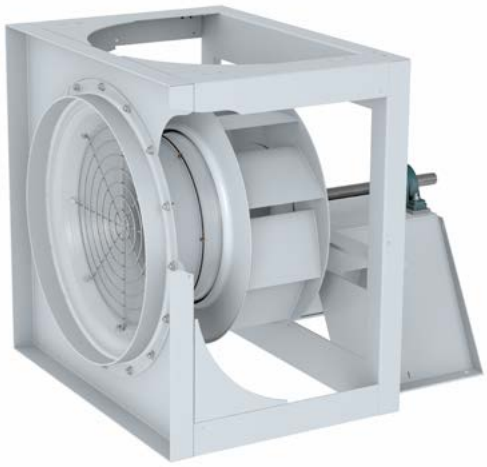
IM-130

August 2026

Airflow Measurement System using Piezometer Ring

Installation, Operation & Maintenance Manual



Review AMCA Bulletin 410 Prior to Installation

This manual has been prepared to guide the users of an airflow measuring system using a piezometer ring in the proper installation, operation and maintenance procedures to ensure maximum equipment life with trouble-free operation. For safe installation, startup and operational life of this equipment, it is important that all involved with the equipment be well versed in proper fan safety practices and read this manual. It is the user's responsibility to make sure that all requirements of good safety practices and any applicable safety codes are strictly adhered to. Because of the wide variety of equipment covered in this manual, the instructions given here are general in nature. Additional product and engineering information is available at *www.aerovent.com*.

SAFETY NOTICE

Refer to the safety section(s) in this manual prior to installing or servicing the fan. The most current version of this installation and maintenance manual can be found on our website at www.aerovent.com/resources/installation-and-maintenance-manuals.

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AEROVENT
Industrial Ventilation Systems

Safety & Hazard Warnings

For general safety practices for air moving equipment, see AMCA Bulletin 410. Aerovent offers many safety accessories. These safety devices include (but are not limited to) belt guards, shaft guards, inlet and discharge screens. The use and suitability of safety devices is the responsibility of the purchaser.

Facility-related safety conditions include fans' accessibility and location. How easily can non-service personnel access the unit? Is the fan in a hazardous duty environment? Was the unit ordered for this duty? Other concerns must also be addressed. All fans should be powered through switches which are easily accessible to service personnel from the fan. Fan power must have the ability to be "locked out" by service personnel trained in lockout/tagout procedures per OSHA requirements (29CFR1910.147). When performing lockout, be aware of factors, such as building pressure and additional fans in the system that can influence unwanted fan rotation (wind milling). If you have any doubt about your ability to perform a task, seek a person qualified to do that task. Before any work is done on a fan, ensure that the fan is isolated from the electrical supply using a 'lockout/tagout system.'

Note: A stationary, non-rotating fan does not mean that the fan is isolated from the electrical supply. A non-rotating fan could be subject to controls or other circuit protection devices that may start the fan without notice.

The following safety precautions should be followed, where applicable:

- Do not attempt to slow a rotating impeller even when it is isolated from the electrical supply. Fan impellers have a high inertia and injury could result from an attempt to stop it. It is recommended that the impeller is isolated by closing off the inlet or outlet to prevent wind-driven rotation. If an impeller is chocked to prevent rotation, ensure that the chocks are removed prior to start up.
- Wear appropriate personal protective equipment. This may include protective clothing, eye protection, ear protection, respiratory equipment, hand and foot protection when installing or servicing the fan.
- Always use caution when entering a fan's air path. High velocity airflow can cause you to lose your balance.
- Motor, bearings and drives can be hot, and similarly if the fan is subject to processes that are hot, the fan housing could be hot.
- Fans are often used to move hazardous materials that could be dangerous. Always wear protective clothing and take precautions not to inhale dust/gases. If hazardous chemical vapors are present, respiratory equipment may be required.
- Sharp edges – wear protective gloves when handling, installing or servicing a fan.
- Fans can operate at high decibel sound levels. Wear proper ear protection to protect from excessive noise levels.
- Access Doors – Do not open access doors when fan is in operation. The effects of suction and air pressure could result in injury.
- When working around pulleys and belts, keep hands away from pinch points. This pertains to when the fan is under or off power.

Throughout this manual, there are a number of HAZARD WARNINGS that must be read and adhered to in order to prevent possible personal injury and/or damage to equipment. Two signal words "WARNING" and "CAUTION" are used to indicate the severity of a hazard and are preceded by the safety alert symbol. It is the responsibility of all personnel involved in installation, operation and maintenance to fully understand the warning and caution procedures by which hazards are to be avoided.

WARNING: Used when serious injury or death MAY result from misuse or failure to follow specific instructions.

CAUTION: Used when minor or moderate injury or product / equipment damage MAY result from misuse or failure to follow specific instructions.

NOTICE: Indicates information considered important, but not hazard-related.

Shipping & Receiving

All Aerovent products are carefully constructed and inspected before shipment to insure the highest standards of quality and performance. Compare all components with the bill of lading or packing list to verify that the proper unit was received. Check each unit for any damage that may have occurred in transit. Any damage should be reported immediately to the carrier and the necessary damage report filed. Damage should be noted on the bill of lading.

Handling

Handling of all air moving equipment should be conducted by trained personnel and be consistent with safe handling practices. Verify the lift capacity and operating condition of handling equipment. When using hoisting equipment, only qualified and trained personnel should operate the equipment.

Units shipped completely assembled may be lifted with slings and spreader bars. (Use well-padded chains, cables or nylon straps, rated to lift the required weight.) On most units, lifting lugs are designed to protect the fan and fan housing from damage. Never lift a fan by the inlet or discharge flange, shafting or drives, impeller, motor or motor base, or in any other manner that may bend or distort parts. Never lift with slings or timbers passed through the fan inlets.

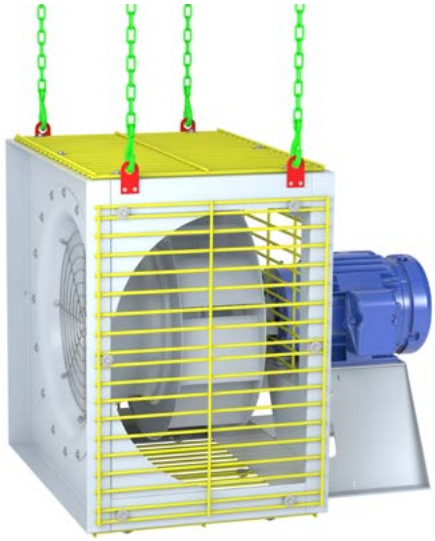
For fans provided without lifting lugs, use a forklift or pallet jack to handle the equipment. Consult a qualified person before lifting.

⚠ CAUTION

1. **Maintain handling equipment to avoid serious personal injury and do not stand under the load.**
2. **If supplied, only use the provided lifting lugs to lift the equipment.**
3. **Ensure that the lifting equipment is rated for the capacity to be lifted.**

Lifting lugs are provided on most units.

Lift fans as shown



Partial or disassembled units require special handling. All parts should be handled in a method which protects the coatings and parts from damage. Components should be handled such that forces are not concentrated to avoid bending or distortion.

The housing should be lifted using suitably rated spreader bars and padded chains or straps. Do not distort housing or side plates when lifting.

The shaft and impeller assembly may be lifted using a hoist and a spreader with slings around the shaft at either side of the impeller. Use the spreader bar to ensure that the slings do not push against the sides of the impeller as this may distort the impeller. Take care not to damage the shaft where the impeller or bearings will be mounted. Never lift or support the assembly by the impeller. Always support the assembly by the shaft when lifting or storing (see the section regarding proper storage of equipment). Do not support the shaft or the impeller on the housing sides. See the Fan Installation section for additional details.

Impellers shipped separately can be lifted by slings running between the blades or through the hub. Never lift the impeller by a single blade or single point on the flange/shroud. Do not to put a chain within the hub bore. Always transport impellers by lifting, do not roll the impeller as this can damage coatings and change the balance of the impeller.

Bent shafting is a source of vibration and bearing failure, so be sure to handle the shaft with care. If the shaft is bent, replace the shaft. Any scratches on the shaft may be repaired with fine emery cloth or a stone. Remove only the displaced metal that forms a high point at the edge of the scratch.

⚠ CAUTION

1. **Bearing pedestals should be lifted using straps or padded chains. Under no circumstance should an attached or separated bearing pedestal be lifted by the shaft, bearings, drives, motor or impeller.**
2. **Note some rotor assemblies may have an off-center CoG and therefore a qualified person should be consulted before lifting.**

Unit Storage

If fan installation is to be delayed, store the unit in an environmentally stable and protected area. During storage, the fan should not be subjected to vibration from external sources or bearing damage may occur. The unit should be reasonably protected from any accidental impacts. Cover the fan to protect coatings and to prevent any foreign material or moisture from entering the inlet or discharge. Take care to protect the motor, drives and bearings.

Extended storage requires monthly inspections. Check for corrosion or damage to the unit and for debris within the fan.

Bearings tend to take on moisture if the atmosphere in which they are stored is not at a constant temperature. To avoid corrosion, it is necessary to keep the bearings full of grease and to rotate them periodically. Even when full of grease, bearings will take on moisture, so it is necessary to purge the bearings with new grease to expel moisture every thirty days. It is recommended that the bearings be purged with grease while being rotated by hand. Do not use high pressure greasers as they may ruin the bearing seals. Spherical roller bearings with split pillow block housings must be opened up and grease removed before start-up. Remove old/excess grease and regrease the bearing in accordance with the bearing manufacturer's instructions.

The drives and belts should be removed if the fan is to be stored for a prolonged period. The drives should be labeled for service and stored in a dry place. Belts should be removed, coiled without kinks, placed in a heavy carton and stored in a dry, well-ventilated place. To prevent belt deterioration storage conditions should not exceed 85°F and 70% humidity. If belts show signs of deterioration, they should be replaced prior to startup.

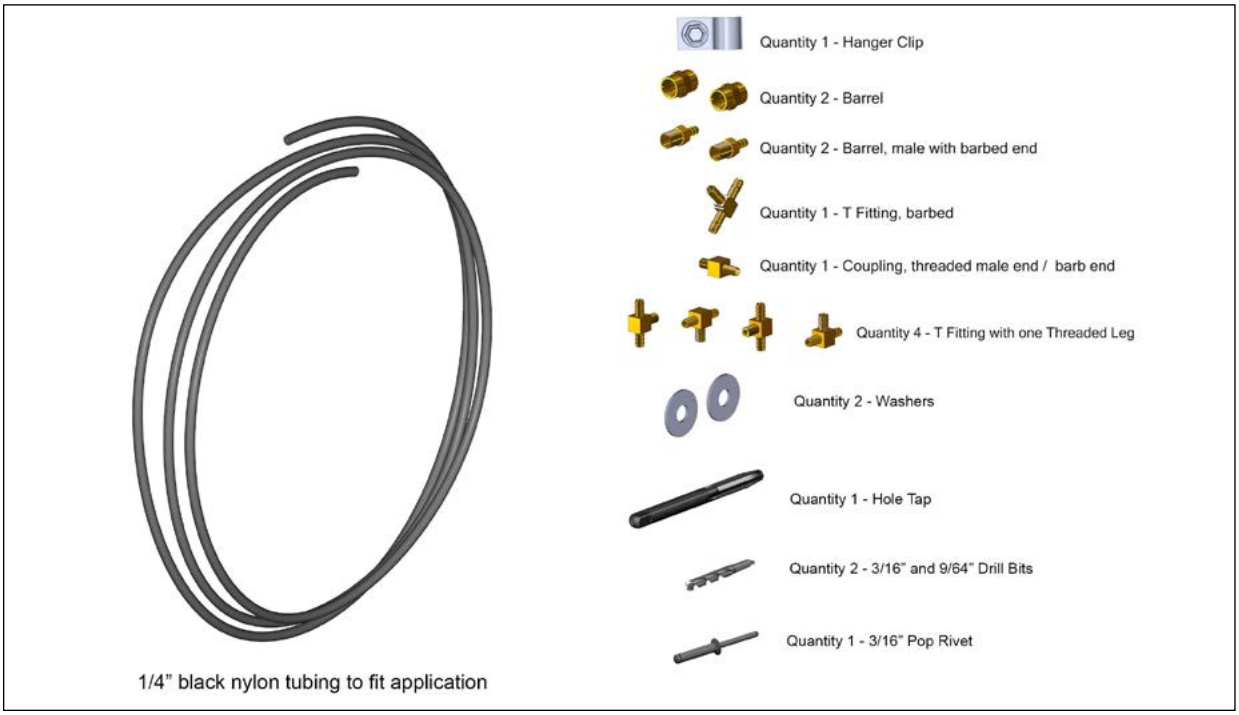
Motors should be stored in a clean, dry and vibration-free location. The packaging should be opened up enough to allow air circulation around the motor. The winding temperature should be kept slightly above that of the surroundings to prevent condensation. This can be accomplished by energizing the internal heaters, if the motor is so equipped, or by using space heaters. If it is impossible to heat the windings, the motor should be wrapped tightly with a waterproof material which also encloses several bags of desiccant. Replace the desiccant regularly to prevent moisture problems. The motor rotor should also be rotated regularly (monthly) to assure the bearing parts are well greased. Shafts on motors equipped with shaft grounding rings must remain rust free. Failure to do so renders the grounding feature inoperative and may result in bearing failure under VFD operation. Consult the motor manufacturer for further detail on motor storage and start up after longer periods of storage. It may be necessary to regrease the bearings. If the fan's bearings or motor bearings have extended lubrication lines, it will be necessary to replace the grease by detaching from the motor/bearing and purging the line with new grease.

Piezometer Ring Installation (refer to handling/safety section)

The Piezometer Ring Airflow Measuring System consists of a piezometer ring mounted at the throat and a static pressure tap mounted on the face of the inlet cone. The inlet cone of the fan is used as the flow nozzle and the flow can be calculated by measuring the static pressure drop through the inlet cone. The pressure drop is measured from the tap located on the face of the inlet cone to the piezometer ring in the throat. The inlet tap is connected to the high-pressure side of the transducer and the piezometer ring is connected to the low-pressure side.

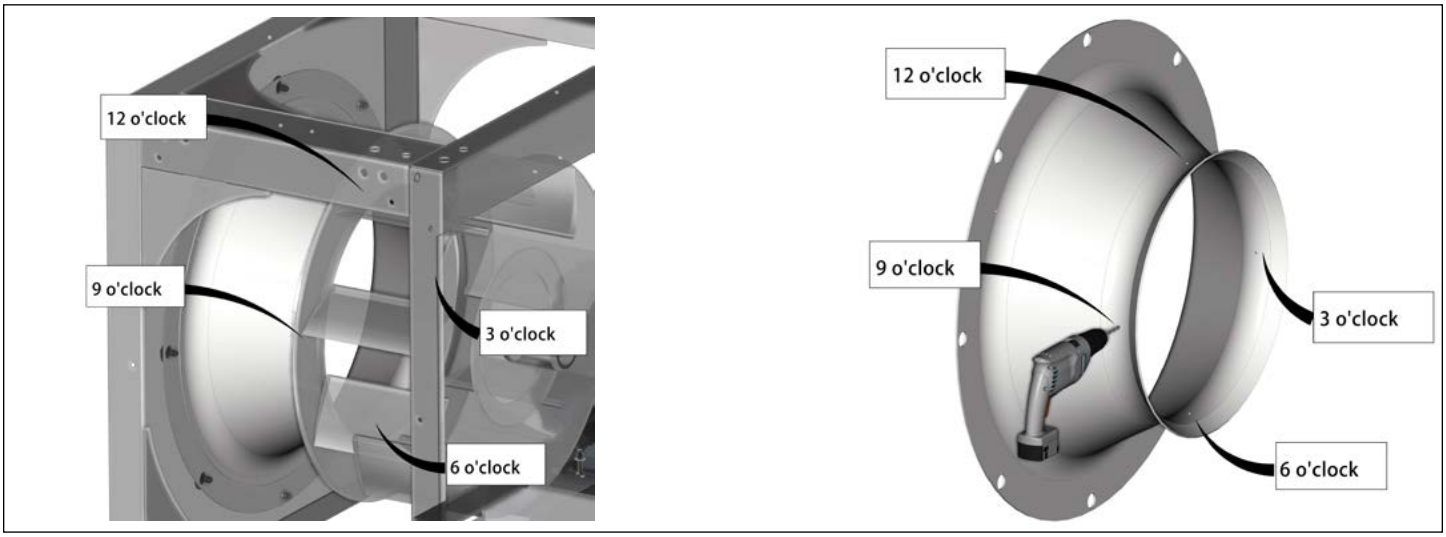
Click To View Our
Piezometer Ring Installation Video

Verify that all items are included in the piezometer ring parts kit. (See image below.)



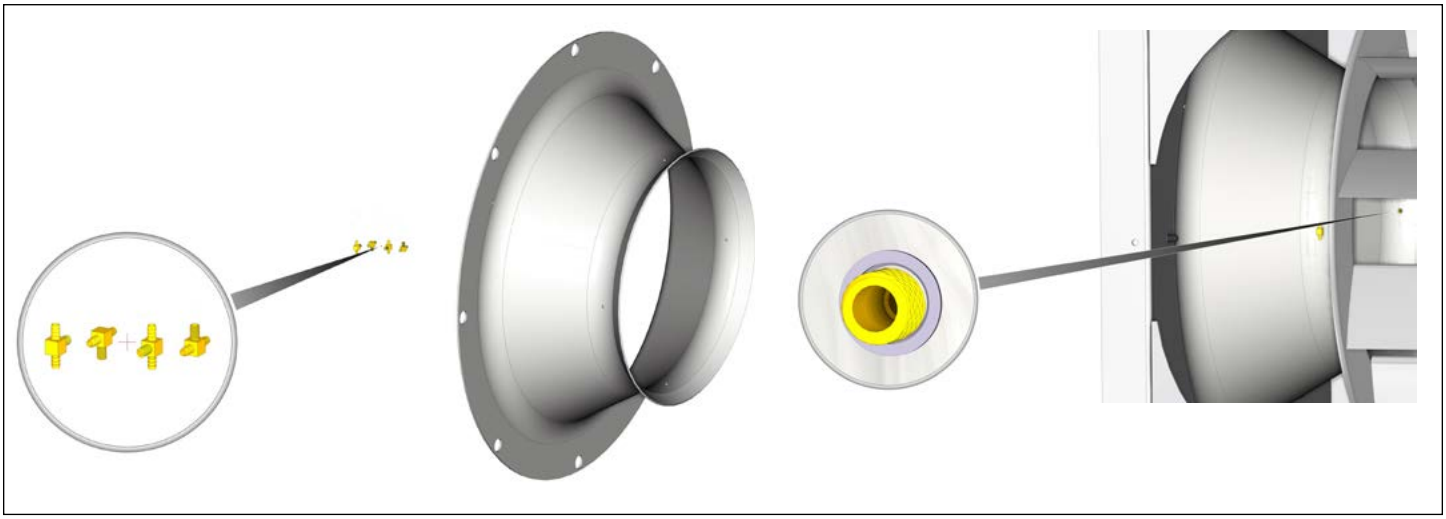
Piezometer Ring Parts Kit

Step 1: Locate and drill a pilot hole with the 9/64" drill bit at the 12, 3, 6 and 9 o'clock positions on the funnel. Tap the holes.

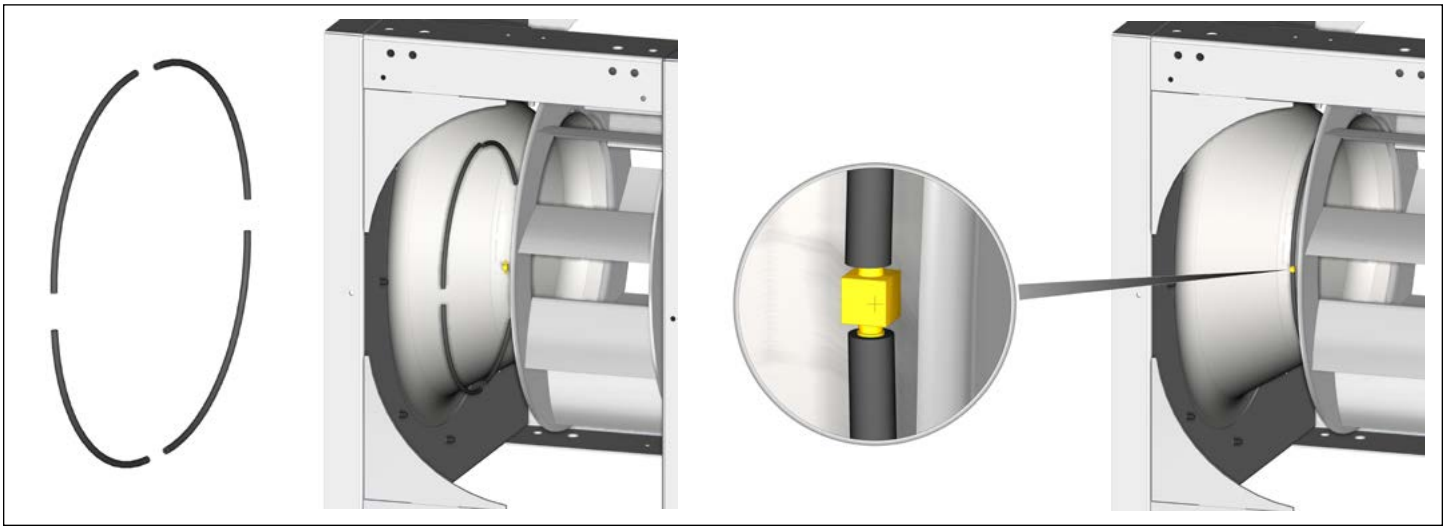


Piezometer Ring Installation (cont.) (refer to handling/safety section)

Step 2: Insert the four (4) T fittings with threaded ends into the holes. It is recommended to use Loctite #277.



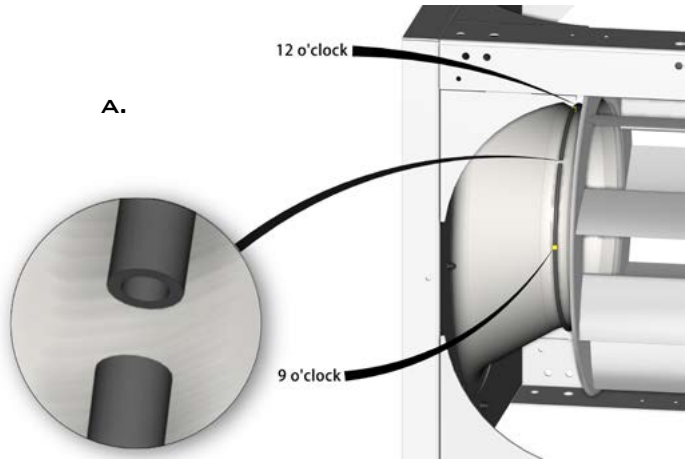
Step 3: If using Loctite, wait for it to dry, then cut the tubing into sections and slide them over the barbed ends of the installed T fittings. The tubing should be flush/snug against the funnel.



Piezometer Ring Installation (cont.) (refer to handling/safety section)

Step 4: Locate the center between the 12 and 9 o'clock positions and in this location cut the tubing. Next, install the T fitting with three barbed ends. Pop rivet the last piece of tubing with the hanger clip to the funnel and leave loose. After installation of the barrel fittings, this will be run to the low pressure plug.

A.



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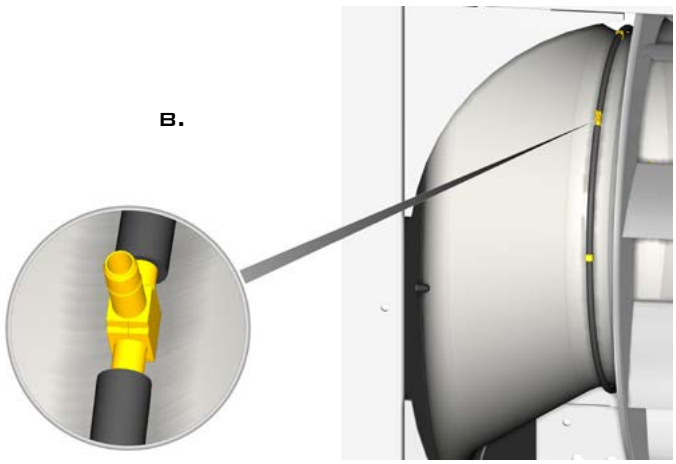

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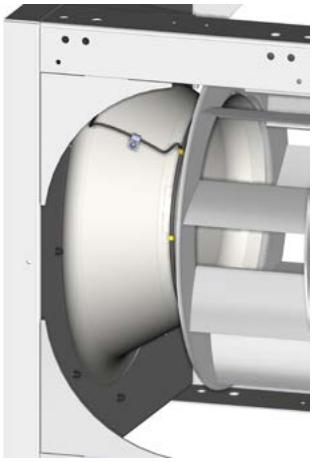
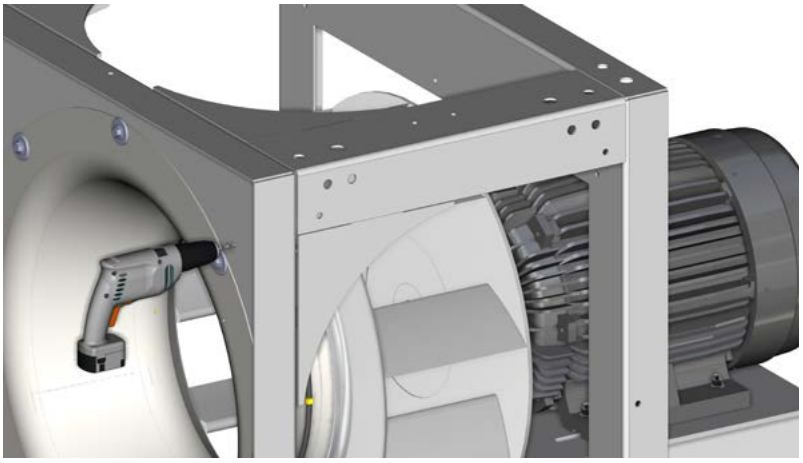


Piezometer Ring Installation (cont.) (refer to handling/safety section)

Step 5: Drill a pilot hole with the 3/16" drill bit on the face of the fan (approximately at the 1:30 position when looking at the inlet) and tap it from the other side of the funnel for the threaded male end/barbed end of the fitting as shown. Trim the fitting to be flush with the inlet funnel on the INLET SIDE of the fan.

A.



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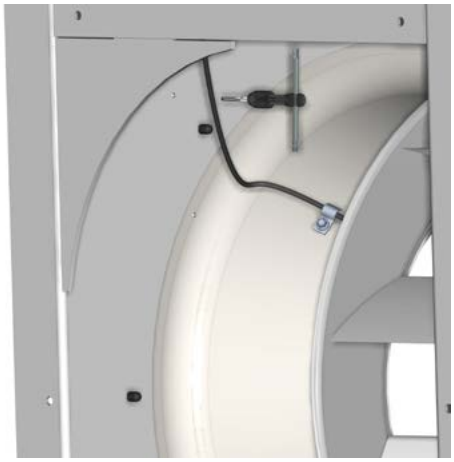
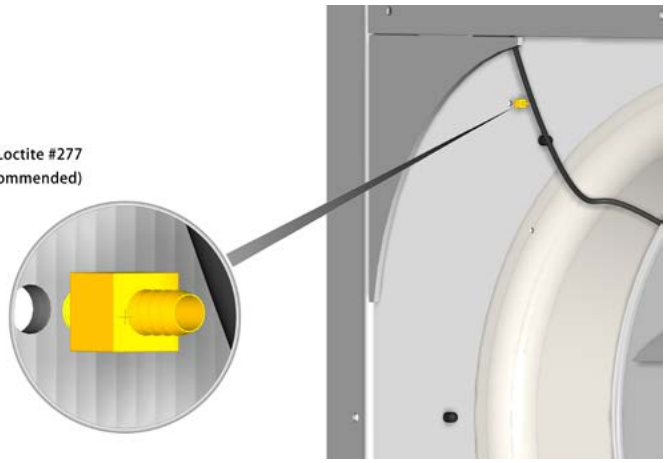
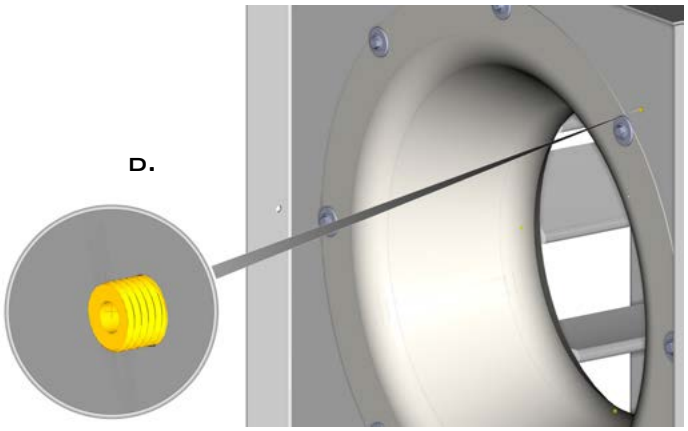


C.

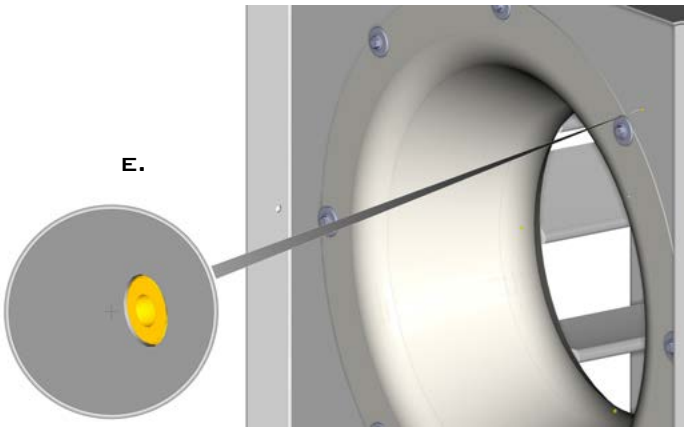
Use Loctite #277
(Recommended)



D.



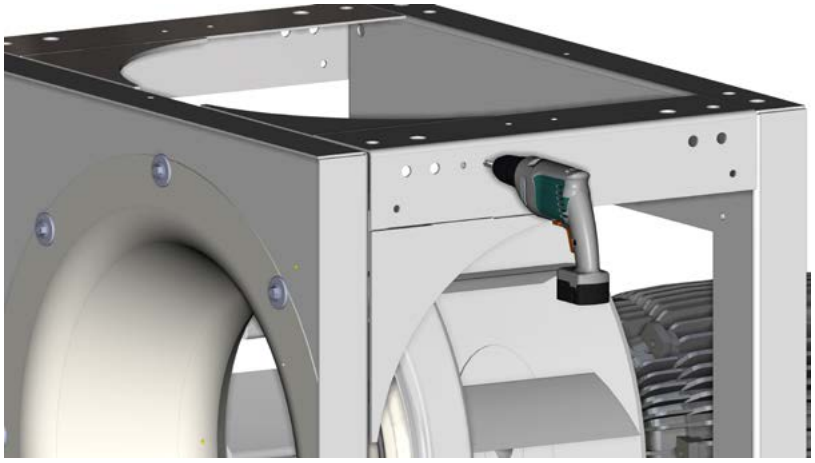
E.



Piezometer Ring Installation (cont.) (refer to handling/safety section)

Step 6: On the side of the fan, drill two holes with the 3/16" drill bit to accommodate the male end barrels with barbed end. Install these with the barb inside the airstream. If the barrel and threaded male end do not tighten up, use the supplied washers as spacers.

A.



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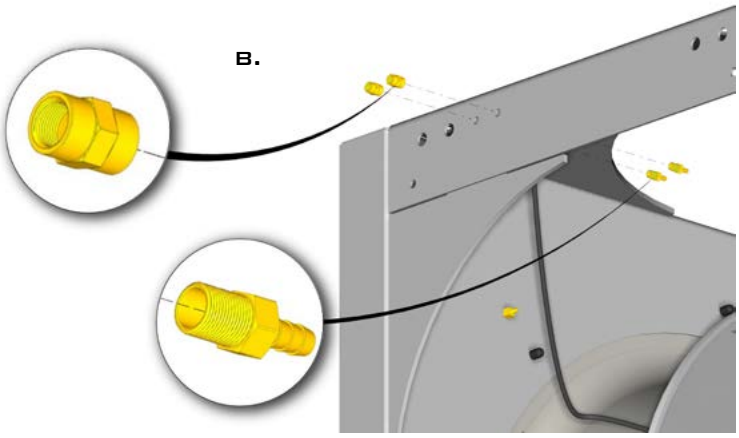

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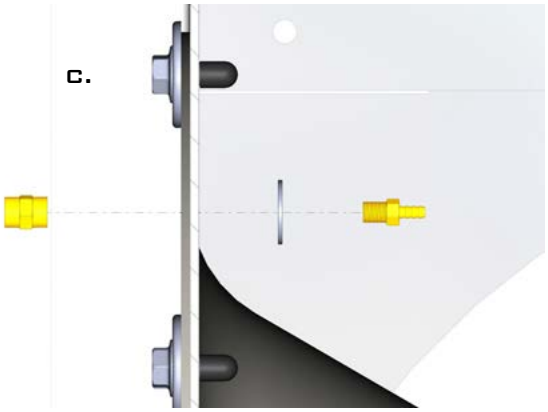
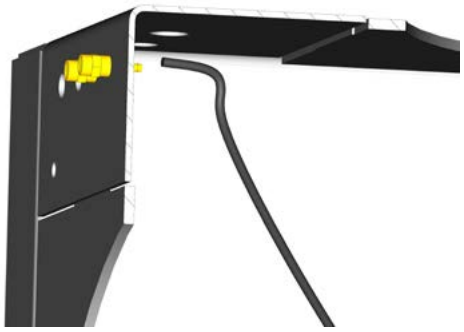


Piezometer Ring Installation (cont.) (refer to lifting/safety section)

Step 7: Attach the loose piece of tubing from the T fitting in Step 4 to the plug that will be used as the LOW pressure point of Step 6. Use the remaining tubing to run from the fitting in Step 5 to the HIGH pressure point of Step 6.

A.



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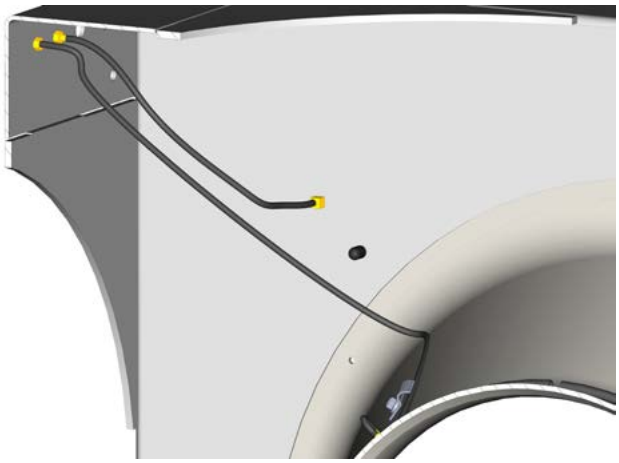
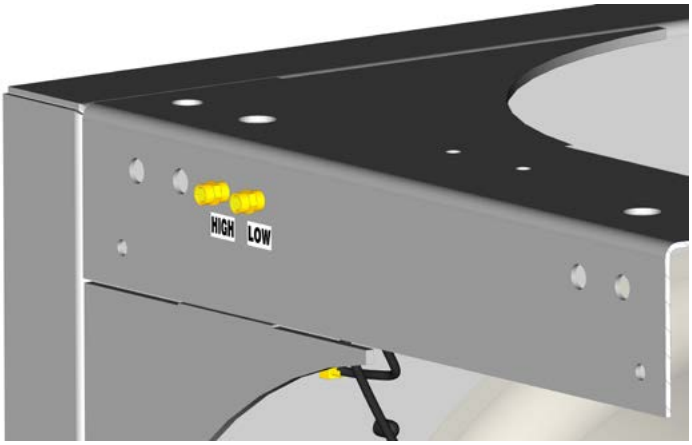
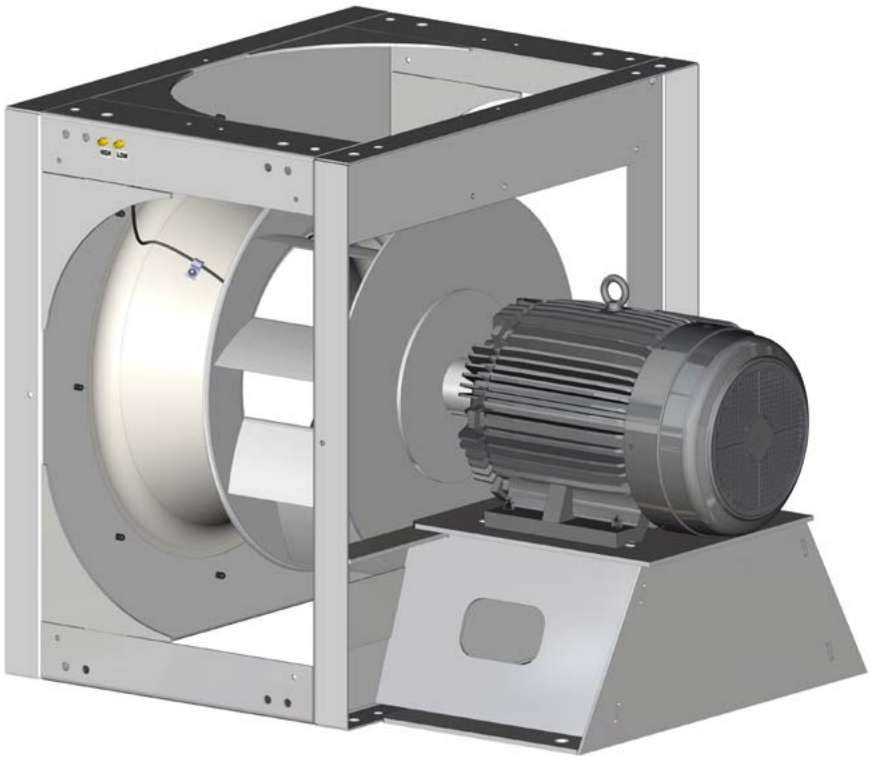


Step 8: Apply "LOW" and "HIGH" pressure labels.



Maintenance (refer to safety section)

Develop a regular maintenance schedule according to your needs and the criticality of the fan. Periodic inspections, lubrication and observations of sound and vibration will help prolong the life of the fan. If changes are noted check bolt tightness, foundation integrity, cleanliness of the impeller and or motor, bearing lubrication and drive components. Always keep records of the maintenance that is performed.



Measurement of Airflow

The equations below are accurate for flow estimation for flows from 40% to 100% of wide-open volume. According to testing done previously at Aerovent, several factors affect the accuracy of this method of determining flow. The equations below assume the following:

- There are no vanes or other obstructions in or near the inlet
- Even flow entering the funnel (no pre-swirl)
- Standard impeller to inlet cone overlap
- Accurate determination of air density at the inlet
- Free inlet

Non-Standard Density Method

One of the following equations is used to measure the flow:

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

where: A = Actual inlet funnel throat area at pressure tap location (square feet) - from tables on pages 13 and 14
ΔP = The differential in static pressure from the piezometer ring and the front pressure tap (inches w.g.)
ρ = Air density (pounds mass/cubic foot)
C1 = Value from Table 1 below

Standard Density Method

The equations can be simplified by assuming standard density and assuming funnel dimensions match drawing dimensions. The following tables show the factor (F) for each fan size and type. The equation then becomes the following:

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

$$ACFM = F \sqrt{\Delta P}$$

where: F = factor from tables on pages 13 and 14
ΔP = The differential in static pressure from the piezometer ring and the front pressure tap (inches w.g.)

Table 1: C1 Values

Product	C1 Free Inlet	C1* Ducted Inlet
CPLFN/CPLQN (Arr. 1 or 4), Sizes 122-165	753.06	794.06
CPLFN/CPLQN (Arr. 1 or 4), Sizes 122A-165A	887.78	949.49
CPLFN/CPLQN (Arr. 1 or 4), Sizes 182-490	692.03	740.14
CPLF/CPLQ (Arr. 3), Sizes 122-165	726.39	765.94
CPLF/CPLQ (Arr. 3), Sizes 122A-165A	856.34	915.87
CPLF/CPLQ (Arr. 3), Sizes 182-982	667.52	713.93

Product	C1 Free Inlet	C1* Ducted Inlet
CB/CBA SWSI	735.42	786.56
CB/CBA DWDI	1470.84	1573.12
AFE	735.42	753.56
AMX	696.00	735.83
CAE-SW **	720.40	735.80
CAE-DW **	1440.80	1471.60
MH Industrial (Std. Inlet Bell)	913.33	997.49

* Values for ducted C1 factors are based on duct diameter matching standard inlet collar diameter.
** CAE sizes smaller than 182 use CB/CBA factors.

Table 2: CPLF/CPLQ (Arrangement 3), CPLFN/CPLQN (Arrangement 1 & 4)

Size	CPLF/CPLQ Free Inlet F	CPLFN/CPLQN CPL-Series Free Inlet F	CPLF/CPLQ Ducted Inlet F	CPLFN/CPLQN CPL-Series Ducted Inlet F	A
122	911.46	944.92	961.07	996.36	0.344
122A, 122MK2	1194.48	1238.33	1277.52	1324.41	0.382
150	1163.68	1206.40	1227.04	1272.08	0.439
150A, 150MK2	1779.21	1844.54	1902.90	1972.75	0.569
165	1464.80	1518.58	1544.56	1601.26	0.552
165A, 165MK2	2138.81	2217.33	2287.49	2371.46	0.684
182	1757.39	1821.92	1879.58	1948.58	0.721
200	2108.38	2185.80	2254.97	2337.76	0.865
222	2617.81	2713.93	2799.81	2902.60	1.074
245	3168.67	3285.02	3388.97	3513.39	1.300
270	3856.03	3997.61	4124.12	4275.53	1.582
300	4770.07	4945.21	5101.71	5289.01	1.957
330	5757.23	5968.62	6157.51	6383.56	2.362
365	7032.01	7290.21	7520.92	7797.03	2.885
402	8555.41	8869.55	9150.23	9486.16	3.510
445	10444.42	10827.92	11170.58	11580.68	4.285
490	12669.80	13135.01	13550.69	14048.16	5.198
542	15541.11	16111.75	16621.62	17231.84	6.376
600	19004.71	19702.52	20326.03	21072.24	7.797
660	22994.79	23839.12	24593.53	25496.41	9.434
730	28128.04	29160.84	30083.67	31188.11	11.54

Note: Pressure tap locations for sizes denoted as '_ _ _ A' and '_ _ _ MK2' do not follow Aerovent convention. Consult factory for locations.

Table 3: CB/CBA/BIUB/BAUB

Size	SWSI Free Inlet F	DWDI Free Inlet F	SWSI Ducted Inlet F	DWDI Ducted Inlet F	A
105	641.87	1283.74	686.51	1373.01	0.239
122	872.90	1745.81	933.61	1867.21	0.325
135	1058.21	2116.41	1131.79	2263.58	0.394
150	1305.20	2610.39	1395.96	2791.92	0.486
165	1587.21	3174.41	1697.58	3395.16	0.591
182	1936.99	3873.98	2071.69	4143.38	0.721
200	2321.58	4643.16	2483.02	4966.04	0.865
222	2883.02	5766.04	3083.50	6167.00	1.074
245	3491.62	6983.24	3734.42	7468.84	1.300
270	4247.77	8495.55	4543.16	9086.32	1.582
300	5254.03	10508.05	5619.38	11238.86	1.957
330	6342.73	12685.46	6783.80	13567.59	2.362
365	7747.97	15495.94	8286.75	16573.50	2.885
402	9426.99	18853.98	10082.53	20165.06	3.510
445	11507.43	23014.86	12307.64	24615.28	4.285
490	13957.43	27914.86	14928.01	29856.02	5.198
542	17121.05	34242.10	18311.62	36623.24	6.376
600	20938.50	41877.00	22394.53	44789.06	7.797
660	25334.37	50668.73	27096.08	54192.16	9.434
730	30991.88	61983.75	33147.00	66294.01	11.54
807	37901.44	75802.87	40537.05	81074.09	14.11
890	46079.00	92158.01	49283.27	98566.54	17.16
982	56192.01	112384.00	60099.52	120199.04	20.93

Table 4: CAE-SW/CAE-DW

(Sizes smaller than 182 use Table 3: CB/CBA)

Size	SWSI Free Inlet F	DWDI Free Inlet F	SWSI Ducted Inlet F	DWDI Ducted Inlet F	A
182	1896.61	3793.22	1937.16	3874.31	0.721
200	2275.41	4550.82	2324.05	4648.10	0.865
222	2825.19	5650.38	2885.58	5771.16	1.074
245	3419.69	6839.38	3492.79	6985.58	1.300
270	4161.50	8322.99	4250.46	8500.91	1.582
300	5147.95	10295.89	5257.99	10515.99	1.957
330	6213.31	12426.62	6346.13	12692.26	2.362
365	7589.08	15178.15	7751.31	15502.62	2.885
402	9233.16	18466.31	9430.53	18861.07	3.510
445	11271.82	22543.63	11512.77	23025.55	4.285
490	13673.49	27346.98	13965.79	27931.57	5.198
542	16772.25	33544.50	17130.79	34261.59	6.376
600	20510.23	41020.47	20948.68	41897.36	7.797
660	24816.41	49632.82	25346.91	50693.82	9.434
730	30356.30	60712.61	31005.23	62010.46	11.540
807	37116.76	74233.52	37910.21	75820.42	14.110
890	45139.88	90279.75	46104.83	92209.66	17.160
982	55056.97	110113.94	56233.92	112467.85	20.930

Table 5: AMX

Size	Free Inlet F	Ducted Inlet F	A
150	1832.36	1937.23	0.721
165	2198.32	2324.14	0.865
182	2729.48	2885.70	1.074
200	3303.84	3492.93	1.300
222	4020.52	4250.63	1.582
245	4973.55	5258.21	1.957
270	6002.82	6346.39	2.362
300	7331.98	7751.62	2.885
330	8920.36	9430.92	3.510
365	10889.96	11513.24	4.285
402	13210.27	13966.36	5.198
445	16204.06	17131.49	6.376
490	19815.41	20949.54	7.797
542	23975.70	25347.94	9.434
600	29327.92	31006.49	11.54
660	35859.36	37911.75	14.11
730	43610.67	46106.71	17.16

Table 6: AFE

Size	Free Inlet F	Ducted Inlet F	A
90	641.87	686.51	0.239
122	872.75	894.27	0.325
150	1305.09	1337.28	0.486
165	1587.06	1626.20	0.591
182	1936.15	1983.91	0.721
200	2322.85	2380.14	0.865
222	2884.09	2955.23	1.074
245	3490.99	3577.10	1.300
270	4248.26	4353.05	1.582
300	5255.28	5384.90	1.957
330	6342.85	6499.31	2.362
365	7747.30	7938.40	2.885
402	9425.66	9658.16	3.510
445	11506.83	11790.66	4.285
490	13958.57	14302.88	5.198
542	17121.95	17544.28	6.376
600	20937.86	21454.32	7.797
660	25333.82	25958.71	9.434
730	30989.22	31753.60	11.54
807	37890.63	38825.25	14.11
890	46081.02	47217.66	17.16

Table 7: MH Industrial

Size	Free Inlet F	Ducted Inlet F	A
905	410.40	448.22	0.123
907	828.77	905.13	0.249
909	1392.65	1520.97	0.418
911	2102.04	2295.74	0.630
913	2956.96	3229.43	0.887
915	3957.39	4322.05	1.187
917	5103.34	5573.59	1.530
919	6394.80	6984.06	1.917
921	7831.78	8553.45	2.348
923	9311.11	10169.10	2.792
926	11944.07	13044.67	3.581
929	14904.43	16277.82	4.469
933	19360.90	21144.93	5.805
937	24399.43	26647.75	7.316
941	30020.04	32786.27	9.001
945	36222.71	39560.50	10.861
949	43007.45	46970.43	12.896
954	51820.34	56595.39	15.538
960	64125.64	70034.58	19.228

Transducer Sizing for Piezometer Ring

Selecting a pressure transducer with the appropriate range is critical in order to get accurate measurements using the piezometer ring. Since most transducers list accuracy as a percent of full scale, if the range selected is too high, this can have a significant impact on the accuracy of the flow measurement. If the range is too low, there is risk of damaging the instrument and/or getting inaccurate readings or no reading at all.

The following steps are for sizing the pressure transducer for use with the piezometer ring flow measurement system:

1. Determine the maximum flow rate in CFM that the fan is expected to produce. This maximum should be the greater of normal, maximum and/or emergency conditions.
2. Find the formula for calculating the actual flow rate from page 12 of this document for the corresponding size and type of fan being used.
3. Calculate the pressure drop corresponding to the maximum flow rate determined in Step 1.
4. Select the pressure transducer with the smallest range that includes the pressure drop calculated in Step 3.
5. Now take the maximum range from the pressure transducer selected in Step 4 and use that to calculate the maximum flow rate that could be measured with this transducer.
6. Determine an acceptable safety factor for sizing the transducer.
7. Multiply the maximum flow rate from Step 1 by the safety factor. If the maximum flow rate from Step 5 is less than the result, bump up the transducer to the next largest size. Otherwise, the transducer from Step 4 should be used.

Example:
Company XYZ has a Size 270 CB SWSI fan to be installed with design conditions of 12,000 CFM at 5 inches w.g. and standard density. What size transducer should be used?

1. After speaking to the design engineer, it was determined that 12,000 CFM is the actual maximum and most of the time the fan will be running closer to 10,000 CFM. Therefore, 12,000 CFM will be used for the calculations.
2. The calculation for this fan type and size is:
   ACFM = 4247.77 * $\sqrt{(\Delta P)}$ for standard density
   Note that if the density was other than standard air, the formula would be different.
3. By rearranging the formula in Step 2, the following formula is obtained:
   ΔP = (ACFM/4247.77)^2
   so, ΔP = (12000/4247.77)^2 = 7.98 inches w.g.
4. For the pressure transducer models being considered, the ranges are 0-3, 0-6, 0-10 and 0-20. Therefore, for this flow rate the transducer model is the 0-10 inches w.g. model.
5. The maximum for this transducer is 10 inches, which corresponds to the following flow rate:
   ACFM = 4247.77 * $\sqrt{(10)}$ = 13433 CFM
6. Since 12,000 CFM is the maximum and normal operating conditions are 10,000 CFM, a 10% safety factor should be plenty for this application.
7. From Step 1, 12000 CFM * 1.1 = 13200 CFM. This is less than 13433 CFM, so the 0-10 inch pressure transducer is acceptable.

Troubleshooting Guidelines

Use current safety practices when investigating fan or system performance problems. General safe practices and performance troubleshooting guidelines can be found in AMCA Publications 410 and 202, respectively. Fan application and field measurement procedures can be found in AMCA Publications 201 and 203.

Below is a list of possible areas to check when air or sound values do not match expectations. Most fan problems can be pinpointed to one of these common causes.

Air Capacity Problems

1. Resistance of the system is not at design rating. If resistance is lower than expected, both airflow and horsepower may be up. If resistance is higher than anticipated, air volume will be down.
2. Fan speed is not at design speed.
3. Air density is not at the design value. Also check air performance measurement techniques/procedures.
4. Devices for air modulation are closed or plugged. Also check filters.
5. Impeller mounted improperly or is rotating in reverse.
6. Parts of the system or fan have been damaged or need cleaning.

Noise Problems

1. Air performance is incorrect and the fan is not at design point of operation. Fan is being forced to operate in an unstable flow region near peak or to the left of the peak of the curve.
2. Bearing failure. Check bearings (lubrication).
3. Supply voltage high or inconsistent supply frequency. Adjustable frequency controllers can generate motor noise.
4. Objects which are installed in a high velocity airstream can generate noise. This includes flow sensors, turning vanes, etc.
5. Poor fan inlet conditions.
6. Acoustics or sound measurement procedure incorrect.

Vibration Problems

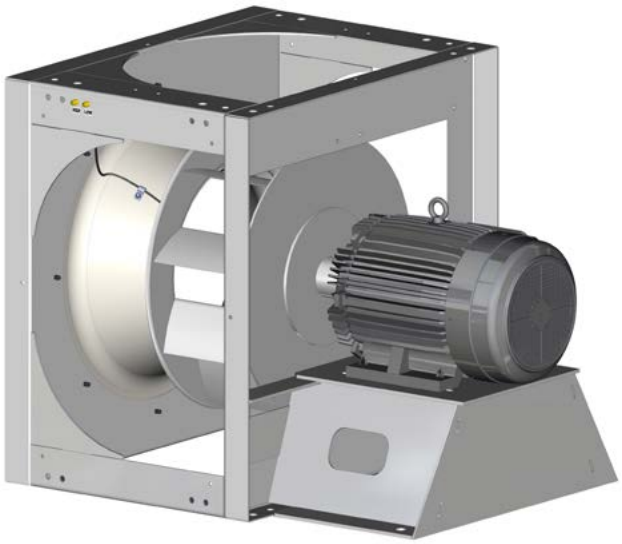
1. Misalignment of drive components. Check belt or coupling.
2. Poor foundation or mounting structure (resonances).
3. Foreign material attached to rotating components.
4. Damaged rotating components (bearings, shaft, fan, impeller, sheaves).
5. Broken, loose or missing set screws.
6. Loose bolts.
7. Vibration transmitted by another source.
8. Water accumulating in airfoil blades.
9. Fan is operating in stall or unstable flow region.

Motor Problems

1. Incorrect wiring.
2. Speed of fan too high.
3. Parts improperly installed; binding.
4. Bearings improperly lubricated.
5. WR^2 capability of motor too low for application.
6. Protection devices may be improperly sized.
7. VFD compatible electrically? Effective shaft grounding?
8. Is cabling and grounding correct?

Drive Problems

1. Belts improperly tensioned.
2. Drive alignment is poor. Check belt or coupling.
3. Coupling lubrication.



NOTICE

All fans manufactured by Aerovent are factory balanced prior to shipment. Installation variables, handling and movement of the fan during shipment may cause the rotating assembly to shift. Balance should be checked once the fan is installed. If a final trim balance is required, it is the end user's responsibility to bring the fan back to factory specifications. Final trim balancing is not the responsibility of Aerovent. Refer to the *Vibration Guidelines* table below.

Vibration Guidelines

Condition	Fan Application Category	Rigidly Mounted mm/s (in./s)	Flexibly Mounted mm/s (in./s)
Start-up	BV-3	6.4 (0.25)	8.8 (0.35)
	BV-4	4.1 (0.16)	6.4 (0.25)
Alarm	BV-3	10.2 (0.40)	16.5 (0.65)
	BV-4	6.4 (0.25)	10.2 (0.40)
Shutdown	BV-3	12.7 (0.50)	17.8 (0.70)
	BV-4	10.2 (0.40)	15.2 (0.60)

Values shown are peak velocity, mm/s (inches/s), Filter out. Table taken from ANSI/AMCA Standard 204-05, Table 6.3. AMCA defines BV-3 for applications up to 400 HP; BV-4 for applications over 400 HP.

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Installation/Start-up Checklist

Become familiar with the equipment by looking at the fan assembly drawing for special instructions and accessories.

Initial Fan Check

- ☐ Inspect fan for damage
- ☐ Check foundation, prepare for shims
- ☐ Level the fan
- ☐ Check bolt tightness
- ☐ Check to see if the fan is distorted by the foundation and/or ductwork
  Note: Applies to direct or isolation mount.
- ☐ Check fan interior for debris and standing water

Fan Impeller

- ☐ Impeller clearance checked
- ☐ Impeller overlap checked
- ☐ Fasteners tight
- ☐ Impeller rotates freely

Springs (if equipped)

- ☐ Springs adjusted properly
- ☐ Flex joints allow movement
- ☐ Electrical conduit allows movement

Bearings

- ☐ Bearings aligned
- ☐ Bearings greased
  Note: Rotate while greasing
- ☐ Set screws tight (if equipped)

Lube Lines

- ☐ Lube lines have been charged with grease prior to connecting to bearings

V-Belts (if equipped)

- ☐ V-belt drives aligned
- ☐ Sheaves retightened
- ☐ Belt tension correct
- ☐ Motor bolts retightened

Couplings (if equipped)

- ☐ Coupling aligned
- ☐ Coupling gap checked
- ☐ Coupling lubricated

Accessories

- ☐ Guards installed correctly, do not rub
- ☐ VIV/damper rotates freely (if equipped)
- ☐ Other accessories per drawing

WARNING

Verify that proper safety precautions have been followed. Electrical power must be locked off.

Electrical Components

- ☐ Motor wired for proper voltage and starter
- ☐ Motor grounded
- ☐ Appropriate starter and heaters
- ☐ Leads are properly insulated
- ☐ Accessories wired per instructions supplied.

Energize

- ☐ Energize motor long enough to start assembly rotating, shut down
- ☐ Verify direction of impeller rotation, rewire if necessary *Note: Refer to Impeller Rotation section*
- ☐ Run the fan up to speed
- ☐ Check for excess vibration and listen for unusual noise. Refer to the *Vibration Guidelines* table in the *Troubleshooting Guidelines* section for vibration limits.
- ☐ Proceed to grout
- ☐ Bearing temperatures should stabilize after a few hours. Less than 200°F
  Note: Use sense of smell to identify possible electrical, belt issues.

After one Week

- ☐ Verify bolt tightness
- ☐ Verify belt tension and adjust as necessary

NOTICE

Always observe site specific and regulatory safety precautions.

Serial Number: _____

Completed By: _____

Date Completed: _____

AEROVENT
Industrial Ventilation Systems

Fan Maintenance Log

Model Number_____

Serial Number _____

Date	Completed Maintenance	Performed By	Comments

Fan Maintenance Log

Model Number_____

Serial Number _____

Date	Completed Maintenance	Performed By	Comments

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