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.

1) 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.
2) 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.
3) 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.
4) 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.

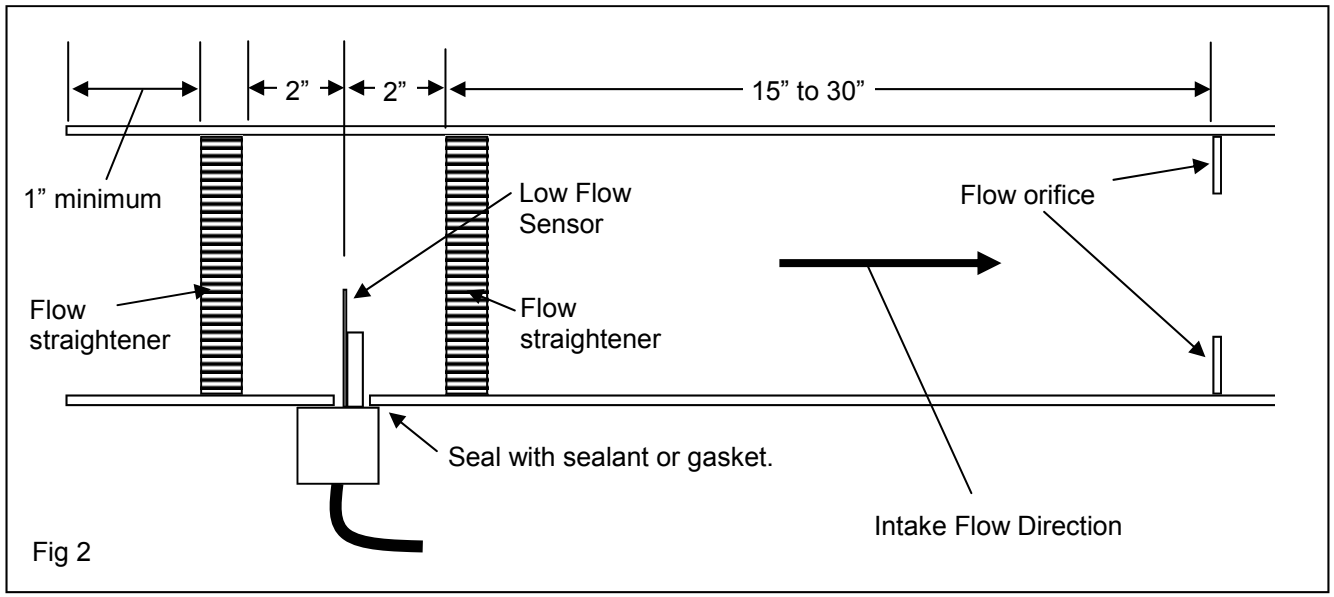


Fig 2

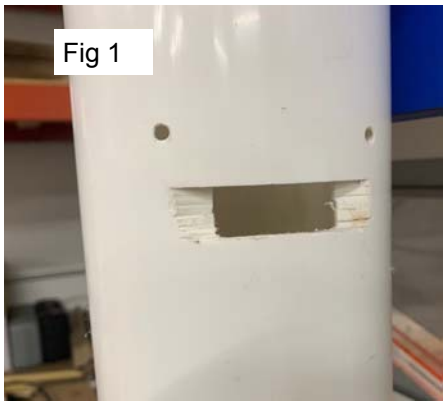


Fig 1

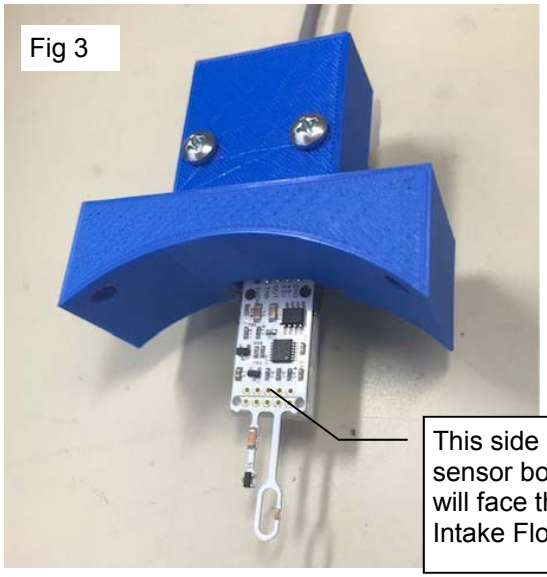


Fig 3

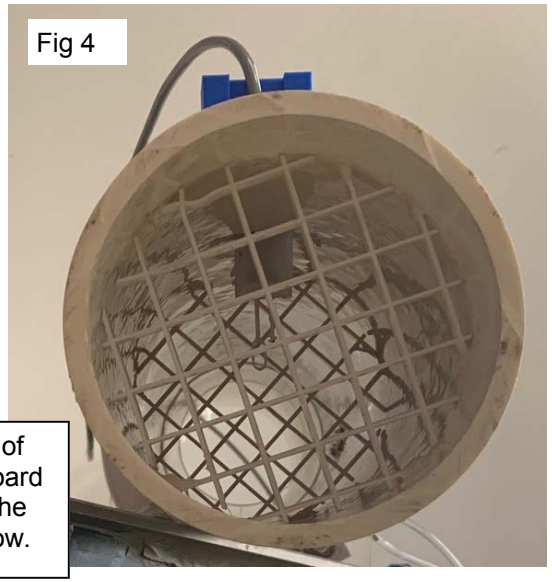
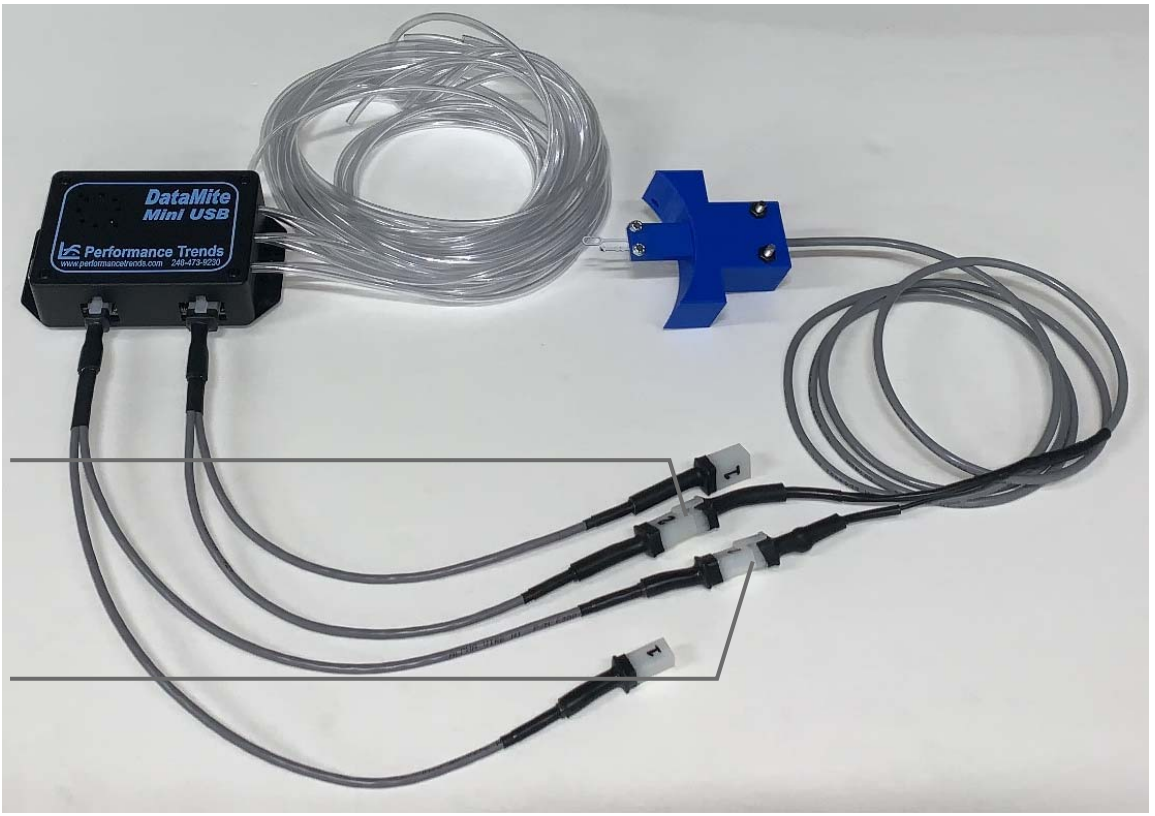


Fig 4

Flow Bench Low Flow Sensor, Installation, cont.

Low Flow Sensor temperature sensor plugged into 4 pin connector

Low Flow Sensor plugged into 6 pin connector



If you are using a 2 channel breakout cable on the 6 pin connector, the Low Flow sensor plugs in the #2 connector. To “double check” you have the right connector, check that the metal terminals in the breakout cable mate up to those of the connector on the Low Flow sensor.

If you are using a 2 channel breakout cable on the 4 pin connector, you can use either connector. If you use #2, like shown in this picture, the temperature will show up as T2 in the software.

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.

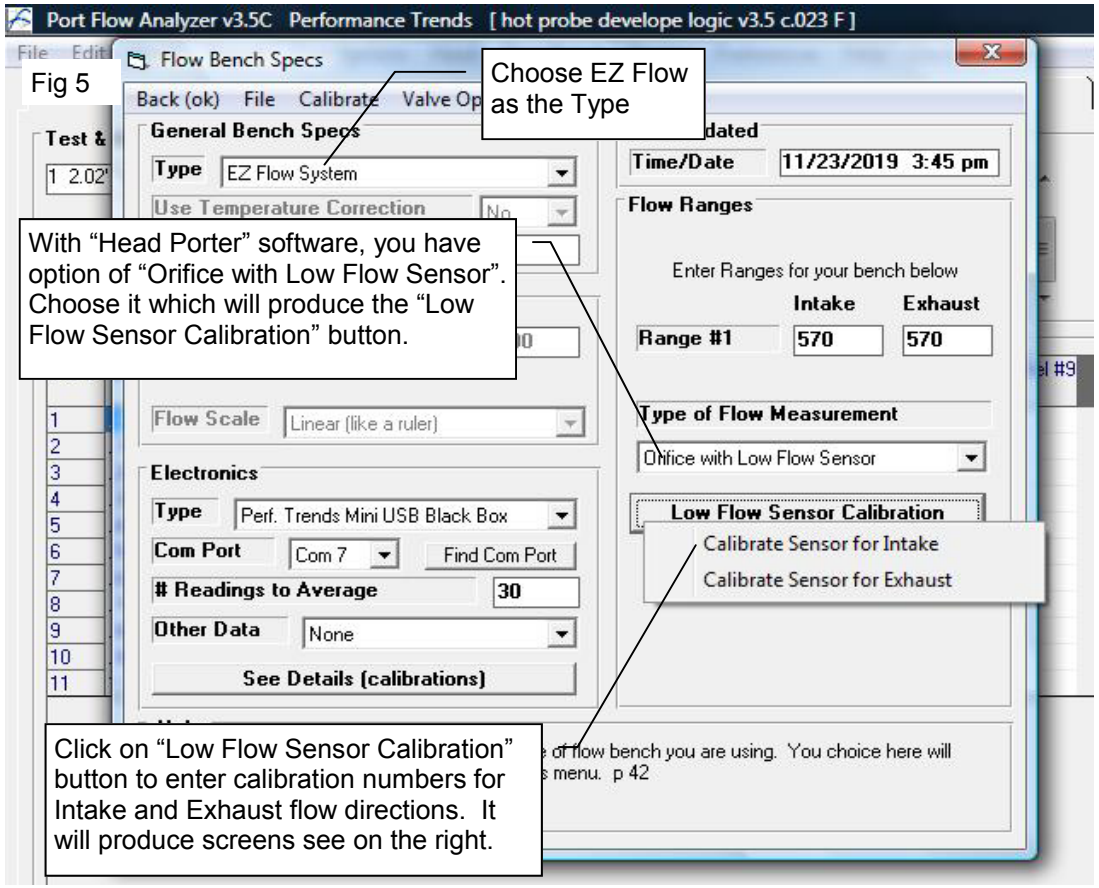
Now enter the Low Flow sensor calibration numbers provided by Performance Trends or following the calculation below.

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 x 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.

Fig 5



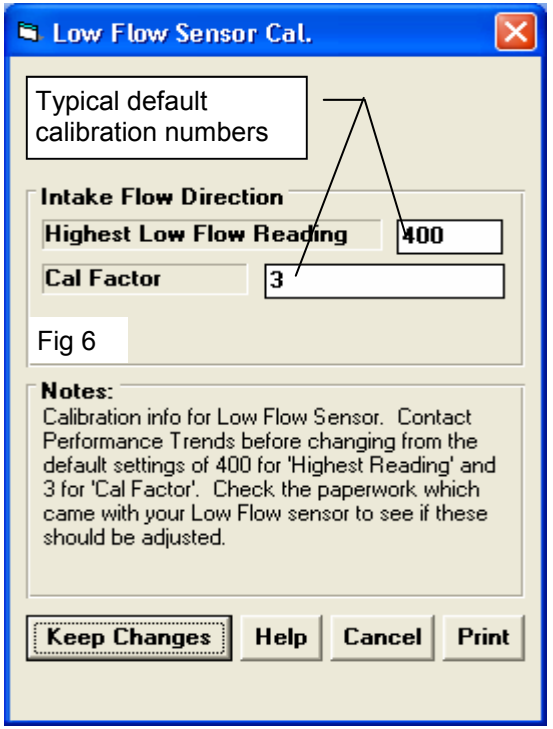


Fig 6

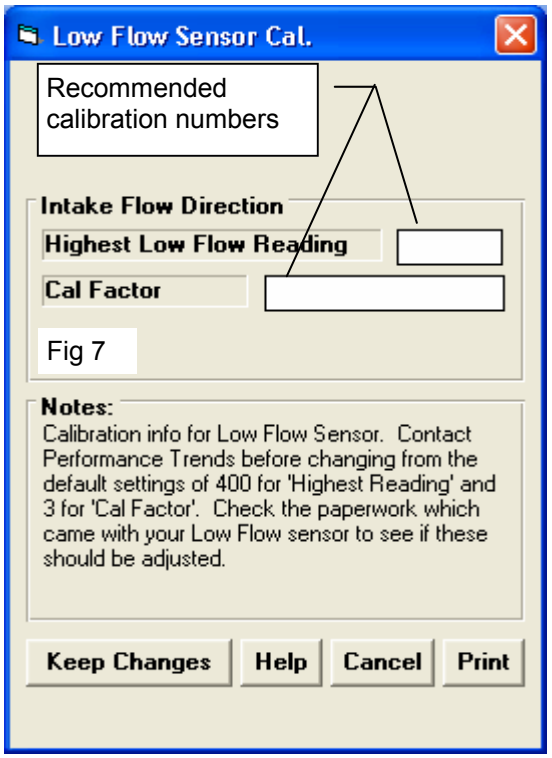


Fig 7

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)

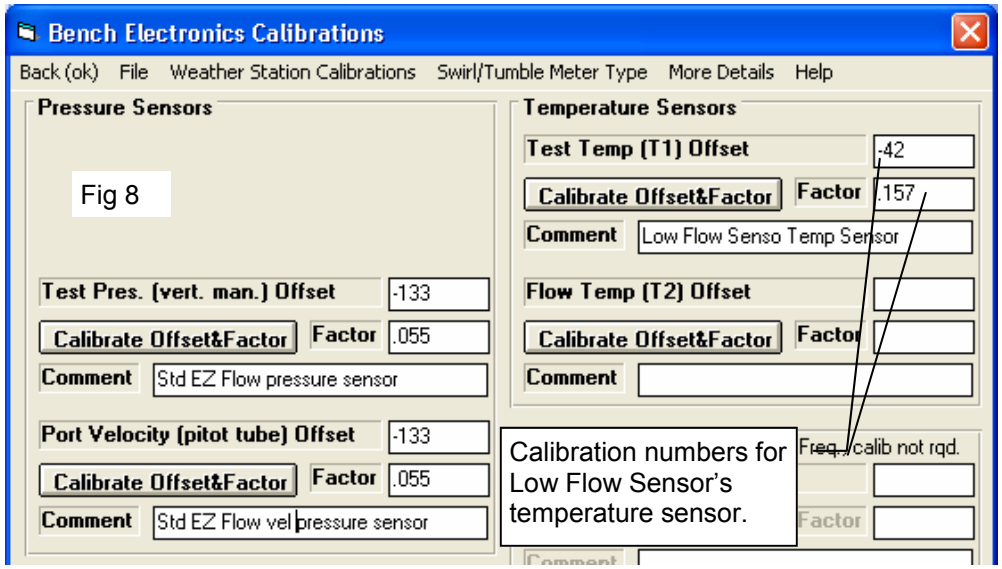
For example, a 1/4" diameter hole is .25 inches tested at 28" water would be:

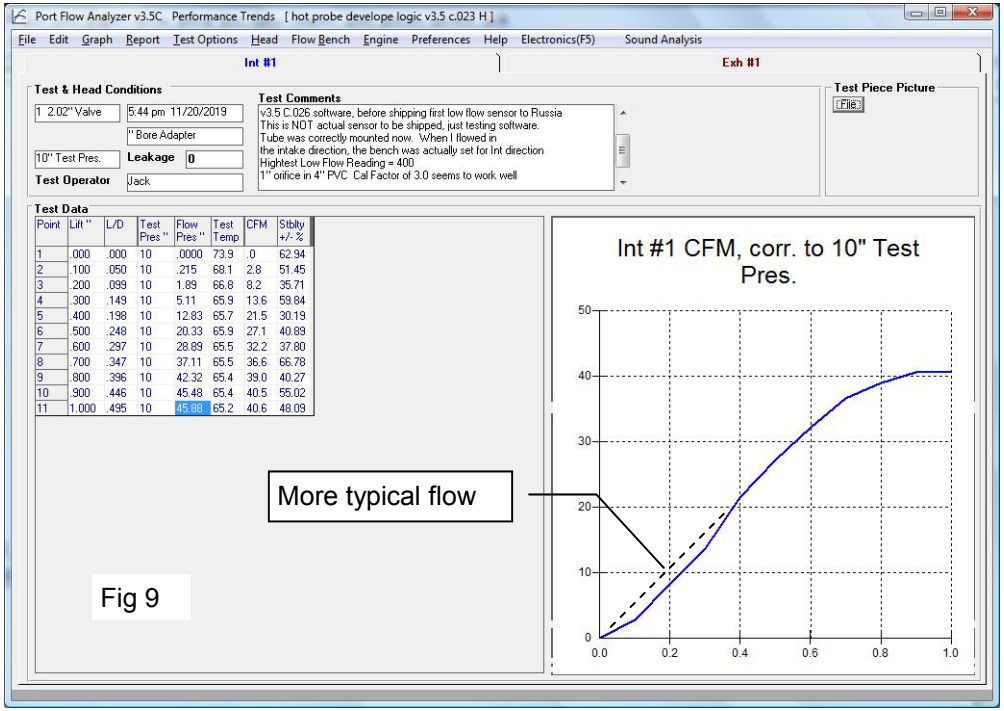
CFM = 13.29 x .188 ^2 x square root (28)

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.





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.

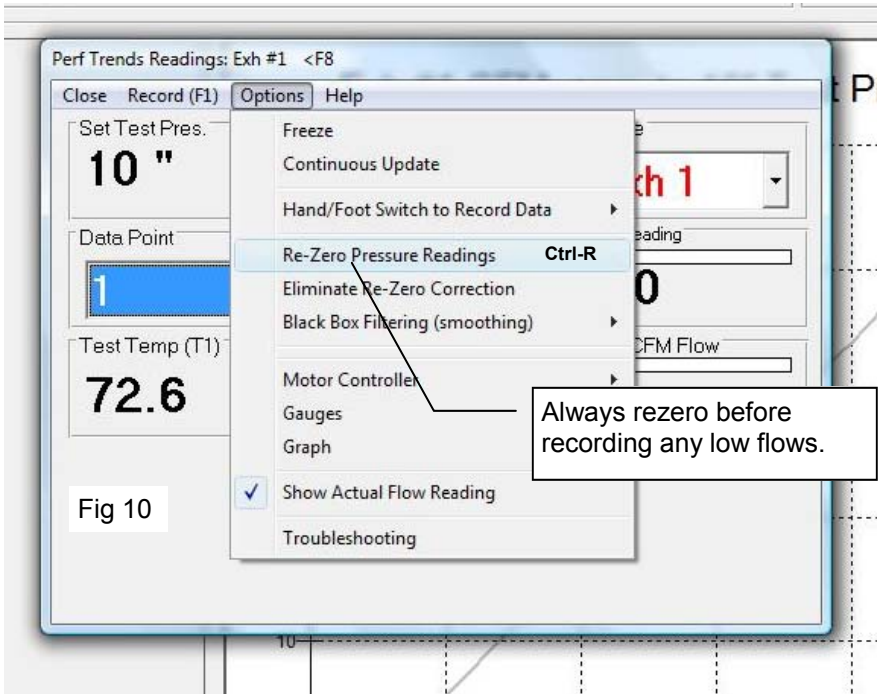


Fig 10

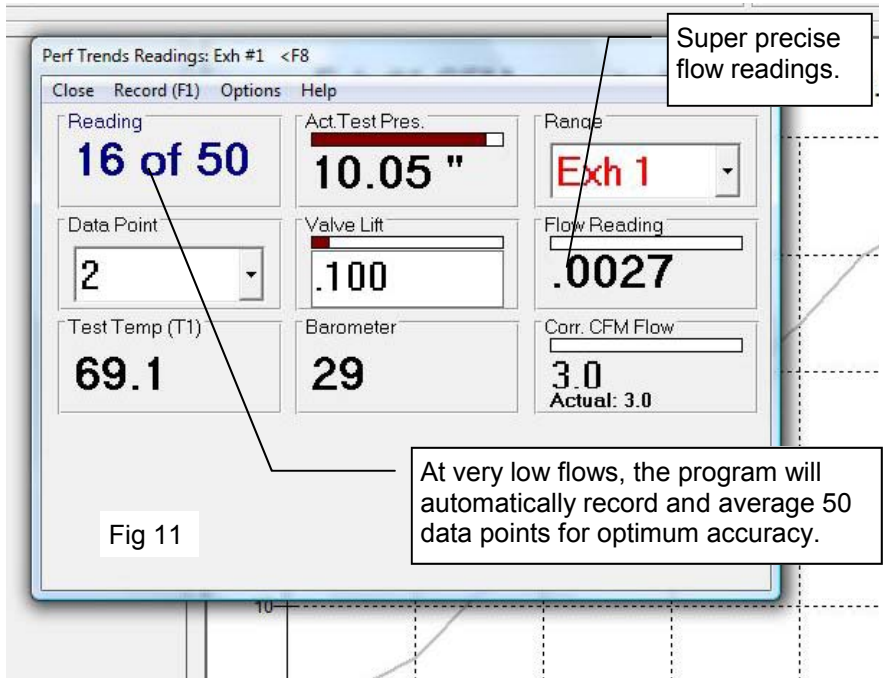


Fig 11