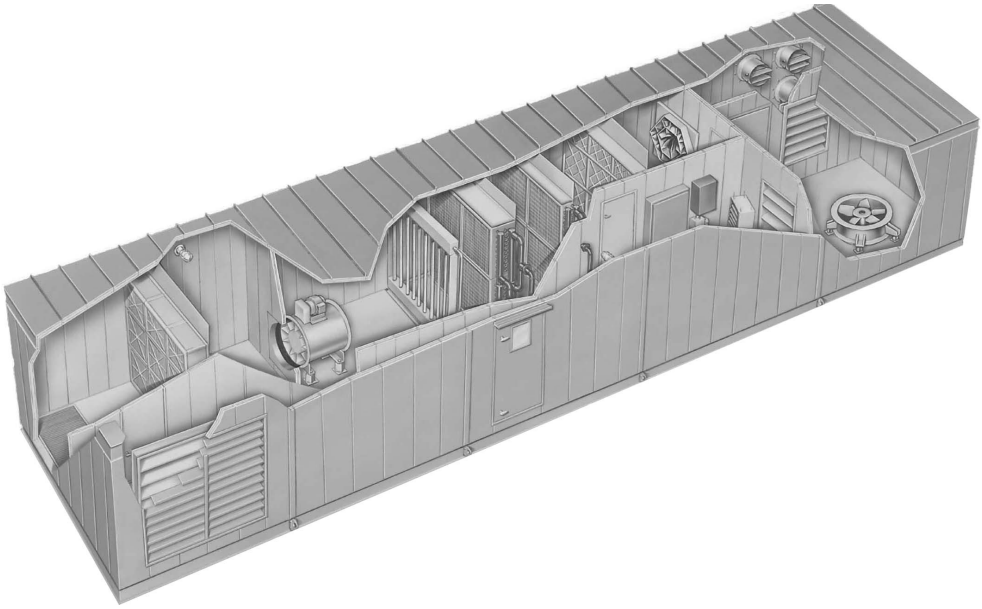
TRANE®

Installation
Operation
Maintenance

Custom Climate Changer™ Air Handlers



Part No. X39640745010

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NOTICE:

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

⚠ 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, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION

...indicates a situation that may result in equipment or property-damage-only accidents.

Introduction

Use this manual to install, startup, operate, and maintain the Custom Climate Changer™ air handler. Carefully review the procedures discussed in this manual to minimize installation and startup difficulties.

Unit Description

Custom Climate Changer™ air handlers are designed for a variety of controlled-air applications. The basic unit consists of a fan, heating and/or cooling coils, filters, and dampers. See the unit submittal drawings for detailed descriptions.

Each unit is provided with a nameplate. This nameplate includes unit model number, serial number and electrical data.

The fans are internally isolated. To insure fan stability, the unit ships with a minimum of four lock-down devices that prevent the fan from shifting during shipment and installation. These spacers must be removed prior to fan operation to assure proper vibration isolation. Retain these spacers for use in adjusting fan isolators if required.

The units are available with factory mounted controls for climate and humidity control. These can be use as stand-alone devices or operate with a complete controls system. End devices include factory-mounted starters and variable speed drives.

Custom Climate Changer™ air handlers ship as complete assemblies or in sections. Some jobsite assembly is required when the units ship in sections.

Protecting the Environment

World environmental scientists have concluded, based on the best currently available evidence, that ozone in our upper atmosphere is being reduced due to the release of CFC (chlorofluorocarbon) fully halogenated compounds.

Trane urges that all HVAC servicers working on Trane equipment, or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC (halocarbon that contains fluorine, chlorine, carbon, and hydrogen), and HFC (halocarbon that contains only fluorine, carbon, and hydrogen) refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service on this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available.

Refrigerant used in any type of air-conditioning or refrigerating equipment should be recovered for reuse, recovered and/or recycled for reuse, reprocessed (reclaimed), or properly destroyed, whenever it is removed from equipment. *Never release it to the atmosphere!*

Contents

General Information

Operating Environment

When considering the placement of the Custom Climate Changer air handler, it is important to consider the operating environment. The acceptable ambient temperature range for unit operation is -40ºF to 140ºF (-40ºC to 60ºC).

For heating applications, a special motor may be required to withstand the higher temperatures. Motors with Class B insulation are acceptable for ambient temperatures up to 104° F, while motors with Class F insulation can withstand ambient temperatures to +140° F (60° C).

For the units furnished with gas furnaces, the heating demands require a special motor to withstand the higher temperatures. These motors are furnished with Class "H" insulation to withstand this rigorous duty.

Note: The customer should provide adequate freeze protection for the coils.

Controls

Wiring Sizes and Connections

As a standard, there are no penetrations into the Custom air handler for any field-provided wiring or device. Before installation, consider overall unit serviceability and accessibility before mounting, running wires (power), making cabinet penetrations, or mounting any components to the module cabinet.

Wiring to the unit must be provided by the installer and must comply with all national and local electrical codes. The fan motor nameplate includes a wiring diagram. If there are any questions concerning the wiring of the motor, be sure to write down the information from the motor nameplate and contact your local fan motor manufacturer representative for assistance.

Factory-Mounted Controls

Small items that cannot be factory mounted will ship inside the control enclosures. Larger items may ship inside the fan module.

Note: All control valves ship directly to the "ship-to address" from the vendor unless another address is given on the Trane sales order.

Depending on job requirements, the customer may need to provide 120 Vac control power. A dedicated 15-amp circuit is recommended.

Factory-mounted control systems ordered with factory-mounted starters or VFDs are supplied with line to 24 Vac control transformers. No additional power wiring is required.

For a more in-depth understanding of controls, refer to the following manuals:

- For factory-configured AH540/AH541 controllers, CNT-SVX05B-EN
- For programmable MP580 controllers, CNT-SVP01A-EN
- For hardware installation, CNT-SVN01A-EN
- For Danfoss VFD, TR1-SVX10A-EN
- For universal programmable control modules (UPCMs):
  - EMTX-PG-5
  - EMTX-IN-22A

Custom air handlers and/or field-installed accessories that must be stored for a period of time prior to being installed must be protected from the elements. All controllers and electrical/electronic components should be stored in conditions of -20 to 120°F and 5- to 95-percent relative humidity non-condensing. Electrical components are not moisture-tolerant.

Note: The warranty will not cover damage to the unit or controls due to negligence during storage. A controlled indoor environment is recommended for proper storage. For further storage considerations, refer to "Job Site Storage Recommendations" on page 7.

Ultraviolet (UV) Germicidal Irradiation Lights (optional)

The United States Environmental Protection Agency (EPA) believes that molds and bacteria inside buildings have the potential to cause health problems in sensitive individuals[1]. If specified, Trane provides ultraviolet lights (UV-C) as a factory-engineered and installed option in select commercial air handling products.

When UV lights are factory provided, polymer materials that are susceptible to deterioration by the UV-C light will be substituted or shielded from direct exposure to the light.

In addition, UV-C radiation can damage human tissue, namely eyes and skin. To reduce the potential for inadvertent exposure to the lights by operating and maintenance personnel, electrical interlocks that automatically disconnect power to the lights are provided at all unit entry points to equipment where lights are located.

1. United Sates Environmental Protection Agency; A Brief Guide to Mold, Moisture and your Home; Brochure EPA 402-K-02-003.

⚠ WARNING
Equipment Damage From Ultraviolet (UV) Lights!

Trane does not recommend field installation of ultraviolet lights in its air handling equipment for the intended purpose of improving indoor air quality. High intensity C-band ultraviolet light is known to severely damage polymer (plastic) materials and poses a personal safety risk to anyone exposed to the light without proper personal protective equipment (can cause damage to eyes and skin). Polymer materials commonly found in HVAC equipment that may be susceptible include insulation on electrical wiring, fan belts, thermal insulation, various fasteners and bushings. Degradation of these materials can result in serious damage to the equipment.

Trane accepts no responsibility for the performance or operation of our air handling equipment in which ultraviolet devices were installed outside of the Trane factory.

Pre-Installation Requirements

Receiving Checklist

Based on customer requirements, Custom Climate Changer air handlers can ship as complete units or as individual sections to be field assembled.

Upon receipt of the unit(s) and prior to unloading, remove any shipping material and inspect the unit for damage and verify that the shipment is complete.

Note: Delivery cannot be refused. Trane is not responsible for shipping damage.

1. Visually inspect components for any damage that may have occurred during shipment.
2. Check all access doors to confirm that the latches and hinges are not damaged.
3. Inspect the interior of each section for any internal damage.

Note: Concealed damage must be reported within 15 days of receipt.

4. Inspect the coils for damage to the fin surface and/or coil connections.
5. If the unit was ordered with factory-mounted controls, locate all sensors.

Note: Items that cannot be factory-mounted should ship inside the control enclosures or should be packaged inside the fan module or mixing box module.

6. Check all devices attached to the unit exterior and confirm that they are not damaged.
7. Manually rotate the fan wheel to ensure free movement of the shaft, bearings, and drive. Inspect the fan housing for any foreign objects.
8. Locate assembly hardware.
9. Inspect and test all piping for possible shipping damage. Nipples may be installed on coils at the factory but should always be tightened and tested before any connections are made. Rough handling during shipping, in addition to other factors can cause pipe connections to become loose.

Note: Trane will not be responsible for any leak at the field connections. Coils have been factory pressure tested before shipping.

Resolving Shipping Damage

Trane air handlers ship free on board (FOB), meaning that the unit belongs to the customer the moment the delivery truck leaves the factory. If damage has occurred to the unit during shipment, follow these instructions:

Note: Trane is not responsible for shipping damage.

1. Make specific notation, describing the damage, on the freight bill. Take photos of the damaged material, if possible.
2. Report all claims of shipping damage to the delivering carrier immediately and coordinate carrier inspection, if necessary.

Note: Do not attempt to repair the unit without consulting the delivering carrier.

3. Notify your Trane sales representative of the damage and arrange for repair.

Note: Do not attempt to repair the unit without consulting the Trane sales representative.

4. Keep the damaged material in the same location as it was received.

Note: It is the receiver's responsibility to provide reasonable evidence that concealed damage was not incurred after delivery.

Job Site Storage Recommendations

Custom units and/or field-installed accessories that must be stored for a period of time before installation *must* be protected from the elements. A controlled indoor environment is recommended for proper storage.

Note: The warranty does not cover damage to the unit or controls due to negligence during storage.

CAUTION
Use Canvas Only!

Use only canvas tarps to cover air handlers. Plastic tarps cause condensation to form in and on the equipment, which can result in corrosion damage or wet storage stains.

General Storage

The unit controller and all other electrical/electronic components should be stored in conditions of -20°F to 120°F and 5 to 95 percent relative humidity, non-condensing. Electrical components *are not* moisture-tolerant. Factory protective coverings should be removed prior to storage.

Long-Term Storage

For longer periods of storage, allow proper clearance around the unit to perform periodic inspection and maintenance of the equipment.

While the unit is in storage:

- Every two weeks, rotate the fan and motor shaft 30 revolutions by hand.
- Every six months, check fan shaft bearings and grease lines. Add grease using a manual grease gun following the lubrications recommendations in "Fan Bearing Lubrication" on page 51.

Outdoor Storage Considerations

Outdoor storage is not recommended; however, when outdoor storage is necessary, several things must be done to prevent damage:

Note: Keep the equipment in the original shipping container for protection and ease of handling.

1. Select a well-drained area, preferably a concrete pad or blacktop surface.
2. Place the unit on a dry surface or raised off the ground to assure adequate air circulation beneath the unit and to assure no portion of the unit will contact standing water at any time.
3. Loosen the belt tension on the drive belts.
4. Cover the unit securely with a canvas tarp.
5. Do not stack units.
6. Do not pile other material on the unit.

Preparing the Unit Site

1. Ensure the installation site can support the total weight of the unit. The building roof must be able to support the entire weight of the unit, roof curb and accessories. Refer to the unit submittals for weights.
2. Allow sufficient space to allow adequate free air and necessary service access. Refer to submittals for specific minimums.
3. Allow room for supply and return piping, ductwork, electrical connections, and coil removal.
4. Ensure there is adequate height for condensate drain requirements. See "Drain Pan Trapping" on page 29.

Note: Inadequate height may necessitate core-drilling the floor to attain proper trap height. Insufficient height could inhibit condensate drainage and result in flooding the unit and/or equipment room.

⚠ WARNING
Level Foundation!

The floor or foundation must be level and the condensate drain at the proper height for proper coil drainage and condensate flow. Standing water and wet surfaces inside air-handling units could result in microbial growth, which may cause unpleasant odors, serious health problems, or death.

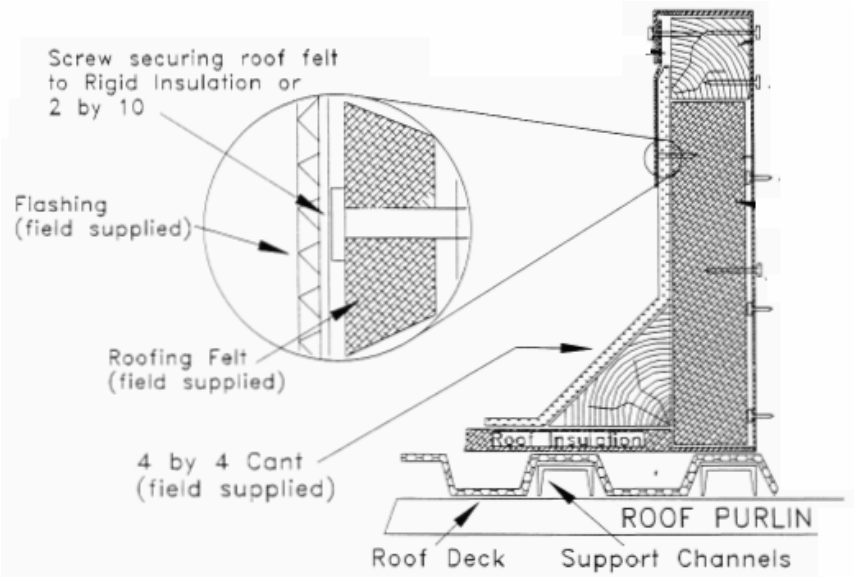
5. Confirm the foundation of the mounting platform is level and large enough to include the unit dimensions (refer to the unit submittals for specific dimensions).
6. Provide adequate lighting for maintenance personnel to perform maintenance duties.
7. Provide permanent power outlets in close proximity to the unit for installation and maintenance.
8. Depending upon job requirements, the customer may need to provide 120 Vac power to the unit controller. Refer to submittals for more information. A dedicated 15-amp circuit is recommended.
9. Wiring for Custom units must be provided by the installer and must comply with all national and local electrical codes.
10. Rooftop curb mounted units must be sealed tightly to the curb. Use proper sealants and roof to curb sealing techniques to prevent water and air leakage.

Note: Preparation of the roof curb or pier mount and roof openings should be completed prior to lifting the unit to the roof.

Roof Curb Installation

It is recommended that the curb be installed directly on the support members and fastened to the supports using tack welds or other equivalent methods. Properly supported decking should be installed inside the air handler section of the curb when this method is used. (See Figure 1)

Figure 1. Cross section of typical curb installation on new construction



Typical Curb Installation Checklist

- Verify that the roof structure can adequately support the combined weight of the unit and curb assembly.
- Ensure that the selected installation location provides sufficient service and operational clearances.
- Remove any twist within the curb due to roof supports and square the curb.
- Level the curb.
- Secure the curb to the roof support members.
- Install 2-inch thick boards or rigid insulation around the curb.
- Install cant strips around the curb.
- Bring field supplied roofing felt up to the top of the curb nailing strips. ail felt into place.
- Install field supplied flashing under the lip of the curb flanges and over the felt.
- Apply sealant to the four corners. Caulk all joints between the curb and the roof. Attach the gasket material to the curb's top flanges (entire perimeter) and to the supply and return air duct opening panel flanges.

Installation

Lifting and Rigging

⚠ WARNING
Lifting and Rigging!

Do not lift, rig, or ceiling-suspend from the top of the unit. Lift from lifting lugs only, located at the bottom of the unit. Use all lifting lugs provided.

Do not use cables (chains or slings) except as shown. Each of the cables (chains or slings) used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

Do not use a fork lift for handling units. This may result in equipment damage. Trane is not responsible for equipment damage resulting from improper forklifting practices.

Test lift unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

Always place, assemble, and suspend sections one at a time.

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

Figure 2. Recommended attachment to lifting lugs.

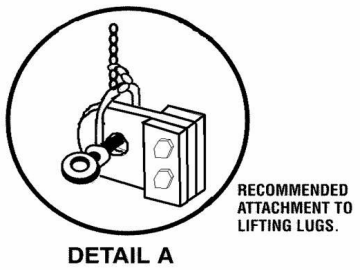


Figure 3. Use proper lifting and rigging methods

Per job requirements, air handlers will ship as a complete assembly or in sections.

Trane recommends that the contractor use spreader bars and slings to rig units and subassemblies.

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of the placement of internal components, the unit weight may be unevenly distributed, with more weight in the coil and fan areas. Refer to the unit submittals for section weights. Test the unit for proper balance and rigging before lifting.

General Lifting Considerations

- Always rig subassemblies or sections as they ship from the factory. See the unit submittal drawings for correct placement of sections.
- Always assemble unit at the installation site. Never bolt sections together before rigging.
- Make the loop of the sling parallel to the direction of airflow, if possible.
- Each of the cables used to lift the unit must be capable of supporting the entire weight of the unit.
- When hoisting the unit into position, use the proper rigging method, such as straps, slings, spreader bars, or lifting lugs for protection and safety.

Note: Never lift units in windy conditions.

- Personnel should be positioned overhead and on the ground to guide the crane or helicopter operator in positioning the sections.
- The air handler is not designed to be lifted, rigged or ceiling suspended from the top of the unit.
- Never stack the pipe cabinet and inlet hoods on the unit as the unit is being lifted.
- Do not attach the intake/exhaust hoods to the unit prior to lifting the unit. Doing so may damage the equipment. Attach the hoods to the unit only after all sections are in place.

Unit Assembly

Note: If the unit is shipped as a complete assembly, go to "Coil Piping and Connections" on page 28.

Prior to unit assembly, refer to the unit submittal drawings and unit tagging for correct placement of sections. Failure to review the submittal drawings could result in performance or assembly problems. If there are any discrepancies, contact your local Trane sales representative before proceeding.

All shipping supports and crating on the face of the sections must be removed and discarded to permit proper fit-up and sealing of the surfaces.

Units may be mounted on the roof with a roof curb or pier mount. Units may be mounted indoors on housekeeping pads. Refer to submittals for unit dimensions and openings.

Note: For proper operation, the unit must be supported around the entire unit base perimeter. If the unit is shipped in sections, the entire section perimeter must be supported, as well as at the base channels of the unit splits.

Provide clearance around the unit to allow adequate free air and necessary service access. Also, allow room for supply and return piping, ductwork, electrical connections, and coil removal.

The building roof must be able to support the entire weight of the unit, roof curb and accessories. See submittals for approximate unit weights.

- Preparation of the roof curb or pier mount and roof openings should be completed prior to lifting the unit to the roof.
- Check that the gasketing or sealant on the roof curb is intact and provides an airtight seal with the unit base.
- Complete all ductwork, piping and electrical connections only after mounting the unit.

Assembly Hardware

Air handlers ship with all necessary assembly hardware and gasket material. This hardware is packaged in either a clear plastic envelope or cardboard box and can be found inside one of the sections. If space inside a section is not adequate, a crate or pallet will be loaded onto the bed of the truck. Check the Parts List on the Field Assembly drawing against the contents of the crate. Do not proceed with unit assembly until verification that all materials are present. The number of sections to be assembled often makes it necessary to use more than one section to ship the material. Please check all sections thoroughly before contacting your local Trane sales engineer to report missing hardware.

TCP Model Assembly Instructions

If your nameplate model number begins with TCP, use the assembly instructions below.

Joining Sections Edge-to-Edge

Units must be installed level for proper drainage of condensate from the drain pan. In addition, each section in a multi-section unit must be properly supported.

Note: Leveling each section, beginning with the first, is critical. Failure to level and align the sections immediately creates greater misalignment or even structural damage afterward.

1 Remove all crating and wrapping from the surfaces to be joined.

2 Place one section of the air handler into the desired position. Verify each section is level and properly supported prior to proceeding with assembly. Each unit must be level side-to-side and front to back. Check squareness measuring the critical dimensions given.

3 When the unit is positioned and squareness is assured within 1/8-inch, remove all lifting lugs located along the split plane.

4 Install 4-inch x 1/4-inch neoprene gasket to all mating surfaces of the section, including the internal walls. This gasket must be applied to the full perimeter of the section split of both sections to be joined.

5 Move the next mating section into alignment with the positioned section. Alignment of sections must be completed before gasket surfaces meet. The two sections should be within 12 inches to reduce the amount of dragging required.

6 Remove lifting lugs on mating section as required.

7 Insert threaded rods through each hole of each mating connecting plate (see Figure 4). Bring each connecting surface together uniformly until gasketing is contacted.

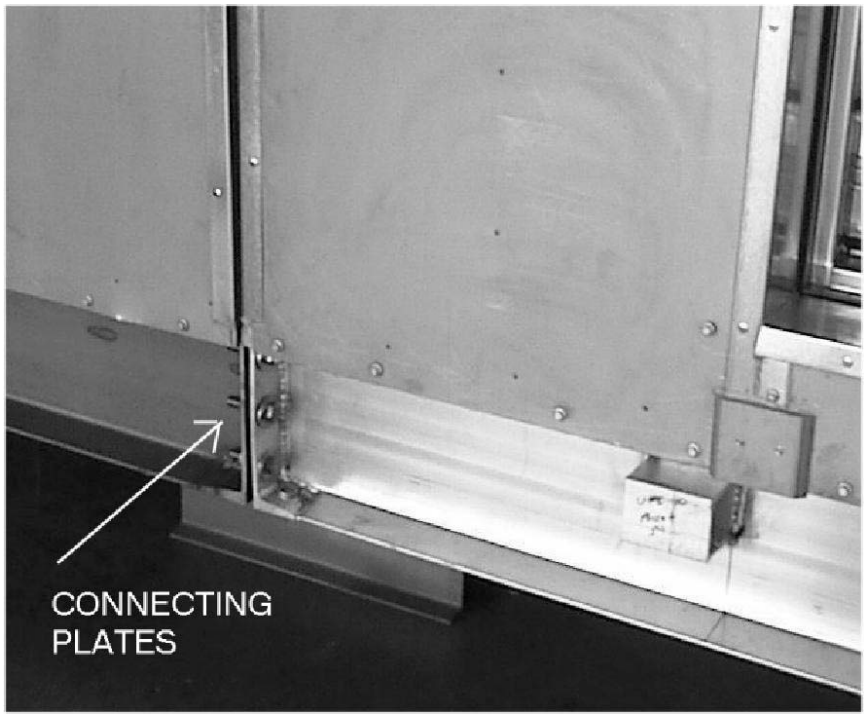
Note: Use field provided threaded rods inserted in all holes of each connecting plate to prevent damage and distortion of the sections as they are joined. Tighten all rods in sequence. Do not try to join sections by tightening only some of the rods.

Note: Failure to compress the gasketing may result in air leakage.

8 Secure the unit sections at the base using the field provided bolts, nuts and washers at the connecting plates.

9 Once the sections are pulled together, install the assembly hardware as applicable for the walls, roof, and the base as demonstrated in the following assembly sections.

Figure 4. Insert threaded rods through each hole of mating connecting plate.



TCP Base Section Assembly (Typical)

Note: Failure to completely compress the gasketing may result in air leakage.

1 Join the two units and secure with field provided 5/8-inch flat washers and 5/8-inch X 2-1/2-inch grade 9 bolts though each of the six holes.

2 Caulk the overlapping flange along the length of each split to maintain a seal.

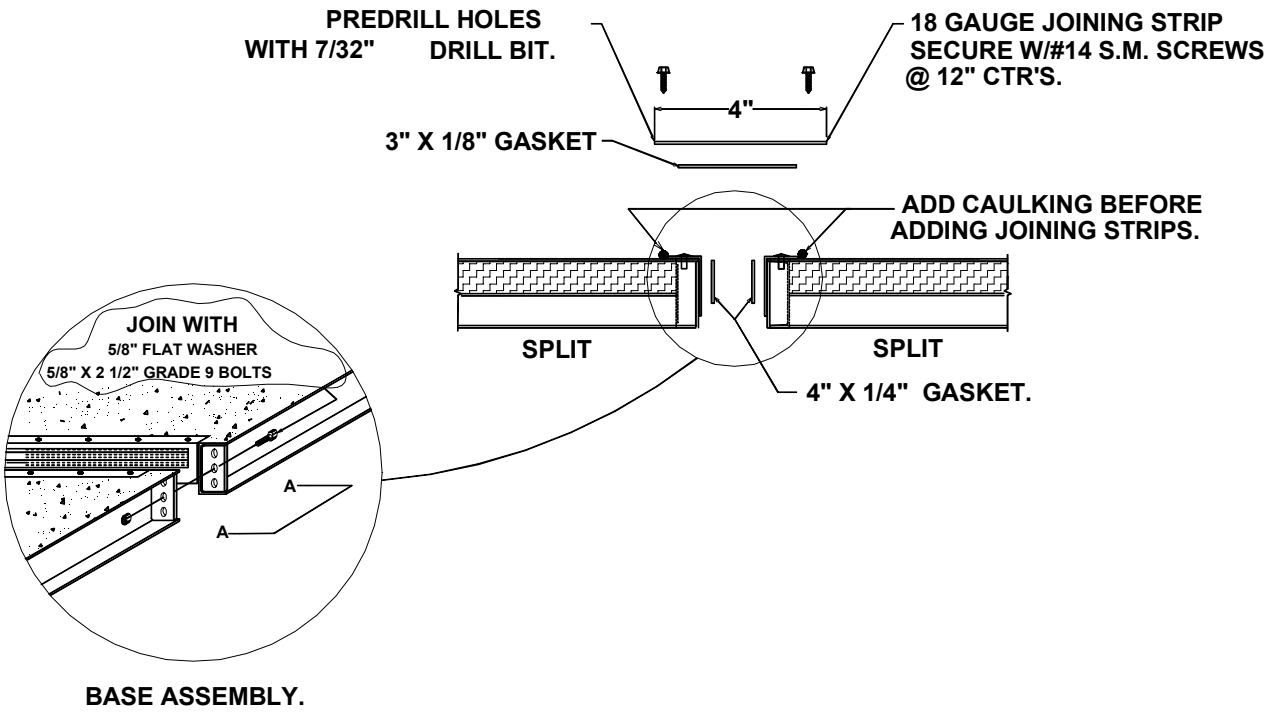
Note: Use a polyurethane or equivalent caulk.

3 Apply the 3-inch X 1/8-inch gasket evenly across the two joined edges of the splits.

4 Before installing the pre-cut 4-inch 18 gauge joining strip over the gasket, pre-drill holes in the floor using the 4-inch strip as a guide with a 7/32-inch drill bit at 12 inch centers.

5 Apply the 4-inch joining strip over the gasket and uniformly straddle the splits. Secure with number 14 sheet-metal screws at 12-inch centers.

Figure 5. TCP base assembly



TCP Wall Section Assembly (Typical)

1 Apply the walls and join at the inside angles with number 14 sheet-metal screws on 12-inch centers along the length of the angles.

2 Apply the 1/8-inch gasket evenly to the exterior of the walls across the two joined edges of the splits.

3 Before installing the pre-cut joining strip over the gasket, pre-drill holes in the wall using the strip as a guide with a number 29 drill bit at 12-inch centers.

4 Apply the joining strip over the gasket and uniformly straddling the splits. Secure with number 10 sheet metal screws.

5 Fit the pre-cut hub cap over the joining strip the vertical height of the wall flush with the roof and secure it to the wall with number 8 sheet metal screws. Fill the top and bottom openings with caulk as moisture seal. Pre drill holes with a number 29 bit.

TCP Outdoor Roof Section Assembly (Typical)

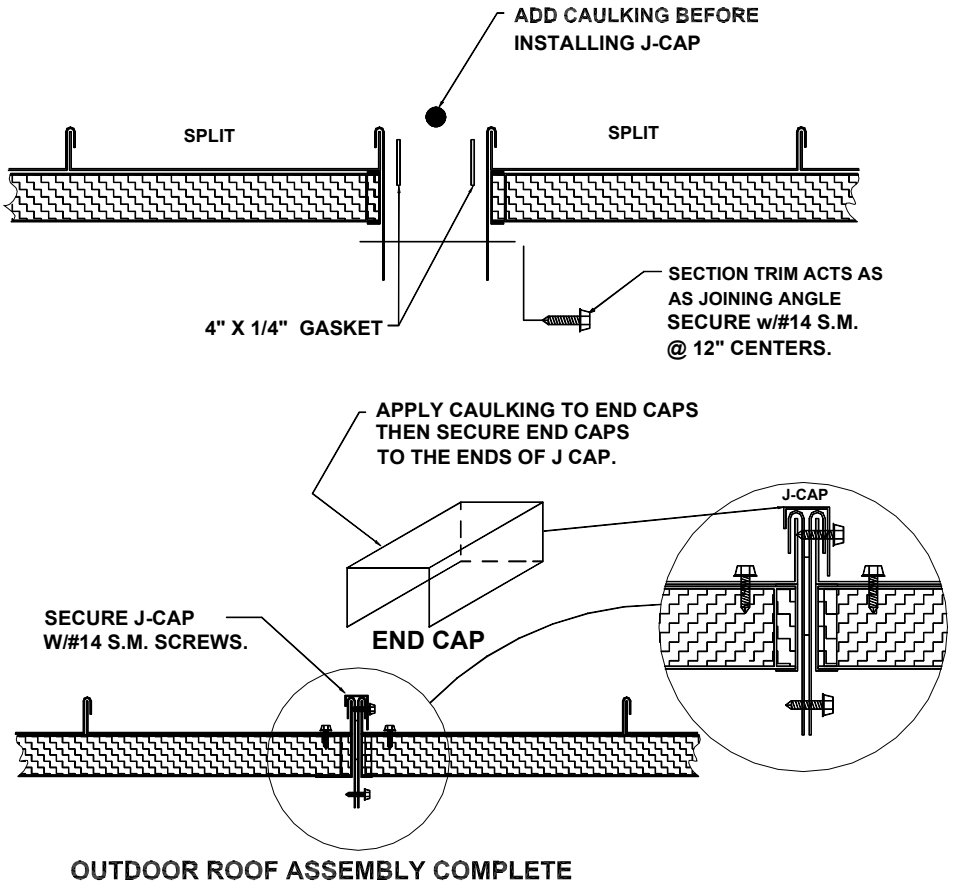
1 Align the roof splits and join the interior section trim with number 14 sheet metal screws on 12 inch centers.

2 Add a bead of caulk along the length of the roof seams. Install the pre-cut J-cap over the seam and secure with number 14 sheet metal screws on 12-inch centers.

Note: Use a polyurethane or equivalent caulk. It may be necessary to clamp the joint together or predrill to prevent separation when drilling with screws.

3 Apply caulk to the end cap interior surface. Secure the end cap on the J-cap with one number 10 screw.

Figure 6. TCP outdoor roof assembly



TCP Indoor Roof Section Assembly (Typical)

1 Align the walls and join the inside angles with number 14 sheet metal screws on 12-inch centers along the length of the angles.

2 Apply a bead of caulk along the length of the roof seam joint.

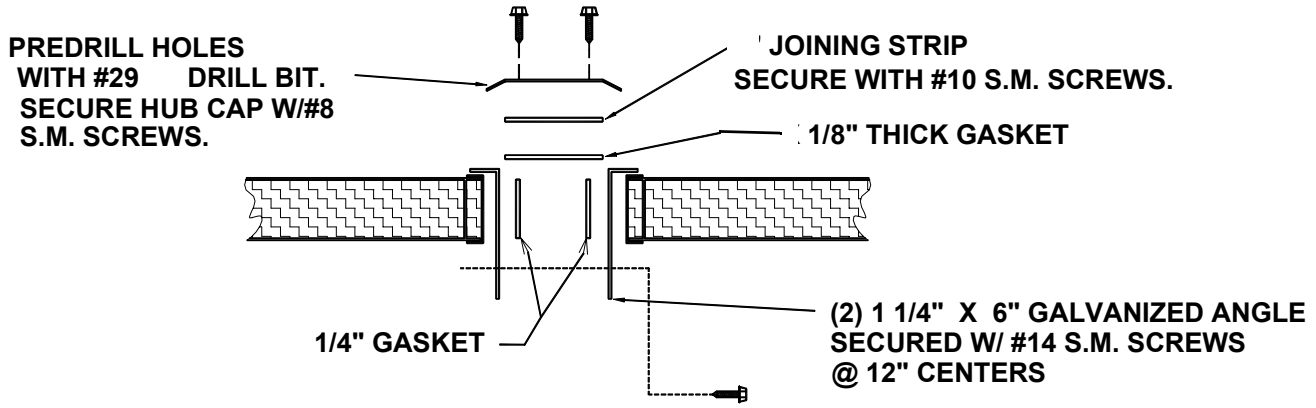
3 Apply the 1/8-inch gasket on the exterior of the roof evenly across the roof split.

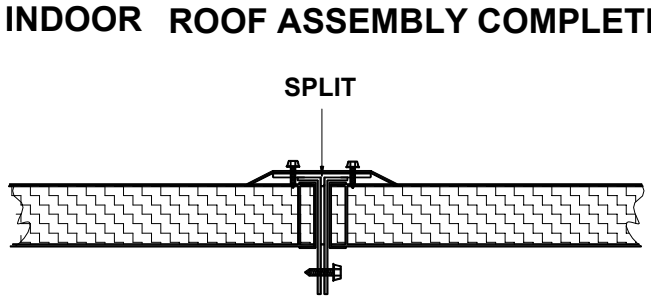
4 Before installing the pre-cut joining strip over the gasket, pre-drill holes in the roof using the strip as a guide with a number 29 drill bit at 12-inch centers.

5 Apply the joining strip over the gasket and uniformly straddling the splits. Secure with #10 sheet metal screws.

6 Fit the pre-cut hub cap and secure it to the roof with #8 sheet metal screws. Fill the end openings with caulk as moisture seal. Note: Pre drill the screw holes with a number 29 bit.

Figure 7. TCP indoor roof assembly





TCP Base to Interior Wall Section Assembly (Typical)

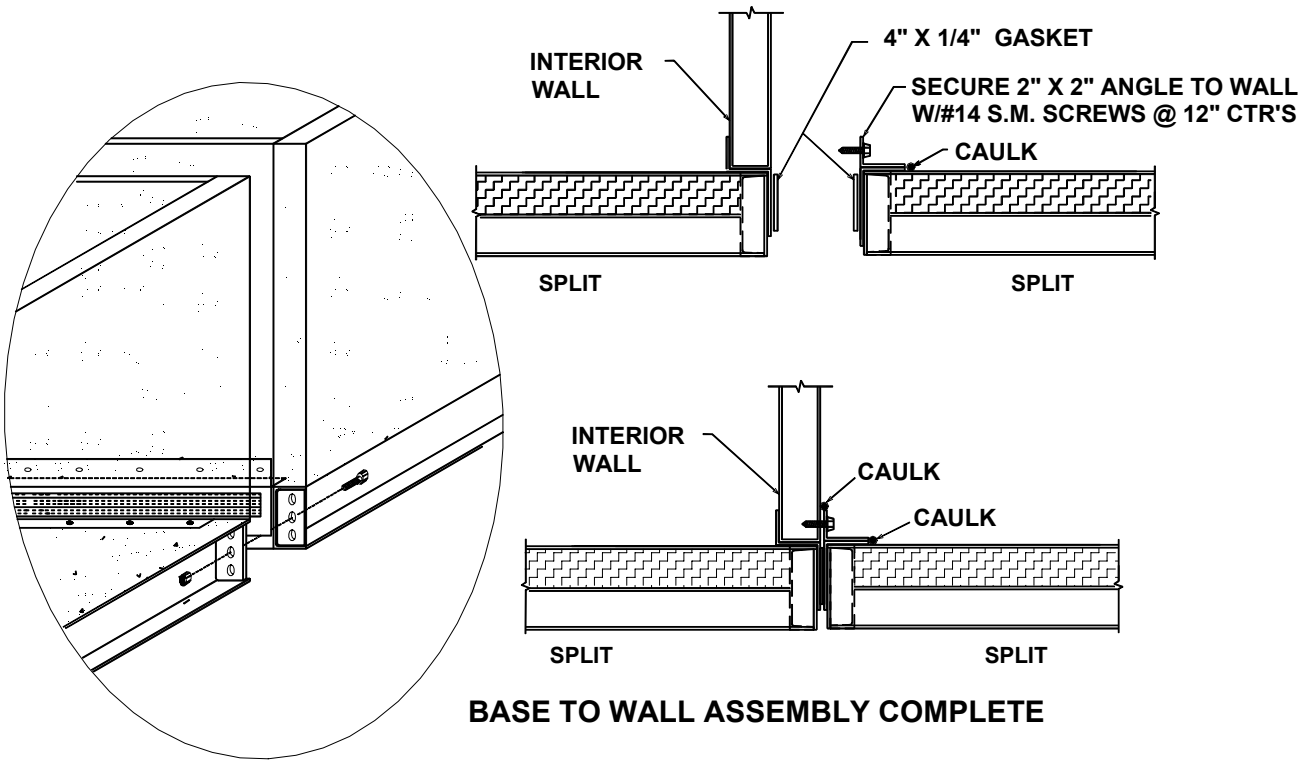
Note: Failure to completely compress the gasketing may result in air leakage.

1 Join the two units and secure with field provided 5/8-inch flat washers and 5/8-inch X 2-1/2-inch grade 9 bolts though each of the six holes.

2 Apply caulk the length of the base between the 2-inch X 2-inch angle on the one base section and the wall on the adjoining section. See Illustration below. Note: Use a polyurethane or equivalent caulk.

3 Secure the 2-inch X 2-inch angle to the adjoining wall with number 14 sheet-metal crews on 12-inch centers along the length of the angle and wall.

Figure 8. TCP base to interior wall sections



TCC Model Assembly Instructions

If your nameplate model number begins with TCC, use the assembly instructions below.

Joining sections - Edge to Edge

Units must be installed level for proper drainage of condensate from the drain pan and for squareness of the sections during installation. In addition, each section in a multi-section unit must be properly supported.

Note: Leveling each section, beginning with the first section, is critical. Failure to level and align the sections immediately creates greater misalignment or even structural damage afterward.

- Remove all wooden blocks under the unit and shipping protection from adjoining surfaces (see Figure 9).
- Place the first section of the air handler on the end of the roof curb or the housekeeping pad. The section must be level from side-to-side and front to back. Section squareness should be within 1/8-inch. Remove the bottom bolts from lifting lugs located at the shipping split (see Figure 10).

Figure 9. Remove shipping blocks

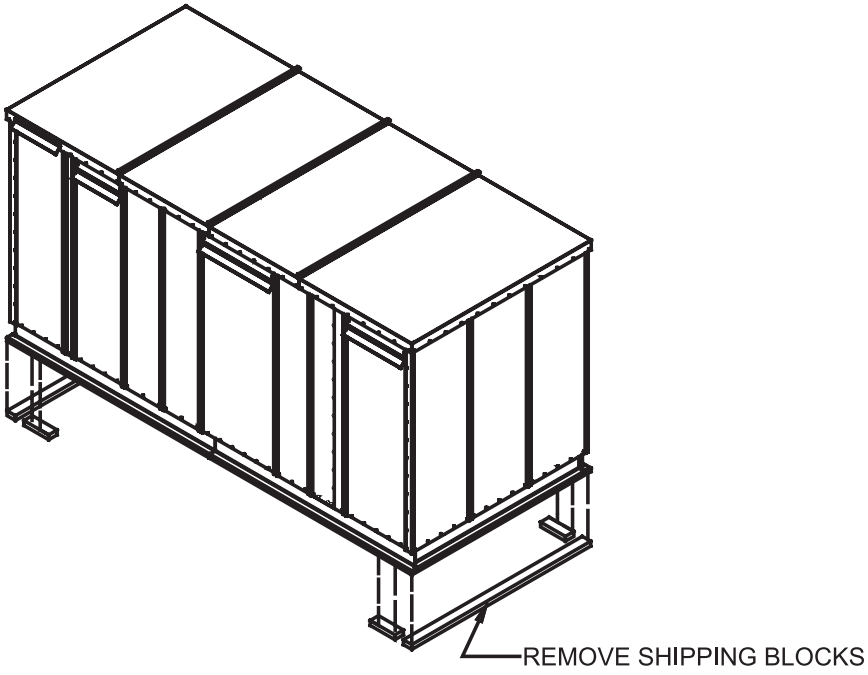
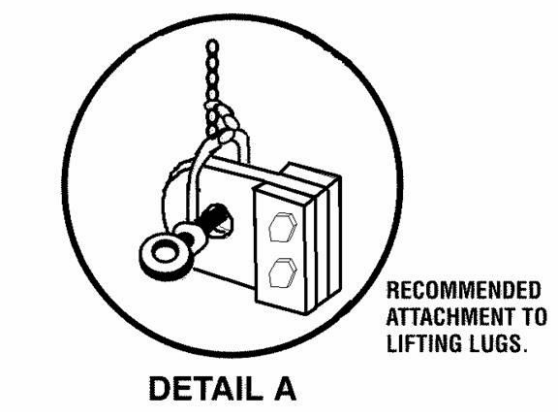


Figure 10. Remove lifting lug bolts



- Apply 1.25-inch x 0.33-inch ribbed butyl tape to the shipping split channel and shipping split plates (see Figure 11).
- Verify the section is level prior to proceeding with the next section of the unit.
- Move the next unit section as close as possible from the previous section. The two sections should be close enough to reduce the amount of dragging required. This is particularly important when mounting on a roof curb to minimize damage to the sealant on the roof curb. Alignment of sections must be completed before drawing sections together.
- Remove the bottom bolts from the shipping split lifting lugs (see Figure 12).

Figure 12. Remove bottom bolts from lifting lugs

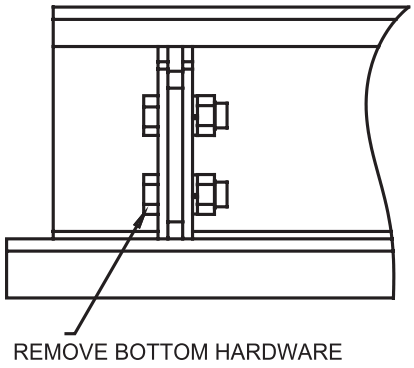
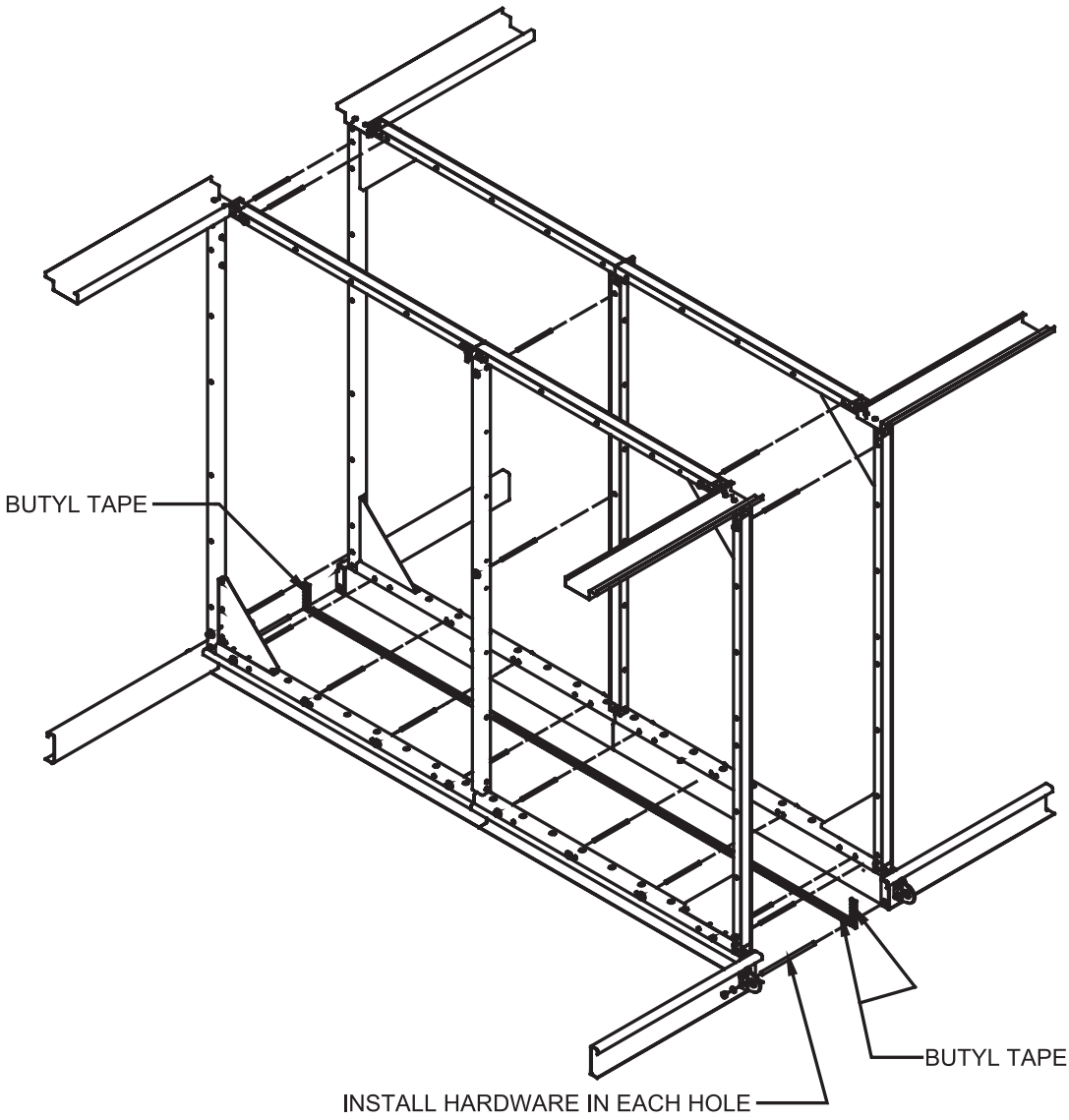


Figure 11. Apply butyl tape to shipping splits



- Insert field provided threaded rods through the bottom lifting lug and shipping split plates on each sides of the unit. Draw both sides of the section together equally to prevent damage and distortion of the sections as they joined. Do not try to join sections by tightening only one side of the rods (see Figure 13).

Note: Field-provided threaded hardware should consist of 5/8-11x12 inch threaded rods 5/8-inch lock washers and 5/8-inch nuts.

Note: Failure to compress the butyl tape may result in air and water leakage.

- Once the sections are pulled together, add a bead of caulk (sikaflex) along the seam between the two perimeter caps (see Figure 14).
- Install the assembly hardware as applicable for the shipping split frame inside of unit, the walls, and the roof as demonstrated in the following assembly sections.

Figure 14. Add caulk along the seam

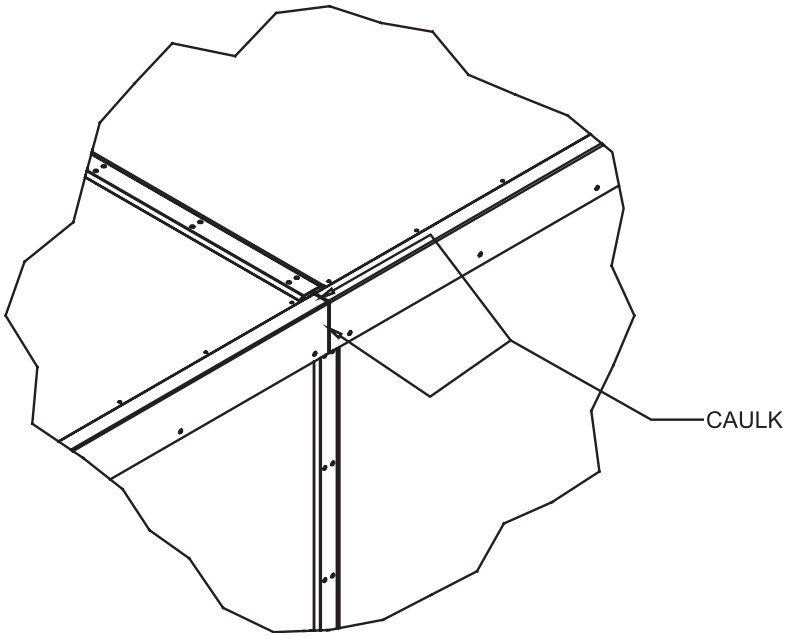
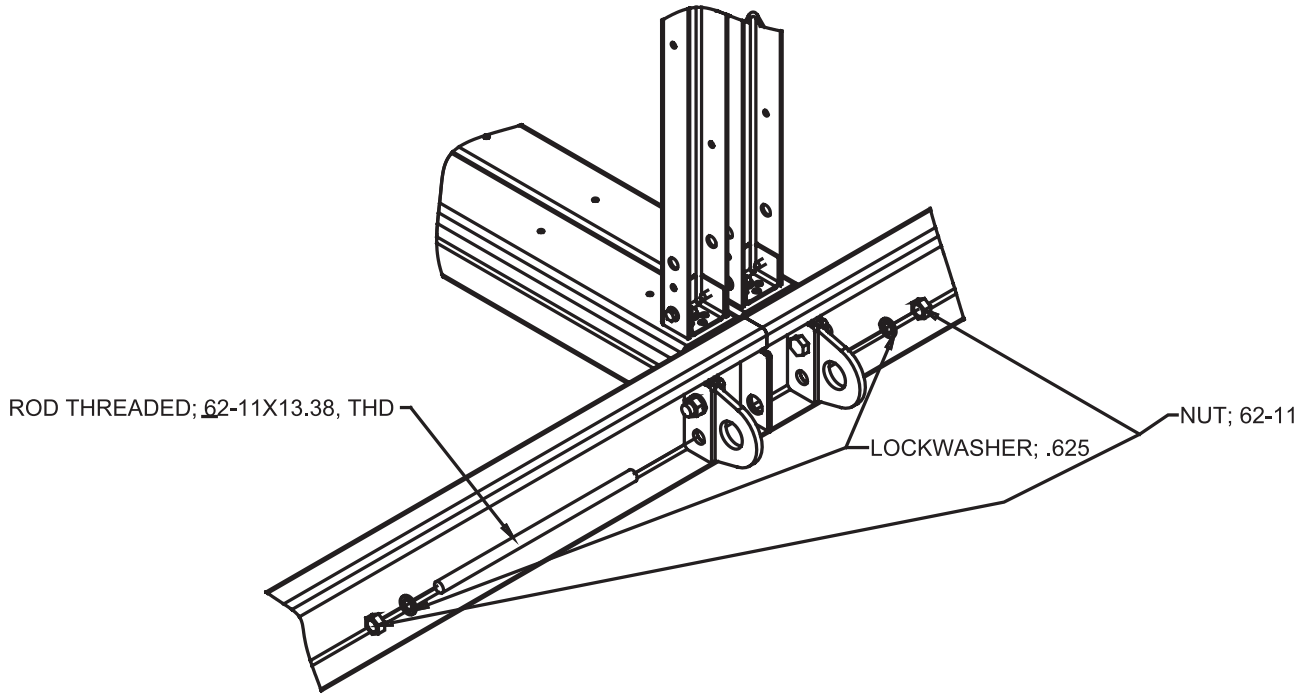


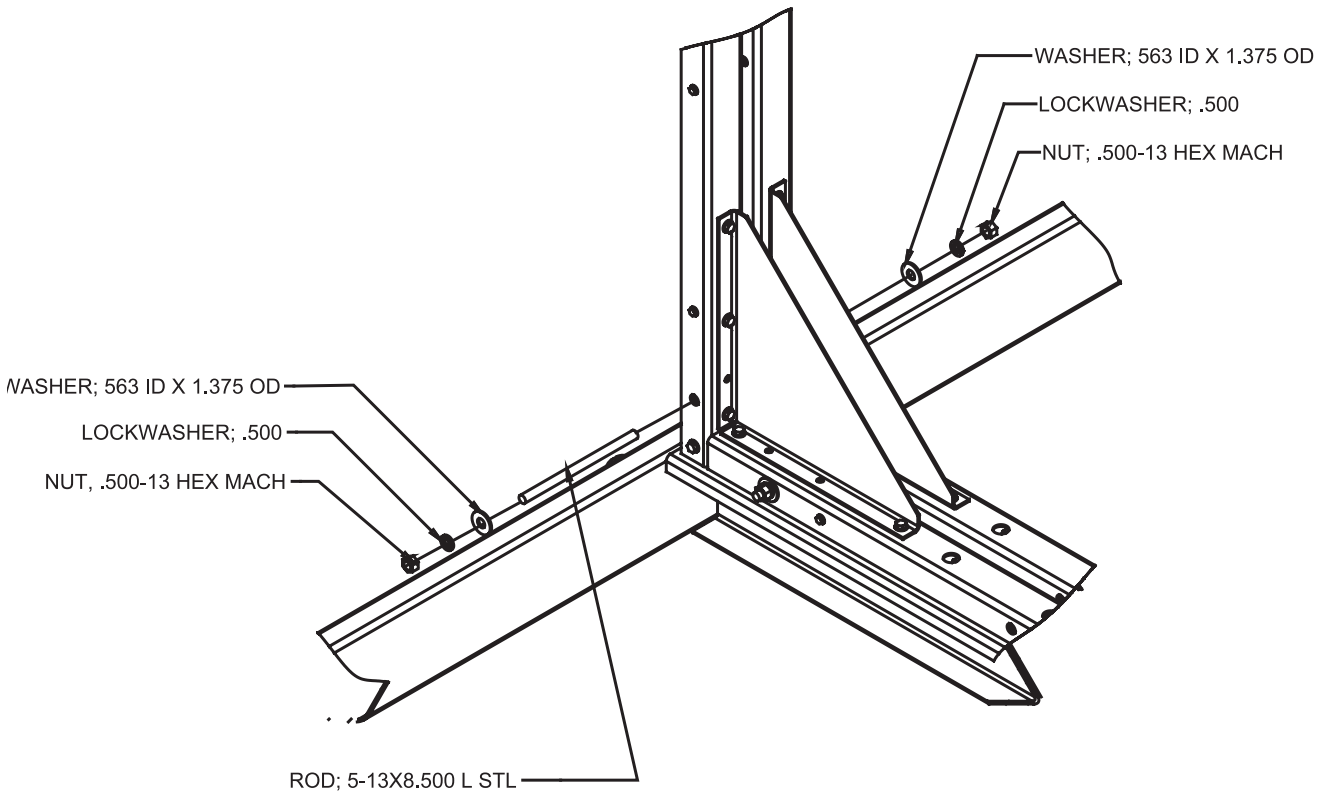
Figure 13. Insert field provided threaded rods



TCC internal shipping split frame assembly (typical)

- Join the two sections and secure with field provided ½-13x8.5 inch threaded rods, ½-inch flat washers and ½-inch lock washers through each of the holes provided in the internal shipping split frame (see Figure 15) This frame runs around the entire perimeter of the unit (see Figure 11).

Figure 15. Join internal shipping split frame



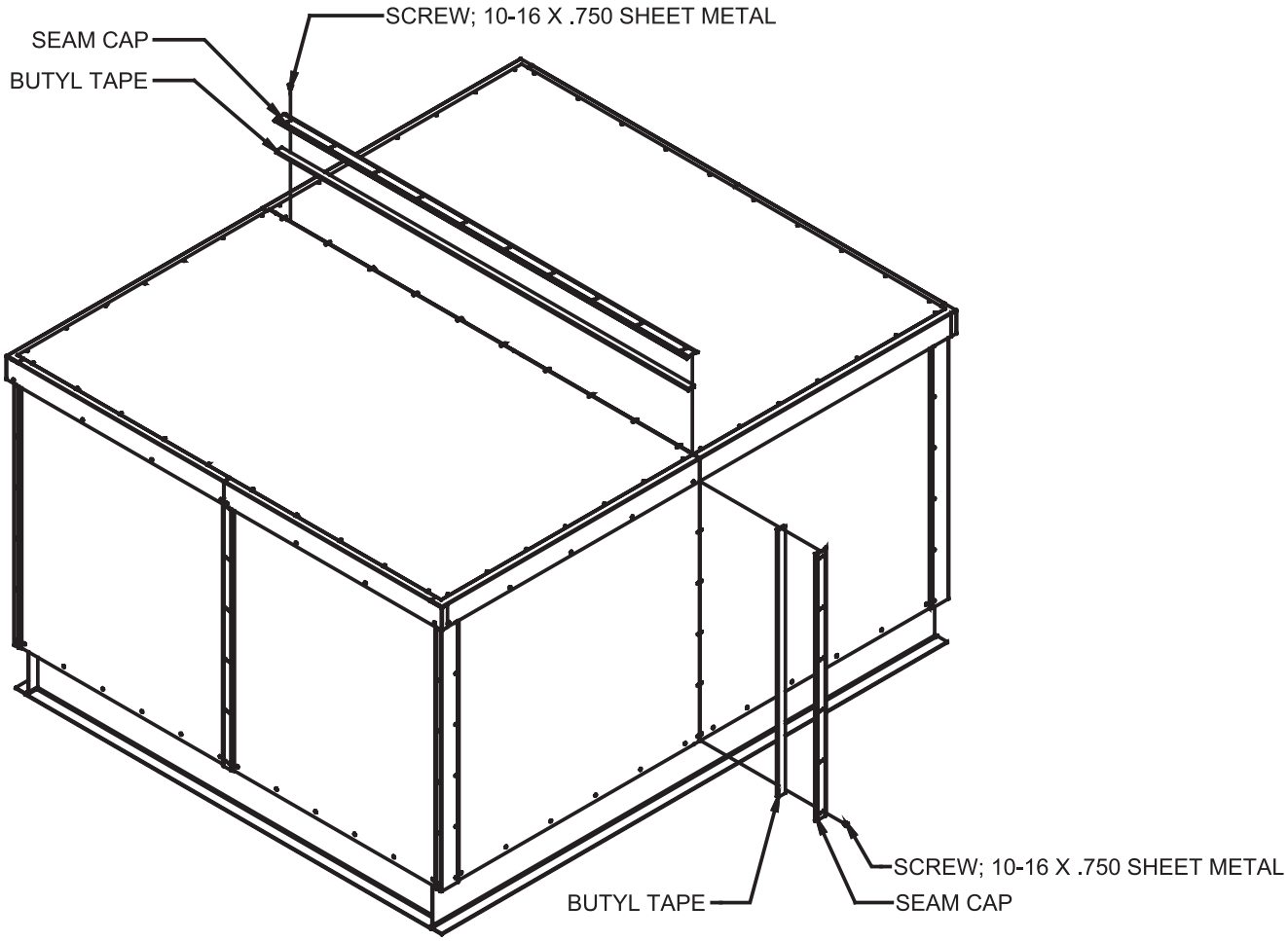
TCC wall sections assembly (typical)

- Verify external unit squareness.
- Apply the 1.25-inch x 0.33-inch ribbed butyl tape to the exterior of the walls covering the seam of the two adjoining sections (see method sheet).
- Install seam cap over the butyl, uniformly straddling the splits. Secure with the provided number 10 sheet metal screws (see Figure 16).

TCC indoor roof sections assembly (typical)

- Verify external unit squareness.
- Apply the 1.25-inch x 0.33-inch ribbed butyl tape to the exterior of the roofs covering the seam of the two adjoining sections (see method sheet).
- Install seam cap over the butyl, uniformly straddling the splits. Secure with the provided number 10 sheet metal screws.

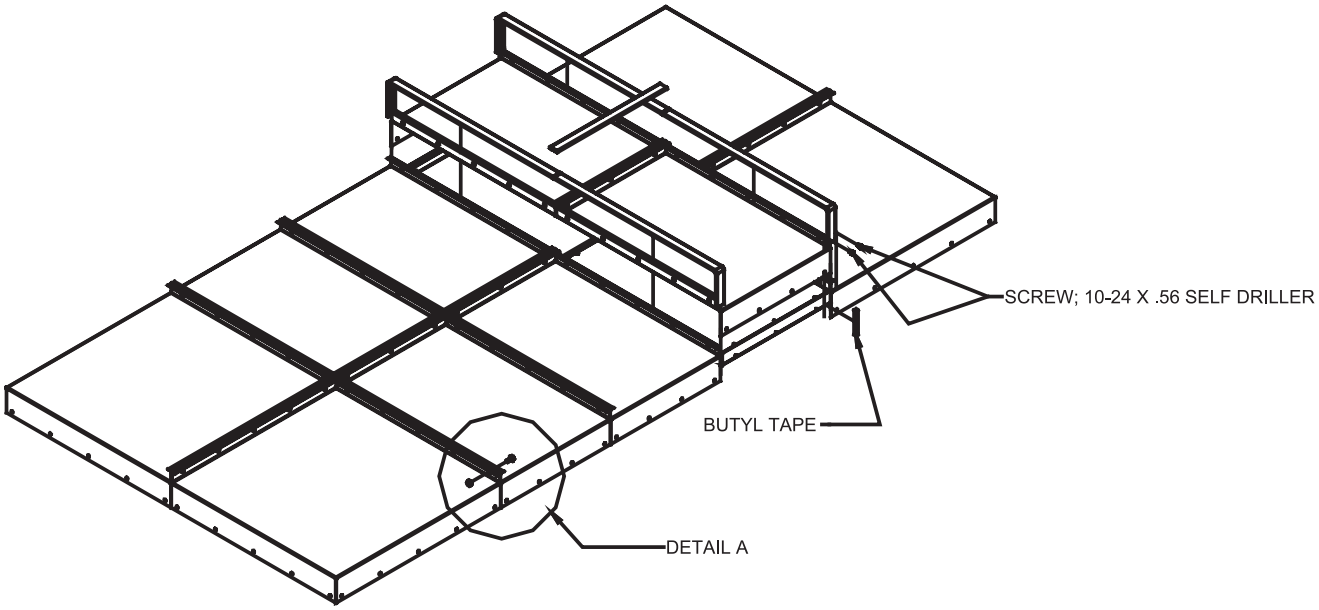
Figure 16. Install seam cap over the butyl tape



TCC outdoor roof sections assembly (typical)

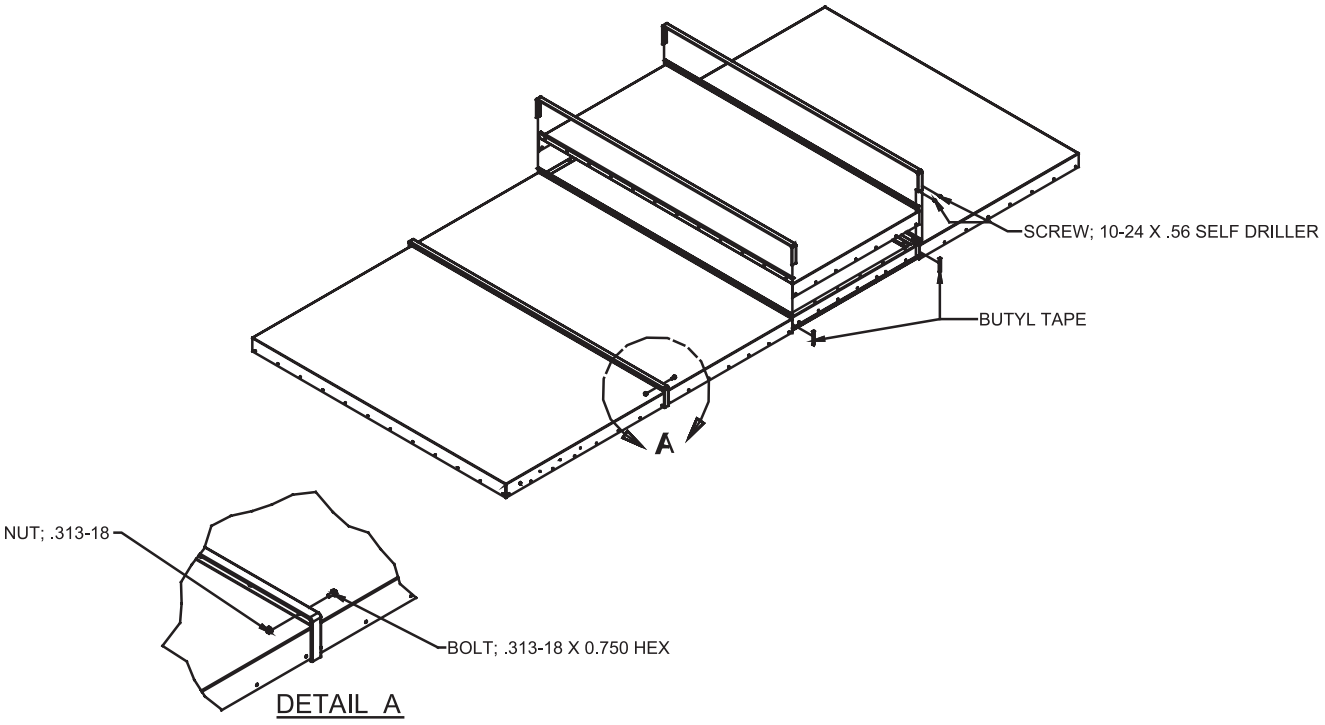
- Join two outdoor roof panels together at the seams at the direction of airflow and secure them in place with 5/16-inch x 3/4-inch bolts and 5/16 lock nuts. Cut the proper length of roof joint strip to cover the seam between two outdoor roof panels at the direction of airflow. (exclude single outdoor roof panel) (see Figure 17).

Figure 17. Join outdoor roof panels at the seams



- Join outdoor roof panels together at the seams in the direction perpendicular to airflow and secure them in place with 5/16-inch x 3/4-inch bolts and 5/16 lock nuts. Install the roof joint strip to cover the seam between two outdoor roof panels in the perpendicular to airflow direction of. Use 3/8-inch butyl tape to cover the seam between two outdoor roof panels overhang at the side the unit. Bend joint strip over roof panel and use two number 10 sheet metal screws (one in each roof panel) to secure joint strip. Trim the roof joint strip to insure that it does not protrude more than 1/16-inch beyond outdoor roof overhang (see Figure 18).

Figure 18. Trim roof joint strip



Duct Connections

All duct connections to the units should be installed in accordance with the standards of the National Fire Protection Association (NFPA) for selecting and installing of air conditioning and ventilating systems other than residence type (NFPA 90A), and residence type warm air heating and air conditioning systems (NFPA 90B).

To ensure the highest fan efficiency, duct turns and transitions must be made carefully, minimizing air friction losses and turbulence. Proper duct work installation by such organizations as SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.) should be adhered to.

Component Installation Requirements

Each component in the Custom air handler may have installation requirements that could affect the unit's performance.

Note: For components included in the unit but not included in this manual, reference the component manufacturers specific Installation, Maintenance, and Operation manual. Copies of these manuals are either included in the package with this unit IOM or are attached to the components mounted in the unit.

Fans

The fan and motor assembly are internally isolated. The fan and motor bases are bolted to a minimum of four spring isolators. The isolators are secured to the fan section support base. Shipping tie-down blocks are bolted to the isolators between the fan base and the isolator support frame.

To activate the isolation, remove the shipping tie-down blocks. Retain these blocks for use in adjusting isolators if necessary.

Isolator Adjustment

Note: Isolators are pre-adjusted and set at the factory. Follow this procedure only if necessary and as it applies to the isolators used in this unit. This procedure, for isolators can, and should be, performed by one person to ensure that the proper sequence is followed.

Isolators are selected for distribution of equipment weight, but may not all compress the same. This procedure assumes the base surface is level. Isolators are not intended to be leveling devices.

1. Verify that the shipping bolts that hold the fan base in a fixed position have been removed.
2. Remove the jam nut on top of the isolator adjusting stud at the first isolator to be adjusted. Check that the shipping block is in place.

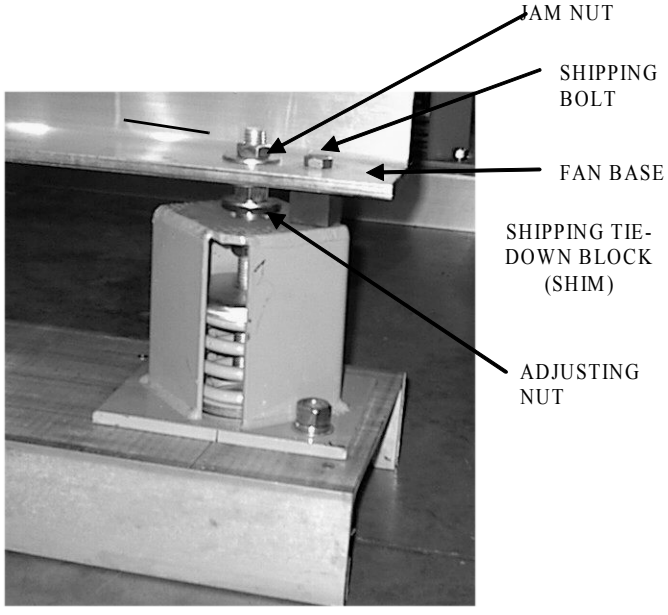
⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

Turn the adjusting nut 2 or 3 turns only, counterclockwise on each isolator in a sequenced manner. The equipment weight will compress the spring inside the housing approximately 1/4 inch.

Figure 19. Isolator



3 Check that the bushing on the isolator stud is centered in the isolator. Adjust to center by moving the stud in the fan base hole.

4 This procedure will raise the equipment load until the isolators are all off the shims (shipping tie-down blocks) approximately 1/32-inch (the thickness of a credit card), and the internal gap is approximately equal to the external gap.

Note: Do not adjust isolators once the fan base is off of the shipping tie down blocks.

5 Continue adjusting other isolators in sequence and repeat the same adjustment. Continue until all isolators are adjusted.

6 Replace the jam nut on each isolator adjusting bolt, tighten the nut, and remove the shipping tie down block.

Traq™ Dampers

Traq dampers are low-leak dampers that modulate and measure airflow. Each Traq damper module is supplied with a factory-mounted ventilation control module (VCM) on the interior of the mixing box module. The VCM has an input terminal for power and an output terminal for air velocity (see Figure 20).

The actuators, factory-mounted or field-supplied, are separately wired and controlled by a direct-digital controller or other building logic.

VCM (Transducer) Calibration. The VCM has an auto-zero function that recalibrates the transducer once every minute.

Input Power Signal. The only input signal the VCM needs is the 24 Vac power connected to terminals 1TB1-5 and 1TB1-6.

Output Velocity Signal. The 2 to 10 VDC linear output signal from the VCM represents air velocity. This voltage can be converted to represent airflow (cfm or L/s) using the formula below, Table 1 and data in your submittal package.

$$\text{Airflow} = k\ (\text{cfm @ 10V}) \left[\frac{(\text{volts} - 2)}{8}\right]$$

OR

$$\text{Airflow} = k\ (\text{L/s @ 10V}) \left[\frac{(\text{volts} - 2)}{8}\right]$$

Altitude can be adjusted for by using the following factors:

Table 1. Altitude adjustment factors

Sea level = 1.0	
Elevation (feet)	**k**
1000	0.982
2000	0.964
3000	0.949
4000	0.930
5000	0.914
6000	0.897
7000	0.876
8000	0.860
9000	0.846
10,000	0.825

Control Dampers

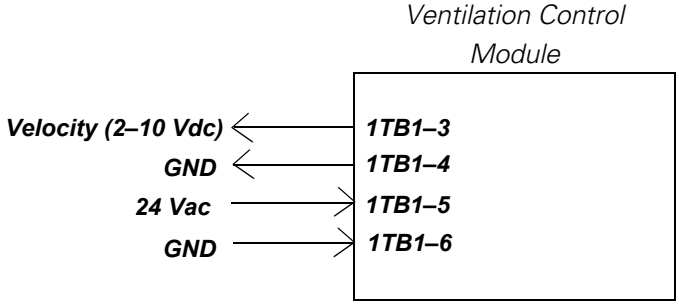
If the damper actuators are not factory mounted install damper actuators and connecting linkage. Check damper operation and linkage alignment.

Damper blades should be non-binding. Adjust damper frame as necessary to ensure free blade movement.

Magnahelic Air Filter Gage

Check zero adjustment of the gage. Turn both vent valves to the "Vent" position and adjust the gage pointer to zero by means of the external adjustment screw in the face of the gage. After zeroing, turn the vent valves to the "Line" position.

Figure 20. Traq damper terminal connections



Air Filters

Front Load Filters

Most filters in custom units are installed in unitary sheet metal frames. Filters are secured with a metal clip. There are several different styles.

To install filters:

1. Disconnect power to the unit.
2. Open or remove the filter clip.
3. Remove the filter from the rack.
4. Install new filters with the directional arrows pointing in the direction of airflow.
5. Secure the filter using the appropriate clip for each filter.

Review Figure 21 through Figure 24 for an explanation of the methods for securing the different types of filters.

The filters are often installed in a pre/post filter configuration. Be sure to note the order of installation.

Note: Filters must have an airtight seal to prevent air bypass.

⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Figure 21. C-70 fastener holds 2-inch filter

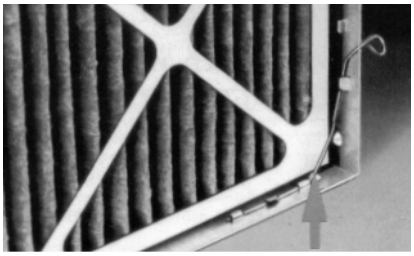


Figure 22. C-86 fastener (shown) or C-77 fastener holds 4-inch pleated filters

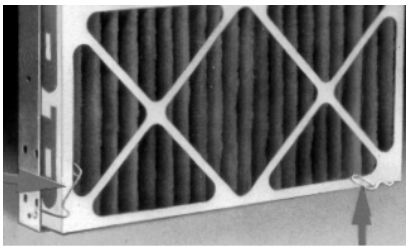


Figure 23. Bag filter show with C-70 fastener

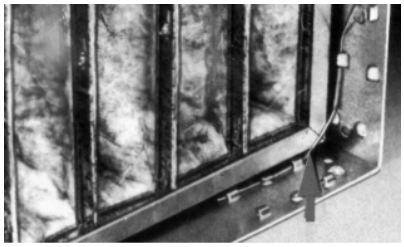
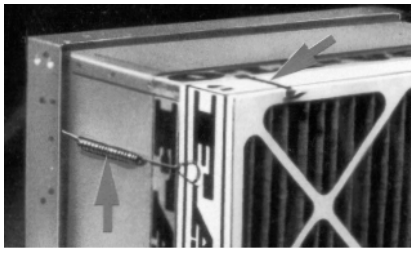


Figure 24. C-80 spring fastener secures cartridge



Side Load Filters

Most filters in custom units are installed in unitary sheet metal frames. If unit is provided with side access rack, do the following for installation:

2-inch or 4-inch flat filters.

1. Disconnect the power to the unit.
2. Open the filter section access door and remove the filters and block-offs from their installed position.
3. Slide the filter into the rack.
4. Some side load racks will be provided with block-off plates. Install them into the rack last before closing the door.
5. Close and secure the door, making certain the door closes snug against the block-off (see Figure 25).

Bag or Cartridge Filters.

1 Disconnect power to the unit.

2 Keeping the bag filters folded, slide each filter into the filter rack, pushing them tightly against the unit. Pleats should be in the vertical position.

3 If using optional pre-filters, slide them into the appropriate filter rack.

4 If block-offs are provided with the unit, slide the block-offs into the filter track.

5 Close and secure the access door, making certain the door closes snug against the rack.

Note: The block-off is intended to make a seal when the access door is closed. It may require a few adjustments to ensure a proper seal.

Outdoor Unit Weather Hood(s)

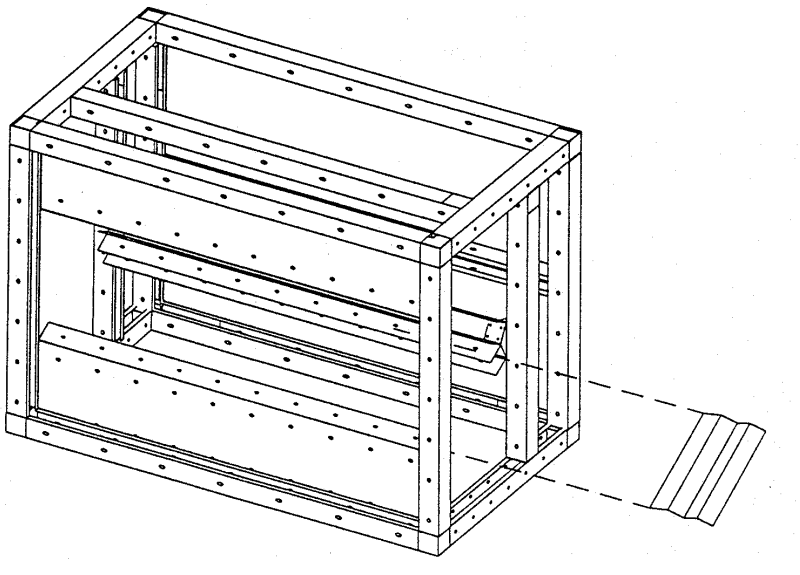
1 Per the unit drawing determine mounting location of the unit weather hoods.

2 All weather hoods have been pre-fit on the unit and removed for separate shipping at the factory. Remove any factory mounted screws located in the weather hood mounting location.

3 Using the factory provided screws mount the weather hoods to the unit.

Note: Note it is required that the hoods be sealed to the unit using field provided caulk or gasket.

Figure 25. Filter block-off placement



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.
- If the coil was ordered with factory-mounted controls, install the control valves. The valves ship separately.

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.
- Extended drain and vent connections are provided as standard on DD and D coils only. If extended drains and vents are required on other water coils, they must be field-installed or ordered as specials from the factory.
- Pipe coils counterflow to airflow.
- When attaching the piping to the coil header, make the connection only tight enough to prevent leaks. Maximum recommended torque is 200 foot-pounds.
- Use pipe sealer on all thread connections.
- After completing the piping connections, seal around pipe from inner panel to outer panel.

CAUTION
Prevent Coil Damage!

To prevent coil damage, do not use teflon-based products for any field connections because their high lubricity may allow connections to be over-tightened. Failure to use proper materials may cause coil header damage.

Seal the piping penetration into the unit casing before insulating. Seal from inner panel to outer panel to prevent unconditioned air from entering the module. Failure to properly seal penetrations may cause water leakage.

CAUTION
Use Approved Glycol!

If glycol is used in chilled water or hot water systems, use a glycol approved for use with commercial cooling and heating systems and copper tube coils. Failure to do so may result in equipment damage.

CAUTION
Use a Backup Wrench!

Use a backup wrench when attaching piping to coils with copper headers to prevent damage to the coil header. Do not use brass connectors because they distort easily and may cause connection leaks.

Drain Pan Trapping

Threaded condensate drain connections are provided on only one side of the coil module. Pitch the connection lines horizontal or downward toward an open drain. Trane recommends installing a plug to facilitate cleaning of the trap.

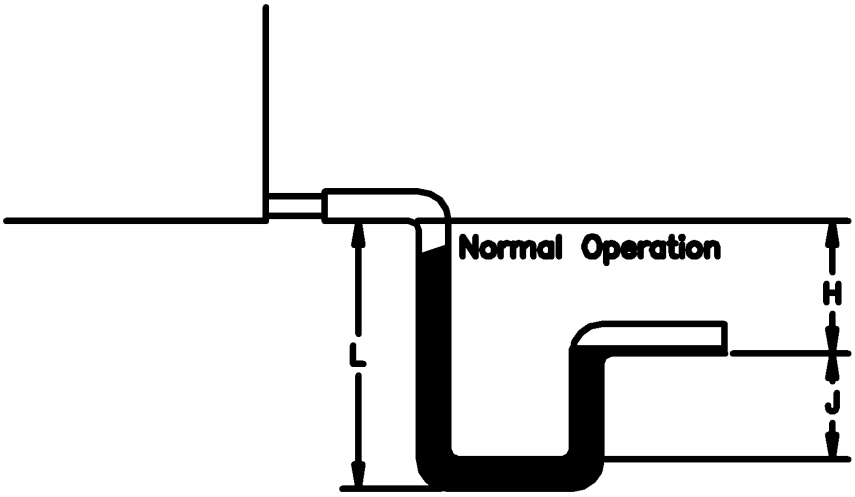
Figure 26 illustrates the proper trapping, piping, and operation of the trap for negative pressure modules. Use the formula under the figure to determine the correct minimum depth for the condensate trap.

Figure 27 illustrates the proper trapping, piping, and operation of the trap for positive pressure modules.

CAUTION
Water Damage!

When more than one module has a drain pan, trap each module individually. Connecting all drains to a common line with only one trap may result in condensate retention and possible water damage to the air handler or adjoining space.

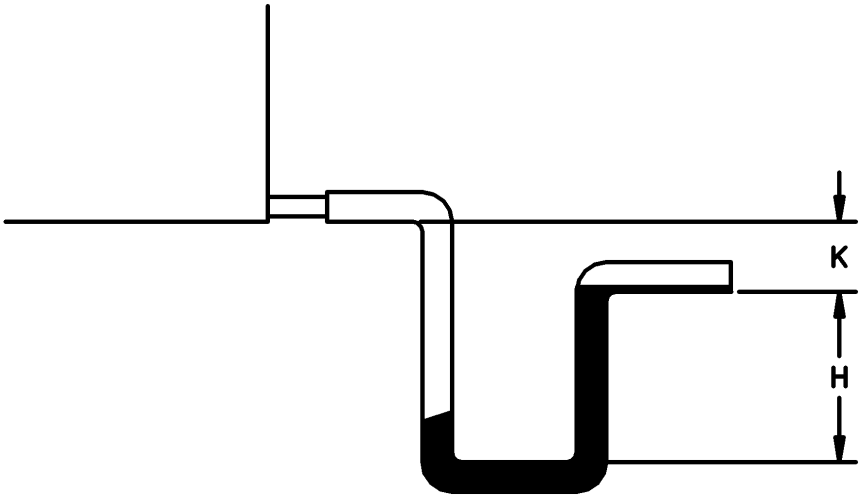
Figure 26. Drain pan trapping for module under negative pressure



L = **H** + **J** + pipe diameter
where:
H = 1 inch for each inch of negative pressure* plus 1 inch
J = 1/2 H

*Negative pressure=total unit static pressure at worst case (loaded filters) minus external pressure

Figure 27. Drain pan trapping for module under positive pressure



K = 1/2 inch (minimum)
H = 1/2 inch plus the total unit static pressure at worst case (loaded filters)

Steam Coil Piping

M-Series air handlers fitted with steam coils have labeled holes for piping penetrations. Figure 28 and Figure 29 illustrate typical steam coil piping configurations. See Table 2 for the codes of system components in these figures.

Table 2. Code of system components for piping figures

Code	System component
FT	Float and thermostatic steam trap
GV	Gate valve
OV	Automatic two-position (ON-OFF) control valve
VB	Vacuum breaker
ST	Strainer
AV	Automatic or manual air vent
MV	Modulating control valve

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 tapping size.

- Install a 1/2-inch NPT, 15 degree swing check valve vacuum breaker with cracking pressure of 0.25 inches Hg (3.5 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 types A, AA, N, NS, and NN, install the vacuum breaker in the unused condensate return tapping at the top of the coil.
- Types T and ST coils require that the vacuum breaker be located as near as possible to the supply connection.
- 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.

CAUTION
Coil Damage!

In all steam coil installations, the condensate return connections must be at the low point of the coil. Failure to properly install the condensate return connection may result in coil damage from water hammer, unequal thermal stress, freeze-up and/or corrosion.

Note: 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 (3.5 inches of water).

Figure 28. Typical piping for Type N steam coils and horizontal tubes for horizontal airflow

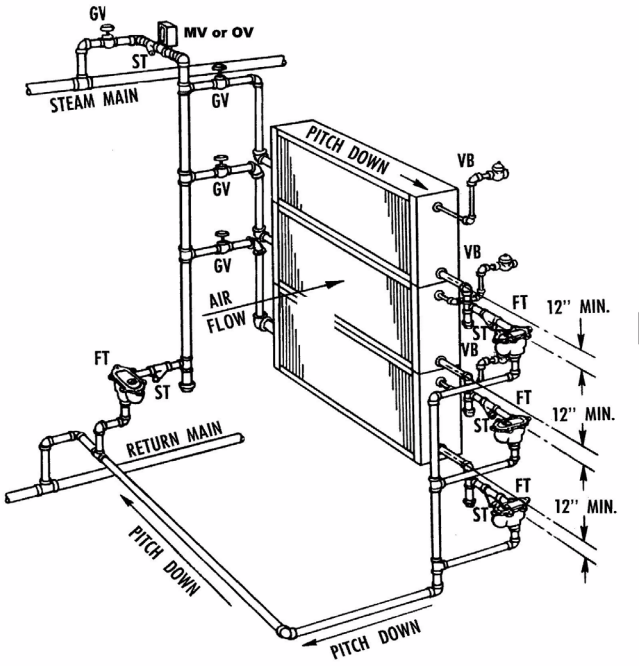
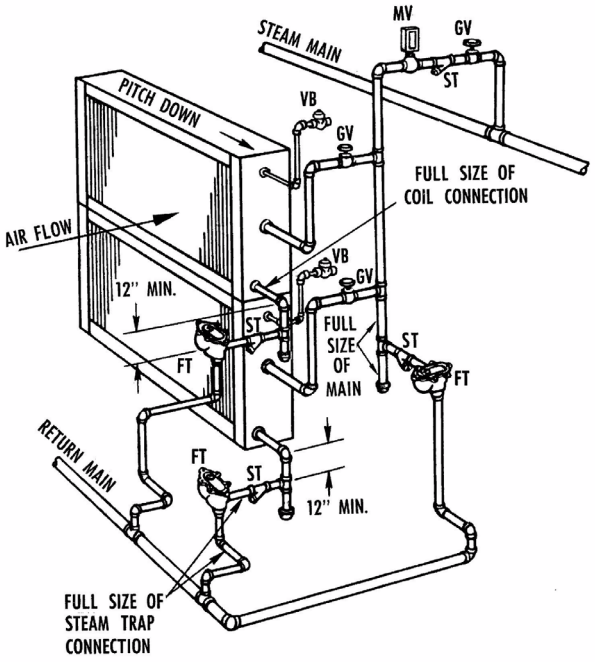


Figure 29. Typical piping for Type NS steam coils and horizontal tubes for horizontal airflow



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. Twelve 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.

Water Coil Piping

Figure 30 through Figure 32 illustrate typical water coil piping configurations.

Type WA, 5A, 5W, D, K, W, UW, TT, P,2, P4, and P8 water coils are self-venting only if the water velocity exceeds 1.5 feet per second (fps) in the coil tubes. Type UU, WD, and 5D 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:

- Install an air vent in the top pipe plug tapping of the return header.
- 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: T, ST, and TT coils are designed with larger than normal end tube sheet holes to allow for maximum expansion. Air leakage around tubes should be expected and handled by capping over coil ends or by sealing around tubes with a pliable sealant such as silicone.

Figure 30. Typical piping for type 5W one-row water coil

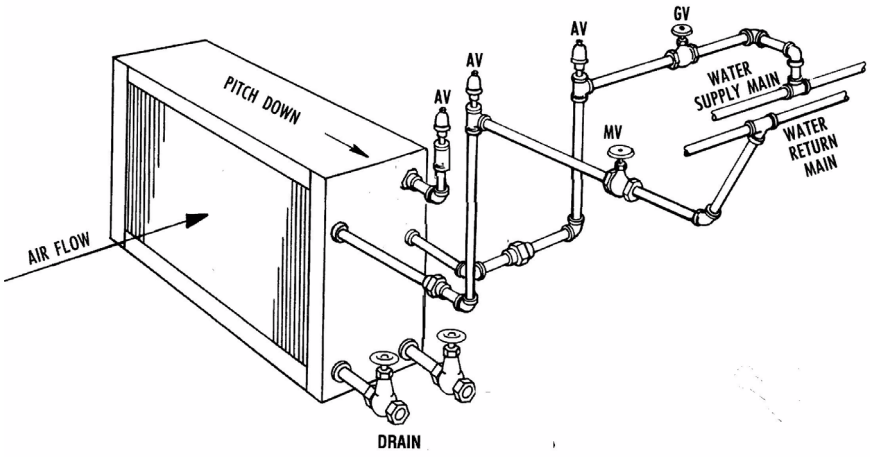


Figure 31. Typical piping for type 5A, 5W two-row, K, W 3- to 12-row, WD, D, and DD water coils

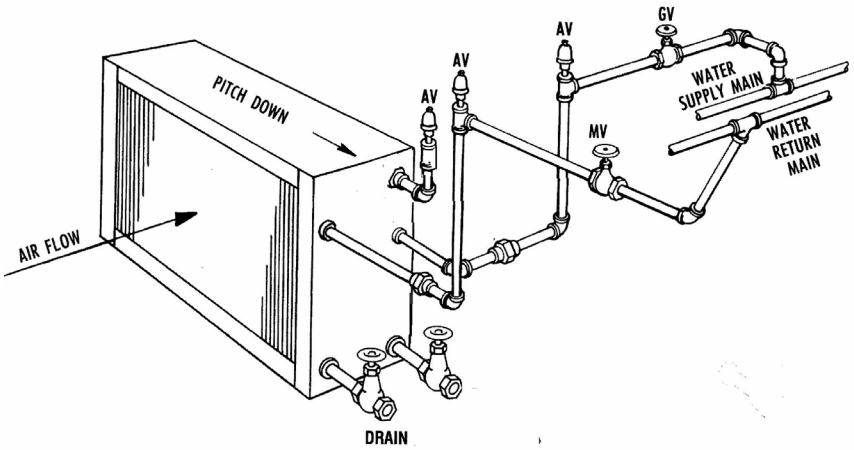
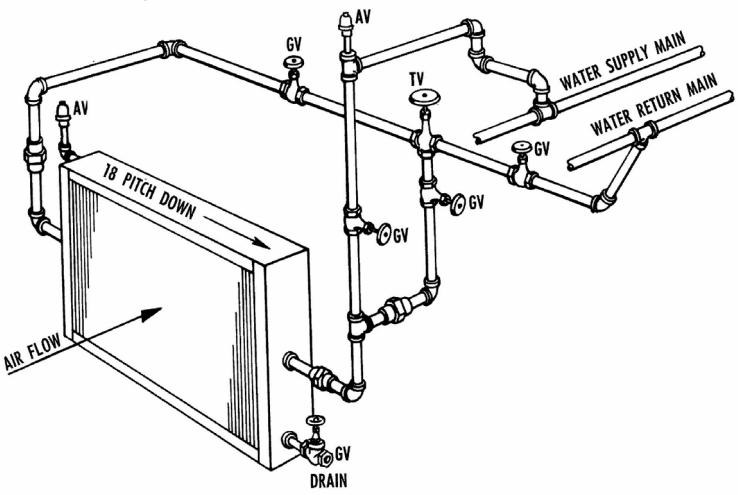


Figure 32. Typical piping for type W or WA 1-row water coil



Refrigerant Coil Piping

Note: Refer to the "Protecting the Environment" section on page 3 for information on handling refrigerants.

Use Figure 33 to determine the proper, relative sequence of the components in the refrigerant lines that connect the condensing unit to an evaporator coil. Refer to the "Examples of Field-Installed Evaporator Piping" section on page 35 for more detailed schematics of evaporator piping.

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.

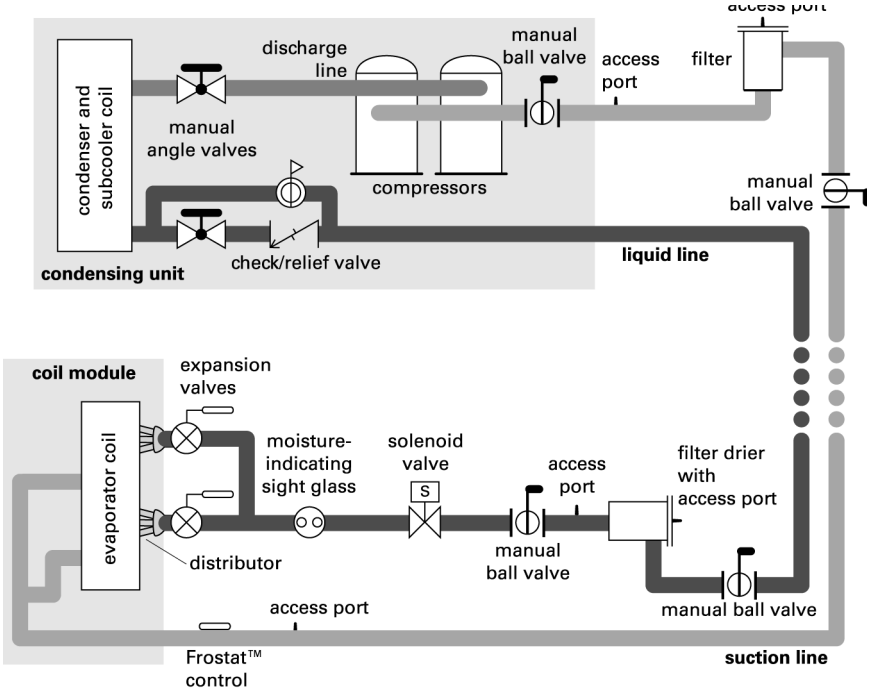
Routing. Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line. Minimize tube bends and reducers because these items tend to increase pressure drop and to reduce subcooling at the expansion valve. Liquid line receivers, other than those that 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 33 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-air-volume 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.

Figure 33. Example of placement for split-system components



Kit with sensor 13790452010 SEN-01212
Kit with switch - X13100429010 THT 02442

- *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.*

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 34 and install the expansion valve directly to the liquid connections.

CAUTION
Valve Damage!

Disassemble the thermal expansion valve before completing the brazing connections. If necessary, wrap the valve in a cool, wet cloth while brazing. Failure to protect the valve from high temperatures may result in damage to internal components.

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 1/4-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 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.

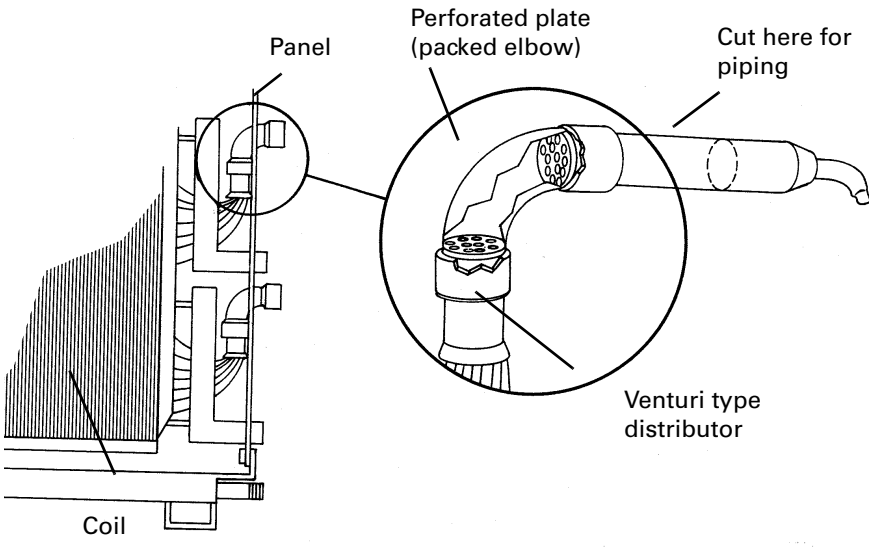
Insulation. Any heat that transfers from the surrounding air to the cooler suction lines increases the load on the condenser (reducing the system's air-conditioning capacity) and promotes condensate formation (adversely affecting indoor air quality). After operating the system and testing all fittings 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.

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 33.

- *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.

Figure 34. Type F refrigerant coil with packed elbow



- *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.

Examples of Field-Installed Evaporator Piping

Single-Circuit Condensing Units: Evaporator Coil with One Distributor (see Figure 35)

1. Pitch the liquid line slightly—1 inch/10 feet [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 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
4. For the 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 [1 cm/3 m]—so the refrigerant drains toward the evaporator.
7. Insulate the suction line.

Figure 35. Single-circuit evaporator coil with one distributor

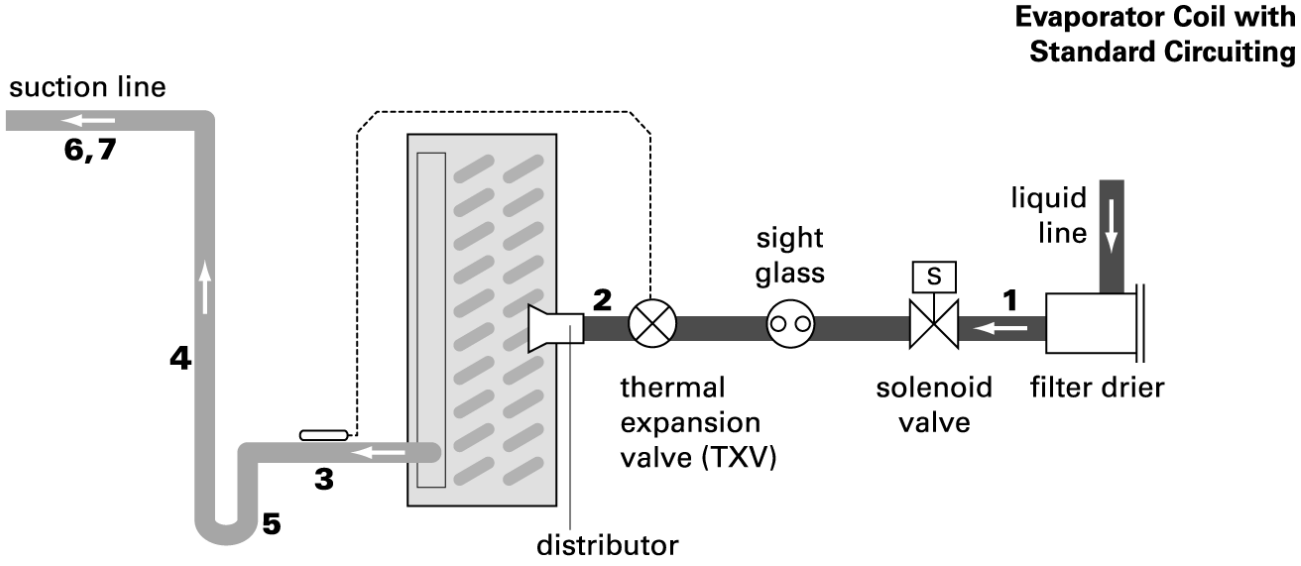
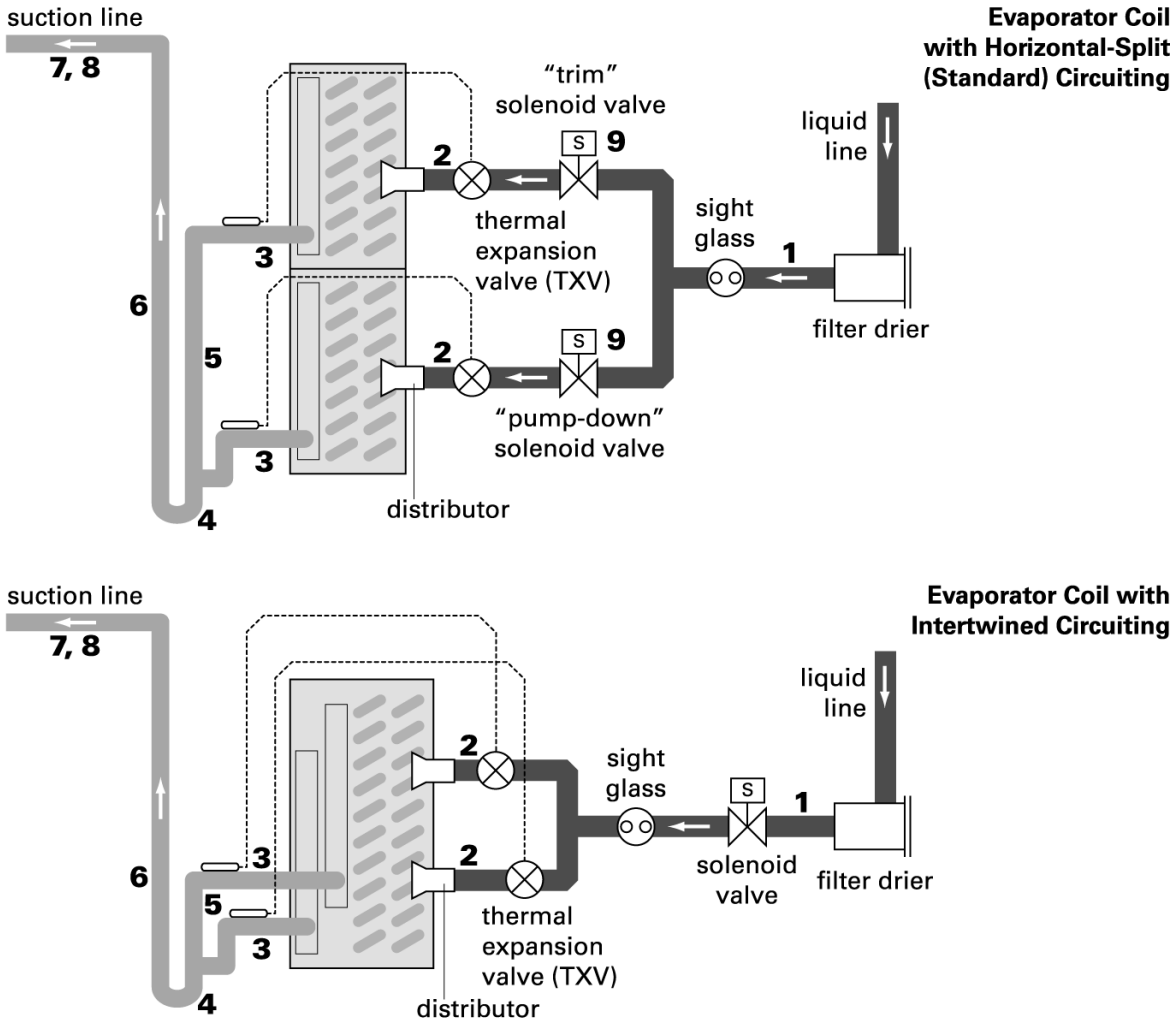


Figure 36. Single-circuit evaporator coil with two distributors



Single-Circuit Condensing Units: Evaporator Coil with Two Distributors (see Figure 36)

1 Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so 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 [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 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.

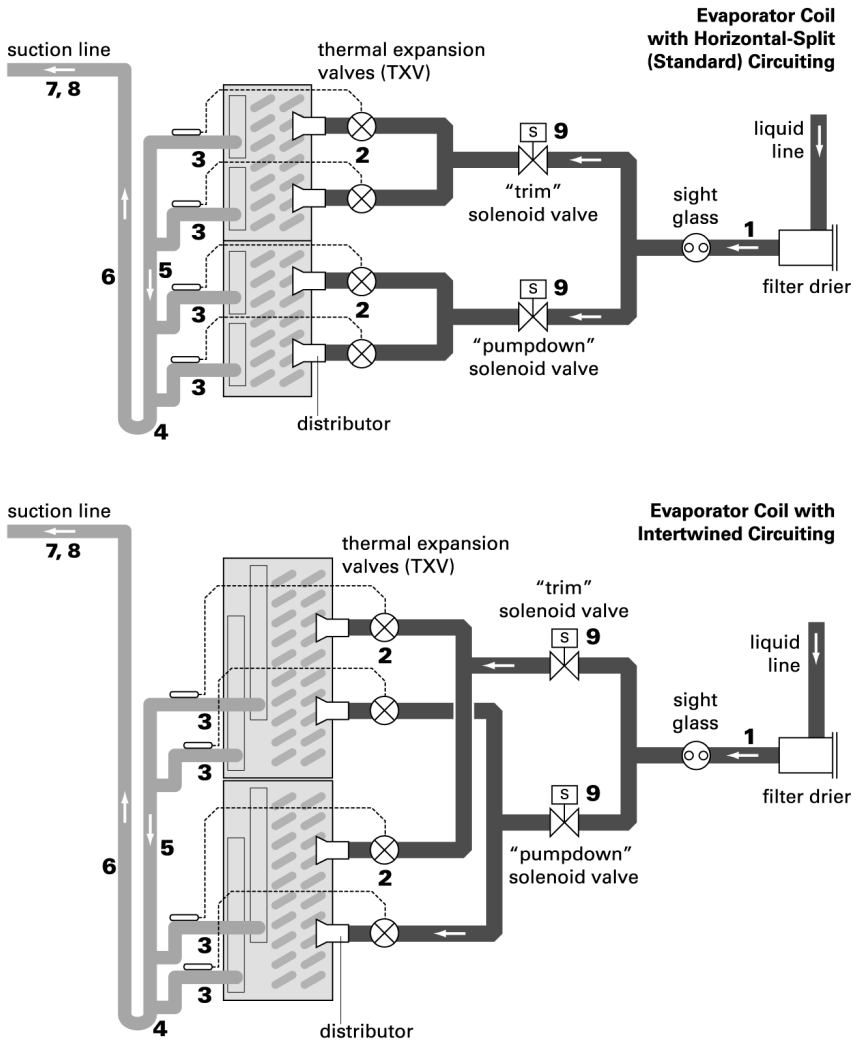
6 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—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.

Figure 37. Single-circuit evaporator coil with four distributors



Single-Circuit Condensing Units: Evaporator Coil with Four Distributors (see Figure 37)

1 Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so 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 [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 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 the 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 [1 cm/3 m]—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.

Dual-Circuit Condensing Units: Evaporator Coil with Two Distributors (see Figure 38)

1 Pitch the liquid lines slightly—1 inch/10 feet [1 cm/3 m]—so 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 [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 by the condensing unit manufacturer for the riser.

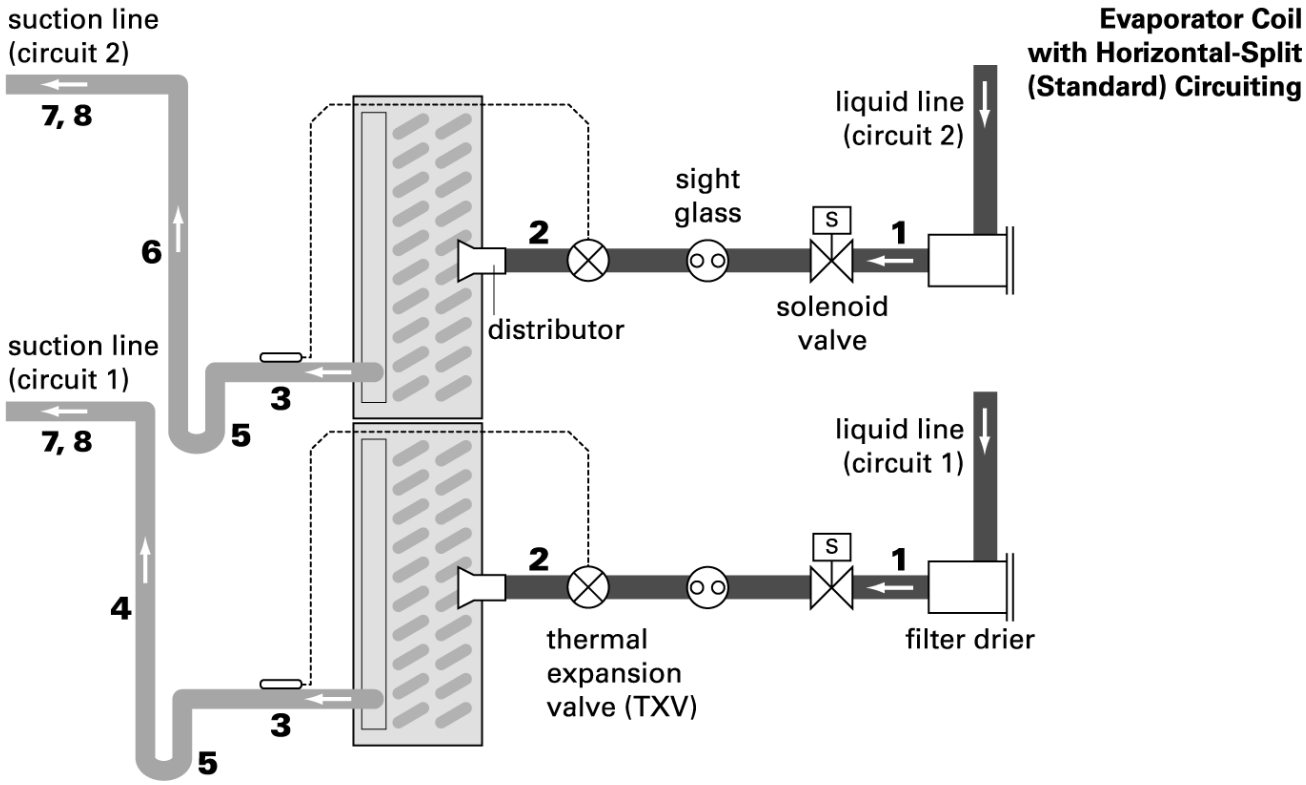
5 Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward.

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 lines slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.

8 Insulate the suction lines.

Figure 38. Dual-circuit evaporator coil with two distributors



Dual-Circuit Condensing Units: Evaporator Coil with Four Distributors (see Figure 39)

1 Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so 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 [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 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.

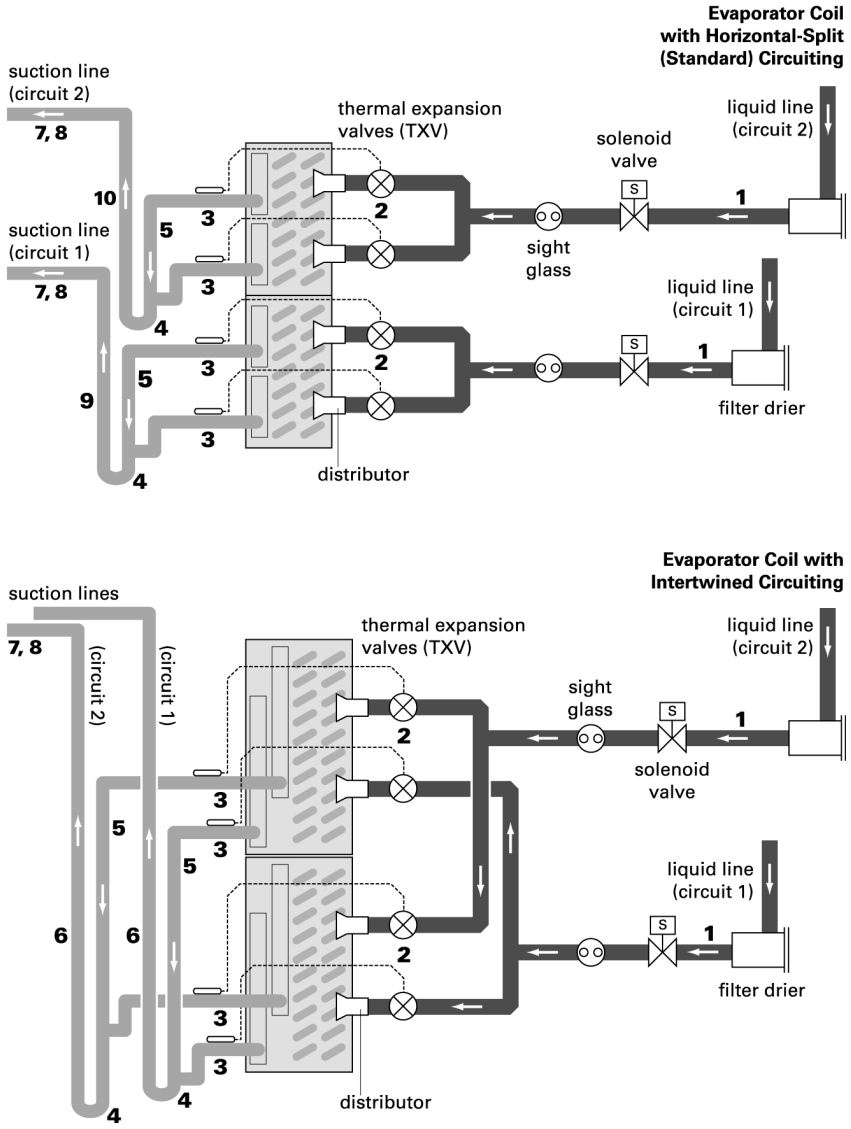
5 For horizontal tubing, use the tube diameter recommended by the condensing unit manufacturer.

6 For the 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 [1 cm/3 m]—so the refrigerant drains toward the evaporator.

8 Insulate the suction line.

Figure 39. Dual-circuit evaporator coil with four distributors



9 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.

10 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.

Dual-Circuit Condensing Units: Evaporator Coil with Eight Distributors (see Figure 40)

1 Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so 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 [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 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 For horizontal tubing, use the tube diameter recommended by the condensing unit manufacturer.

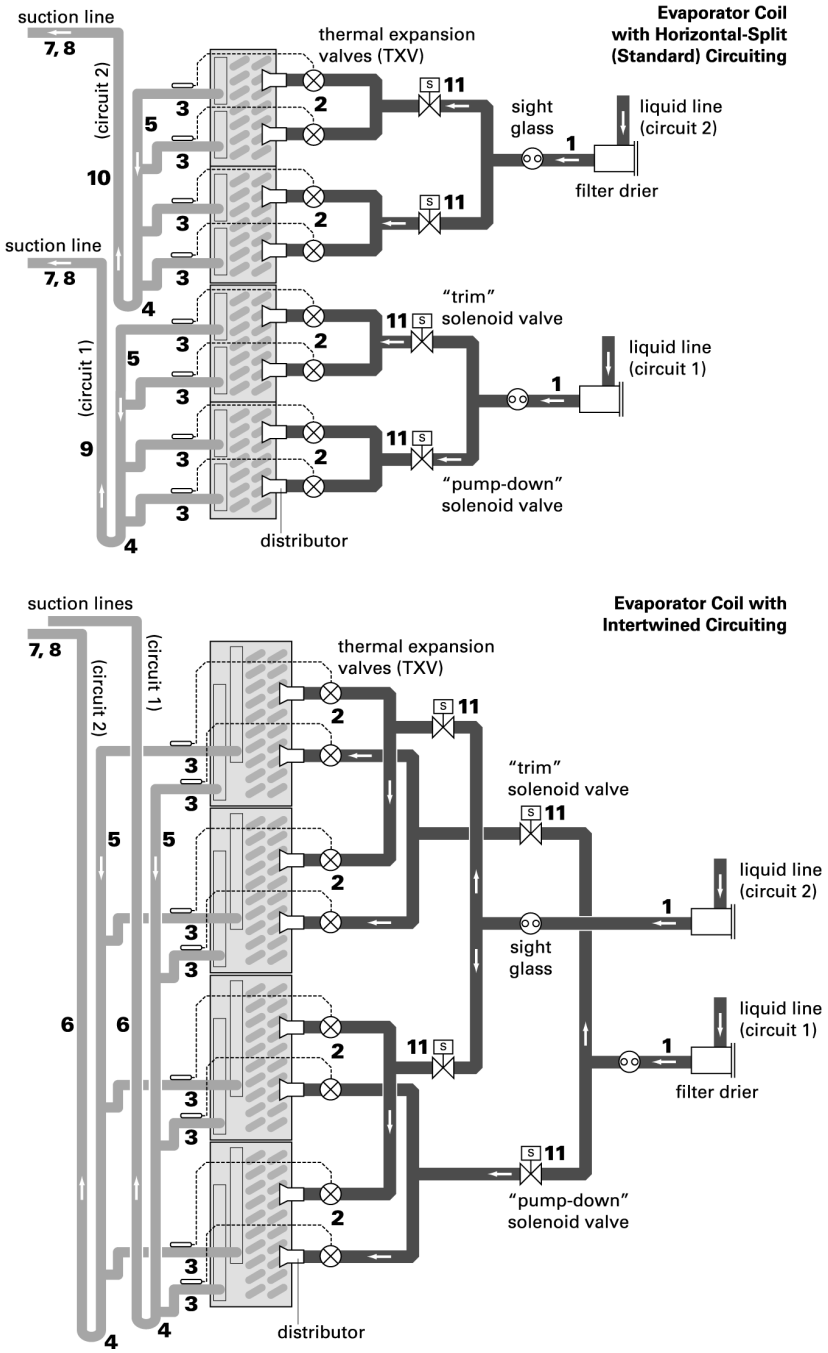
6 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—so 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 by the condensing unit manufacturer for the riser.

Figure 40. Dual-circuit evaporator coil with eight distributors



10 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.

11 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.

Wiring

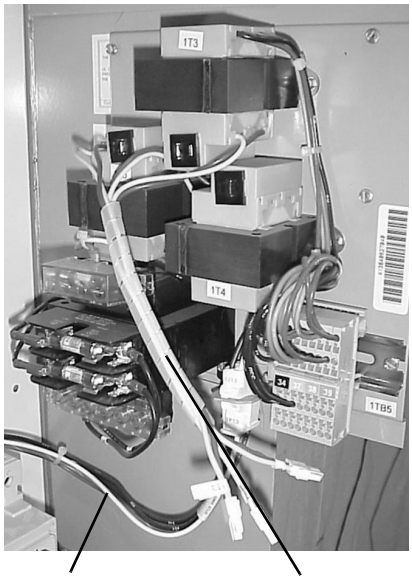
Wiring to the unit fan motor must be provided by the installer and must comply with all national and local electrical codes. The installer must also furnish a fused disconnect switch in compliance with national and local electrical codes.

Fan motors also require motor overload protective devices that are rated or selected in compliance with the National Electric Code or Canadian Electric Code. Specific unit and motor connection diagrams are provided on the starter/VFD, if Trane-provided, or refer to the motor nameplate.

CAUTION
Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

Figure 41. Transformer plate



All direct-digital controllers (DDCs) are provided with line voltage to 24 Vac control transformers mounted and wired in the starter or variable-frequency drive (VFD) power box transformer plate (see Figure 41) or 120 to 24 Vac control transformers mounted and wired in the auxiliary control panel (see Figure 42).

Figure 42. Controller with power box attached

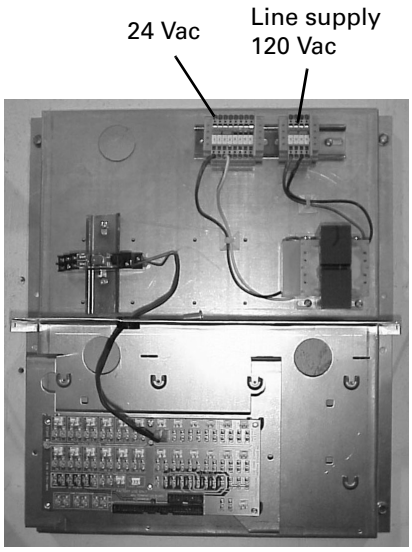


Figure 43. Variable-frequency drive (VFD)

Figure 43 shows a typical VFD power box.

Note: The valve jack/junction box is typically located at the air-leaving side of the coil connection inside panel. For coils with headers on both sides of the module, the valve jack is located at the return connection for water coils and the supply connection for steam coils.

⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

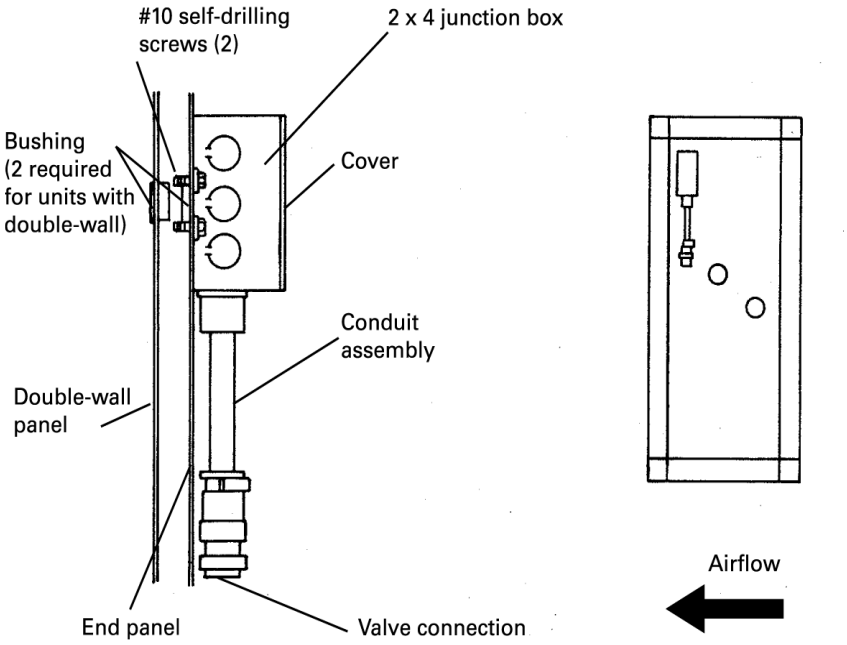
To provide field-wiring to units with DDC controls:

- Provide 120 Vac power to a transformer in the junction box provided when a separate circuit is recommended (see Figure 42).
- Install outside-air sensor and space sensor, if ordered.
- For valve jack junction box mounting and wiring detail (see Figure 43).

CAUTION
Seal the Penetrations!

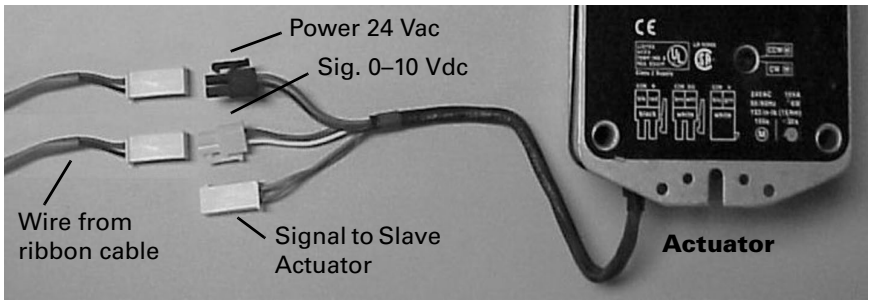
Seal all penetrations into the unit to prevent air infiltration during operation. Failure to do so may result in equipment damage.

Figure 44. Junction box mounting and wiring details



Valve jack wiring:
.Black connector is for 24 Vac power supply (black wire for GND and red wire for 24 Vac)
.White connector is for 0 to 10 Vac analog signal (black wire for GND and red wire for 0 to 10 Vac.

Figure 45. Typical quick connects with wiring identification



External Insulating Requirements

The following areas should be specifically addressed, as applicable:

- Supply and return water piping connections
- Supply and return refrigerant piping connections
- Condensate drain lines and connections
- Outdoor-air-intake duct connections
- Discharge duct connections
- Special requirements for low-temperature-air systems

Startup

Once the Custom Climate Changer air handler has been assembled and installed, attention must be directed to individual components for proper operation. Before operating the unit, complete the pre-startup checklist.

⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

Pre-Startup Checklist

Fan-Related Checks

- If the unit is internally isolated, ensure that the fan isolator tie-down bolts have been removed.
- Rotate all fan wheels manually to confirm they turn freely in the proper direction.
- Check fan shaft bearings, fan wheel, and drive sheave set screws for proper torque settings.
  - Fan sheaves should be tight and aligned.
  - Bearing set screws should be torqued.
- Inspect the inlet vane assembly for freedom of movement. If resistance is above the recommended torques, check the assembly for any binding or misalignment. Do not force the vanes.
- Check fan drive belt tension.
- Inspect fan motor and bearings for proper lubrication, if necessary.
- Check the motor lubrication, if necessary.
  - Remove and clean grease plugs.
  - Check for moisture in the grease. If moisture is present, remove the motor and send it to an authorized repair shop for bearing inspection/ replacement. If no moisture is present, refer to the motor manufacturer's lubrication recommendations for proper lubrication.
- Check the motor lubrication, if necessary.
  - Remove and clean grease plugs.
  - Check for moisture in the grease. If moisture is present, remove the motor and send it to an authorized repair shop for bearing inspection/ replacement. If no moisture is present, refer to the motor manufacturer's lubrication recommendations for proper lubrication.

Coil-Related Checks

CAUTION
Proper Water Treatment!

The use of untreated or improperly treated water in coils may result in scaling, erosion, corrosion, algae, or slime. Engage the services of a qualified water treatment specialist to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures that result from untreated or improperly treated water.

- Ensure coil and condensate drain piping connections are complete.
- Check the piping and valves for leaks.
  - Open or close the valves to check operation.
  - The drain lines should be open.
- If unit has a refrigerant coil, ensure that it has been charged and leak-tested according to the instructions provided with the condenser equipment. Adjust the superheat setting.
- Remove all foreign material from the drain pan and check the pan opening and condensate line for obstructions.
- For steam coils, slowly turn the steam on full for at least 10 minutes before opening the fresh air intake on units with fresh air dampers.

Motor-Related Checks

- Check motor winding. An acceptable winding resistance reading is from 6 meg-ohms to infinity. If reading is less than 5 mega-ohms, the winding should be dried out in an oven or by a blower.
- Inspect the entire motor for rust and corrosion.

General Checks

- Ensure the unit has been installed level.
- Ensure supply-air and return-air ducts have been connected.
- Ensure damper operator motors and connecting linkage have been installed.
- Verify damper operation and linkage alignment.
- Check that air filters are in place and positioned properly.
- Remove any debris from the unit interior.
- Close and secure all unit access doors.

Note: UL-listed units require a removable latch on access doors. The door clip shipped with the unit meets this requirement.

- Inspect electrical connections to the unit and unit controllers.
  - Connections should be clean and secure.
  - Compare the actual wiring with the unit diagrams.
  - Reference the appropriate controller manual for more details about starting units with factory-mounted controls.
- Leave this manual with the unit.

Unit Operation

Before complete startup, bump-start the unit and confirm the fan wheel rotates properly, as indicated by the rotation arrow located on the fan housing.

After initial startup:

- Calculate the motor voltage imbalance, notifying the power company to correct unacceptable imbalances.
- Periodically check the fan belt tension.

Calculate Motor Voltage Imbalance

After startup, measure the motor voltage and amperage on all phases to ensure proper operation. The readings should fall within the range given on the motor nameplate. The maximum allowable voltage imbalance is 2 percent.

Voltage imbalance is defined as 100 times the sum of the deviation of the three voltages from the average, divided by twice the average voltage. For example, if the three measured voltages are 221, 230 and 227, the average voltage would be 226 volts. The percent of voltage imbalance is then calculated:

$$\text{Voltage imbalance} = \frac{100A}{2 \times \text{AvgVoltage}}$$

where:

A = (226-221) + (230-226) + (227-226)

Voltage imbalance = 2.2% (not acceptable)

In the example, 2.2 percent imbalance is not acceptable and the power company should be notified to correct it.

⚠ WARNING
Live Electrical Components!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Tension the Fan Belt

Check the fan belt tension at least three times during the first days of operation because there is a rapid decrease in tension until the belt settles in (see Figure 46 and Figure 47).

⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

CAUTION
Tension Belts Correctly!

Over-tensioning belts can cause damage to bearings, shafts, and drive components. Under tensioning belts is the primary cause of premature belt failure. Belts should not squeal at startup. Recheck belt tension after 8 hours, 24 hours, and 100 hours of operation and monthly thereafter.

Proper belt tension is required to ensure maximum bearing and drive component life and is based on motor horsepower requirement. A label located on the bearing support on the drive side of the unit lists all drive parts, the proper belt tension, and deflection for that tension for the specific drive.

If the drive is changed from the original, proper belt tension can be estimated using Table 3.

The correct operation tension for a V-belt drive is the lowest tension at which the belts will not slip under the peak load conditions. It may be necessary, however, to increase the tension of some drives to reduce excessive belt flopping or to reduce excessive startup squealing.

Figure 47. Belt tensioner

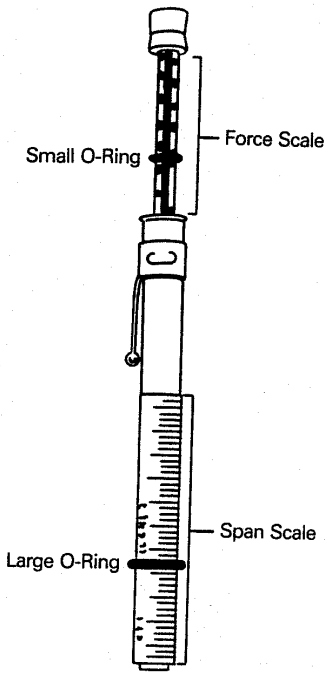


Figure 46. Belt tension measurement

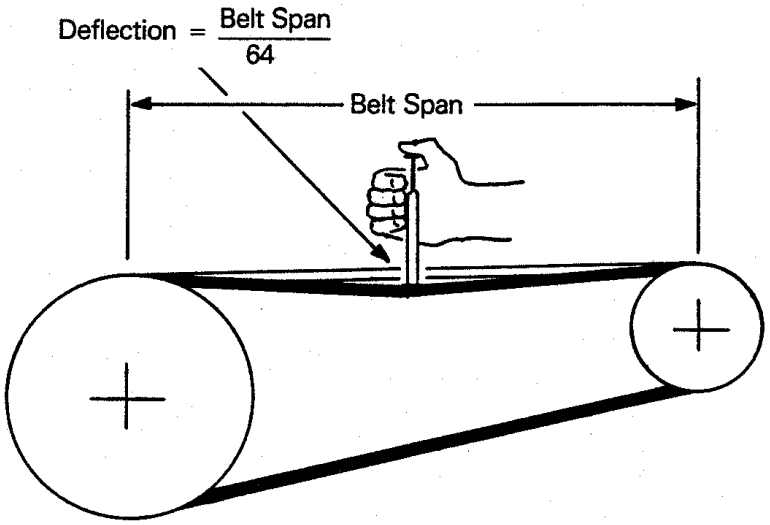


Table 3. Typical sheave diameter and deflection force1

Cross Section	Smallest Sheave Diameter Range (in.)	Speed (rpm) Range	Belt Deflection Force (lbs)			
			Super Gripbelts and Unnotched Gripbands		Gripnotch Belts and Notched Gripbands	
			Used Belt	New Belt	Used Belt	New Belt
A, AX	3.0–3.6	1,000–2,500	3.7	5.5	4.1	6.4
		2,501–4,000	2.8	4.2	3.4	5.0
	3.8–4.8	1,000–2,500	4.5	6.8	5.0	7.4
		2,501–4,000	3.8	5.7	4.3	6.4
	5.0–7.0	1,000–2,500	5.4	8.0	5.7	9.4
		2,501–4,000	4.7	7.0	5.1	7.6
B, BX	3.4–4.2	860–2,500	n/a	n/a	4.9	7.2
		2,501–4,000	n/a	n/a	4.2	6.2
	4.4–5.6	860–2,500	5.3	7.9	7.1	10.5
		2,501–4,000	4.5	6.7	7.1	9.1
	5.8–8.6	860–2,500	6.3	9.4	8.5	12.6
		2,501–4,000	6.0	8.9	7.3	10.9
C, CX	7.0–9.0	500–1,740	11.5	17.0	14.7	21.8
		1,741–3,000	9.4	13.8	11.9	17.5
	9.5–16.0	500–1,740	14.1	21.0	15.9	23.5
		1,741–3,000	12.5	18.5	14.6	21.6
D	12.0–16.0	200–850	24.9	37.0	n/a	n/a
		851–1,500	21.2	31.3	n/a	n/a
	18.0–20.0	200–850	30.4	45.2	n/a	n/a
		851–1,500	25.6	38.0	n/a	n/a
3V, 3VX	2.2–2.4	1,000–2,500	n/a	n/a	3.3	4.9
		2,501–4,000	n/a	n/a	2.9	4.3
	2.65–3.65	1,000–2,500	3.6	5.1	4.2	6.2
		2,501–4,000	3.0	4.4	3.8	5.6
	4.12–6.90	1,000–2,500	4.9	7.3	5.3	7.9
		2,501–4,000	4.4	6.6	4.9	7.3
5V, 5VX	4.4–6.7	500–1,749	n/a	n/a	10.2	15.2
		1,750–3,000	n/a	n/a	8.8	13.2
		3,001–4,000	n/a	n/a	5.6	8.5
	7.1–10.9	500–1,749	12.7	18.9	14.8	22.1
		1,750–3,000	11.2	16.7	13.7	20.1
	11.8–16.0	500–1,749	15.5	23.4	17.1	25.5
		1,750–3,000	14.6	21.8	16.8	25.0
8V	12.5–17.0	200–850	33.0	49.3	n/a	n/a
		851–1,500	26.8	39.9	n/a	n/a
	18.0–22.4	200–850	39.6	59.2	n/a	n/a
		851–1,500	35.3	52.7	n/a	n/a

1. Source for table: Browning® catalog DC-98, page B-30.

Determine Fan Speed

⚠ WARNING
Rotating Components!

During installation, testing, servicing and troubleshooting of this product it may be necessary to measure the speed of rotating components. Have a qualified or licensed service individual who has been properly trained in handling exposed rotating components, perform these tasks. Failure to follow all safety precautions when exposed to rotating components could result in death or serious injury.

Fan speed can be determined using a strobe-type tachometer, or revolution counter.

Check unit vibration if the fan speed is changed more than 5 percent from the original designed speed, or if parts such as shafts, fan wheels, bearings, or other drive components are replaced. Do not exceed the maximum fan speed.

Pay particular attention to any vibration, noise, or overheating of the motor and fan bearings; however, note that bearings may run warm during break in.

Sheave Alignment

Align the fan and motor sheaves using a straightedge. The straightedge must be long enough to span the distance between the outside edges of the sheaves. When the sheaves are aligned, the straightedge will touch both sheaves at points **A** through **D** (see Figure 48) to confirm the shaft is parallel. For uneven width sheaves, place a string in the center groove of both sheaves and pull tight. Adjust the sheaves and tighten the sheave set screws to the proper torque given in Table 4.

Figure 48. Proper drive alignment

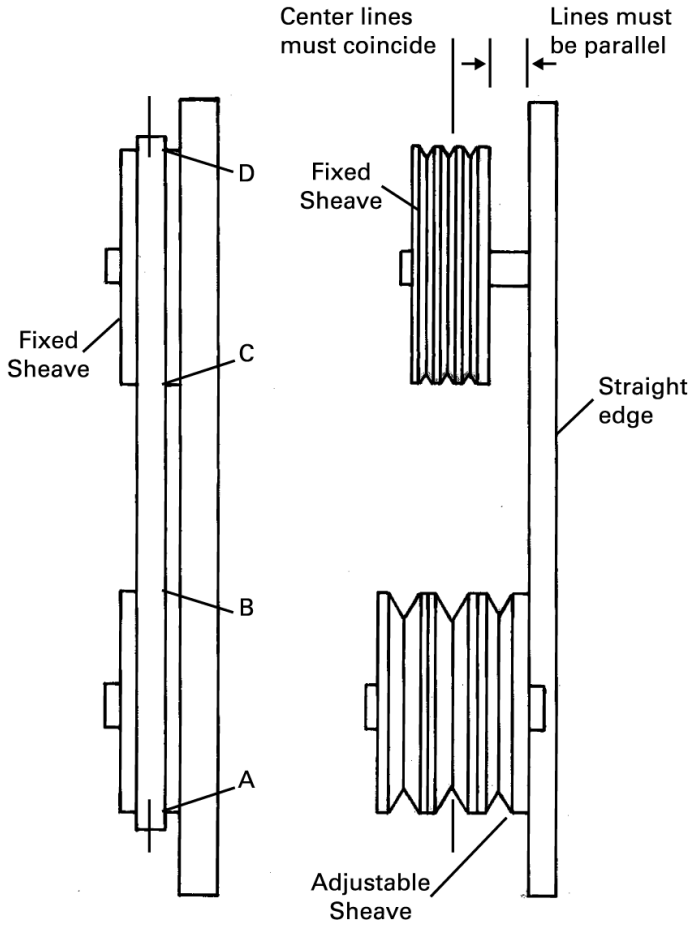


Table 4. Fan and drive compound torque settings (inches)

Screw Size	Hex Key	Square Head	Hex Head	Torque (in.-lb.)	Torque (ft.-lb.)
1/4	1/8	3/8	7/16	66-90	5.5-7.5
5/16	5/32	1/2	1/2	126-164	10.5-13.7
3/8	3/16	9/16	9/16	228-300	19.0-25.0
7/15	7/32	5/8	5/8	348-450	29.0-37.5
1/2	1/4	3/4	3/4	504-650	42.0-54.2
5/8	5/16	15/16	15/16	1290-1390	107.0-116.0

Multibelt Check

Tighten the belts slightly and rotate the drive several times.

On multiple belt drives, ensure the force of deflection is approximately the same on each belt by pushing each belt in an equal distance at a point halfway from each sheave (see Figure 48). If this force is not the same for each belt, the motor and fan shaft are not parallel. Realign as required. After realignment, tighten the belts again to the standard belt tensioning specifications. If the force is still not the same for all belts, the belts or sheaves are worn and must be replaced.

Routine Maintenance

The following checklist is provided as an abbreviated guide to periodic maintenance. Detailed procedural information is given after this checklist.

⚠ WARNING Hazardous Service Procedures!

The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. When possible, disconnect all electrical power including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

When servicing fans or ductwork, secure the impeller to physically restrict rotational movement. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

Table 5. Routine maintenance checklist

Frequency	Maintenance
After 48 hours of operation	Belts have acquired their permanent set. Readjust but do not overtighten. See the "Tension the Fan Belt" section on page 45 for more information.
Every week	Observe unit weekly for any change in running condition and unusual noise.
Every month	• Clean or replace air filters if clogged or dirty; coat permanent filters with oil after cleaning. See the "Air Filters" section on page 49 for more information. • Relubricate fan bearings if necessary. See the "Fan Bearing Lubrication" section on page 51 for more information. • Check and adjust fan belt tension.
Every three to six months	• Check fan bearing grease line connections. Lines should be tight to the bearings. • Check bearing and motor bracket bolt torque and bearing setscrew torque. • Align fan and motor sheaves. Tighten sheave set screws to the proper torque. See the "Sheave Alignment" section on page 47 for more information. • Inspect and clean drain pans. See the "Drain Pans" section on page 50 for more information. • Tighten electrical connections. • Inspect coils for dirt build-up. See the "Coils" section on page 52 for more information.
Every year	• Inspect the unit casing for corrosion. If damage is found, clean and repaint the surface with a rust-resistant primer and vinyl chlorinated lacquer. • Clean the fan wheels and fan shaft. See the "Fans" section on page 50 for more information. • Inspect and clean drain pans. • Check damper linkages, set screws, and blade adjustment. Clean, but do not lubricate, the nylon damper rod bushings. • Clean damper operators. • Inspect electrical components and insulation. • Inspect wiring for damage. • Rotate the fan wheel and check for obstructions in the fan housing. The wheel should not rub on the fan housing. Adjust the center if necessary and tighten wheel set screws to the proper torque. • Lubricate motor bearings in accordance with motor manufacturer's recommendations (see the "Fan Bearing Lubrication" section on page 51 for more information). • Check condition of gasketing and insulation around unit, door and dampers. • Examine flex connections for cracks or leaks. Repair or replace damaged material.

Air Filters

Refer to product catalog CLCH-PRC003-EN for filter sizes, types, and quantities.

⚠ WARNING
Hazardous Voltage with Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

Throwaway Filters

To replace throwaway filters, install new filters with the directional arrows pointing in the direction of airflow.

Note: Bag and cartridge filters must have an airtight seal to prevent air bypass. If using other than Trane-supplied filters, apply foam gasketing to the vertical edges of the filter.

Permanent Filters

To clean permanent filters:

1. Disconnect all electrical power to the unit.
2. Wash the filter under a stream of water to remove dirt and lint.
3. Remove oil from the filter with a wash of mild alkali solution.
4. Rinse the filter in clean, hot water and allow to dry.
5. Coat both sides of the filter by immersing or spraying it with Air Maze Filter Lote W or an equivalent.
6. Allow to drain and dry for about 12 hours.
7. Reinstall the filter.

Note: It may be preferable to keep extra, clean filters to replace the dirty filters to minimize unit downtime for filter maintenance.

Front Load Filters

Most filters in custom units are installed in unitary sheet metal frames. Filters are secured with a metal clip. There are several different styles.

To install filters:

1. Disconnect power to the unit.
2. Open or remove the filter clip.
3. Remove the filter from the rack.
4. Install new filters with the directional arrows pointing in the direction of airflow.
5. Secure the filter using the appropriate clip for each filter.

The filters are often installed in a pre/post filter configuration. Be sure to note the order of installation.

Note: Filters must have an airtight seal to prevent air bypass.

Side Load Filters

Most filters in custom units are installed in unitary sheet metal frames. If unit is provided with side access rack, do the following for installation:

2-inch or 4-inch flat filters

1. Disconnect the power to the unit.
2. Open the filter section access door and remove the filters and block-offs from their installed position.
3. Slide the filter into the rack.
4. Some side load racks will be provided with block-off plates. Install them into the rack last before closing the door.
5. Close and secure the door, making certain the door closes snug against the block-off.

Bag or Cartridge Filters

1. Disconnect power to the unit.
2. Keeping the bag filters folded, slide each filter into the filter rack, pushing them tightly against the unit. Pleats should be in the vertical position.
3. If using optional pre-filters, slide them into the appropriate filter rack.
4. If block-offs are provided with the unit, slide the block-offs into the filter track.
5. Close and secure the access door, making certain the door closes snug against the rack.

Note: The block-off is intended to make a seal when the access door is closed. It may require a few adjustments to ensure a proper seal.

See "⚠ WARNING Hazardous Voltage with Capacitors!" on page 49 regarding disconnection of power.

Drain Pans

The condensate drain pan and drain line must be checked to assure the condensate drains as designed. This inspection should occur a minimum of every six months or more often as dictated by operating experience.

If evidence of standing water or condensate overflow exists, identify and remedy the cause immediately. Refer to the "Troubleshooting" section on page 56 for possible causes and solutions.

To clean drain pans:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, remove any standing water.
3. Scrape solid matter off of the drain pan.
4. Vacuum the drain pan with a vacuum device that uses high-efficiency particulate arrestance (HEPA) filters with a minimum efficiency of 99.97 percent at 0.3 micron particle size.
5. Thoroughly clean all areas with a mild bleach and water solution or an EPA-approved sanitizer specifically designed for HVAC use.
6. Immediately rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of metal surfaces.
7. Allow the unit to dry completely before putting it back into service.
8. Be careful that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Fans

Inspecting and Cleaning Fans

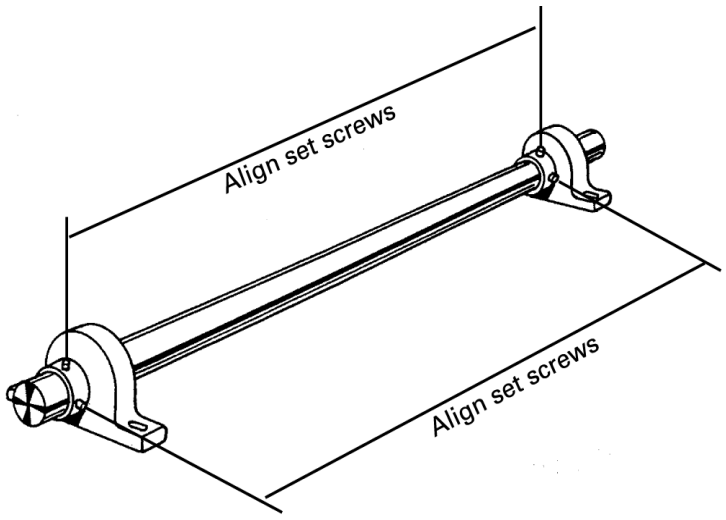
Fan sections of air handlers should be inspected every six months at a minimum or more frequently if operating experience dictates. If evidence of microbial growth (mold) is found, identify and remedy the cause immediately. Refer to the "Troubleshooting" section on page 56 for possible causes and solutions. To clean the fan section:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, remove any contamination.
3. Vacuum the section with a vacuum device that uses high-efficiency particulate arrestance (HEPA) filters with a minimum efficiency of 99.97 percent at 0.3 micron particle size.
4. Thoroughly clean all areas with a mild bleach and water solution or an EPA-approved sanitizer specifically designed for HVAC use.
5. Immediately rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of metal surfaces.
6. Allow the unit to dry completely before putting it back into service.
7. Be careful that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Bearing Set Screw Alignment

Align bearing set screws as illustrated in Figure 49. Table 4 on page 47 provides bearing set screw torque measurements.

Figure 49. Bearing set screw alignment



See "⚠ WARNING Hazardous Voltage with Capacitors!" on page 49 regarding disconnection of power.

Fan Bearing Lubrication

CAUTION
Bearing Failure!

Do not mix greases with different bases within the bearing. Mixing grease within the bearing may result in premature bearing failure.

The grease used in electric motor bearings is usually not compatible with the grease used in fan bearings. Never mix the two grease types!

Note: Lubricate the bearing according to the motor manufacturer's recommendations and use the manufacturer-recommended grease.

Refer to Table 6 for minimum torque of motor mounting and bearings bolts.

Table 6. Minimum hex head bolt torque in lb.-ft. (Grade 5 bolts)

Size (inches)	Thread Designation	Minimum Torque
1/4-20	UNC	6
1/4-28	UNF	7
65/16-18	UNC	14
5/16-24	UNF	16
3/8-16	UNC	24
3/8-24	UNF	28
7/16-14	UNC	42
7/16-20	UNF	45
1/2-13	UNC	69
1/2-20	UNF	83
9/16-12	UNC	99
9/16-18	UNF	118
5/8-11	UNC	150
5/8-18	UNF	176
3/4-10	UNC	254
3/4-16	UNF	301
7/8-9	UNC	358
7/8-14	UNF	422
1-8	UNC	500
1-14	UNF	602

Soft metric conversions are not acceptable for screw and hex sizes.

- Fan bearings without lubrication lines are sealed bearings. Re-lubrication is not required.
- Fan bearings equipped with lubrication lines should be lubricated with a lithium-based grease that conforms to NLGI No. 2 for consistency.

Compatible greases include:

- Texaco Multi Fak 2
- Shell Alvania 2
- Mobil 532
- Chevron Dura-Lith 2
- Exxon Beacon
- Keystone 84H

Motor bearings are factory-lubricated for normal life. In the case of a double-shielded bearing, the grease provided is that which is in the bearing. To regrease motors without grease fittings:

1. Remove the bearing brackets.
2. If the original bearing is to be relubricated, remove the shield opposite the rotor.
   a. Do not replace.
   b. Flush old grease from bearing with suitable solvent.
3. Lubricate the bearing and add grease to the bearing chamber. The chamber should be three-quarters full of grease. (An alternate method is to replace the old bearing with a new double-shield pre lubricated bearing.) See Table 7 for maximum grease capacity.

Note: Lubricate the bearing according to the motor manufacturer's recommendations and use the manufacturer-recommended grease.

4. Reassemble the motor.

Fan Motor Inspection

Inspect fan motors periodically for excessive vibration or temperature.

Table 7. Fan bearing maximum grease capacity

Shaft size (inches)	Capacity (fluid ounce)
1/2 - 3/4	1/7
7/8 - 1 3/16	3/8
1 1/4 - 1 1/2	5/8
1 11/16 - 1 15/16	7/8
2 - 2 7/16	1 1/4
2 1/2 - 2 15/16	2

See "⚠ WARNING Hazardous Voltage with Capacitors!" on page 49 regarding disconnection of power.

Coils

All coils should be kept clean to maintain maximum performance.

Steam and Water Coils

To clean steam and water coils:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, use a soft brush to remove loose debris from both sides of the coil.
3. Insert a block-off to prevent steam from blowing through the coil and into a dry section of the unit.
4. Use a steam cleaning machine to clean the coil, cleaning the leaving air side of the coil first, then the entering air side. Repeat as necessary.

Note: Start from the top of the coil and work downward.

5. Straighten any coil fins that may have been damaged during the cleaning process.
6. Confirm the drain line is open following the cleaning process.
7. Allow the unit to dry thoroughly before putting it back into service.
8. Replace all panels and parts and restore electrical power to the unit.
9. Be careful any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials.

Type K Cooling Coils

Type K cooling coils have removable headers for cleaning:

1. Remove the headers.
2. Use a small nylon or fiber brush to clean the tubes.
3. Flush the tubes with water.
4. Install a new rubber sealing gasket and be sure it seats properly when the header is replaced.

Note: Apply washers under the bolt heads. Bolts should be evenly tightened to 50 foot-pounds of torque, beginning in the center and working toward the outside.

Refrigerant Coils

⚠ WARNING Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline. Handle chemical carefully. Proper handling should include 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. Failure to follow all safety instructions could result in death or serious injury.

⚠ WARNING Hazardous Pressures!

Coils contain refrigerant under pressure. When cleaning coils, maintain coil cleaning solution temperature under 150°F to avoid excessive pressure in the coil. Failure to follow these safety precautions could result in coil bursting, which could result in death or serious injury.

To clean refrigerant coils:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, use a soft brush to remove loose debris from both sides of the coil.
3. Install a block-off to prevent spray from going through the coil and into a dry section of the unit and/or system ductwork.
4. Mix a high-quality coil cleaning detergent with water according to the manufacturer's instructions.

Note: If the detergent is strongly alkaline after mixing (PH 8.5 or higher), it must contain an inhibitor. Follow the cleaning solution manufacturer's instructions regarding the use of the product.

5. Place the mixed solution in a garden pump-up sprayer or high-pressure sprayer. If a high pressure sprayer is to be used:
   - Maintain minimum nozzle spray angle of 15 degrees.
   - Spray perpendicular to the coil face.
   - Keep the nozzle at least 6 inches from the coil.
   - Do *not* exceed 600 psi.
6. Spray the leaving air side of the coil first, then the entering air side.
7. Thoroughly rinse both sides of the coil and the drain pan with cool, clean water.
8. Repeat steps 6 and 7 as necessary.
9. Straighten any coil fins damaged during the cleaning process.
10. Confirm the drain line is open following the cleaning process.

11 Allow the unit to dry thoroughly before putting it back into service.

12 Replace all panels and parts and restore electrical power to the unit.

13 Be careful any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Coil Winterization

Water coil winterization procedures consist primarily of draining water from the coil before the heating season. Trane recommends flushing the coil with glycol if coils will be exposed to temperatures below 35 degrees.

Install field-fitted drains and vents to permit winterization of coils not in use and to assist in evacuating air from the water system during startup. If draining is questionable because of dirt or scale deposits inside the coil, fill the coil with glycol before the heating season begins.

Note: On many unit sizes, there are multiple coils in the coil module. Be sure to winterize all coils in a given coil module.

CAUTION
Use Approved Glycol!

Use a glycol approved for use with commercial cooling and heating systems and copper tube coils. Failure to do so may result in equipment damage.

CAUTION
Avoid Coil Freezeup!

Properly drain and vent the coils when they are not in use. Trane recommends glycol protection in all possible freezing applications. Failure to properly protect coils may result in equipment damage.

Type W, P2, P4, P8, WD, 5D, and 5W Coils

1 Remove the vent and drain plugs.

2 Blow the coil out as completely as possible with compressed air.

3 Fill and drain the coil several times with full strength glycol so that it mixes thoroughly with the water retained in the coil.

4 Drain the coil out as completely as possible.

5 To ensure no water remains in the coil, do not replace the vent and drain plugs until the coils are put back into service.

CAUTION
Twisted Tubes!

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

Type K Coils

1 Remove all vent and drain plugs.

2 Allow the water to drain from the coil.

3 Remove the header covers.

4 If tubes are fouled, clean the tubes with a nylon or wire brush.

5 To ensure no water remains in the coil, do not replace the header covers until the coils are put back into service.

Note: When the coils are put back into service, use new gaskets. Trane recommends washers be used under the bolt heads and bolts be evenly tightened to 50 ft.-lbs torque.

Moisture Purge Cycle

By it's very nature, any HVAC unit with a cooling coil serves as a dehumidifier, reducing the surrounding air's ability to hold water vapor as its temperature falls. This normally doesn't present a problem when the unit is running. However, when the fan stops, water vapor condenses on the cold metal surfaces inside the air handler and remains there until the air warms sufficiently to re-evaporate it.

Providing a moisture purge cycle 15 to 30 minutes after shutdown disperses the cold, humid air inside the air-handling system more evenly throughout the building. This four-step cycle:

- Closes the outdoor air dampers.
- Turns off the cooling coil.
- Opens any variable-air-volume terminals connected to the air handler.
- Operates the supply fan for 10 to 15 minutes.
- Rotates inlet guide vanes full open to full close.

Air movement discourages water condensation and hastens re-evaporation of any condensate that does happen to form. This simple preventative measure effectively combats microbial growth and curbs moisture-related deterioration of air-handling components.

See "⚠ WARNING Hazardous Voltage with Capacitors!" on page 49 regarding disconnection of power.

⚠ WARNING
Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline. Handle chemical carefully. Proper handling should include 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. Failure to follow all safety instructions could result in death or serious injury.

Internal Insulation

The process of cooling and dehumidification produces condensate that must be continuously removed from the air-handling unit. The section of the unit from the entering air side of the cooling coil to the leaving edge of the drain pan is considered to be the "wet" section of the unit. Other potentially "wet" sections are immediately downstream of a humidifier and/or an outside air intake section.

Internal insulation in areas of the unit that are normally considered to be "dry" must also be periodically inspected to assure the insulation is clean and dry. Wet insulation in an area that is normally considered to be "dry" can indicate an operational problem (refer to the "Troubleshooting" section on page 56 for further information). The equipment should be inspected a minimum of every six months or more frequently as operating experience dictates.

Accumulated dirt and other organic matter exposed to water or extended periods of high relative humidity (60 percent or higher) can support microbial growth, which must be removed to prevent the unit from becoming a contaminant source.

If evidence of contamination exists in either the wet or dry sections:

- Determine and eliminate the cause.
- Remove the contamination.
- Sanitize the affected area.

See the "Troubleshooting" section on page 56 for assistance in identifying the cause.

If microbial growth on a non-porous insulating surface (closed cell insulation or sheet metal surface) is observed:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, use a brush for sheet metal surfaces or a soft sponge on a foil face or closed cell foam surface to mechanically remove the microbial growth.

Note: Be careful not to damage the non-porous surface of the insulation.

3. Install a block-off to prevent spray from going into a dry section of the unit and/or system ductwork.
4. Thoroughly clean all areas with an EPA-approved sanitizer specifically designed for HVAC use.
5. Rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of the drain pan and drain line.
6. Repeat steps 4 and 5 as necessary.
7. Confirm the drain line is open following the cleaning process.
8. Allow the unit to dry thoroughly before putting it back into service.
9. Replace all panels and parts and restore electrical power to the unit.
10. Be careful that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

To clean a porous insulating surface (fiberglass insulation):

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, use a vacuum device with a HEPA filter (99.97 percent efficient at 0.3 micron particles) to remove the accumulated dirt and organic matter.

Note: Be careful not to tear the insulation surface or edges.

3. Confirm the drain line is open following the cleaning process.
4. Allow the unit to dry thoroughly before putting it back into service.
5. Replace all panels and parts and restore electrical power to the unit.
6. Be careful that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Ultraviolet (UV) Germicidal Irradiation Lights

The intensity of the ultraviolet energy emitted from the ultraviolet bulbs provided in this unit is dependent on the cleanliness and age of the bulb. The surface of the bulb should be kept as clean as possible for optimum intensity. Depending on the filtration level of the HVAC system and the general hygiene of the building, periodic cleaning may be necessary. Before attempting any maintenance procedures, always follow all warnings and cautions as detailed in this maintenance section.

⚠ WARNING
Hazardous Voltage and Exposure to Ultraviolet Radiation!

This product contains components that emit high-intensity ultraviolet (UV-C) radiation which can be harmful to unprotected eyes and skin.

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

⚠ WARNING
Hazardous Vapors!

If large numbers of UV bulbs are broken, an appropriate respirator should be considered to prevent inhalation of mercury vapors. Failure to use a respirator could result in death or serious injury.

⚠ CAUTION
Broken Glass!

Bulbs are fragile and can be easily broken. Always use gloves and eye protection when handling these bulbs. Failure to handle bulbs properly may result in minor to moderate injury. Refer to the MSDS sheet from the bulb manufacturer for additional safety information.

Always use cloth gloves and suitable eye protection when cleaning or replacing these bulbs. Bulbs may break if dropped or handled improperly.

Disposal of Bulbs: UV bulbs, like fluorescent bulbs, contain mercury, which is a regulated hazardous waste. The disposal requirements for hazardous wastes are determined by local, state and federal guidelines. Check all regulations before disposing of bulbs to assure you have met all requirements.

Refer to the MSDS sheet from the bulb manufacturer for additional disposal, handling and safety information.

To clean the bulbs:

1. Disconnect all electrical power to the unit and the ultraviolet bulbs.
2. Wearing soft cloth gloves and safety glasses, use two hands and firmly grasp the bulb at each end.
3. Rotate the bulb 90 degrees in either direction and move bulb away from the fixture and out of unit.
4. Wipe down each bulb with a clean cloth and alcohol. Avoid touching the bulb with bare hands as skin oils can accelerate future glass soiling and degrade the bulb performance.
5. Carefully return the bulb to the fixture and rotate it 90 degrees in either direction until it is firmly secured.
6. Close and latch all unit panels and reenergize power to the lights.

Replacement of ultraviolet bulbs

The ultraviolet bulb should be replaced annually if operated continuously or after 9,000 hours of use if operated intermittently. Replacement bulbs must be the specific size and wattage as originally supplied from the factory.

Note: Although the lights may continue to generate a characteristic blue glow beyond 9,000 operating hours, the ultraviolet radiation emitted by the bulbs degrades over time and will no longer provide the intended benefit.

1. Disconnect power to the HVAC unit and the ultraviolet bulbs.
2. Wearing soft cloth gloves and safety glasses, use two hands to firmly grasp bulb at each end.
3. Rotate bulb 90 degrees in either direction and move bulb away from the fixture and out of unit.
4. Carefully install a new replacement bulb in the fixture and rotate it 90 degrees in either direction until firmly secured.
5. If broken bulbs are found or if you are required to dispose of used bulbs, the proper warning and cautions must be followed.
6. After replacing bulbs, close and latch all unit panels and reenergize power to the lights.

Troubleshooting

This section is intended to be used as a diagnostic aid only. For detailed repair procedures, contact your local Trane service representative.

⚠ WARNING
Hazardous Service Procedures!

The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. When possible, disconnect all electrical power including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

Table 8. Air handler troubleshooting recommendations

Symptom	Probable Cause	Recommended Action
Bearing is excessively hot	First start after relubrication (grease distribution)	Allow machine to cool down and restart.
	Over-lubrication	Clean surface of grease and purge.
	Over tensioned belts	Adjust belt tension.
	No lubricant	Apply lubricant. Check bearings for damage.
	Misaligned bearing	Correct alignment. Check shaft level.
Motor fails to start	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker.
	Overload trip	Check and reset overload.
	Improper wiring or connections	Check wiring with diagram supplied on unit.
	Improper current supply	Compare actual supply power with motor nameplate recommendations. Contact power company for adjustments.
	Mechanical failure	Check that motor and drive rotate freely. Check bearing lubricant.
Motor stalls	Open phase	Check line for an open phase.
	Overloaded motor	Reduce load or replace with larger motor.
	Low line voltage	Check across AC line. Correct voltage if possible.
Excessive vibration	Poor alignment	Align bearing set screws (see Figure 49). Loosen and retighten bearing set screws.
	Bolts not removed.	Remove bolts (see the "Isolator Adjustment" section on page 24).
	Over tensioned belts	Adjust belt tension.
	Misaligned drive	Align drive.
Motor runs and then dies down	Partial loss of line voltage	Check for loose connections. Determine adequacy of main power supply.
	Starter shorts when motor warms up	Replace starter.
Motor does not come up to speed	Low voltage at motor terminals	Check across AC line and correct voltage loss if possible.
	Line wiring to motor too small	Replace with larger sized wiring.
Motor overheats	Overloaded motor	Reduce load or replace with a larger motor.
	Motor fan is clogged with dirt preventing proper ventilation	Remove fan cover, clean fan and replace cover.
Excessive motor noise	Motor mounting bolts loose	Tighten motor mounting bolts.
	Rigid coupling connections	Replace with flexible connections.
	Worn motor bearings	Replace bearings and seals.
	Fan rubbing on fan cover	Remove interference in motor fan housing.
Rapid motor bearing wear	Excessive overhung load due to overtensioned drive	Check belt tension and overhung load.
	Excessive overhung load due to a small diameter motor sheave	Replace sheave with larger one.
Loose fan belt	Motor is poorly positioned	Adjust belt tension.
	Worn or damaged belt	Replace belt or belt set. Check sheave alignment.
	Worn sheaves	Replace sheaves.

Table 5. Air handler troubleshooting recommendations

Symptom	Probable Cause	Recommended Action
Short belt life	Worn sheaves	Replace sheaves.
	Misaligned belt	Realign drive with MVP sheave set at mean pitch diameter.
	Grease or oil on belts	Check for leaky bearings. Clean belts and sheaves.
	Belt slipping	Improper belt tension. Adjust tension.
	Belts rubbing	Remove obstruction or realign drive for clearance.
Bearing noise	Poor alignment	Loosen bearing set screws and realign (see the "Bearing Set Screw Alignment" section on page 50).
	Failed bearing	Replace bearing.
	Inadequate lubrication	Replace bearing.
Low water coil capacity	Incorrect airflow	Check fan operating condition.
	Incorrect water flow	Inspect the water pumps and valves for proper operation and check the lines for obstructions.
	Incorrect water temperature	Adjust the chiller or boiler to provide the proper water temperature.
	Coil is piped incorrectly	Verify coil piping (see the "Coil Piping and Connections" section on page 28.
	Dirty fin surface	Clean the fin surface (see the "Coils" section on page 52).
	Incorrect glycol mixture	Verify glycol mixture and adjust if necessary.
Low refrigerant coil capacity	Incorrect airflow	Check fan operating condition.
	Expansion valve is not operating properly or is sized incorrectly	Check sensing bulb temperature. Verify valve operation. Verify proper valve size.
	Incorrect refrigerant charge	Verify refrigerant charge and adjust if necessary.
	Condensing unit failure	Verify condensing unit operation.
	Coil is piped incorrectly	Verify coil piping (see the "Coil Piping and Connections" section on page 28).
	Clogged refrigerant line filter	Change filter core.
	Failure of suction/liquid line components	Verify component operation
	Dirty fin surface	Clean the fin surface (see the "Coils" section on page 52). *Note: Do not use steam to clean refrigerant coils.*
	Fin frosting	Verify defrost cycle operation. Verify frostat operation. Verify refrigerant charge.
Low steam coil capacity	Incorrect airflow	Check fan operating condition.
	Coil is piped incorrectly	Verify coil piping (see the "Coil Piping and Connections" section on page 28).
	Incorrect steam pressure	Verify steam pressure and adjust if necessary.
	Excessive steam superheat	Check steam superheat. Steam superheat should not exceed 50ºF.
	Failure of steam line/condensate return components	Verify component operation
	Boiler failure	Verify boiler operation
	Dirty fin surface	Clean the fin surface (see the "Coils" section on page 52).
Drain pan is overflowing	Plugged Drain Line	Clean drain line
	Unit not level	Level unit
	Improper trap design	Design trap per unit installation instructions
Standing water in drain pan	Improper trap design	Design trap per unit installation instructions
	Unit not level	Level unit
	Plugged Drain Line	Clean drain line
Wet interior insulation	Coil face velocity too high	Reduce fan speed
	Improper trap design	Design trap per unit installation instructions
	Drain pan leaks/overflows	Repair leaks
	Condensation on surfaces	Insulate surfaces
Excess dirt in unit	Missing filters	Replace filters
	Filter bypass	Reduce filter bypass by ensuring all blockoffs are in place.
Microbial growth (mold) inside air handler	Standing water in drain pan	See "Standing water in drain pan"

Notes

Notes

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