Installation, Operation and Maintenance Manual

EQUIPMENT: Greenheck Makeup Air Unit

PROJECT: Pleasant Valley Country Club – Club House Renovation

LOCATION: Little Rock, AR

MECHANICAL CONTRACTOR: Comfort Systems, USA

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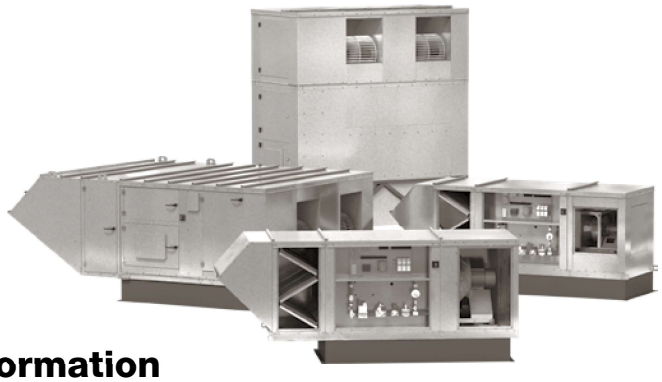
GREENHECK
Building Value in Air.

Document 482886
Models DG, DGX, TSU, VSU
Direct Gas Make-Up Air
and Industrial Space Heat

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.



C ETL LISTED US
Intertek

General Safety Information

Only qualified personnel should install this unit. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity are present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electrical Code (CEC) in Canada.
2. The rotation of the supply fan wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than the maximum cataloged fan rpm. Adjustments to fan speed significantly affects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces, or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open fan access doors while the fan is running.

DANGER

Always disconnect power before working on or near a unit. Use appropriate lockout tagout procedures to prevent accidental power up.

CAUTION

When servicing the unit, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

FOR YOUR SAFETY

If you smell gas:
1. Open windows.
2. Do not touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

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

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.

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General

Receiving

This product may have been subject to road salt during transit. If so, immediately wash off all visible white reside from all exterior surfaces. Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier if any damage is detected, **do not refuse shipment**. The customer shall make notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading should be countersigned by the delivering carrier. If damaged, immediately contact your manufacturer's representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

Handling

Units are to be rigged and moved by the lifting brackets provided or by the skid when a forklift is used. Location of brackets varies by model and size. Handle in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce ability of unit to resist corrosion.

Unpacking

Verify that all required parts and the correct quantity of each item have been received. Inspect interior of unit cabinet for any shipped loose items. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

Storage

Units are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the unit and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

The ideal environment for the storage of units and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Units designed for outdoor applications may be stored outdoors. All accessories must be stored indoors in a clean, dry atmosphere.

Indoor

Maintain temperatures evenly to prevent condensation. Remove any accumulations of dirt, water, ice, or snow and wipe dry before moving to indoor storage. To avoid condensation, allow cold parts to reach room temperature. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ in. (89 mm) off the floor. Clearance should be provided to permit air circulation and space for inspection.

Outdoor

The unit should be placed on a level surface to prevent water from leaking into the unit. The unit should be elevated so that it is above water and snow levels. Ensure sufficient support to prevent unit from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight, and space for periodic inspection. To minimize water accumulation, place all unit parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Inspection and Maintenance

While in storage, inspect units once per month. Keep a record of inspection and maintenance performed.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the fan wheel by hand ten to fifteen revolutions to distribute lubricant on motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Units with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Wipe thoroughly clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

Removing from Storage

As units are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the equipment goes into operation.

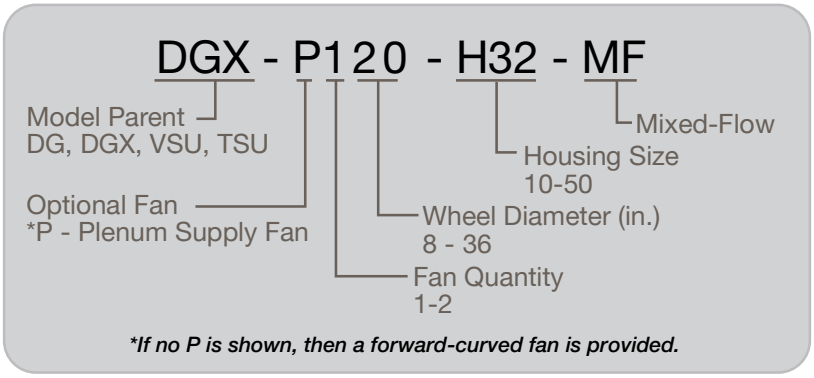
Prior to installing the unit and system components, inspect the unit assembly to make sure it is in working order.

1. Check all fasteners, set screws on the fan, wheel, bearings, drive, motor base, and accessories for tightness.
2. Rotate the fan wheel(s) by hand and assure no parts are rubbing.

General

Model Number Code

The model number code provides basic identification of the unit. The serial number can be used by the manufacturer's representative or the factory to identify the specific unit configuration. The serial number of the unit must be provided when consulting the manufacturer's representative or the factory.



If no P is shown, then a forward-curved fan is provided.

Installation

Required Clearances

Clearance to Combustibles

Clearance to combustibles is defined as the minimum distance required between the unit and adjacent combustible surfaces to ensure the adjacent surface temperature does not exceed 90ºF above the ambient temperature.

	Floor	Top	Sides	Ends
Insulated/Units	0	0	0	0
Non Insulated Units	0	6 (16)	6 (16)	6 (16)

All measurements are shown in inches (cm).

Required Clearances

Service Clearances

Service clearances are factory recommendations for ease of servicing**.** All deviations must still adhere to clearance to combustibles requirements. All deviations from the service clearance recommendations are at the discretion of the end-user as this may impede component removal.

Reference the ***Start-Up: Optional Features, Other, PDX Cooling Module*** section in this Installation, Operation and Maintenance Manual for further clearance requirements, if applicable.

Not all models listed will incorporate access on both sides; this will vary based on supply fan type and options selected.

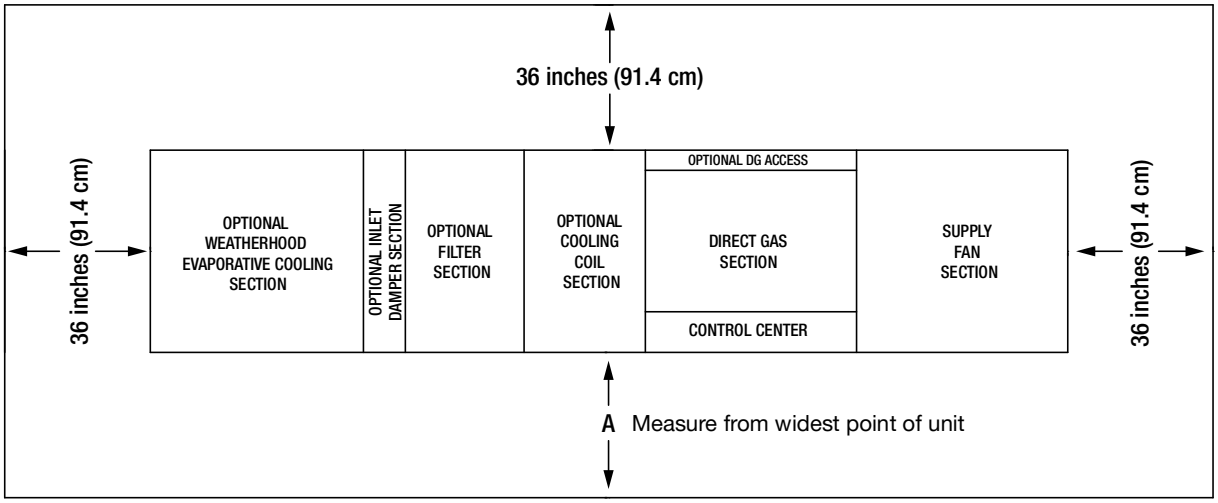
Note: If DG-H05 is equipped with an evaporative cooling module, access to the filters, media, sump, and water connections is accomplished through the roof of the evaporative cooling module. A minimum service clearance of 24 inches (61cm) is recommended above this module.

Recommended Minimum Service Clearances		
Model	**Housing**	**A inches (cm)**
DG	H05	36 (92)
	H10	36 (92)
	H20	37 (94)*
	H30	48 (122)
DGX	H12	33 (84)
	H22	44 (112)**
	H32	52 (132)
	H35	78 (198)
	H38	96 (244)
	H42	101 (255)
TSU	H50	156 (396)
VSU	H20	41 (104)
	H30	53 (135)
	H40	54 (137)
	H50	64 (163)

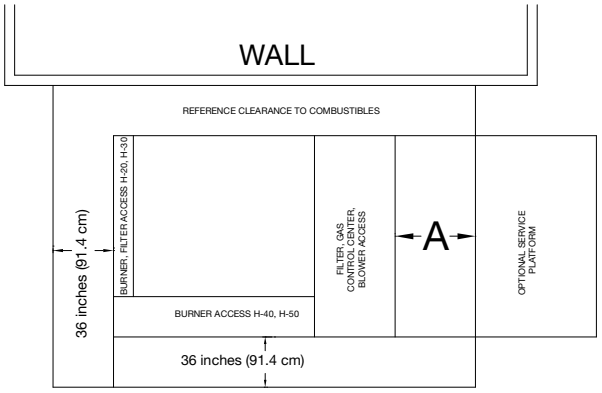
*67 in. (170 cm) when equipped with evaporative cooling module

**61 in. (155 cm) when equipped with evaporative cooling module over 4800 cfm

Models DG, DGX and TSU



Model VSU



Note: All sides of this unit must adhere to clearance to combustibles requirements. Any and all sides that have a noted unit access point will need to be left free and clear of any obstructions based on the below noted dimensions shown to ensure proper installation and maintenance of the unit.

Installation

Duct Sizes

See charts for duct sizes and straight duct lengths recommended for optimal performance based on AMCA Publication 201-90. Using duct sizes less than recommended will affect fan performance. Follow good duct installation practices for the remaining ductwork.

Forward Curved Fans (Horizontal Units)				
Model	**Fan**	**H**	**W**	**Straight Duct Length**
DG DGX	108	13 (33)	10 (25)	32 (81)
	109	13 (33)	14 (36)	38 (97)
	110	14 (36)	16 (41)	42 (107)
	112	16 (41)	18 (46)	48 (122)
	115	18 (46)	22 (56)	56 (142)
	118	22 (56)	24 (61)	65 (165)
	120	28 (71)	26 (66)	76 (193)
DGX	122	30 (76)	30 (76)	85 (216)
	125	34 (86)	34 (86)	96 (244)
	127	38 (97)	38 (97)	107 (272)
	130	40 (102)	40 (102)	113 (287)
	133	46 (117)	42 (107)	124 (314)
	136	46 (117)	46 (117)	130 (330)
TSU	225	32 (81)	103.5 (263)	162 (411.5)
	230	37 (94)	103.5 (263)	175 (445)

All measurements are shown in inches (cm).

Forward Curved Fans (Vertical Units)				
Model	**Fan**	**H**	**W**	**Straight Duct Length**
VSU	108	13 (33)	10 (25)	32 (81)
	109	13 (33)	14 (36)	38 (97)
	110	14 (36)	16 (41)	42 (107)
	112	16 (41)	18 (46)	48 (122)
	115	16 (41)	19 (49)	49 (1245)
	118	22 (56)	24 (61)	64 (163)
	120	28 (71)	28 (71)	79 (201)
	218	24 (61)	68 (173)	114 (290)
	220	26 (66)	68 (173)	118 (300)
	225	37 (94)	104 (264)	175 (445)
	230	37 (94)	104 (264)	203 (516)

All measurements are shown in inches (cm).

Plenum Fans										
Model	**Housing**	**Down Discharge**			**End Discharge**			**Side Discharge**		
		H	**W**	**Straight Duct Length**	**H**	**W**	**Straight Duct Length**	**H**	**W**	**Straight Duct Length**
DG	**H05**	15.8 (40)	15 (38)	43 (110)	20 (51)	19.5 (50)	56 (142)	20 (51)	19.5 (50)	56 (142)
DGX	**H12**	22.5 (57)	22.5 (57)	63 (160)	22.5 (57)	22.5 (57)	63 (160)	22.5 (57)	22.5 (57)	63 (160)
	H12-MF	16.8 (17)	22.8 (58)	55 (140)	31 (79)	28.2 (72)	83 (211)	26.1 (66)	32.8 (83)	83 (211)
	H22	25.5 (65)	25.5 (65)	72 (183)	25.5 (65)	25.5 (65)	72 (183)	25.5 (65)	25.5 (65)	72 (183)
	H22-MF	27.5 (70)	33.6 (85)	86 (218)	36.8 (94)	39.1 (99)	107 (272)	38.7 (98)	25.5 (65)	89 (226)
	H32	31.5 (80)	31.5 (80)	89 (226)	31.5 (80)	31.5 (80)	89 (226)	31.5 (80)	31.5 (80)	89 (226)
	H32-MF	32.9 (84)	42 (107)	105 (267)	39.8 (101)	46.9 (119)	122 (310)	42.1 (107)	31.5 (80)	103 (261)
	H35	30 (76)	62 (157)	121 (307)	30 (76)	61.2 (155)	121 (307)	35 (89)	33 (84)	96 (244)
	H38	36 (91)	72 (183)	143 (363)	35.8 (91)	72 (183)	143 (363)	40 (102)	36 (91)	107 (271)
	H42	40 (102)	78 (198)	157 (399)	40 (102)	77.5 (197)	157 (399)	40 (102)	40 (102)	113 (287)

All measurements are shown in inches (cm).

Installation

Indoor Unit Mounting

Hanging

When suspending a unit indoors, adequate structural support is required. Design of the support structure is the responsibility of the installing contractor and/or the structural engineer. Support structure will vary based on application, building design, code requirements, unit size, and unit weight. The following information is provided as a guideline; it is not intended to replace job specific structural design provided by a structural engineer.

1. Install Field-Supplied Hangers

Install hangers from ceiling supports. Ensure hangers are located to avoid interference with access doors and allows for component removal.

2. Install Unit

Using sheet metal screws, assemble optional shipped loose modules. Ensure that all cover seams and vertical panels on each module are fastened securely. Raise the assembled unit into place.

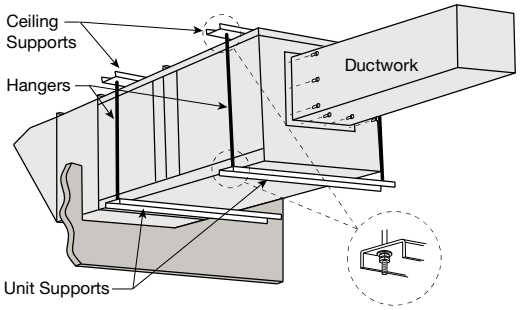
Appropriate field-supplied unit supports, such as C-channel or angle iron, are to be placed under the unit. Fasten the unit supports to the hangers and to the unit using appropriate methods.

To prevent the unit from swinging and to provide a safe environment for service and maintenance, additional measures must be taken to secure the unit in all directions.

The installer is responsible for determining appropriate support and fastening methods to ensure compliance with all applicable codes.

3. Attach Ductwork

Using appropriate methods, attach ductwork to unit. Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and any further local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.

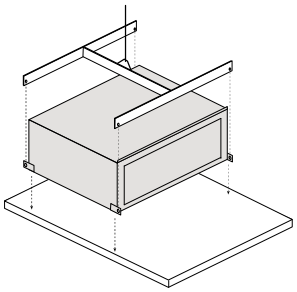


4. Seal Wall Opening

Sealant must be applied around the perimeter of the weatherhood to prevent water penetration and drafts into the building.

Floor Mounted

1. Install Unit



Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and locate the unit in place. The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit.

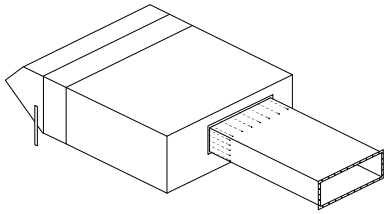
It is recommended that any shipped loose modules be installed after the base unit. The shipped loose modules must be fastened together. Fasten the cover seams and vertical panels on each module using sheet metal screws. Some shipped loose modules will require field-provided shims for proper alignment with the base unit.

Fasten the unit using appropriate methods. The installer is responsible for determining appropriate support and fastening methods to ensure compliance with all applicable codes.

2. Attach Ductwork

Refer to the unit submittal for the duct size and location. An appropriate sealant should be used around the discharge opening of the unit to create a weathertight seal.

Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.



Note for both Hanging and Floor Mounted Installations: The manufacturer recommends units equipped with evaporative cooling be installed outdoors. If an evaporative cooling module must be installed indoors, it is recommended a field-supplied secondary drain pan be installed under the evaporative cooling section. This will help mitigate damage to building materials in the event the evaporative cooling module sump tank overflows.

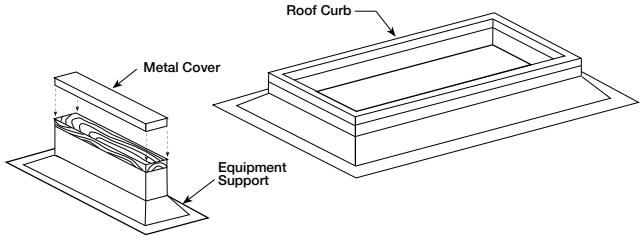
Installation

Outdoor Unit Mounting

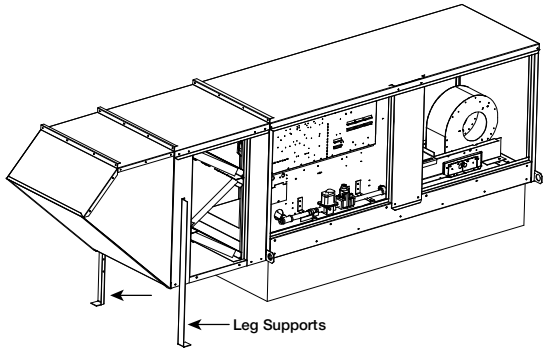
Standard Curb

1. Install Curb and/or Equipment/Leg Support(s)

Position curb and/or equipment/leg support(s) on the roof (reference the unit submittal for placement in relation to the unit). Verify that unit supports are level; shim if necessary. Attach curb to roof and flash into place using appropriate methods. Attach the equipment/leg support(s) to the roof, remove metal cover, flash to wooden nailer, and reinstall cover.



Curb and Equipment Support



Unit Profile and Leg Support

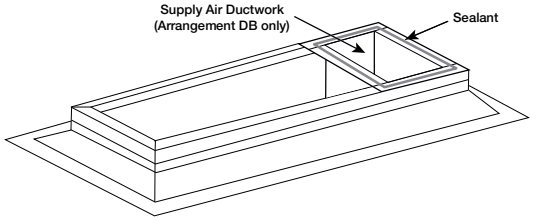
2. Install Ductwork

Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.

The use of a duct adapter is recommended on a downblast (DB) arrangement to align the ductwork with the supply unit. The duct adapter is only a guide and is not to be used as a support for the ductwork.

3. Apply Sealant

Apply an appropriate sealant around the perimeter of the curb and duct to isolate fan vibration and prevent water penetration.

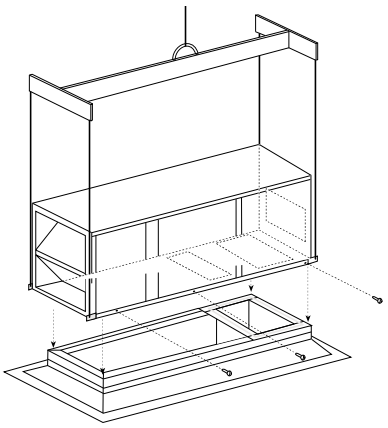


Ductwork

4. Install Unit

Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and position the unit on the curb/equipment support(s). The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit.

Fasten the unit to the curb/equipment support(s) using appropriate methods. The installer is responsible for determining appropriate support and fastening methods to ensure compliance with all applicable codes.



Setting Unit

5. Assemble and Attach Shipped Loose Modules

Using sheet metal screws, assemble optional shipped loose modules. Fasten the cover seams and vertical panels on each module securely.

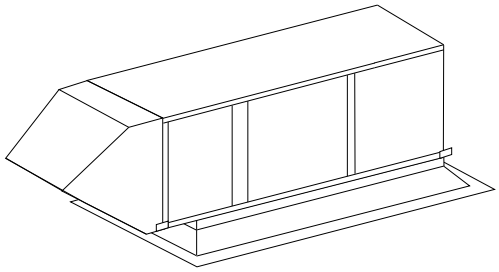
Some weatherhoods may ship disassembled. Detailed assembly instructions ship with the weatherhood.

If an optional evaporative cooling module is included, reference ***Installation, Optional Component Mounting, Evaporative Cooling Module*** section in this Installation, Operation and Maintenance Manual for more information.

The installer is responsible for ensuring that the unit fastening methods are sufficient to account for the weight and size of these additional modules.

6. Seal Seam(s)

Using an appropriate sealant, seal the seam(s) between each shipped loose module and the weatherhood.



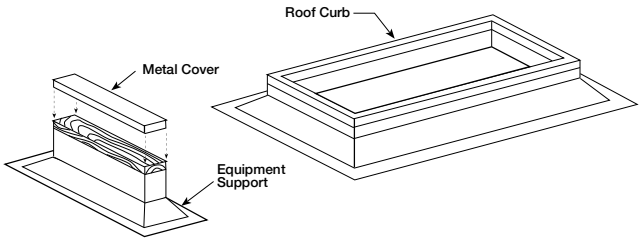
Complete Rooftop Installation

Outdoor Unit Mounting

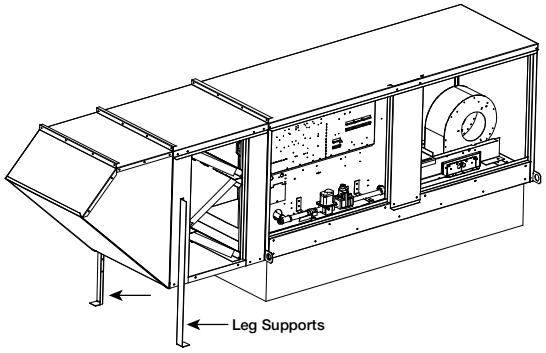
Combination Curb

1. Install Curb and Equipment/Leg Support(s)

Position curb and equipment/leg support(s) on the roof (reference the unit submittal for placement in relation to the unit). Verify that unit supports are level, shim if necessary. Attach curb to roof and flash into place using appropriate methods. Attach the equipment/ leg support(s) to the roof, remove metal cover, flash to wooden nailer and reinstall cover.



Curb and Equipment Support

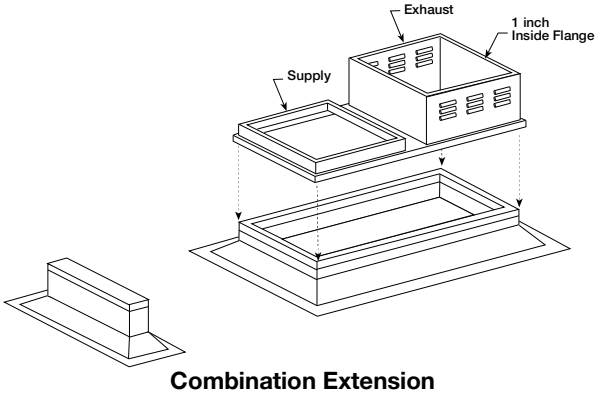


Unit Profile and Leg Support

2. Install Combination Curb Adaptor

Install combination curb adaptor over curb, fasten adapter to curb using appropriate methods. Locate extension so the tall louvered side is over the exhaust opening, as shown in illustration. Caulk vented exhaust extension to combination curb adaptor. Fasten extension to curb adaptor using appropriate methods (field-provided).

The installer is responsible for determining appropriate support and fastening methods to ensure compliance with all applicable codes.

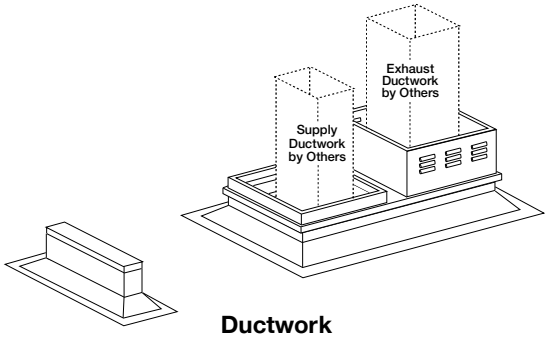


Combination Extension

3. Install Ductwork

Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.

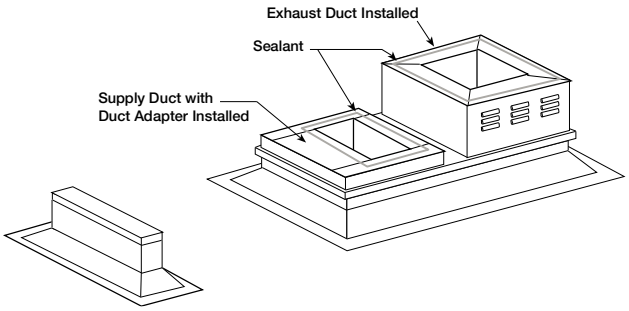
The use of a duct adapter is recommended on a downblast (DB) arrangement to align the ductwork with the supply unit. The duct adapter is only a guide and is not to be used as a support for the ductwork.



Ductwork

4. Apply Sealant

Apply an appropriate sealant around the perimeter of the curb and duct to isolate unit vibration and prevent water penetration.

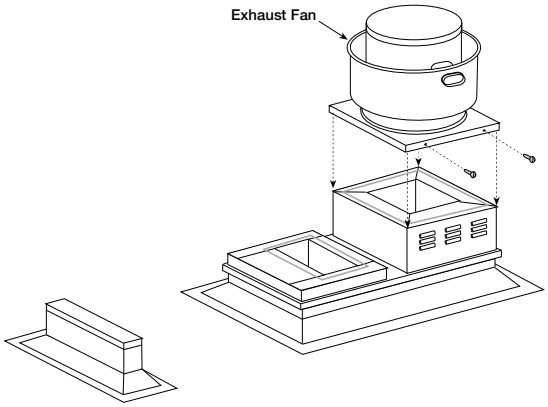


Sealing Ductwork

Combination Curb *(continued)*

5. Install Exhaust Fan

Fasten exhaust fan to curb extension using appropriate methods. Installing the exhaust fan prior to the supply unit will allow for easier installation of options. NFPA 96 requires the exhaust fan to be hinged. Follow instructions included with the exhaust fan.



Installing Exhaust Fan

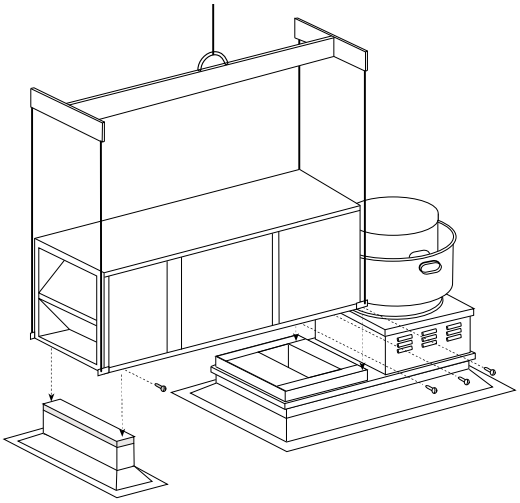
6. Install Exhaust Fan Options

Install hinges (an optional hinge kit is available from manufacturer) with restraining cables and optional grease trap with drain connection.

7. Install Supply Unit

Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and position the unit on the curb extension and equipment support(s). The use of all lifting lugs and a set of spreader bars is mandatory when lifting unit.

Fasten the unit to the curb extension and equipment support(s) using appropriate methods. The installer is responsible for determining appropriate support and fastening methods to ensure compliance with all applicable codes.



Installing Supply Unit

8. Assemble and Attach Shipped loose Modules

Using sheet metal screws, assemble optional shipped loose modules. Fasten the cover seams and vertical panels on each module securely.

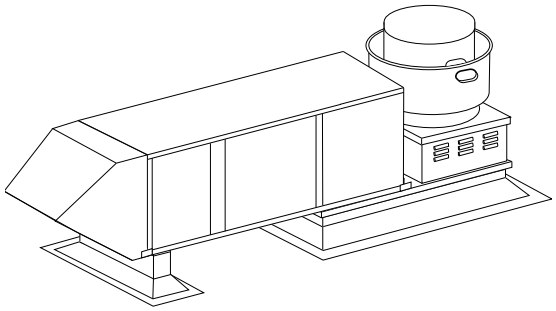
Some weatherhoods may ship disassembled. Detailed assembly instructions ship with the weatherhood.

If an optional evaporative cooling module is included, reference ***Installation, Optional Component Mounting, Evaporative Cooling Module*** section in this Installation, Operation and Maintenance Manual for more information.

The installer is responsible for ensuring that the unit fastening methods are sufficient to account for the weight and size of these additional modules.

9. Seal Seam(s)

Using an appropriate sealant, seal the seam(s) between each shipped loose module and weatherhood.



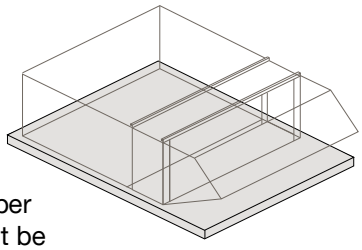
Complete Combination Installation

Installation

Outdoor Unit Mounting

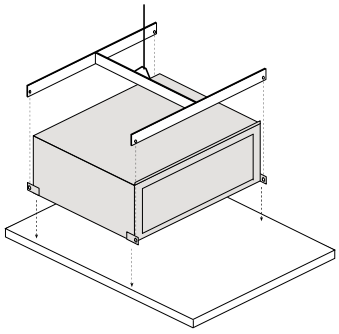
Slab

1. Pour Concrete Slab



Pour the concrete slab. Make the slab one foot larger than the unit on all sides. The slab must be capable of supporting the weight of the unit. Proper subgrade preparation must be completed under the slab. Allow the concrete slab to properly cure before installing the unit.

2. Install Unit



Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and position the unit on the concrete slab. The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit. It is recommended that any shipped loose modules be installed after the base unit.

The shipped loose modules must be fastened together. Fasten the cover seams and vertical panels on each module using sheet metal screws. Using an appropriate sealant, seal the seam(s) between each shipped loose module and the weatherhood.

Some shipped loose modules will require field-provided shims for proper alignment with the base unit.

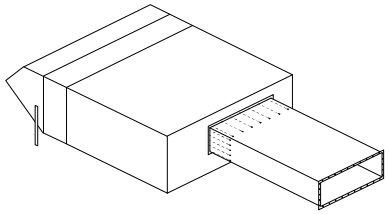
If an optional evaporative cooling module is included, reference ***Installation, Optional Component Mounting, Evaporative Cooling Module*** section in this Installation, Operation and Maintenance Manual for more information.

Fasten the unit to the slab using appropriate methods. The installer is responsible for determining appropriate fastening methods to ensure compliance with all applicable codes.

3. Attach Ductwork

Use an appropriate sealant around the discharge opening of the unit to create a weathertight seal.

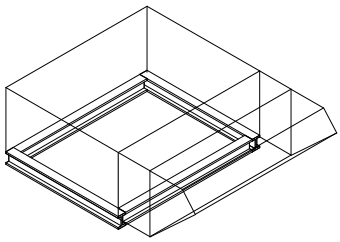
Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.



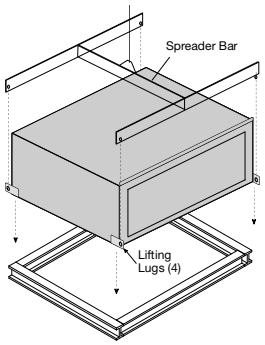
Rail

1. Install Rails

The rails must be located around the perimeter of the base unit on all four sides. This is required to ensure proper unit support. Model TSU requires an additional rail section under the filter section to ensure proper support of the filter section and weatherhood. Rails are field-supplied by others and are not supplied by manufacturer.



2. Install Unit



Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and position the unit on the field-supplied rail supports. The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit. It is recommended that any shipped loose modules be installed after the base unit.

The shipped loose modules must be fastened together. Fasten the cover seams and vertical panels on each module using the appropriate methods. Fasten the unit to the rails using appropriate methods.

If an optional evaporative cooling module is included, reference ***Installation, Optional Component Mounting, Evaporative Cooling Module*** section in this Installation, Operation and Maintenance Manual for more information.

The installer is responsible for determining appropriate fastening methods to ensure compliance with all applicable codes.

3. Attach Ductwork

Use an appropriate sealant around the discharge opening of the unit to create a weathertight seal.

Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.

Outdoor Unit Mounting

Stand (VSU only)

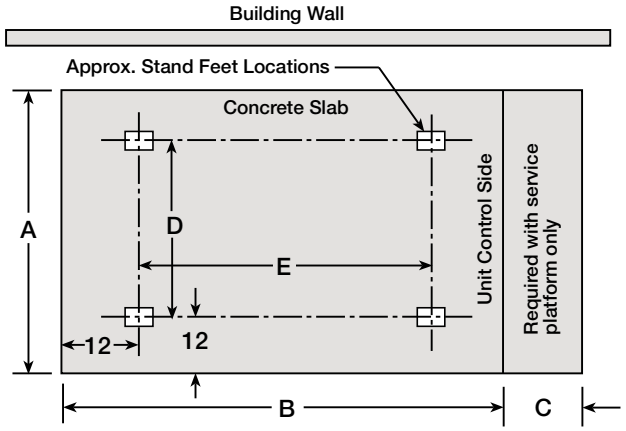
1. Pour Concrete Slab

The first step in unit installation is to pour a concrete slab capable of supporting the weight of the unit. Proper subgrade preparation must be completed under the slab.

Note that the concrete forms a 1 foot wide apron on all four sides of the unit. A 42 in. extension must be added to the control end of the unit when a service platform is used.

Concrete Slab Dimensions					
Housing Size	A	B	C	D	E
20	64 (163)	64 (163)	42 (107)	37 (94)	37 (94)
30	77 (196)	76 (193)	42 (107)	49 (124)	49 (124)
40	78 (198)	135 (343)	42 (107)	51 (130)	108 (274)
50	87 (220)	180 (457)	42 (107)	60 (152)	153 (389)

All dimensions are shown as inches (cm).

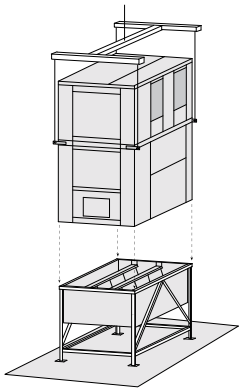


Concrete Slab and Unit Footprint

2. Install Filter Stand Section

Locate the filter stand section on the concrete slab as shown in the drawing above. Fasten the filter stand section to the slab using appropriate methods. The installer is responsible for determining appropriate fastening methods to ensure compliance with all applicable codes.

3. Set Burner/Fan Section



Use a crane and a spreader bar hooked to the factory lifting lugs to lift and position the unit onto the filter stand section. The sections should be sealed with appropriate sealant and fastened using appropriate methods. The installer is responsible for determining appropriate fastening methods to ensure compliance with all applicable codes.

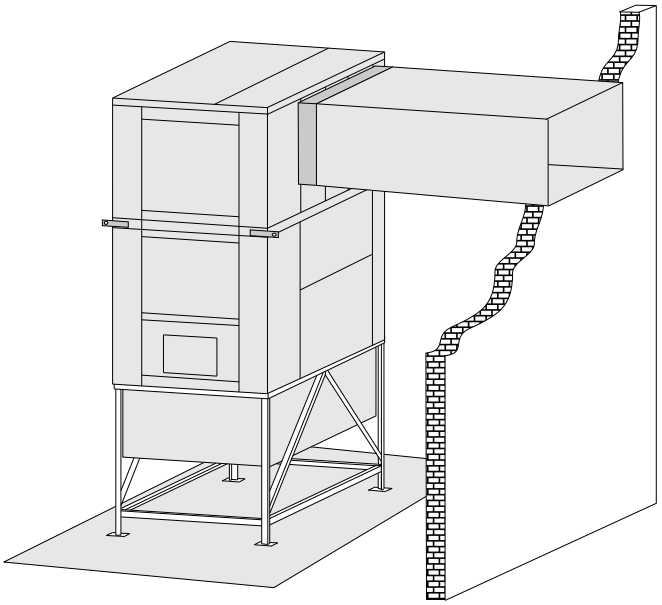
4. Install Ductwork

Follow good duct practices for all ductwork. Install ductwork in accordance with SMACNA and AMCA guidelines, NFPA 96 and local codes. Reference ***Installation, Duct Sizes*** section in this Installation, Operation, and Maintenance Manual for proper duct sizes.

For upblast units, a duct elbow may be needed to turn the ductwork into the building. Follow proper ductwork methods recommended by AMCA to minimize duct losses.

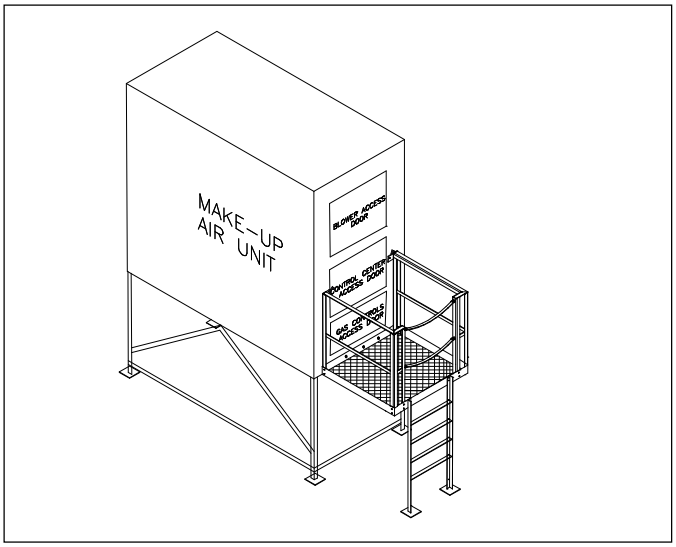
5. Complete Installation

A typical horizontal discharge installation is shown. Gas and/or electrical lines can be connected at this time. Reference ***Installation, Piping, Gas*** section in this Installation, Operation and Maintenance Manual for more information.



Stand (VSU only) *(continued)*

6. Install Optional Service Platform

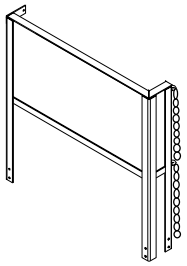


TOOLS REQUIRED

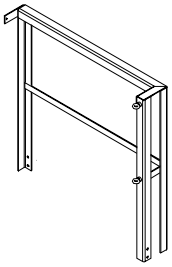
- (2) 9/16 in. sockets or wrenches
- Drill with 7/16 in. drill bit and 5/16 in. drill bit
- A crane or forklift is recommended for assembly and attachment

Service Platform Material List

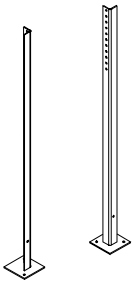
(1) Left Hand Rail with Safety Chains



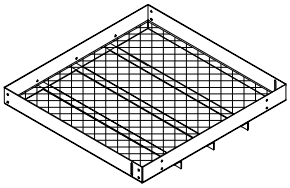
(1) Right Hand Rail



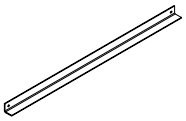
(2) Legs

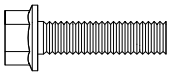
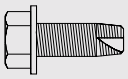
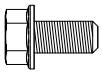


(1) Platform Base Unit with predrilled holes for hand rails, legs and attachments.



(1) Leg Cross Member



Fasteners			
Description	**Size**	**Qty.**	**Image**
Hex Head Bolts	3/8 in. x 1-1/2 in.	3	
Thread Cutting Screws	3/8 in. x 1 in.	2	
Hex Head Bolts	3/8 in. x 3/4 in.	18	
Hex Head Nuts	3/8 in.	27	

Outdoor Unit Mounting

Stand (VSU only) *(continued)*

Assembly

1. Position platform base as shown below in Figure A with the grate side up.
2. Attach the left and right handrails to the platform base with (3/8 in. x 3/4 in.) hex head bolts and (3/8 in.) hex nuts as shown in Figure A. Use six bolts and nuts on each rail.
3. Raise the platform base, grate side up, with a crane or forklift.
4. Attach legs to the slots on sides of platform base with two (3/8 in. x 3/4 in.) hex head bolts and (3/8 in.) hex nuts.

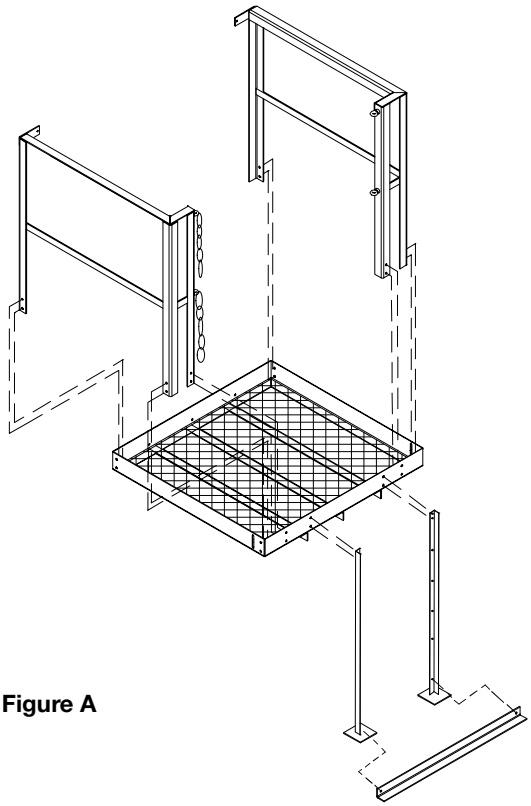


Figure A

5. Fasten three (3/8 in. x 1-1/2 in.) hex head bolts into the side of the platform base. Secure each bolt with two (3/8 in.) hex head nuts placed back to back on each bolt as shown in Figure B. These bolts will be used to attach the platform base to the unit.

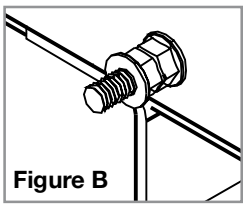


Figure B

6. Facing the control panel side of the unit, find the center of the housing and drill a (7/16 in.) hole through the housing and support stand (3/8 in.) above the form line as shown in Figure C.

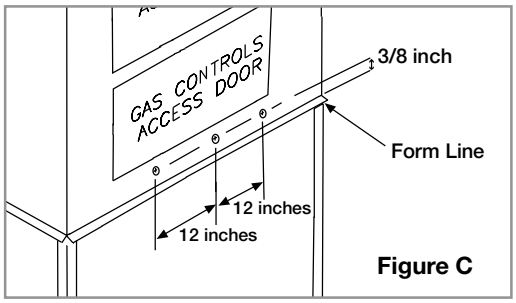


Figure C

Next, drill two more (7/16 in.) holes through the housing and support stand (12 in.) on either side of the center hole, (3/8 in.) above the form line. These holes are used to attach the platform base to the unit.

7. Attach the service platform to the control panel side of the housing by inserting the three (3/8 in. x 1-1/2 in.) bolts of platform base into the three holes of the housing. Securely fasten with three (3/8 in.) hex nuts.
8. Level service platform if necessary by adjusting legs and then attach leg cross member with two (3/8 in. x 3/4 in.) hex head bolts and 3/8 in. hex head nuts.
9. Securely fasten all nuts and bolts. Make sure all nuts and bolts are tight.
10. Attach arm rails of service platform to the housing by first drilling a 5/16 in. hole through the housing at the attachment point as shown in Figure D. Secure arm rails to the housing with (3/8 in. x 1 in.) thread cutting screws. Be sure not to over-tighten screws.
11. Attach safety chains to the right hand rail, across the entryway. Assembly is complete.

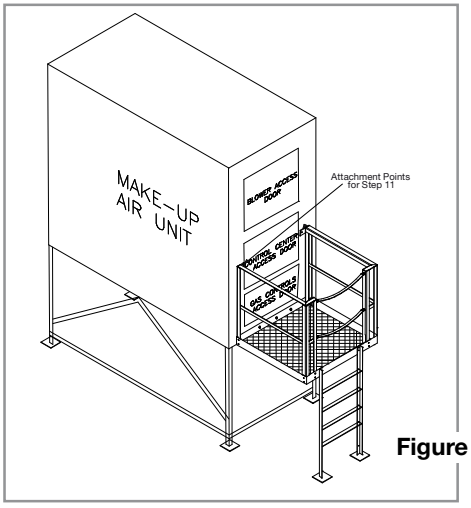


Figure D

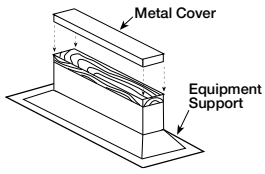
Optional Component Mounting

Evaporative Cooling Module

Note: Small evaporative cooling module will ship attached to the base unit from the factory and will not require any additional fixation to the base unit as illustrated below.

1. Locate Equipment Support(s)

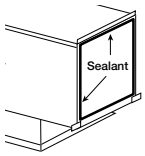
Position equipment support(s) on the roof (reference the unit submittal for placement of equipment support(s) in relation to the unit). Verify that all unit supports are level, shim if necessary. Attach equipment support to the roof using appropriate methods, remove metal cover, flash to wooden nailer and reinstall cover.



Equipment Support

2. Apply Sealant

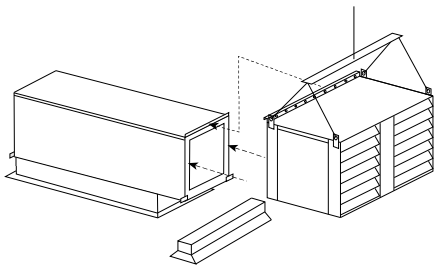
Apply an appropriate sealant around the airstream opening to create an airtight seal.



Sealant

3. Set Evaporative Cooling Module

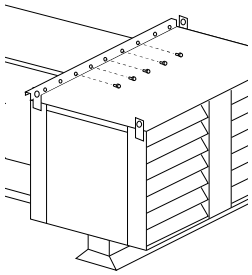
Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and position the module on the equipment support(s). The cover flange on the evaporative cooling module should overlap the cover flange on the unit. The use of all lifting lugs and a set of spreader bars is mandatory when lifting the evaporative cooling module.



Placing Evaporative Module

4. Secure Cooling Module to Unit

Use self-tapping screws to fasten the cooling module to the base unit along the top and down both sides. Fasten at the top through the cover flanges. To fasten the sides, the media may need to be removed. To remove the media, first remove the access panel on the evaporative module and disconnect the evaporative pump(s). The media will now slide out. With the media removed, you can access the side fastening points inside the evaporative cooling module. With all the screws in place, reinstall the media, reconnect the pumps and reinstall the access panel.



Securing Evaporative Module

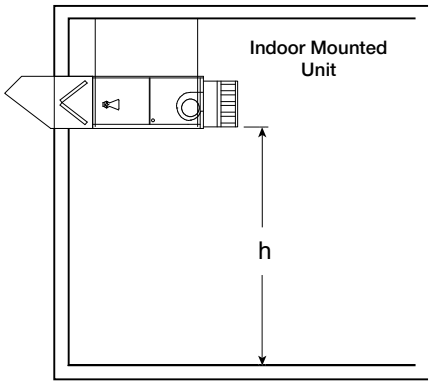
The evaporative cooling module must be mounted level to ensure proper operation and water drainage.

Diffuser

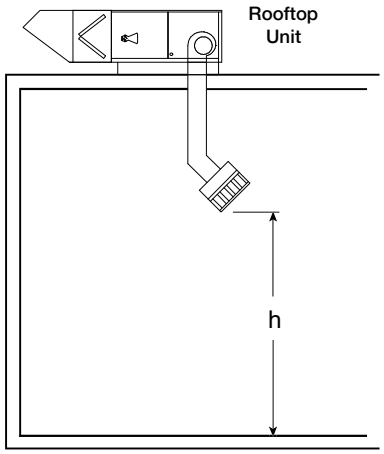
The location of the discharge diffuser is critical for optimum performance of the system.

Using self-tapping screws, attach diffuser to the ductwork or unit. Be sure to maintain the recommended floor to diffuser height. Refer to the chart for this information.

Airflow cfm (m^3/s)	Diffuser Height feet (m)		
	Minimum	Recommended	Maximum
4,000 (2)	15 (5)	20 (6)	25 (8)
6,000 (3)	15 (5)	20 (6)	25 (8)
8,000 (4)	20 (6)	20-25 (6 - 8)	30 (9)
10,000 (5)	20 (6)	20-25 (6 - 8)	35 (11)
13,000 or greater (6 or greater)	25 (8)	30-35 (9 - 11)	40 (12)



Thru-Wall Diffuser Height



Rooftop Diffuser Height

Installation

Line Voltage Electrical Wiring

Before connecting power to the unit, read and understand the following instructions and wiring diagrams. Complete wiring diagrams are attached on the inside of the control center door(s).

All wiring must be done in accordance with the latest edition of the National Electrical Code NFPA 70 and any local codes that may apply. In Canada, wiring must be done in accordance with the Canadian Electrical Code.

The equipment must be properly grounded. Any wiring running through the unit in the airstream must be protected by metal conduit, metal clad cable or raceways.

CAUTION

If replacement wire is required, it must have a temperature rating of at least 105ºC.

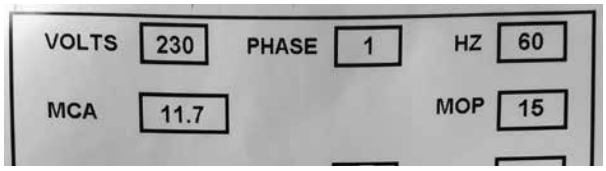
Any wiring deviations may result in personal injury or property damage. Manufacturer is not responsible for any damage to, or failure of the unit caused by incorrect field wiring.

DANGER

High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

1. Determine the Size of the Main Power Lines

The unit's nameplate states the voltage and the unit's MCA. The main power lines to the unit must be sized accordingly. The nameplate is located on the outside of the unit on the control panel side.



Electrical Nameplate

2. Provide the Opening(s) for the Electrical Connections

Electrical openings vary by unit size and arrangement and are field-supplied.

3. Connect the Main Power

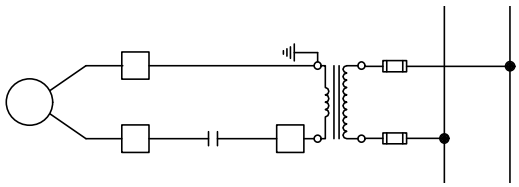
Connect the main power lines to the disconnect switch and main grounding lug(s). Torque connections to disconnect according manufacturer specifications.

4. Wire the Optional Convenience Outlet

The convenience outlet requires a separate 115V power supply circuit. The circuit must include short circuit protection supplied by others.

5. Wire Evaporative Cooling Pumps

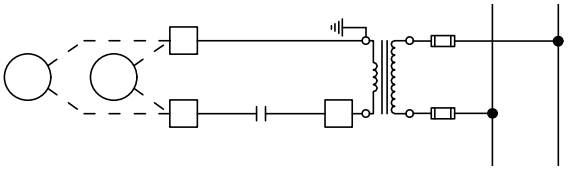
Reference the unit wiring diagram attached to the inside of the unit control center door. Locate the "Evap Pump(s)" on the wiring diagram. If they are connected with solid lines indicating factory wiring, no field wiring is required.



Evap Pump Factory Wiring Example

Refer to wiring diagram for unit specific wiring

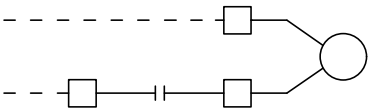
If the evaporative pump(s) are shown with dashed lines indicating field wiring, wire the pumps to the terminals indicated in the unit control center.



Evap Pump Field Wiring Example

Refer to wiring diagram for unit specific wiring

Larger units may require a separate 115 VAC power source. If this is necessary, it will be indicated on the wiring diagram. Wire a separate 115 VAC power supply as indicated on the wiring diagram to power the pumps.



Separate Power Wiring Example

Refer to wiring diagram for unit specific wiring

Optional Electrical Accessory Wiring

Evaporative Cooling Module

1. Auto Drain and Fill Valves

The unit may have been provided with the auto drain and fill option. If this option has been provided, the unit wiring diagram will indicate field wiring (dashed lines) to the supply valve, drain valve, and supply drain valve. Wire the valves as indicated on the unit wiring diagram.

Note: The valves can be provided by the factory or field-supplied by others. If field-supplied valves are utilized, the total inrush VA shall not exceed 160 VA and the total holding VA shall not exceed 66 VA with a 24 VAC supply.

2. Freeze Protection Sensor

If the unit was provided with the auto drain and fill option and the evaporative cooling module was shipped separately, the freeze protection sensor must be field-wired. The freeze protection sensor will be factory installed to the bottom side of the top louver on the unit intake. Wire the freeze sensor as indicated on the unit wiring diagram (dashed lines).

3. Single Pass Water Control Valves

The unit may have been provided with the single pass control valve option. If this option has been provided, the unit wiring diagram will indicate field wiring (dashed lines) to the supply valve and supply drain valve. Wire the valves as indicated on the unit wiring diagram.

NOTE: The valves can be provided by the factory or field-supplied by others. If field-supplied valves are utilized, the total inrush VA shall not exceed 160 VA and the total holding VA shall not exceed 66 VA with a 24 VAC supply.

Cooling Relay(s)

If the unit was provided with an optional chilled water coil or split DX coil, the cooling relay can provide an enable signal for the cooling system. When a call for cooling has been signaled, the cooling relay closes a dry NO contact rated for 8 amps and 250 VAC.

Carbon Dioxide (CO_2) Sensor

Depending on the application, recirculating units may have been provided with a wall mounted CO_2 sensor. The CO_2 sensor is intended to prevent the build-up of CO_2 in the space. It must be wired as indicated on the unit wiring diagram to command the unit to 100% outside air in the event CO_2 rises above the alarm setting. If a microprocessor is included with this unit, reference the supplemental ***Microprocessor Controller for Make-Up Air Reference Guide*** for more information.

Fire Suppression System

The building fire suppression system is typically wired to shut down the unit in the event of a fire. A normally closed (NC) contact should be wired in series with unit enable switch or contact. This is located between terminals R and G on the wiring diagram. When the fire suppression system alarms, it shall open this contact removing 24 VAC power from terminal G which will disable the unit.

Fire Stat Type III

The optional fire stat type III is shipped separately for field installation and wiring. The fire stat is typically installed in the return air duct to shut down the fan in the event of elevated temperature in the duct. The normally closed (NC) contact can be wired in series with the fire suppression contact to shut down the unit. The fire stat has additional contacts that can be used to alert an external system.

Duct Smoke Detector

The optional duct smoke detector is shipped separately for field installation and wiring. The smoke detector is typically installed in the return air duct to shut down the fan in the event of a fire. The normally closed (NC) contact should be wired in series with the fire suppression contact to shut down the unit. The smoke detector has additional contacts that can be used to alert an external system.

Remote Panel

The optional remote panel is shipped separately for field installation and wiring.

24 VAC control wiring must be connected between the remote panel and the units control center.

All required field wiring is illustrated by dashed lines on the unit and remote panel ladder diagrams. These field connections are to be accomplished by point-to-point wiring from the remote panels terminal strip to the unit's terminal strip. Terminals are illustrated as squares surrounding the terminals ID. For unit specific wiring requirements please refer to the unit and remote panel wiring diagram for further illustration.

Note: Any sensor(s) or temperature adjustment dial(s) located on or in the remote panel must be run with shielded cable or in separate conduit.

Only the designated terminals shown with dashed lines on the unit and remote panel ladder diagrams should be used to establish field control connections. If other terminals are utilized it can result in component damage or failed unit operation.

Optional Electrical Accessory Wiring

Control Voltage

Manufacturer's standard control voltage is 24 VAC. Control wire resistance must not exceed 0.75 ohms (approximately 285 feet total (86.9 m) length for 14 gauge wire; 455 feet (138.7 m) total length for 12 gauge wire). If the resistance exceeds 0.75 ohms, an industrial-style relay must be wired in place of the remote switch. The relay must be rated for at least 5 amps and have a 24 VAC coil. Failure to comply with these guidelines may cause motor starters to chatter or not pull in, resulting in contactor failures and/or motor failures.

Room Temperature Sensing Devices

One of the following sensors or equivalent may have been provided and will require field wiring. Refer to the unit wiring diagram for terminal designations. If a microprocessor is included with this unit, reference the supplemental ***Microprocessor Controller for Make-Up Air Reference Guide*** for more information.

Room Override Thermostat
Requires wiring to be run in separate conduit or run with shielded cable.

Maxitrol Room Temperature Sensor
Requires wiring to be run in separate conduit or run with shielded cable.

Room Thermostat
Requires wiring to be run in separate conduit or run with shielded cable.

Unit Controller Room Temperature Sensor
Requires wiring to be run in separate conduit or run with shielded cable.

Night Setback Thermostat
(occupied/unoccupied mode)

Piping

Gas

All gas piping must be installed in accordance with the latest edition of the National Fuel Gas Code ANSI/ Z223.1 and any local codes that may apply. In Canada, the equipment shall be installed in accordance with the Installation Code for Gas Burning Appliances and Equipment (CGA B149) and Provincial Regulations for the class. Consult authorities having jurisdiction before installations are made. All piping must be clean and free of any foreign matter. Foreign material entering the gas train can damage the valves, regulators and burner.

Do not connect the unit to gas types other than what is specified and do not connect the unit to gas pressures that are outside of the pressure range shown on the label.

When connecting the gas supply, the length of the run must be considered in determining the pipe size to avoid excessive pressure drop. Refer to a Gas Engineer's Handbook for gas pipe capacities.

WARNING

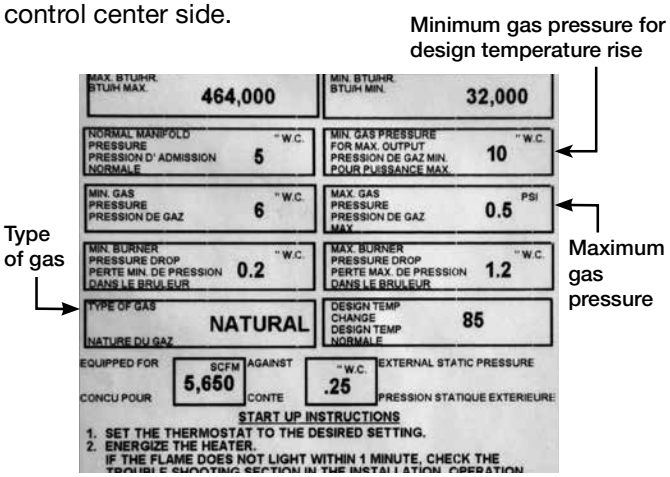
All components of this or any other gas-fired heating unit must be leak tested prior to placing the unit into operation. Use a soap and water solution or equivalent to perform this test. NEVER test for gas leaks with an open flame.

When leak testing pressures that are equal to 14 in. wg (3.5 kPa), first close the field-installed shutoff valve to isolate the unit from the gas supply line.

When leak testing pressures that are above 14 in. wg (3.5 kPa), close the field-installed shutoff valve, disconnect the furnace and gas train from the gas supply line, and plug the supply line before testing.

1. Determine the Supply Gas Requirements

The unit's direct gas nameplate states the requirements for the gas being supplied to the unit. The direct gas nameplate is located on the outside of the unit on the control center side.



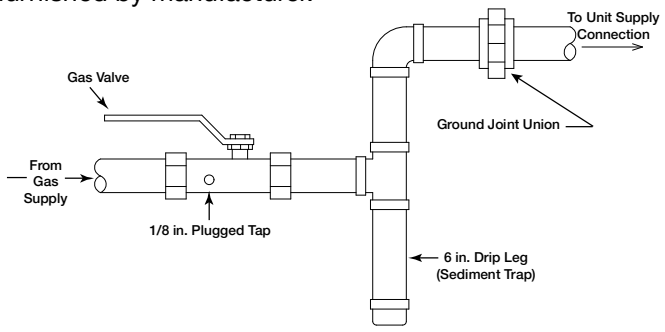
Direct Gas Nameplate

2. Install Additional Regulator if Required

When the supply gas pressure exceeds the maximum gas pressure shown on the direct gas nameplate, an additional regulator is required to reduce the pressure. The regulator must be a full lock up type. Additionally, it must incorporate a listed leak limiting device or be vented to the outdoors.

3. Connect the Supply Gas Line

A manual shut off valve, 1/8 in. plugged test port and 6 in. drip leg must be installed prior to the gas train. The valve and the test port must be accessible for the connection of a test gauge. Supply gas connections must be made by a qualified installer and are not furnished by manufacturer.



Supply Gas Line

4. Test the System for Leaks

WARNING

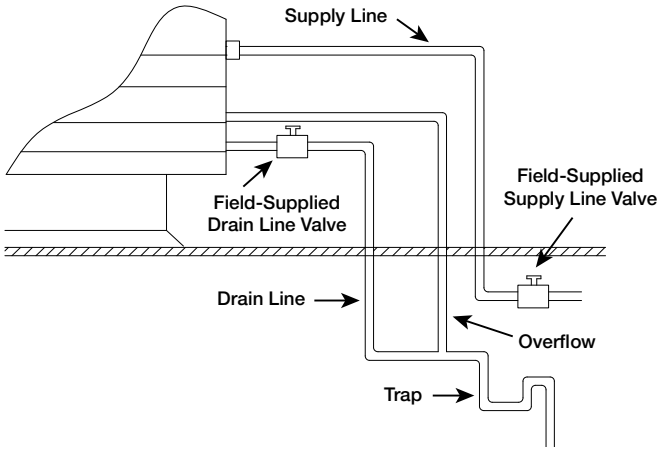
NEVER test for a gas leak with an open flame.

Check both the supply lines and the factory piping for leaks. Apply a soap and water solution or equivalent to all piping and watch for bubbling which indicates a leak.

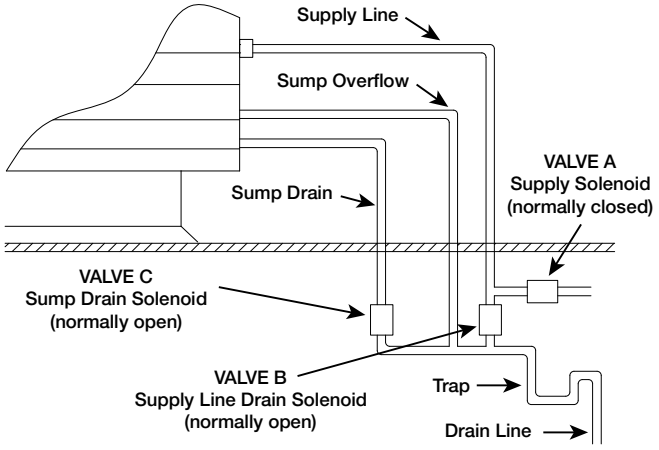
The factory piping has been checked for leaks, but must be rechecked due to possible movement during shipping and installation.

Optional Evaporative Cooling Module

Recirculating Pump



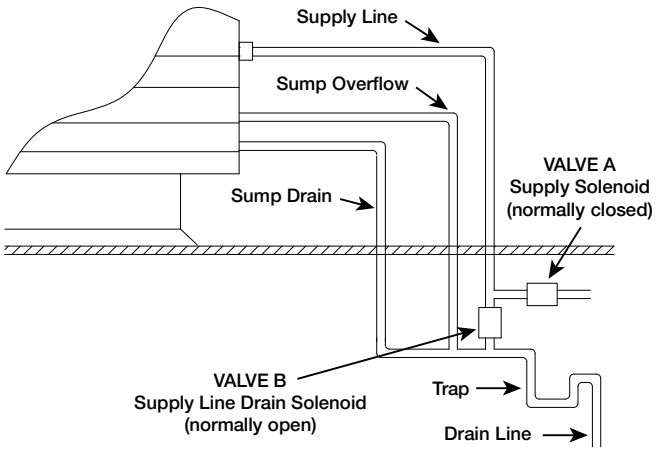
Auto Drain and Fill



Auto Drain & Fill Valves (when provided by manufacturer)						
Assm. Number	Mfg. Part Number	ASCO Part Number	Solenoid Type	De-Energized Position	Diameter	Qty.
852178	461262	8210G2	Supply	Closed	1/2 inch (13 mm)	1
	461263	8262G262	Supply Line Drain	Open	1/4 inch (6 mm)	1
	461264	8210G35	Sump Drain	Open	3/4 inch (19.mm)	1

Part numbers subject to change.

Single Pass



Mfg. Part Number	ASCO Part Number	Solenoid Type	De-Energized Position	Diameter	Qty.
461262	8210G2	Supply	Closed	1/2 inch (13 mm)	1
461263	8262G262	Supply Line Drain	Open	1/4 inch (6 mm)	1

Part numbers subject to change.

All three solenoid valves are different. Make sure to use the proper solenoid for each location. Check your local code requirements for proper installation of this type of system.

Note: The valves can be provided by the factory or field-supplied by others. If field-supplied valves are utilized, the total inrush VA shall not exceed 160 VA and the total holding VA shall not exceed 66 VA with a 24 VAC supply.

All solenoid valves and traps must be installed below the roof to protect the supply water line from freezing. If they cannot be installed below the roof, an alternative method must be used to protect the lines from freezing.

CAUTION

Provisions must be taken to prevent damage to the evaporative cooling section during freezing conditions. The sump, drain lines and supply lines must be drained prior to freezing conditions or an alternate method must be used to protect the lines and media.

Optional Evaporative Cooling Module *(continued)*

1. Install the Water Supply Line

Supply line opening requirements vary by unit size and arrangement. Connect the water supply line to the float valve. A field-provided opening must be created for the supply line.

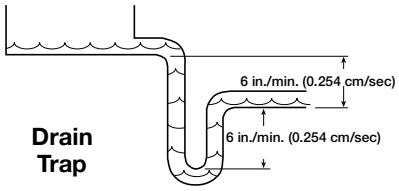
The supply line must be of adequate size and pressure to resupply the amount of water lost due to bleed-off and evaporation. The drain line should be the same size or larger than the sump tank drain connection.

Auto Drain and Fill or Single Pass - Install the 1/2 in. normally closed solenoid (Valve A) in the supply line. Install the 1/4 in. normally open solenoid (Valve B) between the supply line and the drain line.

2. Install the Drain Line

Recirculating Pump - Connect an unobstructed drain line to the drain and overflow connections on the evaporative cooling module. A shut off valve (by others) is required in the drain line. A trap must be provided for proper unit drainage.

Auto Drain and Fill - Connect an unobstructed drain line to the sump overflow connection. Install the 3/4 in. normally open solenoid (Valve C) between the sump drain connection and the drain line. A trap must be provided for proper unit drainage.



Single Pass - Connect an unobstructed drain line to the sump drain and overflow connections. A trap must be provided for proper unit drainage.

3. Check/Adjust Water Level

Check the water level in the sump tank. The water level must be above the pump intake and below the overflow. Adjust the float as needed to achieve the proper water level. The float can be adjusted by bending the float lever arm. The single pass system does not use a float valve and does not retain water in the sump tank.

Note: The manufacturer recommends that units equipped with evaporative cooling be installed outdoors. If an evaporative cooling module must be installed indoors, it is recommended that a field-supplied secondary drain pan be installed under the evaporative cooling section. This will help mitigate damage to building materials in the event the evaporative cooling module sump tank overflows.

Optional Split Direct Expansion (DX) Coil

Guidelines for the installation of direct expansion (DX) cooling coils have been provided to ensure proper performance and longevity of the coils. These are general guidelines that may have to be tailored to meet the requirements of a specific installation. Qualified personnel must perform the installation and maintenance of any coil. Proper protective equipment is recommended during the installation and maintenance of the coil.

All field-brazing and welding must be performed using high quality materials and an inert gas purge (such as nitrogen) to reduce oxidation of the internal surface of the coil.

All field-piping must be self-supporting and flexible enough to allow for the thermal expansion of the coil and piping.

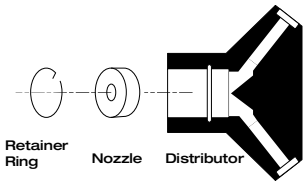
1. Locate the Distributor(s)

A field-provided opening must be created for the liquid line(s). The distributor(s) are located behind the distributor access panel.

Distributor Access Panel

2. Verify Nozzle Placement

Inspect the refrigerant distributor and verify that the nozzle is in place. The nozzle is generally held in place by a retaining ring or is an integral part of the distributor itself. The nozzle is not a metering device. A thermostatic expansion valve (TXV) must be field-supplied.

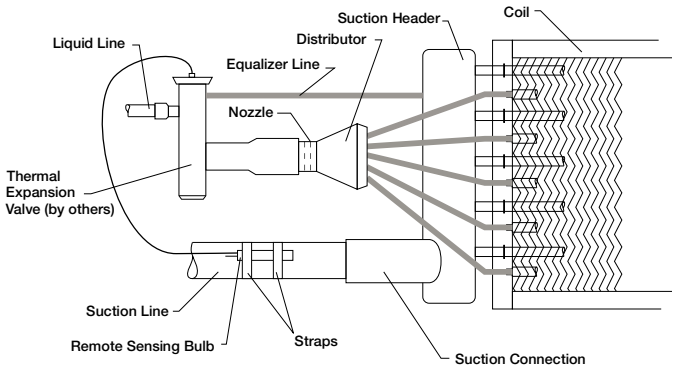


3. Install Suction Line

Install suction line(s) from the compressor(s) to the suction connection(s) which are stubbed through the side of the cabinet.

4. Install the Liquid Line and Thermostatic Expansion Valve (TXV) (by others)

Liquid line openings vary by coil size and circuiting and are field-supplied. Follow the TXV recommendations for installation to avoid damaging the valve. If the valve is externally equalized, use a tubing cutter to cut off the plugged end of the factory installed equalizer line. Use a de-burring tool to remove any loose metal from the equalizer line and attach it to the TXV. If the valve is internally equalized, the factory-installed equalizer line can be left as is. If a hot gas bypass kit was provided by others, refer to the manufacturer's instructions.



General Installation

5. Mount the TXV Sensing Bulb (by others)

Mount the TXV sensing bulb to the horizontal run of the suction line at the TXV manufacturer's recommended position and insulate it.

6. Check System for Leaks

Pressurize the coil to 100 psig with dry nitrogen. Leave the system pressurized for a minimum of 10 minutes. If the system holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the system and wait another 10 minutes. If the pressure drops again, there is likely one or more small leaks which must be located and repaired. Pressure losses greater than 5 psig indicate a large leak that must be isolated and repaired.

7. Evacuate and Charge the System

Use a vacuum pump to evacuate the system. Measure the vacuum in the system using a micron gauge located as far from the pump as possible. Evacuate the system to 500 microns or less, and then close the valve between the pump and the system. If the vacuum holds to 500 microns or less for one minute, the system is ready to be charged.

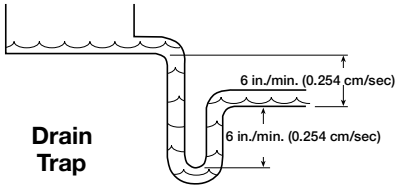
A steady rise in vacuum pressure indicates that moisture is still present and that the system must be further vacuumed until the moisture has been removed.

Failure to obtain a vacuum of 500 microns or less indicates a great deal of moisture or a leak. Break the vacuum with a charge of dry nitrogen and recheck for leaks. If no leaks are found, continue vacuuming the coil until the desired vacuum is reached.

8. Install the Drain Line

Connect an unobstructed drain line to the drain pan. A trap must be provided for proper unit drainage.

All traps must be installed below the roof line or be otherwise protected from freezing.



Drain Trap

Optional Chilled Water Coil

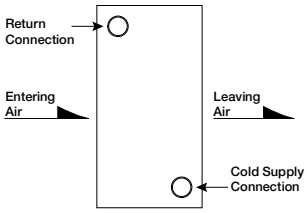
Guidelines for the installation of chilled water cooling coils have been provided to ensure proper performance and longevity of the coils. These are general guidelines that may have to be tailored to meet the requirements of a specific installation. Qualified personnel must perform the installation and maintenance of any coil. Proper protective equipment is recommended during the installation and maintenance of the coil.

When installing couplings, do not apply undue stress to the connection. Use a backup pipe wrench to avoid breaking the weld between the coil connection and the header.

All field-piping must be self-supporting. System piping must be flexible enough to allow for the thermal expansion and contraction of the coil and piping.

1. Verify Coil Hand Designation

Check the coil hand designation to ensure that it matches the system. Coils are generally plumbed with the supply connection located on the bottom of the leaving air-side of the coil and the return connection at the top of the entering air-side of the coil. This arrangement provides a counter flow heat exchanger and positive coil drainage.



2. Connect the Supply & Return Lines

Connect the supply and return lines as shown.

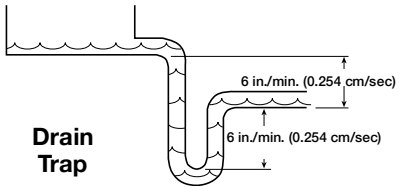
3. Check the System for Leaks

Pressurize the system to 100 psig. Leave the system pressurized for a minimum of 10 minutes. If the system holds pressure, it can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the system and wait another 10 minutes. If the pressure drops again, there is likely one or more small leaks which must be located and repaired. Pressure losses greater than 5 psig indicate a large leak that must be isolated and repaired.

4. Install the Drain Line

Connect an unobstructed drain line to the drain pan. A trap must be provided for proper unit drainage.

All traps must be installed below the roof line or be otherwise protected from freezing.



Optional Components

Building Pressure Control

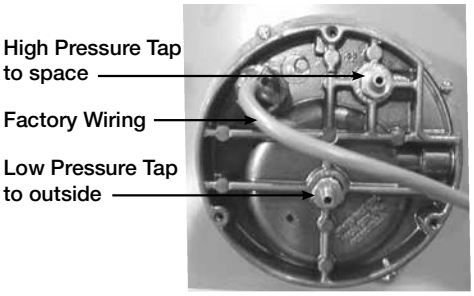
1. Mounting Pressure Sensor

Using the factory provided bracket, mount the pressure sensor outside of the building. The pressure sensor mounting location must be out of prevailing winds and away from supply or exhaust fans to assure accurate readings.

2. Running Pressure Tap Lines

Connect and run a pressure tube from the pressure sensor outside of the building to the low pressure tap on the back of the Photohelic® gauge. Run a second pressure tube from the high pressure tap on the back of the Photohelic gauge to the space. If the Photohelic gauge is located in the space to be controlled, the high pressure tube is not required.

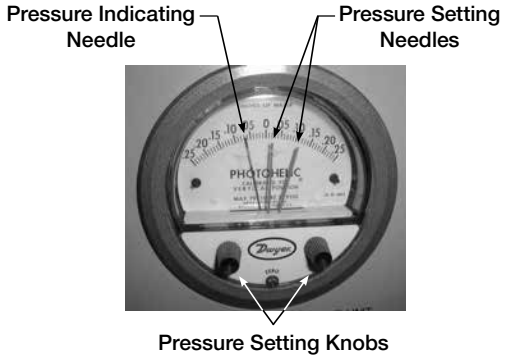
Note: Fifty feet of tubing is supplied with the unit. If further tubing is required, this must be supplied by others.



Connections for Photohelic® Gauge

3. Setting the Desired Building Pressure

The Photohelic pressure gauge is used to set the desired building pressure. The pressure is set by adjusting the upper and lower pressure limits. A typical positive pressure setting is: 0.0 in. wg (0.0 kPa) for the lower and 0.10 in. wg (0.02 kPa) for the upper pressure setting.



Building Static Pressure Sensor (with microprocessor)

The controller will modulate the supply fan based upon a comparison of the building static pressure set point to the actual building static pressure level reported from the sensor. Sensor shipped loose.

Duct Pressure Control

The optional microprocessor controller can be selected to modulate the supply fan based upon a comparison of the duct static pressure set point to the actual duct static pressure level reported from the sensor. The factory-supplied sensor will ship loose for field-mounting and wiring. Further component identification and terminal designation can be found by referencing the unit specific ladder diagrams and supplemental material supplied with the unit.

Carbon Dioxide (CO_2) Sensor

This sensor is intended to measure the CO_2 concentration in the ventilated space or return air duct. If the unit has been equipped with a microprocessor controller, the CO_2 sensor will modulate either the VFD or the return and outside air dampers based upon a comparison of the CO_2 set point to the actual CO_2 levels reported from the sensor. The duct mount or room mount sensor is shipped loose for field mounting and wiring.

Duct-Mounted Smoke Detector

The duct smoke detector provides early detection of smoke present in the HVAC duct system. The smoke detector is designed to prevent the recirculation of smoke by the air handling system. Complete system shut down will occur in the event of smoke detection. The detector will operate on 115 or 24 VAC. Output terminals are provided for remote accessories such as a horn, strobe, remote status indicators and reset switches or push buttons.

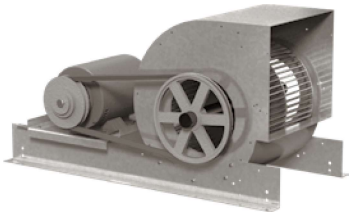
Supply Fan

Fan Identification

The fan type must be identified before performing the supply fan pre-start checks and start-up. The unit was supplied with one of three fan options.

Forward-Curved Fans

The forward-curved fans utilized in these units are double width, double inlet, belt driven, housed centrifugal fans. The impeller is constructed with shallow blades that "scoop" the air. In some instances, Models VSU or TSU units use two forward-curved fans with a common shaft.



Forward-Curved

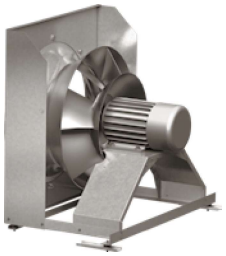
Backward-Curved Plenum Fans

Backward-curved plenum fans are single width, single inlet fans. The impellers are unhoused, with blades that curve away from the direction of rotation. These fans throw the air radially outward, 90° from the inlet direction, pressurizing the fan cabinet. These fans are direct driven with the impeller mounted directly to the motor shaft. A "P" is present in the model number.

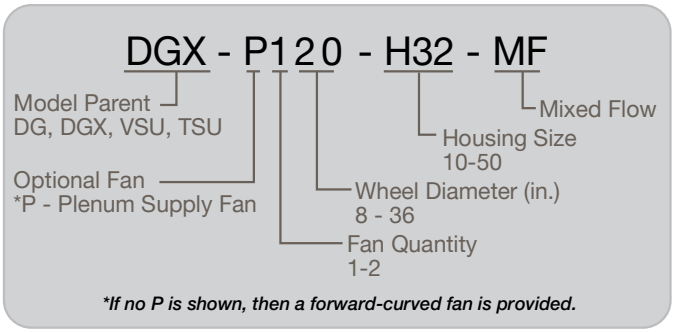
Backward-Curved Plenum

Mixed Flow Plenum Fans

Mixed flow plenum fans are single width, single inlet fans. The impellers are unhoused with blades that curve away from the direction of rotation. These fans throw the air radially outward, approximately 45° from the inlet direction, pressurizing the fan cabinet. These fans are direct driven with the impeller mounted directly to the motor shaft. A "P" and "MF" are present in the model number.



Mixed Flow Plenum



**If no P is shown, then a forward-curved fan is provided.*

Supply Fan

Pre-Start Checks

TOOLS REQUIRED

- Voltage Meter (with wire probes)
- Amperage Meter
- Pressure Gauges
- Tachometer
- Thermometer
- U-tube manometer or equivalent

WARNING

Disconnect and lock-out all power and gas before performing any maintenance or service to the unit. Failure to do so could result in serious injury or death and damage to equipment.

Check the housing, fan, and ductwork for any foreign objects before running the fan.

Units with a direct drive backward-curved plenum supply fan must always be supplied with a Variable Frequency Drive (VFD) due to the direct drive arrangement on the supply fan. Before proceeding further, identify if this is a constant volume or Variable Air Volume (VAV) unit. A VAV unit will have a bypass damper located adjacent to the burner. Reference the ***Start-Up: Direct Gas-Fired Heating, Optional Features, Variable Air Volume*** section in this Installation, Operation, and Maintenance Manual for further information.

1. Check Fasteners for Tightness

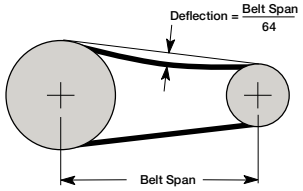
Check fasteners, set screws and locking collars on the fan, bearings, drive, motor base, and accessories for tightness.

2. Check Supply Fan Clearance

The rotation of the supply fan wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.

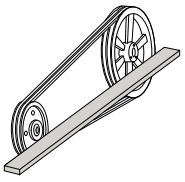
3. Check V-Belt Alignment (if applicable)

Check the V-belt drive for proper alignment and tension. Check the tension by measuring the deflection in the belt as shown.



Belt Tension

Check the alignment by using a straight edge across both sheaves. Differences in sheave width must be accounted for.



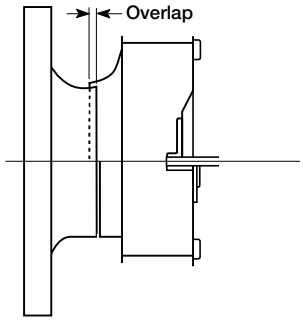
Drive Alignment

4. Check Plenum Fan Radial Overlap, Offset, Gap, and Wheel Alignment (if applicable)

Backward-Curved Plenum Fan Radial Overlap

Proper wheel and inlet cone overlap is shown in the chart. The overlap can be adjusted by loosening the setscrews in the wheel and moving the wheel to the correct position.

Fan Size	Overlap in. (cm)
P114	0.14 (0.36)
P115	0.25 (0.64)
P120	0.20 (0.51)
P125	0.26 (0.66)
P128	0.28 (0.71)

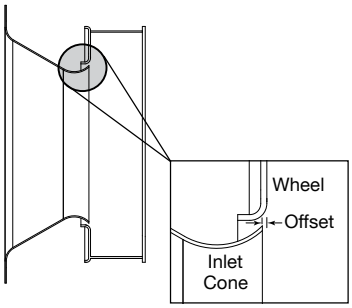


Backward-Curved Plenum Fan Radial Overlap

Backward-Curved Plenum Fan Radial Offset

Radial offset is adjusted by loosening the wheel hub from the shaft and moving the wheel to the desired position along the shaft. The correct radial offset between the inlet cone and wheel is shown in the chart. There is a smooth feel to the profile when moving from one component to the other.

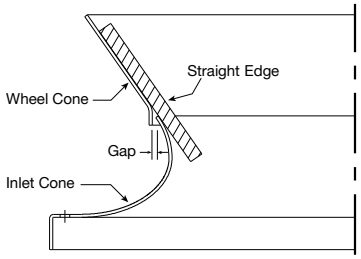
Fan Size	Offset in. (cm)
P127	0.375 (0.95)
P222	0.250 (0.64)
P227	0.375 (0.95)



Backward-Curved Plenum Fan Radial Offset

Mixed Flow Plenum Fan Alignment

If necessary, adjust wheel position by loosening the wheel hub from the motor shaft. Adjust wheel position so that a straight edge held tight to the wheel cone just touches the inlet cone.



Mixed Flow Alignment