VAV Variable Air Volume Box Damper Actuator Calibration

1.0 Maintenance Objective & Frequency

The objective of this procedure is to calibrate the damper actuator on a Variable Air Volume (VAV) box to ensure the damper position matches the control signal from the Building Automation System (BAS). Proper calibration prevents airflow imbalances, reduces energy waste, and maintains indoor air quality. This PM is recommended annually or whenever actuator replacement or control signal issues are suspected.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect power to the VAV box controller at the local disconnect or panel. Apply personal lock and tag.
- Pneumatic Isolation: If the actuator is pneumatic, isolate and bleed the air supply line to the actuator.
- Confined Space: If accessing the VAV box requires entering a ceiling space, ensure proper ladder safety and use a harness if required.
- PPE: Safety glasses, cut-resistant gloves, and hard hat if working in a ceiling or industrial environment.

3.0 Required Tools, Parts & Lubricants

- Digital multimeter (capable of reading 0-10 VDC or 4-20 mA)
- Small flathead screwdriver (for terminal connections)
- 5 mm Allen key (for actuator set screw)
- Actuator calibration tool or BAS interface (laptop with software)
- Replacement actuator (if existing is faulty)
- Silicone-based lubricant (for damper shaft if binding)
- Torque wrench (if actuator mounting bolts require specific torque)

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Verify zero energy state by attempting to operate the actuator via BAS or manual switch.
2. Remove the actuator cover (if applicable) by unscrewing the retaining screws. Set aside.
3. Visually inspect the actuator and damper linkage for signs of wear, corrosion, or mechanical binding. Lubricate the damper shaft with silicone lubricant if movement is stiff.
4. Check the actuator mounting bolts. Torque to manufacturer specification (typically 4-6 Nm for small actuators). Ensure the actuator is securely fastened to the damper shaft.
5. Reconnect power to the VAV controller. Use the BAS interface or a signal generator to apply a known control signal (e.g., 0 VDC for closed, 10 VDC for fully open).

6. Measure the actual control signal at the actuator terminals using the digital multimeter. Confirm the signal matches the commanded value within ±0.1 VDC (or ±0.2 mA for 4-20 mA systems).

7. Observe the actuator movement. The damper should move smoothly from fully closed to fully open without hesitation or stalling. If the actuator does not move, check wiring and replace actuator if faulty.

8. If the actuator has an internal calibration mode (e.g., Belimo actuators), initiate the auto-calibration sequence per manufacturer instructions. This typically involves pressing a button or cycling power.

9. For actuators without auto-calibration, manually adjust the actuator end stops or linkage to ensure the damper fully seats at 0% and fully opens at 100% signal. Use the set screw to lock the position.

10. Reinstall the actuator cover and secure all screws. Ensure no wires are pinched.

11. Remove LOTO tags and locks. Restore normal power to the VAV box.

5.0 Verification & Return to Service

1. From the BAS, command the VAV box to several positions (e.g., 0%, 25%, 50%, 75%, 100%) and verify the damper position feedback matches within ±5%.

2. Monitor the airflow sensor reading (if equipped) to ensure it responds appropriately to damper movement.

3. Run a full cycle test: command the damper from fully closed to fully open and back. Listen for unusual noises (grinding, binding).

4. Document the calibration results in the PM work order within ServiceGrid, including any adjustments made or parts replaced.

5. Sign off on the PM and return the VAV box to normal operation.