Installation, Operation, and Maintenance

Air Rotation Units

⚠ SAFETY WARNING

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

September 2022 **PKG-SVX028A-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

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

The three types of advisories are defined as follows:

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

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

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

Important Environmental Concerns

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

Important Responsible Refrigerant Practices

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

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

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

⚠ WARNING

Follow EHS Policies!

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

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

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Table of Contents

Overview

Use this manual to install, start up, operate, and maintain the air rotation unit. Carefully review the procedures discussed in this manual to minimize installation and startup difficulties.

General Information

Construction

The Air Handling (AHU) air handler or air rotation units are constructed of an extruded aluminum tubular frame and painted exterior aluminum panel construction.

An access door is included for service, exterior filter section, control panel with motor starter/VFD, and temperature controller (optional). The interior coil and fan section is insulated with fiberglass insulation which is durable, long lasting and quiet.

The following information is intended to supplement the fan Installation, Operation, and Maintenance (IOM) manual.

Unit Construction

- Double wall (insulated) wall panels 2 in.
- Extruded aluminum tube construction.
- Lower section has welded steel channel base frame with lifting lugs.

Electrical

- 480 Vac 3phase (verify nameplate) 208/230 Vac optional.
- Single Point power connection.
- See power diagram for details.

Controls Options

- Full Controls by Trane (Controls programming by Trane).
- Basic controls.
- Honeywell Cool T775M2048/ Standard thermostat and/ or Return sensor/ Heat T775U2016

Typical chilled water temperature control can be handled with room temperature control.

Most heat applications function better with discharge temperature control.

Controls By Others

Typical package provides power wiring to fans, heaters, and dampers. All controls would be by others. The controller and sensors provided and installed by others. This includes control signal wiring to fan VFD, heater activation, and damper control signals.

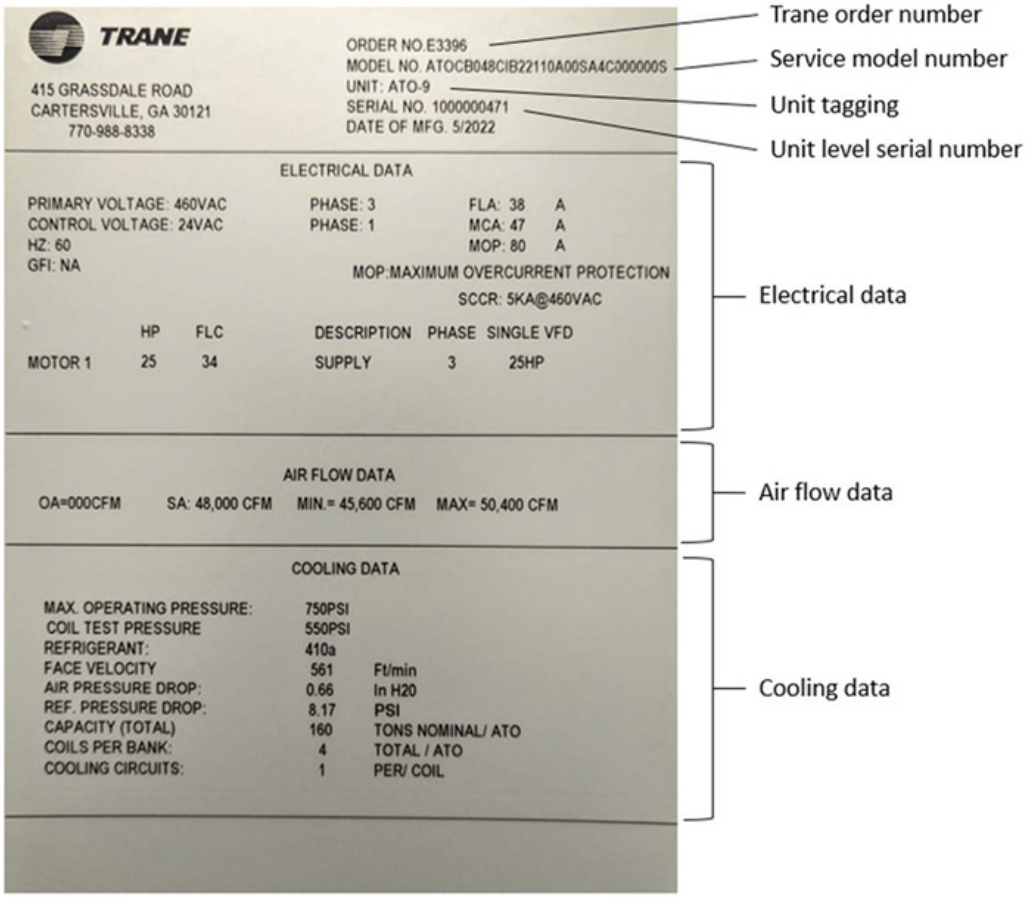
Unit Literature (shipped with unit)

Figure 1. Power panel literature location

Nameplate

Each air rotation unit (ARU) module includes one or more nameplate/label(s), which identifies the type of section and functional components, customer tagging information, the unit serial number, the unit order number, the build-section position for installation, and the unit model number.

Note: *The unit serial number and order number are required when ordering parts or requesting service for a Trane air handler.*



Operating Environment

The air handler is a central station air handler for indoor and outdoor applications. When selecting 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).

Unit Description

The air handler is designed for a variety of controlled-air applications. The basic unit consists of a fan, heating and/or cooling coils, filters, and dampers.

Components

Air handlers ship as sub-assemblies. Some assembly is required. A wide variety of components are available for air handlers including numerous fan, coil, and filter options, access sections, diffusers, discharge plenums, face-and bypass sections, UL-approved electric heat sections, humidity management options, energy recovery options, mixing boxes, moisture eliminator sections, exhaust dampers, controls, blenders, and airflow monitoring stations.

⚠WARNING

Proper Field Wiring and Grounding Required!

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE AND electrocution hazards. to avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes. Failure to do follow code could result in death or serious injury.

Wiring

Entrances are generally provided for field-installation of high and low voltage wiring through a pipe/nipple connection in the unit depending on unit configuration with or without factory-mounted controls.

Before installation, consider overall unit serviceability and accessibility prior to mounting, running wires (power), making penetrations, or mounting any components to the cabinet. Wiring to the air handler must be provided by the installer and must comply with all national and local codes. The fan motor nameplate includes a wiring diagram.

Model Number Description

Digits 1, 2, 3 - Unit Model

ARU = Air Rotation Unit

Digit 4, 5 - Design Sequence

AA

Digits 6 - Base Size

A = 5 x 5
B = 9 x 7
C = 13 x 7
D = 17 x 7
Z = Custom

Digit 7, 8, 9 - KCFM

Digit 10 - Mode

C = Cooling
H = Heating
B = Both

Digits 11, 12, 13, 14 - MBH

Digit 15 - Indoor/Outdoor

I = Indoor
O = Outdoor

Digit 16 - Voltage

A = 208V/230V
B = 460V
C = 575V

Digit 17 - Coil Type

1 = CW
2 = DX

Digit 18, 19, 20 - Tonnage

Digit 21 - Fan Size

1 = 36"
2 = 54"
C = Custom

Digit 22 - Fan Quantity

Digit 23 - Controls Options

0 = None
1 = Stand Alone
2 = DDC

Digit 24 - Dampers

0 = None
1 = Econo Split
2= Full Eco
3= OA

Digit 25 - Grilles

S= Stamped
A = Airfoil
D = Ducted

Digit 26 - Discharge Module

0 = No
1 = Yes

Digit 27 - Paint

0=No
1= Yes

Digit 28 - Drain Pan

G= Galvanized
S= Stainless

Digit 29 - Filter Type

A = 2" MERV 8
B = 2" MERV 13
C = Custom

Digit 30- Grill Config

1
2
3
4

Digit 31 - Unit Height

A = 17’ Cooling only
B = 25'
C = Custom

Digits 32-39

Reserved for future expansion

Digit 40

0= N/A
S = Design Special

Pre-Startup Checklists

Verify that there are no obstructions to the unit.

- ☐ Inlet
- ☐ Discharge
- ☐ Fan Section
- ☐ Cooling Coils
- ☐ Heat Exchanger
- ☐ Remove all shipping plastic on ARU
- ☐ Anchor bottom module to the ground in position
- ☐ Stack modules as shown in stacking instructions in IOM
- ☐ Bolt modules together as shown in IOM
- ☐ Install clean filters
- ☐ Power electrical connections terminated to unit power panel
- ☐ Wire connections inside unit connected to junction boxes
- ☐ DX/Chilled water pipes are connected
- ☐ Cooling water condensation drain is connected with P-trap
- ☐ If condensate pump present, installed on drain connection
- ☐ Chiller/Condenser is operational

Dampers

- ☐ Tighten all linkage.
- ☐ Verify proper operation of each damper section
- ☐ OA dampers
- ☐ RA dampers
- ☐ Bypass dampers
- ☐ Discharge dampers

Heaters

- ☐ Gas pipe connected to unit heater
- ☐ Gas pipe has been bleed free of air
- ☐ Proper gas type supplied to heater (verify with unit nameplate)
- ☐ Burner condensation drain is connected
- ☐ Heater flue pipe is connected through roof/wall
- ☐ Sealed combustion vent is connected (If required)
- ☐ If condensate pump present, installed on drain connection

Startup Test

Heaters

Refer to heater manufacturer's sequence of operation and startup procedures.

- ☐ Tighten all power and control terminals
- ☐ Three-phase supply voltage: 460V nom. standard (verify with nameplate)
- ☐ Verify the supply voltage to the air handler (leg to leg)
- ☐ Air handler Off (all units)
- ☐ Check all motor starters for proper overload settings
- ☐ For non VFD applications, check the overload settings for two motor application with 1 VFD
- ☐ The overload does not exceed Full Load Amps for the motor

VFD Motor Parameters

- ☐ Compare all variable frequency drive (VFD) programming parameters with specifications provided in electrical section of IOM
- ☐ For VFD systems, set programming parameters for proper overload protection (See VFD Instruction Manual)
- ☐ Check/Adjust fan belt if applicable
- ☐ Remove the fan shipping retaining brackets or bolts that prevent the shipping damage of the fans
- ☐ Remove the brackets or blocks holding the fans down and adjust the spring tension until the fan is sitting evenly (front to back and side to side)
- ☐ If more than one exhaust motor is used with one VFD, each motor must have its own overload protection

Controls

- ☐ Three-phase supply voltage to control voltage: 24V nominal
- ☐ Check fan amp draw and compare to nameplate
- ☐ Check fan rotation: See fan label
  - ☐ Verify correct fan rotation

  Note: *Leading edge of the propeller fan blade should contact the air first*

    - ☐ Air handler On (all units)
  - ☐ Note the total system current draw
  - ☐ Note the motor current draw (burner Off)
  - ☐ Note the burner and motor current draw
- ☐ Verify air flow volume. cfm of supply air
- ☐ Outside air - If applicable the cfm of outside air. (Adjust volume: with internal adjusting plates/ dampers behind the OA hoods/ min. position on on/off dampers/ set min. through ddc)
- ☐ Verify proper unit airflow (See unit nameplate)
  - ☐ Testing and balancing required

Air Flow Switches

Important: *Air flow switches must be field adjusted as described below.*

Fan: Non-VFD unit

- ☐ Adjust pulleys/VFD for rated air flow if needed
- ☐ On non-DDC controlled units, typical Hand-Off-Auto switch is used to start the fan in hand and start the fan and heater in auto mode
- ☐ See the electrical print

Dampers

- ☐ Example: Minimum OA settings for on/off dampers set in the field

Important: *The air flow is one of the most important aspects of the startup for proper operation. Do not assume the unit is at design flow if it is running at 60Hz. Look up the cfm in the above data section and verify by spot testing the airflow with a velocity meter to ensure you are close to design cfm. The standard cfm of the unit may have been changed from factory unit settings.*

Startup

See Heater IOM for startup information.

Control systems:This can vary from full DDC system to basic thermostat operation to controls by other projects.

Initial Test

- ☐ Observe fan operation and start system in cooling mode; let run 10 minutes, monitoring temps and let stabilize
- ☐ Observe each of the unit valve modulation and adjust the throttling range as needed

Temperature Setpoint Adjustment

As the system settles, stabilizes, and operates at peak load, some adjustments may be necessary to maintain leaving setpoint temperature.

Please leave all manuals and a copy of this sheet with the air handler

Technician's Name	
Signature	
Date	

Should any component installed by MJC require replacement, please contact a customer service representative at 770-988-8338. Do not order replacement components based on the part information listed above, as more information may be necessary to completely define the part.

Receiving and Storage

Inspection

Upon delivery, thoroughly inspect all components for any shipping damage that may have occurred, and confirm that the shipment is complete. See “Receiving Checklist” section for detailed instructions.

Note: *Delivery cannot be refused. All units are shipped F.O.B. factory. Trane is not responsible for shipping damage.*

Packaging/Shipping

Complete ARU units ship in individual sections (modules) to be field assembled. All factory shipping protection should be removed upon delivery. This wrapping is for transit protection only.

Identification

Each ARU module includes a nameplate identifying the section type and functional components, customer tagging information, unit serial number, unit order number, the build-section position for installation, and the unit model number. See “Nameplate,” p. 7.

Receiving Checklist

Review the following checklist immediately after receiving shipment to detect possible shipping damage.

- ☐ Check to ensure that the shipment is complete. Small components may ship inside the unit or ship separately. Check the parts list to ensure all materials are present. If any component is missing, contact your local Trane sales office.
- ☐ Check all units, components, connections, and piping
- ☐ Check the fan wheel for free rotation by spinning manually.
- ☐ Check all doors, latches and hinges. Inspect the interior of each unit or section. Inspect coils for damage to fin surface and coil connections. Check for rattles, bent corners, or other visible indications of shipping damage. Tighten loose connections.
- ☐ If a unit is damaged, make specific notations concerning the damage on the freight bill. Do not refuse delivery.
- ☐ Notify the carrier’s terminal of the damage immediately by phone and mail. Request an immediate joint inspection of the damage by the carrier and consignee.
- ☐ Notify your Trane sales representative of the damage and arrange for repair. Do not attempt to repair the unit without consulting the Trane representative.
- ☐ Inspect the unit for concealed damage as soon as possible after delivery. Report concealed damage to the freight line. It is the receiver’s responsibility to provide reasonable evidence that concealed damage did not occur after delivery. Take photos of damaged material if possible.

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

Jobsite Storage

ARU modules and field-installed accessories must be protected from the elements. A controlled indoor environment is recommended for proper storage. Outdoor unit modules are not weather-proof before installation.

Outdoor Storage

NOTICE

Corrosion Risk!

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

Outdoor unit storage is not recommended. However, when outdoor storage is necessary, several things must be done in order to prevent damage:

Note: *Keep the equipment on the original wooden blocks/ skid 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 assure adequate air circulation beneath the unit and to assure no portion of the unit will contact standing water at any time.
- Loosen the belt tension on the drive belts.
- Cover each module securely with a canvas tarp.
- Do not stack modules while storing.
- Do not pile other material on the modules.

Storage Checklist

- ☐ Store unit modules indoors before installation. Protect them from the weather if outside.
- ☐ Take inventory of pieces received. (How many units/ How many pieces
- ☐ Is there any damage to the unit? Notify the Trucking company.

See the IOM that shipped with the unit (typically ships in the electrical panel) for unit layout and stacking instructions. Check the B.O.L.

Recommended Service Clearance

- Typical 3 feet in front of all electrical panels.
- Heaters commonly are at a higher level.
- Using a scissor lift is the most typical means of access. Plan the area accordingly to accommodate the size lift to access unit sections.

- Stairs and or catwalks are not provided by MJC. The ARU is not designed to support the weight.
- **Plan for possible coil replacement.** Either by removal of the unit completely or sliding the coils out.
- **Filter replacement**: Depending on the height of the filter frames adequate room is required for access.
- **Service**: The removal of the coil or fans is not easy and may require unstacking the unit as the fastest method. Plan the installation with replacement in mind. 24-hour operations require additional planning.

Site Preparation

- Ensure that the installation site can support the total weight of the unit (refer to the unit submittals for actual 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.
- Install the unit on a level pad.
- Anchor the unit to the concrete.

Lifting and Rigging

Lifting lugs can vary depending on the Manufacturer, unit size and weight. Refer to the following table.

Note: *Use all available lifting points to maintain uniform lift.*

Unit Type	Unit Size	Length (inches)	Width (inches)	Height (inches)	Weight (lbs)
Cooling	B	125	90	204	3,888
Cooling	C	168	90	204	6,630
Cooling	D	219	90	204	8,580
Heating and Cooling	B	125	90	366	6,043
Heating and Cooling	C	168	90	366	10,273
Heating and Cooling	D	218	90	366	13,420

Important: *Use spreader bar arrangement to avoid damage. Review drawings before ordering the crane.*

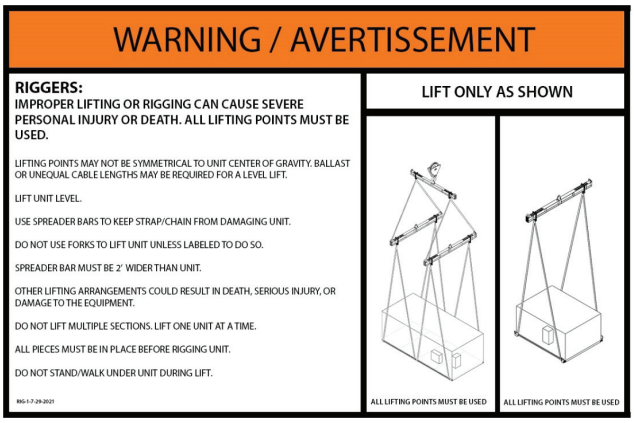
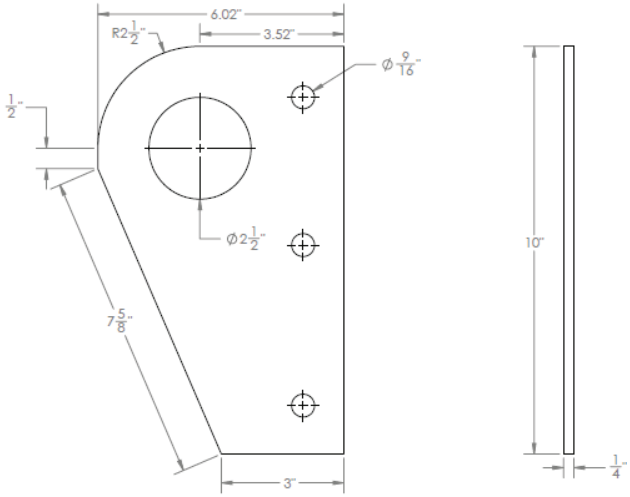


Figure 2. Non-welded upper section lift lug



Welded Base Frame Lifting Lug

Welded base frames have lifting lugs in order to lift the unit and attach to the floor.

Installation

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, 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.

Module Identification

A single ARU unit consists of separate modules. A typical ARU unit has three modules:

- Module 1 normally contains the coils.
- Module 2 contains the fan.
- Module 3 typically has grills on some of its faces and is the discharge module.

Each module in a shipment is marked with an identifying tag used during the installation process. The tag identifies what ARU unit the module is for and which module it is in the stack order.

The ability to identify the modules associated with an ARU unit is important when multiple ARU units are ordered.

Modules from different units may be the same size and fit together well but if the modules are not from the same unit they will not operate as intended.

Note: *ARU modules are not built to be interchangeable across units.*

Figure 3. Unit and model labeling location example

See the general layout diagram for installation of components that are ship-along items.

In order for the ARU unit to be installed correctly, the unit modules must be stacked vertically in a specific order:

- Module 1 is typically set closest to the ground.
- Module 2 is set on the lower coil module(s).
- Module 3 is the topmost module of the stack.

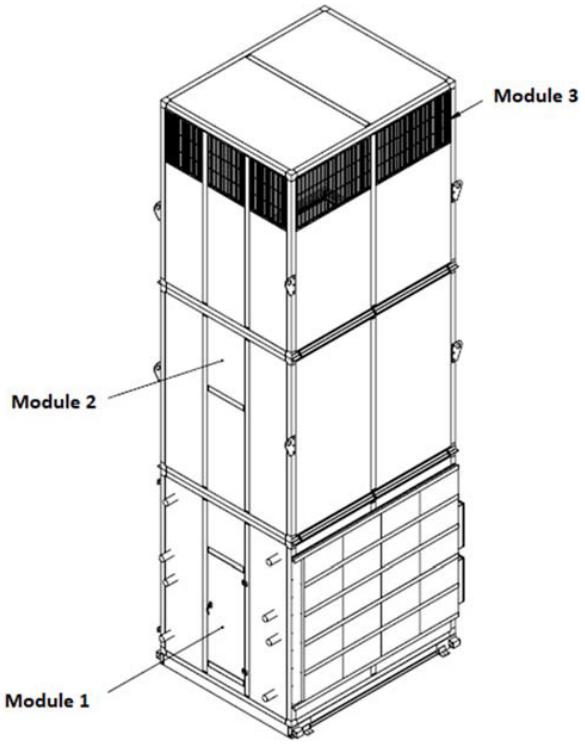
See the provided **Stacking Instructions** page with the unit shipment for stacking labels and unit specific stacking information to assist in installing the modules.

⚠WARNING

Risk of Unit Dropping!

Always place, assemble, and suspend modules/subassemblies one at a time. Placing, assembling, and/or suspending more than one module/subassembly at a time could result in module/subassemblies dropping and crushing technicians which could result in death, serious injury, or equipment damage.

Figure 4. Stacking example



If lifting points are provided, use a crane /boom truck depending on the weight and reach required to set the unit. Use available lifting points to maintain uniform lift.

Important: *The use of a forklift is not recommended. Lift with a forklift at your own risk. Warranty may not be maintained.*

For small ship-along pieces/crates without lifting points, use EXTENDED FORKS to prevent damage.

Connecting Unit Sections

- Flanged connections between sections typically ship with 1/2 in. grade-5 bolts. Standard torque for this type of bolt is 75 ft-lbs for zinc plated bolts and dry conditions.
- Foam tape is provide to install between sections. 2 in. x 1/8 in. thick/ role(s). Apply tape to the aluminum frame before the next section is lifted. The connection flanges to connect each section do not need foam tape.
- The connection flanges to connect each section do not require foam tape.
- Caulk as needed.

Figure 5. Hardware kit typically shipped with unit

Figure 6. Typical electrical panel and layout

Note the following:

- Power panel with disconnect.
- Control panel.
- VFD
- Liquid line to be installed by others when the txv is installed. Cutting of the hole location and sealing around the pipe by others.
- Typical VFD location next to the power panel.

Figure 7. Typical lower module 1 coil section with DX coils (older style lifting lugs)

Note the following:

- Liquid line penetration by others to assist in the location and installation of the TXV.
- TXV is by others. Selected and Installed.
- Suction line connections per circuit. See coil data sheet.
- Condensate drain connect located below the door. P-trap by others. Condensate pump if needed by others.

Main Power

The Main Disconnect is the location where the 3-phase power is brought to the unit by others. See the Data plate for electrical requirements.The label is installed next to the power panel.

The 3-phase power for the fan motor and control panel must be brought into the power panel. See electrical diagram.

The prewired pigtail from the fan section is coiled up inside the FAN section and must be connected to the LOWER section after the units are stacked.

Important: *VFD(s) are installed on this unit (NOT MANUAL MOTOR STARTERS). There is a single point power panel on the unit.*

Figure 8. Typical power panel layout (options vary)

Power will be supplied to the motors from the VFDs. (Special VFDs shipped loose for field installation.) Reconnect wires between junction boxes.

- Reconnect the fan motor wires
- Reconnect control wire
- Reconnect Heater wires

Figure 9. Unit interior (electrical reconnection)

Drop down the wire extensions down to the lower module and reconnect the wires to terminal blocks. Terminal box shown.

Refer to the included Electrical Diagrams. If room is available, locate stickers inside the door of the electrical panels included with the IOM material.

Figure 10. Reconnection extensions example

Refer to wiring diagram for matching wire numbers and terminal blocks.

Figure 11. Typical control wiring - discharge temperature sensor (optional)

Component Installation

Ship-with Components

ARU units are typically shipped with a number of components. These components must be installed onto the ARU to ensure proper operation and performance.

Filters

Before a unit is shipped, the filters are removed to prevent damage or loss of the filters before arrival. These filters must be reinstalled before the unit is used to prevent damage to the coil face.

Proper filter sizes and quantities are marked on the side of the unit where the filters should be installed.

Figure 12. Filter size and quantity identifier on a unit

Note: *Different units may require different sizes and quantities of filters. Refer to markings on the unit or the unit specific literature.*

Sensors

Thermostats, sensors if applicable. See the included wiring diagrams.

Discharge Plenum

Discharge Plenum (optional).

Figure 13. Typical discharge plenum (optional)

Note: *Hardware and rigging is not included for the Discharge Plenum.*

Note: *The previous section only covers the most typical ship-with components for an ARU unit. Always refer to the unit specific literature for a full explanation of the ship-with components and their installations.*

Piping Connections

NOTICE:

Over Tightening!

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

NOTICE:

Leakage!

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

NOTICE:

Connection Leaks!

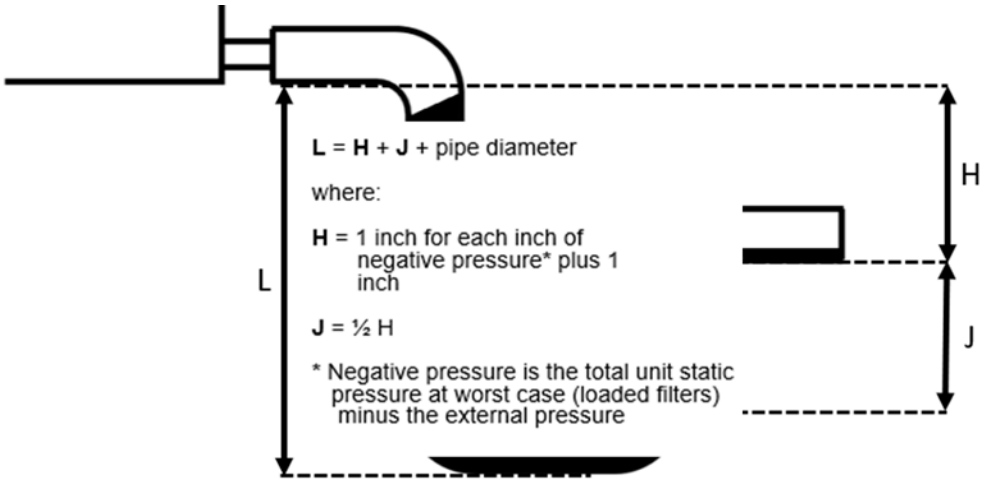
Use a backup wrench when attaching piping to coils with copper headers to prevent damage to the coil header. Do not use brass connectors because they distort easily and could cause connection leaks.

General Recommendations

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

- When attaching the piping to the coil header, make the connection only tight enough to prevent leaks.
- Use pipe sealer on all thread connections.
- After completing the piping connections, seal around the pipe from inner panel to outer panel.

Figure 14. Proper trapping and piping operation



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, resulting in the operator/technician to fall. Failure to follow this recommendation could result in death or serious injury.

Figure 14, p. 19 illustrates the proper trapping, piping, and operation of the trap. Use the formula within the figure to determine the correct minimum depth for the condensate trap. Only sections handling condensate, such as a cooling coil section or moisture eliminator section, require a trap.

Water Coil Piping

Chilled Water Application

See Performance Data - Cooling Coils. GPM and Pressure drop.

For fluid application cooling coils, the Entering Water Connection (EWC) and the Leaving Water Connection (LWC) must be connected to the coil(s). See diagram. The coldest water the EFC connections are the interior connections on the air-leaving side of the coils. Connections are labeled.

Air vent and drain is located on the leaving air side of the coils.

Air vent and/or Auto-venting of the cooling coils is performed by others. Done by others if needed: Coil drains plug can be replaced with a small ball valve and can be accessed in the interior of the unit.

Standard units have coil vent and drain connections on the interior of the unit. The vent typically has a ball valve and the drain a plug.

Modulating valve and actuator not typically provided by MJC. Provided and installed by others.

DX Cooling Only

Important: *If this unit is a DX system, liquid and suction connections will replace the fluid cooling connections. Use standard practices for installing the liquid and suction lines. Additional cautions are required for longer line sets or higher vertical applications. See electrical print for the control DX stages. Refer to the coil data sheet for circuiting of coils.*

- Refrigeration specialty components are not provided. A standard installation extends the suction connection out of the units.
- A standard unit does not include a TXV; therefore, to allow the installer freedom to install the liquid, an additional penetration is required in the cabinet to bring the liquid line inside.

Note: *Refer to the addition of factory condenser for installation of liquid line solenoids, ball valves, suction line filter dryers, site glasses, and TXVs.*

All field piping design is by others. To include suction vertical suction lines, use liquid line solenoids to prevent refrigerant migration and long line set applications. Refer to Condenser application guide.

Indirect Style Heaters

Field installation required (see the heat section and factory literature provided with heater for installation connections, setup, and operation).

Unit Connections

1. Proper volume and pressure fuel gas is required. Verify with Name plate fuel type. If the gas pipe is connected the gas required to operate the all heaters at maximum fire rate requirement that are connected to that header pipe. If there are separate heaters that require gas connection and condensate connections. Depending on availability and unit configuration: Rack system heaters built with a common vestibule typically have a common gas train for one gas connection and one condensate connection. **Heat with SEPARATE HEATER MODULES:** each heater gas supply connection must be connected separately. See heater manufacturer IOM for details. For units with individual heaters the gas will be required to be connected to each heater.
2. **Condensate drains should also be piped and trapped.** See the Heater Manufacturer Factory Installation. The condensate drain(s) should be piped and trapped to drain according to local codes and guidelines. The condensate drains need to be connected to an appropriate drain per local rules concerning heater condensate removal. The temperature and acidity may have to be reviewed. Refer to heater supplier IOM for details. Typical: thin wall stainless.
3. **Indirect Indoor units: Exhaust flue is not provided**. See the drawing. Installation, support, penetration through the roof and sealing by others. Each heater will have to be vented to the exterior individually. See IOM. Common flue connection design and construction by others. Do not connect flues together without an engineered solution. It is dangerous and the heaters will not operate properly.
4. **Outdoor Indirect units only:** Typically, the exhaust is directed out, away from the unit with a small weather covering. Flue is typically not needed. See manufacturer IOM for proper material selection and installation requirements.
5. **Electrical Connections**: The power and controls extensions will have to be reconnected between sections after stacking sections together. Typical controls options for heaters will require downstream temperature sensor(s) to be installed. Discharge temperature control.

Typical Safety Components

High limit switch: High limit switches are provided. If high limit switch trips it will shut off the heater and manual reset is required.See the electrical print(s). High limit installed and wired on each heater(s). Verify operation and setpoint required on startup. Some installations require them to be installed. Locate downstream of the air handler and wire back to the heater control panel. Refer to the electrical diagram.

Airflow Switch: Airflow switches are provided. There is Qty=1airflow switch for heater(s). There is a high limit switch. It is typically set to 185°F. If air is proved then the switch will close. See the electrical print(s) if the airflow switch is required to be field installed and wired. To be mounted upstream (in the airflow before the heater) of the heater in an accessible spot. Verify operation and setpoint required on startup.

Controls: Re-Connect control wires at the heater as required.

Heater Control Options

Controls Modulating: From above these units are connected to a sequencer. A dry set of contacts is needed to activate the heat system and a modulating signal (0-10Vdc). The sequence will turn on each heater as needed and modulate the modulating valve on the 1 heater.

Controls: (No controls job) See Heater factory wiring diagram for the 24 Vac dry contacts required to start each heater. Dry contact heater start command needed for each heater(s).

Two stage heaters: multiple heat start commands. Modulating heaters require a 0-10 vdc modulating signal.

Discharge Air Temperature Control: It is suggested to us a discharge temperature control to prevent overheating of the heater and better temperature control including heaters with temperature rise above 60°F.

Thermostat Control: Thermostat will call for stages of heat based off zone temperature read at thermostat and the heating setpoint set in the thermostat. This heater has 2 stages of cooling; W1 from the thermostat output will call for first stage of heat and W2 from the thermostat output will call for second stage of heat. See Honeywell Thermostat literature for setting up the second stage of heat is called for (most applications will work with “comfort” set as the second stage differential).

Important: *Start-up of unit by qualified technician. If indoors unit, the heater exhaust flue must be connected with proper flue to the exterior. Refer to the Factory Heater Installation instructions.*

Heater Startup

1. Follow the manufactures startup procedures.
2. Check all piping connections for leaks.
3. Tighten all electrical terminal connections.
4. Fill out heater startup sheets.
5. Follow manufacturers startup guidelines.
6. For combined heaters that use flexible gas pipe connectors to the main gas supply header, reconnect and leak check before startup.

THIS UNIT HAS BEEN END-OF-LINE TESTED. NORMAL STARTUP UNDER OPERATING CONDITIONS IS REQUIRED. THIS INCLUDES BUT IS NOT LIMITED TO SYSTEM PRESSURES, FLOW RATE, AMP DRAW, AND FAN DIRECTION OF ROTATION. STARTUP OF A HEATER BY A QUALIFIED TECHNICIAN ONLY.

ARC FLASH SAFETY EQUIPMENT REQUIRED FOR HIGH VOLTAGE PANELS UNLESS ALL POWER HAS BEEN LOCKED OUT AT THE SOURCE OUTSIDE THE PANEL ACCESSED.

Fall protection and proper ladder safety procedures followed in addition to specific jobsite safety procedures.

Routine Maintenance

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, 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.

⚠WARNING

Rotating Components!

The following procedure involves working with 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 rotor to ensure the rotor cannot freewheel. Failure to secure rotor or disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury.

Maintenance Schedule

Weekly

Observe the unit on a weekly basis to detect any change in running condition and unusual noise.

Monthly

Clean or replace air filters if clogged or dirty; coat permanent filters with oil after cleaning; change bag filters when pressure drop is 1 in. w.g.

Three to Six Months

- Check fan bearing grease line connections. Lines should be tight to the bearings.
- Check motor bracket torque.
- Fans - check bearing bolt torque and bearing setscrew torque.
- Belt-drive fans - align fan and motor sheaves. Tighten sheave set screws to the proper torque.
- Inspect and clean drain pans.
- Tighten electrical connections.
- Inspect coils for dirt build-up.
- Clean moisture eliminator with high pressure sprayer. Remove any debris.

Yearly

- Inspect the unit casing for corrosion. If damage is found, clean and repaint.
- Clean the fan wheels and shaft.
- 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. The wheel should not rub. Adjust the center if necessary.
- Lubricate motor bearings in accordance with motor manufacturer's recommendations for more information.
- Check condition of gasketing and insulation around unit, door and dampers.
- Examine flex connections for cracks or leaks. Repair or replace damaged material.

Coils

All coils should be kept clean to maintain maximum performance.

Water Coils

⚠WARNING

Hazardous Chemicals!

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

To clean 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. Install a block-off to prevent spray from entering

through the coil and into a dry section of the unit and/or system ductwork.

3. 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.*

4. 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.
5. Spray the leaving air side of the coil first, then the entering air side.
6. Thoroughly rinse both sides of the coil and the drain pan with cool, clean water.
7. Repeat the last two steps as necessary.
8. Straighten any coil fins that may have been damaged during the cleaning process.
9. Confirm the drain line is open following the cleaning process.
10. Allow the unit to dry thoroughly before putting it back into service.
11. Replace all panels and parts and restore electrical power to the unit.
12. Use caution to ensure that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials.

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.

⚠WARNING

Hazardous Chemicals!

Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin occurs. Handle chemical carefully and avoid contact with skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices. Failure to follow all safety instructions 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. Install a block-off to prevent spray from entering through the coil and into a dry section of the unit and/or system ductwork.
3. 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.*

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

Coil Winterization

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

Table 1. Freezing temperatures of water-glycol solutions

%Ethylene Glycol Freezing Point (by volume)	Degrees Fahrenheit
0	32°F
10	25°F
20	17°F
30	5°F
40	-13°F
50	-34°F
60	-54°F

Table 2. Freezing temperatures of water-glycol solutions

%Propylene Glycol Freezing Point (by volume)	Degrees Fahrenheit
0	32°F
10	26°F
20	19°F
30	8°F
40	-7°F
50	-29°F
60	-60°F

NOTICE

Coil Freeze Up!

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 could result in equipment damage.

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.

Individual coil types determine how to properly winterize the coil. To determine the coil type, locate the *service model number of coil* on the coil section nameplate. The coil type is designated by the second and third digits on that model number.

For example, if the model number begins with DUWB, the coil type is UW; if the model number begins with DWOB, the coil type is W.

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.

Note: *Use care in removing header plugs from Type P2, P4, and P8 coils. Over-torquing may result in twisted tubes.*

Moisture Purge Cycle

By default, 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 does not 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. The moisture purge cycle operates as follows:

- 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.

Drain Pans

The condensate drain pan and drain line must be checked to assure the condensate drains as designed.This inspection should occur a minimum of every six months or more often as dictated by operating experience. If evidence of standing water or condensate overflow exists, identify and remedy the cause immediately.

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

Fans

Observe the following safety recommendations.

Prior to performing maintenance operation on the fan, ensure that:

- The drive motor is disconnected from all terminals.
- The impeller has come to rest.
- The surface temperature has been checked to avoid injury.
- The fan may not be started accidentally during maintenance.
- No debris of damage or dangerous materials are inside the fan.

Only limited maintenance may be carried out while the fan is in operational condition while safety and accident prevention regulations are being observed (for example: measurement of vibration).

Any disregard of these points may endanger the life of maintenance personnel.

Fan Housing and Impeller

Depending on the type of medium transported, wear and dirt is to be expected on the housing and impeller (corrosion, abrasion, attached materials).

Regular inspection and cleaning must take place. The intervals between is determined by the operator in accordance with individual operating conditions. No high-pressure cleaners (steam rod cleaners) are to be used.

Bearings

Like all components, the bearings must be periodically checked and, if required, cleaned and re-lubricated.

The bearings mounted on the fans are of different types according to the fans size and the absorbed power.

The base and R-version are supplied with pre- greased sealed for life ball bearings.They have an anticipated design life of 40.000 hours at peak performance. By changing the bearings, it is necessary to change the rubber as well.

The T-version fans are supplied with re-greasable, sealed-for-life ball bearings with plummer block.

Bearing Replacement (Cross-arm Bearings)

1. Release the grains and remove the locking rings from the bearings using a punch and hammer.
2. Unthread the locking rings from the shaft. With the use of appropriate tools, hold the shaft in order to avoid damages to the wheel and inlet cone.
3. Remove the cross bearings from the side plates and unthread the cross bearings from the shaft. Replace bearings and rubber rings.
4. Mount new bearings and new rubber rings in the cross-arms.
5. Mount the cross-bearings on the side-plates, taking care to center the impeller in the inlet cone.
6. Fix the cross-bearings on the side plates, tightening the bolts. Thread and tighten the locking rings on the bearings; then tighten the grains in the locking rings.
7. Turn the wheel in order to check the correct rotation.

Substitution of bearings mounted into cast iron pillow block:

1. Release the grains and remove the locking rings from the bearings using a punch and hammer.
2. Remove the pins form the cast-iron pillow block and release the bolts.
3. Unthread the cast-iron pillow blocks from the shaft. With the use of appropriate tools, hold the shaft in order to avoid damages to the wheel and inlet cone.
4. Replace the bearings, mounting the new bearings on the cast-iron blocks.
5. Mount the cast-iron pillow blocks on the frames, having care to center the impeller on the inlet cone.
6. Fix the cast-iron pillow blocks on the frames tightening the bolts.
7. Thread and tighten the locking rings on the bearings then tighten the grains in the locking rings too.
8. Turn the wheel in order to check the correct rotation.

Substitution of bearings mounted into cast-iron split pillow blocks SKF mod.SNL:

1. Unlock the block cover, releasing the bolts located on both sides.
2. With the use of appropriate tools, hold the shaft in order to avoid damages to the wheel and inlet cone.
3. Remove the locking rings from the bearing side (note that only one bearing is equipped with the locking rings), and the half-sealing rings from the bottom and upper part of the block housing after cleaning off the grease.
4. Slide out the bearings, straightening the feather key of threaded ring placed on the bushing; release the threaded ring from both sides using a punch and hammer.

5. Place the bearings. Tighten the bushing by using the threaded ring, then bend the feather key.
6. Mount the new seal ring inside the grooves located on the bottom part of the block.
7. Place the greased group shaft/bearing over the block basement.
8. Mount the locating rings on the sides of one bearing only (the other bearing will not be locked).
9. Place the other seal ring inside the upper part of the block.
10. Place the upper part of the block over the bottom part and tighten the bolts.
11. Grease and turn the wheel in order to check the correct rotation.

Motor Bearing Lubrication

Obtain the 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 the life of the bearing. A variety of motors styles are available as standard selections; therefore, obtain the motor IOM and use the manufacturer-recommended grease.

Fan Motor Inspection

Inspect fan motors periodically for excessive vibration or temperature. Operating conditions will determine the frequency of inspection and lubrication. Motor lubrication instructions are located on the motor tag or nameplate.

If these instructions are not available, contact the motor manufacturer. Some motor manufacturers may not provide oil tubes on motors with permanently sealed bearings.

Filters

Bag and cartridge filter sections can be used as a pre-filter section, a final filter section, or both. This use is determined by the filter placement in relation to the fan.

- A final filter is placed after the fan.
- A pre-filter is placed before the fan.

Note: Cartridge and bag filters provided by Trane are fitted with a 7/8-inch header that fits in the filter track. If using filters supplied by another manufacturer, filters should be purchased with a 7/8-inch header. In some cases it may be necessary to gasket other manufacturers' filters to ensure a good air seal.

Filters should be installed when the unit is set. This will protect internal components, such as the heating and cooling coils.

Final Filter Section

A final filter section should not be bolted directly to the face of a fan section. One or more intermediate sections must be placed between the fan discharge and the filter section.

Pre-Filter Section

A pre-filter section has no special installation requirements unless placed directly upstream of a plenum fan. In these configurations, ensure a blank section is placed between the fan inlet and the filter section.

Trane recommends the use of disposable pre-filters with high-efficiency filters. Disposable pre-filters slide into the mounting tracks just ahead of the bag/cartridge filters.

Filter Installation

⚠WARNING

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To install filters:

1. Disconnect the power to the unit.
2. Open the filter section access door.
3. Slide the filters into the tracks.

   The block-off is permanently installed and will create a seal when the access door is closed.

Note: *Bag filters must be installed with the pleats in the vertical plane.*

4. Close the access door slowly to allow any gasketing to compress.

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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