Introduction

This document guides you through the process of upgrading your currently installed Venturi valve with agnostic hardware so that it can be controlled and monitored by any controller capable of providing and accepting a 0 - 10V signal.

This document will assist you in the process of removing and re-installing the mechanical components on the valve and then will take you through the steps to set up and configure the Universal Valve Module (UVM) as the interface to the valve.

If you need additional support, please contact the Triatek Service Team at +1 770-242-1922 or email service@triatek.com.
Items Needed For Setup

Actuator and Linkage Set Up Tools

- Needle nose pliers
- A cordless 20v drill
- Hex key set
- Screw driver set
- 7/16 socket and/or wrench
- 5/16 socket and/or wrench
- 3/8 socket and/or wrench

Universal Valve Module (UVM) Set Up Tools

- USB to RS485 cable - FTDI
- Windows PC with USB port
- UVM Configuration Tool software installed on PC
  (contact the Triatek factory if you were not provided with this software)
- Access to UVM Configuration Tool Users Guide:
## Included in the Box

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Preparation

1. Inspect the valve and its location to ensure safe and convenient working conditions.

2. Prepare the valve by removing the controls and actuator so that the mounting plate is ready for the new actuator assembly.

3. Remove the old position sensor by loosening the coupler set screws with a hex key and slide it forward on to the shaft pin to clear the old position sensor shaft. Using pliers, twist the two tabs that hold the position sensor bracket in place and remove the old position sensor. **Take care not to lose the coupler as a replacement is not provided.**

4. Check the valve for visible signs of damage. If the valve has holes or cuts that compromise the envelope, the valve should be replaced. If the valve has dents or deformations in the air flow regulation portion of its shell, the portion from the throat to the air inlet, the valve should be replaced.

5. With the actuator de-clutched or removed, check for the ease of movement of the control lever. If the lever sticks, is hard to move, is not uniformly smooth in its action or cannot travel the expected full range, the valve should be replaced.

6. With air flowing through the valve (in situ in the ductwork) ensure that there are no rattling or unwanted (other than air movement) noises. If any noise from loose parts is detected, the valve should be replaced.
7. Check that there is no damage to the lever pivot point or the air tight shroud at the pivot point. If there is any damage or looseness at the lever pivot point, or the air seal around the pivot point is loose or damaged, the valve should be replaced.

8. Check that the potential connection point for the hall effect position (feedback) sensor is viable for use with the replacement sensor. Check that it is not bent, stripped, or loose, and that it moves smoothly with the lever when it is moved back and forth. If it is not suitable for use, the valve should be replaced.

9. Preassemble the actuator and linkage hardware onto the mounting bracket.
Installation

1. Remove the position sensor cover and bend back the guard tab to make room for the new position sensor assembly.

2. Remove the black plastic cap on the new position sensor and install it by placing the small bracket tabs into the two slots in the mounting plate. Using pliers, twist the tabs 45 degrees to secure the bracket in place. Make sure not to over-twist the tabs as they may easily shear off.
3. The flat face on the position sensor shaft should be facing directly up and parallel to the mounting plate surface. Position the cone shaft perpendicular to the plane of the mounting plate so that it is vertical. **This is an important step in setting the operating range of the hall effect sensor.**
4. After aligning the flat face of the position sensor shaft with the vertical cone shaft, move the coupler to mate with the cone shaft pin and the position sensor shaft. Tighten the coupler set screws using a hex key. Make a side cut on the black plastic cap to help maneuver it back onto the new position sensor. Due to the tight fit a second side cut may be necessary to install the black cap without damaging the wire connections. Once the cap is installed, bend the guard tab back to secure it in place.

5. Use the preassembled actuator with linkage hardware and connect it with the valve cone shaft. When the actuator is in the 50% position, the crank arm should be about vertical when connected to the valve cone shaft in its vertical position. This helps to ensure that the actuator can move the valve through its entire range. The connecting bracket should be about horizontal for optimal operating range.
6. Check that the actuator can move the valve through its entire range and will not limit the cone shaft travel form 0% to 100%.

7. Verify the valve and actuator operating range, by pressing the clutch and moving the shaft through its full range. The full range of the valve should not be reduced by the actuator. The motion should be smooth with no interference utilizing the entire range of the valve cone shaft.

8. Once verified, check the alignment of all the brackets and adjust as necessary before tightening the crank arm with the actuator shaft.

9. Proceed to mount the actuator assembly bracket to the valve mounting plate with the provided fasteners. **Take care not to drill though the valve body.**

10. Finally, mount the UVM on the valve.
1. Follow the wiring instructions to connect the position sensor and actuator with the UVM.
2. Ensure the UVM dip-switches are set correctly.

3. Ensure the actuator DIP switches are set correctly.
4. Take note that if the valve is an exhaust it may need to operate in reverse acting mode. Otherwise it will need to be set in normal mode.

Configure actuator range and install valve curve. Refer to the UVM Configuration tool manual as to how to configure and manipulate the UVM. Page 14 refers to the process required to take in a Phoenix voltage matrix to generate a CFM curve for the UVM.


5. Refer to the UVM Configuration Tool Manual to program for setting up the valve for operation.


UVM Setup

6. Stroke the actuator by pushing the small black button next to the actuator DIP switches. The actuator will cycle between the 0 and 100% end stops and determine 0 and 100% positions.
7. Connect the + and - (+ typically orange, - typically yellow) to the UVM communication terminals on the UVM (RS485 + -).

8. Insert a USB to RS485 communications cable into the PC. Using the PC's device manager (or equivalent) determine the Comm port that the USB device has taken on.

9. Start the UVM Configuration Tool program on the PC.

10. Using the “Comms Port” tab, set the port to that determined previously, and the baud rate to 9600. Click “Set.” If the same cable is used in the future, the program will have remembered this and the port will not need to be set again.

11. Ensure the spin box with “Address of Device to Edit Settings on” is at the same address that the UVM’s 4 address switches are set at. This is typically 0.

12. Click the “Get All Settings From Device” button. The button will grey out. Wait until it goes black again. The Configuration Tool will now have all the settings from the UVM. It is recommended, but not essential, that you save these settings to the PC with the “Save Displayed Values to File” button.

13. Click the “User Settings” tab.

14. Set the “10V on IN =” scaling factor to a value relevant for the valve. Typically this is set as 700 for 8in valves, 1100 for 10 in valves, 1600 for 12 in valves and 2200 for 14 in valves. Set this value into the UVM by clicking the “Set 10V CFM” button. Record this value as it must match the scaling used in the OEM controller.

15. In the “Permanents” Controller State Settings panel, ensure that “Use AI Setpoint” and “Use DIP Switches” are checked. If a DP switch is used check “Use DI as DP” and “DP Switch NC” as appropriate. All other checks are typically OFF.

16. Ensure that the actuator and the UVM have the correct Normal/Reverse settings selected. On the UVM this is through the DIP switch if “Use DIP Switch” is selected, or via the Norm/Rev checkbox if the Use DIP Switch is not checked.

17. Check “CFM Table” tab.

18. If the retrofit valve is a Phoenix unit, click the “Phoenix Valve Volt to Pos Utility.” A dialog will appear. Fill this with the voltage and CFM information available on the valve sticker. Include the Max and Min voltages.

Fill in all remaining “0” entries with a repeat of the preceding values. If there is no Voltage/CFM chart available, manual T&B readings will need to be taken and the values entered manually. This is done by selecting a range of positions and putting them in the Positionx10 and FBx10 columns. They are values without decimal and are x 10, so 25% is 250. Suggested values are 0, 400, 600, 800, 900, 950 and 1000.
19. Override the actuator (See UVM Configuration Tool Manual) and take CFM readings at the selected positions (0, 40, 60, 80, 90, 95 and 100% if the above is used). Remove the Override when done. Enter the CFM values in the CFM column of the table against the position they were read at.

20. Click the “Set CFM Entries” and then the “Set Feedback Entries” buttons.

21. The Feedback sensor will now need to be calibrated. If the “Phoenix Valve Volt to Position Utility” was used, check the “This is Phoenix Valve Data” check box, otherwise leave this box unchecked (if T&B was used to fill the table with an overridden actuator) Leave the “Auto Populate FB Entries” check box checked. Check the “Do Hysteresis averaging on each curve point” check box if a more accurate result is required. This will take twice as long as normal.

22. Ensure the “Actuator Stroke Time” is set to a few seconds longer than the actuator stroke time (4 sec for 3 second actuators).

23. Ensure that there is air pressure on the cone, otherwise there needs to be an equivalent pressure (in the direction that air would normally generate) on the lever during the calibration process. This is to remove any slack or hysteresis in the calibration process.

24. Click the “Calibrate FB Sensor” button. The PC program will override the actuator and drive it to the 0 and 100% positions and then to each of the positions in the chart and take readings from the Sensor. This will populate one of the columns in the chart and then send the data to the UVM. The FB sensor raw values may be up to +/- 5% off from the actuator position and this process will correct for that. The position mismatch is due to the geometry of the linkages between the actuator and the position sensor. The PC program will flag any errors greater than +/- 5%.
Frequently Asked Questions

Q1
If I want to switch to Johnson Controls from another building management system (BMS), what steps are required? Who needs to be involved?

A1
In order to switch from one BMS to another, the owner would need to have a program created in the new BMS. This program would need to use the same I/O points to perform the lab balance. This programming could be done by BMS Manufacturer or Installer. Triatek could assist with the programming, but they would not need to be involved. Triatek could also work with the owner to verify the program is properly functioning. The situation would be the same for other building management systems such as Delta, Tridium, Honeywell, Siemens, etc.

Q2
If Johnson Controls updates their BMS Software, what steps are necessary to update the air flow controls?

A2
Since the UVM does not control the valves, any changes to the BMS software would involve the BMS only. Hence, no updates to the air flow controls are required. If the BMS Update significantly changes the controller, the programming may need a major overhaul; however, as discussed already, this change could be handled by the BMS Manufacturer. If obscure or bogus readings are being observed on the updated BMS, Triatek could assist by verifying data on the BMS. The situation would be the same for other building management systems such as Delta, Tridium, Honeywell, Siemens, etc.

Q3
Are gateways required in the completed system?

A3
No, there are no gateways in the UVM-based system. The room controllers are standard BMS controllers with BACnet MSTP capability.

Q4
Does the existing pneumatic system require continued maintenance in order for the laboratory control system to function?

A4
No. All valves that have been upgraded to the new UVM system have had their pneumatics replaced with electronic controls.

Q5
Can the fume hood monitor display face velocities?

A5
Yes, the Triatek side wall sensor is reporting true/accurate face velocities to the fume hood monitor. It is not calculating face velocity readings based on valve position and displaying them on the fume hood monitor. On a constant volume fume hood, the true face velocity will be displayed on the fume hood monitor at all times as the sash raises and closes. On a variable air
volume fume hood, 95% of the face velocity flow is determined by the vertical sash sensor as the sash rises. The sidewall sensor calculates the remaining 5% of the flow. This functionality is referred to as trimming out the final flow through the face of the fume hood. The sidewall sensor also displays the true face velocity value even if there is an obstruction in the fume hood. For example, if half of the sash was blocked with an experiment, the side wall sensor would take over and reduce the airflow to compensate for the obstructed area to maintain the face velocity set point. The fume hood monitor would also display this value. The combination of sash sensor and sidewall sensor creates a safer fume hood.

Q6
What is the normal maintenance for the typical lab air flow system?

A6
For critical air flow systems, we recommend that an annual inspection occurs to all components to verify functionality and proper/accurate readings. Triatek can train your employees to perform some of these tasks.

Q7
If I enter the lab and the fume hood monitor is showing red, what does that mean? What needs to do to get it back to green?

A7
If the fume hood monitor is displaying red (either the main screen or the Safety Halo™), one of the alarms is signaling a parameter that is out of range (low flow, high flow, sash position, face velocity, etc.). Depending upon the parameter that is out of range, the solution could vary from simply putting the sash back to its correct position, verifying that the exhaust is working properly, verifying power to the fan and its controls, etc. Alarms can be programmed into your BMS to send an alert to appropriate personnel when the fume hood monitor signals an issue.

Q8
What is the process to switch a constant volume (CV) fume hood to variable air volume fume hood (VAV)?

A8
If the fume hood already has a valve capable of providing VAV (locked in CV mode), the fume hood would need to be reconfigured from CV to VAV via the control panel on the Triatek fume hood monitor. Triatek can train your employees to perform this task. In some cases, the valve may need to be upgraded. Contact Triatek for more information.

Q9
What function does the hall effect sensor provide? How does the hall effect sensor differ from a potentiometer?

A9
The potentiometer provides actuator arm feedback (valve position) to the BMS. This feedback can signal that a valve is not properly functioning. As part of the UVM Upgrade, a hall effect sensor has been substituted for the potentiometer. A potentiometer is an adjustable resistor which consists of a wiper that slides across a resistive strip to deliver an increase or decrease in resistance. The level of resistance determines output of current to the circuit. This physical contact results in wear to the wipers and resistance strip over time, which could result in dead
spots. These dead spots render the potentiometer faulty. A hall effect sensor is a transducer that varies its output voltage in response to a magnetic field. The hall effect sensor uses a non-contact method featuring magnetic resistance similar to a hard drive. The advantage to this technology is that due to the lack of friction, the hall effect sensor has a much longer lifespan than a potentiometer.

Q10
Can the fume hood controller be located away from the valve and in a more easily accessible location?

A10
There are five components to control the fume hood – sash sensor, sidewall sensor, fume hood monitor, fume hood controller (HMS) and the UVM on the exhaust valve. The sash sensor, the fume hood monitor and sidewall sensor are all mounted on the hood. The fume hood controller can be located away from the fume hood exhaust valve - preferably on top of the fume hood itself. The advantage to separating the fume hood controller form the valve is that it can be placed in a more easily accessible location. The UVM is mounted on the valve as it is for all Triatek applications.

Q11
If Triatek upgrades their firmware, how do I upgrade the valve/UVM?

A11
The firmware on the UVM can be changed via the 10-pin connector on the back of the UVM. A connection is made between the UVM and a firmware programming tool. The firmware programming tool is then connected to a laptop, which upgrades the firmware. Triatek could train the owner to upgrade the UVM firmware.

Q12
If an upgraded UVM valve (i.e. a Phoenix Controls valve body) should fail in the future, what is required to replace this valve?

A12
The owner would need to order a new Triatek UVM valve body meeting the existing specifications (air flow, cfm to voltage scale, etc.). The existing valve body would need to be disconnected from power and controls and removed. The new Triatek UVM valve would be placed into position and the power and control wiring would be landed in the same locations on the UVM. Once power is returned to the valve, the valve should properly function. No new programming is required as the BMS is already programmed for the valve. The owner could make this swap. If the UVM failed, a new UVM would need to be purchased and installed. Similar to replacing the valve body, the power and controls wiring would need to be disconnected, the bad UVM removed, the new UVM installed and power and control wiring landed to the same location on the UVM. Once power is returned to the valve, the valve should properly function. No new programming is required.