

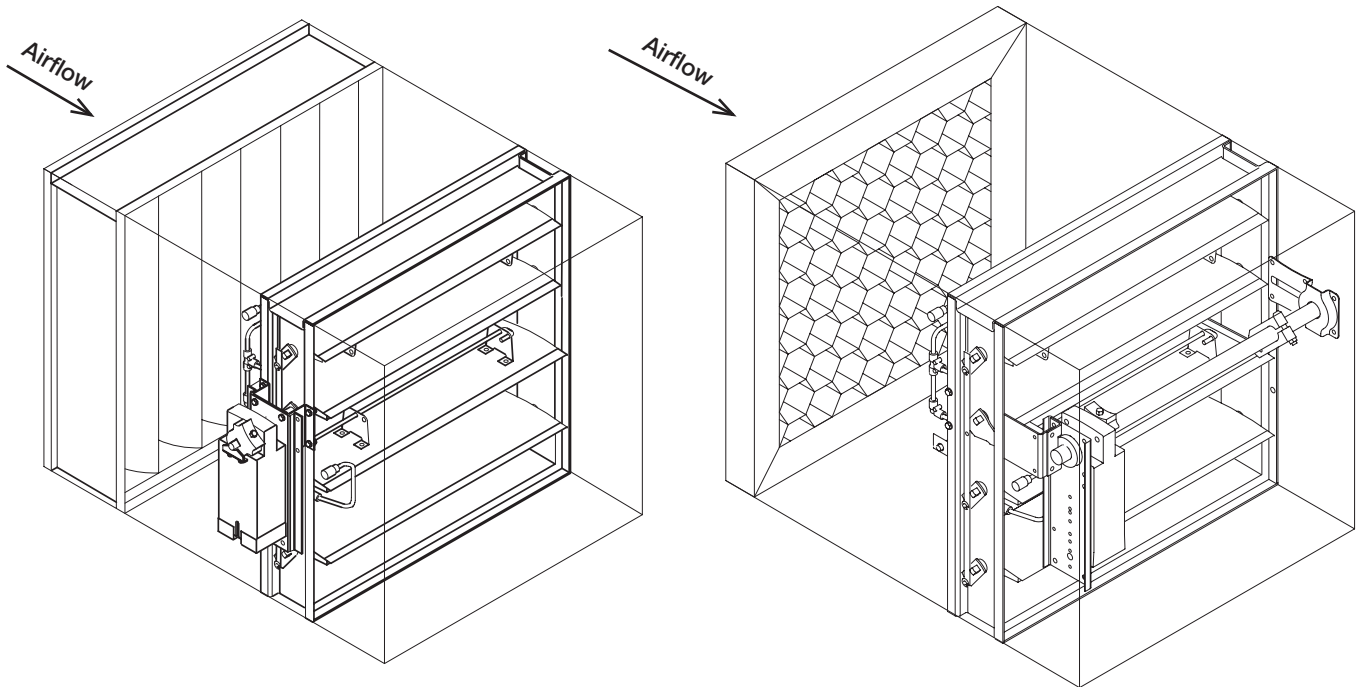


Installation, Operation, and Maintenance Instructions

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

SAFETY 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.



RECEIVING AND HANDLING

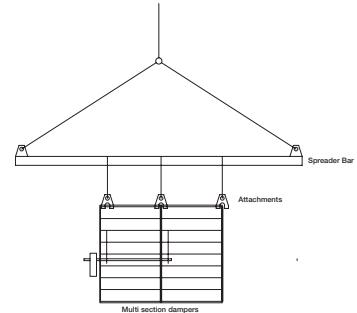
Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F (37°C).

Pre-Installation Guidelines

The basic intent of a proper installation is to secure the IAQ-42 damper into the opening in such a manner as to prevent distortion and disruption of damper operation. The following items will aid in completing the damper installation in a timely and effective manner.

- 1) Check the schedules for proper damper locations within the building. Visually inspect the damper for damage.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades, linkage, actuators, pick-ups, or jackshifting. When handling multiple sections assemblies, use sufficient support to evenly lift at each section mullion (see drawing). Do not drag, step on, apply excessive bending, twisting, or racking.
- 3) Do not install screws in damper frame that will interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 4) Damper must be installed into duct or opening square and free of twist or other misalignment. Damper must not be squeezed or stretched into duct or opening. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 5) Damper and actuator must be kept clean, dry and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:
 - a) Mortar dust
 - b) Drywall dust
 - c) Firesafing materials
 - d) Wall texture
 - e) Paint overspray
- 6) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet (1.5m) of the damper. Excessive dirt or foreign material deposits on damper can cause excessive leakage and/or torque requirements and inaccurate airflow measurement to exceed damper/actuator design.
- 7) ACCESS: Suitable access (actuators maintenance, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct.

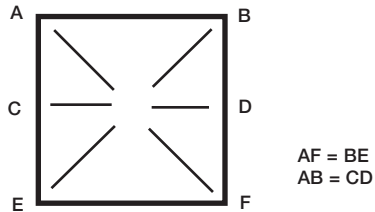


Installation- Failure to follow instructions will void all warranties

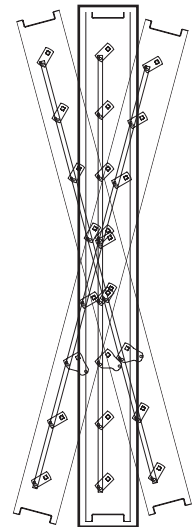
1. Ensure the IAQ-42 damper is mounted with airflow straightener or louver mounted upstream of the damper.
2. Duct opening or opening square should measure 1/4 inch (6mm) larger than damper dimension and should be straight and level.
3. If no holes are present in frame, drill 1/4 inch (6mm) diameter holes at 6 inch (52mm) centers and fasten frames together with 1/4 inch (6mm) #20 (.03mm) bolts and nuts.
4. Use shims between damper frame and duct opening or opening space to prevent distortion of frame by fasteners holding it in place. Brace at every horizontal mullion and vertically brace at every 8 feet (2.4m) of damper width for strength. Dampers in high velocity (2000 fpm [610m per second]) may require more bracing. Note: Greenheck dampers are specifically designed and engineered for structural integrity based on model and conditions. Attachment, framing, mating flanges, and anchoring of damper assemblies into openings, ductwork, or walls is the responsibility of the installer. Design calculations for these retaining and supporting members should be determined by field engineers for that particular installation.
5. If damper actuator is to be mounted out of the airstream, the extension pin should extend approximately 6 inches (152mm) beyond the frame.

Installation - cont...

6. Individual damper sections, as well as entire multiple section assemblies must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each section.



Do not twist or bow. Mount damper plumb in the opening.



7. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle dampers after installation to assure proper operation. On multiple section assemblies, all sections should open and close simultaneously.

Electrical Guidelines

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations.

SAFETY CAUTION !

Verify power requirements before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring.

SAFETY DANGER !

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician.

Connect electrical connection to terminal strip as shown on drawing (see figure 1).

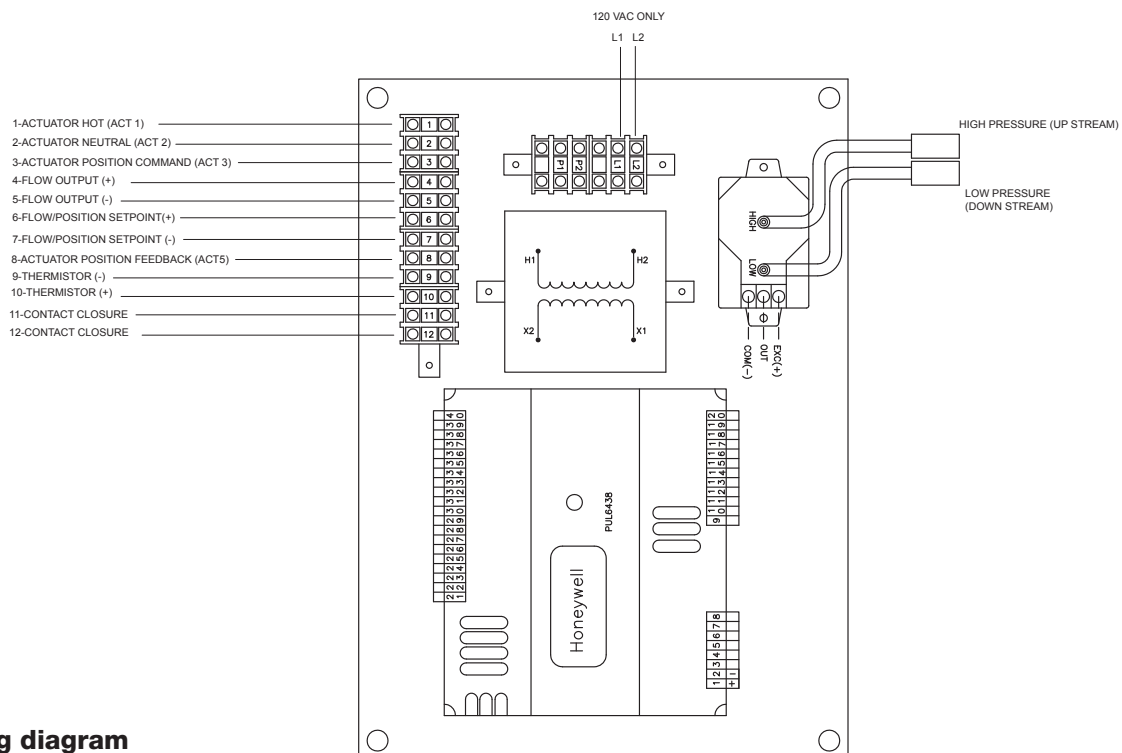


Fig.1 wiring diagram

Setup and Operation for IAQ-42's With Factory Supplied Controller

Basic Setup

1. Locate the serial number label on both the damper and control box. Make sure that the control box and damper with the same serial number are wired together. Mount the control box higher than the damper to avoid condensation from running back into the pressure transducer.
2. Wire the actuator terminals to the control box terminal strip as shown in figure 1.
 - Wire the actuator power, actuator terminals 1 and 2, to the control box terminals labeled 1 and 2 respectively.
 - Wire the actuator position command, actuator terminal 3, to the control box terminal labeled 3.
 - Wire the actuator position feedback, actuator terminal 5, to the control box terminal labeled 8.
3. Wire the temperature sensor, located in the 4 x 2 J-box mounted on the damper sleeve, to the control box terminals labeled 9 and 10 as shown in figure 1.
4. Plumb the air pressure pickups from the damper to the control box as shown in figure 1. Make sure that the air pressure pickup fitting labeled "High Pressure" is plumbed back to the control box fitting labeled "High Pressure". Likewise, the air pressure pickup fitting labeled "Low Pressure" should be plumbed back to the control box fitting labeled "Low Pressure".
5. Wire the airflow setpoint command (+) to control box terminal 6 and the airflow setpoint command ground (-) to control box terminal 7. Note: The control signal source must have an impedance of less than 2,000 ohms.

Note: Step 6 is only applicable if it necessary to override the normal airflow control mode and put the damper into position control mode.

6. Wire a dry contact closure that will determine the mode of operation that the damper is in across control box terminals labeled 11 and 12. (If this circuit is open the damper will be in airflow control mode. If the circuit is closed the damper will be in position control mode.)

Airflow Control Mode (Normal Operation)

The damper will be in airflow control mode when there is an open circuit between control box terminals 11 and 12. In this mode of operation the damper will modulate open and closed based on the 0-10 Vdc flow setpoint signal sent to control box terminals 6 and 7. The 0-10 Vdc flow setpoint will linearly modulate the airflow rate going through the damper between 0 and 2,000 fpm. The correct flow setpoint signal can be calculated based on the following formula:

$$C = Q / (200 * A)$$

Where:

Q= Desired Airflow (cfm)

C= Flow Setpoint (Vdc)

A= Face Area of the damper (ft²)

Example: the building desires 6,000 cfm through a 24"x24" IAQ-42

$$A = (24 * 24) / 144 = 4 \text{ ft}^2$$

$$C = 6,000 / (200 * 4) = 7.5 \text{ Vdc}$$

Setup and Operation cont....

Position Control Mode (Override)

The damper will be in position control mode when there is a closed circuit between control box terminals 11 and 12. In this mode of operation the damper will modulate open and closed based on the 0-10 Vdc position setpoint signal sent to control box terminals 6 and 7. The 0-10 Vdc position setpoint will linearly modulate the damper's blade position between 0 and 100% open. For example, a position setpoint of 4 Vdc will drive the damper blades to the 40% open position.

Setup and Operation for IAQ-42's Without Factory Supplied Controller

1. Plumb the High and Low Pressure ports to a differential pressure transducer to determine the pressure difference (P) between the upstream and downstream pickups on the damper blades. A pressure transducer with an approximate span of 0 – 2.5 in. wc is recommended.
2. Wire the damper's actuator. Wire actuator terminals 1 (power), 2 (common), 3 (position set-point), and 5 (position feedback). Actuator terminal 4 should not be used.
3. Program the field-supplied controller. A field-supplied controller can be programmed to determine the airflow going through the damper by using one of two methods. Both methods use the following formula to calculate the airflow:

$$Q \text{ (cfm)} = A * K * P^e$$

Where:

A = Total Damper Area in Sq. Ft.

K = Flow Coefficient that is a function of the damper's blade position supplied by the actuator feedback.

P = Differential Pressure across IAQ damper

e = exponent (constant) supplied by Greenheck

The K value, which is a function of actuator feedback, can be determined by using either of the following methods. **Method A is recommended and will result in the most accurate readings.**

Method A

The K value can be determined by using a look-up table that is supplied with every IAQ-42 that is ordered without a factory supplied controller. The K value is determined by interpolating between the two values that the actuator feedback falls between. Since every unit is factory calibrated, every unit will have a unique look-up table. To the right is an example look-up table.

Method B

The K value can also be determined by using the following formula where x is the 0-10 Vdc signal from the actuator's position feedback:

$$K = Ax^4 + Bx^3 + Cx^2 + Dx + E$$

The A, B, C, D, and E values are supplied by Greenheck with every IAQ-42 that is not ordered with a factory supplied controller.

Coefficient Look-Up Table

Point	Act Feedback (0-10 Vdc)	K
1	0.00	0
2	1.95	183
3	2.70	280
4	3.58	369
5	4.35	478
6	4.77	551
7	5.23	647
8	5.57	703
9	5.88	770
10	6.18	843
11	6.52	856
12	6.83	879
13	7.19	900
14	7.54	949
15	7.84	1,008
16	8.17	1,092
17	8.45	1,147
18	8.81	1,273
19	9.10	1,376
20	9.52	1,501
21	9.84	1,651
22	10.00	1,721

IAQ-42 Trouble Shooting Guide

IMPORTANT: The LED on top of the IAQ-42's controller will flash 1 time per second when it is receiving all of the proper inputs. If the LED is flashing more than once per second there is an alarm condition that must be corrected. Verify that all of the connections are made per the setup and operation instructions.

Symptom	Possible Cause	Corrective Action
<p>The damper doesn't respond to position or airflow commands and remains closed. The controller LED is not lit at all.</p>	There is no power to the control box.	Apply 120 VAC across the input power terminals as shown in figure 1.
	The transformer has been damaged.	Using a volt meter, check the voltage across control box terminals 1 and 2. If it is not approximately 24 VAC the transformer may have been damaged. Contact the factory.
	The control box has been damaged.	Contact the factory.
<p>The damper doesn't respond to position or airflow commands and remains closed, but the controller LED flashes at the proper 1 time per second.</p>	<p>The actuator is not getting power or is damaged.</p>	<p>Send a 10 Vdc signal to the flow/ position command. Check that there is approximately 24 VAC across control box terminals 1 and 2 and approximately 10 Vdc across control box terminals 6 and 7. If the proper voltage is being applied and the actuator does not move from the closed position it may be damaged. Contact the factory.</p>
<p>The damper responds to changes in airflow command signal, but the airflow through the damper is believed to be incorrect. The LED flashes at the proper 1 time per second.</p>	<p>The high-pressure pickup is not properly plumbed back to the control box or there is a leak in the line.</p>	<p>Make sure that the pneumatic bulkhead fitting coming out of the damper labeled "high pressure" is plumbed back to the pneumatic fitting in the control box labeled "high pressure". Check the line for leaks. Make sure that pneumatic lines inside the damper are properly connected.</p>
	<p>One or more of the pressure pick-up mounted on the upstream side of the damper are plugged.</p>	<p>Disconnect the pneumatic line running back to the controller and run high-pressure air through the pin holes in the blade air pressure pick-ups. Reconnect the pneumatic line running to the controller.</p>
	<p>The honeycomb airflow straightener is damaged.</p>	<p>Replace the airflow straightener</p>
	<p>One or more of the pressure pick-ups has been bent or damaged.</p>	<p>Replace the damaged pressure pick-up(s). Contact the factory.</p>

Trouble Shooting Guide cont....

The damper is wide open all the time regardless of the requested flow, but the LED flashes at the proper 1 time per second.	The low-pressure pickup is not properly plumbed back to the control box or there is a leak in the line.	Make sure that the pneumatic bulkhead fitting coming out of the damper labeled "low pressure" is plumbed back to the pneumatic fitting in the control box labeled "low pressure". Check the line for leaks. Make sure that pneumatic lines inside the damper are properly connected.
	The pressure pick-up mounted on the downstream side of the damper are plugged.	Disconnect the pneumatic line running back to the controller and run high-pressure air through the pin holes in the blade air pressure pick-ups. Reconnect the pneumatic line running to the controller.
	The high-pressure and low-pressure pick-ups are plumbed backwards.	Make sure that the pneumatic fitting mounted upstream of the damper runs back to the pressure transducer port labeled "High" and that the pneumatic fitting mounted downstream of the damper runs back to the pressure transducer port labeled "Low".
	The damper is mounted backwards.	The honeycomb or louver must be facing upstream.
The damper is wide open all the time regardless of the requested flow. The controller LED flashes more than once per second.	The actuator position feedback is not wired or is reporting incorrectly.	Make sure actuator terminal 5 is wired back to control box terminal 8. Using a volt meter, check the voltage across control box terminals 8 and 2. It should be near 10Vdc (because the damper is wide open). If not contact the factory.
	The pressure transducer has been damaged or disconnected.	While air is going through the damper, use a volt meter to check the voltage across the pressure transducer terminals labeled "-" and "o". It should be greater than 0 Vdc, but less than 10 Vdc. If not contact the factory.
The damper doesn't react to position or airflow commands and stays closed, but the controller LED flashes at the proper 1 time per second.	The actuator is slipping on the extension pin/jackshaft.	Using a vice grip, close the damper completely. Cut power to the actuator. Retighten down the actuator to the shaft.
The damper will close to a certain point, but too much air is believed to be moving through the damper. The LED flashes at the proper 1 time per second.	The pressure transducer is seeing more than 2.5" wc.	Verify by using a volt meter to measure the voltage across the pressure transducer terminals labeled "-" and "0". If the value is greater than 10 Vdc the system pressure is too high for the transducer. Contact the factory.

Trouble Shooting Guide cont....

<p>The damper responds to changes in position or airflow command and the controller LED flashes at the proper 1 time per second, but the damper moves back and forth even after the same control signal has been sent to the damper for several minutes.</p>	<p>The electrical impedance of the controller sending the command signal may be more than 2,000 ohms.</p>	<p>It is normal for the damper to move back and forth after a change in command signal or a change in system conditions. However, after a few minutes the damper should settle at a given position. If it doesn't, check the impedance of the controller. It should be less than 2,000 ohms.</p>
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Damper Maintenance

Greenheck's dampers are designed to be trouble free and hassle free under normal operation. Dampers are to be installed square and straight so as to prevent binding during operation. The following annual damper maintenance suggestions will help to insure proper damper operation and increase the life expectancy of the damper.

- Foreign Matter** Over the course of time, dirt and grime may collect on damper surfaces. The damper surfaces should be cleaned to prevent hindrance to airflow.
- Moving Parts** Make sure that parts such as linkage, bearings, blades, etc. that are intended to move freely, can do so. Lubricating these components can prevent possible rusting and unnecessary friction increase. Use only a moli-spray oil or similar graphite based oil as regular lubricating oil will attract dirt.

Bearings. Synthetic, oil impregnated, and ball bearings (without grease fittings) do not require lubrication. Ball bearings with grease fittings require only minimal grease.
- Closure** Remove foreign materials that may be interfering with blade closure or effective sealing of the blades with each other or with the frame.
- Operation** While operating the damper through its full cycle, check to see that the blades open and close properly. If there is a problem, check for loose linkage, especially at the actuator. Tighten the linkage where required.

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 to be defective during the warranty period will be repaired or replaced at our option. Greenheck shall not be liable for damages resulting from misapplication or misuse of its products. Greenheck will not be responsible for any installation or removal costs. Greenheck will not be responsible for any service work or backcharges without prior written authorization.



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