Flow Bench Low Flow Sensor, Installation

The Low Flow Sensor makes it possible to read very low flows in the EZ Flow system. At very low flows, there is not enough pressure drop across the orifice to produce accurate or any CFM flow reading. The Low Flow Sensor works differently and can produce a signal at these very low flow. However, the installation is critical for good accuracy.

- Pick a spot to install the low flow sensor in your EZ Flow tube. It should be at least 17" from the flow orifice and it requires flow straighteners before and after it, about 2" from the sensor. You should also have at least 1" of tube before the first flow straightener.
- Cut a slot in your tube and place the sensor into the tube. Mark the 2 holes and drill and tap. Notes: With flow straighteners in place, you will not be able to use nuts inside the tube. Fig 3 shows which side of the sensor should face into the Intake Flow.
- Cut your flow straighteners to fit within your tube. It is not critical that they fit perfectly. Push the inner one in place and epoxy in place. Then push the outer one in place and

epoxy in place. You will likely only be able to epoxy the straightener at 3 or 4 spots along the inside of the tube.

- Screw the sensor in place with some type of sealant or gasket between the sensor housing and tube.
- 5) Plug the sensor cable into the 6 pin connector of the Mini USB logger. At this

time, this sensor only works with that logger.





Fig 1

Flow Bench Low Flow Sensor, Installation, cont.



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Flow Bench Low Flow Sensor, Software Setup

It is critical that you follow all procedures to get your EZ Flow settings correct, and pressure sensor calibration numbers. It is also critical you have entered accurate numbers for Range #1, Intake and Exhaust following the suggestions in the EZ Flow setup documentation.

Now enter the Low Flow sensor calibration numbers provided by Performance Trends or following the calculation below.

Cal Factor = 7 - 8 x Orifice Diameter Factor

where Orifice Diameter Factor = Orifice Diameter / Flow Tube Inside Diameter

For example, if you have a 2" orifice in a flow tube with a 4" inside diameter, the Orifice Diameter Factor would be 0.5 and the Cal Factor would be $7 - 8 \times 0.5 = 3$ Limit the Cal Factor to nothing less than 1 or greater than 5.

For most all situations, the "Highest Low Flow Reading" of 400 works well.	Port Flow Analyzer v3.5C Performance Trends [hot probe develope logic v3.5 c.023 F] File Edit Elit Fig 5 Back (ok) File Choose EZ Flow as the Type General Bench Specs Interview Type EZ Flow System	should be adjusted. Keep Changes Help Cancel Print
	With "Head Porter" software, you have option of "Orifice with Low Flow Sensor". Choose it which will produce the "Low Flow Sensor Calibration" button. Flow Ranges Intake Exhaust Range #1 570 570 570 1 Flow Scale Linear (like a ruler) Image #1 2 Flow Scale 1 Flow Scale 1 Flow Scale 1 Flow Scale 1 See Details (calibrations) 1 See Details (calibration" 0 Theorem calibration 10 See Details (calibrations) 11 See Details (calibrations) 10 See Details (calibrations) 11 See Details (calibration) 11 View Flow Sensor Calibration 11 See Details (calibration) 11 See Details (calibration)	 Low Flow Sensor Cal. Recommended calibration numbers Intake Flow Direction Highest Low Flow Reading Cal Factor Fig 7 Notes: Calibration info for Low Flow Sensor. Contact Performance Trends before changing from the default settings of 400 for 'Highest Reading' and 3 for 'Cal Factor'. Check the paperwork which came with your Low Flow sensor to see if these should be adjusted. Keep Changes Help Cancel Print

🖻 Low Flow Sensor Cal.

Intake Flow Direction

3

Calibration info for Low Flow Sensor. Contact Performance Trends before changing from the

default settings of 400 for 'Highest Reading' and

3 for 'Cal Factor'. Check the paperwork which came with your Low Flow sensor to see if these

400

Typical default calibration numbers

Cal Factor

Fig 6

Notes:

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Flow Bench Low Flow Sensor, Software Setup, cont

The Low Flow Sensor comes with a 4 pin connector to let you record the temperature from the sensor's own temperature sensor. See page 2. This temperature is not used for any calculations, but could be good information for your records.

If you use it, you will plug the 4 pin connector into the 4 pin connector on the Mini USB logger. If something else is already plugged in, you may need a breakout cable to get both signals into this connector. Shown to the right are the factor calibration settings of - 42 for Offset and .157 for Factor.

With only this temperature connector plugged into the Mini USB logger, this temperature will appear as T1. With a breakout cable, it could appear as either T1 or T2.

Tip: Figure 9 shows a flow curve which seems too low at lower flows. If you suspect that the low flow sensor is not reading correctly, you can check it with an orifice plate. The hole in the plate will be VERY small to produce low flow, like 1/4" in diameter. To calculate the CFM produced from flow through an orifice, check the equation on page 152 in the Port Flow User's Manual.

CFM = 13.29 x Orifice Dia ^2 x square root (test pressure, inches water)

For example, a 1/4" diameter hole is .25 inches tested at 28" water would be:

CFM = 13.29 x .188 ^2 x square root (28)

CFM = 13.29 x .0625 x 5.29 = 4.39 CFM

Flow a plate with a 1/4" diameter hole. If it reads *significantly* too low or too high, change the Cal Factor described on page 3. For example, if it reads 7 CFM and should read 4.39, you want it to read lower by a factor of 4.39/7 or .63. If the Cal Factor is 3, change it to .63 x 3 or 1.89.

Check the Tip in page 5 to make sure that the Low Flow sensor is being used for your flow measurement in the range of 7 CFM, by requiring 50 samples for the reading. If 7 CFM is above the flow where the Low Flow sensor is being used, you risk making a wrong adjustment in the Cal Factor. If you are not sure, leave the Cal Factor as suggested by the equation on page 3.

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🖣 Bench Electronics Calibrations 🛛 🔀			
Back (ok) File Weather Station Calibrations Swirl/Tumble Meter Type More Details Help			
Pressure Sensors Temperature Sensors			
	Test Temp (T1) Offset -42		
Fig 8	Calibrate Offset&Factor Factor .157		
	Comment Low Flow Senso Temp Sensor		
Test Pres. (vert. man.) Uffset	Flow Temp [12] Uffset		
Calibrate Offset&Factor Factor .055	Calibrate Offset&Factor Factor		
Comment Std EZ Flow pressure sensor	Comment		
Port Velocity (pitot tube) Offset			
Collinet Official Factor OFF	Calibration numbers for Freq.//calib not rqd.		
	temperature sensor		
Std EZ Flow vel pressure sensor			
Commont Commont Commont			
Elle Edit Graph Report Test Options Head Flow Bench Engine Preferences Help Electronics(F5) Sound Analysis			
Test & Head Conditions Test Piece Picture Test Piece Picture			
1 2.02"Valve 5.44 pm 11/20/2019 V3 5 C 025 software, before shipping first low flow sensor to Russia This is NOT actual sensor to be shipped, just testing software.			
10" Test Pres. Leakage 0 Hightest Low Flow Reading = 400 E			
Test Data			
Point Litt" L/D Test Flow Test OFM Subly Pres" Pres" Pres" Temp +/-%			
1 000 000 10 0000 73 0 6234 2 100 060 10 215 681 28 5145 Pres.			
5 .200 0.309 10 1.63 06.0 0.2 33.71 4 .300 1.49 10 5.11 659 13.8 59.84 5 .400 1.98 10 12.83 657 21.5 30.19			
6 500 248 10 20.33 659 27.1 40.89 7 600 287 10 28.89 655 322 37.80 9 700 247 10 22.11 655 656 657			
0 00 396 10 42.32 654 300 4027 10 900 446 10 45.48 654 40.5 5502			
	20		
More typical flow			
Fig 0	10		
riy s			

Flow Bench Low Flow Sensor, Operation

The Low Flow Sensor only comes into play when the flow is very low. Otherwise it operates as a standard EZ Flow bench and software setup.

Because we are trying to obtain accurate flows at very close to zero flow, it is critical you "Re-Zero Pressure Readings" before you start testing. This also re-zeros the Low Flow Sensor. Click on Options at the top of the recording screen for the "Re-Zero Pressure Readings" option. A new option is being able to re-zero the sensors with the Ctrl-R function. Hold down the Ctrl key and press and release the R key (R for re-zero) to save some steps re-zeroing.

After re-zeroing, you should record your low flow readings first, because all sensors can drift slightly with time. This typically means starting at the low valve lifts or for checking for leakage.

Because the sensor is measuring very low air velocity, it is critical that all air velocity is coming from air flow through the EZ Flow tube. Therefore, eliminate any air currents around the EZ Flow tube. This would be especially fan air currents, but even hand motions or other movement around the tube.

When the system senses the flow is very low, the program will take and average 50 readings to get a good stable reading. When the flow is high enough, it will then take the number of readings you have selected in the Flow Bench specs screen.

The data you record will not look any different that data recorded without the Low Flow Sensor, except there will be Flow Readings shown to 4 decimal places.

Tips:

If you have selected to record and average 30 sample for each reading, but the program is showing it is actually recording 50, that lets you know the Low Flow Sensor is being used for this reading. This can be handy to determine if there is a problem with the data if the problem is with the normal flow pressure sensor, or the low flow sensor.

Check page 4 for an additional tip if you suspect the accuracy of the Low Flow sensor.

