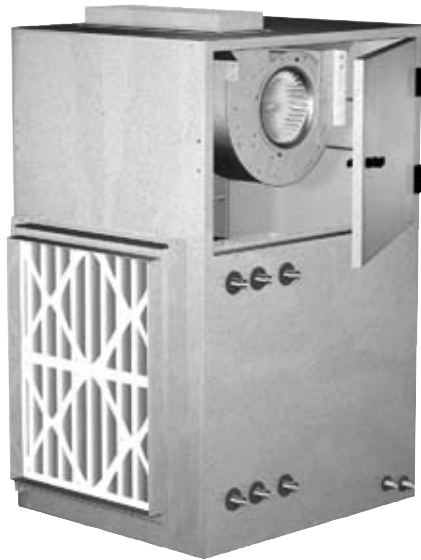




**Model VFCD
Vertical Fan Coil**

Installation, Operation and Maintenance Manual



Report any damaged equipment to the shipper immediately!

All units are shipped on a skid or packaged to minimize damage during shipment. The transporting carrier has the responsibility for delivering all items in their original condition as received from Greenheck. The individual receiving the equipment is responsible for inspecting the unit for obvious or hidden damage, recording any damage on the bill of lading before acceptance and filing a claim (if required) with the final carrier. Some accessory items are stored inside the unit during shipping. Care must be taken during installation to prevent damage to units.

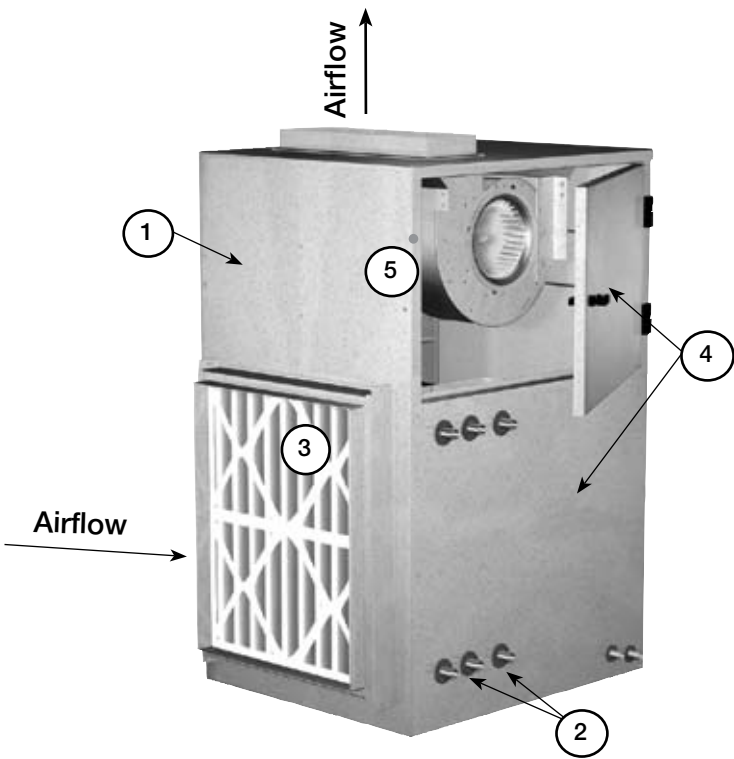
****WARNING****

Disconnect and secure all electrical power to the "OFF" position prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

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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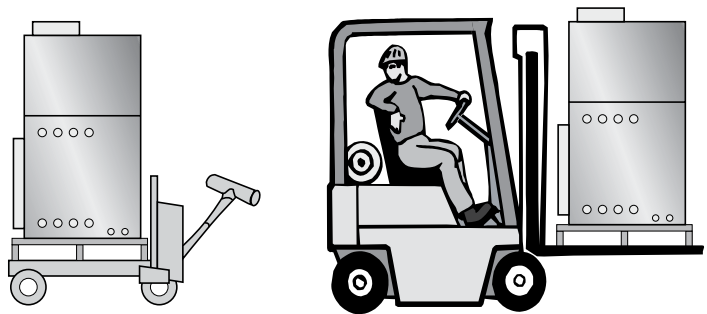
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1. Fan Section
2. Coil Section
Chilled Water or DX Coils
Hot Water or Steam Coils
3. Inlet Filter
Vertical inlet filter with ¼ turn fasteners
(Removed for internal viewing)
4. Side Access Panels
Right and left access to each unit
(Upper panel hinged open)
5. Knock out for recommended electrical
wiring penetration or disconnect switch.

Lifting Instructions

Greenheck's Vertical Fan Coil (VFCD) can be moved around a job site on a wheeled cart or with a forklift. Avoid twisting or uneven lifting of equipment. Do not lift equipment by coil connections or headers. The unit must remain upright during lifting. All access doors and panels must be closed during lifting to avoid damage.



Mounting Instructions

The VFCD should be mounted on a field supplied base as shown in Figure 2. An optional Greenheck supplied 6 inch extended base may be used when mounting as shown in Figure 3. *The VFCD is available with both external neoprene and spring isolation options.*

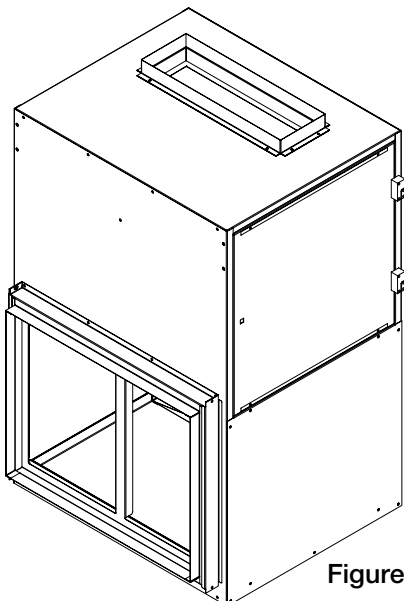


Figure 2

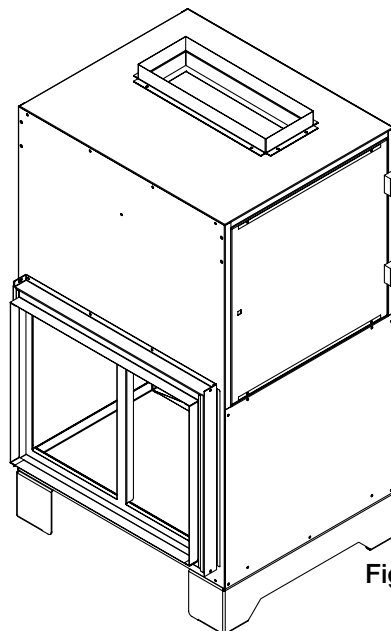
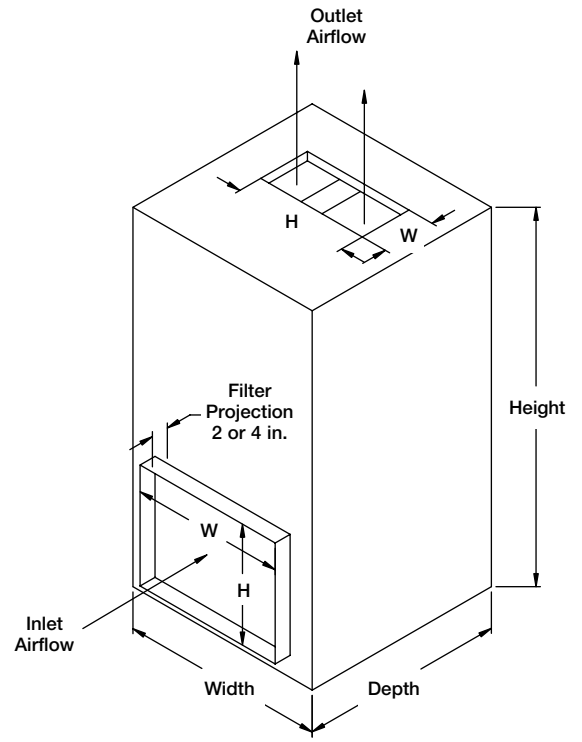


Figure 3

VFCD Filter Information

Size	Filter Size	Qty	Face Area ft. ²
600	20 x 24	1	2.7
800	20 x 24	1	2.7
1300	20 x 24	1	2.7
1600	24 x 24	1	3.6
2000	16 x 25	2	4.7
2400	16 x 25	2	4.7
3000	24 x 24	2	6.7

All dimensions are shown in inches.



VFCD Dimensional Data

Unit Size	Height	Width	Depth	Inlet		Outlet	
				Width	Height	Width	Height
600	40	24	24	18	22	7	5½
800	40	24	24	18	22	7	5½
1300	44	24	28	18	22	18	5⅝
1600	44	30	28	22	22	18	5⅝
2000	52	34	28	29	23	26	5⅝
2400	52	34	28	29	23	26	5⅝
3000	52	50	28	45	22	32⅞	10⅞

All dimensions are shown in inches.

VFCD Weight Information

Unit Size	Fan w/ Drain Pan			Row 1	Row 2	Row 4	Row 6	Row 8	Row 10	2 in. Vertical Filter	4 in. Vertical Filter
	Fan	Motor	Total								
600	235	15	250	38	51	77	106	135	-	8	13
800	240	15	255	38	51	77	106	135	-	8	13
1300	260	15	275	38	51	77	106	135	164	8	13
1600	300	25	325	51	70	110	152	195	238	11	17
2000	350	25	375	58	80	127	175	225	275	12	19
2400	360	35	395	58	80	127	175	225	275	12	19
3000	425	50	475	64	90	143	198	225	252	14	22

All weights are shown in lbs. Motor weights may vary depending on enclosure type and horsepower.

VFCD Coil Data

Hot Water

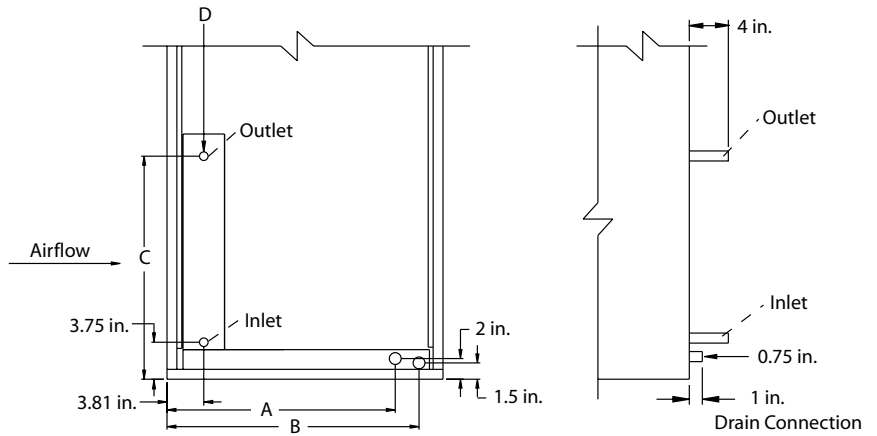
1 & 2 Row

Dimensional Data

Size	A	B	C	D
600	20.00	22.50	22.63	0.875
800	20.00	22.50	22.63	0.875
1300	24.00	27.50	22.63	0.875
1600	24.75	27.25	22.63	0.875
2000	24.75	27.50	25.13	0.875
2400	24.75	27.50	25.13	0.875
3000	28.75	31.25	22.63	1.375

All dimensions are in inches.

NOTE: Fluid enters the coil from the bottom connection (Inlet) and exits from the top (Outlet).



0.25 Vent and Drain Supplied
Right Side Connection Shown

Hot Water

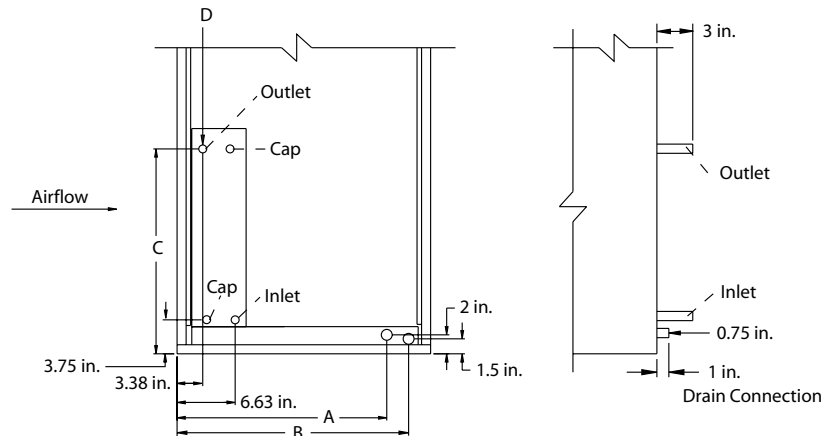
4 Row

Dimensional Data

Size	A	B	C	D
600	20.00	22.50	22.63	0.875
800	20.00	22.50	22.63	0.875
1300	24.00	27.50	22.63	0.875
1600	24.75	27.25	22.63	0.875
2000	24.75	27.50	25.13	0.875
2400	24.75	27.50	25.13	0.875
3000	28.75	31.25	22.63	1.375

All dimensions are in inches.

NOTE: With airflow from left to right the fluid enters the coil from the bottom connection (Inlet) and exits from the top (Outlet). The other two coil connections should be capped off.



0.25 Vent and Drain Supplied
Right Side Connection Shown

Steam

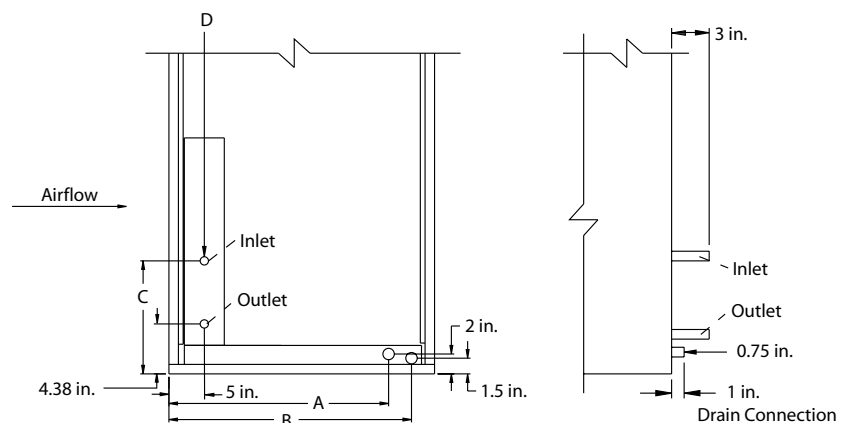
1 & 2 Row

Dimensional Data

Size	A	B	C	D
600	20.00	22.50	13.20	2.0
800	20.00	22.50	13.20	2.0
1300	24.00	27.50	13.20	2.0
1600	24.75	27.25	13.20	2.0
2000	24.75	27.50	14.44	2.0
2400	24.75	27.50	14.44	2.0
3000	28.75	31.25	13.20	2.5

All dimensions are in inches.

NOTE: Steam enters the coil from the center connection (Inlet) and exits from the bottom (Outlet).



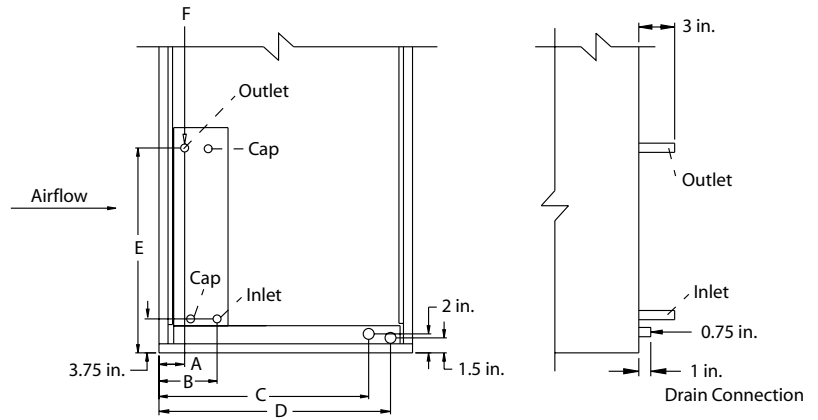
Right Side Connection Shown

VFCD Coil Data

Chilled Water

4, 6 or 8 Row

0.25 Vent and Drain Supplied
Right Side Connection Shown



Dimensional Data

Size	A			B			C	D	E	F
	4 Row	6 Row	8 Row	4 Row	6 Row	8 Row				
600	3.38	3.29	3.21	6.63	8.71	10.79	20.00	22.50	22.63	0.875
800	3.38	3.29	3.21	6.63	8.71	10.79	20.00	22.50	22.63	0.875
1300	3.38	3.29	3.21	6.63	8.71	10.79	24.00	27.50	22.63	0.875
1600	3.38	3.29	3.21	6.63	8.71	10.79	24.75	27.25	22.63	0.875
2000	3.38	3.29	3.21	6.63	8.71	10.79	24.75	27.50	25.13	0.875
2400	3.38	3.29	3.21	6.63	8.71	10.79	24.75	27.50	25.13	0.875
3000	3.38	3.29	3.21	6.63	8.71	10.79	28.75	31.25	22.63	1.375

All dimensions are in inches.

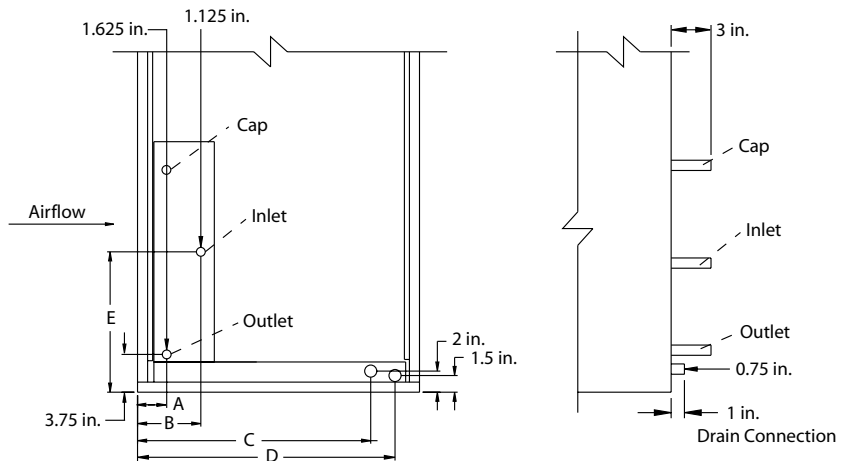
NOTE: With airflow from left to right the fluid enters the coil from the bottom connection (Inlet) and exits from the top (Outlet). The other two coil connections should be capped off (Cap).

Direct Expansion (DX)

Single Circuit

4, 6 or 8 Row (Orifice Code 18/19)

Right Side Connection Shown



Dimensional Data

Size	A			B			C	D	E
	4 Row	6 Row	8 Row	4 Row	6 Row	8 Row			
600	3.38	3.29	3.21	5.66	6.25	7.33	20.00	22.50	13.19
800	3.38	3.29	3.21	5.66	6.25	7.33	20.00	22.50	13.19
1300	3.38	3.29	3.21	5.66	6.25	7.33	24.00	27.50	13.19
1600	3.38	3.29	3.21	5.66	6.25	7.33	24.75	27.25	13.19
2000	3.38	3.29	3.21	5.66	6.25	7.33	24.75	27.50	14.44
2400	3.38	3.29	3.21	5.66	6.25	7.33	24.75	27.50	14.44
3000	3.38	3.29	3.21	5.66	6.25	7.33	28.75	31.25	13.19

All dimensions are in inches.

NOTE: With airflow from left to right the fluid enters the coil from the center connection (Inlet) and exits from the bottom (Outlet). The other connections should be capped off.

Airflow System Start-Up

For proper unit function and safety, follow everything in this start-up procedure in the order presented. This is to be done after the electrical connections are complete.

Pre-Start Check List

1. Disconnect and lock-out all power switches to fan.
2. Check all fasteners, set screws and locking collars on the fan, motor base and accessories for tightness.
3. Rotate the fan wheel by hand and assure no parts are rubbing.

Special Tools Required

- Voltage meter
- Tachometer
- Amperage meter

1. Check Voltage

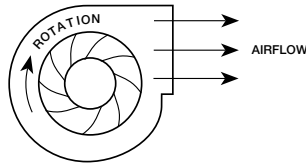
Before starting the unit, compare the supplied voltage with the units nameplate voltage and the motor voltage. Units are not provided with thermal overload protection unless a control center has been ordered with the unit or the motor has been selected with thermal overload protection.

2. Check Blower Rotation

If the blower is rotating in the wrong direction, the unit will move some air, but not perform properly. To check the rotation, open the blower access door and run the blower momentarily to determine the rotation.

To reverse the rotation, turn the power off and use the following procedure:

- For single phase units, rewire the motor per the instructions on the motor.



3. Check for Vibration

Check for unusual noise and vibration. Excessive vibration maybe experienced during initial start-up. Left unchecked, excessive vibration can cause a multitude of problems, including structural and/or component failure. Many conditions can be discovered by careful observation. If the problem is wheel unbalance, in-place balancing can be done providing there is access to the fan wheel. Generally, fan vibration and noise is transmitted to

other parts of the building by the ductwork. If noise is an issue, we recommend using heavy canvas connections on the inlet of the fan. Refer to the Troubleshooting section of this manual if a problem develops.

4. Air Volume Check and Measurement

Along with the building balance, the units air volume (cfm) should be measured and compared with its rated air volume. This unit is flexible for varying air volume, but the actual air volume should be known for making final adjustments. The most accurate way to measure the air volume is by using the pitot traverse method in the ductwork away from the blower. Other methods can be used but should be proven and accurate. To adjust the air volume, change the fan rpm or the system losses. See Troubleshooting section in this guide.

5. Measure Motor Voltage, Amperage and Fan RPM

All access doors must be installed. Measure and record the input voltage and motor amperage(s).

To measure the fan rpm, the blower door will need to be removed. Minimize measurement time because the motor may over amp with the door removed.

Compare measured amps to the motor nameplate full load amps and correct if over amping. See the Troubleshooting section in this guide.

Speed Controls

Speed controls may be used on Model VFCD fans for manual adjustment of the fan's performance (for final system balancing) or to control the fan's output in confined spaces, such as conference or meeting rooms. The fan can be adjusted to 60% of design airflow with a speed control. This reduction in airflow and fan speed is also accompanied by a reduction in noise level. Solid state speed controls are available for a range of applications up to 15 amps. Speed controls can be used to operate more than one fan if the combined total amperage of the fans does not exceed the control rating.

Model 5WSSC - For use w/ shaded pole and PSC motors.

- Rated for 115 - 127v, 5 amp
- UL Listed
- Require a 2x4 handy box

Model 5W240 - For use w/ shaded pole and PSC motors.

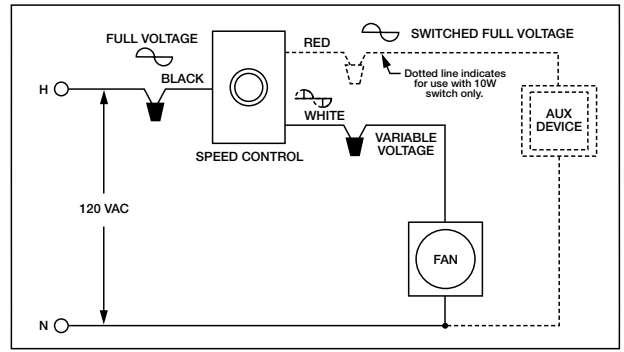
- Rated for 220 - 240v, 5 amp
- UL Listed
- Requires 2x4 handy box

Model 8WSSC - For use w/ shaded pole and PSC motors.

- Rated for 220 - 240v, 8 amp
- UL Listed
- Requires 2x4 handy box

Model 10WSSC - For use w/ shaded pole and PSC motors.

- Rated for 115 - 127v, 10 amp
- UL Listed
- Requires 4x4 handy box



Airflow Troubleshooting

Blower Unit		
Symptom	Possible Cause	Solution
Blower fails to operate	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Defective motor or capacitor	Replace
	Motor starter overloaded	Reset starter and check amps
Motor overamps	CFMs too high	Check CFMs
	Static pressures are higher or lower than design	If higher, ductwork should be improved If lower, fan RPMs should be lower
	Blower rotation is incorrect	Check rotation and correct
	Motor voltage incorrect	Check motor nameplate and supplied voltage
	Motor horsepower too low	See specifications and catalog for fan curves to determine if horsepower is sufficient
	Shorted windings in motor	Replace motor
Insufficient airflow	Mixing box damper not fully open	Adjust damper linkage or replace damper motor
	System static pressure too high	Improve ductwork to eliminate losses using good duct practices
	Blower speed too low	Check for correct drives and RPMs with catalog data
	Mixing box dampers closed	Open and adjust
	Dirty or clogged filters	Clean or replace
	Leaks in ductwork	Repair
	Elbows, or other obstructions may restrict fan outlet	Correct or improve ductwork
Too much airflow	Blower fan speed too high	Check for correct fan RPM
	Filter(s) not in place	Install filters
	Insufficient static pressure (SP) (airflow resistance)	Induce SP into system ductwork
Excessive noise or vibration	Wheel rubbing on housing	Center wheel
	Loose wheel on shaft	Tighten wheel setscrew
	Loose motor or blower sheave	Tighten sheave setscrew
	Motor base or blower loose	Tighten mountings bolts
	Motor out of balance	Replace
	Wheel out of balance	Replace or rebalance
	Accumulation of material on wheel	Clean wheel and housing

Hot Water, Chilled Water & DX Coils

Water Coils

1. Piping should be in accordance with accepted industry standards. Pipework should be supported independently of the coils. Water pipes are copper with sweat connections. **USE WET TOWEL TO AVOID BURNING COIL CONNECTION GROMMETS.** When installing coupling, do not apply undue stress to the connection extending through the unit. Use a back-up pipe wrench to avoid breaking the weld between coil connection and header.
2. Connect the **WATER SUPPLY TO THE BOTTOM CONNECTION** on the air-leaving side and the **WATER RETURN TO THE TOP CONNECTION** on the air-entering side. The extra bottom connection can be used for an auxiliary manual drain connection, and the extra top connection may be used for an automatic air vent or the extra connections can be capped. To ensure proper venting, an external air vent in the piping is recommended. Connecting the supply and/or return in any other manner will result in very poor performance. **CAP UNUSED CONNECTIONS.**
3. The air vent at the uppermost point should be temporarily opened during system start-up to release all of the air from the coil. To maintain heat transfer capacity, periodically vent any air in coil. Vent is to be located behind connections side access door.
4. Water coils are not normally recommended for use with entering air temperatures below 40°F. No control system can be depended upon to be 100% safe against freeze-up with water coils. Glycol solutions or brines are the only safe media for operation of water coils with low entering air conditions.

CONTINUOUS WATER CIRCULATION THROUGH THE COIL AT ALL TIMES IS HIGHLY RECOMMENDED.

5. Pipe sizes for the system must be selected on the basis of the head (pressure) available from the circulation pump. Piping should be in accordance with accepted industry standards.
6. For chilled water coils, the condensate drain pipe should be sized adequately to ensure the condensate drains properly. See **DRAIN PAN TRAPS** and Figure 4.

Direct Expansion (DX) Coils

1. Piping should be in accordance with accepted industry standards. Pipework should be supported independently of the coils. Undue stress should not be applied at the connection to coil headers.
2. The condensate drain pipe should be sized adequately to ensure the condensate drains properly. See **DRAIN PAN TRAPS** and Figure 4.
3. When connecting suction and liquid connections make sure the coil is free from all foreign material. Make sure all joints are tight and free of leakage.
4. Dual circuits are recommended to be run by two compressors. One compressor with the appropriate valves and piping can be used, but is not recommended. Greenheck does not supply compressor or condensing units, for further instruction on DX coil installation and operation contact your compressor and/or condenser manufacturer.

DXI coils have dual connections and should be used with two compressors.

Drain Pan Traps

Drain lines and traps should be run full size from the drain pan connection. Drain pans should have drain lines and traps to permit the condensate from the coils to drain freely. On all units with drain pans, the trap depth and the distance between the trap outlet and the drain pan outlet should be twice the static pressure (P) in the drain pan section under normal operation to assure the trap remains sealed. Refer to Figure 4.

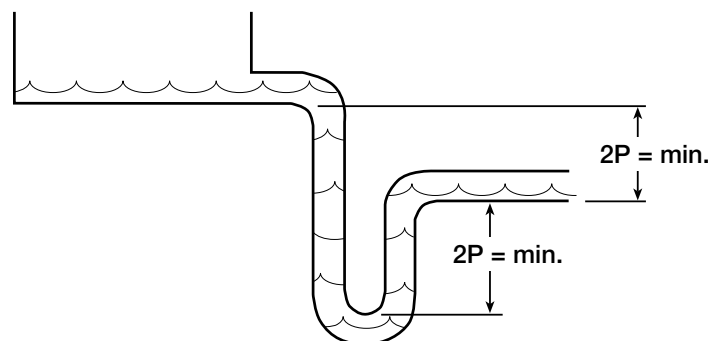


Figure 4
Drain Pan Trap

Steam Coils

Application Recommendations:

Satisfactory operation and service life are best ensured when coils are installed with proper piping, trap and support arrangement. The following notes and Figure 5 are recommended for the coil unit installation and operation.

General:

1. Provide separate supports and hangers for the unit and the piping.
2. Be certain that adequate piping flexibility is provided. Stresses resulting from expansion of closely coupled piping and coil arrangement can cause serious damage.
3. Standard steam coils are pitched in the casings when installed for horizontal airflow. The **CASING MUST BE LEVEL** after the unit is installed for proper condensate drainage. If condensate is not removed, the coil will suffer from water hammering and will have a shortened life. On vertical airflow applications, the coils must be pitched when installed.
4. 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.
5. It is recommended that vacuum breakers be installed on all applications to prevent retaining condensate in the coil. Generally, the vacuum breaker is to be connected 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.
6. Do not attempt to lift condensate when using modulating or on-off control.
7. Do not reduce the pipe size leaving the coil.

Traps:

1. Size traps in accordance with the manufacturer's recommendations. Be certain that the required pressure differential will always be available. **DO NOT UNDERSIZE.**
2. Float and thermostatic or bucket traps are recommended for low pressure steam. On high pressure systems, bucket traps are normally recommended. The thermostatic traps should be used only for air venting.
3. Bucket traps are recommended for use with on-off control only.
4. Locate traps at least 12 inches below the coil return connection.

Controls:

1. On high pressure installations, a two-position steam valve with a face and bypass arrangement is preferred where modulating control is required.
2. Modulating valves must be sized properly. **DO NOT UNDERSIZE.**

Freezing Conditions (Entering air below 35°F):

1. 5 PSI steam must be supplied to the coil at all times.
2. Modulating valves are not recommended. Control should be by means of face and bypass dampers.
3. Provision should always be made to thoroughly mix fresh air and return air before it enters the coil on return air units. Also, temperature control elements must be properly located to obtain true air mixture temperatures.
4. As additional protection against freeze-up, the trap should be installed sufficiently far below the coil to provide an adequate hydrostatic head to ensure removal of condensate during an interruption in the steam pressure. Estimate 3 feet for each 1 PSI of trap differential required.
5. On start-up, admit steam to coil ten minutes before admitting outdoor air.
6. Provision must be made to close fresh air dampers if steam supply pressure falls below minimum specified.

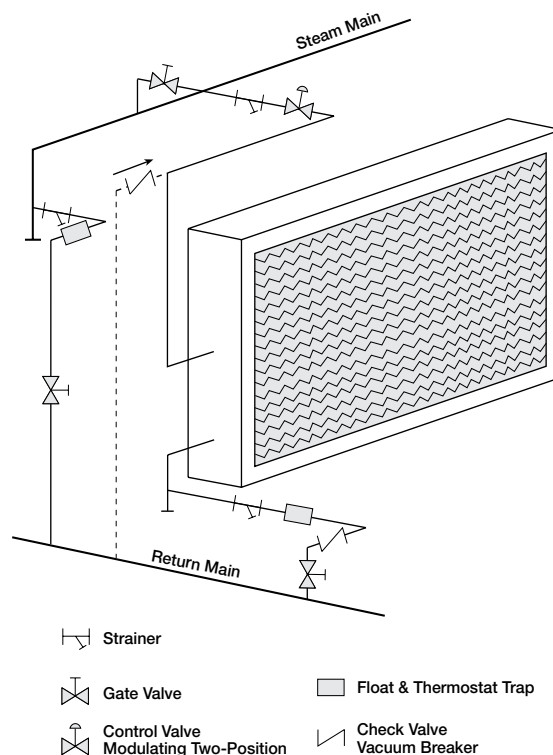


Figure 5
Recommended Steam Coil Piping

Fan Maintenance

Greenheck recommends these procedures to ensure trouble-free operation of this unit. It is especially important to maintain heater units for clean and efficient operation. Most unit failures can be attributed to poor setup or poor maintenance.

A record of maintenance performed on this unit should be kept. This information will provide essential information if problems are encountered. A section at the back of this manual is provided for recording the unit's maintenance history.

CAUTION: *When performing any maintenance on this unit be sure that the power is disconnected and cannot be accidentally turned on. The control center disconnect can be locked in the off position.*

Pre-Starting Checks

Check all fasteners for tightness. The wheel should rotate freely and be aligned. Wheel position is preset at the factory, however, movement may occur during shipment and realignment may be necessary. Centering may be accomplished by loosening the set screw in the wheel and moving the wheel to desired position.

Every 3 Months

The filter in the unit should be inspected at least every 3 months. Depending on the environment, filters could require changing or cleaning more or less often. The filters can be slid out of either side of the unit.

If **washable filters** are installed, they can be washed in warm soapy water. An adhesive spray can be applied to increase filter efficiency.

If **disposable filters** are installed, check by holding up to a light source. If light cannot pass through the filter, it should be replaced. Replacement filters should be of the same manufacturer and size. When reinstalling filters, be sure to install with the airflow in the correct direction indicated on the filter.

Motor maintenance is generally limited to cleaning and lubrication (where applicable). Cleaning should be limited to the exterior surfaces only. Removing dust and grease buildup on motor housing assures proper motor cooling. Greasing of motors is intended only when grease fittings are provided. Many fractional motors are permanently lubricated and require no further lubrication. Motors supplied with grease fittings should be greased in accordance with manufacturer's recommendations. When motor temperature does not exceed 104°F (40°C), the grease should be replaced after 2000 hours of running time as a general rule.

Wheels require very little attention when moving clean air. Occasionally, oil and dust may accumulate on the wheel causing imbalance. When this occurs the wheel and housing should be cleaned to assure smooth and safe operation. Inspect fan impeller and housing for fatigue, corrosion or wear.

Routinely check all **fasteners, set screws and locking collars on the fan, motor base and accessories** for tightness.

Coil Maintenance

1. Coils must be clean to obtain maximum performance. Check once a year under normal operating conditions and if dirty, brush or vacuum clean. Soiled fins reduce the capacity of the coil, demand more energy from the fan, and create an environment for odor and bacteria to grow and spread through the conditioned zone. High pressure water (400 psi or less) may be used to clean coils with fin thickness over 0.006 inches thick. **TEST THE SPRAY PRESSURE** over a small corner of the coil to determine if the fins will withstand the spray pressure.

For coils with fragile fins or high fin density, foaming chemical sprays and washes are available. Many coil cleaners contain harsh chemicals, so they must be used with caution by qualified personnel only. Care must be taken not to damage the coils, including fins, while cleaning.

CAUTION: Fin edges are sharp.

2. Drain pans in any air conditioning unit will have some moisture in them, therefore, algae and other organisms will grow due to airborne spores and bacteria. Periodic cleaning is necessary to prevent this build-up from plugging the drain and causing the drain pan to overflow. Inspect twice a year to avoid the possibility of overflow. Also, drain pans should be kept clean to prevent the spread of disease. Cleaning should be performed by qualified personnel.

Winterizing Coils

Coil freeze-up can be caused by such things as air stratification and failure of outdoor air dampers and/or preheat coils. Routine draining of water cooling coils for winter shutdown cannot be depended upon as insurance against freeze-up. Severe coil damage may result. It is recommended that all coils be drained as thoroughly as possible and then treated 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 will be 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 will have a higher freezing point in their natural state than when mixed with water.

Maintenance Documentation

Job Information

Job Name: _____
 Address: _____
 City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____
 Contact Person: _____

Service Organization: _____
 Address: _____
 City: _____ State: _____ Zip: _____
 Phone: _____ Fax: _____
 Work Done By: _____

Name Plate Information

Model: _____
 Volts: _____ Hertz: _____ Phase: _____
 Amps: _____ Mark: _____
 Serial Number: _____
 Motor Voltage: _____
 Motor Amperage: _____
 Fan rpm: _____

Field Start-Up Documentation

Actual Voltage: _____ Hertz: _____ Phase: _____
 Actual Amperage: _____
 Blower Rotation Correct
 Air Volume Design _____ cfm
 Actual _____ cfm

Maintenance

Date	Time	Notes:

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at our option when returned to our factory, transportation prepaid. Motors are warranted by the motor manufacturer for a period of one year. Should motors furnished by Greenheck prove defective during this period, they should be returned to the nearest authorized motor service station. Coils are warranted by the coil manufacture for a period of one year. Greenheck will not be responsible for any removal or installation costs.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

*This manual is the property of the owner, and is required for future maintenance.
 Please leave it with the owner when you complete the job.*

