

Appendix 3 V1.1B Features

The v1.1B of the Valve Spring Tester adds several new features, which are described in this Appendix. In addition, the Automatic Spring Tester was released after the original publication of this manual, so some of its features will be described here also.

Calculation and Accuracy Improvements:

A new Shim report has been added, which lets you specify different shim requirements and the program automatically finds the best shims for each spring to meet those requirements. See Figure A9.

A Valve Lift input has been added to the Quick Check screen so you can quickly find a seated height which meets your seated force requirements and quickly shows bind height clearance. See Figure A10.

A new, faster "Gen 3" USB logger has been released, which records more data and provides for better accuracy. You need this v1.1B to read that logger.

Operation:

Graph printouts now have no border around the graph, so there are no broken lines on the left side of the printed graph. See Figure A11.

Program has added Graph Format option to display the Legend Titles to appear in 3 different font sizes, larger than the standard font. See Figure A12.

Program now allows up to 100 data points for graphs and/or reports.

Program now automatically checks for proper USB logger, and warns you if you have chosen the wrong one.

Program now disables the 'Settings' option on main screen until you have opened a previous test as a template.

There is a new Preference to allow for showing when calibration numbers do not match those of the master tester specs. This could cause confusion to some users. The Preference also lets you set this to 'Always', which is very handy for troubleshooting.

Company Logo is now displayed on Main Screen.

Program has added Export to Excel option to screen for saving ASCII data files. See Figure A14.

Program has added a Browse button screen for saving ASCII data files. See Figure A14.

Program has several improvements so it is more accurate when calibrating force from a known spring. It also has more explanation about calibrating with a known spring and further identify if you must include a retainer for doing the calibration.

When switching program or file from Metric to English units or vice versa, the program now also converts the Quick Check settings and Spring Height scales in the Electronics screen.

Program has a New Preference of "Warn About Slowing Data Recording" which you can set to 'No' to stop the "nag" screen we added.

Figure A7 New, Faster Mini Logger
(looks same from outside as previous logger)



Program now warns you if tester encounters a force which is close to over-ranging and damaging the load cell. This can be due to too force from user, or testing springs which are too large for the range of load cell. The program may be able to still use the data for a valid test, but just warn you.

Starting with Windows Vista, the Operating System works best if the data files for programs are stored in a “public” folder, and not with the program files under C:\Program Files or C:\Program Files(x86) folder. For some brands of computers, this is not a big problem, for other brands, and or newer operating systems like Windows 8 or newer, this can be a big problem. Therefore, starting with this v1.1 B, we are storing the data files for Vista, Windows 7, Windows 8, Windows 10 in the folder path of:

C:\Users\Public\Public Documents\Performance-Trends-Data\Valve-Spring-Tester-Files

Therefore, if you want to copy data files using Windows Explorer, or other types of browsers, start looking in this location. See Figure A15.

Automatic Valve Spring Tester:

The Automatic Spring Tester uses an air cylinder to stroke the valve spring into bind, then allowing the spring to return to its fully open height, and then retract back to its fully retracted position. All these different steps may need to be “tweaked” depending on the air pressure supply, length and/or force of the valve springs, or your particular spring tester. Some of the items listed below identify different settings in the program to tweak these steps. See Figure A13.

Notes:

Since the Automatic Spring Tester is powered by compressed air, the amount of force the tester can generate depends on the air pressure. The standard tester with a 4 inch cylinder can generate about 12 lbs of force for each PSI of air pressure, or about 1500+ lbs at 130 psi shop air pressure. The optional High Pressure tester with a 5 inch cylinder can generate about 19.5 lbs for each PSI of air pressure, or about 2500+ lbs at 130 psi shop air pressure. A clean, steady supply of high pressure shop air will help the Automatic Tester operate reliably and accurately.

You must choose one of the “Automatic tester” or the “Gen III” logger types under Settings, then Tester Calibration to see all of these features in the program.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Maximum Compression Time, the amount of time before the tester assumes there is not enough force for bind, and stops compressing. Click on Options, then Automatic Tester, then Maximum Compression Time to change this. The default of 15 seconds is typical a good setting.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called "Retract Setpoint". The default is 10 units, but can be adjusted by the user. If you find the tester is not retracting once the spring is fully open, try increasing this number.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Number of Pre-Test Cycles. Many engine builders believe you get a more accurate, repeatable number if you run the valve spring into bind a few times before you make your final measurement. These Pre-Test Cycles are sometimes called “bull nosing”. Zero 0 is the default setting.

There is an Option in the Electronics Recording Screen, under "Automatic Tester Utilities" called Safety Setting – Minimum Clearance. This is the amount of clearance allowed between the 2 plattens. This should be set low enough to be less than your spring's bind height, but not so low as fingers could be crushed.

In Preferences, there are also some Automatic Spring Tester settings to note:

Figure A8 Automatic Spring Tester



Click on Settings, then Preferences, then General Operation tab at the top. The Preference of "Auto Tester, Pause after Bind" is the amount of time the tester will set at bind before retracting. If the tester seems to be "hanging up" at the bind condition, try changing this setting. Zero (0) is the default setting.

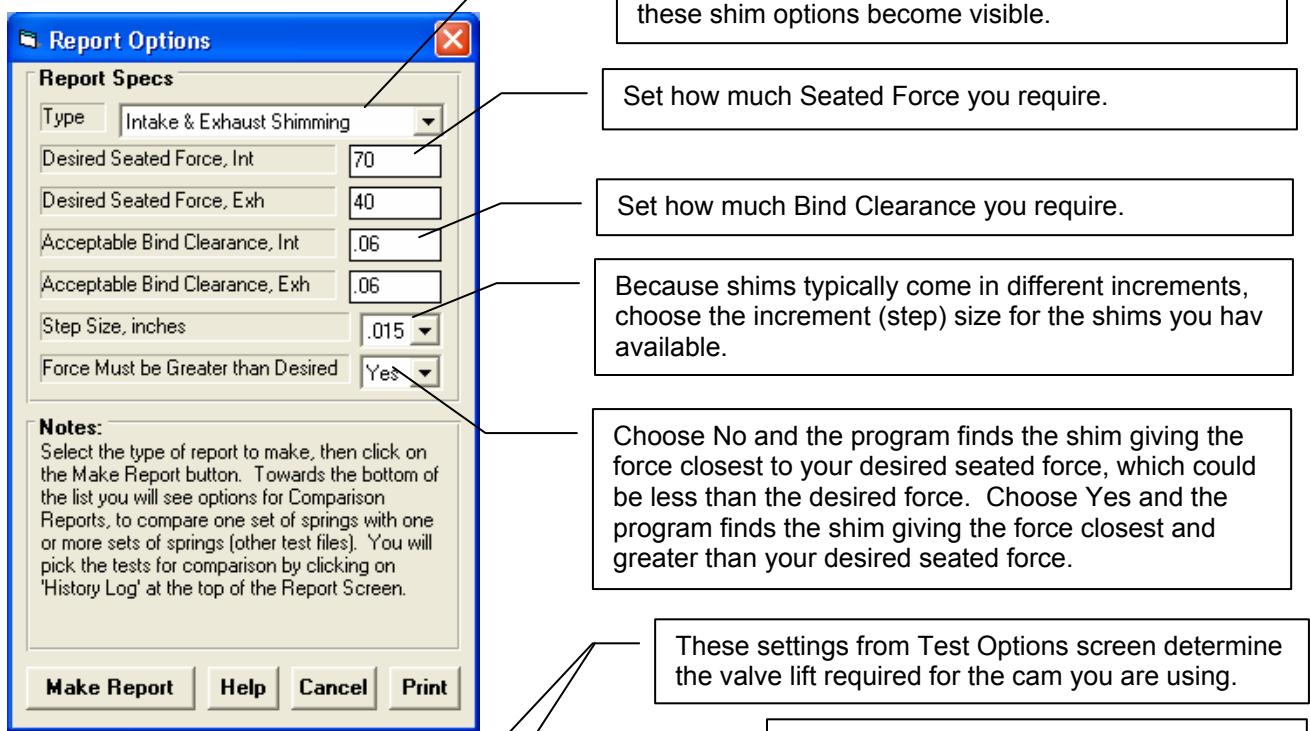
Click on Settings, then Preferences, then General Operation tab at the top. Set the Preference of "Auto Tester has High Force Option" to Yes, if you have the High Force tester with 5" diameter air cylinder. This adjusts the cycle parameters some, and accurately shows the approximate air pressure be supplied to the tester. No is the default setting.

The approximate air pressure being supplied to the Auto Tester is now displayed on the recording screen. This can help you troubleshoot problems if the spring is not being compressed sufficiently or quickly.

An info message has been added for if the spring tester exceeds the 'Auto Tester Max Compression Time' and possible reason being 'Digital Retract Offset'.

The Auto Spring Tester now stops it's test cycle when it encounters a force which is close to over-ranging and damaging the load cell. This can be due to too much air pressure, or testing springs which are too large for the range of load cell. The program may be able to still use the data for a valid test, but just warn you.

Figure A9 Shim Report



Valve Spring Tester 'Plus' v1.1B [Typical Valve Spring]

Back Print Report Types File History Log Help

	Comments	Test Time 10:15 am 02/24/2003	Open Ht Int: 1.204 Exh: 1.197	Seated Ht .100	Retainer >70.0 >40.0	Seal F:	Report of: Operator: Jack Errors: None			
Cylinder	Spring Rate	Open Force	Open Height	Seated Force	Seated Height	Non Linear %	Bind Ht	Clearance	Shim	Possible Valve Lift
Int 1	285.0	228.4	1.204	75.6	1.740	12.4	.936	.028 < .06	.240	.504
Exh 1	236.6	171.4	1.197	43.0	1.740	2.4	.937	.155	.105	.638
Int 2	281.3	226.0	1.204	75.2	1.740	10.8	.936	.028 < .06	.240	.504
Exh 2	238.7	173.2	1.197	43.6	1.740	3.3	.936	.156	.105	.639
Int 3	284.8	228.3	1.204	75.6	1.740	11.7	.936	.028 < .06	.240	.504
Exh 3	Shim required to meet your Seated Force requirement.						.937	.155	.105	.638
Exh 4	This shows how much valve lift is possible to meet your requirements of Seated Force and Bind Clearance.						.935	.029 < .06	.240	.505
Exh 5							.933	.159	.105	.642
Exh 6							.942	.037 < .06	.225	.513
Exh 7							.935	.157	.105	.640
Exh 8							.933	.046 < .06	.225	.522
Exh 9	Flag for Clearance spec not being met.						.937	.155	.105	.638
Exh 10							.935	.044 < .06	.225	.520
Int 7	240.1	174.6	1.197	44.2	1.740	3.0	.938	.154	.105	.637
Int 8	257.4	210.1	1.204	72.1	1.740	5.8	.936	.043 < .06	.225	.519
Exh 8	239.6	173.8	1.197	43.7	1.740	2.3	.937	.155	.105	.638
Int. Maximum	286.5	230.1	1.204	76.6	1.740	12.4	.942	.046	.240	.522
Int. Minimum	257.4	210.1	1.204	72.1	1.740	5.8	.933	.028	.225	.504
Int. Spread	29.1	20.0	.000	4.5	.000	6.6				
Int. Average	274.6	221.5	1.204	74.3	1.740	9.9				
Exh. Maximum	241.2	174.6	1.197	44.2	1.740	3.3				
Exh. Minimum	236.6	171.4	1.197	43.0	1.740	2.3				
Exh. Spread	4.6	3.2	.000	1.2	.000	1.0				
Exh. Average	238.9	173.4	1.197	43.7	1.740	2.8				

Note that Int and Exh minimum Seated Forces are greater than your Desired Force, as selected for "Force Must be Greater than Desired" in screen above.

Figure A10 Valve Lift on Quick Check Screen

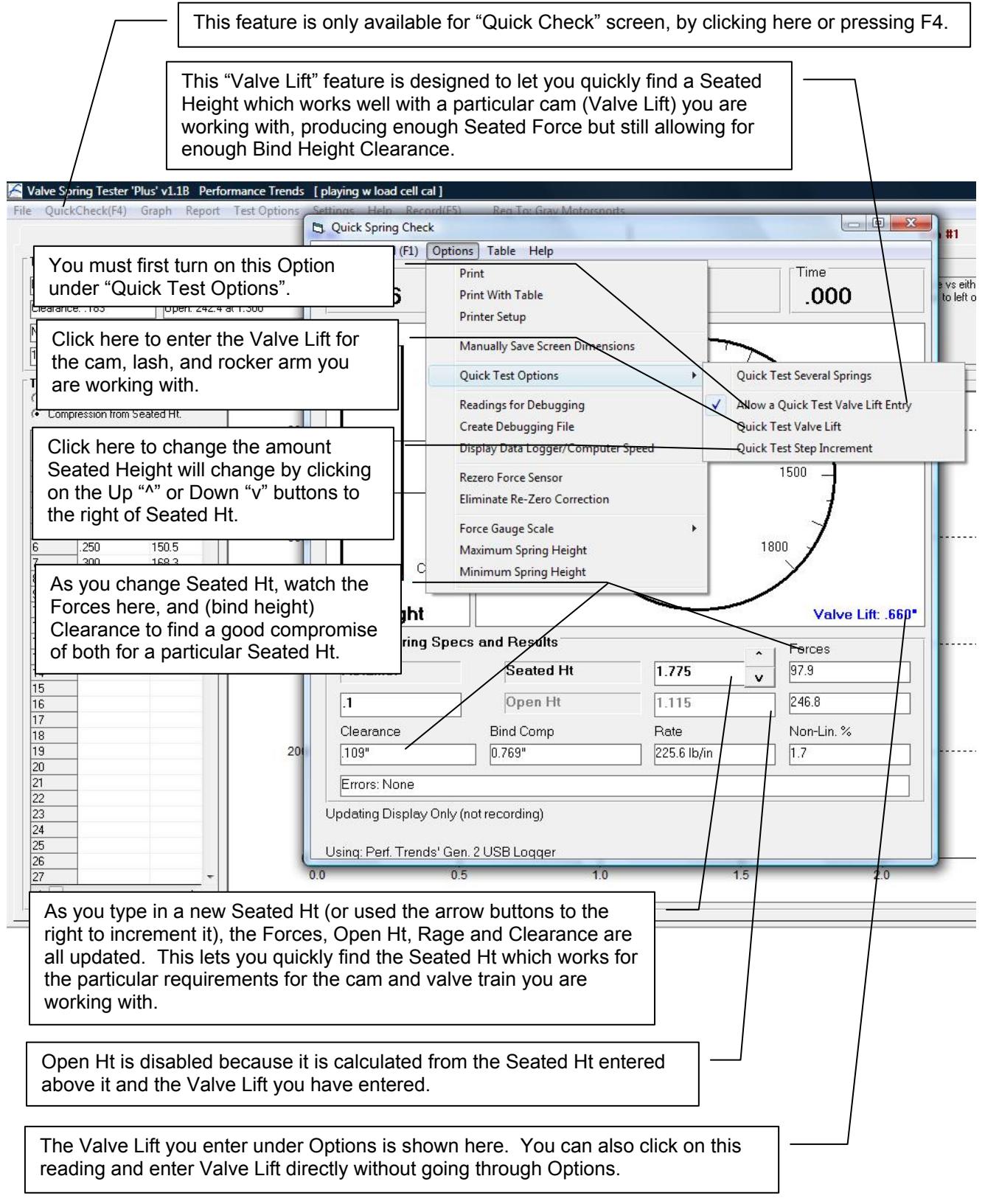
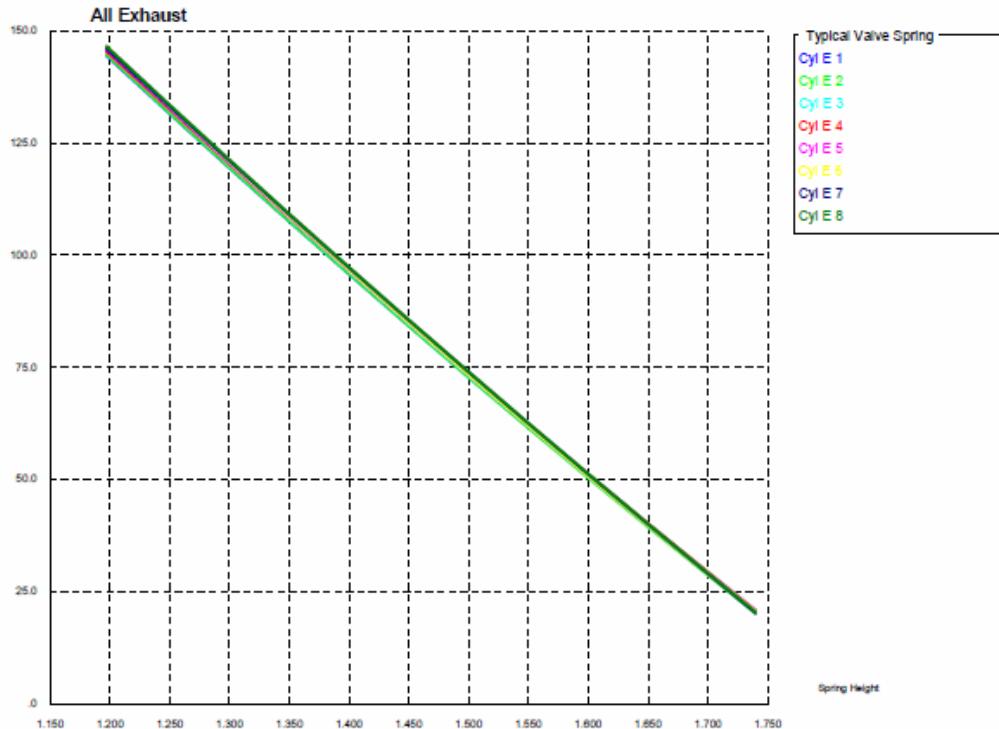


Figure A11 New Graph Printout

	Valve Spring Tester 'Plus' v1.1B GRAY MOTORSPORTS Test: Typical Valve Spring 704-809-1070 Folder: examples Performance Trends (C) 2013	This Graph Printed: 9:05 am 11-01-15 Page: 1
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Graph Comments would go here, if you select to do so.													
Test Summary and Comments for: Typical Valve Spring													
Test Time		Open Ht	Seated Ht	Retainer	Ht for:		Graph of:	All 8 Cylinders					
10:15 am	Int:	1.204	1.740	.100	100. lb		Operator:	Jack					
02/24/2003	Exh:	1.197	1.740	.100	150. lb		Errors:	None					
Example of 16 stock 5.0L Mustang valve springs Limits in the Test Options will flag out spring rates which fall outside the range of 240 to 250 lbs/inch. Note that Exh #2 is too high, at 250.1 lb/in													
Lift	1.197	1.200	1.250	1.300	1.350	1.400	1.450	1.500	1.550	1.600	1.650	1.700	1.740
Cyl E 1	144.5	143.7	131.5	119.4	107.5	95.8	84.2	72.8	61.5	50.5	39.6	28.8	20.4
Cyl E 2	144.7	144.0	131.7	119.6	107.6	95.8	84.2	72.8	61.5	50.4	39.4	28.6	20.1
Cyl E 3	145.6	144.9	132.5	120.3	108.3	96.5	84.8	73.4	62.1	50.9	40.0	29.2	20.7
Cyl E 4	145.3	144.6	132.4	120.3	108.4	96.6	85.0	73.5	62.2	51.1	40.1	29.3	20.7
Cyl E 5	145.8	145.1	132.7	120.5	108.5	96.6	84.9	73.4	62.1	50.9	39.9	29.1	20.6
Cyl E 6	146.4	145.6	133.1	120.8	108.7	96.7	85.0	73.4	62.0	50.8	39.8	28.9	20.4
Cyl E 7	146.0	145.2	133.0	120.9	108.9	97.1	85.4	73.8	62.4	51.1	39.9	28.9	20.2
Cyl E 8	146.6	145.8	133.4	121.2	109.2	97.3	85.5	73.9	62.5	51.2	40.1	29.1	20.4

New graph style eliminates the lines to the left and right of the graph. These lines could appear broken on some styles of printers.

Figure A12 New Graph Feature, Larger Legends

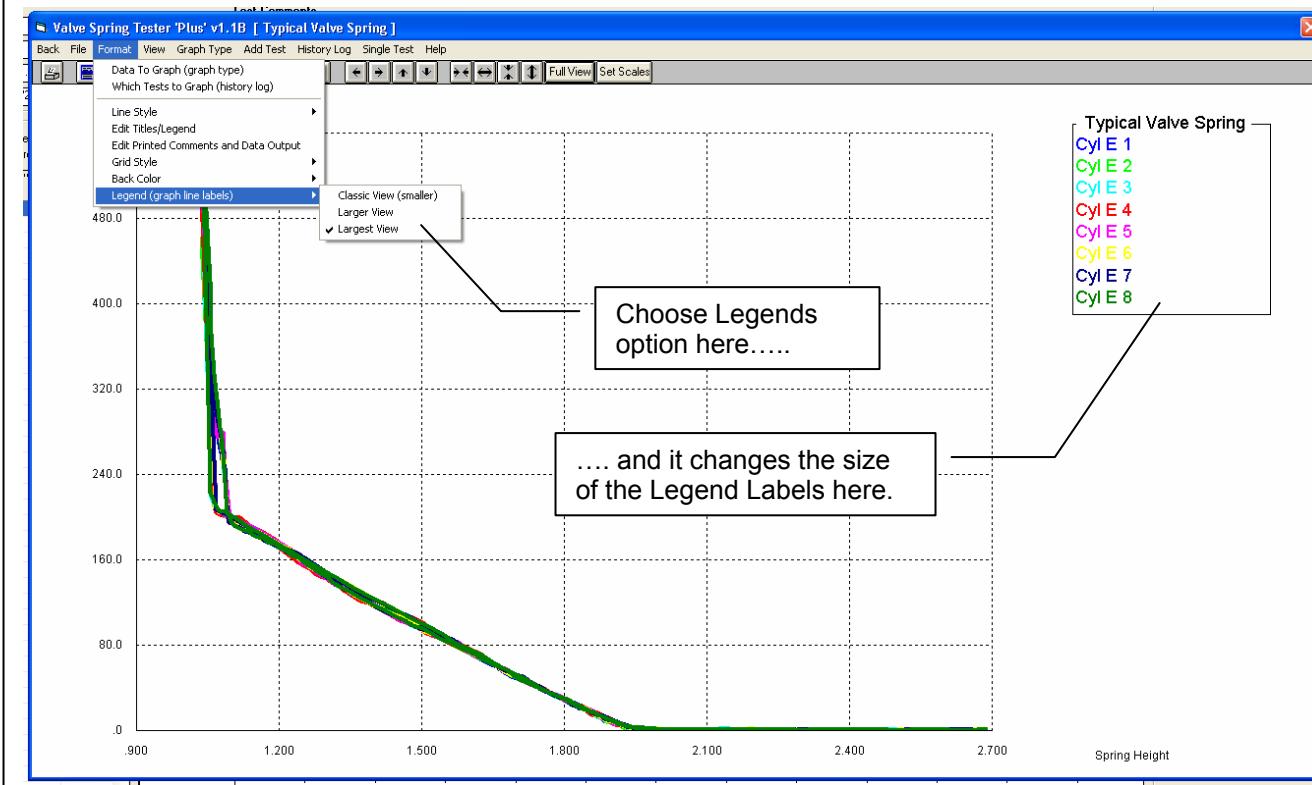


Figure A13 Automatic Spring Tester Options

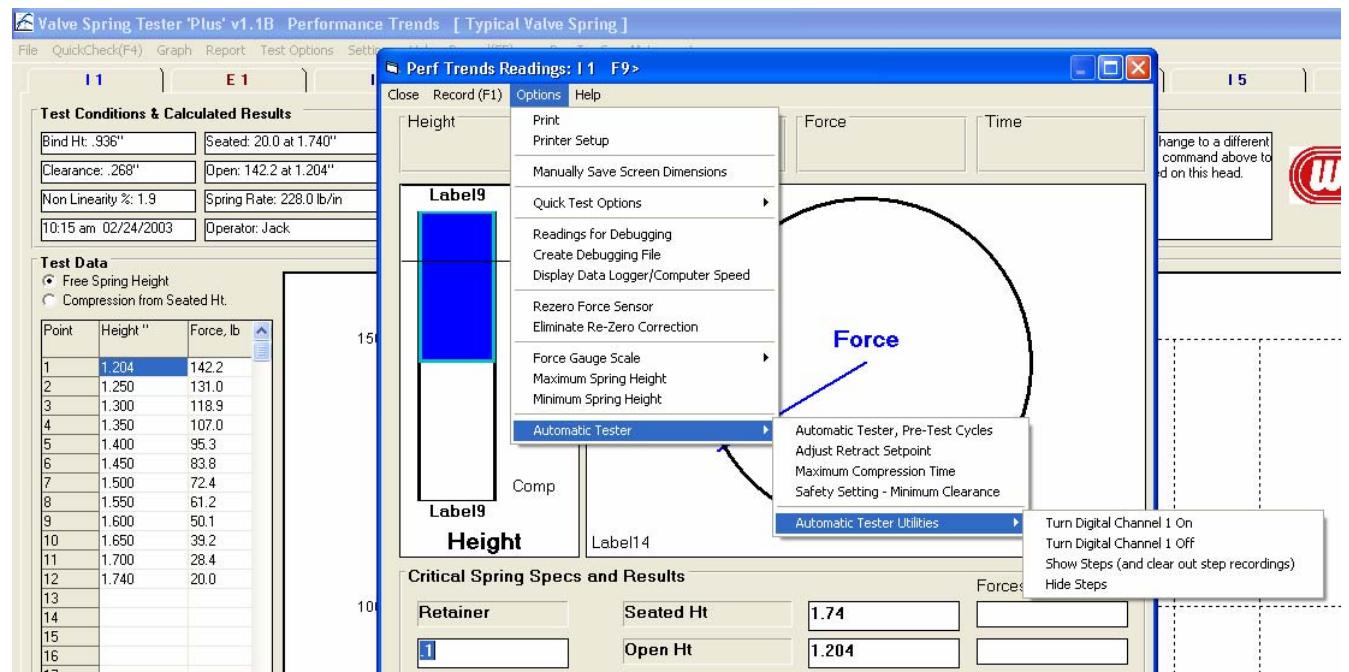


Figure A14 New ASCII File Options

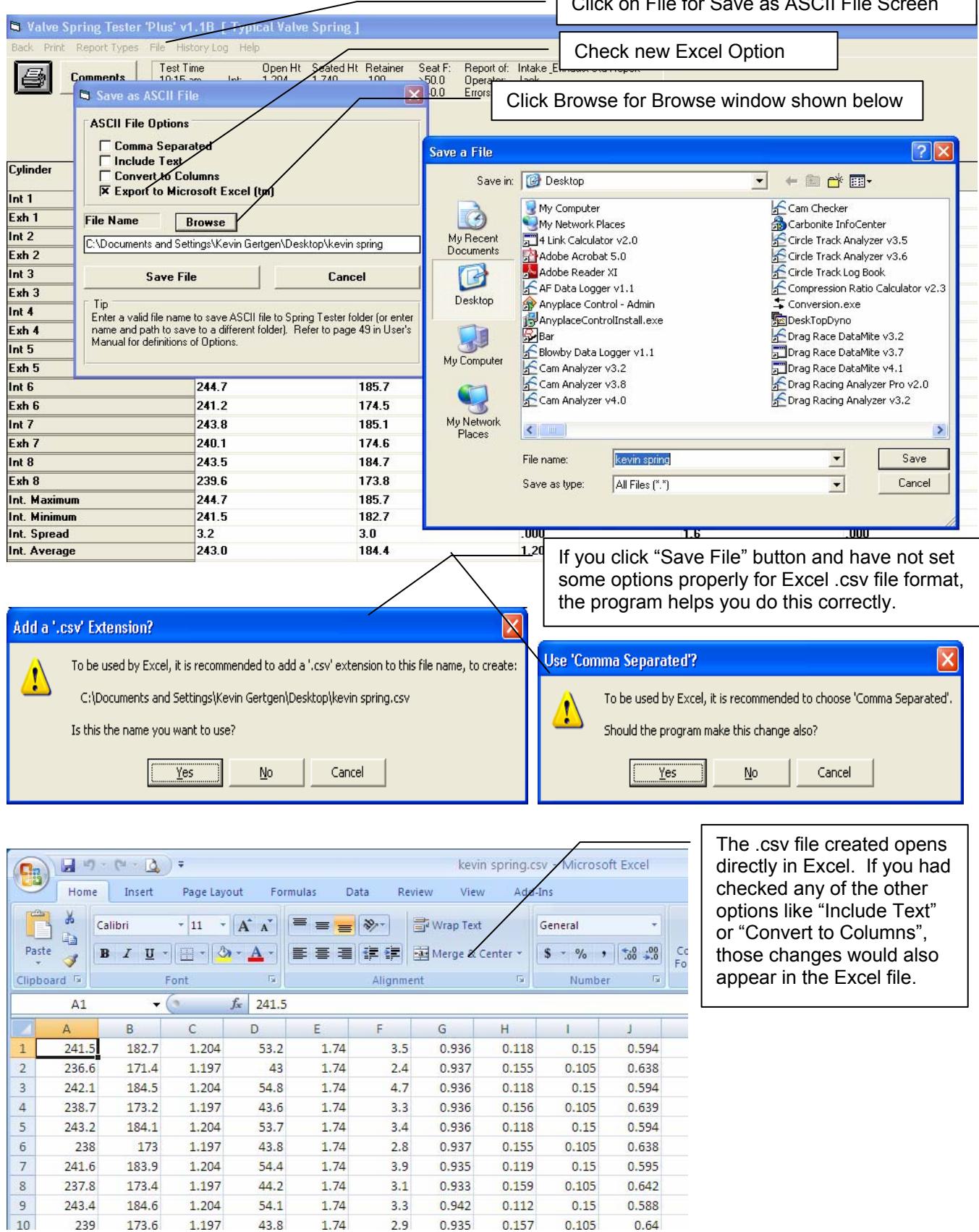
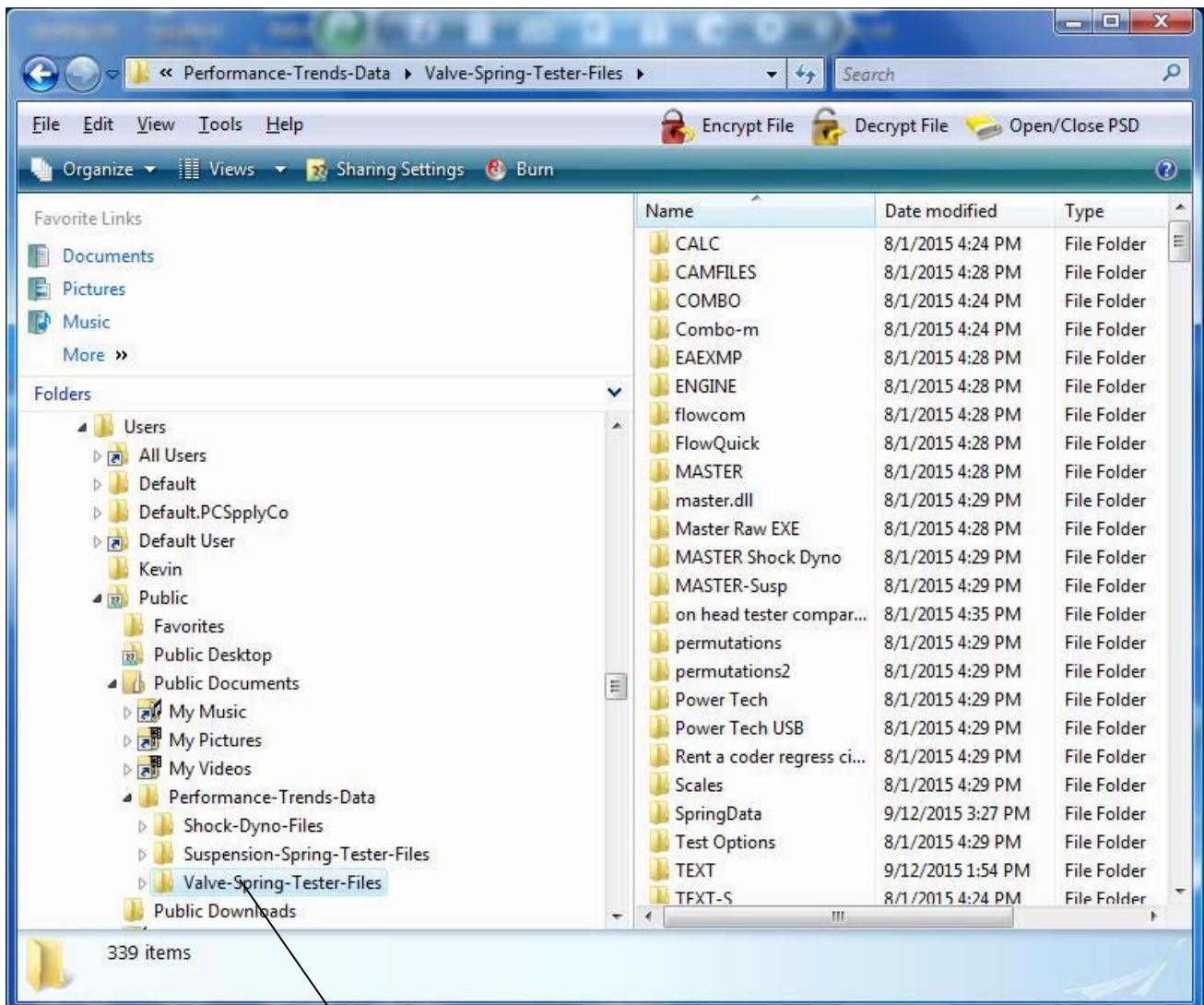


Figure A15 New Location for Spring Tester Data Files (not for XP or older)



Appendix 4 V1.1C Features

The v1.1C of the Valve Spring Tester adds several new features, which are described in this Appendix.

Calculation and Accuracy Improvements:

In Test Options, you now have the choice for Test Type of:

- Smooth Data, compress to bind (the original and default Test Type)
- Smooth Data, do not compress to bind
- 'Bent' Data, compress to bind
- 'Bent' Data, do not compress to bind

'Bent' Data would be for springs where you may encounter a 2nd spring half way through the stroke, or the spring curve has a VERY unusual graph of force vs compression. There is a button in the Test Options screen to explain these 4 options. Fig A17.

For Test Types for No Bind, the max compression is now called 'End Ht' instead of Bind Height.

A major new Test Option is being able to choose "Allow Individual Seated Heights". This lets you specify the seated heights of each spring individually. Because this option can cause confusion if you do not want to use it, it must be turned On in Preferences under 'Operation, cont' tab as 'Allow Individual Seated Heights'. Fig A18 and 19.

We've added an option in the Test Conditions screen to explain how you still need to enter a Seated and Open Height to get Valve Lift even though you are entering Individual Seated Heights.

In the Recording screen, there is a new Option called 'Adjust Length Sensor'. It is similar to rezeroing the force sensor, except you install a known height standard where the spring would go, and squeeze the standard. The program asks what the height of the standard is, and the program adjusts the calibration to exactly match this height in the future. Fig A20.

A new Report Type of "Heights for Forces" has been added to report Spring Heights which produce different amounts of force, say in 10 lb increments. Fig A21.

There is a new Preference under 'Operation, cont' called 'Use Linear Adjustment Factor' for the length sensor calibration. If set this to Yes, you can calibrate the length sensor with 3 or more standard heights. This will then allow for any slight 'bend' in the length sensor calibration curve for a small improvement in the spring tester accuracy. Fig A22.

A new 12 bit "Gen 3" USB logger has been released, which records the stroke or lift data with more precision than the previous "Gen 3" logger. The software can tell if the logger is the older 10 bit or new 12 bit, so you do not have to tell the software which type of board you have. (The v1.1B could read this logger also.) Fig A16.

Operation:

For Reports and Graphs, the program now asks you in a separate input if you want data for Intake, Exhaust, or Intake and Exhaust. Fig A21.

You can now select to do Intake, Exhaust, or Intake & Exhaust for the Force vs Height Details report. Previously, it was only Intake & Exhaust.

There is a new Preference setting under 'Operation, cont' tab called 'Ask about errors when they happen'. This is set to 'Yes' by default, and is the way the program has always worked in the past. However, if you enter, say, an Open Height which is lower than Bind Height (impossible condition), the program could ask you MANY questions about this problem for all springs

Figure A16 New, 12 Bit Mini Logger
(looks same from outside as previous logger)



affected. Now, if you set this Preference to No, the program will just report the Open Force as 0 because it could not be measured based on the Open Height you have given the program. Results which can not be obtained are now highlighted in red on the main screen. Fig A22 and 23.

We've fixed a bug where if the program asked you about entering a new Open or Seated Height because what you have entered did not make sense for this spring, the program would not let you cancel out of the question. Now you can cancel out and leave your heights as they are.

When Starting a New Test, the fields for entering the Test and Folder names are now larger to allow for easily making longer names. The same is true when Saving a file, and for most fields in the program for the test file name and folder name. If you cancel out of starting a new test, the program now explains any changes you have made will not be saved. Fig A24.

You can now display the Tests listed by Date Last Accessed (or changed), option called 'List by Access Date' .

The program is using new routines for better naming of file names by adding numbers to the end of the names. If you want a file name to be, say, 'Joe Smith', the program used to suggest adding a number to the end to create 'Joe Smith1'. If you would do more than 9 tests, these tests would not be listed alphabetically in order. Now the program suggests this name to be 'Joe Smith001', so tests will be listed alphabetically, at least for the first 1000 tests you run with this name. Fig A24.

You can now Filter (search for) tests by File Name. Fig A27.

Now Filtered Files (searched for and found) are displayed in Notepad with better spacing to allow for very long file and folder names. Fig A27.

In the Open a Test screen, you now have several options to Add, Delete, Copy, Rename and Merge folders. Fig A25.

Files and folders you now delete from inside the program are sent to the computer's Recycle Bin, so they can be recovered if need be. Fig A25.

The program now displays the Valve Lift for entering simple inputs of Seated and Open Heights, which saves you from doing the math in your head.

There is a new Preference setting under 'Operation, cont' called 'Load Cell Overload Allowed'. The program tries to prevent you from overloading the load cell (squeezing a spring too much). This is to prevent damage, and this setting should be kept at 0 for all Performance Trends spring testers. However, for some retro-fits, the other brand's load cells could have been undersized. For this condition, you may have to allow a certain percentage of overload to the the same operation you had with the previous software. Fig A22.

The Graph on the main screen now has a title to clearly state whether the data is graphed 'vs Free Standing Spring Ht' or 'vs Compressed Spring Ht", the units being used (inches " or mm, KG, etc) and the retainer thickness used during the test. Fig A28.

In Version 1.1B, we started to store data files in a different folder for Vista, Windows 7, Windows 8, Windows 10, typically:

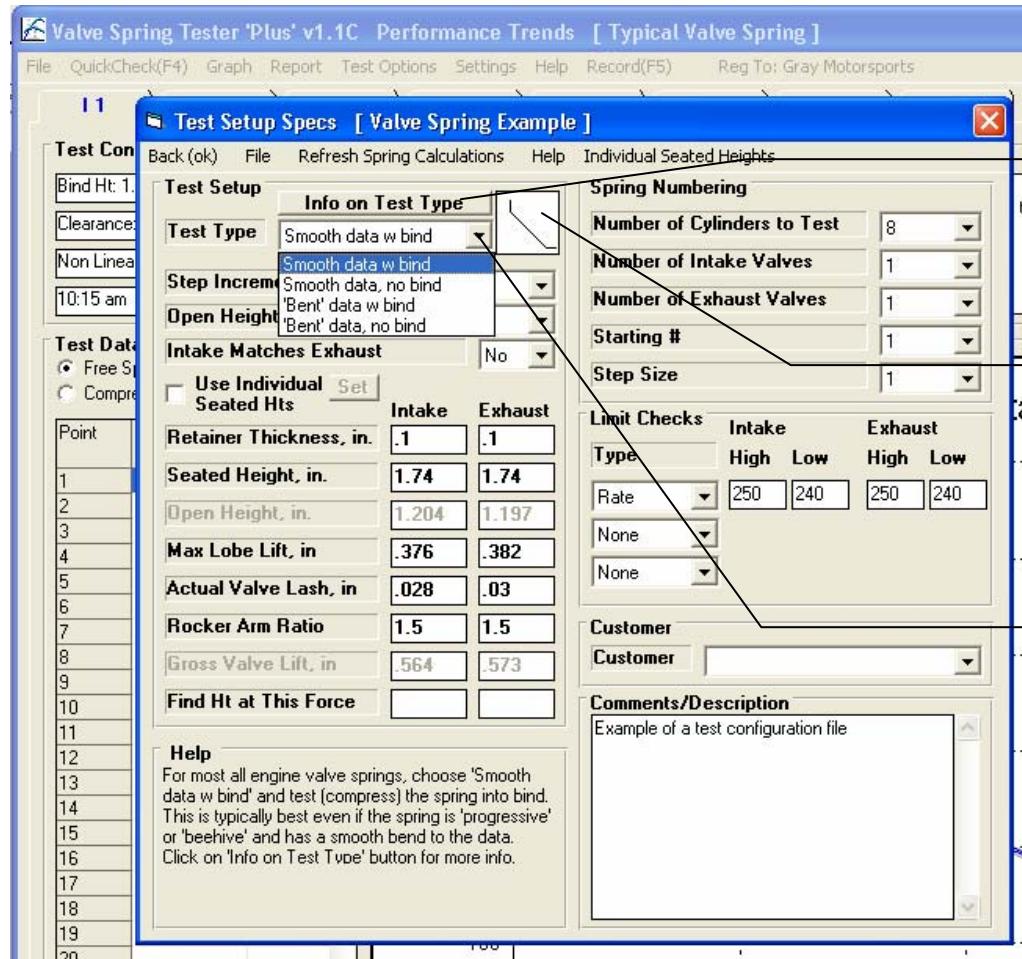
C:\Users\Public\Public Documents\Performance-Trends-Data\Valve-Spring-Tester-Files

In version 1.1C (and later versions of 1.1 B) we went back to storing them in the same folder as the Spring Tester folder. The change produced more problems than it fixed. The program should sense if data was stored in this location and automatically fix it so you don't have to do anything special.

There is a Preference setting "Show if Calibrations Match" where you can have the program point out that the critical calibration numbers used for measuring a spring (from the MASTER TESTER SPECS) are different from those currently loaded in the current test on the main screen. Setting to something other than 'No' (the previous standard method) can help remove confusion on why tested results are being measured as they are. Fig A22 and 29.

There are now several "how to" videos on the Performance Trends website on operating the software and calibrating the tester. We also have the movies on our youtube channel, which may display the movies better depending on your browser and computer: To find it, google the key words: youtube performance trends . Fig A30.

Figure A17 Test Type Setting to Accommodate Different Types of Springs



Picture graph of what this type of test expects for the raw data.

3 new Test Types to choose from. The first choice "Smooth data w bind" is the default, original method before these 3 new Types were added.

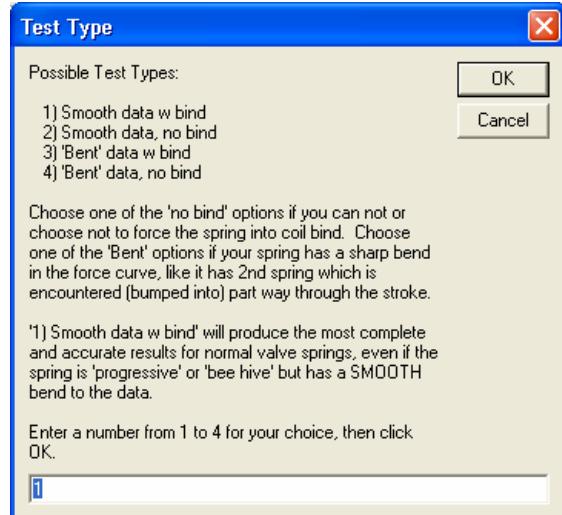
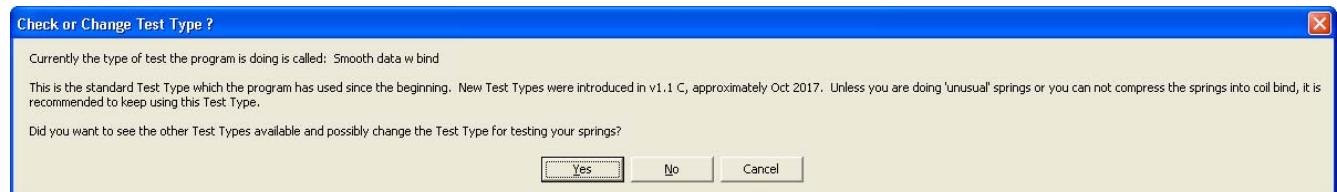


Figure A18 Setting Individual Spring Seated Heights

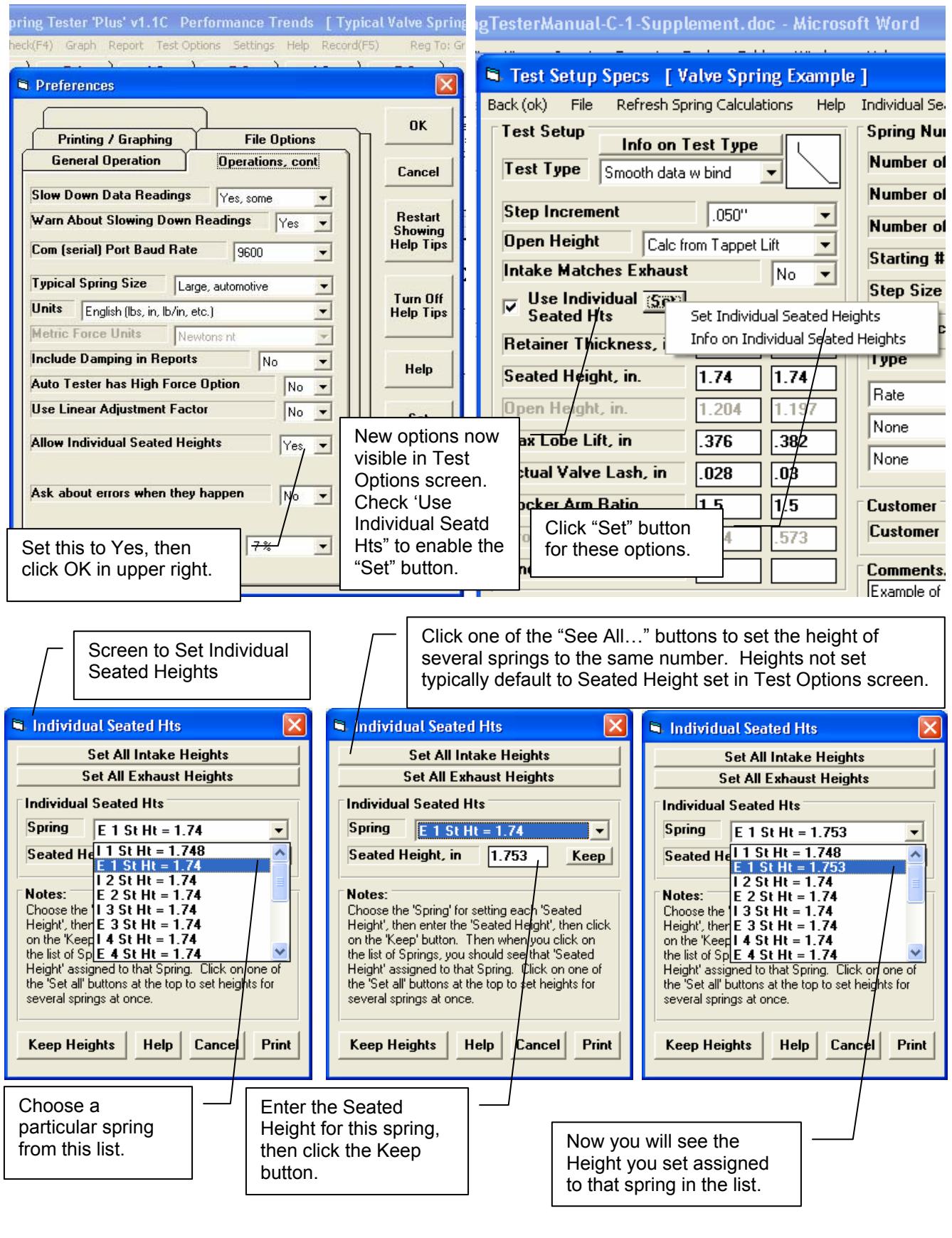


Figure A19 Setting Individual Spring Seated Heights in Recording Screen

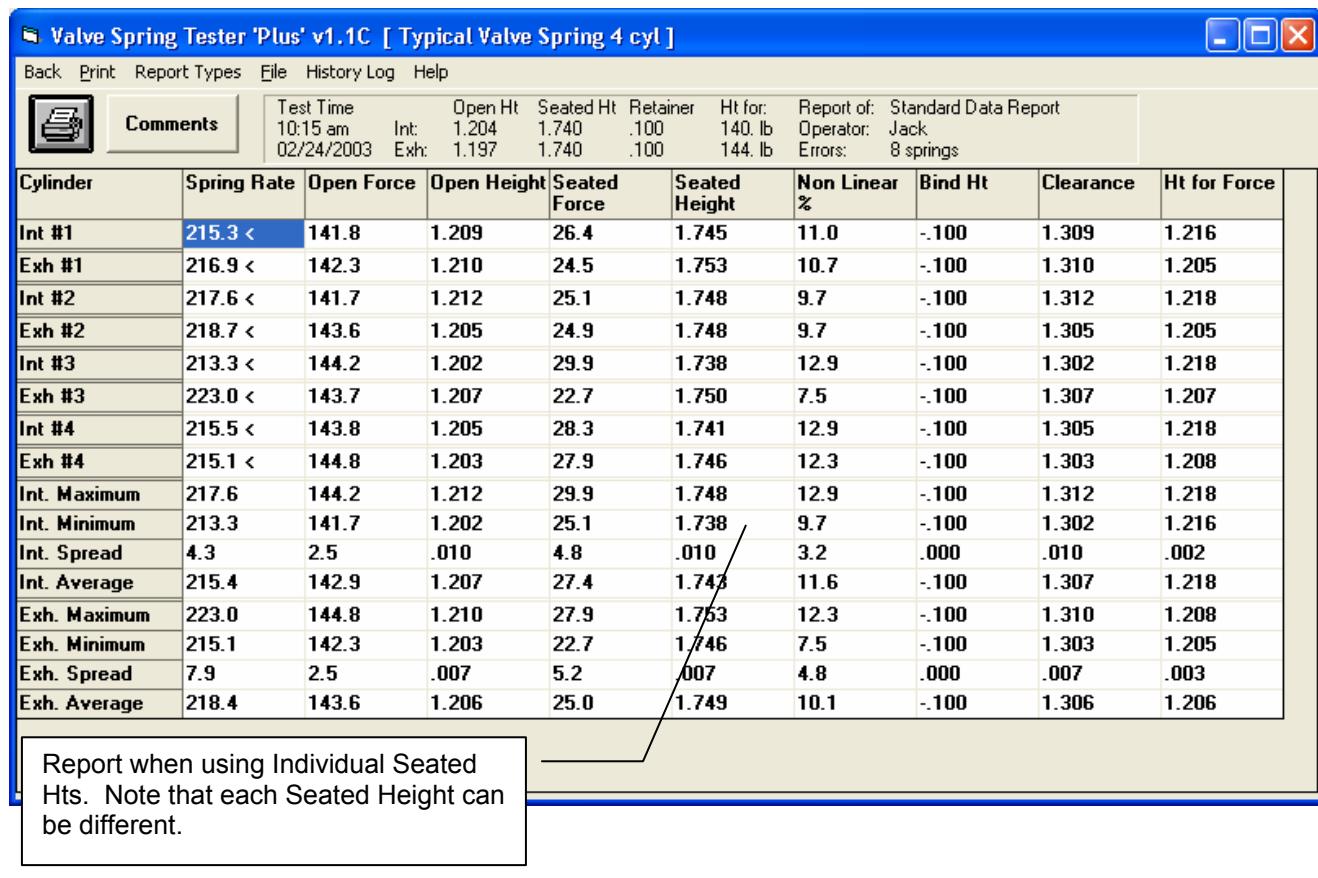
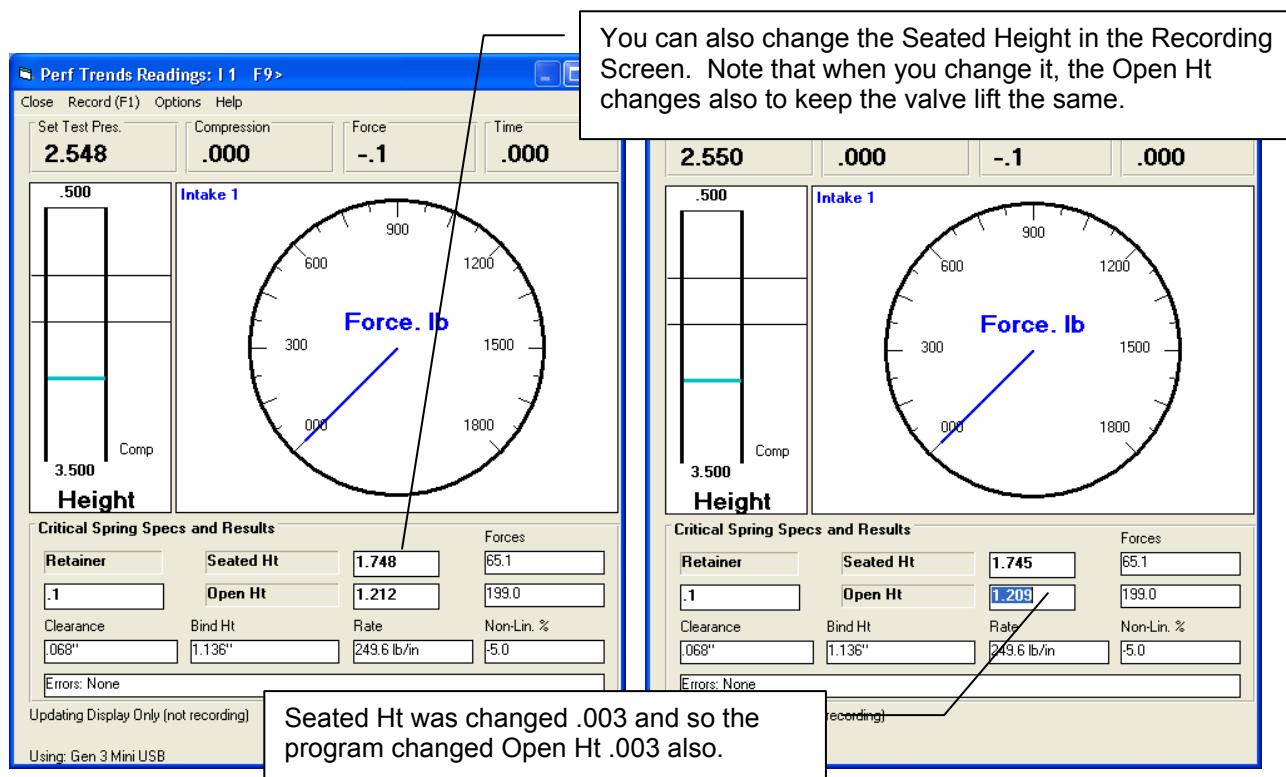


Figure A20 Adjusting the Linear Sensor Calibration

Click on Options, then Adjust Length Sensor, to check and/or adjust the length sensor calibration. Then follow directions as given in screens below.

Install a solid piece of exactly known height in your tester and squeeze it to produce a known height.

Proceed to Adjusting/Checking the Length Sensor?

To quickly adjust or check the length sensor, you will need to install a known standard (something solid of an EXACTLY known height). Do you want to continue with this process?

Spring Tester

Install a known height standard into the spring tester. Click OK when ready.

Spring Tester

Click OK when tester is firmly squeezing the 'Height Standard', perhaps 50-100 lbs of force.

Enter Height for Standard

Enter the height of the standard in the tester.

2

Change Linear Offset?

The standard height was measured to be:
2.0107

And you have said it should measure:
2.0000

The difference is:
-.0107

Which will permanently change the linear sensor Off
From: .6292 To: .6185

Do you want to make this change?

Choose No if you just want to check the calibration. If this screen shows a large difference, say .020" or more, run this check again, perhaps with a different height standard. If the 2nd check shows a similar difference, then answer Yes or check to see why the calibration could have changed (sensor moved).

IMPORTANT: Do NOT change the calibration unless you think the length sensor could have moved. Constantly adjusting the calibration will make your measurements LESS repeatable.

Figure A21 New Report Options and Types

Valve Spring Tester 'Plus' v1.1C Performance Trend

Report Options

Type: Heights for Forces

Spring To Report: Intake & Exhaust

Force Increment: 10

Notes:
Select the type of report to make, then click on the Make Report button. Towards the bottom of the list you will see options for Comparison Reports, to compare one set of springs with one or more sets of springs (other test files). You will pick the tests for comparison by clicking on 'History Log' at the top of the Report Screen.

Make Report | Help | Cancel | Print

New Report Type of "Heights for Forces"

Separate setting for what springs to include in the report.

For the Report Type of "Heights for Forces", this Force Increment will appear. Enter the number for the increments you want. Note: There is a limit to the number of lines which can be in the report. If you choose a small increment, the report may not cover the entire range of the spring's force curve.

Valve Spring Tester 'Plus' v1.1C [Typical Valve Spring]

Comments	Test Time	Open Ht	Seated Ht	Retainer	Ht for:	Report of:	Operator:	Errors:
	10:15 am 02/24/2003	1.204 1.197	1.740 1.740	.100 .100	240. lb 260. lb	Heights for Forces	Jack	16 springs

Force, lb	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8
140. Int	1.215	1.217	1.216	1.216	1.223	1.215	1.221	1.223
130. Int	1.249	1.252	1.249	1.249	1.257	1.246	1.254	1.256
120. Int	1.284	1.287	1.284	1.283	1.292	1.279	1.288	1.291
110. Int	1.321	1.325	1.320	1.319	1.329	1.314	1.325	1.327
100. Int	1.359	1.363	1.358	1.356	1.366	1.359	1.361	1.363
90. Int	1.399	1.404	1.398	1.396	1.407	1.399	1.404	1.407
80. Int	1.442	1.447	1.441	1.439	1.452	1.442	1.447	1.452
70. Int	1.487	1.493	1.488	1.486	1.497	1.487	1.493	1.497
60. Int	1.536	1.542	1.539	1.536	1.546	1.536	1.542	1.546
50. Int	1.590	1.595	1.593	1.593	1.600	1.590	1.595	1.600
40. Int	1.649	1.654	1.659	1.660	1.661	1.679	1.657	1.658
30. Int	1.718	1.720	1.737	1.737	1.730	1.721	1.731	1.729
140. Exh	1.217	1.218	1.219	1.219	1.217	1.220	1.223	1.224
130. Exh	1.251	1.252	1.255	1.252	1.249	1.255	1.258	1.257
120. Exh	1.286	1.288	1.292	1.287	1.283	1.291	1.294	1.291
110. Exh	1.323	1.325	1.330	1.323	1.319	1.329	1.331	1.327
100. Exh	1.361	1.364	1.370	1.362	1.357	1.368	1.370	1.365
90. Exh	1.401	1.404	1.411	1.402	1.397	1.409	1.411	1.405
80. Exh	1.443	1.447	1.454	1.445	1.440	1.452	1.453	1.447
70. Exh	1.489	1.493	1.500	1.491	1.486	1.497	1.498	1.493
60. Exh	1.538	1.541	1.548	1.540	1.537	1.546	1.546	1.543
50. Exh	1.591	1.593	1.599	1.595	1.593	1.598	1.597	1.597
40. Exh	1.650	1.649	1.654	1.657	1.659	1.654	1.652	1.660
30. Exh	1.717	1.713	1.715	1.729	1.739	1.717	1.713	1.733

Report created from settings shown, and for the range of force data between the Seated Height and Open Height.

Some values may not be given, because in this case there was no data available because the Seated Height produces more than 30 lbs.

Figure A22 New Preference Options, including Use Linear Adjustment Factor

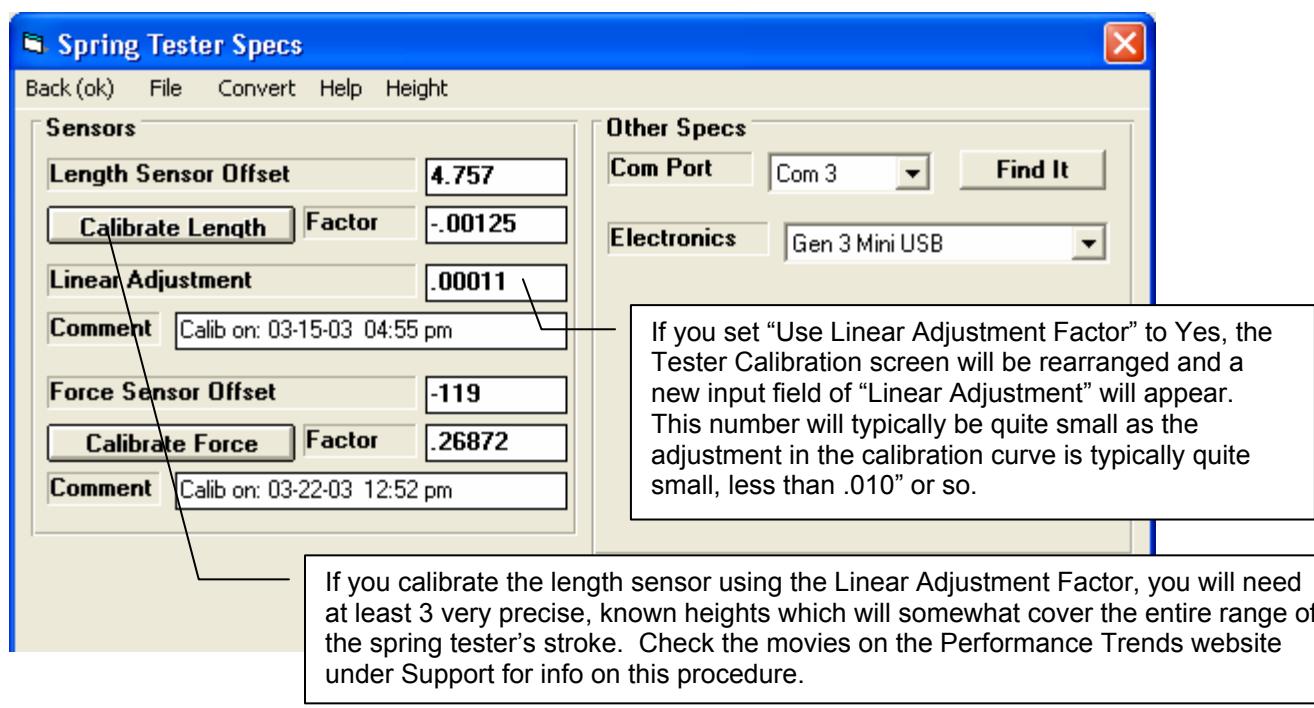
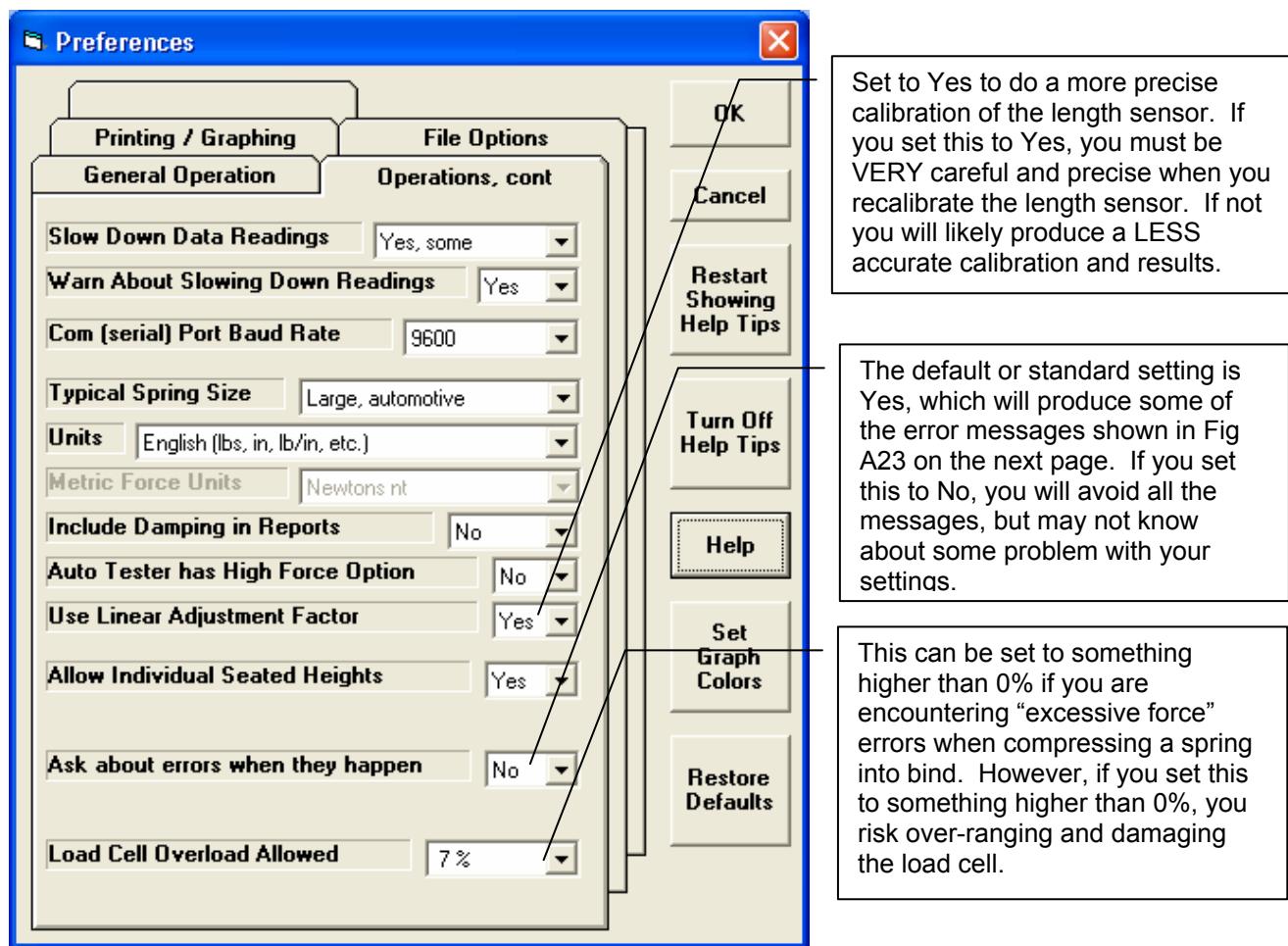


Figure A23 Preference to Turn Off Error Messages for Calculations

Here are some of the error messages and questions the program will display if you enter a Seated Height or Open Height which is not within the spring's range of travel. Check Fig A22 for the Preference setting which can avoid these messages.

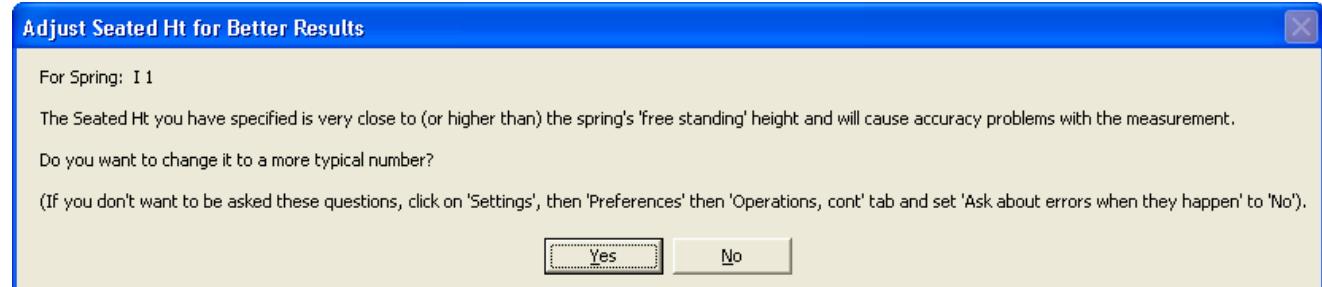
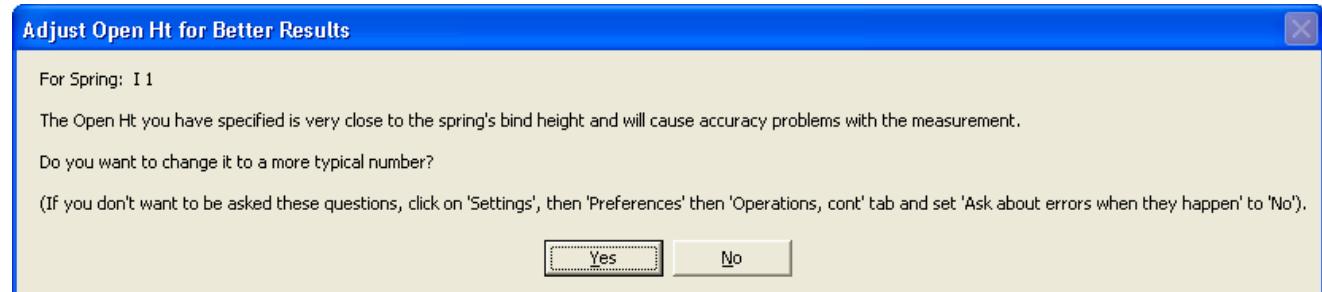
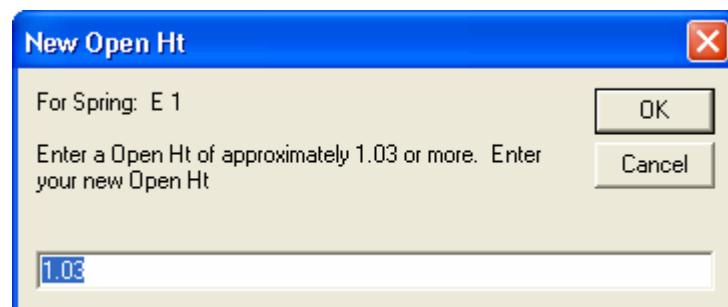
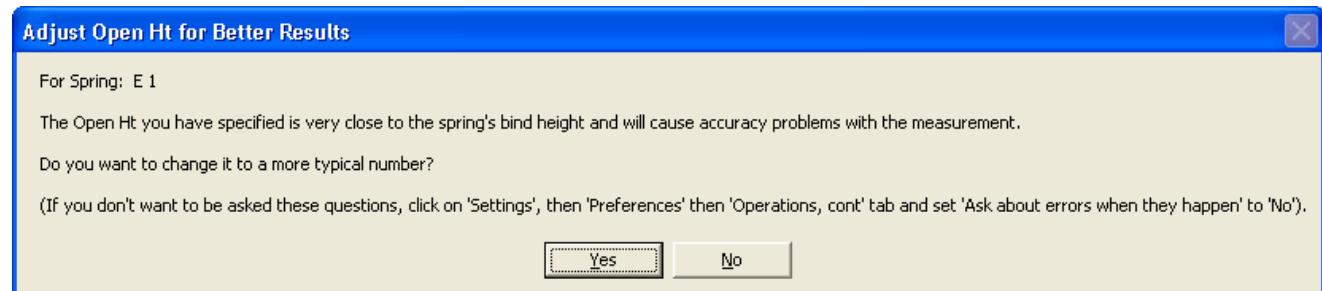


Figure A24 New Features for Starting a New Test

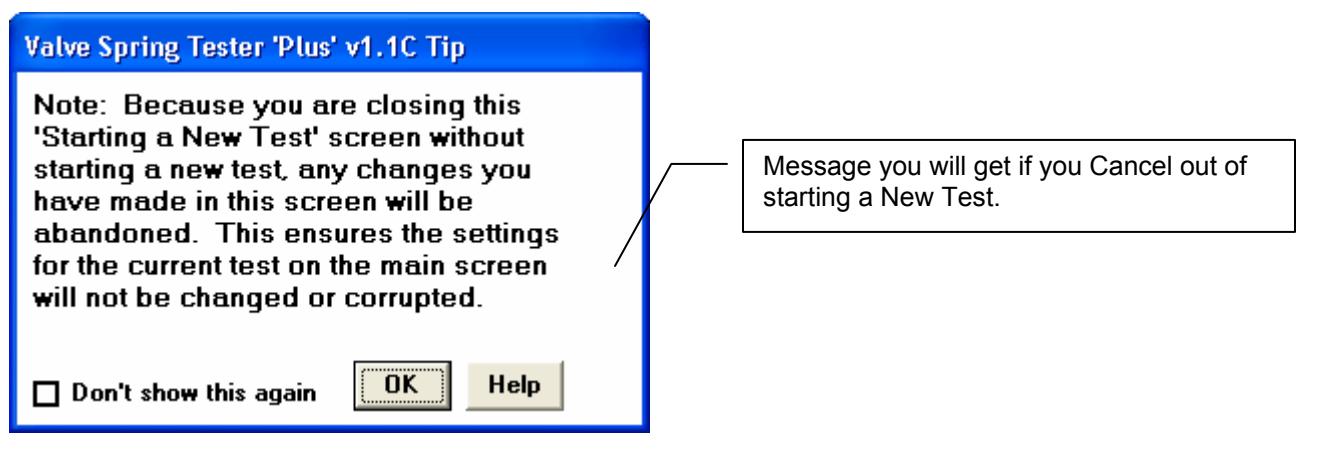
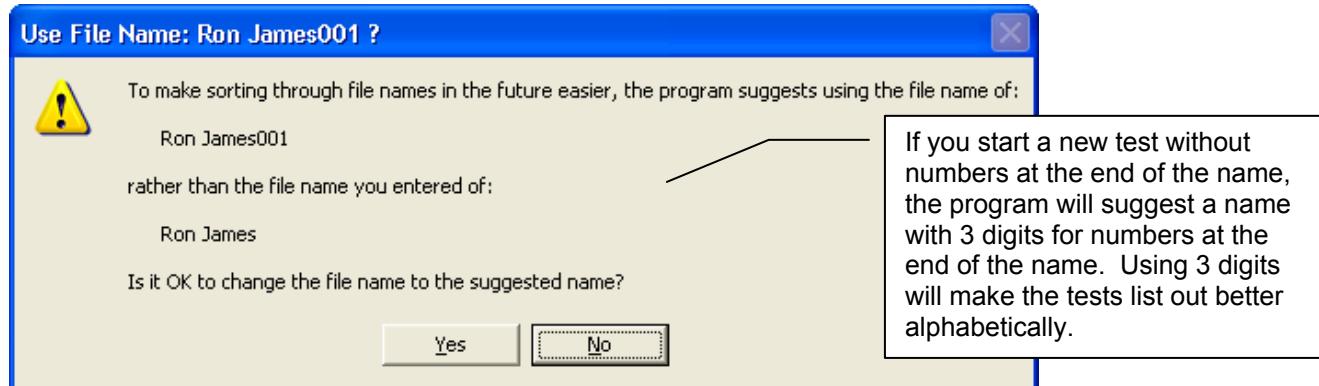
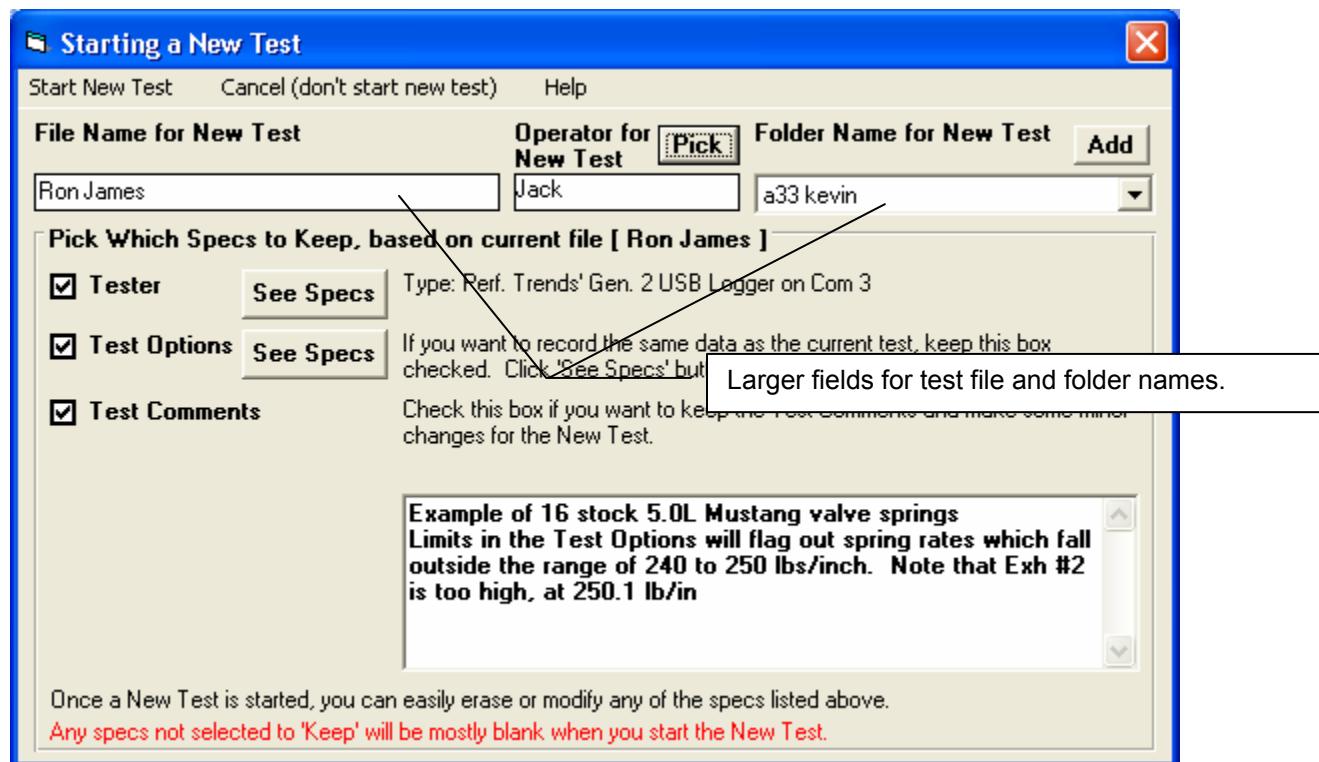


Figure A25 New Features Deleting, Adding, etc Files and Folders

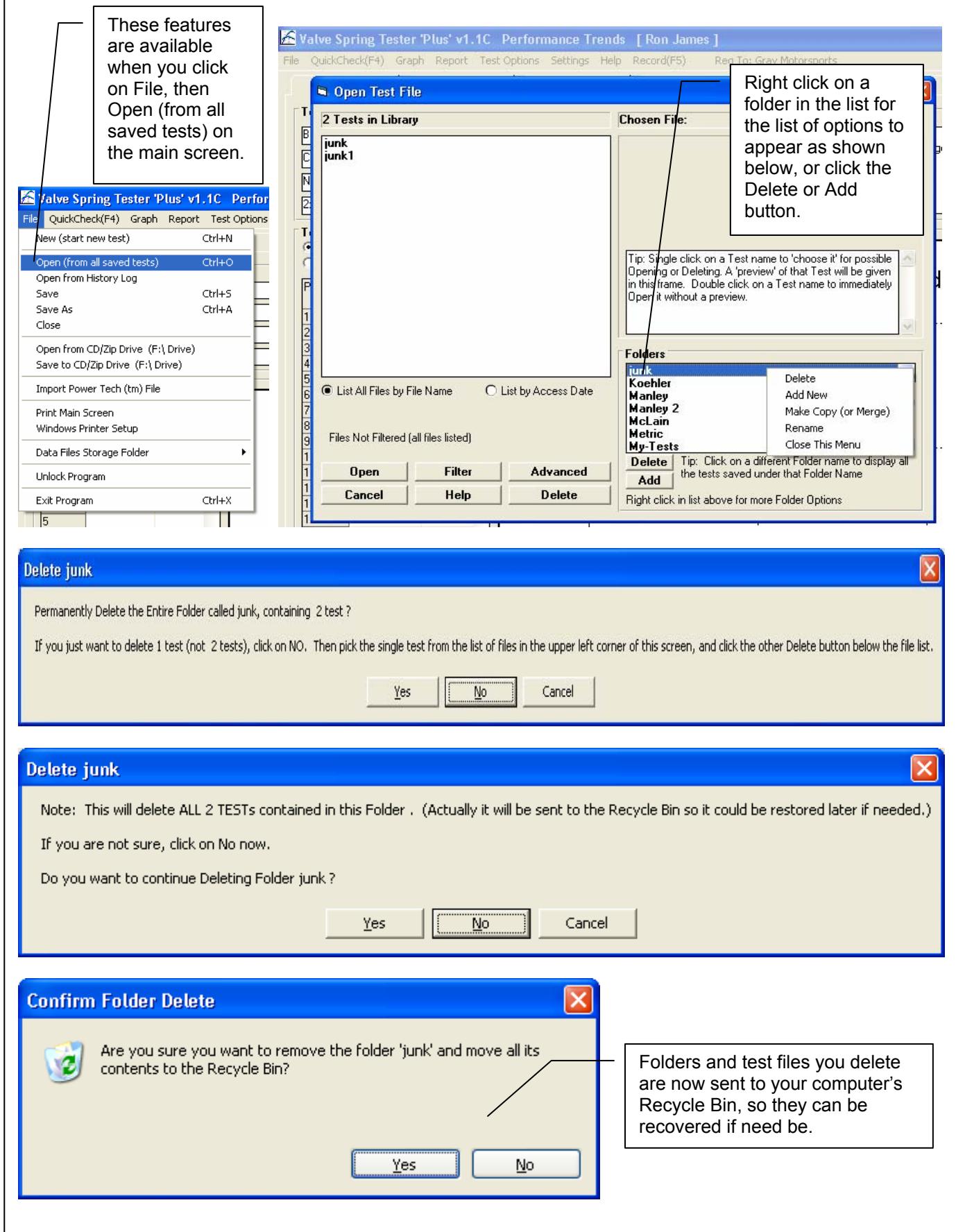
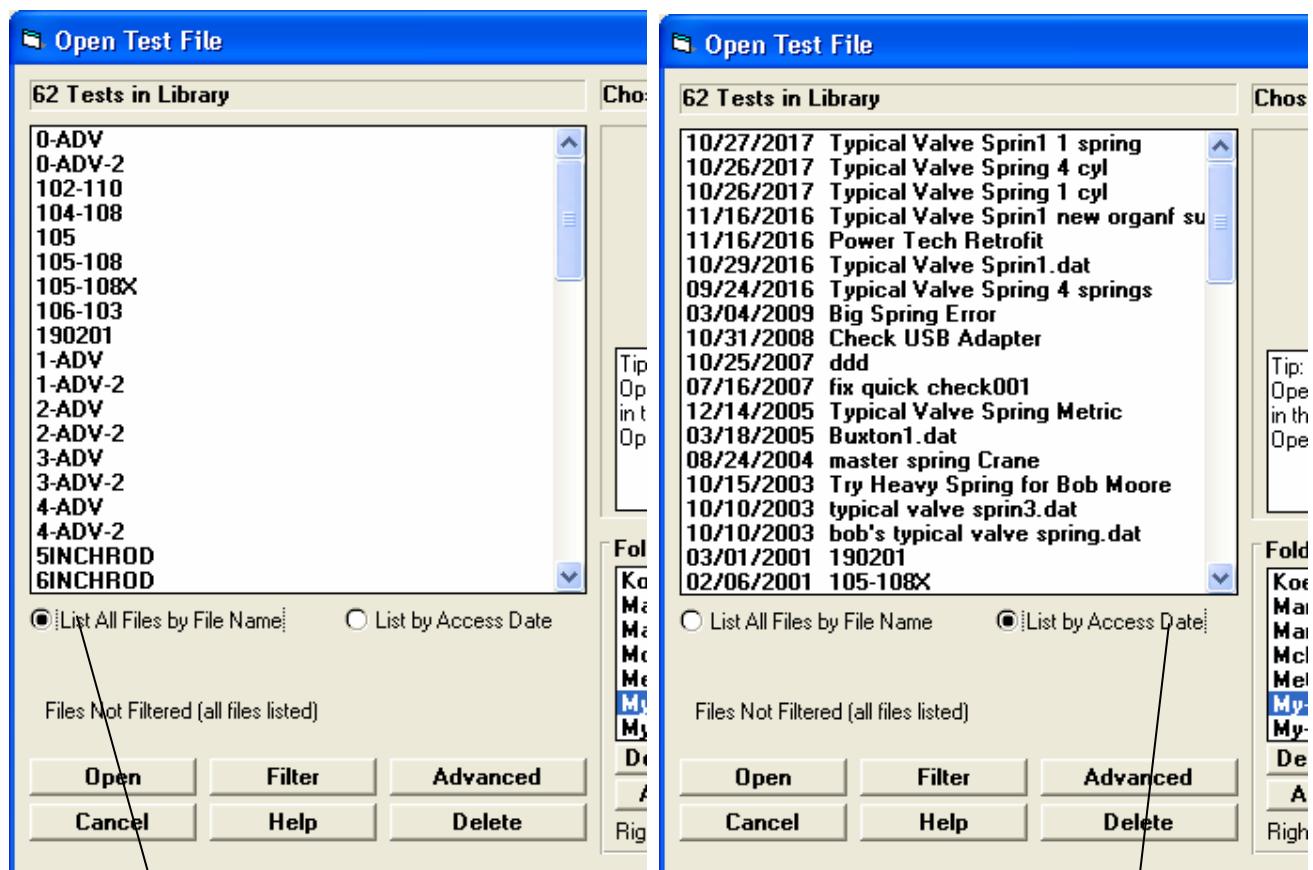


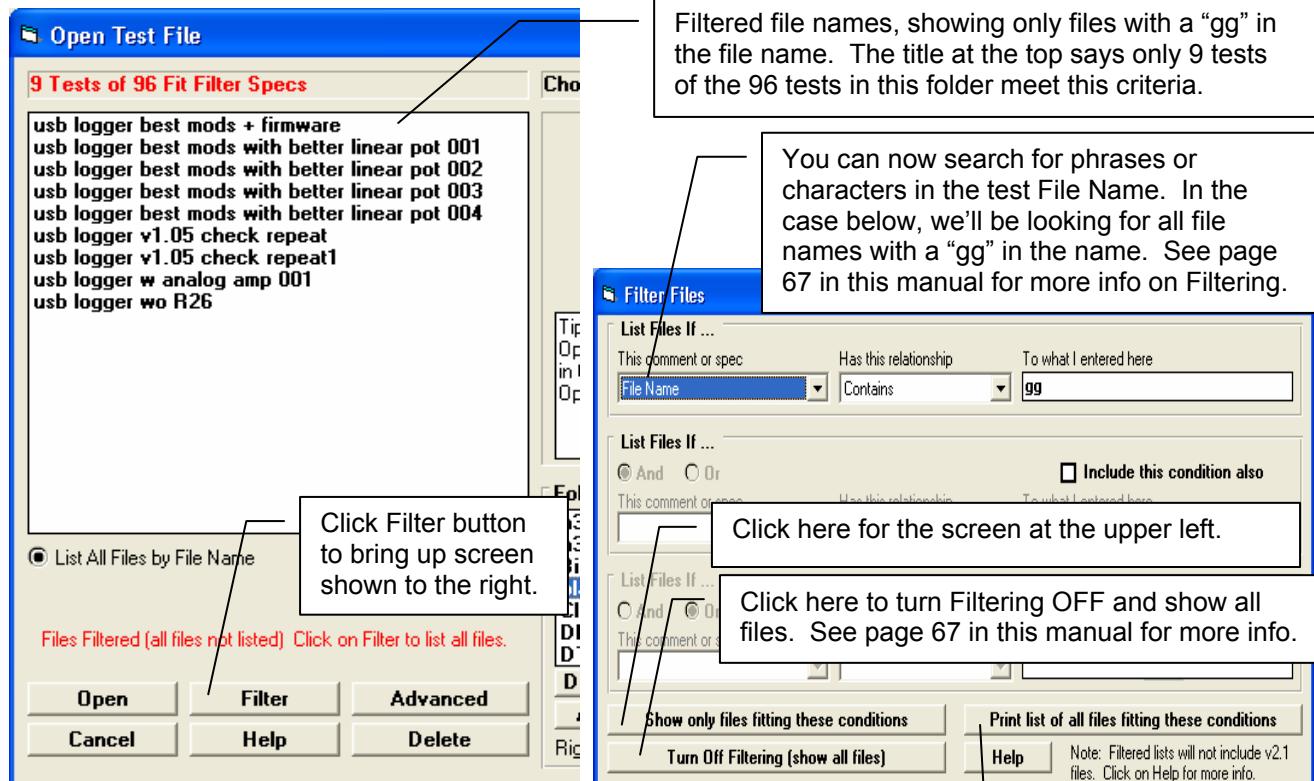
Figure A26 New Feature for Listing Files by Date



The typical method for listing files is alphabetically as shown here.

The new method available is to list them by the last date the files were "accessed" or opened. This may not be the date of the test. For example if you ran the test in July, but opened the test in September, the test will be listed by the September date.

Figure A27 New Features for Filtering (finding) Test Files



Filtered.txt - Notepad

```

File Edit Format View Help
Folder           Test
black box        usb logger best mods + firmware
black box        usb logger best mods with better linear pot 001
black box        usb logger best mods with better linear pot 002
black box        usb logger best mods with better linear pot 003
black box        usb logger best mods with better linear pot 004
black box        usb logger v1.05 check repeat
black box        usb logger v1.05 check repeat1
black box        usb logger w analog amp 001
black box        usb logger wo R26
My-Tests Full Boar Haggerty
My-Tests Full Boar Haggerty2
My-Tests Full Boar Haggerty3
My-Tests Full Boar Haggerty3-kev
PRI 2005          Briggs.dat
Sanborn           Haggerty2.txt
Sanborn           Haggerty3.txt
USB Logger        Try USB Logger
USB Logger        Try USB Logger -Mini BB Cal
USB Logger        Try USB Logger -Mini BB Cal + USB Logger1
USB Logger        Try USB Logger -Mini BB Cal + USB Logger
USB Logger        USB Lggr 1.04 w Dif Caps Rests
USB Logger        USB Lggr 1.04 w Dif Caps Rests #2
USB Logger        usb logger best mods + firm compare
USB Logger        usb logger best mods + firm compare 2
USB Logger        USB Logger Best Mods Repeats
USB Logger        usb logger best mods with better linear pot
USB Logger        usb logger w analog amp
USB Logger        usb logger w analog amp 001
USB Logger        usb logger w analog amp new-old firmware

```

Ln 1, Col 1

Click here to obtain a screen as shown to the lower left, a list of all file names and folders where the test name contains a "gg".

Figure A28 New Graph Title on Main Screen Summarizing Results



Figure A29 New Feature Showing if Tester Calibration of Current Test does not Match Calibration of Master Tester Specs

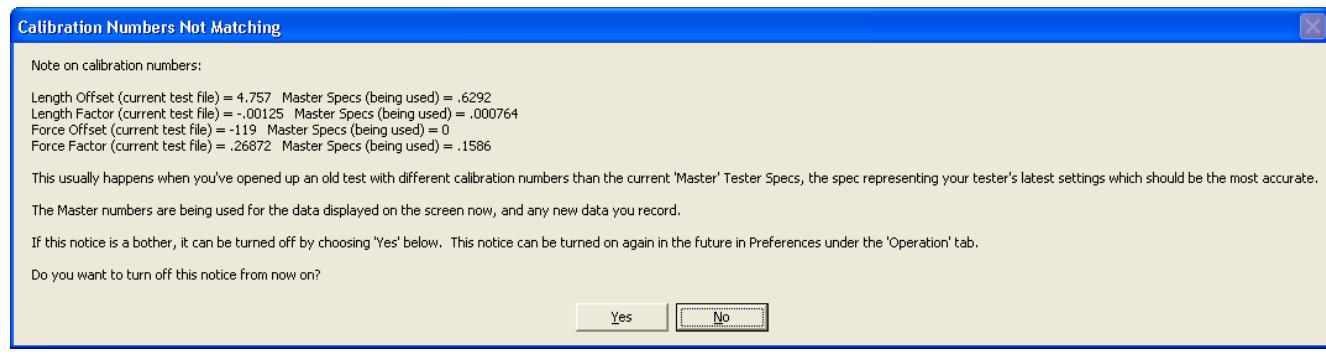


Figure A30 Video Movies to Demo the Spring Tester Features

The figure consists of three vertically stacked screenshots of a web browser displaying the Performance Trends website. The background of all three screenshots shows a grid of faint, repeating 'F' and 'L' shapes.

Screenshot 1: Home Page

The top screenshot shows the main homepage of performance trends.com. The navigation bar includes links for Home Page, Software, Downloads, Tools & Electronics, Our Customers, Support, Prices, and News. The 'Support' menu is expanded, showing options like FAQ's, Message Board, Movie Demo Files, and Definitions. A callout box on the right says: "At the Performance Trends website, click on Support, then Movie Demo Files."

Screenshot 2: Demo Movie Files

The middle screenshot shows a page titled "Demo Movie Files". It contains text about the movies and two "IMPORTANT" notices. Below this is a section titled "Click on these possible categories:" with a list of engine tools. A callout box on the right says: "If these movies do not show up correctly on your particular computer, click this button to go to the Performance Trends youtube page. The movies on youtube will likely play correctly on most any computer."

Screenshot 3: Valve Spring Tester Movie Options

The bottom screenshot shows a list of video movies for the Valve Spring Tester. The first item, "Valve Spring Tester Basic Movie", is highlighted. A callout box says: "Click on Valve Spring Tester from the list of Engine Tools." Another callout box on the right says: "Choose from the list of Valve Spring Tester movies."

List of Valve Spring Tester Movies (Screenshot 3)

- Valve Spring Tester Basic Movie
- Valve Spring Tester Advanced Movie
- Automatic Valve Spring Tester Movie
- Calibrating Spring Tester Length Sensor Movie
- Automatic-Valve-Spring-Tester-Calibrate-Length-Sensor.wmv
- Automatic-Valve-Spring-Tester-Calibrate-Length-Sensor.mp4
- Cam Analyzer Test Prep Movie

