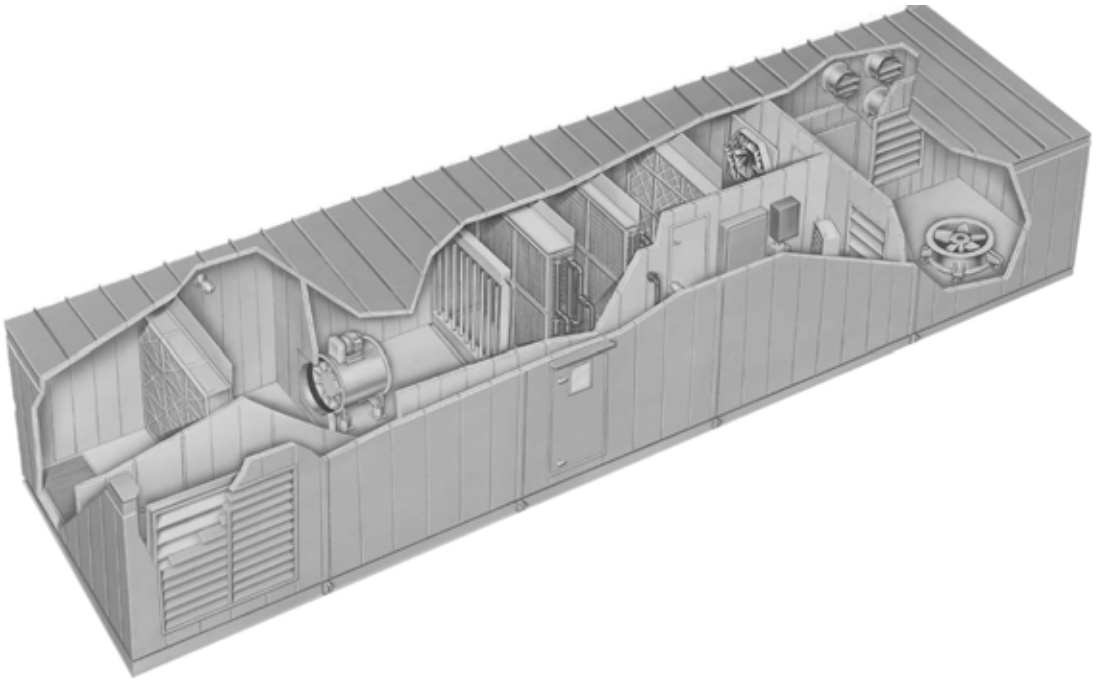
TRANE®

Installation
Operation
Maintenance

Custom Climate Changer™ Air Handlers



X-code - X39640745010

July 2010

CAH-SVX01B-EN

Warnings, Cautions and Notices

Warnings, Cautions and Notices. Note that warnings, cautions and notices appear at appropriate intervals throughout this manual. Warnings are provide to alert installing contractors to potential hazards that could result in personal injury or death. Cautions are designed to alert personnel to hazardous situations that could result in personal injury, while notices indicate a situation that may result in equipment or property-damage-only accidents.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

ATTENTION: Warnings, Cautions and Notices appear at appropriate sections throughout this literature. 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, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

***NOTICE*:** Indicates a situation that may result in equipment or property-damage only accidents.

Important Environmental Concerns!

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

Responsible Refrigerant Practices!

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

⚠ WARNING
Refrigerant warning information!

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

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

⚠WARNING
Hazard of Explosion!

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units. Failure to follow these recommendations could result in death or serious injury or equipment or property-only damage.

Ultraviolet (UV) Germicidal Irradiation Lights

The United States Environmental Protection Agency (EPA) believes that molds and bacteria inside buildings have the potential to cause health problems in sensitive individuals. If specified, Trane provides ultraviolet lights (UV-C) as a factory-engineered and installed option in select commercial air handling products for the purpose of reducing microbiological growth (mold and bacteria) within the equipment. When 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.

⚠ 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 (could 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.

Table of Contents

General Information

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.

Each Trane air handler section is provided with a nameplate which identifies the type of section, customer tagging information, the section serial number, the section position, the service model number, and electrical data.

Note: This information is required when ordering parts or requesting service for a Trane air handler.

Operating Environment

When considering the placement of the 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 104º F, while motors with Class F insulation can withstand ambient temperatures to +140º F (60º 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: Units with UL approval have a maximum ambient temperature requirement of 104ºF. The customer should provide adequate freeze protection for the coils. See “Coil Winterization” on page 93 for more information.

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.

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 ensure 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.

Factory-Mounted Controls

Trane air handlers are available with a wide selection of factory-mounted controls, including controllers, motor starters, and variable frequency drives (VFD).

Most control components are mounted inside the unit. Depending on the system configuration, this may include damper actuators, dirty filter switches, averaging temperature sensors, and low limit switches. VFDs, starters, controllers, control transformers, static pressure transducers, DC power supplies, and customer interface relays will be in enclosures mounted on the inside of the unit.

Small items that cannot be factory-mounted, such as space temperature sensors, outside air temperature sensors, and humidity sensors, will ship inside the control enclosures, or packaged and shipped inside the fan or mixing box section. Larger items are shipped inside the fan section.

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

All factory-mounted control systems (controls that are factory-wired to a unit controller or terminal strip) ordered without starters or variable-frequency drives (VFDs) are provided with 120 to 24 Vac control transformers mounted and wired in the auxiliary control panel. The customer must provide 120 Vac 50/60 Hz 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:

- Tracer MP580/581 Programmable Controllers catalog, CNT-PRC002-EN
- Tracer MP581 Programmable Controllers Hardware Installation, CNT-SVN01C-EN
- Variable Frequency Drives TR200 Series, BAS-SLB026-EN

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 *"Storage Recommendations" on page 11**.*

Wiring

⚠ WARNING
Grounding Required!

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes. Failure to follow these instructions could result in death or serious injuries.

On outdoor units, entrances are provided for field-installation of high and low voltage wiring through a pipe/nipple connection in the base of the unit. 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 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.

Pre-Installation Requirements

Receiving Checklist

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

Upon receipt of the air handler(s), a thorough inspection should be performed to note any shipping damage that may have occurred and that the shipment is complete. All factory shipping protection should be removed immediately to allow complete access for the inspection.

Note: The shipping protection provided by the factory is for transit protection only and should not be used as a jobsite storage cover.

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

- Check all access doors to confirm that the latches and hinges are not damaged.
- Inspect the interior of each section for any internal damage.

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

- Inspect the coils for damage to the fin surface and/or coil connections.
- 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 or mixing box section.

- Check all control devices attached to the unit exterior and confirm that they are not damaged.
- Manually rotate the fan wheel to ensure free movement of the shaft, bearings, and drive.
- Inspect the fan housing for any foreign objects.
- If the unit is shipped in sub-assemblies, locate the assembly hardware, which should be packaged and shipped inside the fan or mixing box section.
- 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.

Assembly Hardware

Trane 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 the fan, mixing box, or access section. If there is not enough space inside the section, 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. Sometimes it is necessary to use more than one section to ship hardware. Please check all sections thoroughly before contacting your local Trane sales engineer to report missing hardware.

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.

Storage Recommendations

Air handlers 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.

NOTICE

Use Canvas Only!

All factory shipping protection should be removed. This wrapping is for transit protection only and should not be used for jobsite storage. Use only canvas tarps to cover air handlers. Plastic tarps can cause condensation to form in and on the equipment, which could 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 -20ºF 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. Check for free rotation.
- 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 89.
- Check the motor lubrication; remove and clean grease plugs and check for the presence of 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 if present, refer to the motor manufacturer's lubrication recommendation for proper lubrication

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.

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

Preparing the Unit Site

NOTICE
Microbial Growth!

The roof curb 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 the equipment can become an amplification site for microbial growth (mold), which may cause odors and damage to the equipment and building materials.

NOTICE
Level Foundation!

A level foundation is critical to proper unit and door alignment, operation, and sealing. Failure to level and align sections properly can lead to structural damage.

- Ensure the installation site can support the total weight of the unit. Refer to the unit submittals for weights.
- Allow sufficient space for adequate free air and necessary service access. Refer to submittals for specific minimums.
- Allow room for supply and return piping, ductwork, electrical connections, and coil removal.
- Ensure there is adequate height for condensate drain requirements. See "Drain Pan Trapping" on page 54.

Note: If unit is installed in a mechanical room on a pad, 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.

- Confirm the roof curb or foundation of the mounting platform is level and large enough to accommodate the unit. Refer to the unit submittals for specific dimensions.
- Provide adequate lighting for maintenance personnel to perform maintenance duties.
- Provide permanent power outlets in close proximity to the unit for installation and maintenance.
- 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.

- Wiring for units must be provided by the installer and must comply with all national and local electrical codes.
- 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 Checklist

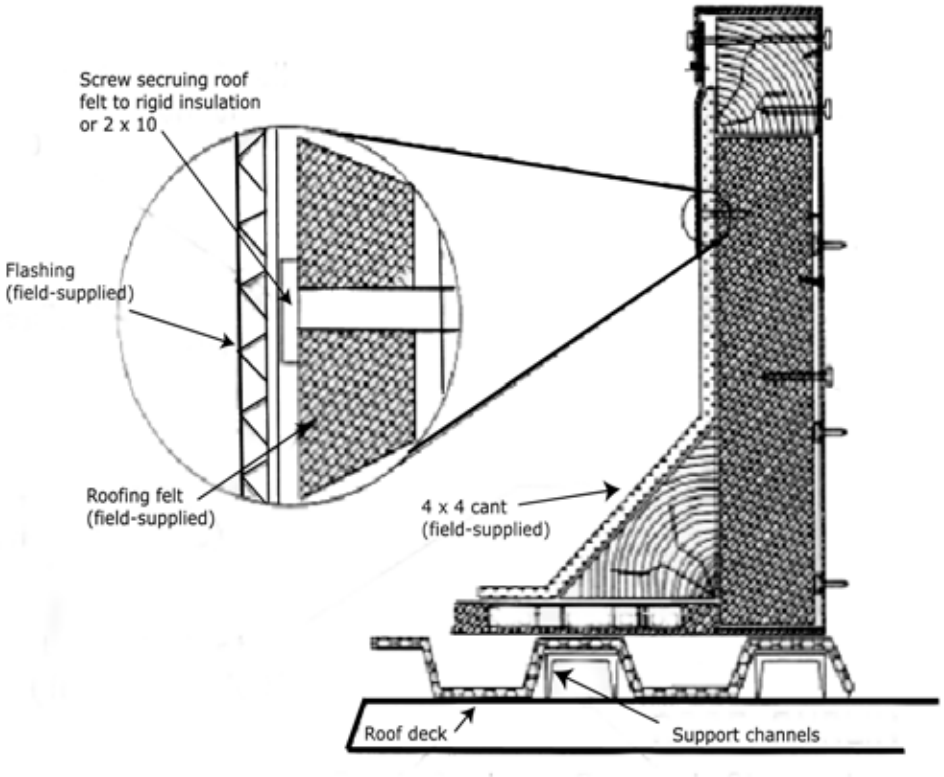
It is recommended that the curb be installed directly on the support members and fastened to the supports using tack welds or other equivalent methods. Properly supported decking should be installed inside the air handler section of the curb when this method is used. See Figure 1.

NOTICE

Roof Curb Structurally Sound

Check with curb manufacturer and job engineer to ensure the roof curb is structurally sufficient to support the weight of the unit. The curb should be checked to ensure it is level and square. Curb bowing, buckling, or sagging can lead to unit assembly and operation problems up to complete failure.

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



1. Verify that the roof structure can adequately support the combined weight of the unit and curb assembly.
2. Ensure that the selected installation location provides sufficient service and operational clearances.
3. Remove any twist within the curb due to roof supports and square the curb.
4. Level the curb.
5. Secure the curb to the roof support members.
6. Install 2-inch thick boards or rigid insulation around the curb.
7. Install cant strips around the curb.
8. Bring field supplied roofing felt up to the top of the curb nailing strips. Nail felt into place.
9. Install field supplied flashing under the lip of the curb flanges and over the felt.
10. 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

Suggested Tools

- Two chain come-alongs. These have the pulling power to bring the shipping splits together, one on each side of the unit. Cable come-alongs are not strong enough and normally will fail. The chain versions work well.
- Two long drift pins to keep holes aligned as the sections come together.
- One half-inch or 3/4-inch electric impact gun. These are very effective to tighten the bolts at the base once it's close enough together to get the bolts in.
- Caulk guns.
- Standard battery impact gun or battery drill for installation of screw in joint strips, hubcaps, and inlet or exhaust hoods.
- Nut setters for battery impact gun - 3/8-inch and 5/16-inch.
- Utility knives for cutting section-to-section gasket.
- A couple of large pry bars.
- Proper size sockets and wrenches to remove lifting lugs when in positions. Multiple size sockets. Must have 15/16-inch and 1 1/16-inch sockets.

Installation - Mechanical

Lifting and Rigging

⚠ WARNING
Heavy Objects!

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. Other lifting arrangements may cause equipment or property-only damage. Failure to properly lift unit could result in death or serious injury. See details below.

⚠ WARNING
Heavy Objects!

Always place, assemble, and suspend sections/subassemblies one at a time. Do not lift units in windy conditions. Do not raise units overhead with personnel below unit. Failure to follow these instructions could result in death, serious injury, or equipment damage.

WARNING

⚠ WARNING
Improper Unit Lift!

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. Failure to properly lift unit could result in death or serious injury or possible equipment or property-only damage.

NOTICE
Equipment Damage!

Do not use a fork lift on air handlers or subassemblies. Improper use of fork lifts on units may result in equipment damage. Trane is not responsible for equipment damage resulting from improper forklifting practices.

Preparation of the roof curb or pier mount and roof openings should be completed before lifting unit to the roof. 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 sub-assemblies (sections).

Lifting Considerations

Figure 2. Recommended attachment to lifting lugs.

- Before lifting the unit, 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.
- Always assemble unit at the installation site. Never bolt sections together before rigging.
- Always rig subassemblies or sections as they ship from the factory. See the unit submittal drawings for correct placement of sections.
- Lift all sections individually using all lifting lugs provided. See Figure 2. See specific instructions for handling the pipe cabinet (see “TCC Wall Section Assembly (Typical)” on page 37) and inlet and exhaust hoods (see “Outdoor Unit Weather Hood(s)” on page 52).

Figure 3. Use proper lifting and rigging methods

- Make the loop of the sling parallel to the direction of airflow whenever 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. See Figure 3.
- The air handler is not designed to be lifted, rigged or ceiling suspended from the top of the unit.
- 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.
- 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.
- Remove all wooden blocks before installing the unit to the roof curb.

Unit Assembly

All Trane air handlers are identified by a multiple-character model number that identifies each section. It is located on the panel on the inside of the supply fan section access door. Be sure to refer to the information on the nameplate when ordering replacement parts or requesting service.

Note: If the unit is shipped as a complete assembly, go to "Coil Piping and Connections" on page 53.

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.

Outdoor units may be mounted on the roof with a roof curb or pier mount. Indoor units may be mounted 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.

- Prepare the roof curb or pier mount and roof openings before 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.

TCP Model Assembly Instructions

If the model number on the nameplate begins with TCP, use the assembly instructions below. The TCP base is constructed for specific installation requirements such as standard roof curbs, structural support curbs, steel I-beam dunnage support, and pier mounting.

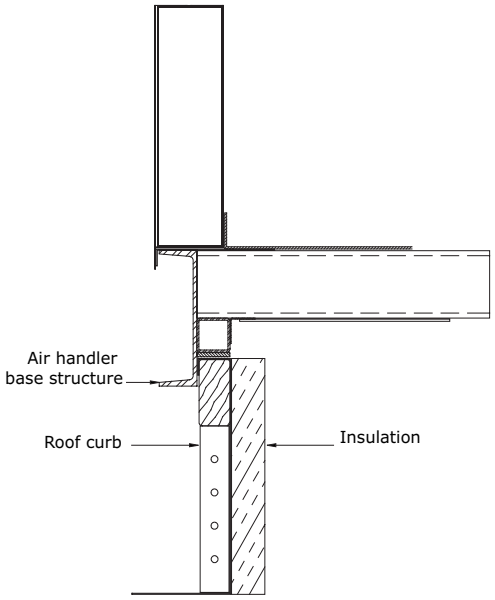
NOTICE

Roof Curb Structurally Sound

Check with curb manufacturer and job engineer to ensure the roof curb is structurally sufficient to support the weight of the unit. The curb should be checked to ensure it is level and square. Curb bowing, buckling, or sagging can lead to unit assembly and operation problems up to complete failure.

TCP Standard Roof Curb

Figure 4. Standard roof curb



The TCP unit exterior base channel is constructed to overhang the roof curb. Unit support is provide by a square tube channel locate inside of exterior base channel. See Figure 4. The standard curb should be designed to properly support the unit's weight without bow and sized to fit within the perimeter base channel.

For large units shipped in sections, see additional requirements in "TCP Roof Curbs for Large Units with Shipping Splits" on page 21.

TCP Structural Roof Curb and I-Beam Dunnage

The TCP base for structural roof curbs (see Figure 5) and I-beam dunnage (see Figure 6) are designed to sit directly onto unit support with no overhang. The structure should be designed to properly support unit weight without bow and sized to the unit's perimeter exterior base channel.

For large units shipped in sections, see additional requirements in "TCP Roof Curbs for Large Units with Shipping Splits" on page 21.

Figure 5. Structural roof curb

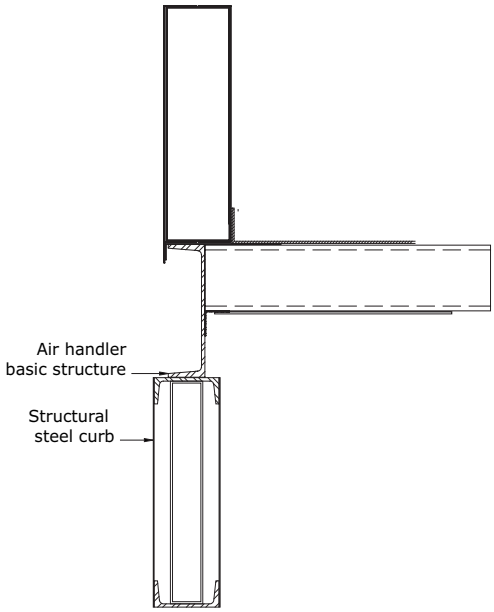
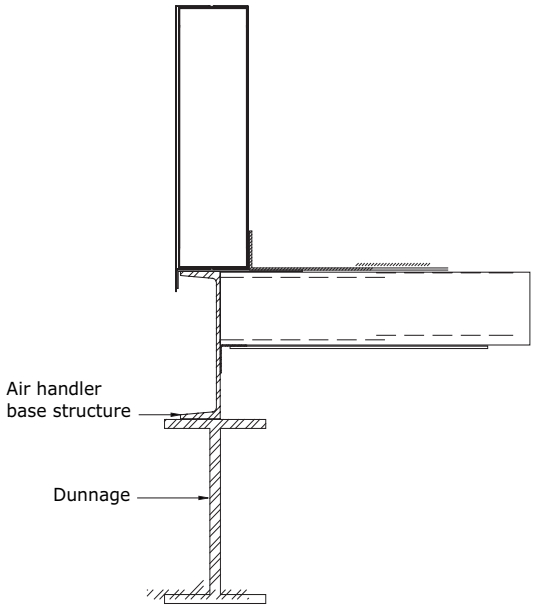


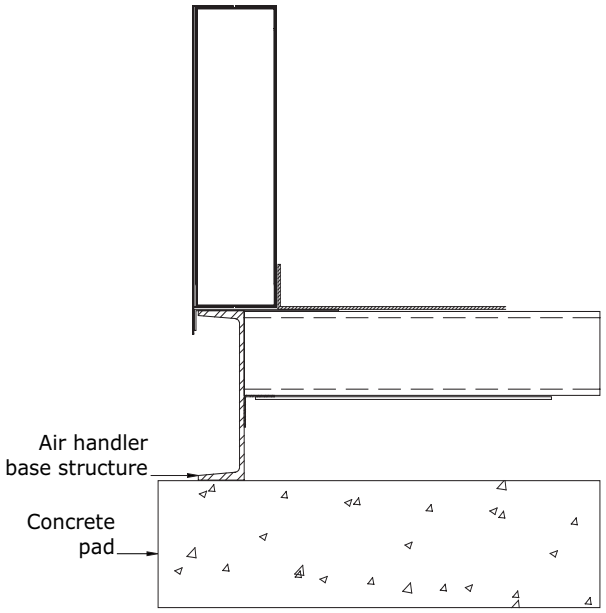
Figure 6. I-beam dunnage mount



TCP Flat Concrete Pad

The TCP base for concrete is designed to sit flat on the concrete with full perimeter contact. Concrete pads should be perfectly level, flat, and sized to the minimum exterior base channel measurements. See Figure 7.

Figure 7. Flat concrete pad mount



TCP Roof Curbs for Large Units with Shipping Splits

Larger units with shipping splits may require full-width intermediate support. With any raised type roof support such as curbs or dunnage, provisions must be made to carry the weight of the base cross members at the sectional splits. Since these unit bases are designed with lifting lugs between the sections, temporary support must be provided so additional sections can be set down with a 12-inch gap to allow for working room between sections and lug removal.The use of field-provided outriggers has proven to be a successful way to accomplish this, as shown in Figure 8.

.

Figure 8. Large units with shipping splits may require intermediate support. Field-supplied outriggers may be a useful tool in making this field joint.

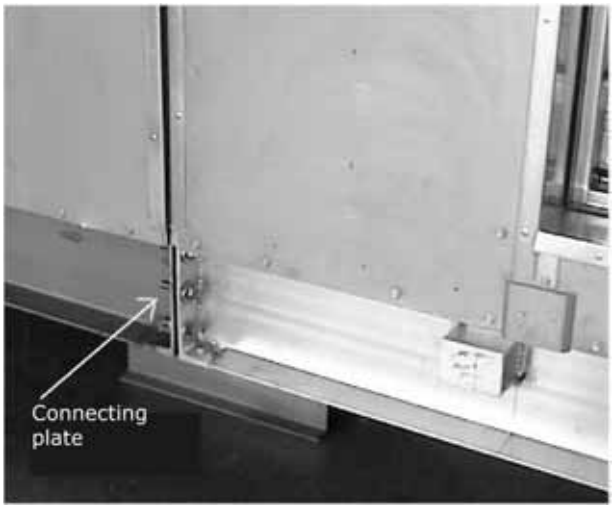
TCP Joining Sections Edge-to-Edge

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 section is installed level front to back and side to side. Verify section is square to support structure, this is critical to insure proper alignment for next adjoining sections.
3. Check squareness measuring the critical dimensions given. Use preselected method to anchor first piece in place. This is necessary so movement will not affect pulling next sections into alignment.
4. When the unit is positioned and squareness is ensured within 1/8-inch, remove all lifting lugs located along the split plane.
5. After assuring positioning is correct, anchor in place either by welding unit base to the curb or by mechanical fasteners. The first section will be used to pull remaining sections up tight so it's critical that first section be secured.
6. Install 4-inch x 1/4-inch neoprene gasket to all mating surfaces of the section, including any internal walls. This gasket must be applied to the full perimeter of the section split on both sections to be joined.
7. 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.
8. Remove lifting lugs on mating section as required.

Figure 9. Insert supplied bolts through each hole of mating connecting plate.



9. Pulling sections together on a flat surface can be done by using chain come-alongs hooked onto the welded square tubes located on each side of the shipping split. These square tubes are designed to fully support the stress of pulling sections together. Sections should be pulled together until mating gaskets make contact and factory-supplied bolts can be installed in connecting plate.
10. When sections are close enough to allow full threading of the factory-supplied nut onto the bolt, chain come-alongs can be removed. The use of an electric impact gun to tighten bolts in a sequential manner will allow the additional section to be pulled into the final position.
11. Check overall unit length to assure proper joint compression.

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

12. 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.

TCP Base Section Assembly with Flat Floor

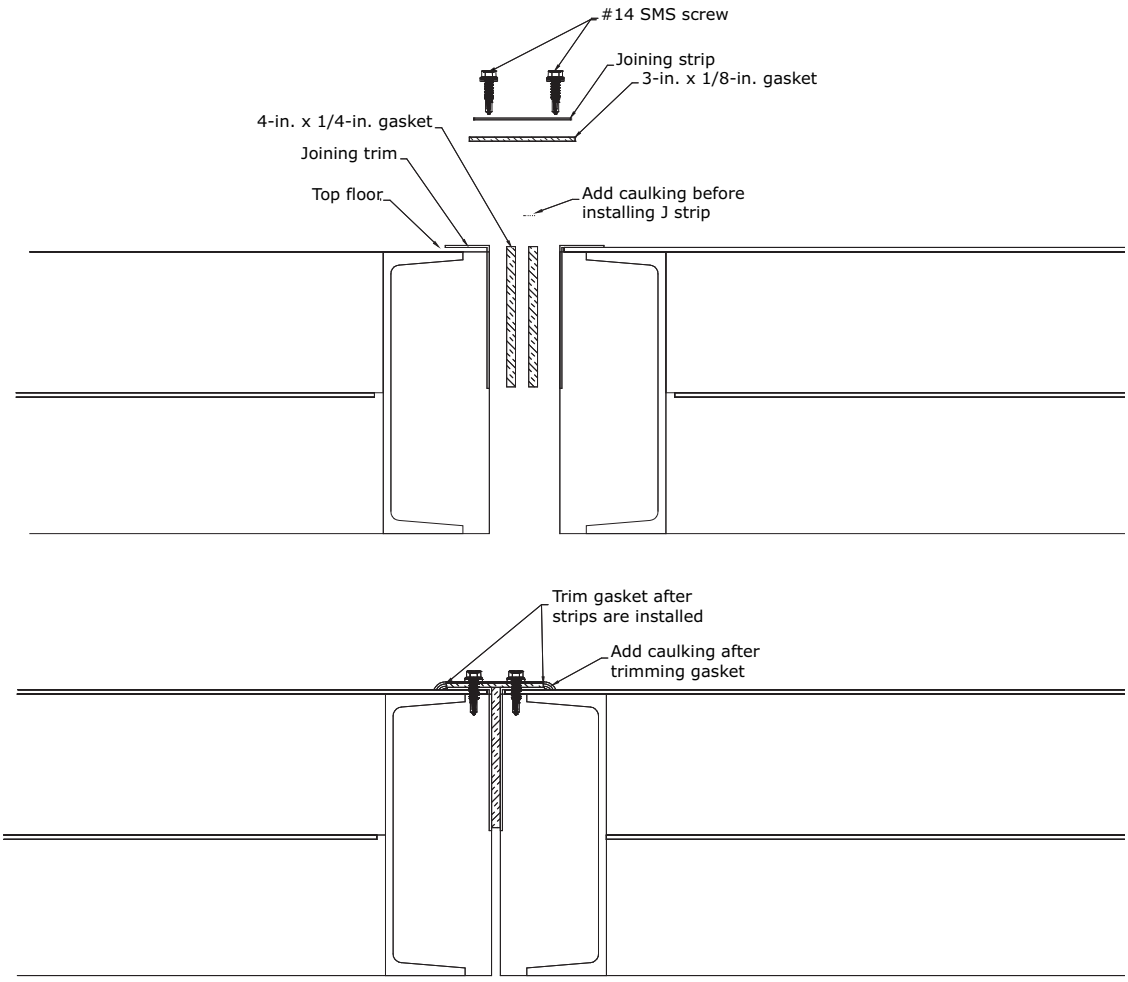
Note: Failure to completely compress the gasketing may result in air leakage.

1. Join the two units and secure with factory-provided 5/8-inch flat washers and 5/8-inch X 2-1/2-inch grade 9 bolts though each of the six holes. See Figure 10.
2. Caulk the overlapping flange along the length of each split to maintain a seal.

Note: Use a polyurethane or equivalent caulk.

3. Before installing the pre-cut 4-inch 18-gauge joining strips, 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.
4. After holes are pre-drilled, apply an ample bead of caulk to the joint then install 4-inch strip with #14 sheet metal screws uniformly straddling the split.
5. In cases of tread plate floor, some job specifications may call for the seam to be welded. In those cases make sure the sections are pulled together tightly then weld with appropriate method. The floor construction in those cases will be such that the heat from welding will not affect the insulation.

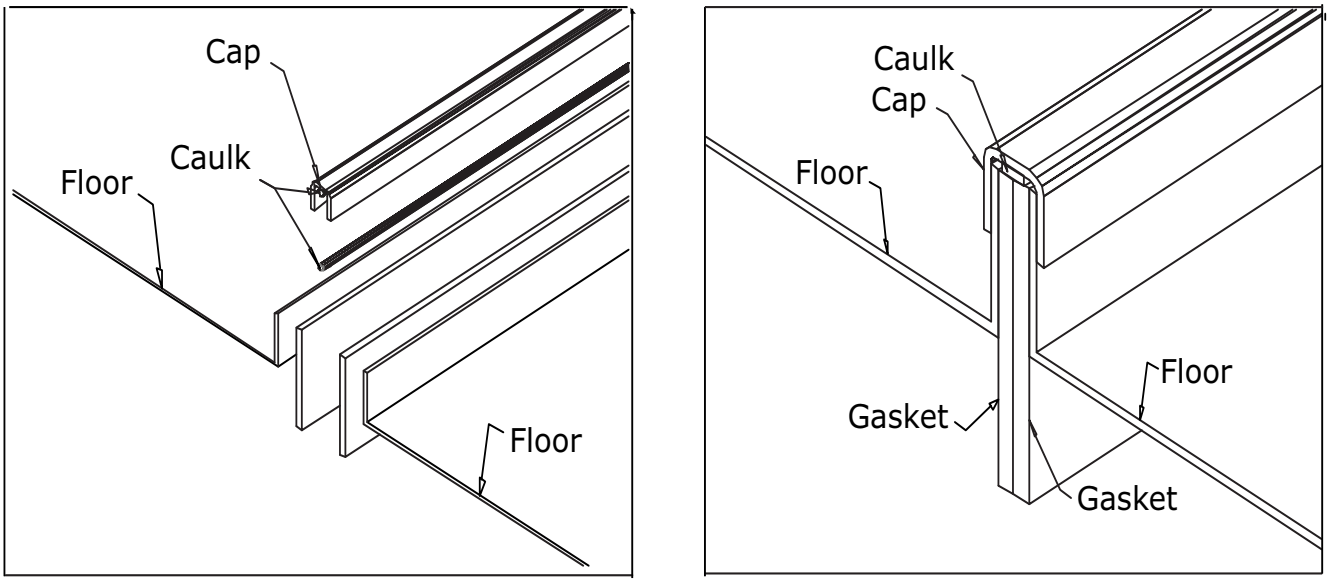
Figure 10. TCP base assembly with flat floor



TCP Base Section Assembly with Turned-Up Floor

1. See Figure 11. Apply 4-inch x ¼-inch neoprene gasket to the full perimeter face of each shipping split section.
2. Join the two sections and secure with field-provided 5/8-inch flat washers and 5/8-inch x 2 ½-inch grade 9 bolts through each of the six holes.
3. Apply a heavy bead of caulk to the inside of the U-channel.
4. Press U-channel down over upturned flanges with moderate pressure to ensure it is fully seated onto upturned flanges. The caulk will cure and act as an adhesive to hold U-channel in place, no fasteners are required.

Figure 11. Upturned floor assembly



TCP Wall Section Assembly

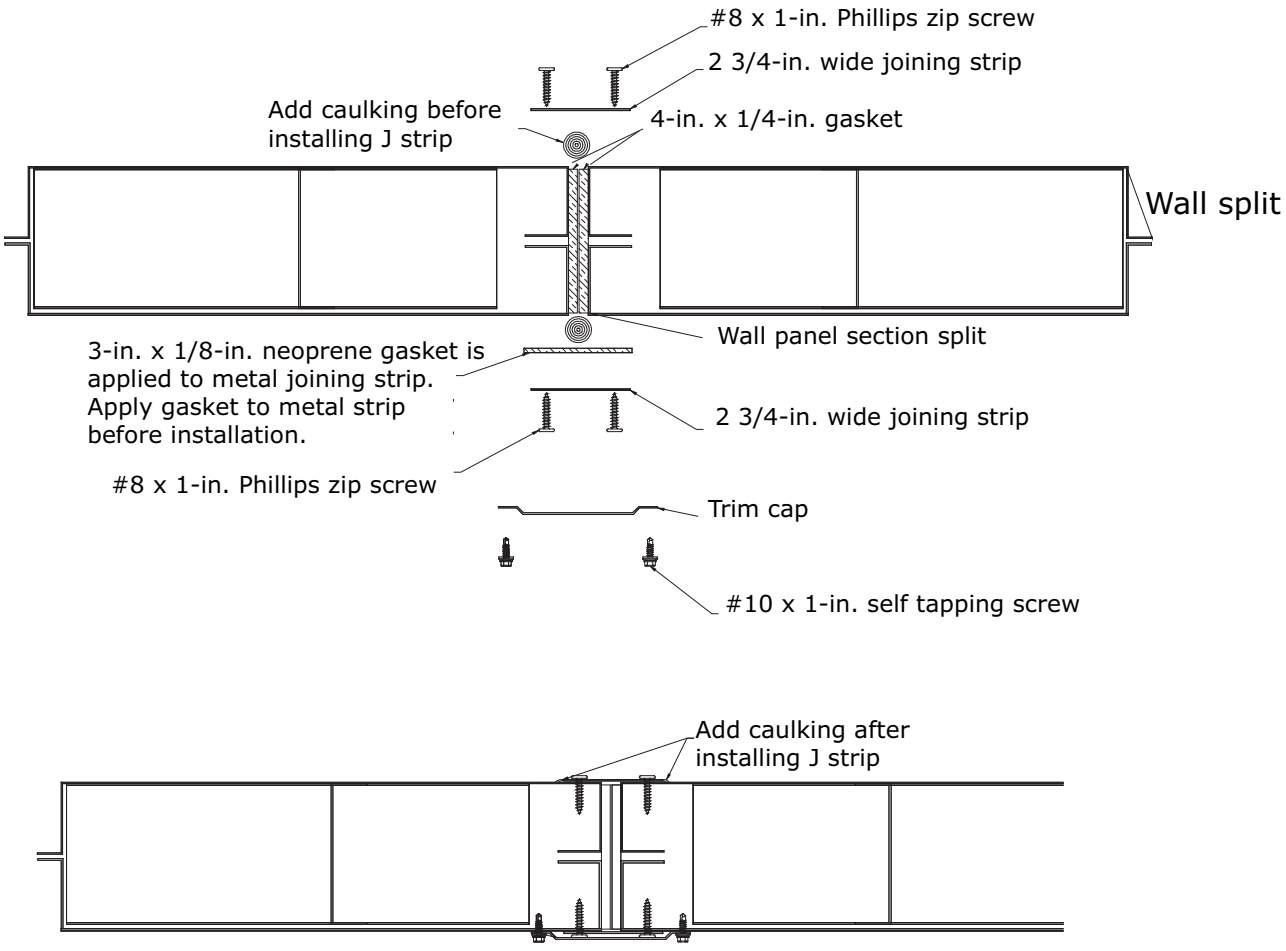
Exterior Wall Assembly (Typical)

1. See Figure 12. Ensure shipping split sections are aligned and pulled together properly.
2. Apply a bead of caulk to full height of wall joint.
3. Apply 3-inch x 1/8-inch adhesive-backed foam gasket to inner joining strip.
4. Install inner joining strip using #14 x 1.5-inch gasketed tec 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 # 8 sheet metal screws. Fill the top and bottom openings with caulk as a moisture seal. Screw holes can be pre-drilled with a #29 bit.

Interior Wall and Roof Joint Assembly (Typical)

1. See Figure 12. Ensure shipping split sections are aligned and pulled together properly.
2. Pre-drill interior joining strip screw holes using #29 drill bit.
3. Apply a bead of caulk the full height of interior wall joint.
4. Install joining strips using #10 sheet metal screws.

Figure 12. Wall section assembly



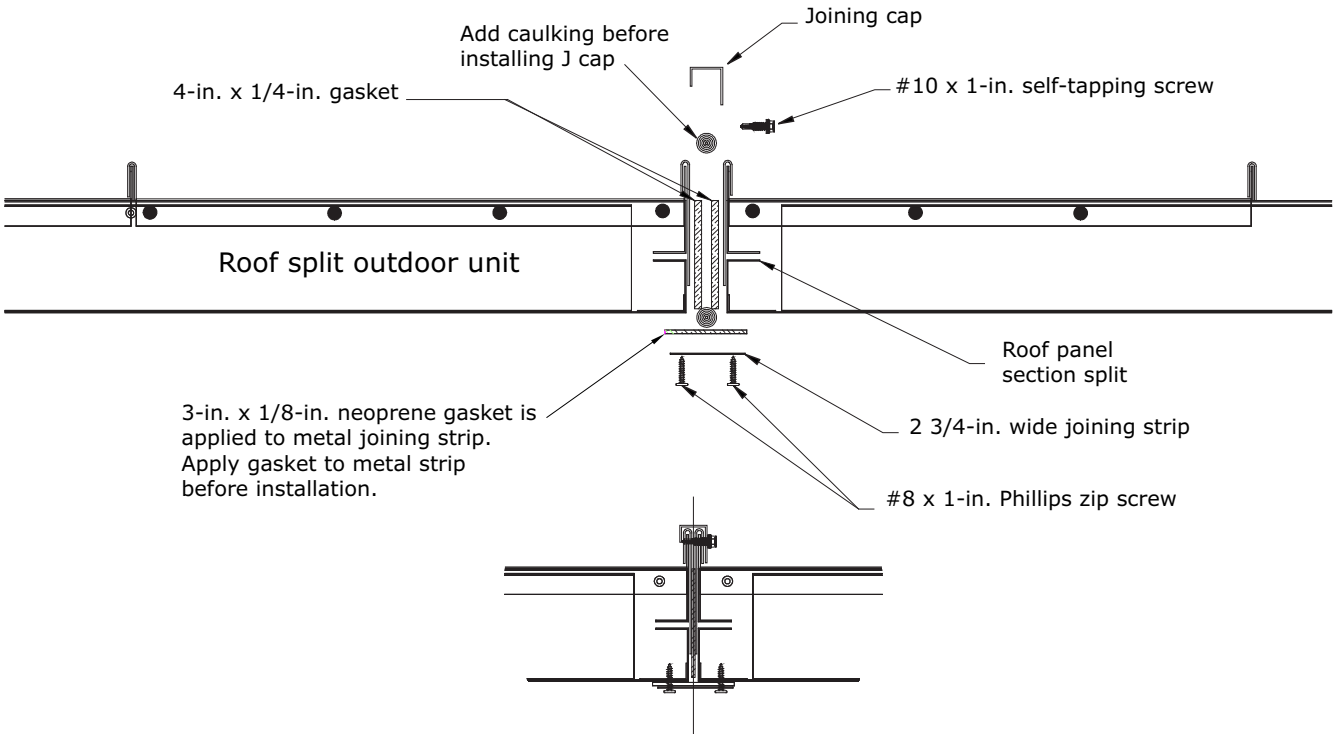
TCP Outdoor Roof Assembly - Single Span

1. Ensure shipping split sections are aligned and pulled together properly. See Figure 13.
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 #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 pre-drill to prevent separation when drilling with screws.

3. Apply caulk to end of J-cap to seal thoroughly.

Figure 13. TCP outdoor roof assembly - single span

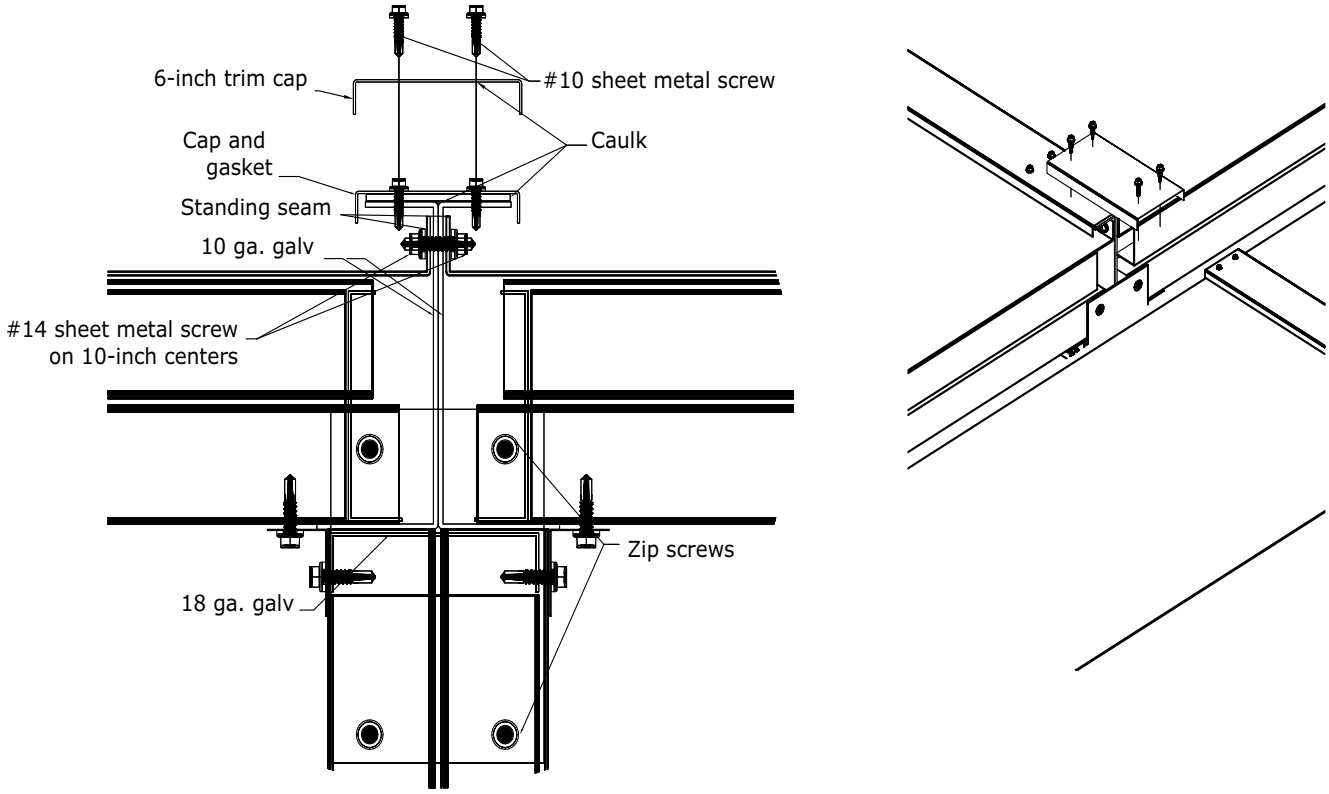


TCP Outdoor Roof Assembly - Multiple Span

Follow instructions in Figure 13 for installation of J-Caps.

4. The multiple roof split requires and additional cap that covers the center T-shaped seam running parallel to air flow.
5. Install #14 self drilling screws on 10-inch centers on underside of center split as shown in Figure 14.

Figure 14. TCP outdoor roof assembly - multiple span

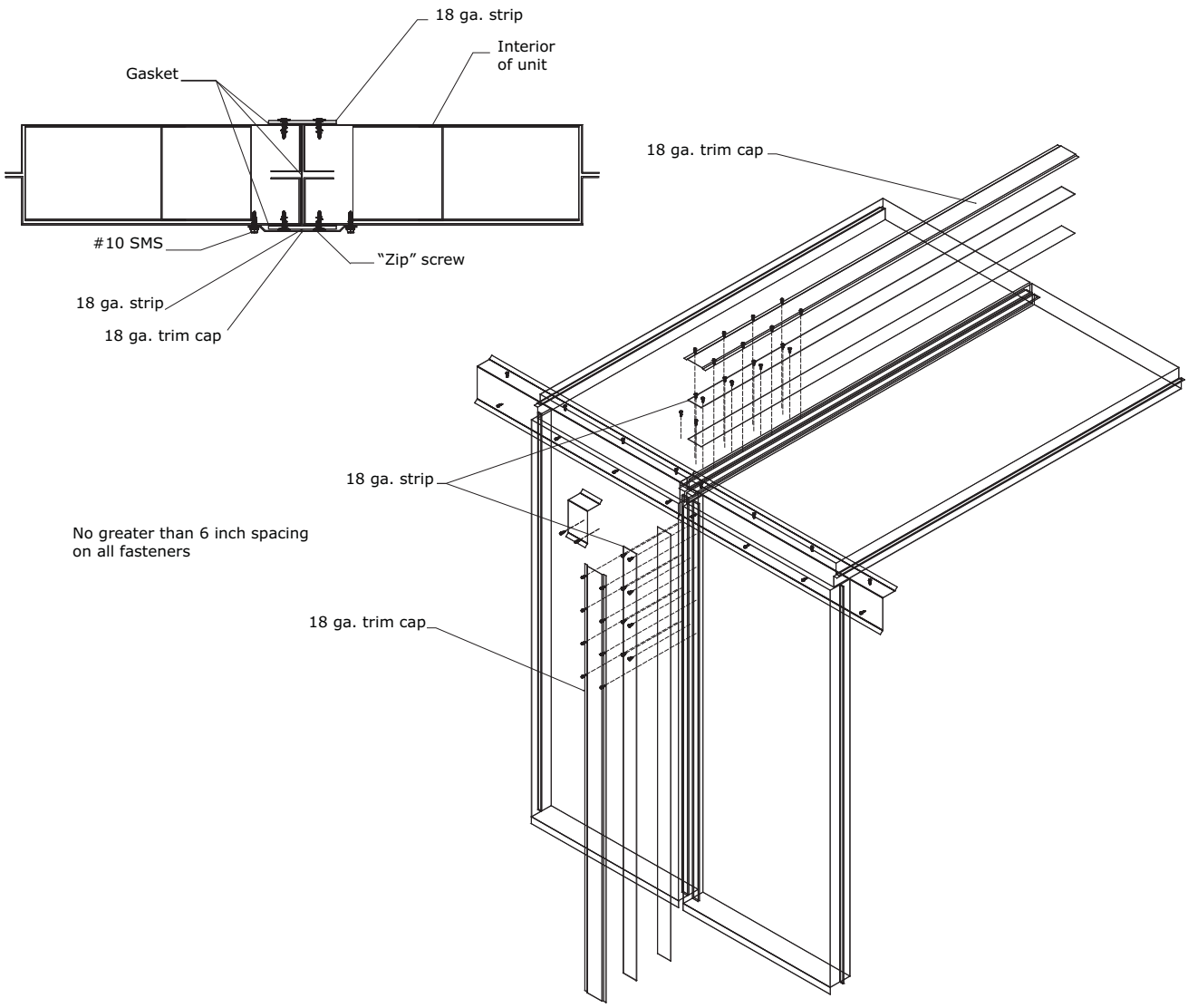


6. Apply a bead of caulk to the seam the full length that roof cap will cover.
7. Apply 3-inch x 1/8-inch adhesive-backed neoprene gasket to underside of roof cap.
8. Install roof cap using #10 sheet metal screws in pre-punched holes.
9. Apply a bead of caulk over the butt joint where roof caps meet.
10. Install roof cap trim piece at joint of each roof cap using #10 sheet metal screws.

TCP Indoor Roof Section Assembly (Typical)

1. Ensure shipping split sections are aligned and pulled together properly.
2. Apply a bead of caulk to full height of wall joint.
3. Apply 3-inch x 1/8-inch adhesive-backed foam gasket to inner joining strip.
4. Install inner joining strip using #14 x 1.5-inch gasketed tec 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 #8 sheet metal screws.
6. Fill the top and bottom openings with caulk as a moisture seal. Screw holes can be pre-drilled with a #29 bit.
7. Apply a bead of caulk over top corner of cap seam.
8. Using #10 sheet metal screws, attach corner seam trip cap as shown in Figure 15.

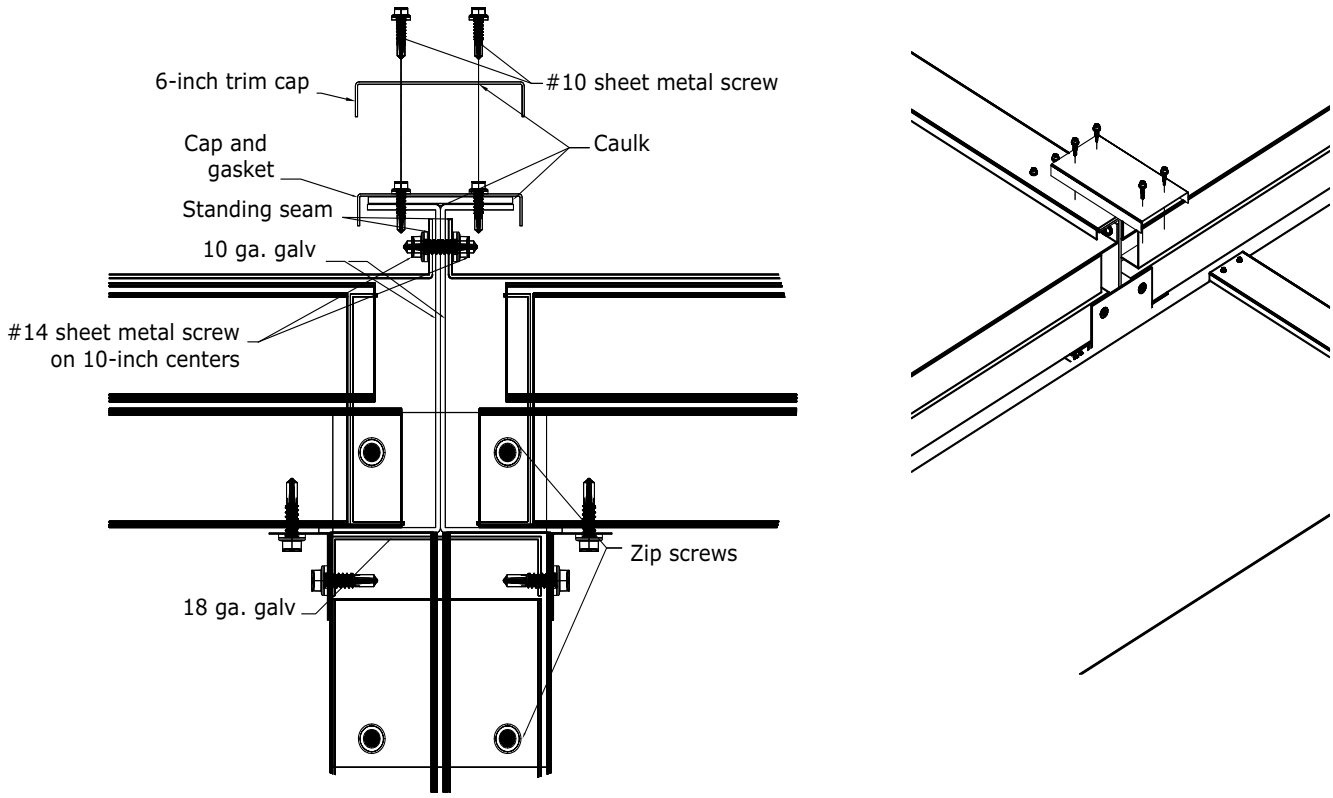
Figure 15. TCP indoor wall and roof assembly - trim cap



TCP Indoor Roof Assembly - Multiple Span

1. Ensure shipping split sections are aligned and pulled together properly.
2. Apply a bead of caulk to full height of wall joint.
3. Apply 3-inch x 1/8-inch adhesive-backed foam gasket to inner joining strip.
4. Install inner joining strip using #14 x 1.5-inch gasketed tec 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 #8 sheet metal screws.
6. Fill the top and bottom openings with caulk as a moisture seal. Screw holes can be pre-drilled with a #29 bit.
7. Apply a bead of caulk over top corner of cap seam.
8. Using #10 sheet metal screws, attach corner seam trip cap as shown in Figure 16.

Figure 16. TCP indoor roof assembly - multiple span

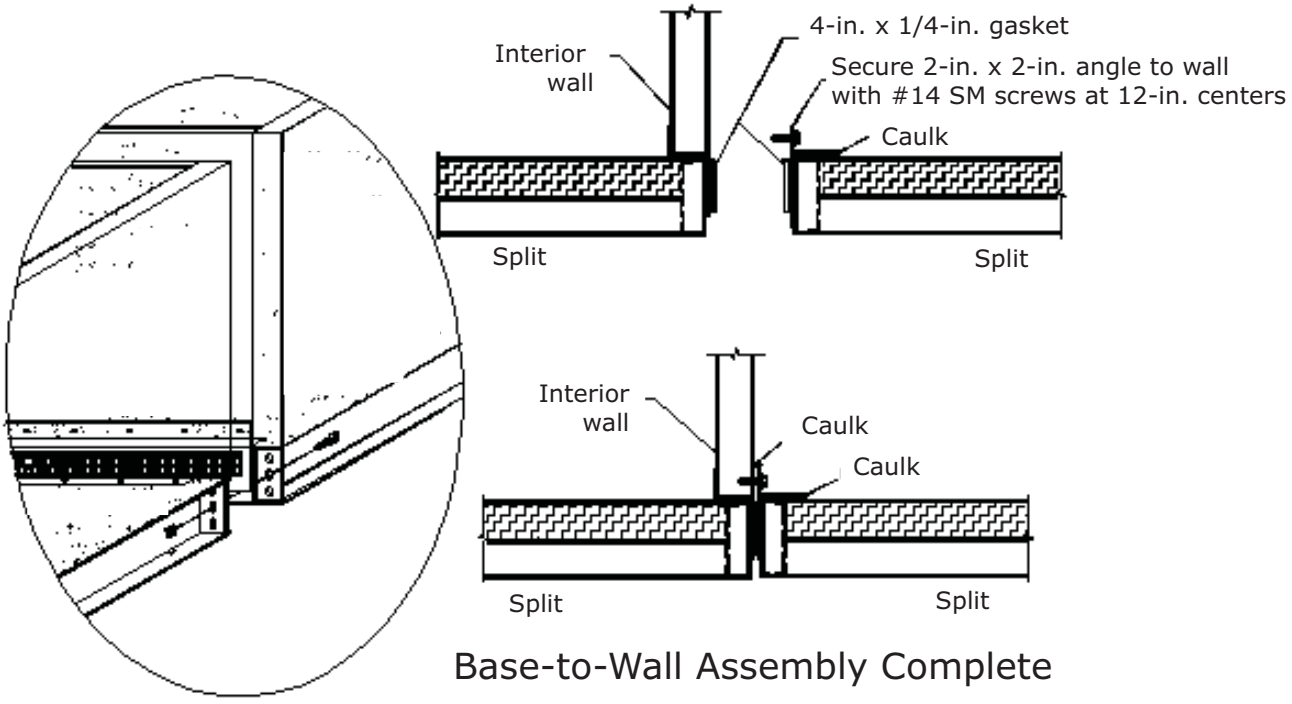


TCP Base-to-Interior Wall Section Assembly

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 Figure 17 below. Note: Use a polyurethane or equivalent caulk.
3. Secure the 2-inch X 2-inch angle to the adjoining wall with #14 sheet-metal crews on 12-inch centers along the length of the angle and wall.

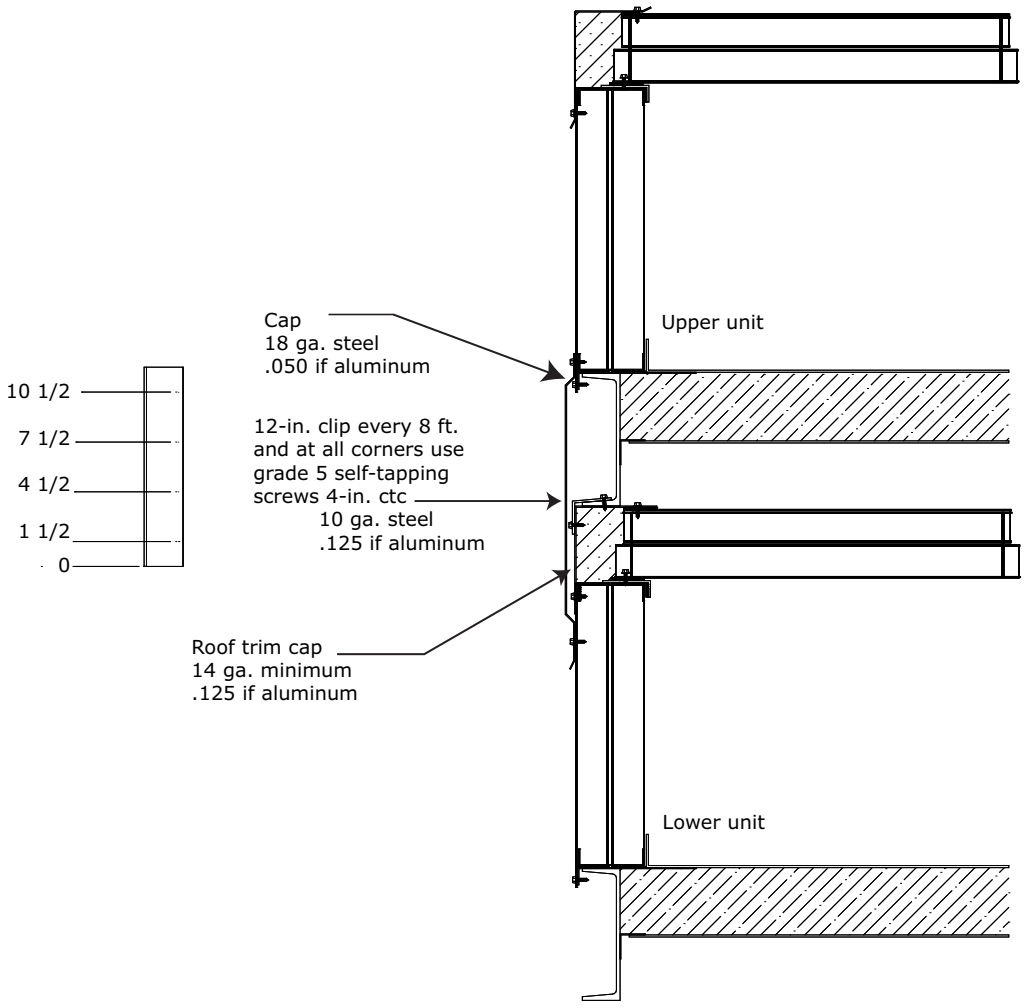
Figure 17. TCP base-to-interior wall sections



TCP Stacked Unit Assembly

1. Install and assemble all lower sections as described in typical assembly.
2. Lift first piece of upper section into place assuring proper alignment with lower unit.
3. Install 10 gauge 12-inch angle clips as shown in Figure 18 and secure with grade 5 self-tapping screws placed 4-inches on center.
4. Lift next upper piece into place and secure shipping split with appropriate hardware then anchor to lower section as described above.
5. Continue until all sections are installed and anchored properly.
6. Install the 18-gauge cover trim cap using #10 self drilling screws. See Figure 18.

Figure 18. Stacked unit trim assembly



TCC Model Assembly Instructions

NOTICE

Roof Curb Structurally Sound

Check with curb manufacturer and job engineer to ensure the roof curb is structurally sufficient to support the weight of the unit. The curb should be checked to ensure it is level and square. Curb bowing, buckling, or sagging can lead to unit assembly and operation problems up to complete failure.

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

TCC Overhang Base on Common Roof Curb

1. A base designed for use with a roof curb allows for 1/2- inch clearance around the full perimeter of the curb.
2. The end section must be installed first making sure it's properly aligned with the remainder of the curb. Anchor this section securely so the base lugs can be used to pull the next section for base connections.
3. Install 3/16-inch x 1.25-inch grey butyl tape to bottom rail of installed section allowing the tape to turn up each side wall approximately 8 inches. Remove paper backing from butyl tape. This will ensure the module-to-module joint is water tight along the bottom.
4. Lift next section onto roof curb using come-alongs to pull securely to first section. See "TCC Joining Sections - Edge-to-Edge" on page 33 for assembly details.

TCC Flat Base to Steel Dunnage or Concrete Pad

Important: 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.

1. A base designed for concrete or steel dunnage has a flat channel base that allows the sections to be installed level and square. Pad and dunnage should have unit perimeter marked clearly allowing a completely square installation. See Figure 19 and Figure 20.
2. Install first section and anchor with best method to hold securely.
3. Proceed with remaining sections per installation guidelines.

Figure 19. Steel base to concrete pad

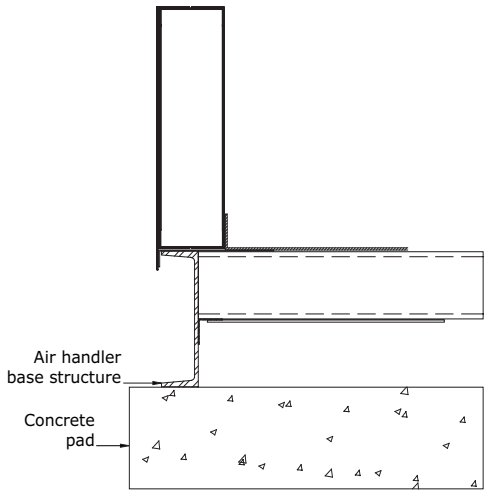
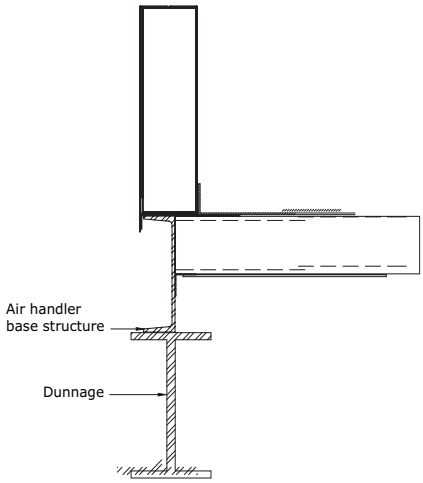


Figure 20. Flat base to steel dunnage



TCC Joining Sections - Edge-to-Edge

NOTICE
Microbial Growth!

The roof curb 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 the equipment can become an amplification site for microbial growth (mold), which may cause odors and damage to the equipment and building materials.

NOTICE
Level Foundation!

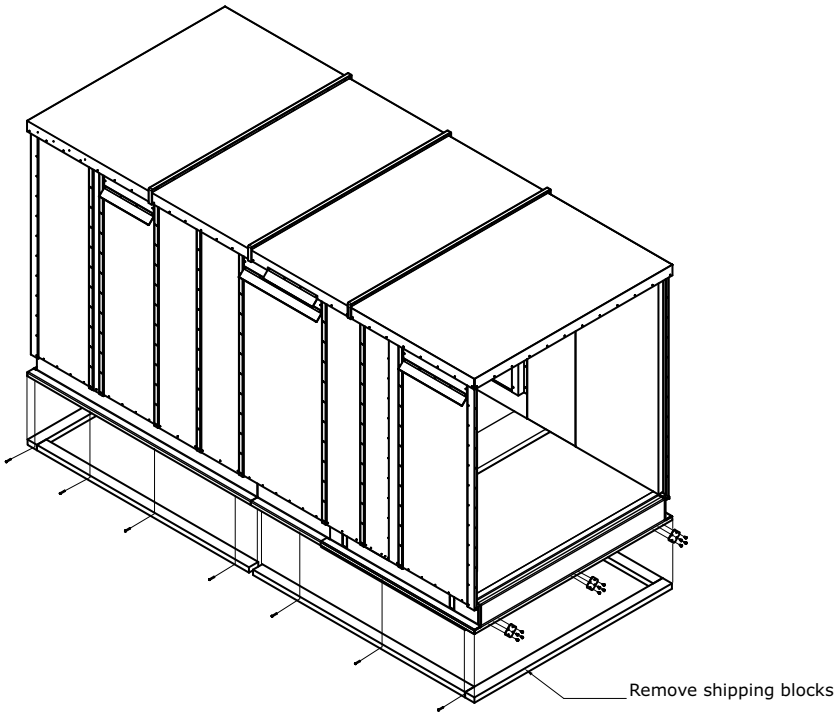
A level foundation is critical to proper unit and door alignment, operation, and sealing. Failure to level and align sections properly can lead to structural damage.

Important: 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.

1. The end section must be installed first making sure it's properly aligned with the remainder of the curb. Anchor this section securely so the base lugs can be used to pull the next section for base connections.
2. For units with curb base, remove shipping blocks (see Figure 21).

Figure 21. Shipping block removal.



3. Install 3/16-inch x 1.25-inch ribbed grey butyl tape to bottom rail, each side wall, and top rail. Remove paper backing from butyl tape. This will ensure the module-to-module joint is water tight along the bottom. See Figure 22 and Figure 23.

Figure 22. Apply butyl tape to shipping splits

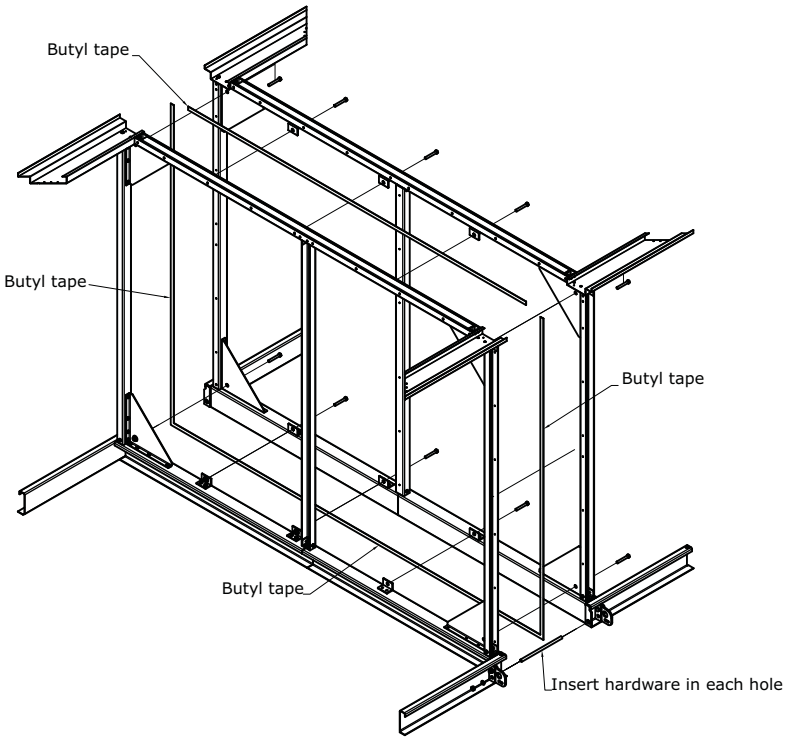
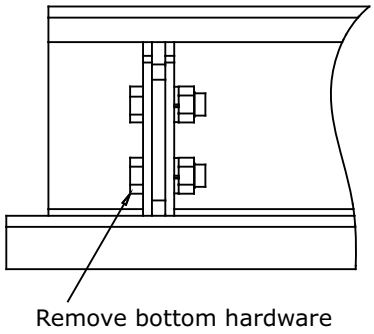


Figure 23. Butyl tape is applied to shipping splits

Figure 24. Remove lifting lug bolts



4. Lift next section into place sitting it as close to the previous section as possible.
5. Remove lifting lug bolts. See Figure 24.
6. Using a come-along on each side in unison, pull second section securely to first section. Insert all 5/8-inch threaded rod through base lugs and tighten nuts to pull sections firmly together for final fit. See Figure 25 and Figure 26 for assembly details.

Figure 25. Insert field provided threaded rods

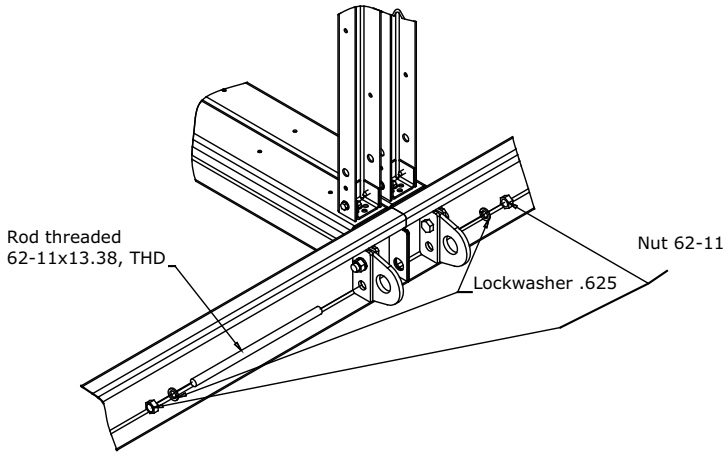
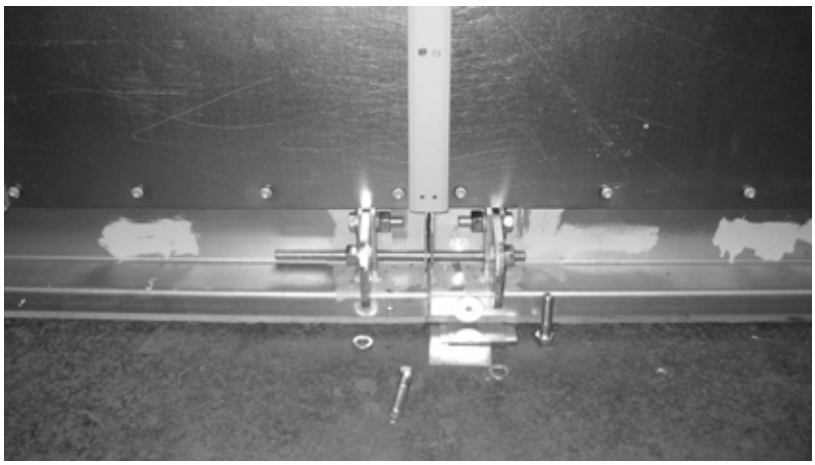


Figure 26. Insert threaded rods



TCC Internal Shipping Split Frame Assembly (Typical)

1. After exterior shipping split has been sealed, interior 2.5-inch x 2.5-inch angles can be bolted together using supplied hardware (see Figure 27, Figure 28, and Figure 29).

Figure 27. Join internal shipping split frame

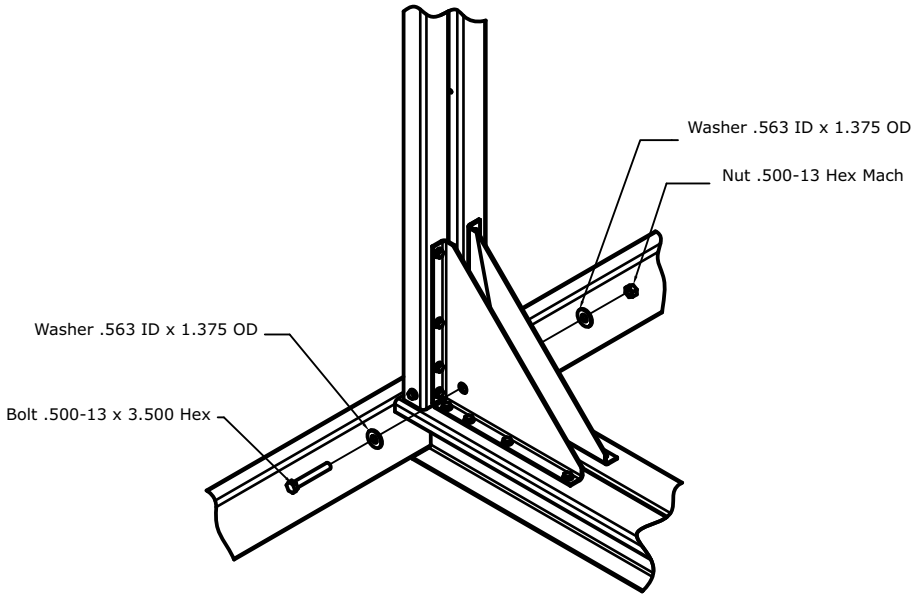


Figure 28. Join internal shipping split frame- Graphic 1

Figure 29. Join internal shipping split frame- Graphic 2

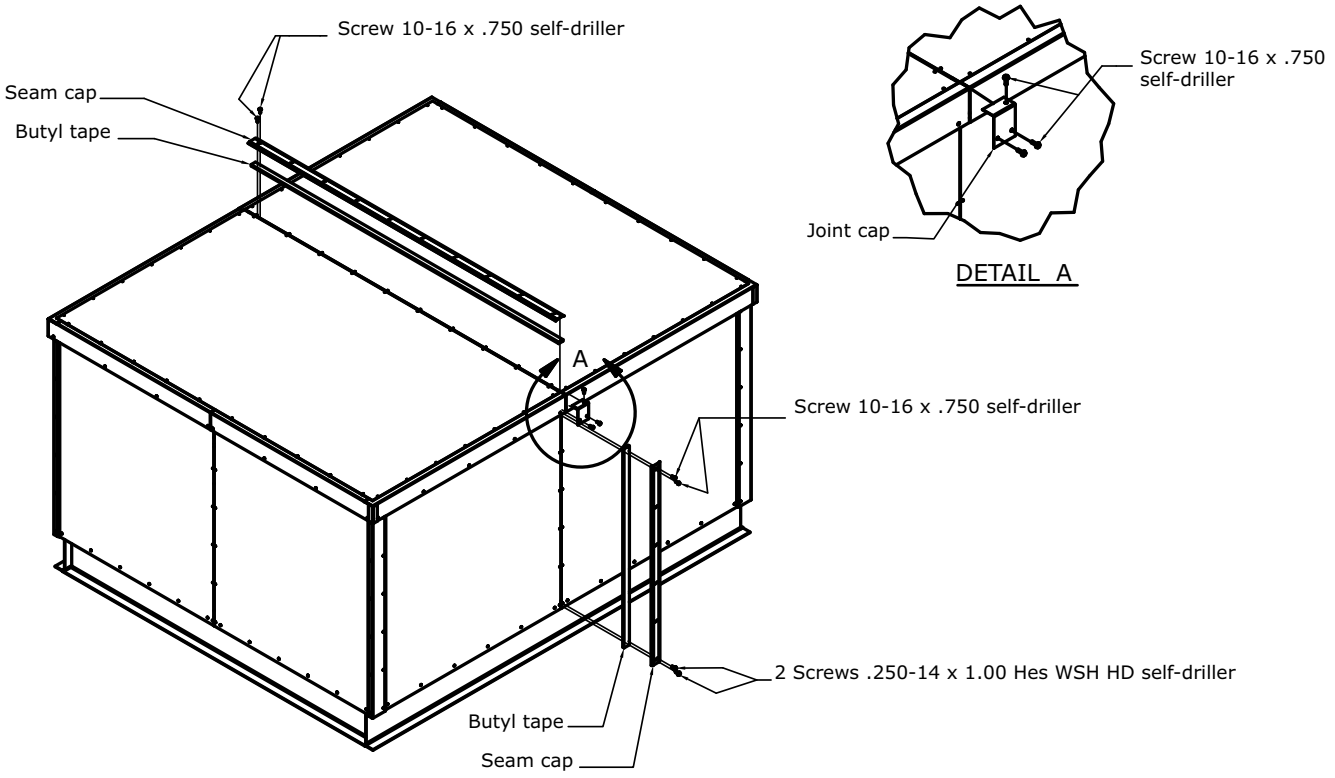
TCC Wall Section Assembly (Typical)

1. Verify external unit squareness.
2. To complete the exterior joint, install a bead of caulk full height of side panel joint.
3. Over caulk, install 3/16-inch x 1.25-inch ribbed grey butyl the full height of the side panel up to underside of roof overhang. Leave the paper backing on this tape, sealing the joint does not require this to be removed. The paper will be facing out towards seam cap.
4. Install side seam cap over butyl tape and secure with #10-16 x 0.750 self-drilling screw. The bottom two screws on this seam cap will be larger, ¼ x 20 self drillers with neoprene gasket (see Figure 30).

TCC Indoor Roof Section Assembly (Typical)

1. Verify external unit squareness.
2. 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).
3. Install seam cap over the butyl, uniformly straddling the splits. Secure with the provided number 10 sheet metal screws. See Figure 30.

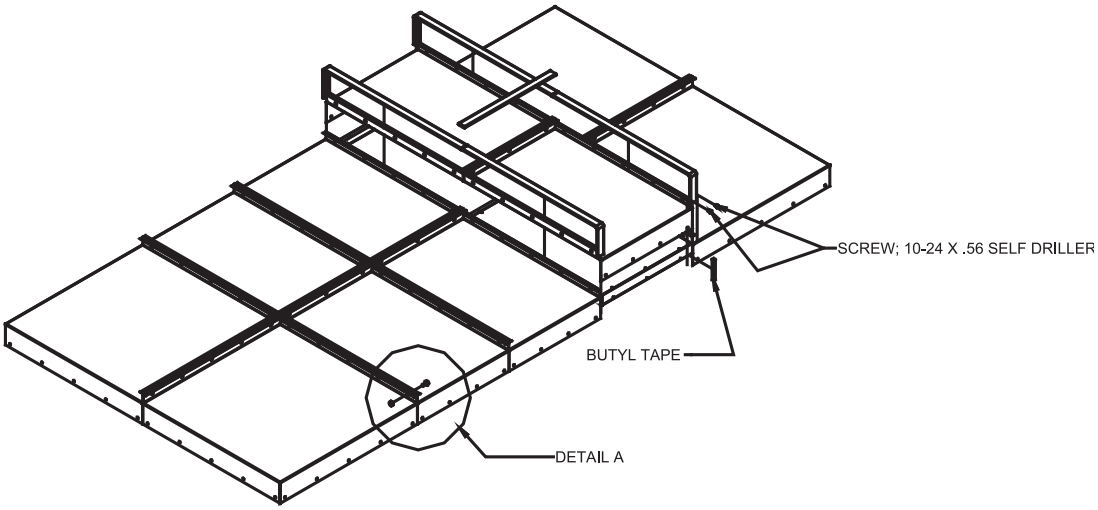
Figure 30. Install seam cap over the butyl tape



TCC Outdoor Roof Section Assembly (Typical)

1. 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 31).

Figure 31. Join outdoor roof panels at the seams



2. 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 32 and Figure 33).

Figure 32. Trim roof joint strip

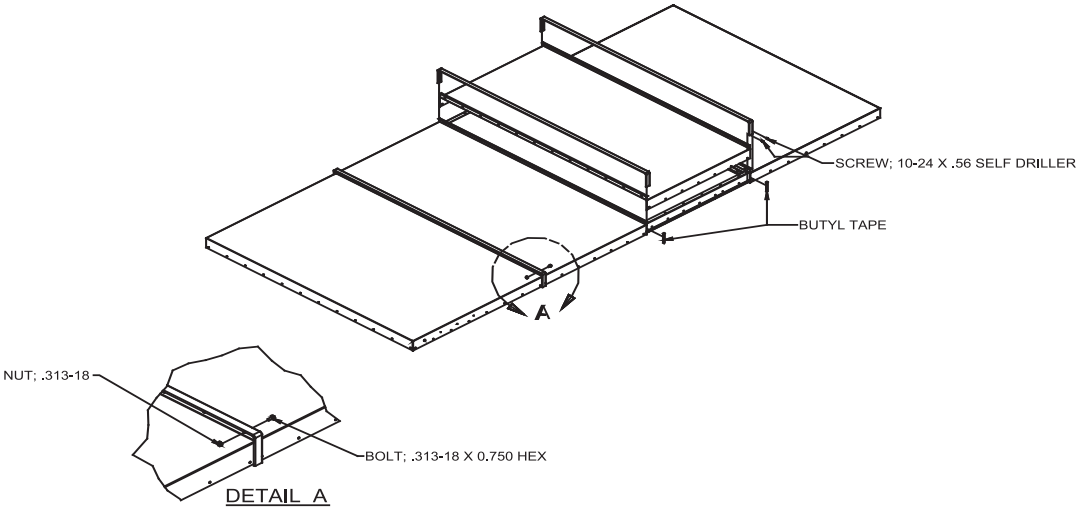
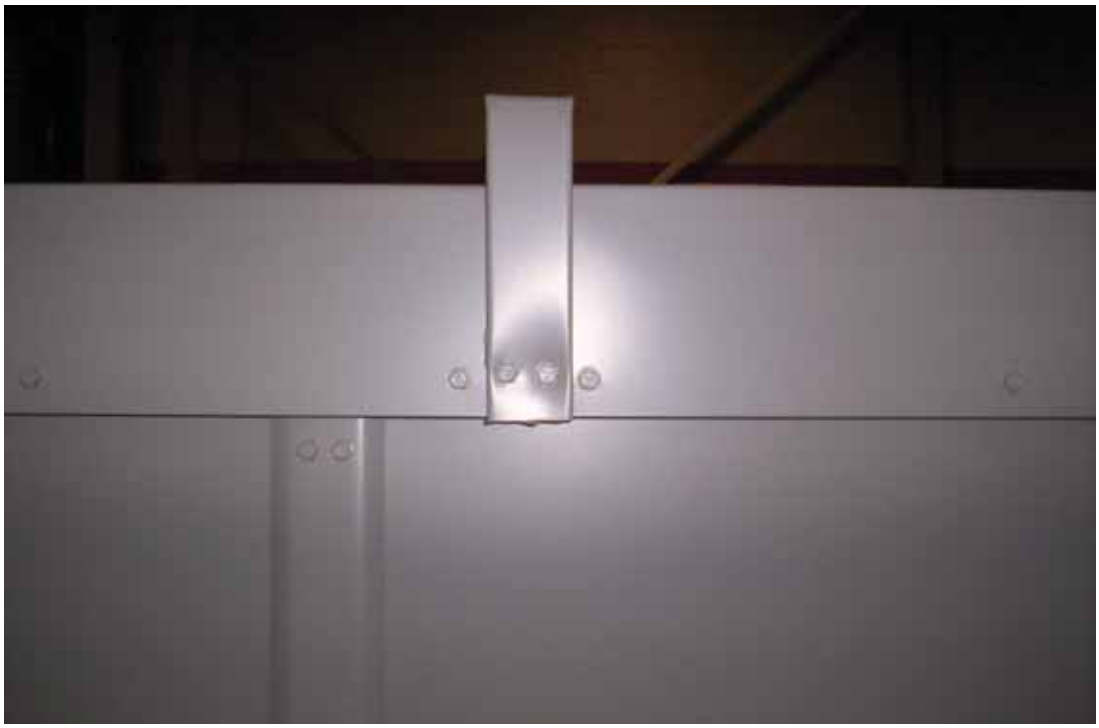


Figure 33. Trim roof joint strip



TCC Stacking Procedure

1. After bottom section of stacked arrangement is in place, ensure top is clean and free of debris.
2. Apply two layers of 0.188-inch x 2-inch gasketing around perimeter of top section layout. See Figure 34.
3. Apply two layers of 1-inch x 2-inch tape around perimeter of openings in lower unit roof. See Figure 34 and Figure 35.
4. Lift upper section into place carefully aligning into proper position (see Figure 35).
5. Install 0.250-14 x 0.750 self drilling screws in each hole around upper unit base perimeter.
6. Install flashing at base of top section (see Figure 35 Detail A).

Figure 34. Upper base connection to lower unit gasket.

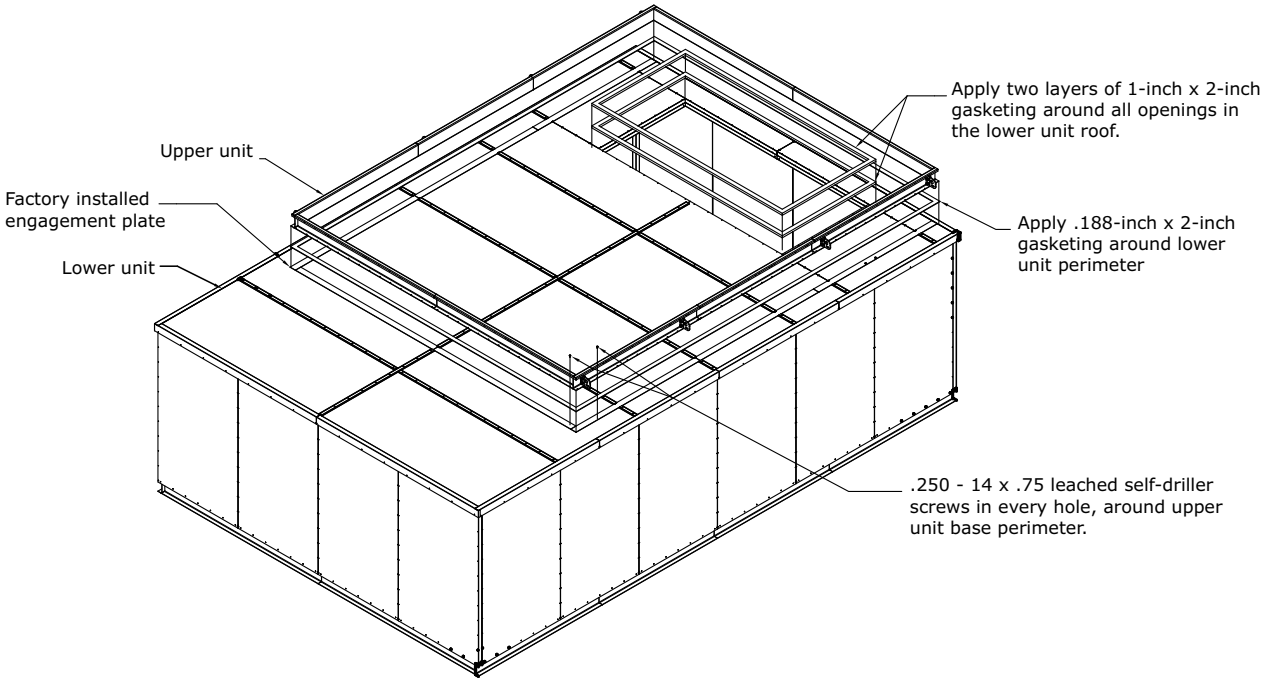
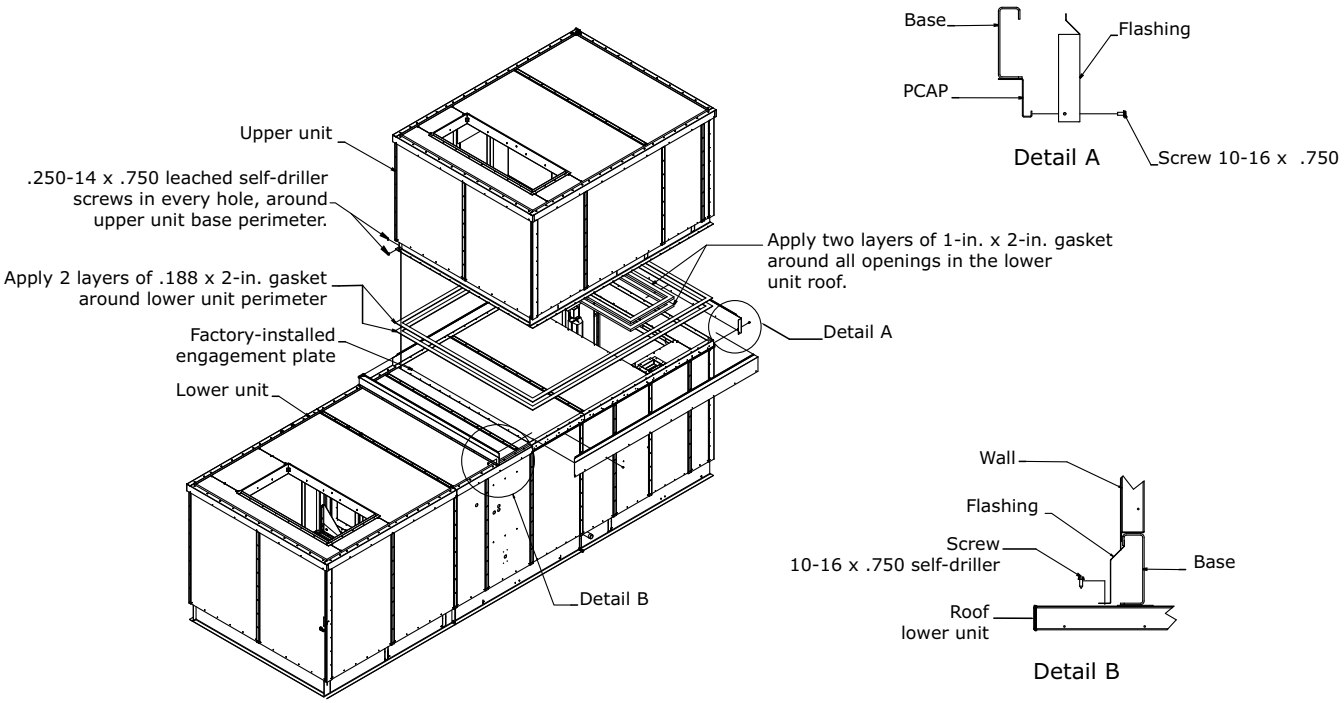


Figure 35. Stacked assembly

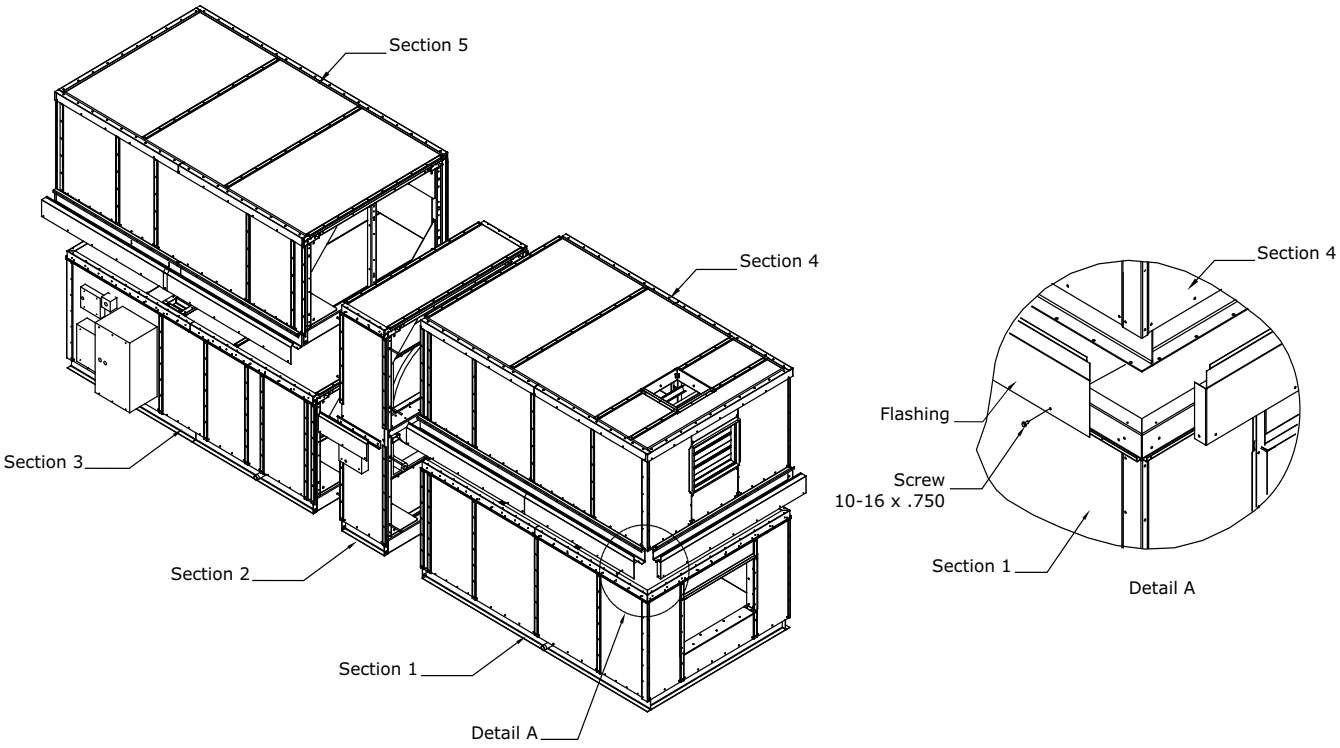


TCC Energy Wheel and CDQ Wheel Assembly

Units are shipped unstacked.

1. Set sections 1 – 5 of the unit in place in sequence order as shown in Figure 36 and secure as needed.
   – Prior to setting section 2 and 3 apply 2-in. x 1-in. thick gasket across full unit width along the wheel's upper-to-lower septum.

Figure 36. Energy wheel and CDQ wheel assembly



2. Prior to upper unit placement, install 0.188-in. x 2-in. gasketing on entire length of engagement plate and/or lower unit perimeter as needed. Engagement plates are used when the upper and lower unit dimensions are not matched. Refer to "TCC Stacking Procedure" on page 40.
3. Apply two layers of 1-in. tall x 2-in.wide gasketing around perimeter of roof opening in lower unit section prior to lifting upper unit. Refer to "TCC Stacking Procedure" on page 40.

Note: If gasketing is not installed first, leakage may occur between the upper and lower units and will result in CFM loss.

4. Upper unit with duct opening should be placed within 1-inch of lower duct opening in order to sufficiently compress gasket.
   – Once unit is set in place verify the gasket seal between openings.
5. After installing all of the upper unit sections, Install all-thread rods (field-provided) fastening both upper and lower sections to the wheel section.
6. Fasten the upper unit to the lower unit perimeter cap with ¼-inch self-drilling screws through base rail.

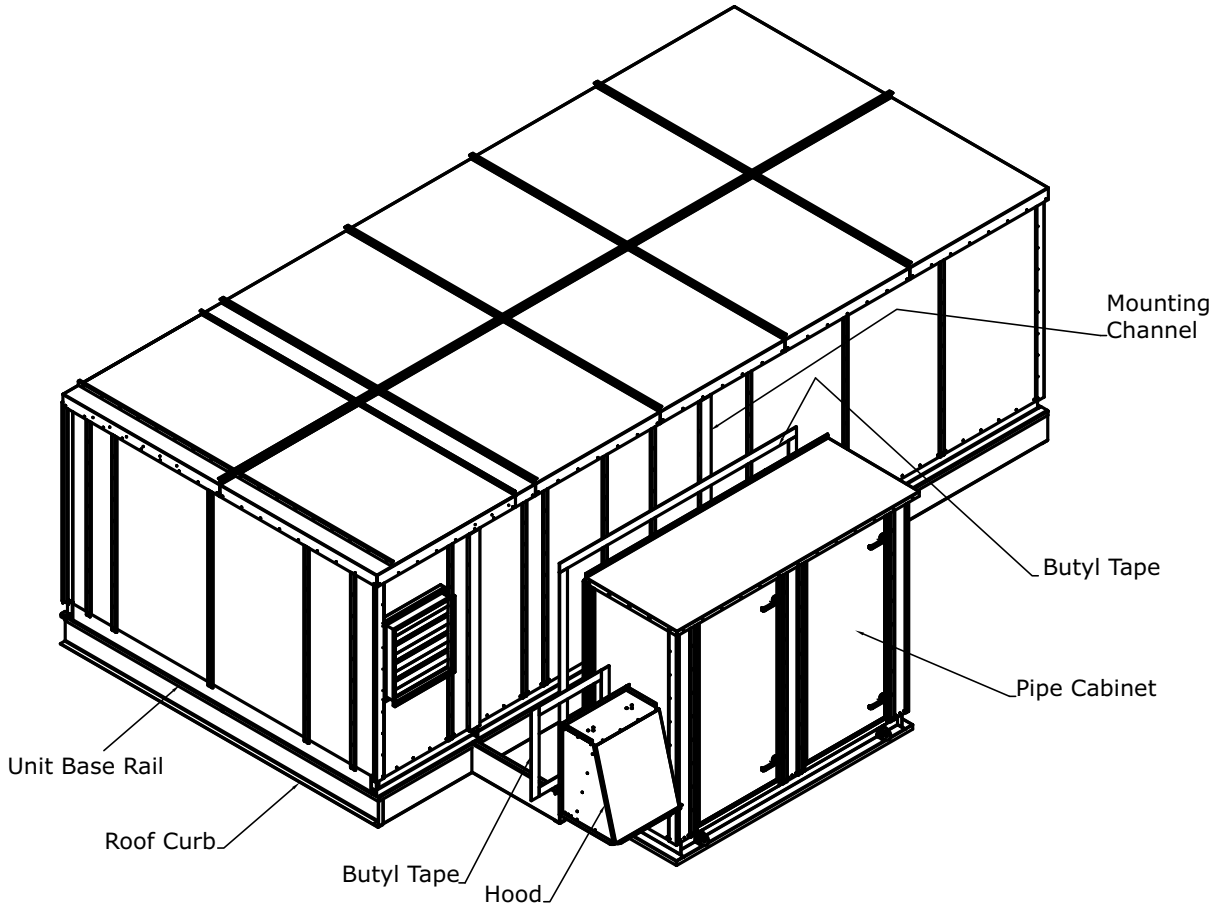
Note: A drill extension will be required to ensure straight alignment.

7. Units will have field installed flashing. Remove upper unit lifting lugs, in order to install flashing between the upper and lower unit.
   - Parts are number matched to the unit. Each piece of flashing will be identified with a unit section number in which it applies.
   - Top edge of flashing will be placed behind upper unit base rail flange and fastened to lower unit perimeter cap.
   - Use #10 screws to install flashing.
   - For external/outdoor units caulk the corners and top edge of the flashing.

Pipe Cabinet Installation

1. After air handler is completely installed and checked for accuracy of level and square, pipe cabinet install can begin.
2. Remove bolts holding the lifting lugs in place from the base of the air handler.
3. Check to ensure that the structure the pipe cabinet is to be installed on is square and level.
4. Install 3/16-inch x 1. 25-inch grey ribbed butyl tape to flanged side of pipe cabinet wall and remove paper backing from tape. See Figure 37.

Figure 37. Pipe cabinet installation



5. Lift cabinet into place aligning base tab with lifting lug brackets on air handler base.
6. Slide pipe cabinet tight up against mounting channels on side wall of air handler.
7. Install bolts through lifting lug gussets to anchor pipe cabinet base to the air handler. See Figure 38. and Table 1.

Figure 38. Pipe cabinet detail

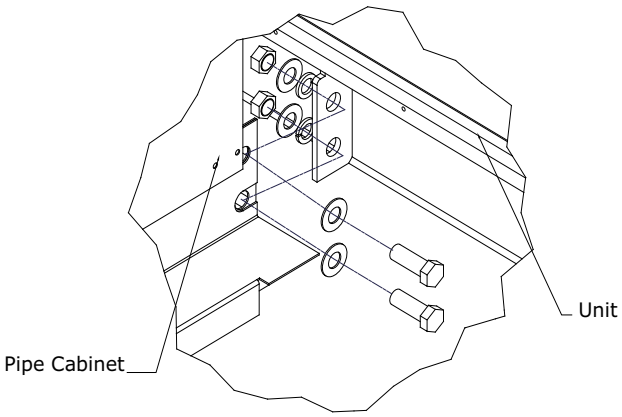


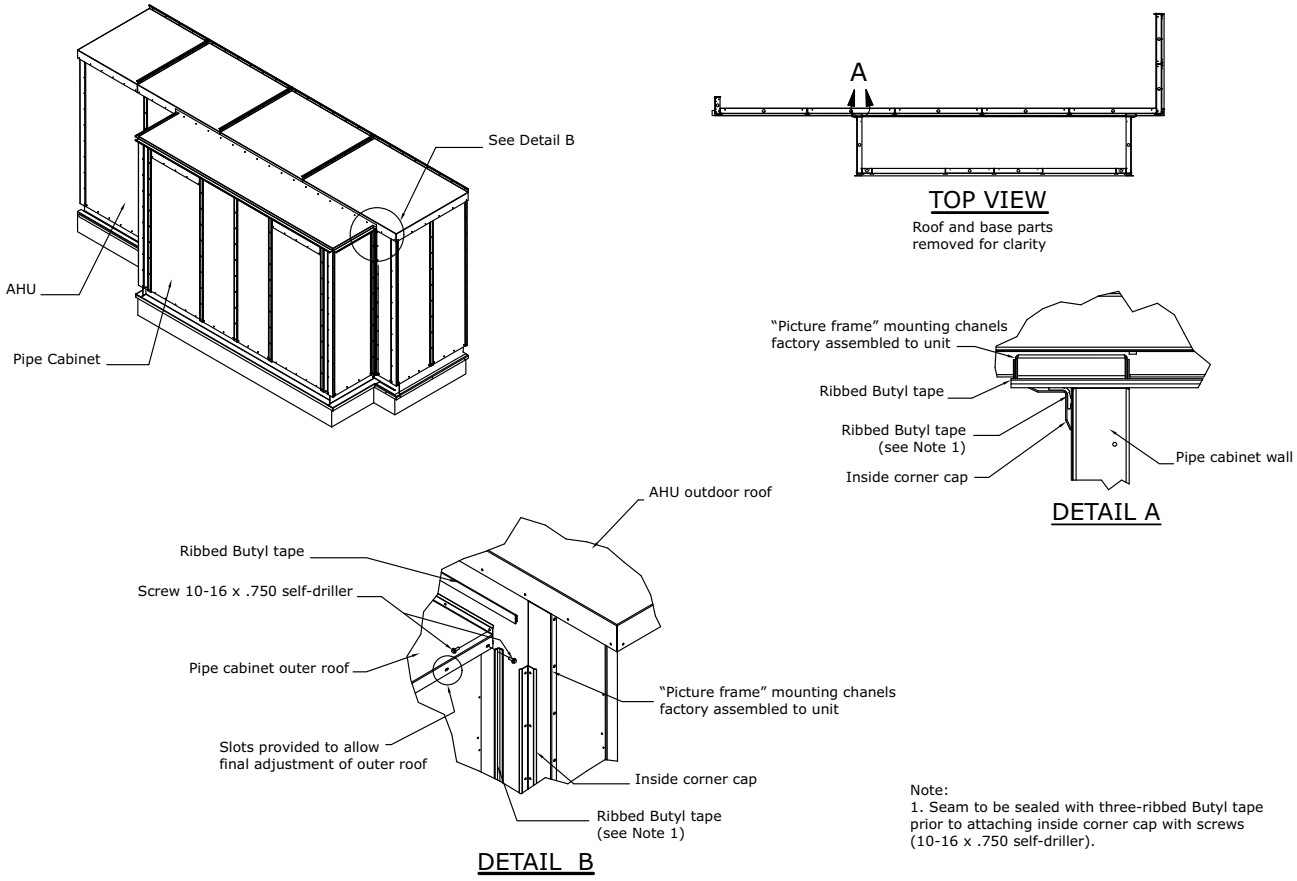
Table 1. Pipe cabinet hardware

Qty	X-Code	Code Description	Description
4	X25017800000	BOLT; 0.625-11 X 1.750	5/8-1.75 in. Bolt
4	X28021500000	NUT; 0.62-11	5/8-11 Nut
4	X22020800000	LOCKWASHER; 0.625 ID	5/8-in. Lock Washer
8	X22050313010	WASHER; 0.656 ID X 1.312 OD	Flat Washer

8. Check pipe cabinet side walls to ensure they are plumb.
9. Apply a bead of caulk along the corner between the pipe cabinet and air handler wall prior to installing connecting angle.

10. Install inside corner cap. See Figure 39 Detail A and B.
11. Install 3/16-inch x 1.25-inch grey ribbed butyl tape to unit wall where pipe cabinet roof connects.
12. Lift pipe cabinet roof into place and attach to unit wall with screws. See Figure 39.

Figure 39. Pipe cabinet



Duct Connections

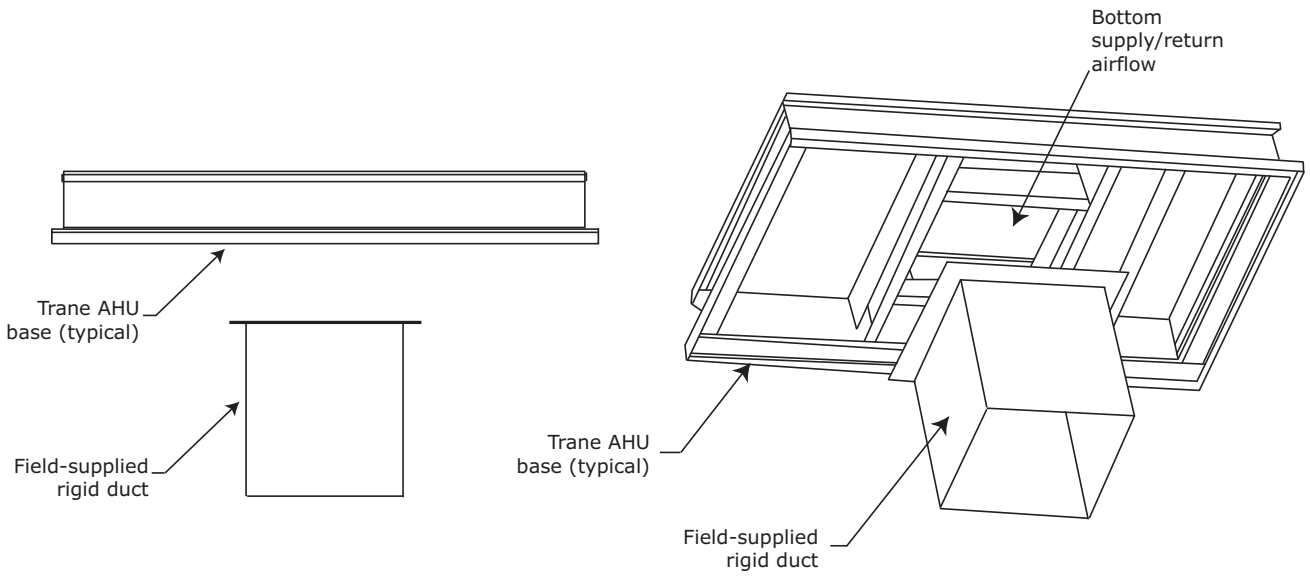
All duct connections to the units should be installed in accordance with the standards of the National Fire Protection Association (NFPA) for selecting and installing of air conditioning and ventilating systems other than residence type (NFPA 90A), and residence type warm air heating and air conditioning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

Bottom Opening Duct Installation

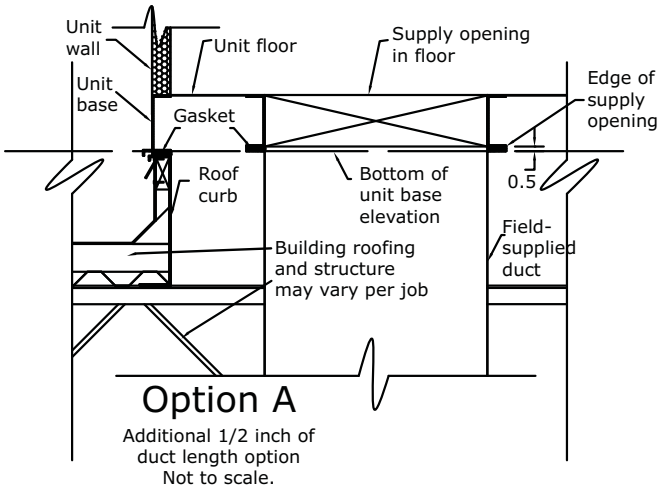
1. Install gasket to duct flange to ensure air tight seal.
2. Install duct into place underneath framed opening in unit base per Figure 40. Refer to factory curb layout provided with unit submittals for duct size and location.

Figure 40. Field-supplied duct connection to AHU bottom supply/return air opening



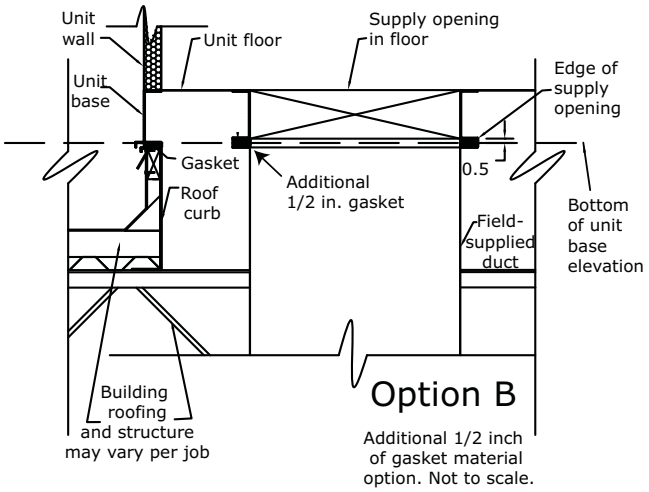
3. Bottom of unit base elevation is ½ inch lower than edge of duct opening in bottom of unit. During unit installation on roof curb, either raise field provided duct per Option A (see Figure 41) or add additional gasket material to compensate for the ½ inch offset per Option B (see Figure 42).

Figure 41. Field-supplied duct connection option details - Option A



Note: Bottom of unit base elevation is 1/2 inch lower than edge of duct opening in bottom of unit. During unit installation on roof curb, either raise field-provided duct or add additional gasket material to compensate for the 1/2 inch offset.

Figure 42. Field-supplied duct connection option details - Option B



Note: Bottom of unit base elevation is 1/2 inch lower than edge of duct opening in bottom of unit. During unit installation on roof curb, either raise field-provided duct or add additional gasket material to compensate for the 1/2 inch offset.

Component Installation Requirements

⚠ 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.

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

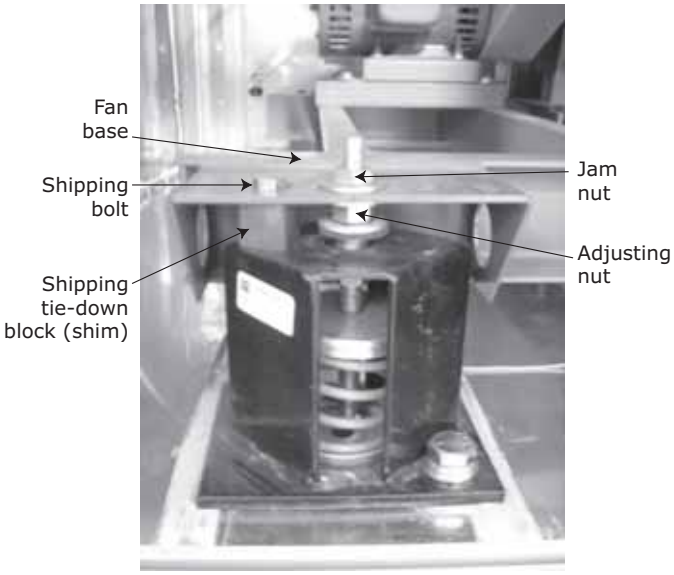
The fan and motor assembly are internally isolated. The fan and motor bases are bolted to a minimum of four spring isolators. The isolators are secured to the fan section support base. Shipping tie-down blocks are bolted to the isolators between the fan base and the isolator support frame.

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 can and should be performed by one person to ensure that the proper sequence is followed.

Figure 43. Isolator



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. See Figure 43.

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.
3. Turn the adjusting nut two or three turns only, counterclockwise on each isolator in a sequenced manner. The equipment weight will compress the spring inside the housing approximately 1/4 inch.
4. 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.
5. 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.

6. Continue adjusting other isolators in sequence and repeat the same adjustment. Continue until all isolators are adjusted.
7. Replace the jam nut on each isolator adjusting bolt, tighten the nut, and remove the shipping tie down block.

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.

Air Filters

⚠ 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.

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 44 through Figure 47 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.

Figure 44. C-70 fastener holds 2-inch filter

Figure 45. C-86 fastener (shown) or C-77 fastener holds 4-inch pleated filters

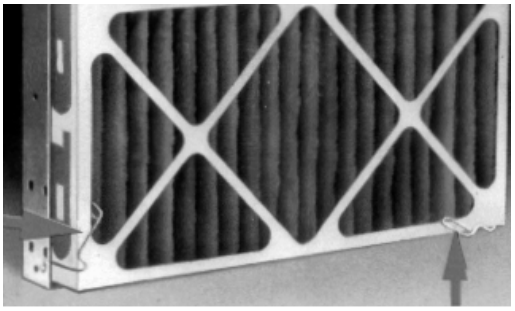


Figure 46. Bag filter show with C-70 fastener

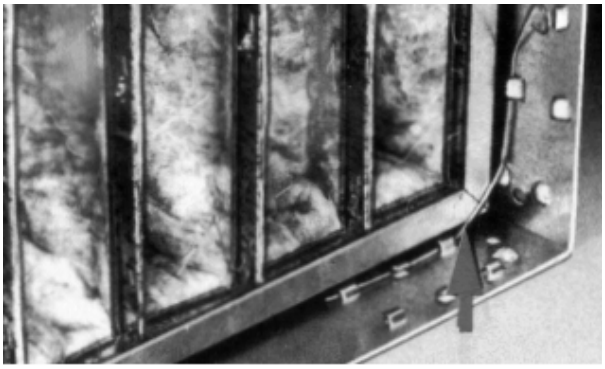
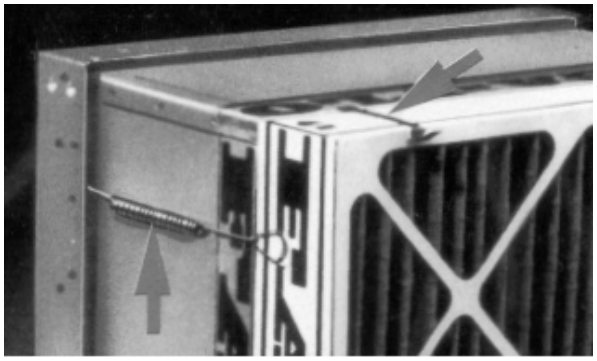


Figure 47. C-80 spring fastener secures cartridge



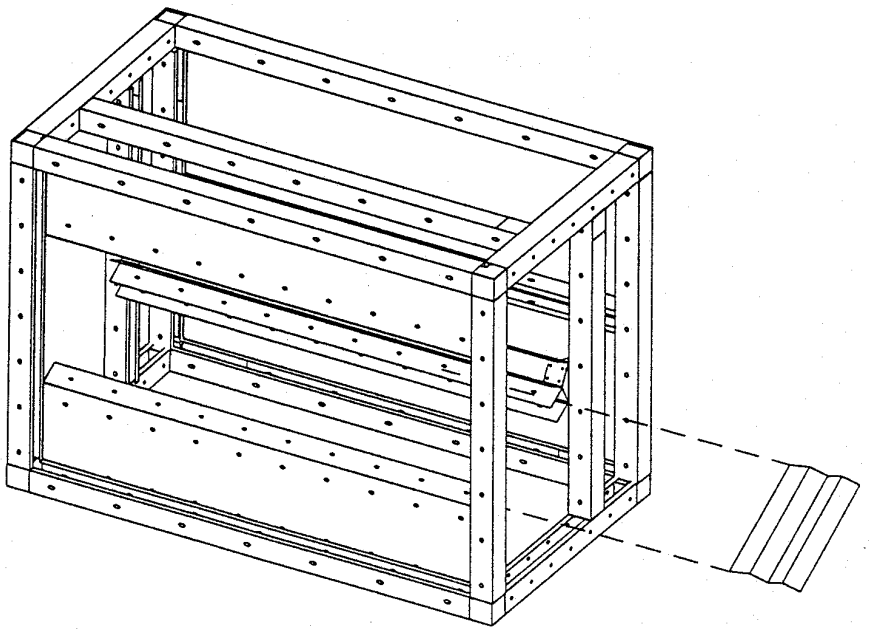
Side Load Filters

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.
5. Close and secure the door, making certain the door closes snug against the block-off (see Figure 48).

Figure 48. Filter block-off placement



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.

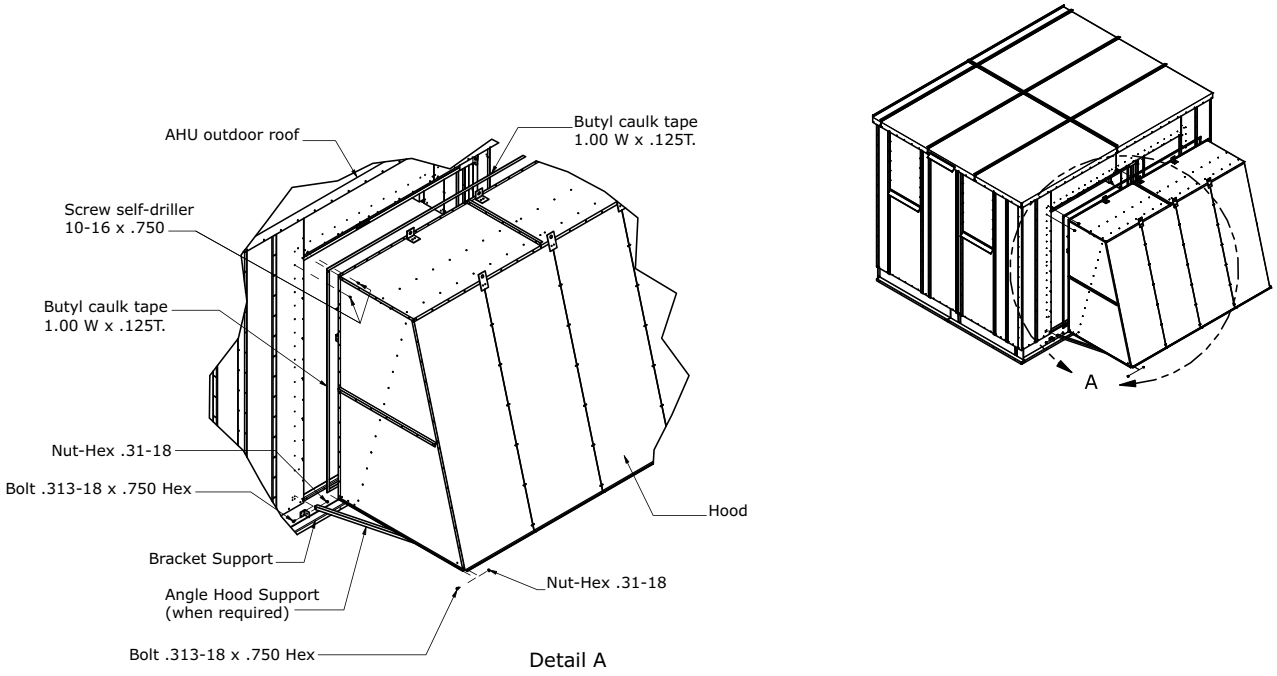
Note: The block-off is intended to make a seal when the access door is closed. It may require a few adjustments to ensure a proper seal.

Outdoor Unit Weather Hood(s)

1. Per the unit drawing determine mounting location of the unit weather hoods.
2. Using the factory provided screws mount the weather hoods to the unit.
3. On larger units, weather hoods may be large enough to require angled down supports. In those cases, the angles are shipped attached to the hood but will need to be connected to the air handler by the installing contractor. See Figure 49.

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

Figure 49. Hood installation



Coil Piping and Connections

General Coil Piping 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.
- If extended drains and vents are required on water coils, they must be field-installed or ordered from the factory.
- Pipe coils counterflow to airflow.

NOTICE
Connection Leaks!

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 could cause connection leaks.

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

NOTICE
Over Tightening!

Do not use teflon-based products for any field connections because their high lubricity may allow connections to be over-tightened, resulting in damage to the coil header.

- Use pipe sealer on all thread connections.

NOTICE
Leakage!

Properly seal all penetrations in unit casing. Failure to seal penetrations from inner panel to outer panel may result in unconditioned air entering the unit, and water infiltrating the insulation, resulting in equipment damage.

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

Drain Pan Trapping

⚠ WARNING
No Step Surface!

Do not walk on the sheet metal drain pan. Walking on the drain pan could cause the supporting metal to collapse. Failure of the drain pan could result in death or serious injury.

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

Figure 50 illustrates the proper trapping, piping, and operation of the trap for negative pressure sections. Use the formula under the figure to determine the correct minimum depth for the condensate trap.

Figure 51 illustrates the proper trapping, piping, and operation of the trap for positive pressure sections.

Note: Positive pressure traps require a different design than negative pressure traps.

If a section has a drain pan for cleaning purposes only, it does not need a trap; however, a cap or shutoff valve should be installed on the drain connection. Only sections handling condensate, such as a cooling coil section or moisture eliminator section, require a trap.

NOTICE
Water Damage!

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

Figure 50. Drain pan trapping for section under negative pressure

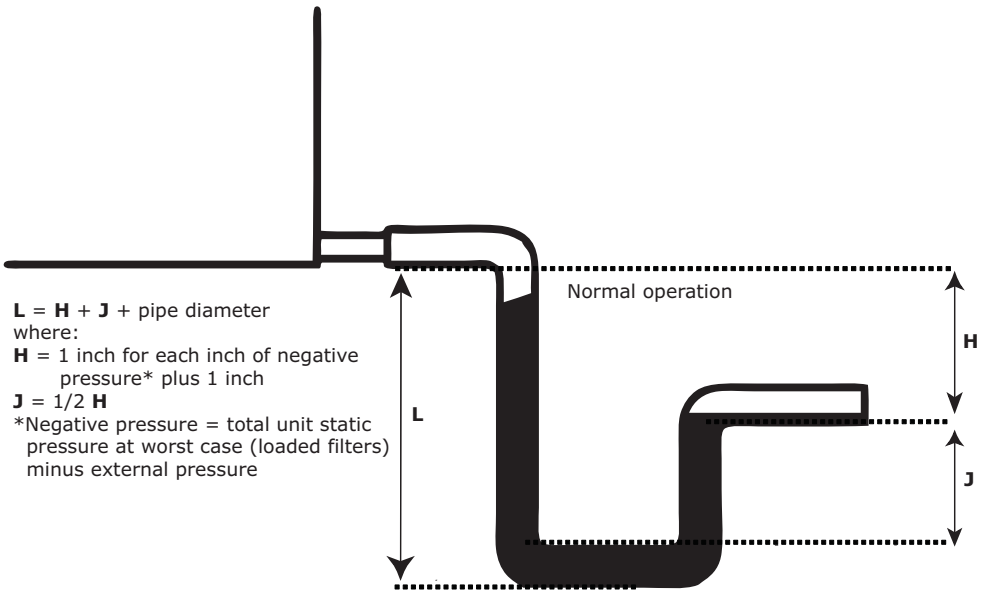
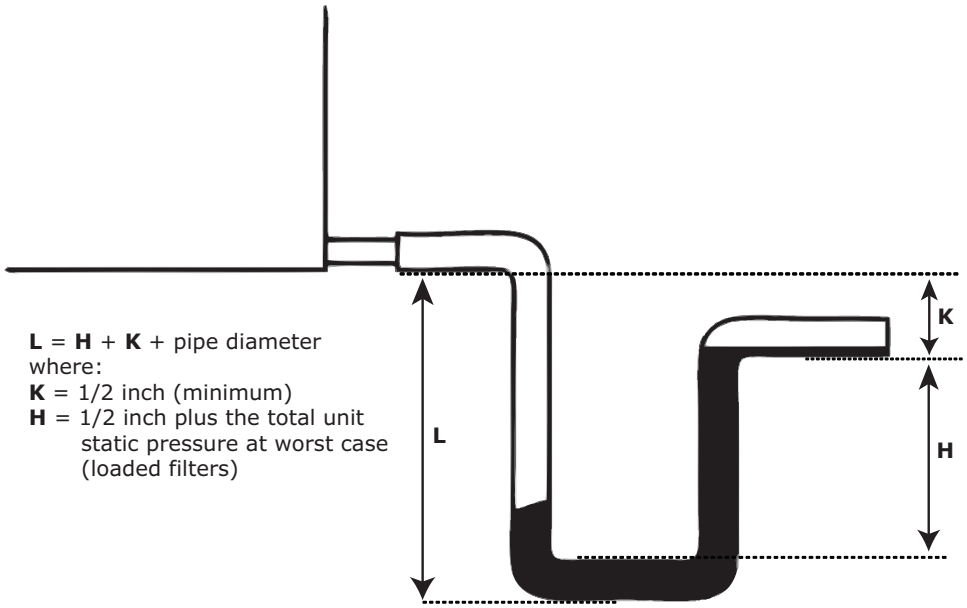


Figure 51. Drain pan trapping for section under positive pressure



Steam Coil Piping

Air handlers fitted with steam coils have labeled holes for piping penetrations. Figure 52 and Figure 53 illustrate typical steam coil piping configurations. See Table 2 for the codes of system components in these figures.

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

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

Figure 52. Typical piping for Type N steam coils and horizontal tubes for horizontal airflow

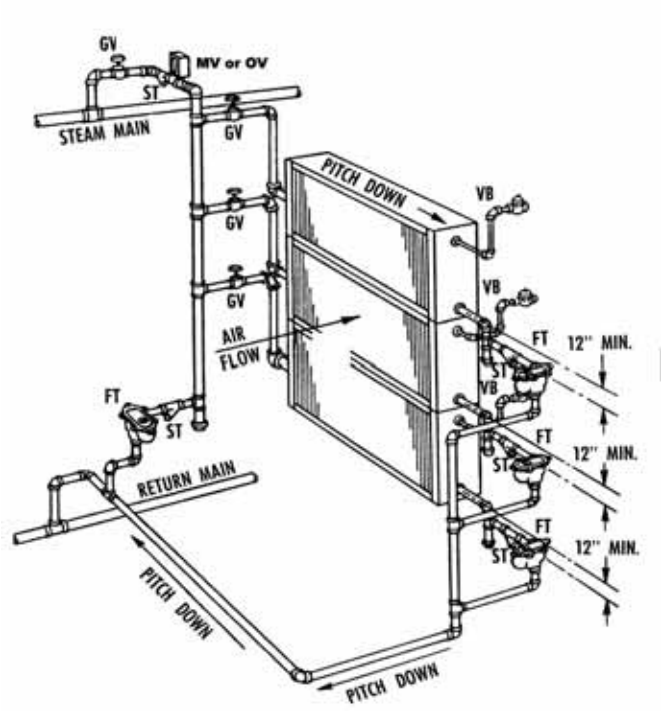
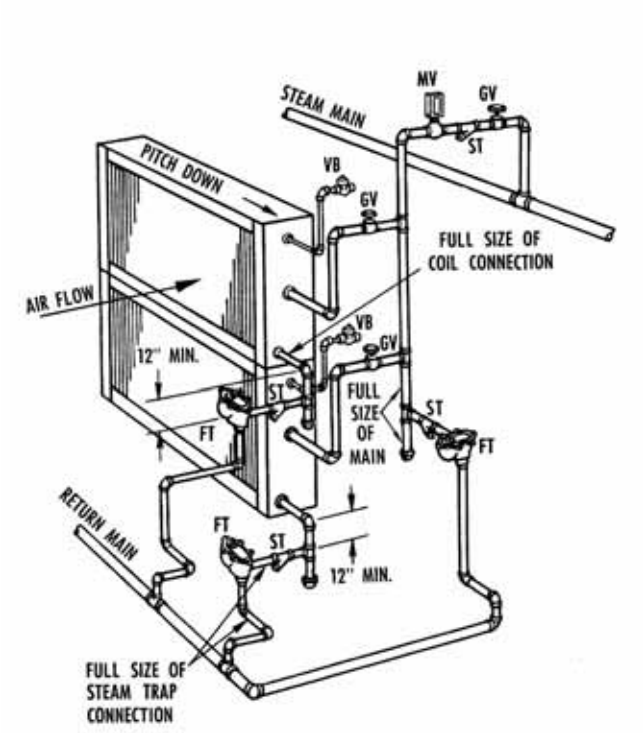


Figure 53. Typical piping for Type NS steam coils and horizontal tubes for horizontal airflow



NOTICE

Breaker Cracking Pressure!

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

To prevent coil damage, complete the following recommendations:

- Install a 1/2-inch NPT, 15 degree swing check valve vacuum breaker with cracking pressure of 0.25 inches Hg (3.4 inches water) or lower at the top of the coil. This vacuum breaker should be installed as close to the coil as possible.
- For coil 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.

NOTICE

Coil Condensate!

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

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

1. Install the steam trap discharge 12 inches below the condensate return connection. 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 ensure 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 54, Figure 55, and Figure 56 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:

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

Note: 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 silicon.

Figure 54. Typical piping for type 5W one-row water coil

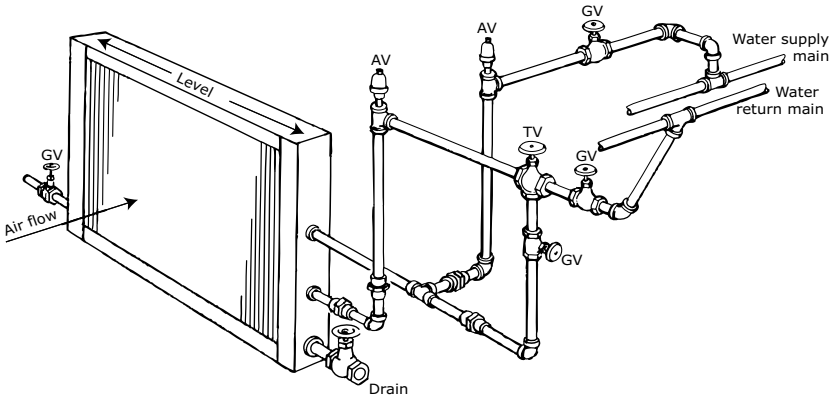


Figure 55. Typical piping for type 5A, 5W two-row, K, W 3- to 12-row, WD, D, and DD water coils

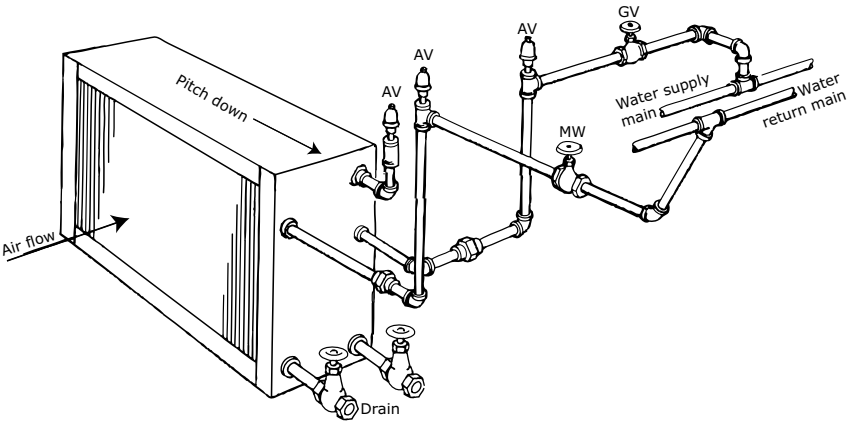


Figure 56. Typical piping for type W or WA 1-row water coil

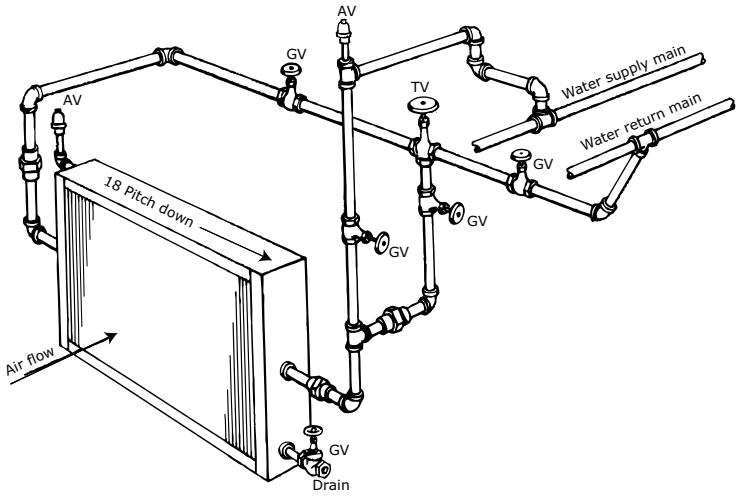
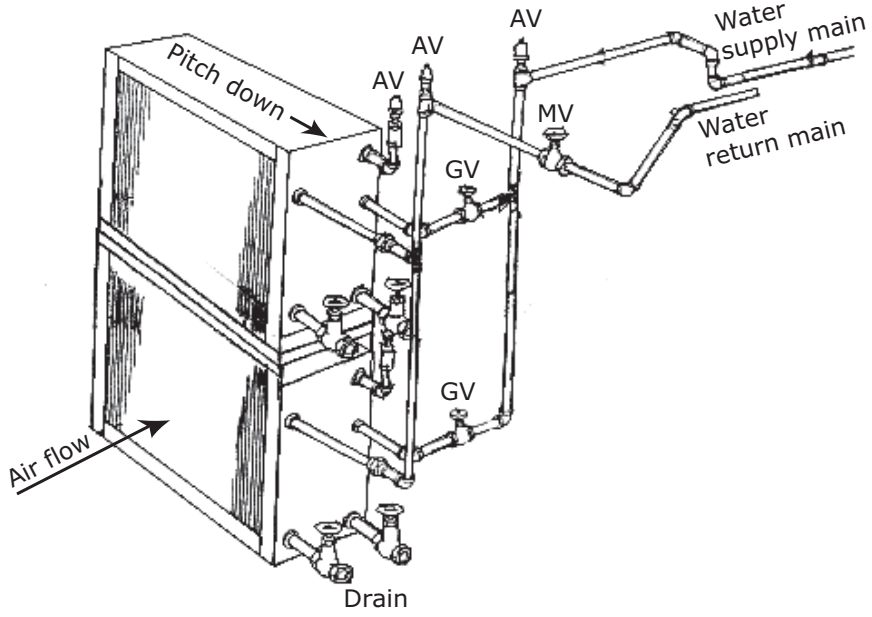


Figure 57. Typical piping for stacked water coils

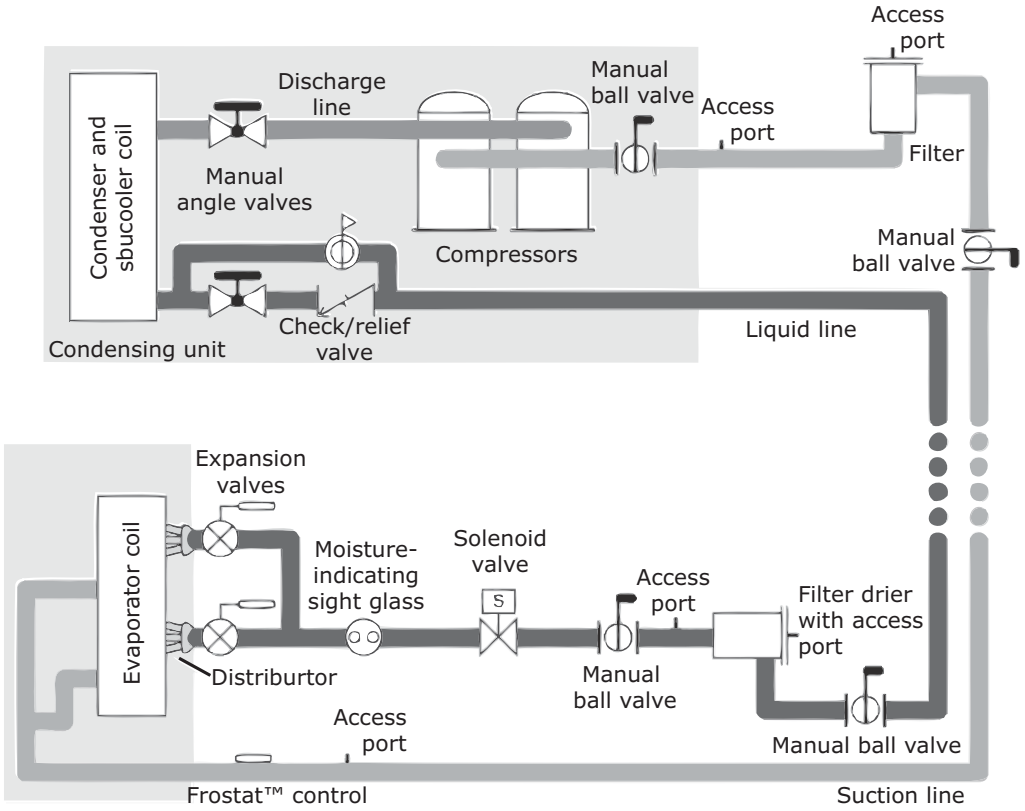


Refrigerant Coil Piping

Note: Refer to "Important Environmental Concerns!" on page 2 for information on handling refrigerants.

Use Figure 58 to determine the proper, relative sequence of the components in the refrigerant lines that connect the condensing unit to an evaporator coil. Refer to "Examples of Field-Installed Evaporator Piping" on page 63 for more detailed schematics of evaporator piping.

Figure 58. Example of placement for split-system components



Kit with sensor - X13790452010 SEN-01212
Kit with switch - X13100429010 THT 02442

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.

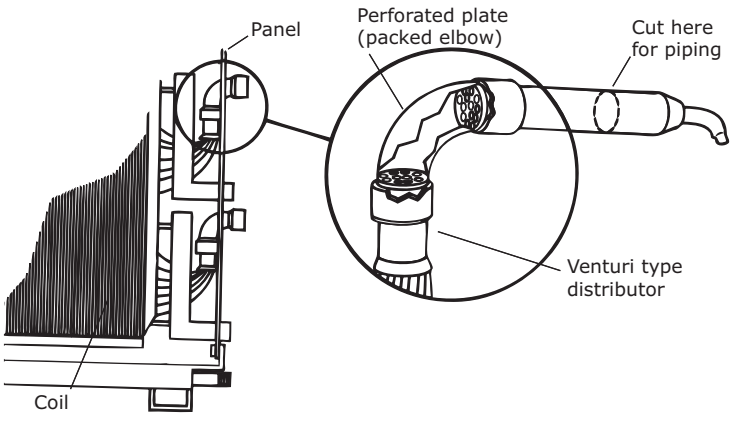
Routing. Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line. Minimize tube bends and reducers because these items tend to increase pressure drop and to reduce subcooling at the expansion valve. Liquid line receivers, other than those that 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 58 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.
- *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 ensure 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.*

Figure 59. Type F refrigerant coil with packed elbow



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

NOTICE
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 ¼ inch to 1 inch per 10 feet of run—toward the evaporator. When the application includes a suction riser, oil must be forced to travel the height of the riser. Riser traps and double risers are unnecessary in the suction line when the refrigerant coil is used with Trane condensing units.

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

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

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.

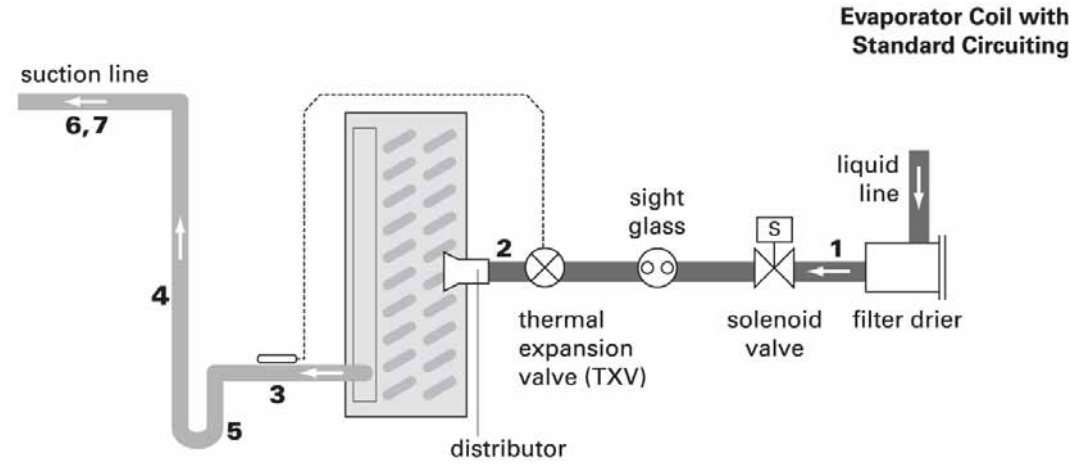
Note: Placement of the Frostat control is illustrated in *Figure 58 on page 60.*

- *Filter.* The suction filter prevents contaminants, introduced during installation, from entering the compressor. For this reason, the suction filter should be the replaceable-core type, *and* a clean core should be installed after the system is cleaned up.
- *Access port.* The access port is used to determine suction pressure. This port is usually a Schraeder valve with a core.
- *Frostat™ coil frost protection.* The Frostat control is the preferred method for protecting evaporator coils from freezing when the refrigerant coil is used with Trane condensing units. It senses the suction-line temperature and temporarily disables mechanical cooling if it detects frost conditions. The control is mechanically attached to the outside of the refrigerant line, near the evaporator, and wired to the unit control panel.
- *Ball shutoff valve.* Adding manual, ball-type shutoff valves upstream and downstream of the filter simplifies replacement of the filter core.

Examples of Field-Installed Evaporator Piping

Single-Circuit Condensing Unit: Evaporator Coil with One Distributor

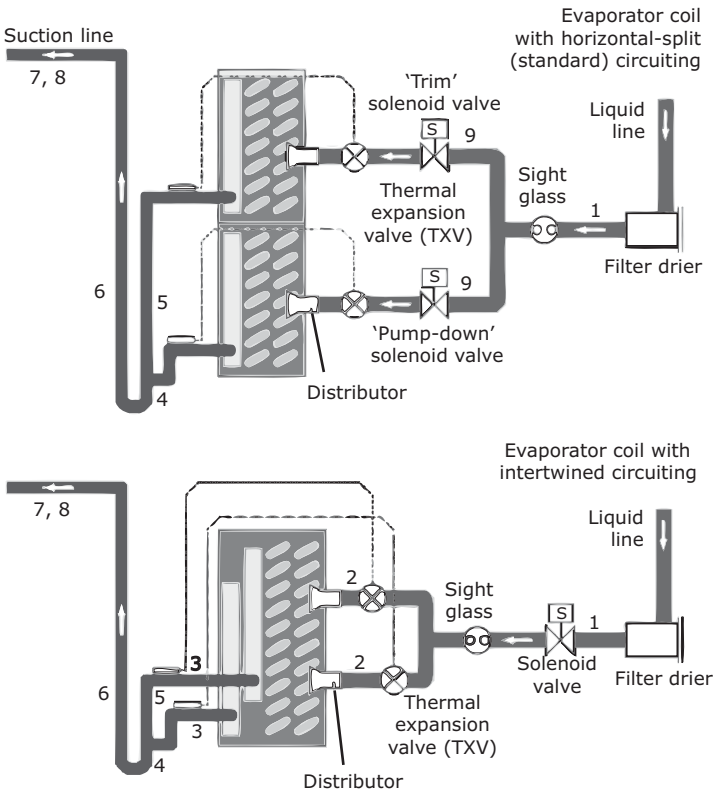
Figure 60. Single-circuit evaporator coil with one distributor



1. Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so that the refrigerant drains toward the evaporator. See Figure 60.
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. Ensure 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.

Single-Circuit Condensing Unit: Evaporator Coil with Two Distributors

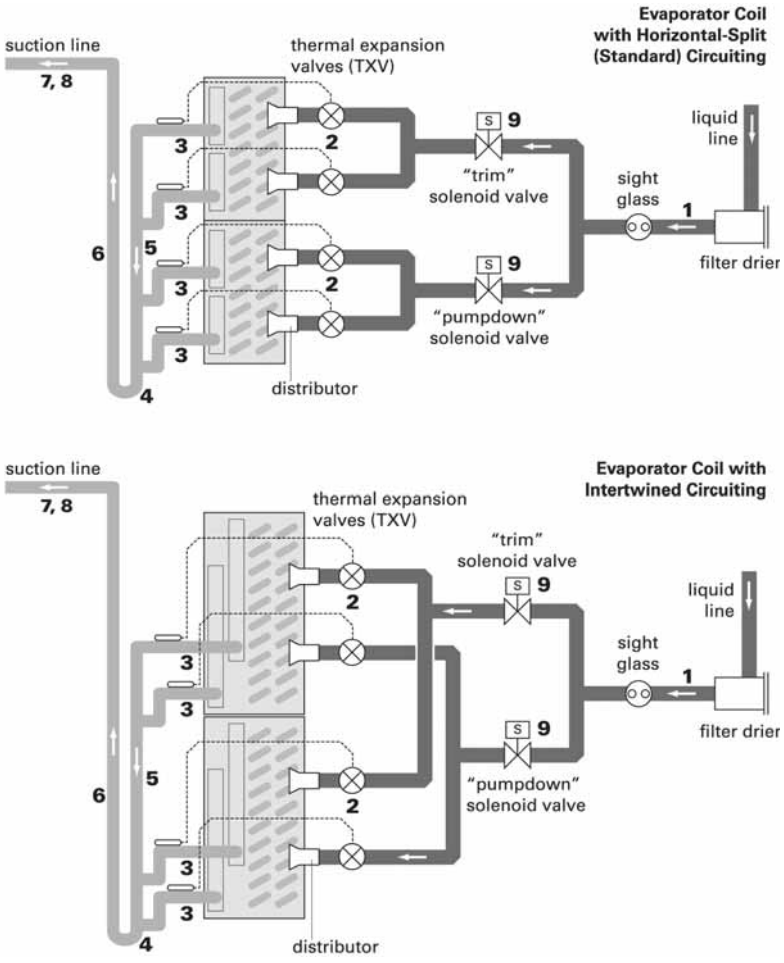
Figure 61. Single-circuit evaporator coil with two distributors



1. Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator. See Figure 61.
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. Ensure 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.

Single-Circuit Condensing Unit: Evaporator Coil with Four Distributors

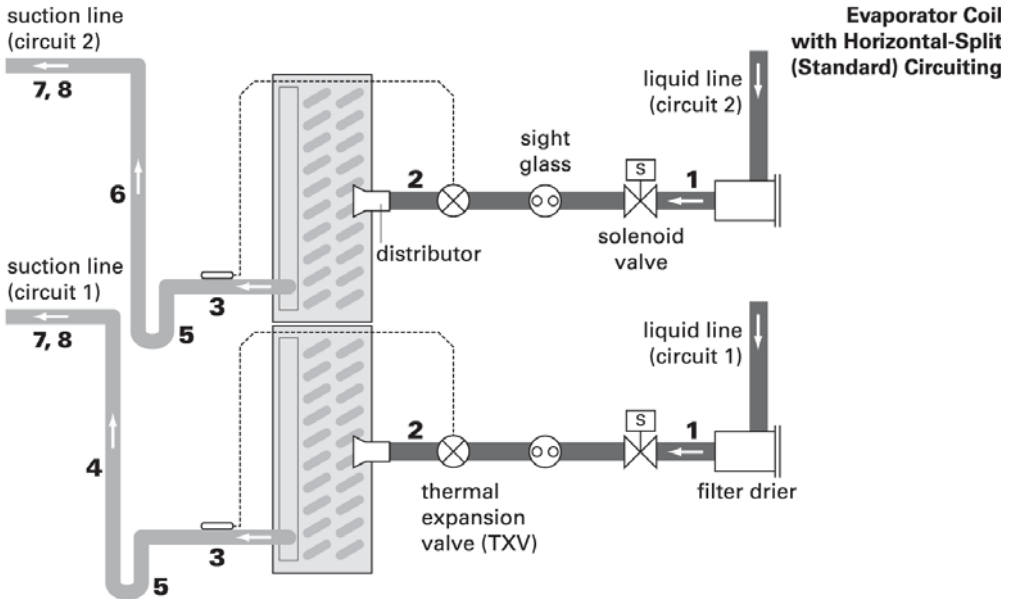
Figure 62. Single-circuit evaporator coil with four distributors



1. Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator. See Figure 62.
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. Ensure 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 Unit: Evaporator Coil with Two Distributors)

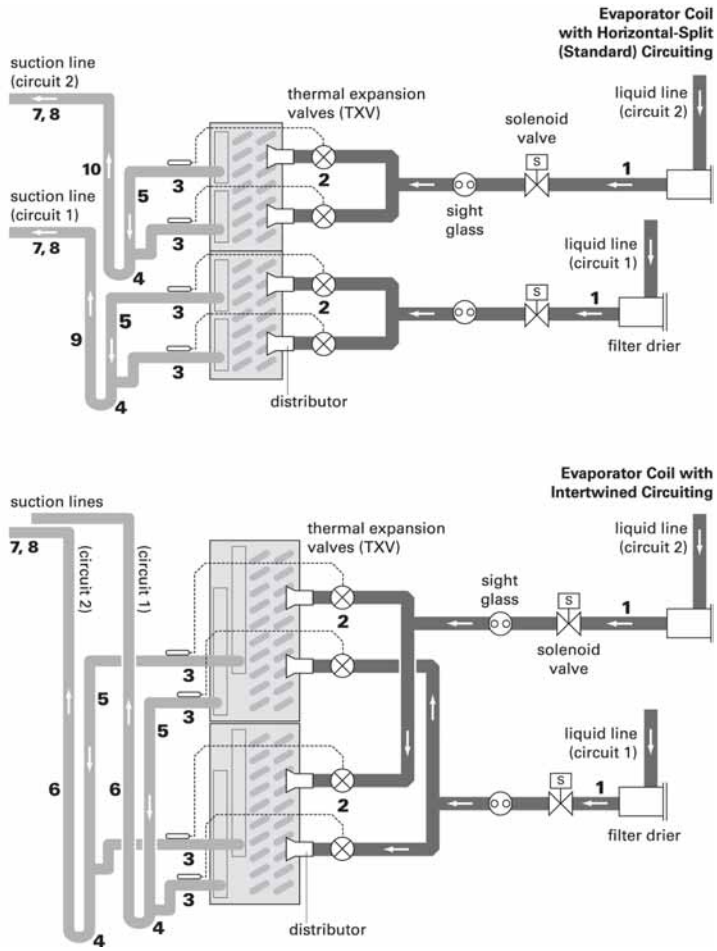
Figure 63. Dual-circuit evaporator coil with two distributors



1. Pitch the liquid lines slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator. See Figure 63.
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.

Dual-Circuit Condensing Unit: Evaporator Coil with Four Distributors

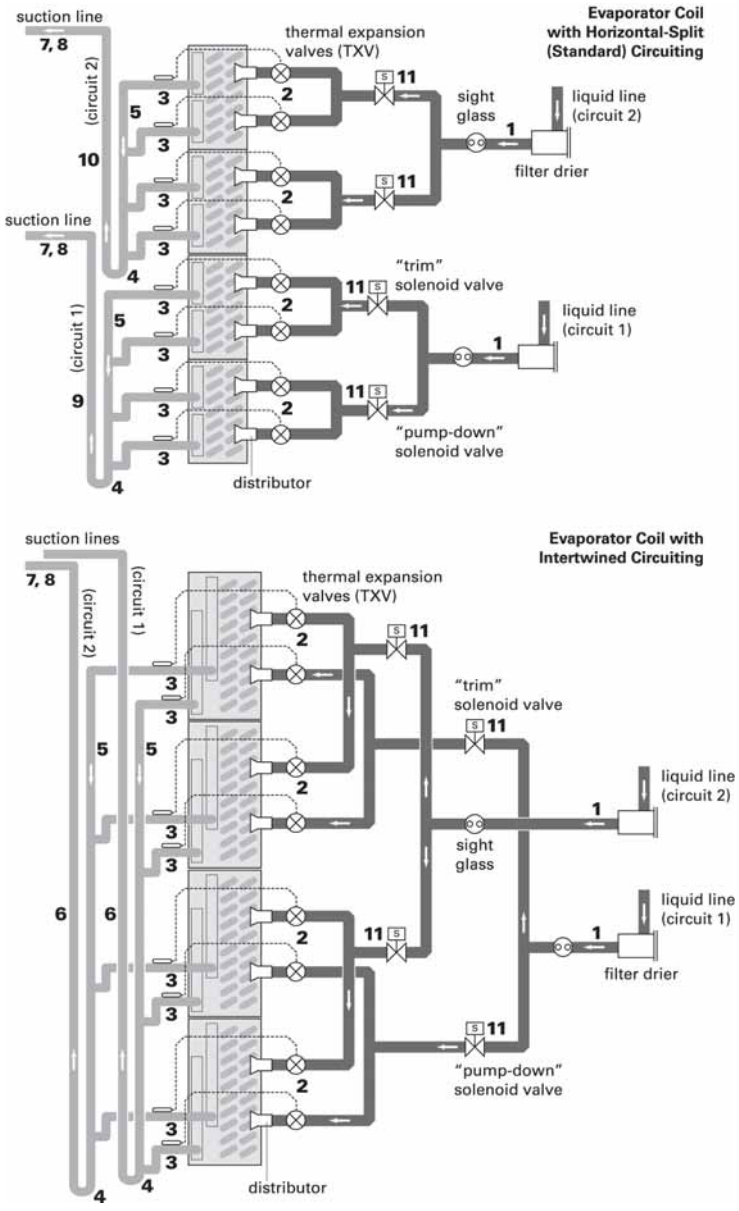
Figure 64. Dual-circuit evaporator coil with four distributors



1. Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator. See Figure 64.
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. Ensure 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.
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 Unit: Evaporator Coil with Eight Distributors

Figure 65. Dual-circuit evaporator coil with eight distributors



1. Pitch the liquid line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator. See Figure 65.
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. Ensure 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.
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.

Installation - Electrical

⚠ WARNING
Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the equipment 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 or PROD-SVB06A-FR

NOTICE
Use Copper Conductors Only!

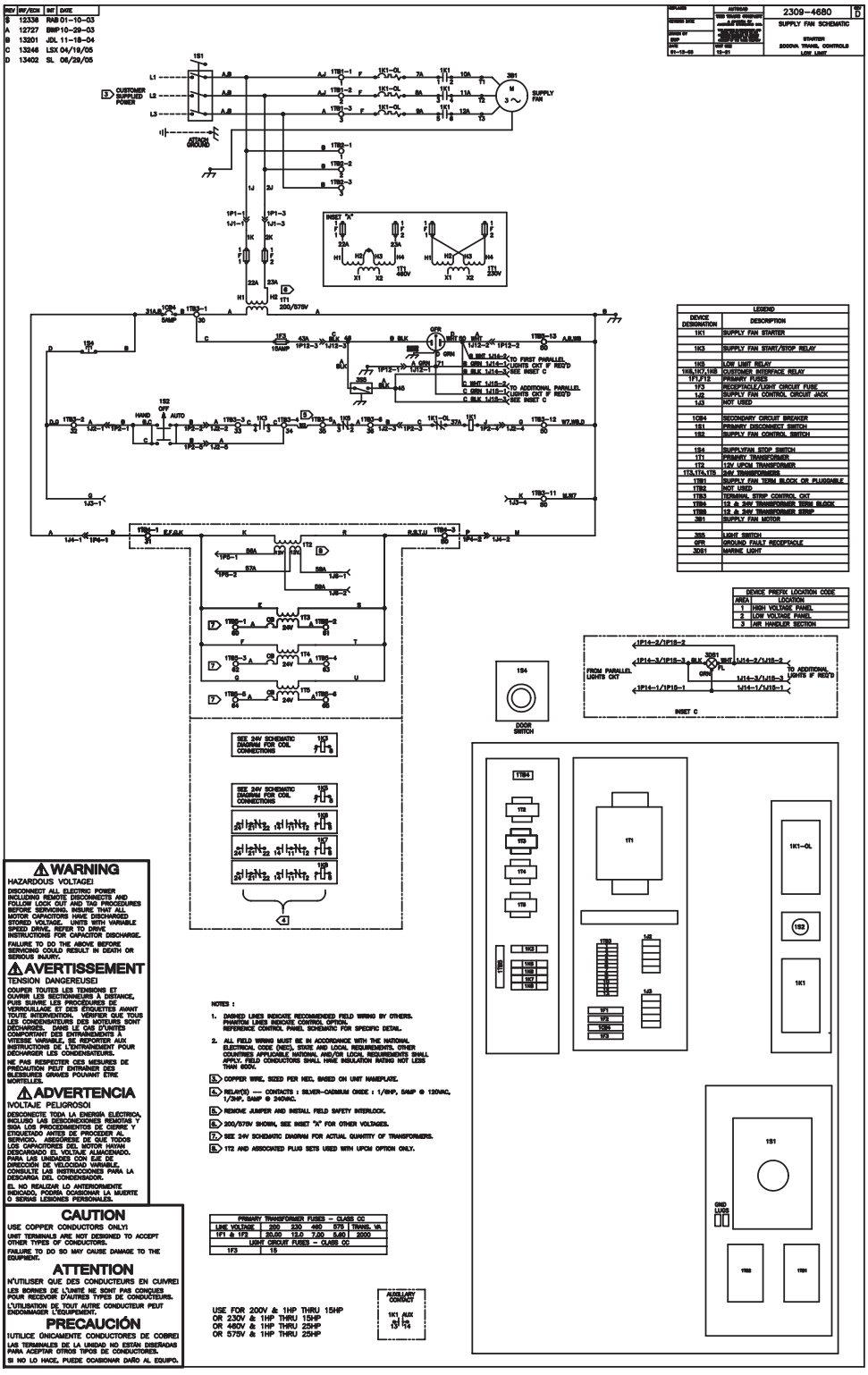
Unit terminals are not designed to accept other types of conductors. Use of aluminum or other type of wiring may result in galvanic corrosion or overheating. Failure to use copper conductors may result in equipment damage.

If the unit does not include a factory-mounted starter, 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 service disconnect switch in compliance with national and local electrical codes.

Fan motors require motor overload protective devices that are rated or selected in compliance with the National Electric Code (NEC) 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.

If wiring directly to the motor, a flexible connection at the motor to permit fan belt adjustment should be provided. Fractional horsepower motors may be factory connected to a terminal box on the unit. If this construction is provided, the installer should complete field wiring to this connection box. For a typical high voltage wiring schematic, see Figure 66.

Figure 66. Typical high voltage wiring schematic



NOTICE
Penetration Leaks!

Properly seal all penetrations in unit casing. Failure to seal penetrations from inner panel to outer panel may result in unconditioned air entering the unit, and water infiltrating the insulation, resulting in equipment damage.

Figure 67. Transformer plate

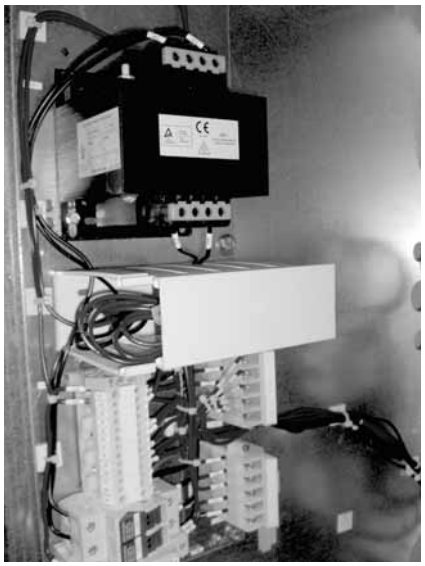


Figure 68. 120 to 24 Vac Control Transformer

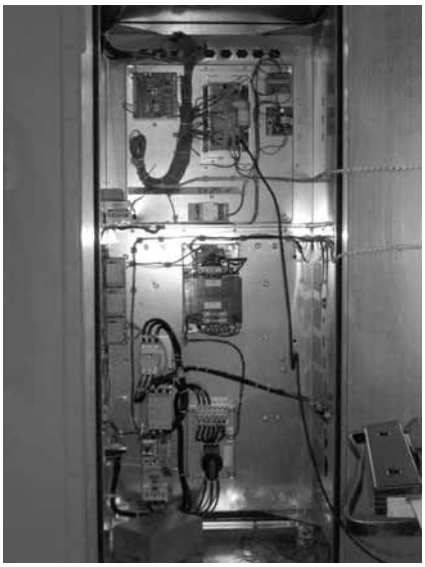


Figure 69. Variable-frequency drive (VFD)

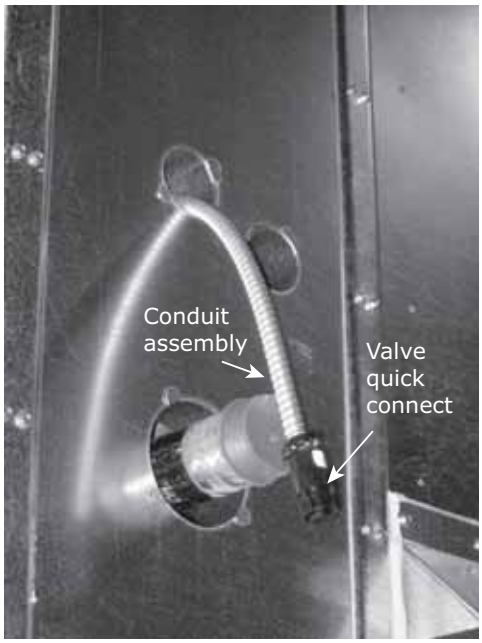
All units with starters or variable-frequency drives (VFDs) that have direct-digital controllers (DDCs) are provided with line voltage to 120 Vac power transformers (see Figure 67) with power 120 Vac to 24 Vac control transformers (see Figure 68). Figure 69 shows a typical VFD power box.

To provide field-wiring to units with DDC or low limit controls:

- If VFD or starter is not factory-mounted, provide 120 Vac power to a transformer in the valve jack when a separate circuit is recommended (see Figure 68).
- Install outside-air sensor and space sensor, if ordered.
- For valve jack mounting and wiring detail, see Figure 70.

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

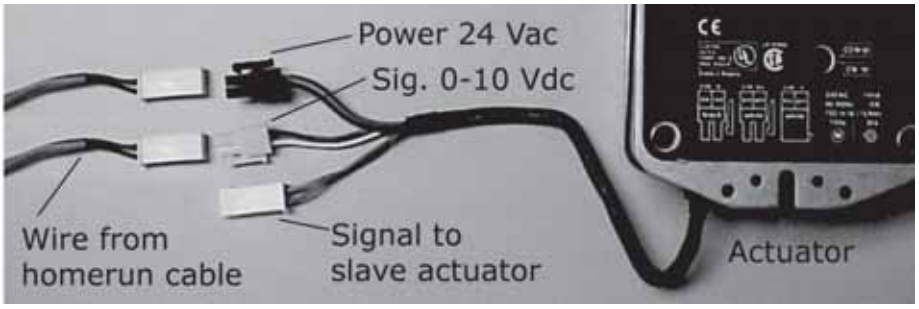
Figure 70. Valve jack wiring details



Quick Connects

The actuators, factory-mounted or field-supplied, are separately wired and controlled by a direct-digital controller or other building logic. Figure 71 illustrates the typical quick connect scheme.

Figure 71. Typical quick connects with wiring identification



Controls Interface

The portable operator display is used for temporary connection to and operation of Tracer MP580/581 and AH540/541 controllers. With the portable operator display, you can monitor data, change setpoints, monitor alarms, and override points. The portable operator display includes a 10 ft (3 m) cable with connector that is stored in the storage compartment of the carrying bag. The cable cannot be disconnected from the operator display. Keep this document with the portable operator display for access to calibration and cleaning instructions.

Note: The portable operator display is not used for timeclock scheduling. To provide scheduling you must use a Tracer Summit system.

Connecting the Operator Display

To connect the portable operator display:

1. Open the controller enclosure door.
2. Attach the operator-display cable to the operator-display connector on the controller circuit board. The operator display receives power from the controller and turns on automatically when it is connected to the controller.

Setting Up the Operator Display

NOTICE
Equipment Damage!

To clean the operator display, use a cloth dampened with commercial liquid glass cleaner. Spraying water or cleansers directly on the screen may result in equipment damage.

This section shows how to calibrate the operator display touch screen and how to adjust the brightness and contrast. To set up the operator display screens and security, see CNT-SVP01C-EN Programming Tracer MP580/581 Programmable Controller programming guide.

Calibrating the Operator Display

To calibrate the operator display:

1. On the home screen, press Setup. The Setup menu appears.
2. Page down to view the next screen.
3. Press Calibrate Touch Screen. A calibration screen appears.

NOTICE
Equipment Damage!

Do not allow the operator display to come in contact with sharp objects. This may result in equipment damage.

4. Touch the target using a small, pliable, blunt object, such as a pencil eraser or your finger. Hold until the beeping stops. A second calibration screen appears.
5. Again, touch the target with the object. Hold until the beeping stops. The Advanced Selection screen appears.
6. Press Home. The home screen appears.

Adjusting Brightness and Contrast

To adjust the brightness and contrast of the operator display:

1. On the home screen, press Setup. The Setup menu appears.
2. Page down to view the next screen.
3. Press the Adjust Brightness and Contrast buttons. The Brightness and Contrast screen appears.
4. To increase the brightness, press the buttons along the top row, in sequence, from left to right. To decrease the brightness, press the buttons from right to left.

Note: Contrast adjustment is not available on all computer display models.

5. To increase the contrast, press the buttons along the bottom row, in sequence, from left to right. To decrease the contrast, press the buttons from right to left.
6. Press Home. The home screen appears.

External Communications Port

On units that have been selected with the external communications port, both the operator display and Rover service tool can be connected without shutting off the unit through the external communications port. Remove the cover plate on the port and plug into the RJ-11 port for the operator display or the RS 485 port for the Rover service tool. This enables continuous operation of the Air Handling unit without disruption to the operating conditions of the unit. When servicing of the unit is complete, replace the cover plate on the external port to eliminate the air leakage path.

Start-Up

Once the 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

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. Damper blade and linkage positioning may have changed due to shipping and handling vibration.
- 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.

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.

Coil-Related Checks

NOTICE

Proper Water Treatment!

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

Obtain an IOM from the motor manufacturer for the specific motor installed. The motor manufacturer's recommendations take precedence for all matters related to the start-up and routine maintenance of the motor.

- Check the motor lubrication for moisture and rust.
  - Remove and clean grease plugs to inspect.
  - If moisture is present, consult an authorized repair shop for bearing inspection/replacement. This may require removal and transport of motor.
  - If no moisture is present, refer to the motor manufacturer's lubrication recommendations for proper lubrication.
  - The motor manufacturer may recommend lubricating the motor as part of their routine startup instructions.
- 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.
- Bump-start the unit and confirm the fan wheel rotates properly, as indicated by the rotation arrow located on the fan housing.

Note: Note: For motor warranty needs, contact you local Trane sales office.

Unit Operation

⚠ 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.

⚠ 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.

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 absolute 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:

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

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

Voltage imbalance = 2.2% (not acceptable)

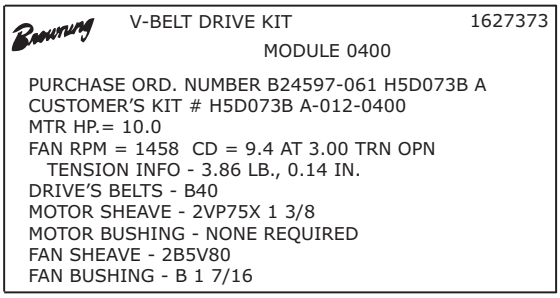
In the example, 2.2 percent imbalance is not acceptable and the power company should be notified to correct it.

Tension the Fan Belt

NOTICE
Belt Tension!

Do not over-tension belts. Excessive belt tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure. 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.

Figure 72. Tension drive belt label

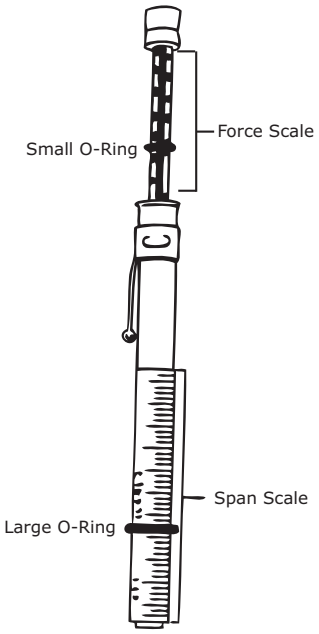


Proper belt tension is required to ensure maximum bearing and drive component life and is based on motor horsepower requirement. A label located on the bearing support on the drive side of the unit lists all drive parts, the proper belt tension, and deflection for that tension for the specific drive (Figure 72).

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 73. Belt tensioner



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. To measure belt tension, use a belt tensiometer (see Figure 73). Determine actual deflection by depressing one belt with the belt tensiometer and measuring the deflection relative to the other belts or to belt line (see Figure 74). Adjust the belt tension to the correct pounds force and tighten all set screws to the proper torque.

Figure 74. Belt tension measurement

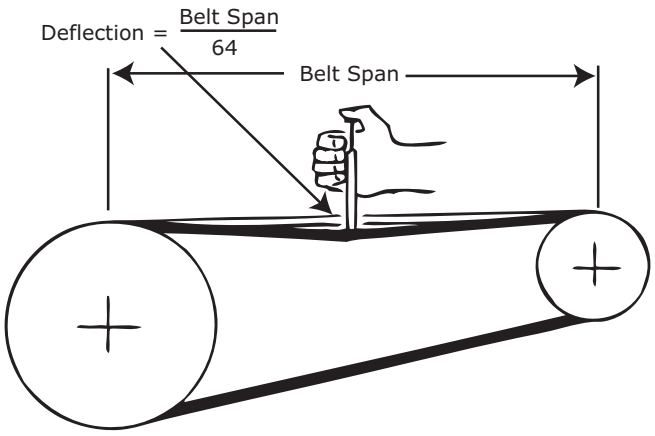


Table 3. Typical sheave diameter and deflection force

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

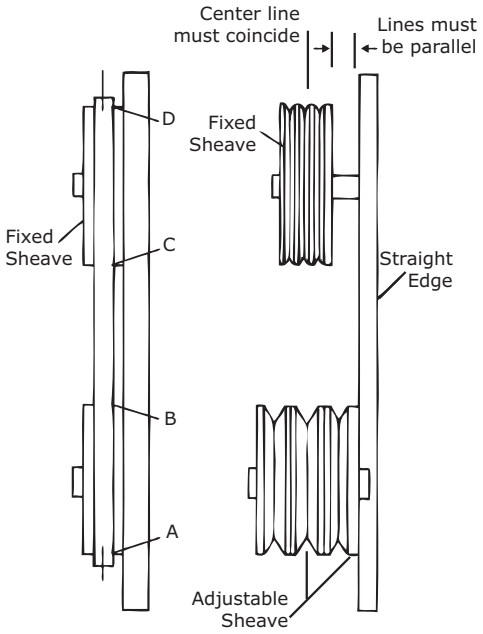
Determine Fan Speed

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

Check unit vibration if the fan speed is changed more than five 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.

Figure 75. Proper drive alignment



Align Fan and Motor Sheaves

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 75) 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.

Check Multiple Belts

Tighten the belts slightly and rotate the drive several times.

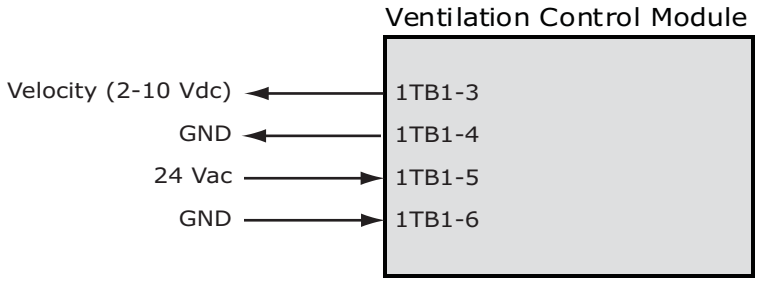
On multiple belt drives, ensure the force of deflection is approximately the same on each belt by pushing each belt in an equal distance at a point halfway from each sheave (see Figure 75). If this force is not the same for each belt, the motor and fan shaft are not parallel. Realign as required. After 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.

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
#10	3/32	-	-	28-40	2.3-3.3

Traq™ Dampers

Figure 76. Traq damper terminal connections



Traq dampers are low-leak dampers that modulate and measure airflow. Each Traq damper section is supplied with a factory-mounted ventilation control module (VCM) on the interior of the mixing box. The VCM has an input terminal for power and an output terminal for air velocity (see Figure 76). A direct-digital controller controls the factory-mounted and wired actuators.

VCM (Transducer) Calibration. The VCM has an auto-zero function that recalibrates the transducer once every minute. When troubleshooting, allow for the recalibration time before making any measurements.

Input Power. The only input 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 5 and Table 6.

In Table 6 the cfm at 10Vdc is a calculated value based on area and peak velocity. In certain situations, it can be advantageous to raise the velocity of air through the remaining Traq dampers by closing off one or more dampers in the unit. The cfm at 10Vdc can be recalculated based on the proportion of remaining Traq dampers or by multiplying the remaining area of dampers by peak velocity.

Table 5. 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

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

For example, if the VCM on a size 30 air handler at sea level (k=1) has a 10-volt signal, it would represent 17,335 cfm (8181 L/s) through the Traq damper. If the voltage were 6 volts, airflow through the Traq damper would be 8,668 cfm (4091 L/s).

Table 6. Back or Top Inlet Traq Dampers - Air-Mixing and Economizer Section - VCM voltage versus airflow at sea level

Part Number	Traq Damper Size (inches)	Quantity	Total Area (ft^2)	Peak Velocity (fpm)	CFM @ 10VDC Peak Velocity	L/S @ 10VDC
DMP01123	13	1	0.9213	2500	2303	1087
DMP01124	16	1	1.3956	2650	3698	1745
DMP01663	20	1	2.1806	2650	5779	2727
DMP01125	24	1	3.1400	2700	8478	4001
DMP01126	28	1	4.2739	2700	11540	5446

Fan Inlet Airflow Measuring System

Figure 77. Piezometer ring airflow measurement

A fan inlet airflow measuring system with a piezometer ring is available on many centrifugal and plenum fans. Each system comes with a differential pressure transmitter. The piezometer ring is connected to the LO port of the transmitter and the reference pressure point is connected to (or actually is) the HI port of the transmitter. See Figure 77.

Wiring

In the absence of a factory-provided control system, consult the transmitter manufacturer or the factory for wiring.

Note: Ensure that the transmitter has a separate power source.

Transmitter Sizing

The Trane specification requires that the flow meter option have a total accuracy of 5 percent. The total accuracy is a combination of:

- how accurately the piezometer ring itself is in sensing airflow
- how accurately the transmitter senses the differential pressure
- how accurately the controller translates the signal from the transmitter to a differential pressure.

Selecting the proper transmitter is critical in order to get accurate airflow measurements using the piezometer ring. How accurately the transmitter senses the differential pressure is dependent on:

- the pressure range selected
- accuracy of the selected transmitter

Trane air handlers use a 0-20 inch range transmitter as standard. To sufficiently cover VAV turndown on the smallest fans with the above range, a transmitter with an accuracy of 0.25 percent (full scale) is used as standard. If a field-provided transmitter with a lower accuracy is selected, the range should be chosen closer to the actual, maximum pressure differential expected for the application.

The transmitter outputs a signal that represents the differential pressure which is used to calculate airflow. To adequately calculate and display the airflow for the smaller fans, ensure that the analog input is programmed with enough decimal places to sufficiently represent the pressure differential being measured. For instance, Rover should be used to increase the number of decimal places being used (to a maximum of 4) on an MP-580/581 controller in lieu of the default zero.

Note that the adjustment of the "Zero" and "Span" controls on the transmitter itself are not required at time of installation. The transmitter is factory-calibrated to the range selected and cannot be significantly adjusted to "tighten" the range closer to the pressure being read for the given application. The adjustments are primarily provided to account for any drift that may occur over time.

Transmitter Calibration

The transmitter is factory-calibrated to a specific pressure range with a 0-20 inch w.g. range being used in most cases. To check calibration and to adjust if necessary, consult the transmitter manufacturer or the factory for specific procedures.

The transmitter outputs a linear, 4-20 mA signal representing a differential pressure measurement. With this measurement, the airflow through the fan can be calculated using the following equation:

CFM = K * SQRT(DP)
Where:
CFM = Airflow (ft^3/min.) assuming a standard air density of 0.075 lbm/ft^3.
K = A constant factor that's unique for each fan. See next section for more information.
DP = Differential pressure (inches w.g.) being measured by the transmitter.

Significant differences in elevation and/or temperature will affect the density of air. For air at a constant, non-standard density, a field-obtained K factor can be used. Alternatively, the following equation can be used to continuously correct the equation above:

ACFM = CFM * SQRT(0.075/ρ)
Where:
ACFM = Actual airflow (ft^3/min) corrected for non-standard air density.
ρ = Density (lbm/ft^3) of the air at the inlet to the fan.

Note: Alternative units, including SI, can be used in place of the IP units above although the K-factor must be converted appropriately.

Constant Factor K

The constant factor K is unique for each fan and is primarily a function of the area and the geometry of the fan inlet. Pre-engineered factors are available from the factory for fan types where the airflow measurement system is available.

Field-obtained factors can provide maximum accuracy. To obtain the factor in the field, measure the differential pressure being output from the transmitter while measuring the airflow through the system. Once these two values have been measured, simply solve for K using the following equation:

K = ACFM/SQRT(DP)
Where:
K = Field-provided constant factor.
ACFM = Actual airflow (ft^3/min) being measured at the air density being measured.
DP = Differential pressure (inches w.g.) being measured by the transmitter.

External Insulating Requirements

NOTICE

Microbial Growth!

Wet interior unit insulation can become an amplification site for microbial growth (mold), which may cause odors and damage to the equipment and building materials. If there is evidence of microbial growth on the interior insulation, the insulation should be removed and replaced prior to operating the system.

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

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 disconnect and discharge all energy storing devices such as capacitors 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.

⚠ WARNING
Rotating Components!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Secure drive sheaves to ensure rotor cannot freewheel. Failure to secure drive sheaves or disconnect power before servicing could result in death or serious injury.

Table 7. Routine maintenance checklist

Frequency	Maintenance
After 48 hours of operation	Belts have acquired their permanent set. Readjust but do not overtighten. See “Tension the Fan Belt” on page 78 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; and, change bag filters when pressure drop is 1 in. wg. See “Air Filters” on page 86 for more information. • Relubricate fan bearings if necessary. See “Fan Bearing Lubrication” on page 89 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 “Align Fan and Motor Sheaves” on page 80 for more information. • Inspect and clean drain pans. See the “Drain Pans” section on page 87 for more information. • Tighten electrical connections. • Inspect coils for dirt build-up. See “Coils” on page 91 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. • Clean the fan wheels and fan shaft. See “Fans” on page 88 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 “Motor Bearing Lubrication” section on page 90 for more information). This may only need to be done every 2 to 3 years. • 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

⚠ WARNING
Rotating Components!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. Secure drive sheaves to ensure rotor cannot freewheel. Failure to secure drive sheaves or disconnect power before servicing could result in death or serious injury.

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 Kote 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.

Cartridge or Bag Filters

To replace cartridge or bag filters:

1. Disconnect all electrical power to the unit.
2. Remove the dirty filters and block-offs from their installed position.
3. Keeping the new bag filters folded, slide each filter into the filter rack, pushing them tightly against the unit.

Note: The pleats on bag filters should be in the vertical position.

4. If using the optional pre-filters, replace them on the appropriate filter rack.
5. If fixed and adjustable block-offs are provided with the unit, slide the fixed block-offs into the filter track before the adjustable block-off.

Note: The adjustable block-off should always be installed last, next to the access door.

6. Close and secure the access door. If the door can be closed without compressing the filter, adjust the block-off by loosening its screws and position it to provide an airtight seal.

Drain Pans

⚠ WARNING
Hazardous Chemicals!

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
No Step Surface!

Do not walk on the sheet metal drain pan. Walking on the drain pan could cause the supporting metal to collapse. Failure of the drain pan could result in death or serious injury.

The condensate drain pan and drain line must be checked to ensure 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 "Troubleshooting" on page 98 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 any contaminated area(s) 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 any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Fans

⚠ WARNING
Rotating Components!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the equipment can not be inadvertently energized. Secure drive sheaves to ensure rotor cannot freewheel. Failure to secure drive sheaves or disconnect power before servicing could result in death or serious injury.

⚠ WARNING
Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the equipment can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

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 “Troubleshooting” on page 98 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 any contaminated area(s) 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 any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Fan Bearing Lubrication

NOTICE

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! See Table 8 for compatible greases and Table 9 for maximum grease capacity.

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

- 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.

Table 8. Compatible Greases

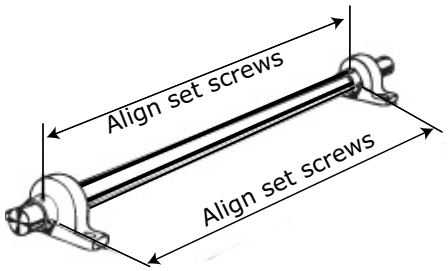
Type
Texaco Multi Fak 2
Shell Alvania 2
Mobil 532
Chevron Dura-Lith 2
Exxon Beacon
Keystone 84H

Table 9. 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

Refer to Table 10 for minimum torque of motor mounting and bearings bolts.

Figure 78. Bearing set screw alignment



Bearing Set Screw Alignment

Align bearing set screws as illustrated in Figure 78. Table 10 provides bearing set screw torque measurements.

Table 10. 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

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

Motor Bearing Lubrication

⚠ WARNING
Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedure to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

Obtain an IOM from the motor manufacturer for the specific motor installed. The motor manufacturer's recommendations take precedence for all matters related to the start-up and routine maintenance of the motor.

Motor grease fittings have been removed from factory-installed motors in compliance with UL regulations. Motor bearings require periodic maintenance throughout their life. Many different styles of motors come as standard selections, so please obtain the motor IOM and use the manufacturer-recommended grease.

Fan Motor Inspection

Inspect fan motors periodically for excessive vibration or temperature.

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.

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. 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:
   a. Maintain minimum nozzle spray angle of 15 degrees.
   b. Spray perpendicular to the coil face.
   c. Keep the nozzle at least 6 inches from the coil.
   d. 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 that may have been 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.

Cleanable Cooling Coils

Cleanable 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 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

NOTICE

Coil Freeze-up!

Properly drain and vent coils when not in use. Trane recommends glycol protection in all possible freezing applications. 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.

In general, most coil manufacturers recommend the same method to protect coils from subfreezing temperatures. Primarily, this consists of draining water from the coil before the heating season and thoroughly blowing the coil out with compressed air. Trane also recommends flushing the coil with glycol if coils will be exposed to temperatures below 35 degrees. If coils are purchased from a manufacturer other than Trane, contact that coil manufacturer for recommendations specific to their product.

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 units, there are multiple coils in the coil section. Be sure to winterize all coils in a given coil section.

Chilled Water Coils

Note: Use care in removing header plugs from coils. Over-torquing may result in twisted tubes.

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.

Cleanable 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. This damp, dark environment—though temporary—can encourage the growth of mold, mildew, and other microbial contaminants.

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.

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.

Internal Insulation

NOTICE

Microbial Growth!

Wet interior unit insulation can become an amplification site for microbial growth (mold), which may cause odors and damage to the equipment and building materials. If there is evidence of microbial growth on the interior insulation, the insulation should be removed and replaced prior to operating the system.

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 ensure 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 "Troubleshooting" on page 98 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 "Troubleshooting" on page 98 for assistance in identifying the cause.

⚠ WARNING

Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

⚠ 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.

Cleaning Non-Porous Insulating Surface

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 the contaminated area(s) 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 any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Cleaning Porous Insulating Surface

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

Controls

On units that have been selected with the external communications port, both the operator display and Rover service tool can be connected without shutting off the unit through the external communications port. Remove the cover plate on the port and plug into the RJ-11 port for the operator display or the RS 485 port for the Rover service tool. This enables continuous operation of the Air Handling unit without disruption to the operating conditions of the unit. When servicing of the unit is complete, replace the cover plate on the external port to eliminate the air leakage path.

Multiple Fans

When controlled in a bank of fans, these fan units must be controlled using a common control signal, such as the duct static control signal, to modulate the fan speed.

Ultraviolet (UV) Light Maintenance

⚠ WARNING

Hazardous Voltage and Exposure to Ultraviolet Radiation!

If UV lights are present in this unit, it contains components that emit high-intensity ultraviolet (UV-C) radiation which can be harmful to unprotected eyes and skin. Disconnect all electrical power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the equipment cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

The intensity of the ultraviolet energy emitted from the ultraviolet bulbs 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.

Cleaning the Bulbs

Note: If bulbs are found to be broken, see the proper warning and cautions below regarding broken bulbs and hazardous vapors.

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.

Replacing the Bulbs

⚠ 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.

Ultraviolet bulbs 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. SEE WARNING ABOVE.
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. Carefully install a new replacement bulb in the fixture and rotate it 90 degrees in either direction until it is 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. 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 ensure you have met all requirements.

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

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 disconnect and discharge all energy storing devices such as capacitors 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. 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 11. 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 "Bearing Set Screw Alignment" on page 89). Loosen and retighten bearing set screws.
	Shipping spacers not removed	Remove shipping spacers and/or bolts (see "Fans" section on page 48).
	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 11. 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 "Bearing Set Screw Alignment" on page 89)
	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 "Coil Piping and Connections" section on page 53).
	Dirty fin surface	Clean the fin surface (see "Coils" section on page 91).
	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 "Coil Piping and Connections" section on page 53).
	Clogged refrigerant line filter	Change filter core.
	Failure of suction/liquid line components	Verify component operation
	Dirty fin surface	Clean the fin surface (see "Coils" section on page 91). 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 "Coil Piping and Connections" section on page 53).
	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 "Coils" section on page 91).
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" above
	Moisture problems	See "Wet interior insulation" above

TRANE®

www.trane.com

For more information, contact your local Trane office or e-mail us at comfort@trane.com

Literature Order Number	CAH-SVX01B-EN
Date	July 1, 2010
Supersedes	CAH-SVX01A-EN (July 2005)