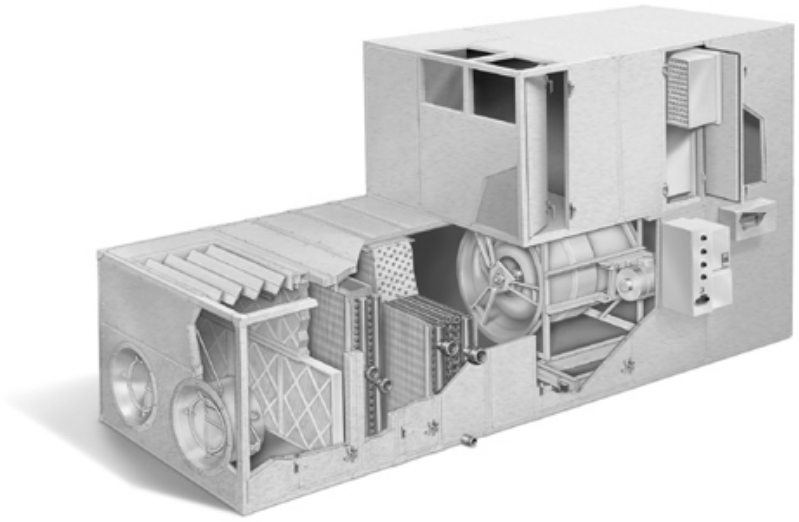
TRANE®

Installation
Operation
Maintenance

M-Series
Climate Changer™
Air Handlers

Sizes 3 to 120



Part No.: X39640701-010

March 2006

CLCH-SVX03C-EN

NOTICE:

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

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

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

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

Introduction

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

Product Information

Trane M-Series Climate Changer air handlers are central-station air handlers designed for a variety of controlled-air applications. The basic unit consists of a fan, heating and/or cooling coils, filters, and dampers. The unit may also include a wide variety of other modules. See product catalog CLCH-PRC003-EN for a list of available modules.

Each M-Series module is provided with a module nameplate/label (see Figure 1), which identifies the type of module, the module's position within the unit, customer tagging information, the module serial number, and the service model number. Refer to the module nameplate to ensure proper placement of the modules during assembly.

If the unit ships as individual modules or module subassemblies (a collection of modules), refer to the module nameplate to ensure proper placement of the modules during assembly.

Note: This information is required when ordering parts or requesting service for an M-Series module.

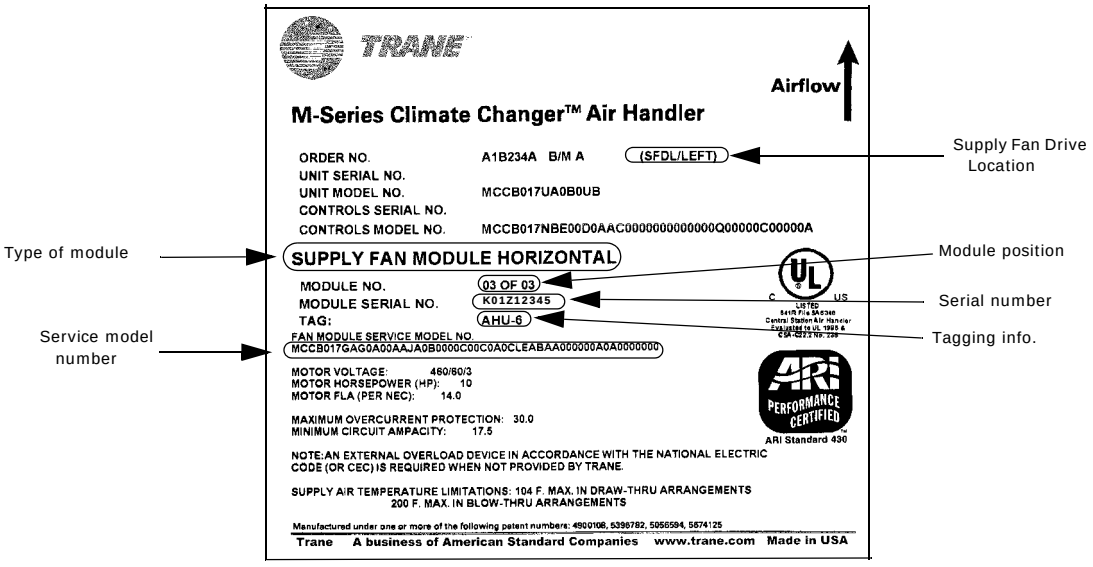
Protecting the Environment

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

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

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

Figure 1. M-Series module nameplate / label



Contents

General Information

Operating Environment

When considering the placement of the M-Series 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).

Note: The customer should provide adequate freeze protection for the coils. See the "Coil Winterization" section on page 63 for more information.

Controls

Wiring Sizes and Connections

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

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

Factory-Mounted Controls

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

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

All factory-mounted control systems (controls that are factory-wired to a unit controller or termination strip) ordered without starters or variable-frequency drives (VFDs) are provided with line to 24 Vac control transformers mounted and wired in the auxiliary control panel. The customer must provide 120 Vac control power, 50/60 Hz, typically 3 amps for unit sizes 3 to 57 and 5 amps for unit sizes 66 to 120. A dedicated 15-amp circuit is recommended.

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

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

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

Custom Options

For inquiries about our standard custom options, contact your local Trane sales engineer, or refer to the following manuals:

- Gas heat - CLCH-SVX04B-EN
- Energy wheels - CLCH-SVX02C-EN
- LJ Wing Coils - installation manuals available from www.ljwing.com
  - IOM-VIFB-3
  - IOM-IFB-2R
- Humidifiers - installation manual available from www.armstrong-intl.com
  - Armstrong Bulletin No. 560-G

Ultraviolet (UV) Germicidal Irradiation Lights (optional)

The United States Environmental Protection Agency (EPA) believes that molds and bacteria inside buildings have the potential to cause health problems in sensitive individuals. 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.

Pre-Installation Checklists

M-Series Climate Changer air handlers can ship as individual modules, module subassemblies, or a complete air handler. Unit sizes 3 to 57 may have a base rail (also called an external support kit). Unit sizes 66 to 120 ship on an integral base rail. Modules shipped without a base rail are securely fastened to a wooden skid using 4-inch mounting legs for ease of handling. No skid is provided on units with base rails. Trane recommends leaving units and accessories, such as filter boxes and control devices, in their shipping packages/skids for protection and ease of handling until installation.

M-Series air handler sizes 3 to 57 ship in subassemblies if the total length of the unit exceeds 98 inches, or if the total weight exceeds the limits as calculated using Table 2 on page 10, Table 3 on page 11, and Table 5 on page 12. If an optional factory base rail and standard factory shipping splits were ordered, each subassembly will ship on its own base rail as standard. If an optional factory base rail and minimum factory shipping splits were ordered, the base rail will ship separate from each subassembly.

M-Series air handler sizes 66 to 120 ship in subassemblies if the total length of the unit exceeds 102 inches, or if the total weight exceeds 4,300 pounds. These unit sizes have an integral base rail on each module.

Receiving Checklist

Upon receipt of the air-handling unit, visually check the components for any damage that may have occurred during shipment. Conduct a thorough inspection immediately before accepting the shipment:

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

CAUTION
Equipment Damage!

Keep skid in place until unit is ready to set. Do not move the unit or subassembly without the skid in place as shipped from the factory. Premature skid removal may result in equipment damage.

1. Remove any shrink wrap material that may have been used during shipping. Cut all banding loose from the skids (if applicable). Do ***not*** remove the unit from the skid.
2. Check all access doors to confirm the latches and hinges are not damaged.
3. Inspect the interior of each module for any internal damage.

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

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

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

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

Resolving Shipping Damage

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

Note: Trane is not responsible for shipping damage.

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

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

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

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

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

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

Job Site Storage Recommendations

M-Series units and/or field-installed accessories that must be stored for a period of time before installations *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.

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, such as shrink-wrap material, should be removed within 48 hours of receiving the unit, and prior to storage.

Long-Term Storage

While the unit is in storage:

- Every two weeks, rotate the fan and motor shaft 30 revolutions by hand.
- Every six months, check fan shaft bearings and grease lines. Add grease using a manual grease gun following the lubrications recommendations in the "Fan Bearing Lubrication" section on page 61.

Outdoor Storage Considerations

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

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

1. Remove any shrink-wrap material within 48 hours of receiving the unit.
2. Select a well-drained area, preferably a concrete pad or blacktop surface.
3. 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.
4. Loosen the belt tension on the drive belts.

CAUTION
Corrosion!

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

5. Cover the unit securely with a canvas tarp.
6. Allow proper clearance around the unit to perform periodic inspection and maintenance of the equipment while in storage (see Figure 2 and Table 1 on page 9).
7. Do not stack units.
8. Do not pile other material on the unit.

Preparing the Unit Site

1. Ensure the installation site can support the total weight of the unit (see the "Dimensions and Weights" section on page 10 for approximate module weights; refer to the unit submittals for actual module weights).
2. Allow sufficient space for the recommended service access (see Figure 2 and Table 1).

CAUTION
Microbial Growth!

The floor or foundation must be level and the condensate drain at the proper height for proper coil drainage and condensate flow. Standing water and wet surfaces inside the equipment can become an amplification site for microbial growth (mold), which may cause odors and damage to the equipment and building materials.

3. Ensure there is adequate height for condensate drain requirements (see the "Drain Pan Trapping" section on page 35).
4. Confirm the foundation of the mounting platform is level and large enough to include the unit dimensions (refer to the unit submittals for specific dimensions).
5. Provide adequate lighting for maintenance personnel to perform maintenance duties.
6. Provide permanent power outlets in close proximity to the unit for installation and maintenance.

⚠ 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.

7 Unless the unit is ordered with a factory-mounted/wired starter or variable-frequency drive, the customer must provide 120 Vac power to the unit controller, 50/60 Hz, typically 3 amps for unit sizes 3 to 57 and 5 amps for unit sizes 66 to 120. A dedicated 15-amp circuit is recommended.

8 Wiring to M-Series units must be provided by the installer and must comply with all national and local electrical codes.

9 If a factory-provided base rail was not ordered to ceiling suspend M-Series unit sizes 3 to 57, the installer/contractor must provide a ceiling-suspended mounting frame designed to support the length, width, and weight of the entire air-handling unit. See the "Ceiling Suspension" section on page 18 for more information.

Figure 2. Service Clearance

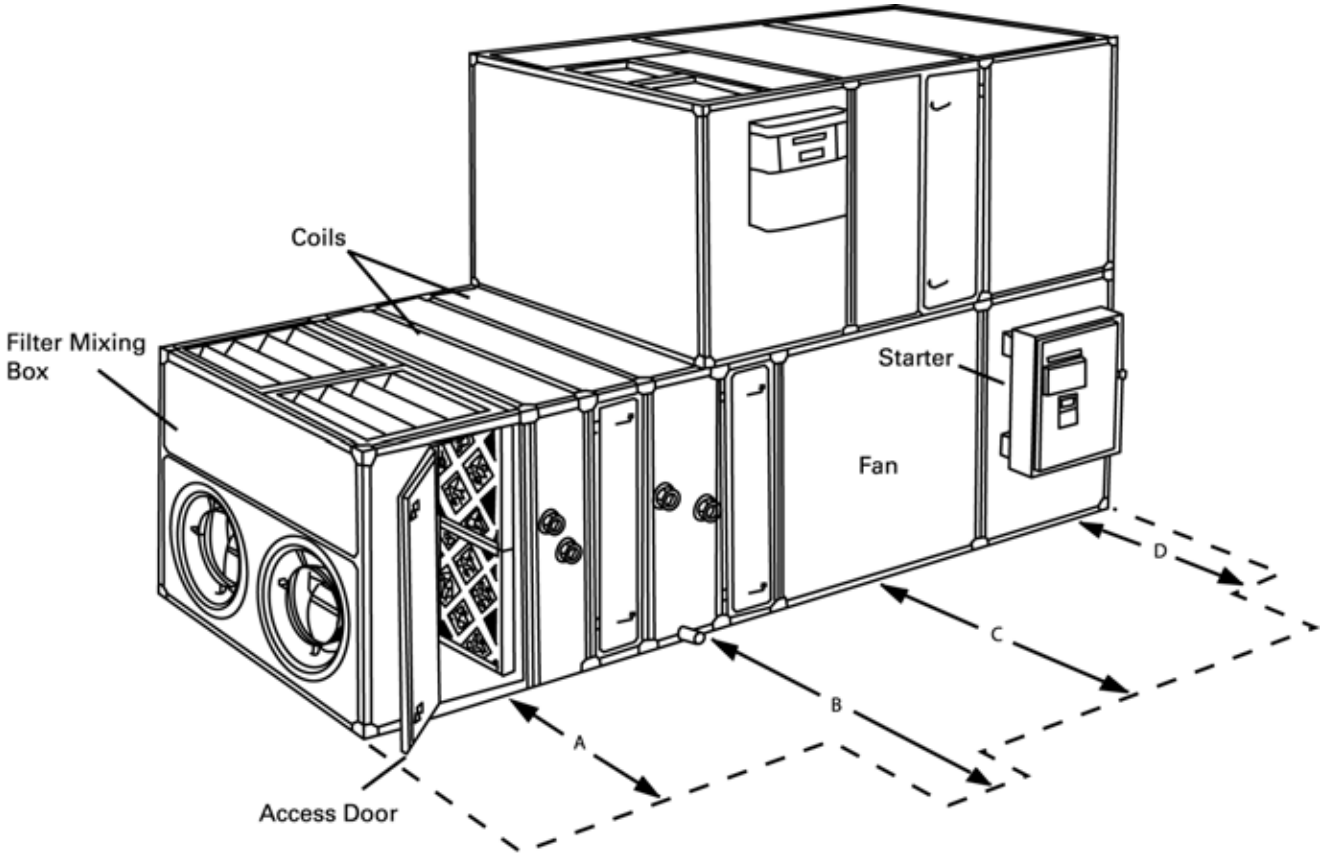


Table 1. Service clearances (inches)

Clearance Items	3	6	8	10	12	14	17	21	25	30	35	40	50	57	66	80	100	120
A (filter)	48	48	48	48	48	48	48	48	48	48	48	48	48	48	52	56	58	58
B (coil)	48	60	64	75	79	83	89	91	93	106	110	123	134	134	150	150	165	165
C (fan)	48	48	48	51	54	58	61	60	66	66	65	70	77	77	93	91	101	101
D (starter or VFD)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

NOTE: At a minimum, the above clearance dimensions are recommended on one side of the unit for regular service and maintenance. Refer to as-built submittal for locations of items such as filter access doors, coil, piping connections, motor locations, etc. Sufficient clearance must be provided on all sides of unit for removal of panels or module-to-module attachment brackets. Clearance for starters, VFDs, or other high-voltage devices must be provided per NEC requirements.

Dimensions and Weights

For specific dimensional and weight information, refer to the unit submittals. The dimensions and weights in this manual are approximate. *NOTE: Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.*

Table 2. Module weights (pounds) per unit size for single-wall construction

Module Type	3	6	8	10	12	14	17	21	25	30	35	40	50	57	66	80	100	120
Intake	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mixing box with filter	156	195	237	271	312	339	379	429	498	558	780	861	1010	1144	1430	1616	1915	2156
Mixing box without filter	124	174	212	241	278	289	323	366	433	485	699	771	904	997	1251	1392	1630	1825
Traq™ mixing box	136	168	206	236	268	301	332	426	427	565	684	747	873	959	1281	1433	1661	1867
Blender module	106	141	153	174	232	251	226	250	292	325	402	448	516	565	647	725	853	1273
Filter, angled	106	139	141	161	176	198	217	235	248	271	325	349	399	466	698	755	859	960
Filter, short bag or cartridge	108	140	141	160	177	206	227	233	250	274	380	423	491	554	764	830	935	1054
Filter, flat	54	67	76	84	98	104	113	124	130	142	195	210	274	310	497	537	612	688
Filter, flat combination	79	100	114	127	155	166	180	192	203	224	251	274	313	355	552	601	691	781
Filter, flat, open-return	11	16	19	22	34	39	43	44	45	53	68	78	99	120	146	169	210	247
Filter, HEPA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Filter, long bag-30 in.	128	171	200	192	227	264	326	344	398	434	472	517	588	646	937	1052	1229	1373
Blank/inspection, small	59	72	80	89	97	102	110	118	126	136	177	189	240	257	455	464	506	567
Blank/access, medium	72	85	94	106	115	121	131	141	149	162	205	220	n/a	n/a	n/a	n/a	n/a	n/a
Blank/access, ext-medium	82	97	108	122	132	139	150	161	171	186	235	252	284	303	476	487	528	586
Blank/access, med-large	n/a	n/a	134	151	164	171	185	198	210	228	316	340	381	407	610	624	677	752
Blank/access/turning, large	102	134	164	191	207	215	232	253	297	325	448	480	538	574	869	945	1113	1230
Blank/access/turning, ex-large	111	148	174	163	197	211	244	296	345	371	542	575	668	707	893	1007	1135	1229
Face-and-bypass, external	101	136	163	196	228	242	283	315	349	399	444	488	606	660	982	1101	1304	1519
Face-and-bypass, internal	78	107	131	155	195	185	212	259	291	332	409	446	586	662	910	997	1180	1363
Face damper	83	109	133	158	188	199	236	267	299	340	372	408	517	570	825	945	1128	1311
Coil, small w/2-row UW	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, medium w/8-row UW	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, ext-med w/8-row UW	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, med-large w/10-row W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, large or vert w/10-row W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, electric heat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, integral face-and-bypass	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Coil, multizone/double-duct	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Humidifier	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Moisture eliminator	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
FC fan[1]	292	371	461	507	567	629	786	912	1042	1152	1785	1937	2543	2582	3923	4130	4455	4587
AF fan[1]	323	472	494	629	717	742	926	1167	1226	1647	2269	2156	2957	2997	3662	4349	5189	5732
BC fan[1]	342	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Q™ horizontal vaneaxial fan[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Q™ vertical vaneaxial fan[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Plenum fan[1]	323	410	447	518	638	645	710	1119	1292	1423	1671	1838	2485	2524	3228	4077	4665	5066
Diffuser	68	86	97	114	126	180	197	212	225	249	322	350	438	477	927	1037	1230	1377
Discharge plenum, horizontal	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Discharge plenum, vertical	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Silencer, 3 ft.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Silencer, 5 ft.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Energy wheel[2]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gas heat[3]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

(**1**) Fan module weights include the heaviest fan with the largest ODP motor available.

(**2**) The weight of the energy wheel module is with the largest wheel available for each unit size. The weights include all dampers and filter rack, they do not include end devices, control wiring or a starter.

(**3**) Weights of the gas heat modules are with the largest capacity burner. Refer to the M-Series Gas Heat Quick Select (CLCH-SLB004-EN) or the TOPSS selection program for detailed dimensions.

Table 3. Module weights (pounds) per unit size for double-wall construction

Unit size	3	6	8	10	12	14	17	21	25	30	35	40	50	57	66	80	100	120
Intake	134	183	221	263	307	332	380	432	485	553	670	747	973	1096	1513	1699	2023	2326
Mixing box with filter	181	223	277	319	367	390	437	495	577	646	890	982	1158	1290	1589	1798	2133	2387
Mixing box without filter	142	202	253	288	332	341	381	432	512	573	809	891	1051	1143	1410	1575	1847	2056
Traq™ mixing box	159	191	239	275	309	341	376	512	487	676	770	840	978	1056	1743	1936	2161	2328
Blender module	129	174	193	221	297	322	282	309	366	407	507	564	646	700	801	902	1071	1665
Filter, angled	126	168	169	194	212	235	258	278	294	321	390	421	480	549	791	852	967	1082
Filter, short bag or cartridge	128	170	168	193	213	243	268	276	295	324	446	495	571	637	857	927	1042	1175
Filter, flat	62	78	89	99	115	121	131	143	151	165	221	238	314	352	543	585	666	748
Filter, flat combination	91	116	131	148	178	190	207	219	232	257	287	313	353	397	598	649	745	841
Filter, flat, open-return	11	16	19	22	34	39	43	44	45	53	68	78	99	120	146	169	210	247
Filter, HEPA	213	296	363	400	450	493	608	710	840	972	1028	1150	1374	1467	1735	1969	2383	2740
Filter, long bag-30 in.	158	218	257	241	292	334	408	443	516	565	586	642	728	793	1104	1244	1464	1635
Blank/inspection, small	65	79	88	99	107	112	121	131	139	150	193	207	265	283	484	495	541	605
Blank/access, medium	80	95	105	119	129	136	147	158	168	182	228	244	n/a	n/a	n/a	n/a	n/a	n/a
Blank/access, ext-medium	92	109	122	137	150	157	170	182	193	210	262	282	318	339	516	529	575	638
Blank/access, med-large	n/a	n/a	151	171	186	195	210	225	238	259	357	384	431	460	669	686	746	828
Blank/access/turning, large	115	152	190	221	240	247	267	290	344	376	514	551	619	659	965	1058	1252	1384
Blank/access/turning, ex-large	141	195	231	212	261	282	326	395	463	502	697	744	873	926	1197	1361	1548	1686
Face-and-bypass, external	117	156	185	221	256	271	315	350	385	439	500	548	674	732	1061	1186	1398	1623
Face-and-bypass, internal	94	127	153	181	213	224	244	293	328	372	453	495	654	734	990	1082	1274	1467
Face damper	99	129	156	184	216	228	268	301	335	381	427	468	584	642	905	1030	1223	1415
Coil, small w/2-row UW	108	139	159	186	215	232	256	296	329	370	444	483	625	693	899	1008	1169	1333
Coil, medium w/8-row UW	174	238	281	339	405	447	505	597	678	782	921	1025	n/a	n/a	n/a	n/a	n/a	n/a
Coil, ext-med w/8-row UW	187	253	299	359	426	469	532	627	709	816	958	1065	1317	1488	1804	2092	2534	2721
Coil, med-large w/10-row W	n/a	n/a	499	602	731	798	925	1027	1168	1362	1630	1827	2331	2697	3220	3715	4511	5287
Coil, large or vert w/10-row W	293	432	543	656	790	859	992	1098	1294	1499	1835	2045	2573	2952	n/a	n/a	n/a	n/a
Coil, electric heat	201	309	372	440	483	518	583	634	758	836	1056	1169	1434	1611	2261	n/a	n/a	n/a
Coil, integral face-and-bypass	312	398	500	559	611	677	788	820	1019	1064	1161	1188	1691	1715	1901	2014	2162	2371
Coil, multizone/double-duct	n/a	733	818	1031	1303	1384	1511	1719	1897	2139	2718	2993	3818	n/a	n/a	n/a	n/a	n/a
Humidifier	198	256	281	317	363	386	439	462	512	565	743	810	1039	1076	1511	1617	1780	1898
Moisture eliminator	120	166	201	240	281	304	348	396	446	510	611	683	885	999	1317	1483	1779	2061
FC fan[1]	322	418	518	557	632	699	868	1012	1160	1282	1941	2106	2747	2800	4227	4484	4868	5044
AF fan[1]	353	519	551	678	782	813	1008	1266	1344	1804	2424	2325	3162	3216	4378	5137	6014	6629
BC fan[1]	371	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Q™ horizontal vaneaxial fan[1]	n/a	n/a	n/a	n/a	842	872	1082	1257	1533	1821	2872	3005	3451	3504	4772	n/a	n/a	n/a
Q™ vertical vaneaxial fan[1]	n/a	1060	1104	1116	1309	1411	1680	1824	2130	2557	2765	2970	3804	4070	4336	4389	n/a	n/a
Plenum fan[1]	353	456	502	567	700	713	791	1218	1410	1554	1826	2007	2689	2742	3532	4431	5077	5523
Diffuser	84	106	119	140	154	210	229	246	262	289	366	398	506	549	1120	1263	1509	1684
Discharge plenum, horizontal	133	180	223	263	292	305	336	366	431	480	674	731	850	926	1286	1432	1713	1919
Discharge plenum, vertical	148	205	249	251	279	296	327	357	428	475	633	689	801	801	n/a	n/a	n/a	n/a
Silencer, 3 ft.	354	431	468	528	604	639	705	757	803	971	1047	1130	1390	1657	1890	2034	2499	2891
Silencer, 5 ft.	534	648	707	794	966	1009	1115	1197	1591	1606	1730	1860	2218	2604	2920	3155	3911	4516
Energy wheel[2]	417	555	617	837	1051	1165	1311	1399	1778	1979	2325	2634	3079	n/a	n/a	n/a	n/a	n/a
Gas heat[3]	n/a	1170	1226	1407	1437	1491	1806	2482	2450	2441	3133	3222	3854	3949	4491	4750	4508	4646

(**1**) Fan module weights include the heaviest fan with the largest ODP motor available.

(**2**) The weight of the energy wheel module is with the largest wheel available for each unit size. The weights include all dampers and filter rack, they do not include end devices, control wiring or a starter.

(**3**) Weights of the gas heat modules are with the largest capacity burner. Refer to the M-Series Gas Heat Quick Select (CLCH-SLB004-EN) or the TOPSS selection program for detailed dimensions.

Single-Piece Shipment Limitations

The specifications provided in Table 4 indicate the maximum values for a single-piece shipment. If either the maximum weight or maximum length is exceeded, the M-Series unit will ship in multiple pieces.

Note: These limits are based on a four-point lift.

Table 4. Shipping length and weight limitations for single piece shipments

Unit Size	Maximum Unit Weight (lb.)	Baserail Unit Maximum Unit Length (in)	Non-Baserail Unit Maximum Unit Length (in)
3–30	<2,500	98	96
35	<3,900	98	96
40	<4,300	98	96
50–57	<5,100	98	96
66-120	<4300-6000	102	n/a

Base Rail Weight Calculations

To determine the weight of the base rail for each shipping split, use the following equation and the weight factors provided in Table 5:

Weight = (A × length) + B

Note: When an M-Series unit ships in multiple pieces, a base rail may be provided for each piece (if ordered). In these instances, the base rail weight must be calculated for each piece. M-Series unit sizes 66 to 120 have integral base rails; module weights for these module sizes include the base rail.

Table 5. Base rail weight calculation factors

	Weight Factors per Unit Size													
Variable	3	6	8	10	12	14	17	21	25	30	35	40	50	57
A	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
B	23	29	30	36	37	39	42	43	43	49	51	57	62	62

Inlet Guide Vane Weights

Fan weights include inlet guide vane weights; therefore, when inlet guide vanes are not included on a fan module, subtract the weights in the table below from the fan module weight to determine the actual module weight.

Table 6. Inlet guide vane weights

	Weights (lb.) per Unit Size																	
Fan Type	**3**	**6**	**8**	**10**	**12**	**14**	**17**	**21**	**25**	**30**	**35**	**40**	**50**	**57**	**66**	**80**	**100**	**120**
FC fan	n/a	38	38	43	46	55	57	65	70	70	105	128	155	155	155	n/a	n/a	n/a
AF fan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	36	43	54	n/a	64	93	111	n/a
Plenum fan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	25	29	29	40	64	74	74	100	122	118	118

Motor Weights

Fan weights provided in this manual include the heaviest ODP (open drip-proof) motor. Approximate weights below are based on A.O. Smith brand motors.

Table 7. Approximate motor weights

		Horsepower																				
Motor Type	**Voltage**	**1/6**	**1/4**	**1/3**	**1/2**	**1**	**1-1/2**	**2**	**3**	**5**	**7-1/2**	**10**	**15**	**20**	**25**	**30**	**40**	**50**	**60**	**75**	**100**	**125**
Energy efficient ODP (EEOP)	115s	12	14	16	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	230s	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	200/3	-	-	-	-	34	43	43	80	78	106	119	170	210	240	284	631	404	772	838	1091	-
	230/460/3	-	-	-	-	36	42	42	64	76	110	132	164	210	240	278	631	360	-	-	-	-
	575/3	-	-	-	-	37	48	50	70	78	106	119	170	212	240	284	631	440	-	-	-	-
Energy efficient TEFC (EETC)	200/3	-	-	-	-	60	60	65	81	89	142	154	250	290	358	-	639	705	794	860	1224	
	230/460/3	-	-	-	-	60	60	65	84	90	140	138	252	283	356	436	661	705	794	860	1224	1562
	575/3	-	-	-	-	60	60	65	81	89	142	154	250	287	358	436	661	705	-	-	-	-
NEMA Premium ODP (HEOP)	200/3	-	-	-	-	-	-	-	83	94	141	126	220	250	310	300	639	720	-	-	-	-
	230/460/3	-	-	-	-	-	-	-	87	94	118	126	217	250	309	300	676	616	-	-	-	-
	575/3	-	-	-	-	-	-	-	87	94	141	124	220	250	310	306	676	720	794	860	1224	-
NEMA Premium TEFC (HETC)	200/3	-	-	-	-	-	-	-	92	99	158	200	259	290	358	-	-	-	-	-	-	-
	230/460/3	-	-	-	-	-	-	-	92	99	158	175	275	308	418	424	750	740	-	-	-	-
	575/3	-	-	-	-	68	56	66	92	99	158	200	290	290	358	436	750	686	799	904	-	-

Approximate motor weights in pounds. Motor manufacturers vary and this data may change without notification.

Starter/VFD Weights

Fan weights do not include starter/ VFD weights. The table below gives approximate starter/VFD weights.

Table 8. Approximate starter and VFD weights

	Weights (lb.) per Horsepower																	
Horsepower	**1**	**1.5**	**2**	**3**	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**40**	**50**	**60**	**75**	**100**	**125**
Starter[a]	65	65	65	65	65	65	65	65	65	97	97	97	97	97	97	97	97
VFD[1]	75	75	75	75	75	180	180	180	180	260	260	260	260	260	260	260	n/a

[a] These weights represent the largest available starter/VFD.

Installation

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
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.

CAUTION
Equipment Damage!

Keep skid in place until unit is ready to set. Do not move the unit or subassembly without the skid in place as shipped from the factory. Premature skid removal may result in equipment damage.

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of the placement of internal components, the unit weight may be unevenly distributed, with more weight in the coil and fan areas. Approximate unit weights are provided in the "Dimensions and Weights" section on page 10. Refer to the unit submittals for actual module weights.

When hoisting the unit into position, use the proper rigging method, such as straps, slings, spreader bars, or lifting lugs for protection and safety.

- For unit sizes 3 to 57 without base rails, use spreader bars and slings to rig units and subassemblies as shown in Figure 3.
- For unit sizes 3 to 57 with base rails, use spreader bars and slings to rig units and subassemblies as shown in Figure 4.
- For unit sizes 66 to 120, use spreader bars in conjunction with shackles attached at the base rail lifting lugs to rig units or subassemblies as shown in Figure 5.

General Lifting Considerations

- Always rig subassemblies or modules as they ship from the factory.
- Make the loop of the sling parallel to the direction of airflow, if possible.
- Each of the cables used to lift the unit must be capable of supporting the entire weight of the unit.
- Use care when using fork lifts to avoid damaging the unit.

Figure 3. Lifting detail for unit sizes 3 to 57 without a base rail

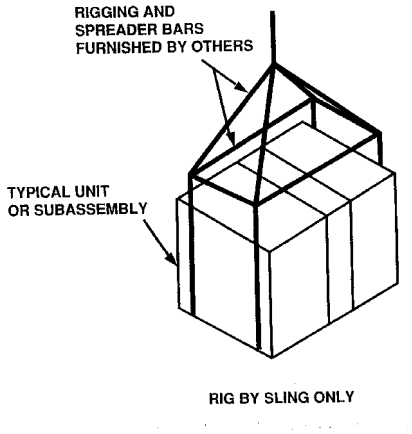


Figure 4. Lifting detail for unit sizes 3 to 57 with a base rail

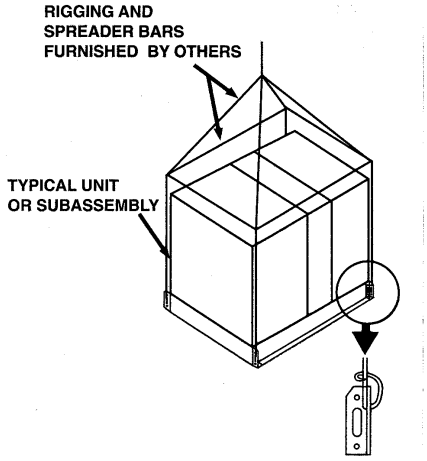
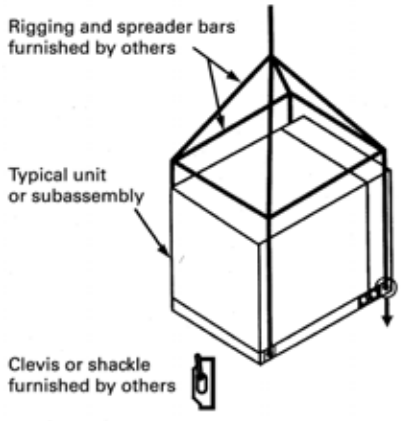


Figure 5. Lifting detail for unit sizes 66 to 120 (per shipping split)



Forklifting Considerations

CAUTION
Equipment Damage!

Do not use a fork lift on air handlers or subassemblies larger than size 30. Improper use of fork lifts on units larger than size 30 may result in equipment damage. Trane is not responsible for equipment damage resulting from improper forklifting practices.

Forklifting Units Attached to Skids

While attached to the skids, units or sub-assemblies should be lifted with forks that are 40 inches or longer—*only* while attached to the skid. The forks *should not contact* the bottom of the air handler (see Figure 6 and Figure 7). To reduce the risk of equipment damage, units should only be lifted on the proper end identified by the lifting label on the modules.

Forklifting Units with Base Rail

A forklift may be used to lift single modules or small sub-assemblies with base rails, providing the forks extend under both ends of the base rail. Units should only be lifted from the proper end identified by the lifting label on the modules.

Figure 6. Fork lift points with base rail

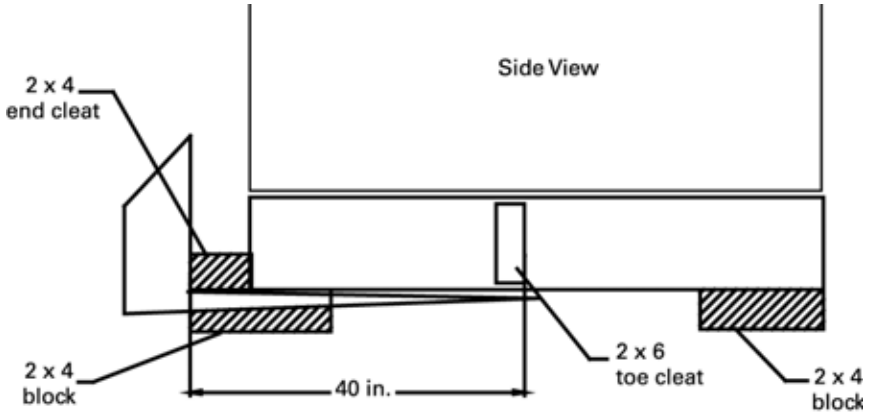
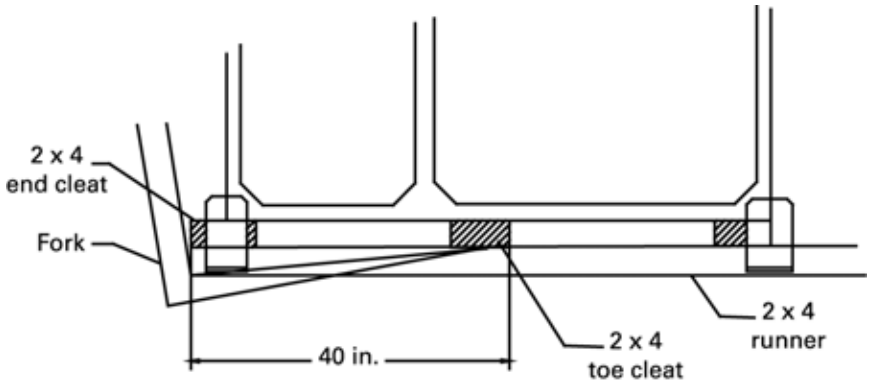


Figure 7. Fork lift points - no base rail (view 2)



Unit Placement and Assembly

If the M-Series unit ships in subassemblies or as individual modules, some assembly is required, including:

1. Six-inch mounting leg assembly (if required); see page 16.
2. Base rail assembly (if required); see page 17.

Note: Base rails are shipped attached to the modules/subassemblies as standard. Base rails ship separately only if the sales order specifies special base rails and/or separate shipment for the base rails.

3. Ceiling-suspended unit assembly; see page 18.
4. Module-to-module assembly; see page 19.

Unit Placement

Refer to the unit submittals and unit tagging for correct placement of all modules. If there are any discrepancies between the submittals and the unit tagging, contact your local Trane representative before proceeding.

⚠ WARNING
Heavy Objects!

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

Following the module order on the unit submittals and tagging, individually place each unassembled module or subassembly in the appropriate installation location.

Unit Assembly

IMPORTANT: There are no penetrations into the M-Series air handler for any field-provided wiring or device. Consider overall unit serviceability and accessibility before mounting, running wires (power), making cabinet penetrations, or mounting any components to the module cabinet.

Refer to See “Component Installation Requirements” on page 25. for special module assembly/installation considerations.

Removing the Shipping Skid

To remove the shipping skid after the module/subassembly is in place, remove the leg’s lower lag bolts, the cross bracing, and the runners.

⚠ WARNING
Heavy Objects!

Do not use mounting legs for ceiling suspension, external isolation, or unit support during module placement. Mounting legs are designed only to secure the unit to the floor, housekeeping pad, or platform. Improper use of the mounting legs as described above could result in death, serious injury, or equipment damage.

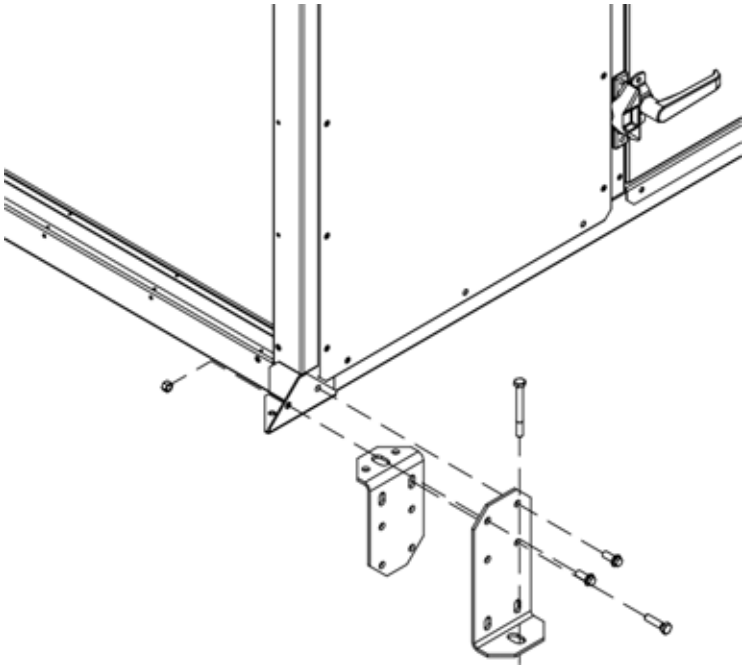
Assembling Optional 6-Inch Mounting Legs

All units or subassemblies that do not ship on a base rail ship with 4-inch mounting legs that secure the unit to the shipping skid. After the unit is in place and the skids are removed, these mounting legs may be used to secure the unit to the floor, housekeeping pad, or mounting platform. If 6-inch mounting legs were ordered, use the following procedure to assemble them to the module/subassembly:

Note: The unit must be in the final installation location with the skid removed before proceeding.

1. Place a block under the unit to prevent the unit from sagging while replacing the mounting leg.
2. Remove the 4-inch leg, all hardware, and the saddle bracket from the unit.
3. Using the removed hardware, install the 6-inch leg as shown in Figure 8.

Figure 8. Six-inch mounting leg installation



Assembling Base Rails size 3 to 57

When a special base rail is ordered, or when it is specifically requested, base rails for M-Series unit sizes 3 to 57 will be shipped separately. Base rails for unit sizes 66 to 120 are integral to the module and do not require assembly.

Note: The unit must be in the final installation location with the skid removed before proceeding. These instructions are also provided in the paperwork that ships with the base rail

.

To assemble the base rails to size 3 to 57 modules or subassemblies:

1. Assemble the base rail as shown in Figure 9.
2. Assemble the base rail to the module as shown in Figure 10.

Figure 9. Base rail assembly

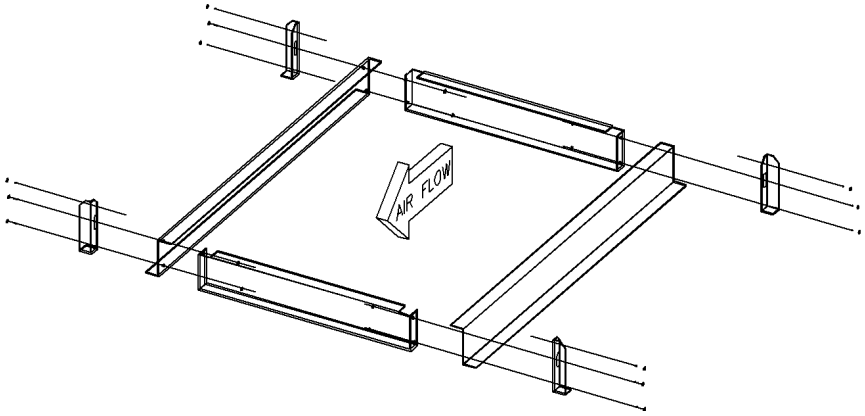
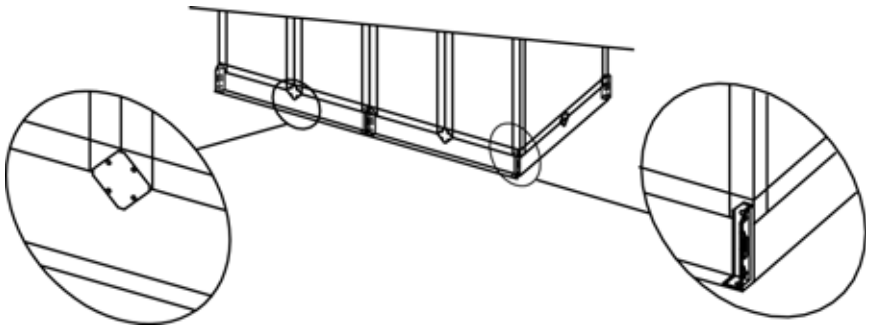


Figure 10. Mounting unit to base rails, sizes 3 to 57



Ceiling Suspension

Note: Ceiling suspension is recommended only for M-Series unit sizes 3 to 57 with factory-provided base rails. Unit sizes 66 to 120 should be platform-mounted.

Using a Field-Provided Mounting Frame

If a factory-provided base rail was not ordered, the installer/contractor must provide a ceiling-suspended mounting frame designed to support the length, width, and weight of the entire air-handling unit. See the "Dimensions and Weights" section on page 10 for approximate module weights.

Note: It is the building engineer's responsibility to size the structural channels and to provide the appropriate hangers.

Structural channels in a field-provided frame can be mounted parallel to airflow or perpendicular to airflow:

- For parallel-to-airflow channels, size the channels based on a four-point load distribution (see Figure 11.
- For perpendicular-to-airflow channels, size the channels based on the load distribution of the individual modules and install the channels so that *both ends of every module are supported* (see Figure 12).

Using Factory-Provided Base Rails

If individual modules and/or subassemblies have base rail shipping splits, use the following considerations:

- Suspend the unit (on both sides of the unit) at each shipping split as well as the four corners of the unit (see Figure 13).
- Bolt shipping splits together.

Note: The hanger rods must extend through the bottom of the base rail. It is the building engineer's responsibility to provide the appropriate hangers.

Figure 11. Typical suspension method using parallel channels

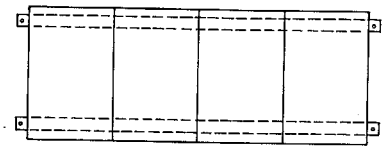


Figure 12. Typical ceiling suspension using perpendicular channels

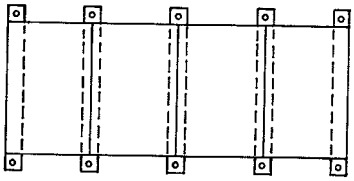
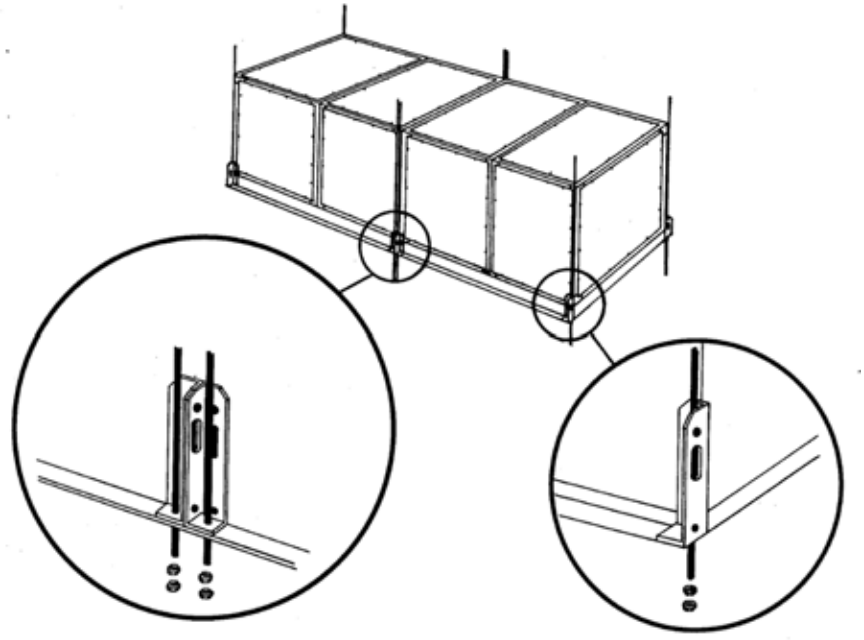


Figure 13. Ceiling suspension, sizes 3 to 57 with base rail



⚠ WARNING
Heavy Objects!

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

Module-to-Module Assembly

M-Series air handlers ship with all necessary assembly hardware and gasket material. The hardware should be packaged in either a clear plastic envelope or cardboard box inside the fan module, access module, or mixing box module.

Note: The number of modules to be assembled often makes it necessary to use more than one module to ship the assembly material; therefore, check all modules thoroughly before contacting your Trane sales representative to report missing items.

Modules are joined with gasketing applied to one of the mating surfaces and hardware to bolt the modules together. The gasketing for module-to-module joints is a closed cell foam with adhesive backing.

If unit ships in multiple shipping splits, fasten the quick connects where the modules bolt together (Figure 14).

Figure 14. Module-to-module quick connect

To assemble M-Series units:

1. Locate the mounting hardware and gasket material.
2. Remove any shipping bolts located on the mounting surfaces of the modules (see Figure 15).
3. Apply the gasketing to one of the mating surfaces; see the following figures:
   - Figure 15 shows basic module-to-module assembly.
   - Figure 16 shows coil-module-to-downstream-module assembly (note the special splash guard).

Figure 15. Module-to-module installation

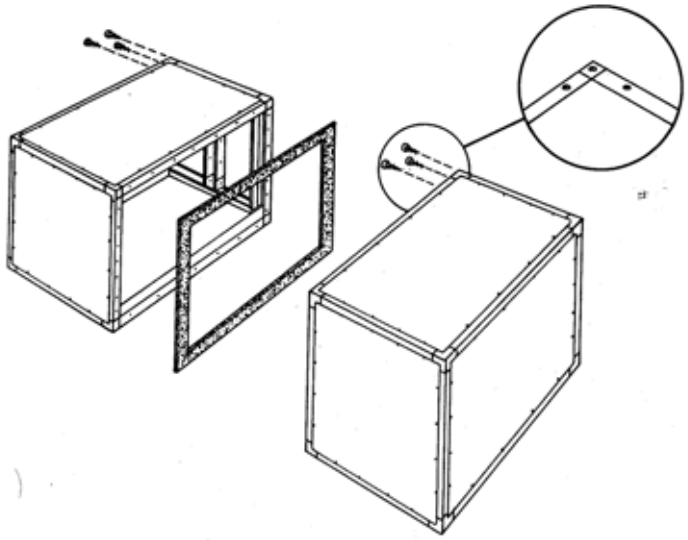
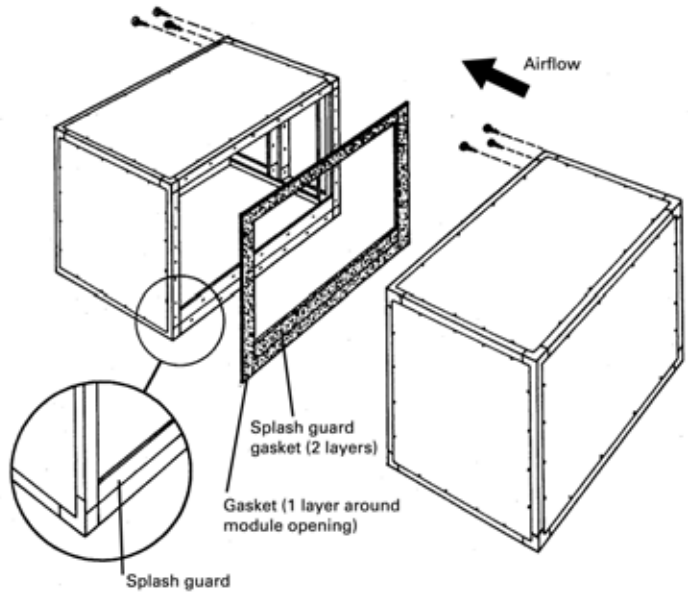


Figure 16. Coil-module-to-downstream-module assembly



– Figure 17 shows stacked unit assembly.
– Figure 18 shows module-to-module assembly for unit sizes 3 to 57 with a roof.

Figure 17. Stacked unit

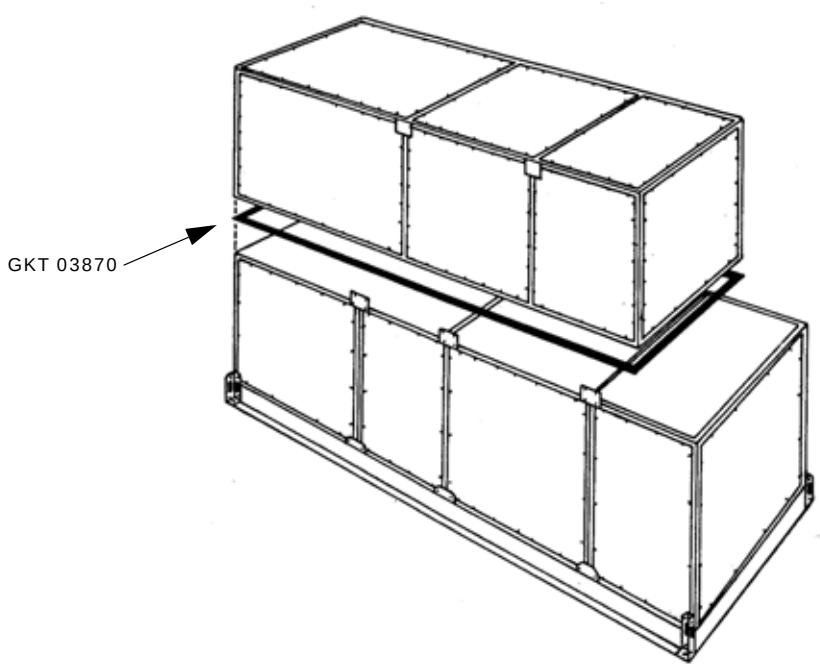
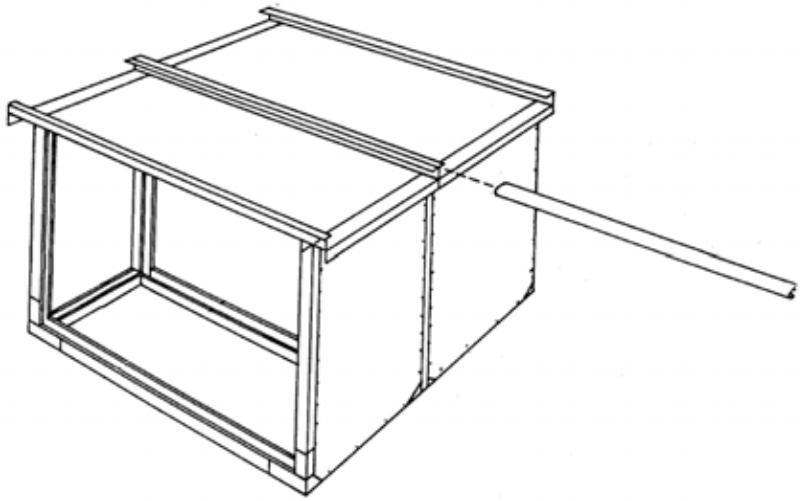


Figure 18. Unit roof installation, sizes 3 to 57



- Figure 19 shows module-to-module assembly for unit sizes 66 to 120 with a roof.
- Figure 20 shows seam cap installation for unit sizes 66 to 120 (using 0.25-inch self-drilling screws).

Figure 19. Module-to-module with unit roof 66 to 120

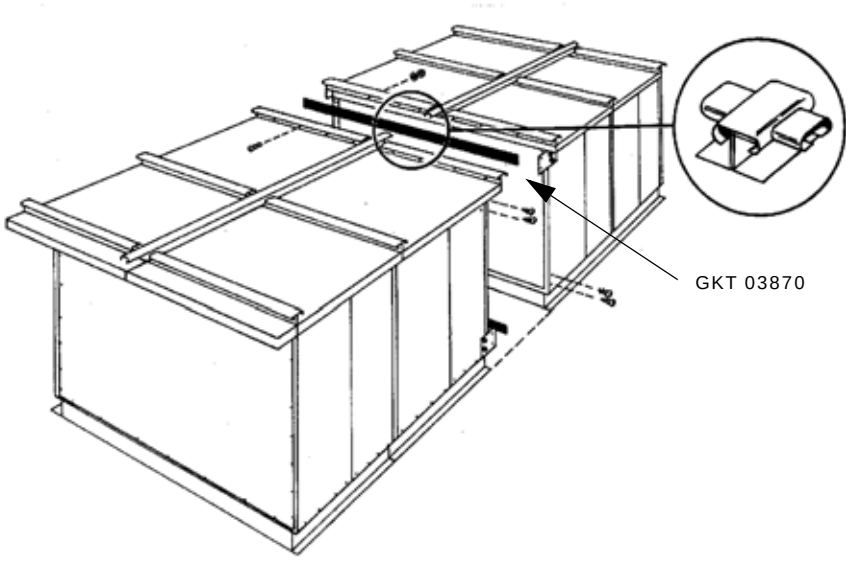
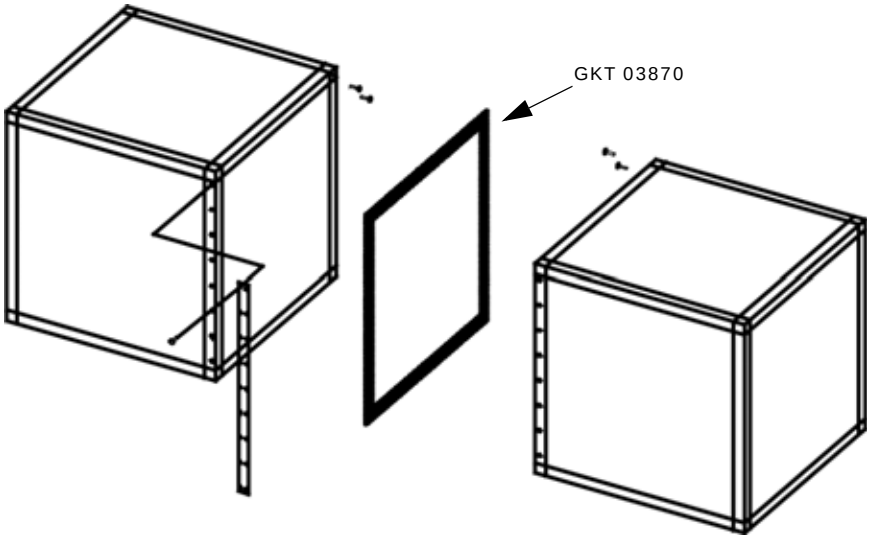


Figure 20. Seam cap installation (unit sizes 66 to 120)



4 If the unit is equipped with factory-mounted controls, fasten the quick connects where the modules bolt together (see Figure 21 and Figure 22).

Note: Reference the appropriate controller manual for more details on the installation of units with factory-mounted controls.

Figure 22. Vertical module-to-module quick connects

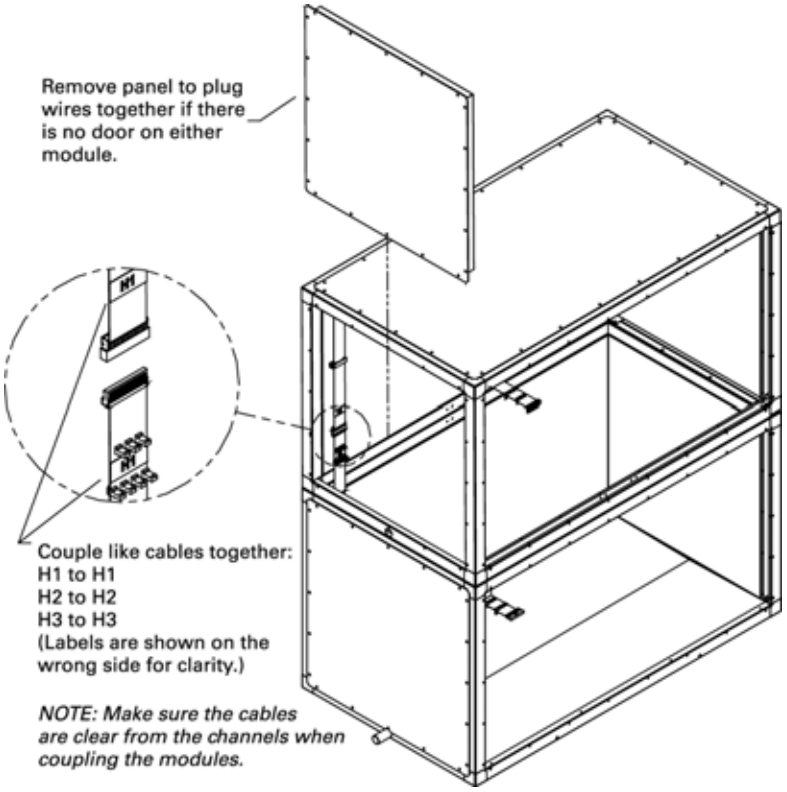
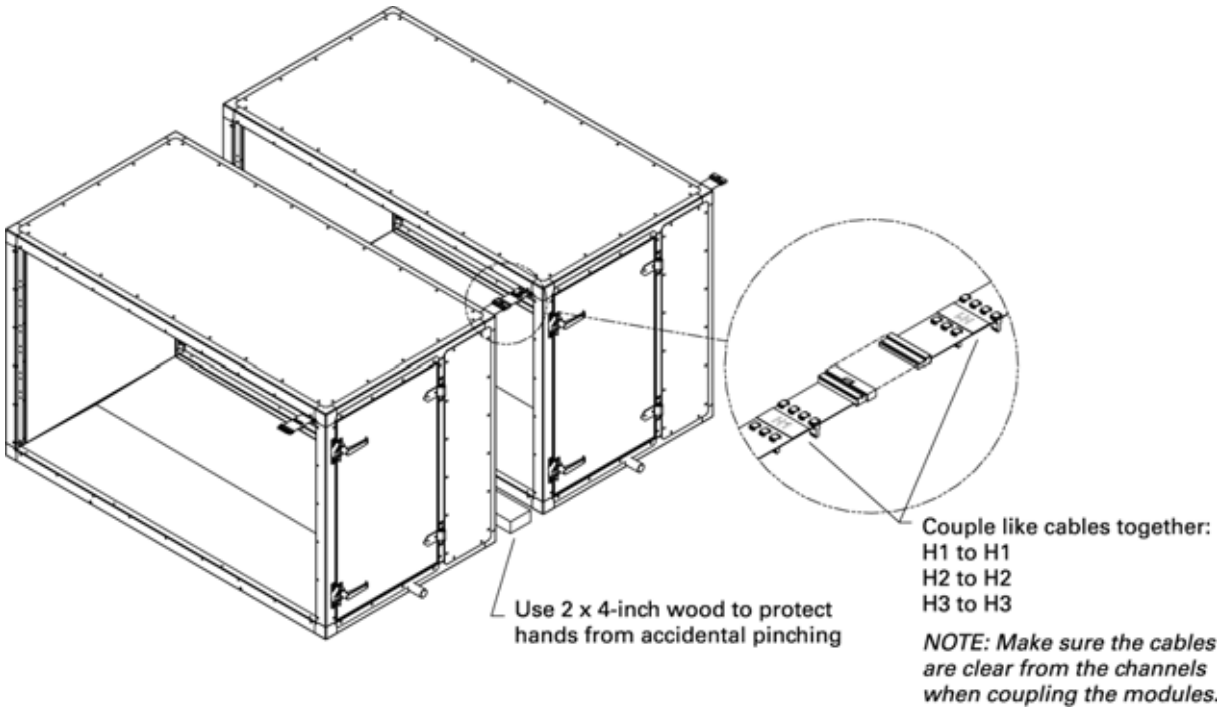


Figure 21. Horizontal module-to-module quick connects

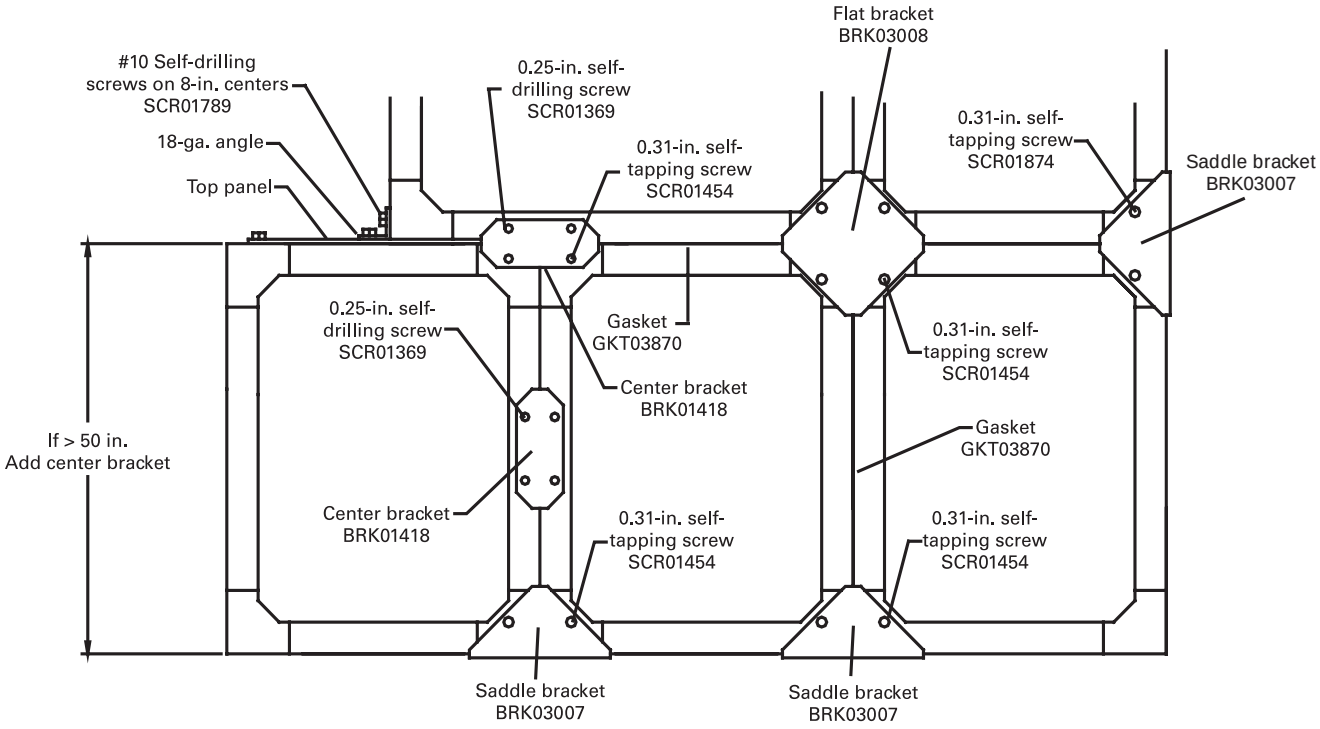


5 Use a bar clamp or come-along to compress the gasketing and pull the modules together.

6 Install the brackets as shown in Figure 23, inserting the appropriate screws using a powered impact gun and taking care not to strip the bolts.

Note: Be sure to compress the gasketing to avoid excessive air leakage.

Figure 23. Bracket installation



7 For units sizes 3 to 57 with base rails, bolt the base rails together using 5/16-inch bolts, see Figure 24. For unit sizes 66 to 120, bolt the base rail together using grade 5, 1/2-inch bolts, nuts, and locking washers (see Figure 25.

Figure 24. Base rail split assembly size 3 to 57

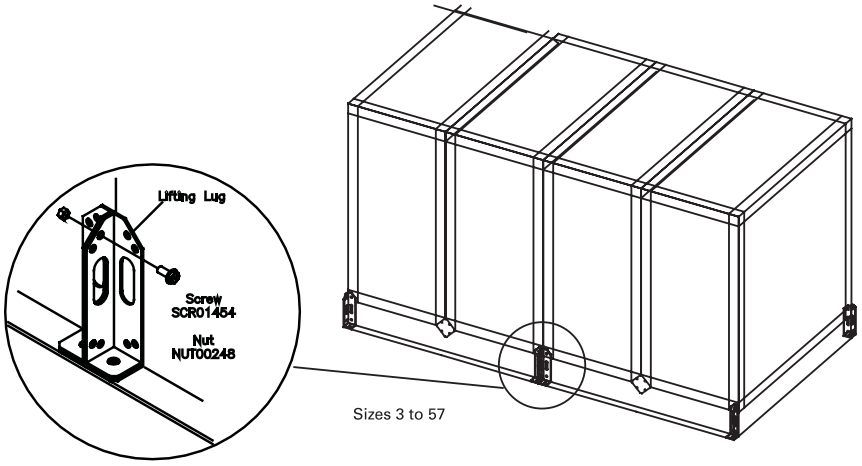
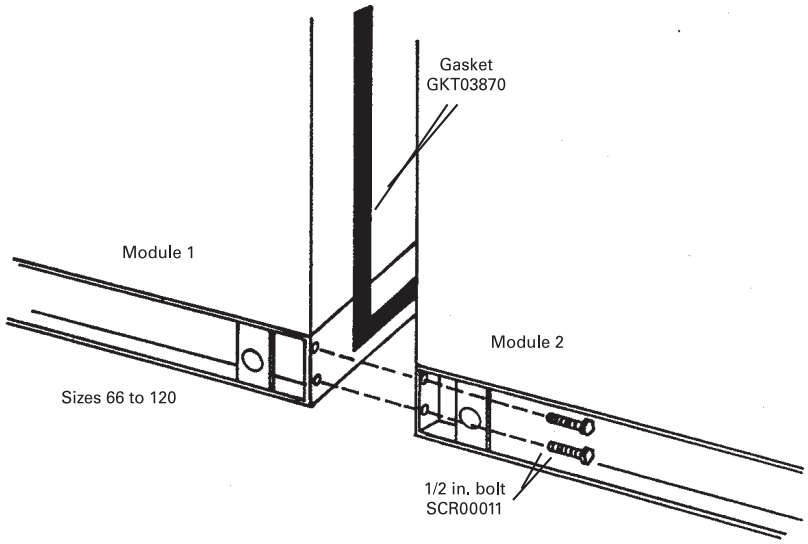


Figure 25. Base rail assembly size 66 to 120



Component Installation Requirements

The M-Series air handler is extremely versatile and the assembled unit is a complete air-handling system; however, each module may have installation requirements that could affect the unit's performance.

Diffuser Modules

Diffuser modules are usually placed between a fan and a downstream coil or filter. Because placement is critical to unit performance, verify the correct placement of the diffuser module before assembling the module (see Figure 26 and Figure 27).

Figure 26. Diffuser placement sizes 3 to 57

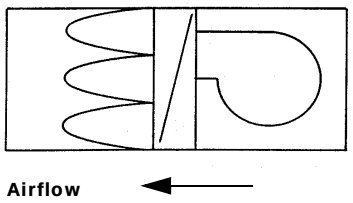
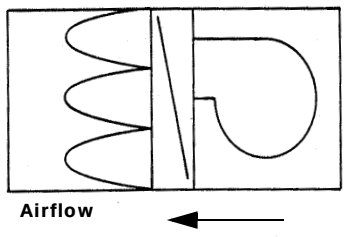


Figure 27. Diffuser placement sizes 66 to 120



Filter Modules

Bag and cartridge filter modules can be used as a pre-filter module, a final filter module, or both. This use is determined by the filter's placement in relation to the fan:

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

Final Filter Module

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

Pre-Filter Module

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

Installing Filters

Filters should be installed before startup to protect internal components such as the unit's heating and cooling coils.

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.

To install filters:

1. Disconnect the power to the unit.
2. Open the filter module access door.
3. Remove the block-off from the filter track.
4. Slide the filters into the tracks.

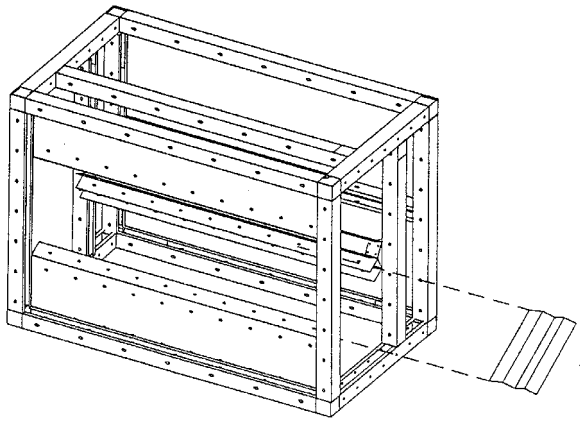
Note: Bag filters must be installed with the pleats in the vertical plane.

5. Replace the block-off (see Figure 28).

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.

6. Close the access door.

Figure 28. Filter block-off placement



⚠ 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.

Fan Modules

The fan module can be configured as either draw-thru or blow-thru. Review the submittals and unit tagging information prior to assembly to determine placement.

Fan Isolation

The fan-and-motor assembly is internally isolated. The fan and motor bases are bolted to four spring isolators. The isolators are secured to the fan module support base.

Four shipping tie-downs are bolted adjacent to the isolators between the fan isolation base and the support frame. The shipping tie-downs secure the isolation base to the support assembly to prevent any damage to the fan module during shipment.

*Note: Remove the tie-downs **only** if the factory-provided isolation is to be used.*

Removing Shipping Tie-Downs.

There are three types of shipping tie-downs used to secure the isolation base, depending on unit size:

- Sizes 3 to 8 use a 3/8 x 1-inch pipe (see Figure 29).
- Sizes 10 to 57, use a tie-down bolt and shim (see Figure 29).
- Sizes 66 to 120 and plenum fans use a tie-down angle and bolt (see Figure 30).

Figure 29. Isolator tie-down removal for unit sizes 3 to 57

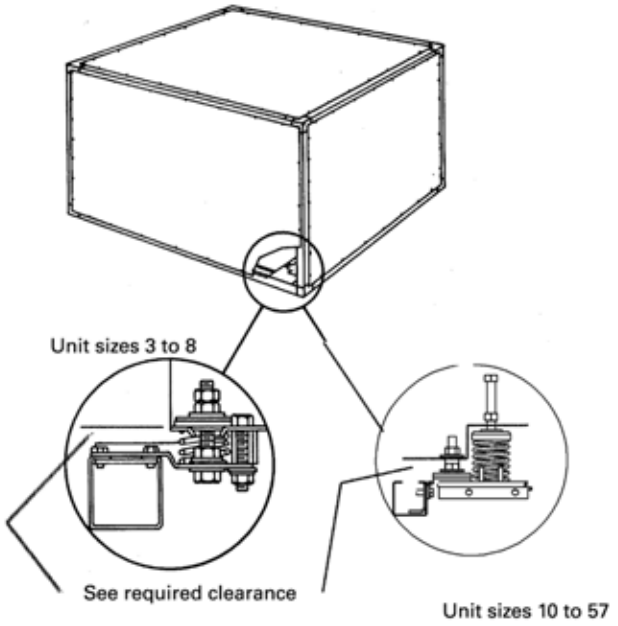


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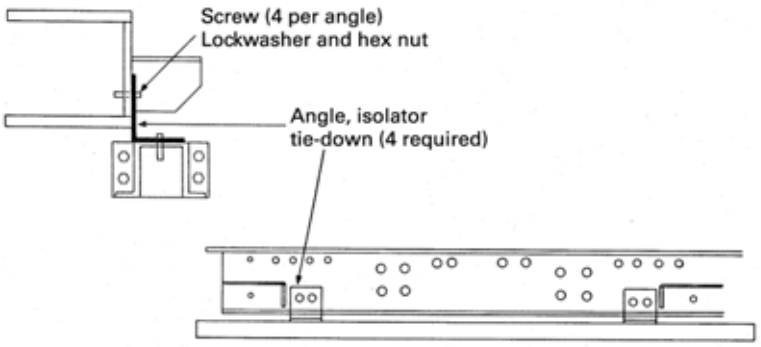
Figure 30. Isolator tie-down removal for unit sizes 66 to 120 and plenum fans

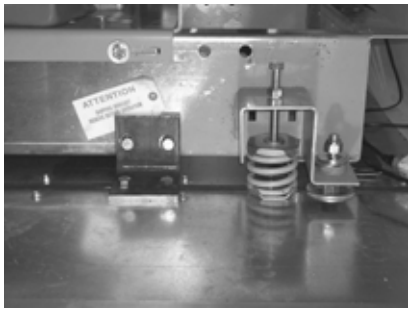


To remove the shipping tie-downs:

1. Disconnect the power to the unit.
2. Remove the access panels adjacent to the isolators (isolators are at each corner of the fan base)
3. For each isolator, remove the bolt holding it.
4. Remove the pipe or spacer provided with each isolator.

Adjusting the Isolators. Once the shipping tie-downs are removed and the internal isolation is released, it may be necessary to adjust the isolators to achieve the proper operation height of the fan and motor isolation base.

Figure 31. Isolators



Minimum required clearances are listed in Table 9. To determine the isolator clearances on all unit sizes, measure between the top of the cabinet channel and the bottom of the isolation base channel.

Table 9. Minimum isolator clearances (inches)

Unit Size	Fan Type	Required Clearance
3–8	FC	1.0
10–30	FC, AF	0.5
21–57	Plenum	0.5
35–57	FC, AF	0.5
66–120	FC, AF, Plenum	1.0

Inlet Guide Vanes

Inlet guide vanes can be provided with factory-mounted actuator motors. If actuators are not ordered factory-mounted, it is the responsibility of the contractor to provide the actuator and all mounting hardware.

The inlet guide vanes are designed for the actuators to be internally mounted in the fan module. Size the actuators based on the operating torque requirements found in Table 11. The table lists the combined torque driven from the 3/4-inch interconnecting jack shaft based on a 90-degree rotation.

Note: To provide even torque distribution and reliable vane tracking, it is recommended that equally sized actuators be mounted on each side of the fan housing for unit sizes 35 to 120.

Note: The inlet guide vanes should be set up on a purge cycle (full, open, and closed) once every 24 hours to keep the vanes operating freely. See the "Moisture Purge Cycle" section on page 64 for more information.

Damper Modules

Dampers are factory-installed and adjusted and can be found in mixing box/economizer modules, internal or external face-and-bypass modules, and face damper modules. There are two damper blade configurations available: parallel-blade and opposed-blade. Traq™ dampers are another type of damper available in mixing box modules.

The M-Series air handler is available with factory-mounted controls or end devices. If the unit is not ordered with controls or end devices, it is the installer's responsibility to provide and install the damper actuators. Size the actuators according to Table 12.

Mixing modules and face-and-bypass dampers are designed for the damper actuators to be direct coupled and installed in the air stream. If other provisions are required, modifications to the module will be the responsibility of the installing contractor.

For set-screw torque settings, see Table 10.

Table 10. Set-screw torque settings (lb.-ft.)

Set-screw size	Hex size	Torque
No. 10	n/a	2.3
1/4	1/8	5.5
5/16	5/32	10.5
3/8	3/16	19.0
7/16	7/32	29.0
1/2	1/4	42.0
5/8	5/16	92.0

Opposed-Blade and Parallel-Blade Dampers

The damper actuator is internally mounted on the end drive rod for mixing box module sizes 3, 6, and 8 (see Figure 32). The driven damper rotates 90 degrees when the driver damper is turned 90 degrees.

Opposed-blade and parallel-blade dampers in unit sizes 10 to 120, as well as internal and external face-and-bypass modules, have centered dampers with an internal jack-shaft (see Figure 33, Figure 34, and Figure 35 on page 30). A 95-degree actuator rotation gives a 90-degree blade travel.

Table 11. Torque required to operate inlet vanes (FC and AF fans) in lb-in

Unit Size	Fan Size	Fan Outlet Velocity			
		2000 fpm		3000 fpm	
		Open (Torque)	Close (Torque)	Open (Torque)	Close (Torque)
3	9.5 FC	n/a	n/a	n/a	n/a
6	12.25 FC	10.0	3.5	22.5	7.8
	10.5 FC	5.7	2.9	19.6	6.5
8	13.5 FC	10.9	3.9	24.5	8.7
	12.25 FC	10.0	3.5	22.5	7.8
10	15 FC	14.1	5.0	31.9	11.4
	13.5 FC	10.9	3.9	24.5	8.7
12	16.5 FC	18.0	6.4	40.5	14.4
	15 FC	14.1	5.0	31.9	11.4
14	18.25 FC	23.1	8.3	52.2	18.6
	16.5 FC	18.0	6.4	40.5	14.4
17	20 FC	24.0	9.0	54.0	19.5
	18.25 FC	23.1	8.3	52.2	18.6
21	22.38 FC	25.0	9.5	56.0	21.0
	20 FC	24.0	9.0	54.0	19.5
25	25 FC	26.5	10	59.7	22.5
	22.38 FC	25.0	9.5	56.0	21.0
30	25 FC	26.5	10	59.7	22.5
	22.38 FC	25.0	9.5	56.0	21.0
35	27.63 FC	115	46	200	104
	25 FC	26.5	10	59.7	22.5
40	30.25 FC	150	65	220	120
	27.63 FC	115	46	200	104
50	33 FC	215	100	310	180
	30.25 FC	150	65	220	120
57	33 FC	215	100	310	180
	30.25 FC	150	65	220	120
66	33 FC	215	100	310	180

Table 12. Damper torque requirements (in. lb.) at 1 in. wg

Unit Size	Mixing Box						Face-and-bypass damper			Multizone (torque per blade)	Integral face-and-bypass
	Traq linked to parallel or opposed	Traq linked to Traq	Parallel or opposed linked to parallel or opposed	Parallel or opposed (non-linked)	Traq (non-linked)	Side parallel or opposed (non-linked)	Internal	External	Face only		
3	20	36	14	12	18	11	17	27	16	n/a	n/a
6	39	72	24	21	36	18	29	40	24	7	n/a
8	39	72	27	24	36	22	39	52	33	7	26
10	58	108	33	29	54	30	50	66	43	8	31
12	73	135	41	36	68	36	62	81	56	8	36
14	73	135	47	41	68	43	69	87	60	8	41
17	74	135	56	49	68	49	83	107	78	8	62
21	81	144	69	60	72	58	99	122	92	10	62
25	82	144	82	72	72	67	115	139	108	10	86
30	111	198	96	84	99	87	136	163	127	10	86
35	122	216	114	100	108	102	154	180	143	24	103
40	125	216	132	115	108	117	172	201	160	24	103
50	159	225	167	146	113	148	228	261	215	24	161
57	211	225	227	199	113	169	267	299	253	n/a	161
66	216	300	227	199	150	200	308	404	307	n/a	201
80	254	375	266	233	188	240	364	460	364	n/a	221
100	318	450	334	292	225	296	460	569	460	n/a	314
120	379	450	404	353	225	342	549	678	549	n/a	314

Table 13. M-Series fan inlet dimensions

Unit Size	Inside Diameter (in.)
03A	7.810
03B	7.810
D03	6.100
E03	6.100
03P	8.75
06A	10.250
06B	9.066
D06	8.540
E06	8.540
06P	9.64
08A	11.500
08B	10.250
D08	8.540
E08	8.540
08P	10.86
10A	12.875
10B	11.500
D10	10.820
E10	10.820
F10	8.540
G10	8.540
10P	11.93
12A	12.124
12B	12.875
D12	12.000
E12	12.000
F12	10.820
G12	10.820
12P	13.06
14A	15.625
14B	14.124
D14	12.000
E14	12.000
F14	10.820
G14	10.820
14P	14.43
17A	17.125
17B	15.625
D17	13.460
E17	13.460
F17	12.000
G17	12.000
17P	16.06
21A	18.250
21B	17.125
D21	15.160
E21	15.160
F21	13.460
G21	13.460
21P	18.37
25A	21.569
25B	18.250
D25	15.160
E25	15.160
F25	13.460
G25	13.460
25P	20.63
30A	21.259
30B	18.250
D30	17.080
E30	17.080
F30	15.160
G30	15.160
30P	22.90
35A	24.000
35B	21.259
D35	17.080
E35	17.080
F35	15.160
G35	15.160
35P	22.90
40A	26.037
40B	24.000
D40	19.290
E40	19.290
F40	17.080
G40	17.080
40P	25.56
50A	28.404
50B	26.037
D50	21.650
E50	21.650
F50	19.290
G50	19.290
50P	28.34
57A	28.404
57B	26.037
D57	21.650
E57	21.650
F57	19.290
G57	19.290
57P	34.91
66A	28.404
B66	29.040
D66	24.020
E66	24.020
F66	21.650
G66	21.650
66P	34.91
A80	29.040
B80	29.040
80D	26.890
80E	26.890
80F	24.010
80G	24.010
80P	39.06
A100	32.740
B100	32.740
100D	30.000
100E	30.000
100F	26.890
100G	26.890
100P	42.85
A120	32.740
B120	32.740
120D	33.460
120E	33.460
120F	30.000
120G	30.000
120P	42.85

Figure 32. Typical mixing box configurations for unit sizes 3, 6, and 8

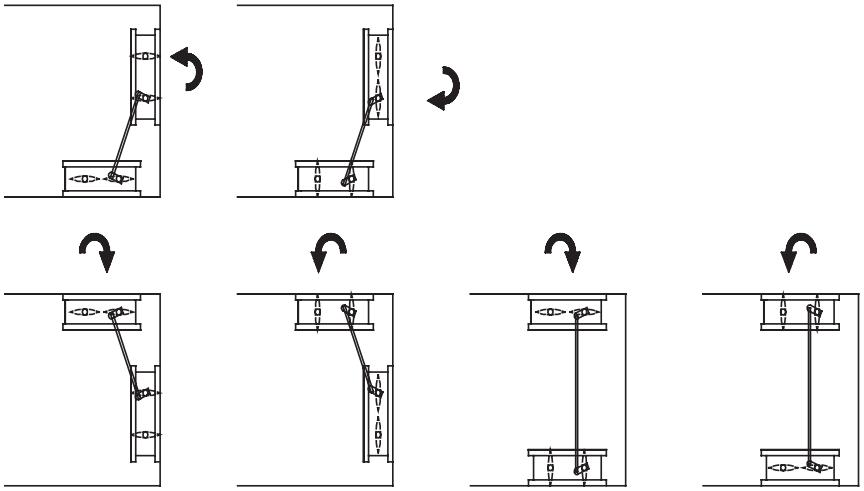


Figure 33. Typical mixing box configurations for sizes 10 to 120

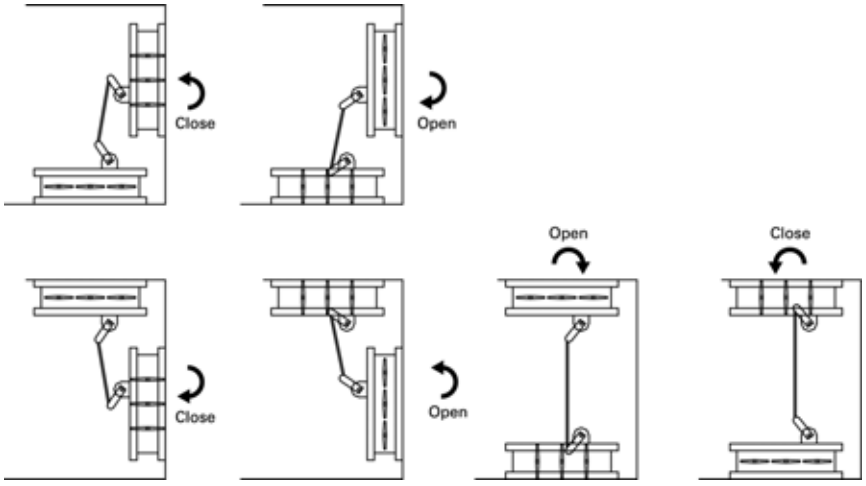


Figure 34. Typical internal face-and-bypass configuration

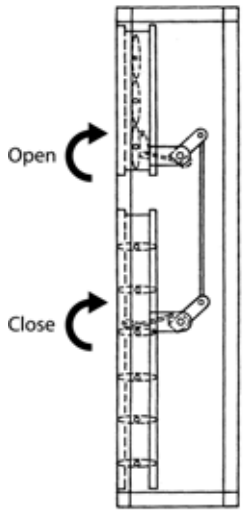
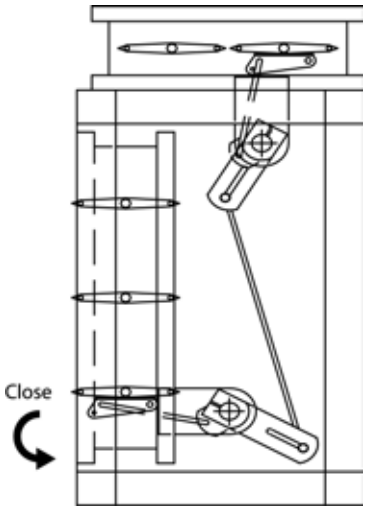


Figure 35. Typical external face-and-bypass configuration



Multizone Modules

Under certain operating conditions, condensation may form on the cold deck portion of the multizone damper section. To prevent this, insulate around the damper rods. Be sure the insulation does not affect damper operation.

Zone Damper Operators

Zone damper operators are available factory-mounted with factory-mounted controls or as a stand-alone end device. If not factory-provided, the contractor is responsible for providing these operators. In all cases, the damper operator should be connected to the drive rod.

Adjusting Zone Dampers

Zone dampers should be installed and adjusted prior to making duct connections, assuring proper setup of the damper zones:

1. Check the damper blades to confirm they are not binding. The blade should rotate 90 degrees.
2. Determine the number of zones required. The zone damper is fitted with a linkage bar that connects all damper zones.
3. Select the number of damper segments required for the first zone.
4. Cut a section out of the damper linkage bar just after the last lever in that zone.

Note: It may be necessary to remove the damper linkage bar to cut it. To remove the linkage bar pry the "e" rings from the blade axles and remove the bar.

5. Repeat steps 3 and 4 for the remaining zones.
6. Attach the damper operator drive rod to one blade axle in each zone with the two-deck damper.
7. Use the self-drilling screws provided to mount the bearing bracket assembly (see Figure 36).

Note: The drive rod kits ship in a separate box, found in the fan module or the cold deck of the multizone module.

Duct Connections

All duct connections to M-Series air handlers should be installed in accordance with the standards of the National Fire Protection Association (NFPA):

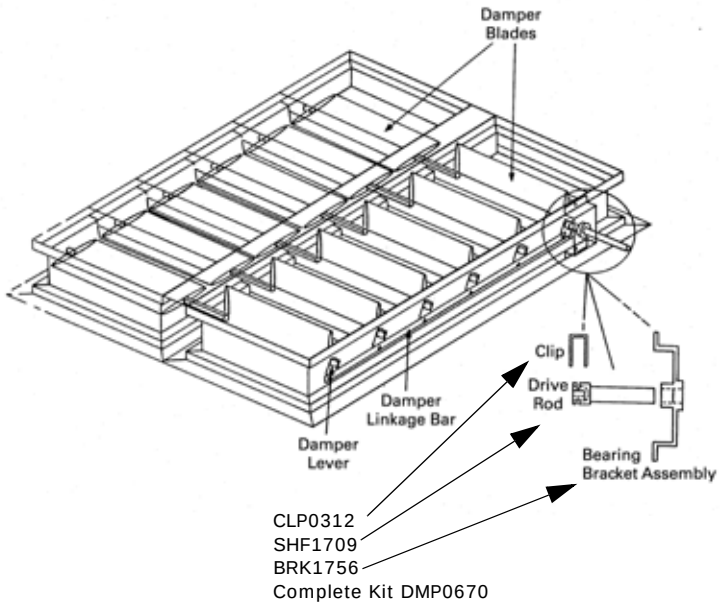
- NFPA 90A for installing air conditioning and ventilating systems other than residence type
- NFPA 90B for residence-type warm air heating and air-conditioning systems

Fan Discharge Connections

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

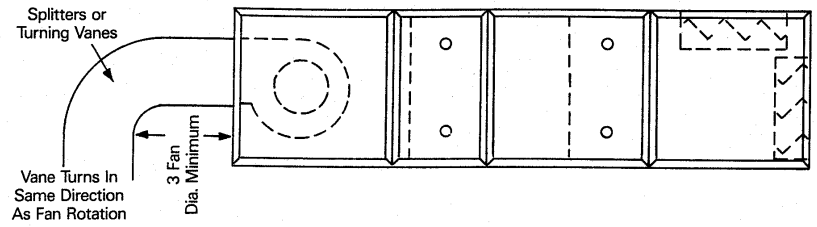
The fan module has a 1-inch flange on the discharge that can be used to attach the duct. When using lined ducts, the insulation should not obstruct the discharge opening.

Figure 36. Setting the zone damper rods and damper linkage



Connections made directly to the discharge opening of the fan should have a minimum of three fan diameters of straight duct before any turns or transitions. The ductwork should be the same size as the fan discharge opening. The first turn of the connection should be in the same direction as the fan rotation as shown in Figure 37. The air that the fan discharges into the duct is extremely turbulent and requires some length of duct to stabilize. Abrupt changes in ductwork directly off the fan discharge may adversely affect fan performance and acoustics.

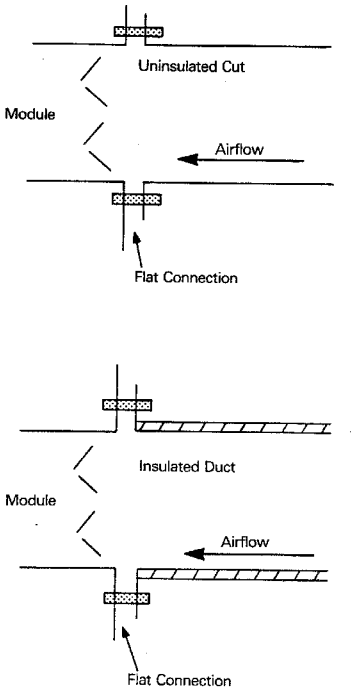
Figure 37. Typical discharge ductwork recommendations



Damper Module Connections

For standard damper modules, size the attached ductwork to fit the opening of the damper. The duct opening dimensions should be in the unit submittals. Ensure the insulation does not obstruct the damper opening when using a lined duct (see Figure 38).

Figure 38. Typical module with duct flat / flange connections



Discharge Plenum Connections

Discharge plenum modules are available with or without openings. Modules with openings have a framed opening that can be used to secure the duct to the frames. If the duct is lined, it is important the insulation does not obstruct the opening of the module.

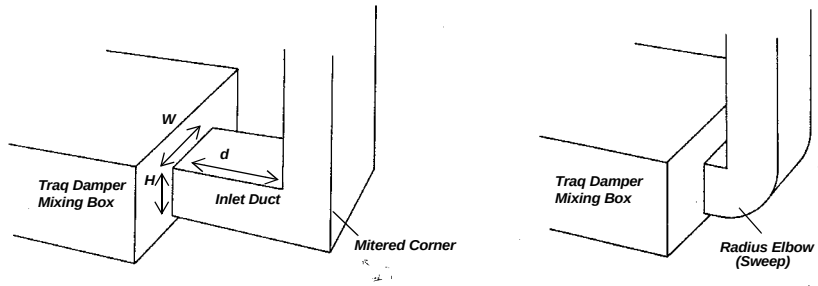
For discharge plenum modules with field-cut openings, attach the duct to the side panel.

Traq Damper Connections

Size the duct connections to attach to the specified portion on the face of the Traq damper module.

For a mitered corner, provide one hydraulic duct diameter between the entering face of the Traq dampers and the duct turn. For a radius elbow, or sweep, place the elbow directly against the face of the Traq dampers (see Figure 39).

Figure 39. Traq damper duct connections



$$d = 1 \text{ hydraulic duct diameter} = \frac{2 \times W \times H}{W + H}$$

External Face-and-Bypass

The external face-and-bypass damper modules will require a field fabricated duct to direct the bypass air into the appropriate module. Duct sizing recommendations are listed in Table 14.

When attaching a bypass duct to a downstream fan module, it may be necessary to cut a hole in the fan module panel. When cutting a penetration, it is important the cutting have the same cross sectional area as the bypass duct. In other words the length of the opening should be the same as the height of the duct (see Figure 40, Figure 41, and Figure 42.)

When bypassing into an access module, remove a panel. it is not necessary to cut an opening.

Other Modules

Access modules, coil modules, and intake modules have open inlets with a 2-inch (sizes 3 to 30) or 2 1/2-inch (sizes 35 to 120) frame for connecting the ductwork. If the duct is lined, it is important the insulation does not obstruct the opening of the module.

Multizone units require field-provided zone duct clips to attach duct to the specific zones.

Table 14. Recommended bypass duct sizes (inches)

Unit size	Duct height	Duct width
3	12	27
6	14	40
8	14	44
10	14	56
12	18	60
14	18	64
17	18	70
21	24	72
25	24	74
30	24	87
35	28	91
40	28	104
50	28	115
57	40	115
66	40	132
80	40	132
100	40	147
120	40	174

Figure 40. External face-and-bypass with vertical duct configuration

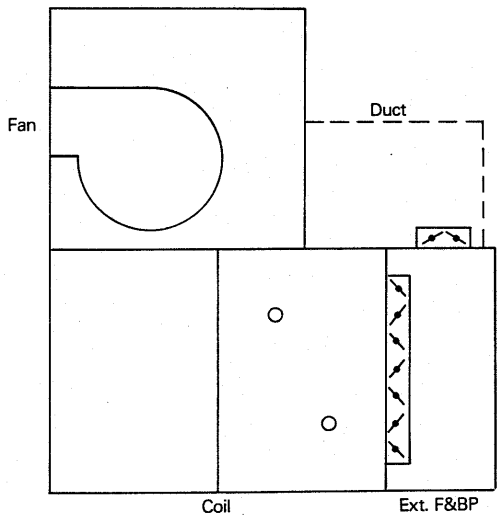


Figure 41. External face-and-bypass with duct configuration designed to bypass air around one coil

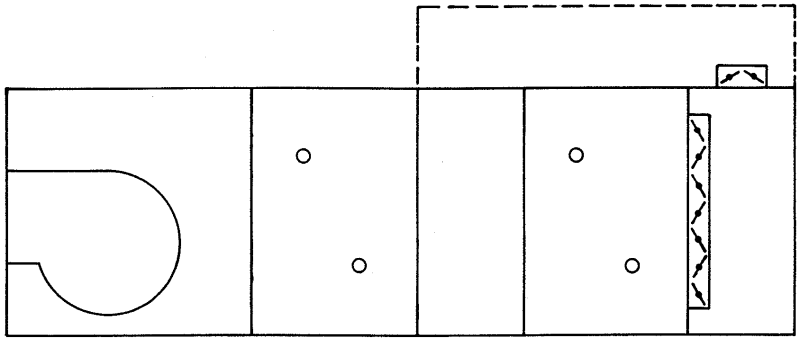
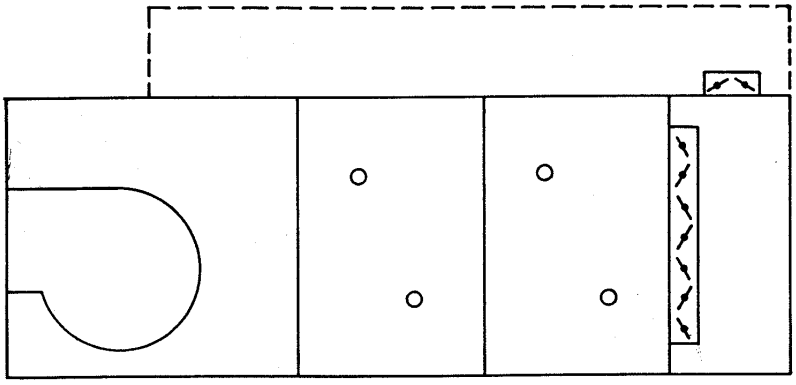


Figure 42. External face-and-bypass with duct configuration designed to bypass air into a fan module



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.
- Extended drain and vent connections are provided as standard on DD and D coils only. If extended drains and vents are required on other water coils, they must be field-installed or ordered as specials from the factory.
- Pipe coils counterflow to airflow.

CAUTION
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.

CAUTION
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.

CAUTION
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 module, 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 module. Pitch the connection lines horizontal or downward toward an open drain. Trane recommends installing a plug to facilitate cleaning of the trap.

The drain connection size is 1-inch NPT (national pipe threads) external for unit sizes 3 to 30; 1 1/4-inch NPT external for unit sizes 35, 40, 50, and 57; and 1 1/2-inch internal threads on sizes 66, 80, 100, and 120.

Figure 43 illustrates the proper trapping, piping, and operation of the trap for negative pressure modules. Use the formula under the figure to determine the correct minimum depth for the condensate trap.

Figure 44 illustrates the proper trapping, piping, and operation of the trap for positive pressure modules.

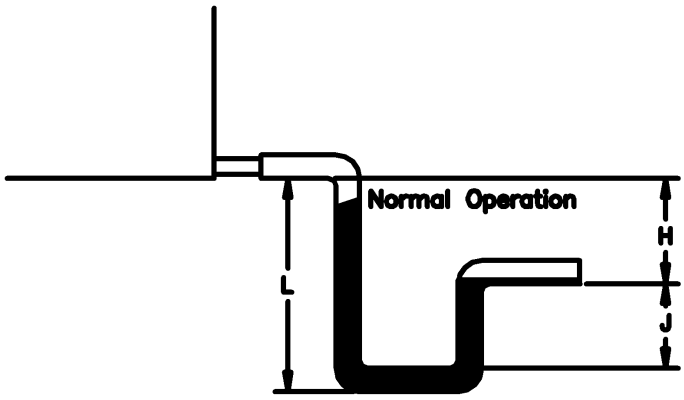
Note: Positive pressure traps require a different design than negative pressure traps.

If a module 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 modules handling condensate, such as a cooling coil module or moisture eliminator module, require a trap.

CAUTION
Water Damage!

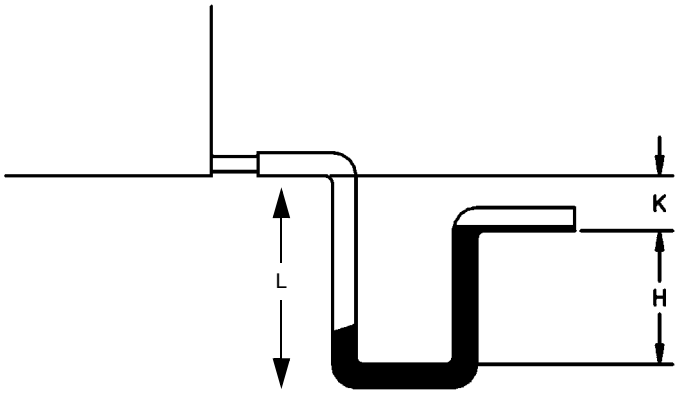
When more than one module has a drain pain, trap each module individually. Connecting all drains to a common line with only one trap can result in condensate retention and possible water damage to the air handler or adjoining space.

Figure 43. Drain pan trapping for module under negative pressure



L = H + J + pipe diameter
where:
H = 1 inch for each inch of negative pressure plus 1 inch*
J = 1/2 H
**Negative pressure=total unit static pressure at worst case (loaded filters) minus external pressure*

Figure 44. Drain pan trapping for module under positive pressure



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

Steam Coil Piping

M-Series air handlers fitted with steam coils have labeled holes for piping penetrations. Figure 45 and Figure 46 illustrate typical steam coil piping configurations. See Table 15 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 15. 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 45. Typical piping for Type N steam coils and horizontal tubes for horizontal airflow

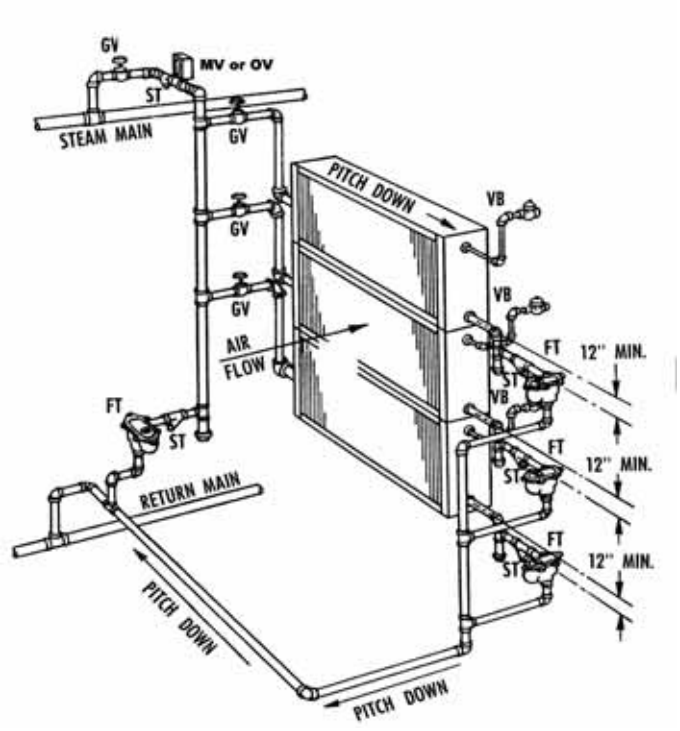
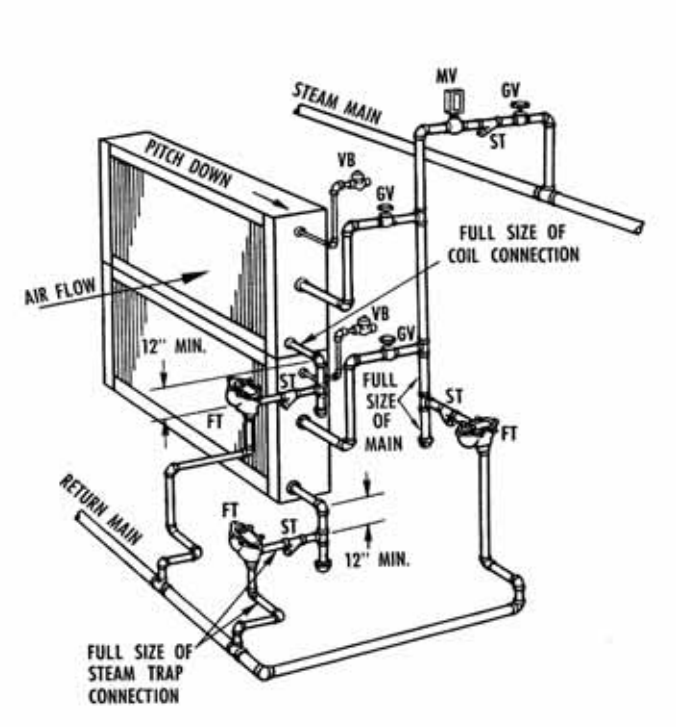


Figure 46. Typical piping for Type NS steam coils and horizontal tubes for horizontal airflow



CAUTION
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.

CAUTION
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 assure even heat distribution.

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

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

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

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

7. Ensure overhead returns have 1 psig of pressure at the steam trap discharge for every 2 feet of elevation for continuous condensate removal.

Water Coil Piping

Figure 47, Figure 48, and Figure 49 illustrate typical water coil piping configurations.

Type WA, 5A, 5W, D, K, W, UW, TT, P,2, P4, and P8 water coils are self-venting only if the water velocity exceeds 1.5 feet per second (fps) in the coil tubes. Type UU, WD, and 5D water coils are self-venting only if the water velocity exceeds 2.5 fps in the coil tubes. See the unit submittals for coil water velocity. If the water velocity is below these minimums, vent the coil by one of the following methods:

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

Note: T, ST, and TT coils are designed with larger than normal end tube sheet holes to allow for maximum expansion. Air leakage around tubes should be expected and handled by capping over coil ends or by sealing around tubes with a pliable sealant such as silicone.

Figure 47. Typical piping for type 5W one-row water coil

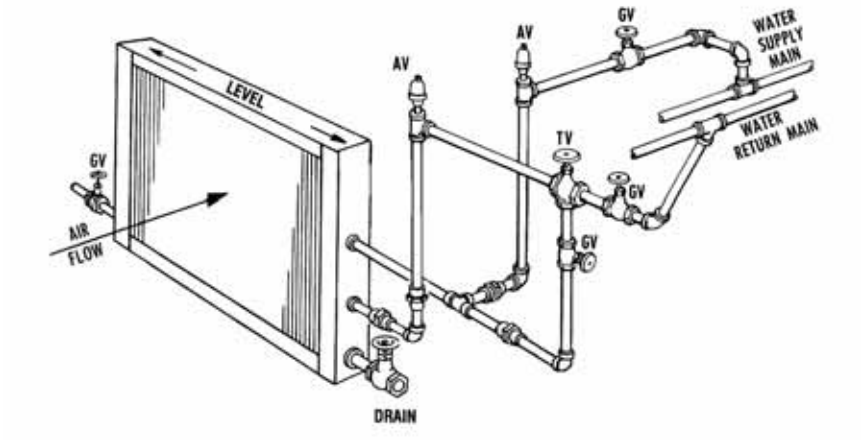


Figure 48. Typical piping for type 5A, 5W two-row, K, W 3- to 12-row, WD, D, and DD water coils

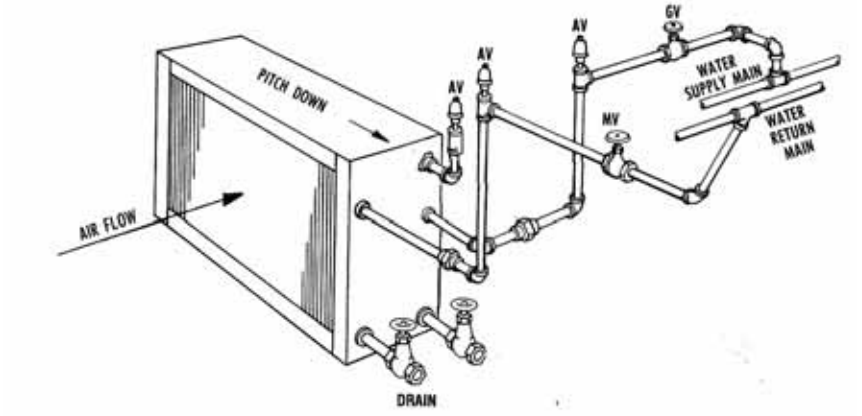


Figure 49. Typical piping for type W or WA 1-row water coil

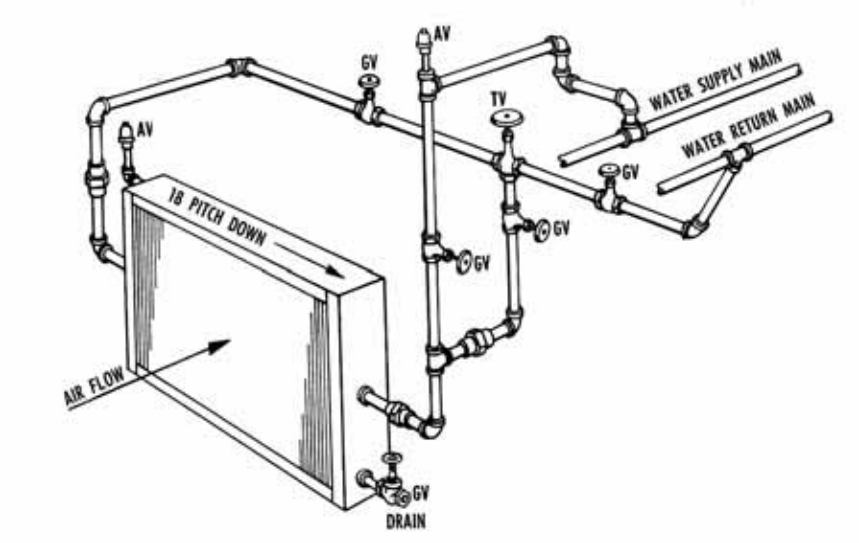
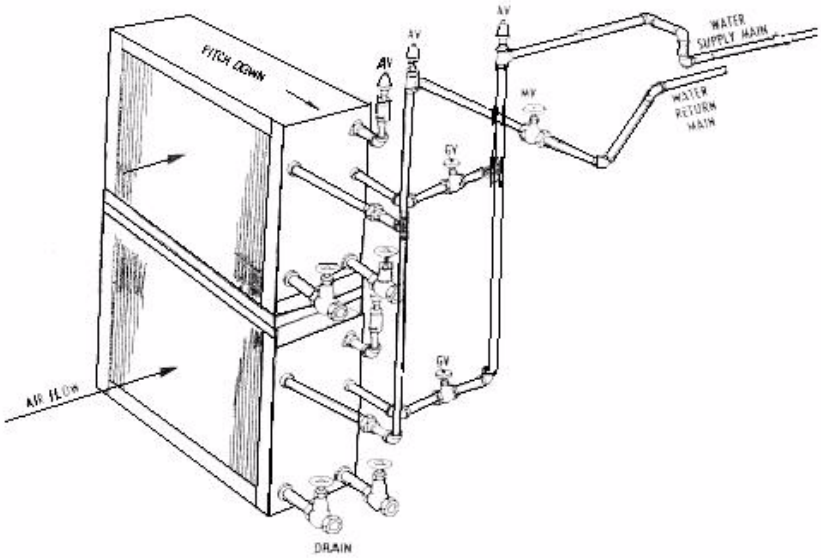


Figure 50. Typical piping for Type 5A, 5W two-row, K, W 3- to 12-row, WD, D, and DD water coils



Refrigerant Coil Piping

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

Use Figure 51 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 43 for more detailed schematics of evaporator piping.

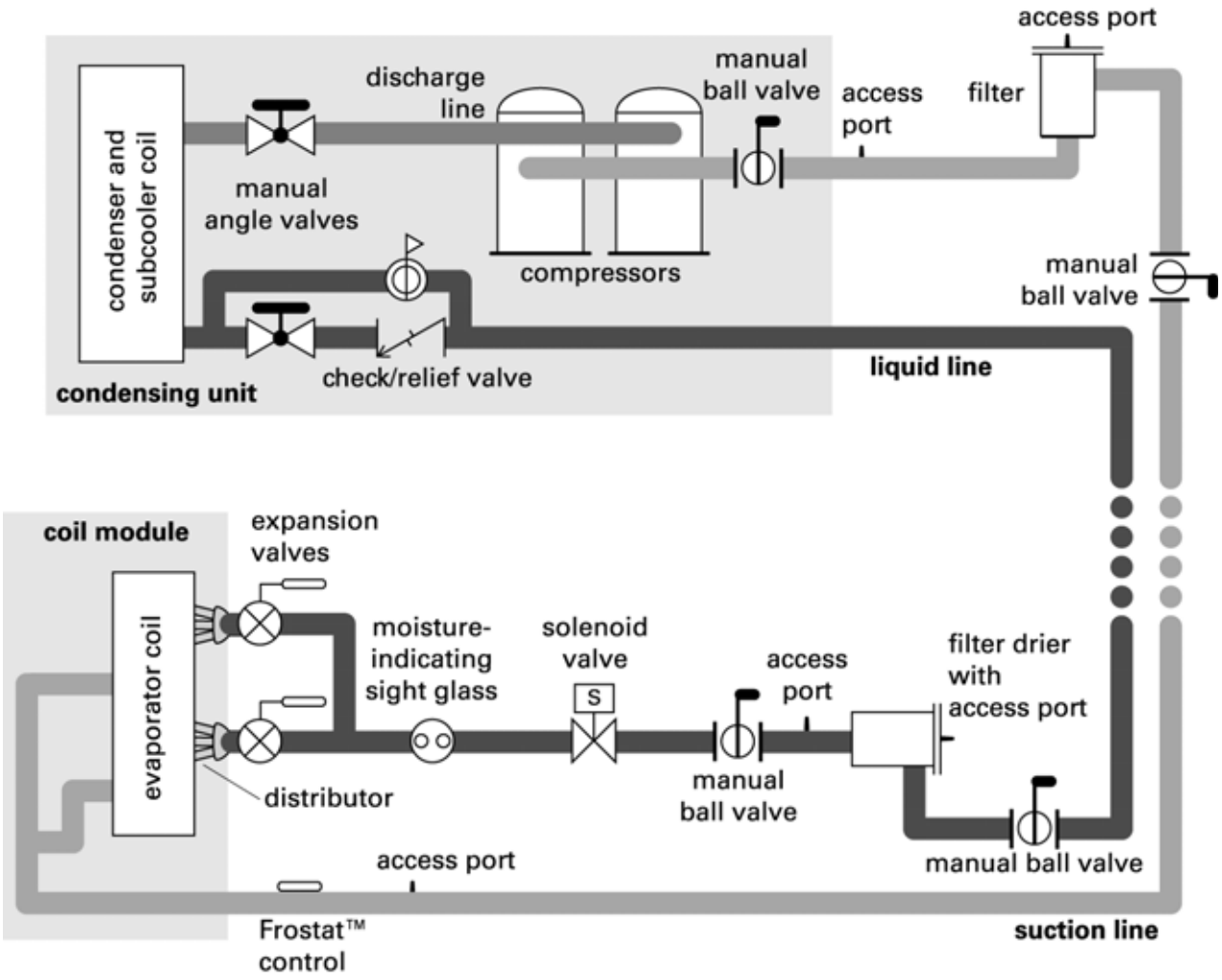
Liquid Lines

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

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

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

Figure 51. Example of placement for split-system components



Kit with sensor - X13790452010 SEN-01212

Kit with switch - X13100429010 THT 02442

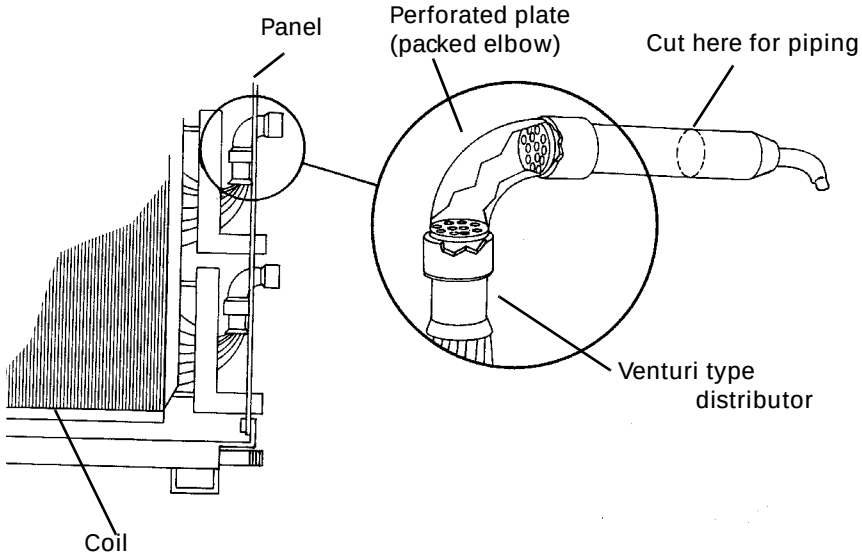
Components. Liquid-line refrigerant components necessary for a successful job include a filter drier, access port, solenoid valve, moisture-indicating sight glass, expansion valve(s), and ball shutoff valves. Figure 51 illustrates the proper sequence for positioning them in the liquid line. Position 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 assure it will correctly meter refrigerant into the evaporator coil throughout the entire operating envelope of the system. *Correct refrigerant distribution into the coil requires an expansion valve for each distributor.*

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

Cut the process tube and cap assembly from the liquid connection as shown in Figure 52 and install the expansion valve directly to the liquid connections.

Figure 52. Type F refrigerant coil with packed elbow



CAUTION
Valve Damage!

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

Suction Lines

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

Routing. To prevent residual or condensed refrigerant from "free-flowing" toward the compressor, install the suction line so it slopes slightly—that is, by ¼ inch to 1 inch per 10 feet of run [1 cm per 3 m]—toward the evaporator. When the application includes a suction riser, oil must be forced to travel the height of the riser. Riser traps and double risers are unnecessary in the suction line 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 51, p. 40.

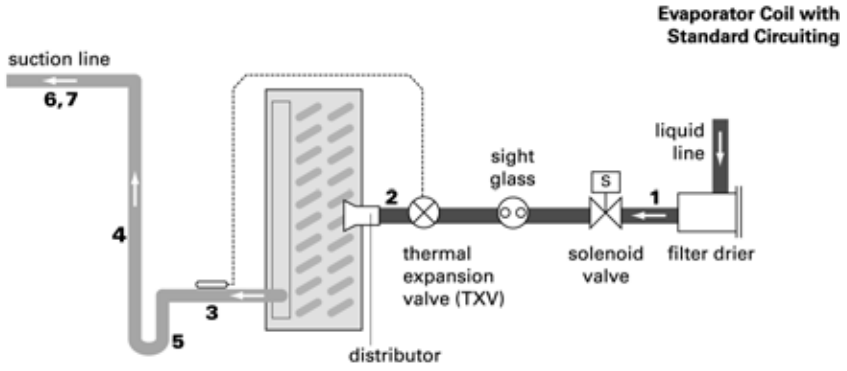
- *Filter.* The suction filter prevents contaminants, introduced during installation, from entering the compressor. For this reason, the suction filter should be the replaceable-core type, *and* a clean core should be installed after the system is cleaned up.
- *Access port.* The access port is used 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 Units: 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.
2. Provide one expansion valve per distributor.
3. Slightly pitch the outlet line from the suction header toward the suction riser—that is, 1 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
4. For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.
5. Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward.
6. Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.
7. Insulate the suction line.

Figure 53. Single-circuit evaporator coil with one distributor



Single-Circuit Condensing Units: 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.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser—that is, 1 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward. Use a double-elbow configuration to isolate the thermal expansion valve bulb from other suction headers.

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

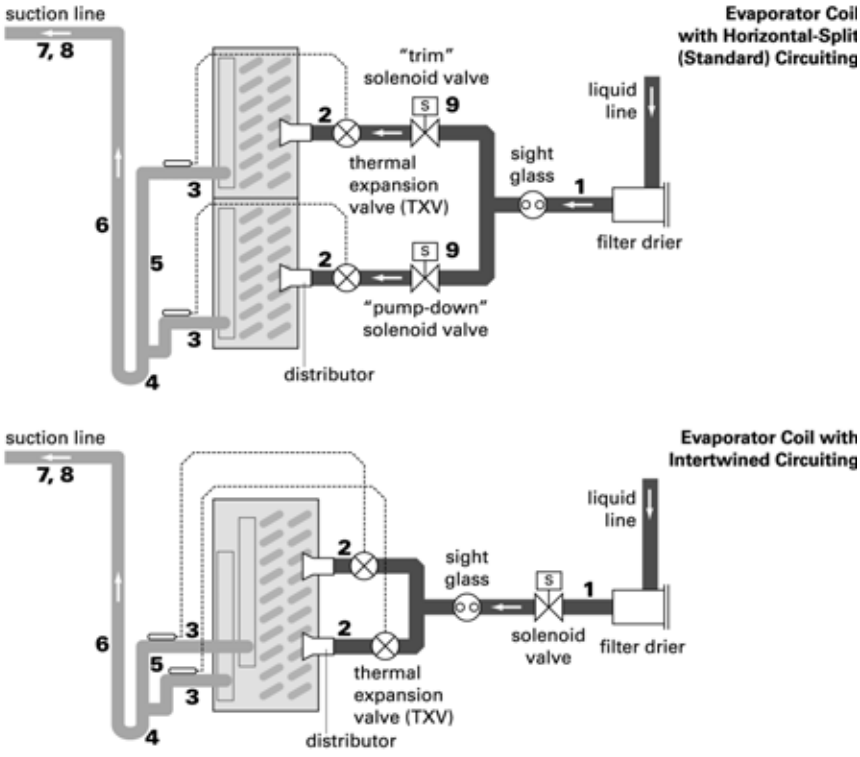
6 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.

8 Insulate the suction line.

9 Only use a “trim” solenoid valve for constant-volume, humidity-sensitive applications. For all other applications, install a single solenoid valve (the “pumpdown” solenoid valve) between the liquid-line filter drier and the sight glass.

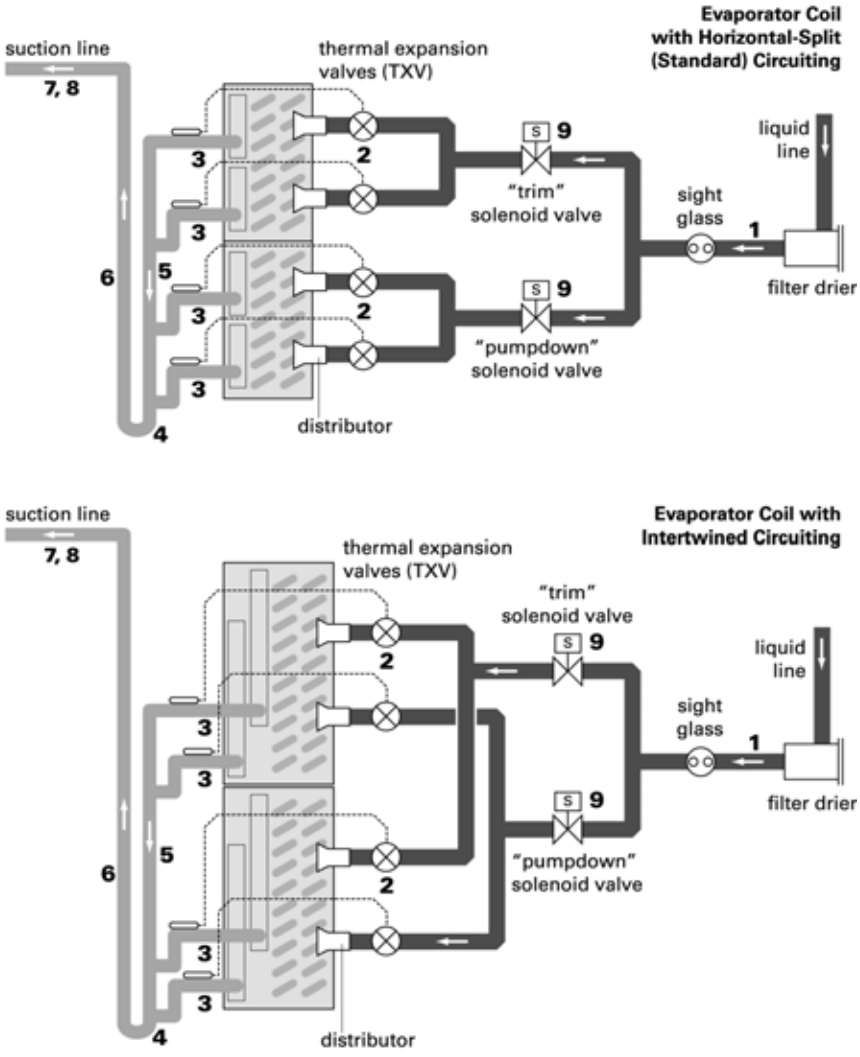
Figure 54. Single-circuit evaporator coil with two distributors



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

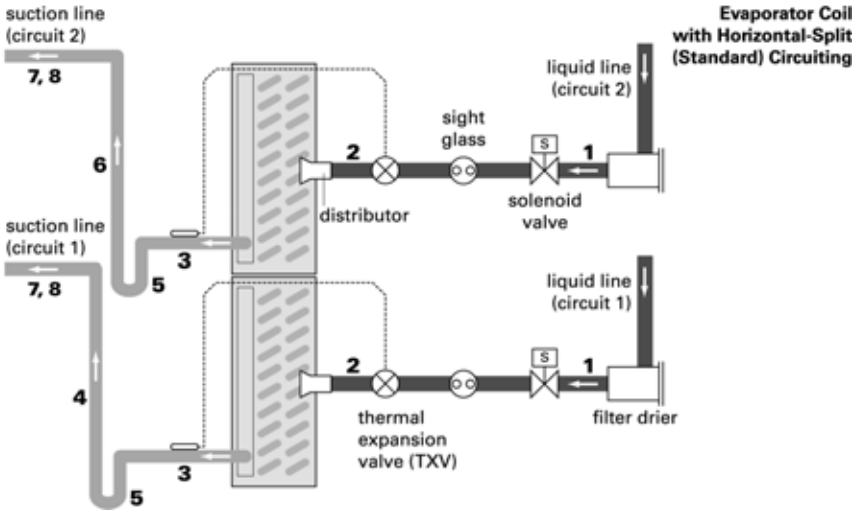
Figure 55. Single-circuit evaporator coil with four distributors



Dual-Circuit Condensing Units: 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.
2. Provide one expansion valve per distributor.
3. Slightly pitch the outlet line from the suction header toward the suction riser—that is, 1 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.
4. The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.
5. Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward.
6. The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.
7. Pitch the suction lines slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.
8. Insulate the suction lines.

Figure 56. Dual-circuit evaporator coil with two distributors



Dual-Circuit Condensing Units: 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.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser—that is, 1 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward. Use a double-elbow configuration to isolate the thermal expansion valve bulb from other suction headers.

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

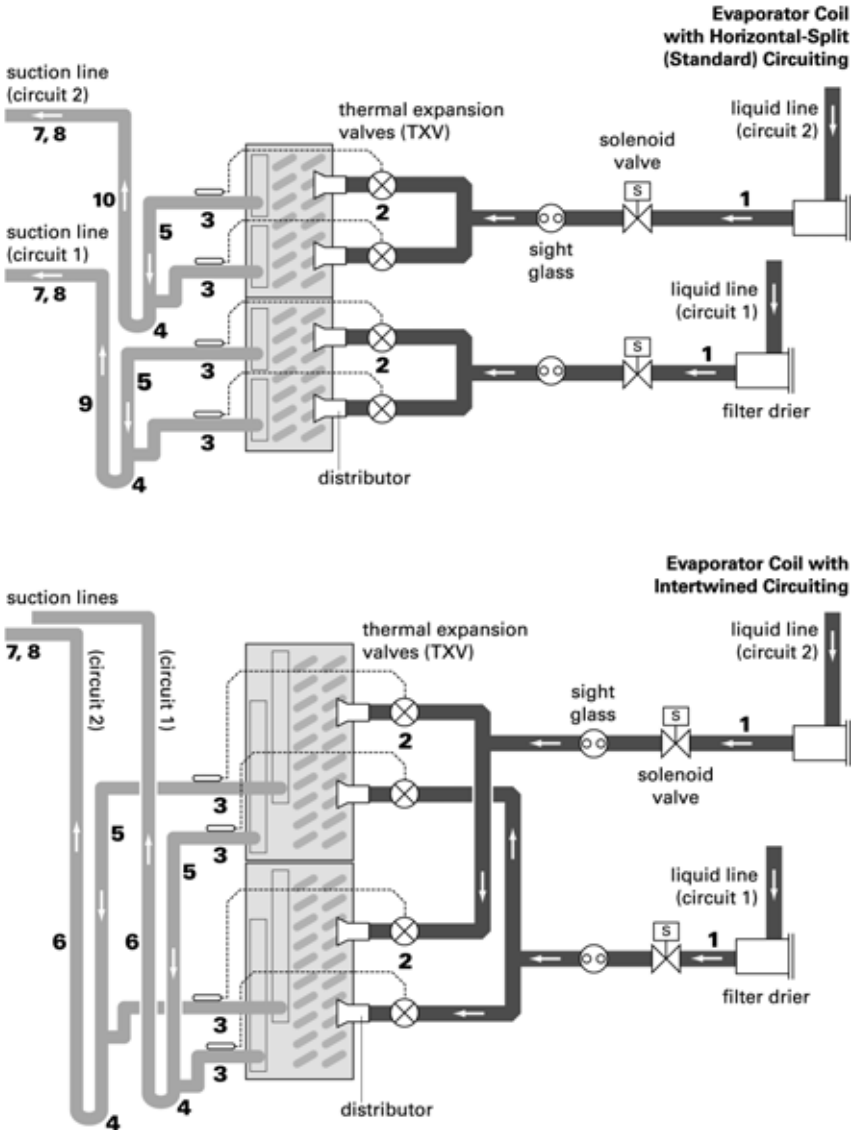
6 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.

8 Insulate the suction line.

9 The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.

Figure 57. Dual-circuit evaporator coil with four distributors



10 The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.

Dual-Circuit Condensing Units: 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.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser—that is, 1 inch/10 feet [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 Arrange the suction line so the refrigerant gas leaving the coil flows downward, past the lowest suction-header outlet, before turning upward. Use a double-elbow configuration to isolate the TXV bulb from other suction headers.

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

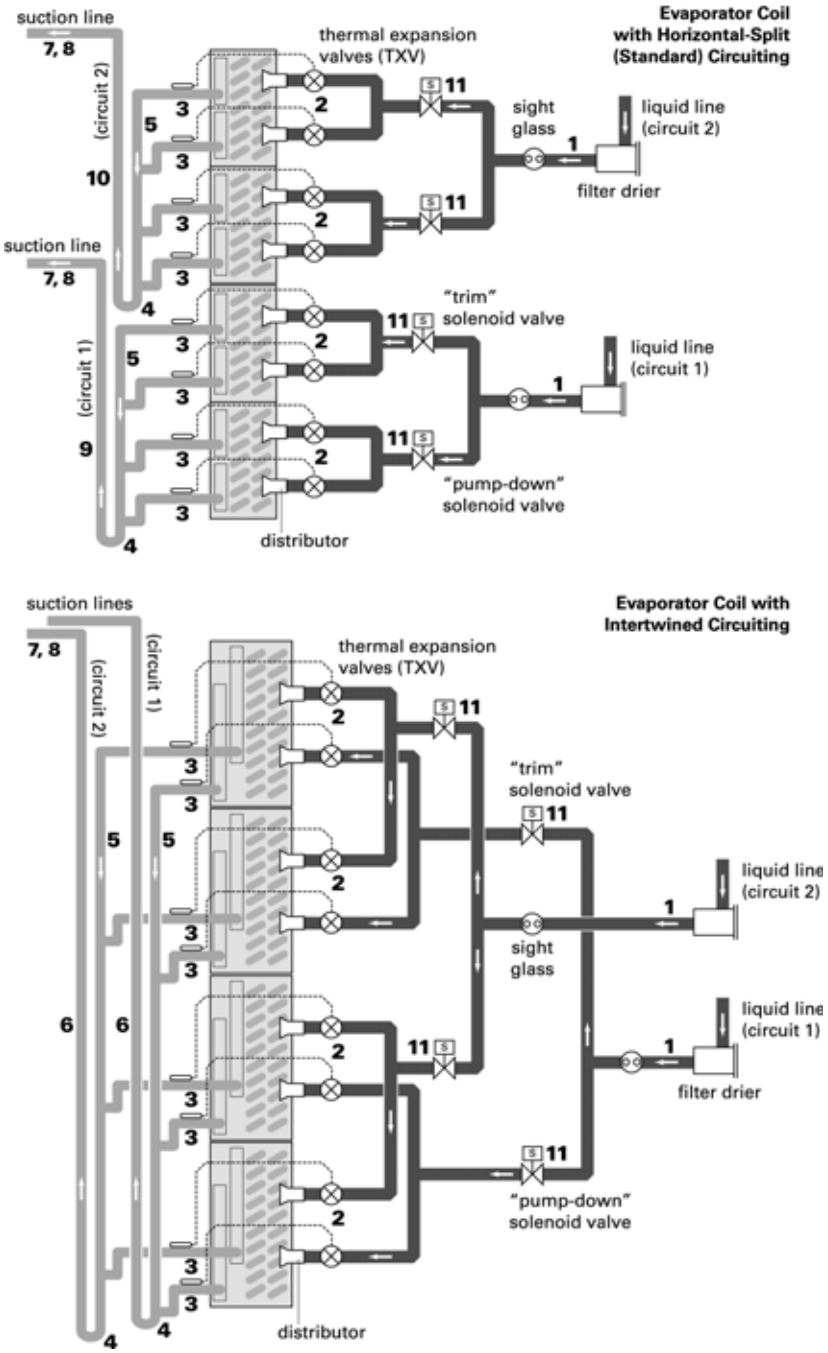
6 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

7 Pitch the suction line slightly—1 inch/10 feet [1 cm/3 m]—so the refrigerant drains toward the evaporator.

8 Insulate the suction line.

9 The top of the Circuit 1 suction riser must be higher than the bottom evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.

Figure 58. Dual-circuit evaporator coil with eight distributors



10 The top of the Circuit 2 suction riser must be higher than the top evaporator coil. Use the tube diameter recommended by the condensing unit manufacturer for the riser.

11 Only use a "trim" solenoid valve for constant-volume, humidity-sensitive applications. For all other applications, install a single solenoid valve (the "pumpdown" solenoid valve) between the liquid-line filter drier and the sight glass.

Wiring

⚠ WARNING
Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects 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 or PROD-SVB06A-FR

CAUTION
Use Copper Conductors Only!

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

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

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

Figure 59. Controller with power box attached

All direct-digital controllers (DDCs) are provided with line voltage to 24 Vac control transformers mounted and wired in the starter or variable-frequency drive (VFD) power box transformer plate (see Figure 60) or 120 to 24 Vac control transformers mounted and wired in the auxiliary control panel (see Figure 59).

Figure 60. Transformer plate

Figure 61 shows a typical VFD power box.

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

Figure 61. Variable-frequency drive (VFD)

To provide field-wiring to units with DDC controls:

- If VFD or starter is not factory-mounted, provide 120 Vac power to a transformer in the junction box when a separate circuit is recommended (see Figure 59).
- Install outside-air sensor and space sensor, if ordered.
- For valve jack junction box mounting and wiring detail, see Figure 62.

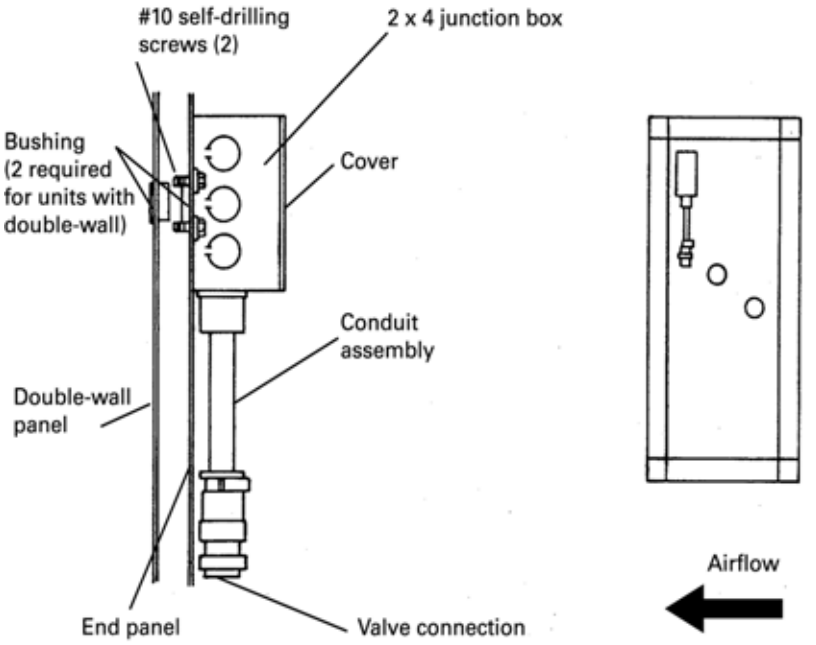
CAUTION
Penetration Leaks!

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

CAUTION
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.

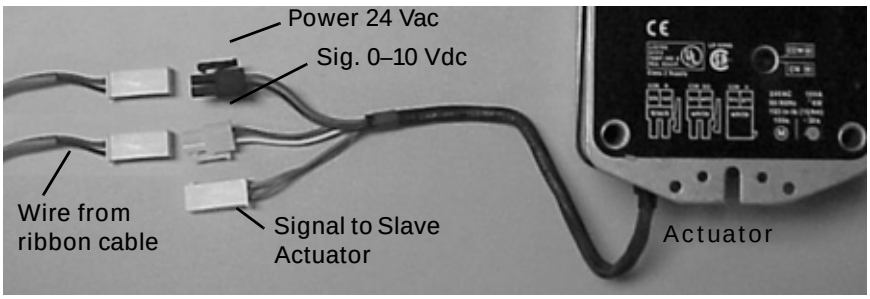
Figure 62. Junction box mounting and wiring details



Valve actuator wiring:

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

Figure 63. Typical quick connects with wiring identification



Traq™ Dampers

Traq dampers are low-leak dampers that modulate and measure airflow. Each Traq damper module is supplied with a factory-mounted ventilation control module (VCM) on the interior of the mixing box module. The VCM has an input terminal for power and an output terminal for air velocity (see Figure 64). 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.

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

Output Velocity Signal. The 2 to 10 Vdc linear output signal from the VCM represents air velocity. This voltage can be converted to represent airflow (cfm or L/s) using the formula below and Table 16 and Table 17.

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 M-Series air handler has a 10-volt signal, it would represent 18,376 cfm (8672 L/s) through the Traq damper. If the voltage were 6 volts, airflow through the Traq damper would be 8,325 cfm (3,930 L/s).

Figure 64. Traq damper terminal connections

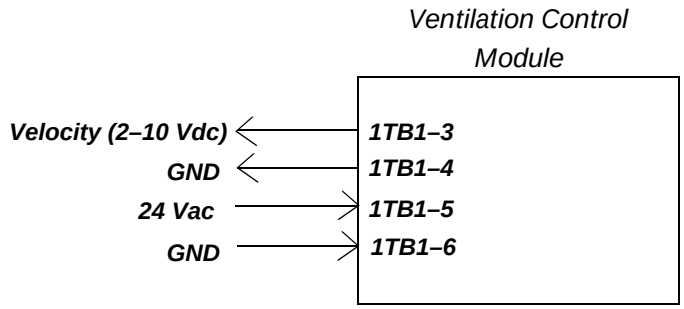


Table 16. Altitude adjustment factors

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

Table 17. Voltage Conversion Factors

Unit size	CFM @ 10 VDC with correction factor	L/s @ 10 VDC
3	2303	1087
6	4606	2174
8	4606	2174
10	6910	3261
12	11,760	5550
14	11,760	5550
17	11,760	5550
21	17,973	8482
25	17,973	8482
30	18,376	8672
35	26,960	12,724
40	26,960	12,724
50	37,388	17,645
57	37,388	17,645
66	49,851	23,527
80	62,313	29,409
100	74,776	35,290
120	74,776	35,290

Fan Inlet Airflow Measuring System

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.

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 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:

$$ACFM = CFM * SQRT(0.075/\rho)$$

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.

Figure 65. Piezo ring airflow measurement

External Insulating Requirements

CAUTION
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

Startup

Pre-Startup Checklist

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

⚠ WARNING
Hazardous Voltage w/ Capacitors!

Disconnect all electric power, including remote disconnects 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 or PROD-SVB06A-FR

Fan-Related Checks

- If the unit is *not* externally isolated, ensure that the fan isolator tie-down bolts have been removed. See the "Fan Isolation" section on page 26 for more information.
- 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 (see Table 19 on page 58 and Table 23 on page 61).
  - Fan sheaves should be tight and aligned.
  - Bearing set screws should be torqued. See Table 19 on page 58 for torque values.
- Inspect the inlet vane assembly for freedom of movement. If resistance is above the torques given in Table 11 on page 28, check the assembly for any binding or misalignment. Do not force the vanes.
- Check fan drive belt tension. See the "Tension the Fan Belt" section on page 56.
- Inspect fan motor and bearings for proper lubrication, if necessary. See the "Fan Bearing Lubrication" section on page 61.
- Check the motor lubrication, if necessary.
  - Remove and clean grease plugs.
  - Check for moisture in the grease. If moisture is present, remove the motor and send it to an authorized repair shop for bearing inspection/ replacement. If no moisture is present, refer to the motor manufacturer's lubrication recommendations for proper lubrication.

Coil-Related Checks

CAUTION
Proper Water Treatment!

The use of untreated or improperly treated water in coils may result in scaling, erosion, corrosion, algae or slime. 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

- 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.

Note: Motor warranties are the responsibility of the motor vendor. Contact local recognized service center for motor warranty needs.

General Checks

- Ensure the unit has been installed level.
- Ensure supply-air and return-air ducts have been connected.
- Ensure damper operator motors and connecting linkage have been installed.
- Verify damper operation and linkage alignment.
- Check that air filters are in place and positioned properly.
- Remove any debris from the unit interior.
- Close and secure all unit access doors.
- If differential pressure switch is provided on filter rack, adjust per system requirements.

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

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

Unit Operation

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

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

where:

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

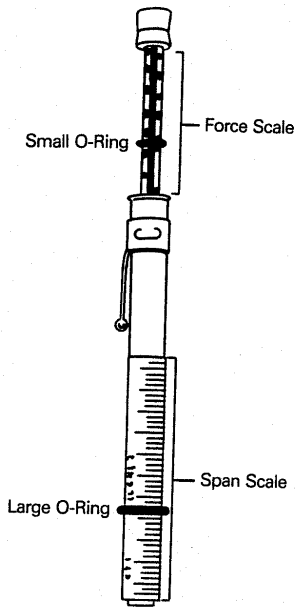
Voltage imbalance = 2.2% (not acceptable)

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

Tension the Fan Belt

Check the fan belt tension at least three times during the first days of operation because there is a rapid decrease in tension until the belt settles in (see Figure 67 and Figure 66).

Figure 66. Belt tensioner



CAUTION
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 67. Belt tension measurement

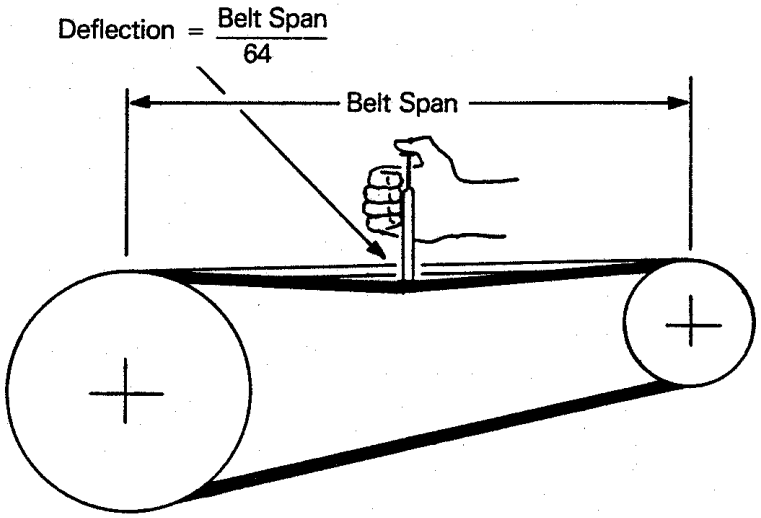
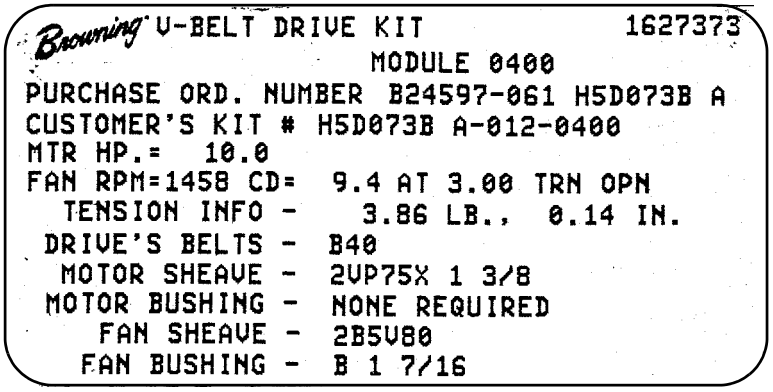


Figure 68. Tension drive belt label



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 68).

If the drive is changed from the original, proper belt tension can be estimated using Table 18.

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.

Table 18. 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

Determining 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 5 percent from the original designed speed, or if parts such as shafts, fan wheels, bearings, or other drive components are replaced. Do not exceed the maximum fan speed.

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

Sheave Alignment

Align the fan and motor sheaves using a straightedge. The straightedge must be long enough to span the distance between the outside edges of the sheaves. When the sheaves are aligned, the straightedge will touch both sheaves at points A through D (see Figure 69) 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 19.

Multibelt Check

Tighten the belts slightly and rotate the drive several times.

On multiple belt drives, ensure the force of deflection is approximately the same on each belt by pushing each belt in an equal distance at a point halfway from each sheave (see Figure 69). 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.

Figure 69. Proper drive alignment

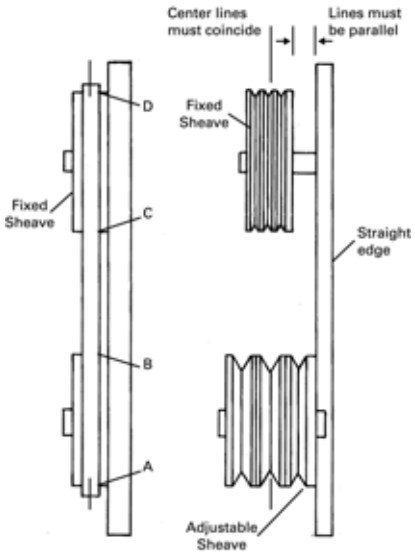


Table 19. Fan and drive compound torque settings (inches)

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

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 20. Routine maintenance checklist

Frequency	Maintenance
After 48 hours of operation	Belts have acquired their permanent set. Readjust but do not overtighten. See the “Tension the Fan Belt” section on page 56 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 the “Air Filters” section on page 60 for more information. • Relubricate fan bearings if necessary. See the “Fan Bearing Lubrication” section on page 61 for more information. • Check and adjust fan belt tension.
Every three to six months	• Check fan bearing grease line connections. Lines should be tight to the bearings. • Check bearing and motor bracket bolt torque and bearing setscrew torque. • Align fan and motor sheaves. Tighten sheave set screws to the proper torque. See the “Sheave Alignment” section on page 58 for more information. • Inspect and clean drain pans. See the “Drain Pans” section on page 60 for more information. • Tighten electrical connections. • Inspect coils for dirt build-up. See the “Coils” section on page 62 for more information.
Every year	• Inspect the unit casing for corrosion. If damage is found, clean and repaint the surface with a rust-resistant primer and vinyl chlorinated lacquer. • Clean the fan wheels and fan shaft. See the “Fans” section on page 61 for more information. • Inspect and clean drain pans. • Check damper linkages, set screws, and blade adjustment. Clean, but do not lubricate, the nylon damper rod bushings. • Clean damper operators. • Inspect electrical components and insulation. • Inspect wiring for damage. • Rotate the fan wheel and check for obstructions in the fan housing. The wheel should not rub on the fan housing. Adjust the center if necessary and tighten wheel set screws to the proper torque. • Lubricate motor bearings in accordance with motor manufacturer’s recommendations (see the “Fan Bearing Lubrication” section on page 61 for more information). • Check condition of gasketing and insulation around unit, door and dampers. • Examine flex connections for cracks or leaks. Repair or replace damaged material.

Air Filters

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

Throwaway Filters

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

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

Permanent Filters

To clean permanent filters:

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

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

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: NOTE: The pleats 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: 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
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 assure the condensate drains as designed. This inspection should occur a minimum of every six months or more often as dictated by operating experience.

If evidence of standing water or condensate overflow exists, identify and remedy the cause immediately. Refer to the “Troubleshooting” section on page 66 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.

⚠ 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.

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 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.

Inspecting and Cleaning Fans

Fan sections of air handlers should be inspected every six months at a minimum or more frequently if operating experience dictates. If evidence of microbial growth (mold) is found, identify and remedy the cause immediately. Refer to the "Troubleshooting" section on page 66 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.

Bearing Set Screw Alignment

Align bearing set screws as illustrated in Figure 70. Table 19 on page 58 provides bearing set screw torque measurements.

Fan Bearing Lubrication

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 21 for compatible greases and Table 22 for maximum grease capacity.

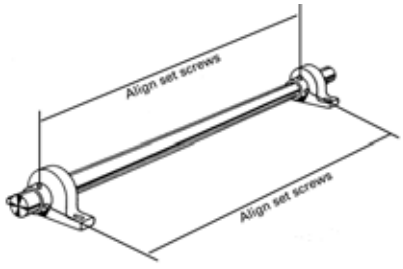
Note: Lubricate the bearing according to the motor manufacturer's recommendations and use the manufacturer-recommended grease.

Refer to Table 23 for minimum torque of motor mounting and bearings bolts.

CAUTION
Bearing Failure!

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

Figure 70. Bearing set screw alignment



- 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 21. Compatible Greases

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

Table 22. 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

Table 23. Minimum hex head bolt torque in lb.-ft. (Grade 5 bolts)

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

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

⚠ 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.

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

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

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

4. Reassemble the motor.

Fan Motor Inspection

Inspect fan motors periodically for excessive vibration or temperature.

⚠ 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.

Coils

All coils should be kept clean to maintain maximum performance.

Steam and Water Coils

To clean steam and water coils:

1. Disconnect all electrical power to the unit.
2. Wearing the appropriate personal protective equipment, use a soft brush to remove loose debris from both sides of the coil.
3. 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 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.

Type K Cooling Coils

Type K cooling coils have removable headers for cleaning:

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

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

Refrigerant Coils

⚠ WARNING
Hazardous Pressures!

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

To clean refrigerant coils:

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

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

5. Place the mixed solution in a garden pump-up sprayer or high-pressure sprayer. If a high pressure sprayer is to be used:
   - Maintain minimum nozzle spray angle of 15 degrees.
   - Spray perpendicular to the coil face.
   - Keep the nozzle at least 6 inches from the coil.
   - Do *not* exceed 600 psi.
6. Spray the leaving air side of the coil first, then the entering air side.
7. Thoroughly rinse both sides of the coil and the drain pan with cool, clean water.
8. Repeat steps 6 and 7 as necessary.
9. Straighten any coil fins damaged during the cleaning process.
10. Confirm the drain line is open following the cleaning process.
11. Allow the unit to dry thoroughly before putting it back into service.
12. Replace all panels and parts and restore electrical power to the unit.
13. Be careful any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Coil Winterization

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

CAUTION
Coil Freezeup!

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.

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 find the "Service Model No of Coil" on the coil module 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 "DW0B," the coil type is W.

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

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

Note: Use care in removing header plugs from Type P2, P4, and P8 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.

Type K Coils

1. Remove all vent and drain plugs.
2. Allow the water to drain from the coil.
3. Remove the header covers.
4. If tubes are fouled, clean the tubes with a nylon or wire brush.
5. To ensure no water remains in the coil, do not replace the header covers until the coils are put back into service.

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

Moisture Purge Cycle

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

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

Internal Insulation

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

CAUTION
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.

⚠ 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.

Internal insulation in areas of the unit that are normally considered to be "dry" must also be periodically inspected to assure the insulation is clean and dry. Wet insulation in an area that is normally considered to be "dry" can indicate an operational problem (refer to the "Troubleshooting" section on page 66 for further information). The equipment should be inspected a minimum of every six months or more frequently as operating experience dictates.

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

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

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

See the "Troubleshooting" section on page 66 for assistance in identifying the cause.

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

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

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

3. Install a block-off to prevent spray from going into a dry section of the unit and/or system ductwork.
4. Thoroughly clean 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.

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.

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 24. Air handler troubleshooting recommendations

Symptom	Probable Cause	Recommended Action
Bearing is excessively hot	First start after relubrication (Grease distribution)	Allow machine to cool down and restart.
	Over-lubrication	Clean surface of grease and purge.
	Over tensioned belts	Adjust belt tension.
	No lubricant	Apply lubricant. Check bearings for damage.
	Misaligned bearing	Correct alignment. Check shaft level.
Motor fails to start	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker.
	Overload trip	Check and reset overload.
	Improper wiring or connections	Check wiring with diagram supplied on unit.
	Improper current supply	Compare actual supply power with motor nameplate recommendations. Contact power company for adjustments.
	Mechanical failure	Check that motor and drive rotate freely. Check bearing lubricant.
Motor stalls	Open phase	Check line for an open phase.
	Overloaded motor	Reduce load or replace with larger motor.
	Low line voltage	Check across AC line. Correct voltage if possible.
Excessive vibration	Poor alignment	Align bearing set screws (see Figure 70, p. 61). Loosen and retighten bearing set screws.
	Shipping spacers not removed	Remove shipping spacers and/or bolts (see the “Fan Isolation” section on page 26).
	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.

Air handler troubleshooting recommendations

Symptom	Probable Cause	Recommended Action
Short belt life	Worn sheaves	Replace sheaves.
	Misaligned belt	Realign drive with MVP sheave set at mean pitch diameter.
	Grease or oil on belts	Check for leaky bearings. Clean belts and sheaves.
	Belt slipping	Improper belt tension. Adjust tension.
	Belts rubbing	Remove obstruction or realign drive for clearance.
Bearing noise	Poor alignment	Loosen bearing set screws and realign (see the “Bearing Set Screw Alignment” section on page 61)
	Failed bearing	Replace bearing.
	Inadequate lubrication	Replace bearing.
Low water coil capacity	Incorrect airflow	Check fan operating condition.
	Incorrect water flow	Inspect the water pumps and valves for proper operation and check the lines for obstructions.
	Incorrect water temperature	Adjust the chiller or boiler to provide the proper water temperature.
	Coil is piped incorrectly	Verify coil piping (see the “” section on page 34).
	Dirty fin surface	Clean the fin surface (see the “Coils” section on page 62).
	Incorrect glycol mixture	Verify glycol mixture and adjust if necessary.
Low refrigerant coil capacity	Incorrect airflow	Check fan operating condition.
	Expansion valve is not operating properly or is sized incorrectly	Check sensing bulb temperature. Verify valve operation. Verify proper valve size.
	Incorrect refrigerant charge	Verify refrigerant charge and adjust if necessary.
	Condensing unit failure	Verify condensing unit operation.
	Coil is piped incorrectly	Verify coil piping (see the “” section on page 34).
	Clogged refrigerant line filter	Change filter core.
	Failure of suction/liquid line components	Verify component operation
	Dirty fin surface	Clean the fin surface (see the “Coils” section on page 62). Do not use steam to clean refrigerant coils.
	Fin frosting	Verify defrost cycle operation. Verify frostat operation. Verify refrigerant charge.
Low steam coil capacity	Incorrect airflow	Check fan operating condition.
	Coil is piped incorrectly	Verify coil piping (see the “” section on page 34).
	Incorrect steam pressure	Verify steam pressure and adjust if necessary.
	Excessive steam superheat	Check steam superheat. Steam superheat should not exceed 50ºF.
	Failure of steam line/condensate return components	Verify component operation
	Boiler failure	Verify boiler operation
	Dirty fin surface	Clean the fin surface (see the “Coils” section on page 62).
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

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