Check that the valve will successfully operate at the lightest load condition. For improved modulation, choose expansion valves with balanced port construction and external equalization.

Cut the process tube and cap assembly from the liquid connection as shown in Figure 18 and install the expansion valve directly to the liquid connections.

Figure 18. Type refrigerant coil with packed elbow



Suction Lines

Line sizing

Proper suction-line sizing is required to guarantee 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.

Routing

To prevent residual or condensed refrigerant from "free-flowing" toward the compressor, install the suction line so it slopes slightly—that is, by ¼ inch to 1 inch per 10 feet of run—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 when the refrigerant coil is used with Trane condensing units.

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 the system is leak-free, insulate the suction lines all the way to inner side panel to prevent heat gain and unwanted condensation.s

Components

Installing the suction line requires field installation of these components: a filter, access port, and a Frostat™ control when the refrigerant coil is used with Trane condensing units. Position them as close to the compressor as possible.

Note: *Placement of the Frostat control is illustrated in* *Figure 17, p. 21.*

- *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.
- *Access port:* The access port is used to determine suction pressure. This port is usually a Schraeder valve with a core.
- *Frostat™ coil frost protection:* The Frostat control is the preferred method for protecting evaporator coils from freezing when the refrigerant coil is used with Trane condensing units. 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.

Refrigerant Charging

Evacuate and leak-test the entire refrigeration system after piping is complete. Charge the unit according to approximate weight requirements and operating pressures. Then measure superheat and subcooling after the system has been allowed time to stabilize and adjust the thermal expansion valve setting if necessary. Always allow the system to stabilize before taking pressure or temperature readings.

Installation Checklist

Use the following checklist to verify that all necessary installation procedures have been completed. Refer to specific sections of this manual for more detailed information.

- Coil is installed with airflow in same direction as indicated on the coil nameplate or casing.
- Suction connection of refrigerant coils is at the bottom of suction header.
- If stacking more than three coils, stacking channels are properly installed. Bypass air is prevented by caulk or blockoffs.
- Condensate drain pans and piping installed.
- Clean filters are installed upstream of the coil.
- A liquid line filter-drier is installed upstream of the expansion valve.
- A moisture indicator/sight glass is installed between the expansion valve and filter-drier.
- A liquid line shutoff valve with access port is installed close to the condenser.
- A schraeder valve is installed in the suction line close to the refrigerant coil outlet.
- The thermal expansion valve, with external equalizer connections, is installed directly on the coil liquid connection. The liquid distributor must be in a true vertical position.
- Piping system is evacuated, leak-tested and charged.
- Superheat and subcooling measurements are taken. Thermal expansion valve is adjusted if necessary to obtain desired superheat.

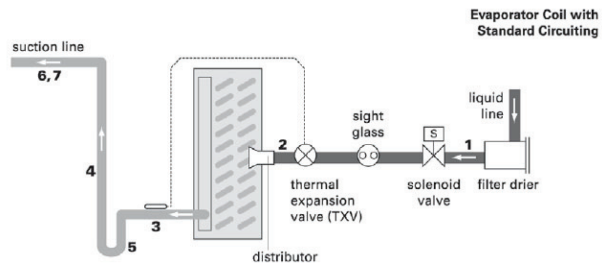
Coil identification

A nameplate is provided on the top channel near the piping connection end of the coil. The name plate contains the coils serial number and model number. Use these numbers whenever inquiring on coil information with a Trane representative.

Examples of Field-Installed Evaporator Piping

Single-Circuit Condensing Unit: Evaporator Coil with One Distributor

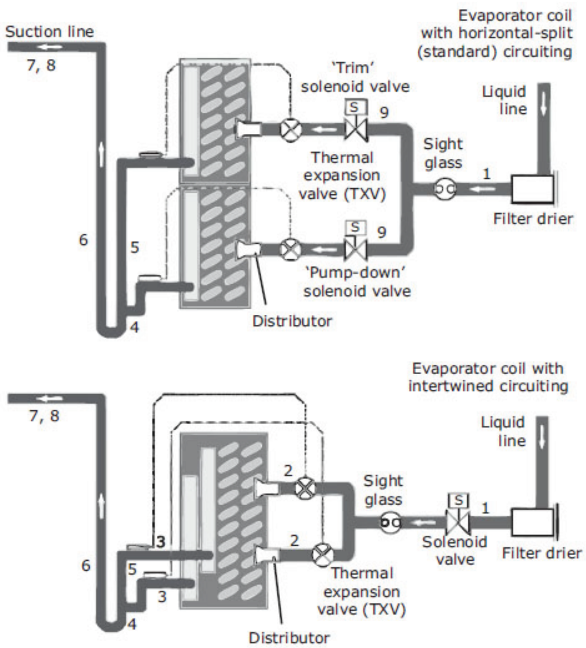
Figure 19. Single-circuit evaporator coil with one distributor



1. Pitch the liquid line slightly—1 inch/10 feet—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 inch/10 feet in the direction of flow. Use the tube diameter that matches the suction-header connection.
4. For vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.
5. Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward.
6. Pitch the suction line slightly—1 inch/10 feet—so the refrigerant drains toward the evaporator.
7. Insulate the suction line.

Single-Circuit Condensing Unit: Evaporator Coil with Two Distributors

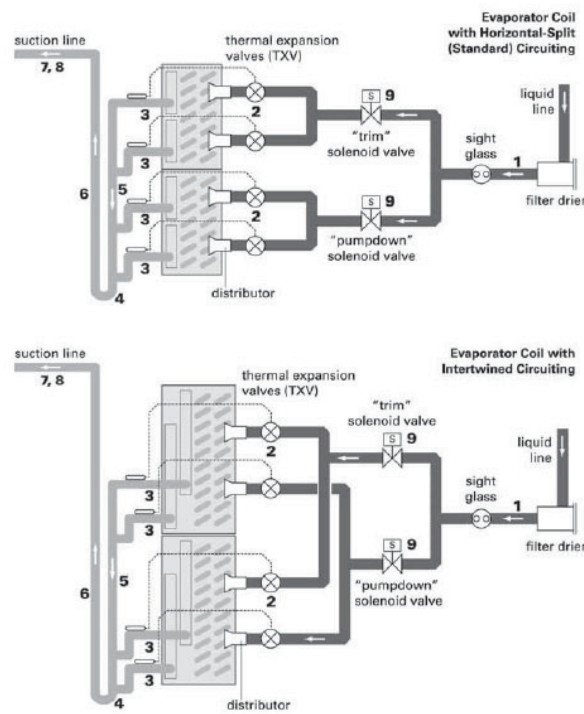
Figure 19. (continued from previous page) Single-circuit evaporator coil with two distributors



1. Pitch the liquid line slightly—1 inch/10 feet—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 inch/10 feet in the direction of flow. Use the tube diameter that matches the suction-header connection.
4. Arrange the suction line so 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 thermal expansion valve bulb from other suction headers.
5. For horizontal tubing, use the tube diameter recommended by the condensing unit manufacturer.
6. For vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.
7. Pitch the suction line slightly—1 inch/10 feet—so 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.

Single-Circuit Condensing Unit: Evaporator Coil with Four Distributors

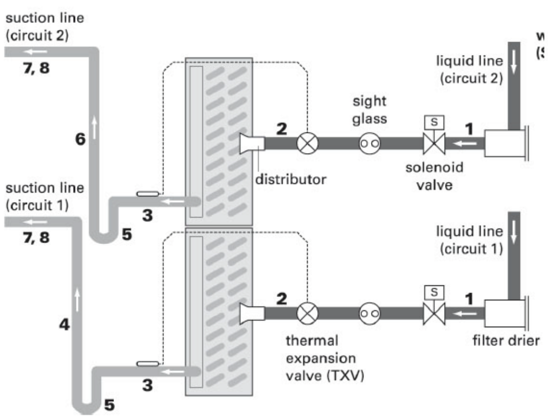
Figure 20. Single-circuit condensing unit: evaporator coil with four distributors



Follow steps 1-9 as in "Single-Circuit Condensing Unit: Evaporator Coil with Two Distributors," p. 24.

Dual-Circuit Condensing Unit: Evaporator Coil with Two Distributors

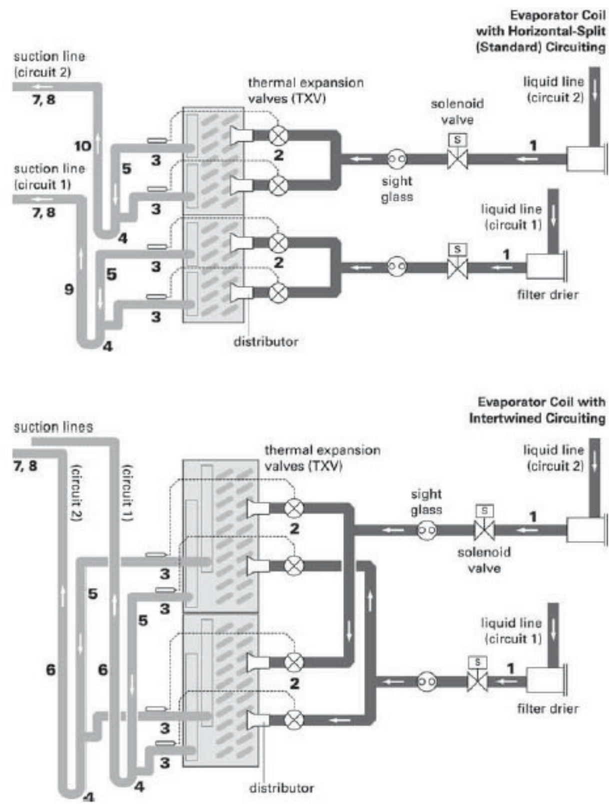
Figure 21. Dual-circuit evaporator coil with two distributors



1. Pitch the liquid line slightly—1 inch/10 feet—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 inch/10 feet 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 by the condensing unit manufacturer for the riser.
5. Arrange the suction line so 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 by the condensing unit manufacturer for the riser.
7. Pitch the suction line slightly—1 inch/10 feet—so the refrigerant drains toward the evaporator.
8. Insulate the suction line.

Dual-Circuit Condensing Unit: Evaporator Coil with Four Distributors

Figure 22. Dual-circuit evaporator coil with four distributors

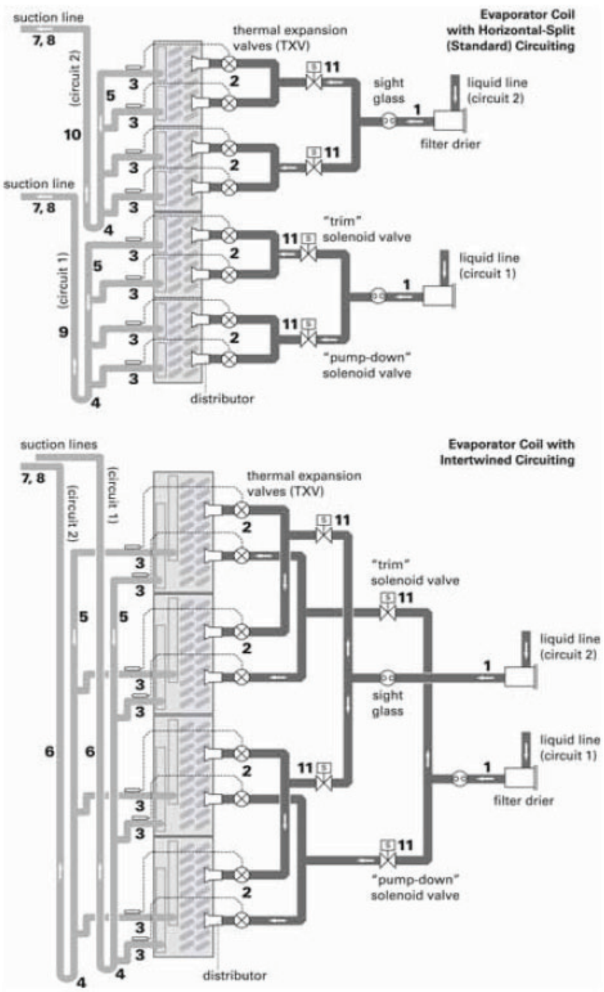


Follow steps 1-3 as in "Dual-Circuit Condensing Unit: Evaporator Coil with Two Distributors," p. 25.

1. Arrange the suction line so 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 thermal expansion valve bulb from other suction headers.
2. For horizontal tubing, use the tube diameter recommended by the condensing unit manufacturer.
3. For vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.
4. The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil.
5. The top of the Circuit 2 suction riser must be higher than the top evaporator coil.
6. Pitch the suction line slightly—1 inch/10 feet—so the refrigerant drains toward the evaporator.
7. Insulate the suction line.

Dual-Circuit Condensing Unit: Evaporator Coil with Eight Distributors

Figure 23. Dual-circuit evaporator coil with eight distributors



Follow steps 1-10 as in "Dual-Circuit Condensing Unit: Evaporator Coil with Four Distributors," p. 25.

8. 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.

Maintenance

⚠WARNING

Hazardous Chemicals!

Failure to follow this safety precaution could result in death or serious injury. Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin or eyes occurs. Handle chemical carefully and avoid contact with skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices.

Coil Cleaning

NOTICE

Coil Damage!

Failure to follow instructions below could result in coil damage.

Do not clean the refrigerant coil with hot water or steam as it could cause high pressure inside the coil tubing. Do not use acidic chemical coil cleaners. Also, do not use alkaline chemical coil cleaners with a pH value greater then 8.5 (after mixing) without using an aluminum corrosion inhibitor in the cleaning solution.

NOTICE

Equipment Damage!

Do not use acidic chemical coil cleaner. Do not use alkaline chemical coil cleaners that, after mixing, have a ph value greater than 8.5, without also using an aluminum corrosion inhibitor in the cleaning solution. Failure to follow these guidelines or the manufacturer's instructions for use of cleaning chemicals could result in damage to the unit.

Keep coils clean to maintain maximum performance. For operation at its highest efficiency, clean the coil often during periods of high cooling demand or when dirty conditions prevail. A routine cleaning schedule is recommended to prevent dirt build-up in the coil fins, where it may not be visible.

Remove large debris from the coils and straighten fins before cleaning.

Clean refrigerant coil fin surfaces with cold water and detergent or with one of the commercially available chemical coil cleaners. Rinse coils thoroughly after cleaning.

Type K coils have removable headers for cleaning. A small nylon or fiber brush may be used to clean the tubes. After cleaning tubes flush with water. Replace rubber sealing gasket with new gasket when removing any header and be sure it seats properly when replacing the header. If necessary, pull turbulators, clean tubes, and replace with new turbulators.

When the header covers are replaced, washers are recommended under bolt heads and bolts should be evenly tightened to 50 ft.-lbs. torque.

Coils should be kept clean to maintain maximum performance. If fins become dirty, clean with steam and detergent, hot water spray and detergent, or one of the commercially available chemical coil cleaners.

Fin Straightening

Coil fins may have been bent during shipping or servicing, and must be straightened to maintain maximum heat transfer. Reduction of the effective coil surface correspondingly reduces coil capacity. Always check in appearance after any handling of the coil and after any servicing is done near the coils.

Fin rakes are sized according to number of fins per inch of the coil. For relatively small bends that require only minor repair, other tools may be used to evenly space the fins. Be careful not to damage the coils.

Rinse coils thoroughly after cleaning.

Winterization Procedures

General Guidelines

Water coil winterization procedures consist primarily of draining water from the coil before the heating season and adding antifreeze to prevent freezing of any water left standing in the coil.

NOTICE

Coil Damage!

Inactive water coils exposed to freezing and sub-freezing temperatures must be winterized annually to prevent "coil freeze" damage.

Individual coil type and attitude (pitched toward drain header) will determine how completely each coil can be drained for shutdown during inoperative period. If draining is questionable because of dirt or scale deposits. Blow coil out with compressed air and fill the coil with antifreeze before the heating season begins.

Type D and DD coils

Where coils are installed level or pitched toward the drain header, remove the vent and drain plugs at the ends of each header and allow the water to drain from the coil. If the coils have been pitched away from header, it will be necessary to drain and blow the coils out as completely as possible with compressed air. The coil should then be filled and drained several times with full strength ethylene glycol so that it will mix thoroughly with the water retained in the coil. Drain the coil as completely as possible.

Type K coils

Remove the header covers. If tubes are fouled, cleaning can be done with nylon or wire brush. To ensure that no water will remain in the coil, do not replace the header covers until the coils are put back into service.

Note: *Type K coils are not cleanable by mechanical means when spring wire turbulators are used.*

When the coils are put back into service, new gaskets must be used. It is also recommended that when header covers are replaced, washers be used under bolt heads and bolts be evenly tightened to 50 ft.-lbs. torque.

All Coils Types except WL and UW—Leveled

If these coils have been installed perfectly level, remove the vent and drain plugs at the lower ends of each header and allow the water to drain from the coil.

If coil level is questionable, blow coil out with compressed air to ensure proper drainage.

Type UW and WL Coils—Leveled and/or Pitched — All except WL, UL, D and DD

NOTICE

Equipment Damage!

Use care in removing header plugs from P2, P4 and P8 coils. Overtorquing may result in twisted tubes.

Remove the vent and drain plugs and blow the coils out as completely as possible with compressed air. The coils should then be filled and drained several times with full strength ethylene glycol so that it will mix thoroughly with the water retained in the coil. Drain the coil out as completely as possible.

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