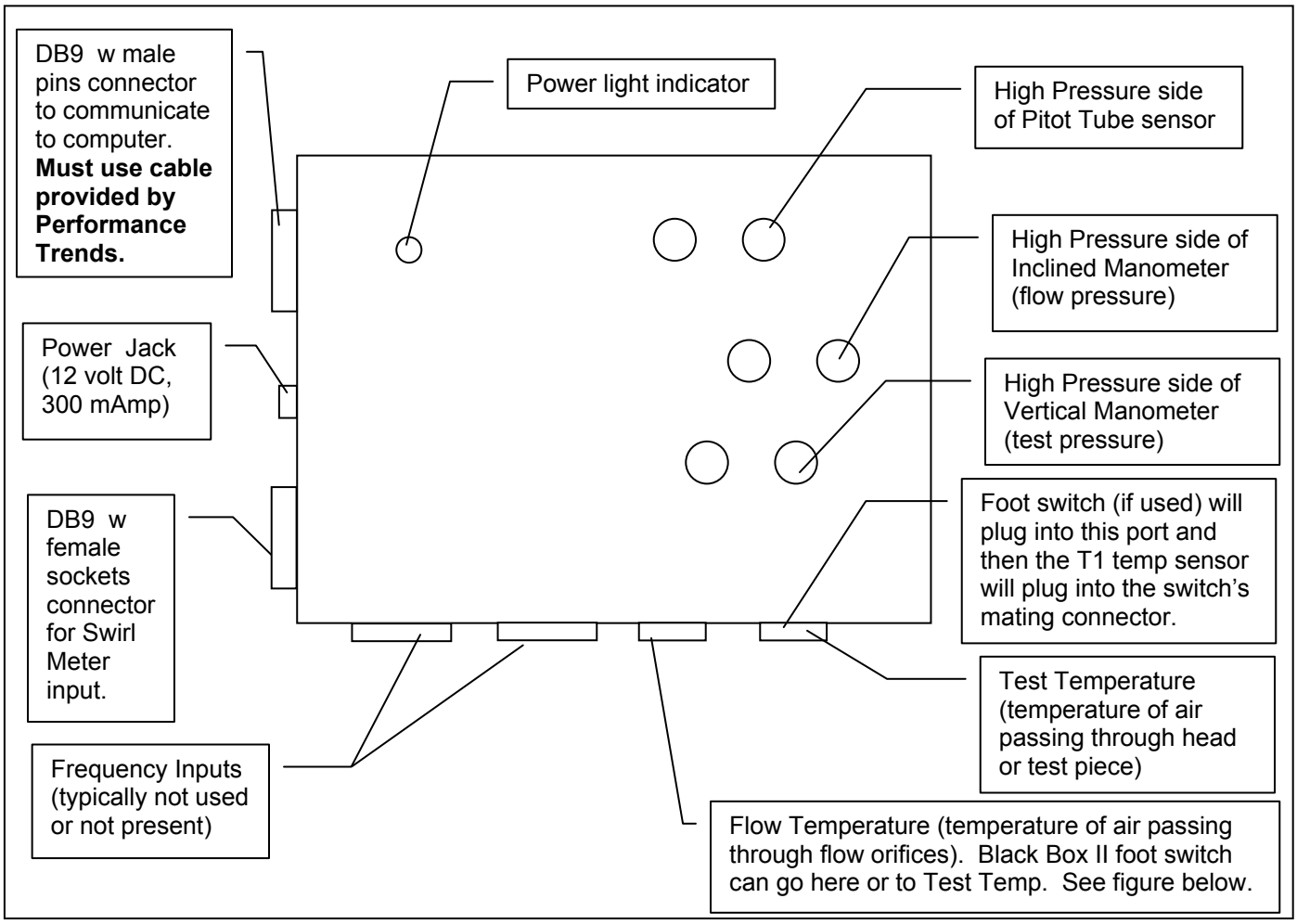
Check page 5 for “factory calibration”

Performance Trends’ “Black Box”

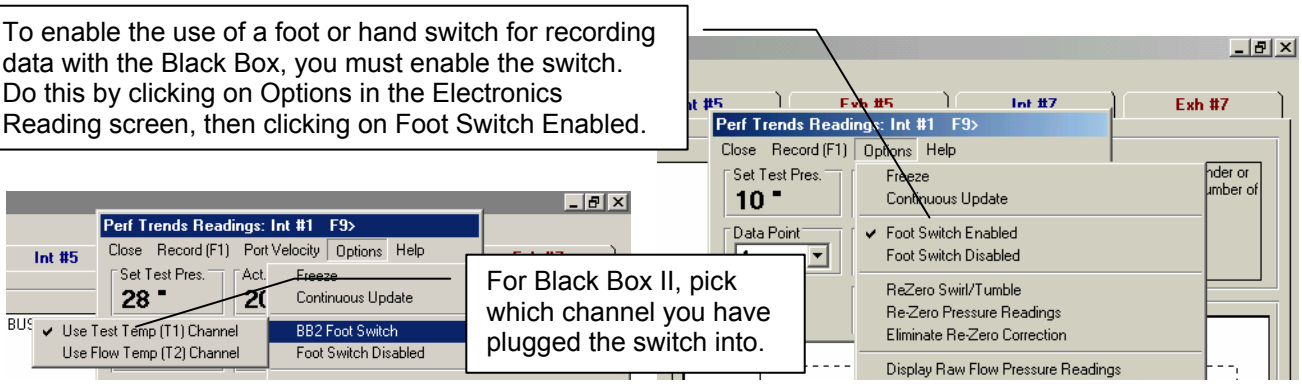
Instructions for Hookup to Flow Bench

Performance Trends’ “Black Box” data logger will record data from your flow bench to greatly enhance your flow bench testing. The 2 figures below give an explanation of the various connections to the Black Box, and how it hooks up to a typical SF 600 or 300 or custom style flow bench.

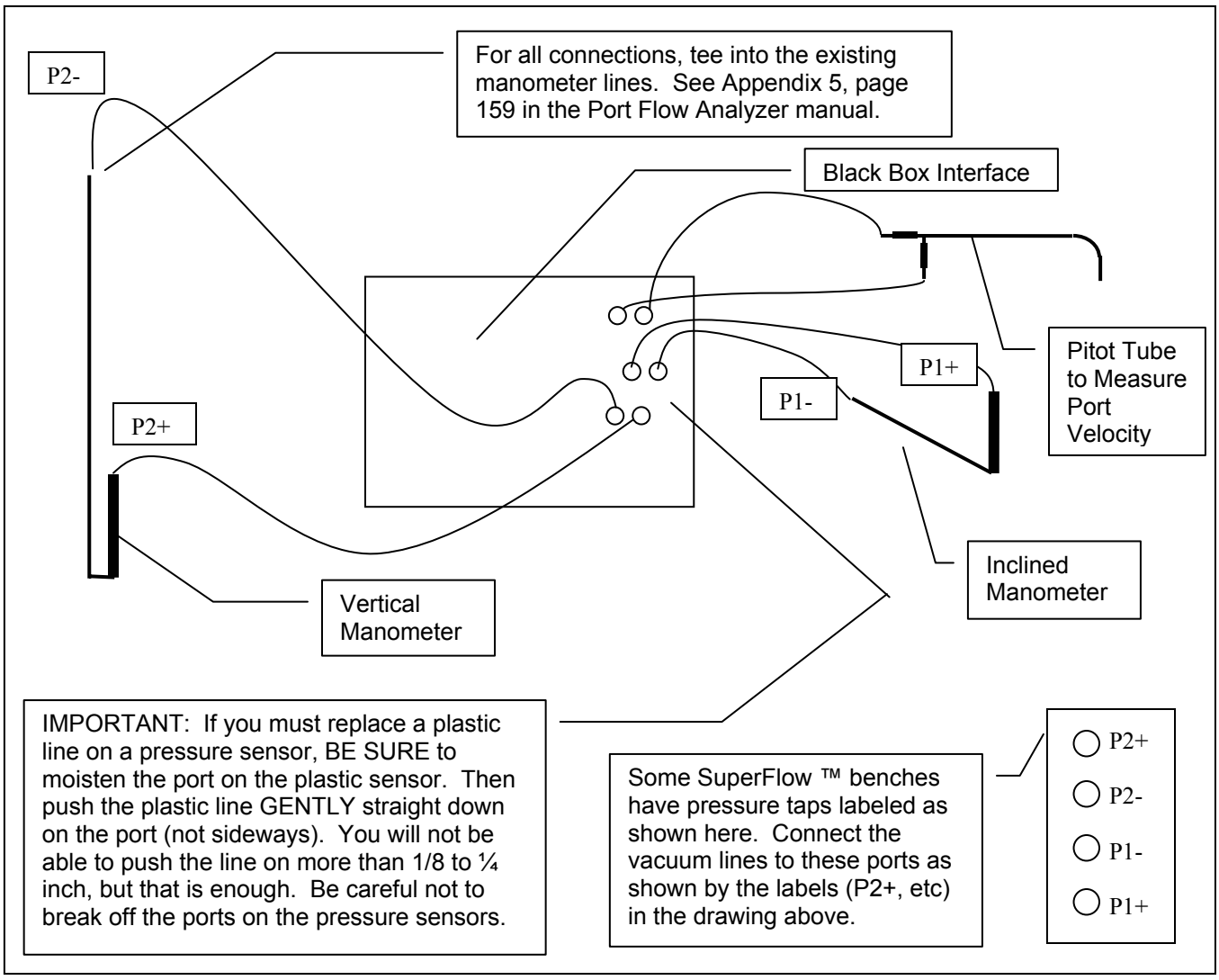


Enable Foot Switch

To enable the use of a foot or hand switch for recording data with the Black Box, you must enable the switch. Do this by clicking on Options in the Electronics Reading screen, then clicking on Foot Switch Enabled.



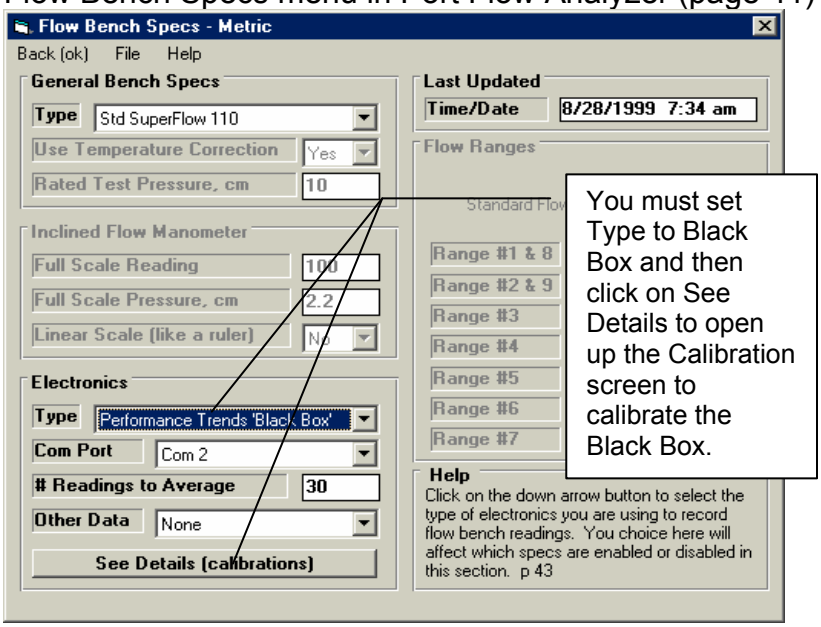
For Black Box II, pick which channel you have plugged the switch into.



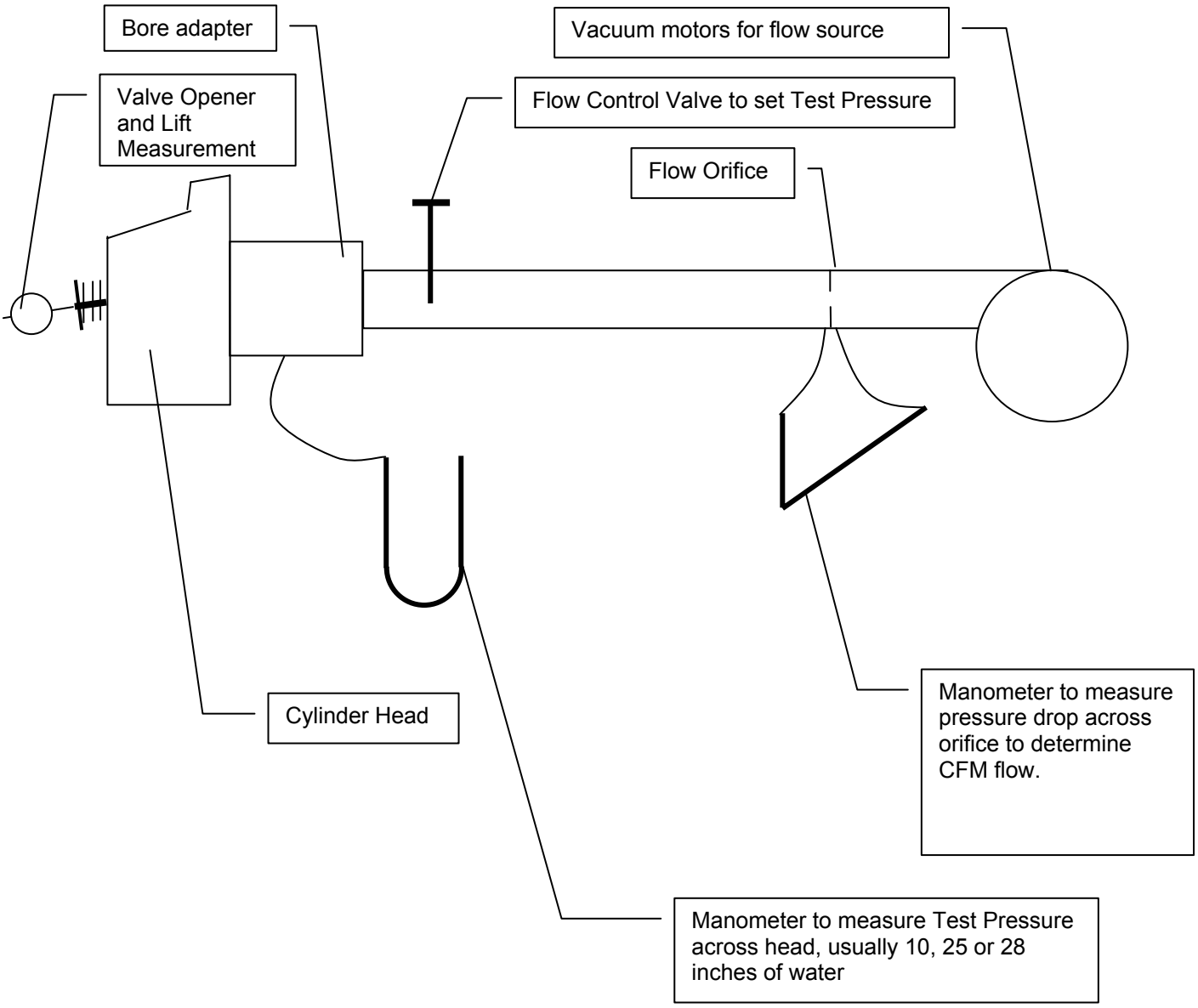
After you hook up the Black Box, you must calibrate following the procedure outlined in Appendix 5, starting on page 159.

You must specify that you are using a Black Box Type of Electronics in the Port Flow Analyzer as shown in the menu to the right. You must also click on the "See Details (calibrations)" button to calibrate the sensors to match the manometers on your bench. See Page 41 in manual.

Flow Bench Specs menu in Port Flow Analyzer (page 41)



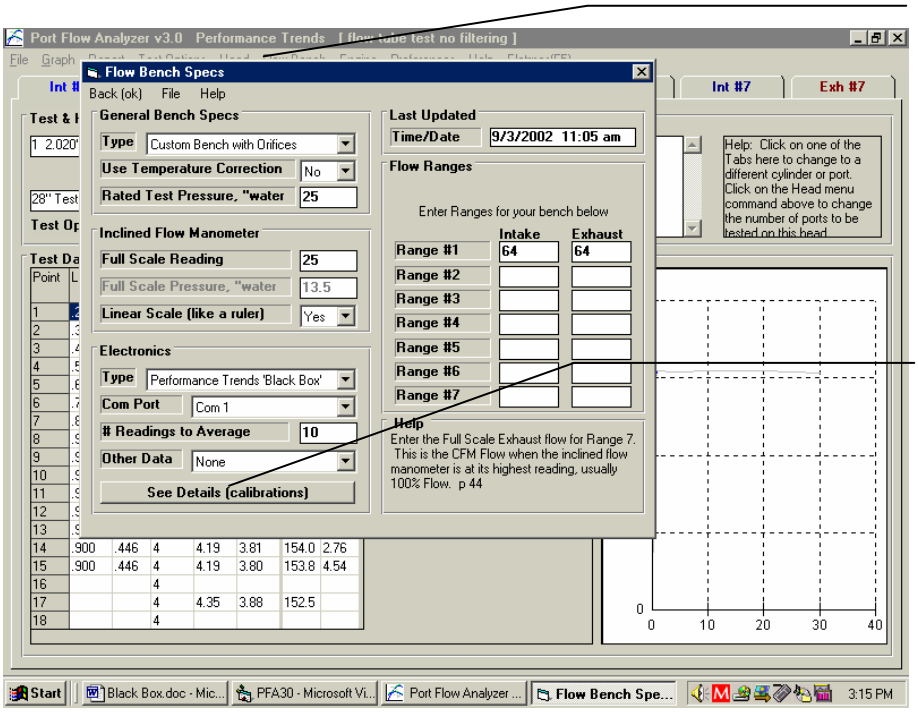
Schematic of Typical Custom Flow Bench



For more information, visit www.performancetrends.com and check out:

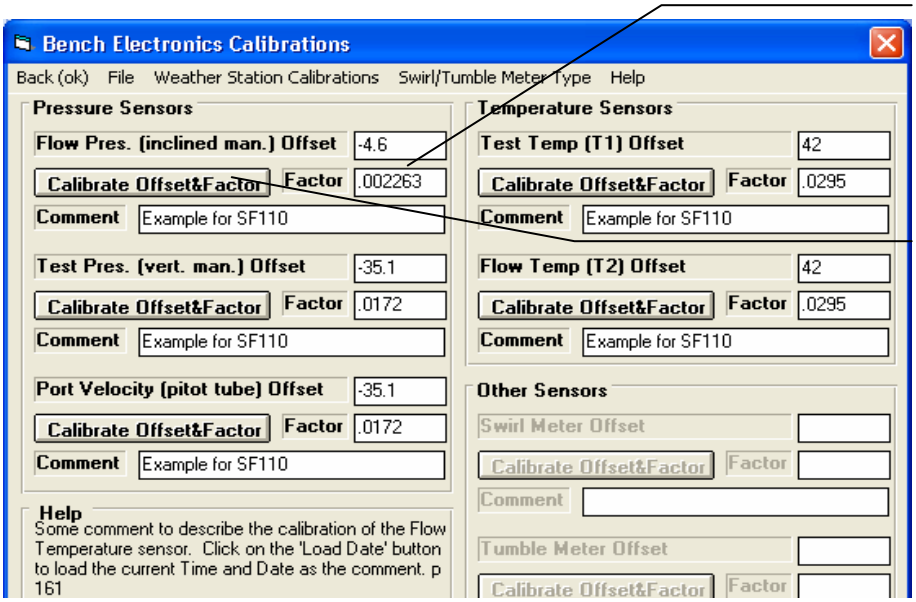
Port Flow Analyzer (software)
Black Box (electronics)
Swirl Meter
Tumble Fixture

Black Box Setup in Port Flow Analyzer Software



Click on Flow Bench at top of Main Screen to bring up Flow Bench specs screen shown here.

Click on See Details (calibrations) to enter typical calibrations for sensors in Black Box.



Enter both the Offset and Factor for the sensors you are using. See the table below for typical calibration values.

It is always best to do an actual calibration for each channel to account for minor difference between different sensors of the same design. To calibrate, click on the Calibrate Offset & Factor button for the different sensors and follow the instructions given by the program.

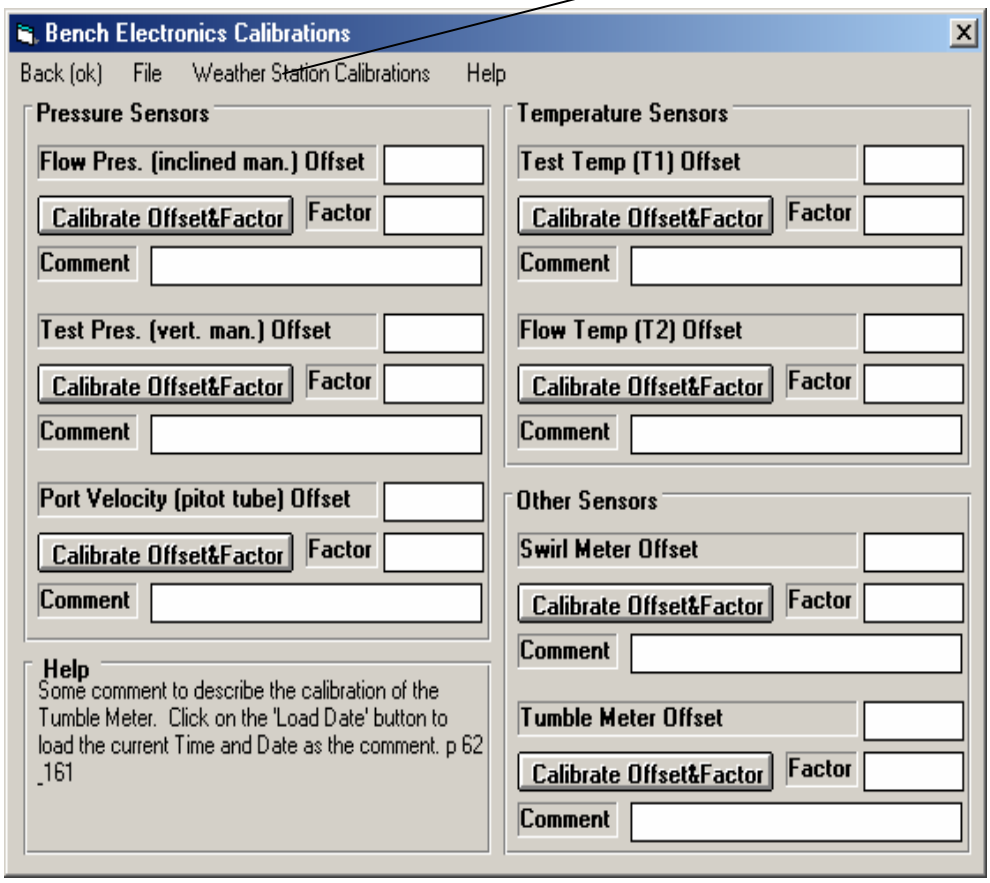
Typical calibration numbers for a Custom and some SuperFlow Benches include:

	Offset	Factor		Offset (mpxv *)	Factor (mpxv *)
Flow Pres, SF110 (% scale)	-.15	.00344	0.3 psi	-4.6	.002263
Flow Pres, SF300/600 (% scale)	-.109	.00056	1.0 psi	-2.6	.001267 (.00286 sf300)
Test Pres (1 psi sensor)	-1.67	.0076	0.3 psi	-10.2	.005
Test Pres (5 psi sensor)	-6.19	.038	1.0 psi	-35.1	.0172
Port Velocity	-1.67	.0076	3.6 psi	-113	.055
Baro 15 abs (Port Velocity)	-3.55	.0089	* mpxv sensors have pressure ports which		
Test Temp/fFlow Temp	42	.0295	do NOT stick out the top of the box. The hoses		
Swirl or Tumble Meter	-10500.	5.26	go inside the box to smaller sensors inside.		

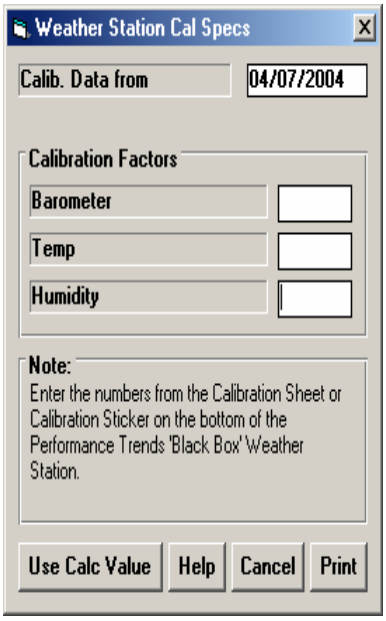
With Black Box that measures +/- pressures	1 psi sensor	-15.1	.0076
that read directly in PSI:	5 psi sensor	-79.4	.038

(mpxv sensors do read +/- pressure, but do NOT need these special calibration numbers)

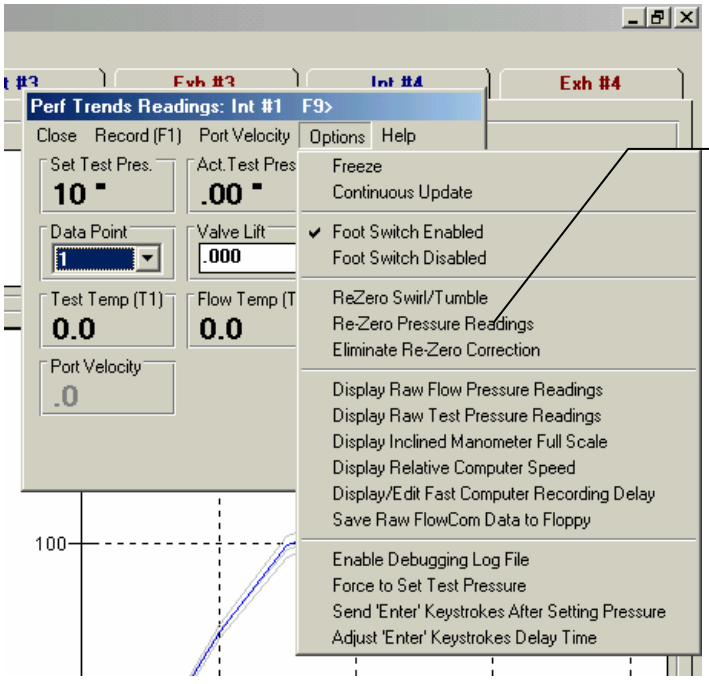
Factory (typical) Calibration for Black Box SN _____



Though generally not used, if you have a Barometer or other weather sensors in the Black Box and you were provided calibration info, you can click on this menu item and enter the data in the screen as shown below.



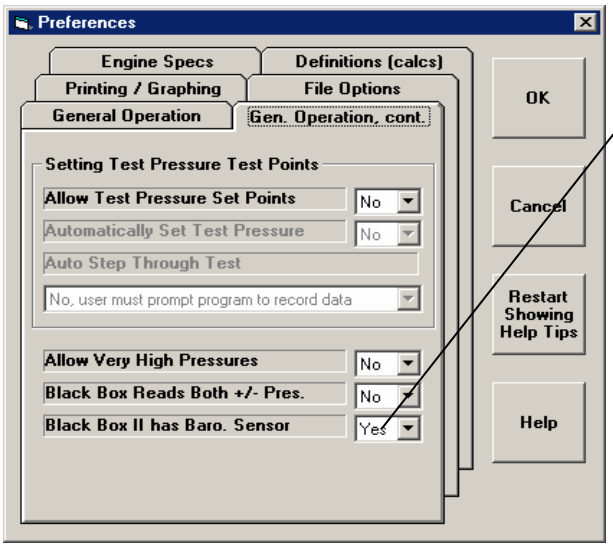
Enter the calibration numbers above for your black box to get a typical “factory” calibration.

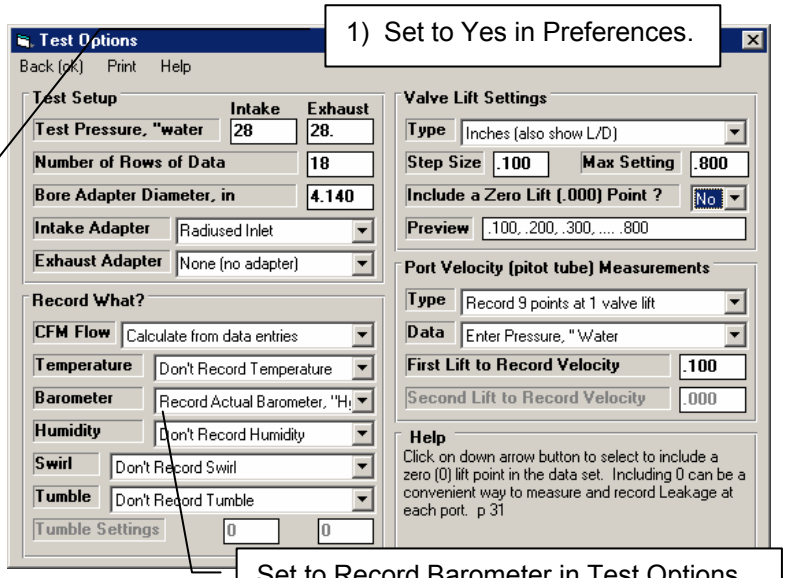


During testing, you can click on Options, then click on one or both of the “ReZero” options to better “fine tune” the factory calibration. Using a factory calibration from the numbers above and then using the “ReZero” options is generally sufficient for most testing.

NOTE: Non-repeatability is often due to constantly changing (recalibrating) the calibration numbers in the screen above. Using the “ReZero” option should only improve the repeatability and keep data accurate.

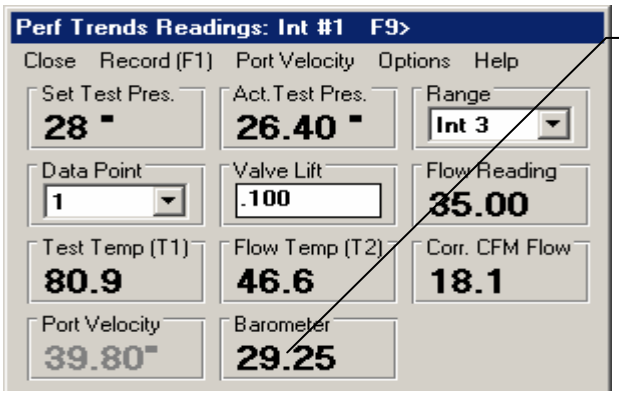
Black Box II with Barometer Sensor





1) Set to Yes in Preferences.

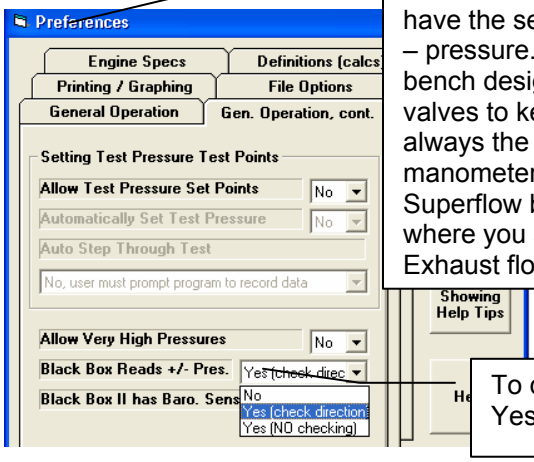
Set to Record Barometer in Test Options.



You will see the Barometer reading here, in the Electronics Readings screen.

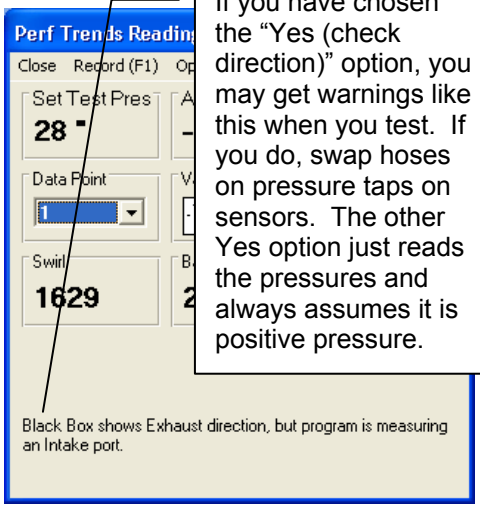
See Previous page for info on entering any Weather Calibration factors for the Barometer, to adjust it up or down slightly. Note that the Black Box II will record the actual barometer reading, which is different than the Barometer obtained from a TV or radio weather station, which is a corrected barometer. A corrected barometer will be higher than the true barometer by about 0.1 inch of mercury for every 100 ft you are above sea level.

Black Box II Reading Positive and Negative Pressure

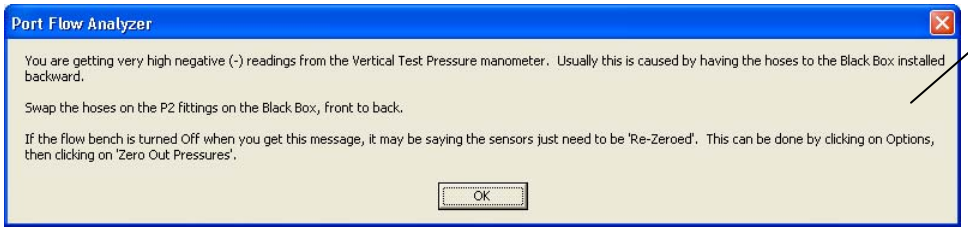


A Preference in the program lets you have the sensors measure both + and – pressure. This lets you simplify your bench design. Otherwise you need valves to keep the high pressure side always the high pressure side of the manometers and sensors, like in a Superflow bench, or swap hoses where you switch from Intake to Exhaust flow direction.

To do this, choose either Yes option in Preferences.

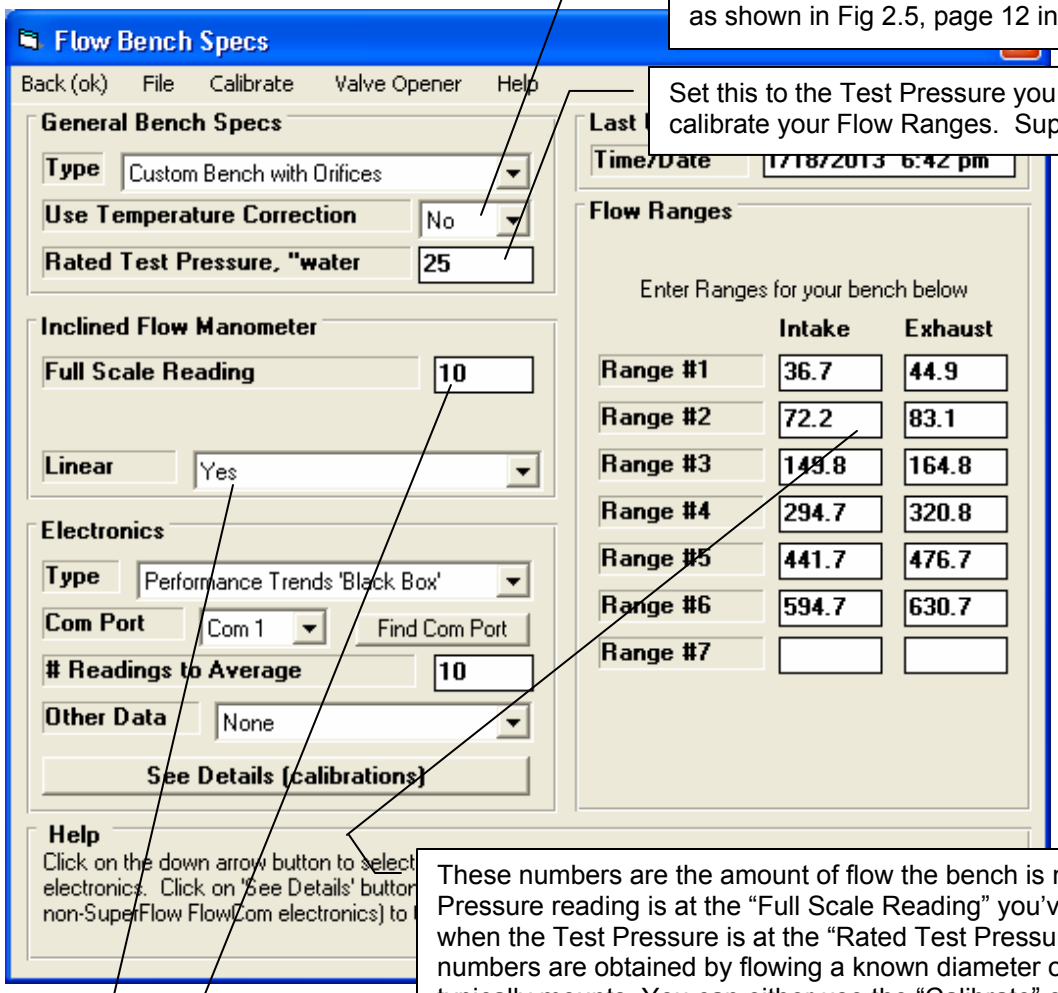


If you have chosen the "Yes (check direction)" option, you may get warnings like this when you test. If you do, swap hoses on pressure taps on sensors. The other Yes option just reads the pressures and always assumes it is positive pressure.



Here's another type of message you may get as the program checks to see if the pressure readings make sense.

Typical Custom “Do it yourself” Bench Settings



Choose “No” unless you have a “blower centered” bench as shown in Fig 2.5, page 12 in the Port Flow manual.

Set this to the Test Pressure you are using when you calibrate your Flow Ranges. SuperFlow uses 25”.

These numbers are the amount of flow the bench is measuring when your Flow Pressure reading is at the “Full Scale Reading” you’ve entered on this screen, when the Test Pressure is at the “Rated Test Pressure” on this screen. These numbers are obtained by flowing a known diameter orifice where the head typically mounts. You can either use the “Calibrate” option at the top of this screen, or by filling out the worksheet at the end of Appendix 2, page 150 in the Port Flow manual to determine these numbers.

Set this to the maximum reading you will see on the Flow Pressure (inclined) manometer. If you are not trying to match an inclined manometer (no manometer is present), enter the maximum pressure you will measure with the Flow Pressure sensor. This maximum pressure should be in the same units as the Flow Pressure sensor is calibrated in. For example, if you enter the factory calibration numbers which are in Inches of Water (page 4), then this will be the maximum Inches of Water pressure you will likely see for Flow Pressure. In the screen above, it is set to 10” water if we used the factory calibration numbers. NOTE: If you go above the Full Scale Reading, the program will still calculated flow, so this entry is not critical.

Set this to Yes unless you are trying to match some special “non-linear” manometer like what SuperFlow uses on their benches. See examples below:

Linear Scale: | ‘ | ‘ | ‘ | ‘ | ‘ | Non Linear Scale: || | | ‘ | ‘ | ‘ | ‘ |