Dyno DataMite Analyzer V2.0 for Windows

User's Manual

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** W A R N I N G **

The DataMite Analyzer makes calculations based on equations and data found in various published and heretofore reliable documents. The program is designed for use by skilled professionals experienced with engines and Tests. The following processes are hazardous, particularly if done by an unskilled or inexperienced user:

- Obtaining data to input to the program
- Interpreting the program's results

Before making measurements of or modifications to any Test, engine or driving situation, DO NOT FAIL TO:

- Regard the safety consequences
- Consult with a skilled and cautious professional
- Read the entire user's manual
- Obey all federal, state & local laws
- Respect the rights and safety of others

Acknowledgment:

Tom Krause of TDK Motorsports has been instrumental in bringing modern, accurate inertia dynos within reach of the average cart racer. The TDK website:

http://www1.cedar-rapids.net/tdkmotors

Has shown many how relatively easy and inexpensive it is to build a simple inertia dyno that works.

Tom has also had considerable input on this program, both with suggestions and troubleshooting. His efforts are greatly appreciated.

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Chapter 1 Introduction

1.1 Overview of Features

The DataMite data logger hardware and Dyno DataMite Analyzer software by Performance Trends, Inc is a system to let racers, engine & chassis builders, and motorsports enthusiasts measure dynamometer data. The Dyno DataMite Analyzer can analyze this data with graphs, comparison graphs and reports. This analysis lets you calculate torque and HP, clutch slip, temperatures, pressures, etc to detect performance differences from engine modifications.

The software is available in 2 versions, Basic and Pro. The Basic version has fewer options and features to make the program easier to operate. In the Pro version, you have additional data recording and analysis features. Should you start with the Basic version, you can easily update to the Pro version later.

The DataMite and Dyno DataMite Analyzer software provides sophisticated data acquisition and computer analysis at a fraction of the cost of other systems. The Dyno DataMite system's major features are listed below:

Basic Features:

- Capability to configure and calibrate the software for most any combination of sensors you have installed on the DataMite data logger.
- Capability to tailor the program to work with most any type of dynamometer, including inertia wheel types, absorber types (with load cells and lever arms), and even chassis dynamometers.
- User friendly, Windows interface, compatible with Windows 3.1, 95, 98 and NT.
- Can print results using most any Windows compatible printer, many times in color.
- Save nearly unlimited number of tests for recall, comparison and analysis in the future.
- Allows several reporting and graphing options for analysis, either vs RPM or vs time in seconds.

Added Features for Pro Version

- You can also input and/or record:
  - Additional dyno details like frictional losses in the dyno system (which affect the torque and HP recorded), correct for engine inertia effects when running an accelerating test (which is all inertia dyno tests), dimensions and weights of more inertia dyno components, etc.
  - Engine specs like bore, stroke, head descriptions, cam descriptions, etc.
  - Additional test conditions like fuel, coolant/head temp, etc.
- Customize printed reports and especially graphs. You can include comments for each engine graphed.
- Write ASCII files for importing data into other computer programs.
- Filter (find) past tests based on certain criteria, like Peak HP, certain Customer name, etc.
- "History Log", keeps a running log of tests you have recently started new, run, graphed or reported.

Please read Sections 1.2 "Before You Start" and 1.3 "A Word of Caution" before you turn on the computer. Then try running the program following the guidelines in 1.4 "Getting Started" and 1.5 "Example to Get You Going". When you feel a little familiar with the program, take time to read this entire manual. It will show you all the things you can do with this powerful tool.

1.2 Before You Start

What you will need:

- IBM 486, or Pentium (or 100% compatible). Math coprocessor or Pentium recommended.
- 8 Meg of RAM.
- Approximately 10 Megabyte of disk space. (More is required for storing large #s of tests.)
- Windows v3.1 or Windows 95 or 98 or NT.

Many terms used by the Dyno DataMite Analyzer and this user's manual are similar to terms used by other publications, i.e. Inertia, Correction Factor, etc. However, these terms may have different definitions. Therefore, read Chapter 2 to see what these terms mean to the Dyno DataMite Analyzer.

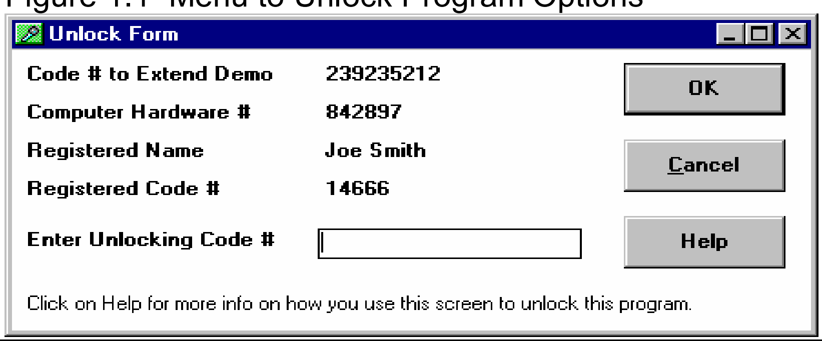
Occasionally it will be necessary to identify "typos" in the manual, known "bugs" and their "fixes", etc. which were not known at the time of publication. These will be identified in a file called README.DOC in the Dyno DataMite Analyzer directory or folder. This file can be displayed right in the DataMite Analyzer by clicking on Help at the Main Screen, then clicking on Display Readme.doc File. You can also read it using utilities like NotePad or WordPad.

Unlocking Program Options:

The Dyno DataMite Analyzer is equipped with copy protection. This ensures the legitimate users do not have to cover the costs for unauthorized distribution of the program. When you first receive the program, it is in demo mode. ***All features work in Demo mode.*** In demo mode you can try either the Basic version, or the full Professional version for ten days. Sometime during those 10 days, you must call Performance Trends to obtain an "Unlocking Code". This Unlocking Code will be for either the Basic version or the Pro Version, whichever you have purchased.

Before you call Performance Trends, you should get your disk serial number (stamped in blue on the disk), your registered name and code number, and computer hardware number. The registered name and code numbers are available by clicking on file in the upper left hand corner of the Main Screen, then clicking on Unlocking Program Options. A screen will appear as shown in Figure 1.1.

Figure 1.1 Menu to Unlock Program Options



Performance Trends will provide you an unlocking code number. Type in the unlocking code number and click on OK. If you typed in the number correctly, you will be given a message that the program is permanently unlocked to either the Basic or Pro mode. The program will only run on this one computer.

If you want to run the program on another computer, you must install it, obtain the computer hardware number and registered code number as shown in Figure 1.1, and call Performance Trends for a new Unlocking Code for that computer. There may be a charge for additional computers.

You may need to transfer the program to another computer, like when you buy a new computer. If so, install the program on the new computer. It will run for 10 days. During that 10 days, call when you can have your old computer up and running. Go into the DataMite program, click on File, then Transfer Program to Another Computer. Performance Trends will ask for some numbers from this screen and give you a code # which will ***permanently*** turn the program Off on this old computer. Then give Performance Trends the information for the new computer and they will give you a new unlocking code ***free.***

1.3 A Word of Caution

To install the DataMite data logger, you must install some sensors on the dyno. This is covered in Appendix 2.

If you are not familiar with proper safety precautions when working on engines or rotating machinery, HAVE A QUALIFIED MECHANIC OR ENGINE BUILDER HELP YOU. Dynamometer testing can be dangerous. Engines do fail, possibly throwing "shrapnel" and burning fuel in all directions. Take the proper precautions using shields and high quality fuel system components to minimize these dangers. PLAN for the engine or even the dyno failing and you will cut down on the chances they ever will.

The Dyno DataMite Analyzer has features which estimate the engine's performance based dyno data, some user input and assumptions. These estimates can be used for analysis of engine performance on the race track or on the street. However, these assumptions (like knowing the friction losses in the dyno system, accurately knowing the inertia, etc) limit the accuracy of these estimates. (See other assumptions in this manual listed under Assumptions and Accuracy in the Index.)

With any data acquisition and analysis, the computer can help the user by automatically doing various calculations, plotting the data easily, etc. However, the computer is not thinking for you. You, the user, are the key to properly understanding and using the data. If confusing results are obtained, take a minute to:

- Plot the Raw RPM data and see if that looks correct. See Appendix 3 on Troubleshooting.
- If the Raw RPM data looks OK, double check all your data input like Dyno Specs, DataMite Setup Specs, etc.
- Refer back to this manual, especially Appendix 3, Troubleshooting and Example 4.1 on dyno testing procedure.
- Ask someone else skilled and experienced in the particular area.
- Give the retailer or Performance Trends Inc's. Tech Help Line a call for an explanation. (Also, computer programs are written by ***people*** so it's always possible there may be an error in the calculations. Your phone call may help us correct it.)

Please also read the Warranty and Warning at the beginning of this manual and on the diskette envelope.

IMPORTANT: The Dyno DataMite Analyzer program will ask for dynamometer specs and measurements, and engine specs. The Dyno DataMite Analyzer program is NOT checking for safe RPM limits of the dynamometer or engine design. ***You*** must have your dyno design checked by a qualified engineer to determine its safe operating RPM range.

1.4 Getting Started (Installation)

You must install the Dyno DataMite Analyzer from the distribution disks (floppy disks) to a hard drive before it will run. To do this:

Windows 3.1:

- Start your computer and go into Windows. Insert the distribution disk #1 into the floppy drive, for example the A drive.
- From File Manager, select the File menu and then select Run. Type in:

  A:SETUP and press <enter> or click on OK

- Follow the instructions of the Setup program.
- Then, to run the program once it is installed:
  - There should be a Perf.Trnds icon or program group for you to click on.
  - Click on the Perf Trnds icon or program group, which should expand and show you the contents, which now include a Dyno DataMite Analyzer icon.
  - Double click on this icon to run the program.

Windows 95 or 98 or NT:

- Start your computer.
- Insert the distribution disk #1 into the floppy drive, for example the A drive.
- Click on the Start button, then select Run.
- Type in:

  A:SETUP and press <enter> or click on Yes

- Follow the instructions of the Setup program.
- Then, to run the program once it is installed:
  - Click on Start
  - Click on Programs
  - Click on Performance Trends
  - Click on Dyno DataMite Analyzer

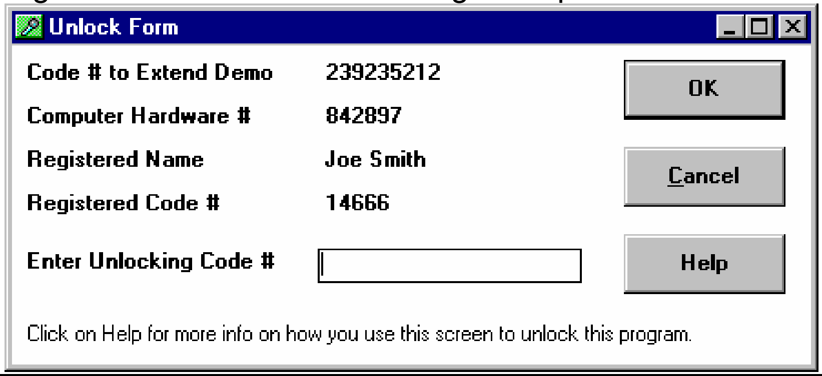
Entering Registered Owner's Name:

The first time you run the Dyno DataMite Analyzer, you will be asked to enter your name as the Registered Owner. During this first session, you can modify it until you are satisfied. Once you accept the name, the computer will generate a Registered Code # based on the name. To be eligible for Tech Help, you will need both your registered name and code #, and to have sent in your registration card. The name you enter should be very similar to the name you enter on the registration card.

Click on Help, then About Dyno DataMite Analyzer at the Main Screen to review your name and code # .

Unlocking Program Options:

Figure 1.2 Menu to Unlock Program Options



The Dyno DataMite Analyzer is equipped with copy protection. This ensures that legitimate users do not have to cover the costs for unauthorized distribution of the program. When you first receive the program, it is in demo mode. In demo mode you can try either the Basic version, or the full Professional version for ten days. ***All features are working in demo mode***.

Sometime during those 10 days, you must call Performance Trends to obtain an "Unlocking Code". This Unlocking Code will be for either the Basic version or the Pro Version, whichever you have purchased.

Before you call Performance Trends, you should get your disk serial number, registered name and code number, and computer hardware number. These are available by clicking on file in the upper left hand corner of the Main Screen, then clicking on Unlocking Program Options. A screen will appear as shown in Figure 1.2.

Performance Trends will provide you with an unlocking code number. Type in the unlocking code number and click on OK. If you typed in a number correctly you will be given a message that the program is permanently unlocked to either the Basic or Pro mode. The program will only run on this one computer.

If you want to run the program on another computer, you must install it, obtain the computer hardware number and registered code number as shown in Figure 1.2, and call Performance Trends for a new Unlocking Code for that computer. There may be a charge for additional computers.

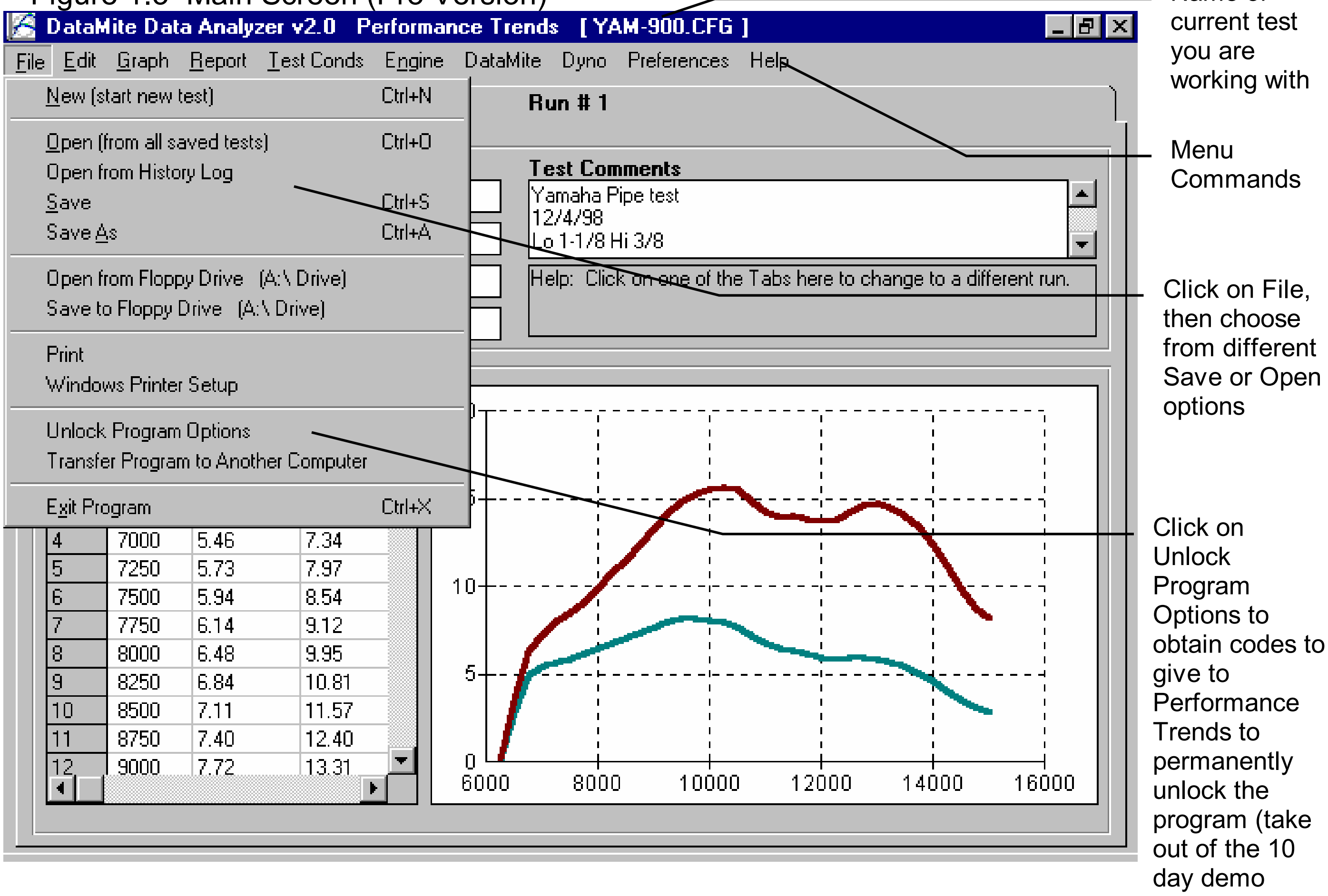
Also See Section 1.2.

1.5 Example to Get You Going

To start the Dyno DataMite Analyzer from Windows 3.1, click on the Dyno DataMite Analyzer icon in the Perf.Trnds program group. From Windows 95 or 98 or NT, click on Start, then Programs, then Performance Trends, and then Dyno DataMite Analyzer (or click on the Dyno DataMite icon on your desktop). During startup of the program, you will be given some introductory tips.

After these brief introduction screens and questions, you will be left at the Main Screen shown below: Notice that there is already a dyno test loaded and displayed. This is for the last dyno test the program was working with when the program was last shut down. If you just got your program, this would be an example test which was loaded at the factory. The name of the test is shown at the top in square brackets [ ] , YAM-900 shown in Figure 1.3 .

Figure 1.3 Main Screen (Pro Version)



From this Main Screen, you can:

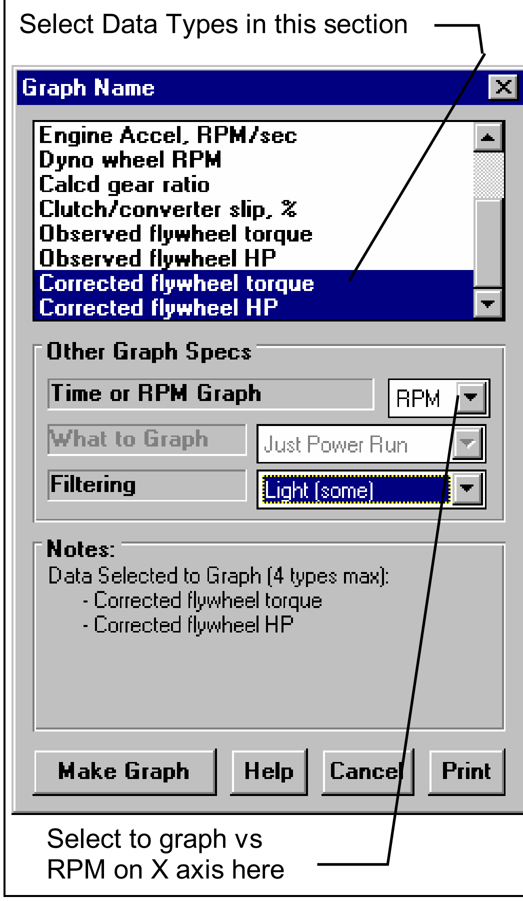
- Choose to review your options by clicking on the menu items at the top of the screen.
- Open or save a file of test results and specs by clicking on File in the upper left corner, and then the Open or Save commands.
- Edit or review test data, settings or comments for the file you are currently working with.
- Graph or report the test for the file you are currently working with.
- Change the Preferences options to somewhat customize the program for your needs.
- Click on File, then Unlock Program Options to obtain codes to give to Performance Trends to permanently unlock the program (take out of the 10 day demo mode). See Section 1.4.
- Get HELP to explain these options by clicking on Help or pressing <F1>.
- Quit the program by clicking on File, then Exit.

All these options are explained in detail in Chapters 2 and 3.

In the Main Screen's blue title bar you will notice the name of the current test is contained in square brackets [ ]. The program has several examples of tests saved in the Test Library's Example folder right from the factory.

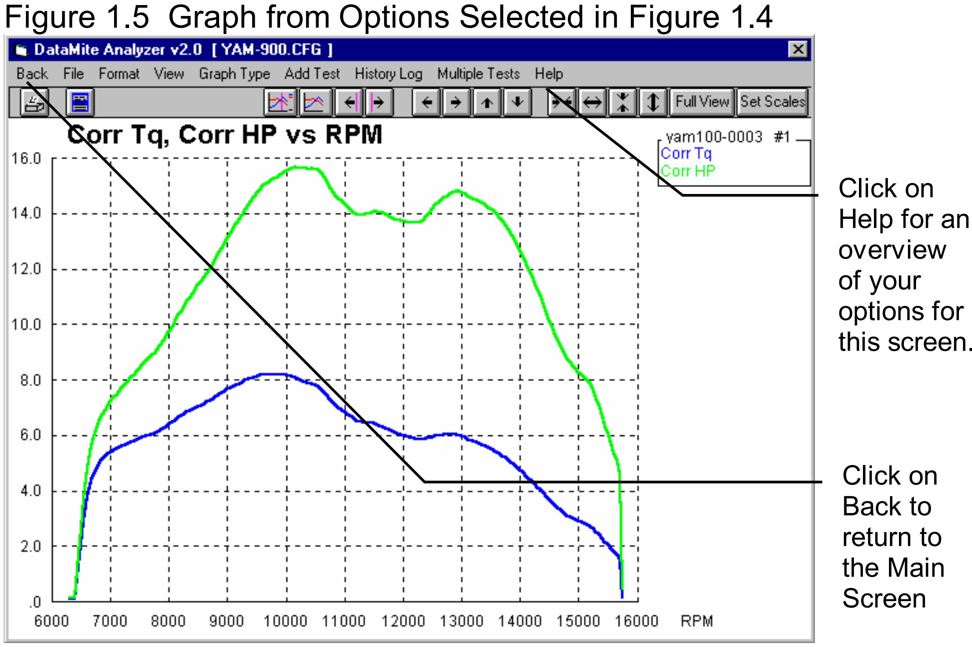
To get started, let's try a couple of Menu commands. Click on the Graph menu command to open up the graph options menu shown in Figure 1.4. The graph settings shown in Figure 1.4 are for Corrected Torque and HP vs RPM.

Figure 1.4 Graph Options Menu



Click on the Make Graph button to produce the graph shown in Figure 1.5. At the graph screen you have several other options available for changing the graph. These options are available by clicking on the commands in the menu bar or on the buttons at the top of the screen, including the Help command. The Help command at this screen (and most screens) provide a good background on what the various options are. For now, just click on Back at the upper left to return to the Main Screen.

Figure 1.5 Graph from Options Selected in Figure 1.4

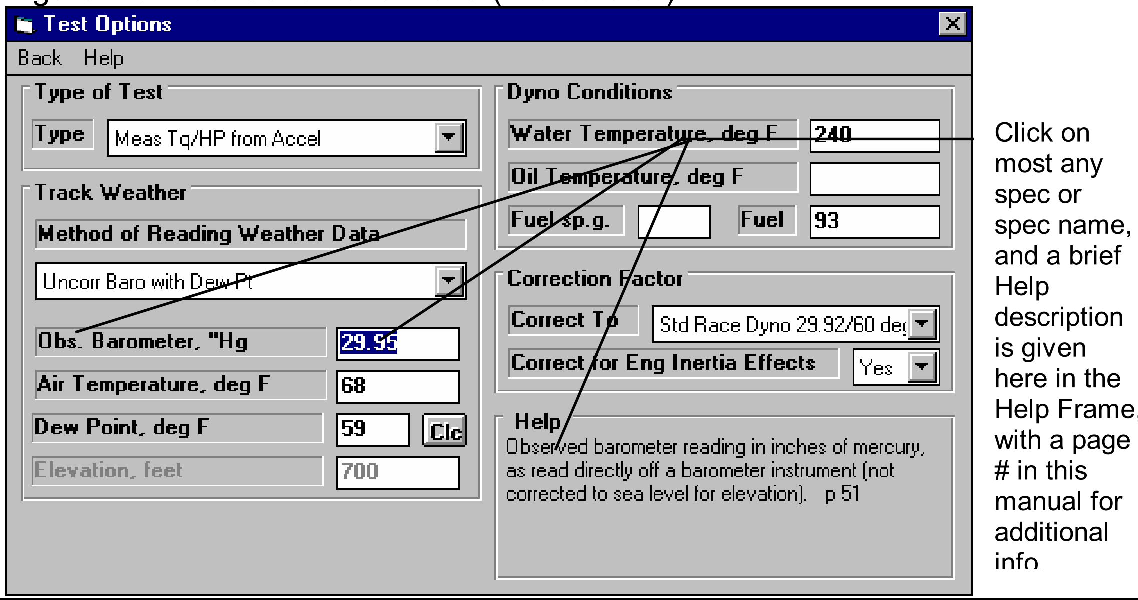


A Test File is actually made up of 3 files:

1. The .DAT file (data file) which is the data recorded by the DataMite
2. The .CFG file (configuration file) which is the DataMite and dyno settings, engine specs, test comments, etc. This is the file the program actually looks for when you open a test or save a test, etc. For that reason, you will see a ".CFG" after the test name, like in the square brackets [ ] at the top of the main screen shown in Figure 1.3.

3. The .LAP file (lap or run file) which the DataMite Analyzer uses to determine where each run starts and stops. Even though you may have recorded 45 seconds of time for a dyno run, the actual run which the DataMite Analyzer found may start 13 seconds into the run and may end at 23 seconds, a 10 second run.

Figure 1.6 Test Conditions Menu (Pro version)



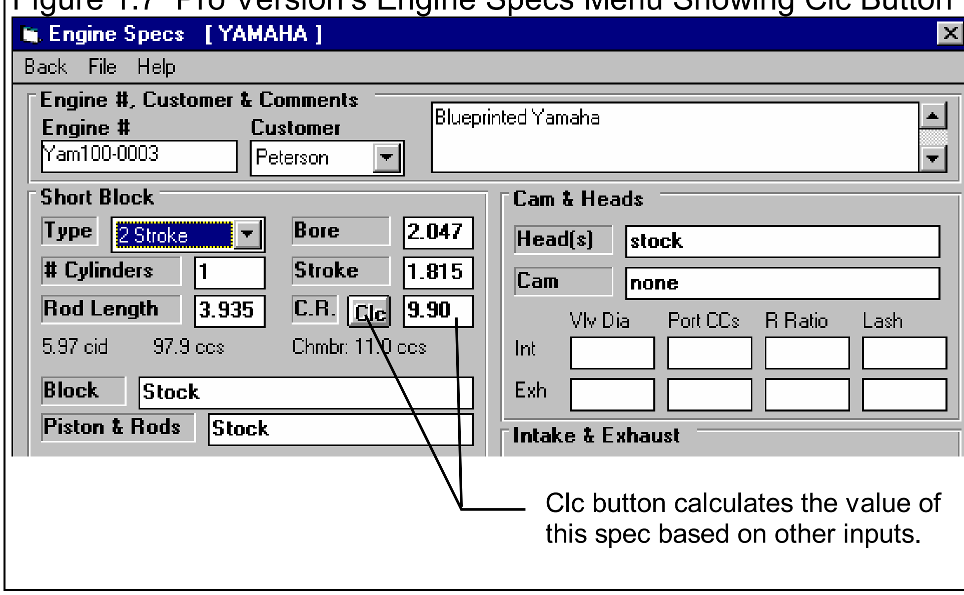
This is explained in Section 3.5 "Data Libraries". Click on the Test Conditions command to obtain a menu as shown in Figure 1.6.

These specs are used for calculating certain outputs (like corrected torque and HP, etc), and they are useful descriptions to remind you of what this test run was in the future.

Many of the input specifications you see in the various menus may not be familiar to you. For a brief definition of the inputs, simply click on the specification name. The definition will appear in the Help frame with a page # in this manual for more info.

Some specs have “Clc” buttons. One example is Compression Ratio in the Pro version’s Engine Specs menu. “Clc” stands for "calculate". For example, if you want to calculate compression ratio from chamber volume, deck height, etc., simply click on the Clc button. The program will display a new menu listing the inputs and the Calc Compression Ratio from these inputs. For further explanation, click on the Help buttons in these menus. To use the Calc Compression Ratio calculated from these inputs, click on the Use Calc Value button. Otherwise click on Cancel to return to the Engine Specs menu with no change to Compression Ratio. Section 2.8, Calculation Menus explains all these calculations.

Figure 1.7 Pro Version’s Engine Specs Menu Showing Clc Button



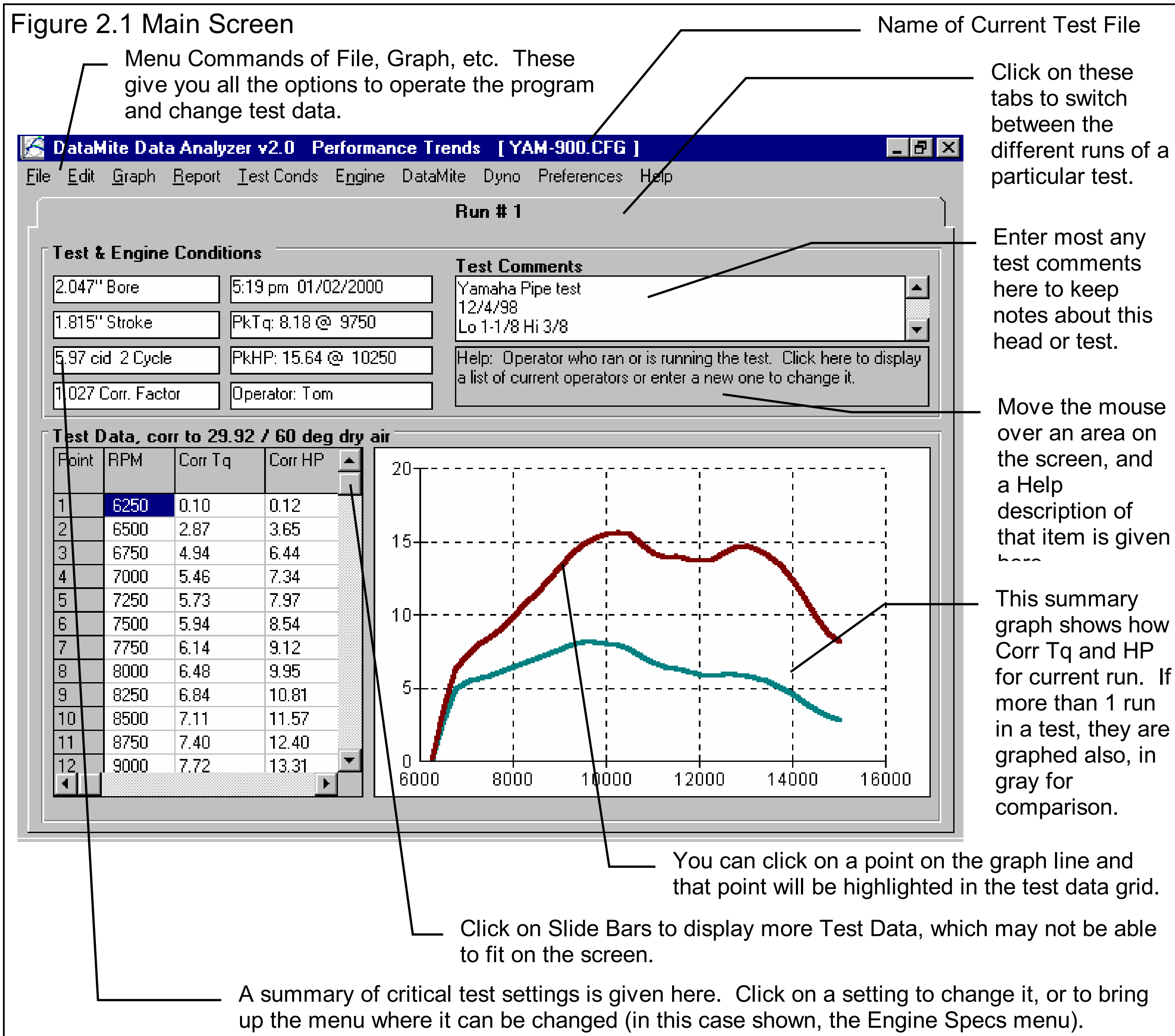
Once you feel comfortable changing specifications in the various menus and making various graphs and reports, read Section 3.5 of this manual called Data Libraries to learn how to save tests or recall tests which have been previously saved. Then you will know all the basic commands to operate the program. For a more in-depth knowledge of using these commands and an explanation of the results, read this entire manual.

Chapter 2 Definitions

2.0 Basic Program Operation:

Whenever you start the Dyno DataMite Analyzer (Basic or Pro versions), you are brought to a Main Screen which will look like Figure 2.1.

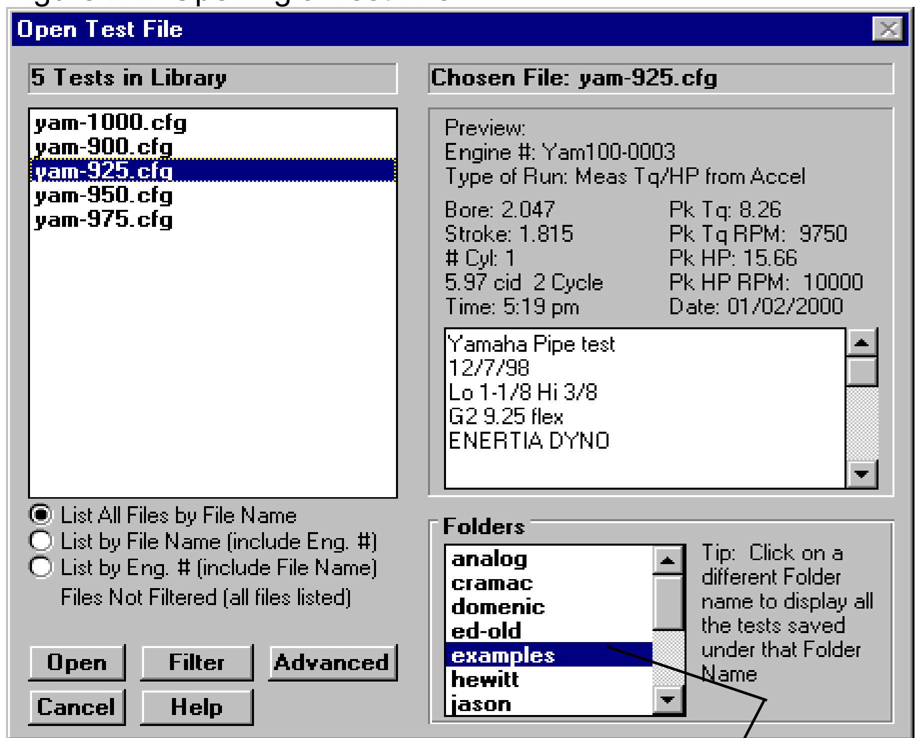
Figure 2.1 Main Screen



If you want to Open a previously saved test, you can click on File in the upper left corner, then click on Open (from all saved tests). You will get a screen as shown in Figure 2.2 where you are presented with a list of saved tests in the Test Library. Some tests are examples provided by Performance Trends. As you run tests yourself and save the results, you will add many more tests to the library. These saved files are useful for making comparisons in the future, and can be used as test patterns (or templates) for new tests (saving you considerable time by not having to type in specs which match a past test).

Figure 2.2 shows that the Test Library is divided into sections (called Folders in Figure 2.2) to help organize a large number of tests. For example, all tests for the company ABC Engines could be saved under a section name of ABC-ENG. All 4 cylinder Ford tests could be saved under a section name of 4CYL-FORD. This will save considerable time and confusion when trying to located a particular test in the future. To look in different sections, click on the Folder name from the list shown at the lower right of Figure 2.2. The list of tests will then be updated for that Folder. To pick a test, simply click on it from the list of tests, then click on the Open button. (For those familiar with computers, Folders are actually subdirectories or folders in the DTMDATA folder. The Name "Folder" can be changed to something else, like "Track" used in the DOS v1.x, in the Preferences menu.)

Figure 2.2 Opening a Test File



Click here to pick a different category or group of tests (Folder) from which to display a list of Test

Notice in Figure 2.1 that a current test name is listed at the top in square brackets [ ]. This is the file of recorded DataMite data, engine data, and DataMite and Dyno settings which are currently saved in the Test Library, and are the data and specs you are currently working with. If you change the engine specs, DataMite specs, Test Conditions or Dyno Specs, make a graph or report, it is for this test file.

If you click on one of the Menu Commands at the top of the Main Screen, you can be presented with a screen of specs. Figure 2.3 shows the screen for the Pro version's Engine Specs. Figure 2.3 discusses some of the commands to enter or change settings at this menu.

Before Running Your First Dyno Test:

It is recommend you becoming very familiar with the Dyno DataMite Analyzer before starting "real" tests. Points to consider include:

- Be sure your DataMite is installed correctly, is recording data properly. See Appendix 2.
- Review the proper procedure for performing a test as outlined in Example 4.1.
- Become familiar with how to ***validate*** your data, to ensure the raw data that was recorded is correct, as shown in Example 4.1 and Appendix 3 Troubleshooting.

> ***Important: The raw DataMite data must be correct and free from defects for the calculated torque and HP to be correct. Become familiar with the way to check the raw DataMite data shown in Example 4.1.***

Figure 2.3, Explanation of Sections of Typical Menu (Engine Specs menu shown which is only available in the Pro version)

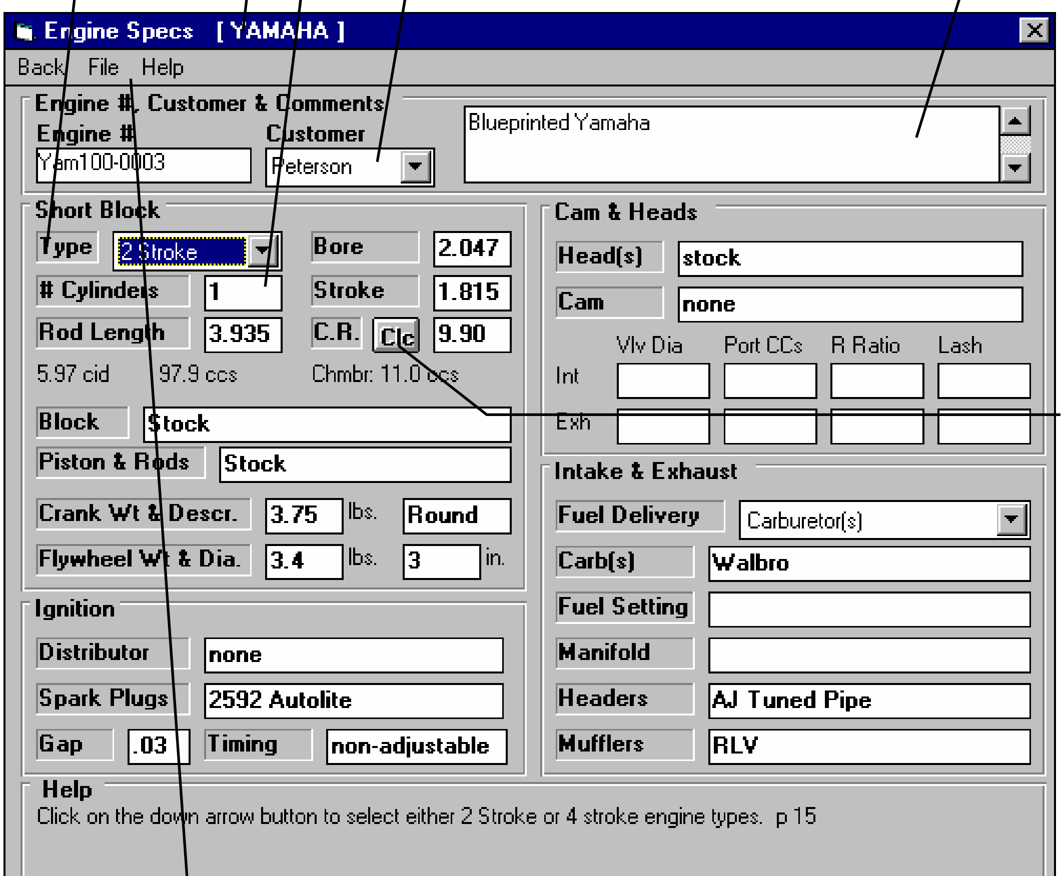
Names of component specs. Click on them for a description in the Help frame in the lower left corner.

Name of component file displayed in this menu.

Standard text entry box where you can type in a number for a spec. For many others in this screen, like Head(s), Cam, etc, you can type in most any descriptive words you want or leave them blank. These can be useful comments for describing how this engine was built or modified for this particular dyno test.

Drop down combo box. For some specs (like Customer in these Engine Specs) you can either type something in the box, or click on the arrow button to select a pre-programmed selection. For most others you can only select from a list of pre-programmed choices.

Comment text frame to enter a comment to describe these component specs. These comments are saved with the specs in the Component Library, in the case shown here, the Engine Library.



Some specs have a Clc (calculate) button, where you can either enter the specs directly (in this case the compression ratio) or click on the Clc button to calculate it from other inputs.

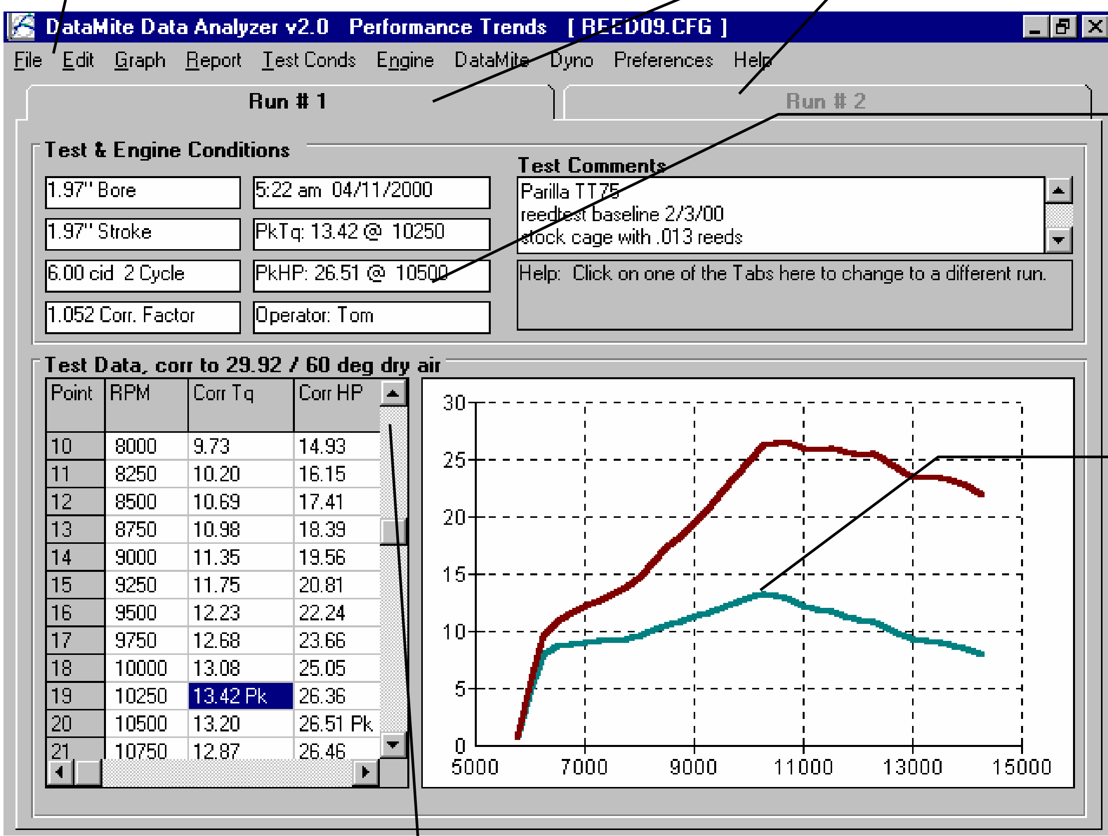
Standard menu commands which provide the options for closing this menu (Back), saving or open files of these individuals specs (click on File, then Save or Open), erasing a set of specs (click File, then New, printing this screen (click on File, then Print), etc. See the sections later in this chapter for more details on individual menus.

2.1 Main Screen (Test Data) Inputs

The Main Screen is shown in Figure 2.4 and is designed to resemble a typical dyno printout and graph. Like a dyno printout, it shows the torque and HP obtained at a range or RPMs, and a torque and HP vs RPM graph. The Main Screen is made up of 5 basic sections as shown in Figure 2.4. These are discussed in the next 5 sections. The rest of this section gives an overview of how the Main Screen is organized.

Figure 2.4 Main Screen (Pro version)

5) Menu Commands of File, Graph, etc. These give you all the options to operate the program and change test data.



1) Click on these Tabs to switch between the different runs of this particular test file.

2) Test & Engine Conditions summarizes some critical test specs, and includes a comments section to keep notes about this

3) This Summary Graph shows Tq and HP for current run for this test file. If you click on a graph line (as pointed out here), that data point will be displayed and highlighted in the Test Data grid.

4) Click on slide bar and slide up or down to display all results. The Filtering (smoothing) of the power curve and RPM increments are selectable in the Preferences Menu, Section 2.2. Peak torque and HP are marked with "Pk".

2.1.1 Tabs

A test you download from the DataMite usually is for only 1 dyno run, however can be for as many runs as the DataMite's memory can store (possibly 10 or more). You move to different dyno runs of this test by clicking on the Tabs at the top of the screen. If you want to break up a test of 2 or more runs into smaller tests, possibly with only 1 dyno run per test, click on Edit at the top of the Main Screen, and select Delete Beginning or End of Run. See Section 2.10, page 75.

2.1.2 Engine and Test Conds

Bore (Pro version only)
Stroke (Pro version only)
cid Cycle (Pro version only)

Describes the size of the engine and type of engine (2 or 4 stroke) based on settings in the Engine Specs menu Click on this item to display the Engine Specs menu where this data is contained.

Correction Factor

Is the correction factor based on the Weather Specs entered in the Test Conds menu. Click on this item to display the Test Conditions menu where this data is contained.

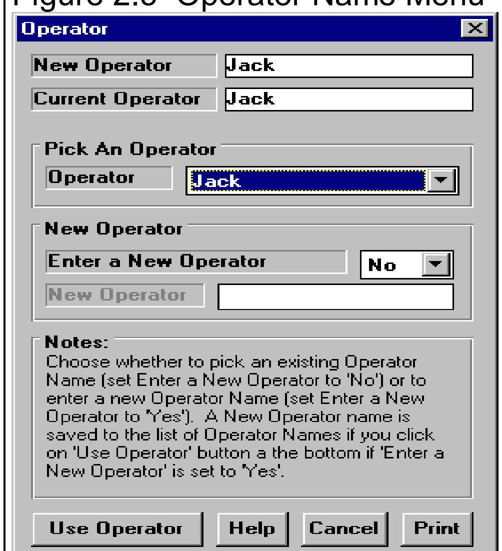
Test Time and Date

This records the time and date at the time you downloaded the test from the DataMite. When a dyno test is started with the New Test command (click on File, then click on New Test at the Main Screen), the computer's current time and date are saved as the test time and date. The test time and date can also be changed by clicking on it here at the Main Screen.

Pk Tq
Pk HP

Is the highest torque and HP reading for the test. Note that this can change if you change the RPM increments or the Filtering specs in the Preferences menu, Section 2.2.

Figure 2.5 Operator Name Menu



Operator

This is the name of the operator who ran the test. Click on this item for the menu of Figure 2.7 to be displayed, where you can type in a new operator name, or choose from one you have previously entered. It is always recommended you first check the list of existing operators, so you do not end up with several names for the same operator. For example, Bob, Bobby and Robert may all be for the same guy. When you go to look for tests run by Bobby in the future, the Pro version's search (Filter option) will not show up the tests run by Bob or Robert.

To pick an existing operator name, pick No for Enter a New Operator, then pick from the Operator list. To enter a New Operator name, pick Yes for Enter a New Operator, then type in a New Operator name, which will be added to the list of operator names.

Test Comments

Test comments are for making most any notes about the test, unusual observations, customer requirements, etc. In the Pro version, you can search the Comments for various words. For example, you could search for all the tests which had the word "Holley" or "Johnson" in the Test Comments.

Help

The help frame will describe what ever portion of the screen the mouse has passed over or clicked on.

2.1.3 Summary Graph

The summary graph shows Corrected Torque and HP graphed versus RPM for the current run of this particular test (Figure 2.6). The increment of the RPMs and the level of Filtering (smoothing) can be selected in the Preferences Menu, Section 2.2.

If you click on a graph line in the Summary Graph, that particular data point will be highlighted and displayed in the Test Data Grid. This is a quick way to find data points which may look unusual or be important.

2.1.4 Test Data Grid

Point

The point column simply numbers the rows of data, and is used by the program to identify a row of data for messages.

RPM

Is the RPM for this row of data. The increment of the RPMs can be selected in the Preferences Menu, Section 2.2.

Torque
HP

This is the corrected Torque and HP numbers for the corresponding RPM. This data is corrected for weather conditions and for any inertia effects as indicated in the Test Conditions menu. This number is averaged for all the RPM data which is closer to this RPM than the RPM above or below it. For example, if the RPMs are 5000, 5250, 5500, etc, the torque and HP numbers given at 5250 RPM are for all RPMs from 5125 to 5375 RPM.

2.1.5 Main Screen Commands

The next section discusses some of the commands available at the top of the Main Screen. Most will not be discussed here in detail, as they are discussed in other sections of this manual.

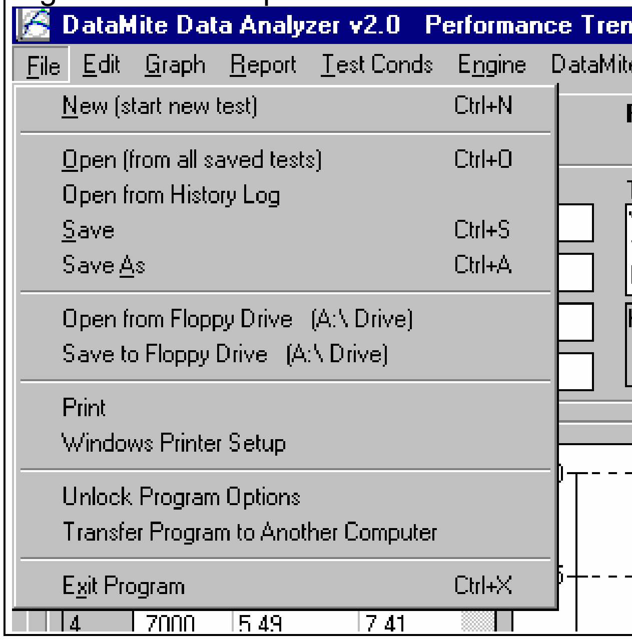
File (see Figure 2.6 for File Options)

New (get data from DataMite)

Click on File, then New to start a new test. This process will “walk you through” some critical steps to preparing to download data from the DataMite. You can select to keep certain data from the previous test like test comments, engine specs, etc.

Keeping data can save you considerable time since you don't have to type in information which may be the same as the current test. The New Test command is discussed in full detail in Section 2.9.

Figure 2.6 File Options at Main Screen



Open (from all saved tests)

This option presents the Open Test File menu discussed in Section 3.5, Data Libraries. From there you have several options to open a previously saved test file from any place in the Test Library, or from most any place on the computer, including the floppy disk drive.

Open (from History Log) (Pro version only)

This option presents the History Log, a chronological list of test files you have been working with as discussed in Section 3.7. From there you can review a summary of the last 25 to 100 tests, and pick one to open. This method can make it easier to find a file you have just worked with lately, say in the last couple of weeks.

Save

Select Save if you want to save the current test and any recent changes ***to the same name*** as you are currently working with. This is the file name shown in square bracket [ ] at the top of the Main Screen.

Save As

Select Save As if you want to save the current test and any recent changes ***to a new name or new folder***. You will be presented with the menu discussed in Section 3.5 where you can change the test name, change the folder you are saving it to, or add a new folder name.

Open from Floppy Drive
Save to Floppy Drive

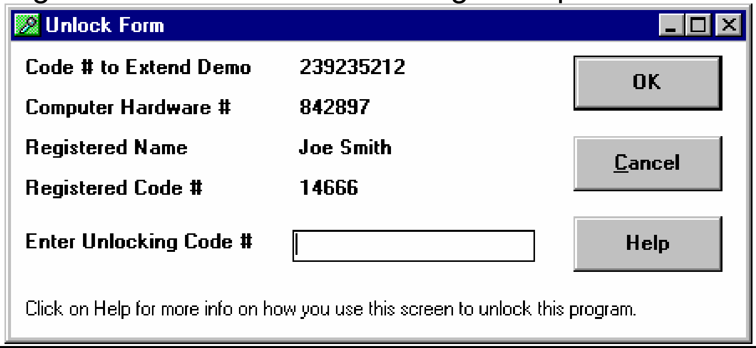
The Open command provides a simple 1 click command to open a standard Windows "File Open" menu displaying the contents of the disk in the Floppy Drive. The Save command provides a simple 1 click command to save the current test file to the disk in the Floppy Drive to the same name as is currently being used. These commands provides a convenient method for copying files from one computer to another. The drive letter (A or B) that the program defaults to can be changed in the Preferences menu, Section 2.2 (Advanced Users: This command copies all 3 files which make up a test file, the .CFG, .DAT and .LAP file. See Section 3.5 Data Libraries.)

Print
Windows Printer Setup

The Print command will produce a printout of all the data on the Main Screen. Many users find this to be a convenient summary of a test. The Windows Printer Setup lets you change your Windows default printer, paper orientation, etc for printing reports or graphs in other areas of the program.

Unlock Program Options

Figure 2.7 Menu to Unlock Program Options



The Dyno DataMite Analyzer is equipped with copy protection. This ensures that legitimate users do not have to cover the costs for unauthorized distribution of the program. When you first receive the program, it is in demo mode. In demo mode you can try either the Basic version, or the full Professional version for ten days. ***All features are working in demo mode***.

Sometime during those 10 days, you must call Performance Trends to obtain an "Unlocking Code". This Unlocking Code will be for either the Basic version or the Pro Version, whichever you have purchased.

Before you call Performance Trends, you should get your registered code number and computer hardware number. These are available by clicking on File in the upper left hand corner of the Main Screen, then clicking on Unlocking Program Options. A screen will appear as shown in Figure 2.7. See Section 1.2 for more information on how to unlock the program.

Graph

The Graph command lets you graph several different types of data from the current test, either by itself or with data from other tests for comparisons. The Graph options are discussed in detail is Section 3.3, page 91.

Report

The Report command lets you create reports of several different types of data from the current test. The Report options are discussed in detail is Section 3.1, page 83.

Test Conds

The Test Conds command opens up the Test Conditions menu. There you tell the program what type of test you ran and the weather conditions which are used for the correction factor. In the Pro version you can also specify what type of corrections you want to make and have a place to record some running conditions, like coolant temp, etc.

Engine (Pro version only)

The Engine command opens up the Engine Specs menu. There you can describe the engine you are testing. Some of these inputs are actually used for calculations, like if you want corrections made for Engine Inertia effects (in Test Conditions). Then inputs like Stroke, Crank Weight, etc are used to estimate Engine Inertia. Many of the other specs, like Head(s), Cam, etc are just spots to record info about this engine. Engine Specs are discussed in detail in Section 2.4, page 33.

DataMite

The DataMite command opens up the DataMite Specs menu, where you can describe the DataMite you are using, what each channel is recording and how each channel is calibrated.

The specs in the DataMite menu are critical for accurate results. Be sure to read and understand the DataMite Specs as discussed in detail in Section 2.5, page 41.

Dyno

The Dyno command opens up the Dyno Specs menu, where you can describe the Dyno you are using. These specs are critical for calculating torque and HP from the raw data you are actually recording.

The specs in the Dyno menu are critical for accurate results. Be sure to read and understand the Dyno Specs as discussed in detail in Section 2.6, page 49.

Preferences

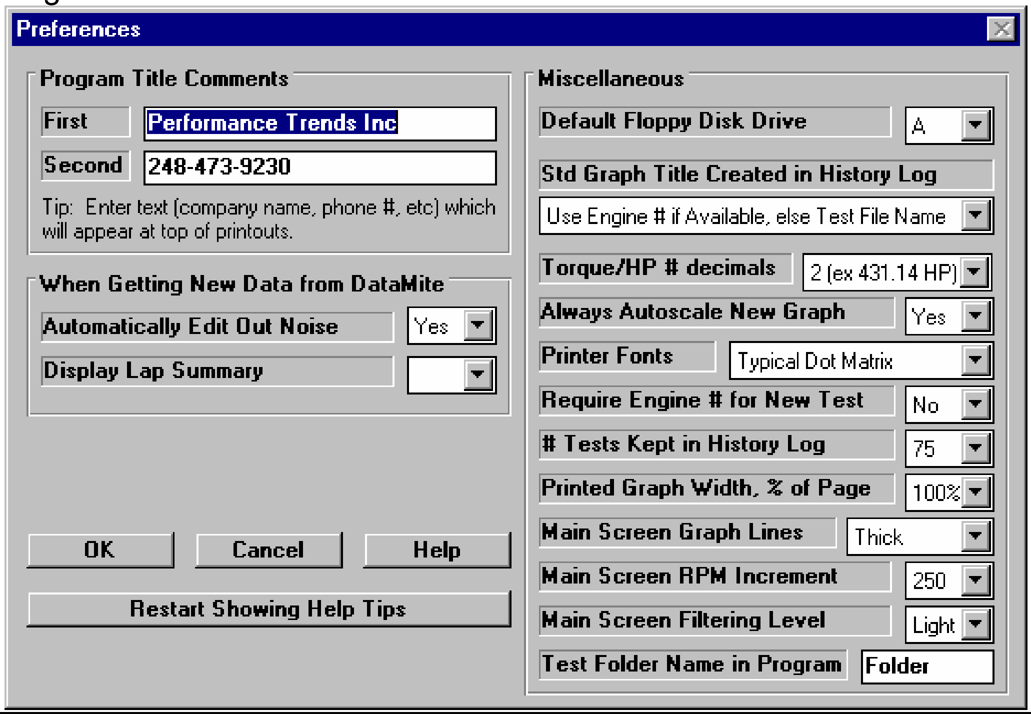
Preferences let you customize the program for your needs and for your computer and printer. See Section 2.2, page 23.

Help

Click on Help for several options to help describe your options at the Main Screen, and for other information to help you understand how this program works.

2.2 Preferences

Figure 2.8 Preferences Menu



Click on the Preferences item in the menu bar at the top of the Main Screen to bring up the Preferences menu shown in Figure 2.8. Here you can adjust some program items to personalize the program for your needs. Preferences may also save time by eliminating steps you don't require.

Program Title Comments

Enter most any text here for the First and Second lines. These 2 lines will appear at the top of printouts and printed graphs. This is a good place for your business name or your personal name. You can change these entries as often as you wish.

When Getting New Data from DataMite

Automatically Filter Out Noise

Choose Yes for Automatically Edit Out Noise and the program will automatically remove 'noise spikes' from each new test you record from the DataMite. This is good for beginners. Choosing No can be useful to troubleshoot the source of the noise.

Display Run Summary

Choose Yes for Display Run Summary and the program automatically shows a summary of how it divided a test into different runs. This is good for beginners. Choosing No can save time by eliminating extra screens when getting (downloading) data from the DataMite.

Default Floppy Disk Drive

Choose the letter of the floppy disk drive on your computer, usually A . This is the disk drive which will be first opened when using the Save to Floppy Disk or Open from Floppy Disk File commands at the Main Screen.

Std Graph Title Created in History Log (Pro version only)

Choose how you want the standard Graph Name created in the History Log. If you are very careful about how you use engine #s, then Engine Number may be a good choice. However, for most users, the Test File Name is a better choice.

Torque/HP # decimals

Pick the number of decimal places you want displayed for Torque and HP on graphs and reports. For small engines (like Briggs), choose 2 to obtain more detail, like 7.45 HP. For larger engines, choose 1 or 0 for numbers like 122.3 HP or 591 HP respectively.

Always Autoscale New Graph (Pro version only)

Choose Yes for 'Always Autoscale New Graph' and each time you do a new graph, the graph is autoscaled (program picks the scales to show all data). This is usually the best for beginners. Choose No and any manual scales you have set will be maintained for each new graph, until you quit the program.

Require Engine # for New Test (Pro version only)

Choose Yes and whenever you start a new test, the program will not let you proceed until you have entered an Engine #. This is useful for shops which carefully number every engine they work on. It also encourages you to use engine #s which follow a certain format, generally several letters followed by several #s, which increase in sequence.

For smaller shops or shops which are less “fussy” about engine #s, you may want to choose No. Then you can type in most any number you want or leave Engine # blank. If you select this option, it is strongly recommended you set Std Graph Title Created in History Log preference described above to “Test File Name”.

Printer Fonts

Choose which basic type of font to use for printouts. You may not get your choice if your printer does not support that particular font.

Tests Kept in History Log (Pro version only)

Pick the number of tests which you want the History Log to hold, from 25 to 100.

Printed Graph Width, % of Page

Due to the endless combinations of computers, Windows setups and printers, some printed graphs may not fill the page, some may extend off the page to the right. This option lets you expand (% greater than 100) or shrink (% less than 100) the printed graph to better fit the page.

Main Screen Graph Lines

This option lets you choose the line thickness of the summary graph of Corrected Torque and HP vs RPM for the current run of the current test file displayed on the Main Screen.

Main Screen RPM Increment

This spec lets you pick how often you want RPM data reported on the Main Screen, much like the similar spec for Reports. The smaller the number, the more data which is reported, the longer the list of torque and HP data, and the "jumpier" (less smooth) the Main Screen graph.

Main Screen Filtering Level

This spec lets you pick how much filtering (smoothing) the program does to the RPM data reported on the Main Screen, much like the similar spec for Reports. The higher the filtering, the less "jumpy" (more smooth) the Main Screen graphs.

Test Folder Name in Program

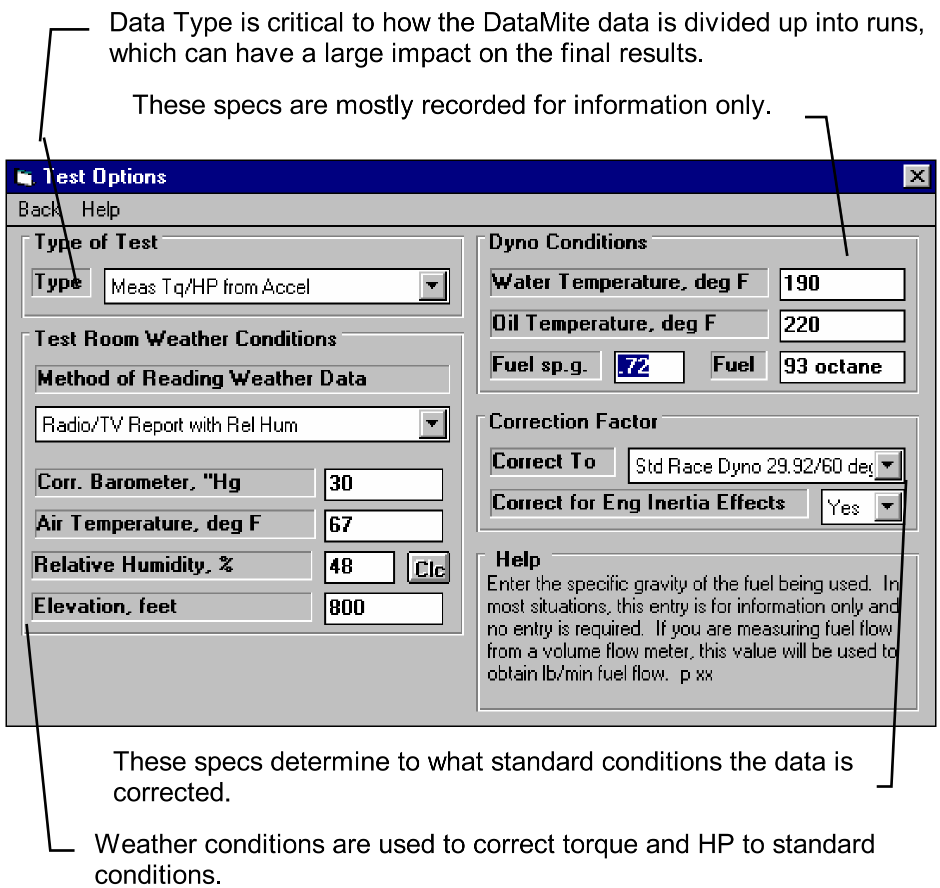
The Dyno DataMite Analyzer saves tests under different folders (directories) under the main folder DTMDATA. Some users may prefer to have the 'Folder' be called 'EngFamily' or 'Customer', depending how they choose to organize their tests. Your entry here of most any text up to 9 characters is what the program will use to call the different folders where test files are stored.

Note: In the DOS version 1.x, these folders were called "tracks". If you want to match the wording used in the DOS version 2.1, change this word to Track.

2.3 Test Conds

The Test Conds let you record weather conditions on which corrected torque and HP numbers are based. In the Pro version it also lets you record some running conditions and specify ***how*** you want the torque and HP data corrected.

Figure 2.9 Test Conds Menu (Pro version)



Type of Test

Click on down arrow to select the type of test you ran. This choice can have a large impact on what data is graphed and analyzed. Your choices are basically:

- Dyno Run to measure torque and HP.
- Custom Test, which would be anything else.

Notice that some of the choices are not used, as they are used for Test Types in the vehicle versions of the software.

Weather Conditions

The weather conditions surrounding the engine affect the air's oxygen density which affects engine power. You can use your own "weather stations". In this cases, be sure you read the Notes on Weather Conditions at the end of this section., page 29.

Method of Recording Weather Data

Click on the down arrow button of this combo box to be presented with this list of options:

- Radio/TV Report with Rel Hum
- Radio/TV Report with Dew Pt
- Uncorr. Baro with Rel Hum
- Uncorr. Baro with Dew Pt
- Altimeter with Rel Hum
- Altimeter with Dew Pt

If you change the Method, the 4 inputs specs in the Weather section are changed or enabled/disabled as necessary to represent the new Method. In addition, all the input specs are adjusted to what they would be with the new Method. For example, Corr. Barometer of 29.3" at an elevation of 1200 feet is converted to 28.03" Obs Barometer with Elevation disabled. (Elevation is not important when you are using an uncorrected or observed barometer, as this type of barometer shows the actual air pressure at the dyno.)

If you change from “Uncorr Baro” to Radio/TV Report with a “Corr. Baro”, the program will ask for an Elevation for the track, since this is needed to make the Barometer Correction. All these different inputs are explained below.

Barometric Pressure

Corr. Barometer, "Hg

This input is used for either “Radio/TV Report with Rel Hum” or “Radio/TV Report with Dew Pt”. It is the Corrected Barometric Pressure in inches of Mercury you will hear from most any TV or radio weather report. This spec is disabled if you are using an Altimeter, because the altimeter alone is measuring the air pressure.

Obs. Barometer, "Hg

This input is used for either “Uncorr. Baro with Rel Hum” or “Uncorr. Baro with Dew Pt”. It is the actual or observed Barometric Pressure in inches of Mercury at the track. These barometers measure the actual air pressure at the track, and will read ***approximately*** .1 inches of mercury less than the barometric pressure you will hear from a TV or radio weather report for each 100 feet of elevation. This spec is disabled if you are using an Altimeter, because the altimeter alone is measuring the air pressure.

Air Temperature

Air Temperature deg F

Air temperature in degrees F of the air at the entrance to the air cleaner, carb or throttle body. Be careful not to get this too close to the carb if there is fuel “stand off” (fuel mist spraying back out of the engine). This fuel on any temperature measurement instrument will make the air temperature look much colder than the air actually is. This spec is used for all Methods of Recording Weather Data.

Humidity

Relative Humidity, %

Describes the air’s humidity level in percent of humidity the air could hold at its present temperature. Relative Humidity can be calculated from either wet and dry bulb temperatures, or from dew point and air temperature readings by clicking on the Clc button. See Section 2.8.4, page 67.

> Relative humidity is only useful when you know the air temperature where the relative humidity is measured. Since that temperature may be quite different than the air temperature going into the engine, Dew Point described below is a better, less confusing way to enter the air’s moisture level.

Dew Point, deg F

The dew point in degrees F of the air at the track, which describes the air's humidity level. The Dew Point, deg F must be less than the Air Temperature. Dew Point can be calculated from either wet and dry bulb temperatures, or from relative humidity and air temperature readings by clicking on the Clc button. See Section 2.8.3, page 66.

Dew Point is a less confusing way of describing the air's moisture level than relative humidity. Relative humidity readings are only meaningful if the air temperature when the reading was made is also known. However, the air's dew point remains constant even when the air temperature changes. For example, 40 degree air with a 80 % relative humidity has only a 10% relative humidity when the same air is heated to 100 degrees. However, the dew point remains at 36 degrees for both air temperatures.

Elevation

Elevation, ft

The elevation of the track above sea level in feet. This spec is only used if you are using a Corrected Barometer, like from a TV or radio station weather report. If the elevation is below sea level (very unlikely), enter a negative (-) feet for this reading.

Altimeter

The altitude in feet above sea level from an altimeter instrument. The program assumes the altimeter is corrected to 29.92". This means on a standard 29.92" barometric pressure, 60 deg day, the altimeter would read 0 feet at sea level. If the altimeter is reading feet below sea level, enter a negative (-) feet for this reading.

Notes on Weather Readings and Weather Stations

Many dyno testers will use "weather stations", a collection of temperature, humidity and barometric pressure measuring devices. When using these instruments, here are some things to keep in mind:

- Unless you are very close to sea level, an actual (observed or uncorrected) barometer will usually read less than a TV or radio weather report barometer. For elevations less than 5000 feet, an uncorrected barometer should read ***approximately*** 0.1 " Mercury less for each 100 feet of elevation above sea level. For example, if your barometer instrument is at 850 feet elevation and the closest weather station reports 30.46" barometric pressure, your barometer should read ***approximately*** .85" (850/100 x .1) less, or 30.46-.85= 29.61. It is useful to keep records of information like this (what your actual barometer reads versus what this simple calculation says it should approximately read) to see if the comparison is constantly jumping around. If you always make the check at the same place (same elevation) like your home or shop, and the difference is varying high by .1", than low by .2", etc., you may want to have the barometer or altimeter checked out.
- If you find that you are making many adjustments to your weather station, you are probably doing something wrong. A barometer or altimeter which reads low, but ***consistently*** reads low is better for correcting torque and HP to see trends than one you are trying to keep accurate by constantly adjusting it.

Performance Trends is developing an electronic weather station to help eliminate any confusion and improve accuracy.

Dyno Conditions

Water Temperature, deg F

Enter the average temperature of the coolant during the test. For air cooled engines, enter the cylinder head temperature or cooling air temperature. This entry is for information only. No entry is required.

Oil Temperature, deg F

Enter the average temperature of the oil during the test. This entry is for information only. No entry is required.

Fuel sp.g.

Enter the specific gravity of the fuel being used. In most situations, this entry is for information only and no entry is required. If you are measuring fuel flow from a volume flow meter, this value will be used to obtain lb/min fuel flow.

Fuel

Enter most any description of the fuel being used, octane, vapor pressure, fuel brand, etc. This entry is for information only. No entry is required.

Correction Factor

Correct To

Click on down arrow to select the type of correction factor you want to use for corrected Torque and HP. 'Std Race Dyno' corrects to 29.92" Hg, 60 deg F dry air, which is typical of most aftermarket and race dyno runs you will see in the United States . 'Std SAE' corrects to 29.6" Hg, 77 deg F air with 49 deg F dew point humidity and is what most new car engines are rated to.

Correct for Eng Inertia Effects

Click on down arrow to select if you want all torque and HP numbers corrected for the engine's inertia effects when the engine is accelerating. Just as the inertia dyno absorbs torque during an acceleration, the engine’s internal inertia (crank, engine flywheel, etc) absorbs torque which does not pass through to the dyno. This correction, if set to Yes, attempts to produce torque and HP numbers you would see during a steady state or 'step' test.

2.4 Engine Specs (Pro version only)

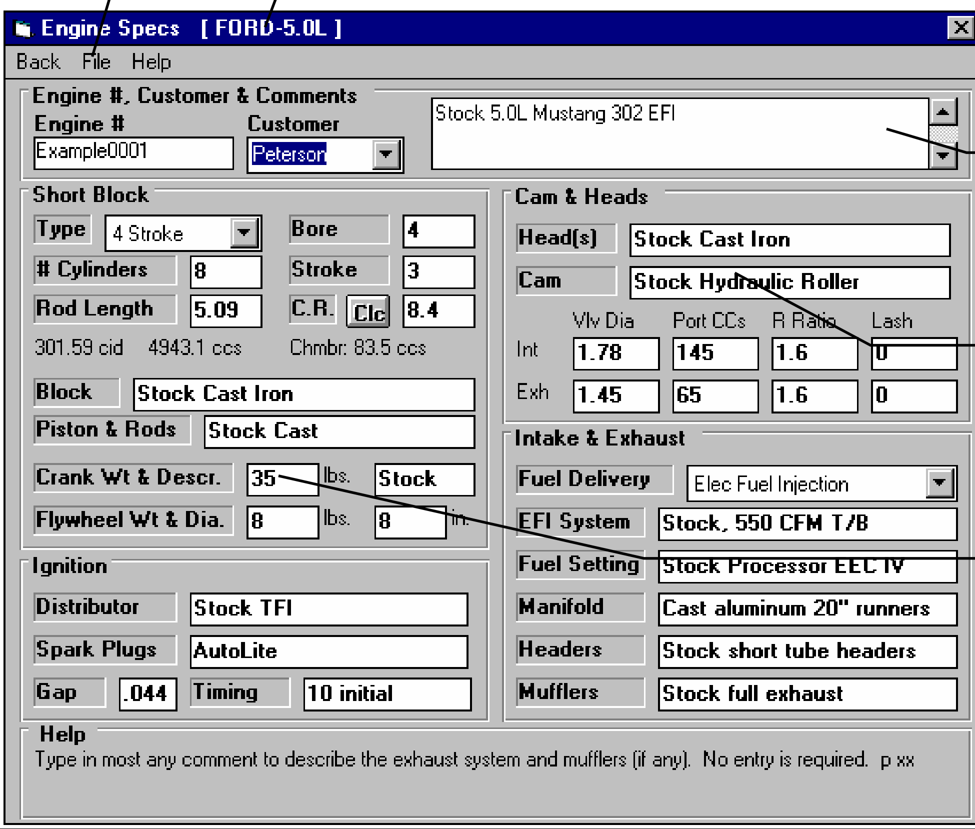
The Engine Specs describe the engine being tested. Some specs are used for calculations, but most of the other specs are for information only. You can use the “Filter” command in the Open (from all saved tests) menu to find tests you have saved based on these entries. For example, you can find all test you’ve run where the Cam description has the word “Crane” in it.

Figure 2.10 Engine Menu

Click on File, then:

- New to blank out this menu.
- Open Example to pick an example engine provided with the program.
- Save to save these engine specs to a name of your choosing.
- Print or Windows Printer Setup to print this screen.

Name of current set of Engine Specs (Ford-5.0L). You give the specs a name when you save them.



Engine Comments (different than Test Comments) lets you describe the engine itself.

Most specs in this screen are for recording information only, and are not used for any calculations. You can enter most anything you want, or leave them blank.

Some Short Block specs are used to estimate Engine Inertia, which can be used to estimate losses to accelerating engine inertia for some dyno tests. See Test Conds, Section 2.3.

Engine #, Customer and Comments

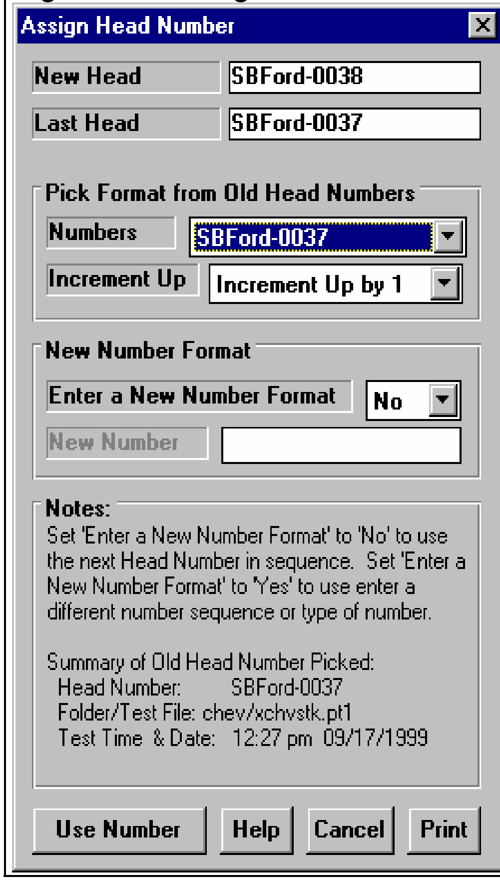
Engine

Engine numbers can be critical for shops testing many engines. The program keeps track of numbers so you don't assign duplicates or skip numbers. Consistency of Engine number patterns also makes it easy to find engines in the Test Library. If you click on the Engine # spec, the menu of Figure 2.11 is displayed. This menu lets you pick a new engine # 3 different ways.

1. You can start a new Engine # format if you select Yes for Enter a New Number Format. For example, say you currently are using 'Johnson0012' as a Engine # for 1 customer Johnson. Now you have a new customer Smith and you want to start with #s like 'Smith0000'.
2. You can simple use the last Engine # used, incremented up by 1 if you select No for Enter a New Number Format.
3. Select No for Enter a New Number Format, then select some other Engine # (not the latest Engine #) from the Numbers list, and a new Engine # will be created from it. This new # will be, either the exact # you picked (typical if you are testing an engine which you have already tested), or incremented up by 1 if you request it (typical if you are working with a new engine but with the same Engine # format). This is a list of the last 100 Engine #s you have assigned.

For Advanced Users: To delete or change #s in this list, use WordPad or NotePad and edit the 'Headnum.pti' file in the DTM20 folder, but keep a backup in case you make a mistake.

Figure 2.11 Engine # Menu



Customer

Click on the down arrow of Customer to be presented with a list of customers you have previously used. You can pick one of these customers, or type in a new one. New ones are saved by the program and added to the list.

For Advanced Users: To delete or change customer names in this list, use WordPad or NotePad and edit the 'Customer.pti' file in the DTM20 folder, but keep a backup in case you make a mistake.

Comments

Type in comments to help describe these engine specs. These comments are saved with the Test File, with the Engine File if you save the Engine File, and can be printed out with the Engine Specs when reports are printed.

Short Block Specs:

Type

Click on the down arrow button to select either 2 Stroke or 4 stroke engine types.

Bore

Cylinder bore measured in inches.

Cylinders

Number of cylinders in the engine (ex. for a V-8, this would be 8).

Stroke

Piston stroke measured in inches. This specs is also used only for correcting engine power for engine inertia effects. See Correction Factor in Test Options.

Rod Length

Center to center connecting rod length measured in inches.

C.R.

Compression Ratio. Click on the Clc button to calculate Compression Ratio from other inputs.

Block

Type in most any comment to describe the block, bearings, deck height, etc. No entry is required.

Piston & Rods

Type in most any comment to describe the Pistons, wrist pins, rings and Connecting Rods. No entry is required.

Crank Wt & Descr.

Enter the weight of the crankshaft in lbs. This specs is used only for correcting engine power for engine inertia effects. See Correction Factor in Test Options.

Crank Description

Type in most any comment to describe the crankshaft. No entry is required.

Flywheel Wt & Dia.

Enter the weight of the flywheel in lbs. This specs is used only for correcting engine power for engine inertia effects. See Correction Factor in Test Options.

Flywheel Diameter

Enter the outside diameter of the flywheel in inches. This specs is used only for correcting engine power for engine inertia effects. See Correction Factor in Test Options.

Ignition

Distributor

Type in most any comment to describe the ignition distributor or ignition system. No entry is required.

Spark Plugs

Type in most any comment to describe the spark plugs. No entry is required.

Gap

Type in most any comment to describe the spark plug gap, generally a number in thousandths of an inch, like .035 . No entry is required.

Timing

Type in most any comment to describe the ignition timing. No entry is required.

Heads & Cam

Head(s)

Type in most any comment to describe the cylinder heads. No entry is required.

Cam

Type in most any comment to describe the cam shaft or cam timing. No entry is required.

Intake Valve Diameter

Enter the diameter of the intake valve in inches. This number is not used for calculations and no entry is required.

Intake Port Volume

Enter the volume of the intake port in CCs. This number is not used for calculations and no entry is required.

Intake Rocker Arm Ratio

Enter the ratio of the intake Rocker Arm. This number is not used for calculations and no entry is required.

Intake Valve Lash

Enter the intake valve lash in inches (ex .018). This number is not used for calculations and no entry is required.

Exhaust Valve Diameter

Enter the diameter of the Exhaust valve in inches. This number is not used for calculations and no entry is required.

Exhaust Port Volume

Enter the volume of the Exhaust port in CCs. This number is not used for calculations and no entry is required.

Exhaust Rocker Arm Ratio

Enter the ratio of the Exhaust Rocker Arm. This number is not used for calculations and no entry is required.

Exhaust Valve Lash

Enter the Exhaust valve lash in inches (ex .018). This number is not used for calculations and no entry is required.

Intake & Exhaust

Fuel Delivery

Click on the down arrow button to select the type of fuel delivery system. This number is not used for calculations and no entry is required.

Carb

Type in most any comment to describe the carburetor(s). No entry is required.

Fuel Setting

Type in most any comment to describe the jetting, power valve, injector duty cycle, pill size, pump, etc. No entry is required.

Manifold

Type in most any comment to describe the intake manifold (and spacer plate). No entry is required.

Headers

Type in most any comment to describe the exhaust headers or manifolds. No entry is required.

Mufflers

Type in most any comment to describe the exhaust system and mufflers (if any). No entry is required.

Menu Commands

The menu bar at the top provides for several command options, some which are fairly self explanatory:

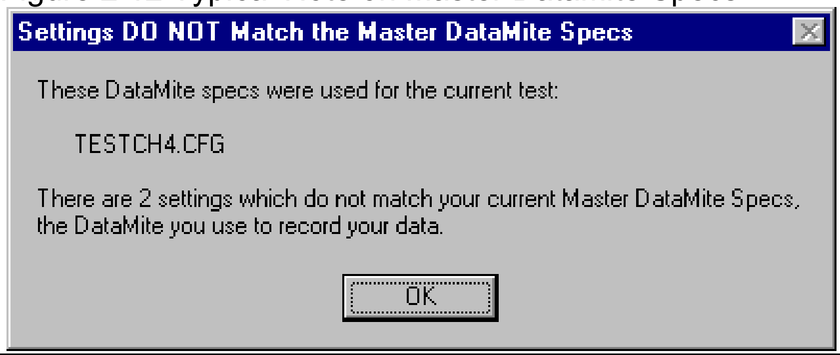
- Back (ok) closes this menu and returns you to the Main Screen.
- File opens up several typical Windows options. You can open and save these Engine specs as separate files. This allows you to easily change these specs to match a different engine with only a couple of clicks. See Section 3.5, Data Libraries.
    - New will blank out all the Engine Specs, Engine Comments; and the Engine File name will be called "Untitled".
    - Open Example Engine File will open a typical Dyno DataMite Analyzer "File Open" menu, where you can pick a set of example Engine Specs loaded by Performance Trends.
    - Open Saved Engine File will open a typical Dyno DataMite Analyzer "File Open" menu, where you can pick a set of Engine Specs which ***you*** have saved, using the Save command in this menu.
    - Save Engine File will open a typical Dyno DataMite Analyzer "File Save" menu, where you can save the current set of Engine Specs and Engine Comments under a name of your choosing. This name then appears at the top of the Engine Specs menu. This name should not be confused with the Test File Name which appears at the top of the Main Screen. The Test File includes all the Engine Specs and Test Data, and therefore includes the Engine Name.
    - Print lets you print this screen.
    - Windows Printer Setup lets you change printer selection, paper orientation, etc.
- Help brings up a series of help screens on the Engine Specs menu.

2.5 DataMite Specs

The DataMite menu tells the program what type of DataMite you have, what sensors you are using and how the sensors are calibrated.

The entries in this screen are critical to accurately recording data.

Figure 2.12 Typical Note on Master DataMite Specs

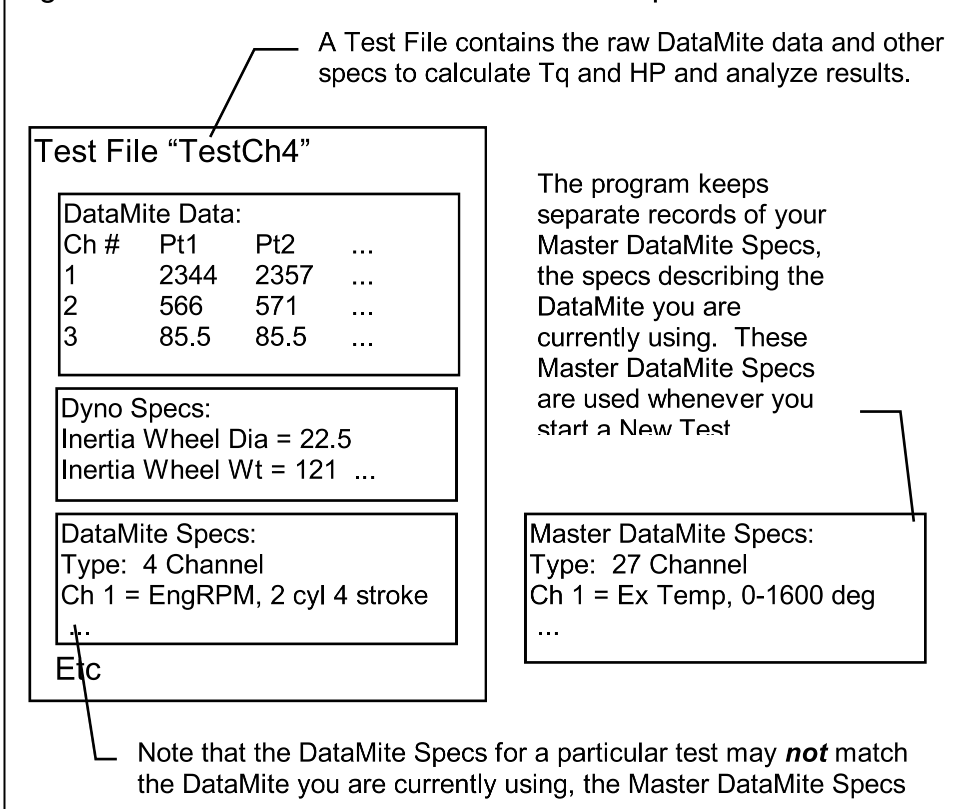


Master DataMite Specs

A critical concept for DataMite Specs is the idea of the Master DataMite Specs. When you download data from the DataMite, you are using a particular DataMite Setup with certain sensors and calibrations. (A calibration describes how the DataMite should convert a sensor input into useful information, like 2.2 volts is 34 ft lbs of torque.) When you save the dyno test, the program saves a copy of the DataMite Specs with the test. Lets call this test "TestCh4" and assume it was run with a 4 Channel DataMite.

Lets say several months later that you buy a new DataMite II 27 Channel system. (Or you could have changed any DataMite spec: different sensors, different calibrations, etc.) Your current DataMite II specs do ***not*** match the specs for "TestCh4". If you open the old "TestCh4", the program installs the 4 Channel DataMite specs which you used when you ran that test. This lets you accurately calculate torque and HP and other data just as you did when you first ran the test.

Figure 2.13 Illustration of Master DataMite Specs



If you go into the DataMite Specs menu, you will likely get a message shown in Figure 2.12, saying that the DataMite Specs for TestCh4 do not match your ***Master DataMite Specs***, the specs for your current DataMite II 27 Channel system. You may ask "What are ***Master DataMite Specs?"***

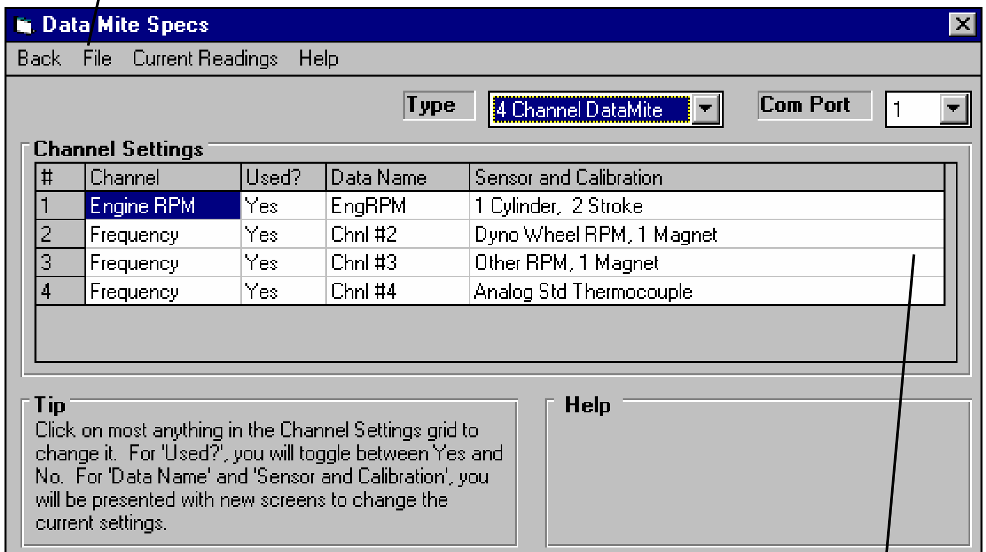
The program keeps track of any changes to DataMite Specs, asking you if these changes should only apply to the DataMite Specs for a particular dyno test, or if these changes represent your actual DataMite, the Master DataMite specs. Whenever, you start a new test, either based on a previous test or starting completely blank, the Master DataMite Specs are used. Whenever you open an old test file, the DataMite specs used for that particular test are used.

Type

Is the type of DataMite you are using, either 3 Channel, 4 Channel or the DataMite II 27 Channel system. You choice here will affect how the Channel Settings grid is displayed and how you can specify various channel #s.

Figure 2.14 DataMite Specs Menu

Click on File, then:
- Save as My Master DataMite Specs
- Open Master DataMite Specs
- Print or Windows Printer Setup to print this screen.



Click here to bring up the Sensor and Calibration screen for defining each channel, as shown in Figures 2.15 and 2.16.

Com Port

Click on the down arrow button to select computer's Com (serial) port # you are using to 'talk' to the DataMite. This spec is used to hold the last Com port the computer used to talk to the DataMite. If this particular port does not work, the program automatically checks all Com Ports on your computer, 1-4. Therefore a mistake here is not critical, but can save some time when downloading, by avoiding looking at all Com ports.

Channel Settings

Channel

This column describes the type of data recorded with this channel, like RPM, On/Off Switch, Analog Input, etc. You can not change what is in this column, as this is determined by your choice of the Type of DataMite.

Used?

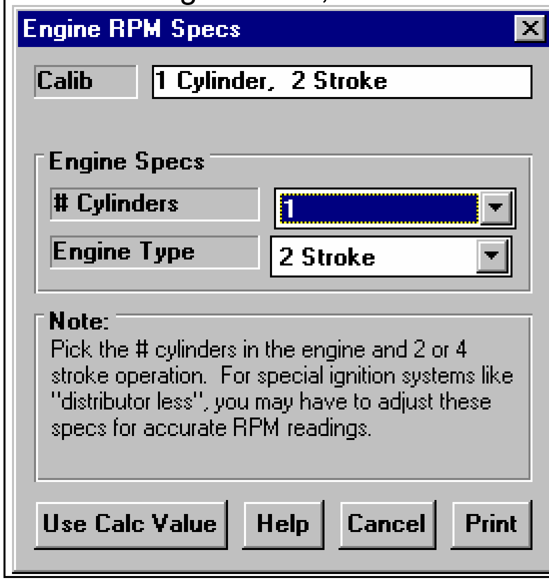
Click on this column to set it to Yes, or if it is already Yes, to blank it out (which means it is not currently being used).

Data Name

Click in this column to bring up a screen which simply asks for a new name for this data channel. This name is what will be used on graphs and reports when this channel is graphed or reported.

Sensor and Calibration

Figure 2.15 Sensor and Calibration Screen: Engine RPM, Channel 1



If you click in the Sensor and Calibration column, you will be presented with one of the screens shown if Figures 2.15 (if you click on the top row for Engine RPM) or 2.16 for most other rows (other RPM channels).

In each screen, you choose from the options below, and the calibration description is displayed at the top. This description is read by the program so it knows how to interpret the DataMite's readings and convert them to "engineering units", things like RPM, degrees F, movement in inches, etc.

Engine RPM Calibration, Figure 2.15

Cylinders

Pick the number of cylinders that obtain spark from the source of the DataMite's ignition signal. Usually, this is the number of cylinders in the engine. However, for some engines, there may be 2 or more ignition coils. A modern "distributerless" V-8 may have 4 coils, each firing 2 spark plugs. In that case, if you attached the DataMite's engine RPM wire to one of these coils, you would use 2, since each coil fires 2 cylinders.

Engine Type

This input specifies how often this spark source fires each cylinder, either 1 time for each revolution (typical 2 stroke), or 1 time for every 2 revolutions (typical 4 stroke). Again, you may have to adjust this input to match your engine. For example, a Briggs & Stratton engine fires each revolution, even though it is a 4 stroke engine with a cam and valves. For the Briggs engine, you would specify # Cylinders as 1 and Engine Type as 2 Stroke. (Note, you could also specify # Cylinders as 2 and Engine Type as 4 Stroke to obtain the same RPM data.)

Notes on RPM Data:

Engine RPM, as with most of the other RPMs, is not going to be off just a little bit. It will be off a lot if you put in the wrong calibration specs. For example, if you put in # Cylinders as 1 and Engine Type as 4 Stroke for the Briggs example above, you would obtain RPMs exactly double what they should be. If you should read 5000 RPM, you would read 10,000 RPM, if you should read 3000 RPM, you would read 6000 RPM, etc. Therefore, it is easy to find errors in calibration. You may have to adjust these inputs to make the Engine RPM read correctly. It is recommended that you only change the Engine Type, or drop the # Cylinders by one half, then one half again. This means on a V-8, you might try 4 cylinders (half), or 2 cylinders (half again), but not 7, 5 or 3 cylinders.

If you think the recorded RPM is off only a little bit (you think you should read 5000 RPM but actually read 5200 RPM), the DataMite is probably correct and your other measurement system is probably wrong. The recorded and downloaded DataMite data is much faster responding and more accurate than typical tachometers.

Other RPM Calibrations, Figure 2.16

Sensor

Pick the source of the RPM data. This can be very critical, as for an inertia dynamometer, ***you must have 1 channel specified as the Dyno Wheel RPM.*** This is the channel that is used for all inertia wheel acceleration measurements, which is what the torque and HP numbers are based on. For an Absorber Dyno, you must specify one of the channels as being for Dyno Tq. See Section 2.6, Dyno Specs for details.

The choices for this sensor include:
- Dyno Wheel RPM (required for Inertia Dynos).
- "Other RPM", which could be some RPM on an engine pulley, like water pump or supercharger RPM.
- Analog Converter (required for Absorber Dynos, with a channel set to Dyno Tq)
- Not Being Used

Your choice here will determine what other inputs on this screen are made available.

Magnets

If you have specified an RPM type of Sensor, click on the down arrow button to choose the number or magnets on the shaft or wheel.

Be sure to read the Notes on RPM Data concerning the Engine RPM calibration on the previous page. Unlike Engine RPM, where you may not be sure of the number of cylinder firings per engine revolution, the # Magnets you pick should be the same as what are actually mounted. If not, or the recorded data is "noisy", you have some other problem with your setup. See Appendix 3, Troubleshooting.

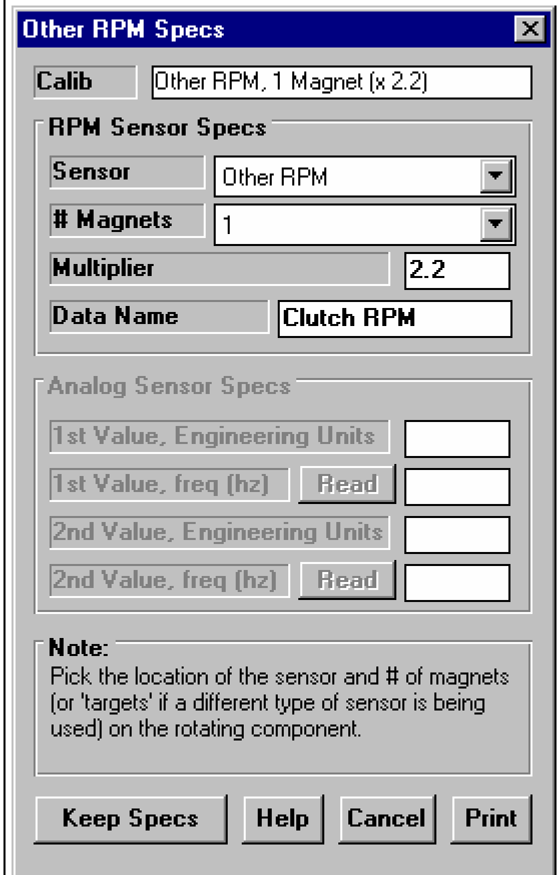
Or, Sensor Type

If you have specified an Analog Converter type of Sensor, click on the down arrow button to choose the type of sensor. For most, the program will know the calibration simply by your choice. However, if you choose "Custom (user supplies specs)", then the lower section called Analog Sensor Specs becomes enabled. See Analog Sensor Specs on the next page.

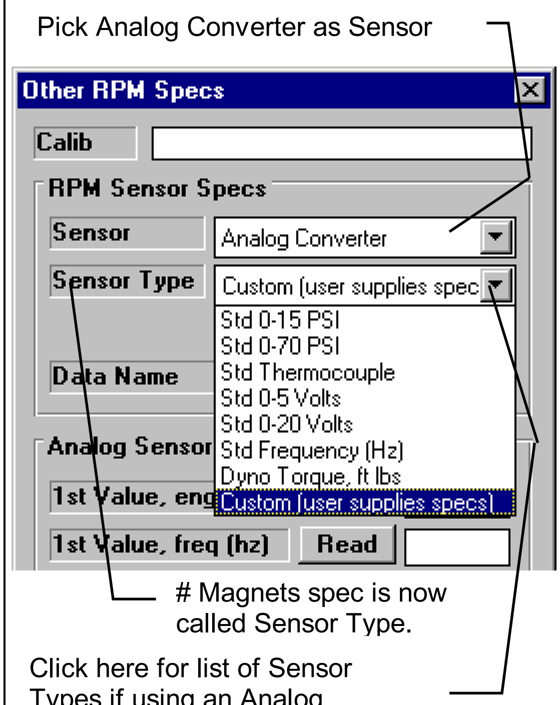
Multiplier

If you selected "Other RPM" as the Sensor, then the Multiplier spec becomes enabled. This allows you to multiply this RPM by some number. Often this is used by motorcycle racers who multiply clutch RPM by the gear reduction between the engine and the clutch. This allows them to see when Engine RPM matches "multiplied" clutch RPM, then they have zero clutch slip.

Figure 2.16 Sensor and Calibration Screen: Other RPM Channels



Screen for Analog Converter



Data Name

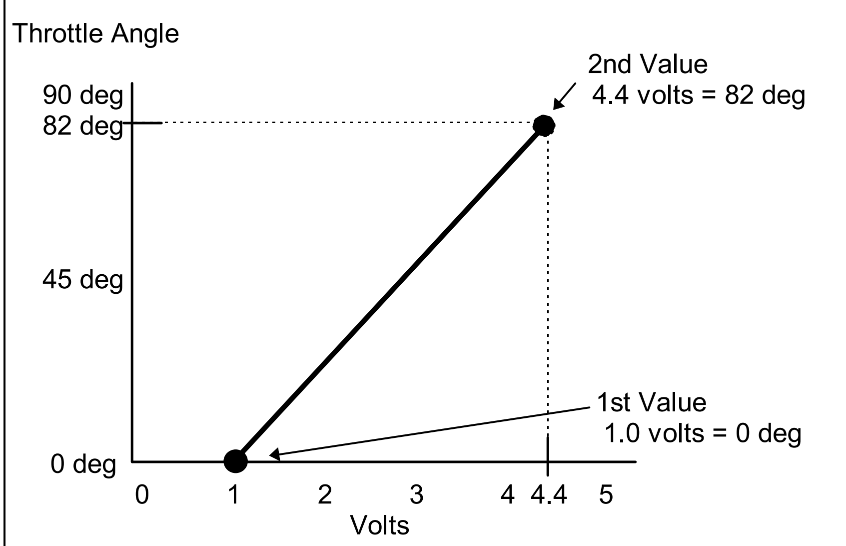
This is the Data Name shown in Column 4 of the Channel Settings grid of the main DataMite screen shown in Figure 2.14. You can change the name here in this screen, or by clicking on the name in the Channel Settings grid and entering a new name there.

Analog Sensor Specs
1st Value, Engineering Units
1st Value, Freq (hz)
2nd Value, Engineering Units
2nd Value, Freq (hz)

These 4 specs are used to calibrate a "Custom Sensor" to read most anything you want. These specs can be used 2 ways:

- Type in the information provided with the sensor. This will be on a sheet with this menu printed on it with the required information written in. This tells the computer the sensor output at 2 conditions.
- Perform a calibration. A calibration is the process where you set the sensor to 2 known conditions (positions, temperatures, etc) and let the computer read the sensor output at these 2 conditions. You can click on the 'Read' buttons to have the DataMite actually read the sensor values for these 2 conditions.

Figure 2.17 Illustration of a Custom Sensor Calibration



The process of actually performing a calibration is somewhat involved and is outlined in Appendix 5, Calibrating an Analog Sensor.

Menu Commands

Back

Simply closes this menu and returns you to the Main Screen.

If you made changes to these specs, you will be asked if you want to keep them for the current test. If you answer Yes, the results of the current test may be changed based on these changes. This is good if you are correcting a mistake. If you answer Yes, you will also be asked if these changes should be saved to the Master DataMite specs. Only answer Yes if all the current settings in this screen match the current settings, sensors and calibrations of the DataMite right now and for the near future. Remember that the Master DataMite specs will be used for the next test you download from the DataMite.

File

Open Master DataMite Specs

Click on File, then Open Master DataMite Specs and the Master DataMite specs (which should be the current DataMite setup) will be copied to this screen. When you back out of this screen, you can then keep these Master DataMite specs as the DataMite specs (sensors and calibrations) which will be used for calculating this test's results.

Save As Master DataMite Specs

Click on File, then Save As Master DataMite Specs and the current settings is this screen will be copied to the Master DataMite specs. Do this only if all the current settings in this screen DO match the current settings, sensors and calibrations of the DataMite right now and for the near future. Remember that the Master DataMite specs will be used for the next test you download from the DataMite.

Print

Click on File, then Print to print this screen.

Current Readings

Click Current Readings to display the a screen showing current readings for most sensors. This screen can be very useful for troubleshooting problems with signals, or for watching the engine through a dyno test, like a tachometer. See Section 2.7 for more details.

Help

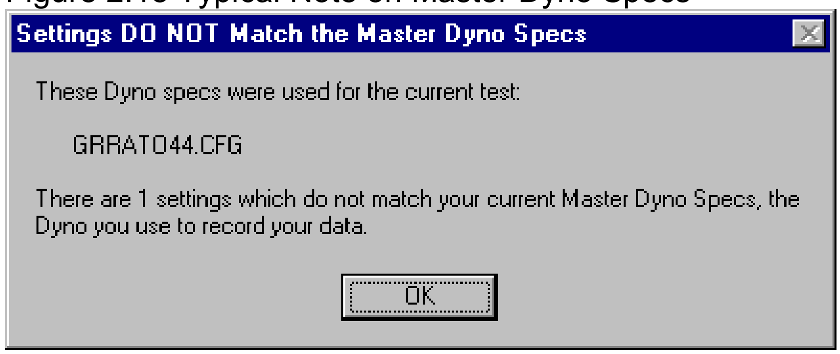
Click on Help for help on this screen.

2.6 Dyno Specs

The Dyno menu tells the program what type of Dyno you have and how you measure torque. In the Pro version you can also get into more details describing the dyno and any power losses in the system to make the torque and HP measurements more accurate.

The entries in this screen are critical to accurately recording data.

Figure 2.18 Typical Note on Master Dyno Specs



Master Dyno Specs

A critical concept for Dyno Specs is the idea of the Master Dyno Specs. When you download data from the DataMite, you are using a particular Dyno Setup. When you save the dyno test, the program saves a copy of the Dyno Specs with the test. Lets call this test "GrRato44" and assume it was run with a 4.4 gear reduction.

Lets say several months later that you test a higher RPM engine and you install a 6.2 gear reduction. (Or you could have changed any Dyno spec: different inertia wheel size, etc.) Your current Dyno specs do ***not*** match the specs for "GrRato44". If you open "GrRato44", the program installs the 4.4 gear ratio Dyno specs which you used when you ran that test. This lets you accurately calculate torque, HP, clutch slip, and other data just as you did when you first ran the test.

If you go into the Dyno Specs menu, you will likely get a message shown in Figure 2.18, saying that the Dyno Specs for GrRato44 do not match your ***Master Dyno Specs***, the specs for your current 6.2 gear reduction. You may ask "What are ***Master Dyno Specs?"***

The program keeps track of any changes to Dyno Specs, asking you if these changes should only apply to the Dyno Specs for a particular dyno test, or if these changes represent your actual Dyno, the Master Dyno specs. Whenever, you start a new test, either based on a previous test or starting completely blank, the Master Dyno Specs are used. Whenever you open an old test file, the Dyno specs used for that particular test are used.

Figure 2.19 Illustration of Master Dyno Specs

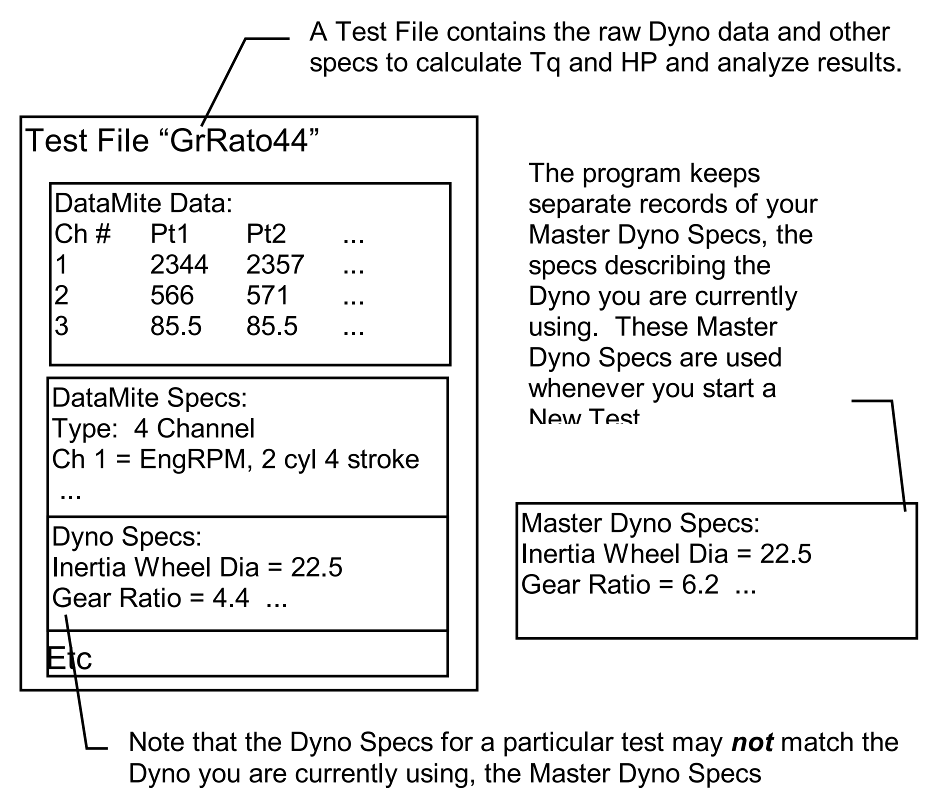
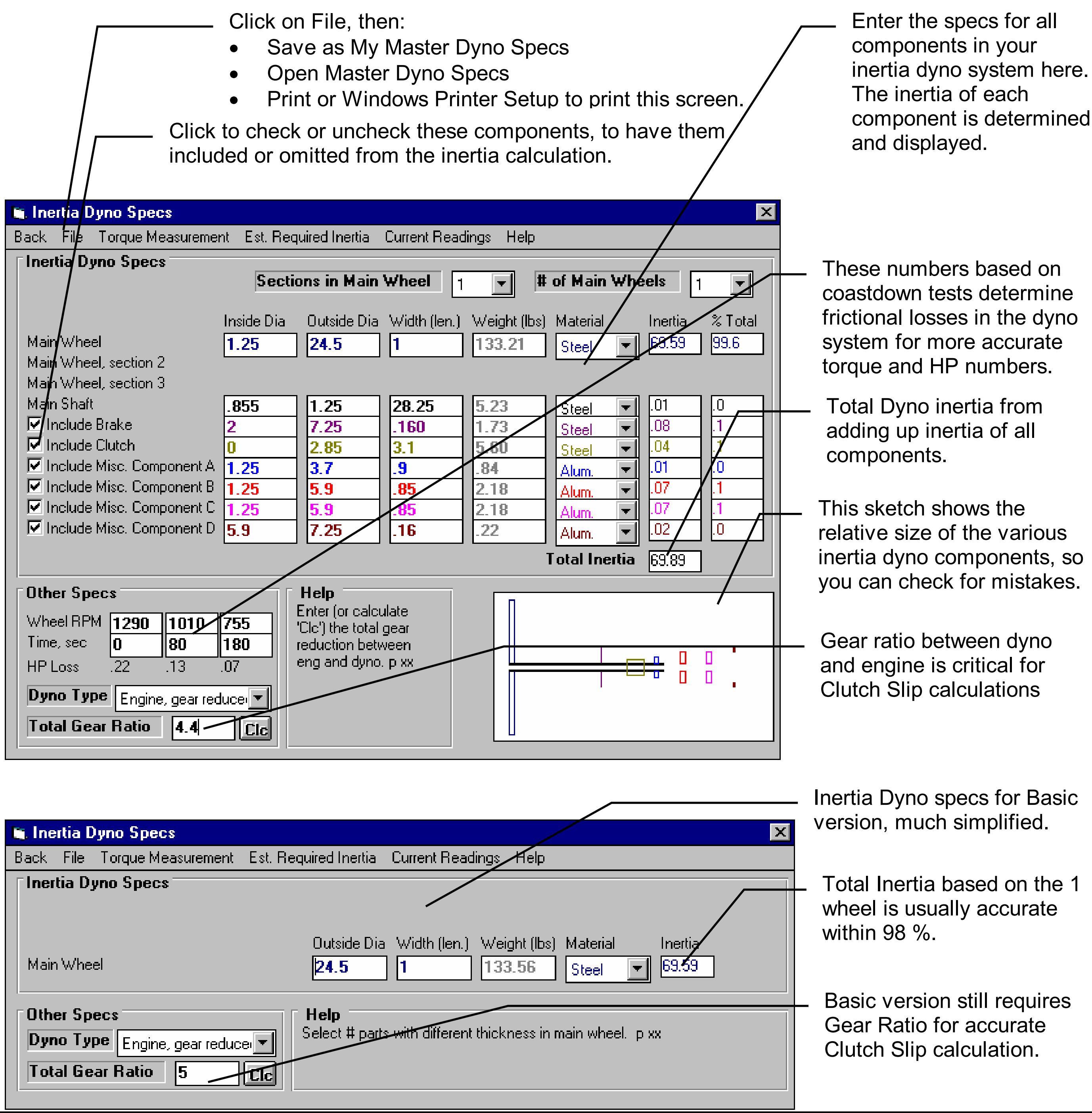


Figure 2.20 Dyno Specs Menu for Inertia Dyno (Pro Version)



Overview of Individual Inertia Wheel Dyno Components

Basic Version

For an Inertia Dyno, Basic version, simply enter the outside diameter and width of the inertia wheel. Then select the material, Steel or Aluminum, and the Wheel Wt and Inertia of the system is calculated. For Material, you can also select 'Use Wt'. This choice then disables Width and enables Weight. Now you can type in the weight directly and the Inertia is calculated.

Pro Version

In the Pro version, the process is the same except that you can identify many more components of the system. You can also specify different sections of the Main Wheels, like a wheel with a step (thicker sections at certain diameters).

First select the # Sections in the Main Wheel at the top of the screen. If your wheel is of a constant thickness, select 1. If you select more than 1, you will set the inside diameter of a larger section to the outer diameter of the smaller section. Then select the # Main Wheels installed in the system, typically 1. Some Inertia Dynos let you add or remove Main wheels as necessary to simulate different acceleration rates.

For other components which are part of the inertia wheel assembly, click on the Check Box. Then their input specs will appear and you can enter their specs similar to the Main Wheel. It does not matter what you call a component. If you have 2 brake components, enter the measurements of 1 brake component as the Brake, and the other component as a Misc Component.

You will see that for light components which have relatively small diameter, they contribute little to the overall inertia of the dyno. See the column called % Total. Therefore, the measurements of these small components contributing less than 3 % is not that critical

For each component of the inertia wheel assembly, its inertia is calculated and added to the total and its relative size is sketched in the layout in the lower right corner. The sketch is not an exact drawing of your system. It is meant only to show the relative size of the different components so you can see any obvious errors in your inputs.

Individual Inertia Dyno Specs

Sections in Main Wheel (Pro version only)

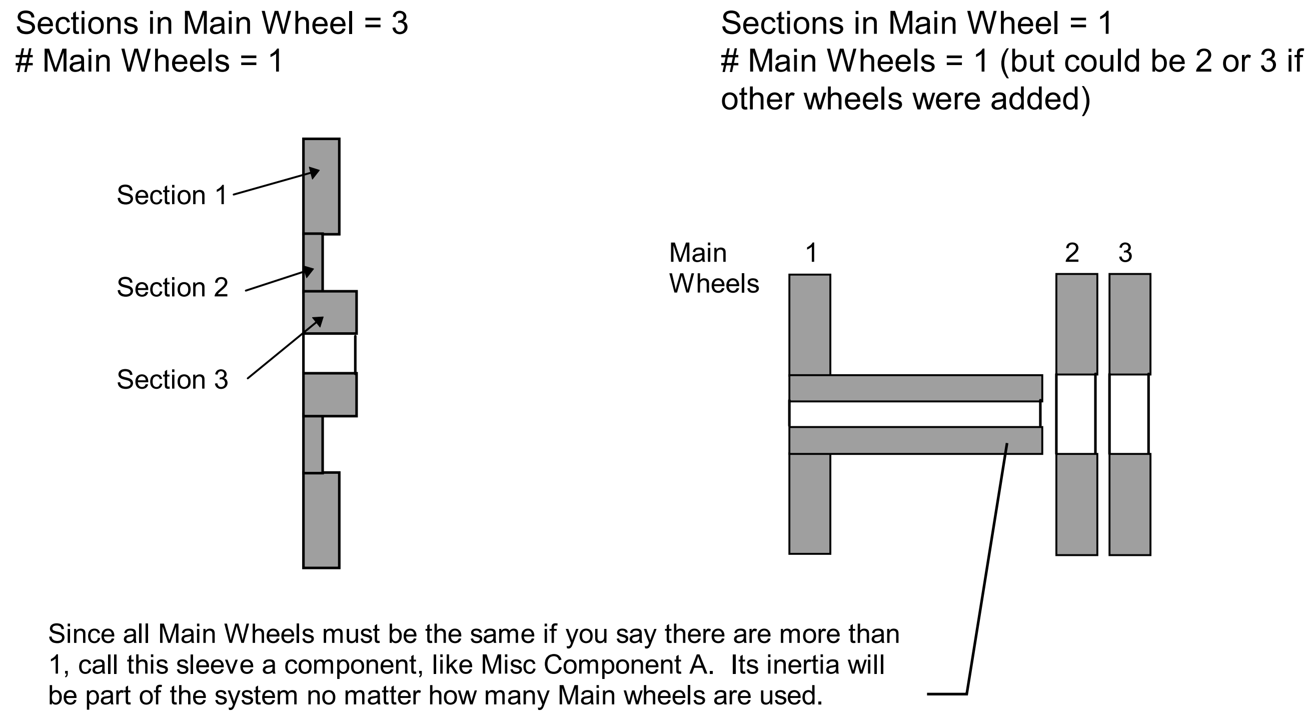
Click on the down arrow button of this spec to choose the number of sections in your main inertia wheel. If your inertia wheel has a constant thickness, choose 1 section. If it has sections of different thicknesses, then choose a number from 1-3 which best describes how many thicknesses there is. See Figure 2.21. If you have more than 1 inertia wheel which you can add or remove from the system, see the # of Main Wheels spec below, as this may influence your choice here.

of Main Wheels (Pro version only)

Click on the down arrow button to select how many wheels you have installed for this run. For most inertia dynos, there is probably only 1 main wheel. In this case you would always keep this set to 1. However, some inertia dynos can have more than 1 wheel, so inertia can be increased or decreased depending on the engine power level being tested. See Figure 2.21 for explanation.

Note that the program will just multiply the inertia of the Main Wheel specified by the # of Main Wheels. Therefore, all additional Main Wheels must be exactly the same as the Main Wheel specs you have entered.

Figure 2.21 Examples of Inertia Wheel Systems, side view



Coastdown Data (Pro version only)

In the Pro version, you can also estimate the aerodynamic and bearing losses in the dyno, for more accurate torque and HP measurements. This is done by letting the inertia wheel coast down from a high RPM to 2 lower RPMs. Start a stop watch at a high RPM. Then note the time at some significantly lower RPM, and then at some much lower RPM. The high RPM should be in the high RPM range of your engine testing, and the lowest RPM should be in the low RPM range of your engine testing.

Enter the RPMs and times, where the highest RPM will have a time of 0. The program will calculate the HP loss at the different RPMs. For small, Briggs inertia dynos, these HP losses are generally in the .2 to .4 HP range. Note that this process may be done automatically in a later version.

During this coast down, it is CRITICAL that you are NOT spinning the engine also. Coastdowns can only be done with dyno systems with clutches which complete disengage the engine, or one-way clutches. See Example 4.1 for a procedure.

Other Specs

For either the Basic or Pro version, tell the program the Type of Dyno, and any Gear Ratio between the engine and inertia wheels. Click on the Gear Ratio 'Clc' button to calculate the gear ratio. This calculation is discussed in Section 2.8.2.

Dyno Type

Select the Type of Dyno you have. In this version, this choice has little effect. In future versions it will be used to determine if separate Engine and Dyno RPM readings are required, and whether the entire vehicle is pressent (Chassis Dyno). Check the Readme.Doc file (click on Help, then Display Readme.doc File at the top of the main screen) to see if this has been updated.

Total Gear Ratio

This spec is critical for calculating Clutch Slip, the slip between the Engine and Dynamometer. In future versions, this number will be used if you specify the Dyno Type is Direct Drive (no clutch).

Menu Commands

Back

Simply closes this menu and returns you to the Main Screen.

If you made changes to these specs, you will be asked if you want to keep them for the current test. If you answer Yes, the results of the current test may be changed based on these changes. This is good if you are correcting a mistake. If you answer Yes, you will also be asked if these changes should be saved to the Master Dyno specs. Only answer Yes if all the current settings in this screen match the current specs of the Dyno right now and for the near future. Remember that the Master Dyno specs will be used for the next test you download from the Dyno.

File

Open Master Dyno Specs

Click on File, then Open Master Dyno Specs and the Master Dyno specs (which should be the current Dyno setup) will be copied to this screen. When you back out of this screen, you can then keep these Master Dyno specs as the Dyno specs which will be used for calculating this test's results.

Save As Master Dyno Specs

Click on File, then Save As Master Dyno Specs and the current settings is this screen will be copied to the Master Dyno specs. Do this only if all the current settings in this screen DO match the current specs of the Dyno right now and for the near future. Remember that the Master Dyno specs will be used for the next test you download from the Dyno.

Print

Click on File, then Print to print this screen.

Torque Measurement

Click on Torque Measurement to select the basic type of dyno you are using:

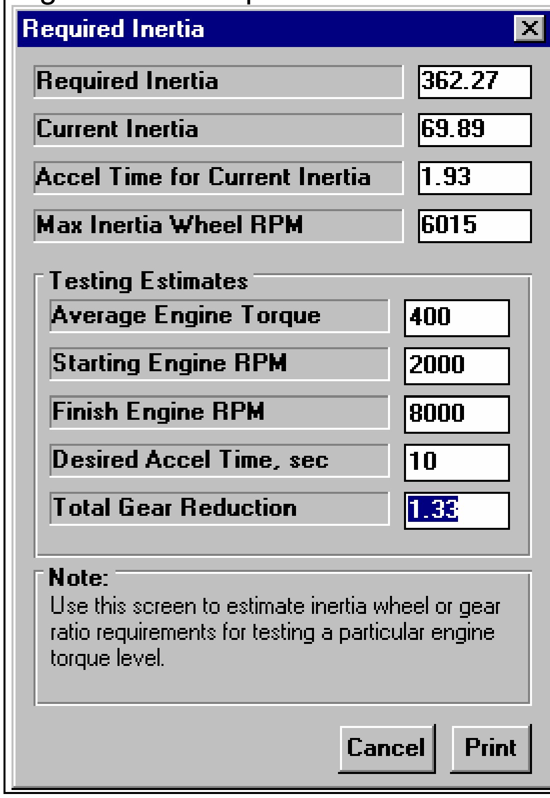
- Inertia and Acceleration (which has been discussed in the previous pages)
- Torque Arm (discussed in Section 2.6.1 on page 55, and calibrated in Appendix 5.)
- Hydraulic Pump Pressure (discussed in Section 2.6.2 on page 56)

Because the method of Torque Measurement is at the heart of any dynamometer, DO NOT change this spec unless you are setting up a completely different type of dyno. See Sections 2.6.1 and 2.6.2 for non-Inertia types of dynos.

Est. Required Inertia

Click on Est. Required Inertia to be presented with a screen shown in Figure 2.22. This screen will calculate how much dyno inertia is needed to provide a certain acceleration test time for various amounts of engine torque.

Figure 2.22 Required Inertia Menu



Required Inertia

Is the dynamometer Inertia needed to provide the acceleration rate indicated by the Testing Estimates specs.

Current Inertia

Is the total dynamometer Inertia of the current dyno specs. This is provided for comparison to the Required Inertia, and to show the Inertia number used to estimate the Accel Time for Current Inertia below.

Accel Time for Current Inertia

Is the time required for the Current Inertia to accelerate from the Starting RPM to the Finish Engine RPM for the given Average Engine Torque and other Testing Estimates specs.

Max Inertia Wheel RPM

Is the Inertia Wheel RPM for the Finish Engine RPM and Total Gear Reduction entered.

This menu does no checks on the safety or design of an inertia wheel. You must design an inertia wheel carefully for it to be safe at some particular operating RPM.

Testing Estimates

Average Engine Torque

Is your estimate of the average engine torque this engine will produce over the RPM range specified, in ft lbs (foot pounds).

Starting Engine RPM

Is the low engine RPM at the start of the test, at which you go full throttle.

Finish Engine RPM

Is the high engine RPM at the end of the test, at which you close the throttle to stop the test.

Desired Accel Time, sec

Is the time for the engine to accelerate from the Starting Engine RPM to the Finish Engine RPM. Generally, you want this time to be from 6 to 12 seconds. If you go quicker than 6 seconds, the data will not be as accurate.

Total Gear Reduction

Is the total gear ratio between the engine and inertia wheel. This should be the Gear Ratio you have entered in the Dyno Specs menu, and is set to this when you first open this menu.

Current Readings

Click Current Readings to display the a screen showing current readings for most sensors. This screen can be very useful for troubleshooting problems with signals, or for watching the engine through a dyno test, like a tachometer. See Section 2.7 for more details.

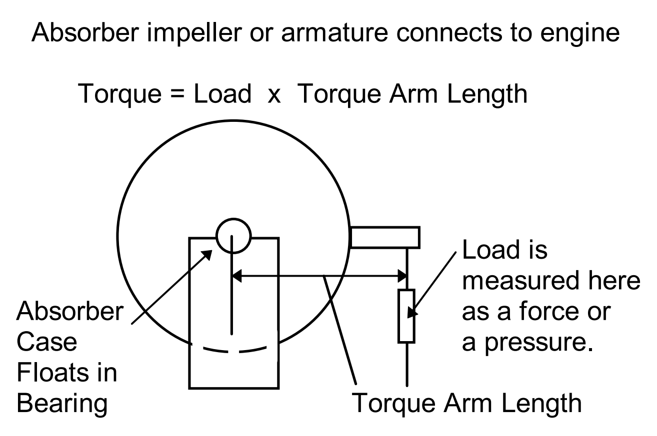
Help

Click on Help for help on this screen.

2.6.1 Torque Arm Torque Measurement

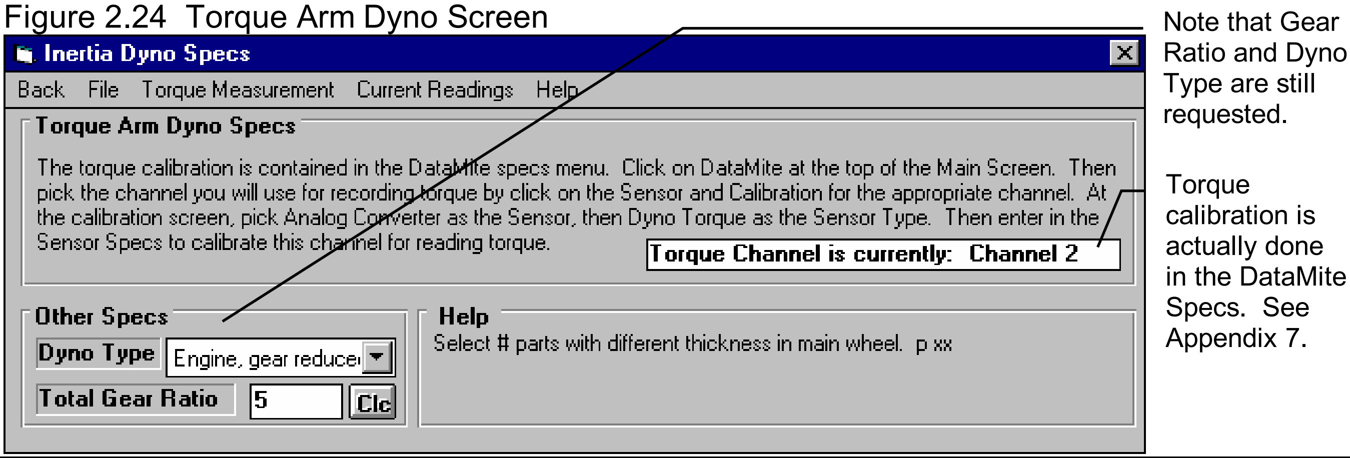
This is the type of dyno most people are used to. The engine's crankshaft is connected to an absorber, like a pump, generator, etc. The power absorber's outside case can float in bearings. A torque arm is attached to the absorber case which prevents the absorber case from turning. The force in this arm is measured, and then knowing the distance from the center of the absorber out to the torque arm, torque can be calculated. See Figure 2.23.

Figure 2.23 Torque Arm Type of Dyno



If this is your type of dyno, choose Torque Arm as the Torque Measurement type. The dyno screen now becomes very simple as shown in Figure 2.24. See Appendix 5 for calibrating a Torque Arm type of dyno.

Figure 2.24 Torque Arm Dyno Screen

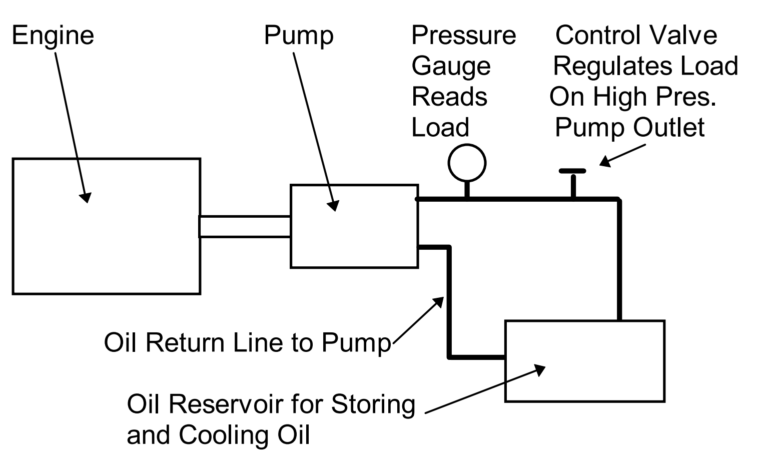


2.6.2 Hydraulic Pump Pressure

This type of dyno is similar to the Torque Arm absorber, except without the floating bearings and the torque arm. For example, you could hook up an engine to a hydraulic pump as shown in Figure 2.25. By controlling the Control Valve Opening, you can load up or unload the engine. You can read the load on the engine with the pressure gauge. To convert pressure into torque you need a performance curve for the pump you are using.

The major disadvantage of this type of dyno is that if the pump changes (more internal leakage, changes in efficiency, etc), the measured torque and HP results will change. If 1000 PSI was 10 ft lbs when the pump was new, 1000 PSI may be 11 ft lbs when the pump gets older.

Figure 2.25 Hydraulic Pump Pressure Dyno



This type of torque measurement is not yet covered in the software. The next few pages are left blank for when we further develop the software for this type of dyno.

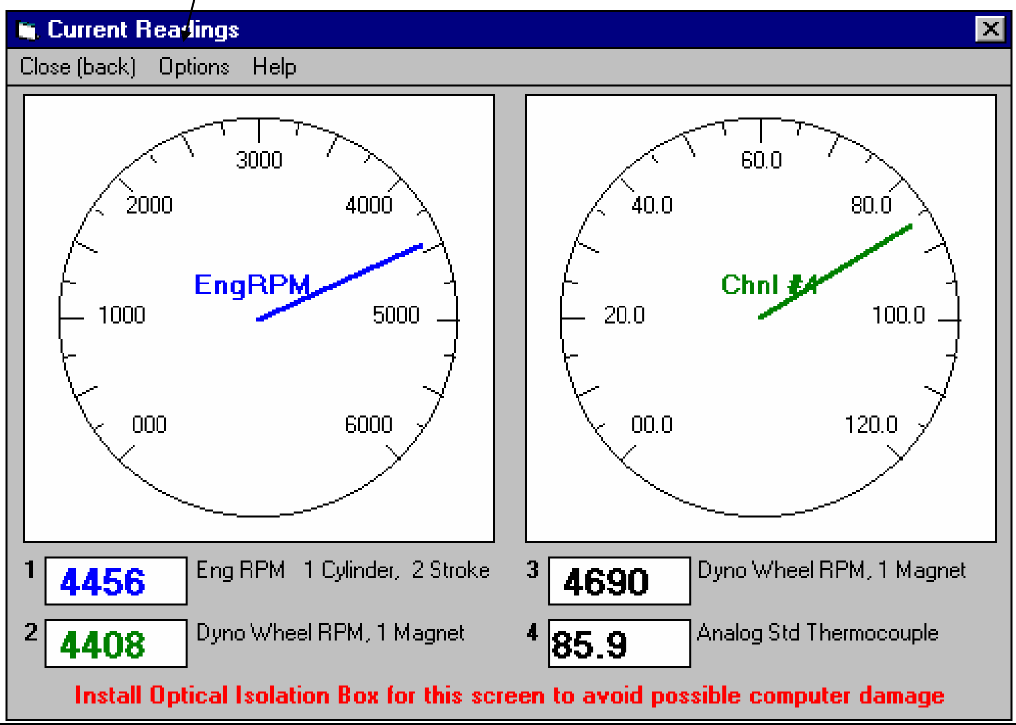
2.7 Current Readings

This screen displays the current readings of selected channels from the DataMite. Some channels are displayed on the two gauges. All channels are shown in the boxes below the gauges.

Click on the Options menu item to open a menu where you can select which channels to view on the gauges, and the range of the gauges. For example, if you want to see Dyno Wheel RPM, you would probably pick an range like 0 - 2400. However, if you were to watch Engine RPM, you would probably pick a range like 0 - 12000 RPM, because Engine RPM would go much higher than 2400 RPM. See Figure 2.32.

Figure 2.30, Current Readings Screen

Click on Options to change the screen update rate or what is displayed on the 2 gauges and the gauge scales.



IMPORTANT: It is strongly recommended that you purchase Performance Trends Optical Isolation box if you use this screen while dyno testing an engine. This will prevent 'voltage spikes' from the engine passing back through the DataMite to your computer, possibly damaging the computer.

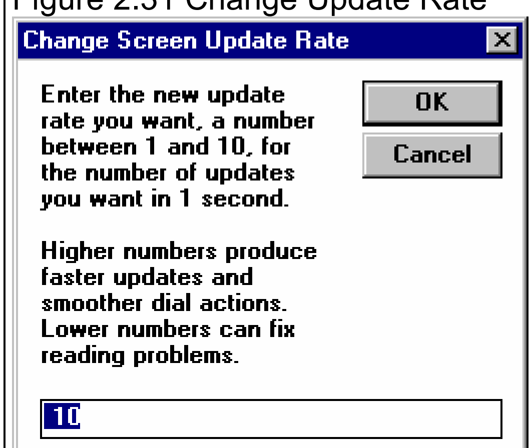
Click on Options to either select to:

- Change the update rate of this screen.
- Change what is displayed on the gauges.

Change the update rate of this screen

Click on Options, then Change Update Rate (currently x), to be presented with the screen of Figure 2.31. Enter any number between 1 and 10 to specify the number of screen updates per second. On slower computers, you may want to specify a low number like 1 or 2. This can produce more reliable readings on this screen. If you want smoother dial operation and more accurate (less lag) readings, then specify a higher update rate.

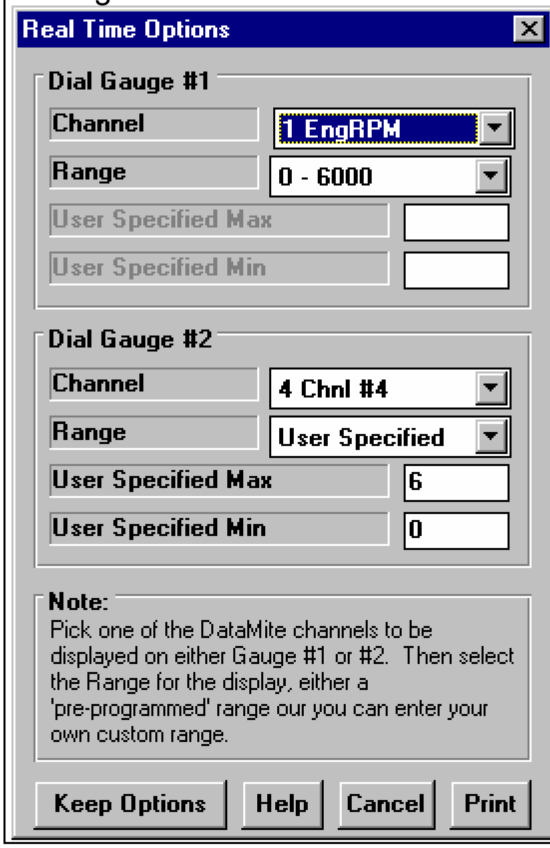
Figure 2.31 Change Update Rate



Gauge Settings

Click on Options, then Gauge Settings, to be presented with the screen of Figure 2.32. Here you set what channels are displayed on the gauges, and what the range of the gauge will be.

Figure 2.32 Current Readings Gauge Settings



Channel

Click on the down arrow button to select the channel to display on Gauge 1 or 2.

Range

Click on the down arrow button to select the range for either gauge 1 or 2. You can select from the pre-programmed ranges provided, or select the top choice of User Specified. Then the User Specified Max and Min specs become enabled so you can enter or change them.

User Specified Max

If you set Range to User Specified, this spec will be enabled. Enter the highest number you want to see on then gauge here. The gauge dial is divided into 6 sections. It is less confusing if the difference between the User Specified Max and User Specified Min is evenly divisible by 6. For example, if you set User Specified Max to 60 and User Specified Min to 0, each gauge increment will be 10. If you set User Specified Max to 70 and User Specified Min to 0, each gauge increment will be 11.67, which is much more confusing.

User Specified Min

If you set Range to User Specified, this spec will be enabled. Enter the lowest number you want to see on then gauge here. The gauge dial is divided into 6 sections. It is less confusing if the difference between the User Specified Max and User Specified Min is evenly divisible by 6. For example, if you set User Specified Max to 60 and User Specified Min to 0, each gauge increment will be 10. If you set User Specified Max to 70 and User Specified Min to 0, each gauge increment will be 11.67, which is much more confusing.

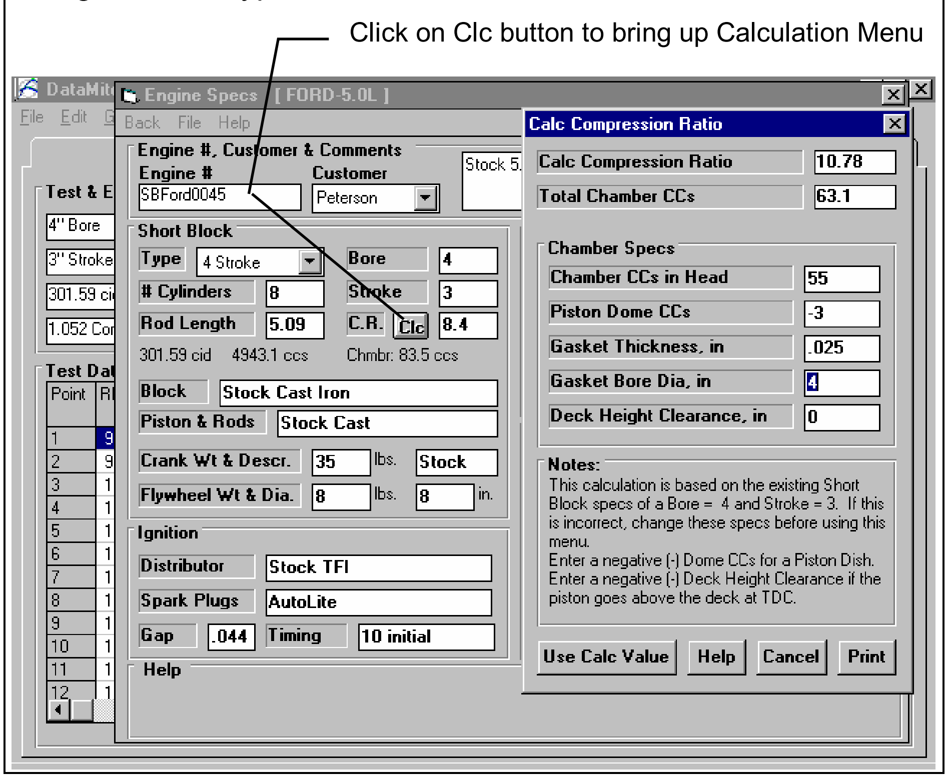
2.8 Calculation Menus

The following section explains the user input for specs listed with Clc buttons. These specs are ones where you can simply enter a value, or click on the Clc button and the program will present a menu of inputs which will calculate that particular parameter. These menus are like computer “scratch pads” for calculating specs like Compression Ratio from other inputs.

Notes:

The starting values in each calculation menu are always blanked out. Once enough specs have been entered, the calculated value(s) at the top of the menu will be displayed. This calculated value(s) will now be updated each time you change a spec. If you want to use this calculated value, click on Use Calc Value. If the calculated value is within expected limits, it will be loaded into the original menu. If you click on Cancel, you will be returned to the original menu with the original value unchanged. If you click on Help, you will be given a general explanation of calculation menus, and a page # in this section for more info about the particular menu you are using.

Figure 2.35 Typical Calculation Menu



The input values or calculated values in any calculation menu have NO affect on calculated performance unless you load the Calculated value into the original menu. ***If you already know a spec in the form required by the program, then you have no need to use the calculation menu.*** For example, if you know the Compression Ratio is 10.3, you have no need to use a calculation menu to calculate Compression Ratio based on Gasket Thickness, Piston Dome CCs, etc.

2.8.1 Calc Compression Ratio

Is the Compression Ratio calculated from the following specs and the current cylinder volume (based on the current Bore and Stroke in the Engine menu). See page 63 for general notes on Calculation Menus and for an example of their use.

The equation for Compression Ratio depends on the cylinder displacement (swept volume). This displacement is based on the current Bore and Stroke in the Engine menu and is displayed in the Notes section at the bottom of this menu. Make sure these specs match the engine for which you are calculating Compression Ratio before using this menu.

Chamber Specs

Chamber CCs in Head

Is the combustion chamber volume in the cylinder head, measured in cubic centimeters. This is the value obtained if the heads are "cc'd".

If you know the entire clearance volume of the cylinder, but do not know Piston Dome CCs, Gasket Thickness or Deck Height Clearance, enter that volume here as Chamber CCs in Head. Then enter 0 for Piston Dome CCs, Gasket Thickness and Deck Height Clearance. The program will calculate compression ratio based on the equation below where Clearance Volume is the Chamber CCs in Head.

$$\text{Compression Ratio} = \frac{\text{Clearance Volume} + \text{Swept Volume}}{\text{Clearance Volume}}$$

Piston Dome CCs

Is the volume of the "pop up" in the piston measured in cubic centimeters. The "pop up" is the volume of piston material added to the top of a flat top piston. If the piston has a "dish" (depression), enter the dish volume as a negative (-) number.

Gasket Thickness, in

Is the thickness of the engine gasket in inches after it has been "crushed". "Crushed" thickness is after the head bolts have been torqued to spec.

Gasket Bore Diameter, in

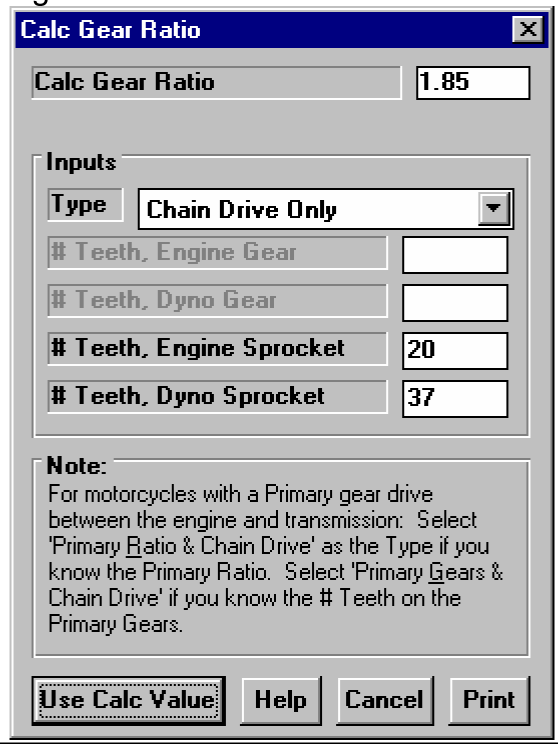
Is the diameter of the bore in the head gasket. A good approximation is to use the same as the Bore in the Engine menu, and this value is loaded in when you first open up this menu. You can change it to most any value you want. (In actual use, gasket bores are usually .030-.100" larger than the cylinder bore.)

Deck Height Clearance, in

Deck Height Clearance is the distance in inches from the top of the piston to the top of the cylinder block when the piston is at TDC. The top of the cylinder is the deck, or surface to which the engine bolts. If the outer edge of the piston travels above the deck, this is called negative deck height and you must enter a negative (-) number.

2.8.2 Calc Gear Ratio

Figure 2.36 Calc Gear Ratio



This menu is available by clicking on the Gear Ratio Clc button in the Dyno specs menu.

Type

Click on this combo box to select from:
- Gearbox Only
- Chain Drive Only
- Primary Ratio & Chain Drive
- Primary Gears & Chain Drive

For motorcycles with a Primary gear drive between the engine and transmission: Select 'Primary ***Ratio*** & Chain Drive' as the Type if you know the Primary ***Ratio***. Select 'Primary ***Gears*** & Chain Drive' if you know the # Teeth on the Primary Gears or Sprockets

Depending on your choice certain inputs will now be enabled.

Teeth, Engine Gear
Teeth, Engine Primary Gear

This is the number of teeth on the gear or sprocket attached to the engine crankshaft, or what will spin at engine RPM when the clutch has locked up. If you selected Gear Reduction & Chain Drive as the Type (typical of motorcycles), this will be called # Teeth, Engine Primary Gear and is the # teeth on the sprocket or drive gear on the engine's crankshaft. In almost all cases, this number will be smaller than # Teeth Dyno Gear.

Teeth, Dyno Gear
Teeth, Clutch Primary Gear

This is the number of teeth on the gear which attaches to the dyno, or spins at dyno RPM. If you selected Gear Reduction & Chain Drive as the Type (typical of motorcycles), this will be called # Teeth, Clutch Primary Gear and is the # teeth on the sprocket or drive gear on the transmission input shaft or clutch shaft. In almost all cases, this number will be larger than # Teeth Engine Gear.

Teeth, Engine Sprocket

This is the number of teeth on the smaller drive sprocket on the engine or clutch for chain drive systems. In almost all cases, this number will be smaller than # Teeth Dyno Sprocket.

Teeth, Dyno Sprocket

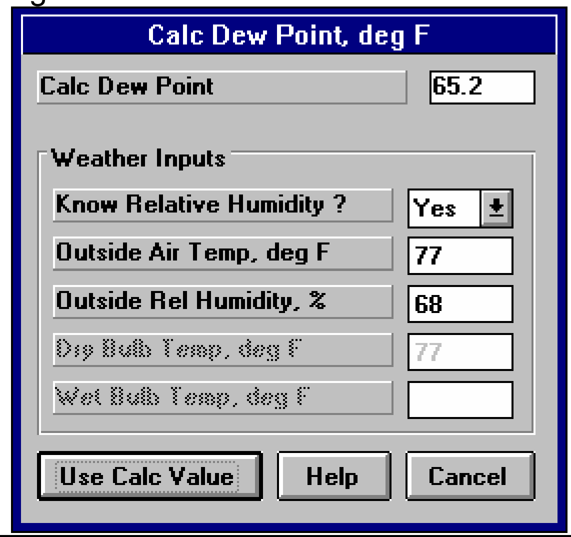
This is the number of teeth on the larger driven sprocket on the dyno for chain drive systems. In almost all cases, this number will be larger than # Teeth Engine Sprocket.

2.8.3 Calc Dew Point, deg F

Depending on your choice of Method of Recording Weather Data, you will be entering either Dew Point or Relative Humidity in the Test Conditions menu. This is the Calculation Menu you will get if you are using Dew Point.

See Section 2.3, Test Conds menu to see why Dew Point is usually more accurate and less confusing than Relative Humidity for entering humidity information.

Figure 2.37 Calc Dew Point



Know Relative Humidity?

If you know the relative humidity of the air and the air temperature, select Yes. Otherwise select No to input Wet and Dry bulb temperatures from a psychrometer. Depending on your choice the appropriate inputs are enabled.

Outside Air Temp, deg F

Is the outside air temperature when the relative humidity measurement was made. For example, if the weather service or weather report gives a relative humidity of 56 % and a temperature of 68 degrees, use 68 degrees. This is not the temperature of the air which enters the engine.

Outside Rel Humidity, %

Is the air's relative humidity as reported by a weather service or measured by humidity instruments.

Dry Bulb Temp, deg F

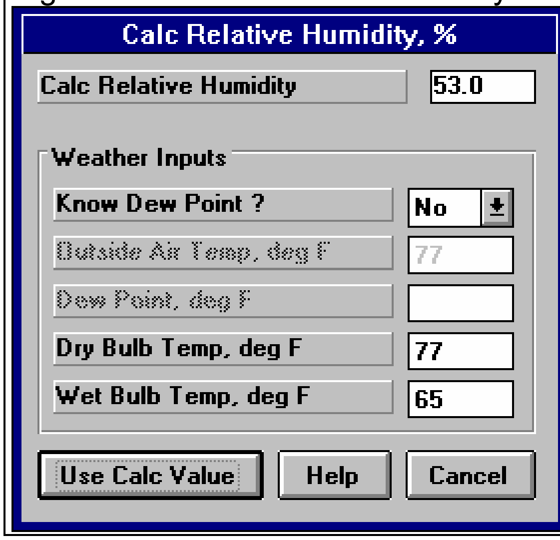
Is the temperature of the dry bulb thermometer on the psychrometer in degrees F. This is also the temperature of any thermometer mounted in the shade when the Wet Bulb Temp reading is taken. The Dry Bulb Temp must not be less than the Wet Bulb Temp.

Wet Bulb Temp, deg F

Is the temperature of the wet bulb thermometer on the psychrometer in degrees F. The wet bulb has a "wick" or cloth covering the bulb which is moistened with water. The dryer the air, the greater the difference between the wet and dry bulb readings. Relative humidity or dew point can be manually read off a Psychometric chart from these two readings. This calculation replaces reading the chart. The Wet Bulb Temp must be less than the Dry Bulb Temp.

2.8.4 Relative Humidity, %

Figure 2.38 Calc Relative Humidity



Depending on your choice of Method of Recording Weather Data, you will be entering either Dew Point or Relative Humidity in the Test Conds menu. This is the Calculation Menu you will get if you are using Relative Humidity.

See Section 2.3, Test Conds menu to see why Dew Point is usually more accurate and less confusing than Relative Humidity for entering humidity information.

Know Dew Point?

If you know the dew point of the air and the air temperature, select Yes. Otherwise select No to input Wet and Dry bulb temperatures from a psychrometer. Depending on your choice the appropriate inputs are enabled.

Outside Air Temp, deg F

Is the outside air temperature when and where the Dew Point measurement was made. This is not the temperature of the air which enters the engine.

Dew Point, deg F

Is the air's Dew Point in degrees F as reported by a weather service or measured by humidity instruments.

Dry Bulb Temp, deg F

Is the temperature of the dry bulb thermometer on the psychrometer in degrees F. This is also the temperature of any thermometer mounted in the shade when the Wet Bulb Temp reading is taken. The Dry Bulb Temp must not be less than the Wet Bulb Temp.

Wet Bulb Temp, deg F

Is the temperature of the wet bulb thermometer on the psychrometer in degrees F. The wet bulb has a "wick" or cloth covering the bulb which is moistened with water. The dryer the air, the greater the difference between the wet and dry bulb readings. Relative humidity or dew point can be manually read off a Psychometric chart from these two readings. This calculation replaces reading the chart. The Wet Bulb Temp must be less than the Dry Bulb Temp.

2.9 New Test Menu (get data from DataMite):

The New Test command is available by clicking on File at the top, left of the Main Screen, then selecting New. You will then be presented with the screen shown in Figure 2.39.

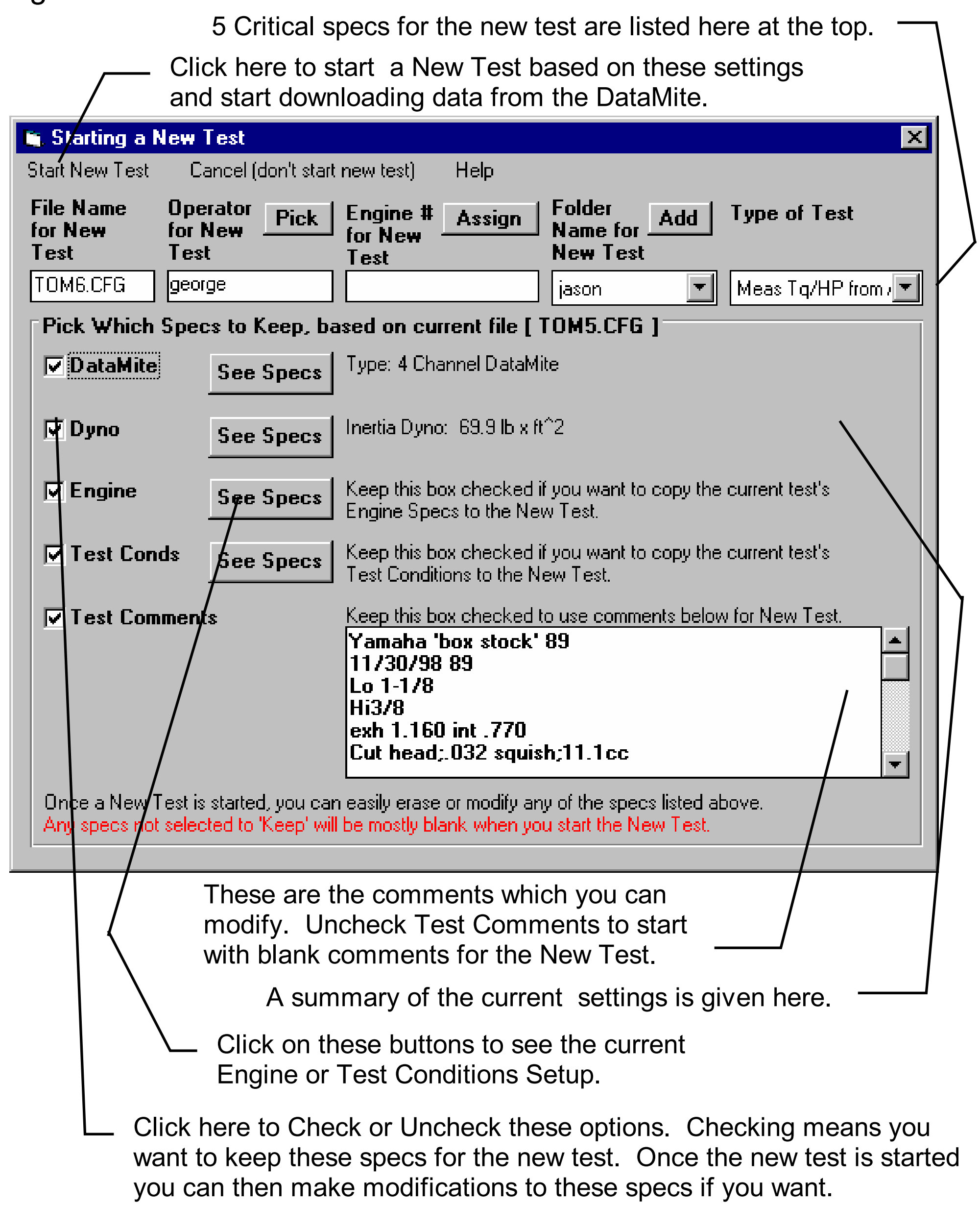
The New Test command is the only way to get a recorded data set (dyno test) from the DataMite. See Example 4.1 and 4.2 for more details on the New Test menu.

When starting a New Test, it is usually best to first Open a previous test which is similar to the New Test you will be running (similar Engine specs, similar Test Conditions and Similar Test Comments.) This previous test will then be the 'pattern' or 'template' for the New Test and will save you from having to type in many specs to describe this New Test. This also ensures consistency between your tests and reduces the possibility of errors.

Important: The DataMite Specs and Dyno Specs for the new test will be from the current Master DataMite and Dyno Specs, which should match your current DataMite and Dyno setup. This will be the same no matter what previous test you are starting from.

If the current test is not a good 'pattern' for this new test, you can abort starting this new test by clicking on 'Cancel (don't start new test)' at the top of the New Test screen. Then click on 'File' at the top, left of the Main Screen and select one of the 'Open' options to open a past test to serve as a pattern.

Figure 2.40 New Test Menu



If you want to check some of the specs in the other screens, or want to modify some specs from the previous test, click on the 'See Specs' buttons for each category of specs. Click on Help at these menus for more info on how to enter these specs.

When you close out these menus, you are brought back to the New Test screen. Be sure to check the check box at the left for all specs you want to use for your new test. ***All*** Categories not checked will be blanked out. Blank specs may cause problems with more detailed analysis, and won't allow you to keep track of important details about the engine you are testing.

Most all specs in these categories can also be changed once the test has started with no problems. This includes specs which simply describe the test and engine and do not affect any calculations or what is recorded, like Engine Specs, Test Comments, etc.

Five (5) other critical specs are listed separately at the top:

1. File Name for New Test is the file name the program will create for saving the Dyno Data for the new test you are starting. The program fills in a default name of the current test name, but incrementing the last digit in the name by 1. You can change this name to most anything you like. The program will warn you if the name entered is not valid and show you what is wrong.
2. Operator for New Test is the name of the operator for this test. Click on Pick to pick an operator name already used or to enter a new name. The program defaults to the operator of the current test.
3. Engine # for New Test is critical for shops who use a engine numbering system. Click on Assign to create a new Engine # based on the last Engine # assigned (incremented up by 1) or to start with a new type of Engine #. (If you want to type in most anything you want for an Engine Number, or leave it blank, go to the Preferences menu and set Allow Direct Entry of Engine Numbers to No.)
4. Folder Name for New Test is the folder in the DTMDATA folder where the test will be saved. The program may not be using the name 'folder' for this spec, but whatever word you have assigned in the Preferences menu at the Main Screen. The folder name 'Examples' is reserved for Performance Trends example tests supplied with the program, and can ***NOT*** be used for your tests.
5. Type of Test describes what type of test was run and how the data should be analyzed and divided up into runs. This is the same spec as the Test Type in the Test Conds menu. Click on down arrow to select the type of test you ran. This choice can have a large impact on what data is graphed and analyzed. Your choices are basically:
    - Dyno Run to measure torque and HP.
    - Custom Test, which would be anything else.

   Notice that some of the choices are not used, as they are used for Test Types in the vehicle versions of the software.

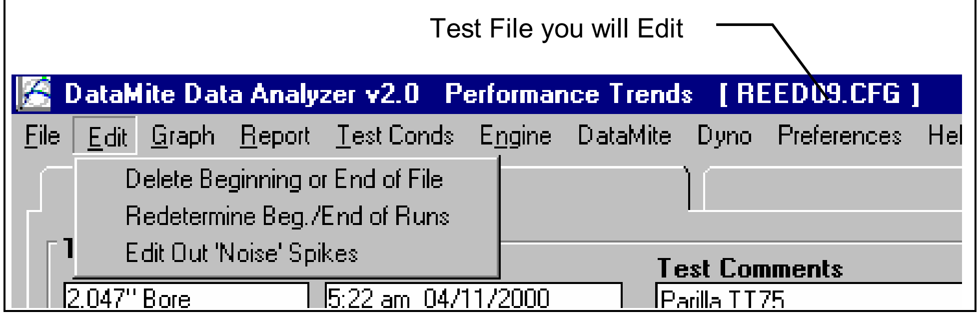
When you are ready to start the new test, click on 'Start New Test' at the top of the screen. If some critical specs has not been entered, the program may warn you and ask you for it at that time. The program will fill in the Test Time and Date based on the computer's time and date. This can be changed later by clicking on the Test Time/Date at the Main Screen.

> Important: When you start a New Test, the DataMite Specs and Dyno Specs will be from the current ***Master*** DataMite and Dyno Specs, which should match your current DataMite and Dyno setup. This will be the same no matter what previous test you are starting from.

2.10 Edit Test File Options:

Click on Edit at the top of the Main Screen for 3 very important options for editing the DataMite's test data, as shown in Figure 2.41. For all 3 of these Edit commands, you will edit the Current Test, which is the test which is named in the square brackets [ ] at the top of the Main Screen.

Figure 2.41 Edit Options at Main Screen

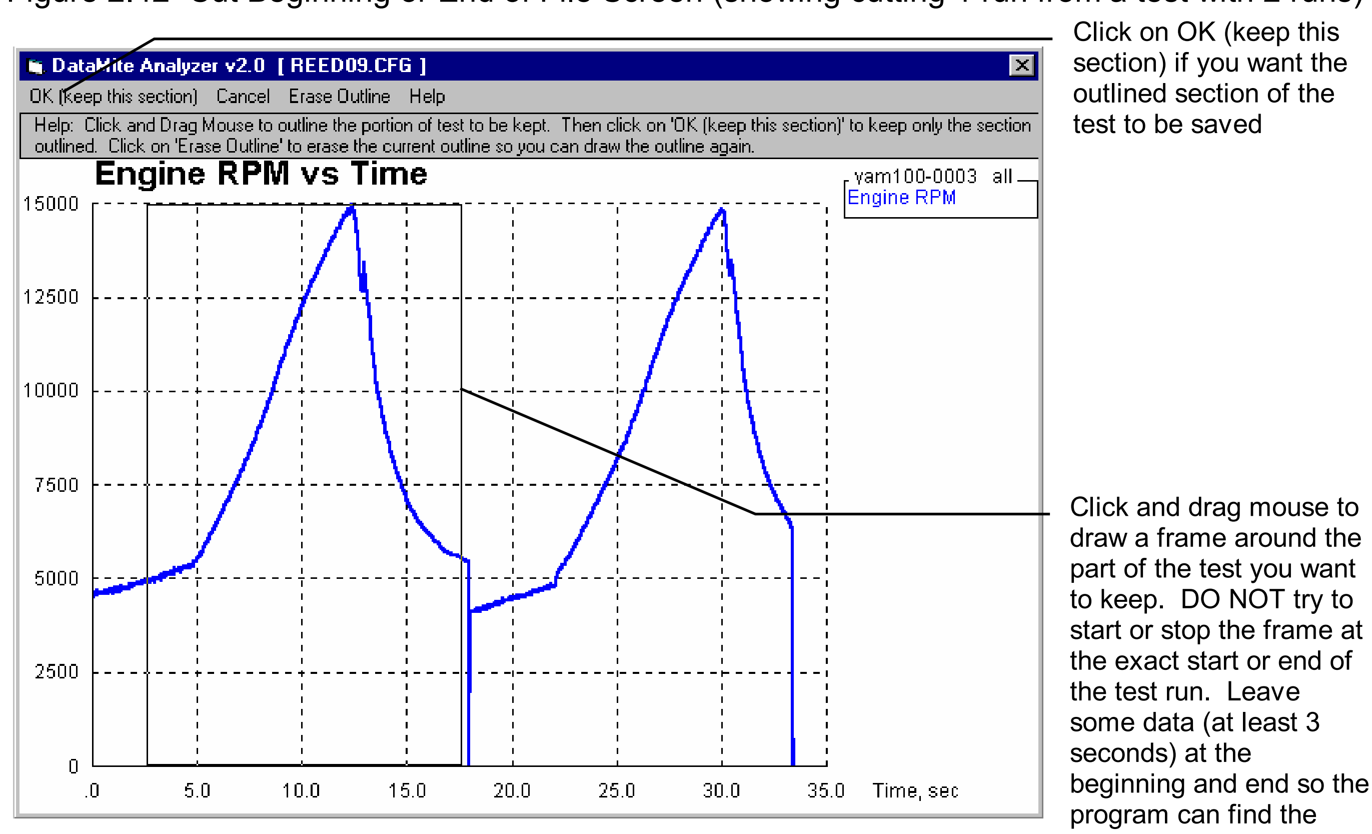


Delete Beginning or End of File

This option lets you delete portions of the recorded data and keep some main section. This is useful as it can create smaller data files, saving disk space on your computer or saving time when doing calculations for graphs or reports.

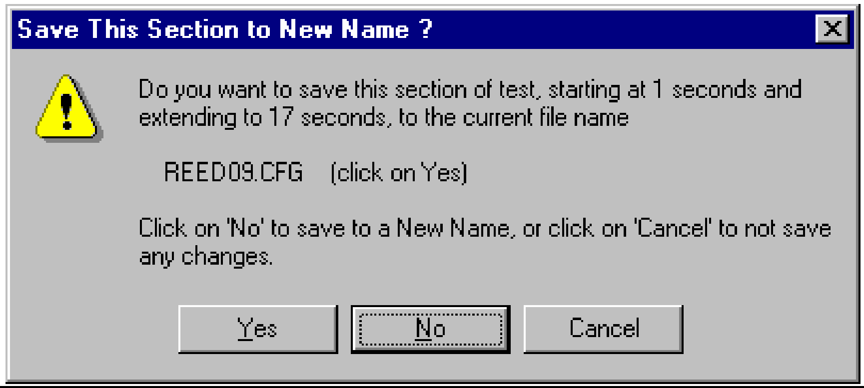
If you save each kept portion to a new file name, you can actually use this command to break up 1 data file into several smaller data files. This can make it much easier to compare one run of a test to another run of the same test if instead each run is a separate test.

Figure 2.42 Cut Beginning or End of File Screen (showing cutting 1 run from a test with 2 runs)



If you click on Edit, then Delete Beginning or End of File, you will be presented with a graph screen showing Engine RPM for the this entire test. Click and drag the mouse to draw a square frame around the portion of the test you ***want to keep.*** The rest of the test will be deleted. When you are satisfied with the section you've drawn, click on OK (keep this section) to be presented with the options shown in Figure 2.43.

Figure 2.43 Options Presented When You Click on OK (keep this section)



If you select No, you will then be asked for a new name to which this data will be saved. This is the method used to break up 1 test into several smaller tests. In this case shown, you would save this section to a new name, perhaps REED-1, which would then become the Current Test. You would then have to open the original REED09 test again so it becomes the Current Test and do the Delete Beginning or End of File command again. This time draw the frame around the 2nd run and save this file to a name of perhaps REED-2.

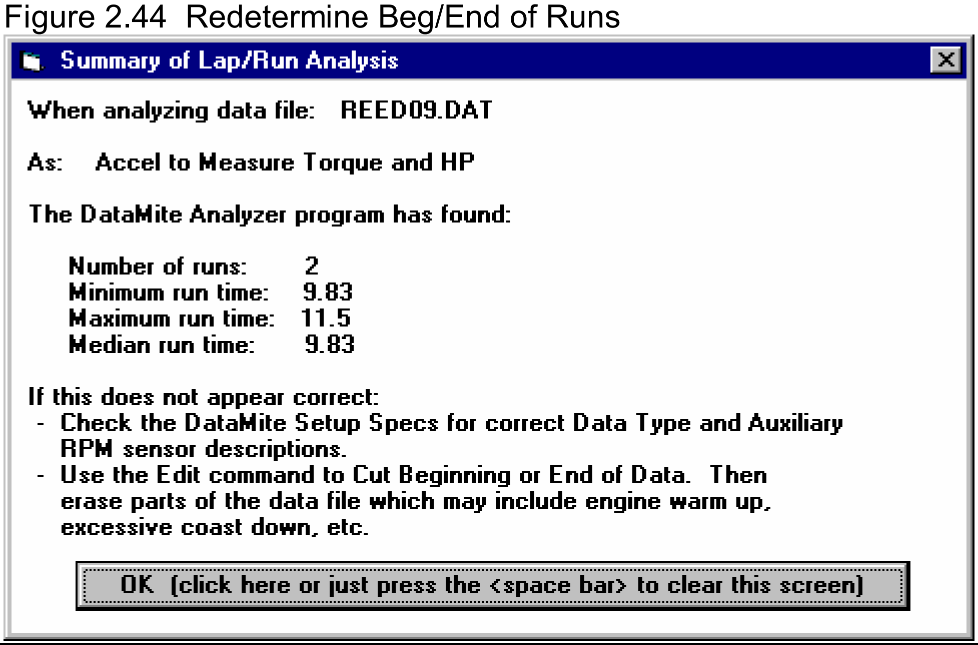
Redetermine Beg./End of Runs

Any time you download data for a New Test, the program checks for the type of test runs you've specified (Accel to Meas Tq/HP or Custom). It looks for the patterns in the data it expects for, say, an Accel to Meas Tq/HP. When if finds a pattern, it remembers the beginning and end of this pattern for each pattern it finds. It then gives you a summary of what it found. See Figure 2.44.

You can also do this at any other time. The only reasons for doing this is when you have changed something about the test so that now the pattern looks different than when you first downloaded the data from the DataMite. These changes could include:

- You have Edited Out some Noise Spikes.
- You have Cut the Beginning or End of Data so the data file now looks different.
- You have changed the Test Type from Custom to Accel to Meas Tq/Hp or vice versa.
- You have changed the DataMite or Dyno Setup, although many times changes to these specs will not affect the Runs found.

Figure 2.44 Redetermine Beg/End of Runs



Edit Out ‘Noise’ Spikes

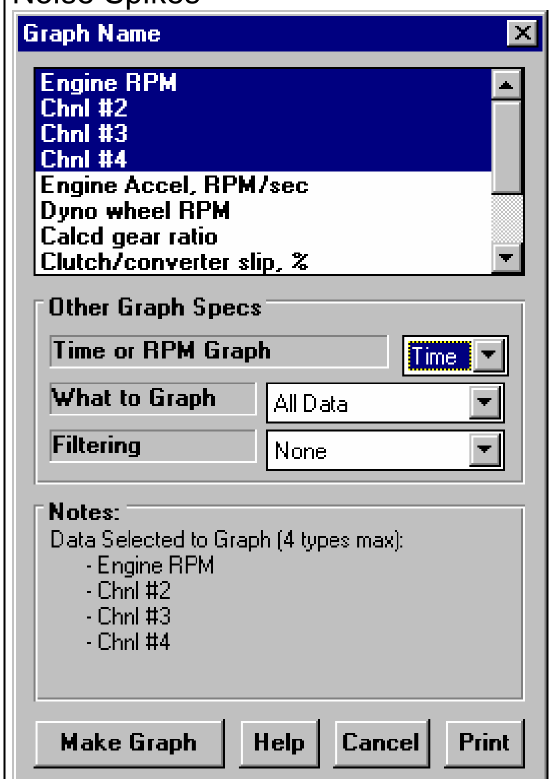
Noise spikes are simply bad data points the DataMite has picked up as shown in Figure 2.46. These can be caused by:

- Electrical noise, especially from the ignition wires.
- Weak or unusual engine ignition signals.
- “Dirty” (pulsing, unsteady) power to the DataMite.
- Bad or intermittent ground.
- Bad connections in the wiring.
- Excessive vibration in a sensor (but this usually looks more like simple noise).
- Or the every popular "Stuff happens."

> If these bad data points are left in the data set, it reduces the accuracy of any analysis. **This is especially true for inertia dyno runs if the noise spikes occur in the Inertia Dyno RPM. One rather small spike can completely distort the entire torque and HP curve.** See Troubleshooting, Appendix 3 for more information.

The process of checking for "noise spikes" happens automatically when you start a New Test (get data from DataMite) or download data. If spikes are found, you can select to NOT have them corrected. This is useful to determine the source of the noise spikes. Although accuracy improves by editing the spikes out, it is best to eliminate spikes at the source if you can.

Figure 2.45 Graph Specs to Graph Noise Spikes



To see Noise Spikes, graph the raw data (not calculated data like torque, clutch slip, etc) vs Time with Filtering set to None. See Figure 2.45 for typical Graph Specs to show Noise Spikes.

If you selected to have the spikes edited out when the data is downloaded, it is unlikely any more spikes will be found again. This edit command is most useful if you did NOT edit out the spikes when the data file was first downloaded.

Note: Noise spikes are different that the "jumpy" or "noisy" data that filtering is designed to fix. "Noisy" data is noisy or jumpy throughout the data file. "Noise spikes" occur here and there, and jump out from the rest of the relatively smooth data. Figure 2.46 illustrates the difference between "noisy" data and "noise spikes".

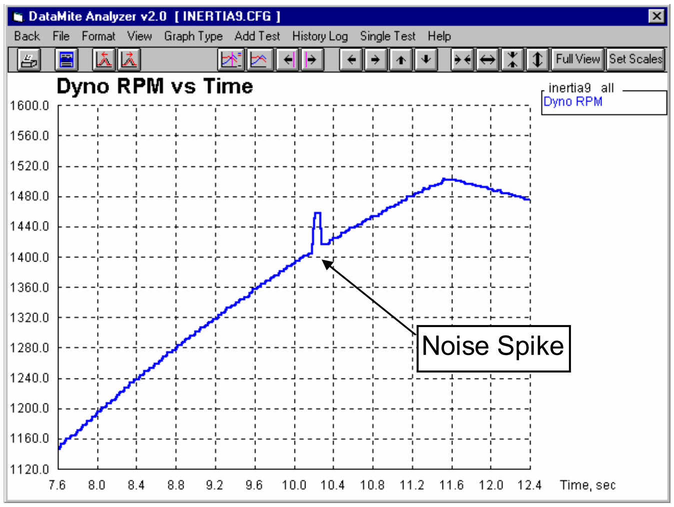
Some times the noise spikes are too numerous or come so close together that the program can determine what is real data and what is a noise spike. In cases like this, especially if the noise is in Engine RPM, and absolutely if the noise is in the Dyno RPM for Inertia Dynos, you must eliminate the source of the noise and run the test again. If the noise spike is in a channel that is not used to calculate torque or HP, the noise spike is not as critical, say in an Exhaust Temperature. However, you must realize that the immediate jump up or down is not real.

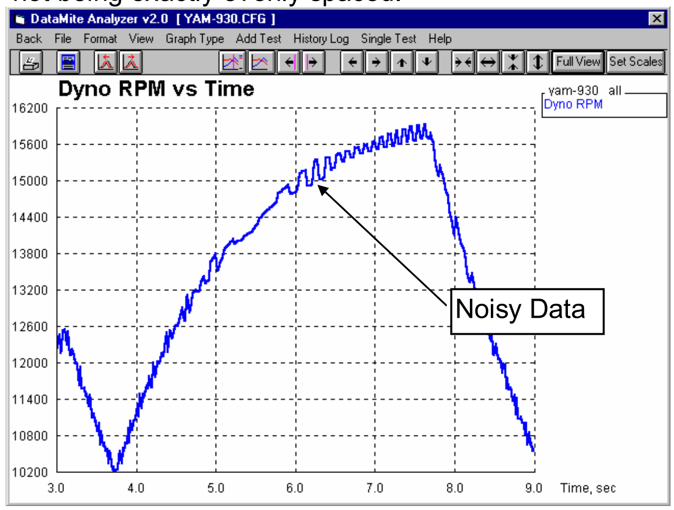
> **Figure 2.46 shows how even a relatively minor noise spike in the Dyno RPM for an Inertia Dyno test can completely distort the torque and HP curve. Any Inertia Dyno runs with even small spikes in the Dyno RPM must be rerun.**

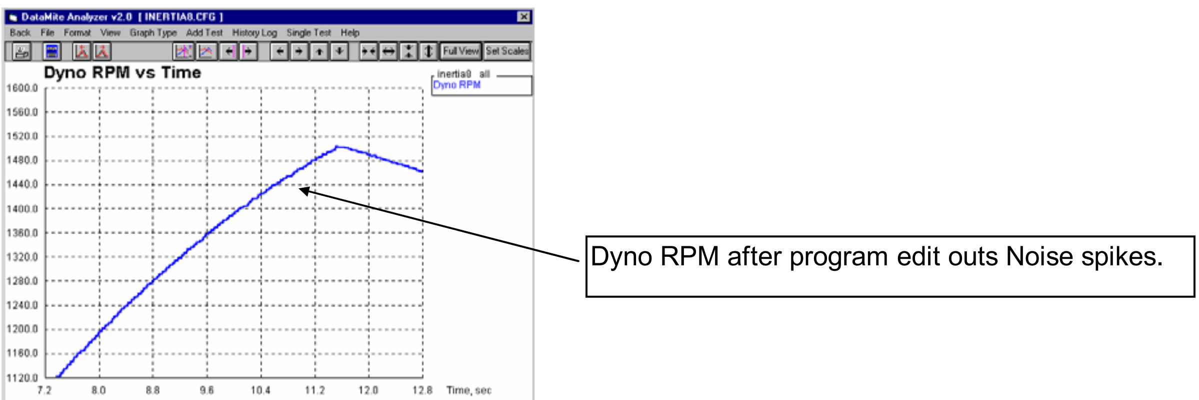
Figure 2.46 Noise Spikes vs Just Noisy (jumpy) Data

Typical "Small" Noise Spike (a couple of data points are significantly different than the data points surrounding them)

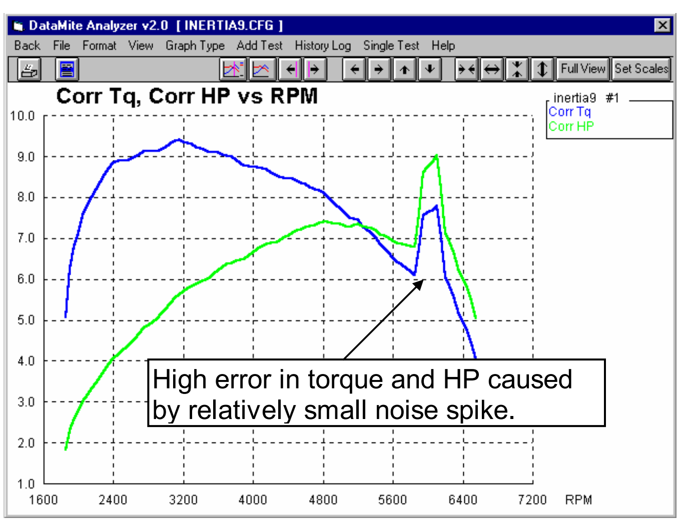
Typical "noisy" or "jumpy" data shows all data points being quite different than the surrounding data points. In this case the "noise" is due to magnets on the shaft not being exactly evenly spaced.







Errors Caused by Relatively Minor Noise Spike



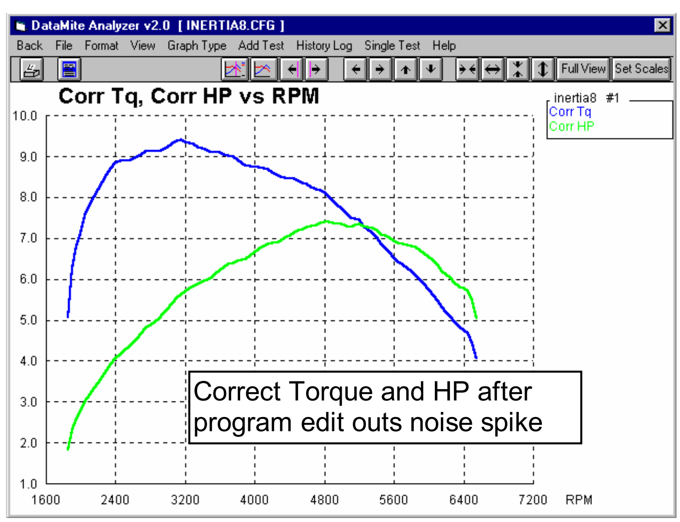
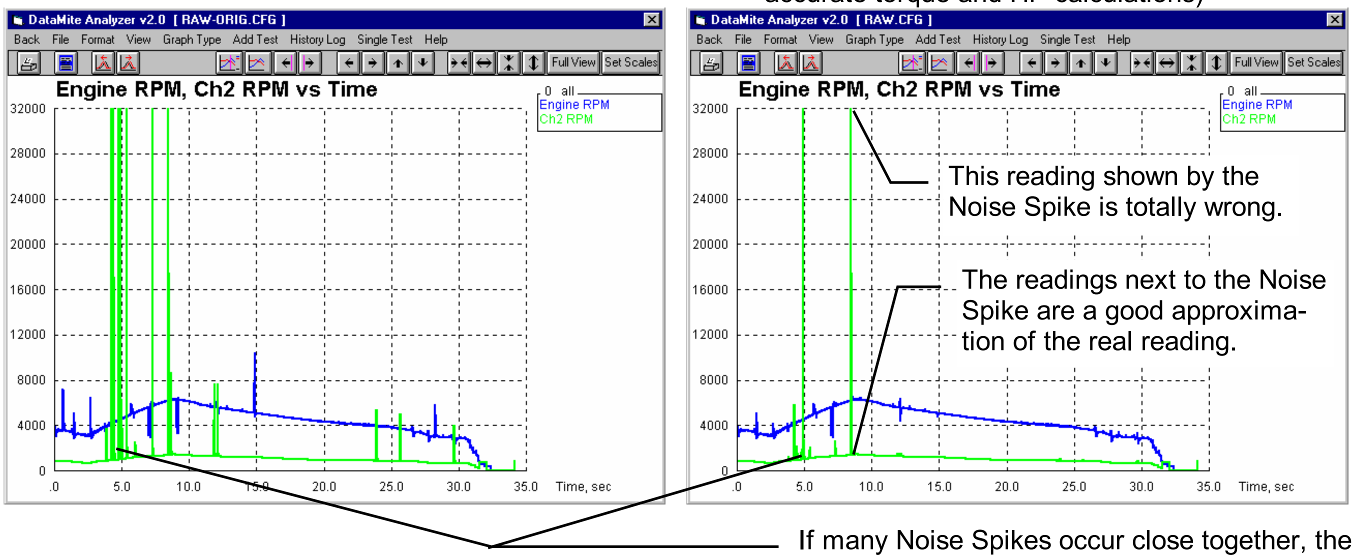


Figure 2.47 Example of Not Editing Out Noise Spikes Very Well

Original Data with Noise Spikes

Data After Editing Out 32 Noise Spikes (many Noise Spikes remain, too many for accurate torque and HP calculations)



If many Noise Spikes occur close together, the program can not accurately determine if a spike is “noise” or real data, and leaves it in.

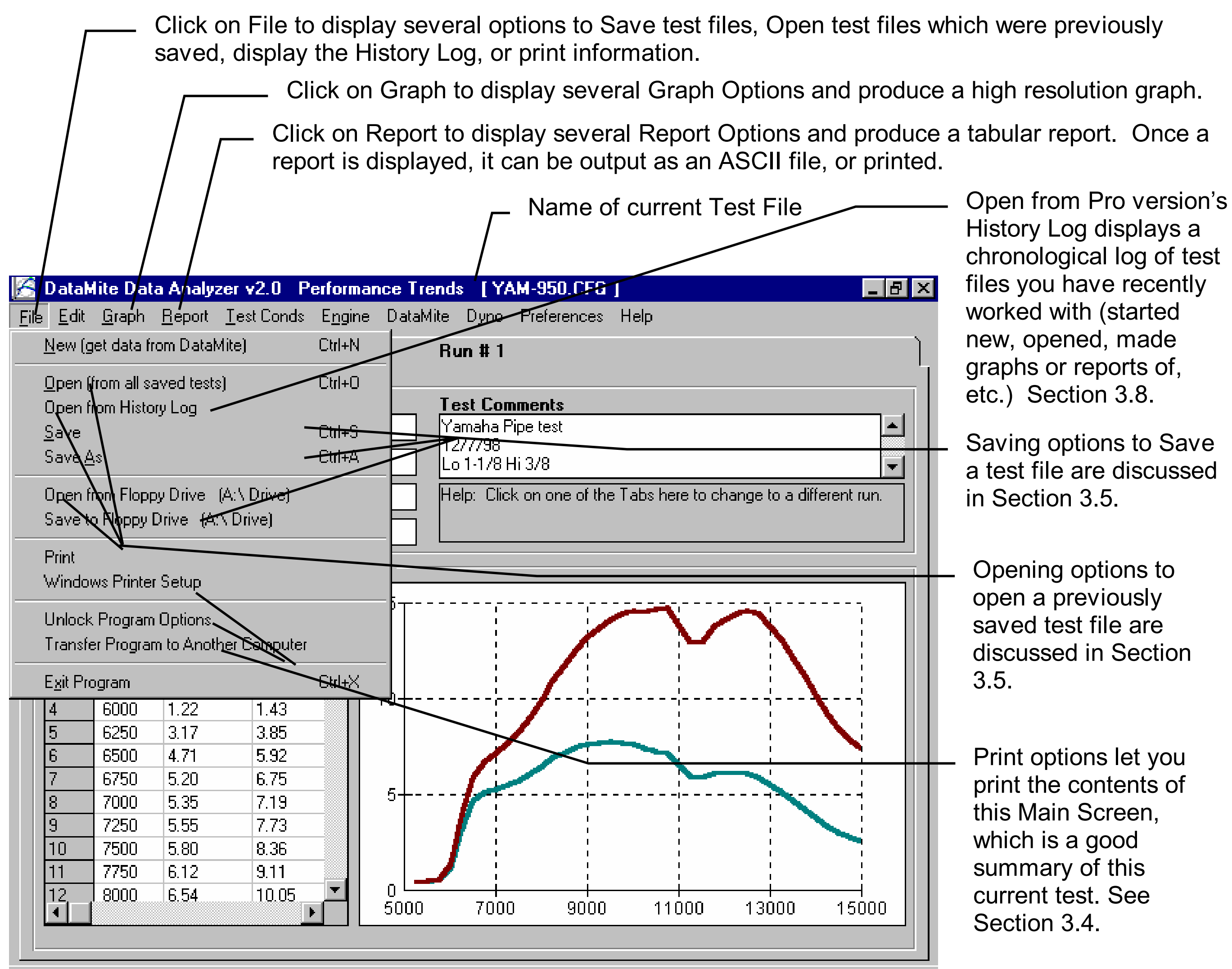
Chapter 3 Output

The Dyno DataMite Analyzer provides several ways to view and output the test results, including:

- Reports of tabular data displayed on the screen
- ASCII files for importing results to other software packages (Pro version only)
- High resolution graphs
- Printer output of reports or graphs
- History Log (Pro version only)
- Data Libraries for recording test data (and sets of engine specs in the Pro version) for later use.

All these topics will be covered in this chapter. Figure 3.1 shows how to reach all these various features.

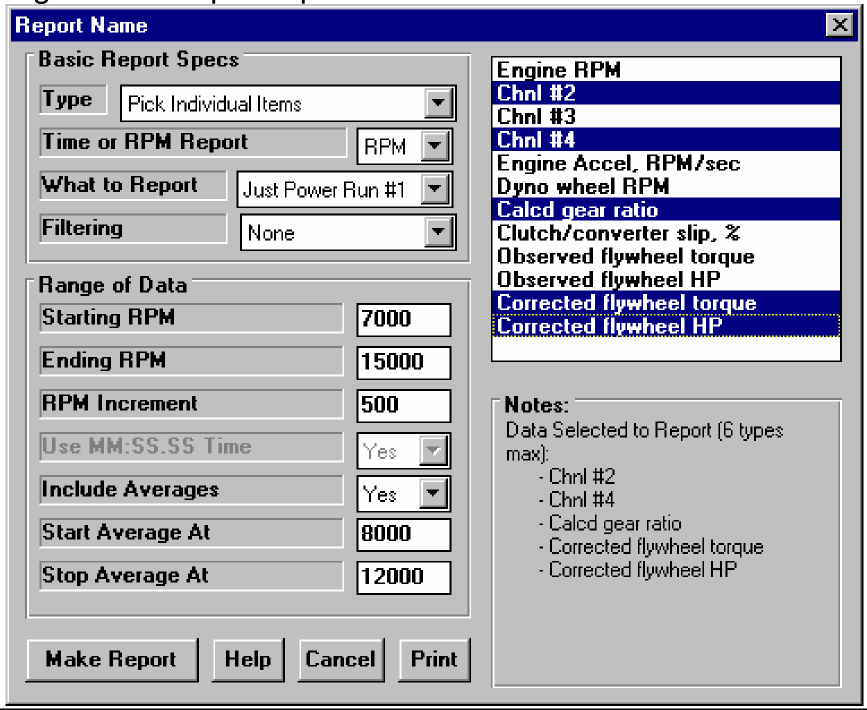
Figure 3.1 Various Output Options from the Main Screen



3.1 Reports

Click on the Report menu command at the Main Screen to be presented with the Report Options Menu shown in Figure 3.2. The inputs in this menu are described below.

Figure 3.2 Report Options Menu



Type

There are 2 basic types of reports:

1. Pick Individual Items.
2. RPM Accel Times.

They can be picked by clicking on the down arrow key of this combo box. If you select RPM Accel Times, several options in this menu may be enabled or disabled (dimmed to gray and you can not change them because they are not applicable to that report type).

If you selected the Pick Individual Items report type, click on the Data Types in the top, right section to select (or 'deselect' if it has already been selected) that Data Type for reporting.

Time or RPM Report

Click on the down arrow button to choose either RPM or Time for the various rows of the report. Your choice will appear in the left column of the report.

What to Report

Select what part of the dyno test you want to make the report of:

- All Data
- Just Power Run #1
- Just Power Run #2 (if it exists)
- Just Power Run #3 (if it exists), etc.

Click on the down arrow button to choose either to report All the Data (all data recorded) or just a particular run. If you have selected an RPM graph, you can only choose a particular run, not All the Data.

Filtering (smoothing)

Click on the down arrow button to select the level of filtering (smoothing) to be done to the data, before the report is made:

- None
- Light (some)
- Medium
- Heavy (lots)

Select the lowest level that eliminates most (not all) of the 'jitter' in the data. Be careful not to 'over-filter', as this can completely distort the data. See page 92 and 93 in the Graphs Section for an illustration of Filtering.

For reports, filtering is not as critical as for graphs. Lets say you specify reporting data at, 250 RPM increments. If your report includes 4500 RPM, then all data within that 250 RPM increment (from 4375 - 4625 RPM) is averaged together to make the number you see reported at 4500. This averaging process is much the same as filtering

Range of Data

Starting Time or RPM

Is the first or lowest time or RPM for the report.

If you have selected a Time Report: If you have selected All Data for What to Report, then this is the time after the start of first data the DataMite recorded. If you have selected Just Power Run #1 for What to Report, then this is the time after the start of what the program saw as being the start of the first dyno power run.

If you have selected an RPM Report: Your only choice for What to Report is one of the power runs. This is the lowest RPM or starting RPM for the report.

To be sure that all data is reported for a particular run, enter 0 for Starting RPM or Time, and a number much larger than possible for the Ending RPM or Time, something like 30000.

Ending Time or RPM

Is the last time or highest RPM for the report. See Starting Time or RPM above.

Time Increment or RPM Increment

Is the step size between report times or RPMs for the report. See Starting Time or RPM above. The smaller this number, the longer and more detailed the report. To report RPM data at every 250 RPM, say at 2500, 2750, 3000, etc, enter 250 for the RPM increment.

Note on data reporting: Lets say you specify reporting data at, 250 RPM increments. If your report includes 4500 RPM, then all data within that 250 RPM increment (from 4375 - 4625 RPM) is averaged together to make the number you see reported at 4500.

Use MM:SS.SS Time

For Time reports, select whether to 'Use MM:SS.SS' time formatting. If you select Yes, then 122.333 seconds will be displayed as 2:02.33 (minutes and seconds).

Include Averages
Start Average At
Stop Average At

Select 'Yes' for Include Averages to enable the Start and Stop Averages specs. Enter the RPM or Time range you want for data averaging in the report. In the report, you will see an asterisks (*) at the times or RPMs in this Average range, and averages on the bottom row of the report for the data in the rows with these asterisks.

Report Types

Pick Individual Items

This report will include columns of data you have selected in the Report What section of the Reports menu. They will be reported following the other specifications you have set in the Reports menu. The Data Types are defined in Table 3.1. Figure 3.3 shows a report for the settings in the Report Menu shown in Figure 3.2.

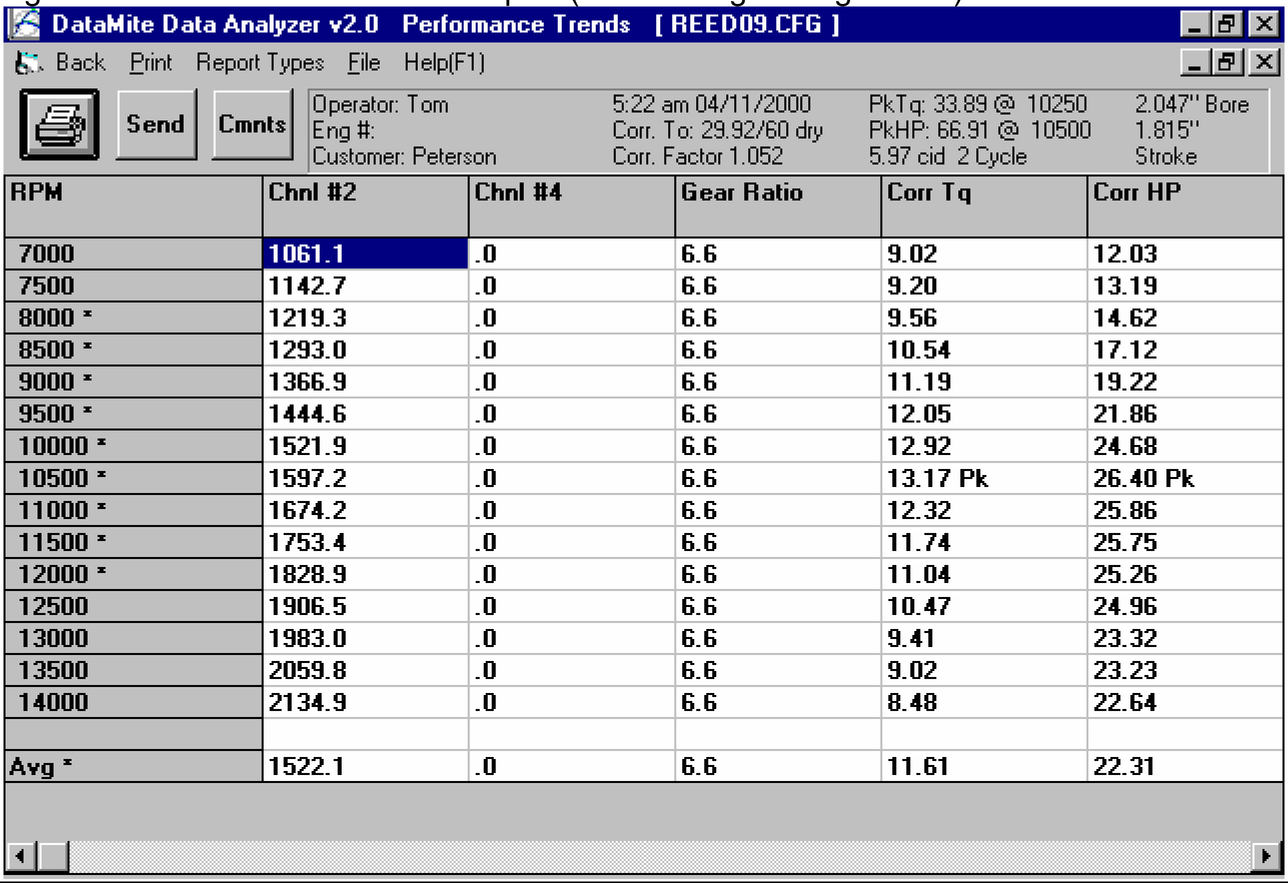
Table 3.1 Data Types for Reports

Data Type	Report Column Name	Definition
Engine RPM	Engine RPM	Engine speed in revolutions per minute, as recorded by channel 1 on the DataMite
Engine Accel, RPM/sec	Eng RPM/sec	Engine acceleration rate in RPM per second. For example, 200 RPM/sec means the engine's RPM increases 200 RPM in 1 second
Dyno wheel RPM	Dyno RPM	Dynamometer speed in revolutions per minute, as recorded by what ever channel you have specified as Dyno RPM on the DataMite
Calcd gear ratio	Gear Ratio	Is the engine RPM divided by the dyno RPM, which should be the same as the Gear Ratio entered in the Dyno Specs menu, unless there is clutch slip.
Clutch/converter slip, %	Cltch Slip	Clutch slip in %. It is critical you have the Gear Ratio in the Dyno Specs correct for Clutch Slip to be accurate.
Observed flywheel torque	Obs Tq	Is the observed (uncorrected) torque measured at the dynamometer. In the Pro version, you can include Coastdown Data to estimate losses in any gears or chains between the engine and the dynamometer in the Dyno Specs menu. You can also request the program to try to correct for engine inertia effects (Test Conds menu and enter Short Block Specs in the Engine Specs Menu.) Then the Observed Flywheel Torque is very close to be what the engine produces at its crankshaft under steady state (non-accelerating) conditions.
Observed flywheel HP	Obs HP	Is the observed (uncorrected) horsepower calculated from Observed flywheel torque above. See Observed flywheel torque above.
Corrected flywheel torque	Corr Tq	Is the Observed flywheel torque described above corrected for weather conditions. Corrected torque should be more repeatable from day to day, even if weather conditions change, ***if you enter accurate weather conditions in the Test Conditions menu for each test.*** In the Pro version, you can select what standard conditions to correct the data to,
Corrected flywheel HP	Corr HP	Is the corrected horsepower calculated from Corrected flywheel torque above. See Corrected flywheel torque above.

RPM Accel Times

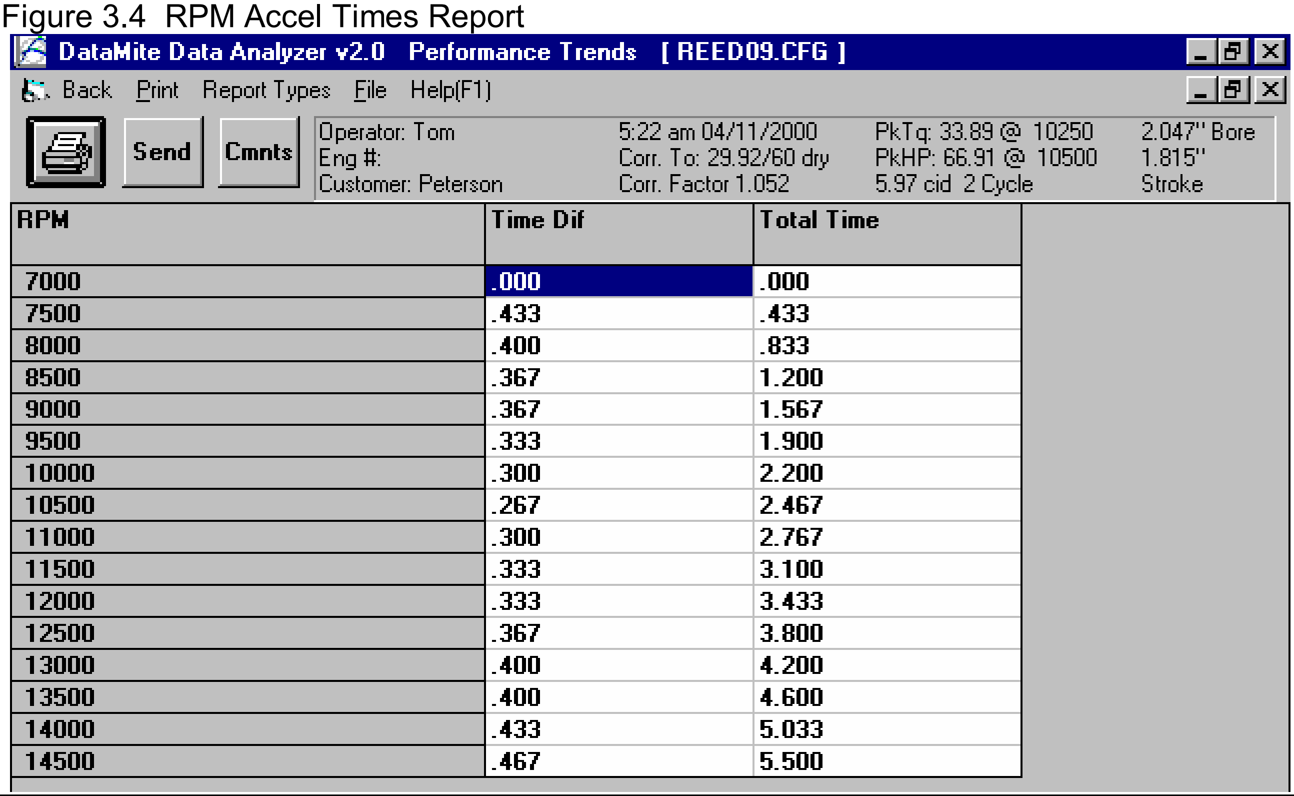
This special report gives the time for the engine to reach various RPM levels as shown in Figure 3.4. Times are given both for cumulative time (from the first RPM) and time between each RPM step.

Figure 3.3 Pick Individual Items Report (from settings in Figure 3.2)



RPM	Chnl #2	Chnl #4	Gear Ratio	Corr Tq	Corr HP
7000	1061.1	.0	6.6	9.02	12.03
7500	1142.7	.0	6.6	9.20	13.19
8000 *	1219.3	.0	6.6	9.56	14.62
8500 *	1293.0	.0	6.6	10.54	17.12
9000 *	1366.9	.0	6.6	11.19	19.22
9500 *	1444.6	.0	6.6	12.05	21.86
10000 *	1521.9	.0	6.6	12.92	24.68
10500 *	1597.2	.0	6.6	13.17 Pk	26.40 Pk
11000 *	1674.2	.0	6.6	12.32	25.86
11500 *	1753.4	.0	6.6	11.74	25.75
12000 *	1828.9	.0	6.6	11.04	25.26
12500	1906.5	.0	6.6	10.47	24.96
13000	1983.0	.0	6.6	9.41	23.32
13500	2059.8	.0	6.6	9.02	23.23
14000	2134.9	.0	6.6	8.48	22.64
Avg *	1522.1	.0	6.6	11.61	22.31

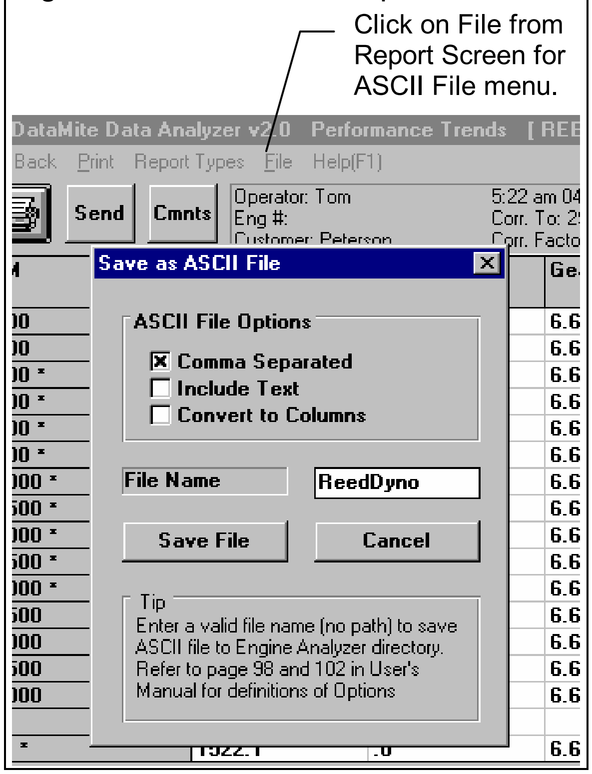
Figure 3.4 RPM Accel Times Report



RPM	Time Dif	Total Time
7000	.000	.000
7500	.433	.433
8000	.400	.833
8500	.367	1.200
9000	.367	1.567
9500	.333	1.900
10000	.300	2.200
10500	.267	2.467
11000	.300	2.767
11500	.333	3.100
12000	.333	3.433
12500	.367	3.800
13000	.400	4.200
13500	.400	4.600
14000	.433	5.033
14500	.467	5.500

3.2 ASCII Data Files (Pro version only)

Figure 3.10 ASCII Files Options Menu



You may want to use the results from the Dyno DataMite Analyzer in other software packages. This could be for additional graph capabilities, statistical analysis, data basing, etc. Once you have created a report (as shown in Section 3.1), click on File to write the results to an ASCII file with a name of your choosing. The ASCII File command is possible any time a report is displayed on the screen.

You can only save the results currently displayed on the Report screen. If you want to write an ASCII file of a test file you have previously run, you must open that test file first, then create a report for that test file.

ASCII File Options

Comma Separated

Select this option to insert commas between data points. Leave this unchecked for data to be arranged in evenly spaced columns.

Include Text

Select this option to strip out all titles and letters, leaving only numbers.

Convert to Columns

If you do not select this option, data will be written to the file much like it is displayed in the report on the screen. Select this option to have the report turned on its side, that is, the rows will become columns and the columns will become rows.

File Name

Enter a file name for saving this ASCII file. Checks are made to ensure what you enter is a valid file name and that you are not overwriting an existing file. The file is written to the Dyno DataMite Analyzer folder (directory), the folder which contains the DTM.EXE program file.

There are certain limitations for file names, including:

- Names can only be 11 characters long.
- Names can not contain certain characters, like commas (,), plus signs (+), or spaces ( ). The program will warn you if you use an illegal character.
- Only 1 period (.) can be used and it can only be toward the end of the file name. The program will warn you if you use a period in the wrong spot.

See Section 3.5 for more details on file names.

3.3 Graphs

Graphs are obtained by clicking on the Graph menu command at the top of the Main Screen. Figure 3.12 shows a typical graph and a descriptions of some of the basic graph screen items.

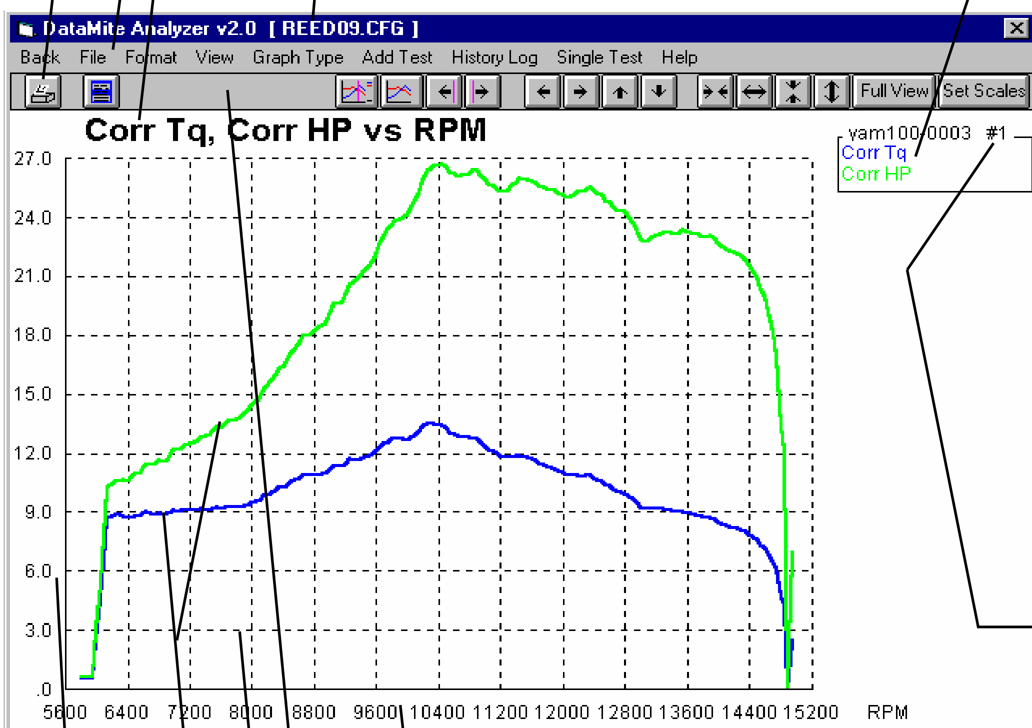
Figure 3.12 Primary Graph Screen Items

Command buttons. Some commands can only be done through these buttons, some of these buttons just provide a graphical button for performing action of some menu items.

Menu bar provides for several graph commands and options.

Graph Title, which can be changed by clicking on Format, then Edit Titles/Legend (Pro version).

Name of current Test File containing all dyno data and specs



Graph Legend, which describes the data graphed. This includes Name of the Test Results file, the particular Dyno Run graphed, Type of Data, which data goes with which file, if any multiplier is applied to the data. You can also click on Data Type names and the corresponding data line will flash. This is useful to find a particular line when several are graphed. In the Pro version, names in the Legend can be changed by clicking on Format, then Edit Titles/Legend.

The Dyno Run #, or All (if all data is graphed) is included in the Test Name.

Horizontal X axis. The scaling of this axis can be easily changed as described in this section.

If 2 or more tests are graphed vs Time, then buttons will appear here letting you shift 1 test with respect to another, a process called “time aligning” (Pro version only.)

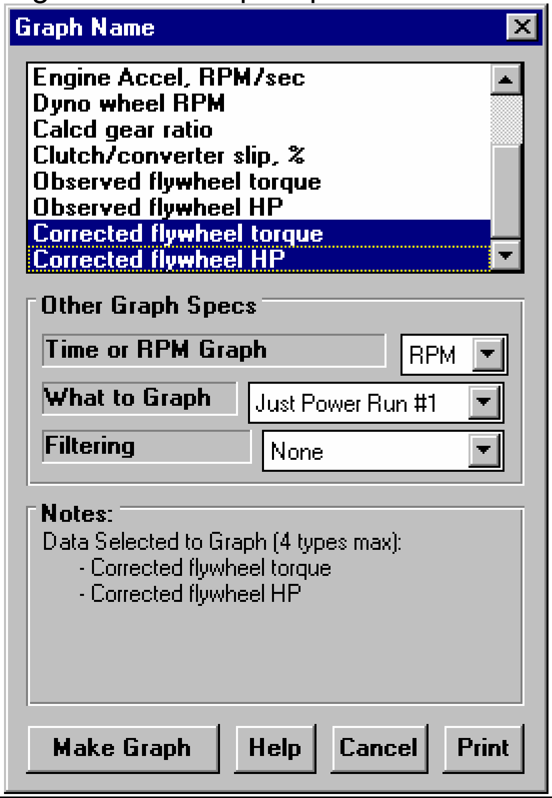
Grid lines. The style or elimination of grid lines can be changed by clicking on Format, then Grid Style (Pro version only).

Data graph lines. The style and thickness of these lines can be changed by clicking on Format, then Line Style.

Vertical Y axis. The scaling of this axis can be easily changed as described in this section.

The Graph Menu is shown in Figure 3.13. It is very similar to the Reports menu in that you select what Data Types you want to graph from the list at the top. Click on a Data Type to select, or click on a selected Data Type to "de-select" it.

Figure 3.13 Graph Options Menu



Data Types

The Data Types you can select are listed and defined in Table 3.1 on page 85. Only 4 Data Types can be selected for any graph.

Other Graph Specs

Time or RPM Graph

Click on the down arrow button to choose either RPM or Time for the horizontal X axis of the graph.

What to Report

Select what part of the dyno test you want to make the report of:

- All Data
- Just Power Run #1
- Just Power Run #2 (if it exists)
- Just Power Run #3 (if it exists), etc

Click on the down arrow button to choose either to report All the Data (all data recorded) or just a particular run. If you have selected an RPM graph, you can only choose a particular run.

Note: In the Pro version, you can also select which run to graph by entering the Run number in the History Log. See Section 3.7.

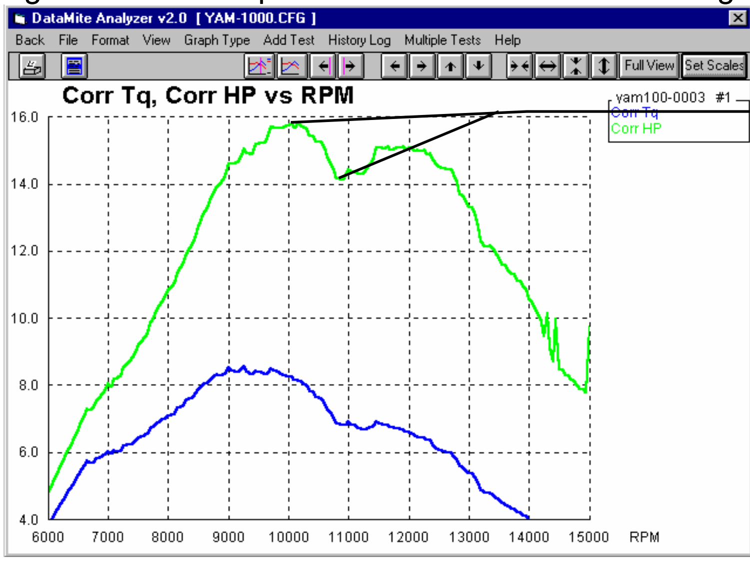
Filtering (smoothing)

Click on the down arrow button to select the level of filtering (smoothing) to be done to the data, before the report is made:

- None
- Light (some)
- Medium
- Heavy (lots)

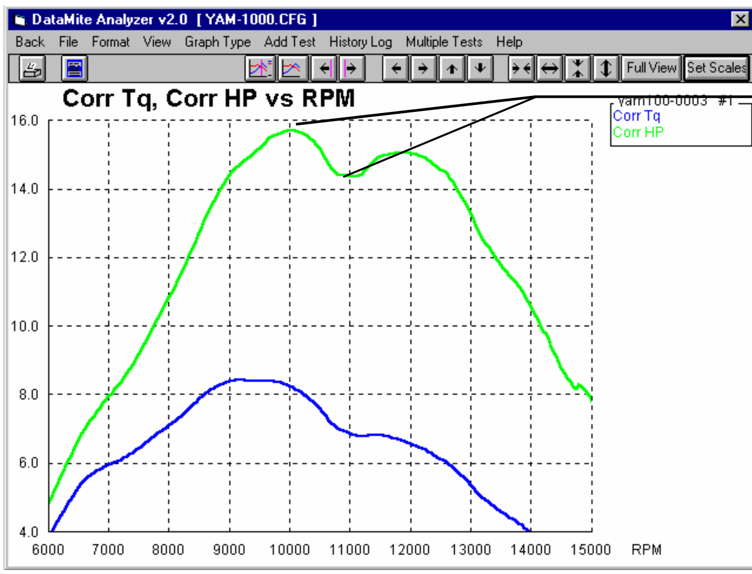
Select the lowest level that eliminates most (not all) of the 'jitter' in the data. Be careful not to 'over-filter', as this can completely distort the data. The dip seen in the Graphs of Figure 3.14 is real and is due to exhaust tuning effects on this 2 stroke engine. Note that the graph with Heavy Filtering has lower Peak values than the graph with Filtering set to None. Also note that the dip at 11000 RPM is not as deep with Heavy Filtering. This shows how Heavy Filtering can distort the data.

Figure 3.14 Examples of Various Levels of Filtering



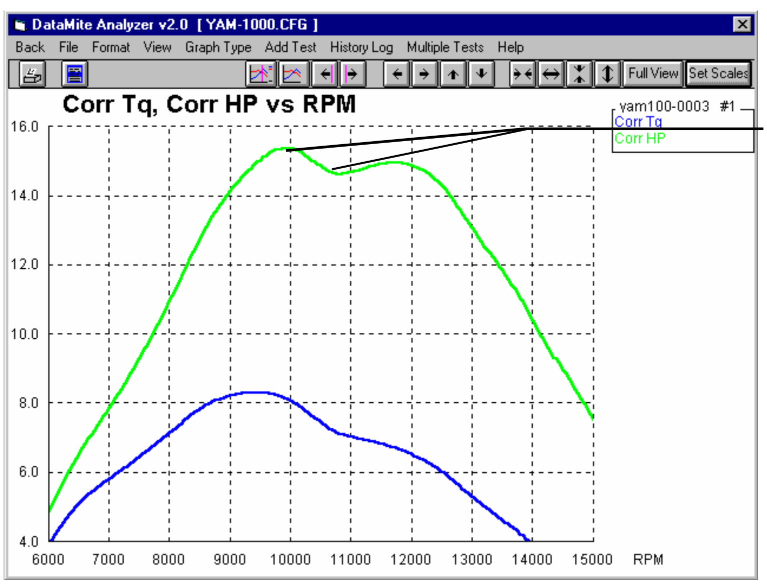
Note that the peak is the highest and the valley is the deepest when filtering is the least, in this case None. These torque and HP graphs look fairly smooth, even with Filtering = None, so even None would be an acceptable for these torque and HP graphs.

Filtering = None



In most cases for torque and HP graphs, Filtering = Some is the best choice. The peak torque and HP values for this graph are fairly accurate and repeatable. For other types of data Some or None is best. Picking a Filtering Level too high can distort the data and cover up problems with the data.

Filtering = Some



Note that the peak is the lowest and the valley is the least deep when filtering is the most, in this case Heavy. Heavy Filtering can hide problems with data. Before you use Heavy Filtering, be sure to check the data with Filtering set to None first.

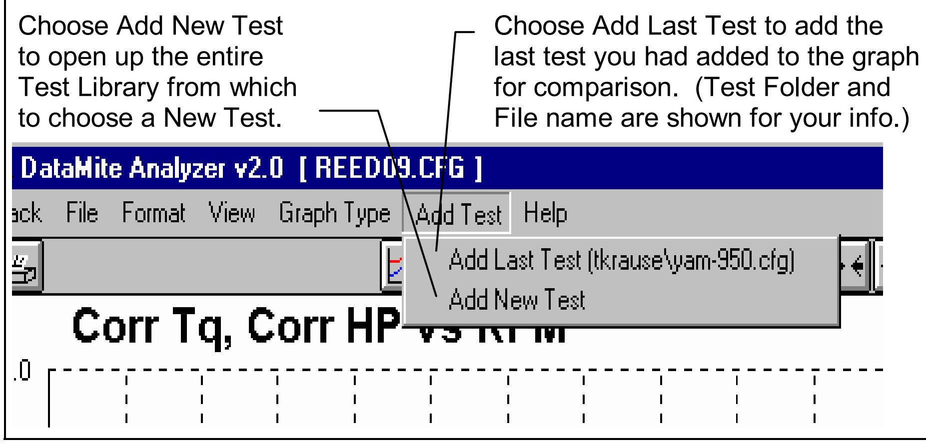
Filtering = Heavy

Graphs Comparing More Than 1 Test (Basic Version)

There are 3 basic types of ***tests*** which can be graphed in the Basic version:

- ***Current test results***. These are the test results of the test file which you are working with on the Main Screen.
- ***Last test results graphed***. These are the test results which you previously included in the graph for comparison. This allows you a way to easily refer back to one particular test for comparison.
- ***Add Test*** lets you pick any test from the Test Library to compare to the Current test results. This test now becomes the ***Last test results graphed***.

Figure 3.15 Graphing Multiple Tests, Basic Version



In the Basic version, you can only compare 1 additional test to the Current Test. If an additional test is graphed for comparison, the *Add Test* command changes to *Remove Test*. You must first click on Remove Test before the Add Test command reappears so you can add a different test.

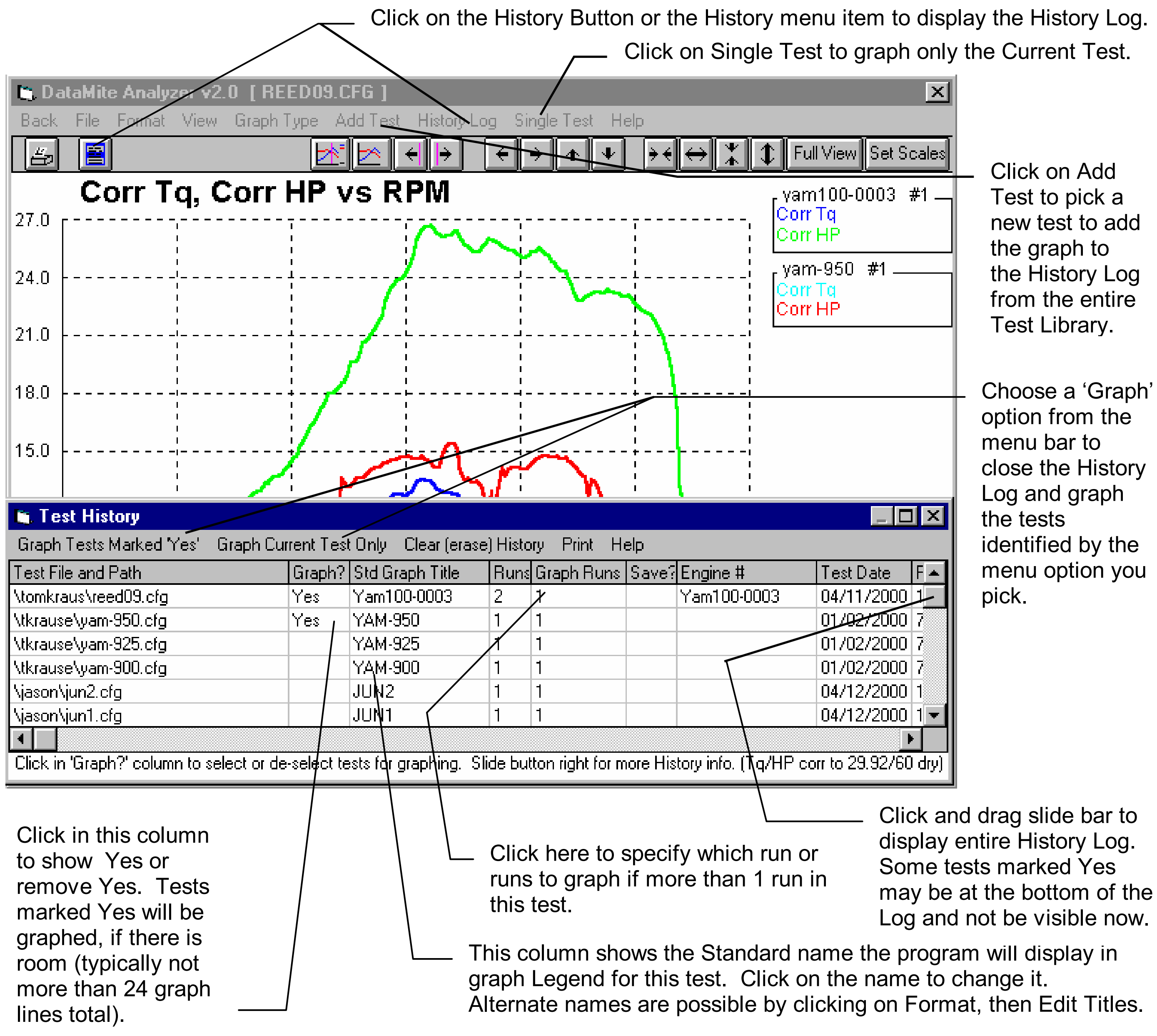
Graphs Comparing More Than 1 Test (Pro Version)

There are 3 basic types of ***tests*** which can be graphed in the Pro version:

- ***Current test results***. These are the test results of the test file which you are working with on the Main Screen.
- ***Tests marked in the History Log***. These are the test results which you previously graphed, started new, opened, etc. which you have marked "Yes" to graph in the History Log (see Section 3.7).
- ***Add Test*** lets you pick any test from the Test Library to add to the top of the History Log, and mark as a test you want to graph. Since it is at the top of the History Log, it should definitely be included in the next graph.

In the Pro version, you can compare data from up to 6 tests, as long as there is room for the Legends (labels) for each graph on the right side of the graph. Usually this ends up being about 24 graph lines, which could be 6 tests with 4 graph lines (for example, Obs Tq, Obs HP, Corr Tq and Corr HP for 6 different dyno tests of 6 different cams).

Figure 3.16 History Log (Pro version only See Section 3.7 for more details.)



Other Graphing Features

The graph screen has several other features, including:

- Printing
- Cursor to pinpoint the value of a particular point on the graph
- Changing titles and legend names
- Changing the scales

These are discussed in this next sections.

Printing

Figure 3.17 shows the options for printing graphs and how to access these options. Figure 3.18 shows the screen for changing the Windows Printer Setup. Figure 3.19 shows how you can add information to a graph printout by clicking on Format, then Edit Printed Comments and Data Output.

Figure 3.17 Printing Graphs

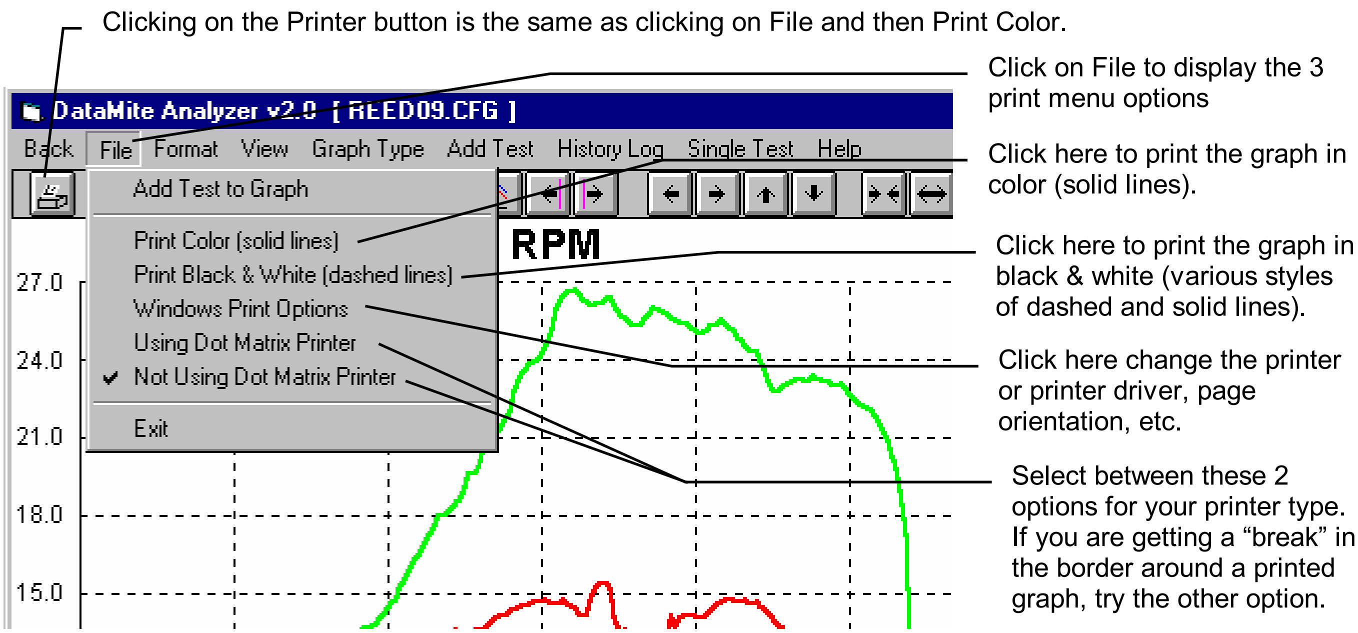


Figure 3.18 Standard Windows Printer Options

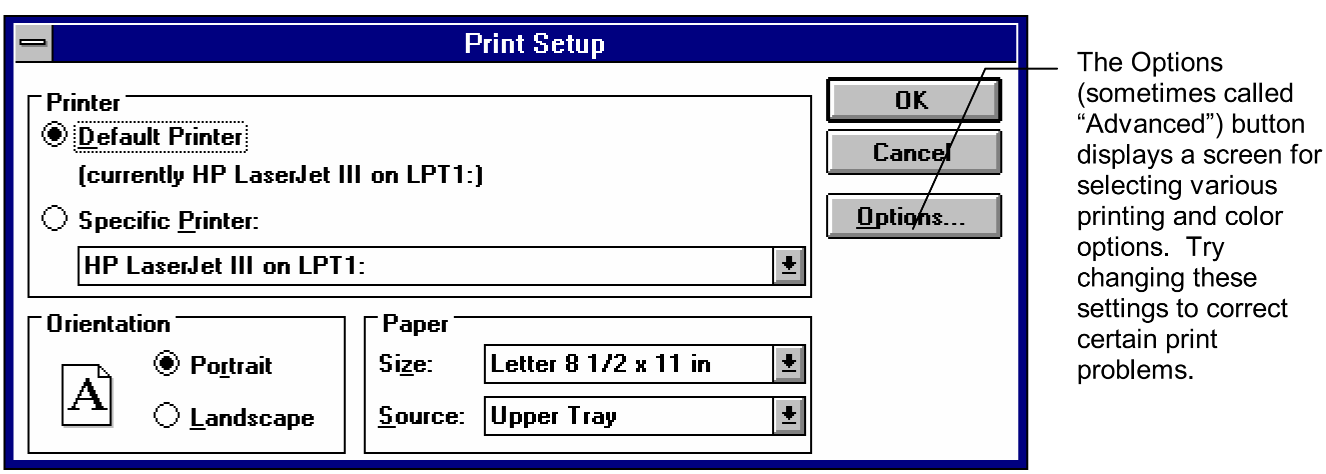
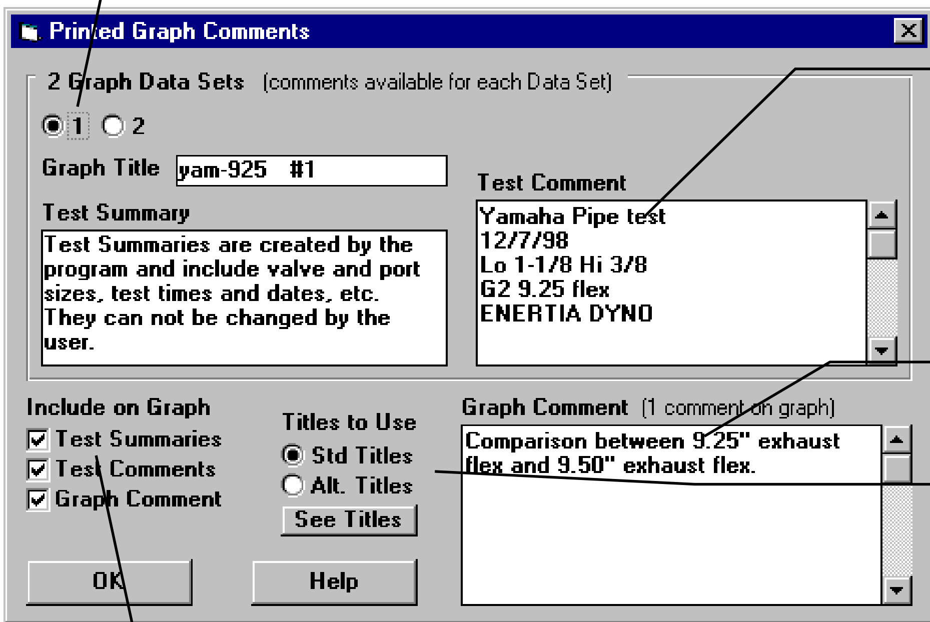


Figure 3.19 Adding Information to a Graph Printout . (Most of these options have no effect on the graph on the screen, only the graph that is printed.)

Click on these #s to change which Data Set's (test file's) comments and title you are working with.



Click here to change the Test Comments (comments which appear on the Main Screen). Changes to Data Set 1's comments (the current test) are permanent. Changes to other Data Set's comments are temporary.

This one comment is printed directly under the graph.

The Titles to Use options give you a way to reach the Menu in Figure 3.26 to change the Titles and Legends of the graph.

Check or uncheck these 4 options to determine what gets printed, and what options are enabled and disabled on this screen.

Bottom Section of Printed Graph

Graph Comment

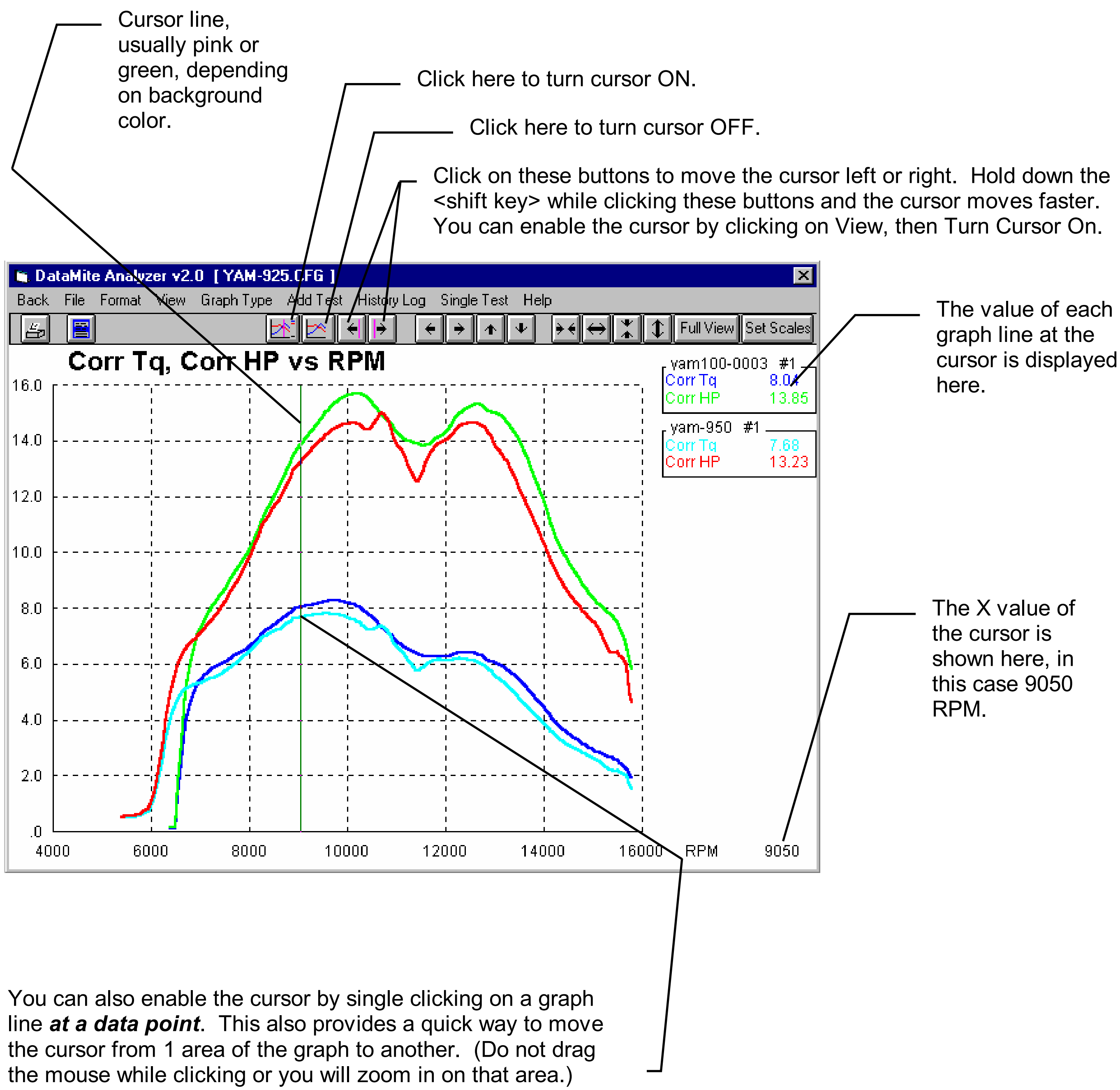
Test Summary

Test Comment

Cursor

The cursor feature is very useful for determining or comparing the value of the graph lines at various places. See Figure 3.20 for explaining the use of the cursor.

Figure 3.20 Cursor Features and Commands



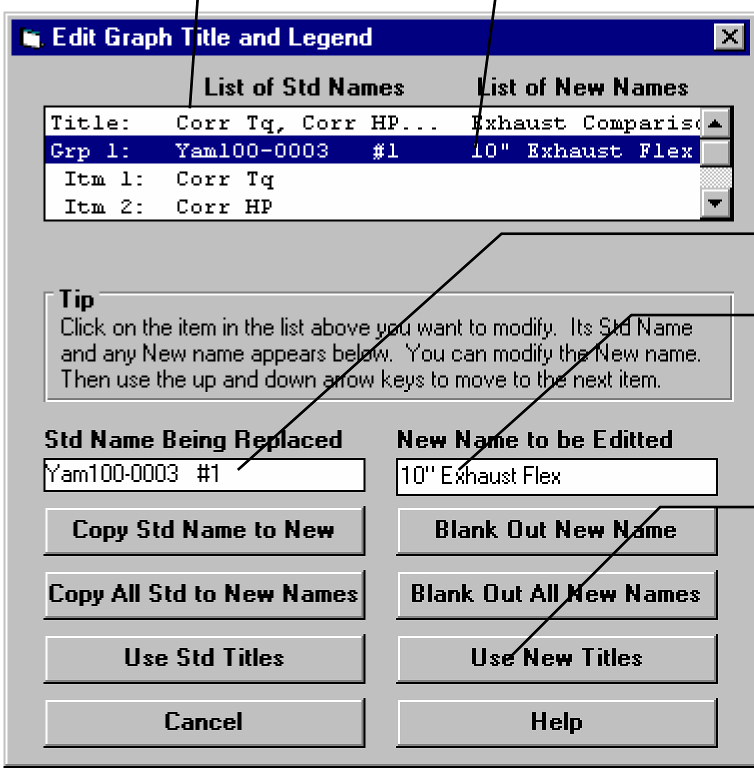
Changing titles and legend names (Pro version only)

Many times you may want to customize a graph by displaying and printing labels of your choice. Click on Format and then Edit Titles/Legend to bring up the menu shown in Figure 3.21 which will allow you to do this.

Figure 3.21 Menu to Edit Title and Legend

This is the list of Standard names the program uses unless you click on the Use New Titles button below. Select (click on) a Standard name you want to change. The Standard Name appears in the edit box, along with the current New name if there is one. ***Once you have selected a name from this list (that row will be highlighted) it is easier to use the up and down arrow keys to select the next item to edit than clicking the item with the mouse.***

This is the list of New names the program will use if you click on Use New Titles. If a title in the List of New Names is blank, the program will use the Standard name.



Standard name from row selected.

New name for you to edit. Other options include clicking on the Copy Std Name to New or Blank Out New Name buttons.

Click here to close this menu and use the New names you have entered. Where New names have been left blank, the Standard name will be used.

Changing the scales

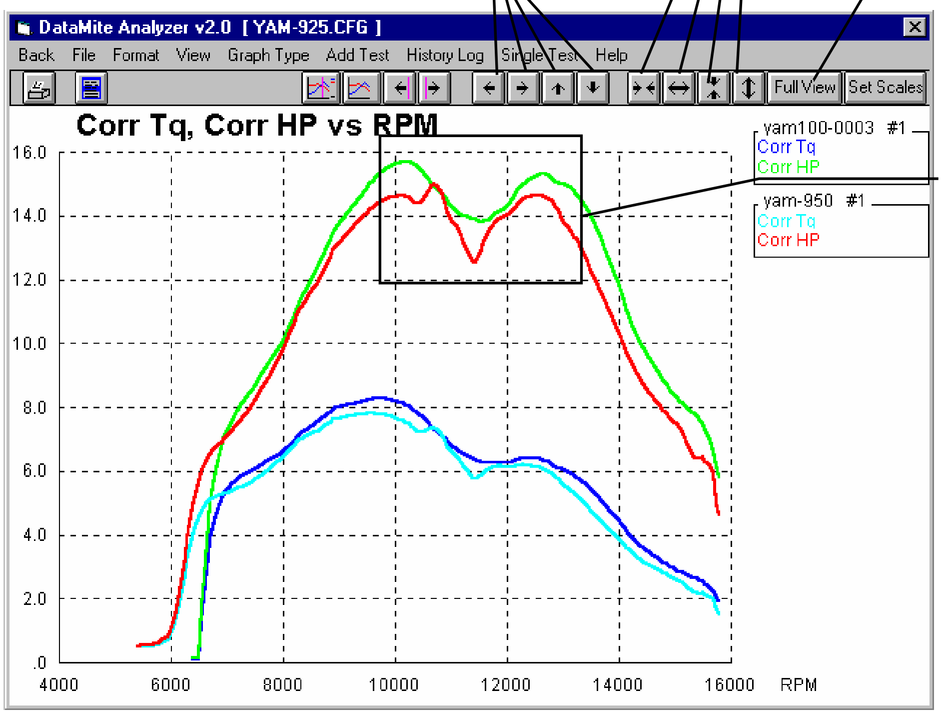
Many times you may want to change the scale of the X or Y axis. This may be to show an area in more detail or to match the scales of a previous graph. The Pro has several ways to change the scales as shown in Figures 3.22 and 3.23.

Figure 3.22 Changing Scales for the X or Y Axis

Clicking on these buttons shifts the graph left, right, up or down. Hold down the shift key while clicking on them and the graph moves farther each step.

Clicking on these buttons zooms in or zooms out on the graph, either vertically or horizontally Hold down the shift key while clicking on them and the graph moves farther each step.

Click here to restore "auto-scaling". That is where the computer picks the scale to show all the graph in good detail.

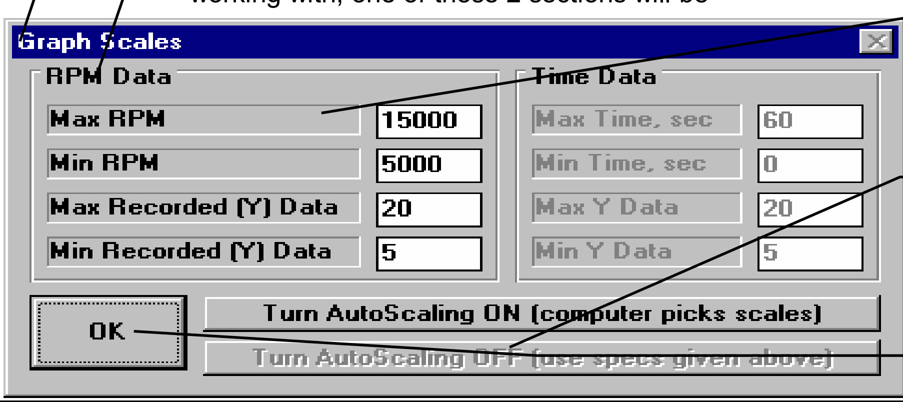


You can use the mouse to outline an area to be zoomed in on. Simply click on the mouse key in the upper left corner of the area, then hold the key down and drag the mouse to the lower right corner of the desired area. A box will be drawn as shown. When you release the mouse key, this area will fill the whole graph. This feature is disabled if the cursor is turned on. Also, start the upper left corner well away from a graph line or the program may turn on the cursor instead.

Figure 3.23 Menu to Specify Graph Axes Scales

This menu can be obtained 2 ways. You can click on View in the menu bar then Specify Scales (axes), or click on the Set Scales button, the right most button on the graph screen.

Depending on the type of graph data you currently working with, one of these 2 sections will be



The current scale limits are loaded when this menu opens. Change any or all these to most any value you want.

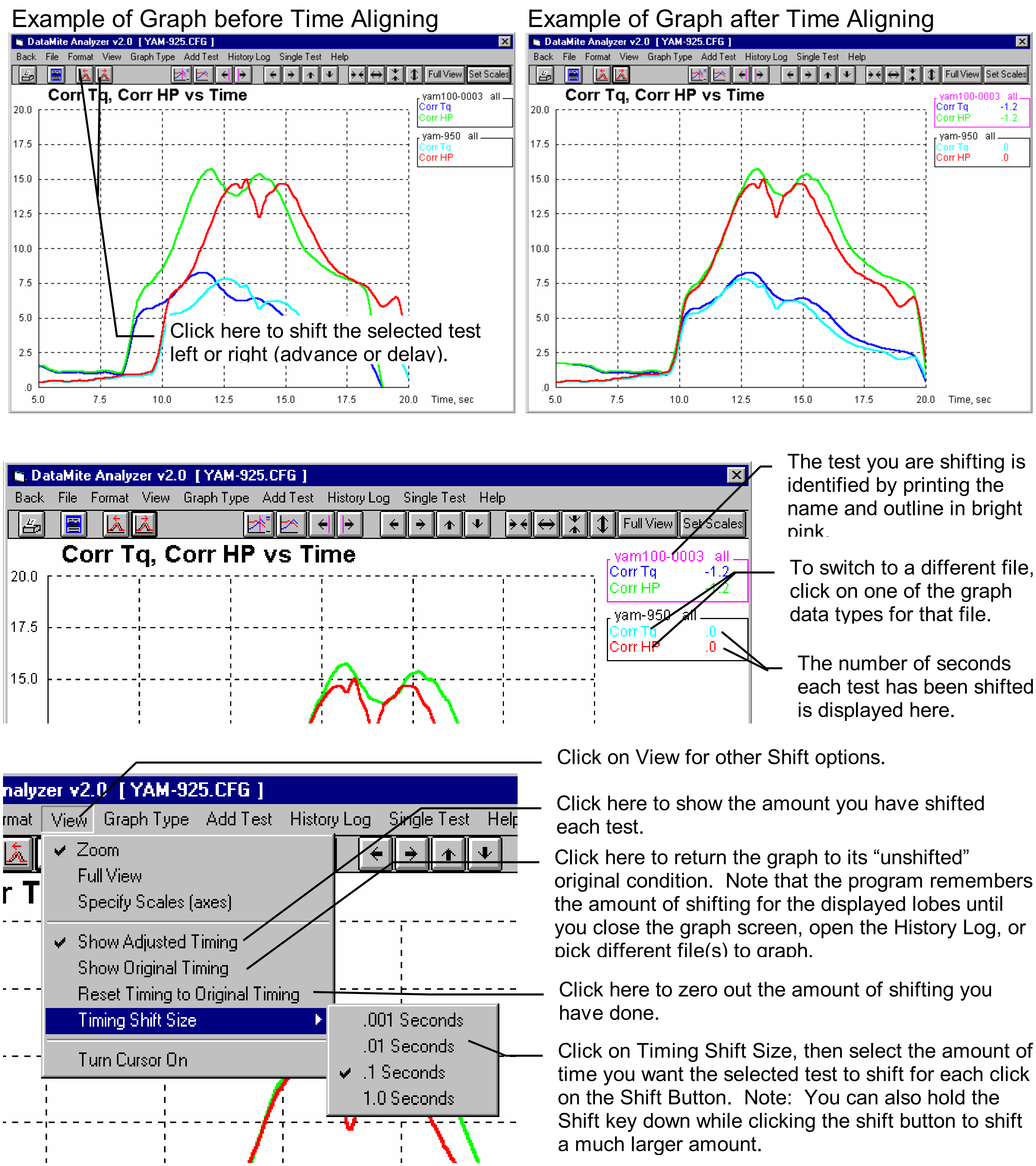
Click the Turn Autoscaling Off button to turn Autoscaling Off to enable changing specs in this menu.

Click on OK to have the graph redrawn to these new scale

Time Aligning (shifting) Graphs

Many times you may want to realign 1 graph with respect to another, for example to line up the start of an acceleration, etc. The program allows you to shift (advance or delay) one test over another on the graph, as shown in figure 3.24.

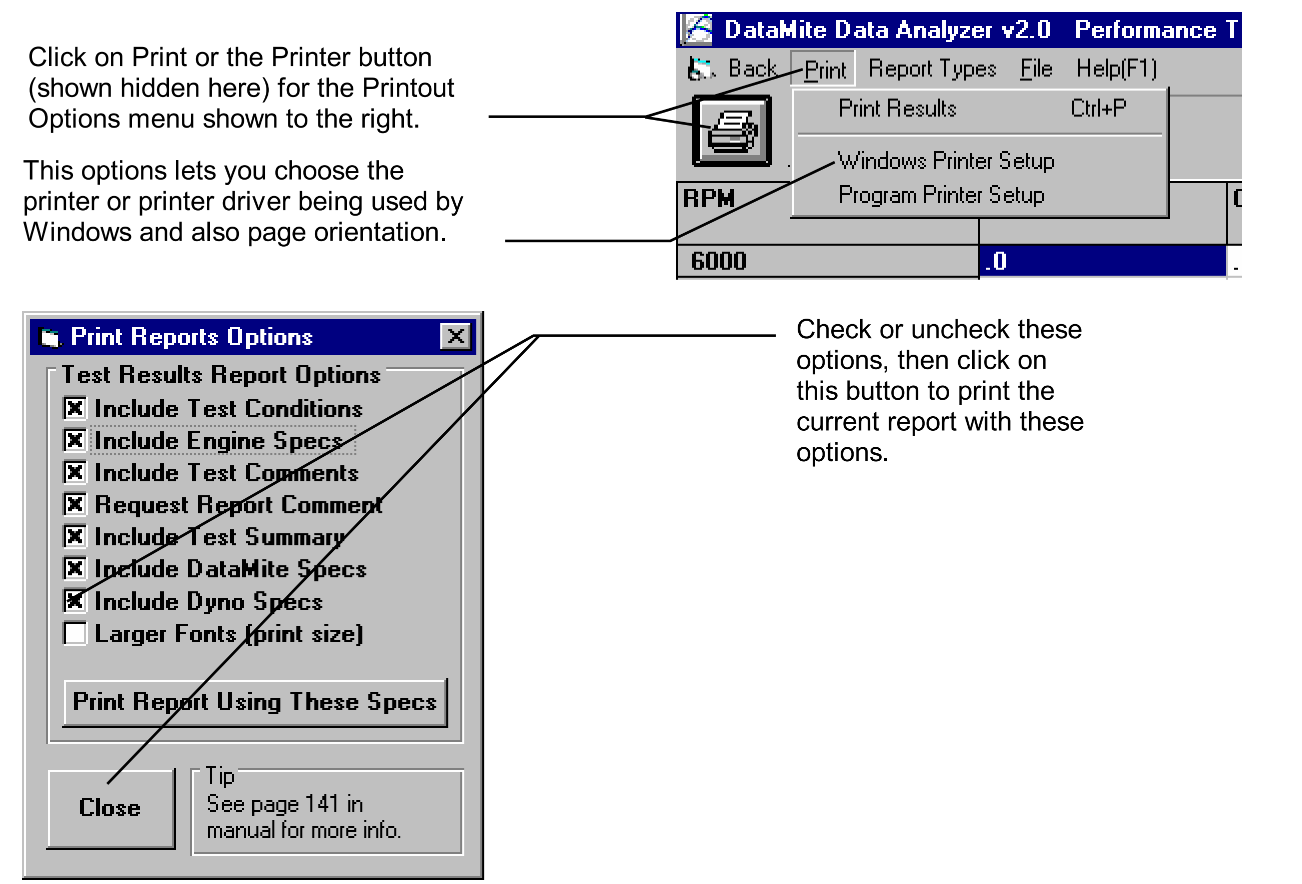
Figure 3.24 Showing Options to Shift Data from 1 File Over Another File



3.4 Printer Output

The Dyno DataMite Analyzer can print the tabular test results of a report for a permanent hardcopy by clicking on Print in the menu bar or the Printer icon. The menu of options shown in Figure 3.25 will appear. Check the options you want to use for the printout by clicking on any or all of the Option boxes. All options and buttons are discussed in this section.

Figure 3.25 Printer Button and Print Menu Command Options - Report Screen



Test Results Report Options

Include Test Conditions
Include Engine Specs (Pro Version Only)
Include DataMite Specs
Include Dyno Specs

Select these options if you want all the specs from these menus printed with the report. This will add 1-2 pages to the printed report.

Include Test Comments

Select this option if you want all the comments for the Test File printed with the results.

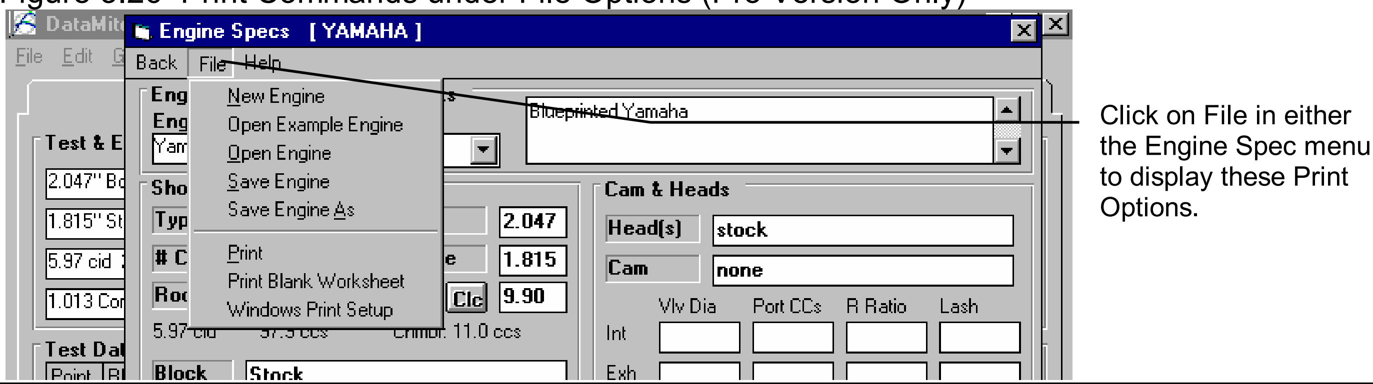
Request Report Comment

Select this option if you want to be asked for a comment for each particular report you send to the printer. These "report comments" are useful to identify important points for future reference, like engine modifications, special test conditions, etc.

Larger Font (Print Size)

Check this option if your particular printer is printing the results with a small print font. This option will increase the font size for some parts of some reports. Also see Preferences for Selecting Printer Fonts, page 24.

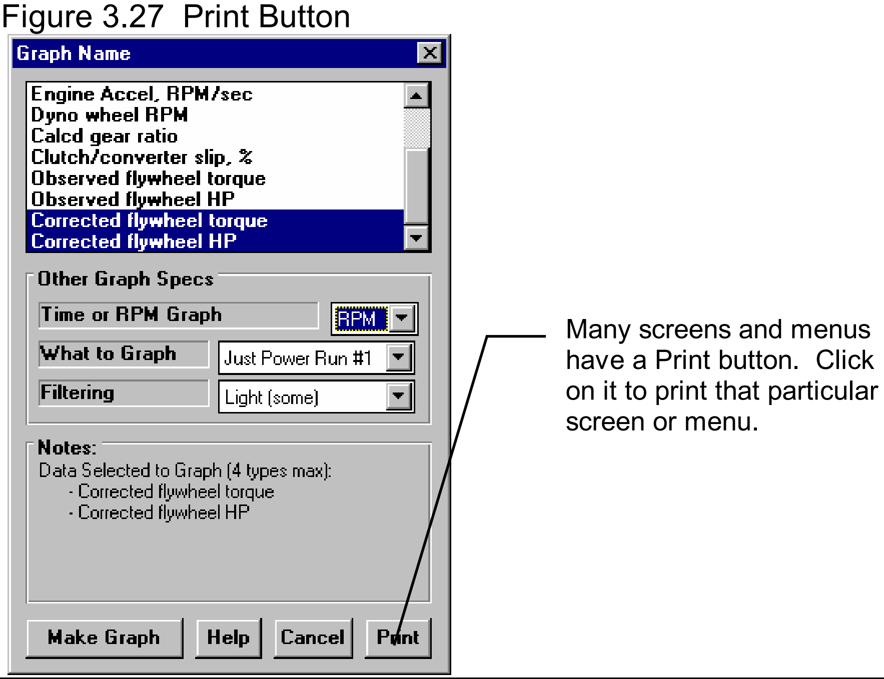
Figure 3.26 Print Commands under File Options (Pro Version Only)



Other Print Options

Other menus have print menu commands or print buttons as shown in Figures 3.26 and 3.27.

Figure 3.27 Print Button



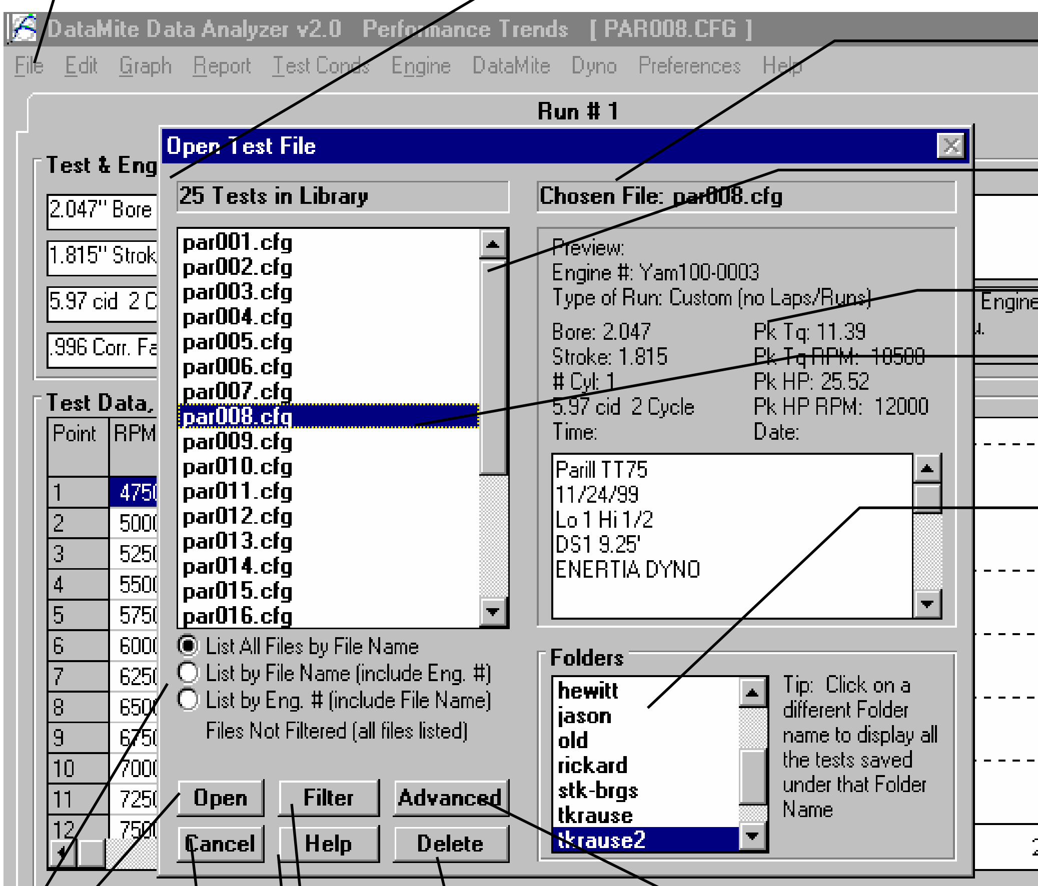
3.5 Data Libraries

The Dyno DataMite Analyzer allows you to save recorded DataMite Data and related specs (Engine Specs, Test Conds, etc) to the Test File Library under a name of your choosing. You can then open these test files out of the Test File Library in the future for comparison or modification. The Open window is explained below with explanations.

Figure 3.28 Test Library Options

Click on File, then Open (from all saved tests) to display Test Library shown here.
Click on File, then Save or Save As to save current test and specs to the Test Library.

Total # Tests in Library under this Folder



Name of chosen Test (currently highlighted in Test List)

Click and drag slide bar to view all Tests in list

Preview of Test

Single click on a Test to choose it for preview. Double click to immediately open it

Tests can be saved under various categories (folders) to help you organize large #s of tests. Click on a different name here and a different list of Test Files will be displayed. The name "Folder" was called "Track" in the DOS version, but can be changed in the Preferences menu to most any word.

Click here to delete the chosen Test.

Click here to bring up standard Windows File Open screen, to let you open a file in most any folder (directory) and disk drive.

Click here to bring up the Filter Options menu where you can select to show only tests which fit certain criteria. See Section 3.6.

Click here to bring up "on screen" help.

Click here to close the Test Library with No changes (without opening a test)

Click here to open the chosen Test

Select one of these options to list the test files alphabetically, either by test file name, or by engine #. This option can save you time looking for a particular test file. (Pro Version Only)

Open a Test File

To open a test file saved in the Test Library, click on File at the upper left corner of the Main Screen, then on the Open (from all saved tests). In the Pro version you have an additional option of "Open (from History Log)" which will be discussed in Section 3.7.

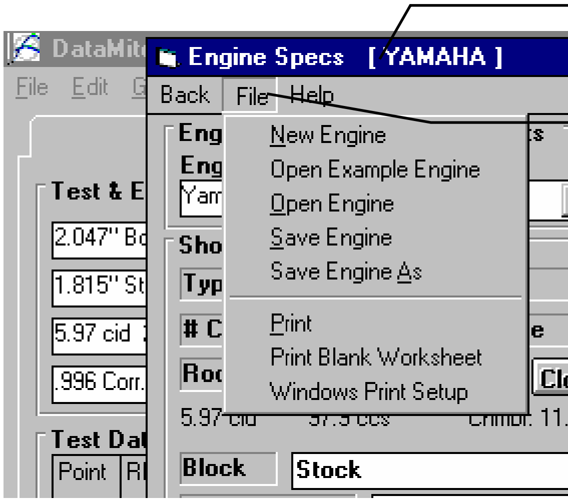
You will obtain the window shown on the previous page. Single click on one of the tests in the list, or click and drag the slide button on the right side of the list to display more tests. Once you single click on a test, it is now the Chosen Test File and a preview of the test is given in the Preview section. If the file you chose was not a valid Dyno DataMite Analyzer file (either Windows V2.0 or the older v1.x for DOS), the program will tell you and you can not choose it. Tip: Once you click on a test and get a preview, use the up and down arrow keys to go through the list test-by-test getting a preview of each test.

Once a test has been chosen, you can delete it by clicking on the Delete button, or Open it by clicking on the Open button in this window. You can also click on a different test to Preview it or close this window and return to the Main Screen without choosing a new test file.

If you are sure of the test you want to open, you can simply double click on it from the Test List. This opens the test without a preview and closes this menu.

Note for Pro Version: You can also save sets of Engine specs to its own separate library. This is done very similarly as with the Test Files, except you click on File, then Open from the individual Engine menus. See Figure 3.29.

Figure 3.29 Engine File Options (Pro version only)



Current Engine File Name

Click on File in the Engine menu to Open a set of saved specs, or to save the current set of specs in just that screen. This allows you to build libraries of Engines for easily creating new tests in the future.

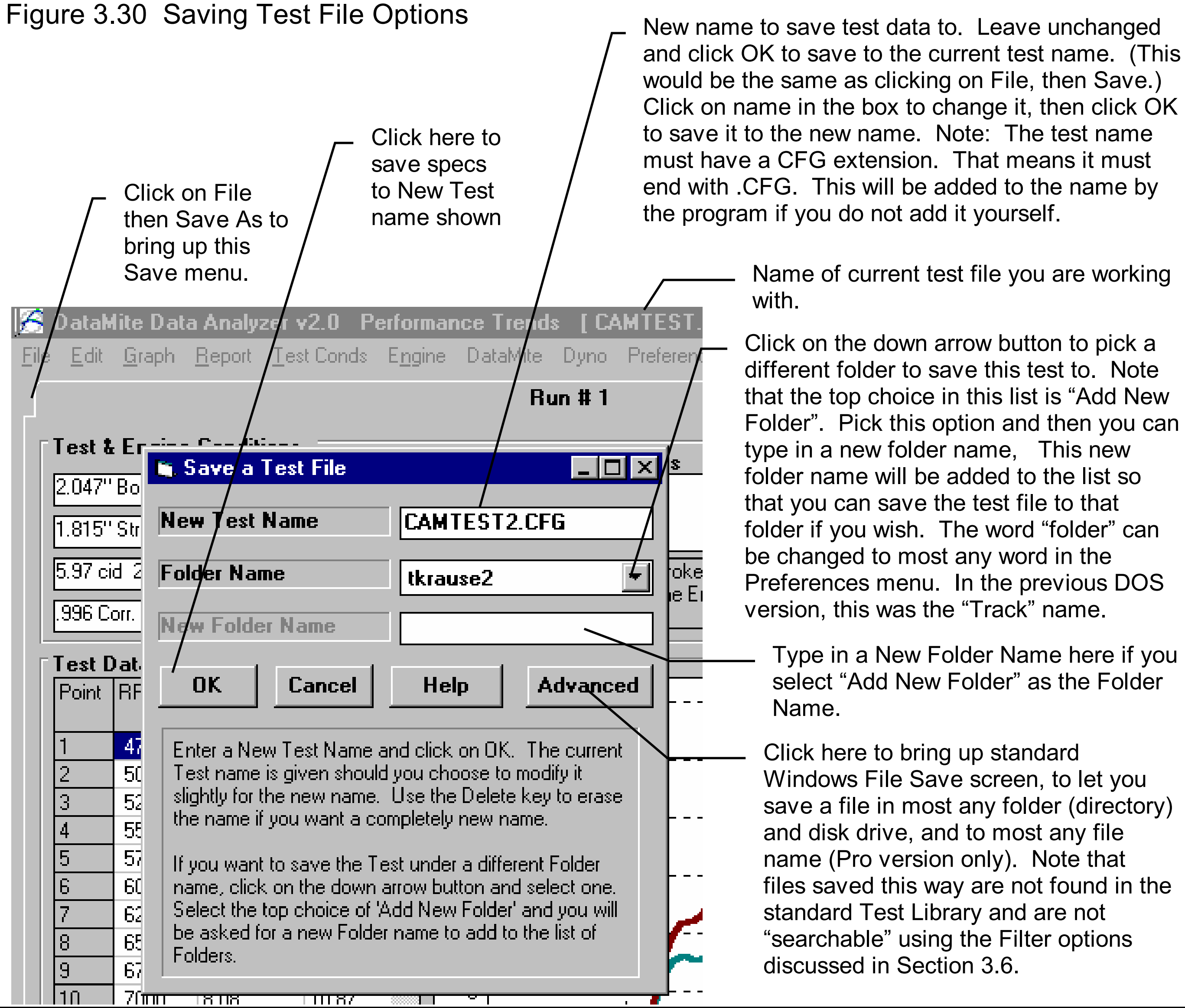
- New blanks out the current specs and comments.
- Open Example opens a library of example specs provided by Performance Trends.
- Open Saved opens a library of specs ***you*** have saved.
- Save saves the current specs to the same name as these specs are currently called.
- Save As saves the current specs to a new name that you will enter.

Save a Test File

Before you discuss saving a test file, it is important for you to understand how the program opens and uses test files. When you open a test from the Test Library, you are only using a *copy* of the test. The original test file is kept in the library.

As you make changes to the test, they are only made to this copy. The original file is not changed. If you want to delete your changes, you can simply open a fresh, unchanged copy of the original test file from the Library. If you want to keep your changes, *you must save them*. This can be done by clicking on File, then Save. You are also asked if you want to save your changes whenever you open a new test, and the program has detected you have made changes to the current file.

Figure 3.30 Saving Test File Options



To save a Test File, you will be presented with the Save Window as shown above. The program suggests a new test name which is the same as the current test name shown at the top of the Main Screen. If you want to save your changes to the same name, simply click on OK. This will update the current test file with your latest changes.

If you want to save the current set of test specs with your changes to a new name (and leave the current test file in the Library unchanged), then click on the suggested file name and modify it as you want. For example, in the window shown above, you may want to add 2 to the current name CAMTEST to create CAMTEST2 to indicate this is the 2nd revision of CAMTEST. This is the safest way to make changes, because you can always return to an earlier version and see what you had done.

The test name must have a CFG extension. That means that the test name can be most any name of up to 8 characters or numbers, but it must end with the 4 characters .CFG. If you do not add the .CFG to the name itself, it will be added to the name by the program.

Other types of file names which are not acceptable include:

- Names with more than 8 characters (or 8 characters to the left of a period if you include the .CFG extension) .
- Names which include the characters:

  / \ [ ] : | < > + = ; , * ? or spaces (or periods, unless you include the .CFG extension yourself)

- Names with lower case letters. These letters will be converted to upper case once the file is saved.

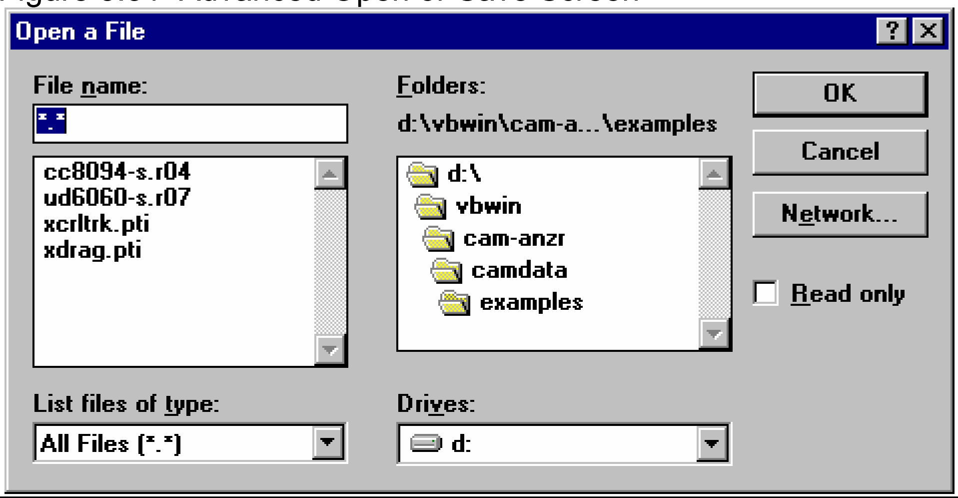
Test files are saved to folders (directories) you have created in the DTMDATA folder (directory) in the DTM20 folder (directory) under PERFTRNS.PTI folder (directory). You ***can*** copy Windows Dyno DataMite Analyzer files from programs on other computers to this folder (directory) and they will be found by the program. The Windows Version 2.0 ***will*** read files produced with the older DOS v1.1 or 1.2. Just copy them into a folder under the DTMDATA folder (other than the Examples folder). The Save to Floppy and Open From Floppy commands discussed on page 18 are an alternate, perhaps easier way to copy files from one computer to another.

The method of saving an Engine file is exactly the same as complete Test Files, except that you access the Save menu by clicking on File at the top of these individual menus, as shown in Figure 3.29. These files are saved to the ENGINE folder (subdirectory).

Advance Open or Save Screen

If you click on the Advanced button in either the Open or Save As screen, you will obtain the screen shown in Figure 3.31. From here you can access most and file on the computer on most any disk drive.

Figure 3.31 Advanced Open or Save Screen



Tips to Advanced Users:

DataMite test files actually consist of 3 files:

1. .DAT file (which is the recorded DataMite data)
2. .CFG file (which is the configuration file, including DataMite specs, Dyno Specs, Engine Specs, etc.)
3. .LAP file (which is the Lap or Run file, identifying where the beginning and end of each dyno run is in the .DAT file)

If you want to copy a DataMite test from one computer to another, you must copy all 3 files. This is done automatically whenever the program saves or opens a file, or when you used the Save to Floppy and Open From Floppy commands discussed on page 18.

If you have a file from another computer, from another disk (like a floppy) or folder, you can simply copy it into any folder in the DTMDATA folder and it will be found by the DataMite program. This can be done with a program like File Manager (Windows 3.1) or Windows Explorer (Windows 95.98). You can also create new folders (directories) in the DTMDATA folder and these will also be used by the DataMite program.

3.6 Filter Test Files (Pro Version Only)

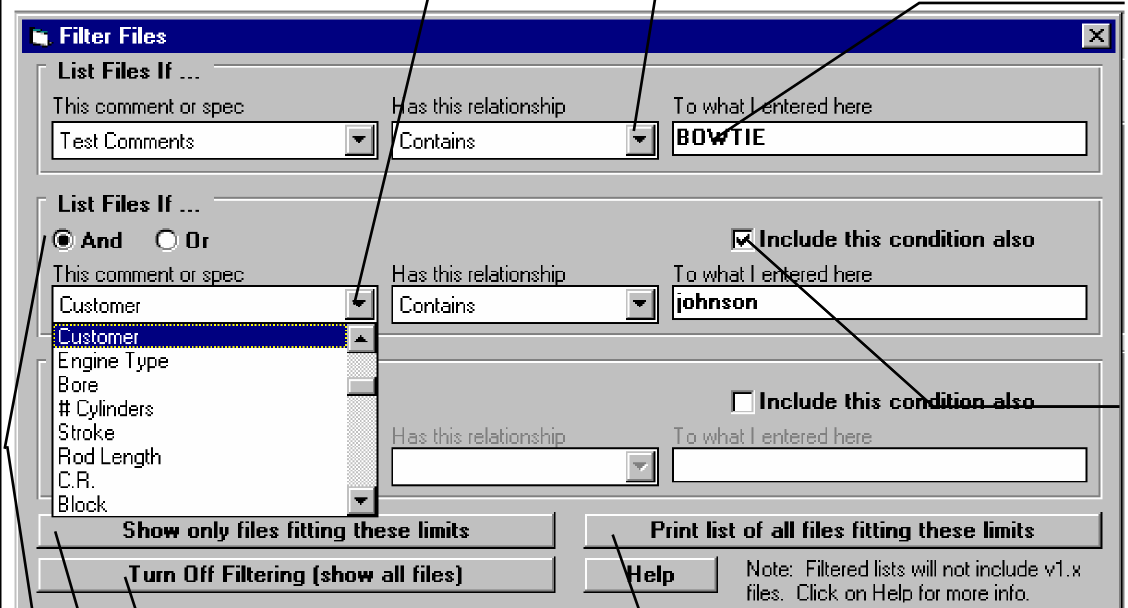
The Dyno DataMite Analyzer has a powerful way to search for tests in the Test Library called the Filter Option. Click on the Filter button in the Open Test File menu (Figure 3.28, page 107) to be presented with the screen shown in Figure 3.32 below.

Figure 3.32 Filter Files Menu

Click on the down arrow button to pick the spec or comment to check for a certain condition "Has this relationship".

Click on the down arrow button to pick the condition to look for. These change depending on the spec or comment you have chosen.

Type in (or pick from a list for some specs) the condition to look for. The program treats UPPER and lower case letters the same (bowtie = BOWTIE = BowTie).



Check here to include a 2nd condition. This enables specs in this section.

Click on this button to return to the File Open menu which will now show ***all test files***.

Click here to produce a report of all files meeting the Filter conditions IN ALL FOLDERS in the DTMDATA folder (the entire Test Library). This way you can avoid looking in each folder separately and can save

Click on this button to return to the File Open menu which will now ***only show files which fit the Filter Conditions***.

Select And and the Test Files displayed must fit ***both*** conditions specified. Select Or and the Test Files displayed can fit ***either*** of the conditions specified.

The settings in this screen will display all test files with the word BowTie (or bowtie or BOWTIE) somewhere in the test comments and with the word Johnson (or johnson or JOHNSON) somewhere in the Customer description (a spec in the Engine Specs menu).

The Filter Feature is very useful for finding a specific test or to find all the tests which meet a certain set of conditions. For example, say you want to find a test that Operator "Jack" ran for Customer "Smith" on a "Big Block Chevy" engine. Or, say you want to check on all tests run with Weber carbs, where "Weber" would be in the Carb description in the Engine Specs menu. Or perhaps you want to find all Small Block Chevys that produced more than 700 HP. In all these cases, the filtering specs would allow you to find the test files.

First you must select the condition you want to look for by clicking on the down arrow button on the 'This comment or spec' box. Your choice of this spec will determine what the 'Has this relationship' options are, and what specs can be entered in the 'To what I enter here' spec.

You can select up to 3 conditions to look for. For the Operator "Jack", Customer "Johnson", "Big Block Chevy" example above, you would need to search for 3 conditions. For the valve seal example, you could just search for 1 condition. You add conditions by checking the 'Include this condition also' box. This enables the other specs for each condition.

If more than 1 condition is being used for the search, you must determine if you want the search to include tests which fit ANY of the conditions (Or) or must match ALL conditions (And). For example, if you are looking for tests run by either Operator Jack or Operator Joe, you would select "Or". If you want Tests which made more than 300 HP ***and*** were done since Jan 1999 (the tests must match both conditions), you would select "And".

The 3 command buttons will do the following:

Show Files Only Fitting These Conditions will return you to the Open Test File screen. Only files fitting these conditions will be displayed (which may be no files in some situations). You can click on various folders (or whatever name you have given to folders in the Preferences menu at the Main Screen) to see if there are any matches in other folders.

Turn Off Filtering (show all files) will return you to the Open Test File screen and now all files will be displayed.

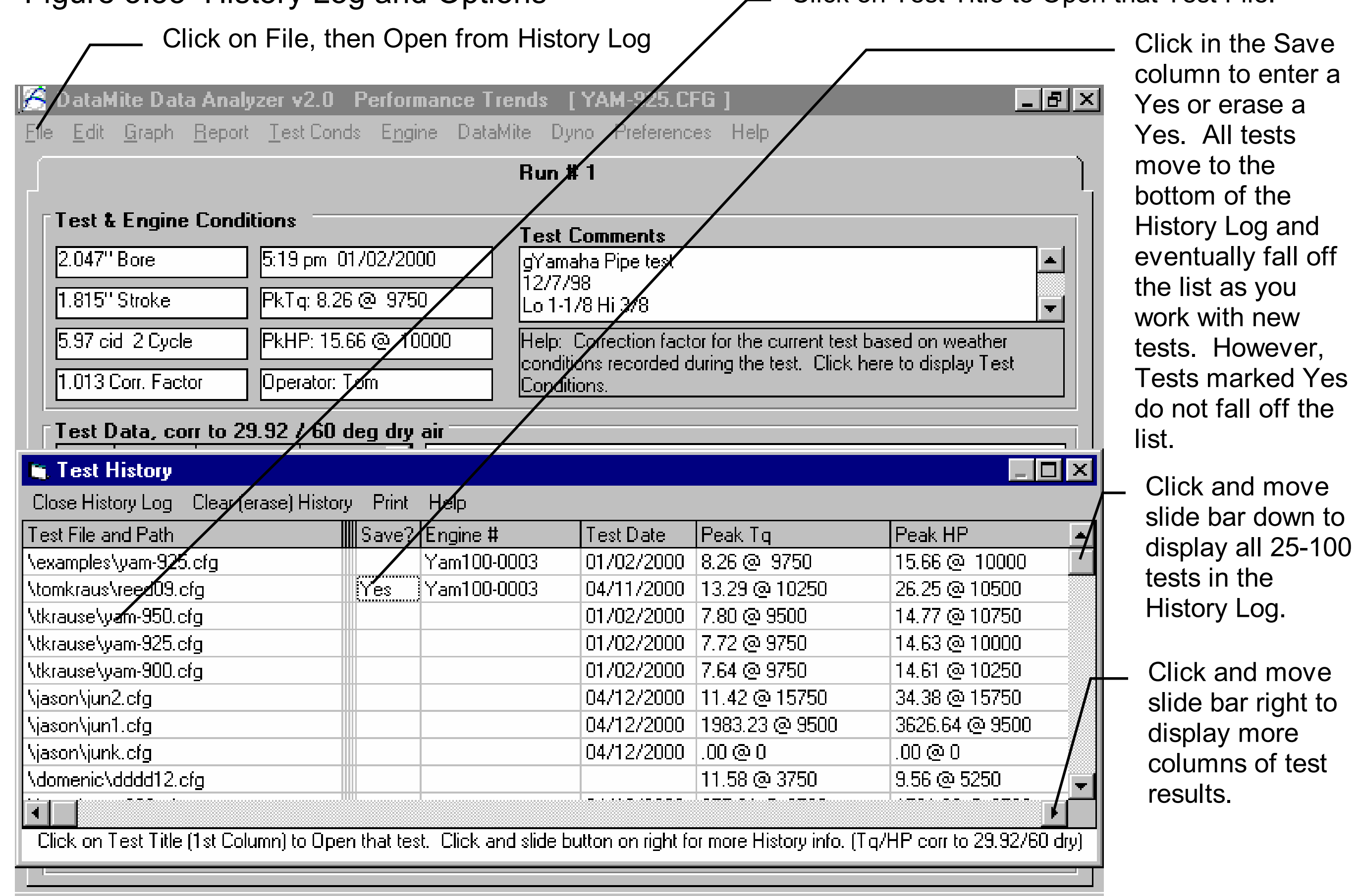
Print List of All Files Fitting These Conditions will search through the entire Test Library (all folders in the DTMDATA folder) for files matching these conditions and display them in a new screen. From this screen, you can also print the list. This is the quickest way to see which folders may contain test files matching your conditions.

> Tip: When looking for a word, the program doesn't care if it is in CAPITAL (upper case) or small (lower case) letters. In Figure 3.32 above you are looking for the word BowTie in the test comments. The program will display all files which have the word "BowTie" or the word "BOWTIE" or the word "bowtie" or the word "BowTIE" anywhere in the comments. The program will ***not*** find files with the words "Bow Tie" (with a space between Bow and Tie) . Therefore, it may be smarter to just look for the word "bow" to avoid this problem. Note, however, that if you do this, the program will also find tests with the word "elbow" or "crossbow" , for example, in the test comments.

3.7 History Log (Pro Version Only)

Click on File, then Open form History Log at the Main Screen to obtain the History Log shown below in Figure 3.33. This screen shows a summary of the results for the last 25-100 tests you have worked with (started new, opened, graphed, etc.) The number of tests in the log (25-100) is selectable in the 'Preferences' menu at the Main Screen. When you work with a new test, it is added to the top of the History Log, and (if the Log is full) the last run drops off the bottom of the list. In the Pro Version, the History Log is an alternate way to Open tests which have been saved to the Test Library. The advantage of the History Log is it lists the tests you most recently worked with at the top.

Figure 3.33 History Log and Options



From this screen you can Open a test file by clicking on the 'Test File and Path' column (first column on the left). If the test file was saved to a standard folder (directory, or whatever you have chosen to call folders in the Preferences menu), the folder name is given first, followed by the test file name.

If a test file has been Opened from or Saved to a non-standard folder (a folder not in the DTMDATA folder) using the 'Advanced' function, the entire path is given. If the 'Path and File Name' won't fit, it is shortened and preceded by '...'.

You can choose to Save certain results you believe are special and you may want to recall or graph in the future by clicking on the Save column to insert a Yes there. Tests marked Yes to Save eventually move to the bottom of the History Log, but are never dropped off the list or erased until you again click on the Yes to make it blank.

Note that just the Test File Name stays in the History Log. Should you delete the file using the Open (from all saved tests) command, the test file will be deleted but the name will stay in the History Log. When you try to open it or graph if from the History Log, you will get note saying the file can not be found.

You can print the History Log on a printer by clicking on the 'Print' menu command. Note that the History Log will be most readable when the Page Orientation is in Landscape setting.

Max torque and HP are handy to remind you what a test was, and for comparing different tests.

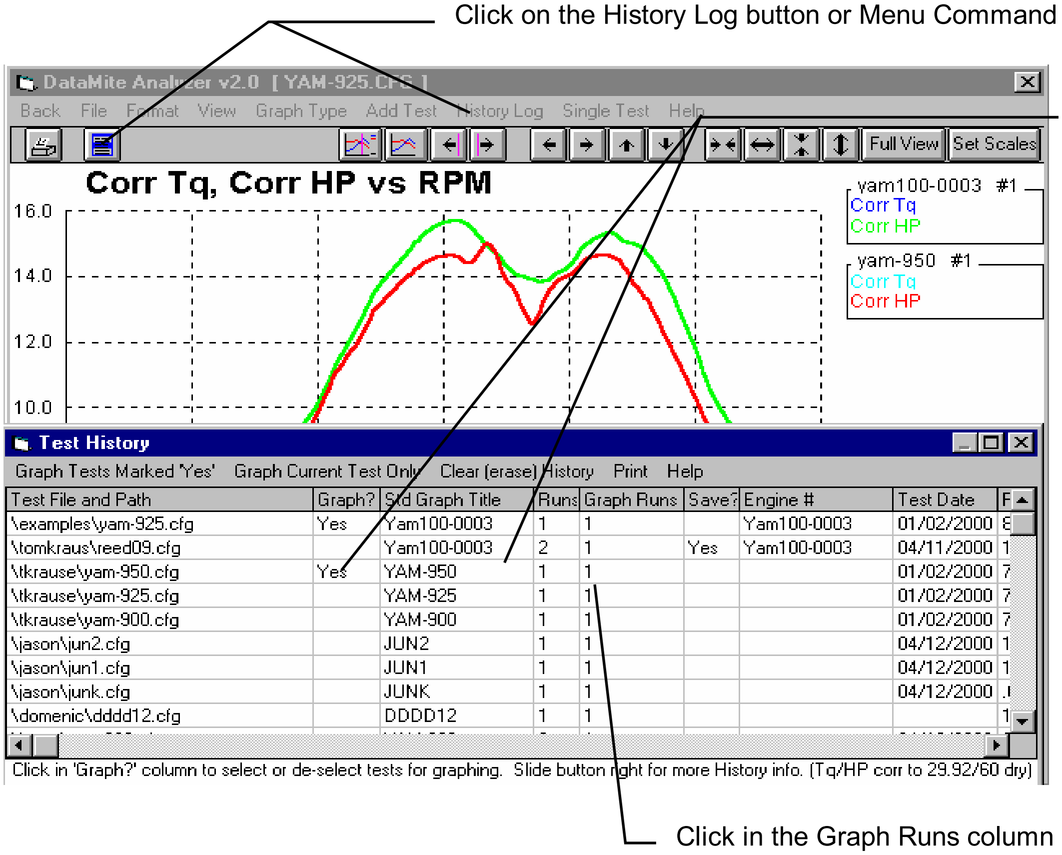
History Log at Graph Screen

At the Graph Screen, several options are available to graph selected tests from the History Log, and change the Graph Titles. You can obtain the History Log by clicking on the menu command History Log at the top of the Graph Screen. The History Log is how you graph different tests together for comparison. From this screen you can:

- Choose to Graph certain Test Results by clicking on the Graph column to insert a Yes there. Tests marked Yes to Graph will be graphed when you click on the 'Graph Tests Marked 'Yes' '. The first test (usually the current Test you are working with) is always graphed even with no Yes marked. The number of tests actually graphed are limited by available space, usually a limit of about 24 graph lines total.
- Graph only the current test results (the test file at the top of the Log) by clicking on 'Graph Current Test Only'.

Figure 3.34 History Log at Graph Screen

Click on the History Log button or Menu Command to display History Log.



From the Graph Screen, 2 additional columns are displayed:

1. Click in the Graph? column to add a Yes or remove a Yes. Tests marked Yes to graph are graphed if you select Graph Tests Marked 'Yes'.
2. Click in the Std Graph Title column to change the Std Graph Title. Alternate titles are also possible by clicking on Format, then Edit Legend/Titles.

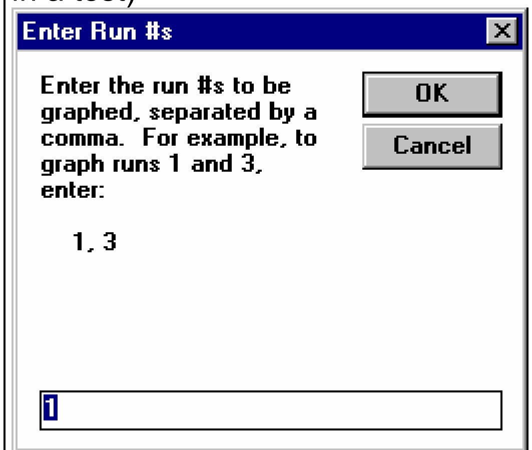
Click in the Graph Runs column to change which run (or runs) you want to graph, a number from 1 to the number in the adjacent "Runs" column.

- Click on 'Graph Title' to change the Standard Title for this test. The program has 2 defaults for naming a file in the History Log which you can select in Preferences. See Section 2.2. It is either; 1) the test file name without the .CFG extension, or 2) the Engine # unless it is blank when it then puts in the test file name without the .CFG extension. (You can also specify 'Alternate' titles and legend names by clicking on 'Format' at the top of the Graph Screen, then 'Edit Titles/Legends'.)

- Choose to Save certain results you believe are special and you may want to recall or graph in the future. See the Save explanation of the previous page.

- Choose which run or runs you want to graph by clicking in the Graph Runs column. The program will ask which runs you want to graph. Enter the number for each run, separated by a comma. See Figure 3.35. Most of your tests will probably be for only 1 run, so there is no need to specify the Run #. The program defaults to Run #1 if there is more than 1 run.

Figure 3.35 Specifying Which Runs to Graph (if more than 1 run in a test)



Chapter 4 Examples

Each example in this chapter becomes progressively more complex, assuming you have performed and understand the preceding example. Section 1.5's example is somewhat more basic than Example 4.1, so it may be a better place to start if Example 4.1 looks complicated.

> The results shown in these examples may be somewhat different than what you obtain with your particular version of the program That is due to minor upgrades in the calculations in later versions.

Example 4.1 Installing the DataMite on an Inertia Dyno and Running a Test

Suggested Background Reading:
- Section 1.5, Example to Get You Going
- Appendix 4, Hardware Installation and Operation

This example demonstrates the basic steps to installing a standard, 4 channel DataMite on an Inertia Dyno, setting up the program's specs for an Inertia Dyno, and running a dyno test. This example will be very thorough so all possible steps are presented. You may decide to omit some steps.

DataMite Installation

Example 4.1 will be fairly long, covering the entire process of getting and analyzing data. We will assume you have installed the DataMite as outlined in Appendix 2. The sensors include:
- Channel 1 is engine RPM from an external Inductive Pickup, as shown in Appendix 2 for a single cylinder engine, like a Briggs.
- Channel 2 is recording dyno wheel RPM 1 magnet epoxied to the outside edge of the inertia wheel.
- Channel 3 is also recording dyno wheel RPM 1 magnet epoxied to the outside edge of the inertia wheel. (This sensor came with the standard harness. Since nothing else was being recorded, you set it up to read the same magnet as Channel 2. Then, should Channel 2's data look bad, you can reconfigure the software to use Channel 3's dyno wheel RPM.)
- Channel 4 is not being used.

After the DataMite is installed, it is a good idea to check that all sensors are working. Put the DataMite into Setup Mode by powering up the DataMite. The Record LED (light emitting diode) may flash, or stay off for several seconds, but will eventually light steady. (If the DataMite's memory was full, then the Clear Memory will eventually light steady and the Record LED will go off.) Then hold down the yellow Record button on the DataMite control panel while you momentarily press (for about half a second) the red Clear Memory key. Then release the Record button also You see the Record LED flash once, then remain off for about a second. This flash pattern repeats. The one flash shows the DataMite is checking out channel #1, or Engine RPM. When you start the engine, you see the Clear Memory LED flash to indicate tach pulses are entering the DataMite. The flash rate increases as you "blip" the throttle and engine RPM increases. The Engine RPM signal looks good. (Note that it takes about 10 engine firings to get the LED to either light or go out. Therefore, the flash rate may be slower than you expect.)

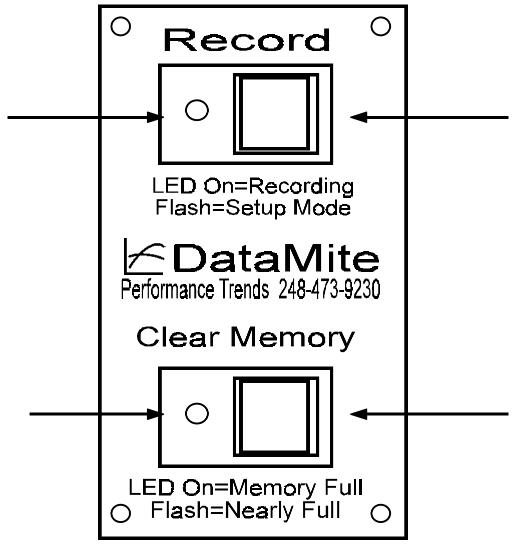
To check out the dyno wheel RPM sensor, press and release the yellow Record button once, holding it down for about half a second. Now you see the Record LED flash twice, then remain off for about a second. This new flash pattern repeats. The 2 flashes show the DataMite is checking out channel #2, or the dyno RPM. If the dyno wheel is spinning, you should see a flash each time a magnet passes the sensor. Otherwise, rotate the dyno to place the magnet over the sensor and leave it there. The Clear Memory LED lights and remains on. Channel 2 or the Dyno Wheel RPM looks OK.

Again, press and release the yellow Record button once, holding it down for about half a second. Now you see the Record LED flash three times, then remain off for about a second. This new flash pattern repeats. The 3 flashes mean you are now checking Channel 3. Check it also as you did Channel 2 above.

Figure 4.1 DataMite Setup Mode

Power up DataMite and wait for Record LED to light steady. Push and release Clear Memory button while holding Record Button down to put into Setup Mode. Setup Mode starts with displaying Channel 1, engine RPM.

LED flashes either once, twice, 3 times, etc quickly to show which channel # is being checked.



Setup Mode starts with displaying channel #1, engine RPM. Push Record button to Channel #2, and again to display Channel #3, etc.

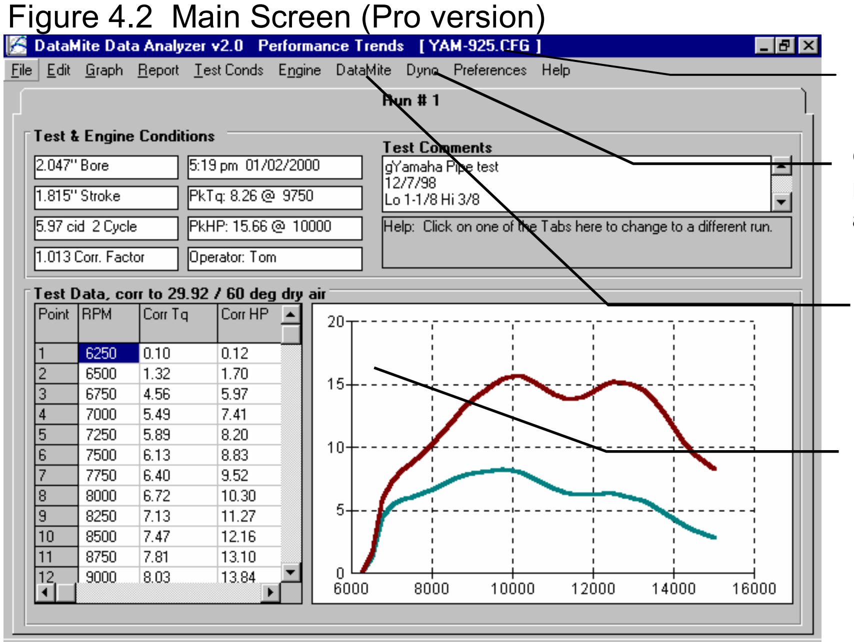
LED flashes as signal comes into DataMite. When engine running and on Channel 1, LED should flash. For RPM sensors, LED lights as magnet passes sensor, or brightens or dims with analog sensors.

Push Clear Memory button to bring out of Setup Mode and go back to Recording Mode.

DataMite Software Setup

In Windows 95 or 98, start the program by clicking on Start, then Programs, then Perf Trends, then Dyno DataMite Analyzer V2.0. Or you can click on the Dyno DataMite Icon on your desktop. Each time you start the Dyno DataMite Analyzer, the program will put you back to precisely where you were when you last quit the program, displaying the same Current Test as when you shut down. When you first get the program, this will be for some test Performance Trends was working with at the factory. You should obtain a Main Screen, as shown in Figure 4.2, where YAM925 is the Current Test.

Figure 4.2 Main Screen (Pro version)



YAM925 is the current dyno test.

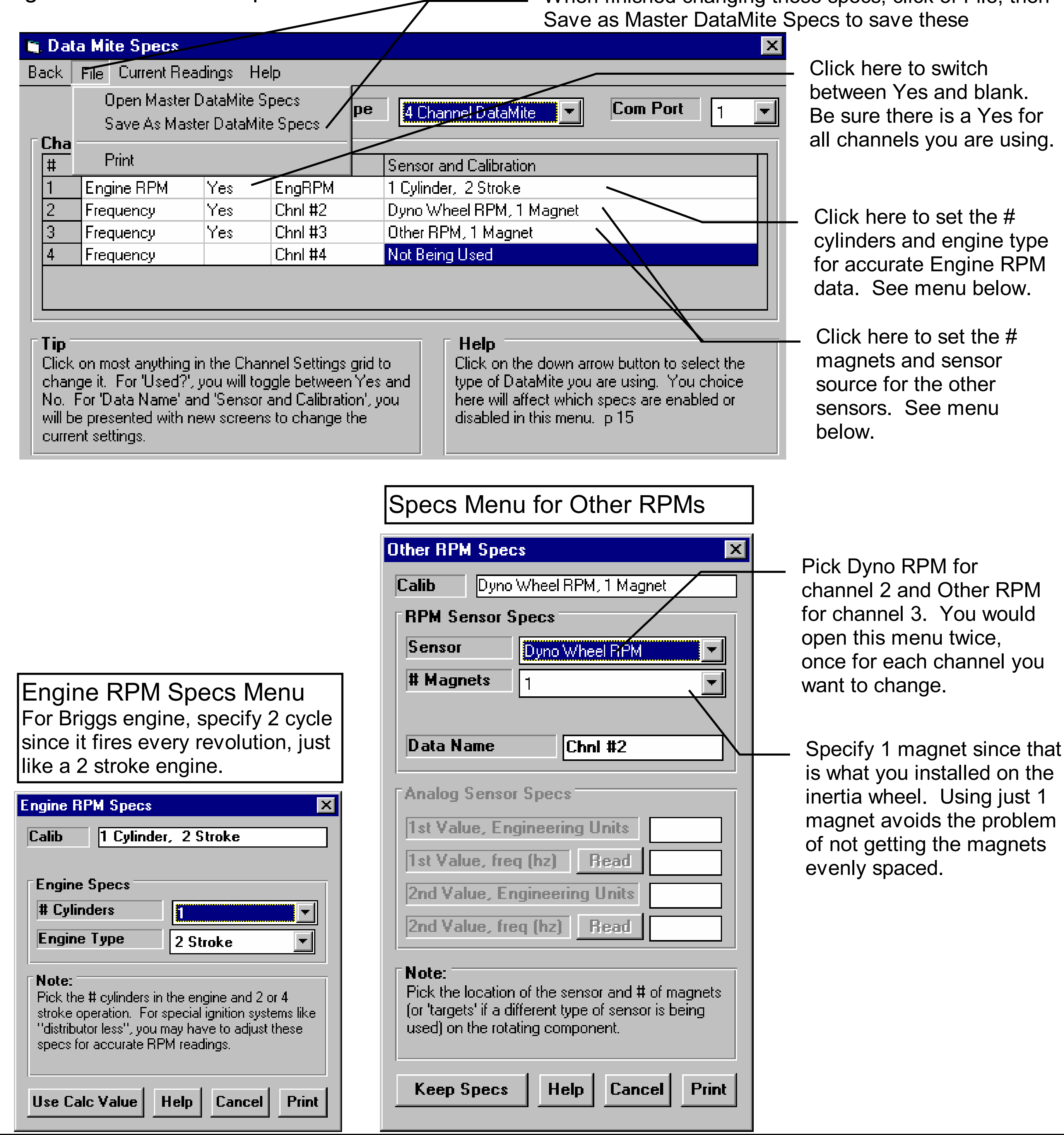
Click on Dyno to set up Dyno Specs to match your inertia dyno measurements and settings.

Click on DataMite to set up the DataMite Specs to match your sensors for particular channels.

These current results are from the last dyno run you were working with. This is identified by the name in square brackets [ ] at the top of the screen, in this case [YAM-925].

Click on DataMite at the top of the Main Screen to open the DataMite Specs menu shown in Figure 4.3. There will already be specs in this menu, which are the DataMite settings used when test YAM-925 was run. You will change these specs to match ***your DataMite*** Put a Yes in each row you are using, the first 3. If there is not already a yes there, then click in the Used? column in the row you need to switch a blank to a Yes.

Figure 4.3 DataMite Specs Menu



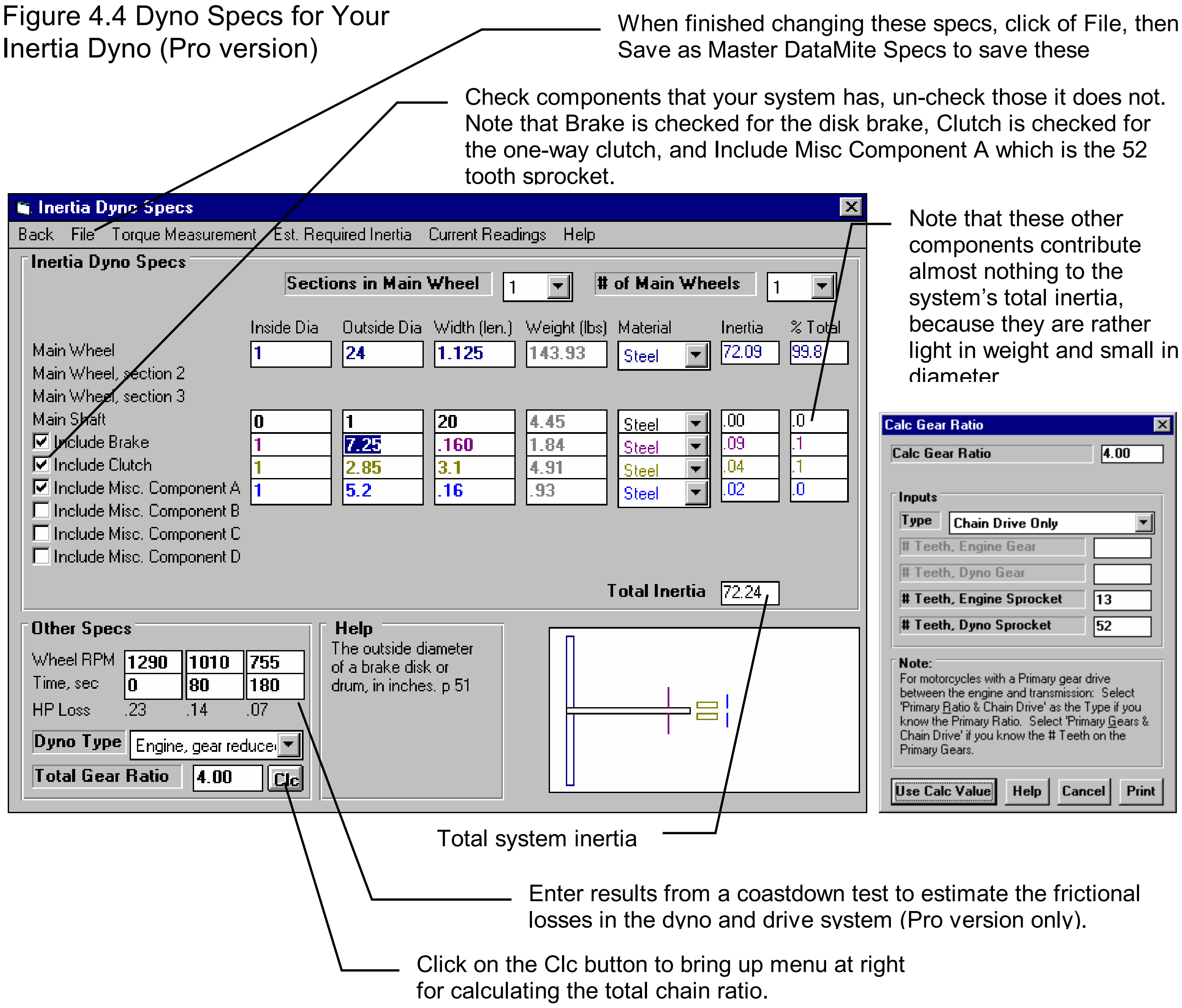
For DataName, you can change it to something you think is more descriptive, or simply leave them at their default names of Eng RPM, Chnl 2 and Chnl 3. For the Sensor and Calibration descriptions, see what is outlined in Figure 4.3. When you are finished, click on File, then Save as Master DataMite Specs to save these changes. Then click on Back to close the DataMite

Specs menu. You will probably be asked if you want to keep these changes for the current test YAM-925. Since they were ***not*** the DataMite specs for that test, answer No. Now when you start a New Test and download data from the DataMite, these Master DataMite specs you created and saved will be the ones used for determining what channel is recording what.

Now do the same for the Dyno Specs as you did for the DataMite specs. Click on Dyno to obtain the screen shown in Figure 4.4. Again, these were the Dyno specs for the YAM-925 test. You should enter the specs for your inertia wheel system. Your inertia dyno's single main wheel is 24 inches in diameter and 1.125 inches thick (1 1/8 inch). It is on a 1 inch diameter solid shaft, a 5.2 inch drive sprocket on it (52 teeth) which .16 inches in diameter, and 7.25" brake disk which is .16 inches thick. Your dyno also has a special one-way clutch, which lets the engine decelerate quickly at the end of the run, while the inertia wheel itself decelerates more slowly.

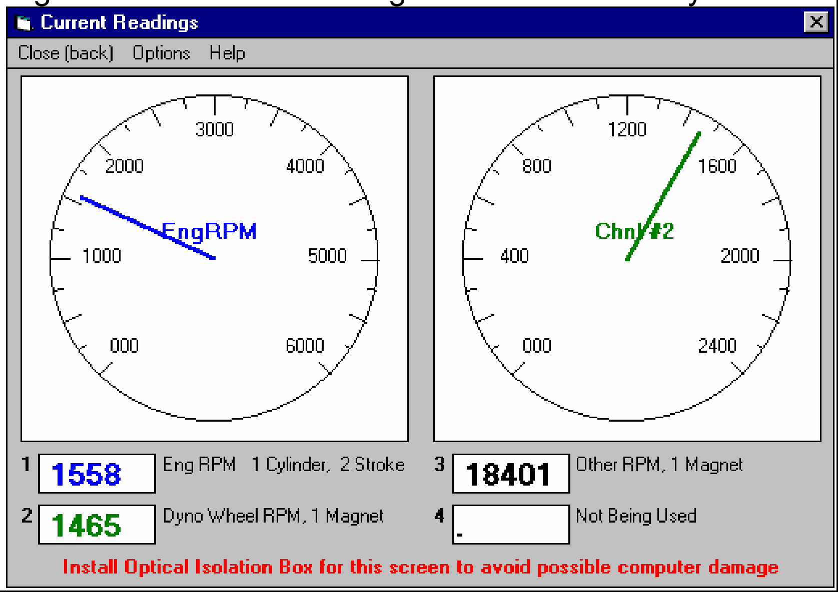
Figure 4.4 shows how these specs would look after you enter the specs described above. You can also click on the Clc button by the Total Gear Ratio to bring up the calculation menu shown in Figure 4.4. There you can enter the # teeth on the engine and inertia wheel sprocket to come up with the gear ratio of 4.

Figure 4.4 Dyno Specs for Your Inertia Dyno (Pro version)



Coastdown Test

Figure 4.5 Current Readings Screen to Read Dyno RPM



Although you probably won't actually do a coastdown test until you get familiar with your DataMite and Dyno system, lets assume you do a coastdown test before you run your first dyno test to help you estimate the aerodynamic and frictional losses in the system. See Appendix 6 for more details. Since your dyno system has a one-way clutch, this is fairly easy to do:

1. Get a stop watch and set it to zero.
2. Warm up your dyno system (spinning the wheel) to the approximate bearing temperatures you think you will see during your dyno testing.
3. Click on Current Readings at the top of the DataMite or Dyno screens to display a tachometer for the inertia wheel.
4. Accelerate the inertia wheel to the highest safe RPM you will encounter during your dyno testing.
5. Disengage the engine and let the inertia wheel coast down. DO NOT brake the inertia wheel or do anything to add drag to the system. Disengaging the engine is easy with this one-way clutch dyno because the act of simply closing the throttle disengages the one-way clutch. Note that the drag of the one-way clutch does add some drag to the system over what would normally be present, but this can not be easily avoided.
6. Soon after the wheel starts to coast, start the stopwatch and note the dyno RPM at that time. Lets say this was 1290 RPM.
7. Note the time on the stopwatch at some RPM which is about 2/3rds of the RPM at which you started. Lets say the dyno RPM dropped to 1010 RPM in 80 seconds.
8. Stop the stopwatch at some RPM which is about 1/2 to 1/3rd of the RPM at which you started. Lets say this was 755 RPM at 180 seconds, that is 180 seconds after you started the stopwatch at 1290 RPM.
9. Type in the results from the coastdown. The results from this test are shown in Figure 4.3. Note that the HP losses calculated are typically less than 5 % of the power levels the particular dyno is intended to absorb.

Note: If you have not done a coastdown test on your dyno, it is best to enter 0 for all 6 coastdown specs to cancel out this correction.

With all the dyno specs set to match your inertia dyno, click on File, then Save as Master Dyno Specs to save these changes. Then click on Back to close the Dyno Specs menu. You will probably be asked if you want to keep these changes for the current test YAM-925. Since they were ***not*** the Dyno specs for that test, answer No. Now when you start a New Test and download data from the DataMite, these Master Dyno specs will be the ones used for determining the torque levels of the engine for various dyno wheel acceleration levels.

Notes to users of the Basic Dyno DataMite Analyzer

You will notice that the additional inertia of the components the Pro version lets you include are only about 0.2 % for this dyno system. This is usually the case, that the main, large diameter wheel is where almost all the inertia is concentrated. Therefore, there is usually little error with the Basic version when you can't include these components.

The same is somewhat true with the coastdown data for correcting for frictional losses. However, it this case at 1290 RPM, the Pro version would report a number .22 HP higher, since the coastdown test is saying there is a .22 HP loss in the system the inertia wheel does not see at 1290 RPM. These losses can be significant and make the Pro version more accurate if the coastdown test is done carefully.

Running a Dyno Test

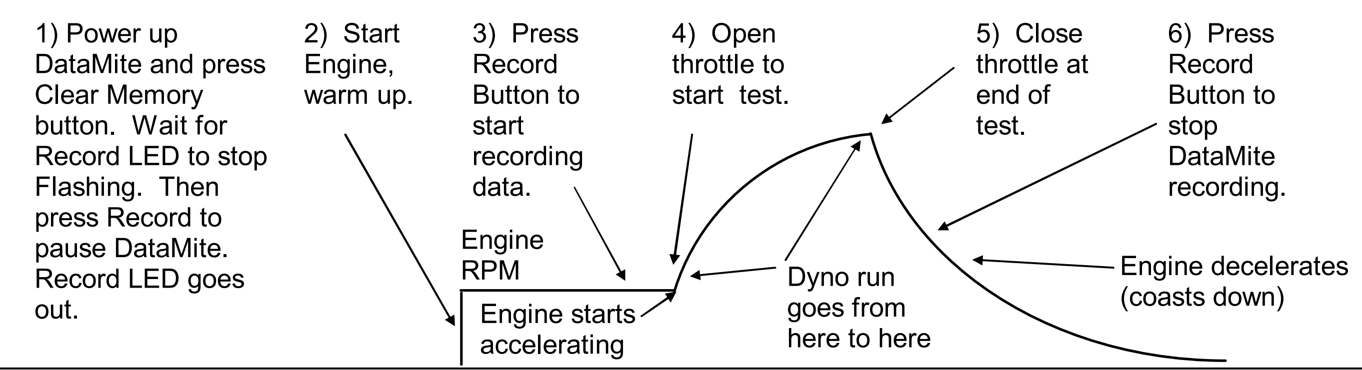
You have now done the preliminary work which checks that the DataMite seems to be working well, and have setup the software's Master DataMite and Master Dyno specs to correctly match your DataMite and Dyno. These initial settings are checks are only done for your first dyno test. Now you can actually start recording engine data. The first tests you run will be basically for practice. Do not expect them to be exactly correct because you will forget something, etc.

An inertia dyno test run is fairly simple to do. Here are some tips before you start:
- The DataMite program is actually smart enough to find your dyno tests in your recorded data. The program wants to see some data before and after the actual dyno test.
- The test is run by warming up the engine, ideally to exactly the same temperatures (coolant temp, oil temp, head temp, etc) for each run.
- You will probably want some type of tachometer for watching Engine RPM. If you do not have an external tach, you can use the DataMite's "Current Readings" screen shown in Figure 4.5. This is possible by clicking on File, then New (get data from DataMite) to open the New Test screen. Then click on Current Readings at the top of that screen.

> Note: It is recommended you use screen only if you have protected your computer's serial port with Performance Trends' optical isolation system. Otherwise, it is possible for "stray" high voltage ignitions signals to pass back through the DataMite and destroy your computer's serial port.

Dyno Test Procedure

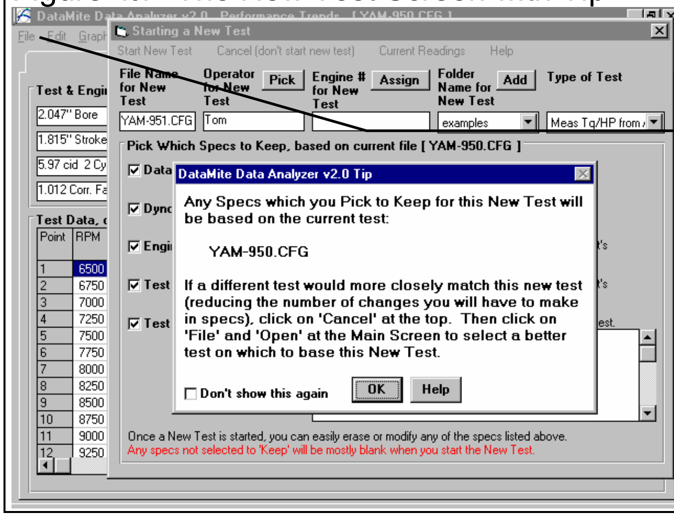
Figure 4.6 Basic Test Procedure for Inertia Dyno



1. Power up the DataMite. When the LED by the yellow Record bottom stops flashing, press the red Clear Memory button to erase the DataMite's memory. Then when the LED by the yellow Record button comes on steady (stops flashing), press the yellow Record button to pause the DataMite (stop its recording). The Record LED will go out. You could omit the step of pressing the Clear Memory button which would keep any data already recorded by the DataMite, but this would not be recommended for beginners.
2. Start the engine and bring it up to the point where the clutch starts to engage (if you have a centrifugal clutch like most cart engines), or to some RPM ***below*** where you want to start recording data.
3. Start the DataMite recording data by being sure power is on, and the LED Record LED is lit by the yellow button. You may want to press the red Clear Memory button on the DataMite's control panel to clear out any previously recorded data.
4. After the Record LED by the yellow button has been On (DataMite recording data) for about 5 to 10 seconds, go to full throttle on the engine. The engine will accelerate with the Inertia Wheel. When you have reached the highest RPM of the test, close the throttle to have the acceleration stop and let the dyno and engine coast down. This system with a one-way clutch makes this easy on the engine. The engine de-couples from the inertia wheel as soon as inertia wheel starts to "drive the engine", so the engine coasts down and stops in just a few seconds.
5. About 5 or 10 seconds after the run, press the yellow Record button on the control panel to stop data recording. You are now ready to download the data from the DataMite into your computer.

Note: Some dyno operators have reported damaging engines by keeping them attached to the inertia wheel and letting the inertia wheel and engine coast slowly to a stop. This coasting time could take well over a minute. Problems could arise because the ignition is off but the carb still metering fuel (fuel dilution or washing the cylinder walls), or lack of lubrication on 2 stroke engines.

Figure 4.7 The New Test Screen with Tip



Click on File, then New (get data from DataMite) to bring up the New Test Screen.

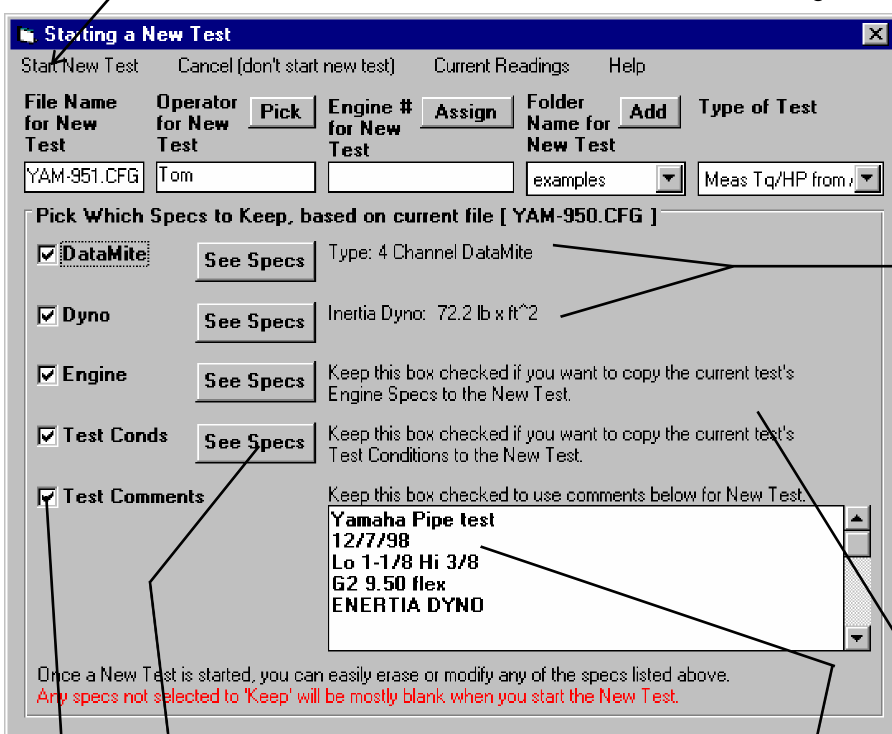
Downloading Data

Once you have recorded a test with the DataMite, you must download it to your computer. Click on File (upper left corner of the Main Screen), then New (get data from DataMite) to bring up the New Test screen, which will likely show a Tip message. See Figure 4.7. As the Tip in Figure 4.7 says, it is usually easiest to start with a Dyno Test file that is as close as possible to the dyno test you just ran. This prevents us from having to make major changes to test information like the Engine Specs, Test Conds, etc. However, assuming you have not tested an engine like this

Figure 4.8 New Test Screen

5 Critical specs for the new test are listed here at the top.

Click here to start a New Test based on these settings.



If this is the first time you have started a New Test and you haven't set up any Master Dyno or DataMite specs, the preview will say no Master Specs. You will have to fill out these specs before you can start the New Test.

You can edit the current comments here for the new test, or un-check Test Comments to start with blank comments.

A summary of the current settings is given here.

Click on these buttons to see the current settings.

Click here to Check or Uncheck these options. Checking means you want to keep these specs for the new test. Once the new test is started you can then make modifications to these specs if you want.

one before, you can start this test with whatever the Current Test is.

The New Test screen appears as in Figure 4.8. There are 5 critical specs at the top which must be filled out or picked.

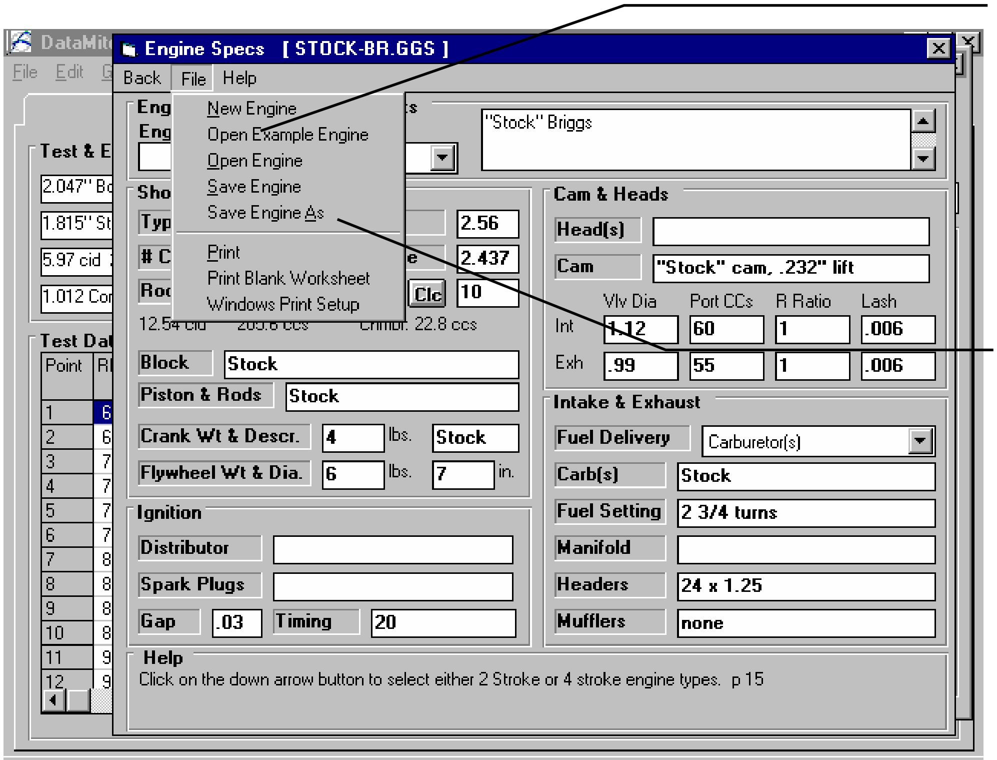
If this is the first New Test you have run (you just got the program) and you had not already entered the Master Dyno and DataMite specs, there would be no summary of the Master DataMite or Master Dyno specs. You would have to fill out the Master Dyno and DataMite Specs before the program would let you start a New Test.

Filling Out Other Specs (other than DataMite or Dyno Specs) to Start a New Test

If you want to modify some specs from the previous test, click on the 'See Specs' buttons for each category of specs. Click on Help at these menus for more info on how to enter these specs.

Since you have not run a Stock Briggs engine before, the engine specs currently loaded for a Yamaha are probably quite different than the Briggs you will run. You can either choose to enter these or change these specs now, before you download data, or change them after you download data. You choose to do it now, before downloading, so click on the See Specs button for Engine Specs (Figure 4.9) and Test Conds (Figure 4.10) to enter these specs. Of these specs, the Weather Conditions in the Test Conditions menu are the most critical. These will affect the Corrected Torque and HP numbers.

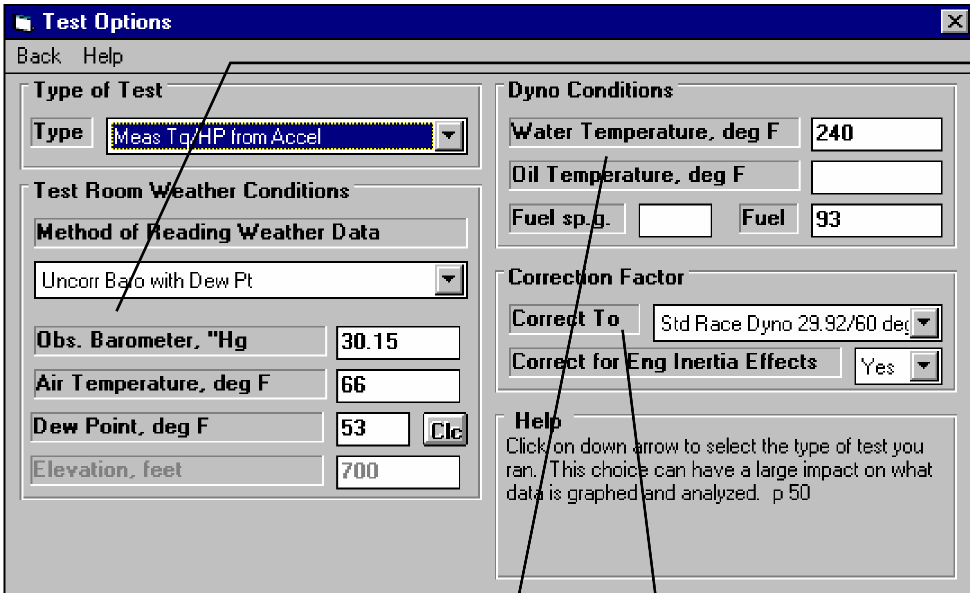
Figure 4.9 Filling Engine Specs Menu



Click on File, then Open Example Engine to see if there are some Briggs specs saved as an Example Engine File. There are, so choose the STOCK-BR.GGS engine file to fill in much of this screen. Then you can go through each specs to make sure it matches your engine.

When you are finished changing the specs, you should save these specs in the Engine Library. This will save you time in the future in the event you run this engine again. Click on File, then Save Engine As to save this engine file. Note that the Engine File is only the specs you see on this screen, not DataMite, Dyno, Test Conditions specs, etc.

Figure 4.10 Filling Test Conds Menu



If you are going to compare and analyze Corrected torque and HP, then it is critical you enter accurate weather conditions for each test. Assume you have a portable weather station in your shop which gives Barometer in inches of Mercury and dew point. For best accuracy, the air temperature you enter should be the temperature right before the air cleaner or carb. However, be sure the temp sensor is not getting wet from fuel "stand off" from the carb.

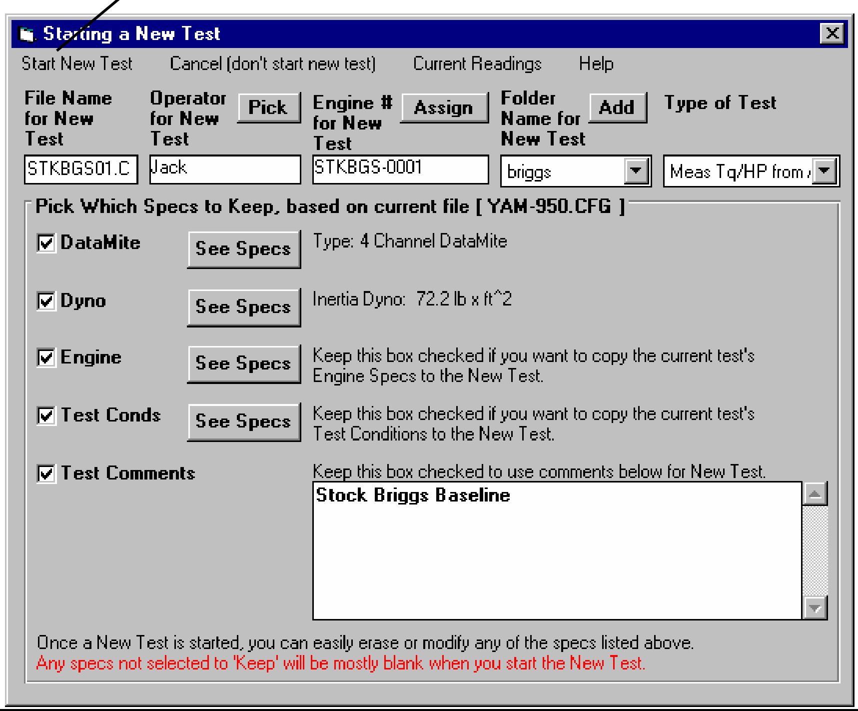
These specs are for information only and can be left blank if you want. You can enter head temp for water temp for this air cooled Briggs engine.

Once you set these Correction Factor specs, it is best to not change them. Otherwise it will be difficult to compare different tests or graphs. To Correct for Eng Inertia Effects, you need reasonably accurate Short Block Specs to estimate the Engine's Inertia.

There are five critical specs listed separately at the top. Most of these ***must*** be filled out before you can start the new test. The program usually fills them in with default values based on the current test.

Figure 4.11 New Test Menu for Starting This New Test

Click Here to Start the New Test



1. File Name for New Test is the file name the program will create for saving the Test Data for the new test you are starting. The program fills in a default name of the current test name, but incrementing the last digit in the name by 1. You can change this name to most anything you like. The program will warn you if the name entered is not valid and show you what is wrong. **For this example, type in the name: STKBGS01** for this stock Briggs engine. The program adds the .CFG extension to produce STKBGS01.CFG.

2. Operator for New Test is the name of the operator for this test. Click on Pick to pick an operator name already used or to enter a new name. The program defaults to the operator of the current test. **Through the Operator Menu discussed in Section 2.1, you enter a new Operator name of Jack.**

3. Engine # for New Test is critical for shops who use a engine numbering system. Click on Assign to create a new Engine # based on the last Engine # assigned (incremented up by 1) or to start with a new type of Engine #. **Through the Engine # Menu discussed in Section 2.4, you enter a new Engine # of STKBGS-0001.** If you do not want to be forced into a certain format for entering engine numbers, or want to be able to leave the Engine Number blank, choose that Preference in the Preferences menu described in Section 2.2.

4. Folder Name for New Test is the folder in the DTMDATA folder where the test will be saved. The program may not be using the name 'folder' for spec, but whatever word you have assigned in the Preferences menu. The folder name 'Examples' is reserved for Performance Trends example tests supplied with the program, and can ***not*** be used for your tests. **By clicking on Add New, you use the new folder of BRIGGS.** This folder will be used for you will use for all Briggs Tests.

5. As you should do for most all inertia dyno tests, **you choose the Data Type Measure Tq/HP from Accel.**

The New Test screen should now look like Figure 4.11. When you are ready to start downloading data from the DataMite, click on 'Start New Test' at the top of the screen. If some critical specs have not been entered, the program will warn you and ask you for it at that time. The program will fill in the Test Time and Date based on the computer's current time and date. This can be changed later by clicking on the Test Time/Date at the Main Screen.

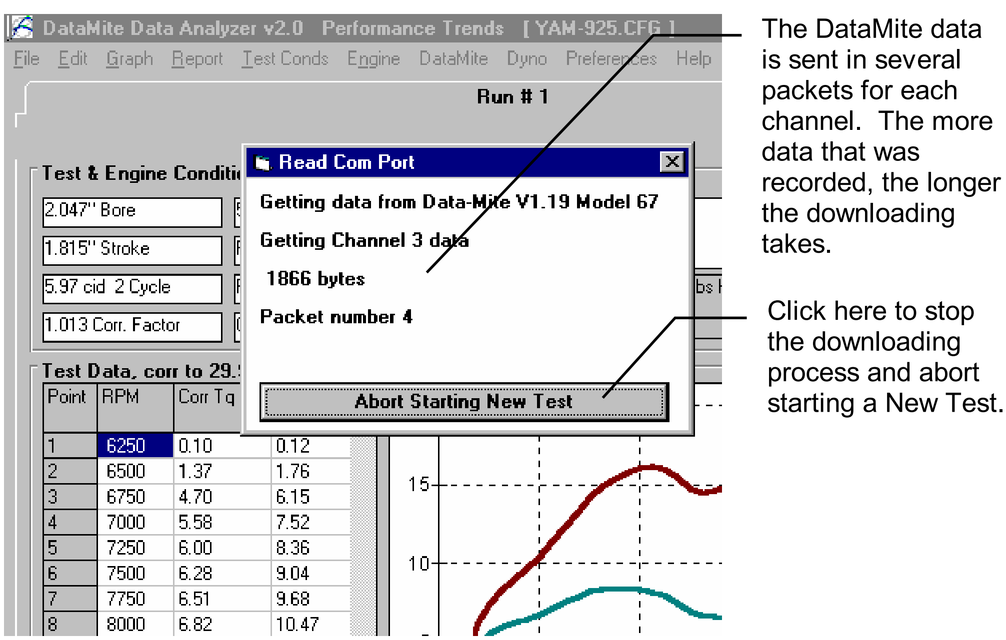
The program will now start to read the DataMite data as shown in Figure 4.12.

After the data is read from the DataMite, the program performs 2 important functions:
1. It checks for "noise spikes" and eliminates all that it can. A noise spike is basically a bad data point, caused by electrical noise or vibration in a sensor. See Section 2.10 Editing Out Noise Spikes and Appendix 3, Troubleshooting.
2. It checks to find the beginning and end of the actual dyno test run, based on pre-programmed criteria of what a dyno run looks like.

Figure 4.13 shows the messages the program could give to let you know how the data appears. If you get several noise spikes, you should investigate the source. Noise spikes in the Engine RPM or Dyno Wheel RPM can cause major errors in calculating torque and HP. Noise spikes can also cause problems when the program tries to find the beginning and end of the dyno run.

Note that editing out noise spikes, and having the program find the beginning and end of the dyno runs can also be done at anytime in the future. See Section 2.10 Editing Tests.

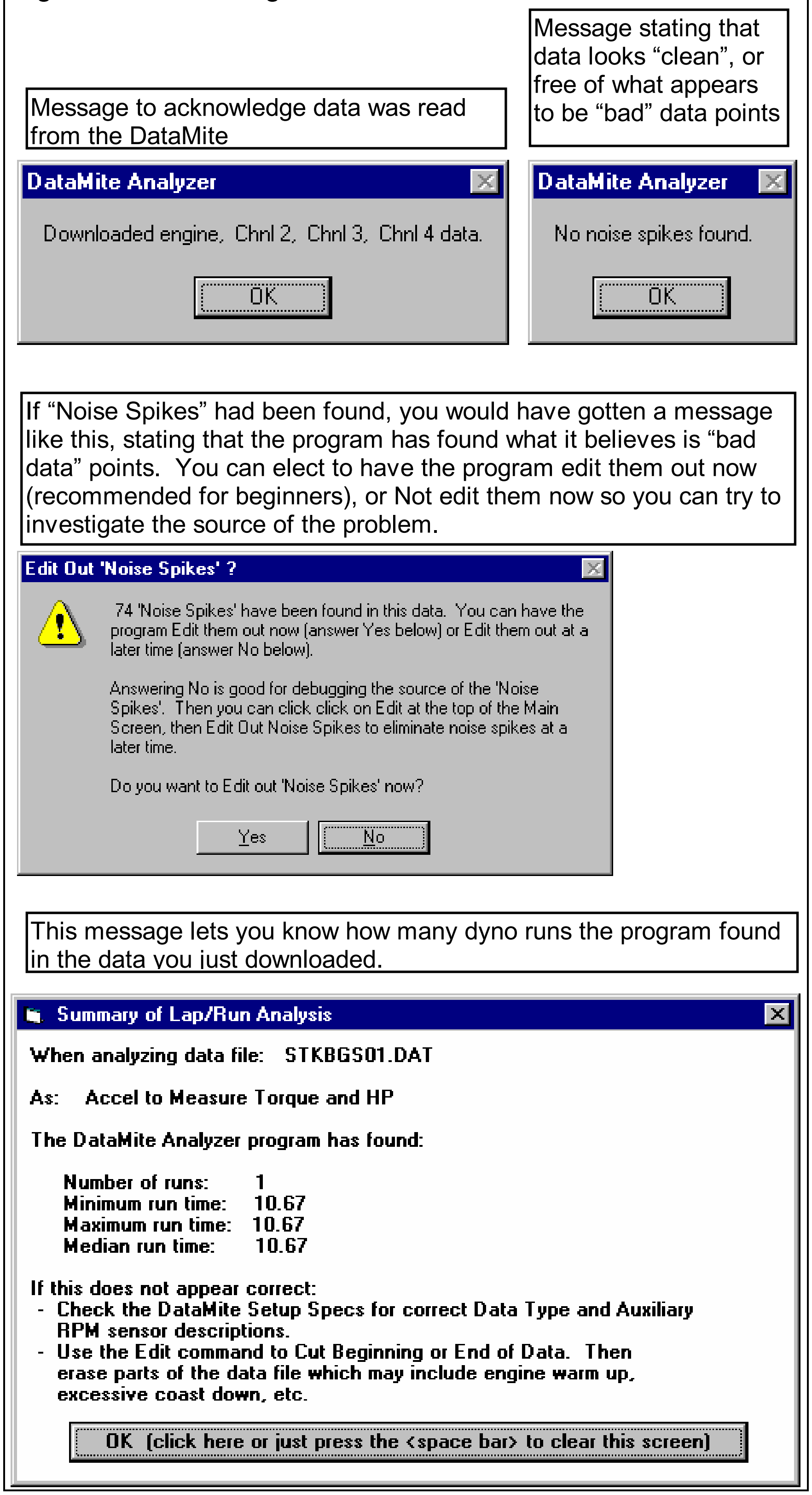
Figure 4.12 Main Screen While Downloading DataMite Data



Analyzing Data

The Main Screen should now look like Figure 4.14, with a graph of the dyno run on the right side, and a table of corrected torque and HP numbers on the left side. The specs which determine the RPM increment for the data table, or how much filtering (smoothing) should be done to the data on this Main Screen are in the Preferences menu. See Section 2.2, Preferences.

Figure 4.13 Messages After Download DataMite Data



Checking Data Quality

You should always look at your data with a skeptical eye. Always try to make the data prove to you that it is good and accurate. A first step in this process is to check the quality of the raw data recorded. For an inertia dyno, that is the Engine RPM and Dyno RPM. The easiest and best way to check data quality is to graph these 2 channels ***vs time***. Data graphed vs RPM has been more "mathematically manipulated" and is not as close to the original data as when graphed vs time.

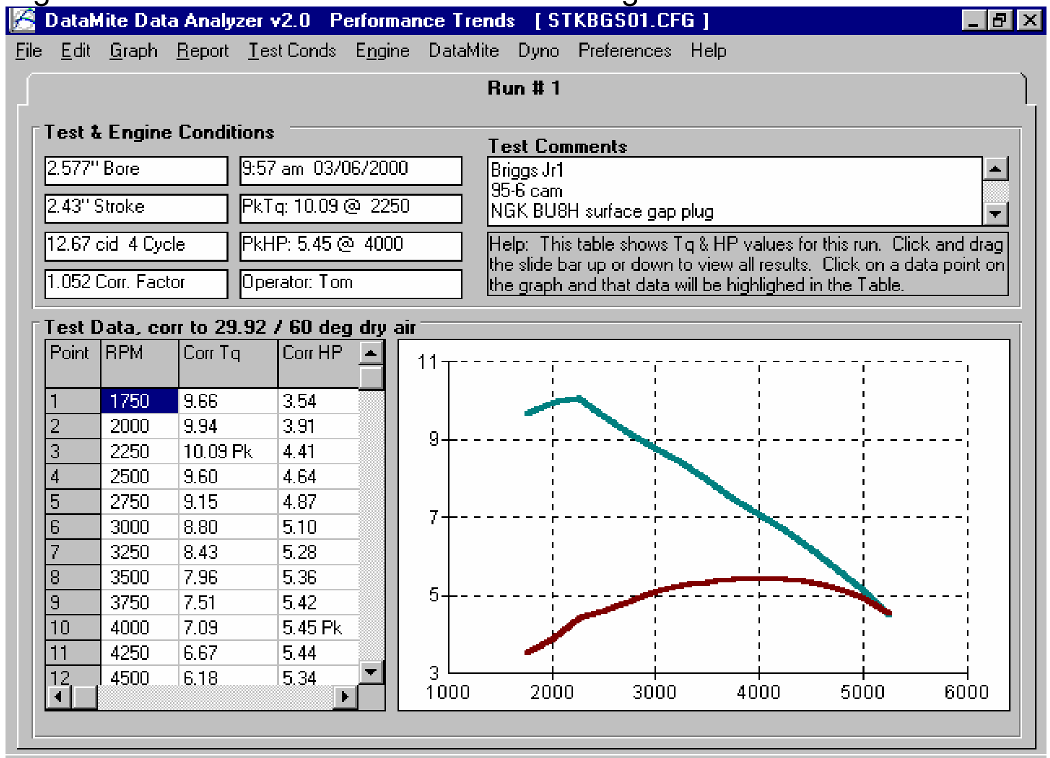
Click on Graph at the top of the Main Screen, then select Engine RPM and Dyno RPM as the only data types to graph. Set Filtering to None so that you see the data in its most detailed, and un-smooth state. The graph specs should look like those in Figure 4.15. Click on the Make Graph button to produce the graph shown in Figure 4.16. The graph shows no noise pikes and in general data very smooth. There is a little jump in Engine RPM when the throttle is closed at the end of the acceleration, but experience tells us this is probably real. Since it occurs at the very end of the acceleration (not in the middle) it will have little affect on the calculated torque and HP.

Since the data quality generally looks very good, you can have good confidence in the calculated torque and HP. Click on Graph Type at the top of the Graph Screen, and select to graph Corrected Torque and HP vs RPM for this test. Set up the graph specs as shown in Figure 4.17. Click on Make Graph and you will obtain a graph shown in Figure 4.18.

If you did not enter good weather conditions yet for this test, then it is usually better to graph and analyze Observed Torque and HP. You will also notice that we set filtering to "Light (some)". This is usually a good compromise between getting rid of some of the "jumpiness" of torque and HP data, and "over-filtering" which can distort the data.

For more details on other graph options, check Example 4.2, Analyzing Dyno Data.

Figure 4.14 Main Screen After Downloading Test Data



If you had just run this test for a particular customer, then you may like to give that customer a printout of the results. Click on Back to return to the Main Screen from the Graph Screen as shown in Figure 4.17. Then click on File, then Print as shown in Figure 4.19 to obtain the Test Summary Printout shown in Figure 4.20.

Figure 4.15 Checking Engine RPM and Dyno RPM Data Quality

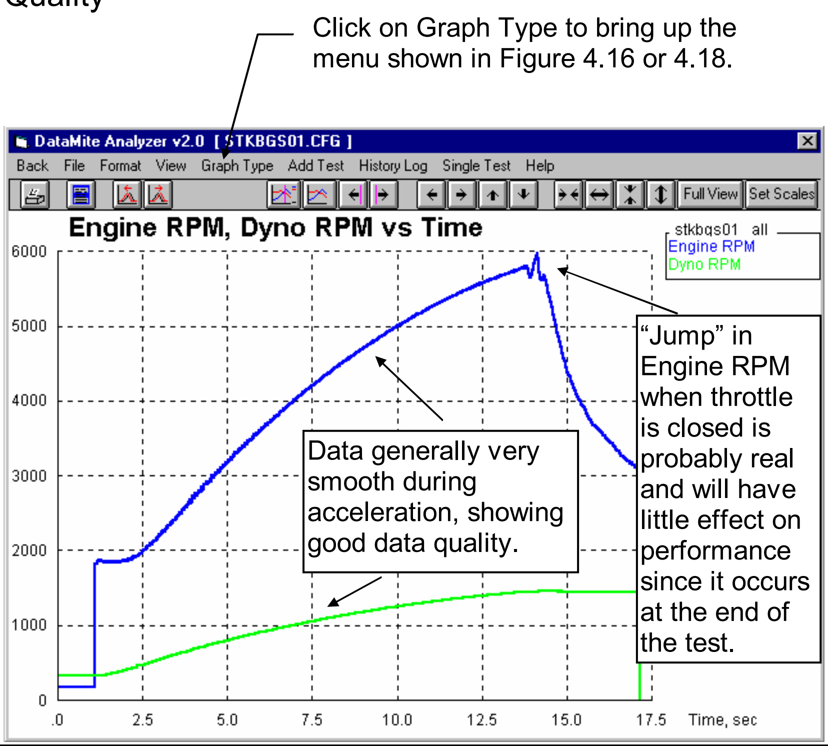


Figure 4.16 Graph Menu Specs to Check for Data Quality

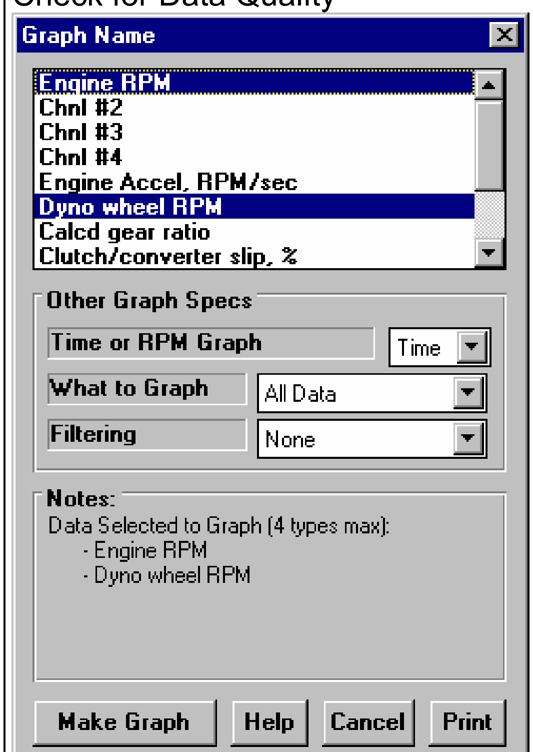


Figure 4.17 Torque and HP Graph

Click on Back to return to the Main Screen

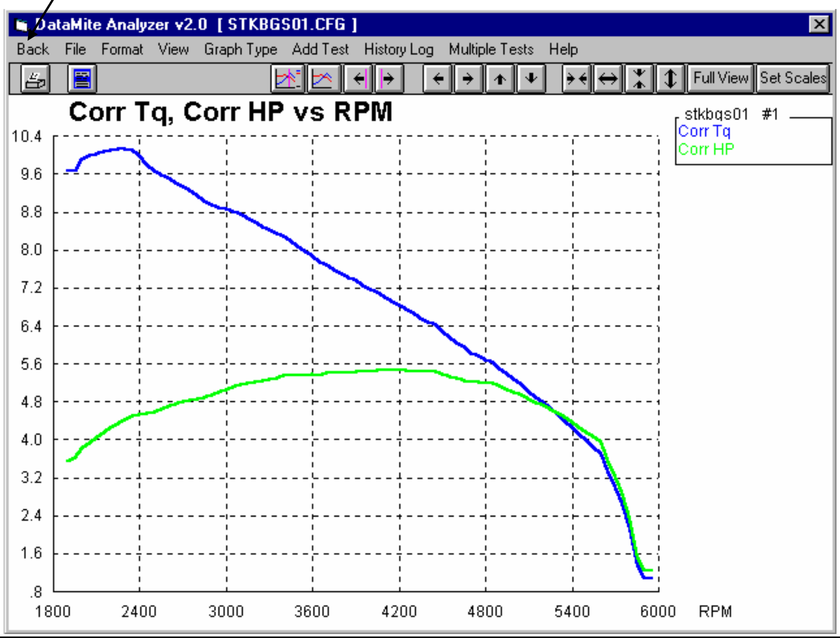


Figure 4.18 Graph Menu Specs for Graphing Torque and HP vs RPM

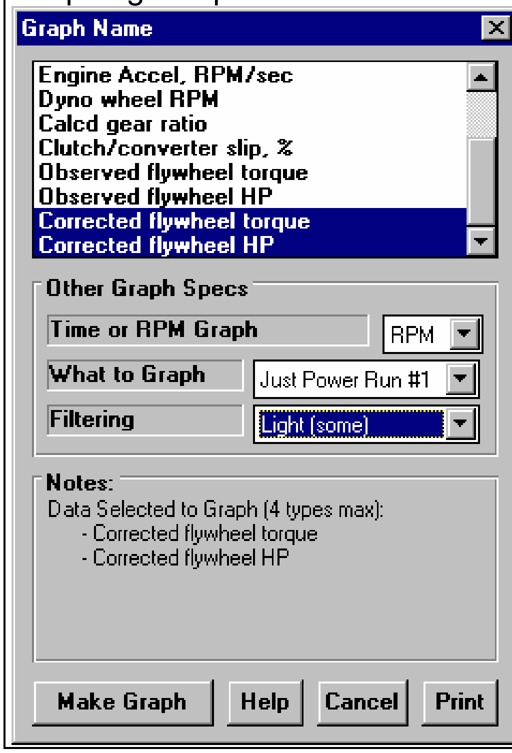


Figure 4.19 Printing a Test Summary

Click on File, then Print for the Printout shown in Figure 4.20

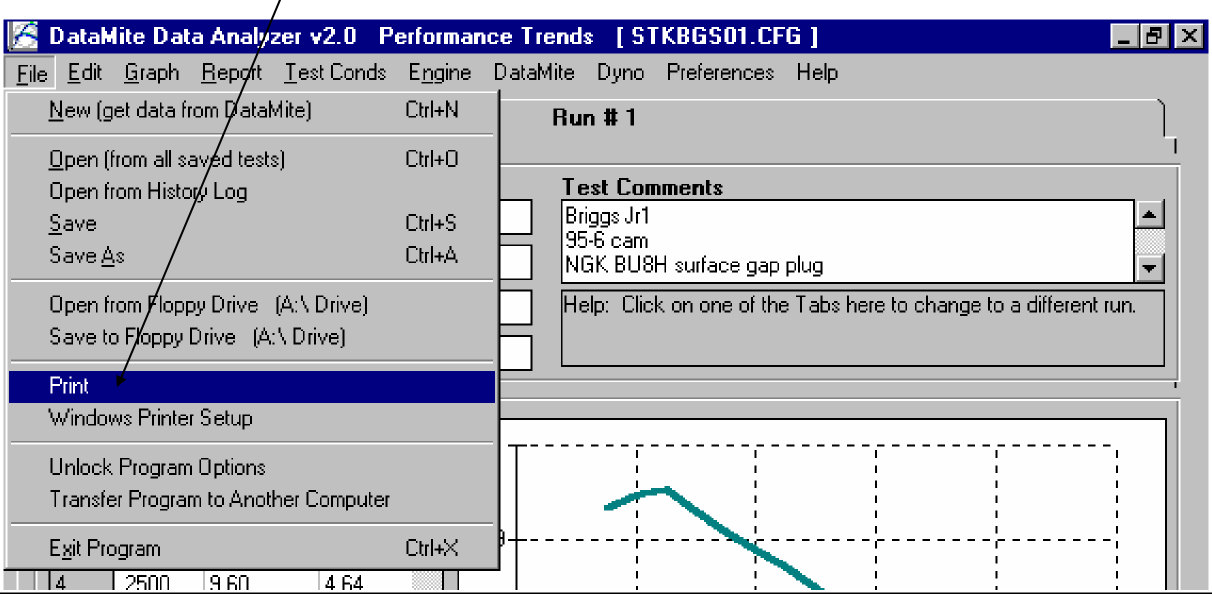


Figure 4.20 Test Summary Printout

Conclusions:

- The installation of the DataMite hardware is critical and is covered in Appendix 2.
- The basic operation of the DataMite can be checked without a computer by putting the DataMite in "Setup Mode".
- DataMite and Dyno settings are critical for accurate data. These specs are saved in "Master" files so each new test starts with the current settings for these critical specs.
- In the Pro version, you have additional dyno specs for improving the accuracy of the data. One of these options lets you load in data from a coastdown test of the dyno system to measure frictional losses in the system and make corrections for them.
- An Inertia Dyno test is outlined as 6 basic steps.
- Once a test is performed, the data is downloaded to your computer from the DataMite by clicking on File, then New (get data from DataMite) commands at the Main Screen.
- You should check the raw recorded data for noise spikes and general data quality.
- Once you are confident the raw data is good, you can better trust the torque and HP numbers calculated and produce graphs and reports.

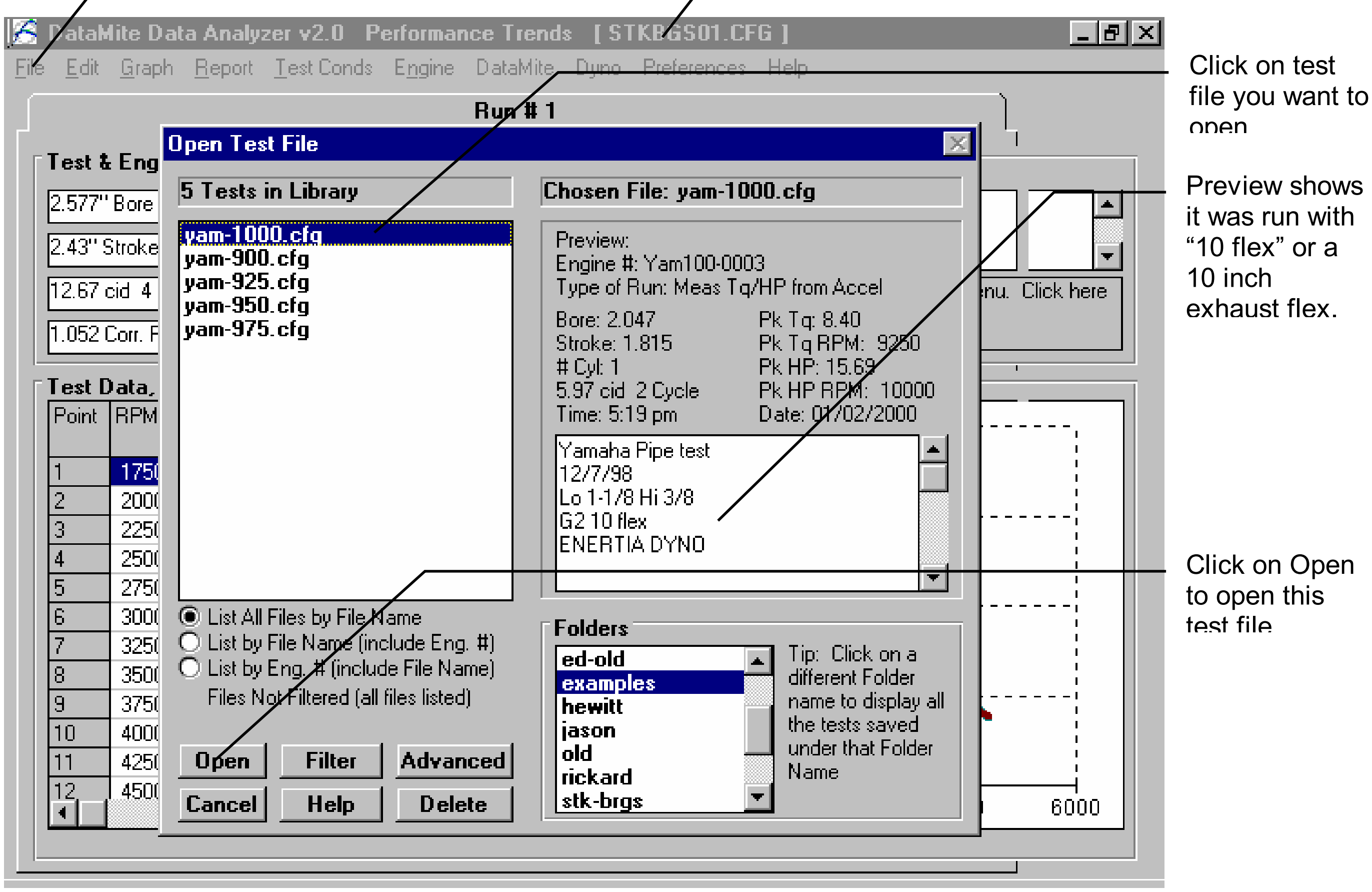
Example 4.2 Analyzing Dyno Data

Sometimes you may want to just see how an engine is running, if the torque and HP peaks are where they should be and the engine is putting out the torque and HP it should. This was outlined in Example 4.1.

Other times you want to make more detailed analysis of a particular dyno run, and compare the dyno run to other runs. This could be to check the effects of a modification. This process will be shown in this example. We will look at the Yamaha 2 stroke engine tests in the Examples folder which came with the program. These tests were run with a 1/4 inch change in the length of the exhaust "flex", which is a section of exhaust pipe before the expansion chamber.

First you will want to make one of these Yamaha tests the current test. If you had just downloaded one of these runs, it would be the current test. If you had run these test several days ago, you may have to open one of them from the Test Library to make it the current test. Click on File, then Open (from all saved tests) to open the Yamaha test with the 10" length of exhaust flex. See Figure 4.21

Figure 4.21 Opening a Past Test



Comparison Graphs

Graphs are often the most insightful way to compare two dyno runs. You can see at a glance how the runs compare, where one setup is stronger (more torque and HP). You can also see if the data looks accurate. If you know something about how a modification should affect the engine, you can see at a glance if it did. For example, if you made a minor change to exhaust pipe length (and 1/4 inch would be a minor change), you would expect the 2 dyno runs to be fairly similar.

First check the data quality of the tests you want to compare. If you checked the data quality right after you first downloaded the tests, you could skip this part now. Click on Graph at the top of the Main Screen and make the settings shown in Figure 4.22. You will graph Engine RPM and Dyno RPM vs Time for all data with Filtering set to None. You will obtain a graph like Figure 4.23. There is only one minor spike in Engine RPM which the program could not Edit out. If this spike had been in Dyno RPM, the data would not be very good. See Section 2.10 on Editing Out Noise Spikes. However, since it is relatively small in the Engine RPM, the data quality is OK.

Figure 4.22 Graph Specs Menu

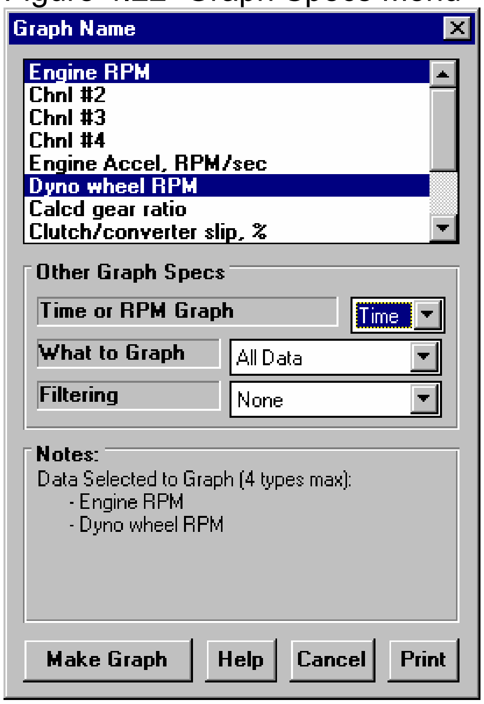
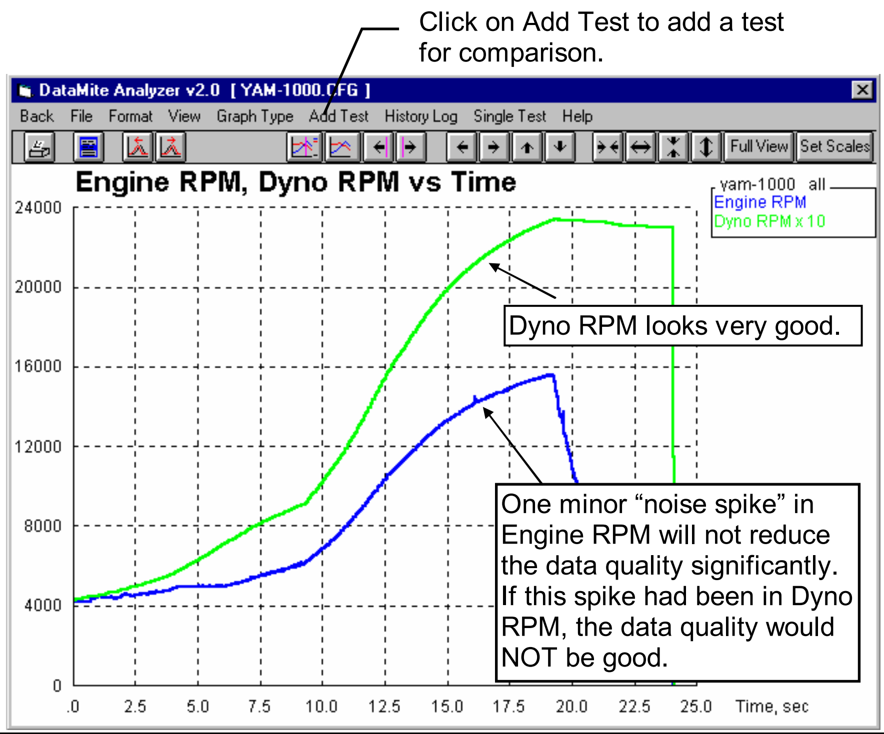


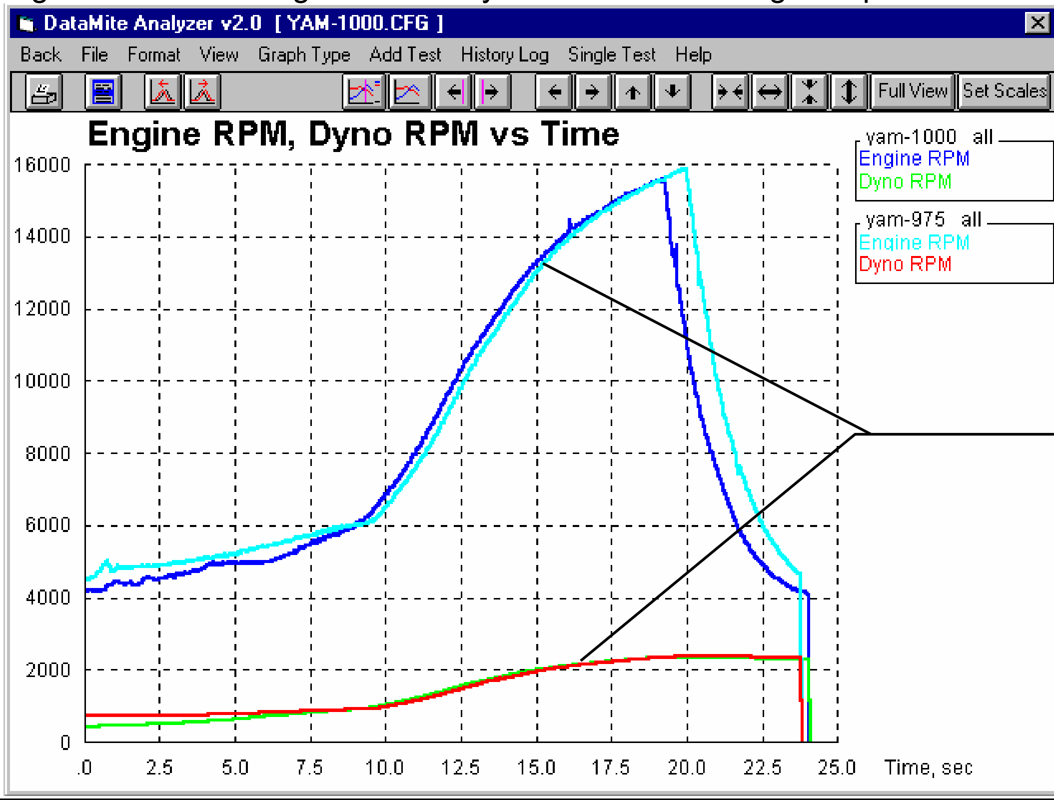
Figure 4.23 Graph Checking for Data Quality



Now add the test you want to compare this test to by clicking on Add Test in the Graph Screen. See Figure 4.23. You will obtain a screen similar to Figure 4.21 on the previous page. Select the YAM-975.CFG test, which had a 9 3/4 inch exhaust flex. You should now obtain a screen similar to that shown in Figure 4.24. The YAM-975 has nothing that looks like a noise spike, so its data quality looks very good.

To illustrate some features of the graph screen, lets say you wanted to compare these 2 conditions for acceleration rates. In order to do this easily, you would want to start the acceleration at the same RPM at the same time. The DataMite Analyzer's "time aligning" feature lets you do this relatively easily. First lets "zoom in" on the acceleration part of the test after you go full throttle. This can be easily done by clicking in the upper left corner of a section of the graph and holding the mouse key down. Then drag the mouse to the lower right corner of the section you want to zoom in on. You will draw a box outlining the portion to zoom in on. See Figure 4.25.

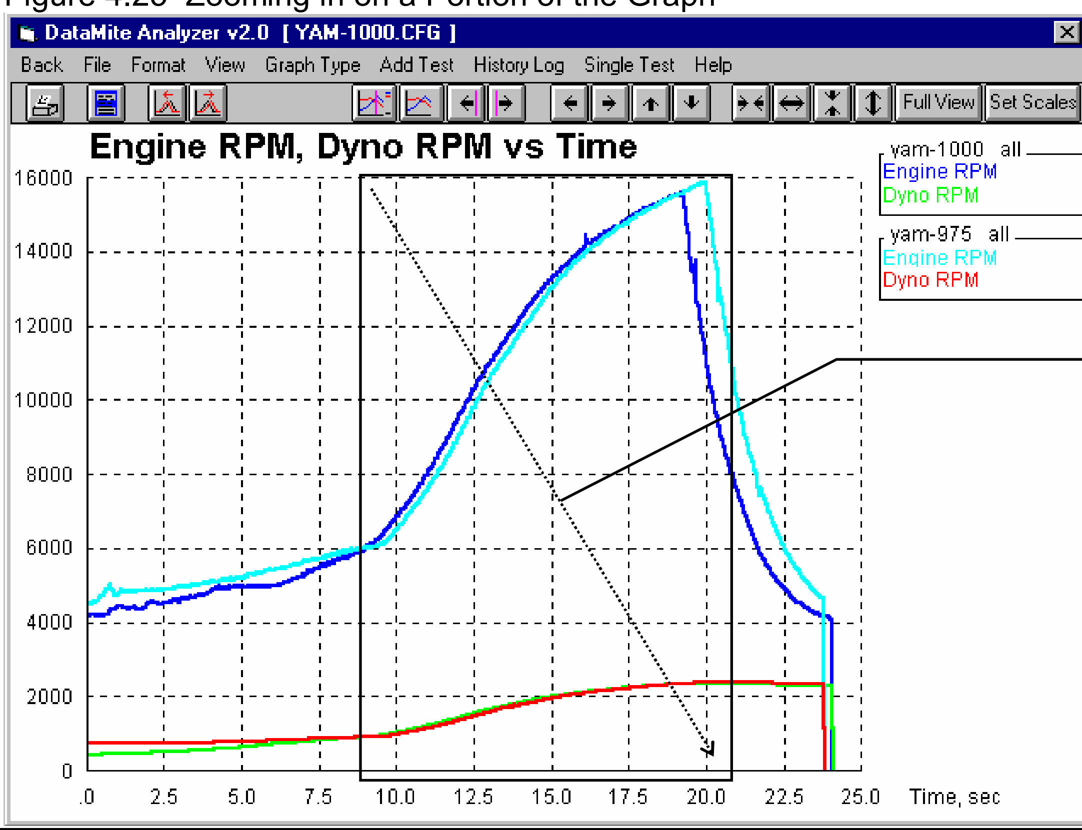
Figure 4.24 Checking Data Quality of Both Tests Being Compared



Note that in this graph the program decided NOT to multiply Dyno RPM by 10 as it did in Figure 4.23. Therefore, dyno RPM looks much smaller compared to Engine RPM in this graph.

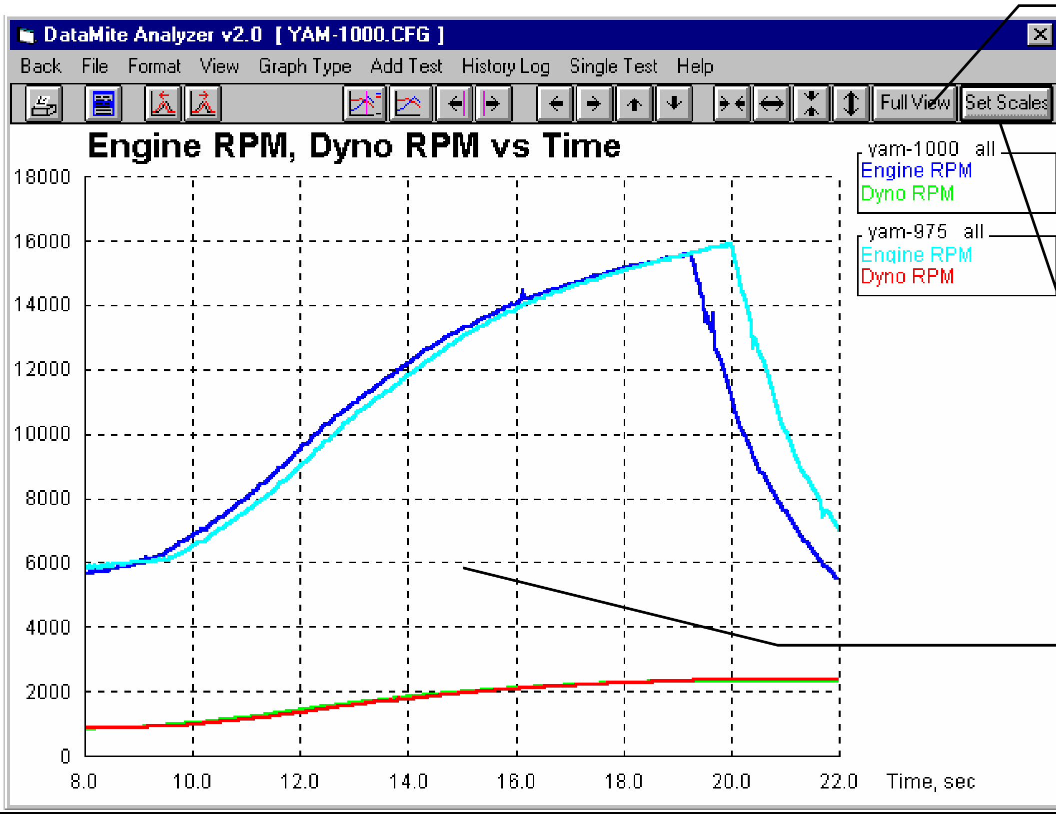
The YAM-975 test shows no noise spikes or other types of problems in the Dyno or Engine RPM data, and therefore has high data quality.

Figure 4.25 Zooming in on a Portion of the Graph



Click and drag mouse to outline the portion of the graph you want to fill the entire graph screen (the portion you want to zoom in on).

Figure 4.26 Graph After Zooming In with the Mouse as Done in Figure 4.25

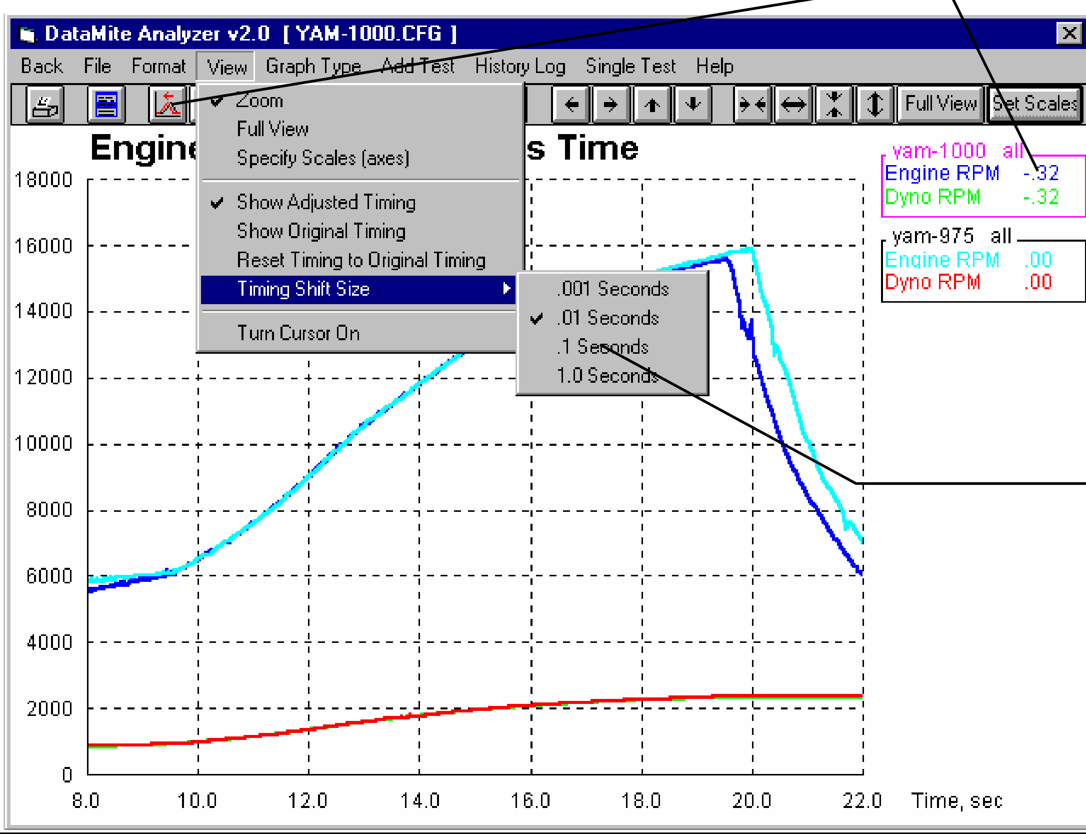


Click on Full View to return to the original scales where the complete test was displayed, as determined by the program. This is called "auto-scaling"

Another way to zoom in is to click on Set Scales and manually enter the scale limits. (Pro version only.)

The portion of the screen outlined is Figure 4.25 with the mouse now fills the entire graph screen.

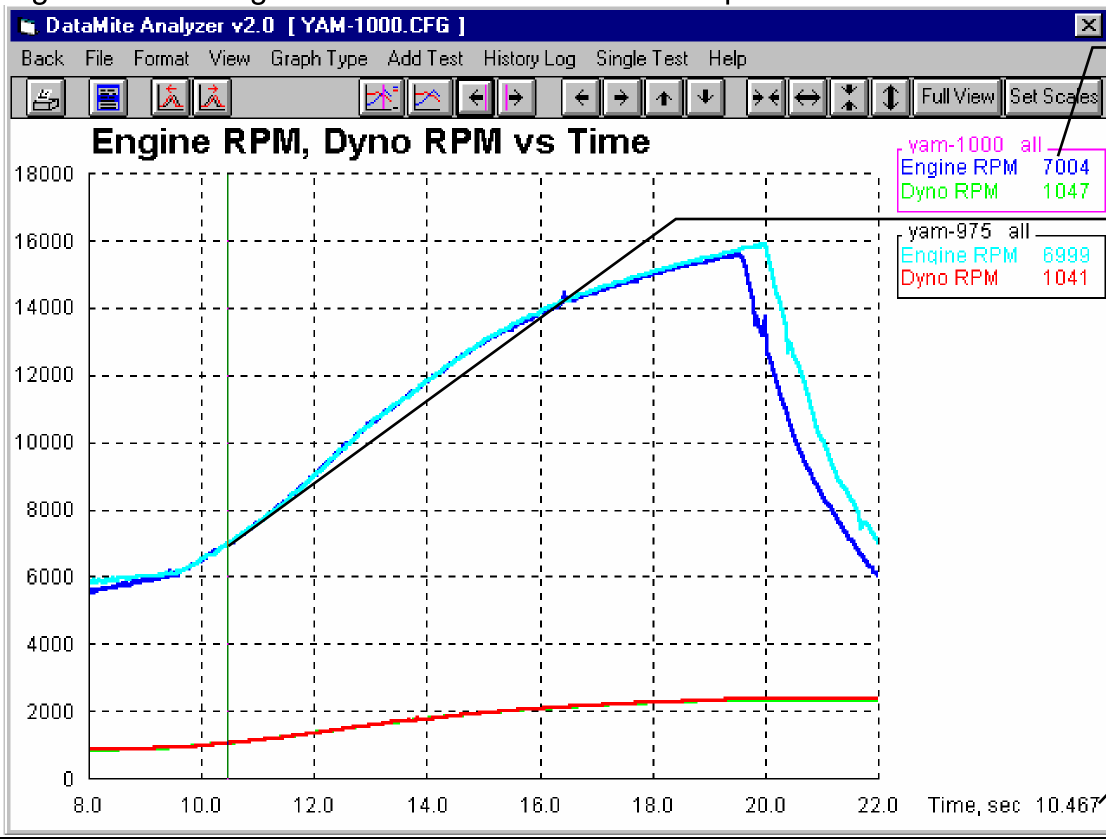
Figure 4.27 Time Aligning Two Time Graphs



Click on these Time Align buttons to shift one of the tests over another. The amount of shift is shown in the legend. The test with the 10" flex had to be shifted back .32 seconds for good alignment with the 9.75" test. (One button is hidden by the "View" drop down menu.)

Click on View, then Timing Shift Size to increase or decrease the amount of time shift which occurs for each click on the Time Align buttons.

Figure 4.28 Using Cursor to Check Values on Graphs

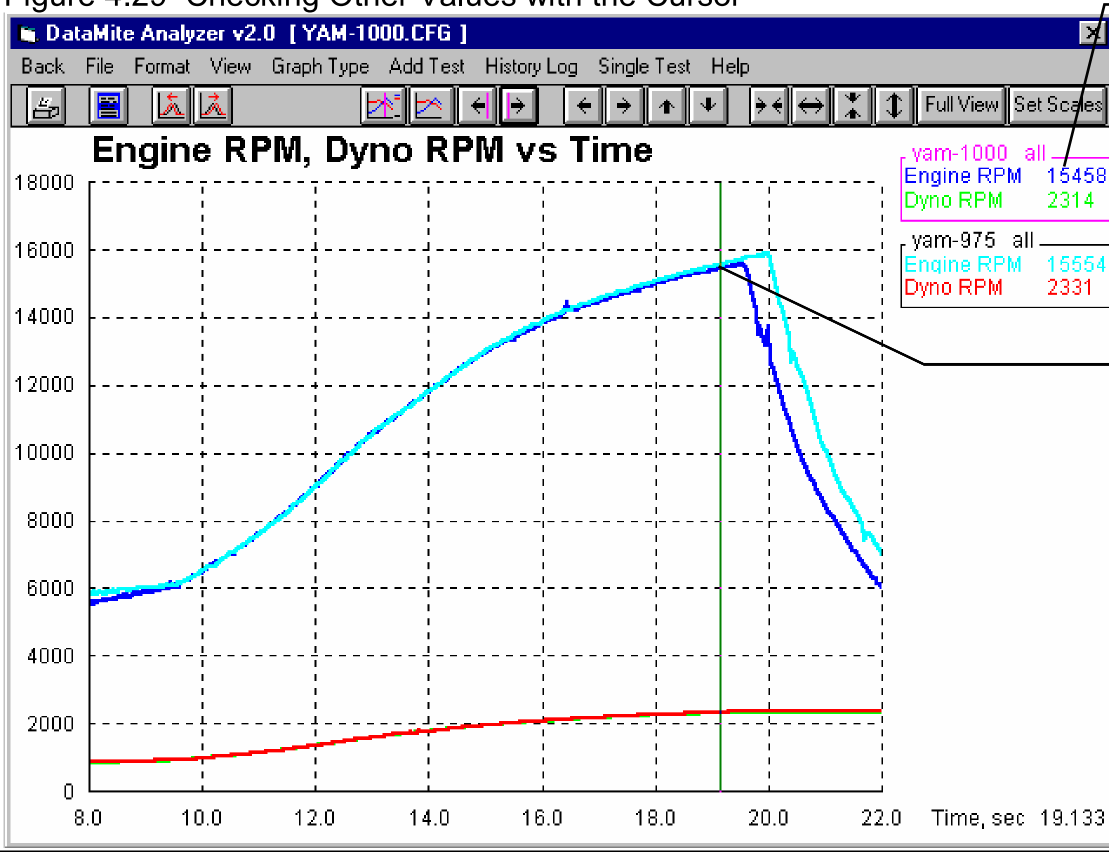


Values at the cursor line are shown here in the Legend.

Click on a graph line to bring up the cursor line. The values of the graphs at this line are displayed in the legend, which shows the Engine and Dyno RPM match well from each test. The accelerations are now starting at the same time at approximately 7000 Engine RPM.

Cursor Time.

Figure 4.29 Checking Other Values with the Cursor



Engine RPM with 10" flex is about 100 RPM less, showing a slightly slower

Click on the graph lines at some later time during the acceleration to see how the Engine and Dyno RPM match. Engine RPM for the 10" flex is about 100 RPM lower at the end of the acceleration, which took about 8.67 seconds (19.133 - 10.467 seconds).

Figures 4.25 through 4.29 show how you can use graph features like Time Aligning, Zooming and the Cursor to check various performance characteristics. However, the most common way to check performance between to engine conditions is the graph the Corrected Torque and HP vs RPM. Figure 4.30 the Graph Menu specs to produce the graph shown in Figure 4.31.

Figure 4.30 Graph Specs Menu

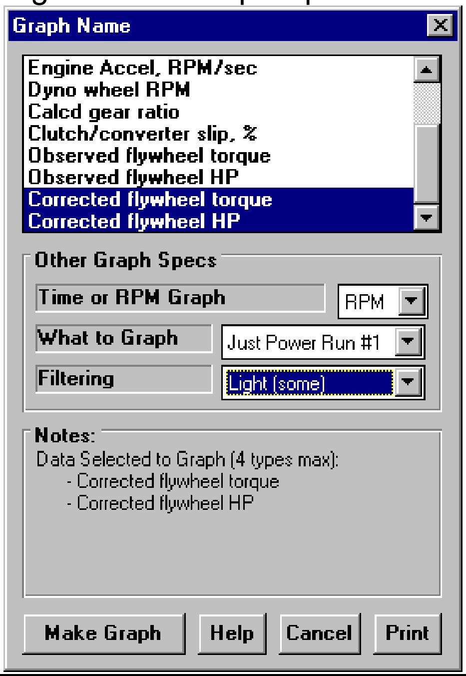
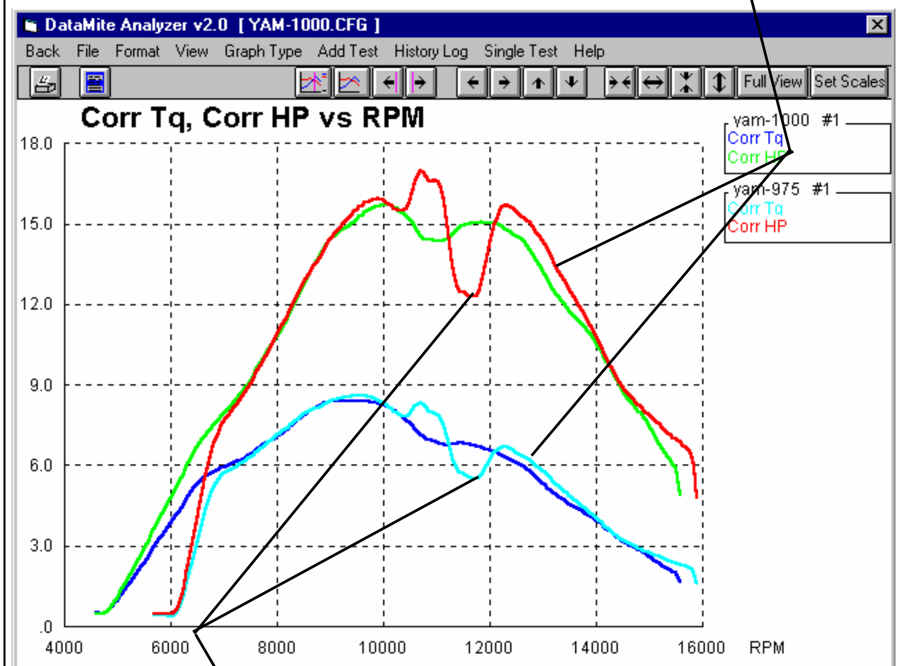


Figure 4.31 Corrected Torque and HP Comparison Graph

The 9.75" flex shows higher HP and torque throughout most of the RPM range, which agrees with the acceleration results, that the 9.75" flex was at a higher RPM at the end of the acceleration.



A quick up, then down (or down, then up) as shown here in the curves usually indicates a bad data point. However, on this highly tuned 2 stroke engine, this may be real.

Figure 4.31 shows 2 main things:

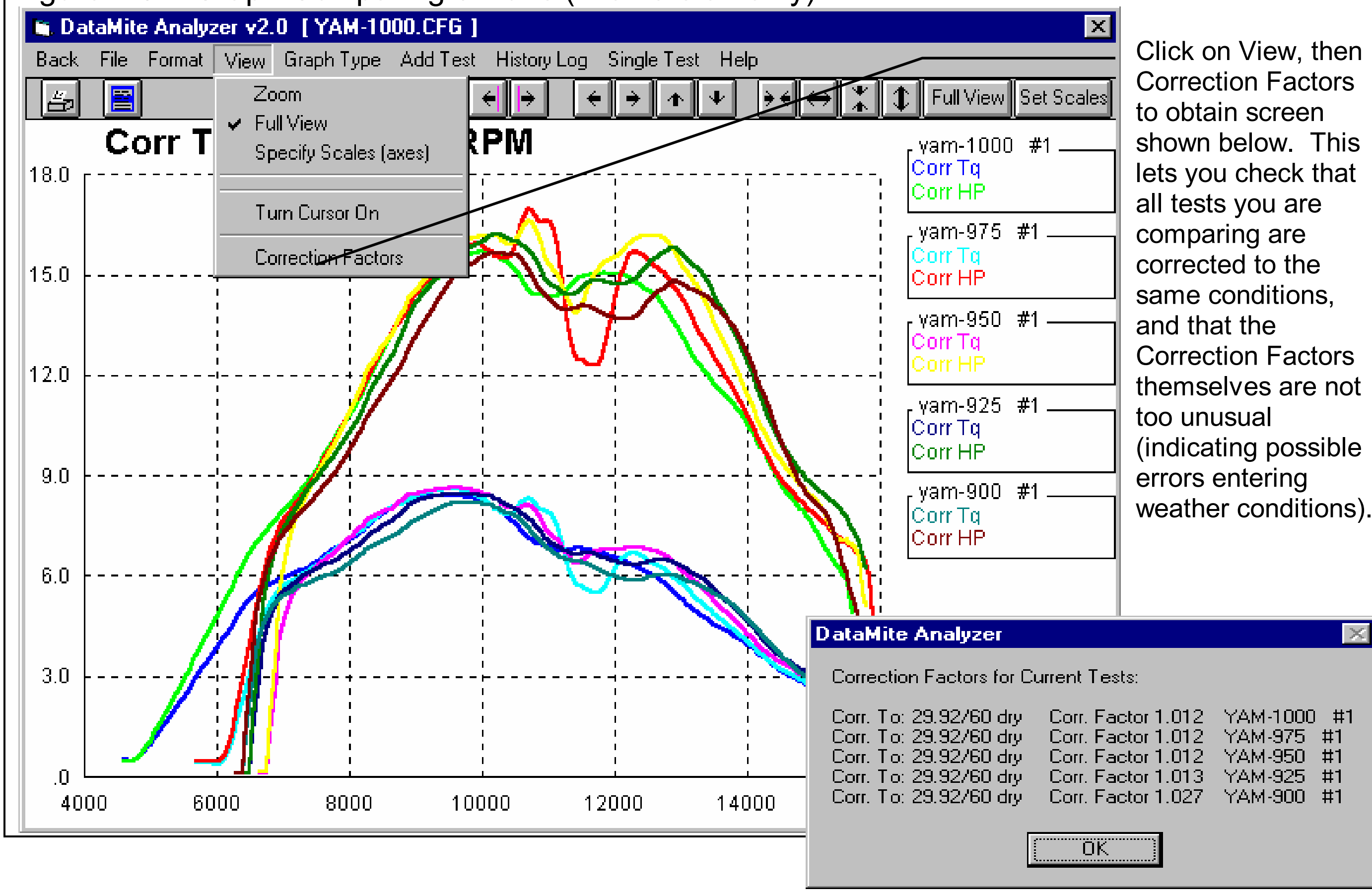
1. The torque and HP for the 9.75" flex is higher over most of the RPM range from 7000 to 15000 RPM.
2. The 9.75" flex shows a sharp rise, then fall in torque and HP. For most engines, this would a clear indication that something unusual happened during the test. However, for this highly tuned 2 stroke engine, this may be real. A highly tuned engine is one which takes strong advantage of the pulses in the intake and exhaust tract. These engines are prone to producing peaks and valleys in the power curves. If time would have allowed, this 9.75" flex test would have been a good test to repeat.

When unusual results are obtained, the best check is to repeat the test. If the trend repeats, it probably is real.

Although the 9.75" test should have been repeated, another way to check its validity is to check if its trends fall in line with other modifications. In the Basic version, you can only compare 2 tests. In the Pro version, you can compare many more. The limit is determined by how many data types you want to graph.

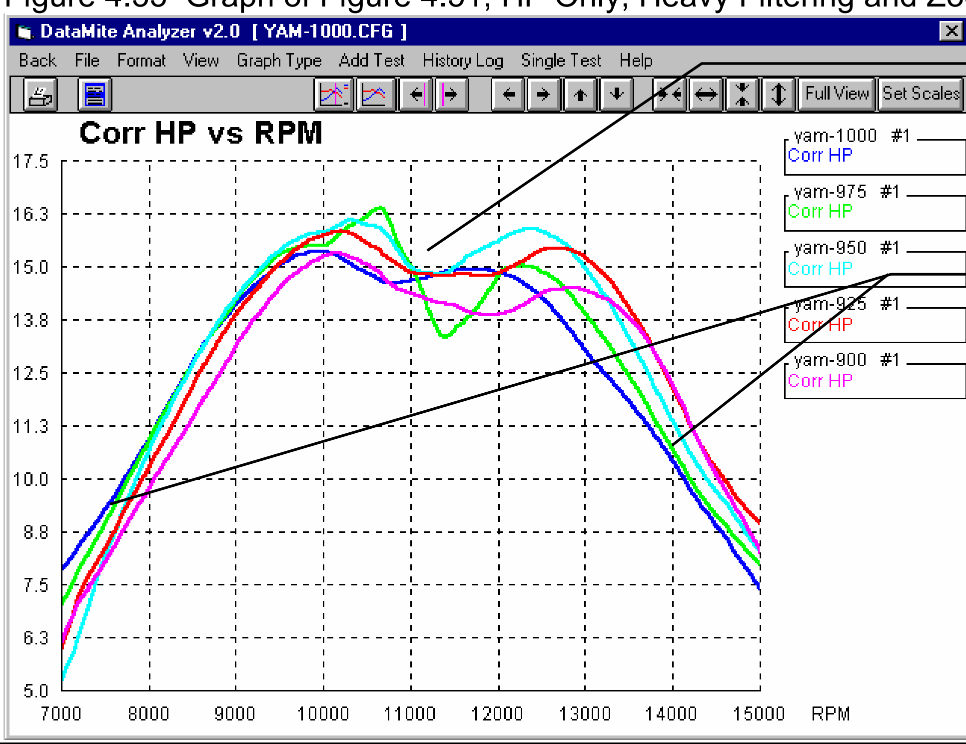
To add more graphs, click on the Add Test command and pick the other test run in this series: 9.50", 9.25" and 9.00" exhaust flex. You would obtain a graph as shown in Figure 4.32 showing all 5 tests.

Figure 4.32 Graph Comparing 5 Runs (Pro version only)



Click on View, then Correction Factors to obtain screen shown below. This lets you check that all tests you are comparing are corrected to the same conditions, and that the Correction Factors themselves are not too unusual (indicating possible errors entering weather conditions).

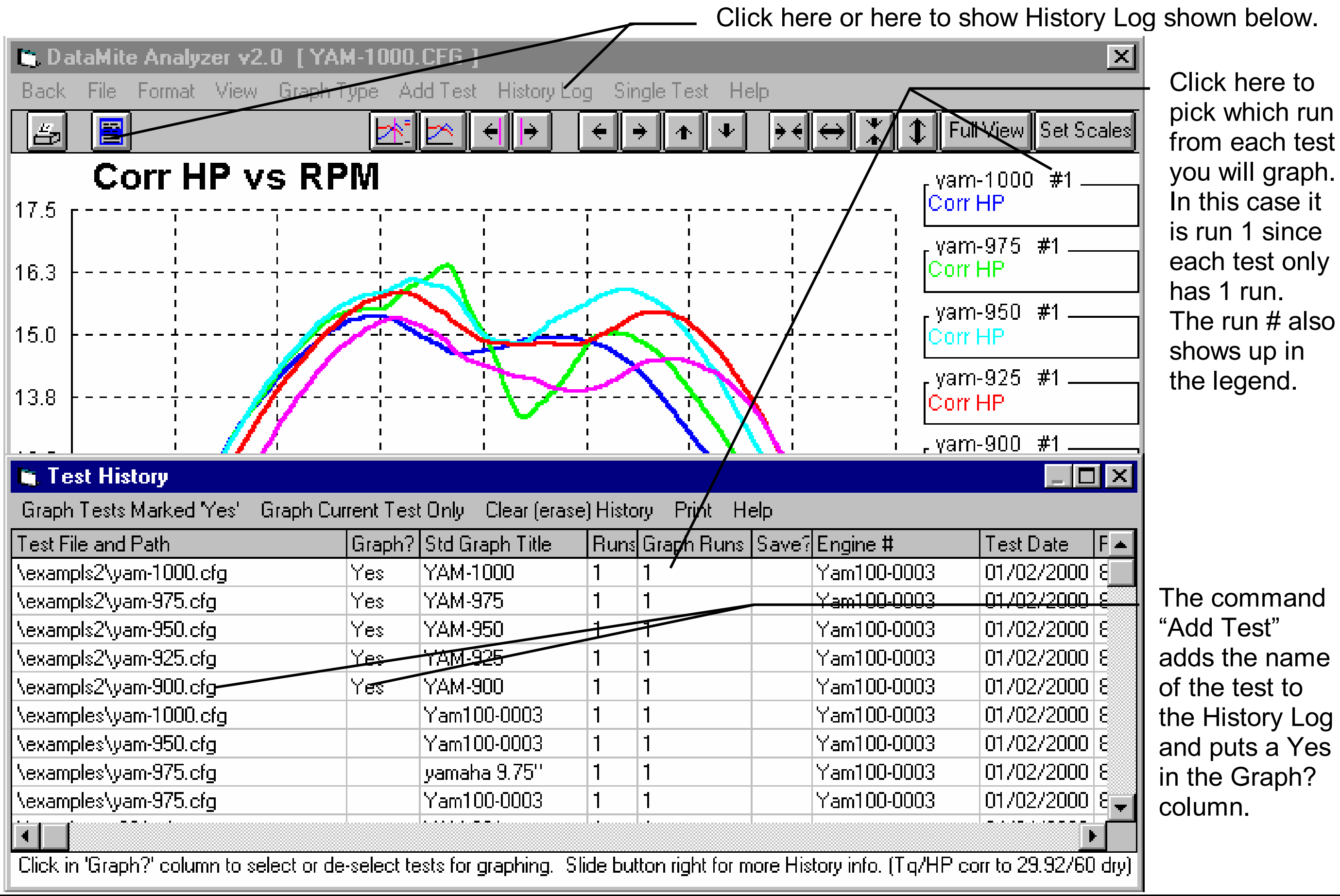
Figure 4.33 Graph of Figure 4.31, HP Only, Heavy Filtering and Zoomed In on Peak HP



Note that all runs have a dip right at the HP peak, indicating the dip seen in Figure 4.25 for the 9.75" flex is probably real.

Before and after the HP peak (where tuning effects are not as significant) the curves are very similar, and all fall very much in order. Going from left to right, the 10" flex comes first, then the 9.75, 9.50, 9.25 and 9.00 " flexes. This is exactly as engine theory would predict, that the longer exhaust pipes will peak at lower RPMs. This gives you good confidence the test data is good.

Figure 4.34 Pro Version's History Log for Graphing Multiple Runs



When comparing ***Corrected*** torque and HP for different tests, it is important that the weather conditions you've entered for each test in the Test Conds menu are accurate. These 5 test were all run on the same day, so the weather conditions should all be quite similar. A quick way to check this is to click on View, then Correction Factors as shown in Figure 4.32. If the Correction Factors are all quite similar, then the weather conditions must also be similar. The 9.00" flex's Correction Factor is the only one that looks somewhat different. Perhaps you should double check the Test Conds for that test.

If the Correction Factor is in error, it will move the Corrected Torque and/or HP curve up or down. It will ***not*** change the shape of the curve or change the RPMs at which the peaks occur.

Figure 4.32 can look quite confusing. Figure 4.33 is the same data with these changes:

- In the Graph Type menu of Figure 4.30, click on Corrected Flywheel Torque to "de-select" it. The graph will now be for only Corrected Flywheel HP.
- Also in the Graph Type menu, select Heavy Filtering.
- Use the mouse as shown in Figures 4.25 and 4.26 to zoom in on the HP peaks.

This graph of Figure 4.33 now shows:

- The longer the exhaust flex, the lower the RPM where the HP peak occurs. This is exactly what engine theory would predict: longer runner lengths move the torque and HP peaks to lower RPMs.
- All curves show a dip right at the HP peak, probably due to the exhaust tuning effects of this engine. Exhaust tuning seems most probable because these relatively small exhaust length changes are significantly changing the shape of the curves.
- In general, the 9.50" pipe test seems to have the higher HP over the largest RPM range. This seems to be the best exhaust pipe length for HP.

When it comes to optimizing an engine for some particular type of racing, HP is the key. Optimize your engine for maximum HP over the RPM range you will be using. Then select gearing and shift points to keep the engine in the highest HP RPM range.

Notes on Multiple Tests, Pro Version

When you click on Add Test in the Pro version, and then pick a test to add, you are actually adding that test to the History Log as shown in Figure 4.34. The program puts a Yes in the Graph? column. All tests marked Yes in the History Log will be graphed, as long as there is enough room in the graph legend. If the tests you wanted to graph were already in the History Log, you could have added them by opening the History Log and manually putting a Yes in the Graph? column. See Section 3.7, History Log.

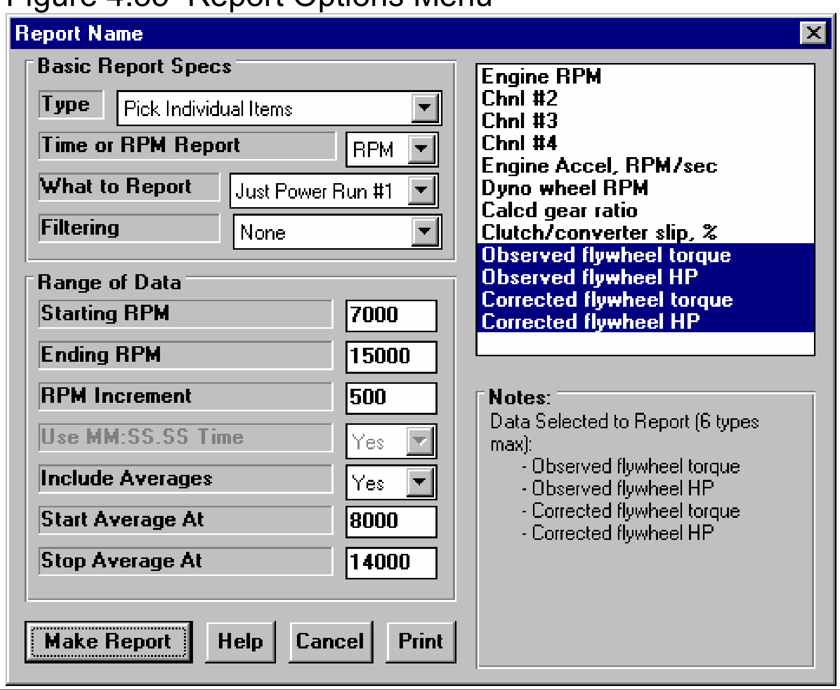
Reports

Another useful analysis tool are the reports. Reports are convenient because a complete dyno run can be summarized in just one number, like Average Corrected HP. Click on Back at the top left of the Graph Screen to return to the Main Screen. Then click on Reports and select the Report Options menu shown in Figure 4.35.

From the graphs you can see that the highest HP readings are in the 7000 to 15000 range. Therefore, you set the Starting and Ending RPM specs to 7000 and 15000 respectively. The RPM increment you set to a relatively large 500 RPM because you are not interested right now on how HP changes with RPM, or what the HP is at 1 particular RPM. You are interested in Average HP.

Set Include Averages to Yes, and the RPM range for Averaging data at 8000 to 14000. Note that the range of RPMs you select for

Figure 4.35 Report Options Menu

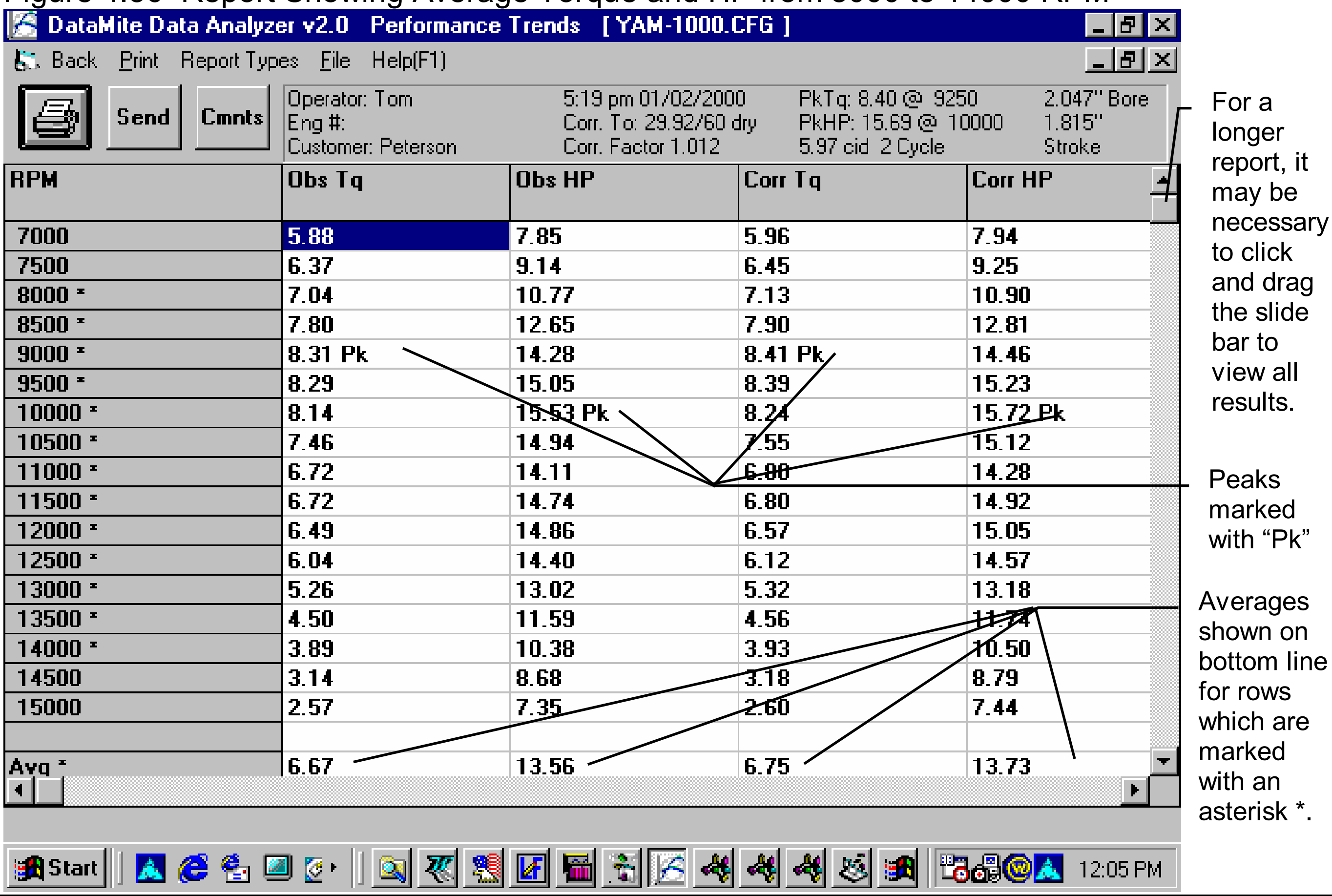


averaging will effect the results, ***and can even change which exhaust length produces the highest average HP***.

Do not extend the Averaging RPM Range out to the very start or end on the dyno test. At those extreme RPMs, it may not be certain if the throttle had gotten completely open, or if the engine "stumbled" when you opened the throttle, or if you had started to close it. Also, do not pick an RPM range larger than what you will use in the vehicle. For drag racing where the transmission may allow the engine to stay in a relatively narrow RPM range, an RPM range from 10000 to 12000 may be correct. However, this engine is used in circle track and road racing so a wider RPM range is used in the vehicle. Your experience tells you to enter a range from 8000 to 14000 RPM.

We also chose to include Observed Torque and HP in this report as a check. If the comparisons between Corrected data does not match the Observed data, it may be useful to double check the weather conditions in the Test Conds menu for each test, or rerun the test.

Figure 4.36 Report Showing Average Torque and HP from 8000 to 14000 RPM



RPM	Obs Tq	Obs HP	Corr Tq	Corr HP
7000	5.88	7.85	5.96	7.94
7500	6.37	9.14	6.45	9.25
8000 *	7.04	10.77	7.13	10.90
8500 *	7.80	12.65	7.90	12.81
9000 *	8.31 Pk	14.28	8.41 Pk	14.46
9500 *	8.29	15.05	8.39	15.23
10000 *	8.14	15.53 Pk	8.24	15.72 Pk
10500 *	7.46	14.94	7.55	15.12
11000 *	6.72	14.11	6.80	14.28
11500 *	6.72	14.74	6.80	14.92
12000 *	6.49	14.86	6.57	15.05
12500 *	6.04	14.40	6.12	14.57
13000 *	5.26	13.02	5.32	13.18
13500 *	4.50	11.59	4.56	11.74
14000 *	3.89	10.38	3.93	10.50
14500	3.14	8.68	3.18	8.79
15000	2.57	7.35	2.60	7.44
Avg *	6.67	13.56	6.75	13.73

Table 4.1 Average Performance for Exhaust Flex Lengths

Test File	Flex Length	Obs Tq	Obs HP	Corr Tq	Corr HP
YAM-1000	10.00	6.67	13.56	6.75	13.73
YAM-975	9.75	6.78	13.82	6.87	13.99
YAM-950	9.50	7.00 *	14.32 *	7.08 *	14.50 *
YAM-925	9.25	6.88	14.14	6.97	14.32
YAM-900	9.00	6.48	13.35	6.66	13.70

* Best

Table 4.1 shows the average Corrected and Observed Torque and HP for the 5 different exhaust flex lengths. The Corrected results agree well with the observed results, indicating the data quality looks good and the correction factors appear correct. The Table shows more conclusively what the graph tended to show:

The 9.50" flex was the best on average over the 8000 to 14000 RPM range.

Conclusions

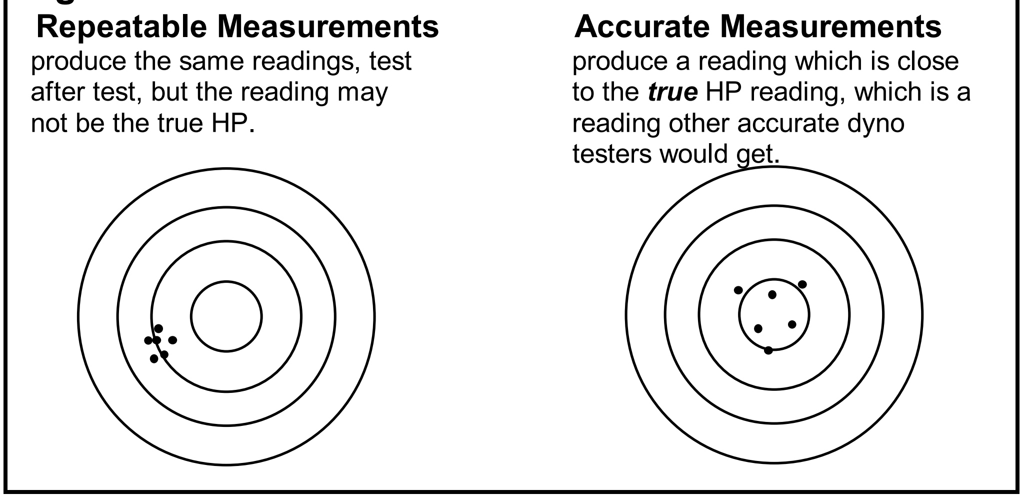
- Graphs allow you to compare one dyno run to another to check the effect of modifications.
- Graphs can compare runs on a time basis or an RPM basis.
- Various graphing features like Zooming, Filtering, Time Aligning and the Cursor let you manipulate the graphs in various ways to obtain different comparisons.
- Reports allow a convenient way to compare tests by obtaining averages over a particular RPM range, and then comparing these average numbers.

Appendix 1: Accuracy and Assumptions

Repeatability:

The difference between ***repeatability*** and ***accuracy*** is a concept you may not understand. Graphically, accuracy and repeatability are shown in Figure A.1.1. Think of the dyno as an "archer" which is trying to hit the "bulls eye" or the engine's true HP measurement. Let's say the true HP was 150 HP, but one dyno always comes up with values between 142 to 143 HP. This dyno is not very accurate, but is very repeatable (only a 1 HP spread in data). Another dyno comes up with measurements which vary from 145 to 155 HP, which average out to the true 150 HP. This dyno with the 10 HP spread in data is not nearly as ***repeatable*** as the first, but ***is more accurate***.

Figure A1.1



Ideally, you want both a repeatable and accurate dyno, but this is not always possible. When are accurate measurements and repeatable measurements most desirable?

- If you very accurately want to determine if a modification (for example, changing the intake manifold) has improved the performance, the repeatable dyno is the one to use.
- If you want dyno numbers to use in a magazine article, for other people to compare their dynos with, you are better off with the accurate dyno.
- If you want HP numbers to use for certifying an engine, for example selling an engine with a guarantee it produces 150 HP, you are better off with the accurate dyno.

For most dyno testing, repeatability is more important. Fortunately, repeatability is also easier to obtain.

Accuracy:

There are many types of calculations being performed by the Dyno DataMite Analyzer. The accuracy of the torque and HP measurements are probably most important to the user and depends on the following:

- For an Inertia Dyno, it is critical that the dyno's inertia be accurate. This could be done by actually measuring the system's inertia, but this would be expensive and time consuming. Therefore, the program estimates the total inertia based on measurements and approximate densities of various materials, or the known weight of the components. An error here will only affect accuracy and not repeatability.
- Additional corrections can be made in the Pro version for losses in accelerating the engine's inertia. The engine's inertia is also estimated by inputs in the Short Block section of the Engine Specs menu. These are also an estimate. An error here will only affect accuracy and not repeatability.

- For an absorber dyno, it is important for the load measurement and torque arm length be measured accurately. See Appendix 5 for the calibration process. An error here will only affect accuracy and not repeatability.
- For absorber dynos, it is also important that the bearings which support the absorber have very little friction. See Appendix 5. An error here will affect accuracy ***and*** repeatability.
- Corrections can be made for changes in weather conditions to produce Corrected Torque and HP readings. It is critical that you accurately enter the weather conditions for each test in the Test Conds menu. See Section 2.3. An error here will affect accuracy ***and*** repeatability.

General Testing Tips

- Dyno tests DO NOT repeat exactly from run to run. Minor changes in temps, procedure, measurement system produce minor changes which can add up to 1-2% difference from test to test. The more time and the more engine teardowns between dyno pulls, the more likely you will have differences.
- Always anticipate what your modification should do before you do your test. An engine simulation program like Performance Trends' Engine Analyzer is good for this. If your results don't match what you expect, start looking for errors in the installation of the part or in the engine rebuild. Many times "dumb mistakes" are the reasons dyno results are not correct. Examples could include:
    - RTV squeezing out into a port or plugging a carb port
    - Changing the coolant temp sensor location so you warm up to a different temp
    - Changing the type of oil or the amount of time on the oil
    - Changing fuel
    - Mis-timing the cam or the distributor
    - Entering the weather conditions wrong, etc.
- Corrected Torque and HP readings should repeat better from day to day than Observed Torque and HP readings. Therefore, you will want to compare Corrected Torque and HP when checking for changes. The corrections Performance Trends use are very similar to any other dyno software package. However, no weather corrections work perfectly. Therefore, when you need to check for small improvements, you should try to run the tests as close together in time as is possible, ideally within a few hours. This helps ensure the weather does not change, and other unknows like fuel, oil, testing procedure due to different operators, etc.
- Always perform each test as exactly the same as possible. Warm up at a certain RPM to a certain coolant, oil and or head temperature, open the throttle at the same rate, wait for a certain RPM, close the throttle the same, etc.
- Do not let your emotions get involved with your testing. You may want to prove your theory that "Attaching magnets to the carb float bowl will energize the fuel and make more power." If you run enough tests, you ***will*** find a before and after test to prove your point, even if the average of all tests say there is no effect.
- Always try to repeat your Baseline or the Before condition. For example, run 2 or 3 tests with the Baseline Cam A. Install Cam B and run 2-3 tests. Then reinstall Cam A and run 2-3 test to prove that your Baseline repeats. Back-to-back repeats do NOT prove repeatability of the whole test like repeating the Baseline again after the modification. Something could happen during the teardown for the cam installation.

Appendix 2: Hardware Installation and Operation

1 Ensure All Pieces Were Shipped

The DataMite data logger system should be shipped with:

1	DataMite module **!!! Important !!!** The standard DataMite module is NOT designed for Magneto ignition systems or uneven firing engines (for example, Harley Davidson V twins). Call Performance Trends for exchange with proper module (possibly at extra charge) before hooking up.
1	DataMite Control panel with 2 push buttons
1	Wiring harness with standard wheel RPM sensors
4	Magnets for wheel RPM sensors
1	Serial cable for connecting DataMite to your computer's COM port.

Common DataMite Options

- Inductive Pickup and wiring harness for measuring engine RPM on single cylinder Briggs or other cart engines.
- 110 VAC to 12 VDC power supply, so dyno system can be powered from AC wall outlet. It is recommended you power your DataMite from the same power as you power your computer, for example from the same power strip, ideally with surge protection.
- Optical isolation connector for the COM port. This is good protection for your computer against high voltage spikes from the engine getting back through the DataMite to your computer's COM port. This can happen any time you are running the engine and have the serial cable attached to the COM port. This is something you may often want to do to watch the Current Readings.

In addition, you may need:

- Epoxy or some other method of mounting magnets to the wheels or driveshafts.
- Heavy metal strips to build brackets to mount the RPM sensors to monitor the magnets.
- Shrink tubing, solder, soldering iron, wire terminals, etc if you are going to shorten, lengthen or change the wiring harness.
- Optional power switch to cut power to the DataMite.

The hardware instructions given here are very general and describe the overall DataMite system. Most DataMite options come with their own installation and instruction sheet.

2 Determine Signals to Record

The system is designed to record engine RPM on channel 1. However, Channels 2, 3 and 4 can record several different things. Figure A2.7 and A2.8 gives typical sources for Engine RPM signals for various ignition systems.

Inertia Dyno:

The standard harness comes with a wheel RPM sensor on Channel 2 and 3. For an Inertia Dyno, either of these can be used to measure the RPM of the Inertia dyno.

Absorber Dyno:

The standard harness comes with a wheel RPM sensor on Channel 2 and 3, and a 6 pin plug for an analog converter on Channel 4. Either wheel RPM sensor can be used to measure the RPM of the dyno. You can plug in the analog converter for measuring the torque arm load on the 4th channel. See Appendix 4.

For most situations, which channel is attached to which sensor can be easily changed in the program. See Section 2.5, DataMite Specs.

3 Build Brackets, Mount Magnets

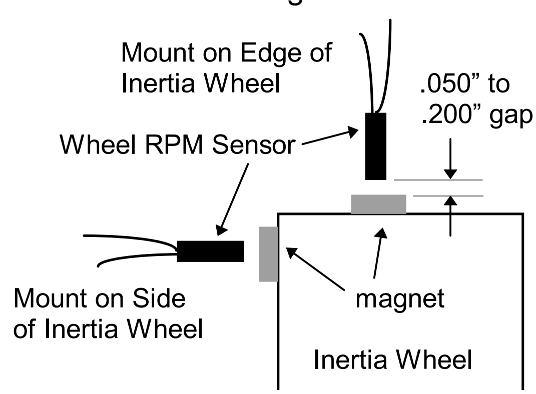
For inertia dynos, epoxying the standard magnets supplied to the outside of the inertia wheel works well. For an additional charge, Performance Trends can supply other types of magnets for other installations, including:

- Tiny (approximately 1/4" diameter, .050" thick magnets) to be epoxied in place. These usually work better on driveshafts or smaller diameter shafts or wheels.
- High temperature magnets which withstand higher temperatures.
- Small plastic bolts, 1/4 x 20 with magnets embedded in the head for mechanically fastening the magnets.

Epoxy the magnets in place following the directions with the epoxy. Be sure the mounting surface is clean and grease free. We recommend using light sand paper or oil free steel wool to clean the surface. The epoxy should be designed to work with metal and ceramic. We recommend epoxies which are 2 parts which must be mixed, including:

Ace Hardware 5 Minute Epoxy
Duro Master Mend 5 Minute Epoxy
Devcon High Strength 5 Minute Epoxy

Figure A2.1 Spacing Required for RPM Sensor and Magnets



When locating the magnets, ***be sure they are evenly spaced***. Apply epoxy and press into place, then apply tape until set. Evenly spacing the magnets insures more accurate, less "noisy" RPM data.

For inertia dynos it is critical that the magnets be evenly spaced for accurate torque and HP results. Many dyno testers just use 1 magnet on the inertia wheel to avoid this spacing issue (1 magnet is always evenly spaced). If your inertia wheel spins VERY slowly (less than 750 RPM at the engine's HP peak), you may need to use 2 or more magnets for better inertia wheel RPM data.

You must fabricate your own brackets to allow adjustment of the sensors from .050" to .200" from the magnets. See Figure A2.1.

Tips for brackets:

- The brackets must be sturdy, either thick metal or very short.
- They should keep the sensor reasonable square with the face of the magnet.

- They should keep the sensor away from heat, either exhaust or brake heat.
- To avoid vibration problems, see Figure A3.3 in Appendix 3, Troubleshooting.

4 Select DataMite Mounting Locations

A good place to mount the DataMite module and control panel would on a metal plate away from the engine. Metal is preferred because it can absorb some of the electrical noise emitted by the engine's ignition system. Keeping the DataMite box away from the engine also reduces the likelihood of electrical noise problems.

To mount the DataMite module, hold the module in place on the flat surface you've selected and mark the 2 bolt holes. Drill holes as required. When bolting the module in place, DO NOT overtighten. Tighten just until the rubber grommet starts to compress. Use a flat washer against the rubber grommet, and a lock washer against the nut. In extreme vibrating conditions, you may have to "double nut" to avoid loosening of the mounting bolts.

The standard mount for the push button control panel is to attach the supplied "high grip" Velcro strip to the mounting location. Peel the backing from this strip and press it firmly onto a clean, dry, oil free surface. Do not touch the adhesive surface. The surface should be smooth, flat and away from heat (65-85 degrees).

Then simply press the control panel enclosure with its own mating Velcro strip into this mounted Velcro. You should hear an audible snap when closure is made.

Note: The cable from the control panel and the DataMite module can NOT be lengthened. However, the panel can be removed from its enclosure and mounted directly in a cutout in some type of panel. This is best done with screws (can use those provided with the plastic enclosure) or pop rivets.

5 Determine Cable Routing

It is recommended you do not lengthen or shorten the DataMite harness unless you solder and shrink tube all connections and are familiar with good electronic cabling practices. Therefore, be sure all wiring reaches the dyno, ignition, power and ground. This may effect where you mount the DataMite module. Excess wiring can be coiled in a location by the DataMite, ***away from the engine's ignition system.***

See Figure A4.4 for an overview of the wiring.

6 Install Wiring Harness with 110 VAC Power Supply (See Figure A2.2)

With the harness NOT hooked up to the DataMite module, string the connections and RPM sensors to the intended locations. You may have to change the standard connectors supplied with the harness.

Most dynos will use the 110 VAC power supply. This must be wired up differently than a DataMite vehicle system

Connect the black ground cable to the black side of the power supply's mating connector. ***If you are using an Inductive Pickup, DO NOT attach this ground to the dyno frame or the engine block. Grounding to the dyno or engine can damage your computer.***

If you are connecting directly to an ignition coil or an ignition box (like an MSD), you may need to ground the DataMite harness to the engine or dyno frame. However, you ***MUST THEN USE THE OPTICAL ISOLATION*** connector to prevent damage to your computer.

It is strongly recommended you install the Optical Isolation connector from Performance Trends to protect your computer from damage to its COM port.

Connect the red power cable to the red side of the power supply's mating connector. Total draw from the DataMite should be 60 mAmp (.060 amps) or less. It is recommended you also install a power switch in this line. This power switch can be used to "reboot" the DataMite should it become "confused". The DataMite is a computer and may need to be rebooted much like your PC needs to be shut down and restarted if an error occurs.

Important !!! The power to the DataMite must be clean. If you are using your own 12 volt source, this power source should NOT be from the same switch that controls power to the ignition system.

Engine RPM, Inductive Pickup:

Connect the yellow ignition lead to the yellow lead of the Inductive Pickup harness. Wrap the Blue or Purple wire from the inductive pickup around the engine's spark plug wire. You may need to adjust the number of wraps around the spark plug wire for different situations. See Appendix 3, Troubleshooting.

Engine RPM, Typical Automotive Spark Signal

Connect the yellow ignition lead to your ignition module's "tach" or "spark" output, or the negative side of the coil, or the yellow wire of the optional inductive pickup. See Figure A2.7, page 157 for examples of ignition sources. ***The standard DataMite module is not designed for Magneto ignitions or uneven firing engines.*** For uneven firing engines, you may need to pull an ignition signal from just 1 coil (if each cylinder has its own coil), or use a wheel RPM sensor or inductive pickup.

Wheel RPM sensors. You may want to remove the nuts for stringing the cable through small openings. Install these sensors and adjust them to come within .150" to .200" of the magnets initially. During testing, you may have to adjust them closer.

When the harness is strung and all cables connected, plug in the DataMite module and the control panel. You should see the Record LED light up on the control panel to indicate the DataMite is powered up. You may see a delay of up to 20 seconds between power up and an LED lighting on the more memory 512K DataMites.

Figure A2.2 Typical DataMite Dyno Wiring Harness Installation

7 Check Out Signals

Put the DataMite into Setup Mode by pressing the Clear Memory button while holding the Record button down. See Figure A2.3. You should see the Record LED start to flash once every second or so. This indicates it is in Setup Mode and is checking channel 1 since it is flashing once.

When you start the engine, you should see the Clear Memory LED start to flash. The flash rate should increase as engine RPM is increased. If not, check the ignition lead for proper installation. (Note that when checking Engine RPM, the LED will not flash for every engine firing, because this would be so fast the LED would appear to be constantly on. The LED changes state for approximately every 10 engine firings to slow the flash rate down.)

Press the Record button once, and the Record LED will flash twice quickly every second or so. This shows it is now displaying channel 2 which is the sensor or connector with white shrink tubing. The Clear Memory LED should light when the magnet passes the sensor for Channel 2. If it does not, adjust the sensor closer to the magnets. Be sure the Clear Memory lights for all magnets.

Check the other channels following the pattern described above for checking Channel 2.

Figure 2.3 DataMite Setup Mode for Checking Channels

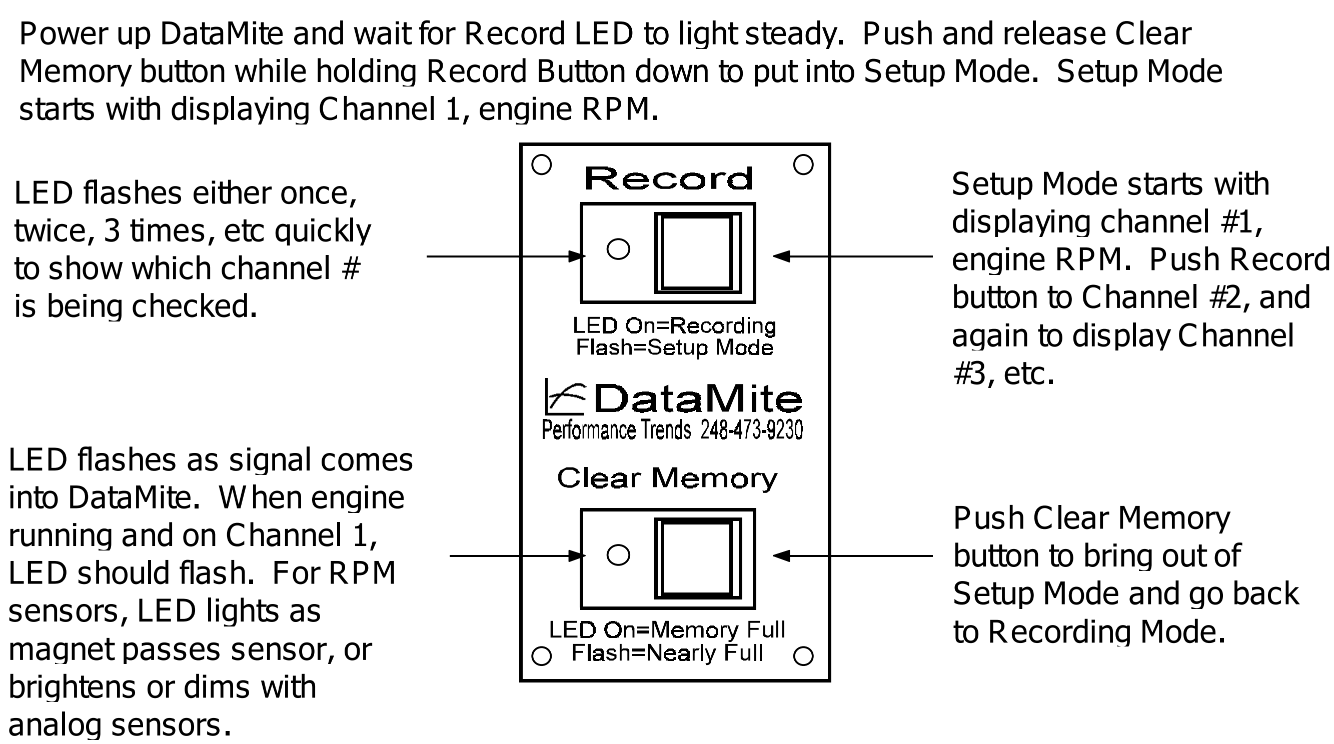
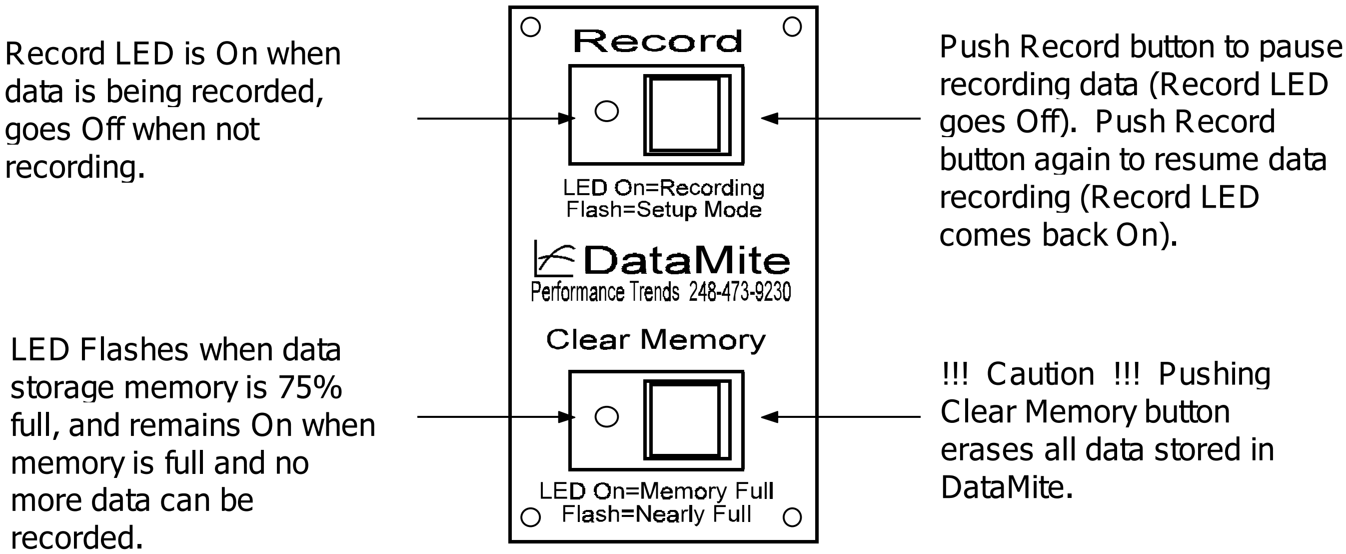


Figure 2.4 DataMite Recording Mode

DataMite automatically goes to Recording Mode when power comes on. Record LED (light) comes on.



Options

The 4th channel and either of 2 wheel RPM channels can be converted to record other types of signals like temperature, pressure, position, torque arm load, etc. Usually this requires the addition of a converter box and sensor. See Figure A2.5.

If you remove the cover of the DataMite box, you will find 3 sets of jumper wires, yellow, blue and orange. Whether these wires are connected or disconnected will set some options for the DataMite's operation. See Figure A2.6.

Figure 2.5 Analog Converter Installation

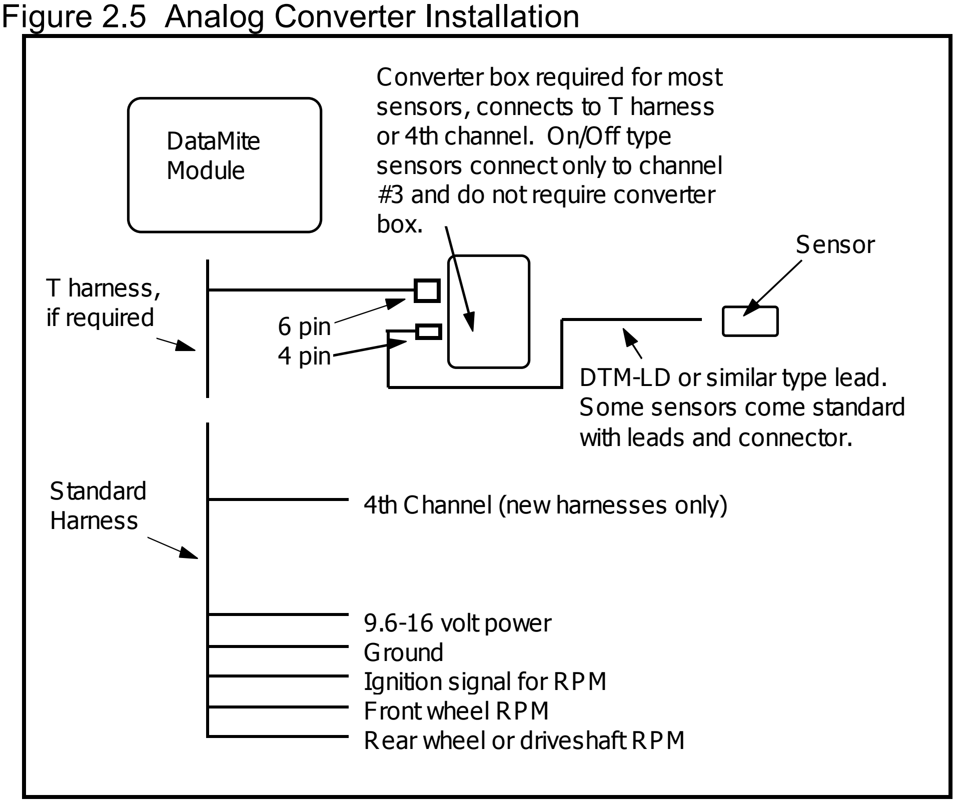


Figure A2.6 Hardware Options

Figure A2.7 Alternate Sources for Ignition Signal for Engine RPM
NOTE: Attach yellow wire where Figure says "Red Clip"

Appendix 3: Troubleshooting Data Recording

Should you encounter problems recording data, or obtain unusual results from your recorded data, check the suggestions below.

No Data Recorded

First, check if data signals are coming to the DataMite by running the Setup Mode, discussed on page 154. Based on what you find, try the following:

DataMite Not Going Into Setup Mode

Check DataMite power. Do any of the LED (lights) come on in the control panel. Note that it may take 5 seconds or more on 128K systems, 10 seconds or more on 512K systems for an LED to light after turning power On. If not:

- First press the Clear Memory button and wait at least 20 seconds to see if an LED will light.
- Check that the power switch (if you installed one) is turned On.
- Check that your power supply is On or plugged in. Plug something else into that outlet (a light or radio) to make sure there is power there.

Press the red Clear Memory button momentarily once. The Record LED should go Off, then come On. Press the yellow Record button momentarily several times waiting about 5 seconds each time. The Record LED should switch between Off and On. If this does not happen as described, call Performance Trends.

If the Record LED ***does*** switch Off and On, try the Setup Mode again. Be sure to hold the yellow Record button down for 5-10 seconds. During the middle of this time, quickly press and release the red Clear Memory key. Try this up to 10 times to be sure the problem is consistent. If the problem persists, call Performance Trends.

DataMite Not Reading Data Signals

If the DataMite does go into Setup Mode, do the signals look as described on page 154 or in the beginning of Example 4.1.

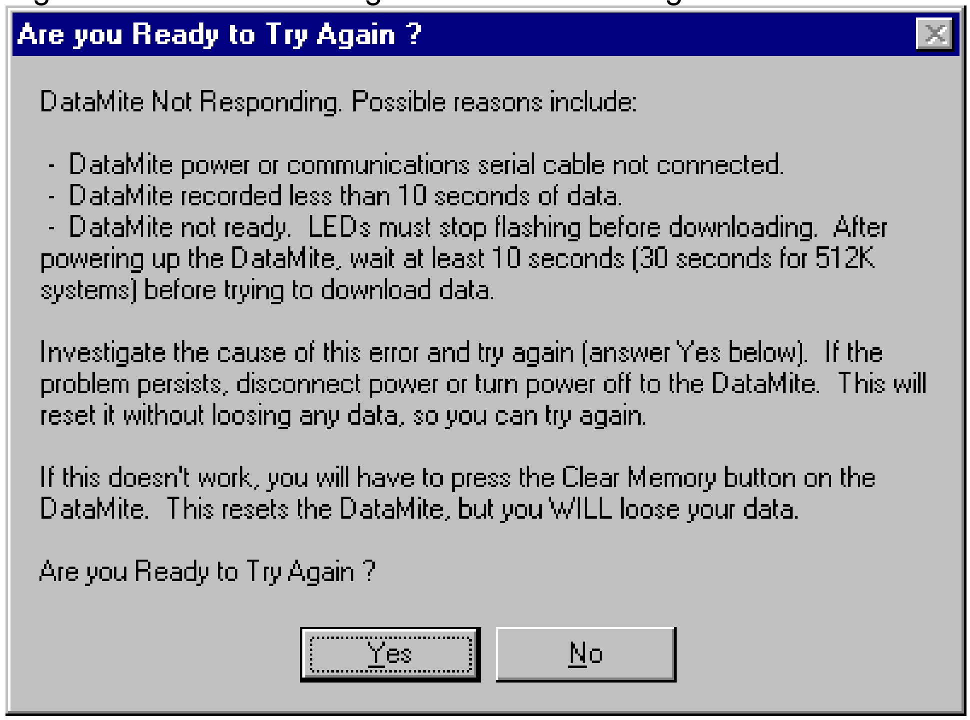
If the Engine RPM signal is not coming through:

- Yellow ignition wire has a break in the harness.
- Black ground wire in harness is not well grounded.
- You are not hooked to the correct terminal or wire in the ignition system to record RPM.
- Fault in the Inductive Pickup or Inductive Pickup harness wiring.
- Fault in DataMite module.

If other RPM signals are not coming through:

- Magnets must be adjusted closer to the sensor. (Note: Do not adjust closer than .050", or so close that the sensor may hit the magnet.)
- Leads to wheel sensors have a break in the harness.
- Black ground wire in harness is not well grounded. (A ground usually does ***not*** affect wheel RPM sensors.)
- Fault in DataMite module.

Figure A3.1 Error Message When Not Reading DataMite Data



DataMite Reading Data Signals, but Not Sending to Computer

Be sure you take the DataMite out of Setup Mode and it goes into Record mode. Record data for at least 1 minute, with at least the engine running to create engine RPM data. Follow the procedure in Example 4.1 for downloading the data. If during this downloading process, you receive the message shown in Figure A3.1, follow the suggestions in Figure 3.1 for troubleshooting.

If you have disconnected the DataMite from the dyno and the main harness to download at a computer away from the dyno, be sure the DataMite's power supply is connected and On.

Only Some Data Recorded

This would be situations where the DataMite starts a run recording data, then during the run it stops recording:

> If both LEDs start flashing on the control panel, the DataMite has become "confused" and has "locked up", much as your computer can "lock up". This is usually caused by electrical noise from the engine, a noisy "unsteady" power source, bad wiring connections, or a bad or intermittent ground. Turn the Power Off, then On to "reboot" the DataMite.

On earlier DataMite systems, vibration of the control panel could actually "false push" the Record button, stopping recording. Try mounting the control panel away from vibration. Also, current DataMites have a built in delay time in the buttons, which means you must press and hold the button down for a half second or so. This is also to prevent "false button pushes" from vibration.

RPM Data Recorded, but Looks Bad

RPM Data Noisy or Jumpy

See Figures 2.46 and 2.47 on pages 78 and 79 for examples of "noisy" data versus "noise spikes". See Section 2.10 for the process to Edit Out 'Noise' Spikes. If an occasional noise spike appears in your data, this is normal (1-30) per test. Simply use the program's Edit feature to get rid of them.

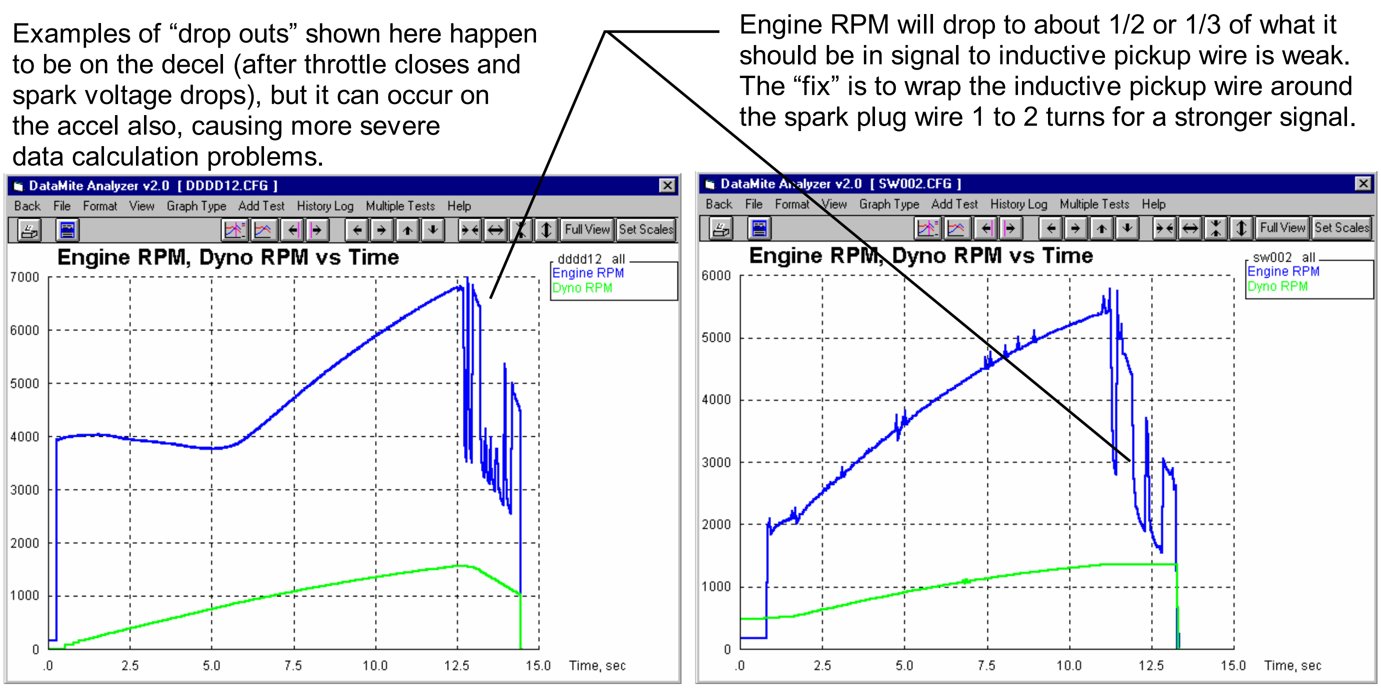
Filtering is designed to help "noisy" data. See pages 92 and 93. However, if the problem is severe or if it is possible to eliminate either the noise or 'noise spikes', the following suggestions may help.

For engine RPM, this can be caused by:

- Electrical "noise" from ignition system. See Noise Sources described below.
- Point ignition systems can cause problems at high speed where the points can "bounce" which looks like additional spark firings. The engine will not run poorly since the first bounce fires the plug correctly. This problem is identified when:
  - RPM looks correct at relatively low RPM, 1000 - 3000 RPM.
  - At higher RPM, the computer reads RPM too high, say the tachometer says 5000 but the computer reads 6000.

  This problem can be corrected by switching to new or higher spring tension points.
- Even though the Setup Mode seems to show engine RPM signals are entering the DataMite, the source of the ignition signal may not be as correct as possible. Refer to ignition signal sources described in Appendix 2.
- If you are using an Inductive Pickup, with a wire tied to the spark plug wire, the signal may be too strong or too weak. See Figure A3.2.
- On some applications, where engine RPM can actually be quite variable from firing to firing (like single cylinder engines at lower RPM or when running rough), Performance Trends has a different DataMite chip which may correct this problem. Contact Performance Trends for details.
- If your engine has an unusual ignition system (very new production system, "distributorless", etc.), there may ***not*** be a clean signal the DataMite can use. NOTE: THE STANDARD DATAMITE IS NOT DESIGNED TO WORK WITH MAGNETO OR UNEVEN FIRING IGNITION SYSTEMS.

Figure A3.2 Examples of Engine RPM “Drop Out” from Inductive Pickup



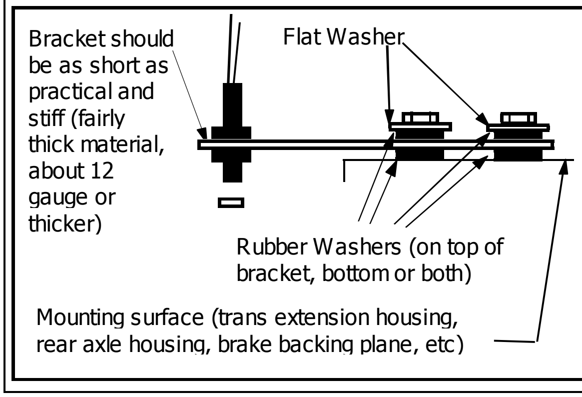
If the inductive pickup signal is too strong (you wrap the spark plug wire too many times), you may not be able to record Engine RPM at high RPM. Engine RPM may drop in half or all the way to 0 RPM.

For other RPM signals using wheel speed sensors, the problem may be:

- Unevenly spaced magnets will cause noisy or jumpy data (not noise spikes). See Appendix 2 about magnet spacing.
- The sensors may be getting hot. If the problem appears Ok when you first start, but get noisy when the engine heats up, this is likely the problem. You may have to position the wheel sensors away from the brakes, or possibly the exhaust.

- You may be specifying the wrong # magnets in the DataMite Specs menu.
- A magnet may have fallen off.
- There may be metal debris or shavings on the magnets.
- The sensor may be "false triggering" due to vibration. See Figure A3.3.

Figure 3.3 Mounting Suggestion to Avoid Vibration Problems



Eliminate Electrical Noise Sources

There can be several sources of electrical "noise" which can look like additional spark firings to the DataMite. The major source is from the spark plug wires. Solid core wires can produce noise to the DataMite just as they do to an AM radio. Switch to resistor or suppresser spark plugs and plug wires. Also check that the spark plug gap is proper and the spark is not arcing somewhere, for example around a fouled plug. Running the engine in the dark can show up arcing plug wires.

Try to position the yellow Ignition lead and any other DataMite cables away from the plug wires, other ignition components, etc. Position the DataMite away from the fire wall, engine, or ignition system.

If the noise problem still persists, try shielding the yellow ignition lead and/or possibly the leads to the wheel sensors. Wrap with aluminum foil or cable shield available from electronics stores and attach a wire from the foil or shield to a good dyno frame or engine ground.

Use a "clean" (steady) power source which can maintain 9-16 volts. A battery is excellent source if you wire directly to the battery. Do not power the DataMite from a terminal which also powers the ignition system, as this will be very unsteady.

Use a "solid" ground source. Do not ground the DataMite to a terminal which also grounds the ignition system, as this will also be very unsteady.

Make sure the engine is well grounded to the dyno frame and the dyno frame is well grounded to earth. This would mean a large ground strap which connects to a ground rod driven in the ground, or (2nd choice) a copper or at least metal cold water pipe.

RPM Data Looks OK but Too High or Too Low

If engine RPM looks like it is exactly half a high, one third as high, three times too high, etc as it should be, read the definitions for # Cylinders and Engine Type on page 43.

The DataMite's microprocessor is constantly trying to make sure Engine RPM is clean and free from errors. If engine RPM is changing VERY rapidly (for example on engine start up, from 0 RPM then it "flares up" to 3000 RPM), the DataMite may not think this is possible, and can jump into a "half RPM mode" or "third RPM mode" by mistake. Usually the DataMite will recover from this by itself if you run normal RPMs for a while (a few seconds).

With Inductive Pickup signals, if the inductive pickup signal is too strong (you wrap the spark plug wire too many times), you may not be able to record Engine RPM at high RPM. Engine RPM may drop in half or all the way to 0 RPM.

For the other RPM signals, the problem may be:

- You may be specifying the wrong # magnets. See page 44.
- A magnet may have fallen off.

- Wrong calibration for an Analog channel. See Appendix 5.

Recorded Data Good, Calculated Data Bad

Calculated data includes these types:

Torque
HP
Clutch Slip

These data types are all based on the settings in the Test Conds, DataMite and Dyno Specs menu. Check these settings and their definitions in Section 2.3, 2.5 and 2.6.

If the problem appears with the graphs, be sure you are reading the graph correctly. Sometimes data types are multiplied by 10, 100, etc so data types which are very different can show up on the same plot. For example, 15 ft lbs of torque may be multiplied by 1000 so it shows up well on a graph which also includes Engine RPM up to 15,000. Use the Cursor option to read the graphs which corrects for the multiplier. See page 98. Or make a report of the data type to eliminate the need for any multiplier.

Calculated data types usually need some filtering. If the calculated data looks noisy or jumpy, increase the filtering level to Medium or Heavy. See Figure 2.46 and 2.47 on pages 78 and 79, and Figure 3.14 on page 93.

If the problem is with Clutch Slip, check that the Gear Ratio is correct in the Dyno Specs menu. See Section 2.6.

If torque and HP look too jumpy:
- The magnets may not be evenly spaced.
- There may be some or even just 1 very minor noise spike in the inertia wheel RPM. See Figure 2.46 on page 78 to see how even the most minor "noise spike" can significantly affect calculated torque and HP.
- The acceleration test is happening too fast. Generally you want a test to take at least 6 seconds for an acceleration. To slow down the acceleration, select a numerically lower Dyno Gear Ratio (for example, switch from a 6.00 ratio to 4.50 ratio).
- Erratic engine RPM signal, especially if HP looks smooth and torque is jumpy.
- See if the trend repeats on a 2nd test. If the hills and valleys keep occurring at the same RPM, the "jumps" may be real.
- Try a higher filtering level. Most torque and HP curves need Filtering set to at least Light (some)
- Try graphing the torque and HP vs Time in seconds. If it looks much more smooth then, contact Performance Trends about this unusual data file.

If torque and HP look too low or too high:
- First, check the other suggestions in this section, RPM Data Good, Calculated Data Bad.
- Double check all your DataMite and Dyno Specs entries. Check Sections 2.5 and 2.6.
- If Observed torque and HP look OK, but Corrected look wrong, check the Weather Specs in the Test Conds menu. See Section 2.3.
- Your engine may not be typical, for example a very low powered engine with a very heavy engine flywheel and/or crankshaft.
- Your dyno may have considerable frictional losses that you are not accounting for correctly. See Coastdown Test in Example 4.1.
- Your tests may be correct, but the tests you are comparing to may be wrong. Many dyno operators tend to report numbers higher than are real, to make their customers "happy".

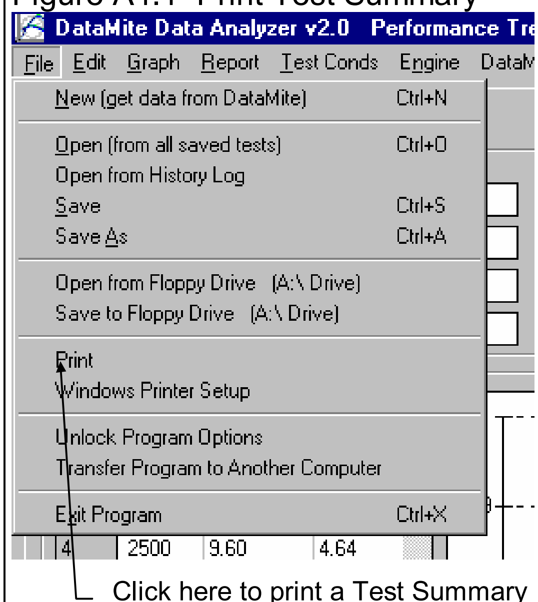
Appendix 4 Backing Up Data

Backing up data means to make more than one copy of the data which can be used or referred to at a later date. This may be needed in the event one copy becomes lost or erased, or you need room in the Test Library. Backing up data can take 2 basic forms:

Paper Reports
Copying files with Windows copy commands

Other than making Paper Reports, backing up data requires knowledge of Windows File Manager (3.1) or Windows Explorer (95, 98, NT) commands. Unless you are experienced with Windows commands, have someone experienced with Windows assist you to prevent losing data.

Figure A4.1 Print Test Summary



Paper Reports:

If you already keep written copies of all dyno tests you perform, you already understand this form of backing up data. You could continue to do this by simply clicking of File, the Print at the Main Screen to print a summary of each test.

Disadvantage of Paper Back Ups:

For example, say you have accidentally erased a Dyno Test File but have a paper report of that data. There is no way to re-enter the DataMite data. You won't be able to recalculate that data, correct the data to a new Weather Conditions, compare new data to this old data, etc.

Copying data to disk with Windows commands:

This method is the preferred method. If you are not familiar with Windows commands, have someone help you the first couple of times. However, ***this is the most reliable and most efficient way to back up your data.***

Note: Unless stated otherwise, all mouse clicks are with the normal, left button on the mouse.

To copy Entire DTMDATA Folder using Windows 95, 98 or NT, which contains all folders and test files in the Test Library:

Click on Start, then Programs, then Windows Explorer (usually at the bottom of the list of programs). You will obtain the Windows Explorer screen shown in Figure A4.2.

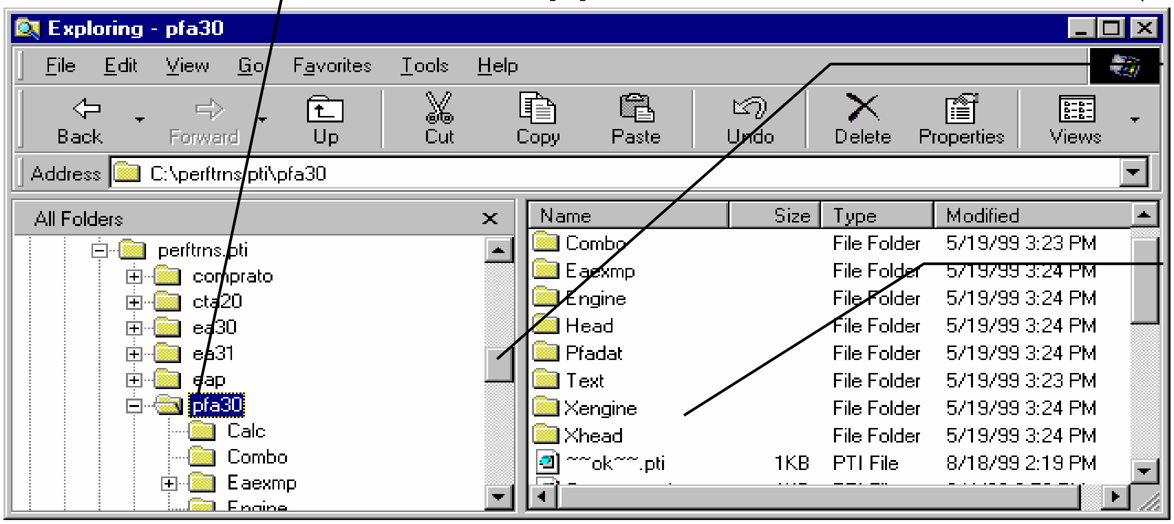
Locate the PERFTRNS.PTI folder (may not be printed in capital letters) on the left side of the Windows Explorer screen, usually on the C drive. Click on the [+] sign to the left of it to display the contents of the PERFTRNS.PTI folder.

You should now see the DTM20 folder. Click on the [+] sign to the left of it to display the contents of the DTM20 folder.

You should now see the DTMDATA folder. Right click on the yellow DTMDATA folder icon to display the menu of options. Click on the Copy command to copy this entire folder (all test files in the standard Test File Library).

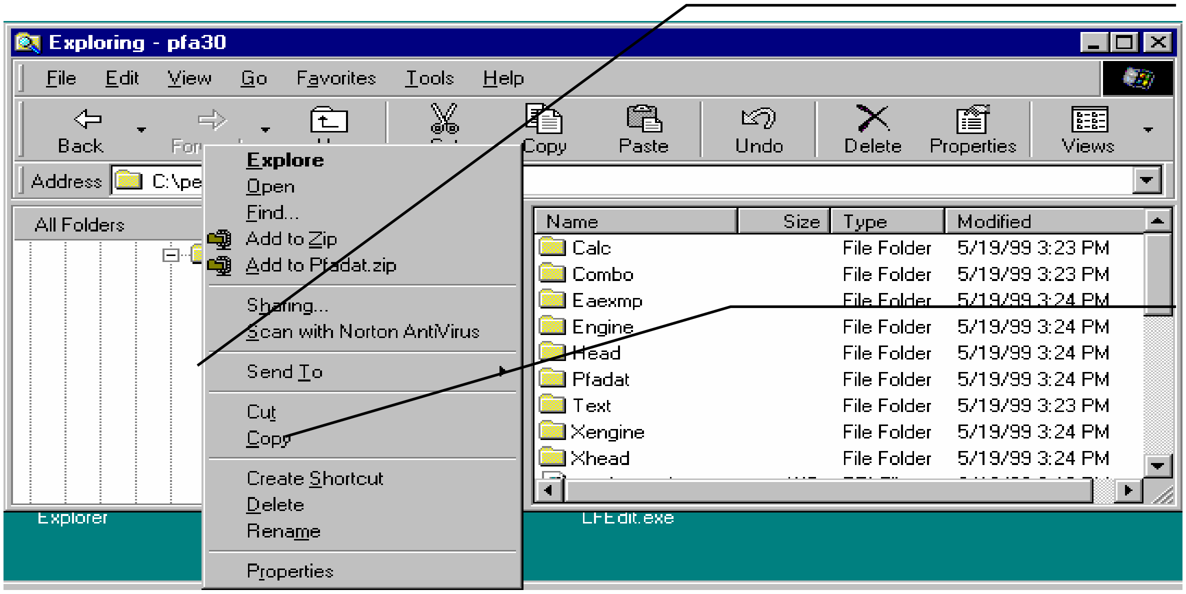
Figure A4.2 Copying Files with Windows 95, 98 or NT Windows Explorer

Find the DTM20 folder under the PERFTRNS.PTI folder, usually on the C drive. Click on the [+] box to the left of a folder to show its contents (folders).



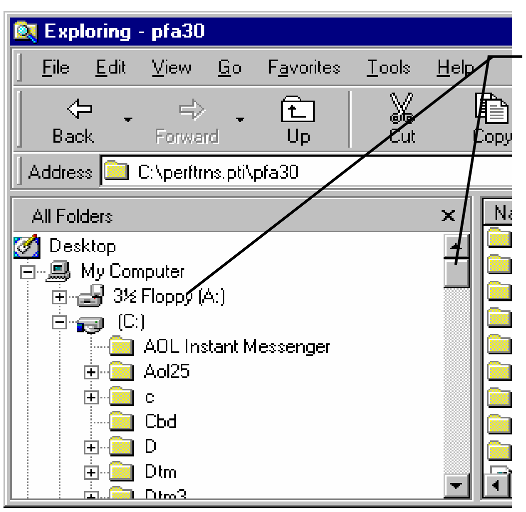
Click and drag the slide bar button to move up and down the list of folders.

The contents of the open (clicked on) folder on the left is shown here, including both folders and files.

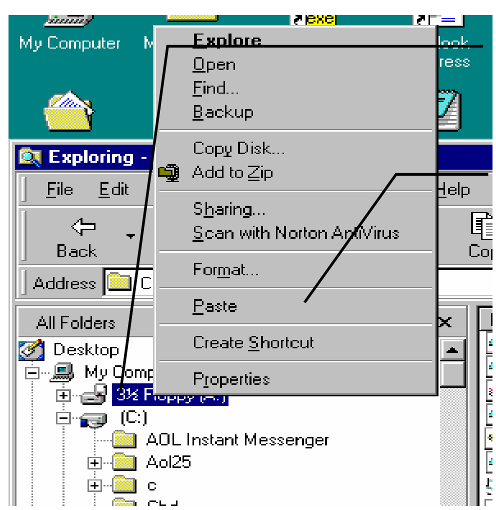


Right click (with the right mouse button) on the DTMDATA folder (not seen here) to open a menu of options.

Click on Copy to copy the entire contents of the DTMDATA folder (the entire test file library). DO NOT click on Cut.



Drag slide bar to the top of the list to find your Floppy disk drive (usually A)



Right click on the Floppy drive icon.

Then click on Paste to paste whatever you copied (in this example, the entire DTMDATA folder) to the disk in the Floppy drive.

Now you must tell the computer where you want to copy the files to. Click and drag the slide bar for the left section of the Windows Explorer screen to the top. (You can also click on the up or down arrow buttons on the slide bar.) Look for the Floppy Drive icon, usually the "A" drive. Put a new, formatted disk in the floppy drive. Then right click on the Floppy Drive icon, and select Paste from the list of options. You will see the floppy drive light come on as the entire DTMDATA folder and all its contents are copied to the floppy disk. Label this disk with something like "DTMDATA folder, xx/xx/xx" with a name and date.

Notes:

If you have so many tests in the Test Library, they may not all fit onto 1 floppy disk. Windows Explorer will tell you this and ask you to insert another new, formatted disk. If this happens, be sure to label all disks with a name, date and sequential #s, and keep the entire disk set together. A suggestion for novice computer users is to make each folder under DTMDATA a separate floppy disk. This may require more floppy disks, but will make it easier to understand restoring just certain folders in the future.

You may just want to back up one particular folder in the test library (in the DTMDATA folder) or just 1 particular test. You would do this the same as with copying the entire DTMDATA folder, just click on the [+] by the DTMDATA folder to display the folders under DTMDATA. Then right click on the folder you want to Copy. To find individual test files, click on the yellow folder icon containing the test file and the contents of the folder will be shown on the right side of the Windows Explorer screen. Then right click on the test file name and select Copy. Note that each test file is made up of 3 files, a .CFG, a .DAT and a .LAP file. All 3 files must be copied for the Dyno Test to be copied. For example, if the test file in question is called Briggs04, you must copy the Briggs04.CFG, Briggs04.DAT and Briggs04.LAP files.

You can also copy individual test files to the floppy drive inside the Dyno DataMite Analyzer program. Open the file you want to copy so it is the current test file. Then click on File at the top of the Main Screen, then select Copy to Floppy Disk. This command takes care of all 3 files mentioned in the previous paragraph automatically.

More experienced computer users may want to use the "Backup" features built into Windows 95 and 98 (click on Start, Programs, Accessories, System Tools, Backup). This compresses test files so it takes fewer floppy disks. However you need to use the Backup program to restore test files, which can be more confusing to novice computer users.

Restoring Data

Be very careful when restoring data, as you may overwrite Test Files with old, erroneous information. Read all the information below before restoring data. If you are not familiar with Windows Explorer, have someone more experienced help you.

The ONLY reason to restore data is if you have lost test files. This could be because you mistakenly erased it, you had a major computer failure, or you are moving the program to another computer. Do NOT restore data unless you have one of these problems, as you could possible create many more problems than you are trying to fix.

When restoring test files and folders, you pretty much reverse the procedure for backing up. First you put your backed up floppy disk in the floppy drive. Then open Windows Explorer, find the Floppy drive icon and click on it to display its contents. Right click on the folder you want to restore and select Copy.

Now find the DTMDATA folder under DTM20 under PERFTRNS.PTI, usually on the C: drive. Right click on the folder ***1 level up*** from the folder you are restoring. For example, if you are restoring the test file folder CHEV which was in the DTMDATA folder, you must click on the DTMDATA folder. If you are restoring the entire Test Library folder DTMDATA, you must click on the DTM20 folder. If you are restoring the test file 194-150 which was in the CHEV folder under the DTMDATA folder, you must click on the CHEV folder.

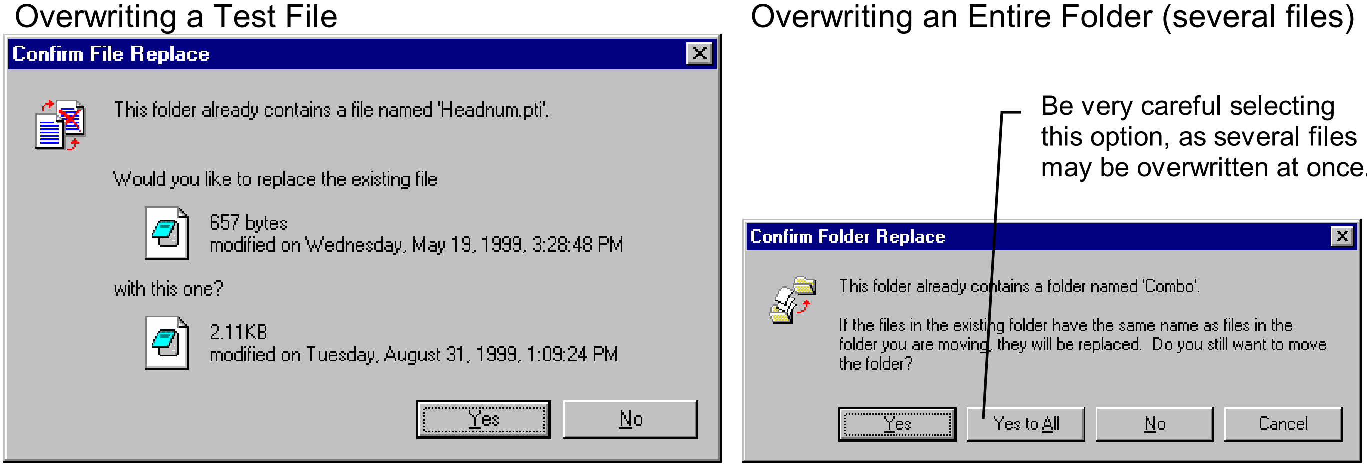
During the restoring (copying) process, Windows Explorer checks to see if it is overwriting an existing file (Figure A4.3). If it is, it will ask you if the existing file or folder should be overwritten. Be very careful when overwriting files, as you may overwrite a new test file with data from an old test file of the same name.

Before restoring test files, it is good practice to back up all test files first. Then if you make a mistake, and overwrite test files you didn't mean to, you have your backup copies to restore the test files from.

Figure A 4.3 Windows Explorer Warnings when Overwriting Test Files

Overwriting a Test File

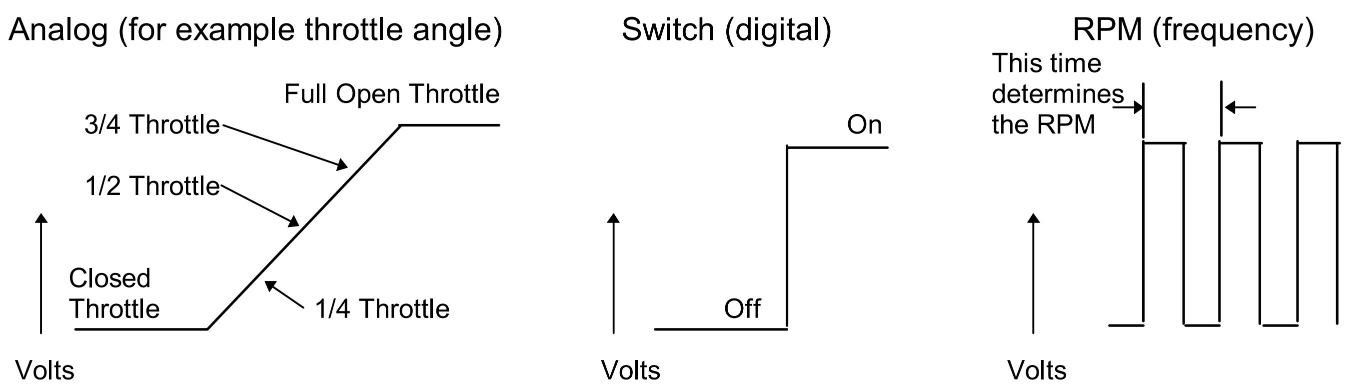
Overwriting an Entire Folder (several files)



Appendix 5 Calibrating an Analog Sensor

An analog sensor is one that records a signal that can gradually and continually change. In contrast, a switch signal is either On or Off, not 95% open, then 94% open, etc. An RPM signal is a series of switch openings and closings. How close these changes come together determines the RPM. See Figure A5.1.

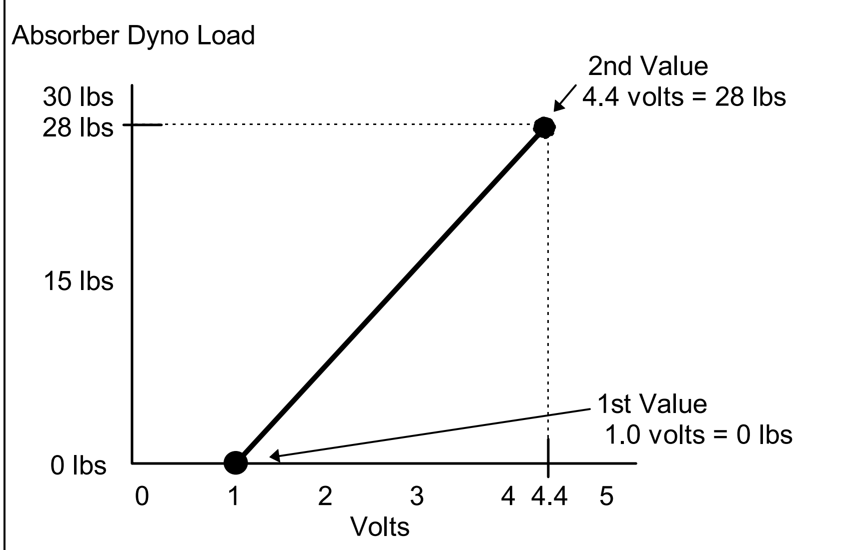
Figure A5.1 Examples of Various Types of Sensor Signals



Switch Sensors and RPM Sensors do not require much calibration. Tell the program if either high or low voltage is opened or closed, or On or Off and the switch channel is calibrated. Just tell the program how many pulses you get on 1 revolution of a shaft, and the RPM channels are calibrated. These 2 types of channels are not usually in error just some. It is usually very obvious if there is a calibration error (like specifying the wrong number of magnets on the dyno inertia wheel).

Analog signals are more complicated. In the example above, the close throttle position could occur at .48 volts and the full open throttle could occur at 4.73 volts. Or the close throttle position could occur at 3.21 volts and the full open throttle could occur at 1.76 volts. Just about any 2 combinations of conditions could happen. If you don't tell the computer the correct combination, the data may be off just a little bit, or be completely wrong.

Figure A5.2 Illustration of a Analog Sensor Calibration



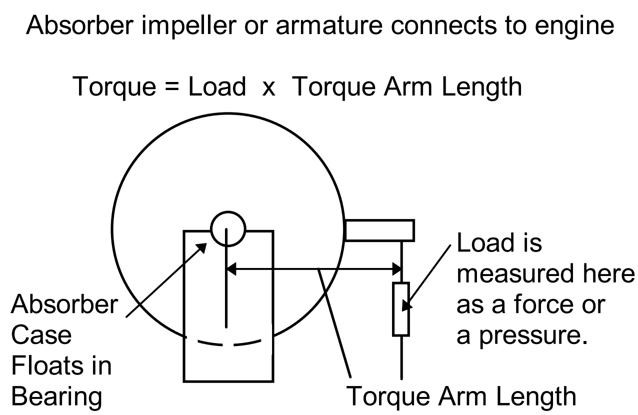
The process of telling the program these 2 combinations is called ***calibrating the sensor.*** This is done in the DataMite screen, as described in Section 2.5.

In the standard 4 channel DataMite, analog sensor signals must be conditioned by an Analog Converter, which converts the analog signal into a frequency, similar to an RPM signal. However as far as you, the user, are concerned, it functions just like an Analog Sensor shown in Figure A5.1.

Example of Calibrating the Torque Arm of an Absorber Dyno

An absorber dyno is described in Section 2.6.1. It measures torque through a load sensor on its torque arm. The torque is the combination of the load at the torque arm times the length of the torque arm. See Figure A5.2. As with any calibration, you must put at least 2 known inputs into the sensor and then see how the DataMite reads the signal from the sensor. These are the 2 combinations mentioned earlier.

Figure A5.3 Torque Arm Type of Dyno

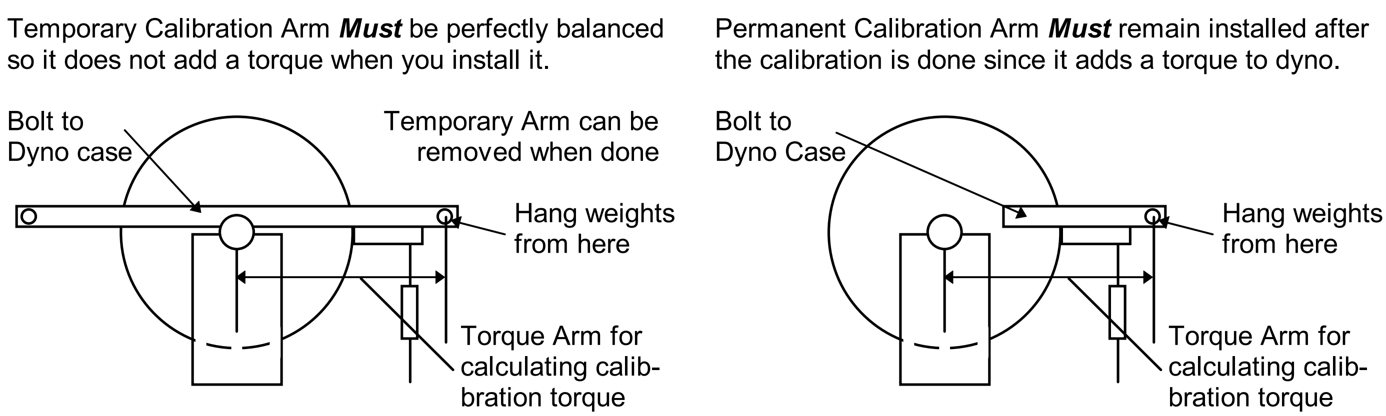


For the torque arm load, one input is easy. That is zero torque. With the engine not running, preferably not hooked up to the dyno, the torque arm load should be zero.

The second combination is more complicated. You must put a known load or torque on the dyno. The best way to do this is to hang known weights on the dyno a known distance out from the center of the dyno. Knowing the weight and the Torque Arm distance, you can calculate the torque you put on the dyno.

You may have gotten a “calibration kit” with your absorber dyno to do this. If not, you will have to make one. There are basically 2 ways to do this shown in Figure A5.4. If you bolt a calibration arm to the dyno case, you will probably add a certain amount of torque to the dyno unless the arm is perfectly balanced from side to side. The additional weight of the arm does not matter as it is absorbed in the bearings holding up the dyno itself.

Figure A5.4 Types of User Fabricated Dyno “Calibration Kits”



The permanent Calibration Arm method of Figure A5.4 is more accurate as you don’t have to be so exact about the balance of the calibration arm. If you choose that method, be sure the arm does not stick out so much you keep banging your knee into it!

You will also need a known weight that will put you in the upper end of the torque range you will be measuring. For example, if you want to measure up to 100 ft lbs of torque, and the Torque Arm of your calibration arm is 15” long (out from the center of the dyno), you would need a weight of about 80 lbs:

$$\text{Required Calibration Weight} = \frac{\text{Desired Torque}}{\text{Calibration Torque Arm in Feet}}$$

From the example above

$$\text{Required Calibration Weight} = \frac{100}{15 \text{ inches}} = \frac{100}{15 / 12} = \frac{100}{1.25 \text{ feet}} = 80 \text{ lbs}$$

This calibration weight can be most anything without moving parts that will hang straight down without moving that you can weight to get its exact weight. This could be a compact chunk of metal, an engine crank damper with a hole on 1 edge so it hangs steady, etc. Be sure to include the weight of the hanger in the calibration weight.

Do not try to obtain some exact weight which produces some even amount of torque. In the example above, a weight of 77.4 lbs would produce just as accurate a calibration as one that was exactly 80.0 lbs. The 77.4 lb weight would produce a torque of 96.75 ft lbs. Since you tell the program the exact torque, 96.75 is a perfectly accurate answer.

Calibration Procedure

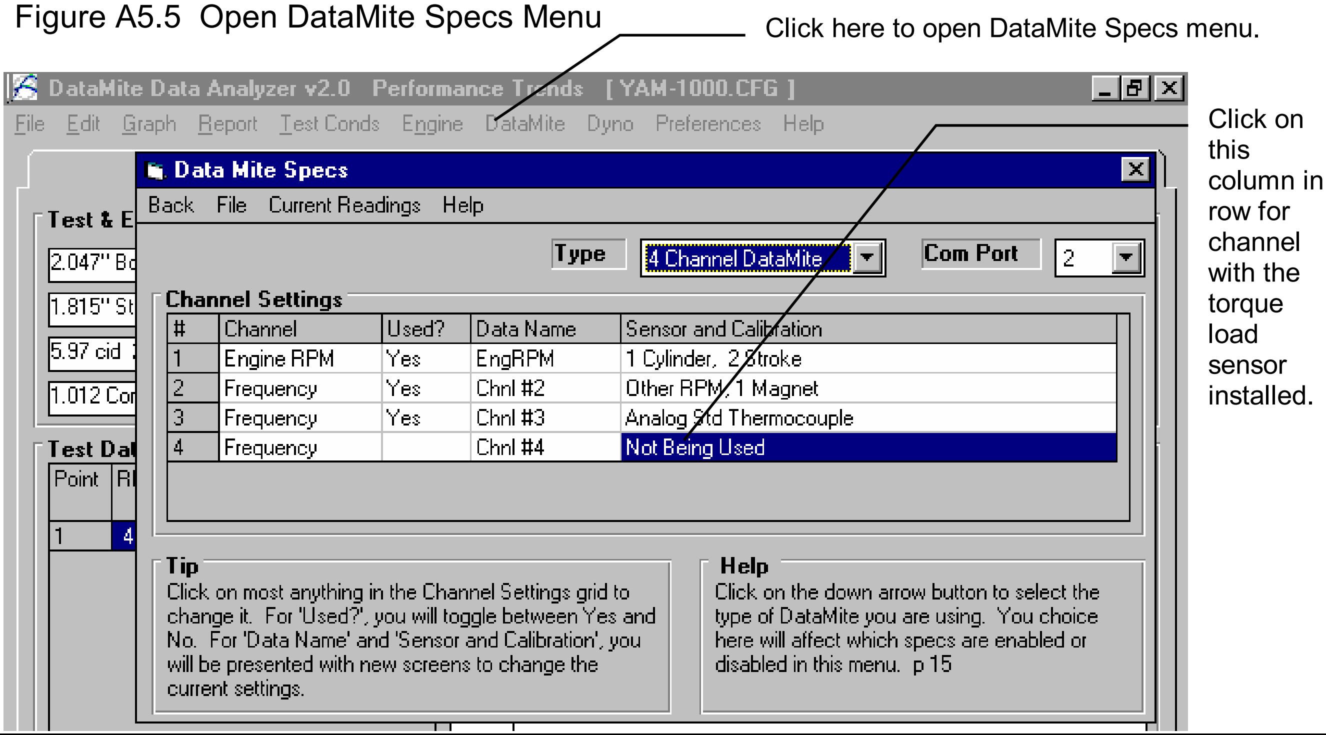
1) Turn on the DataMite to Read the Torque Sensor Channel

This procedure assumes you have installed the load cell or pressure sensor which will read the load arm force as shown in Figure A5.3. Follow the instructions with the sensor for wiring and mechanical hookup. Turn on the DataMite and let the system warm up.

2) Pick the Analog Channel from the DataMite Specs Screen

Click on the channel with the torque load sensor installed as shown in Figure A5.5 This will open the Calibration Screen shown in Figure A5.6.

Figure A5.5 Open DataMite Specs Menu



In the calibration screen of Figure A5.6, select Analog Converter as the Sensor and Dyno Tq as the Sensor Type. Dyno Torque is a special channel name reserved just for Absorber dynos. You will notice the lower section called Analog Sensor Specs become enabled ***When you are done with the calibration, be sure to set the Torque Measurement type in the Dyno Specs screen to Torque Arm.***

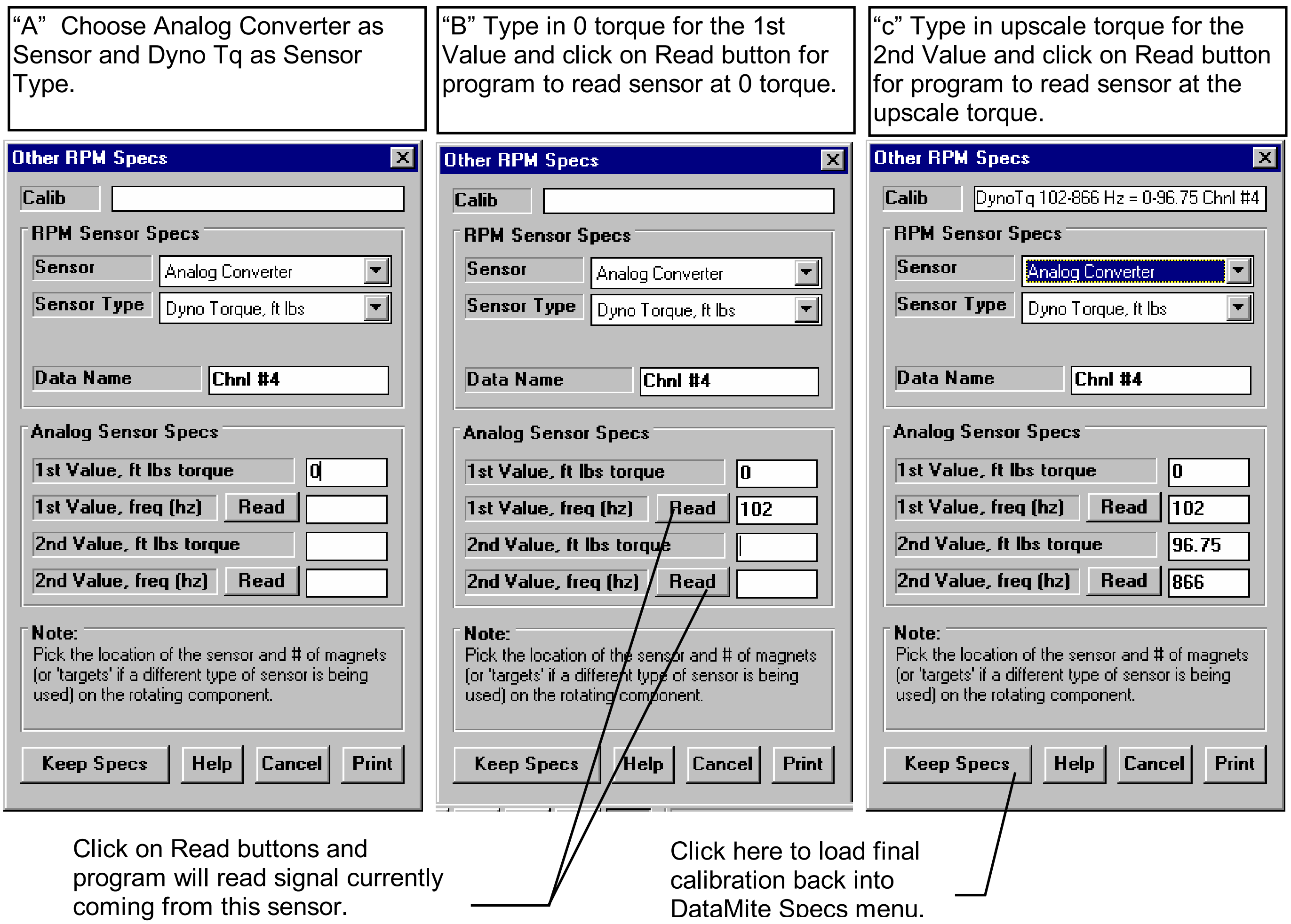
3) Obtain a Zero Reading

A dyno torque calibration is best done with the engine not connected to the dyno. Then with no calibration weights hung from the calibration torque arm, the dyno should be at zero torque. You might want to push down slightly on the calibration arm, then pull up slightly to "free up" any "stiction" in the system.

Type in 0 for the 1st Value, ft lbs torque in the calibration screen.

Then click on the Read button for 1st Value, Freq (hz) and the program will read the signal from the sensor with 0 torque. It will store this reading as the 1st Value, Freq (hz) where you can see it.

Figure A5.6 Calibration Menu for Torque Sensor Using Analog Converter



4) Obtain an "Upscale" Reading

Figure out ***EXACTLY*** the torque produced when you add the Calibration Weight and its hanger to the Calibration Torque Arm.

Calibration Torque = Calibration Weight x Calibration Torque Arm Length

In the example above this would be:

Calibration Torque = 77.4 lbs x 1.25 feet = 96.75 ft lbs

Type in 96.75 for the 2nd Value, ft lbs torque in the calibration screen.

Hang the 77.4 lb weight in the Calibration Arm hole that is 15" (15 / 12 = 1.25 feet) out from the center of the dyno. ***Note that the measurements of 77.4 lbs and 15" are just examples. Your numbers for your system would likely be very different.***

Then click on the Read button for 2nd Value, Freq (hz) and the program will read the signal from the sensor with 96.75 ft lbs of torque. It will store this reading as the 2nd Value, Freq (hz) where you can see it.

5) Save the Calibration

In Figure A5.6 "C" you will note the calibration shown at the top of:

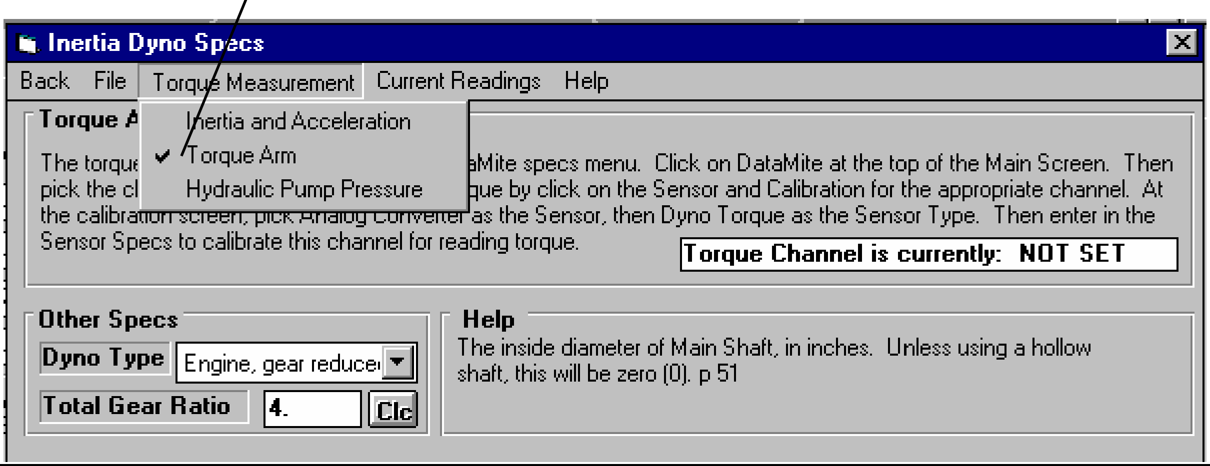
Dyno Tq 102-866=0-96.75 Chnl #4

This is the information the program will use to figure out how much torque is produced from a certain sensor signal. Click on the Keep Specs to keep this calibration and load it into the DataMite Specs "Sensor and Calibration" column for this channel.

After calibrating the Dyno Tq channel in the DataMite Specs menu, you must also assign the correct Torque Measurement type in the Dyno Specs menu. See Figure A5.7.

Figure A5.7 Assigning the Correct Torque Measurement Type for an Absorber Dyno

Click on Torque Measurement and select Torque Arm as the type for an Absorber Dyno in the Dyno Specs menu.



Notes

Other sensors are calibrated much the same as the dyno torque sensor. However, the process is not quite as complicated or critical because torque is such a critical measurement. For example:

To calibrate a throttle position sensor: With the throttle closed, type in 0 and click on the Read button for the 1st Value. Then open the throttle fully, type in 90 degrees (or possibly 85 degrees would be more exact) and click on the Read button for the 2nd Value. Click on Keep Specs and you're done.

To calibrate a pressure sensor: With zero pressure on the system (crack a line fitting to let all pressure bleed off), type in 0 and click on the Read button for the 1st Value. Then Tee in a good pressure gauge to the same source as the pressure sensor and run the system to produce some fairly high pressure. Read the pressure off the gauge and type the reading in. Then click on the Read button for the 2nd Value. Click on Keep Specs and you're done.

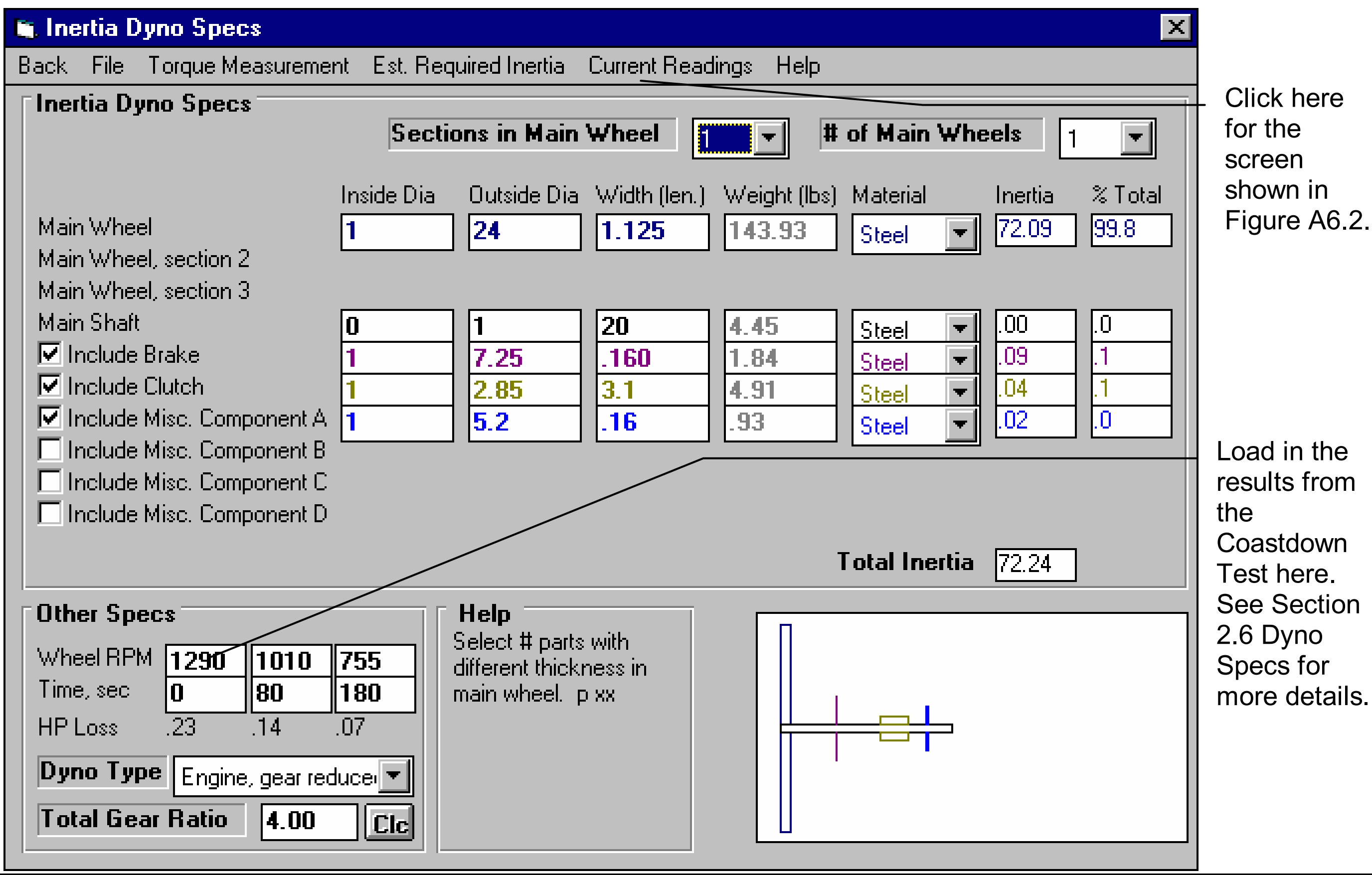
Zero is usually a good choice for the 1st Value. You want the 2nd Value to always be fairly high, at least 65% of the full range or higher. For a 200 PSI pressure gauge, this would be .65 x 200 or at least 130 PSI. For a 50 ft lb torque calibration, it should be at least .65 x 50 or at least 32.5 ft lbs.

The process above works well for Linear Sensors. A linear sensor is one where if what you are measuring doubles, the signal doubles also. Some sensors are non-linear. Future updates to the program will allow you to input curves or even tables of calibration numbers for more advanced calibrations.

Appendix 6 Coastdown Test

A coastdown test for a inertia dyno is one where you bring the dyno inertia wheel up to a fairly high RPM, and then let it coast down. The only forces acting on it are aerodynamic drag, bearing friction, and any friction on whatever else is turning, usually the chain drive also. You can take this information and load it into the Dyno Specs shown in Figure A6.1. It is critical that the engine is not attached to the dyno during the coastdown test If your dyno system has a one-way clutch, this is fairly easy to do.

Figure A6.1 Dyno Specs Menu for Loading Coastdown Results



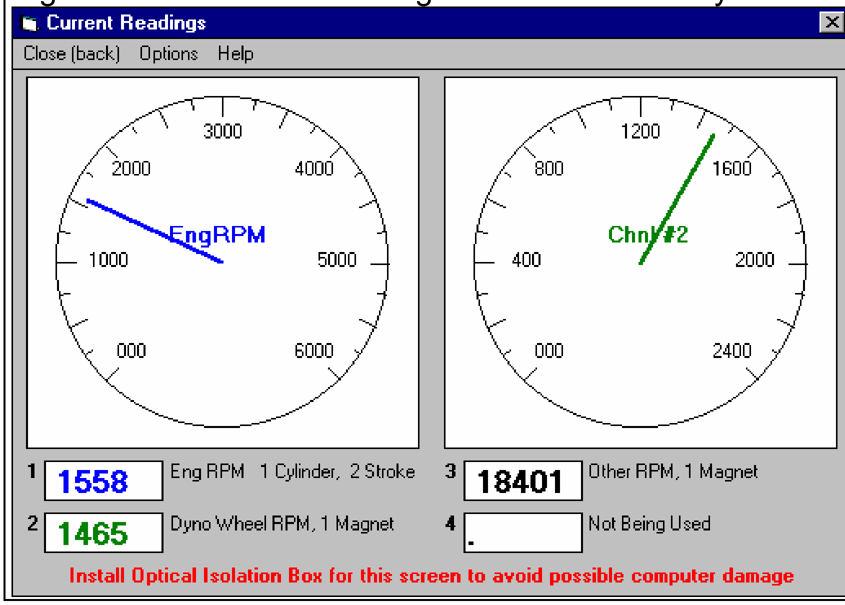
Note: If you have not done an accurate coastdown test on your dyno, it is best to enter 0 for all 6 coastdown specs to cancel out this correction.

Manual Procedure:

1. Get a stop watch and set it to zero.
2. Warm up your dyno system (spinning the wheel) to the approximate bearing temperatures you think you will see during your dyno testing.
3. Click on Current Readings at the top of the DataMite or Dyno screens to display a tachometer for the inertia wheel.

4. Accelerate the inertia wheel to the highest safe RPM you will encounter during your dyno testing.
5. Disengage the engine and let the inertia wheel coast down. DO NOT brake the inertia wheel or do anything to add drag to the system. Disengaging the engine is easy with this one-way clutch dyno because the act of simply closing the throttle disengages the one-way clutch. Note that the drag of the one-way clutch does add some drag to the system over what would normally be present, but this can not be easily avoided.
6. Soon after the wheel starts to coast, start the stopwatch and note the dyno RPM at that time. Lets say this was 1290 RPM.
7. Note the time on the stopwatch at some RPM which is about 2/3rds of the RPM at which you started. Lets say the dyno RPM dropped to 1010 RPM in 80 seconds.

Figure A6.2 Current Readings Screen to Read Dyno RPM



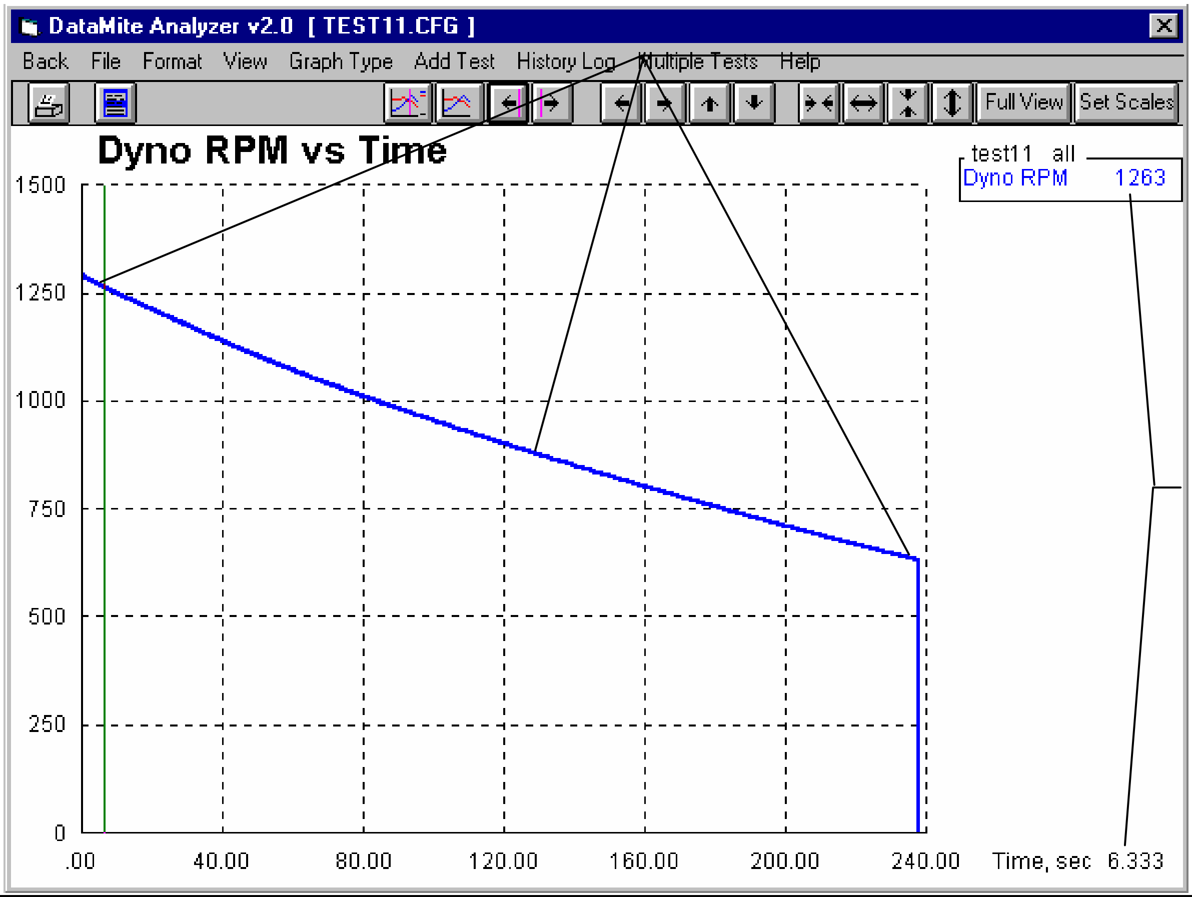
8. Stop the stopwatch at some RPM which is about 1/2 to 1/3rd of the RPM at which you started. Lets say this was 755 RPM at 180 seconds, that is 180 seconds after you started the stopwatch at 1290 RPM.
9. Type in the results from the coastdown into the Dyno Specs screen shown in Figure A6.1. Note that the HP losses calculated are typically less than 5 % of the power levels the particular dyno is intended to absorb.

Recorded Data Procedure

The Recorded Data procedure is the same as the Manual procedure shown above except you record the data with the DataMite.

1. Start the DataMite recording data by powering up the DataMite, then pressing the Clear Memory button, erasing any current data in the DataMite. Then press the Record button to pause the DataMite from recording. The Record LED should go off to indicate the DataMite is NOT recording.
2. Warm up your dyno system (spinning the wheel) to the approximate bearing temperatures you think you will see during your dyno testing.
3. Accelerate the inertia wheel to the highest safe RPM you will encounter during your dyno testing.
4. Press the Record button to start the DataMite recording data.
5. Download this data as you would any dyno test by clicking on File, the New (get DataMite data). You may want to call this Data Type a Custom, but this is not critical.
6. Graph the Dyno RPM for this coastdown test as shown in Figure A6.3. Use the cursor to find 3 points on this curve. See Section 3.3 on using the Graph Cursor. Load these 3 RPMs and their times into the Dyno Specs screen shown in Figure A6.1. Note that the HP losses calculated are typically less than 5 % of the power levels the particular dyno is intended to absorb.

Figure A6.3 Graph of Coastdown Results



Use the cursor to find the Dyno RPM at 3 different times during the coastdown. These times and RPMs should be spread out as much as possible.

Read the RPM and time at the cursor here. Note that the first time you enter in the Dyno Specs screen does NOT have to be 0 seconds, but could be 6.333 seconds shown here.

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