



Installation and Maintenance Manual

IM 777-17

Group: **Applied Air Systems**

Part Number: **IM 777**

Date: **December 2019**

Skyline® Outdoor Air Handler



Introduction	3	Operation Guidelines	29
General Information	3	Startup Checks	29
Receiving and Handling	3	Before Starting the Unit	29
Unit Storage	4	VFD Setup	30
Mechanical Installation	5	Fan Startup	30
Service Clearances	5	Fan Wheel Alignment	30
Rigging	5	Setscrews	33
Curb Mounting and Unit Leveling	6	Daikin Fan Array	34
Assembling Sections	6	Daikin EC Fan Array	38
Shipping Sections	6	Operating Limits	42
Panels, Frame Channels, and Doors	8	Fan Vibration Levels	43
Field Mounting Junction Boxes and Other Components	10	Gas Furnace	44
HEPA Holding Frame, Filter, and Prefilter Installation	10	Indirect Fired Tube Heater	44
Duct Connections	15	Wiring/Controls	46
Dampers and Hoods	16	Rack Furnace	53
Mounting Actuators	16	Direct Fired Heater	56
Angled Economizer Actuator Access	16	Operation of the Basic pCO ⁵⁺ Carel Controller	58
Isolation Dampers for Multiple Fans	17	BACnet Points	60
Piping Vestibules	17	Service and Maintenance	61
Piping and Coils	20	Periodic Maintenance	61
Internal Isolation Assembly Adjustment	24	Fan Drive	62
OSHDP Seismic Anchoring/Mounting	26	Fan Drive Belt Adjustment	66
Electrical Installation	27	Front Load Filter Option	67
Wiring	27	Filter Gauges	67
		Coils	68
		Winterizing Water Coils	68
		Removing and Replacing Components	68
		Parts, Service and Warranty Procedure	71
		Replacement Parts	71
		Warranty	71
		Warranty Return Material Procedure	71
		Check, Test and Warranty Registration Form	72
		Quality Assurance Survey	78

General Information

WARNING

Sharp edges and coil surfaces are a potential injury hazard. Avoid contact.

The system design and installation must follow accepted industry practice as described in the ASHRAE Handbook, the National Electric Code, and other applicable standards. Install this equipment in accordance with regulations of authorities having jurisdiction and all applicable codes.

Installation and maintenance must be performed by qualified personnel familiar with applicable codes and regulations and experienced with this type of equipment. Sheet metal parts, self-tapping screws, fins, clips, and such items inherently have sharp edges; the installer should exercise caution.

Receiving and Handling

Inspection

- Carefully check items against the bills of lading to verify all crates and cartons have been received. Carefully inspect all units for shipping damage. Report damage immediately to the carrier and file a claim.

Packaging

- All shipping wrap material, including stretch and shrink wrap, must be removed upon unit arrival. This wrapping is for transit protection only. Units are not to be stored with wrapping material left on, as white rust will develop if any moisture is present.
- Field-installed components, such as vestibules or shipped loose controls, will ship on separate skid(s).
- Hardware (screws, bolts, etc.) for assembling sections are supplied in a bag attached to each section. NOTE: A special #30 Torx bit is required for assembly.

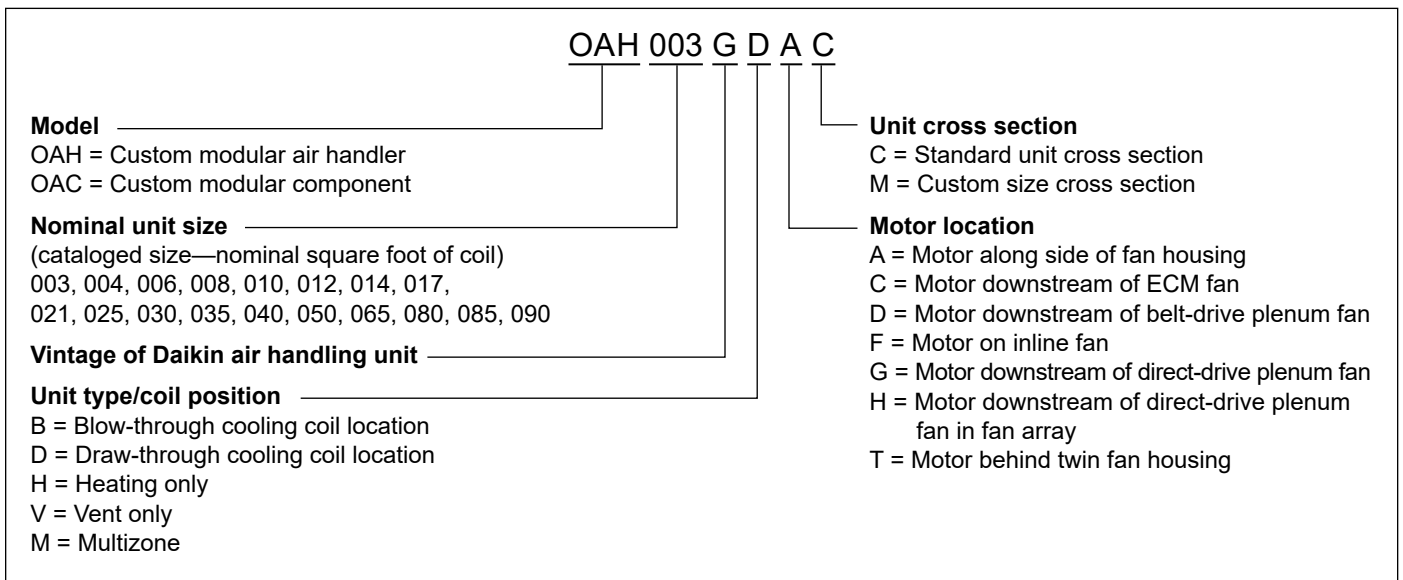
Identification

- Every shipping section includes a nameplate identifying the customer tagging information, unit serial number, unit order number, and the shipping section position for installation.

Handling

- Skyline air handler units are constructed of painted or galvanized steel and are inspected thoroughly before leaving the factory. Take care during installation to prevent damage to units. Do not stand or walk on top of units.
- Air handler bases are designed with the necessary number of lifting points for safe installation. All lifting locations must be used. See Rigging.
- Take special care when handling blower sections. All fans are dynamically balanced before leaving the factory. Rough handling can cause misalignment or a damaged bearings or shaft. Carefully inspect fans and shaft before unit installation to verify this has not happened.

Nomenclature



Unit Storage

- Skyline units may be stored outdoors. Follow the below instructions to ensure proper storage. Any damage to the unit resulting from improper storage will not be covered by Daikin Applied.
- Store units in a clean, dry environment on a level surface. Ensure units are on a dry surface or raised off the ground to protect components from any standing water; ensure adequate support is used to prevent the unit or section base from sagging, if raised. Moisture, debris, and minerals can cause permanent damage to the cabinet and components.
- All openings, including dampers and bottom openings, must be covered to protect from rain, snow, dust, and animals. Do not use plastic tarps to cover the unit, as condensation can form on the air handler resulting in corrosion or stains. Use only canvas tarps to ensure the inside of the unit remains clean, dry, and ventilated. Do not allow coverings to trap moisture on surfaces.
- All tarps should be inspected frequently to ensure the integrity of the tarp is maintained and to prevent damage to the unit by the elements. Any damage to the tarp should be repaired immediately.
- It is recommended that the unit interior be inspected daily to observe whether condensation is occurring and if temporary or routine ventilation of the interior is needed to control condensation. Units should be inspected at different times of the day to ensure varying weather conditions are not causing condensate to occur.
- All shipping wrap material, including stretch and shrink wrap, must be removed upon unit arrival. Units are not to be stored with wrapping material left on, as white rust will develop if any moisture is present.
- A field-supplied desiccant bag may be hung in the interior of the unit to minimize corrosion in humid storage environments.
- Do not stack sections or store anything on top of units.
- Isolate unit from shock and vibration.
- Do not clean galvanized steel surfaces with oil dissolving chemicals. This may remove the protective coating and accelerate corrosion.
- Pack fan and motor bearings (unless motor bearings are sealed) with compatible grease while the fan shaft is stationary. After grease has been installed, rotate shaft a minimum of 10 rotations.
- Once a month, rotate shaft a minimum of 10 revolutions. Ensure the stopped position is different than the original position.
- Coat shafts with lubricant as needed to prevent corrosion.
- Inspect all doors and openings once a month to ensure they are closed and properly sealed.
- Loosen belt tension on belt-driven fans, if storing for more than two (2) months.

Belt driven fans:

- Reduce belt tension by at least 50% or remove the belts. Remove belts if they will be subjected to temperatures exceeding 85°F to avoid deterioration.
- Remove belt guard when adjusting belts
- Reduce belt tension prior to removing or installing belts. Removing or installing tensioned belts may cause personal injury and damage to the sheaves, belts, bearings or shafts.
- Adjustable sheaves should be opened as wide as possible and the adjustment threads lubricated so they do not corrode. Be careful not to put lubricant on the belt running surface

Prior to start up:

- Set screws on bearings, fan wheels, and sheaves need to be checked for proper torque. Also check bolt torque for any taper lock hubs either on the wheel or sheaves.
- Check sheaves for corrosion. Significant corrosion can cause belt or sheave failure.
- Purge old grease from fan bearings while rotating the shaft to distribute the new grease evenly and prevent bearing seal failure.
- Correctly align and tension belts. [See General Rules of Tensioning on page 67](#)

Service Clearances

In addition to providing adequate space around the unit for piping coils and drains, access to at least one side of the unit is always required to allow for regular service and routine maintenance, which includes filter replacement, drain pan inspection and cleaning, fan bearing lubrication, and belt adjustment. Provide sufficient space—at least equal to the length of the coil—on the side of the unit for coil removal. See [Figure 1](#) for servicing space requirements.

Maintain at least 54" of clearance in front of electrical power devices. Electrical power devices that are mounted on the side of the unit typically are up to 12" deep ([Figure 2](#)). Fan sections with multiple fans have motor control boxes up to 16" deep when supplied with VFDs.

Figure 1: Servicing Space Requirements

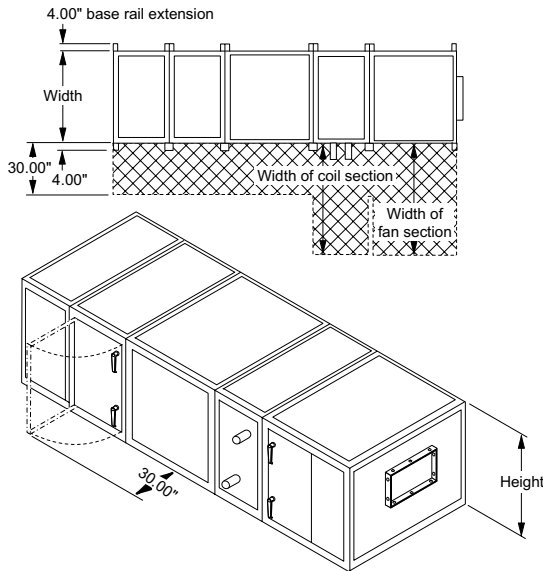
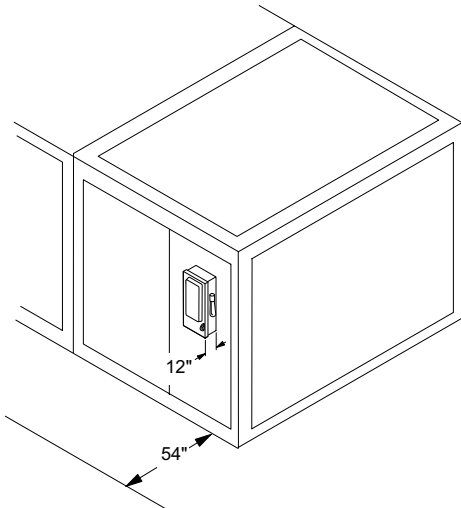


Figure 2: Service Clearance for Electrical Power Devices



Rigging

WARNING

Use all lifting points. Improper lifting can cause severe personal injury and property damage.

CAUTION

Lifting points may not be symmetrical to the center of gravity of the unit. Ballast or unequal cable lengths maybe required.

Skyline air handlers ship as separate sections, completely assembled, or in modules of assembled sections. The unit must be rigged as it ships from the factory. Do not rig units after assembly. Units are provided with a factory-installed base rail and can be lifted using the 2" diameter lifting holes located in the corners of each shipping section. To prevent damage to the unit cabinetry, use spreader bars. Position spreader bars to prevent cables from rubbing the frame or panels. Before hoisting into position, test lift for stability and balance. Avoid twisting or uneven lifting of unit.

Figure 3: Six Point Rigging (Unitized Base Only)

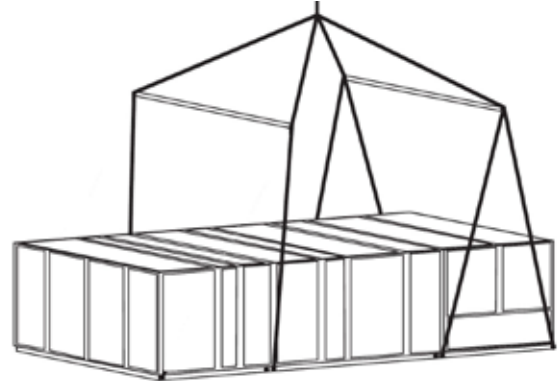
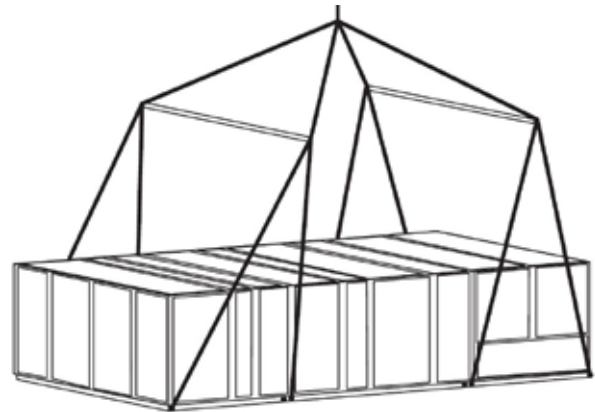


Figure 4: Eight Point Rigging (Unitized Base Only)



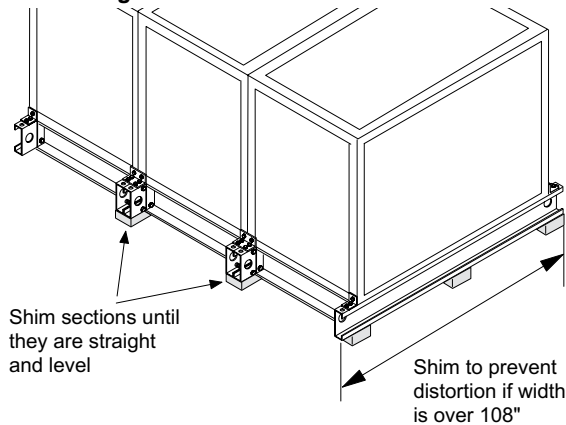
Curb Mounting and Unit Leveling

Do not place a Skyline unit over an open curb unless it is equipped with a curb-ready base. Installation instructions for mounting units on a roof curb are provided in [IM 770](#). For a copy, contact your local Daikin representative or visit www.DaikinApplied.com. Make provisions under the unit to divert any moisture from entering the building below.

For units without roof curb mounting, place the equipment on a flat and level surface. Where surface irregularities exist, shim the base of the unit at one or more points along the length of the rails to prevent distortion or sagging of the support rails. Uneven or distorted sections cause misfit or binding of the doors and panels and improper draining of drain pans ([Figure 5](#)).

If the unit is supported on rails they must be placed around the entire perimeter. Additional Supports must be placed perpendicular to airflow spanning the full width of the unit at all shipping splits. If the unit is over 107" wide these supports must also be placed at the entering and leaving edges of fan and cooling coil sections. The perimeter rails must be at least 2" wide at the top and capable of carrying the entire weight of the unit. The cross supports must be 4" wide at the top and capable of carrying the weight of the two sections it spans. The cross supports shall be placed such that 2" of the top is supporting each section. The perimeter rails shall be placed so that they are fully supporting the outer 2" of the unit. If shims are required they must be placed such that the unit is fully supported.

Figure 5: Leveling the Unit



Assembling Sections

If the unit is shipped in more than one shipping section, rig each section into position separately. Shipping sections are provided with a connection splice joint attached to the cabinet which seals against the gasket of the frame channel on the adjoining shipping section. The splice joint provides an air seal between two sections once they are assembled together. Some unit configurations require multiple splice joints on the same face or on opposing faces of a single section. Confirm correct placement and orientation of unit sections and splice joints based on included unit drawings. Align all splice joints to seat into the mating gasket to provide an air seal. If the splice joint was bent during shipping or rigging, restore it to its original position ([Figure 10](#)). For high pressure low leakage units, ensure that the D-gasket is attached to the entering air side frame channel ([Figure 8](#) and [Figure 11](#)). If it dislodged during shipping, restore it to its designed position.

Shipping Sections

⚠ IMPORTANT

The factory supplied D gasket must be field installed prior to pulling ship sections together. Install D gasket at all section splits on the mating face of the base rail in an arc shape with the ends lower than the center, so that any moisture that may reach the gasket will be drained to the outside of the unit. ([Figure 8](#)).

1. Add a lubricant to top of curb gasket to allow sections to slide together easier.
2. Apply a minimum 1/4" bead of caulk to the mating faces of frame channels and roof panels at all section splits of the unit before joining the sections together. Also adhere the factory supplied, field installed "D" Gasket to the mating face of the base rail at all section splits in the shape of an arc to divert any moisture to the outside of the unit. ([Figure 6](#)).

3. Ensure the splice collar lines up with the opening in the mating section. Use clamps or threaded rod at the base lifting lugs to pull the sections closer. Be careful to not damage them. Use the 3/8"-16 x 1" bolts located in the splice kit provided with the unit to pull the bases together via the holes in the lifting lugs. (Figure 8). Use ratchet straps to pull the top of sections together.
 - a. To fasten two shipping sections together, eight nuts and bolts are required (two on the top, two on the bottom on each side of the unit) which are factory supplied in the splice kits with each unit. Complete each section top and bottom before attaching additional sections. (Figure 8).
 - b. If the bottom internal splice collar gap is larger than 1/4", add sealant to that gap.
 - c. For sections with vestibules, after the vestibule section is on the curb, remove the vestibule lifting brackets and slide sections together. (Figure 7).

Figure 7: Sections with Vestibules

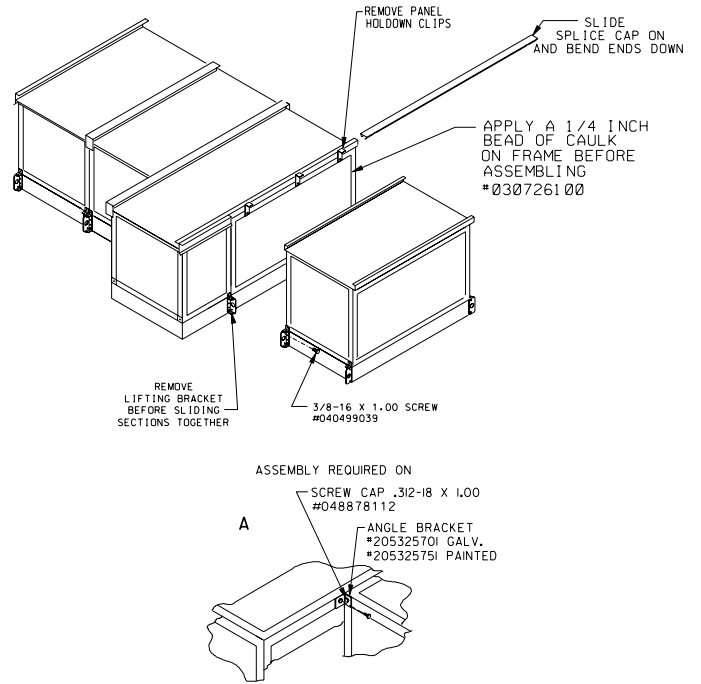


Figure 6: Apply Sealant to Mating Faces

Add minimum 1/4" bead of caulk on mating faces of frame channels and roof panels at all section splits

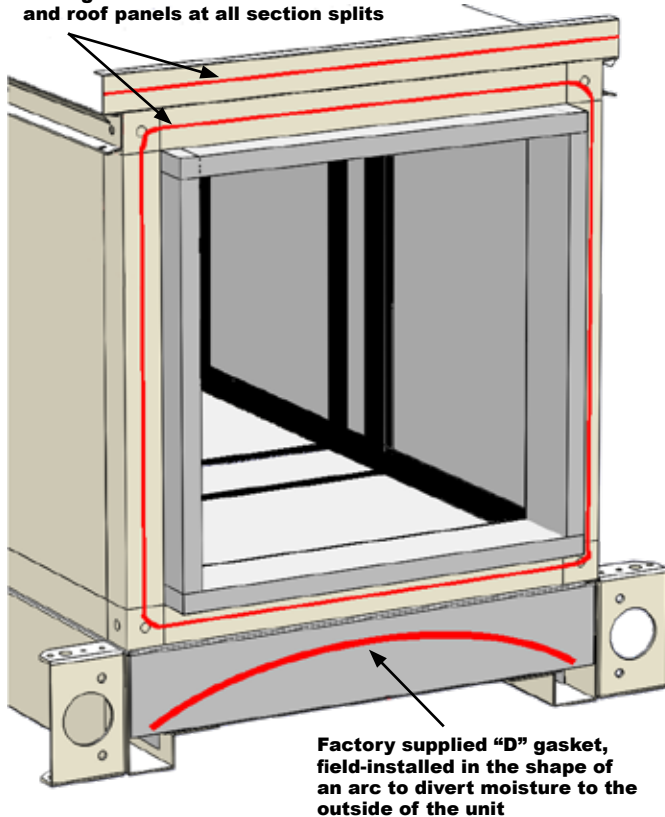
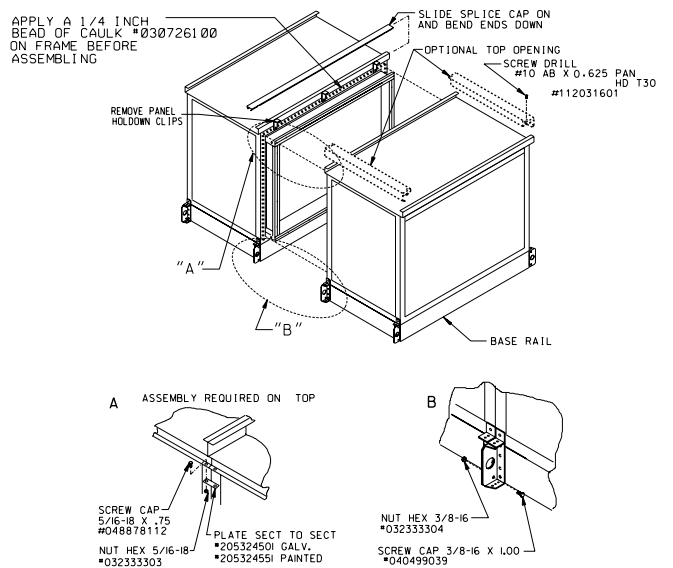


Figure 8: Fasten Sections Together



- d. For certain high pressure low leakage units, use the provided section joining plates to fasten sections together. Space them as shown in [Figure 9](#). Using the provided 1/4"-14 x 1" self tapping screws, drill screw the joining plates into the frame channel on each section, keeping unit sections tight together. Follow instruction drawing included in the assembly kit.
- 4. After sections are seated tightly together, add caulk to the external section split joint from top to bottom. **DO NOT** caulk the bottom of the base rail at the section split. This seam acts as a weep hole.
- 5. After sections are seated tightly together, add caulk to fill the seam between the roof panels at each end. Slide the splice cap over the top panel flanges. Bend the ends of the splice cap down to secure in place ([Figure 12](#))
- 6. Assemble the small splice plate at the top rail to secure the sections together at the top. Use 5/16" bolts ([Figure 12](#)).

Figure 9: Frame Channel Stiffener Plates (High Pressure Low Leakage Units Only)

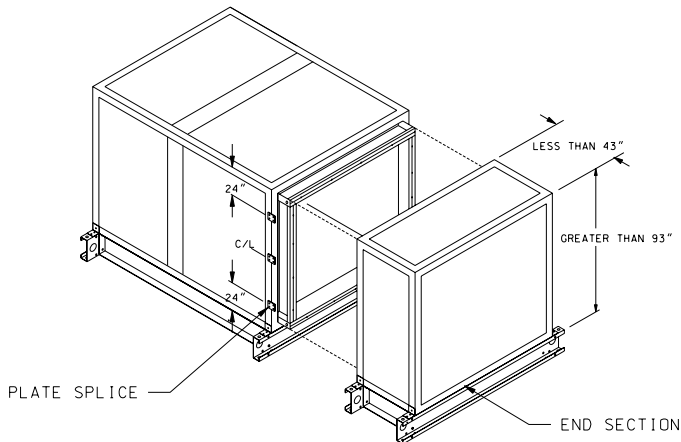


Figure 10: Splice Collar Alignment

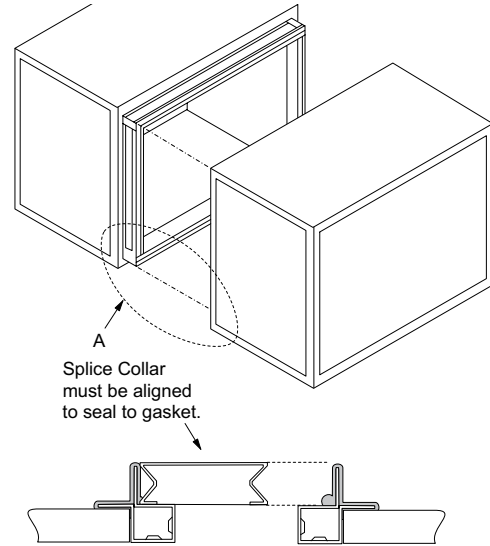


Figure 11: D-Gasket Placement Detail (High Pressure Low Leakage Units Only)

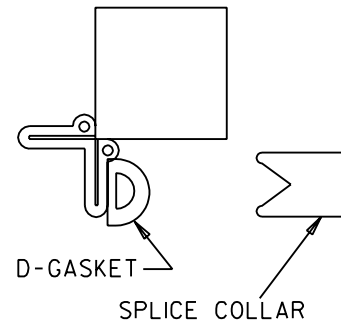
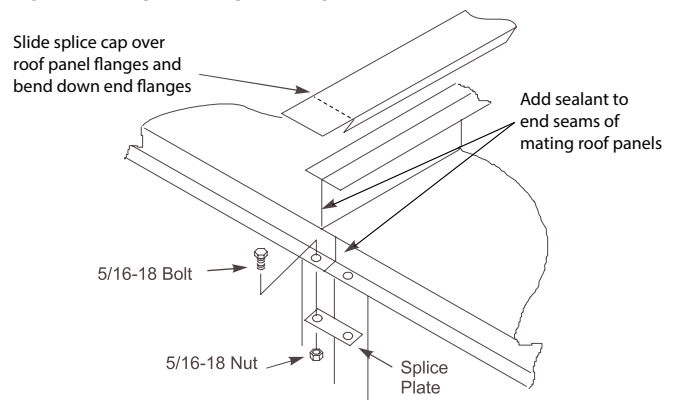


Figure 12: Splice Cap and Splice Plate



Panels, Frame Channels, and Doors

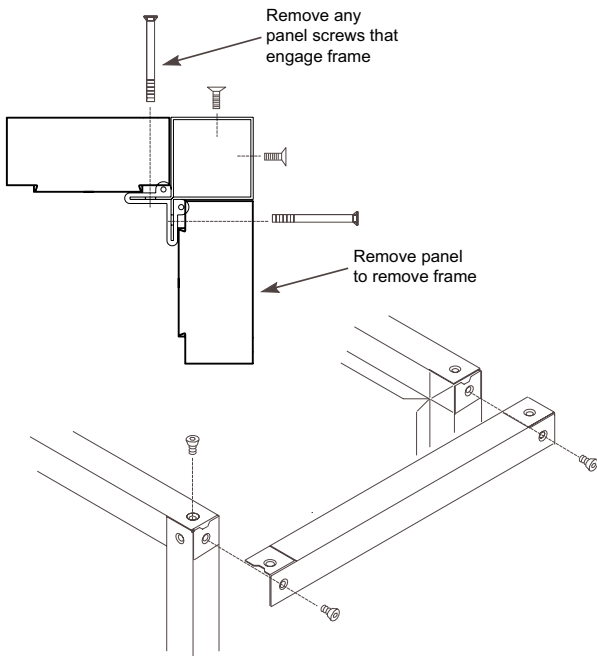
Panel Removal

To remove a side or top panel, remove the flat head Torx 30 fasteners along the sides of the panel. Lift off the panel after removing all fasteners.

Frame Channel Removal

Frame channels that run the length of the unit along the top can be removed to allow access to both the side and top of the unit. To remove the frame channel, first remove the side panel(s). Once the side panel is off, remove the flat head Torx 30 fasteners in the corner of the frame channels. Then pull the frame channel out the side. Remove any panel screws that are within one inch of the of the frame since they are engaged into the gasketed flange of the frame (Figure 13).

Figure 13: Removing Panel Screws



Access Doors and Panels

For routine maintenance, access normally is obtained through access doors or by removing side panels. Removing all flat head fasteners along the sides of a panel allow it to be removed.

Fan and filter sections are always provided with a service door on one side of the unit. If requested on order, doors can be provided on both sides of the unit. Optional service doors are available for most section types and are provided based on customer request.

Fan Section Doors

WARNING

Sharp edges and coil surfaces are a potential injury hazard. Avoid contact.

NOTE: Opening fan section doors requires using a 17 mm socket wrench (Figure 14), which satisfies ANSI standards and other codes that require the “use of tools” to access compartments containing moving parts or electrical wiring.

Figure 14: Opening Fan Section Door

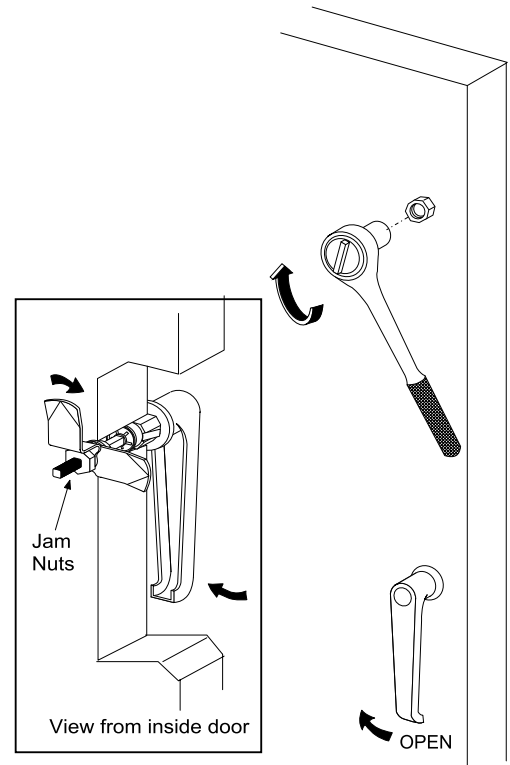
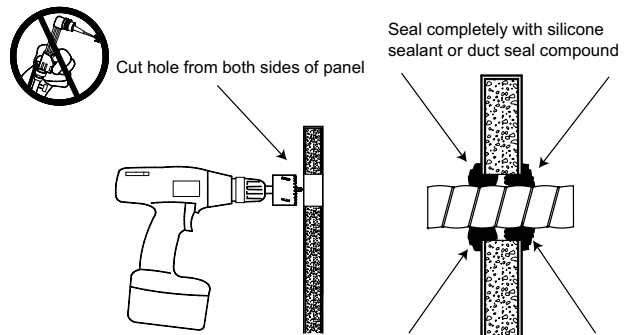


Figure 15: Cutting/Sealing Injected-Foam Insulated Panels





Prop 65—Substances in fuel or from fuel combustion can cause personal injury or death, and are known to the State of California to cause cancer, birth defects or other reproductive harm.

Injected-Foam Insulated Panels

Skyline air handlers now are furnished with double-wall, injected-foam insulated panels. Foam panels are stronger, more rigid, and lighter than panels with fiberglass insulation. The insulation R-value is improved to 13. However, foam insulation can burn when exposed to flame or other ignition sources and release toxic fumes. Take care in cutting and sealing all field-cut openings in these panels.

Panel Cutting Procedure

 WARNING	
	<p>Flame and smoke can cause equipment damage, severe personal injury, or death. Before operating unit, seal all piping and wiring holes on both inner and outer panels with an industrial grade silicone sealant or duct seal compound. Do not use a cutting torch or expose panel to fire. Panel damage can occur.</p>

1. Determine the number and location of holes required for electrical conduit, piping, and control wiring as follows:
 - a. Check that adequate space is available inside the unit for conduit or pipe routing.
 - b. Do not locate holes in a panel that provides access to key maintenance components such as filters and fan assemblies.
 - c. Do not locate where the conduit or piping blocks airflow or obstructs hinged access doors.
2. Once a proper location is determined, drill a small pilot hole completely through the panel. Then use a sharp hole saw or a saber saw and cut from each side of the panel.
3. Seal the double-wall panel on each side with an industrial/commercial grade silicone sealant or duct seal compound. It is extremely important to seal each panel hole or penetration securely so it is airtight, watertight, and so that there is no exposed insulation.

Field Mounting Junction Boxes and Other Components

For field mounting 4" × 4" or smaller junction boxes to the standard panel exterior, use a minimum quantity of four, 3/16" diameter pop rivets. **Do not use self-tapping drill screws. They will not tighten nor secure properly and panel damage can occur.**

If larger, heavier components require mounting on unit panels, use through-bolts with flat washers through both outer and inner panels. To maintain panel integrity, seal both ends with an industrial/commercial grade silicone sealant or duct seal compound.

The unit frame channel is another excellent location for securing heavier components; self-tapping screws are not acceptable. Ensure that the location permits the full operation of all access doors and panels and does not interfere with other vital components.

HEPA Holding Frame, Filter, and Prefilter Installation

These instructions are for installing AAF HEPA filters (11-1/2" depth) into AAF HEPA Holding Frames.

Please read the entire installation instructions before beginning the installation process.

Install filters into the HEPA Holding Frames only after the frames have been securely installed into existing ductwork or housing. Frames should be bolted or pop riveted together into the permanent structure through the pre-drilled holes around the outside perimeter of the frames. Frames should be sufficiently caulked and sealed to prevent any air bypass or leakage.

Required tools for filter installation:

- T-handle Hexkey, size 5/32"

Framing Components Required:

- AAF HEPA Holding Frames
 - P/N 910111491 & 910111674
- Leg Extensions, 4 per frame (A)
 - P/N 910111494
- Latches, 4 per frame
 - P/N 910111493 (B) (without prefilters)
 - P/N 910123164 (C) (with prefilters)
- Prefilter Holding Frames (when prefilters are ordered)
 - P/N 910123166 & 910123168
- Prefilter Latches (when prefilters are ordered)
 - P/N 111048304 & 111048305

Figure 16: Leg Extensions and Latches without Prefilters

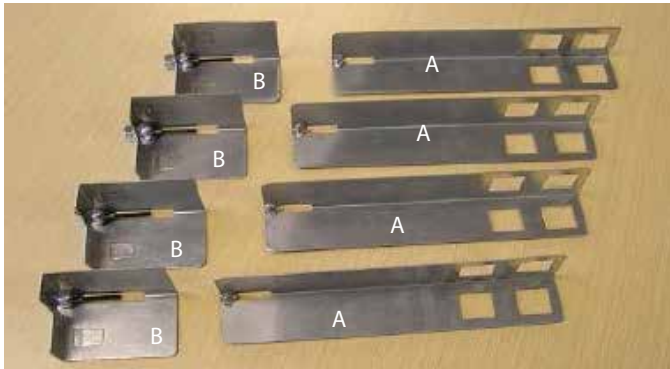


Figure 17: Leg Extensions and Latches with Prefilters



AAF HEPA Filters without Prefilters

STEP 1: At the inside corner of each frame are 4 tabs, 2 per side. Place a leg extension over the 4 tabs as shown in Figure 18, then pull back on the leg extension locking it into place (Figure 19).

Repeat Step 1 with each of the 4 corners. The frame with leg extensions should look like Figure 20.

Figure 18: Place Leg Extension over the Frame Tabs

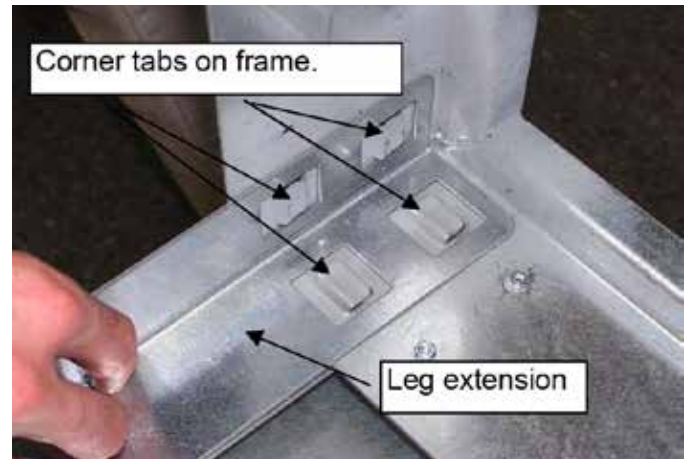


Figure 19: Pull Back to Lock the Leg Extension into Place



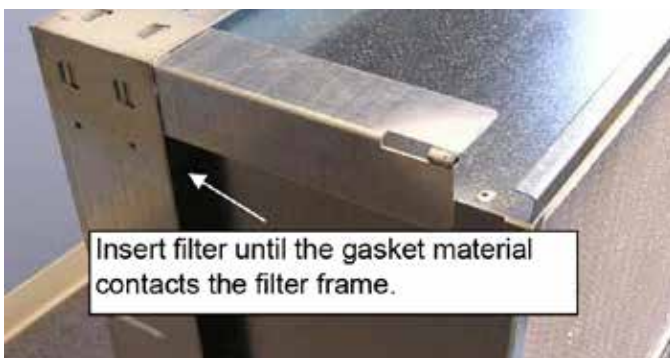
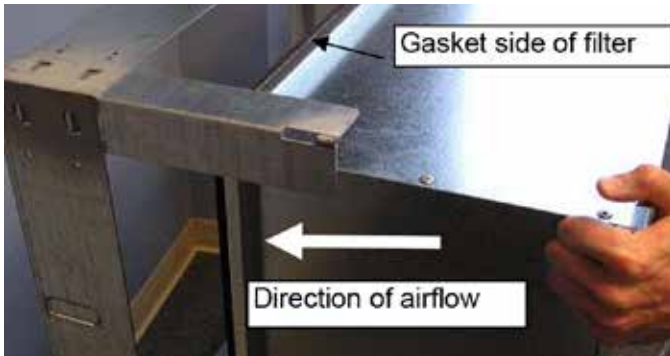
STEP 2: Insert the HEPA filter into the HEPA Holding Frame. The HEPA should be installed with the gasket side of the filter facing the frame. Insert the filter as far into the frame as possible, so that the gasket material is contacting the frame. See [Figure 21](#).

The filter should now be resting inside of the holding frame. When installing the filters into a frame bank of multiple frames, install the lower filters first so that the upper filters can rest on the lower filters ([Figure 22](#)).

Figure 20: Frame with Leg Extensions Installed



Figure 21: Insert HEPA Filter into Frame, until the Gasket Comes in Contact with the Holding Frame



STEP 3: Place a latch so that it overlaps the leg extension, as shown in [Figure 23](#). Align the latches' cap screw with the threaded coupling on the end of the leg extension and tighten using the hexkey. Tighten the cap screw until there is an approximately 1/4" gap between the latch and the leg extension coupling as shown in [Figure 24](#). Repeat this step with all 4 corners.

Figure 22: Filter Placed Inside of Frame



Figure 23: Latch Overlapping Leg Extension

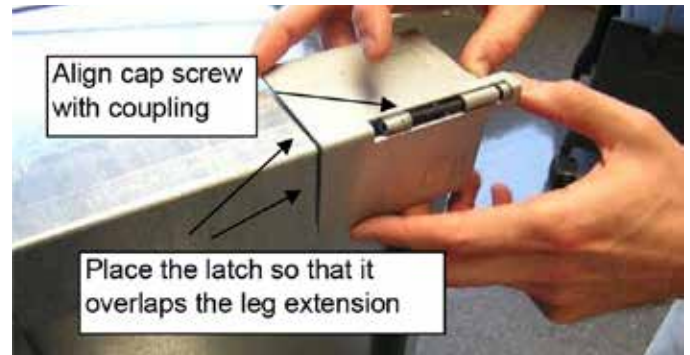


Figure 24: Tighten Cap Screw to 1/4" of the Coupling



STEP 4: Once all four corner latches have been tightened within 1/4" of the leg extension coupling, complete the installation by tightening each corner until the latch and leg extension coupling meet. This is illustrated in [Figure 25](#).

Once all four corners have been tightened the filter should now be properly seated and sealed.

Repeat the process with all remaining filters working from the bottom to the top.

Figure 25: Tighten until Latch and Coupling Meet



Figure 26: Properly Installed Filter Inside of the Frame



AAF HEPA Filters with Prefilters

Follow previous steps 1-2, then continue straight to step 5.

STEP 5: The prefilter holding frame should be placed directly in front of the HEPA filter as shown in [Figure 27](#).

Figure 27: Positioning of the prefilter frame



STEP 6: Place a latch so that the 2 tabs of the latch overlap the prefilter frame on each side of the corner. Slide the latch inside of the leg extension and align the latches' cap screw with the threaded coupling on the end of the leg extension and tighten using the hexkey. See [Figure 28](#).

Tighten the cap screw until there is an approximately 1/4" gap between the latch and the leg extension coupling as shown in [Figure 29](#). Repeat this step with all 4 corners.

STEP 7: Once all four corner latches have been tightened within 1/4" of the leg extension coupling, tighten each corner until the latch and leg extension coupling meet. This is shown in [Figure 30](#).

Figure 28: Latch Positioning for Prefilter Frame

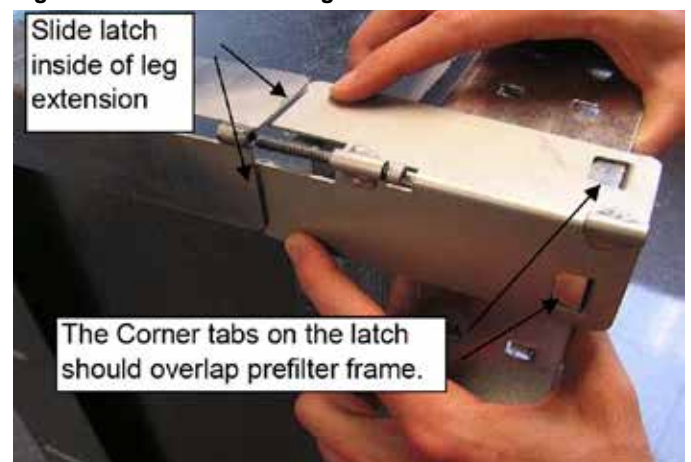


Figure 29: Tighten Cap Screw to 1/4" of the Coupling

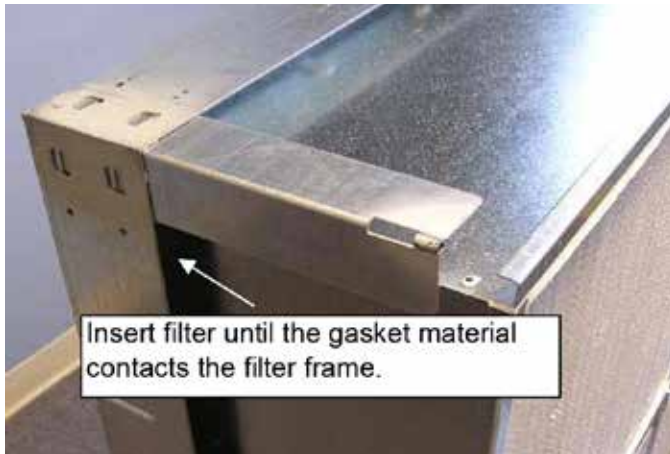
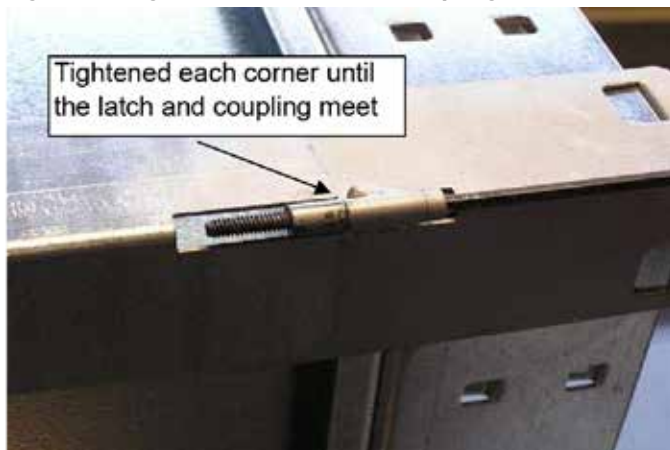


Figure 30: Tighten until Latch and Coupling Meet



Once all four corners have been tightened the HEPA filter should now be properly seated and sealed.

Repeat the process with all remaining filters working from the bottom to the top.

Figure 31: Properly Installed HEPA Filter



STEP 8: To complete the installation, add the appropriate prefilter latches to the prefilter holding frame. Once latches are installed, place the prefilter in the frame, secure with the latches and the installation is complete.

Repeat with all remaining prefilters and frames.

Figure 32: Installation of Prefilter into Frame



Figure 33: Completed Assembly

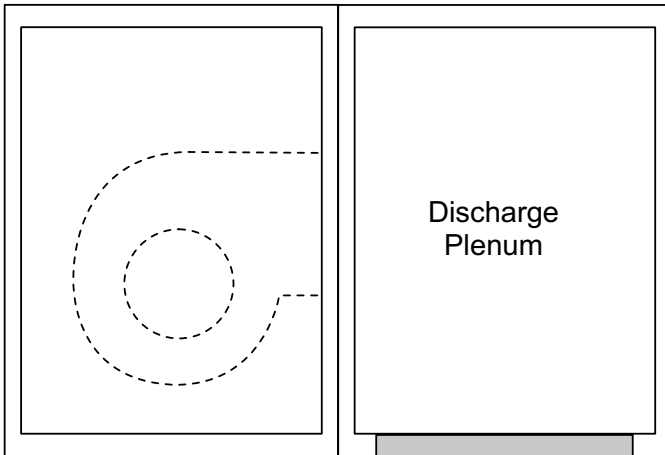


Duct Connections

Use flexible connectors on the outlet and inlet duct connections of all units. Do not position down flow fans over air ducts that are routed down into the building. Use a discharge plenum when bottom connections are necessary (Figure 34).

Support all ductwork independently of the unit or unit casing.

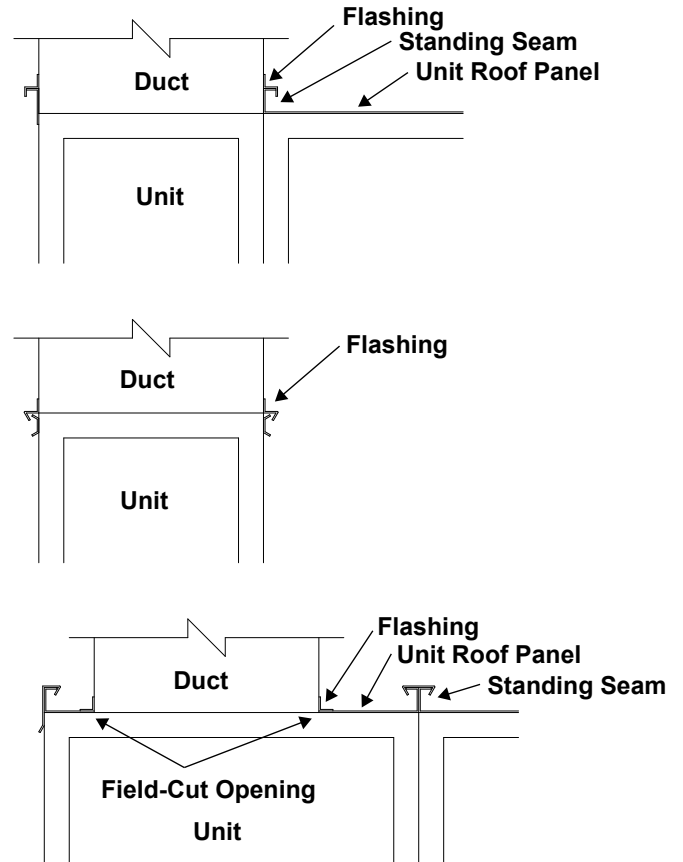
Figure 34: Discharge Plenum



If the unit has a section with a top opening, field fabricate and install flashing to seal out and divert any moisture away from the opening, ductwork, or duct components attaching to the opening. Install flashing so that it laps over the standing seams of the unit roof panels and over the side edges of the unit (Figure 34). Connect ductwork to the unit itself - do not connect ductwork directly to the unit roof panel only. Seal the ductwork to the opening, the unit itself, and to the unit roof panel to prevent moisture intrusion into the unit or building.

NOTE: In certain cases, a full roof panel will be included above top openings or top dampers. Field cut an opening of the desired size taking care to avoid damaging unit panels, flanges, dampers, or any other internal components while cutting. Roof panel(s) may be removed to facilitate cutting, sealing, and flashing connections but must be replaced and resealed in a way that diverts moisture away from the opening and connected ductwork. Ductwork must be sealed and flashed to the opening, the unit itself, and to the unit roof panel to prevent moisture intrusion into the unit or building.

Figure 35: Suggested Flashing over Top Panels and Sides of Units

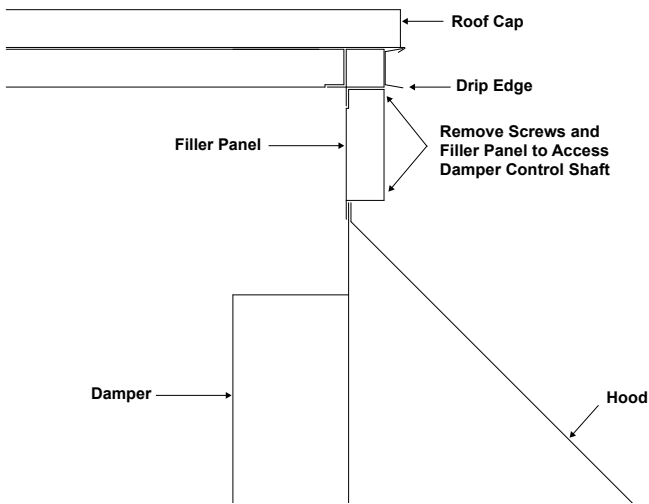


Dampers and Hoods

Side dampers may be provided in the mixing box and economizer sections of units. When dampers are provided, access to the damper drive shaft is recommended internally through the upstream or downstream sections of the unit. If no internal access is available, a removable panel is located above the weather hood to provide access to the damper drive shaft.

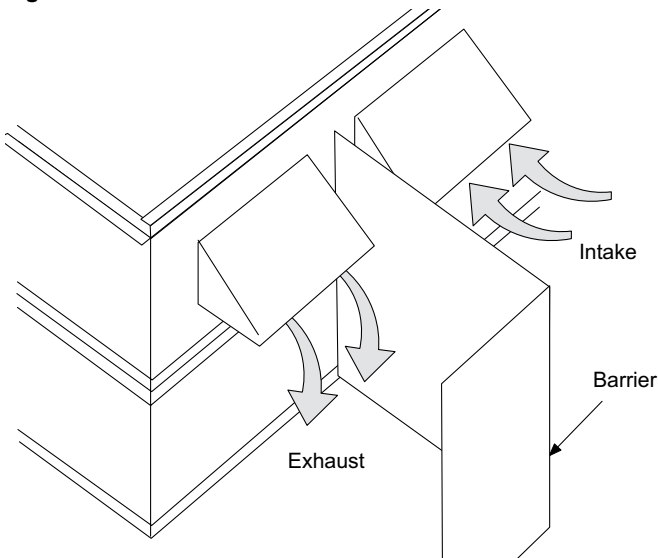
NOTE: The hood and damper must be removed to remove the panel. Other access may be available depending on the specific construction of the unit (Figure 36).

Figure 36: Filler Panel Over the Weather Hood



When units are ordered with exhaust hoods and intake hoods adjacent to each other, install a field-supplied barrier to prevent recirculation of exhaust air into the intake openings. (Figure 37).

Figure 37: Field-Installed Barrier Between Hoods



Mounting Actuators

CAUTION

Maximum damper rotation is 70°. Maximum shaft torque is 205 inches/pound. Greater rotation or torque can cause equipment damage.

The installing contractor is responsible for the mounting of all field-installed actuators. No provisions are made for the location of these actuators due to the number of options and arrangements available and the variety of specific applications. Typically, actuators are mounted inside the cabinet. Provide proper support for the actuator to avoid excessive stress in the cabinet, linkage, or damper shafts.

EXCEPTION: For the angled economizer, the fresh air and return air dampers must always be driven by separate actuators.

NOTE: Damper blades are at full flow when open to 70 degrees. Do not open blades further than 70 degrees.

Fresh air and return air dampers can be linked together and driven from the same actuator if the dampers are the same size. If the dampers are different sizes, they must be driven by separate actuators and controlled appropriately. Exhaust dampers are always driven by a separate actuator.

A typical rotary electric actuator can handle up to 40 sq. ft. of damper. For pneumatic actuators, allow 5 in-lb per square foot of damper area.

Angled Economizer Actuator Access

Access to the fresh air and exhaust air damper drive shafts of the angled economizer is recommended internally through the upstream or downstream sections of the unit. If no internal access is available, a removable filler panel is located above the weather hood to provide access to the damper drive shaft.

NOTE: The hood and damper must be removed to remove the panel. (Figure 36) There are two options for gaining access to the return air damper drive shaft:

1. If the unit has a housed return fan or plenum exhaust fan, an access section should be located immediately downstream of the economizer section for access to the return air damper drive shaft.
2. If the unit has a plenum return fan or housed exhaust fan, access to the return air damper drive shaft can be obtained via the fan section's access door and the removable filler panel located above the return air damper.

Face and Bypass Section Mounting

Internal and external face and bypass sections are mounted together using the instructions for horizontal components and do not require additional instruction. Skyline air handlers are provided with a bypass duct that is integral to the unit construction and requires no field assembly.

Face and bypass dampers may or may not be linked together. When dampers are placed before a single bank of coils, they always are linked together and require a single actuator. When dampers bypass a stacked or staggered coil, the dampers are not linked and require multiple actuators.

Face and bypass dampers have a torque requirement of 10 in-lbs per square foot of damper face area.

Isolation Dampers for Multiple Fans

Optional isolation dampers can be provided on multiple fans to prevent backflow through a fan that is turned off for service. These isolation dampers are not intended to be used to control flow through the fan. The isolation damper for a fan that is going to be started must be positioned in the full open position before the fan is started. Do not start a fan with the damper located at the inlet with the damper fully or partially closed. This can cause airflow, vibration, and sound problems that can lead to failure.

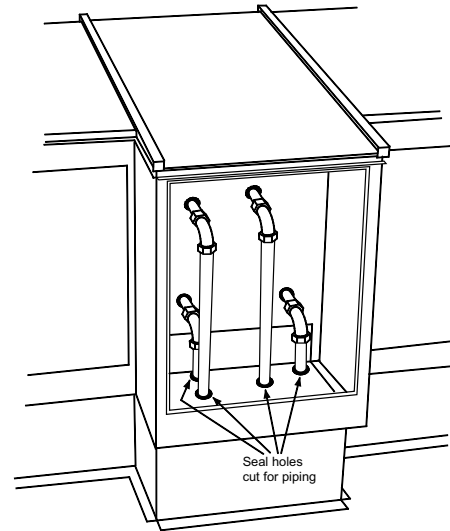
Isolation dampers can be provided with actuators that are mounted in the airstream. Actuator sizing for the isolation dampers should be based on 9 in-lb per square foot of damper.

Piping Vestibules

The Skyline air handler has 2 options for piping vestibules. The curb ready base unit has a factory installed vestibule and the unitized base option has a field installed vestibule. See order for details.

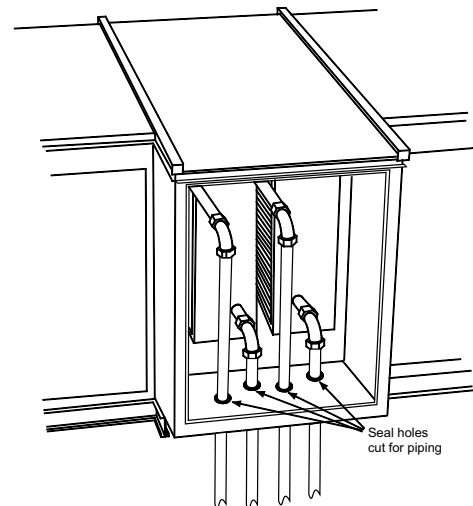
For units that include a piping vestibule, cut the openings for routing the field piping as required in the field. Carefully seal passages cut through the panels to prevent air leakage. A single metal thickness pan is provided in the bottom of the curb-mounted vestibule. The pan can be removed if necessary. If holes are cut into the pan for a piping passage, seal the holes to prevent moisture leakage ([Figure 38](#)).

Figure 38: Seal Holes for Piping—Curb Mounted Units



For units with standard base rails, the vestibule is open to the coil section; therefore, seal all holes to prevent air leakage.

Figure 39: Seal Holes for Piping—Standard Base Rail Units



Field-Installed Vestibule

WARNING

Use all lifting points. Improper lifting can cause severe personal injury and property damage.

CAUTION

Lifting points may not be symmetrical to the center of gravity of the unit. Ballast or unequal cable lengths maybe required.

The unit can be shipped with an optional field installed vestibule. Vestibule will ship fully assembled on a separate shipping pallet. Lifting lugs are located at the top of the vestibule. Field installed vestibule is designed to be mounted on a Skyline roof curb. See [IM 770](#) for curb installation details.

Field-Installed Vestibule Installation

The vestibule comes completely assembled from the factory.

1. Inspect the gasket and splice collar to ensure they are secure and not damaged. Refer to [Figure 40](#), Detail A.
2. Follow the instructions to attach rigging and lift the vestibule vertically. Remove the shipping pallet.
3. Apply a continuous bead of caulking to the vertical flange of the vestibule roof cap on the side that faces the unit ([Figure 41](#)).
4. With the unit in position, lift the vestibule onto the vestibule curb and align it as close as possible to its final position. Make sure not to damage the gasket on the side of the unit. Refer to [Figure 40](#), Detail A.
5. Use the crane and rigging to relieve the weight of the vestibule, manually push and slide the vestibule next to the unit.
6. Access the inside of the vestibule by opening the door or removing the outer panel.
7. Use the supplied mounting screws to connect the vestibule to the unit, screwing through the flange of the vestibule and into the small binding holes of the splice collar. See [Figure 42](#).
8. Once the vestibule is secured to the unit, remove the rigging and apply additional caulking to both corner seams. See [Figure 43](#).

Figure 40: Typical Vestibule

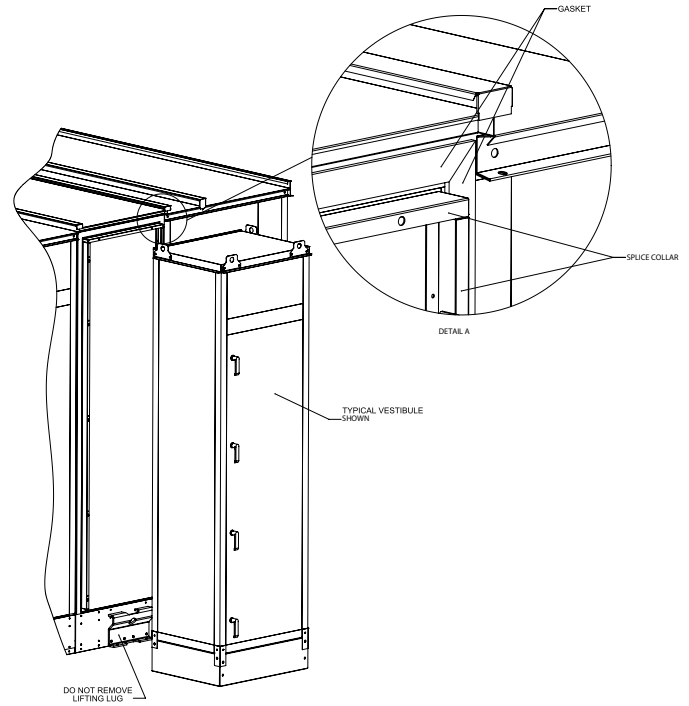


Figure 41: Caulking the Vestibule Roof Cap

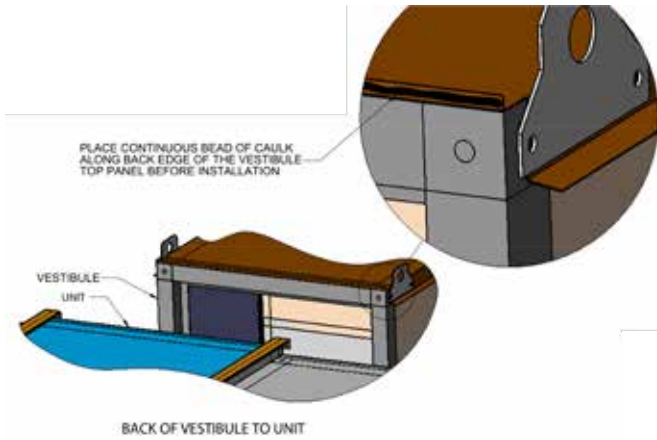


Figure 42: Detail of Mounting Screws

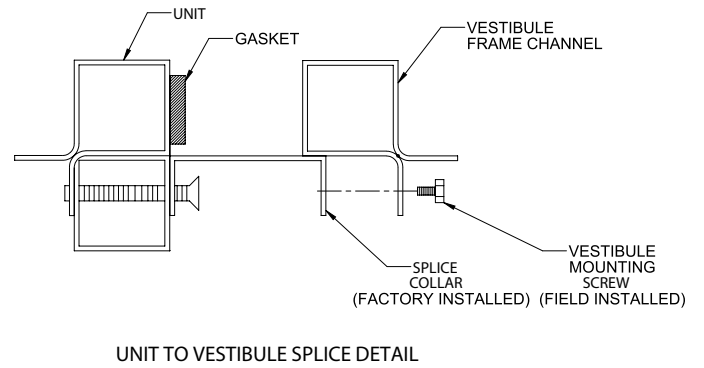
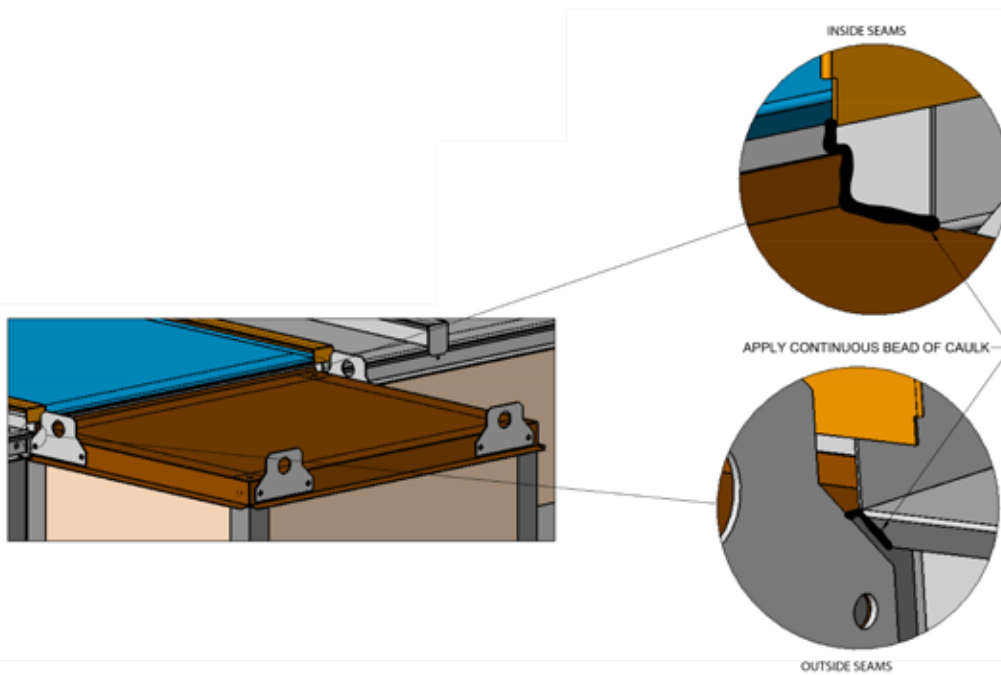


Figure 43: Additional Caulking



Piping and Coils

When designing and installing piping:

- Follow applicable piping design, sizing, and installation information in ASHRAE handbooks.
- Observe all local codes and industry standards.
- Do not apply undue stress at the connection to coil headers; always use a backup pipe wrench.
- Support pipework independently of the coils.

Water Cooling Coils

NOTE: Use glycol in water coils for outdoor air handlers. Power failures and other mechanical issues can expose coils to freezing temperatures.

- Water supply, water return, drain, and vent connections extend through the end panel of the coil section. All connections are labeled on the end panel.
- Water supply and water return connections are typically male NPT iron pipe.
- When installing couplings, do not apply undue stress to the connection extending through unit panel. Use a backup pipe wrench to avoid breaking the weld between coil connection and header.
- Follow recommendations of the control manufacturer regarding types, sizing, and installation of controls.

Direct Expansion Coils

- The coil distributor and suction connection extend through the end panel of the coil section.
- Check nozzle in distributor for proper tonnage.
- When a (field supplied) thermostatic expansion valve is located outside the unit and connected directly to the distributor (except on units with piping vestibules). Do not apply heat to the body of the expansion valve.
- The thermostatic expansion valve must be the external equalizer tube type. Connect the 1/4-inch diameter external equalizer tube provided on the coil to the connection on the expansion valve.
- Use care when piping the system, making sure all joints are tight and all lines are dry and free of foreign material. For typical refrigerant piping, see condensing unit product manual.

Steam Coils

Piping (see [Figure 45](#))

- Steam supply and steam return connections typically are male NPT iron pipe and are labeled on the end panel of coil section. Connections extend through the coil section end panel.
- When installing couplings, do not apply undue stress to the connection extending through unit panel. **Use a backup pipe wrench to avoid breaking the weld between coil connection and header.**
- Support piping independently of coils and provide adequate piping flexibility. Stresses resulting from expansion of closely coupled piping can cause serious damage.
- Do not reduce pipe size at the coil return connection. Carry return connection size through the dirt pocket, making the reduction at the branch leading to the trap.

Coils

- Pitch all steam coils in units toward the return connection.
- Do not drip supply mains through the coil.
- Do not attempt to lift condensate when using modulating or ON/OFF control.
- Install vacuum breakers on all applications to prevent retaining condensate in the coil. Generally, connect the vacuum breaker between the coil inlet and the return main. The vacuum breaker should be open to the atmosphere and the trap design should allow venting of large quantities of air.

Traps

NOTE: Do not place steam traps outdoors.

- Size traps in accordance with the manufacturers' recommendations. Make sure the required pressure differential is always available. Do not undersize.
- Use float and thermostatic or bucket traps for low pressure steam. On high pressure steam, use bucket traps. Use thermostatic traps only for air venting.
- Use bucket traps for ON/OFF control only.
- Locate traps at least 12 inches below the coil return connection.
- Multiple coil installation—individually trap each coil or group of coils.
- Coils in series—use separate traps for each coil, or a bank of coils.
- Coils in parallel—a single trap can be used, but an individual trap for each coil is preferred.
- Do not attempt to lift condensate when using modulating or ON/OFF control.
- With coils arranged for series airflow, use a separate control on each bank or coil in the direction of airflow.

Valves

- Do not use modulating steam valves on high pressure systems.
- Properly size modulating valves. Do not undersize.
- Avoid freezing conditions (entering air temperatures below 35°F).
- Daikin strongly recommends 5JA, 8JA, 5RA and 8RA coils.
- Supply 5 psi steam to coils at all times.
- Do not use modulating valves. Provide control by face and bypass dampers.
- Consider using two or three coils in series with two position steam control valves on the coil or coils that handle 35°F or colder air. Use a modulating valve on the downstream coil to provide the desired degree of control.
- Thoroughly mix fresh air and return air before it enters the coil. Also, to obtain true air mixture temperatures, properly locate temperature control elements.
- As additional protection against freeze-up, install the trap sufficiently below the coil to provide an adequate hydrostatic head to remove condensate during an interruption in the steam pressure. Estimate three feet for each 1 psi of trap differential required.
- On startup, admit steam to coil ten minutes before admitting outdoor air.
- Close fresh air dampers if steam supply pressure falls below the minimum specified.

Pipe Chases

Follow these guidelines when routing piping through the bottom of a unit.

- Cut a hole as small as possible – while still allowing piping to run through - at the desired location(s).
 - The base of a Skyline unit has a secondary drip shield installed below every panel that drains potential moisture to the outside frame trough. It is critical that any cut is adequately sealed to prevent any moisture getting through the penetration.
- The hole(s) must penetrate both the floor panel and the secondary drip shield. Hole(s) must be located fully within panels or sheet metal opening covers. Do not run pipes through 4" wide intermediate panels or on the very edge of the panel.
- Seal the holes through the floor panel and secondary drip shield to divert any moisture away from the opening and prevent moisture leakage through the holes. Recommended sealing options include flashing material, caulk, spray foam, cork tape, or other similar sealing material.
- The installer is responsible for ensuring the penetrations are sufficiently sealed.

NOTE: Do not support piping off of the unit or secondary drip shield.

Figure 44: Base and Drip Shield

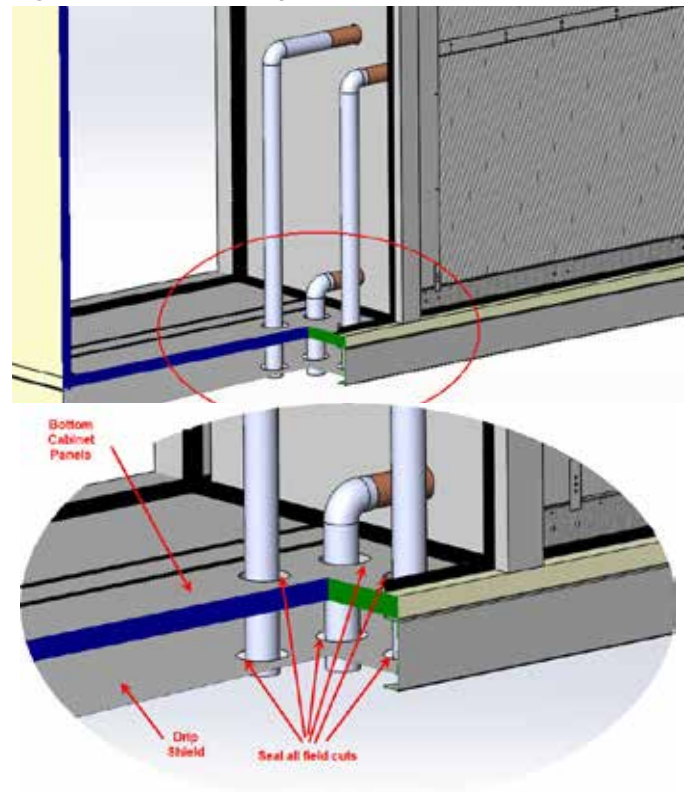
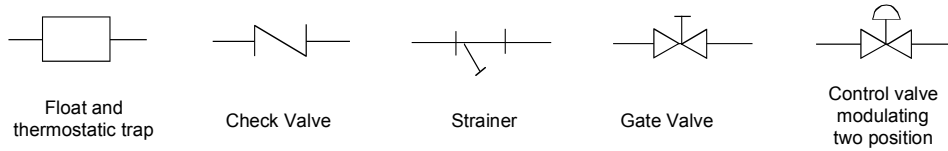
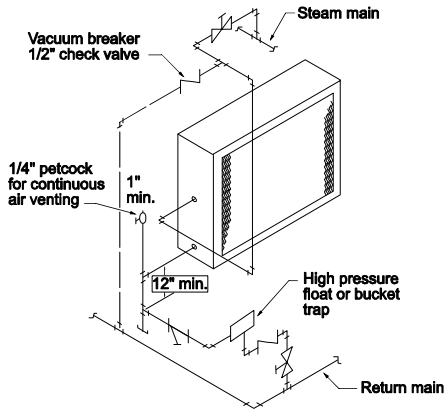


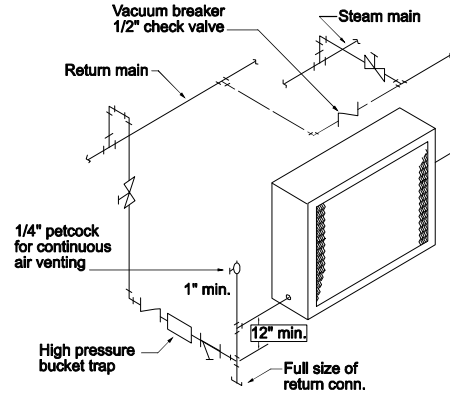
Figure 45: Piping Arrangements



High Pressure (over 25 psi)

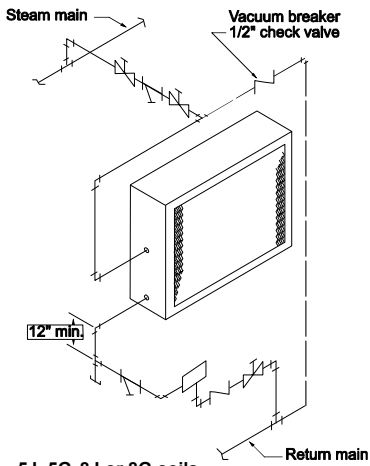


5GA or 8GA coils. Note that the addition of a vacuum breaker to permit the coil to drain during shutdown.

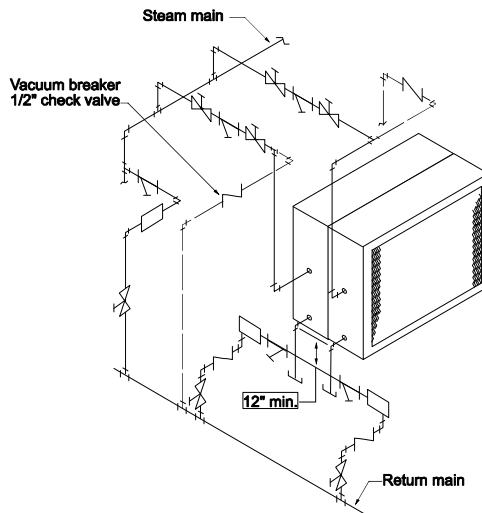


5TA, 8TA, or 5HA coils. Condensate is lifted to overhead return main

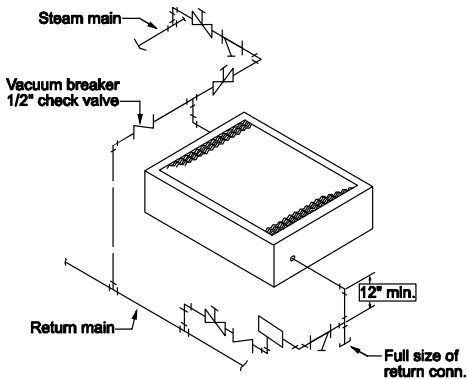
Low Pressure (to 25 psi)



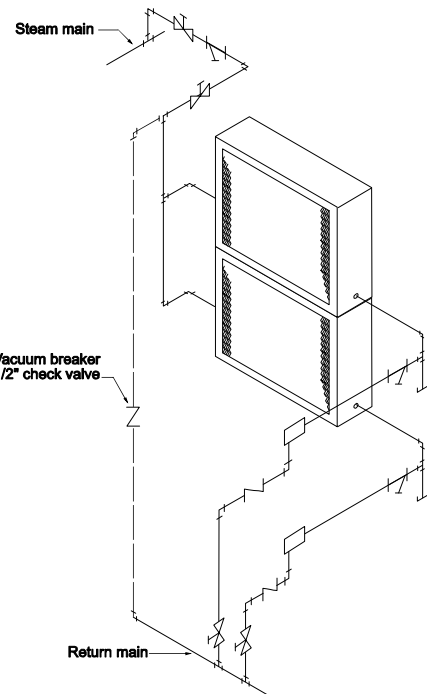
5J, 5G, 8J or 8G coils.



5JA or 8JA coil. Installed in series. Note that each coil must have a separate control valve and trap.



5RA, 8RA, or 5SA coils. Installed



5RA, 8RA, or 5SA coils. Banked two high, individual trapping of each coil as shown is preferred.

Water Heating Coils

CAUTION

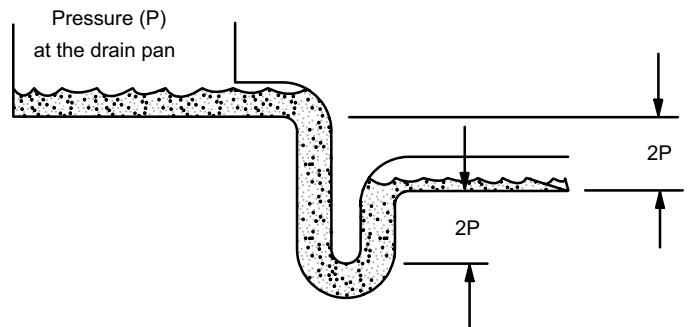
Improper installation, use, or maintenance of water heating coils can cause equipment damage. Read and follow instructions carefully.

- Water supply and water return connections extend through the end panel of the coil section. All connections are labeled on the end panel.
- Water supply and water return connections are male NPT iron pipe.
- When installing couplings, do not apply undue stress to the connection extending through unit panel. Use a backup pipe wrench to avoid breaking the weld between the coil connection and header.
- Follow recommendations of the control manufacturer regarding types, sizes, and installation of controls.
- Do not use hot water coils with entering air below 40°F.
- If fresh air and return air are to be heated by a hot water coil, carefully design the system to provide thorough mixing before air enters the coil.
- To prepare coils for winter operation, [See Winterizing Water Coils on page 69](#).

Drain Pan Traps

Run drain lines and traps full size from the drain pan connection. Install drain pan trap to allow condensate to drain freely. On both blow-through and draw-through units, the trap depth and the distance between the trap outlet and the drain pan outlet must be twice the static pressure in the drain pan section under normal operation so the trap remains sealed ([Figure 46](#)).

Figure 46: Trap Outlet and Drain Pan Outlet

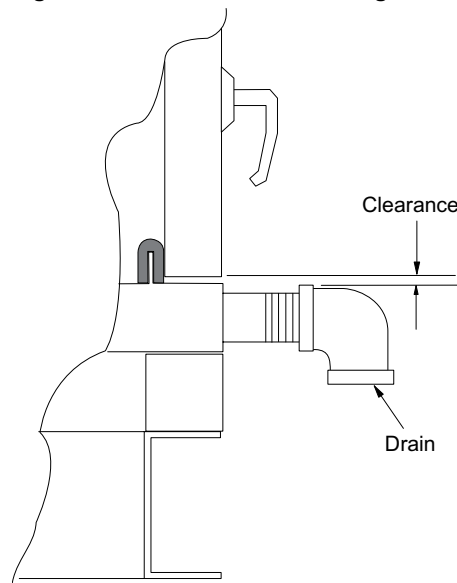


NOTE: The door panels on some applications have a close clearance over the drain pipes. Extend the drain fitting with a coupling if necessary for door clearance ([Figure 47](#)).

Use material that can withstand freezing temperatures for outdoor drain traps.

Drain traps that dry out can allow cold air to seep into the equipment.

Figure 47: Extended Drain Fitting Door Clearance



Internal Isolation Assembly Adjustment

On units with internally isolated fan and motor assemblies, the assemblies are secured for shipment with a tie-down at each point of isolation.

Before Operating the Unit:

Remove the shipping brackets and tie-down bolts (see [Figure 49](#), [Figure 50](#) and [Figure 51](#)) and discard. The shipping brackets located on the opposite drive side of the unit are difficult to access from the drive side of the unit. Either remove them before the unit is assembled or remove the panel on the opposite drive side to gain access.

The spring isolators under the four corners of the fan and motor assembly are factory adjusted while the fan was not running. See [Table 1](#) through [Table 5](#) below. With the unit operating at normal cfm and static pressure, all the isolators should be at the same height opening. If adjustments are required, loosen the 1/2" cap screw on top of the isolator and turn the adjusting bolt to lower or raise the fan and motor base. Retighten the cap screw when adjustments are completed.

For models 040 through 090 with housed fans, the isolators should be at equal height during fan operation (6"). Center the fan outlet in the outlet panel opening. If adjustment is required, loosen the cap screw on top of the isolator assembly. Turn the adjustment nut below the fan frame to lower or raise the fan motor and frame assembly. Retighten the cap screw on top of the isolator assembly.

Figure 48: Adjusting Large Spring Mount Assembly

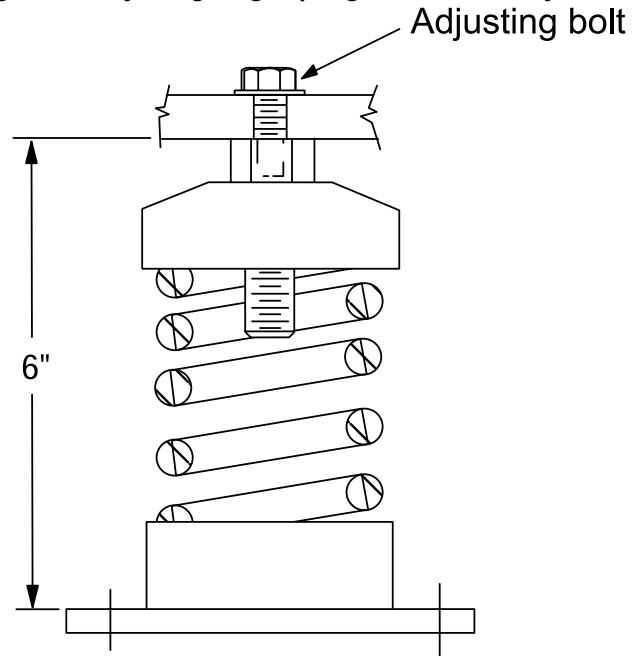


Table 1: Motor Beside Fan Spring Mount Adjustments

Spring Mount Adjustment at Rest			
Isolator position	Top or Bottom Horz. H	Downblast H	Upblast H
Unit Sizes 003 – 035			
1	3.75	3.75	4.25
2	4.25	3.75	4.25
3	4.25	3.75	4.25
4	3.75	3.75	4.25
Unit Sizes 040 – 090			
1	6.00	6.75	6.75
2	6.50	6.75	6.75
3	6.50	6.75	6.75
4	6.00	6.75	6.75

Table 2: Motor Behind Fan Spring Mount Adjustments

Spring Mount Adjustment at Rest			
Isolator Position	Top Or Bottom Horz. H	Downblast H	Upblast H
Unit Sizes 003 – 035			
1	6.75	6.75	6.75
2	6.75	6.75	6.75
3	6.75	6.75	6.75
4	6.75	6.75	6.75
Unit Sizes 040 – 090			
1	6.75	6.75	6.75
2	6.75	6.75	6.75
3	6.75	6.75	6.75
4	6.75	6.75	6.75

Table 3: Class II Belt-Drive Plenum Fan Spring Height

Fan Size	Isolator Type	Operating Height (in.)
13–16	Standard 2"	Deflection 4.5
18–36	Standard 2"	Deflection 4.0
13–36	Seismic	4.0
40–60	All	6.75

Table 4: Class III Plenum Fan Spring Height

Cabinet Width	Isolator Type	Operating Height (in.)
Width < 108"	All	4.0
Width > or = 108"	All	6.75

Table 5: Class II Direct-Drive Plenum Fan Spring Height

Fan Size	Isolator Type	Operating Height (in.)
11–36	All	4.0
40–44	All	6.75

Figure 49: Removing "Motor Behind" Shipping Brackets

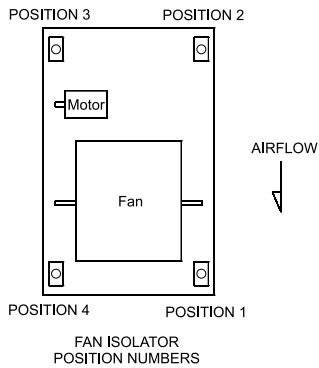
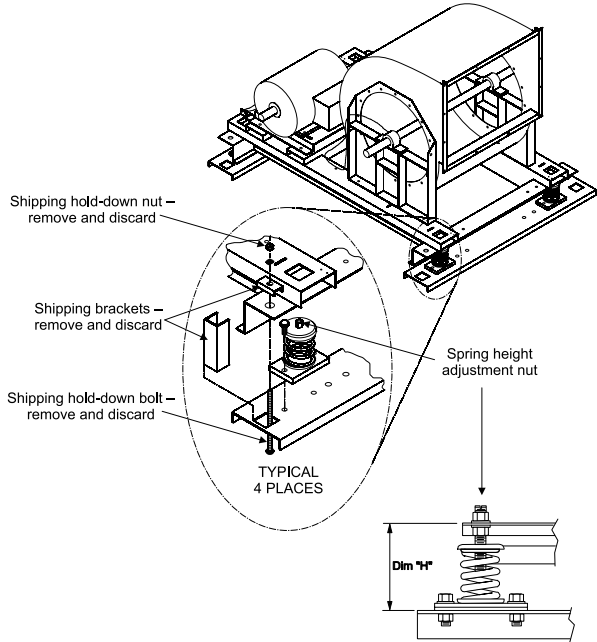


Figure 50: Removing "Motor Beside" Shipping Brackets

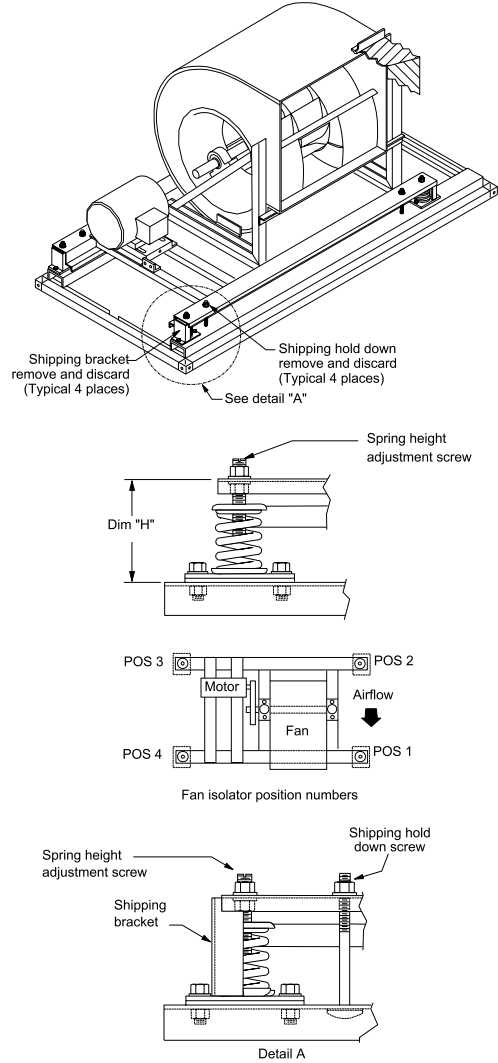
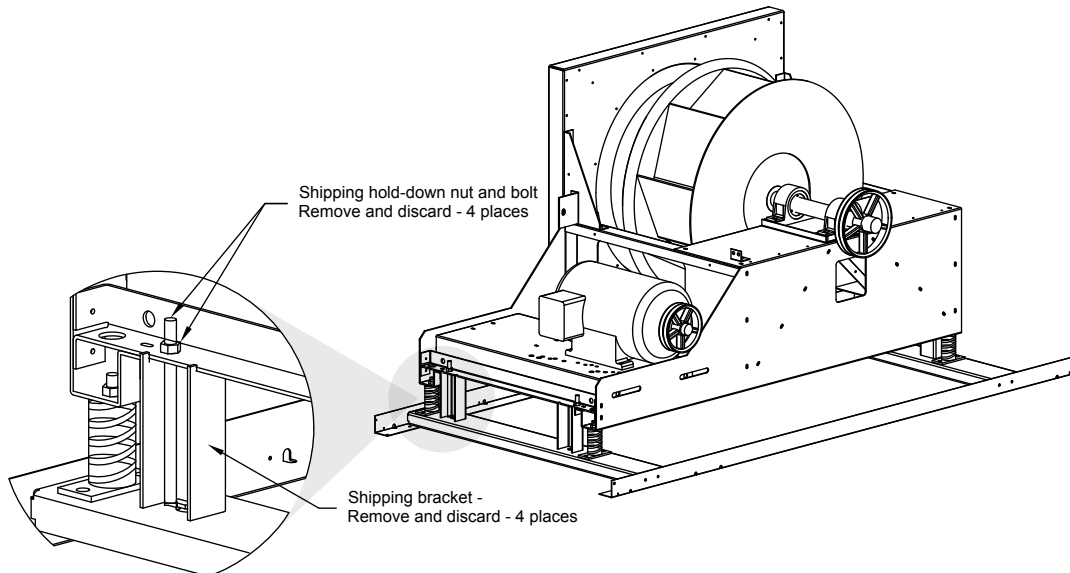


Figure 51: Plenum Fan Typical Shipping Brackets



OSHPD Seismic Anchoring/Mounting

For seismic stability of the unit, additional anchoring and mounting procedures are required. The anchoring options and corresponding spectral response acceleration are given in [Table 6](#). Holes in the Vision/Skyline base frame are to be field drilled. Any mounting hardware is to be field supplied.

Table 6: OSHPD Mounting

Attachment Method	SDS	Attachment System (by Others)	
		Spacing	System
Bolted attachment to steel (Figure 52)	1.93	48	5/8" DIA SAE Grade 5
Welded attachment to steel (Figure 53)	1.84	48	3/16" Weld Leg and 4" welded length
Bolted attachment to Concrete (Figure 54)	1.68	24	Hilti HAD-P M16 x 190/40 with 4-3/4" embedment

Figure 52: Unit with Base Frame Mounted on Steel

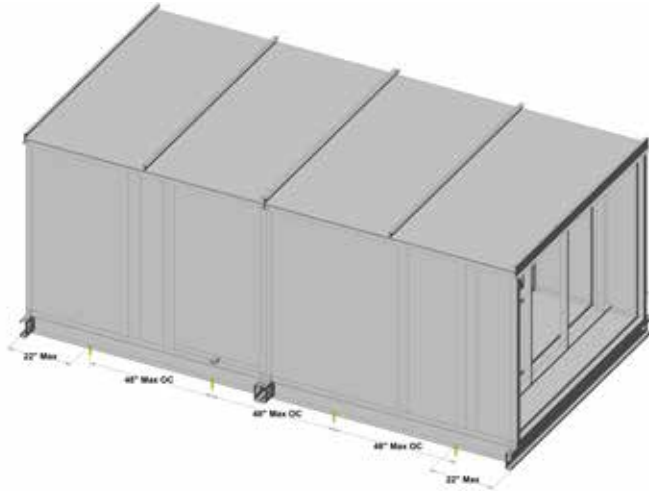


Figure 53: Unit with Base Frame Welded

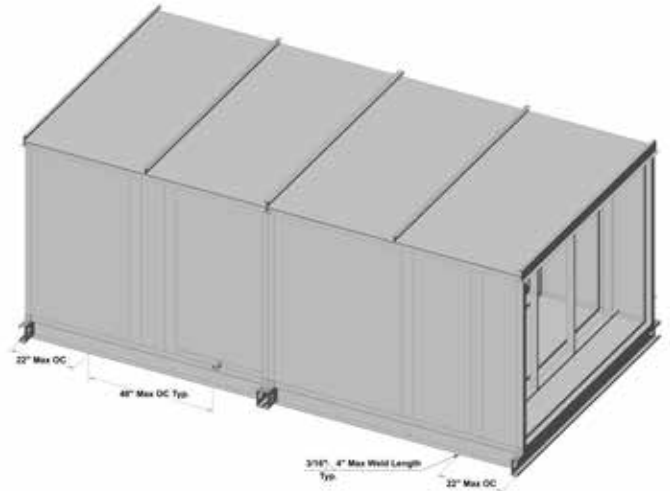
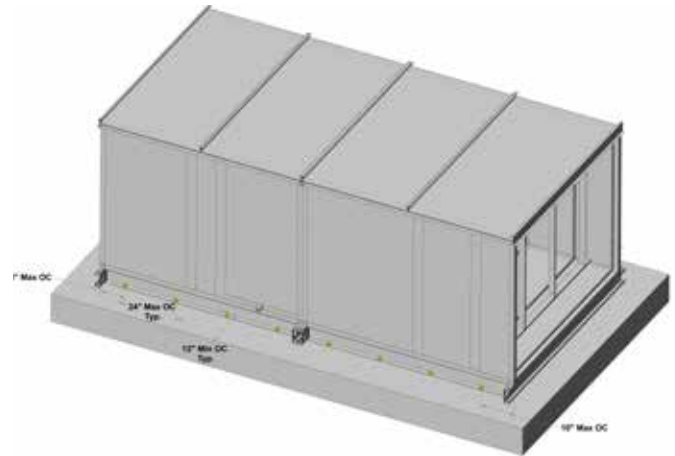


Figure 54: Unit with Base Frame Mounted on Concrete



Wiring

⚠ DANGER

Capacitor hazardous voltage! Failure to disconnect power and discharge capacitors before servicing will result in serious injury or death. Disconnect all electric power (including remote disconnects) before servicing. Perform lockout/tag out procedures to ensure that power can not be energized. For variable frequency drives, or other energy storing components that have been furnished and mounted by either Daikin, or by others, refer to the specific manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify capacitors have been discharged using an appropriate voltmeter.

⚠ DANGER

- This equipment is not suitable for use in high impedance grounding or neutral systems.
- Connect only to low impedance, solidly grounded electrical supply systems.

Failure to follow these instructions will result in death or serious injury.

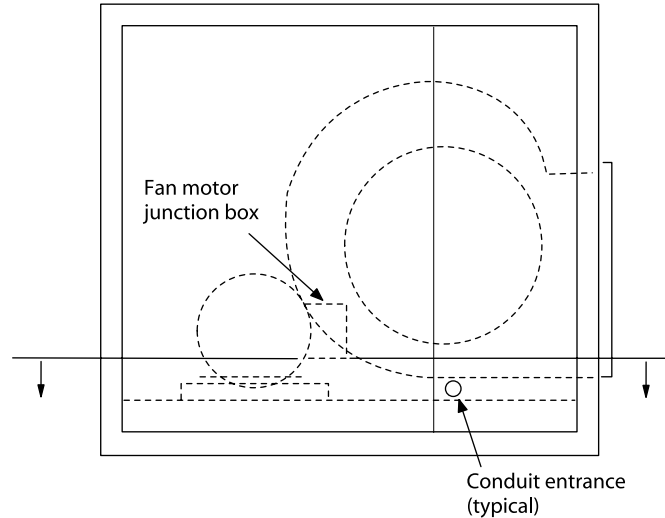
⚠ CAUTION

Use copper conductor only. Failure to use copper conductors can result equipment damage.

⚠ CAUTION

The base section of each cabinet has a drip pan installed below every panel that drains to the outside frame trough. Any holes cut through the bottom of the unit must also penetrate the drip pan. If holes are cut in the drip pan, seal them to prevent moisture leakage.

Figure 55: Electrical Conduit Location



- Electrical service to each fan must correspond to the rated voltage on the motor or electrical panel nameplate and conform to the National Electric Code and local restrictions.
- Connect each fan section metal frame to the building electrical ground.
- A door electrical interlock is not provided as standard.
- Thermal motor protection is external to the unit. Locate electrical conduit entrances for units above the bottom of the unit, high enough to clear components inside, but below the bottom of the fan motor junction box (Figure 55).
- When the unit is provided with an external junction box and variable frequency drive (VFD), the VFD itself will be mounted on the drive side fan panel inside the fan cabinet. The external junction box will provide loose wire connection to the VFD and to the motor. An external mounted keypad/display control box will be provided and connected to the VFD for manual adjustment of the VFD.
- When not being serviced, close and secure electrical panel doors to prevent accidental contact with live parts and prevent ingress of moisture and airborne contaminants.
- For instances where multiple motors are being driven by a single VFD, be sure to set up the VFD and size the wiring according to the power requirements of all motors that are being driven by that VFD.

- Control wiring—access to the VFD is through the fan cabinet access door for single fans. Provide shielded cable only as described in the VFD manual provided with the unit. Route wire through panel so that it not interfere with any other components or in the way of any access doors. Do not drill through drip or drain pans. Refer to the VFD installation manual provided with the unit for detailed control wiring instructions.
- For multiple fans in parallel, the VFD(s) are mounted inside of the electrical enclosure, which is mounted on the exterior of the fan section. When multiple fan sections are provided with multiple VFDs, they must be set up so that the fans always start simultaneously and are set to ramp up and down together. Do not attempt to run fans in parallel at different speeds as this can result in uneven airflow that can cause performance, sound, and vibration problems that can lead to failure. Provided that the fan is capable of running fast enough, the motor is sized appropriately, and the VFD can be sped up within its rated continuous output, VFDs may be operated up to a maximum recommended frequency of 90 Hertz for 1800 RPM and slower motors. Motors that are 3600 RPM may be operated up to a maximum speed of 4000 RPM or 66.7 Hertz provided the fan is rated that high. Operation above 4000 RPM can damage motor bearings and is not recommended.

Wiring Penetrations

- Seal any panel penetrations for wiring or conduit per the panel cutting procedure instructions within this document.
- Seal any other wiring or conduit penetrations in accordance with NEC, relevant codes, and in order to maintain the enclosure rating, only use fittings that are approved to keep the particular rating of the individual enclosure being penetrated per relevant code or standard tables. Seal wireway openings tight enough to prevent air movement between sections and control enclosures.

Startup Checks

⚠ WARNING

Rotating fan. Can use severe injury or death. Before servicing fans, lock out and tag out power.

⚠ WARNING

Fire/electric shock hazard. Can cause property damage, personal injury or death. Wire fan power supply and ground motor frame in accordance with local electric codes.

⚠ WARNING

Fan motor requires overload protection. Failure to provide motor overload protection can result in fire, property damage, electric shock, personal injury, or death. Connect motor to an overload protective device rated in compliance with local electric codes.

⚠ CAUTION

Do not overheat fan motor. High air temperatures in the fan section can cause the fan motor to burnout. On draw-through air handlers or air handlers with the fan section down the air stream from the heating section, the discharge air temperature of the heating section must not exceed 104°F (40°C).

When performing startup and service, always take thorough safety precautions. Only trained, experienced personnel should perform these functions.

Before Starting the Unit

⚠ CAUTION

Equipment damage due to loose fasteners represents improper start-up and equipment abuse. It is not covered by the warranty.

Before entering fan section, make sure that fan electrical power source is disconnected and locked in the OFF position.

1. Check that the unit is completely and properly installed with ductwork connected.
2. Check that construction debris is removed/filters are clean.
3. Check that all electrical work is complete and properly terminated.
4. Check that all electrical connections are tight and that the proper voltage is connected. Phase imbalance must not exceed 2%.
5. Check that ball bearings on the fan shaft and motor are prelubricated and do not need grease before startup.
6. Check tightness of setscrews in bearings and fan wheel(s). If retightening is needed, position the fan wheel(s) per [Table 7](#) through [Table 10](#); [Table 11](#) through [Table 13](#). Torque set screws per [Table 14](#) and [Table 15](#).
7. Check alignment of fan and motor sheaves and belt tension. Adjust if necessary. Check tightness of sheave setscrews and/or capscrews. See [Table 14](#).
8. Leak test the thermal system to verify that connections are tight.
9. Check that the condensate drain is trapped.
10. Rotate the shaft by hand to be sure it is free.
11. If multiple fans are supplied with a block off plate and it is installed on one of the fans, make sure to only start the fans without the block off plate. Do not start any fan that has the block off plate installed on it.
12. If multiple fans are supplied with isolation dampers, make sure the isolation dampers are fully open before starting the fans.

VFD Setup

Fans ordered with VFDs that were factory installed are setup and tested prior to shipment. Prior to starting the fan(s), double check the VFD settings according to the recommendations in the VFD manual.

Once the correct VFD settings are verified, the fans should be run through a sweep of the full range of operating speeds that are expected to check for any vibration issues. If any areas of concern are located, it is recommended to lock out those frequencies using the VFD (see lock out frequencies or skip frequencies in the VFD manual). This will ensure that the fans will never operate continuously at those points, but will rather pass through them to get to the desired points of operation.

Fan Startup

Start and run fan. See Figure 56 for proper fan rotation. Observe the rotation. If the fan operates backward, reverse two legs of the three-phase motor connections.

NOTE: Variable pitch fan drives usually are provided for operation in the mid-speed adjustment range. However, the drives usually ship with the adjustment opened up for minimum fan speed. Adjust the drives for the proper airflow. See Fan Drive on page 63.

After the First 48 Hours of Operation

1. Disconnect and lock electrical power source.
2. Check tightness of all bearing, wheel, and sheave setscrews (or capscrews). See Table 14 on page 34.
3. Recheck belt tension and adjust if necessary. Belts that are tensioned sufficiently to slip one to two seconds at startup perform satisfactorily, extending life and reducing vibration. If re-tensioning is necessary, be certain to retain sheave alignment.

Fan Wheel Alignment

Figure 56: Wheel-to-Inlet Tunnel Relationship—Airfoil Type Fan Wheels (Housed)

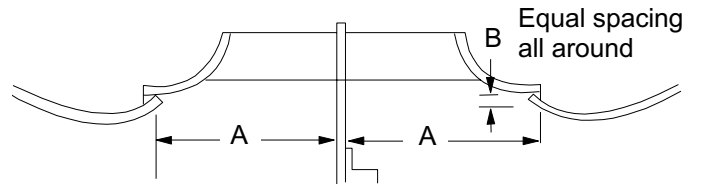


Table 7: Wheel-to-Inlet Funnel Relationship—Airfoil Type

Diameter – in.	A in. (mm)	B in. (mm)
Unit sizes 003 to 035		
13.22	4.56 (116)	0.21 (5.33)
14.56	5.06 (129)	0.21 (5.33)
16.18	5.62 (143)	0.21 (5.33)
17.69	6.90 (175)	0.22 (5.59)
21.56	7.59 (193)	0.24 (6.10)
24.00	8.45 (215)	0.23 (5.84)
Unit sizes 040 to 090		
20.00	7.19 (183)	0.31 (7.87)
22.25	7.69 (195)	0.33 (8.38)
24.50	8.56 (217)	0.31 (7.87)
27.00	9.47 (241)	0.63 (16.00)
30.00	10.47 (266)	0.39 (9.91)
33.00	11.75 (298)	0.38 (9.65)
36.50	12.78 (325)	0.38 (9.65)
40.25	14.31 (363)	0.50 (12.70)

Note:

1. To obtain rated air performance, dimensional relationship must be held.
2. To obtain dimension A, loosen setscrews in wheel hub(s), shifting wheel(s) axially as needed, and retightening setscrews.
3. To obtain dimension B, loosen screw and washer fasteners around periphery of funnel(s), shifting funnel radially as required, and re-torquing fasteners.

Figure 57: Wheel-to-Inlet Funnel Relationship—Forward Curved Type Fan Wheels

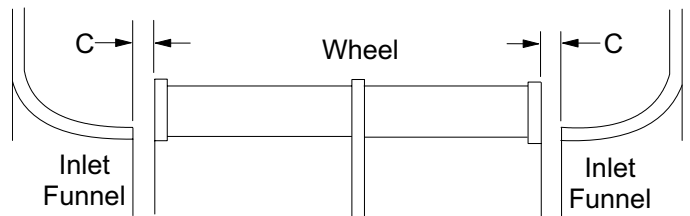


Table 8: Wheel-to-Inlet Funnel Relationship—Forward Curved Type Fan Wheels

Diameter – in.	C in. (mm)
Unit Sizes 003 to 035	
9 × 4	0.25 (6.35)
9 × 7	0.13 (3.30)
9 × 9	0.25 (6.35)
10	0.22 (5.59)
12	0.35 (8.89)
15	0.44 (11.18)
18	0.25 (6.35)
20 (Class 1 & 2)	0.73 (8.54)
22.5 (Class 1 & 2)	0.59 (14.99)
24.5 (Class 1 & 2)	0.56 (14.22)
Unit Sizes 040 to 090	
20 (Class 1 & 2)	0.24 (6.10)
22.38 (Class 1 & 2)	0.41 (10.41)
25 (Class 1 & 2)	0.47 (11.94)
27.62 (Class 1 & 2)	0.47 (11.94)
30 (Class 1 & 2)	0.47 (11.94)
33 (Class 1 & 2)	0.50 (12.70)
36 (Class 1 & 2)	0.75 (19.05)

Note:

- To obtain rated air performance, dimensional relationship must be held.
- Adjust dimension C by loosening wheel hub setscrews, shifting wheel(s) axially as needed, and retightening setscrews

Figure 58: Wheel-to-Inlet Funnel Relationship—13 to 36 Belt-Drive Plenum Fan

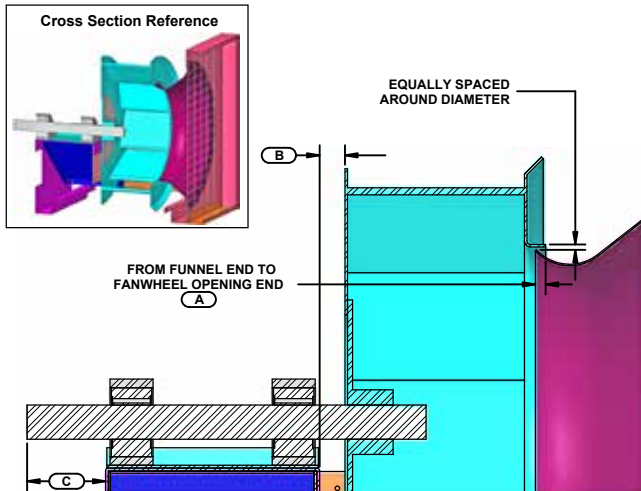


Table 9: Wheel-to-Inlet Funnel Relationship—13 to 36 Belt-Drive Plenum Fan

Wheel-Funnel Parameters in. (mm)			
Size – in.	A	B	C
13	0.25 (6.35)	0.91 (23.11)	3.50 (88.9)
15	0.25 (6.35)	0.91 (23.11)	3.50 (88.9)
16	0.25 (6.35)	0.91 (23.11)	3.50 (88.9)
18	0.38 (88.9)	0.86 (21.84)	3.88 (98.55)
20	0.42 (10.67)	1.11 (28.19)	3.88 (98.55)
22	0.45 (11.43)	1.11 (28.19)	3.88 (98.55)
24	0.51 (12.95)	1.11 (28.19)	3.88 (98.55)
27	0.55 (13.97)	1.36 (34.54)	4.50 (114.3)
30	0.62 (15.75)	1.36 (34.54)	4.50 (114.3)
33	0.55 (13.97)	1.50 (38.1)	5.00 (127.0)
36	0.63 (16.0)	1.50 (38.1)	5.00 (127.0)

Figure 59: Wheel-to-Inlet Funnel Relationship—40 to 60 Belt-Drive Plenum Fan

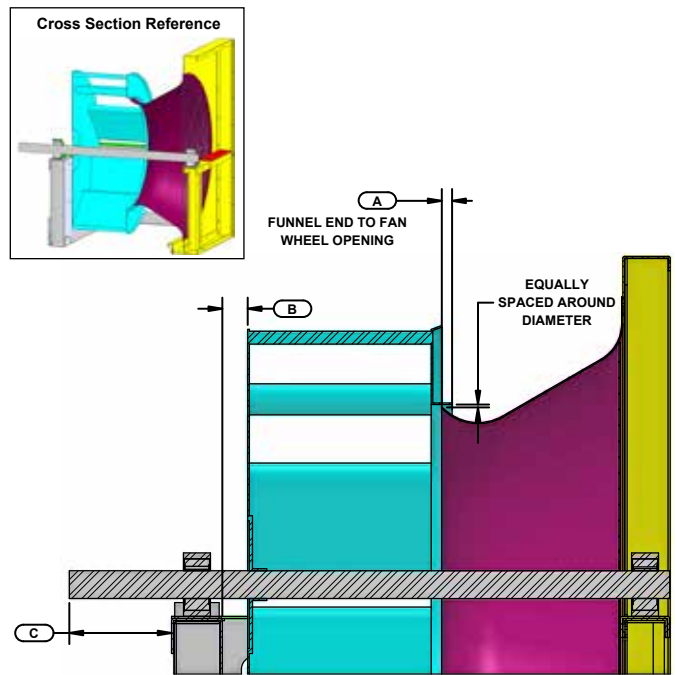


Table 10: Wheel-to-Inlet Funnel Relationship—40 to 60 Belt-Drive Plenum Fan

Wheel-Funnel Parameters in. (mm)			
Size – in.	A	B	C
40	0.82 (20.83)	2.00 (50.8)	4.88 (121.92)
44	0.91 (23.11)	2.25 (57.15)	5.50 (139.7)
49	1.00 (25.4)	2.50 (63.5)	5.50 (139.7)
54	1.10 (27.94)	2.50 (63.5)	5.50 (139.7)
60	1.23 (31.242)	3.00 (76.2)	5.50 (139.7)

Figure 60: Wheel-to-Inlet Funnel Relationship—In-line Fans

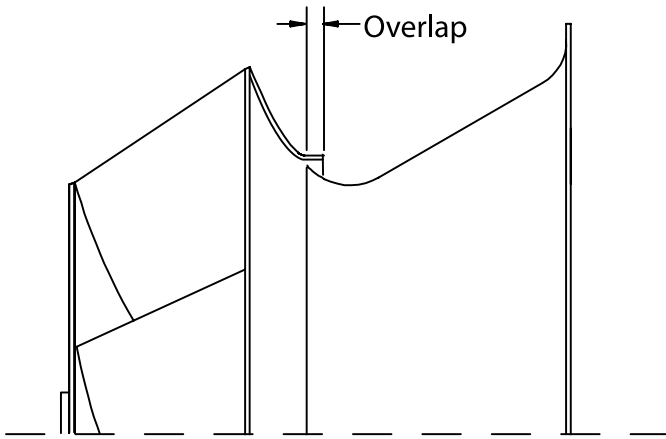


Table 11: Wheel-to-Inlet Funnel Relationship—In-line Fans

Wheel—Funnel Overlap in. (mm)	
Size – in.	Overlap
150	0.375 (9.52)
165	0.438 (11.12)
182	0.562 (14.27)
200	0.625 (15.87)
222	0.688 (17.47)
245	0.75 (19.05)
270	0.812 (20.62)
300	0.875 (22.22)
330	1.0 (25.4)
365	1.125 (28.57)
402	1.25 (31.75)
445	1.375 (34.92)

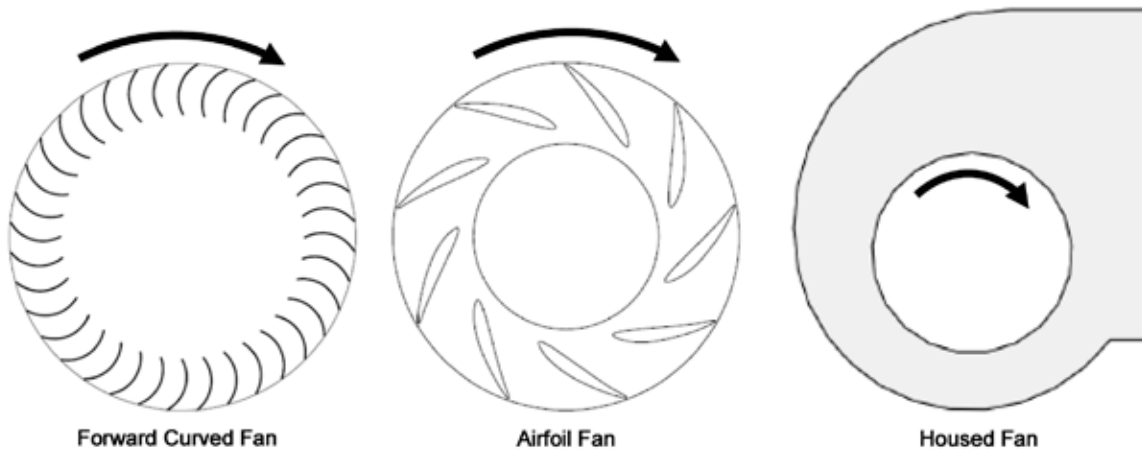
Table 12: Wheel to Inlet Funnel Relationship—Direct-Drive Class II fans

Fan Size – in.	Overlap – in. (mm)
11	0.25 (6.35)
12	0.25 (6.35)
15	0.25 (6.35)
16	0.38 (9.65)
18	0.38 (9.65)
20	0.41 (10.41)
22	0.45 (11.43)
24	0.50 (12.7)
27	0.55 (13.97)
30	0.61 (15.49)
33	0.67 (17.0)
36	0.75 (19.05)
40	0.82 (20.82)
44	0.91 (23.11)

Table 13: Wheel to Inlet Funnel Relationship—Direct-Drive Class III fans

Fan Size – in.	Overlap – in. (mm)
13	0.12 (3.0)
15	0.19 (4.82)
16	0.25 (6.35)
18	0.31 (7.87)
20	0.38 (9.652)
22	0.44 (11.17)
24	0.50 (12.7)
27	0.56 (14.22)
30	0.62 (16.76)
33	0.75 (19.05)
36	0.81 (20.57)
40	0.88 (22.35)
44	0.94 (23.87)
49	1.0 (25.4)
54	1.06 (26.92)
60	1.12 (28.44)

Figure 61: Fan Wheel Rotation



Fan wheel should rotate as shown

Setscrews

Setscrews on MPQ fan wheels must be installed using a calibrated torque wrench to the value listed below, $\pm 5\%$. The fasteners must be periodically checked to satisfy agency requirements for components on rotating machinery.

Table 14: Setscrew Torque Specifications—Class II Plenum Fans Only

Fan Size	Setscrew Size	Torque (ft.-lb)	
		Aluminum	Steel
11/12/13	3/8	19.2	N/A
15	3/8	19.2	N/A
16	3/8	19.2	N/A
18	3/8	19.2	N/A
20	3/8	19.2	N/A
22	3/8	19.2	N/A
24	3/8	19.2	N/A
27	3/8	19.2	22
30	1/2	41.7	55
33	1/2	41.7	55
36	1/2	41.7	55
40	1/2	41.7	55
44	1/2	41.7	55
49	1/2	41.7	55
54	1/2	41.7	55
60	3/4	115	150

Table 15: Bearing Collar and Wheel Hub Set Screw Torque (All Fans Except Class II Plenum Fans)

Setscrew Diameter (in.)	Minimum torque
	ft/lbs (kg/m)
1/4	5.5 (0.76)
1/16	10.5 (1.45)
3/8	19.0 (2.63)
7/16	29.0 (4.01)
1/2	42.0 (5.81)
5/8	92.0 (12.72)

Daikin Fan Array

WARNING

Closing the damper on an operational fan could send the fan into surge that could produce fans stall, excessive vibration, unit damage, or personnel injury.

The Daikin Fan Array is available with optional, factory mounted VFDs. See OM manuals OM 1190 and 1191 for details on the Daikin supplied VFD.

Care should be taken when programing and synchronizing the drives in the Daikin Fan Array such that all fans turn at the same speed. Fans running at unequal speeds can produce vibration and could stall a fan. Definition of fan numbering is given in Figure 62.

The Daikin Fan Array is standard with a manual block off plate. The unit will ship with one block off plate that will come installed on fan 1A. This block off plate is to be removed before unit operation and stored outside of the air tunnel. In the event of a lost fan motor, the block off plate is installed on the non-functional fan to prevent air re-circulation. This is designed to be a temporary measure unit this fan and/or motor is replaced. After fan and/or motor replacement the block off plate is to be removed and stored outside of the air tunnel.

The Daikin Fan Array has an optional gravity actuated block off damper. These dampers are equipped with counter weights.

The Daikin Fan Array has an optional actuated block off damper. These dampers are designed to prevent air recirculation in the event of a lost fan. Care should be taken that the damper actuator only be given a close signal if the fan is not operational (motor burnout for example).

The Daikin Fan Array can be equipped with a fan blank off plate. See Figure 63 with a block off plate mounted to fan 3C. If the unit is ordered with the manual block off plate, it will be installed to fan 1A. This plate has to be removed before start up.

Figure 62: Daikin Fan Array Configuration

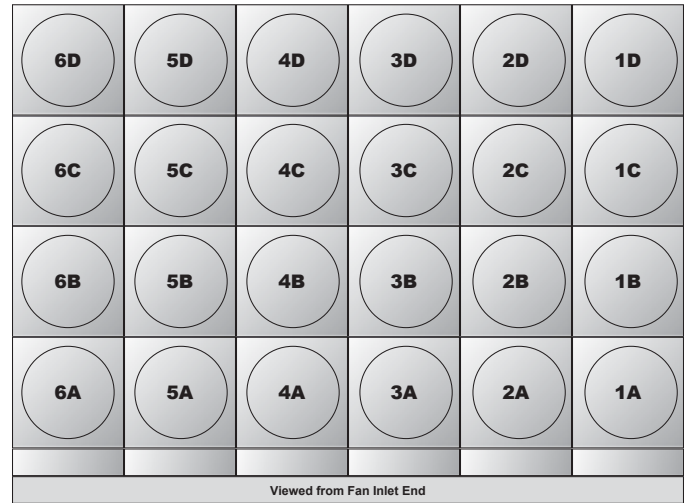
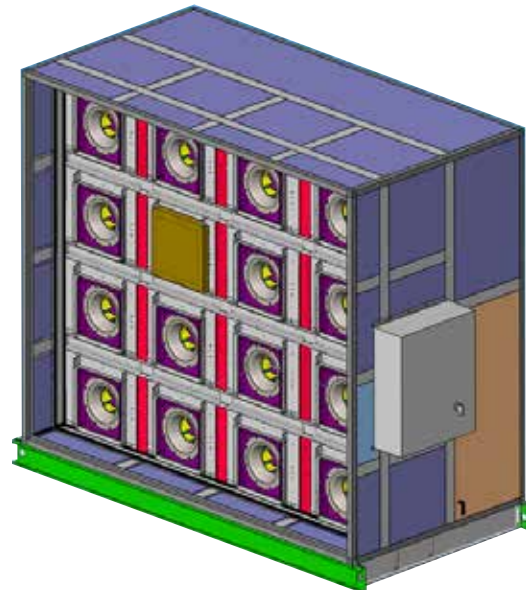


Figure 63: Fan Array with Block Off Plate



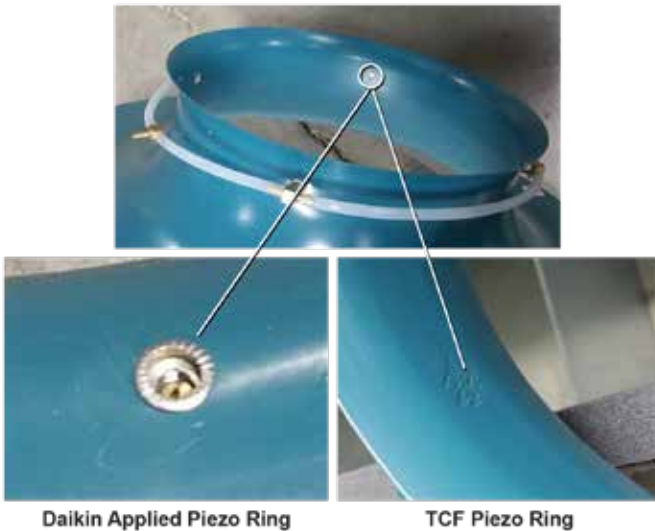
Optional Piezometer Ring Airflow Measurement Device

Piezometer rings are available as an option on direct drive plenum fans to measure airflow through the fan. The device consists of a piezometer ring mounted in the throat of the funnel and a static pressure tap mounted near the inlet of the funnel. The pressure drop is measured from the tap located near the inlet of the funnel to the piezometer ring in the throat. The inlet tap is connected to the high-pressure side of the transducer and the piezometer ring is connected to the low-pressure side.

See the equations and factors required to calculate flow using the piezometer ring.

NOTE: There are two manufacturer options for the piezometer ring. Care should be taken to ensure that the appropriate coefficients are used, otherwise airflow measurement may be incorrect. Reference [Figure 64](#) to determine which piezometer ring you have.

Figure 64: Determining the Manufacturer



Non-Standard Density Method

The following equation is used to measure the flow for non-standard density:

$$ACFM = C1 \times A \times \sqrt{(\Delta P/\rho)}$$

where: A = Inlet funnel throat area (square feet) - from [Table 17](#) and [Table 19](#)

ΔP = The differential in static pressure from the piezometer ring and the inlet pressure tap (inches w.g.)

ρ = Air density (pounds mass/cubic foot)

C1 = Value from [Table 16](#) and [Table 18](#)

Standard Density Method

The equation can be simplified by assuming standard density and assuming funnel dimensions match the drawing dimensions. [Table 17](#) and [Table 19](#) show the factor (F) for each fan size and type. The equation then becomes the following:

For standard air ($\rho = 0.075 \text{ lb/ft}^3$):

$$ACFM = F \times \sqrt{(\Delta P)}$$

where: F = factor from [Table 17](#) and [Table 19](#)

ΔP = The differential in static pressure from the piezometer ring and the front pressure tap (inches w.g.)

Table 16: DDPL Factors For Free and Ducted Inlet — Non Standard Density Method, TCF Piezo Ring

Product	C1 Free Inlet	C1 Ducted Inlet
DDPL Size 11-16	753.06	794.06
DDPL Size 18-44	692.03	740.14

Table 17: DDPL Factors For Free and Ducted Inlet — Standard Density Method, TCF Piezo Ring

DDPL Size	Free Inlet F	Ducted Inlet F	Area A
11 and 12	944.92	996.36	0.344
15	1206.40	1272.08	0.439
16	1518.58	1601.26	0.552
18	1821.92	1948.58	0.721
20	2185.80	2337.76	0.865
22	2713.93	2902.60	1.074
24	3285.02	3513.39	1.300
27	3997.61	4275.53	1.582
30	4945.21	5289.01	1.957
33	5968.62	6383.56	2.362
36	7290.21	7797.03	2.885
40	8869.55	9486.16	3.510
44	10827.92	11580.68	4.285

Table 18: DDPL Factors for Free and Ducted Inlet – Non-Standard Density Method, Daikin Piezo Ring

DDPL Size	C1 Free Inlet	C1 Ducted Inlet
12	783.66	792.43
15	767.48	763.62
16	732.77	757.40
18	612.29	619.65
20	653.83	652.65
22	674.42	673.16
24	679.53	681.34
27	656.57	660.15
30	691.07	692.12
33	675.26	677.89
36	675.83	676.67
40	699.51	694.22
44	681.07	681.01

Table 19: DDPL Factors for Free and Ducted Inlet – Standard Density Method, Daikin Piezo Ring

DDPL Size	Free Inlet F	Ducted Inlet F	Area A
12	1004.66	1016.46	0.344
15	1261.99	1260.20	0.439
16	1526.96	1572.35	0.552
18	1675.69	1672.77	0.721
20	2117.33	2110.61	0.865
22	2710.75	2693.35	1.074
24	3312.67	3319.41	1.300
27	3901.60	3929.94	1.582
30	5017.64	5033.71	1.957
33	5942.72	5979.46	2.362
36	7274.52	7316.07	2.885
40	9179.91	9089.14	3.513
44	10891.71	10880.24	4.285

Optional Transducer for Piezometer Rings

A transducer is available for Piezometer rings. Factory mounting locations for the fan transducer is shown in [Figure 65](#) for direct-drive plenum fans. [Figure 66](#) shows the installation for fan array. Wiring for the transducer is field-supplied and installed.

Figure 65: Direct-drive Plenum Fan Installation

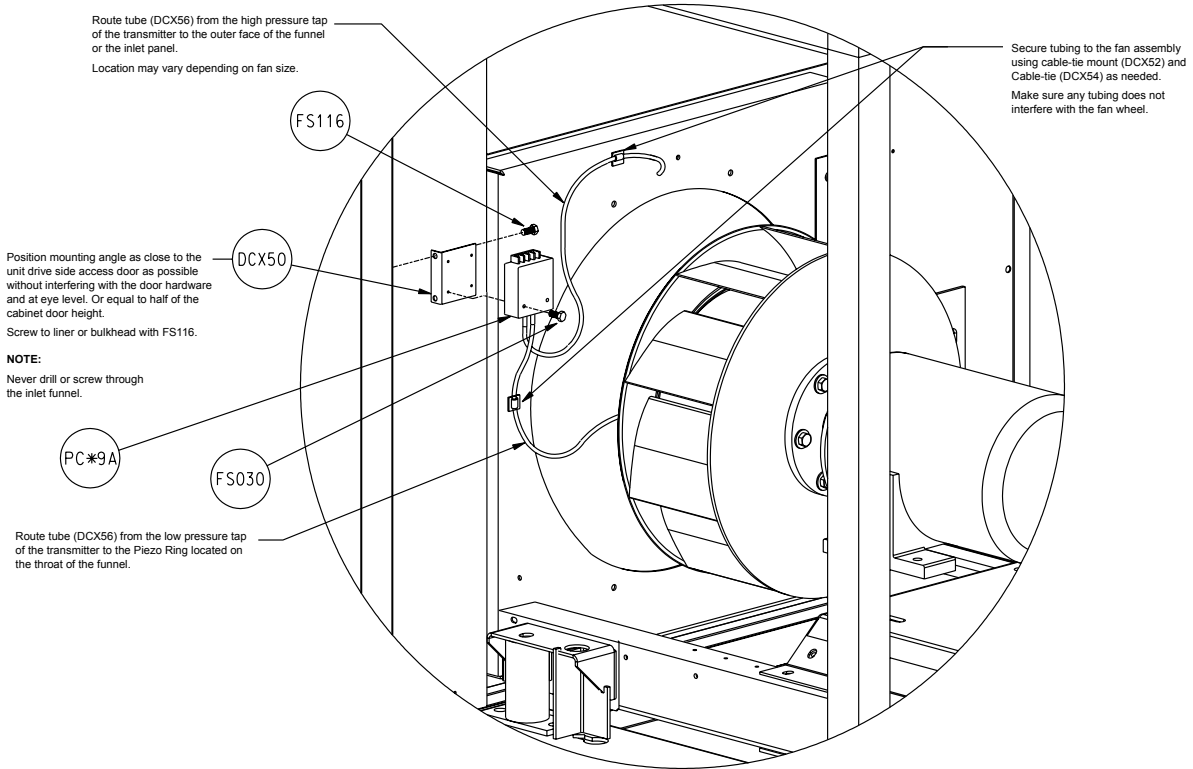
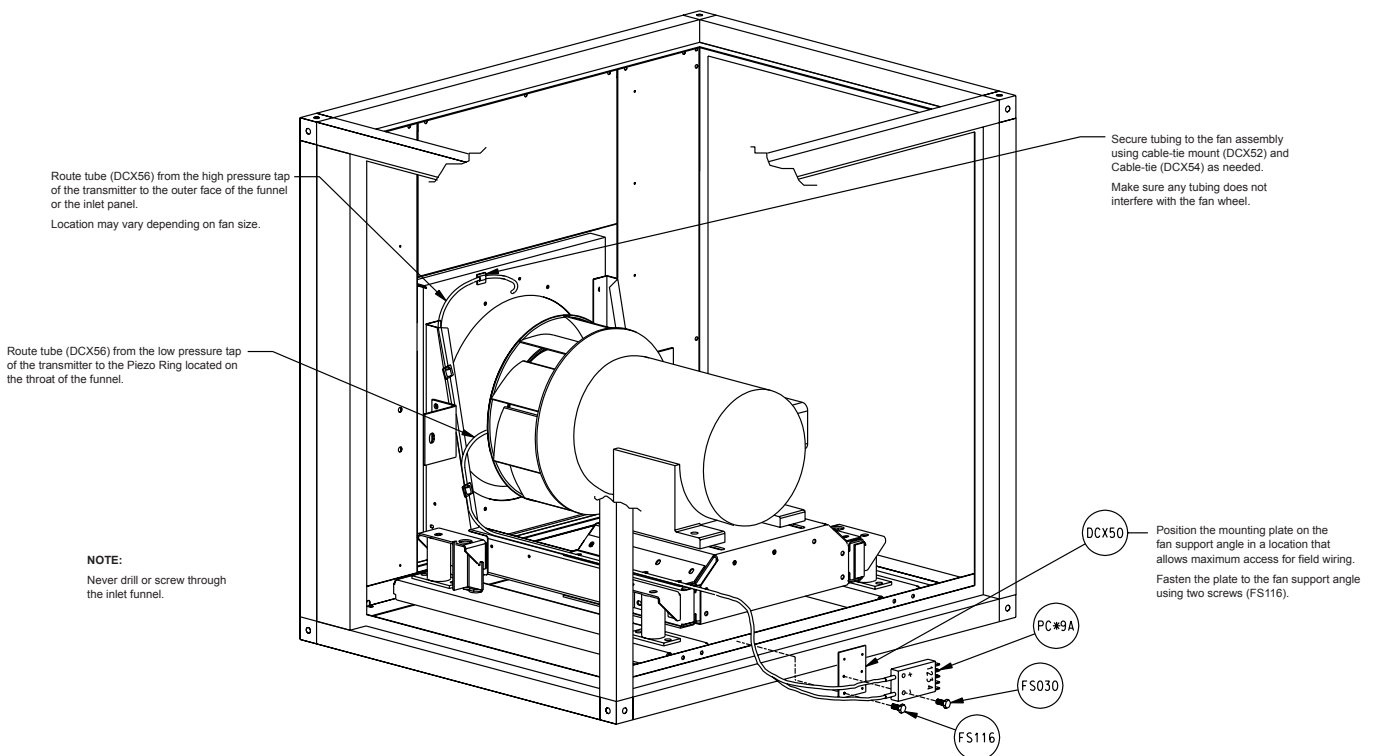


Figure 66: Fan Array Installation



Daikin EC Fan Array

The Daikin EC Fan Array is made of an impeller, EC motor, and inverter. It is installed as an assembly, and in the event of failure, the entire assembly must be replaced. Bearings are permanently sealed and lubricated, so no periodic greasing is necessary.

A minimum 24" access section is recommended downstream of the ECM fan array section to gain access to the fans. If an access section is not selected downstream of the fan array, there will be very limited access to the fans for service/replacement.

The entire array is controlled via a 0-10V signal. Control signal is wired to points 3 and 4 on the Daikin low voltage terminal strip seen in [Figure 72](#). There are two other points for the EC Fan Array: fan array enable and disable are points 1 and 2, and fan array fault are points 5 and 6. If any fan in the fan array faults, there is a contact closure between 5 and 6.

NOTE: To DISABLE the array, connect points 1 and 2 together. The array defaults to ENABLE with nothing connected to points 1 and 2.

The EC Fan Array has an option for a block off plate that can be ordered as a parts kit from the Daikin Parts group. A minimum 24" access section is recommended upstream of the ECM fan array section to install block-off plate.

Remote Mounted Panel

The control panel can be ordered for remote mounting. For remote mounted panels, the control wiring for the individual fans will be provided; however, the control wiring to connect the final fan to the control panel and all of the power wiring must be field-provided.

30 foot long high voltage harnesses may be ordered through the Daikin Parts Group using part number 910232406. One high voltage harness is required per fan.

If wiring harnesses are not purchased through Daikin, follow the below instructions to install the wiring.

1. High Voltage Power Wiring:

- a. Remove the plate on the back of each fan.
- b. Remove the provided high voltage plug and wiring shown in [Figure 67](#).
- c. Cut, strip, and connect 14-gauge wiring directly to each motor terminal shown in [Figure 67](#), paying attention to the correct phasing. Reference the wiring diagram in [Figure 73](#).
- d. Cut, strip, and connect the other end of the wiring to the Manual Motor Protector (MMP) in the control panel, paying attention to phasing. Reference the wiring diagram in [Figure 73](#).

NOTE: [Figure 68](#) shows a single fan control box. There will be 1 MMP per fan in the array to connect each fan to.

2. Low Voltage Control Wiring:

- a. 22-gauge Cat5 wiring, a standard 6-circuit female Molex plug (39-01-2061), and six Molex crimp terminals (39-00-0040) are required ([Figure 69](#)). The finished harness will have a plug on one end and stripped wire on the other end.
- b. Attach the wiring to the Molex crimp terminal and insert into the Molex plug. See [Figure 70](#) for correct crimp terminal locations; reference [Figure 72](#) for wiring numbers (out of ECM01). Connect to the male plug that is on the last fan in the array.
- c. Insert the stripped wire end into the terminals in the control panel, following the wiring diagram shown in [Figure 72](#). Terminals are shown in [Figure 68](#).

Figure 67: Fan - High Voltage Wiring



Figure 68: Single Fan Control Panel - High Voltage Wiring (in red); Low Voltage Wiring (in blue)

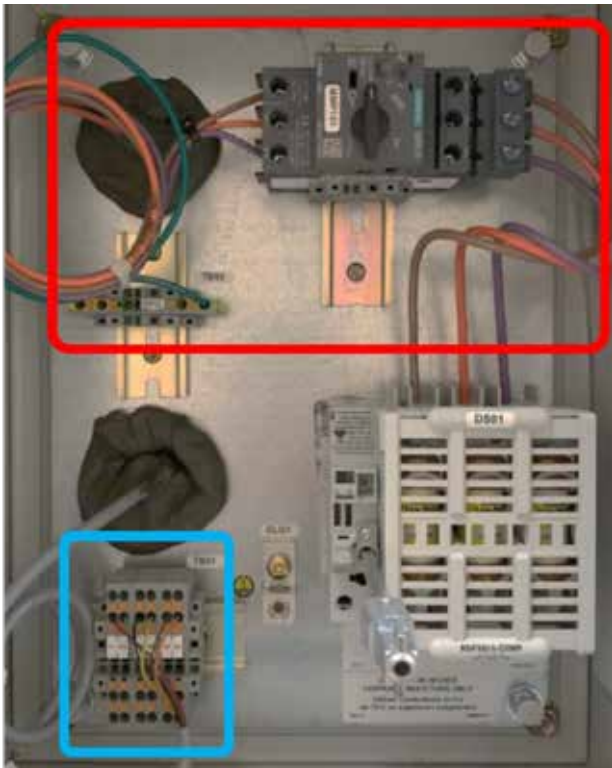


Figure 71: EC Fan Array



Figure 69: Required Molex Plug and Crimp Terminals

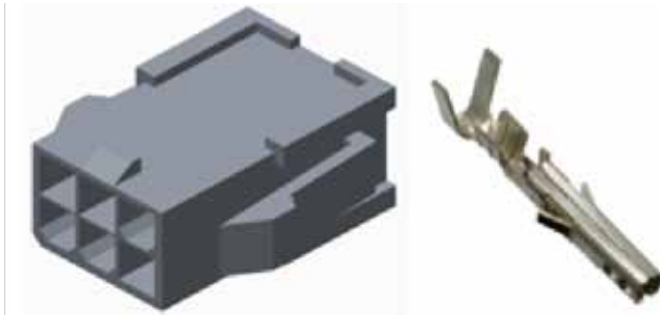


Figure 70: Molex Plug Crimp Terminal Locations

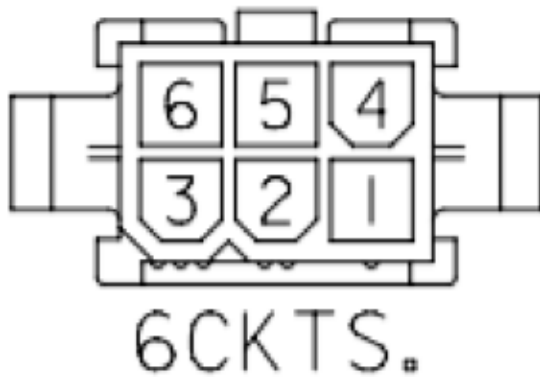


Figure 72: Control Signal

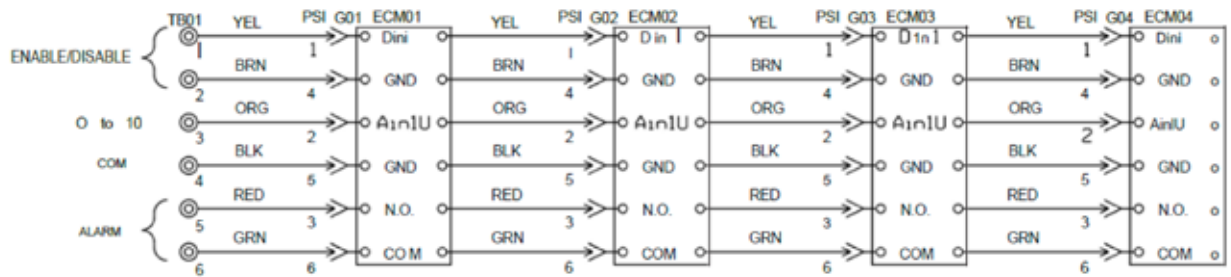


Figure 73: High Voltage Wiring

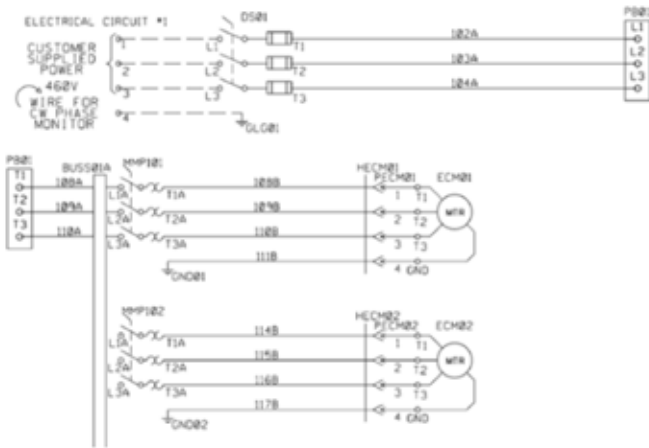
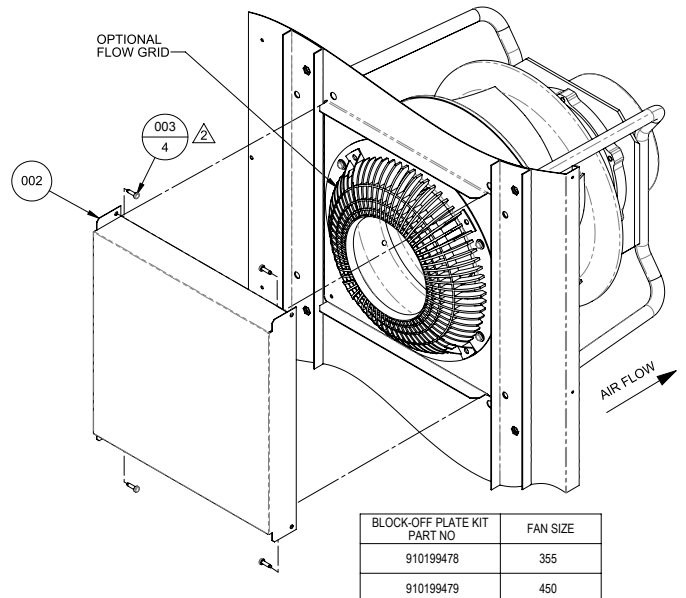


Figure 74: Block-Off Plate Installation



Optional Piezometer Point Airflow Measurement Device

A Piezometer point is an option with EC fans to measure airflow through the fan. The device consists of a piezometer point mounted in the throat of the funnel and a static pressure tap mounted near the inlet of the funnel. The pressure drop is measured from the tap located near the inlet of the funnel to the piezometer point in the throat. The inlet tap is connected to the high-pressure side of the transducer and the piezometer point is connected to the low-pressure side.

A transducer is always factory supplied when the Piezometer Option is selected with an EC Fan. [Figure 75](#) shows the installation for EC fans.

See the equations and factors required to calculate flow using the piezometer point:

Non-Standard Density Method

The following equation is used to measure the flow for non-standard density:

$$ACFM = C1 \times A \times \sqrt{(\Delta P/\rho)}$$

where: A = Inlet funnel throat area (square feet) - from [Table 21](#)

ΔP = The differential in static pressure from the piezometer ring and the inlet pressure tap (inches w.g.)

ρ = Air density (pounds mass/cubic foot)

C1 = Value from [Table 20](#)

Standard Density Method

The equation can be simplified by assuming standard density and assuming funnel dimensions match the drawing dimensions. [Table 20](#) shows the factor (F) for each fan size and type. The equation then becomes the following:

For standard air ($\rho = 0.075 \text{ lb/ft}^3$):

$$ACFM = F \times \sqrt{(\Delta P)}$$

where: F = factor from [Table 21](#)

ΔP = The differential in static pressure from the piezometer ring and the front pressure tap (inches w.g.)

Table 20: ECM Factors for Free and Ducted Inlet — Non-Standard Density Method

ECM Size	C1 Free Inlet	C1 Ducted Inlet
355	774.47	774.47
450	783.31	783.31

Table 21: ECM Factors for Free and Ducted Inlet — Standard Density Method

ECM Size	Free Inlet F	Ducted Inlet F	Area A
355	1372.74	1372.74	0.485
450	2226.07	2226.07	0.778

Figure 75: Piezometer Transducer



Operating Limits

Do not exceed the operating limits in [Table 22](#) through [Table 26](#). A fan wheel operated beyond the rpm and temperature limits shown can suffer permanent distortion or fracture. The resulting unbalance can cause severe unit vibration

Table 22: Unit Sizes 003 to 035

Fan Operating Limits										
Forward curved—housed										
Diameter	9 × 4	9 × 7	9 × 9	10.62	12.62	15	18	20	22.25	24.50
Maximum rpm Class I	N/A	2189	2223	1934	1614	1328	1155	1050	944	858
Maximum rpm Class II	2700	2854	2896	2518	2091	1725	1450	1200	1030	910
Airfoil—housed										
Diameter	13.22	14.56	16.19	19.69	21.56	24.00				
Maximum rpm Class I	3000	3000	2300	2000	1700	1500				
Maximum rpm Class II	4335	3918	3457	2858	2427	2255				

Table 23: Unit Sizes 040 to 090

Fan Operating Limits							
Forward curved—housed							
Diameter	20	22.38	25	27.62	30.25	33	36
Maximum rpm Class I	1010	930	790	690	650	600	560
Maximum rpm Class II	1281	1178	1011	910	835	763	715
Airfoil—housed							
Diameter	20	22.25	24.5	27	30	33	36.5
Maximum rpm Class I	2077	1875	1691	1479	1328	1209	1073
Maximum rpm Class II	2703	2413	2199	1928	1730	1579	1401

Table 24: Operating Limits—Belt-Drive Plenum Fans

Fan Operating Limits																
Belt-Drive Plenum Fans																
Size	13	15	16	18	20	22	24	27	30	33	36	40	44	49	54	60
Maximum rpm Class II	3909	3468	2820	2930	2674	2403	2183	1860	1783	1620	1465	1329	1202	1091	986	891
Maximum rpm Class III	4000	4000	3887	3735	3409	3065	2780	2423	2182	1984	1759	1598	1447	1314	1178	1071

Table 25: Operating Limits—In-line Fans, Twin Fans

Fan Operating Limits												
In-Line Fans												
Diameter	18.25	20	22.25	24.5	27	30	33	36.5	40.25	44.50	49	54.25
Maximum rpm Class I	2727	2488	2236	2041	1835	1665	1476	1330	1208	1072	973	880
Maximum rpm Class II	3409	3111	2796	2551	2294	2082	1846	1662	1510	1340	1216	1100
Twin Fans												
Diameter	9 × 9	10.62	12.62	15	18.12	20						
Maximum rpm	2575	2400	2000	1700	1400	1200						
Maximum HP	10	15	15	30	40	40						

Table 26: Operating Limits—Direct-Drive Plenum Fans

Fan Operating Limits																		
Belt-Drive Plenum Fans																		
Size	11	12	13	15	16	18	20	22	24	27	30	33	36	40	44	49	54	60
Maximum rpm Class II	4000	4000	—	3909	3650	3650	2674	2403	2183	1981	1783	1620	1465	1329	1202	—	—	—
Maximum rpm Class III	—	—	4000	4000	3887	3735	3409	3065	2780	2423	2182	1984	1759	1598	1447	1314	1178	1071

Fan Vibration Levels

Each unit as shipped is trim balanced to operate smoothly. To provide satisfactory operation after shipping and installation, use the accepted industry guidelines for field balancing fans. See [Table 27](#).

Table 27: Vibration Levels

Fan Speed (rpm)	Vibration
800 or less	5 mils maximum displacement
801 or greater	0.20 in/sec. maximum velocity

Note:

Excessive vibration from any cause contributes to premature fan and motor bearing failure. Monitor overall vibration levels every six months of operation. An increase in levels is an indication of potential trouble.

Vibration Causes

1. Wheel imbalance.
 - a. Dirt or debris on wheel blades.
 - b. Loose set screws in wheel hub or bearing-to-shaft.
 - c. Wheel distorted from overspeed.
2. Bent shaft.
3. Drive faulty.
 - a. Variable pitch sheaves—Axial and radial runout of flanges; uneven groove spacing; out of balance. Also similar faults in driven sheave.
 - b. Bad V-belts; lumpy, or mismatched; belt tension too tight or too loose.
4. Bad bearings, loose bearing hold-down bolts
5. Motor imbalance
6. Fan section not supported evenly on foundation

Indirect Fired Tube Heater

DANGER

FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury, death, or property damage
- Be sure to read and understand the installation, operation, and service instructions in this manual
- Improper installation, adjustment alteration, service, or maintenance can cause serious injury, death, or property damage
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or other appliances

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance
- Do not touch any electrical switch; do not use any phone in the building
- Leave the building immediately
- Immediately call your gas supplier, follow the gas supplier's instructions
- If you cannot reach your gas supplier, call the Fire Department

Installation and service must be performed by a qualified installer, service agency, or gas supplier

The optional gas heat furnace design consists of a tubular heat exchanger(s), burner manifold with gas valve, induced combustion blower, gas heat control module and all operational safeties. The tubular heat exchanger is standard with stainless steel construction. The safety switches include a high-limit temperature switch, an auxiliary high-limit switch, a combustion blower proof of airflow, and the flame roll-out switch.

The high limit switch is an automatic reset switch and it opens up at 160°F to shut the furnace down and closes at 130°F. The auxiliary limit switch is a manual reset and opens up at 180°F to shut the furnace down.

Warranty Exclusion

Warranty is void if the furnace is operated in the presence of chlorinated vapors, if the airflow through the furnace is not in accordance with rating plate, or if the wiring or controls have been modified or tampered with.

Gas Piping

WARNING

All field gas piping must be pressure/leak tested prior to operation. NEVER use an open flame to check for leaks. Use a soap solution or other leak detecting solution.

Gas pressure to appliance controls must never exceed 13.5" w.c. (½ psi)

Installation of piping must conform with local building codes and ordinances, or in the absence of local codes with ANSI Z223.1 the National Fuel Gas Code. In Canada, installation must be in accordance with CAN/CGA –B149.1 for Natural gas and B149.2 for propane units. A gas regulator servicing multiple units must have the proper pipe size and internal orifice for the total input of all heating units serviced by that regulator. A field supplied sediment trap and shut off valve is to be provided at the Daikin unit.

The gas furnace gas piping was leak tested prior to shipping. However, during shipping and installation connections may have loosened. Check for leaks using a soap solution and correct any leaks before placing furnace in operation.

Minimum Gas Pressure

Individual duct furnaces require a minimum gas pressure noted in [Table 28](#)

Table 28: Minimum Gas Pressure

Individual Furnace Size	Natural Gas	Propane Gas
50,000 to 400,000 BTUH	5.0" w.c.	11.0" w.c.
<400,000 BTUH	6.0" w.c.	12.0" w.c.

The Daikin furnace modules have a maximum inlet pressure of 13.5" w.c. Installer is responsible for supplying a pressure regulator if required.

Airflow Requirements

When variable air moving (2 stage or variable frequency drive) is provided by others the allowable minimum cfm to the duct furnace is 2/3 (67%) of the listed minimum CFM for the furnace model when applied as follows:

1. The unit has two stage or modulating gas controls.
2. The air handling unit is equipped with a discharge air controller.
3. The system does not include a room thermostat.

Systems utilizing variable air volume to maintain the desired building pressure require separate control of the heating unit input to insure that the maximum temperature rise of the duct furnace is not exceeded. Consult the factory for assistance with system control design in these applications.

Ventilation and Flue Pipe Requirements

WARNING

Hot surface hazard. Can cause severe equipment damage, personal injury, or death. Allow burner assembly to cool before servicing equipment.

WARNING

Units equipped with gas heating must not be operated in an atmosphere contaminated with chemicals which will corrode the unit such as hydrocarbons, chlorine, cleaning solvents, refrigerants, swimming pool exhaust, etc. Exposure to these components may cause severe damage to the gas furnace and result in improper or dangerous operation. Operation of the gas furnace in such a contaminated atmosphere constitutes product abuse and will void all warranty coverage by the manufacturer. Questions regarding specific contaminants should be referred to your local gas utility.

Standard Efficiency Models

The Daikin outdoor air handling unit is equipped with an outdoor air hood to supply adequate combustion air. The unit also has a flue outlet assembly and requires no additional chimney, flue pipe, Breidert cap, draft inducer, etc..

High Efficiency Models

All unit installations must be in accordance with the National Fuel Gas Code ANSI Z223.1 (NFPA 54) in the United States and Can/CGA-B149 Installation Code in Canada, and all other applicable local codes and ordinances. These requirements include but are not limited to:

- Furnace Location and clearances
- Circulating airflow and ductwork
- Combustion air supply to the heating equipment
- Venting of the products of combustion (flue gases)
- Gas supply, piping and connections

Condensate Drain Lines

WARNING

Failure to connect condensate drains can result in accumulation of condensate during heater operation and result in hazardous operation and can damage the heat exchanger.

WARNING

Failure to connect and properly install condensate drains can result in water flow into the building causing structural damage, injury, and death.

WARNING

For outdoor installations, the condensate drain line must be routed through a heated space. **DO NOT DRAIN ON THE ROOF.** Failure to properly connect condensate drains can result in significant amounts of ice buildup, causing structural damage, injury, and death.

Where condensate drains are located outside a heated space or in a space where temperatures may fall below freezing, the drain line must be protected. Use a 2.5 to 5 watt per foot (0.003 to 0.005 kW per meter) at 115 VAC, 40° F (4.4° C) self-regulating, shielded and waterproof heat tape. Wrap the drain trap and drain line with heat tape and secure with ties. Follow the heat tape manufacturer's installation recommendations.

Disposal of condensate is subject to local codes and ordinances. In some locals the condensate drain system may be connected to a sanitary drain within the building. Some municipalities require that the acidic condensate produced be neutralized before being discharged into the sanitary sewer. A condensate neutralizer kit should be used. Refer to installation instructions provided with the kit. Locate neutralizer where it is readily accessible for inspection and maintenance. When a drain is not readily available, a condensate pump might be needed. Installer is responsible for providing the neutralization kit and condensate pump.

Wiring/Controls

Single Furnace

2-Stage Controls

Sequence

When system is powered up 24 VAC will be applied to the ignition control (IC) terminals 24VAC/GND. The control will reset, perform a self-check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds and enter the thermostat scan standby state. Call for Heat

1. Thermostat (controller) closes on call for heat powering terminal T2.
2. 24 VAC is supplied to IC terminal Tstat, provided limit switch is in closed position.
3. The control will check that pressure switch contacts are open (IC terminal APS (PSW) is not powered).
4. The Induced Draft Fan (ID Fan) is then energized at high speed through IC terminal IND.
5. When the Air Switch (APS-1) closes, a 15 second pre-purge period begins.
6. At end of pre-purge period, the spark commences and either 1st stage or both 1st and 2nd stage gas valves (depending on status of call for heat) are energized for the trial for ignition period.
7. If the thermostat (controller) is calling for 1st stage heat only, the 1st stage valve will open (1.0 to 1.4" w.c. manifold pressure on Natural Gas or 2.5 to 3.0" w.c. on Propane Gas). If the thermostat (controller) is calling for high heat, both 1st and 2nd stage valves will open (3.3 to 3.5" w.c. manifold pressure on Natural Gas or 9.5 to 10.0" w.c. on Propane Gas).
8. Burners ignite and cross light.
9. When flame is detected by flame sensor the spark is shut-off immediately and gas valve(s) and combustion blower remain energized.
10. During heating operation, the thermostat, pressure switch and main burner flame are constantly monitored to assure proper system operation.
11. If the 2nd stage thermostat (controller) is satisfied, the 2nd stage contact opens, de-energizing the 2nd stage valve. Heater will continue to operate at 1st stage (low fire).
12. When the thermostat (controller) is satisfied and the demand for heat ends, the 1st stage valve is de-energized immediately, the control senses loss of flame and a 30 second post-purge occurs before de-energizing the ID Fan.

Recovery from Lockout

1. If the thermostat (controller) is still calling for heat one hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.
2. The ignition control may also be manually reset, by turning the thermostat (controller) down and back up to previous temperature setting or removing power (24V) to IC terminal 24VAC.

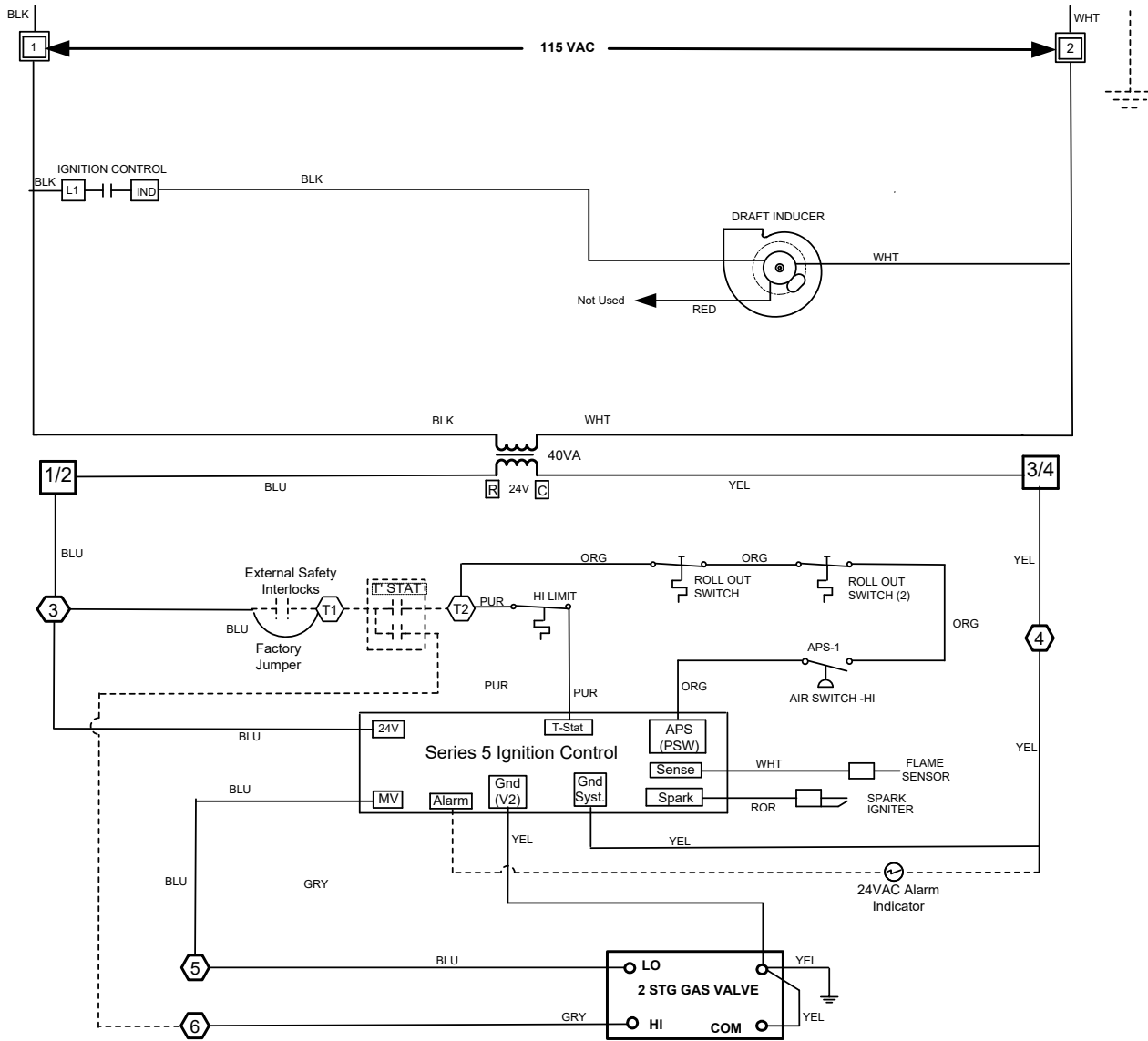
LED Indications, Normal Operation

- Green, ½ sec ON, ½ sec OFF: Pre-purge, Inter-purge, Post-purge
- Green, blinking rapidly: Trial for ignition
- Green, on solid: Flame detected, pilot/main burners on

ERROR CODES - Red Flashes Error Definition Error Type

- 1 flash, then pause No flame in trial time Lockout
- 2 flashes, then pause Flame sense stuck on Lockout
- 3 flashes, then pause Pilot/Main relay failure Lockout
- 4 flashes, then pause Repetitive flame loss error Lockout
- 5 flashes, then pause Rollout error Lockout
- 6 flashes, then pause APS Airflow error Lockout
- 7 flashes, then pause Internal control error Lockout ON Solid Red Line Voltage/Freq Error Standby

Figure 76: HM/HD Series – SN Control (Staged Control)



CUSTOMER PROVIDED COMPONENT

----- CUSTOMER / FIELD WIRING

INTERNAL TERMINAL CONNECTION

EXTERNAL TERMINAL CONNECTION

(2) 2nd ROLLOUT SWITCH ON HORIZONTAL BURNER TRAY ONLY

TIMER RELAY – TR1-090LH15

TR1 TIMER RELAY TERMINAL CONNECTION

5:1 Modulating Furnace

Sequence

When system is powered, 24 VAC will be applied to the ignition control (IC) across terminals 24VAC/GND, to the SC40 (Blue LED lit) and to the EXA Valve. The ignition control will reset, perform a self-check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds and enter the thermostat scan standby state.

Call for Heat

1. Thermostat (or heat enable) closes (T1/T2) on call for heat.
2. 24 VAC is supplied to IC terminal T'STAT, provided the high limit switch is in closed position.
3. The control will check that pressure switch contacts are open (IC terminal APS (PSW) is not powered).
4. The Induced Draft Fan (ID Fan) is then energized at high speed. SC40 Green (AFS) LED is lit.
5. Air Switch (APS-1 Low) closes initiating a 15 second pre-purge period.
6. At end of pre-purge period, the spark commences and the combination gas valve is energized for a trial for ignition period.
7. The SC40 will output 5 VDC to the EXA modulating control valve regardless of the analog input signal to SC40 terminals T10 & T11.
8. Burners ignite and cross light, operating at the adjusted mid-fire input rate
9. When flame is detected by flame sensor, the spark is shut-off immediately and gas valve and ID Fan remain energized.
10. SC40 is powered (terminal T4) simultaneously (Yellow (SU) LED lit) and begins timing a 30 second warm-up period while maintaining the ID Fan at high speed (Green AFS LED remains lit).
11. When the initial timer in SC40 times out, control will respond to analog input at terminals T10 and T11. Green (Mod) LED is lit.
12. If the controller is providing an analog signal between 0.5 and 5.0 VDC to the SC40 control, relay R1 is energized. RED (R1) LED is lit.
13. The ID Fan will run at low speed and the EXA modulating valve will be powered proportional to the analog input voltage signal and will open or close modulating the gas input between low and mid-fire.
14. If the signal is 5.1 VDC or higher, the SC40 relay R1 is de-energized and ID Fan goes to high speed.
15. Provided the High Air Switch (APS-2) contacts are closed, with analog inputs between 5.1 and 10.0 VDC the EXA Valve will modulate the gas input between mid-fire and high fire.
16. During heating operation, the thermostat, pressure switch and main burner flame are constantly monitored by the IC to assure proper system operation.
17. Operation continues in the High fire mode until the controller input signal to the SC40 control drops to 4.8 VDC. At this point the SC40 R1 relay circuit is energized and switches the ID Fan to low speed operation. Low-fire modulation will continue for analog input voltages from 4.7 VDC.
18. When the thermostat (temperature controller) is satisfied and the demand for heat ends, the heat enable contact opens, power is removed from the T'stat terminal on IC and the combination gas valve is de-energized immediately and a 30 second post-purge occurs (at high speed) before de-energizing the ID Fan.

Ignition and Operational failures during a call for heat result in "lockout" of the ignition control

1. If flame is lost during an operational cycle, the control will respond within 0.8 seconds. The spark will be energized for a trial for ignition period to attempt to relight burners and prove flame sensor. If flame is re-established, normal operation resumes
2. If the burners fail to light or carryover during a trial for ignition, the control will attempt two additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15 second inter-purge period begins and the combustion blower continues to run. After the inter-purge period another ignition trial will take place.
3. If burner fails to light or prove the flame sensor following the two additional trials the control will go into lockout. The valve relay in the IC will be de-energized shutting of the gas valve immediately and the induced draft fan following a 30 second post-purge.

Recovery from Lockout

1. If the thermostat (controller) is still calling for heat one hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.
2. The ignition control may also be manually reset, removing power (24V) to IC terminal 24VAC for 5 seconds then restoring power.

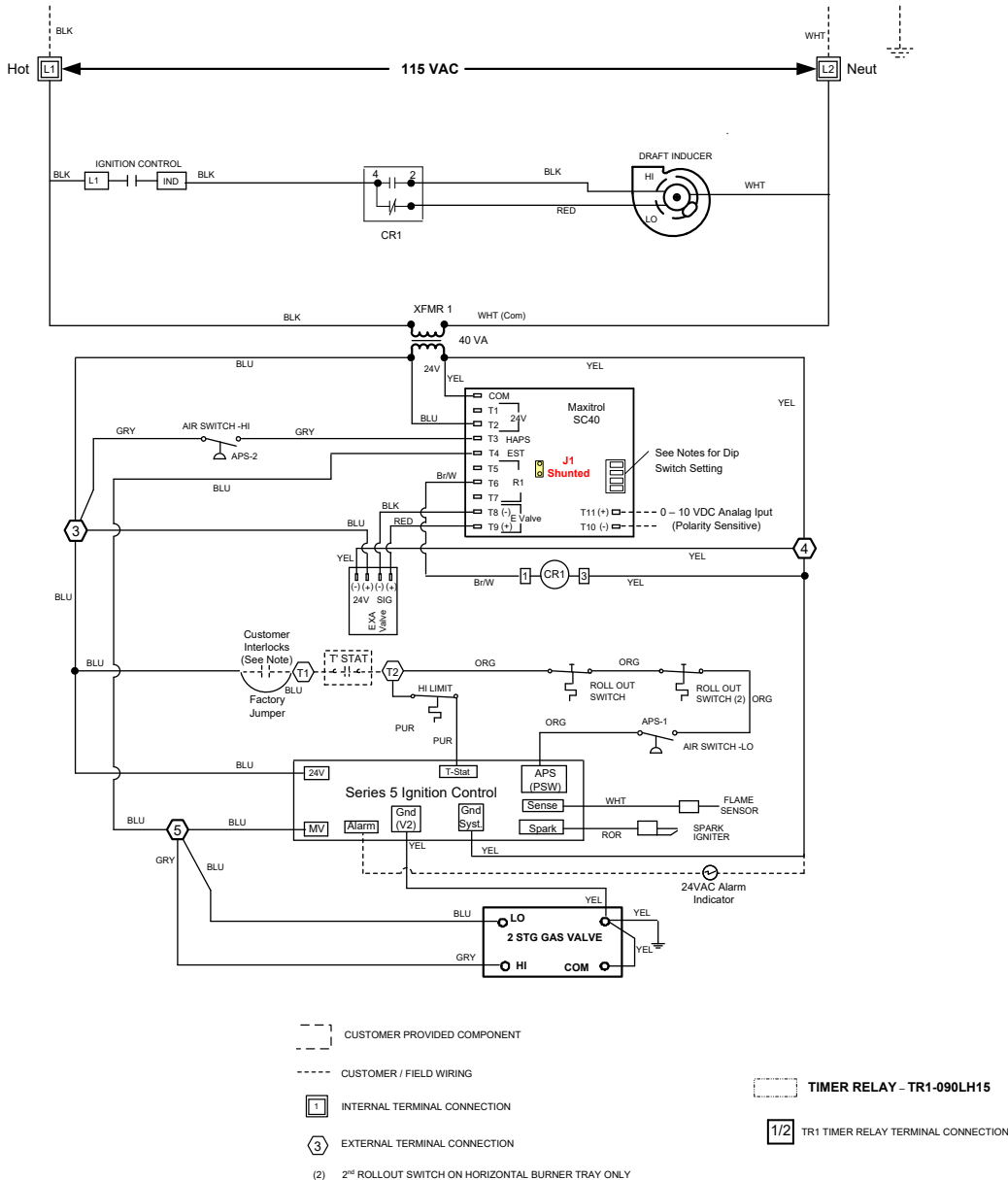
LED Indications, Normal Operation

- Green, 1/2 sec ON, 1/2 sec OFF: Pre-purge, Inter-purge, Post-purge
- Green, blinking rapidly: Trial for ignition
- Green, on solid: Flame detected, pilot/main burners on

ERROR CODES - Red Flashes Error Definition Error Type

- 1 flash, then pause - No flame in trial time Lockout
- 2 flashes, then pause - Flame sense stuck on Lockout
- 3 flashes, then pause - Pilot/Main relay failure Lockout
- 4 flashes, then pause - Repetitive flame loss error Lockout
- 5 flashes, then pause - Rollout error Lockout
- 6 flashes, then pause - APS Airflow error Lockout
- 7 flashes, then pause - Internal control error Lockout
- On Solid Red - Line Voltage/Frequency Error Standby

Figure 77: HM/HD Series – SN Control (Staged Control)



10:1 Modulating Furnace

Sequence

Standby Mode

1. Heat enable (Thermostat) open (No call for heat)
2. Line Voltage applied to Terminals L1 & L2
3. 24 VAC is applied to Terminals T2/COM on the SC30-SM2A (Blue LED lit), to both Ignition Controls (IC) across terminals 24VAC/GND.
4. The ignition control (IC) performs a self-check routine, initiates full time flame sensing, flashes the diagnostic LED for up to four seconds and enters the thermostat scan standby state (Green LED blinks ½ second ON / ½ second OFF).

Startup/Operation - Call for Heat

1. On call for heat, Thermostat (or heat enable) closes (Terminals T1/T2 on terminal strip).
2. Provided that the system safety interlocks (circulating airflow switch and auxiliary high limit) and high limit contacts are closed, 24 VAC is supplied to Section A IC terminal TSTAT.
3. Section A ignition control (IC) will check that APS-1 pressure switch contacts are open, [IC terminal APS (PSW) is not powered].
4. Section A IC Blower (IND) relay contacts close, powering the Induced Draft Fan (ID Fan) which operates at high speed.
5. Combustion Air Switch (APS-1 Low) closes powering terminal APS (PSW) initiating a 15 second pre-purge period.
6. At end of pre-purge period, main gas valve and spark igniter are energized to initiate a trial for ignition. Burners ignite.
7. The SC30-SM2A will output 8.5 VDC to the M Series modulating valve for a pre-programmed 30 second warm-up period (Yellow (SU) and Green (AFS) LED's lit) while maintaining the ID Fan at high speed (Green AFS LED remains lit) and heater Section A operates at preset mid-fire input (30% of total heater input).
8. During this warm-up period, the SC30-SM2A ignores the analog input signal to terminals T12/T13.
9. When the initial timer in SC30-SM2A times out, control will respond to analog input at terminals T12 and T13. Green (Mod) LED is lit.
10. If the controller is providing an analog signal between 0.5 and 5.0 VDC to the SC30-SM2A control, only the modulating section (Section A) will operate from 10%-50% of total heater input.
11. For analog inputs from 0.5 to 2.5 VDC, the ID Fan will run at low speed and LED's PWR (Blue), MOD (Green) R1 (Red) are lit. (Note: Green (AFS) LED may be lit if ID Fan pressure is sufficient to close APS-2). The modulating valve will be powered proportional to the analog input voltage signal and modulating gas input from 10 to 30% of total heater input.
12. For analog inputs from 2.6 to 5.0 VDC to SC30-SM2A the ID Fan will run at high speed (APS-2 closed) and LED's PWR (Blue), MOD (Green) and AFS (Green) are lit. The modulating valve will be powered proportional to the analog input voltage signal and will modulate Section A gas input from 30 to 50% of total heater input.
13. For analog inputs between 5.2 – 7.5 VDC, the SC30-SM2A relay R2 is energized closing contacts between T8 & T9, powering T'stat terminal of Section B Ignition Control (IC). Section B, IC ID Fan relay contacts close powering contact APS (PSW) provided APS-3 and Rollout Switch 2 contacts are closed.
14. Following a 15 second time delay, Section B main gas valve(s) and spark igniter are energized to initiate a trial for ignition. Burners ignite. Section B operates at low fire (25% of total heater input) and ID Fan remains in high speed. LED's PWR (Blue), MOD (Green) R2 (Red) and AFS (Green) are lit.
15. For analog inputs less than 7.6 VDC, Modulating Section A input will be reduced proportional to the analog input voltage signal and will modulate gas input from 25 to 50% of total heater input.
16. For analog inputs between 7.7 – 10.0 VDC, the SC30-SM2A relay R3 is energized closing contacts between T10 & T11, powering Section B 2nd stage gas valve. Section B operates at high fire (50% of total heater input) and ID Fan remains in high speed. LED's PWR (Blue), MOD (Green) R2 (Red), R3 (Red) and AFS (Green) are lit.
17. For analog inputs less than 9.9 VDC, Modulating Section A input will be reduced proportional to the analog input voltage signal and will modulate the gas input from 25 to 50% of total heater input.
18. At an analog input 10.0 VDC, both Section A and Section B will operate at maximum input.
19. During heater operation, the thermostat, pressure switches and main burner flame of both sections are constantly monitored by their IC's and SC30-SM2A to assure proper system operation.
20. Section B operation continues to operate at high fire until the analog input signal to the SC30SM2A control drops below 7.4 VDC. At this point the SC30SM-2A R3 relay opens (Red R3 LED OFF). Section B will operate at low fire.
21. Modulation will continue on the modulating Section A for analog input voltages from 7.4 to 4.9 VDC.

22. Section B operation continues until the analog input signal to the SC30SM2A control drops below 4.8 VDC. At this point the SC30SM-2A R2 relay opens (Red R2 LED OFF). Section B switches OFF.
23. Modulation will continue on the modulating Section A for analog input voltages from 4.8 down to .05 VDC.
24. When the thermostat (temperature controller) is satisfied and the demand for heat ends, the heat enable (thermostat) contact opens, power is removed from the Tstat terminal on Section A IC and the combination gas valve is de-energized immediately and a 30 second post-purge occurs (at high speed) before de-energizing the ID Fan.

Ignition Control Operational Features

Ignition and Operational failures during a call for heat result in "lockout" of the ignition control.

1. If flame is lost during an operational cycle, the ignition control will respond within 0.8 seconds. The spark will be energized for a trial for ignition period to attempt to relight burners and prove flame sensor. If flame is re-established, normal operation resumes
2. If the burners fail to light or carryover during a trial for ignition, the control will attempt two additional ignition trials. If no flame is present at the flame sensor within 10 seconds, the spark and gas valve will be de-energized. A 15 second interpurge period begins and the combustion blower continues to run. After the inter-purge period another ignition trial will take place.
3. If burner fails to light or prove the flame sensor following the two additional trials the control will go into lockout. The valve relay in the IC will be de-energized shutting of the gas valve immediately and the induced draft fan following a 30 second post-purge.

Recovery from Lockout

1. If the thermostat (controller) is still calling for heat one hour after a lockout occurs, the control will automatically reset and initiate a call for heat sequence.
2. The ignition control may also be manually reset, removing power (24V) to IC terminal 24VAC for 5 seconds then restoring power.

Capable Controls Status Indicator LED

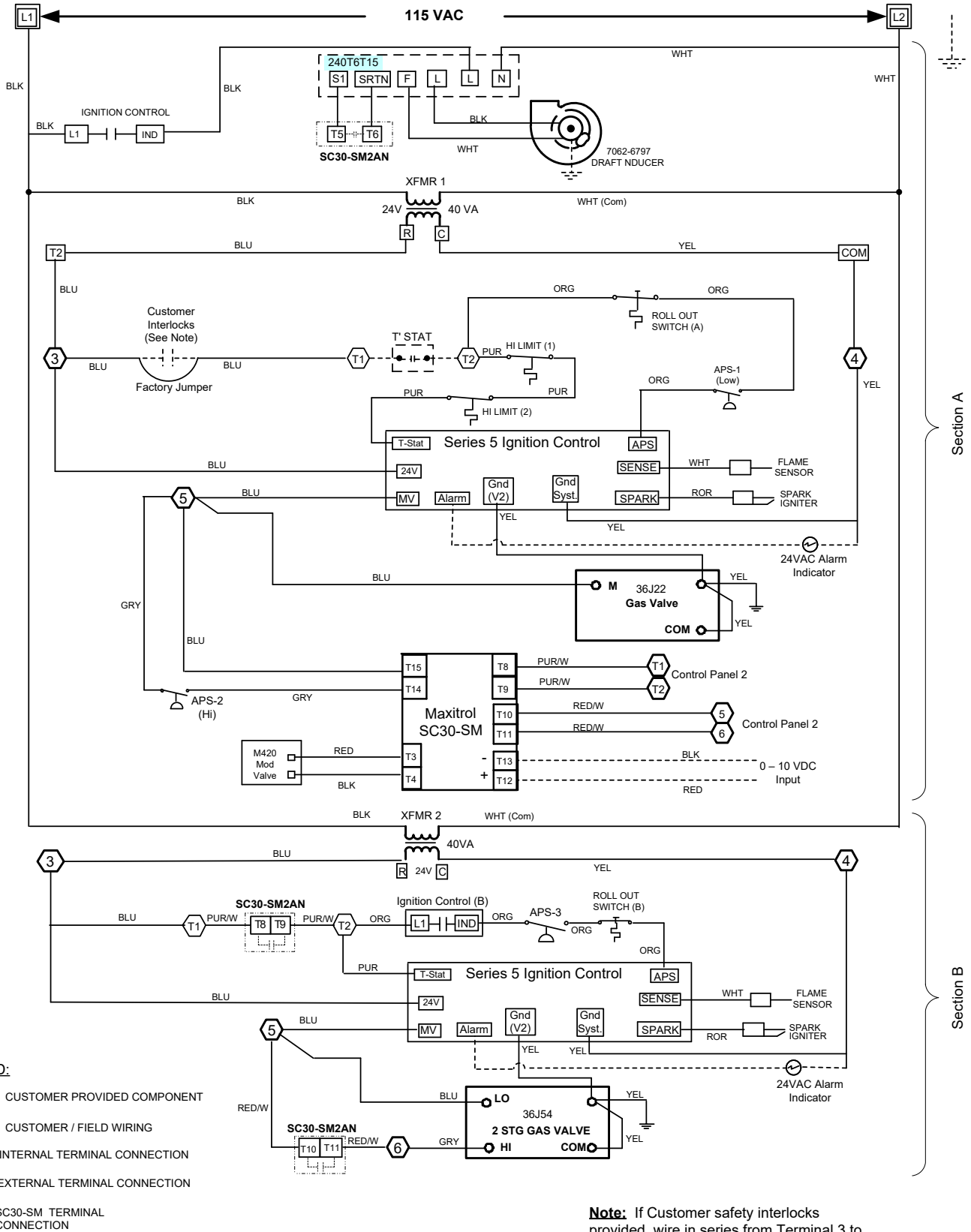
LED Indications, Normal Operation

- Green, ½ sec ON, ½ sec OFF: Pre-purge, Inter-purge, Post-purge
- Green, blinking rapidly: Trial for ignition
- Green, on solid: Flame detected, pilot/main burners ON

ERROR CODES - Red Flashes Error Definition Error Type

- 1 flash, then pause - No flame in trial time Lockout
- 2 flashes, then pause - Flame sense stuck on Lockout
- 3 flashes, then pause - Pilot/Main relay failure Lockout
- 4 flashes, then pause - Repetitive flame loss error Lockout
- 5 flashes, then pause - Rollout error Lockout
- 6 flashes, then pause - APS Airflow error Lockout
- 7 flashes, then pause - Internal control error Lockout ON
Solid Red - Line Voltage/Frequency Error Standby

Figure 78: HM/HD Series - MB Control (10:1)



Section A

Section B

LEGEND:

- CUSTOMER PROVIDED COMPONENT
- - - - - CUSTOMER / FIELD WIRING
- 1 INTERNAL TERMINAL CONNECTION
- 3 EXTERNAL TERMINAL CONNECTION
- T2 SC30-SM TERMINAL CONNECTION

Note: If Customer safety interlocks provided, wire in series from Terminal 3 to T1 & remove factory jumper

Capable Controls – 5 Series Ignition Control

Rack Furnace

HD Rack assemblies employ a Vernier staging modulating control that modulate gas flow up and down to a lead modulating furnace to account for varying heat requirements during operation. Additional slave furnaces have two stage controls which are activated by relays on the staging control to meet higher heating requirements. As slave units are brought on line, the modulating heater gas supply is reduced to meet the system heat demand. Controls are pre-programmed depending on the number of furnaces in the system. The modulating heater is always the top heater.

Figure 79: Typical Rack Distribution Wiring

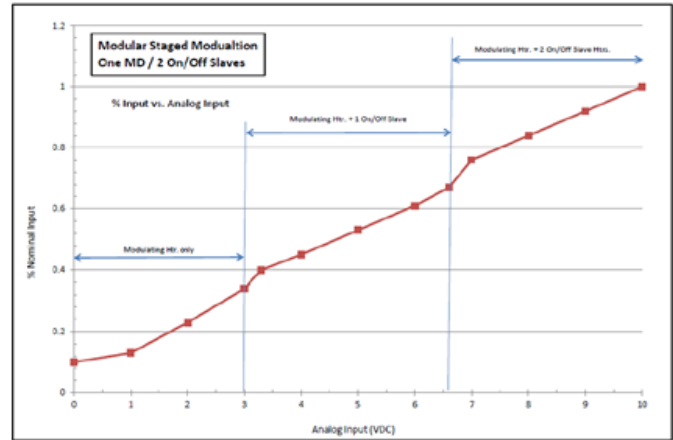


Figure 80: Typical Vernier Control Wiring

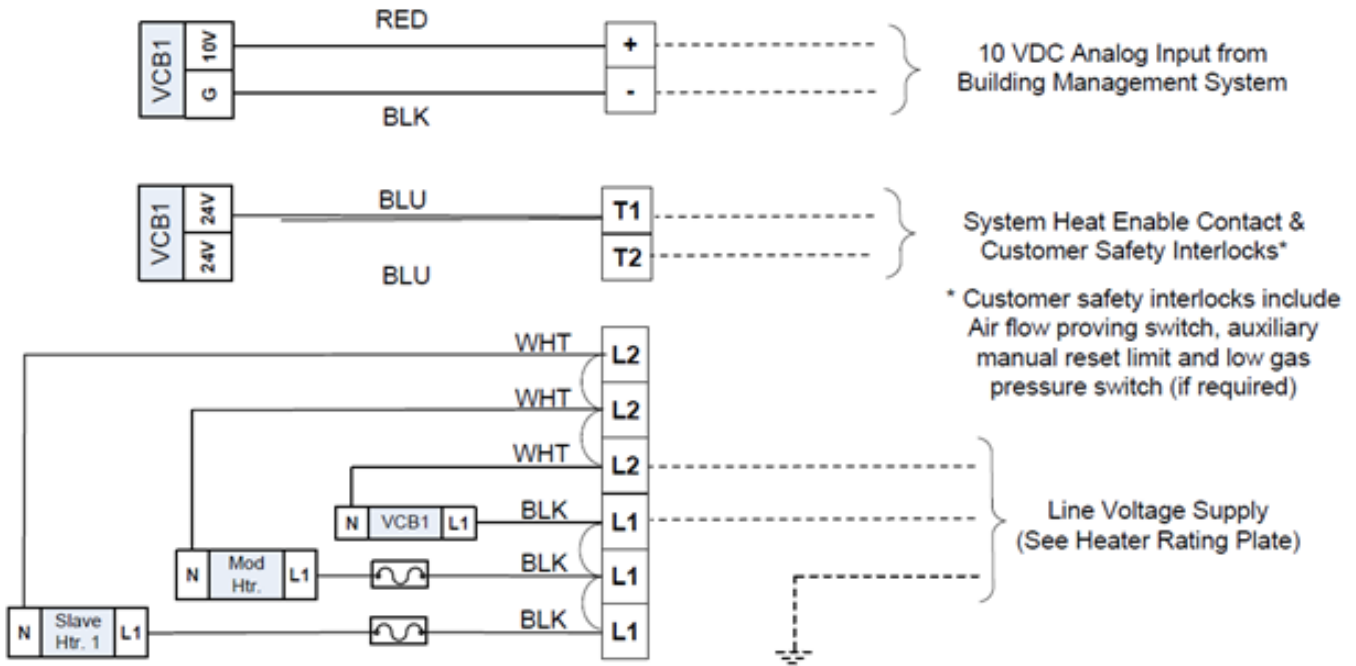


Figure 81: EF (Drum and Tube) High Efficiency Furnace

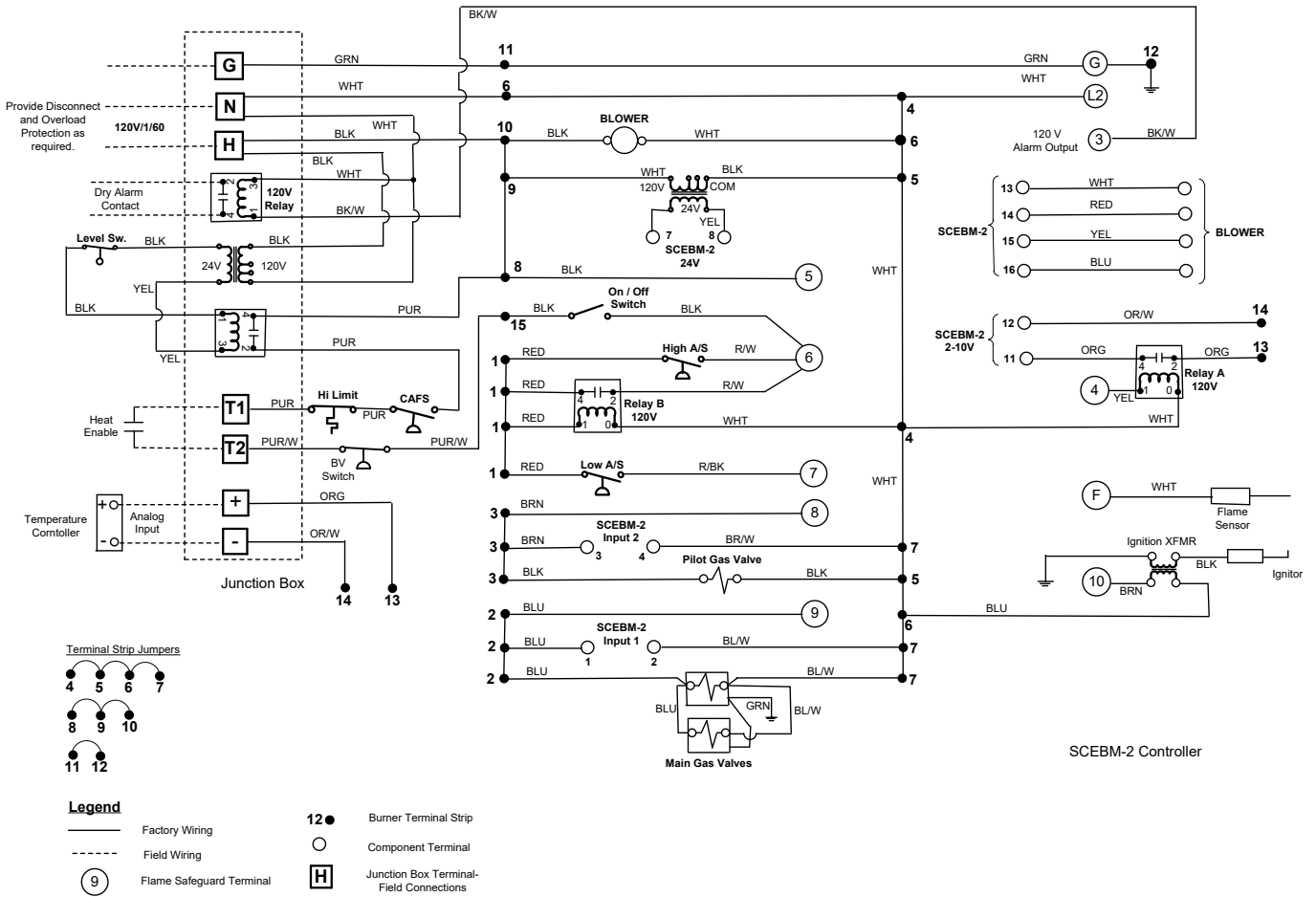
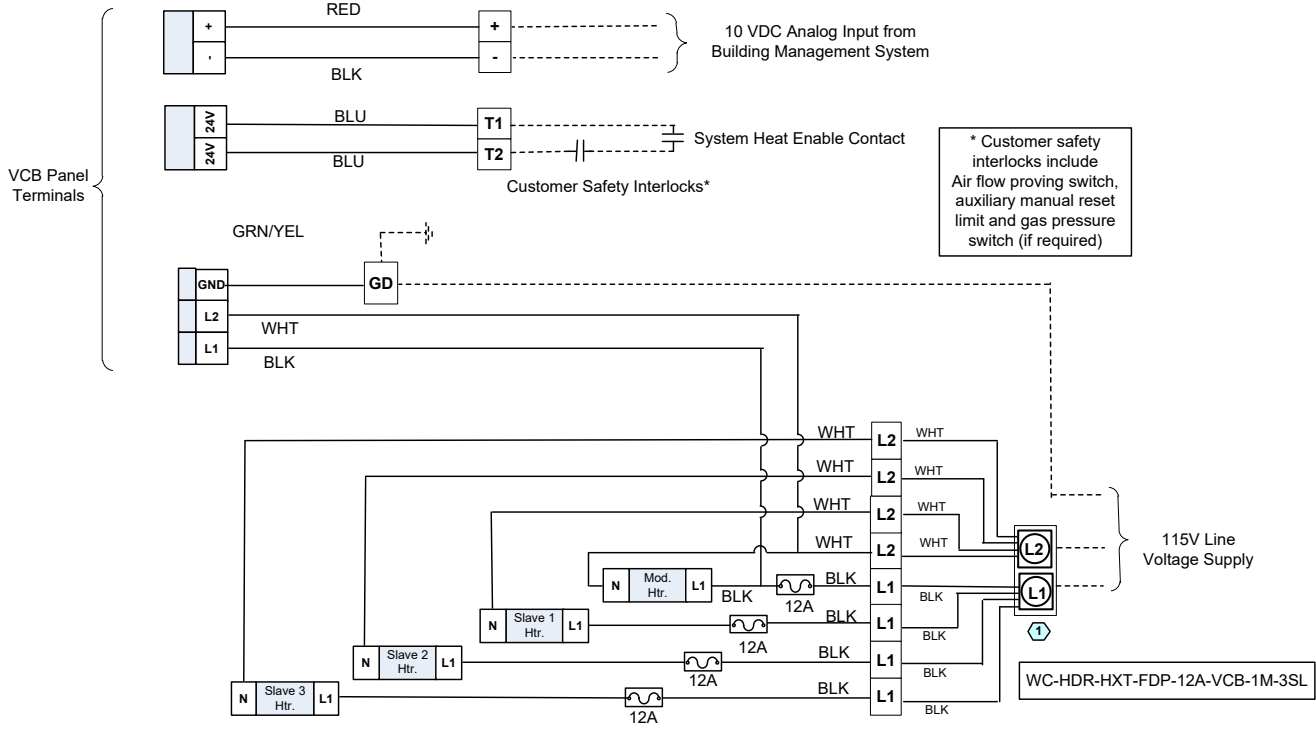


Figure 82: Rack Furnace Wiring Diagram



Legend:

- Distribution Panel Terminal Connection
- N VCB Control Panel terminal
- Factory Wiring
- - - - Customer Wiring
- Fuse

**For use with modular heater assemblies
Models HXT100-125**

Direct Fired Heater

WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

CAUTION

The use and storage of gasoline or other flammable liquids and vapors in open containers in the vicinity of this appliance is hazardous.

DANGER

If you smell gas:

1. Open windows.
2. Do Not touch electrical switches.
3. Extinguish any open flames.
4. Immediately call your gas supplier.

WARNING

Failure to provide proper venting could result in property damage, serious injury, or death.

The unit must have the desiccant reactivation exhaust properly vented to the outside of the building.

An optional direct fired burner consists of the burner, gas train, and a pCO⁵ controller. The pCO⁵ controller only controls the direct fired gas heater and its safeties. It is not a unit controller.

A manual shut-off and sediment trap (supplied by others) shall be installed on the outside of the unit's gas vestibule to be used as the main shut-off of the unit's gas supply, or as how local codes require the installation of such a valve. A minimum 1/8 inch NPT plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the unit. All the different gas piping configurations are not shown in this manual because of the many manifold arrangements that are available for various building code and insurance company requirements, and types of gas modulation. Gas piping must comply with "Standards of National Board of Fire Underwriters" and all applicable local codes and insurance company requirements.

Contact the CDI factory for exact gas piping dimensions, if required. Gas pipes are taped off at the factory before shipment. Be sure to run correctly sized gas line to unit (same size or larger than that used on the unit). Install a manual shutoff valve and a reducing regulator if required. A 1/4 inch NPT pressure tap upstream of the unit regulator is recommended.

Installation

The following recommendations are not intended to supplant any requirements of federal, state, or local codes having jurisdiction. This equipment shall be installed and wired in accordance with regulations of the National Boards of Fire Underwriters, National Electric Code, and local governing bodies. In Canada, equipment should be installed in accordance with the applicable provincial regulations. Furthermore this document is not to relinquish the responsibility of the installer from the correct application of the equipment, nor the safe and correct operation of the unit(s) and other systems that may be required or associated with it. When the unit is to be installed in an airplane hangar, install the unit in accordance with the standard for "Aircraft Hangers", ANSI/NFPA 409 and with CAN/CGA B149 Installation Code when in Canada. When the unit is to be installed in a public garage, install the unit in accordance with the Standard for "Parking Structures", ANSI/NFPA 88A or with the Standard for "Repair Garages", ANSI/NFPA 88B and with CAN/CGA B149 Installation Code when in Canada. Before the unit is turned on for the first time. Steps need to be taken to provide adequate pressure relief for the building to avoid over pressurizing the building when the unit is operated at rated capacity. Pressure relief of the building can be accomplished by taking into account, through standard engineering methods, the structure's design infiltration rate; by providing properly sized relief openings; or by interlocking a power exhaust system; or by a combination.

The DF unit must be LEVEL and located so that there is enough clearance for opening the access doors. In addition to allowing room for access door swing, NEC or others may require 42" or more of clearance in front of the electrical panel or vestibule. Refer to the submittal documents for air flow direction through the unit so that it may be positioned to accommodate

Necessary duct work. Also note from the submittal where electrical and gas hookup points are located so that proper connections can be made. Remember to verify position and ability of support beams, pad, or curb to properly support the unit. At a minimum all DF units are to be supported around the perimeter and across any shipping split. Verify that support structure dimensions coincide with the unit. Locate the unit so that air intakes are not too close to any exhaust fan outlets, gasoline storage, or other contaminants that could potentially cause dangerous situations. The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous. The DF series is burning gas directly into the air stream being heated, therefore anything passing across the burner may be combustive. If the DF series unit is used in an explosion proof environment verify that the potentially explosive materials cannot enter the unit intake(s). Prior to locating the unit, authorities that have jurisdiction should be consulted before installations are made.

Burner shut down

1. Shut of main disconnect
2. Close main gas valve.

Restarting the gas heat after short shut down

1. Open manual gas supply valve and check for leaks
2. Turn on main disconnect
3. Follow pCO⁵ instructions

Restarting the gas heat after a long shut down

1. Check the unit for general cleanliness. ALL debris, small or large, must be removed
2. Make sure all terminals and connections are checked for tightness
3. Check the supply air outlet for and blower inlets to ensure they are free from any obstructions
4. Check blower(s) to make sure shaft rotates freely and sheaves re-aligned.
5. Check sheaves, blowers, and motor bolts or set screws for tightness
6. Check all damper linkages to ensure they are free to move and no binding will occur
7. Open manual gas supply valve and check for leaks
8. Turn on main disconnect
9. Follow pCO⁵ instructions

Air Stream Velocity

⚠ DANGER

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

The use and storage of gasoline or other flammable liquids and vapors in open containers in the vicinity of this appliance is hazardous.

⚠ CAUTION

This heater requires at least 4 cfm outside air per 1000 btu per hour. For details and application limitations, see the manufacturer's instructions.

For your safety, the use and storage of gasoline or other flammable liquids and vapors in open containers in the vicinity of this appliance is hazardous.

Clearance from combustibles: 0" floor, 6" top, and 6" ends.

Standard Burner

Air stream velocity across and through the burner's mixing plates must be kept uniform and within desired limits by use of a silhouette profile plate through which the burner fires.

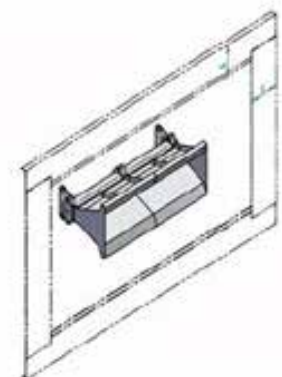
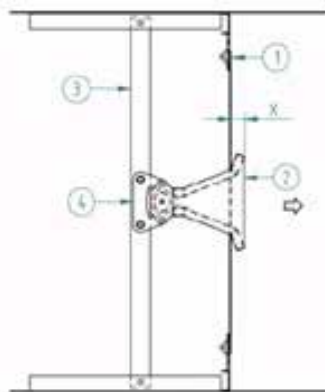
Low NOx Burner

Air stream velocity across and through the burner's mixing plates must be kept uniform and within desired limits by use of a silhouette profile plate through which the burner fires. A 6" (minimum) profile plate should be installed surrounding the interior duct walls at the leading edge of the burner mixing plates.

Figure 83: Silhouette Profile Plate

- 1) Profile plate
- 2) Burner front
- 3) Support
- 4) Burner mounting bracket

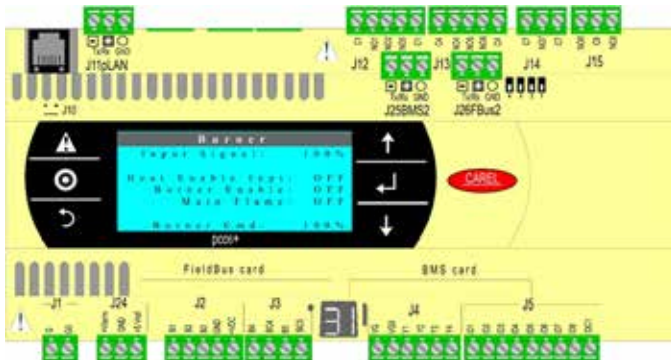
- A Minimum 6"
- B Minimum 6"
- X 1.375"



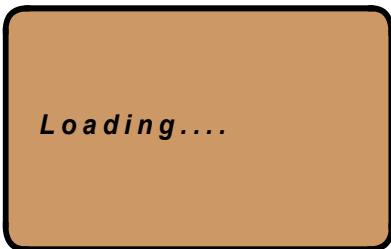
Operation of the Basic pCO⁵⁺ Carel Controller

This is the program on a basic Direct Fired unit; Your program may be similar to this one or may be a custom program that will have some different screens and features.

Figure 84: Controller Components



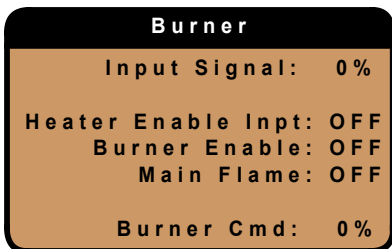
1. When you first power up the controller you will first see this on the screen.



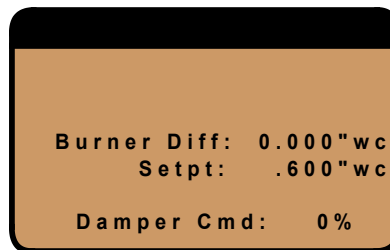
2. Then it will change over to this self-test mode.



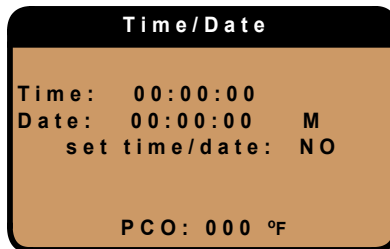
3. After the unit has completed the self-test, it will change to the following screen.



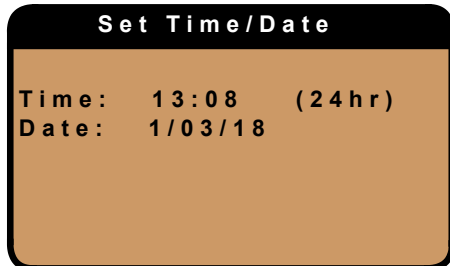
4. The screen above will show if the Input Signal to the Controller, if the Heat Enable Input is ON or OFF, if the Burner is Enabled ON or OFF, if the Main Flame is ON or OFF, and the percent of output to the modulating controller for the burner (example; 10%=1VDC, 50%=5VDC and 100%=10VDC).
5. By using the up ▲ and down ▼ arrow buttons you can scroll through the menu screens on the controller.
6. If you Press the Escape button ⌫ at any time on the controller this will take you back to the beginning screen.
7. Press the down ▼ arrow button to get to the next screen on the controller.
8. The screen below will show you what the Differential Pressure is across the burner, the setpoint differential wanted, and the Damper command (example; 10%=1VDC, 50%=5VDC and 100%=10VDC).



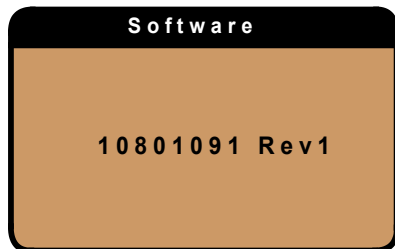
9. If you arrow down ▼ once again it will take you to the screen above showing the actual "Time" and "Date" if not this can be changed by pressing the enter ⏎ button until you get down to the "set time/date" and then press either the up ▲ or down ▼ buttons to change the NO to a YES and press the enter ⏎ button again.



10. This will take you to the screen above that should be and will have the cursor on the hour, use the up ▲ or down ▼ buttons to change this number to the appropriate hour (this is in 24 hour format) example 9PM would be "21". Next press the enter button again to place the cursor on the "Min" number, then use the up ▲ or down ▼ arrow buttons to change this number to the actual minute.

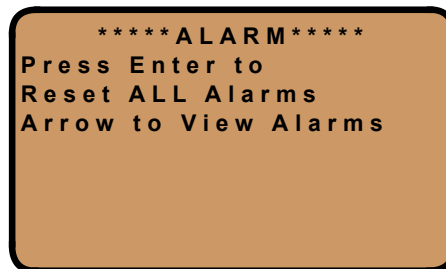


11. Next press the enter button again to place the cursor on the "Day" number, then use the up ▲ or down ▼ arrow buttons to change this number to the actual day of the month. Next press the enter button again to place the cursor on the "Month" number, then use the up ▲ or down ▼ arrow buttons to change this number to the actual month. Next press the enter button again to place the cursor on the "Year" number, then use the up ▲ or down ▼ arrow buttons to change this number to the actual year. Then press the escape button to exit this screen and it will take you to the top level screen. By using the down ▼ arrow button until you get to the screen showing the time and date to make sure they are changed.
12. If you arrow down ▼ once again it will take you to the screen above right displaying the program part number and rev information.

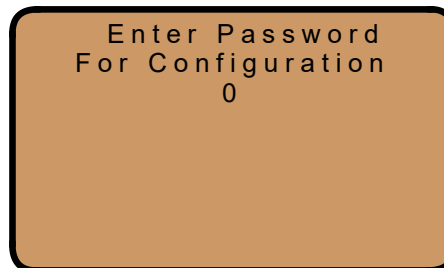


13. If you arrow down ▼ once again it will take you to back to the first screen (see #3).
14. The Alarm button will light up red when the unit is in alarm.

15. To view the alarms;
 - a. Push the Alarm Bell button and then scroll using the up ▲ and down ▼ arrow buttons to view all the alarms before resetting.
 - b. Next, press the Enter button if you want to reset all of the alarms before viewing them.
 - c. If you press the Enter button before pushing the up ▲ and down ▼ arrow buttons to scroll through the alarms you will not know if the unit was down on more than one alarm.
16. To view what Alarms the unit has faulted on press the up ▲ or down ▼ arrow to see what alarm that has caused the unit to shut down. Then press the escape button to exit this screen and it will take you to the top level screen.



17. If you happen to press the Program button you will need to have the Service Password to proceed, or just press the escape button to exit this screen and it will take you to the top level screen.



18. The Program password is used to enter other parts of the program, like the Service Menu. (This is not recommended for the basic user, only for a qualified trained service technicians)

BACnet Points

Table 29: Analog Variables

BMS Address	Description	Read/Write	Variable name
2	Burner Cmd Signal to burner	R	Burner_cmd
3	command to VAV dampers	R	BurnerDamperCmd
4	Customer Burner Cmd input Signal	R	Burner_cmd_in
13	pco board temp	R	pcoTemp

Table 30: Integer Variables

BMS Address	Description	Direction	Variable name
9	Profile pressure /1000	R	profilePressure
95	Current minute	R	CURRENT_MINUTE
96	Current hour	R	CURRENT_HOUR
97	Current year	R	CURRENT_YEAR
98	Current month	R	CURRENT_MONTH
99	Current day	R	CURRENT_DAY

Table 31: Digital Variables

BMS Address	Description	Direction	Variable name
1	customer's burner enable input	R	Cust_Brnr_Enable_In
2	Main Flame	R	MainFlame
3	burner enabled	R	burner_ena
13	External Fault	R	mExternal_Fit
25	General Alarm	R	gen_alarm
27	used to reset alarms in logic	R/W	USAshr_reset_alarms

Periodic Maintenance

1. Check all moving parts for wear every six months.
2. Check bearing collar, sheave, and wheel hub setscrews, sheave capscrews, and bearing hold-down bolts for tightness every six months.
3. Annually check and snug all electrical connections. Inspect for signs of water damage such as corrosion and repair if necessary. Check ground conductor and connection integrity. Service if needed.

Ball Bearing Lubrication



Bearing overheating potential. Can damage the equipment. Do not over-lubricate bearings. Use only a high grade mineral grease with a 200°F safe operating temperature. See below for specific recommended lubricants.

Motor Bearings

Supply and return fans—Supply and return fan motors should have grease added after every 2000 hours of operation. Using the following procedure, re-lubricate the bearings while the motor is warm, but not running. Use one of the greases shown in Table 32.

NOTE: Direct Drive Class II fans that are supplied with TECO motors have double shielded bearings on frame sizes 140T-280T. These bearings are pre-packed with a long life grease and are not re-greaseable. Larger frame size TECO motors are re-greaseable and follow the same lubrication recommendations as all other motors.

1. Remove and clean upper and lower grease plugs.
2. Insert a grease fitting into the upper hole and add clean grease (Table 32) with a low pressure gun.
3. Run the motor for five minutes before replacing the plugs.

NOTE: Specific greasing instructions are located on a tag attached to the motor. If special lubrication instructions are on the motor, they supersede all other instructions.

Table 32: Recommended Lubricants and Amounts for Fan Motor Bearings

Mfr. Grease	NEMA Size	Amount to Add (oz.)
Texaco, Polystar	56 to 140	0.08
	140	0.15
or Polyrex EM (Exxon Mobil)	180	0.19
	210	0.30
or Rykon Premium #2	250	0.47
	280	0.61
or Penzoil Pen 2 Lube	320	0.76
	360	0.81
	400	1.25
	440	2.12

Fan Shaft Bearings



For safety, stop rotating equipment. Add one half of the recommended amount shown in Table 32. Start bearing, and run for a few minute Stop bearing and add the second half of the recommended amount. A temperature rise, sometimes 30°F (1°C), after re-lubrication is normal. Bearing should operate at temperature less than 200°F (94°C) and should not exceed 225°F (107°C) for intermittent operation. For a re-lubrication schedule, see Table 33. For applications that are not in the range of the table, contact Daikin.



The tables below state general lubrication recommendations based on our experience and are intended as suggested or starting points only. For best results, specific applications should be monitored regularly and lubrication intervals and amounts adjusted accordingly.

Any good quality lithium or lithium complex base grease, using mineral oil, conforming to NLGI grade 2 consistency, and an oil viscosity of 455-1135 SUS at 100°F (100-200 cSt at 40°C) may be used for re-lubrication.

Compatibility of grease is critical. Re-lubricatable bearings are supplied with grease fittings or zerks for ease of lubrication with hand or automatic grease guns. Always wipe the fitting and grease nozzle clean.

Table 33: Re-lubrication Intervals

(Use NLGI #2 Lithium or Lithium Complex Grease)

Speed	Bearing Temperature	Cleanliness	Relub. intervals
100 rpm	Up to 120°F (50°C)	Clean	6 to 12 months
500 rpm	Up to 150°F (65°C)	Clean	2 to 6 months
1000 rpm	Up to 210°F (100°C)	Clean	2 weeks to 2 months
1500 rpm	Over 210°F (100°C) to 250°F (120°C)	Clean	Weekly
Above 1500 rpm	Up to 150°F (65°C)	Dirty/wet	1 week to 1 month
Max catalog rating	Over 150°F (65°C) to 250°F (120°C)	Dirty/wet	Daily to 2 weeks
	Above 250°F (120°C)		Contact Browning

Table 34: Recommended Fan Re-lubrication Grease Charge

Shaft Size – in. (mm)	Oz (g)
1/2 to 3/4 (20)	0.03 (0.85)
7/8 to 1-3/16 (25-30)	0.10 (2.84)
1-1/4 to 1-1/2 (35-40)	0.15 (4.25)
1-11/16 to 1-15/16 (45-50)	0.20 (5.67)
2 to 2-7/16 (55-60)	0.30 (8.51)
2-1/2 to 2-15/16 (65-70)	0.5 (15.59)
3 to 3-7/16 (75-80)	0.85 (24.10)
3-1/2 to 4 (85-105)	1.5 (42.53)

Fan Drive

WARNING
Before servicing lock out and tag out all power to the unit. Fans or belts cause severe personal injury or death.

WARNING
Do not open the hinged access door and screw-fastened access panels while the unit is operating. Moving parts and strong suction forces can cause severe personal injury or death.

Upon completion of the air balance, replace the variable pitched motor sheave with a properly sized, fixed sheave. A matching fixed sheave provides longer belt and bearing life and minimizes vibration. Initially, it is best to have a variable pitched motor sheave for the purpose of air balancing. Once the balance is achieved, fixed sheaves maintain balancing and alignment more effectively. Replace the adjustable sheaves with fixed sheaves.

With the electrical power disconnected, locked and tagged out, measure the diameter of the V-belt outer surface where it passes around the sheave (pitch diameter). Calculate fan speed from the motor nameplate rpm.

$$\text{Fan rpm} = \text{motor rpm} \times \frac{\text{Measured diameter at motor sheave}}{\text{Measured diameter at fan sheave}}$$

VM and VP Variable Pitch Key Type Sheaves

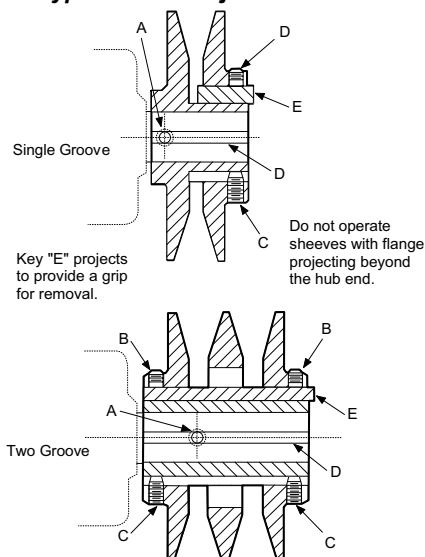
Mounting

1. Mount all sheaves on the motor or driving shaft with the setscrews **A** toward the motor.
2. Verify that both driving and driven sheaves are in alignment and that shafts are parallel.
3. Fit internal key **D** between sheave and shaft and lock setscrew **A** securely in place.

Adjusting

1. Loosen setscrews **B** and **C** in moving parts of sheave and pull out external key **E**. (This key projects a small amount to provide a grip for removing.)
2. To adjust sheave pitch diameter for desired speed, open moving parts by half or full turns from closed position. **Do not open more than five full turns for A belts or six full turns for B belts.**
3. Replace external key **E** and securely tighten setscrews **B** over key and setscrews **C** into keyway in fixed half of the sheave.
4. Put on belts and adjust belt tension. **Do not force belts over grooves.** See [See Fan Drive Belt Adjustment on page 67.](#)
5. Make future adjustments by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Re-adjust belt tension before starting drive.
6. To provide the same pitch diameter, adjust both halves of the two-groove sheaves by the same number of turns from closed position.
7. Verify that all keys are in place and that all setscrews are tight before starting drive. Check setscrews and belt tension after 24 hours service.

Figure 85: VP Type Sheave Adjustment



LVP Variable Speed Sheaves

Mounting

1. Slide sheave on motor shaft so that the side of the sheave with setscrew **A** is next to the motor when setscrew **A** is in the hub or barrel of the sheave.
2. When setscrew **A** is at an angle in the center flange **B**, mount it away from the motor so that the outer locking ring and flange can be removed to get to the setscrew.
3. To remove the flange and locking ring:
 - a. Loosen setscrews **D**.
 - b. Loosen but **do not remove** capscrews **E**.
 - c. Remove key **F**.
 - d. Rotate the flange counterclockwise until it disengages the threads on the sheave barrel.

NOTE: This key projects a small amount to provide a grip for removing.

4. Verify that the driving and driven sheaves are in alignment and the shafts are parallel. When aligning two-groove sheaves, allow room between the sheave and motor to access capscrews **E**.
5. Insert key **C** between the sheave and the shaft and tighten setscrew **A** securely.
6. If flange and locking ring have been removed, when replacing them make sure that the inner and outer flanges are open from the closed position by the same amount as the other flange. Determine this by accurately measuring the top width of the grooves.
7. Insert key **F**.
8. Tighten setscrews **D** and capscrews **E**.
9. Put on belts and adjust belt tension. **Do not force belts over grooves.** See [See Fan Drive Belt Adjustment on page 67.](#)
10. Before starting the drive, ensure that all keys are in place and all setscrews and all capscrews are tight. Check and retighten all screws and retention belts after approximately 24 hours of service.

Adjusting

1. Slack off belt tension if belts have been installed.
2. Loosen setscrews **D**.
3. Loosen but do not remove capscrews **E**.
4. Remove key **F**.

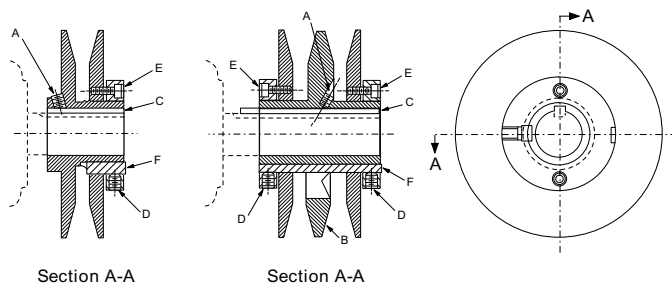
NOTE: This key projects a small amount to provide a grip for removing.

5. Adjust pitch diameter by opening or closing the movable flanges by half or full turns.

NOTE: Two-groove sheaves are supplied with both grooves set at the same pitch diameter.

6. To provide the same pitch diameter for satisfactory operation, move both movable flanges the same number of turns. Do not open sheaves more than five turns for **A** belts or six turns for **B** belts.
7. Replace key **F**.
8. Tighten setscrews **D** and capscrews **E**.
9. If belts have been installed, readjust belt tension. If belts have not been installed, install them and adjust belt tension. **Do not force belts over grooves.** See [See Fan Drive Belt Adjustment on page 67](#).
10. Before starting the drive, ensure that all keys are in place and all setscrews and all capscrews are tight. Check and retighten all screws and retention belts after approximately 24 hours of operation.

Figure 86: LVP Type Sheave Adjustment



MVP Variable Speed Sheaves

Mounting

1. Verify both driving and driven sheaves are in alignment and the shafts are parallel. The centerline of the driving sheave must be in line with the centerline of the driven sheave. See [Figure 87](#).
2. Verify that all setscrews are torqued to the values shown in [Table 35](#) before starting drive. Check setscrew torque and belt tension after 24 hours of service.

Adjusting

1. Adjust motor base forward to release belt tension. Remove the belts for easier adjustment.
2. Loosen, but do not remove both of the locking setscrews **A** in the outer locking ring by using a hex key or torque wrench with a hex bit.
3. Adjust sheave to desired pitch diameter by turning the outer locking ring. Use a spanner wrench or drift inserted into the three holes that are located 120° apart on the ring.
4. Any pitch diameter can be obtained within the sheave range. One complete turn of the outer locking ring changes the pitch diameter 0.233".
5. Do not open sheaves more than the following:
 - a. Do not open **B** sheaves more than 4, 3/4 turns for the **A** belts or 6 turns for the **B** belts.
 - b. Do not open **C** sheaves more than 9, 1/2 turns.
 - c. Do not open **5V** sheaves more than 6 turns.
 - d. Do not open **8V** sheaves more than 8 turns.
6. Tighten BOTH locking screws **A** in the outer locking ring before operating the drive. Use a torque wrench and tighten to the value shown in [Table 35](#).
7. Replace belts and adjust the motor base to tension the belts properly. See [See Fan Drive Belt Adjustment on page 67](#).
8. Do not loosen any screws other than the two locking screws **A** in the outer locking ring when adjusting the sheave pitch. Do not operate the drive until the locking screws have been set to the torque specifications.

Table 35: Screw Torque Values

Nominal screw size (dia—thds/in)	Socket-head cap screws		Flat-head socket screws	Hollow-head set screws only			
	Seating torque (in-lbs)	Seating torque (in-lbs)		Lengths equal or greater than dia.		For lengths (L) less than dia.	
			Seating torque (in-lbs)	Seating torque (in-lbs)	Seating torque (in-lbs)	Seating torque (in-lbs)	Length (L) (in-lbs)
1/4-20NC	150	12.5	100	87	7.3	3/16	50
5/16-11NC	305	25.4	200	165	13.8	1/4	90
3/8-16NC	545	45.4	350	290	24.2	1/4, 5/16	150, 250
1/2-13NC	1300	108.3	N/A	620	51.7	N/A	N/A
5/8-11NC	N/A	N/A	N/A	1225	102.1	N/A	N/A

Figure 87: Sheave Alignment

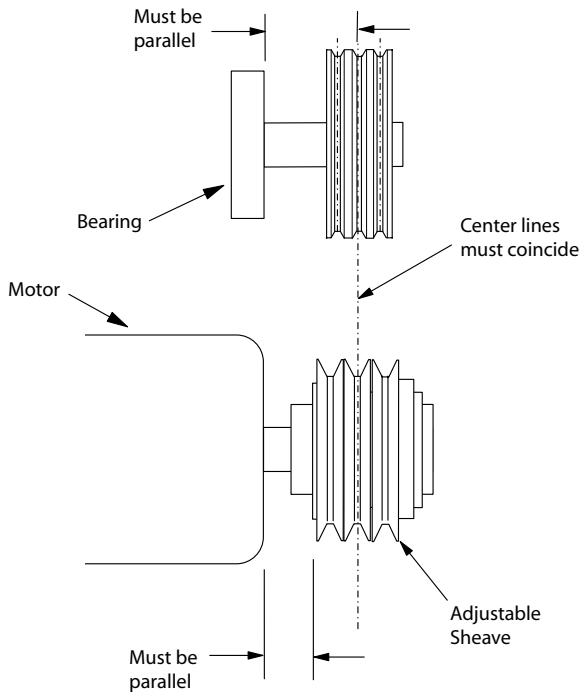
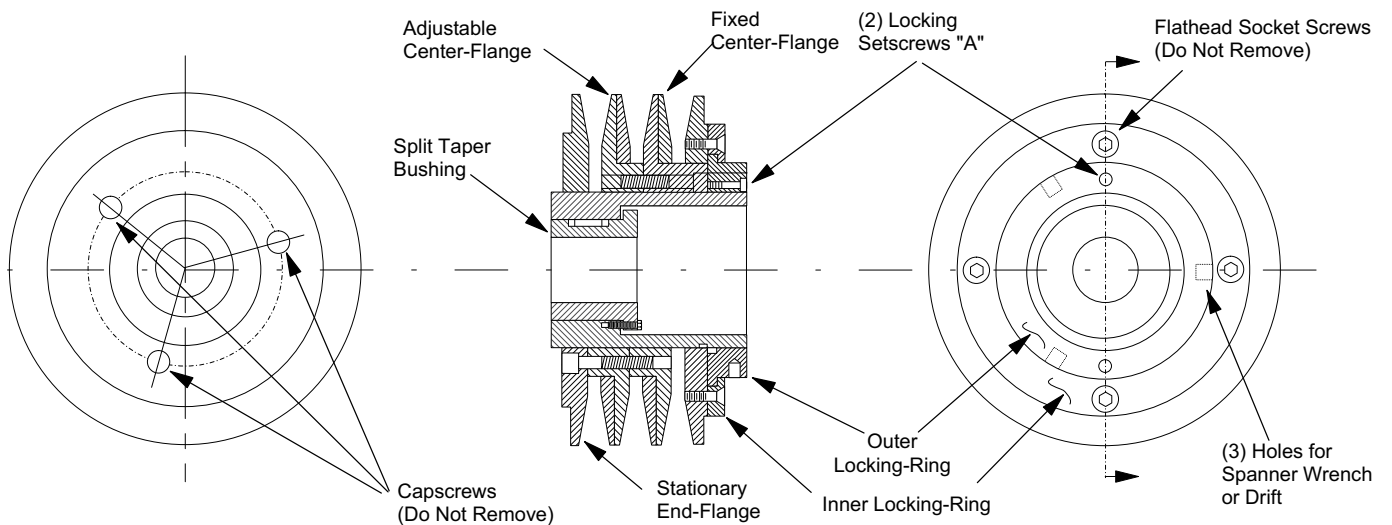


Figure 88: Adjustable Sheave Components



Fan Drive Belt Adjustment

WARNING

Moving belt and fan can cause severe personal injury or death.

During installation and filter maintenance:

- Verify that the belt and fan guards on plenum fan units are always in place.
- Lock and tag out fans to prevent accidental start up.
- Do not enter the filter compartment until the fan is completely stopped.
- Use approved equipment for reaching filters located above normal reach. Do not step on filter frames or unit components.
- Floor surfaces must be dry and free of oil or grease.

General Rules of Tensioning

1. The ideal tension is the lowest tension at which the belt does not slip under peak load conditions.
2. Check tension frequently during the first 24 to 48 hours of operation.
3. Over tensioning shortens belt and bearing life.
4. Keep belts free from foreign material that can cause slippage.
5. Inspect V-drive on a periodic basis. Adjust tension if the belt is slipping. Do not apply belt dressing. This can damage the belt and cause early failure.

Tension Measurement Procedure

1. Measure the belt span. See [Figure 89](#).
2. Place belt tension checker squarely on one belt at the center of the belt span. Apply force to the checker, perpendicular to the belt span, until the belt deflection equals belt span distance divided by 64. Determine the force applied while in this position.
3. Compare this force to the values in [Table 36](#).

Figure 89: Drive Belt Adjustment

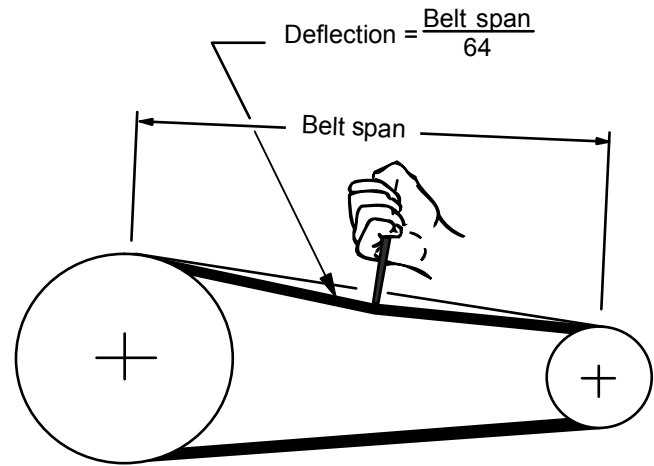


Table 36: Belt Deflection Force (per Browning Specifications)

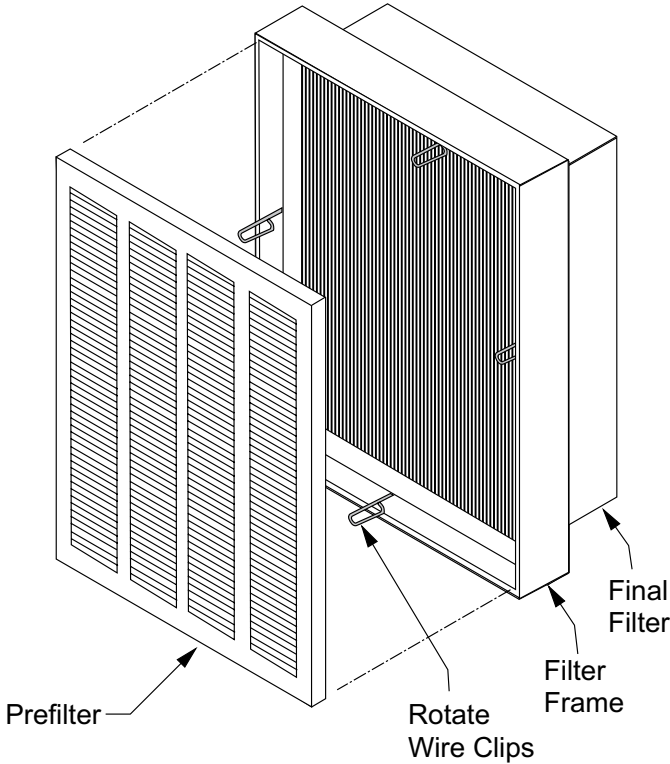
Cross section	Small sheave diameter (in)	Number of belts (deflection force lbs)					
		1		2		3 +	
		min	max	min	max	min	max
A, AX	0.0 to 3.5	3.0	5.0	2.5	4.0	2.0	3.5
	3.6 to 4.4	3.5	5.0	3.0	4.5	2.0	4.0
	4.5 +	4.0	5.5	3.0	5.0	2.5	4.5
B, BX	0.0 to 5.4	5.5	8.0	4.5	7.0	3.5	5.5
	5.5 to 7.6	5.5	8.5	4.5	7.5	3.5	5.5
	7.7 +	6.5	9.0	5.0	8.0	4.0	6.5
5V, 5VX	0.0 to 8.5	7.0	11.0	5.5	9.0	4.0	7.0
	8.6 to 12.0	8.5	13.0	6.5	10.5	5.0	8.0
	12.1 +	10.0	15.0	7.5	11.5	5.5	9.0

Front Load Filter Option

Front loaded filter options require that the filters be removed and replaced from inside the unit.

To remove filters, rotate the wire clips. This releases both the prefilter and the final filter. When installing clean filters, check to verify the filters are fully seated in the frame (Figure 90).

Figure 90: Frame and Filters with Holding Clips



Filter Gauges

Filter gauges indicate pressure drop for installed filters. If prefilters are present, the gauge will indicate the pressure drop for both pre-and final filters

Table 37 shows the typical filter pressure drop for clean filters at rated air flow. The tables also show a final pressure drop for front loaded filters.

Where a single filter gauge is used, the prefilters can be removed to check the pressure drop of the final filters.

Figure 91: Filter Gauge

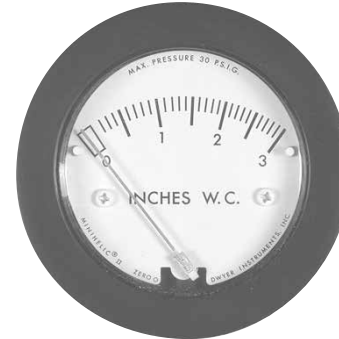


Table 37: Filter Pressure Drops

Bag filters—DriPak 2000				
Efficiency	45%	65%	85%	95%
Rated velocity (fpm)	625	500	500	500
Initial pressure drop	0.20–0.26	0.21–0.30	0.34–0.48	0.50–0.70
Initial pressure drop	1.0	1.0	1.0	1.0
Cartridge filters—Varicel II MH, 4.25" deep				
Efficiency	65%	85%	95%	
Rated velocity (fpm)	500	500	500	
Initial pressure drop	0.43	0.61	0.70	
Final pressure drop	1.5	1.5	1.5	
Cartridge filters—Varicel SH, 12" deep				
Efficiency	70%			
Rated velocity (fpm)	500			
Initial pressure drop	0.39			
Final pressure drop	1.2			
Pleated panel filters				
Type	Perfect pleat	AMAir 300 4"		
Efficiency	30%	30%		
Rated Velocity (fpm)	500	625		
Initial Pressure Drop	0.36	0.36		
Final Pressure Drop	1.0	1.0		
5700 filters				
Efficiency	N/A			
Rated velocity (fpm)	500			
Initial pressure drop	0.25			
Final pressure drop	1.0			
Pleated 62 Plus filters				
Size	2"	4"		
Efficiency	70%	70%		
Initial pressure drop	0.42	0.37		
Final pressure drop	1.0	1.0		

Coils

1. The coil must be clean to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Use a chemical coil cleaner on multiple row coils. Read and follow the chemical cleaner's instructions as some cleaners may contain harsh chemicals. Take care not to damage fins while cleaning.
2. Drain pans in any air conditioning unit may have some moisture. Algae, etc., can grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this buildup from plugging the drain and causing the drain pan to overflow. Also, keep the drain pans clean to prevent the spread of disease. Cleaning should be performed by qualified personnel.
3. Dirt and lint can clog the condensate drain, especially with dirty filters. Inspect twice a year to help avoid overflow.

Winterizing Water Coils

 **WARNING**

Mold can cause personal injury. Clean drain pan regularly so mold does not develop.

Coils can freeze due to air stratification or failure of outdoor air dampers and/or preheat controls. Do not depend on routine draining of water cooling coils for winter shutdown as insurance against freeze-up. Severe coil damage can result. Drain all coils as thoroughly as possible and then treat in the following manner.

- Fill each coil independently with an antifreeze solution using a small circulating pump and again thoroughly drain.
- Check freezing point of antifreeze before proceeding to next coil. Due to a small amount of water always remaining in each coil, there is a diluting effect. The small amount of antifreeze solution remaining in the coil must always be concentrated enough to prevent freeze-up.

NOTE: Carefully read instructions for mixing antifreeze solution used. Some products have a higher freezing point in their natural state when mixed with water. Daikin is not responsible for the freezing of coils.

Removing and Replacing Components

 **WARNING**

Before removing component, lock out and tag out all power to the unit. Fans and belts can cause severe personal injury or death.

See [Panels, Frame Channels, and Doors on page 9](#) for instructions on removing panels and opening fan access doors to remove or replace components.

Removing the Fan Section

The fan shaft, motor, and any drive components can be removed and replaced through the access door opening. If required, the side panel can be removed for additional access.

If fan replacement is required, the entire fan assembly can be pulled out the side of the cabinet for housed fan assemblies. The fan assembly includes the fan housing, the bearing support, and the fan base.

Removing the Fan Assembly

1. Remove the side panels and any intermediate supports (follow instructions for side panel removal).
2. Once the panels and any intermediate supports are removed, disconnect the neoprene bulk head seal that is attached to the fan discharge.
3. Remove the four discharge angles that hold the neoprene canvas in place around the discharge opening.
4. Disconnect the fan sled from each of the corner mounts and pull the entire assembly out the side of the unit.
5. After the fan sled is out, loosen the fan bearings and pull out the shaft.
6. Disconnect the fan housing from the fan sled, and bearing support by removing the attaching bolts.
7. Replace the new fan, reconnect the shaft and bearings and put the fan assembly in the cabinet.
8. Replace panels and fasteners.

Removing the Fan Section

For plenum fan assemblies, the entire fan cabinet may need to be removed to replace the entire fan assembly depending on the length of the fan section. In some cases, the fan section is not long enough for the assembly to fit out the side of the cabinet. For those cases where it will fit, follow the above steps except the neoprene seal is a D-gasket on the inlet side that needs to be removed for plenum fans. Otherwise, the entire fan cabinet must be removed from the other sections and then the fan assembly can be removed out the discharge side of the cabinet.

Removing and Replacing the Coil

Removing Single Coils

NOTE: Single coils are bolted to the unit on the connection end. The connection end is held in place with a clamp.

1. Disconnect all piping and remove the brass plugs for the vents and drains located in the connections.
2. Remove all screws and remove the access panel.
3. Remove the screws holding the coil in place.
4. Lift and pull the coil out the side.

Installing Single Coils

1. Slide the coil through the opening in the coil section onto the bottom coil rests.
2. To prevent any air bypass around the coil, place coils up against the coil bulkheads. See [Figure 92](#).
3. Once the coil is in place, fasten the coil to the section.
4. Caulk the seams between the coil casings and bulkheads.
5. If this is an additional coil being installed and not a replacement, locate the coil supply and return connections dimensionally. Carefully drill holes in the end panels of the unit.
6. Remove the brass plugs for the vents and drains on the connections.
7. Slip the panel over the connections.
8. Replace the brass plugs and panel fasteners.

Figure 92: Single Coil Top Installation/Removal

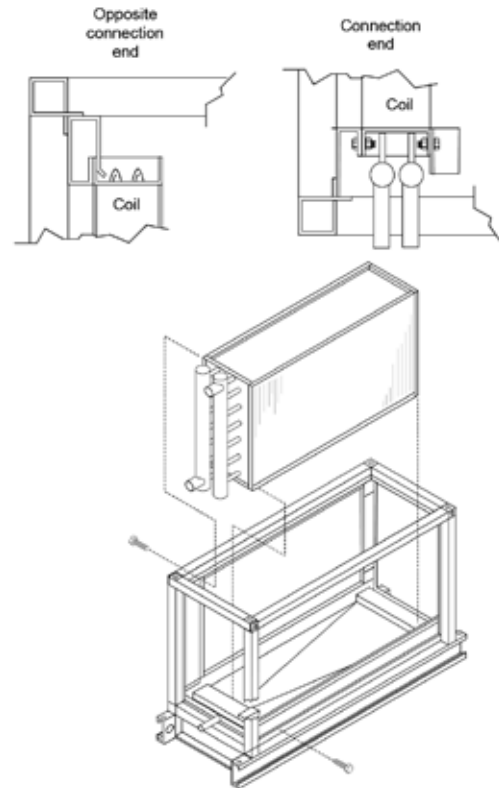
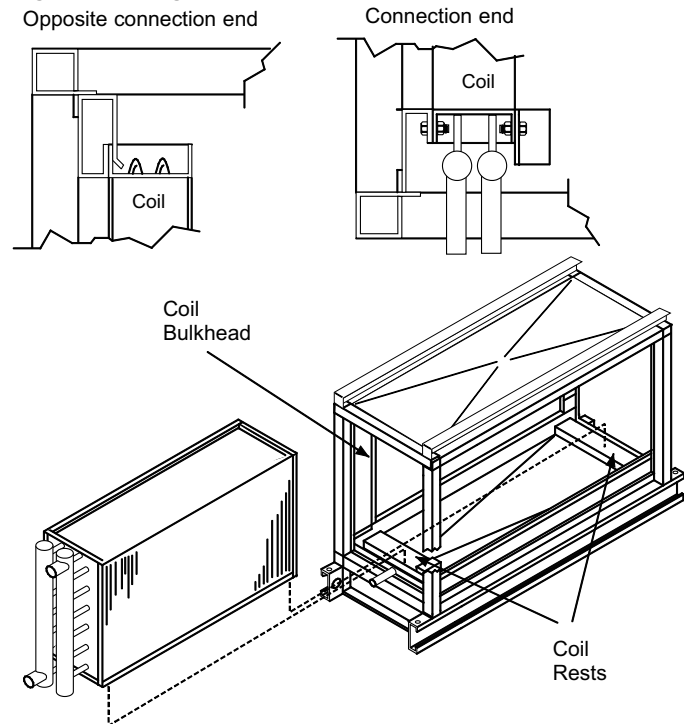


Figure 93: Single Coil Side Installation/Removal



Removing Stacked Coils

NOTE: Top and bottom stacked coils are held together with steel plate and screws on one side and drain trough and screws on the other side. Remove the plate and trough before removing the coils. The coils cannot be removed attached together.

1. Disconnect all piping and remove the brass plugs for the vents and drains located in the connections.
2. Remove all screws and remove the access panel.
3. Remove the bolts holding the coil in place and then lift and pull out the coil from the side.
4. Remove the steel plate and the drain trough that holds the coils together.
5. Remove the bolts on both ends of the top coil holding it in place and then lift and slide the coil out.
6. Remove the bolts on both ends of the bottom coil holding it in place and then lift and slide the coil out.

Installing Stacked Coils

1. Slide the bottom coil through the opening in the coil section onto the bottom coil rests.
2. Place the coil up against the coil bulkheads to prevent any air bypass around the coil.
3. Once the coil is in place, bolt the coil to the section.
4. Caulk the mounting surface of the steel plate and install the plate on the coils.
5. Caulk the mounting surface of the drain trough and install the drain trough on the coils.
6. Caulk the seams between the coil casings and blockoffs.
7. Connect all piping and install the brass plugs for the vents and drains located in the connections.
8. Install the access panel.

Removing and Installing Staggered Coils

Staggered coils have two banks of coils positioned a few inches apart in the direction of airflow. Both coils are secured to the unit on the connection and opposite connection end of the unit.

1. Disconnect all piping and remove the brass plugs for the vents and drains located in the connections.
2. To access bolts holding the coils in place, remove the panels on both the connection and opposite connection end of the coil section.
3. Each coil is held in place with bolts located in the corners of the coil side plates. Remove the bolts and then lift and pull the coil out the side.
4. The bottom coil is fastened to the air block off plate. Remove the screws attaching this plate to the coil.
5. Once the fasteners holding the coil in place are removed, pull out the coil from either side of the unit.
6. Install the coils in reverse order of removal.

Replacement Parts

When writing to Daikin for service or replacement parts, refer to the model number and serial number of the unit stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

Warranty

Consult your local Daikin Applied representative for warranty details. To find your local Daikin sales representative, go to www.DaikinApplied.com.

Warranty Return Material Procedure

Defective material may not be returned without permission of authorized factory service personnel of Daikin in Minneapolis, Minnesota, (763) 553-5330. A "Return Goods" tag must be included with the returned material. Enter the required information to expedite handling and prompt issuance of credits. All parts must be returned to the appropriate Daikin facility, designated on the "Return Goods" tag. Transportation charges must be prepaid.

The return of the part does not constitute an order for replacement. Therefore, a purchase order must be entered through the nearest Daikin representative. The order should include part number, model number, and serial number of the unit involved.

Credit will be issued on customer's purchase order following an inspection of the return part and upon determination that the failure is due to faulty material or workmanship during the warranty period.



Air Handling Equipment Warranty Registration Form

To comply with the terms of Daikin Applied Warranty, complete and return this form within 10 days to the Warranty Department of Daikin Applied.

Check, test, and start procedure for air handling units with or without heat recovery and roof mounted air handlers.

GENERAL INFORMATION

Job Name: _____ Unit No.: _____

SOI No.: _____

Installation address: _____

City: _____ State: _____

Purchasing contractor: _____

City: _____ State: _____

Name of person doing start-up: _____

Company name: _____

Address: _____

City/State/Zip: _____

UNIT INFORMATION

Unit model number: _____ Unit serial number: _____

SF VFD model number: _____ Serial number: _____

RF VFD model number: _____ Serial number: _____



AHU Equipment Warranty Registration Form (continued)

Select Yes or No. If not applicable to the type of unit, select N/A.

I. INITIAL CHECK

- A. Is any shipping damage visible? Yes No N/A
- B. Are fan drives properly aligned and belts properly adjusted? Yes No N/A
- C. Tightened all setscrews on pulleys, bearings and fans? Yes No N/A
- D. Have the hold-down bolts been backed off on spring mounted fan isolators? Yes No N/A
- E. With the power off, do fans turn freely by hand? Yes No N/A
- F. Electrical service corresponds to unit nameplate? Yes No N/A

Volts _____ Hertz _____ Phase _____

- G. Is the main disconnect adequately fused and are fuses installed? Yes No N/A
- H. Are all electrical power connections tight? (Check compressor, electrical box.) Yes No N/A
- I. Is the condensate drain trapped? Yes No N/A
- J. Fill the drain pan. Does water drain freely? Yes No N/A
- K. Is the unit mounted level? Yes No N/A

II. FAN DATA

- A. Check rotation of supply fan(s)? Yes No N/A
- B. Voltage at supply fan motor(s): 1-2 _____ V 2-3 _____ V 1-3 _____ V
 - *Fan array units only 1-2 _____ V 2-3 _____ V 1-3 _____ V
 - 1-2 _____ V 2-3 _____ V 1-3 _____ V
 - 1-2 _____ V 2-3 _____ V 1-3 _____ V
 - 1-2 _____ V 2-3 _____ V 1-3 _____ V
 - 1-2 _____ V 2-3 _____ V 1-3 _____ V
- C. Supply fan motor amp draw(s) per phase: L1 _____ L2 _____ L3 _____
 - *Fan array units only L1 _____ L2 _____ L3 _____
 - L1 _____ L2 _____ L3 _____
 - L1 _____ L2 _____ L3 _____
 - L1 _____ L2 _____ L3 _____
 - L1 _____ L2 _____ L3 _____
- D. Overload amp setting: _____
- E. What is the supply fan rpm? _____
- F. Check rotation of return fan(s)? Yes No N/A



AHU Equipment Warranty Registration Form (continued)

Select Yes or No. If not applicable to the type of unit, select N/A.

G. Voltage at return fan motor(s): 1-2 _____ V 2-3 _____ V 1-3 _____ V
 *Fan array units only 1-2 _____ V 2-3 _____ V 1-3 _____ V
 1-2 _____ V 2-3 _____ V 1-3 _____ V
 1-2 _____ V 2-3 _____ V 1-3 _____ V
 1-2 _____ V 2-3 _____ V 1-3 _____ V
 1-2 _____ V 2-3 _____ V 1-3 _____ V

H. Return fan motor amp draw(s) per phase: L1 _____ L2 _____ L3 _____
 *Fan array units only L1 _____ L2 _____ L3 _____
 L1 _____ L2 _____ L3 _____
 L1 _____ L2 _____ L3 _____
 L1 _____ L2 _____ L3 _____
 L1 _____ L2 _____ L3 _____

I. Overload amp setting: _____
 J. What is the return fan rpm? _____
 K. Record supply static pressure at unit in inches of H₂O: _____
 L. Record return static pressure at unit (with outside air dampers closed) in inches of H₂O: _____

* If additional fans are on the unit, please add them to the space below.

III. DAMPERS

A. Are blades and seals present? Yes No N/A
 B. Do damper open smoothly and shut tight? Yes No N/A



AHU Equipment Warranty Registration Form (continued)

Select Yes or No. If not applicable to the type of unit, select N/A.

IV. ELECTRIC HEAT

A. Electrical heat service corresponds to unit nameplate? Yes No N/A

Volts _____ Hertz _____ Phase _____

B. Are there any signs of physical damage to the electric heat coils? Yes No N/A

C. Have all electrical terminals been tightened? Yes No N/A

D. Does sequence controller stage contactors properly? Yes No N/A

E. Electric heater voltage across each phase: _____ L1 _____ L2 _____ L3

F. Amp draw across each phase at each heating stage:

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Phase L1:	_____	_____	_____	_____	_____	_____
Phase L2:	_____	_____	_____	_____	_____	_____
Phase L3:	_____	_____	_____	_____	_____	_____

G. FLA: L1 _____ L2 _____ L3 _____

H. Operate electric heat with fans off. Electric heat must cycle on high limit control Yes No N/A

V. CHILLED WATER COIL

A. Pressure test OK? Yes No N/A

B. Drain pan draining OK? Yes No N/A

VI. HOT WATER COIL

A. Pressure test OK? Yes No N/A

VII. HEAT RECOVERY

A. Heat wheel rotates freely? Yes No N/A

B. Heat wheel VFD operates properly? Yes No N/A

C. Heat wheel VFD: Model # _____ Serial # _____

D. Check for air bypass around heat wheel. Yes No N/A



AHU Equipment Warranty Registration Form (continued)

Select Yes or No. If not applicable to the type of unit, select N/A.

VIII. Design Flow calibration

- A. Verify power is supplied to the MicroTech III unit controller Yes No N/A
- B. Verify that the shipping screws have been removed from the measuring station vane Yes No N/A
- C. Examine station for damage Yes No N/A
- D. Record Level Position after calibration
 - LH Level Position _____
 - RH Level Position _____

NOTE: This is viewed in the MicroTech III controller, in the Min OA setup menu.

IX. GAS BURNER CHECK, TEST, & START

Specifications:

For gas, see **Forced Draft Gas Burner Installation and Maintenance Bulletin. (IM 684 and IM 685)**

- A. Gas Furnace: Model no. _____
- B. Gas Burner: Model no. _____ Serial no. _____
- C. Gas Type firing: Single Stage _____ Modulation _____
- D. Gas Rated firing rate (MBH input): _____
- E. Gas Altitude (ft. above sea level): _____
- F. Is there a circulating tank? Yes No N/A
- G. Input (CFH): _____
- H. Gas pressure at burner (inches w.c.): _____
- I. CO₂ (%) _____
- J. CO₂ (%): _____
- K. Pilot flame only in microamps (steady at low fire): _____
- L. Pilot Tap-gas pressure (inches w.c.): _____
- M. Motor only/burner FLA running amps: _____
- N. High limit control OK? Yes No N/A
- O. Flame safeguard (microamps): _____
- P. Flame failure shutoff (seconds): _____



AHU Equipment Warranty Registration Form (continued)

Select Yes or No. If not applicable to the type of unit, select N/A.

- Q. Airswitch OK? Yes No N/A
- R. High Gas Pressure Switch OK? Yes No N/A
- S. Low Gas Pressure Switch OK? Yes No N/A
- T. Main Gas Valve Close-off OK? Yes No N/A

Thank you for completing this form. Please sign and date below.

Signature _____ Startup date: _____

Return completed form by mail to:

Daikin Warranty Department, 13600 Industrial Park Boulevard, Minneapolis, MN 55441
or by email to: AAH.Wty_WAR_forms@daikinapplied.com

Please fill out the Daikin Applied "Quality Assurance Survey Report" and list any additional comments that could affect the operation of this unit; e.g., shipping damage, failed components, adverse installation applications, etc. If additional comment space is needed, write the comment(s) on a separate sheet, attach it to the Survey Report and return it to the Warranty Department of Daikin Applied with the completed Equipment Warranty Registration form.

Submit Form

Clear Form



Quality Assurance Survey Report

To whom it may concern:

Please review the items below upon receiving and installing our product. Select N/A on any item that does not apply to the product.

Job Name: _____ Daikin Applied S.O. No. _____

Installation address: _____

City: _____ State: _____

Purchasing contractor: _____

City: _____ State: _____

Name of person doing start-up (print): _____

Company name: _____

Address: _____

City/State/Zip: _____

Unit model number: _____ Unit serial number: _____

1. Is there any shipping damage visible? Yes No N/A

Location on unit _____

2. How would you rate the overall appearance of the product; i.e., paint, fin damage, etc.? Excellent Good Fair Poor

3. Did all sections of the unit fit together properly? Yes No N/A

4. Did the cabinet have any air leakage? Yes No N/A

Location on unit _____

5. Were there any refrigerant leaks? Yes No N/A

From where did it occur? Shipping Workmanship Design

6. Does the refrigerant piping have excessive vibration? Yes No N/A

Location on unit _____

7. Did all of the electrical controls function at start-up? Yes No N/A

Comments _____

8. Did the labeling and schematics provide adequate information? Yes No N/A

9. How would you rate the serviceability of the product? Excellent Good Fair Poor

10. How would you rate the overall quality of the product? Excellent Good Fair Poor

11. How does the quality of Daikin Applied products rank in relation to competitive products? Excellent Good Fair Poor

Comments _____

Please list any additional comments which could affect the operation of this unit; i.e., shipping damage, failed components, adverse installation applications, etc. If additional comment space is needed, write the comment(s) on a separate sheet, attach the sheet to this completed Quality Assurance Survey Report, and return it to the Warranty Department with the completed preceding "Equipment Warranty Registration Form".



Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied Representative for warranty details. To find your local Daikin Applied Representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com.

Products manufactured in an ISO Certified Facility.